Horizon Europe

Grant Agreement nº 101135406

SMILE CITY

Sustainable Materials for Innovative, Low Emissions applications in the CIrcular ciTY

Co-funded by
the European Union

Start date of project: 01/01/2025

Duration: 48 months

Deliverable: D2.1

Soft mobility: current situation and future planning in the partner cities

By: City of Lucca

Due date of submission: 31/08/2025

Actual submission date:

Belonging WP: WP 2

WP responsible partner: City of Lucca

Deliverable responsible partner: City of Lucca

Revision: V 5.0

Dissemination level		
PU	**Public**	**X**
SEN	Sensitive	
CI	Classified	

This project has received funding from the European Union's Horizon Programme (HORIZON-CL6-2023-CIRCBIO-02) under grant agreement No 101135406

AUTHORS

Author	Institution
Pamela Salvatore	City of Lucca
Andrea Bulleri	City of Lucca
Simone Scortecci	City of Lucca
Sara Naldoni	City of Lucca
Philip Amaral (contributor)	ECF – European Cyclists' Federation
Ebru Akgün (contributor)	CIE – Cycling Industries Europe
Giulia Squillacioti (contributor)	UNITO – University of Turin

REVISION PROCESS

Revision	Institution	Validation date
V 1.0	All partners in WP2	25/07/2025
V 2.0	All partners in WP2	19/08/2025
V 3.0	ECF, ETRA	25/08/2025
V 4.0	ECF, ETRA	04/12/2025
V 5.0	ECF, ETRA	17/12/2025

SMILE CITY project has received funding from the European Union's Horizon Programme. The opinions expressed in this document reflect only the author's view and reflects in no way the European Commission's opinions. The European Commission is not responsible for any use that may be made of the information it contains.

This project has received funding from the European Union's Horizon Programme (HORIZON-CL6-2023-CIRCBIO-02) under grant agreement No 101135406

Table of contents

This project has received funding from the European Union's Horizon Programme (HORIZON-CL6-2023-CIRCBIO-02) under grant agreement No 101135406

This project has received funding from the European Union's Horizon Programme (HORIZON-CL6-2023-CIRCBIO-02) under grant agreement No 101135406

1. Introduction

1.1 Objectives of the Deliverable within the Project Framework

1.1.1 Purpose and role of Deliverable D2.1

Deliverable D2.1 represents a key milestone in the methodological development of the SMILE CITY project, serving as a knowledge and comparative baseline. The document aims to provide a shared reference framework on the state of soft and sustainable mobility in the participating urban contexts, interpreting the diversity of local territories in light of the common objectives established at both European and project levels.

D2.1 performs the following main functions:

- **mapping and systematization of data**: it collects detailed and updated information on existing infrastructures, services, regulatory frameworks, environmental indicators, mobility behaviours and governance strategies. The data were gathered through a structured questionnaire submitted to the project's territorial partners and developed around cross-cutting thematic areas aligned with SMILE CITY's goals. The data was further supplemented by descriptive and qualitative contributions provided directly by the project partners, thus strengthening the information base and the active involvement of local stakeholders. Further information on the process is contained in Annex III "*methodological criteria for the construction of deliverable D2.1*";
- **analysis of local plans and policies**: the deliverable explores the existence and implementation status of strategic instruments at municipal, metropolitan or regional level, such as Sustainable Urban Mobility Plans (SUMPs), Bicycle Mobility Plans or measures embedded in Climate-Energy Plans. The analysis also considers compliance with national or regional regulations and alignment with European-level principles;
- **definition of the starting conditions**: a synthetic and analytical profile is developed for each partner city, supporting the design of the pilot actions foreseen in subsequent Work Packages. These profiles include both quantitative indicators (e.g., length of cycling paths, bike usage, accident rates) and qualitative assessments of challenges, priorities and development potential;
- **support for comparing local contexts**: the deliverable provides a structured framework to highlight similarities, differences and complementarities among partner cities. This comparative lens fosters exchange of good practices, transfer of solutions and the creation of a shared project vision;
- **creation of a monitoring baseline**: the collected data serve as a reference point for future monitoring of the evolution of soft mobility, both locally and across cities, particularly in relation to the experimental actions carried out in the project.

The data collected serve as a reference point for monitoring the evolution of soft mobility over time, including in relation to the experimental actions implemented in the project.

The core of the document is represented by Chapters 3 and 4, which aim to enhance the comparative and multidimensional nature of the collected data, by exploring strategic planning and policies, existing infrastructures, digital tools, road safety, environmental impacts and future visions through the inputs

This project has received funding from the European Union's Horizon Programme (HORIZON-CL6-2023-CIRCBIO-02) under grant agreement No 101135406

gathered and elaborated by the partner cities. This structure allows the document to highlight shared convergences, criticalities and context-specific opportunities within each thematic section, which are then translated into the specific target areas of each city in Chapter 4. **Chapter 3** is organized around a set of cross-cutting themes that span all participating cities, such as the presence and implementation of Sustainable Urban Mobility Plans, environmental and climate data, intermodality solutions, the use of digital tools for mobility and data collection, the social dimension of mobility, as well as accessibility and safety concerns. Each topic is developed through a concise and reflective analysis that identifies similarities, innovative practices, common challenges and areas for improvement, offering a solid basis for comparison and future development. **Chapter 4** provides a vertical reading for each of the partner cities, highlighting their urban features, key data and strategic elements. Each urban profile includes a description of demographic and territorial context, current policies, main cycling infrastructures, recent investments and local priorities, enabling a deeper understanding of each city's specificities, strategic vision and starting conditions for the actions planned in the SMILE CITY project.

1.1.2 European project references: experiences and best practices

This deliverable fits into a broader European framework where soft mobility is increasingly recognized as a cornerstone of the urban ecological transition. In recent years, numerous projects funded under Horizon 2020 and Horizon Europe have contributed to the development of knowledge, operational models and tools to support the expansion of cycling, e-mobility and lightweight multimodal systems in cities.

In this context, a review was carried out of European projects that are thematically and strategically aligned with Deliverable D2.1. It is important to stress that the listed projects do not serve as direct sources of tools or design approaches used in SMILE CITY. Rather, they offer useful references for contextual analysis, comparison and in-depth exploration.

The projects were selected based on two main criteria: their thematic relevance to the objectives of D2.1 (e.g., sustainable mobility, cycling, intermodality, planning, e-bike systems, governance) and the presence of shared or similar partners (at city or national level) with SMILE CITY.

The most relevant include:

- *UPPER – Unleashing the Potential of Public Transport in Europe:* focused on integrating cycling with public transport, involving cities such as Rome, Oslo and Mannheim. The project provides tools to strengthen active mobility through SUMP revisions, infrastructure upgrades and behavioural change strategies;
- *MOBILITIES FOR EU*: a pilot initiative under the EU Mission for Climate-Neutral Cities. It tests smart and integrated solutions for urban mobility, including infrastructures for e-bikes and multimodal schemes. Several cities involved share similar profiles with SMILE CITY partners;
- *FLOW*: focused on assessing the impact of active modes (cycling and walking) on urban congestion using simulation models and adaptable indicators. Its approach echoes the one used in D2.1 for integrated data reading and mobility evaluation;

This project has received funding from the European Union's Horizon Programme (HORIZON-CL6-2023-CIRCBIO-02) under grant agreement No 101135406

- *Shared Green Deal*: a European co-design initiative involving schools and local stakeholders in the development of sustainable mobility solutions and community engagement methods. It offers valuable insights for local implementation and education.

The following table summarises the Horizon projects related to the SMILE CITY project, including: project title, reference years, topics addressed, relevance to SMILE CITY and useful references for further information:

Project	Years	Key Theme	Relevance to SMILE CITY
UPPER	2023–2026	Cycling–public transport integration	Aligned with SUMPs and intermodality goals; partner cities include Rome
MOBILITIES FOR EU	2023–2026	Smart infrastructure & e-mobility	Replicable e-bike and digital solutions; networks similar to SMILE CITY
FLOW	2017–2020	Impact of active modes on congestion	Provides methodology for assessing walking and cycling effectiveness
EN-UAC	2017–2020	Urban accessibility & connectivity	Focuses on inclusive mobility frameworks relevant for soft mobility
Shared Green Deal	2020–2024	Co-creation of sustainable mobility (schools)	Useful for participatory and educational approaches
VELOCARE	2025–2027	Care-related cycling and gender equity	Addresses social inclusion and cycling use in care-related travel
metaCCAZE / CIVITAS	2018–2022	Micromobility, living labs & digital urban transport	Relevant for multimodal governance and smart cycle infrastructure
NetZeroCities	2020–2024	Urban climate neutrality and mobility	Capacity-building and frameworks aligned with environmental goals
TRANSFORM	2025–2029	Behavioural change and sustainable mobility	Offers advanced insights on mobility transitions and user behaviour

Collectively, these projects offer a wide-ranging repertoire of complementary approaches, technical solutions and assessment models that enhance the methodological robustness of D2.1, while preserving the originality and territorial specificity of SMILE CITY.

1.2 Operational Definitions

To ensure interpretative coherence and methodological transparency, this section presents a selection of operational definitions referring to key concepts and terms used in Deliverable D2.1. The definitions are drawn from official European Union documents and international policy sources, and have been selected for their relevance to the objectives of the SMILE CITY project. This glossary is not intended to be exhaustive, but rather to serve as a functional reference for analysis, comparison among partner cities, and the design of future project activities.

Term	Operational Definition	Reference Source
Sustainable mobility	A mobility system that meets people's needs while respecting the environment, social equity, and safety, by minimizing negative impacts (emissions, land consumption, congestion, accidents).	EU Urban Mobility Framework (2021), EEA Report 2022
Active mobility	Transport modes relying on human propulsion (walking, cycling, scooters), promoting healthy lifestyles, inclusive public space and reduced environmental impact.	Eltis Glossary, CIVITAS Wiki

This project has received funding from the European Union's Horizon Programme (HORIZON-CL6-2023-CIRCBIO-02) under grant agreement No 101135406

Cycling	The structural and functional condition of an urban context that enables and promotes the safe, comfortable and efficient use of bicycles. It includes infrastructure, regulation, incentives and communication.	EU Cycling Strategy (2023), European Parliament Resolution
E-bike	A bicycle equipped with an electric auxiliary motor that is activated only during pedalling, up to a maximum speed of 25 km/h. It is a key solution for extending cycling to longer distances and a wider range of users.	Regulation (EU) No 168/2013
SUMP – Sustainable Urban Mobility Plan	A mid- to long-term strategic plan promoting sustainable urban mobility by integrating public transport, cycling, walking and accessibility, based on data, participation and measurable objectives.	EU Guidelines on SUMPs (2nd ed., 2019)
Intermodality	The functional integration of multiple modes of transport (e.g. bike + train) to provide efficient and sustainable travel. It requires coordinated infrastructure, services and policies.	EU Transport White Paper (2011), EEA Mobility Report
Cycling infrastructure	Urban structures dedicated or shared for cycling mobility, including segregated lanes, painted cycle paths, bike lanes, bike streets, parking facilities, charging stations and signage.	Eltis Knowledge Hub, Cycling Infrastructure Manual (EU, 2022)
Living lab	An experimental urban environment in which citizens, institutions and stakeholders co-develop, test and evaluate innovative solutions in real-life settings.	ENoLL – European Network of Living Labs
Pilot action	A short-term, small-scale experimental intervention designed to test innovations (e.g. smart cycling infrastructure, school routes, bike-bus integration) before potential city-wide replication.	Horizon Europe – Annotated Model Grant Agreement
Data collection	A systematic process for acquiring quantitative and qualitative data for mobility analysis and monitoring, including surveys, sensors, GIS tools, digital platforms and mobile apps.	EU Data Strategy for Mobility (2020), Eltis Tools

Other relevant terms

Term	Operational Definition	Reference Source
Mobility equity	The principle that mobility policies and services must guarantee equal access opportunities for all people, regardless of gender, age, socioeconomic status, disability or place of residence.	Urban Mobility Scoreboard (2023), Gender Equal Cities
Circular city	An urban model applying the principles of the circular economy across all sectors, including mobility: reuse of materials, reversible infrastructures, waste reduction, energy efficiency and regenerative design.	EU Circular Cities Declaration (ICLEI, 2020), Horizon Projects
Urban climate neutrality	The goal of achieving net-zero greenhouse gas emissions in urban areas by a set deadline (e.g., 2030), through energy transition, sustainable mobility, urban regeneration and behavioural change.	EU Mission: 100 Climate-Neutral and Smart Cities by 2030

This project has received funding from the European Union's Horizon Programme (HORIZON-CL6-2023-CIRCBIO-02) under grant agreement No 101135406

Methodological note

The consistent use of these definitions allows for easier comparison between diverse urban contexts, fosters a shared vocabulary among partners and stakeholders, and ensures internal coherence across deliverables. These terms are also revisited in later chapters, particularly the comparative analysis (chapter 3) and city-by-city reporting (chapter 4), providing a common conceptual basis.

1.3 Selection Criteria, Urban and Territorial Characteristics

The SMILE CITY project is developed within a European framework that recognizes sustainable mobility – and in particular cycling mobility – as a central lever for ecological transition, urban decarbonization, social inclusion, and digital innovation. At the European level, in recent years, an increasingly complex system of strategies, regulations, and operational tools has emerged, placing cities at the forefront of transforming mobility models.

Within this context, Deliverable D2.1 takes on the task of analysing and comparing the state of soft mobility in the project partner cities, referring to a coherent set of **European policy frameworks** that guide the critical interpretation of the collected data, support the identification of good practices, and facilitate the definition of replicable approaches in future pilot actions. A significant contribution in this regard is provided by Deliverable D2.2, which offers a systematic review of the main European cycling policies, identifying emerging trajectories, governance tools, and innovative infrastructural and digital models.

a) *European Green Deal and the Climate Neutrality Objective*

The European Green Deal, approved by the European Commission in 2019, represents the EU's long-term strategy to achieve climate neutrality by 2050. Among its priorities, the transformation of the transport sector – responsible for about a quarter of greenhouse gas emissions in Europe – is considered fundamental. The Green Deal promotes forms of clean, active, and intermodal mobility, with direct investments and legislative measures encouraging cycling, walking, and the use of low-emission vehicles.

Relevance for D2.1: provides the general contextual framework within which to interpret local cycling policies; allows assessing the degree of alignment of the partner cities with European sustainability and resilience priorities.

b) *Sustainable and Smart Mobility Strategy (2020)*

This strategic document from the European Commission outlines the vision for an intelligent, resilient, and sustainable transport system by 2050. Priority actions include developing cycling infrastructure, integrating active mobility with public transport, promoting Sustainable Urban Mobility Plans (SUMPs), and spreading digital solutions for urban mobility management.

Relevance for D2.1: offers an interpretative framework useful to analyse infrastructural and digital measures adopted in the partner cities and to evaluate the level of innovation and systemic integration of local strategies.

c) *Mission "100 Climate-Neutral and Smart Cities by 2030"*

Launched in 2021 under the Horizon Europe program, this mission aims to support 100 European cities in achieving climate neutrality by 2030 through integrated approaches, co-design with citizens, and strong

This project has received funding from the European Union's Horizon Programme (HORIZON-CL6-2023-CIRCBIO-02) under grant agreement No 101135406

technological innovation. The involved cities act as laboratories of experimentation and inspiration for the entire continent.

Relevance for D2.1: some SMILE CITY partner cities are potentially aligned with this path; the Mission provides a useful context to interpret local sustainability plans, assess the adoption of integrated approaches, and identify scalable good practices.

d) *EU Cycling Declaration (2023)*

Approved in 2023, this joint Declaration by the Commission, Parliament, and Council recognizes cycling mobility as a full-fledged transport mode and promotes its full integration into urban planning and European transport systems. It emphasizes road safety, intermodality, equitable access, and infrastructure quality.

Relevance for D2.1: provides a direct reference to evaluate the presence and effectiveness of cycling policies in the partner cities, the adequacy of infrastructure standards, safety measures, and initiatives to culturally promote bicycle use.

e) *European Guidelines on Sustainable Urban Mobility Plans (SUMPs)*

The guidelines for drafting Sustainable Urban Mobility Plans represent the main tool promoted by the EU to foster sustainable urban mobility planning. The guidelines advocate an integrated, participatory, data-driven, and goal-oriented approach with measurable objectives. Their adoption is encouraged both for large cities and smaller urban contexts.

Relevance for D2.1: partner cities are invited to describe if and how they have adopted a SUMP, providing indicators to evaluate the maturity of planning and the integration of cycling within general urban mobility strategies.

f) *Digital Tools, Open Data, and Innovation*

In line with the European strategy for digital transition, the EU encourages the adoption of digital solutions for monitoring, managing, and planning mobility, including open data, participatory platforms, apps, and artificial intelligence systems. The concept of “Smart City” is progressively linked to the intelligent use of data and the enabling of new sustainable behaviours.

Relevance for D2.1: allows analysing partner cities’ experiences in terms of mobility digitalization, integrated information management, use of platforms for civic participation, and collection of user behaviour data.

Overall, the set of European policies and strategies described above provides a coherent reference framework for interpreting the information gathered in the partner cities. It enhances the value of local specificities and enables a comparative reading aligned with the objectives of the SMILE CITY project.

The analyses included in Deliverable D2.2 show that cycling promotion in Europe is gradually evolving toward more integrated and multi-level models. The most effective policies are those capable of combining: clear and shared urban strategic plans (e.g., SUMPs and integrated visions), stable financial tools focused on environmental and social impacts, safe, continuous, and inclusive infrastructure standards, cultural, communication, and participatory initiatives that make cycling a desirable and accessible option.

This project has received funding from the European Union's Horizon Programme (HORIZON-CL6-2023-CIRCBIO-02) under grant agreement No 101135406

D2.2 also highlights that the effectiveness of cycling policies often correlates with the ability to create synergies between public transport, cycling networks, and digitalisation, with particular attention to specific target groups such as children, elderly people, commuters, and socio-economically vulnerable citizens.

These findings are highly relevant to the present deliverable, which aims to map and systematise the current state of soft mobility in the partner cities, in order to support: the design of upcoming pilot actions, the identification of replicable models in other European contexts, and the strengthening of local strategic and planning capacity.

In this perspective, a direct link emerges with what is stated in the Grant Agreement, particularly in the section "*Integration of knowledge and strengthening of competitiveness*". This section underlines the importance of cooperation among European cities to share good practices and build a common technical and strategic language on soft mobility.

The cities involved in SMILE CITY are not merely case studies, but play an active role in shaping and implementing innovative policies. They contribute to testing new approaches, digital tools, participatory models, and infrastructural strategies.

Finally, the comparative analysis presented in Deliverable D2.1 is intended to highlight: systemic weaknesses (e.g., regulatory fragmentation, lack of data, territorial inequalities), shared potentials (e.g., integrated planning, technological innovation, participatory models), and to support alignment of the partner cities with the EU's overarching goals on climate neutrality, ecological transition, circular economy, and spatial justice.

This project has received funding from the European Union's Horizon Programme (HORIZON-CL6-2023-CIRCBIO-02) under grant agreement No 101135406

2. General Framework and Local Context

2.1 Overview of the Partner Cities Involved

The SMILE CITY project, within the framework of WP2 – Design and Planning of Mobility Solutions to be Adopted, Task 2.1 Mobility Analysis, involves ten target cities located in different national and territorial contexts. These areas represent diverse administrative scales (cities, metropolitan areas, regions) and heterogeneous urban and settlement morphologies, with the aim of analysing and comparing the current state of mobility. Each target operates within a specific geographical area of reference—sometimes coinciding with its administrative boundaries, other times extending beyond—that influences its urban dynamics, development priorities, and potential for soft mobility.

The ten analysed areas offer a meaningful sample of the geographical, morphological, and settlement diversity found across European territories, with varying sizes and population densities that reflect the specificities of their respective national contexts. This comparative reading enables a nuanced understanding of both the opportunities and challenges for developing cycling mobility, in relation to urban structure and territorial organization. Below is a summary of the geographical areas targeted in this deliverable:

COD	NAT	TARGET		SUP (kmq)	INH (n.)	DEN (ab/Kmq)
13 - PERIFEREIA	EL	KRITI	Regional area	8.336	620.000	74
17 - LUCCA	IT	COMUNE DI LUCCA	City	185	88.500	478
19 - BURSA	TR	BURSA BUYUKSEHIR BELEDIYESI	Metropolitan area	1.036	3.000.000	2.896
21 - VARNA	BG	OBSHTINA VARNA	City	237	373.500	1.576
24 - IMM	TR	ISTANBUL METROPOLITAN MUNICIPALITY	Metropolitan area	5.170	13.000.000	2.515
26 - BEOGRAD	RS	GRAD BEOGRAD	City	389	1.300.000	3.342
28 - GMINA	PL	GMINA SOSNOWIEC - MIASTO NA PRAWACH POWIATU	City	91	190.000	2.088
29 - CMTO	IT	CITTA' METROPOLITANA DI TORINO	Metropolitan area	6.827	2.200.000	322
33 - MANRESA	ES	AJUNTAMENT DE MANRESA	City	42	78.000	1.857
34 - FPN	ES	FUNDACION PATRIMONIO NATURAL DE CASTILLA Y LEON	Regional area	94.226	2.400.000	25

Overall, these areas highlight how cycling mobility, although taking different forms – urban, metropolitan, tourist, environmental – is acquiring a strategic role in local and national agendas. The growing focus on sustainability, the quality of public space and the integration of active mobility and public transport provides

This project has received funding from the European Union's Horizon Programme (HORIZON-CL6-2023-CIRCBIO-02) under grant agreement No 101135406

common ground on which each context can develop targeted approaches consistent with its own geographical and settlement characteristics. Below is a summary of some information to characterise the areas covered by the data collection and analysis.

- **Kriti** (13 - PERIFEREIA), Greece – Region of Crete

The Region of Crete covers 8,336 km² and has a population of approximately 620,000 inhabitants, with a relatively low density (74 inh/km²). The topography of the island territory is characterised by a combination of mountainous and coastal regions, while the population centres are medium-sized towns dispersed throughout a network of urban and road infrastructure.

- **Lucca** (17 - LUCCA), Italy – Municipality of Lucca

The Municipality of Lucca covers 185 km² and has about 88,500 inhabitants (478 inh/km²). It lies mostly on an inland plain surrounded by hills. The city features a compact historic centre enclosed by Renaissance walls, alongside more recent suburban development.

- **Bursa** (19 - BURSA), Turkey – Metropolitan Municipality

Bursa is a large urban area spanning 1,036 km² with a population of approximately 3 million (2,896 inh/km²). Located at the base of Mount Uludağ, the city stretches across both mountainous and flat areas.

- **Varna** (21 - VARNA), Bulgaria – City of Varna

Varna spans 237 km² with about 373,500 inhabitants, resulting in a medium density of 1,576 inh/km². Overlooking the Black Sea, it is one of Bulgaria's main urban and tourist hubs.

- **Istanbul Metropolitan Municipality** (24 - IMM), Turkey – Metropolitan Area of Istanbul

Istanbul is one of Europe's largest metropolitan areas, with 5,170 km² and over 13 million inhabitants (2,515 inh/km²). It is a highly urbanized territory, marked by significant topographic differences between its European and Asian sides.

- **Beograd** (26 - BEOGRAD), Serbia – City of Belgrade

Belgrade covers 389 km² and is home to around 1.3 million people, with a very high urban density (3,342 inh/km²). The city lies on hilly and riverine terrain, at the confluence of the Danube and Sava rivers.

- **Sosnowiec** (28 - GMINA), Poland – City of Sosnowiec

Sosnowiec is a city within the industrial region of Silesia, covering 91 km² and housing approximately 190,000 people (2,088 inh/km²). It is a highly urbanized territory with a polycentric layout and an industrial legacy.

- **Città Metropolitana di Torino** (29 - CMTO), Italy – Metropolitan Area

Spanning 6,827 km² with over 2.2 million inhabitants (average density 322 inh/km²), the CMTO includes the city of Turin and numerous municipalities in both lowland and alpine valley areas. The alternation of flat, hilly, and mountainous zones defines a complex territorial system.

- **Manresa** (33 - MANRESA), Spain – Catalan Municipality

Manresa is a mid-sized city in central Catalonia, covering 42 km² and with around 78,000 inhabitants (1,857 inh/km²). Located in a hilly basin, the city has a compact urban structure.

- **Fundación Patrimonio Natural de Castilla y León** (34 - FPN), Spain – Regional Area

Castile and León is one of the largest regions in Europe, with more than 94,000 km² and a very low population density (25 inh/km²). The territory features diverse morphology and a dispersed settlement pattern.

This project has received funding from the European Union's Horizon Programme (HORIZON-CL6-2023-CIRCBIO-02) under grant agreement No 101135406

2.2 Selection Criteria, Urban and Territorial Characteristics

The ten target geographical areas are distributed across various national and territorial contexts, characterized by different administrative scales (cities, metropolitan areas, regions) and by heterogeneous urban and settlement morphologies. At this framing stage, it was therefore considered useful to integrate the analysis with a "shift" in scale for the cities, by examining the broader territorial context in which they are situated.

This allows for a better understanding of the rationale behind the choice of targets, as well as the main differences and commonalities related to the reference geographical area. In addition to Kriti, Bursa, the Metropolitan Municipality of Istanbul, the Metropolitan City of Turin, and the regional area of Castilla y León -which are already broad geographical areas- what follows is a brief overview contextualizing the geographical settings of Lucca, Varna, Belgrade, Sosnowiec, and Manresa.

This step also enables the identification of short framing summaries related to the potential for soft mobility development.

- *Province of Lucca (17 - LUCCA)*

The Province of Lucca covers 1,775 km² and has a population of approximately 380,000, with an average density of 214 inhabitants/km². The area is morphologically diverse, including mountain areas (Garfagnana), hills (Colline Lucchesi), river plains (Piana di Lucca), and coastal stretches (Versilia). This creates a complex yet integrated geography that combines dispersed urban systems with natural landscapes.

- *Province of Varna (21 - VARNA)*

The province covers 3,819 km² and includes 417,000 inhabitants. The territory alternates between attractive, densely populated coastal settlements that depend on tourism and less urbanised, sparsely populated inland areas. The hilly terrain and natural landscape create a diverse territorial framework.

- *Belgrade Metropolitan Area (26 - BEOGRAD)*

With an area of over 3,200 km² and a population exceeding 1.6 million, the Belgrade metropolitan area includes both the compact city and a surrounding peripheral belt, with an average density of 520 inhabitants/km². The area alternates between river zones, scattered settlements, and peri-urban areas, forming a complex urban-agricultural landscape under high infrastructure pressure.

- *Silesian Voivodeship (28 - GMINA)*

The city of Sosnowiec is part of the broader Silesian Voivodeship, a historically industrial region covering 12,333 km² and home to around 4.5 million inhabitants. The high settlement density (365 inhabitants/km²) corresponds to a polycentric structure, with numerous municipalities interconnected by rail and road networks. Post-industrial dynamics have fostered urban regeneration and present both challenges and opportunities for cycling mobility.

- *Comarca of Bages (33 - MANRESA)*

The Catalan comarca spans 1,300 km² and includes 181,500 inhabitants. The area is mainly hilly and has a moderate population density of 140 inhabitants per km². It has a polycentric structure, with small towns surrounding Manresa. The territory is characterised by natural areas and its distance from major metropolitan areas.

Overall, the analysed territories show a remarkable variety of geographical and urban configurations, which significantly influence both the opportunities and the challenges associated with soft mobility—and particularly cycling.

This project has received funding from the European Union's Horizon Programme (HORIZON-CL6-2023-CIRCBIO-02) under grant agreement No 101135406

First, large and flat areas like the **Province of Lucca** (17-LUCCA) and the **Comarca of Bages (**33-MANRESA) are well-suited for the development of territorial-scale cycling routes. In Lucca's case, the presence of flat areas such as the "Piana di Lucca" and the coastal zones of "Versilia" facilitates the creation of integrated cycling routes, although the morphological diversity with mountainous and hilly zones requires differentiated solutions to ensure continuity and accessibility. Similarly, the hilly and polycentric territory of Bages, with its low population density, is conducive to the promotion of soft mobility, particularly for local and tourism-oriented purposes, leveraging the surrounding natural areas.

In contrast, insular and mountainous regions like the **Region of Crete** (13-KRITI) exhibit morphological fragmentation that complicates the planning of extensive cycling networks. The insular nature and the distribution of medium-sized settlements in a mountainous territory suggest that soft mobility should focus primarily on proximity-based urban networks and pedestrian-cycle connections integrated with public transport, taking into account elevation variability and distance.

Large metropolitan areas such as **Istanbul** (24-IMM) and **Bursa** (19-BURSA) in Türkiye represent densely populated urban contexts with intense infrastructure pressure. These territories are marked by topographical discontinuities (notably in Istanbul, divided between the European and Asian sides) and high population density, making cycling mobility both a challenging and necessary objective to reduce congestion and pollution. In such cases, soft mobility can benefit from integration strategies with public transport systems and innovative digital mobility solutions, focusing on targeted infrastructure in flatter and more accessible zones.

The **Belgrade metropolitan area** (26-BEOGRAD), with a mix of river zones, peri-urban areas, and dispersed settlements, presents a complex urban-agricultural landscape. The medium population density and the presence of green and river spaces offer potential for developing cycling networks that connect the city with the peri-urban area, promoting routes integrated with natural and agricultural zones. However, overcoming territorial discontinuities requires careful planning.

In the central European context, the **Silesian Voivodeship** (28-GMINA) is a densely populated, polycentric, and historically industrial area with a well-established infrastructure network. The post-industrial transformation has opened new opportunities for cycling mobility, which can leverage the existing railway and road infrastructure to support both commuting and urban travel within a context shifting toward more sustainable mobility models.

The **Metropolitan City of Turin** (29-CMTO) is defined by a complex territorial system that includes flatlands, hills, and mountains. The presence of a consolidated urban fabric and extensive peri-urban and natural areas creates a favourable setting for the development of cycling mobility in urban areas, as well as for tourism and recreation in the hilly and alpine zones. The main challenge lies in integrating soft mobility with the existing transport system while making the most of its morphological diversity.

Finally, vast and low-density territories like the **Province of Varna** (21-VARNA) and the broad **Region of Castilla y León** (34-FPN) show contrasting features for soft mobility: Varna combines densely populated coastal areas with hilly, rural inland zones, offering potential for both urban and territorial cycling networks, particularly for coastal and nature tourism. Castilla y León, with its very large size and low density, is mainly suitable for tourism and environmental valorisation through soft mobility, rather than for everyday transport.

The propensity for cycling mobility development is strongly influenced not only by morphology and settlement density, but also by the economic structure of the territories, which shapes mobility priorities and infrastructure investment capacity.

This project has received funding from the European Union's Horizon Programme (HORIZON-CL6-2023-CIRCBIO-02) under grant agreement No 101135406

Flat territories with medium-to-high density, such as **Lucca**, **Bages** (Manresa), **Silesia** (Sosnowiec), and the **Metropolitan City of Turin**, show high potential for the development of integrated and multi-scale cycling networks (urban, peri-urban, territorial). In these contexts, the balance between manufacturing, advanced services, and tourism attractiveness is an enabling factor. **Lucca** and **Bages**, in particular, benefit from dynamic local economies based on cultural and environmental tourism, which support a growing demand for soft mobility both for leisure and daily use. **Sosnowiec** and **Turin**, meanwhile, are undergoing post-industrial economic transformations, where sustainable mobility can support urban regeneration and infrastructural innovation.

Densely populated and highly urbanized metropolitan areas like **Istanbul** and **Bursa**—with active industrial, logistics, and commercial economies—present complex challenges but also great opportunities for cycling mobility. In contexts where motor traffic is intense and urban congestion has a negative impact on economic efficiency, soft mobility can act as a lever to improve urban accessibility and reduce the social costs of private transport. However, this requires advanced infrastructure solutions, integration with public transport, and significant investment in digital mobility services.

Insular and mountainous areas like the **Region of Crete** or vast, low-density territories like **Castilla y León** are characterised by economies primarily based on agriculture, environmental tourism, and cultural activities. In these cases, cycling mobility plays mostly a tourism and recreational role, linked to the enhancement of natural and landscape heritage. The morphological fragmentation and low population density limit its effectiveness as a mode of daily transport, but enhance its potential for eco-tourism and slow mobility.

Mixed-character areas like Varna and Belgrade offer promising opportunities for cycling development, thanks to diversified economies that include port, tourism, cultural, and agri-food sectors. In these territories, soft mobility can serve to connect various urban and peri-urban functions, improve the usability of public spaces, and promote sustainable urban development models. However, success depends on overcoming territorial discontinuities (topographical, settlement, infrastructure) and implementing integrated planning across central and peripheral areas, between production and residential zones.

This project has received funding from the European Union's Horizon Programme (HORIZON-CL6-2023-CIRCBIO-02) under grant agreement No 101135406

3. Thematic analysis of the state of the art in local contexts

This chapter provides a systematic and cross-cutting analysis of the information supplied by the cities and regions participating in the SMILE City project, in line with the objectives of WP2. The analysis contributes to building a shared knowledge base that is essential for understanding the level of maturity, structural differences, good practices, and critical gaps observed across the territories, while anticipating and supporting the "vertical" city/area-based assessment developed in Chapter 4.

The information presented here incorporates the contributions received—at different times and with varying levels of detail—from nine territories that provided complete and usable data: Kriti / Chania, Lucca, Bursa, Varna, Istanbul, Beograd, Città Metropolitana di Torino, Manresa, Castilla y León. These inputs include both the responses to the main questionnaire and the additional clarifications and elaborations requested at a later stage to address missing or insufficiently detailed information.

The approach adopted follows a "cross-sectional" reading structured around thematic axes (corresponding to sections 3.1–3.12). Each thematic section explores key dimensions of soft and sustainable mobility, as defined in the questionnaire and aligned with the objectives of the SMILE City project. The thematic areas include: local policies and governance, road safety, public health, urban and environmental context, cycling infrastructure, accessibility and inclusion, digitalisation, innovative materials, and circular city strategies.

This analytical structure also enables the collected data to be assessed in relation to the main European strategic frameworks outlined in section 1.3, supporting an integrated understanding of how the target cities and regions align with EU objectives for sustainable, inclusive, and circular mobility.

Methodological introduction on data management

Before conducting the analysis, a qualitative assessment of the information was carried out to determine its degree of "comparability". As detailed in Annex III *"Methodological criteria for the construction of deliverable D2.1"*, the thematic sections were categorised into:

- f*ully comparable information*: available across all cities/regions in a consistent and homogeneous format;
- *partially comparable information*: available in at least two territories but heterogeneous in format, level of detail, or sources;
- *non-comparable information*: absent, highly inconsistent, or based on incompatible methodological approaches.

This preliminary assessment made it possible to identify the most "robust" thematic sections for comparative interpretation and to highlight areas characterised by significant data heterogeneity. These insights inform the analytical choices presented in this chapter and also guide future data collection activities or operational recommendations. The same methodological approach was applied in the preparation of Chapter 4.

3.1 Local Governance and Strategies for Sustainable Mobility

The analysis of local governance and sustainable mobility planning across the nine partner cities and regions reveals an increasingly structured but still heterogeneous framework. All cities have initiated strategic

This project has received funding from the European Union's Horizon Programme (HORIZON-CL6-2023-CIRCBIO-02) under grant agreement No 101135406

processes and planning instruments aimed at promoting sustainable urban and regional mobility, although with varying degrees of maturity, institutional coordination, and operational capacity.

A common denominator among the nine contexts is the existence of local or regional planning documents addressing sustainable mobility, cycling infrastructure, or low-emission transport. Most cities have adopted Sustainable Urban Mobility Plans (SUMPs) or equivalent frameworks, though implementation levels vary. Turin, Lucca, and Kriti/Chania stand out for having comprehensive and updated SUMPs integrating cycling strategies and climate goals. Castilla y León applies a multi-scalar planning approach that links tourism, regional cycling routes, environmental objectives, and intermodality, supported by coordinated programmes and long-term strategies at the regional scale. Manresa has prioritized local actions to reduce car dependency and improve safety. Istanbul and Bursa have recently launched metropolitan-scale mobility strategies focused on smart transport and congestion reduction, while Varna and Belgrade are at earlier stages of implementation, emphasizing infrastructure modernization and the introduction of soft mobility concepts.

From a regulatory perspective, all cities operate within national or regional frameworks. In Italy (IT), municipalities such as Lucca and the Metropolitan City of Turin are required by law to develop both SUMPs and Cycling Mobility Plans. In Greece (EL), the SUMP of Chania follows ministerial guidelines issued in 2020. In Spain (ES), Manresa and Castilla y León align with the national sustainable mobility framework, with Castilla y León additionally referencing regional regulations governing sustainable transport, active mobility, and digitalisation. In Turkey (TR) and Serbia (RS), urban mobility regulations are being progressively updated to include cycling and digital integration. This alignment illustrates a gradual convergence toward European standards, even if local application remains uneven.

Theme	Common findings	Differences among cities/regions	Notable cases
Planning instruments	Widespread presence of SUMPs or equivalent frameworks	Highly variable implementation levels	Turin, Lucca, Kriti/Chania → comprehensive tools; Castilla y León → multi-scalar regional approach
Institutional coordination	Growing tendency toward integration	Fragmentation persists in multi-level governance systems	Castilla y León → strong regional coordination; Turin and Istanbul → consolidated governance
Regulatory framework	Progressive alignment with national and EU references	Different implementation capacity across countries	Italy (Lucca, Turin) → explicit legal requirements; Spain → multi-level regulatory system; Serbia and Turkey → evolving frameworks
Investments	Increasing attention to sustainable mobility	Significant variation in scale and continuity	Turin, Istanbul → substantial investments; Lucca and Castilla y León → national/regional funding; Bursa and Belgrade → limited but growing allocations
Actions over the last 5 years	Expansion of cycling networks, pilot zones, awareness and training	Variation in scope and typology of measures	Kriti/Chania and Bursa → signage and intermodality; Castilla y León and Belgrade → awareness and training programmes

This project has received funding from the European Union's Horizon Programme (HORIZON-CL6-2023-CIRCBIO-02) under grant agreement No 101135406

Emerging challenges	Need for monitoring, limited resources, fragmented governance	Differentiated according to administrative capacity	Less consolidated contexts: Belgrade, smaller municipalities; more advanced: Turin, Istanbul

Table 3.1.1 – Comparative overview of local governance and mobility planning

Regarding investments, the situation remains asymmetric. Turin and Istanbul report significant and continuous investment programs in public transport and cycling infrastructure. Lucca and Castilla y León have accessed national and regional funds, including multi-year programmes supporting cycling networks and soft mobility corridors, often linked to tourism, territorial cohesion, and environmental improvement. Kriti/Chania and Manresa have implemented smaller but targeted projects co-financed by EU schemes. Bursa and Belgrade show limited but growing allocations, focusing mainly on infrastructure rehabilitation, network continuity, and pilot projects. Varna, while benefiting from EU cohesion funding, still lacks a comprehensive financial framework for soft mobility.

In all cities, sustainable mobility actions have expanded over the past five years: upgrading cycling networks (Lucca, Turin, Istanbul), strengthening intermodal nodes and improving signage (Kriti/Chania, Bursa), promoting awareness campaigns and training programmes (Castilla y León, Belgrade), and introducing pilot mobility zones (Manresa, Varna). These efforts highlight a shared trend toward policy integration and the emergence of more systemic approaches.

Nevertheless, several challenges persist. Coordination between administrative levels remains fragmented, particularly in multi-level governance systems such as those of Spain, Greece, and Turkey. Financial and human resources are still limited in medium-sized municipalities. Moreover, while planning frameworks are now widely in place, their implementation is uneven and not always accompanied by robust monitoring systems.

Cities with stronger institutional capacity and inter-sectoral coordination, such as Turin and Istanbul, demonstrate more consistent outcomes and clearer integration between cycling, public transport, and environmental goals. Conversely, where governance frameworks are less consolidated—such as in Belgrade or smaller municipalities—strategies remain at a preparatory stage, often requiring consolidation of planning tools and strengthening of administrative capacity.

Summary

In conclusion, the comparative analysis shows progress across all partner territories but confirms the need for stronger governance integration, improved monitoring of policy implementation, and broader stakeholder participation. These aspects represent both a challenge and an opportunity for the SMILE City project, which can contribute to harmonizing planning methodologies and promoting cross-learning among cities.

City / Region	Maturity of planning instruments	Institutional coordination	Investment capacity	Policy developments in the last 5 years	Overall maturity level
Turin	High	High	High	Extensive	**Very high**

This project has received funding from the European Union's Horizon Programme (HORIZON-CL6-2023-CIRCBIO-02) under grant agreement No 101135406

				implementation	
Lucca	High	Medium	Medium	Expanding cycling network	**High**
Castilla y León	Very high (multi-scalar)	High	Medium–high	Coordinated programmes	**Very high**
Kriti/Chania	Medium	Medium	Low–medium	Targeted EU-funded projects	**Medium**
Manresa	Medium	Medium	Medium	Pilot interventions	**Medium**
Istanbul	High	High	High	Metropolitan strategies	**Very high**
Bursa	Medium	Medium	Medium–low	Network rehabilitation	**Medium**
Varna	Medium	Low–medium	Medium	Pilot mobility zones	**Medium–low**
Belgrade	Medium	Low	Low–medium	Environmental and training programmes	**Medium–low**

Table 3.1.2 – Governance maturity and implementation capacity

3.2 Traffic, Accidents, and Road Safety

This section has been developed with the contribution of the European Cyclists' Federation (ECF)

The analysis of data from the nine partner cities and regions highlights a heterogeneous and often fragmented situation regarding road traffic and accident statistics, particularly those involving cyclists. Differences stem from varying local capacities for data collection, institutional awareness of road safety, and the maturity of monitoring systems within urban mobility planning frameworks.

While most cities provide at least partial traffic data, the level of detail and reliability varies considerably. Turin (CMTO) continues to present one of the most structured and comprehensive datasets, with an average of 40 million vehicle-kilometres per day and a motorisation rate of 640 vehicles per 1,000 inhabitants. Istanbul and Bursa also provide recent and detailed traffic data through smart mobility monitoring systems, although their focus is primarily on congestion management rather than cyclist safety. Manresa maintains modal split data showing that 48.5% of trips occur on foot or by bicycle, while Varna reports similar figures (around 45% active mobility), though with limited breakdowns by trip purpose. Belgrade and Castilla y León describe increasing motorisation and a persistently high reliance on private cars, with Castilla y León highlighting differences between rural and urban areas and reporting traffic intensities of up to 15,000 vehicles per day on major corridors. Kriti/Chania still records a high proportion of motorcycles (23%) compared to bicycles (2%), reflecting structural mobility patterns in the area.

Accident data remain uneven. CMTO stands out with consistent and regularly updated statistics (0.2 accidents involving bicycles per 1,000 inhabitants), supported by cooperation between the metropolitan mobility office and local police. Istanbul reports aggregated accident data showing a gradual decline in severe injuries between 2020 and 2024, reflecting the first outcomes of recent road safety initiatives. Bursa reports that traffic accidents are monitored at metropolitan level, although the data currently available do not separate cyclist-related incidents. Varna provides basic information, generally limited to total accident numbers, and Manresa has recorded 21 bike-related accidents since 2024. Castilla y León offers structured data that differentiate between types of roads and user groups, noting that cyclist incidents are more

This project has received funding from the European Union's Horizon Programme (HORIZON-CL6-2023-CIRCBIO-02) under grant agreement No 101135406

frequent on interurban roads with mixed traffic. Lucca and Chania still rely on historical or non-systematic datasets, while Belgrade reports increasing institutional attention to cyclist safety but lacks consistent monitoring mechanisms.

City / Region	Availability of Traffic Data	Key Traffic Characteristics	Modal Split (Active Mobility)	Notable Issues
CMTO (Turin)	High, structured	40M vehicle-km/day; 640 veh./1000 inh.	Moderate	High car dependence but strong monitoring
Istanbul	High	Smart congestion monitoring	Low-moderate	Focus on cars, limited cyclist data
Bursa	Medium	Smart systems focused on congestion	Low	No cyclist-specific data
Manresa	Medium	Updated modal split	48.5% walking/cycling	Limited detail on trip purpose
Varna	Medium	General traffic data	~45% active mobility	Low data granularity
Castilla y León	High	Urban–rural contrast; up to 15,000 veh/d	Low	Significant interurban risks
Kriti/Chania	Low–medium	High motorcycle share (23%)	2% cycling	Structural mobility patterns
Belgrade	Medium	Growing motorisation	Low	Limited monitoring capacity
Lucca	Low–medium	Partial historical data	Moderate	Non-systematic monitoring

Table 3.2.1 — Traffic and Mobility Conditions Across Partner Cities

The absence of comparable and standardised data across cities hinders the assessment of safety policies and the capacity to monitor progress toward shared European objectives such as reducing road fatalities and serious injuries. This fragmentation also limits the ability to identify risk exposure levels and to prioritise interventions on the basis of evidence. Only a few contexts, such as CMTO and Istanbul, have begun developing integrated systems that combine traffic volume, accident location, and user typology to support data-informed decision-making.

Innovative approaches are emerging in several cities (Lucca, Chania, Bursa, Varna), where local authorities are experimenting with citizen science and participatory monitoring tools—such as mobile apps, low-cost sensors, or participatory mapping—to collect localised traffic and safety data. Castilla y León is also promoting digital platforms that integrate geospatial information, incident reports, and environmental indicators, providing a more consistent framework for analysing risk factors. These instruments are particularly promising in small and medium-sized municipalities, where institutional monitoring capacity is limited and where community engagement can significantly improve data availability.

From a policy perspective, there is growing awareness that improving cyclist safety requires not only infrastructure investment but also coordinated data systems, inter-institutional collaboration, and public engagement. Many cities are progressively integrating safety indicators into their Sustainable Urban Mobility Plans (SUMPs), linking accident trends with interventions such as speed management, intersection redesign, and the expansion of segregated cycling networks. Alignment with broader methodological frameworks is helping to provide more consistent monitoring parameters and shared evaluation criteria.

This project has received funding from the European Union's Horizon Programme (HORIZON-CL6-2023-CIRCBIO-02) under grant agreement No 101135406

Theme	Cross-City Evidence	Cities Illustrating the Theme
Traffic intensity and motorisation	High motorisation rates and growing traffic demand increase exposure to risk, especially in metropolitan areas; urban–rural contrasts remain significant.	CMTO (high vehicle-km), Istanbul & Bursa (congestion), Castilla y León (15,000 vehicles/day interurban), Belgrade (growing car reliance).
Active mobility share	Active mobility varies widely, from low cycling rates in peripheral or insular areas to nearly half of all trips in compact cities.	Manresa (48.5% active), Varna (≈45%), Kriti/Chania (2% cycling; 23% motorcycles).
Availability and quality of traffic data	Strong disparities: some cities have robust, standardised datasets, while others rely on partial, historical or non-systematic data.	High: CMTO, Istanbul, Castilla y León. Medium: Bursa, Manresa, Varna. Low: Lucca, Kriti/Chania, Belgrade.
Availability of cyclist-specific accident data	Only a minority of cities collect systematic accident data disaggregated by mode; most provide only totals or partial information.	Available: CMTO, Manresa, Castilla y León. Limited/Absent: Bursa, Varna, Kriti/Chania, Belgrade, Lucca.
Trends in cyclist and road safety	Some cities show improving safety trends (e.g., declining severe injuries), while others lack continuous monitoring to assess trends.	Positive: Istanbul (decline in severe injuries), CMTO (stable low rate). Unclear: majority of cities due to fragmented datasets.
Monitoring systems and digital tools	Emerging integration of digital tools, participatory sensors, and GIS platforms to support traffic-safety analysis.	Integrated systems: CMTO, Istanbul, Castilla y León. Participatory/low-cost tools: Lucca, Chania, Varna, Bursa.
Structural factors influencing safety	Terrain, urban form, modal mix (e.g., motorcycle prevalence), and interurban road exposure significantly shape local risk.	Kriti/Chania (motorcycles 23%), Castilla y León (higher extra-urban risk), CMTO & Istanbul (complex metropolitan structure).
Governance and institutional capacity	Stronger institutions ensure systematic data collection; smaller cities struggle with continuous monitoring and standardisation.	Strong: CMTO, Istanbul. Limited: Lucca, Kriti/Chania, Varna, Belgrade.
Policy integration and Vision Zero alignment	Awareness of safety issues is increasing, but alignment with EU/ECF frameworks varies significantly.	Advancing: CMTO, Istanbul. Early stage: most medium/small cities.

Table 3.2.2 — Thematic Synthesis of Road Safety, Traffic and Accident Dynamics

Summary

In summary, progress has been made in expanding awareness of cyclist safety and integrating it into broader mobility strategies. However, major gaps remain in data standardisation, institutional coordination, and resource allocation. Strengthening local monitoring systems, harmonising accident reporting, and embedding cyclist safety as a structural element of mobility planning are key priorities for the coming years.

3.3 Urban and Environmental Context and Sustainable Solutions

This section has been developed with the contribution of the University of Turin (UNITO)

The analysis of the urban and environmental contexts across the nine partner cities and regions reveals a complex landscape characterised by structural, socio-economic, and environmental diversity. This section

This project has received funding from the European Union's Horizon Programme (HORIZON-CL6-2023-CIRCBIO-02) under grant agreement No 101135406

provides a thematic and cross-sectional interpretation of data concerning the environmental framework, mobility patterns, pollution, and the social dimensions of sustainable mobility, including public health impacts. The heterogeneity of the available information reflects differences in monitoring capacity, spatial configuration, and the maturity of local sustainable mobility strategies.

Environmental Framework and Public Transport

Public transport networks across the nine territories display significant variations in structure and integration. Turin (CMTO) and Castilla y León maintain the most structured and multimodal systems, integrating metro, tram, rail, and bus services. Istanbul and Bursa have expanded their metropolitan transport systems, supported by real-time data monitoring and investments in electrified fleets. Lucca and Manresa rely mainly on local bus networks with limited intermodality, while Chania and Varna operate smaller-scale systems with partial integration of cycling infrastructure. Belgrade has initiated the renewal of its public transport fleet and is piloting multimodal hubs to reduce car dependency. Regional contributions further highlight the significant differences in network density: Castilla y León, for instance, operates over an extensive and dispersed territory, requiring a differentiated approach between urban and rural nodes. In Belgrade, air quality objectives are increasingly influencing choices regarding fleet renewal and prioritisation of low-emission vehicles.

Shared mobility services, especially bike-sharing and e-scooter systems, are expanding but remain uneven in coverage and user base. Lucca reports over 10,000 annual bike-sharing trips with a steady increase in users, while Istanbul and Bursa operate large-scale smart bike-sharing systems. Manresa and Varna are planning the introduction of new shared mobility schemes, whereas Chania and Castilla y León are testing pilot services in collaboration with universities or private operators. Some regions, such as Castilla y León, are integrating shared mobility with digital platforms that also provide environmental and geospatial information, improving intermodality and user accessibility.

Air Pollution and Monitoring

Air pollution remains a major challenge in most partner cities. Turin and Istanbul consistently record the highest levels of PM_{10} and NO_2 concentrations, mainly linked to private traffic and heating systems. Lucca and Manresa maintain active air quality monitoring networks (managed by ARPAT and local authorities), while Castilla y León provides regional-scale monitoring covering a full range of pollutants (NO_2, PM_{10}, $PM_{2.5}$, O_3, SO_2, CO). Chania reports air quality data through academic networks, while Bursa, Belgrade, and Varna have recently adopted national standards and digital platforms for air quality reporting. Data from Belgrade confirm a growing concern over particulate matter levels, with the city implementing new monitoring stations to strengthen reporting consistency. Castilla y León illustrates how integrating environmental indicators with mobility data enables more coherent assessments across urban and rural areas.

Despite progress, disparities persist in data availability, update frequency, and transparency. Only a few cities, such as Turin and Istanbul, integrate pollution monitoring into their mobility planning systems, linking environmental and traffic data to support targeted mitigation measures. Expanding integrated monitoring frameworks would enhance the ability to evaluate the impact of sustainable mobility policies on air quality and public health.

Traffic Density and Private Vehicle Use

Motorisation rates remain high in most cities, with CMTO reporting 640 vehicles per 1,000 inhabitants and Belgrade exceeding 500. Istanbul and Bursa face significant congestion due to rapid urbanisation and

This project has received funding from the European Union's Horizon Programme (HORIZON-CL6-2023-CIRCBIO-02) under grant agreement No 101135406

suburban expansion. Castilla y León and Chania illustrate the challenges of managing dispersed territories where public transport coverage is limited. Varna and Lucca report moderate but growing car dependency. Recent regional inputs emphasise how interurban corridors in Castilla y León can reach traffic volumes of up to 15,000 vehicles per day, influencing both emissions and mobility choices. In Belgrade, the growing reliance on private cars is identified as one of the major contributors to declining air quality and limited uptake of soft mobility.

Analyses indicate that high private vehicle use correlates with increased pollution and reduced uptake of soft mobility modes. Addressing these issues requires not only infrastructure investment but also behavioural change, incentives for public transport use, and improved accessibility for vulnerable groups. A more systematic monitoring of car dependency, spatial distribution of trips, and socio-economic inequalities is essential to guide targeted interventions.

Socio-demographic Characteristics and Urban Density

Demographic and socio-economic indicators confirm the complexity of local mobility needs. CMTO and Castilla y León present ageing populations and low densities in peripheral and rural areas, while Lucca and Varna show compact urban cores with medium density. Manresa and Chania maintain more balanced demographic structures but face higher unemployment rates (12.9% and 16.2%, respectively). Bursa and Istanbul, in contrast, experience population growth and younger demographics but increasing suburbanisation. The additional contribution for Belgrade highlights how socio-economic disparities affect modal choices, with peripheral districts more dependent on private cars. Castilla y León also reports strong urban–rural contrasts, reinforcing the importance of territorial equity in mobility planning.

These patterns directly influence accessibility, modal choices, and exposure to environmental risks. Densely populated urban centres favour walking and cycling, whereas dispersed territories face structural challenges in providing sustainable alternatives to private cars. Addressing demographic and spatial disparities through inclusive planning is therefore a key aspect of sustainable mobility.

Soft Mobility, Health and Behavioural Impacts

Soft mobility modes such as walking and cycling represent both sustainable transport options and health-promoting activities. Evidence from scientific studies and local practices demonstrates cardiovascular and respiratory benefits associated with cycling, particularly for adults aged 18–45. Integrating health perspectives into mobility policies thus contributes to improving quality of life and reducing healthcare costs. Public health considerations are increasingly taken into account in several cities. Castilla y León associates cycling promotion with active ageing and disease prevention, while Belgrade has introduced environmental-health indicators in its air quality assessments. UNITO's contribution reinforces the strong correlation between environmental exposure, traffic emissions, and respiratory health, especially among vulnerable groups.

However, a key limitation remains the lack of user profiling in most municipal datasets. Few cities collect disaggregated data on age, gender, income, or health conditions of cyclists. Observations indicate that shared e-bike use is more frequent among young men in Turin, Istanbul, and Bursa, raising questions about inclusiveness. Addressing such imbalances through gender-sensitive and age-inclusive mobility policies can increase the equity of soft mobility systems.

This project has received funding from the European Union's Horizon Programme (HORIZON-CL6-2023-CIRCBIO-02) under grant agreement No 101135406

Strategic Gaps and Data Availability

The persistent heterogeneity of data collection across cities limits comparability and long-term assessment of progress. Essential indicators—such as accident rates, modal share by gender, or exposure to air pollution—are often unavailable or inconsistent. A harmonised data framework, possibly combining institutional monitoring with participatory and citizen science approaches, is recommended to improve coverage, reliability, and public engagement. Regional inputs, especially from Castilla y León and Belgrade, highlight the need for unified methodologies that integrate socio-demographic variables, environmental indicators, and mobility patterns within existing planning tools.

In addition, integrating socio-demographic and environmental indicators into Sustainable Urban Mobility Plans (SUMPs) would support evidence-based planning and enhance the evaluation of soft mobility policies.

Theme	Cross-city evidence	Representative cases
Public transport integration	Strong metropolitan systems contrast with fragmented local networks	CMTO, Castilla y León vs. Lucca, Chania
Air pollution trends	High emissions in large metropolitan areas; mixed monitoring capacity	Turin, Istanbul vs. Varna, Bursa
Monitoring systems	Significant variability in consistency, frequency and transparency	High: Castilla y León, CMTO – Low: Chania, Lucca
Motorisation & congestion	Widespread car dependency; structural challenges in dispersed regions	Belgrade, Bursa, Istanbul, Castilla y León
Socio-demographic drivers	Ageing in northern territories; young demographics in metropolitan areas	CMTO, Castilla y León vs. Istanbul, Bursa
Health–mobility nexus	Cycling benefits recognised, but user profiles rarely monitored	UNITO findings; Castilla y León; Belgrade
Data gaps	Lack of harmonised indicators limits comparability	All cities, strongest gaps in small/medium municipalities

Table 3.3.1 – Cross-city thematic synthesis of environmental and urban context

Summary

Demographic and socio-economic indicators reveal the complexity of mobility needs across the analysed territories. Ageing populations, low economic activity rates, and socio-spatial inequalities significantly influence accessibility and modal choices. These aspects must be integrated into planning efforts to ensure that mobility policies are equitable and responsive to local needs. Soft mobility and cycling are increasingly recognised as environmentally friendly solutions and as levers for improving public health. However, the lack of demographic data on users limits the effectiveness of current strategies. For instance, information on the prevalence of e-bike use among men suggests the need for actions targeting women, the elderly, and other vulnerable groups. These findings underline the importance of developing inclusive data frameworks and health-oriented mobility strategies. They provide valuable input for the SMILE City project in designing pilot actions that link environmental, social, and health dimensions of sustainable mobility.

3.4 Existing Cycling Infrastructure: Availability and Characteristics

This section has been developed with the contribution of the European Cyclists' Federation (ECF)

This project has received funding from the European Union's Horizon Programme (HORIZON-CL6-2023-CIRCBIO-02) under grant agreement No 101135406

Cycling infrastructure represents a cornerstone of soft mobility and an essential indicator of how local governments translate policy ambitions into practical interventions. The nine cities and regions involved in the SMILE City project show a broad spectrum of approaches, investment levels, and typologies of cycling infrastructure, reflecting their different territorial morphologies, densities, and institutional capacities.

The availability and distribution of cycle lanes and tracks remain uneven. Some contexts demonstrate mature, extensive networks, while others are still developing basic connections. Castilla y León maintains a consolidated system with approximately 100 km of segregated cycle tracks and 60–70 km of painted lanes, supported by regional cycling tourism plans. Lucca presents a multi-layered network including 1.42 km of segregated tracks, 8.04 km of painted lanes, 8.64 km of cycle streets, and over 20 km of shared paths and greenways, integrating mobility and recreational functions. The Metropolitan City of Turin (CMTO) stands out for the scale and articulation of its network, with more than 218 km of segregated tracks outside the city of Turin, various painted lanes, and connections to the national Bicitalia and EuroVelo 8 routes.

Istanbul and Bursa have made significant progress in expanding their cycling networks. Istanbul's updated cycling plan (2023) foresees more than 350 km of total routes, 170 of which are already operational, linking coastal, suburban and central areas through dedicated corridors and bridges. Bursa reports approximately 120 km of lanes connected to green corridors and recreational areas, also co-financed through European programmes and supported by the new metropolitan transportation master plan. Varna has built about 60 km of urban and peri-urban routes connecting the city centre to residential districts and coastal zones, while Belgrade reports approximately 120 km of routes along the rivers Sava and Danube. By contrast, Kriti/Chania and Manresa show smaller but coherent networks (about 1–9 km) focusing mainly on city centres and short-distance mobility.

A consistent pattern emerges: compact and high-density cities, such as Lucca, Istanbul and Turin, tend to achieve better network continuity and integration, while more dispersed regions such as Castilla y León or Chania face challenges in ensuring functional connections and route safety. Contributions from ECF highlight that continuity, intersection safety and perceived comfort remain decisive determinants of cycling uptake, especially where the modal share is still limited.

Theme	Cross-city evidence	Representative examples
Network continuity	Strong in compact territories; weak in dispersed areas	CMTO, Istanbul vs. Castilla y León, Chania
Infrastructure types	Range from segregated tracks to cycle streets and greenways	Lucca, CMTO, Bursa
Intermodality	Secure parking and access at transit nodes in advanced contexts	Istanbul, Bursa, CMTO
Bike-sharing	Highly uneven development	Strong: Istanbul, Valladolid – Emerging: Manresa, Belgrade
E-bike charging	Limited availability; often pilot-based	Istanbul, Chania, Castilla y León
Data gaps	Weak monitoring of usage and comfort	Most cities, particularly small/medium municipalities

Table 3.4.1 – Cross-city thematic synthesis: infrastructure, services, and gaps

Bike parking facilities are present in all contexts, though with highly variable numbers and distribution. Manresa has 204 spaces across 55 points; Castilla y León reports several hundred across its main cities, from Valladolid (290) to Palencia (150). Varna has recently installed 400 public racks as part of an urban regeneration programme, while Bursa and Istanbul have integrated secure bike parking at metro and BRT

This project has received funding from the European Union's Horizon Programme (HORIZON-CL6-2023-CIRCBIO-02) under grant agreement No 101135406

stations. Belgrade has launched a pilot programme for 200 smart parking units near intermodal hubs. CMTO and Lucca both report improvements, particularly near train stations and park-and-ride facilities.

Bike-sharing services also show very different levels of development. Lucca currently lacks an active public system but shows an increase in e-bike usage through private free-floating services. Manresa plans to activate a station-based network by 2025–2026. In Castilla y León, Valladolid operates a structured bike-sharing network with 98 stations and 861 bicycles (half of them electric). CMTO manages both station-based and free-floating systems. Istanbul operates ISBIKE, a large-scale public bike-sharing service with over 3,000 bicycles and 300 stations, while Bursa runs BURSA BIKE with 40 stations and integrated ticketing. Belgrade has started a small dockless pilot project, and Varna promotes hybrid public-private schemes targeting both residents and tourists. Chania operates a modest public bike-sharing system combining traditional and electric bicycles, mainly oriented toward visitors and short-distance mobility.

The availability of charging infrastructure for e-bikes remains limited in most areas. Only Castilla y León, Chania and Istanbul report specific charging points linked to regional or municipal programmes. Bursa has begun testing solar-powered charging modules at bike-sharing stations, while Lucca and Manresa are planning small-scale infrastructure mainly related to tourism and pilot projects.

Most cities report moderate or low cycling modal shares, generally under 2%, except in cases such as Burgos (7.8%), Istanbul (around 3%), and some pilot areas of Bursa and Turin. This confirms the need to strengthen not only the extent but also the functionality, safety, attractiveness and accessibility of infrastructures. European guidance consistently emphasises the importance of route continuity, surface quality, protection from motor traffic and clear signage as the most influential determinants of regular cycling.

A key limitation remains the lack of systematic and comparable data on infrastructure usage, maintenance and comfort levels. Even where networks exist, monitoring systems are often weak or inconsistent, hindering the capacity to assess actual impacts. This suggests the need to combine infrastructure investment with user-centred approaches, integrating behavioural analysis, participatory feedback and digital monitoring tools.

Summary

In summary, while several cities (such as CMTO, Istanbul, Bursa and Castilla y León) demonstrate significant progress and structured planning, others are still in early development phases. The shared challenge is to ensure that cycling infrastructure evolves from an isolated physical asset to a functional component of integrated mobility systems. Improving data collection, focusing on user experience, and reinforcing intermodality will be essential steps toward consolidating cycling as a key element of sustainable urban mobility.

Functional dimension	Key aspects	Cities showing strongest performance
Extent	Total km, territorial coverage	CMTO, Istanbul, Bursa
Quality	Segregation, surface, visibility	Lucca, CMTO
Safety	Protected intersections, reduced exposure	Istanbul, Bursa
User services	Parking, bike-sharing, charging	Valladolid, Istanbul, Bursa
Intermodality	Integration with rail, metro, bus	CMTO, Istanbul

Table 3.4.2 – Overview of cycling infrastructure by functional dimension

This project has received funding from the European Union's Horizon Programme (HORIZON-CL6-2023-CIRCBIO-02) under grant agreement No 101135406

3.5 Accessibility, User Profiles, and Inclusiveness of Cycling Mobility

This section has been developed with the contribution of the European Cyclists' Federation (ECF)

Cycling mobility is not only about infrastructure but also about people: who uses bicycles, under which conditions, and how accessible cycling is to different segments of the population. The nine cities and regions analysed within the SMILE City project provide a broad and diverse picture in terms of inclusiveness, user profiles, and actions aimed at reducing barriers to cycling for vulnerable or under-represented groups. Accessibility is interpreted in both physical and social dimensions. From a physical point of view, several cities identify topographical or morphological barriers. Lucca and Castilla y León highlight the challenges posed by hilly terrain and historical centres, which limit the adaptability of cycling infrastructure, yet both have adopted compensatory strategies, such as shared paths and greenways. Manresa and Turin present more favourable conditions, with flat urban layouts and compact city structures that facilitate the expansion of accessible networks. Kriti/Chania faces steeper gradients and fragmented urban form but has nevertheless extended soft mobility to previously disconnected neighbourhoods, particularly through targeted connections in areas with limited transport supply. Istanbul and Bursa show strong commitments to improving physical accessibility through the expansion of barrier-free cycle routes, integration with public transport, and dedicated pedestrian–cyclist corridors. Istanbul's "Green Mobility Vision" promotes universal design principles in infrastructure to ensure access for women, children, and older adults. Bursa combines these physical measures with educational campaigns promoting safety and inclusiveness. Varna's cycling network has been planned with accessibility standards aligned with EU guidelines, while Belgrade reports progress in ensuring smoother and safer connections between riverside routes and residential areas, although many peripheral districts still lack inclusive design solutions.

Theme	Key cross-city findings	Representative examples
Physical accessibility	Terrain, historic centres, fragmented morphology, universal design	Lucca, Castilla y León, Chania, Istanbul
Inclusive infrastructure	Barrier-free routes, safe corridors, improved continuity	Istanbul, Bursa, Belgrade
Social accessibility	Gender, age, income disparities; cultural barriers	Bursa, Istanbul, Varna
Targeted programmes	Children, seniors, women, rural communities	Castilla y León, Lucca, Belgrade
E-bike role	Essential to increase participation of elderly and low-mobility users	Castilla y León, Turin
Health integration	Recognised benefits but weakly integrated into planning	All cities (systematic: none)

Table 3.5.1 – Cross-city themes on cycling accessibility and inclusiveness

Social accessibility concerns affordability, safety perception, and cultural inclusion. Several cities have launched programmes to reduce gender and age disparities in cycling. Lucca and Turin have introduced initiatives in schools and community centres to promote cycling among young people, women, and the elderly. Castilla y León's regional framework focuses on accessibility for older residents and rural communities, including pilot projects for assisted e-bike services and training activities to improve confidence among first-time or elderly riders. Chania, with a younger demographic, reports growing participation but limited equity between income and age groups. Bursa and Istanbul are piloting public-awareness campaigns aimed at promoting cycling among women, students, and migrants, recognising cultural and social factors as barriers to active mobility. Varna's recent "Safe to School by Bike" initiative targets children and families,

This project has received funding from the European Union's Horizon Programme (HORIZON-CL6-2023-CIRCBIO-02) under grant agreement No 101135406

while Belgrade's municipal programme offers free cycling lessons to seniors as part of a broader strategy to improve safety and expand cycling among vulnerable groups.

Across all contexts, cycling remains more common among men aged 18–45, particularly in urban areas, while participation rates are lower among older adults, women, and residents in rural environments. This pattern confirms that social inclusion in cycling still depends largely on cultural attitudes, perceived safety, and economic accessibility. E-biking has been identified as a major opportunity to increase inclusiveness, especially for older citizens and individuals with limited physical capacity, strengthening the link between soft mobility and public health.

The potential health benefits of cycling—especially in terms of cardiovascular and respiratory fitness—are widely recognised across the analysed cities. However, few have incorporated these aspects systematically into planning. Promoting active mobility thus becomes both a transport and a public health policy objective, requiring coordination between mobility departments, health authorities, and social services.

Category	Main barriers	Enabling factors
Physical	Slopes, historic centres, fragmented grids	Universal design, seamless connections
Social	Gender bias, safety perception, affordability	School programmes, campaigns, subsidies
Demographic	Ageing populations, rural dispersion	Assisted e-bikes, senior training
Behavioural	Low confidence, lack of cycling culture	Awareness campaigns, community events

Table 3.5.2 – Barriers and enabling factors for cycling inclusiveness

Summary

Enhancing the inclusiveness of cycling mobility requires a dual focus on data and design. Participatory methods – such as mobile apps, citizen-based monitoring, and school-based observation programmes – can help cities understand who uses cycling infrastructure and under what conditions. These insights are crucial for tailoring interventions to different user groups, especially in rural or ageing contexts like Castilla y León.

Equally important is the design of infrastructure and services with vulnerable groups in mind. Inclusive planning means promoting cycling for women, children, the elderly, and people with disabilities through accessible, affordable, and safe solutions.

The gap between infrastructure provision and real accessibility for all remains evident. Addressing this challenge will be key for the SMILE City project, whose pilot initiatives can test inclusive models, improve user engagement, and strengthen the social dimension of sustainable mobility.

3.6 Digital Solutions Currently in Use for Urban Mobility

This section has been developed with the contribution of the European Cyclists' Federation (ECF)

The digitalisation of urban mobility plays an increasingly central role in shaping sustainable transport systems and supporting data-driven planning. The nine cities and regions analysed in the SMILE City project reveal a diverse and evolving picture in terms of digital maturity, data integration, and user-oriented innovation.

Among the initial five cities, the Metropolitan City of Turin (CMTO) stands out as the most advanced, with a fully operational ITS (Intelligent Transport System) platform, multimodal tools such as *Muoversi a Torino*, and

This project has received funding from the European Union's Horizon Programme (HORIZON-CL6-2023-CIRCBIO-02) under grant agreement No 101135406

active data collection systems supporting real-time monitoring and planning. Lucca has several digital initiatives under implementation, including ITS platforms and electronic panels providing public transport information, aiming to improve coordination and real-time communication with citizens. Manresa, though without a centralised digital platform, leverages open-data sources and third-party urban mobility apps, ensuring reliable access to multimodal information through widely used services such as Google Maps.

Castilla y León, as a large and heterogeneous region, shows a fragmented but progressively expanding digital ecosystem: medium-sized cities such as Valladolid or León have developed traffic management platforms, real-time public transport apps, and digital tools supporting accessibility for residents and tourists, while rural areas continue to experience gaps in digital coverage and service integration. Chania is implementing pilot projects including an open-data platform for mobility, GPS monitoring of public buses, and a dedicated app for tracking shared bikes, representing important steps toward strengthening digital capacity in smaller municipalities. Istanbul has developed one of the most advanced smart mobility ecosystems in Europe, integrating cycling routes into the *Trafik Kontrol Merkezi* (Traffic Control Centre) and the city's *Smart Istanbul* app, which provides real-time data on cycling paths, parking availability, and multimodal connectivity. Bursa operates a regional ITS system that coordinates traffic lights, parking, and shared mobility services, while also testing IoT-based sensors for monitoring bicycle usage and air quality trends. Belgrade has launched a smart mobility dashboard integrating GIS mapping and traffic analytics, although cyclist-specific data remain limited. Varna manages a local platform providing real-time information on public transport, bike-sharing availability, and parking occupancy, supporting users with simple multimodal navigation tools.

Theme	Cross-city findings	Representative examples
ITS and real-time platforms	Strong in metropolitan areas; emerging in medium cities; weak in rural areas	CMTO, Istanbul, Bursa
Digital participation tools	Growing use of apps, sensors, surveys	Varna, Chania, Bursa
Integration of cycling data	Partial; advancing in cities with active monitoring systems	Turin, Istanbul, Lucca
Accessibility and universal design	Advanced in large cities; limited in rural territories	Istanbul, Turin
Environmental–mobility integration	Increasing dashboards and CO_2 monitoring	Bursa, Istanbul, Lucca
Digital divide	Significant gaps in rural and peripheral areas	Castilla y León, Chania

Table 3.6.1 – Key thematic dimensions of digital mobility in partner cities

A key emerging trend across all cities is the increasing use of digital participation tools, such as mobile apps, low-cost sensors, and geo-referenced surveys, to gather user-generated mobility data. These instruments help local administrations understand behavioural patterns, identify barriers in the cycling network, and profile user groups (including women, elderly citizens, and students). This contributes to more accurate and inclusive planning, especially in contexts with limited institutional data collection capacity.

Digital tools also enhance accessibility and inclusiveness when designed according to universal usability principles. Some cities, such as Istanbul and Turin, are experimenting with visual or audio assistance functions for vulnerable users, as well as accessible web interfaces for mobility information. In contrast, rural areas in Castilla y León and parts of Chania face challenges in ensuring equal access to digital tools due to lower digital literacy levels and connectivity limitations.

This project has received funding from the European Union's Horizon Programme (HORIZON-CL6-2023-CIRCBIO-02) under grant agreement No 101135406

Another area of progress involves the integration of environmental and mobility data. Linking cycling data to CO_2 emission reductions, air quality improvements, and energy savings helps create a more comprehensive monitoring framework for evaluating the impacts of sustainable mobility policies. Turin and Lucca, where environmental monitoring systems are already active, represent leading examples of this integration. Bursa and Istanbul are also developing CO_2 dashboards to quantify the benefits associated with modal shift toward cycling and public transport.

Summary

Real-time information systems, such as those tracking bike-sharing availability, parking occupancy, or e-bike charging stations, are becoming essential for increasing public confidence in cycling as a reliable transport mode. This is particularly relevant in cities such as Chania, Manresa, and Varna, where digital platforms can accelerate the adoption of shared mobility services.

There is a growing need to further strengthen the digitalisation of active mobility to support inclusiveness, safety, environmental sustainability, and citizen engagement. Digital tools are not merely technical enablers but strategic instruments guiding, measuring, and amplifying the transition toward sustainable and people-centred mobility.

Level	Characteristics	Cities
High	Integrated ITS, multimodal apps, cycling data integration	CMTO, Istanbul
Medium	Functional platforms with partial integration	Lucca, Bursa, Valladolid/León
Emerging	Pilot projects and early-stage digital tools	Chania, Varna, Belgrade
Low / Uneven	Limited coverage, rural–urban digital divide	Castilla y León (rural areas), Manresa

Table 3.6.2 – Digital maturity levels across partner territories

3.7 Strategic vision and future scenarios for sustainable mobility

The future of urban mobility depends largely on the capacity of local administrations to develop long-term strategic visions that align with sustainability, resilience, and citizen well-being. The nine cities and regions analysed in the SMILE City project reveal diverse yet increasingly convergent approaches toward the idea of the “Circular City” and its integration within sustainable mobility planning.

The concept of the Circular City is interpreted differently across contexts. The Metropolitan City of Turin (CMTO) presents a mature and structured vision embedded in its Climate Plan 2030 and the *Biciplan*, positioning cycling as a pillar of low-emission, multimodal urban mobility. Manresa demonstrates a similarly coherent strategy, centred on quality of public space, proximity of services, and integration of cycling with pedestrian and public transport networks. Lucca links the circular city concept to the valorisation of historic and environmental heritage, integrating cycling within cultural and tourism-oriented regeneration projects. Castilla y León, given its regional dimension, articulates a decentralised vision based on sustainable tourism, intermodal connections, and urban–rural cohesion, with particular emphasis on linking natural parks, heritage areas, and rural communities through soft mobility corridors. Kriti/Chania has recently adopted this approach through its updated SUMP, explicitly incorporating circular city principles to improve coastal accessibility, tourism flows, and environmental preservation.

This project has received funding from the European Union's Horizon Programme (HORIZON-CL6-2023-CIRCBIO-02) under grant agreement No 101135406

Istanbul presents one of the most advanced visions, articulated in its Green Mobility and Climate Action Strategy 2035, which integrates circular principles across infrastructure planning, waste reduction, and smart mobility. Cycling forms part of an integrated ecosystem of electric, shared, and active modes. Bursa promotes a pragmatic approach focused on energy efficiency, electrification of public transport, and the creation of "eco-corridors" combining cycling, walking, water management, and green infrastructure. Varna highlights the connection between soft mobility and coastal resilience, positioning cycling as both a daily transport mode and a lever for low-impact tourism. Belgrade has recently adopted a Sustainable Urban Mobility Strategy 2030 that incorporates circular city principles into post-industrial regeneration, particularly through riverside redevelopment, multimodal hubs, and green corridors connecting parks and neighbourhoods.

Across all nine contexts, a shared commitment emerges: mobility strategies increasingly aim to connect environmental goals with social inclusion, tourism, education, and economic development. Turin, Manresa, and Castilla y León prioritise links between peripheral, industrial, and educational areas and sustainable transport nodes. Lucca emphasises connections between the historic centre, schools, and green corridors. Kriti/Chania focuses on tourism-related mobility and access to waterfront areas. Istanbul, Belgrade, and Bursa integrate mobility planning with decarbonisation, renewable energy use, and climate adaptation.

Theme	Cross-city findings	Representative examples
Circular City integration	Increasingly embedded in mobility and climate strategies	Turin, Istanbul, Belgrade
Urban–rural cohesion	Soft mobility linking dispersed settlements	Castilla y León, Varna
Tourism and cultural mobility	Cycling as driver for heritage and coastal mobility	Lucca, Kriti/Chania
Climate and decarbonisation focus	Integration of mobility with climate action	Istanbul, Bursa
Soft mobility as priority	E-bike growth, multimodal hubs	Turin, Manresa, Bursa
Citizen engagement	Widening participatory planning	Belgrade, Varna

Table 3.7.1 – Cross-city themes in strategic mobility visions

Soft mobility—cycling and walking—plays a central role in these visions. Cities such as Turin, Manresa, Istanbul, and Bursa foresee substantial increases in e-bike usage and stronger integration between cycling routes and public transport hubs. Castilla y León and Varna similarly expect cycling to support sustainable tourism, rural access, and nature-based mobility.

Citizen perception and cultural acceptance are evolving in favour of sustainable mobility. Public demand for active and environmentally friendly transport is increasing across all cities. Turin and Manresa report measurable behavioural changes following awareness campaigns; Castilla y León and Kriti/Chania highlight rising interest among youth and tourists; Belgrade and Varna note greater involvement of citizens in mobility planning and participatory design processes.

Summary

The nine cities and regions show a clear convergence toward the principles of the Circular City, where sustainability, intermodality, and inclusiveness underpin future mobility models. Soft mobility is increasingly

This project has received funding from the European Union's Horizon Programme (HORIZON-CL6-2023-CIRCBIO-02) under grant agreement No 101135406

recognised not only as a transport mode but also as a lever for climate resilience, environmental improvement, and overall social well-being.

However, challenges remain. Cross-sector coordination and multi-level governance require further strengthening, particularly in decentralised or multi-jurisdictional contexts such as Castilla y León, Bursa, or Kriti/Chania. The pilot actions within the SMILE City project can help translate strategic visions into operational practices, reinforce cooperation between local authorities, and support the emergence of a shared European framework for circular and sustainable mobility.

Orientation	Key characteristics	Cities
Environmental & climate-driven	Decarbonisation, energy efficiency, resilience	Istanbul, Bursa
Heritage & tourism-led	Cycling integrated into cultural landscapes	Lucca, Varna
Multimodal network integration	Strong links between cycling & PT	Turin, Manresa
Urban–rural mobility bridging	Soft mobility corridors	Castilla y León
Regeneration-focused	Waterfronts, post-industrial areas	Belgrade, Chania

Table 3.7.2 – Strategic orientations for future sustainable mobility

3.8 Cycling infrastructure and the use of recycled materials: planning and sustainability

This section has been developed with the contribution of the Cycling Industries Europe (CIE)

The development and modernisation of cycling infrastructure are essential components of sustainable urban mobility planning. This section explores how such infrastructure can be innovatively aligned with environmental goals, particularly through the use of recycled materials and circular economy principles, across the nine cities and regions analysed within the SMILE City project.

Integration of Recycled Materials in Cycling Infrastructure

The progressive integration of recycled and low-impact materials represents a key opportunity to reduce environmental impact and promote circular supply chains. Recycled plastics, aggregates, end-of-life tyre rubber, permeable mixtures, eco-asphalts, and recycled polymer signage are increasingly considered for pavements, modular elements, dividers, and vertical/horizontal signage.

Several cities have already launched pilot initiatives. The Metropolitan City of Turin uses recycled components in lane dividers and paving. Castilla y León benefits from national programmes supporting secondary raw materials in public works and has piloted modular tracks using recycled aggregates. Lucca and Manresa are testing eco-pavements with recycled aggregates. In Kriti/Chania, collaborations with universities support experimentation on eco-materials adapted to coastal and high-temperature environments.

Istanbul and Bursa integrate circular-economy principles into cycling infrastructure through permeable surfaces made from recycled rubber, low-temperature asphalt, and eco-mixtures aligned with national frameworks. Belgrade is testing recycled polymer signage, while Varna has introduced recycled plastic elements and eco-paints in pilot corridors. These examples confirm growing interest, although institutionalisation and standardisation remain uneven across contexts.

Planning and Regulatory Framework

A major challenge is the absence of harmonised frameworks to guide the use of circular materials. Although Italy, Spain, and Turkey have introduced guidelines on recycled materials, implementation remains

This project has received funding from the European Union's Horizon Programme (HORIZON-CL6-2023-CIRCBIO-02) under grant agreement No 101135406

fragmented. Procurement rules favour conventional suppliers, and municipalities often lack technical capacity to assess innovative materials.

Strengthening harmonised standards, certification mechanisms, and technical support is essential to scale up circular solutions safely and effectively.

Cost-Benefit Analysis and Environmental Impact

Life Cycle Assessment (LCA) and Cost–Benefit Analysis (CBA) remain underused in cycling infrastructure planning, despite their potential to quantify environmental and economic benefits such as reduced CO_2 emissions, resource efficiency, and longer material durability.

Some cities—including Lucca, Manresa, Bursa, and Istanbul—are beginning to embed sustainability criteria in evaluation processes. Belgrade and Varna plan similar approaches in EU-funded projects, while Castilla y León and Kriti/Chania emphasise the need to build technical capacity and standard methodologies.

Technical Innovations and Pilot Projects

Innovative solutions across the territories include modular paving systems, permeable and reflective surfaces, eco-asphalt with rubber or fly ash, and signage made from 100% recycled polymers. Bursa and Istanbul have piloted reclaimed-rubber asphalt; Castilla y León has tested modular tracks; Belgrade and Varna are linking infrastructure pilots with durability monitoring; Chania collaborates with universities to adapt materials to local climatic conditions.

Research partnerships—such as those active in Kriti/Chania and Belgrade—play a decisive role in validating eco-materials and supporting their scaling-up.

Opportunities for the SMILE City Project

Findings highlight opportunities to strengthen the circular transition in cycling infrastructure:

- enabling knowledge exchange among partners;
- co-designing pilot projects with local stakeholders;
- promoting standardised data collection on materials and environmental impacts;
- developing procurement guidelines prioritising circular materials;
- supporting municipal–university partnerships.

These actions reinforce alignment with the European Green Deal, Circular Economy Action Plan, and SUMP framework.

Theme	Key findings	Examples
Use of recycled materials	Growing but uneven adoption	Turin, Castilla y León, Bursa, Istanbul
Eco-pavements & permeable surfaces	Tested in pilots, promising for hot/coastal climates	Chania, Istanbul
Recycled polymer signage & modular elements	Increasing experimentation	Belgrade, Varna
Regulatory barriers	Fragmented standards, procurement limits	All cities
Evaluation tools (LCA, CBA)	Emerging but not systematic	Lucca, Manresa, Bursa
Research partnerships	Essential for scaling innovation	Chania, Belgrade

Table 3.8.1 – Cross-cutting themes on circular materials in cycling infrastructure

This project has received funding from the European Union's Horizon Programme (HORIZON-CL6-2023-CIRCBIO-02) under grant agreement No 101135406

Summary

This section highlights the strategic but still emerging role of circular economy principles in cycling infrastructure. While several cities have begun experimenting with recycled materials—such as recycled aggregates, rubber-based mixtures, eco-pavements, and polymer signage—the level of adoption remains uneven and often limited to pilot projects.

Key challenges persist, including fragmented regulatory frameworks, limited technical capacity, and procurement procedures that favour conventional materials. Tools such as Life Cycle Assessment (LCA) and Cost–Benefit Analysis (CBA) are only partially used, although they could strengthen the environmental and economic assessment of circular solutions.

Readiness level	Characteristics	Cities
Advanced	Pilots + technical standards emerging	Istanbul, Bursa, Castilla y León
Intermediate	Small pilots, early LCA/CBA use	Lucca, Manresa, Turin
Early-stage	Limited pilots, no standardisation	Belgrade, Varna, Chania

Table 3.8.2 – Circular infrastructure readiness levels

Despite these gaps, the pilot experiences carried out in multiple cities confirm the potential of recycled materials to reduce carbon emissions, enhance resource efficiency, and improve infrastructure resilience. Strengthening technical guidelines, harmonising data collection, and fostering collaboration among municipalities, research institutions, and industry will be essential to scale up these innovations.

The SMILE City project offers an opportunity to support this transition by promoting knowledge exchange, standardised methodologies, and targeted pilot actions aimed at integrating circular principles into cycling infrastructure planning.

3.9 Future investments and economic tools for sustainable mobility

This section has been developed with the contribution of the European Cyclists' Federation (ECF)

The capacity of local administrations to plan, finance, and implement investments in soft mobility varies significantly across the nine cities and regions analysed within the SMILE City project. Differences in institutional maturity, planning culture, and access to funding mechanisms strongly influence the ability to develop long-term strategies and economic tools for sustainable urban mobility.

Among all contexts, the Metropolitan City of Turin (CMTO) represents a structured and comprehensive financial framework, with investment priorities clearly defined within long-term strategic documents such as the Sustainable Urban Mobility Plan (SUMP), the Biciplan, and the Metropolitan Cycling Network (RCM). Funding is mobilised through a combination of local, regional, national, and European resources, ensuring continuity across programming cycles. These investments extend beyond infrastructure to support innovation, digitalisation, shared mobility, and environmental objectives.

Manresa follows a proactive investment approach, aligning its financial strategy with the local SUMP and leveraging regional and national co-financing. Its priorities include upgrading cycling infrastructure, improving pedestrian accessibility, and integrating sustainable mobility within urban redevelopment. The region of Castilla y León capitalises on European cooperation and regional initiatives such as MOVELETUR,

This project has received funding from the European Union's Horizon Programme (HORIZON-CL6-2023-CIRCBIO-02) under grant agreement No 101135406

combining funding for infrastructure with awareness campaigns and pilot projects, especially in low-density territories. Integration of additional regional inputs confirms the relevance of EU Cohesion Policy mechanisms and highlights the region's capacity to coordinate multi-source funding for cycling, digitalisation, and tourism-oriented mobility actions.

Lucca and Kriti/Chania are consolidating their financial frameworks for sustainable mobility, linking national, regional, and municipal funding with targeted projects to expand cycling infrastructure, improve road safety, and promote active mobility. Lucca's integration emphasises the importance of national recovery funds and the challenge of ensuring continuity once extraordinary financing cycles end. Kriti/Chania's additional inputs underline the role of EU-funded pilot actions, including digital tools and e-bike infrastructure, to support the early stages of sustainable mobility implementation.

In Istanbul, Bursa, Belgrade, and Varna, institutional and financial mechanisms are also evolving toward greater integration. Istanbul has introduced dedicated sustainability funds within its Green Mobility Strategy 2035, combining public budgets, national grants, and private investment for cycling and e-mobility projects. Bursa channels funding through its Smart City Directorate, which allocates resources to active mobility, renewable energy, and low-emission transport. Additional details confirm that Bursa's new Transportation Master Plan foresees increased investments in cycling corridors, intermodal nodes, and parking facilities. Belgrade relies on EU Instrument for Pre-Accession (IPA) programmes and international partnerships, and the city highlights growing interest in soft mobility projects, especially those related to environmental improvement and air quality. Varna draws on Cohesion Policy instruments such as the Operational Programme for Transport and Environment.

Despite these diverse mechanisms, a recurring challenge across all territories is the limited availability of stable and long-term public funding specifically dedicated to cycling and soft mobility. In many cases, investments depend on project-based schemes, which can lead to fragmentation and hinder systemic change.

A further structural issue concerns the focus of existing funding. Financial resources are still predominantly directed toward infrastructure construction, with less emphasis on maintenance, operations, communication, or behavioural change initiatives. Yet these complementary actions—such as educational programmes, awareness campaigns, and incentives—are crucial for ensuring the social and functional success of new infrastructure. Confirming insights from Lucca and Bursa, the continuity of funding for operational activities and behavioural initiatives appears as a strategic gap.

The monitoring and evaluation of investments also remain underdeveloped. Most cities lack consistent frameworks to measure how mobility investments affect outcomes such as safety, emissions, modal shift, or social inclusion. Introducing performance indicators and cost–benefit models would strengthen decision-making processes and demonstrate the economic, environmental, and health value of soft mobility. Castilla y León and Belgrade explicitly highlight the need to strengthen monitoring capacities to support evidence-based decisions.

Thematic Area	Main Evidence Across the 9 Cities and Regions
Financial Planning Maturity	CMTO shows the most structured long-term financial framework; Manresa and Lucca have medium maturity; Kriti/Chania and Varna are consolidating; Belgrade increases reliance on international funding.
Funding Sources	Mix of municipal, regional, national, EU and private funds. CMTO, Istanbul, Castilla y León and Varna benefit most from EU programmes; Bursa leverages Smart City funds; Belgrade

This project has received funding from the European Union's Horizon Programme (HORIZON-CL6-2023-CIRCBIO-02) under grant agreement No 101135406

	uses IPA funds.
Investment Priorities	Majority of resources target infrastructure (cycle lanes, intermodality, green corridors). Less funding for maintenance, communication, behavioural change or user engagement.
Role of EU Funding	Key driver especially in Castilla y León, Varna, Belgrade, Chania and Bursa. Supports rural areas, digitalisation and pilot projects.
Economic and Territorial Impact	Cycling investments linked to tourism (Castilla y León, Varna, Chania), regeneration (Bursa, Istanbul), job creation and innovation ecosystems.
Challenges Identified	Lack of stable long-term funding; dependence on project-based schemes; weak monitoring and evaluation systems; insufficient cross-sectoral integration.
Opportunities for SMILE City	Harmonisation of evaluation methods; shared indicators; multi-level governance support; co-designed pilot actions; training on funding and procurement.

Table 3.9.1 — Cross-thematic synthesis of future investments and economic tools

Summary

Cycling and soft mobility represent both environmental and economic opportunities across all contexts. In regions such as Castilla y León, Kriti/Chania and Varna, cycling infrastructure supports sustainable tourism and territorial cohesion, while in Bursa and Istanbul it contributes to urban regeneration and innovation. These effects confirm the broader economic and social value of soft mobility investments.

Integrating mobility financing within cross-sectoral policy frameworks—such as public health, climate action, and tourism—can amplify these benefits. However, stable long-term funding remains limited, and many cities still rely on project-based schemes. More systematic monitoring mechanisms would help quantify impacts on emissions, safety, and modal shift, strengthening policy justification.

Governance plays a decisive role. CMTO demonstrates effective vertical coordination, while Castilla y León and Belgrade highlight the potential of multi-level governance in accessing diverse funding instruments. Improving alignment between institutional levels is essential to ensure continuity, impact and scalability of investments.

Overall, long-term planning, diversified funding sources and stronger evaluation frameworks are key to consolidating soft mobility as a strategic lever for sustainability, health, social inclusion and economic resilience.

City / Region	Investment Maturity	Main Funding Sources	Strategic Priorities	Key Challenges
CMTO	Very high	Local, regional, national, EU	Infrastructure, digitalisation, innovation	None major; well-structured
Manresa	Medium	Local + regional/national	Cycling + pedestrian + urban renewal	Funding continuity
Castilla y León	High	Strong EU + regional	Tourism, rural mobility	Low density & territorial dispersion
Lucca	Medium	Municipal + regional + PNRR	Infrastructure, safety	Continuity after PNRR
Kriti/Chania	Medium-low	EU pilots + national	E-mobility, first infrastructure	Limited resources
Bursa	Medium	Smart City funds + EU	Corridors, intermodality	Limited monitoring
Istanbul	High	Public + national + private	Green mobility, e-mobility	Complexity of megacity scale

This project has received funding from the European Union's Horizon Programme (HORIZON-CL6-2023-CIRCBIO-02) under grant agreement No 101135406

Belgrade	Medium-low	IPA + partnerships	Soft mobility pilots	Reliance on external funds
Varna	Medium	EU Cohesion Policy	Urban + coastal cycling	Maintenance and integration

Table 3.9.2 — Comparative overview of investment capacity and tools

3.10 Digital tools for the future of sustainable mobility

The digital transition is emerging as a key driver for the sustainable transformation of urban mobility systems. Across the nine cities and regions participating in the SMILE City project, there is widespread recognition of the strategic role of digital technologies—not only to optimise infrastructure management, but also to influence mobility behaviour, enhance accessibility, and strengthen policy effectiveness.

The information examined revealed a shared interest in developing and adopting innovative, user-oriented digital tools such as:

- smart interfaces at charging and interchange stations providing real-time user information;
- Digital Product Passports (DPPs) integrated with mobile applications and server systems to ensure traceability, transparency, and interoperability;
- other integrated digital solutions adapted to local needs, capable of supporting circular economy goals and soft mobility strategies.

All nine contexts expressed strong interest in smart interfaces that display real-time information on availability, routes, intermodal connections, and service features. Manresa and Lucca highlighted the importance of integrating these interfaces with interactive maps and wayfinding systems to assist inexperienced users. Turin and Istanbul emphasised full interoperability with existing mobility platforms (e.g., “Muoversi a Torino”, “İBB Smart Mobility Platform”), while Castilla y León and Varna stressed the importance of tourist-oriented information in multilingual formats. Inputs from Castilla y León reinforce the relevance of digital tools for rural and low-density environments, where wayfinding and multimodal information can support regional cycling itineraries.

The Digital Product Passport (DPP) concept received broad support across all partners. It is viewed as a tool to collect environmental and operational data on infrastructure and services, enabling integrated management and lifecycle transparency. Kriti/Chania underlined the potential of DPPs to track the use of recycled materials in cycling infrastructure—linking digital innovation with circular economy objectives—while Lucca and Bursa saw opportunities to connect DPPs with regional mobility platforms and emerging ITS systems. Belgrade and Varna identified DPPs as useful for aligning monitoring activities with EU standards and improving access to environmental reporting tools.

A consistent theme across all territories is the need for intuitive, inclusive, and adaptable digital tools designed for universal accessibility. Cities acknowledge that broad adoption—especially among older adults or digitally inexperienced populations—depends on usability and design. Castilla y León and Bursa proposed simplified touchscreen interfaces with strong visual communication; Manresa and Belgrade emphasised universal accessibility principles, including support for users with visual or cognitive impairments. Lucca added that intuitive interfaces are essential to increase adoption among occasional or tourist users.

Equally important is the principle of integration over duplication. All cities recommend developing digital tools that enhance existing ecosystems rather than create parallel systems. Turin, Istanbul, and Lucca already

This project has received funding from the European Union's Horizon Programme (HORIZON-CL6-2023-CIRCBIO-02) under grant agreement No 101135406

operate digital mobility platforms, while Chania and Castilla y León highlight opportunities for integration with public transport, bike-sharing, and tourism apps. Additional contributions from Bursa confirm the importance of linking digital tools with smart city infrastructures, while Belgrade notes that integrating new tools into existing GIS and mobility dashboards can improve monitoring and planning efficiency. In this regard, the SMILE City project is seen as a valuable framework for co-designing interoperable, context-sensitive solutions.

City/Region	Digital Tools Maturity	Key Future Needs
CMTO	High	Integration, DPP, enhanced interfaces
Lucca	Medium	Intuitive tools, tourist info, DPP linkage
Manresa	Medium	Inclusive design, simple interfaces
Castilla y León	Medium	Rural connectivity, multilingual tools
Kriti/Chania	Medium-Low	DPP for recycled materials, platform integration
Bursa	Medium	Smart interfaces, IoT integration
Belgrade	Medium-Low	Accessibility functions, GIS integration

Table 3.10.2 - Comparative overview

Summary

All participating cities demonstrate a strong commitment to digital innovation as a strategic enabler of sustainable mobility. Their shared priorities include:

- developing smart interfaces at charging and interchange points to deliver real-time, geolocated, and contextualised information;
- implementing Digital Product Passports to ensure traceability of materials, energy use, and environmental performance;
- creating simple, inclusive tools accessible to all user groups, regardless of digital skills;
- integrating new tools with existing mobility platforms and data systems to ensure coherence and interoperability.

Beyond technology, cities expect support in testing, training, and scaling digital solutions that can be replicated in different contexts. There is broad consensus that digitalisation should not be an end in itself, but a structural enabler for a cohesive, intelligent, and sustainable urban mobility system—capable of connecting people, infrastructure, and the environment within a single integrated framework.

3.11 Policies for reducing the use of combustion vehicles

The information presented in this section derives primarily from an integrated questionnaire completed by seven participating cities and regions: Lucca, Manresa, Castilla y León, Metropolitan City of Turin (CMTO), Kriti/Chania, Bursa, and Varna. The responses reflect a wide range of approaches to reducing the use of combustion vehicles, influenced by differences in governance capacity, territorial scale, and local environmental priorities. Additional information provided through subsequent partner integrations (Bursa, Castilla y León, Kriti/Chania, Lucca) further enriches this section, particularly regarding local regulatory frameworks and cross-sectoral links with climate and tourism policies.

Across the territories, regulatory restrictions—such as Low Emission Zones (LEZs), Limited Traffic Zones (LTZs), and parking regulations—emerge as key policy instruments. The Metropolitan City of Turin (CMTO) has a well-established system of LEZs and LTZs that limit the circulation of older, more polluting vehicles in

This project has received funding from the European Union's Horizon Programme (HORIZON-CL6-2023-CIRCBIO-02) under grant agreement No 101135406

specific urban areas. Manresa and Lucca also operate LTZs, primarily in historic centres, with varying degrees of enforcement and technological control (e.g., cameras or automated gates).

Bursa enforces restrictions mainly in central and commercial areas, focusing on limiting access for heavy-duty vehicles and freight traffic, with further measures to be defined within its new Urban and Transportation Master Plan (as confirmed by the city's integration document). Kriti/Chania applies seasonal or event-based restrictions in high-density tourist zones but has not yet established permanent LEZs. Castilla y León, due to its regional scale and diversity, applies such measures mainly in larger municipalities, while Varna does not yet have formal LEZs or LTZs but enforces access limits for heavy vehicles in central areas and along main transport corridors. These measures aim to improve safety, reduce congestion, and are expected to evolve into broader low-emission frameworks under national and European directives.

Regarding economic incentives to promote modal shift and fleet renewal, policy consistency remains limited. CMTO and Castilla y León stand out for structured programmes encouraging the replacement of combustion vehicles with electric or hybrid alternatives, supported by national or EU funding. CMTO also offers incentives for e-bike purchases and shared mobility services. Bursa provides discounts on public transport to encourage modal shift, while Manresa promotes reduced fares and free trial passes for public transport use. Lucca and Kriti/Chania mainly rely on awareness campaigns and communication strategies promoting alternative mobility. Varna, though without direct incentives, participates in Horizon Europe 2021–2027 initiatives promoting cargo bike use and multimodal connections, as part of its strategy to reduce car dependency.

The enhancement of public transport and the promotion of active mobility are recurring themes across all seven contexts. CMTO combines improved public transport with restrictive measures on private cars, such as higher parking fees and reallocation of road space for cyclists and pedestrians. Manresa is upgrading bus frequency and accessibility, while Lucca focuses on expanding its cycling network as an alternative to car use. Castilla y León invests in urban transport in major cities, while Kriti/Chania and Bursa prioritise pedestrian and cycling paths in tourist and commercial zones. Varna is developing strategic plans for multimodal connections and new cycling infrastructure, in alignment with EU sustainable mobility goals.

All cities and regions recognise the importance of cultural and behavioural change in reducing combustion vehicle use. CMTO and Manresa implement educational campaigns, while Castilla y León and Lucca connect them to climate and air quality goals. Kriti/Chania and Bursa focus on seasonal campaigns to manage tourist-related traffic peaks. Varna combines awareness actions with research on alternative mobility and cargo bike adoption.

City/Region	Type of restriction	Economic incentives	Active mobility / public transport	Campaigns / Awareness	Stage of implementation
Turin (CMTO)	LEZs, LTZs (structured, permanent)	EV & e-bike incentives; shared mobility incentives	Strong PT integration; road-space reallocation	Year-round campaigns	Advanced
Manresa	LTZs	PT discounts, free trial passes	Improved bus services	Educational and behavioural campaigns	Intermediate
Lucca	LTZs in historic centre	None	Cycling network expansion	Environmental and climate-oriented campaigns	Intermediate

This project has received funding from the European Union's Horizon Programme (HORIZON-CL6-2023-CIRCBIO-02) under grant agreement No 101135406

Castilla y León	LEZs in larger cities	EV subsidies, scrappage schemes	Urban PT upgrades	Climate & air-quality campaigns	Advanced
Kriti/Chania	Temporary/seasonal limits	None	Pedestrian and cycling paths in tourist areas	Seasonal awareness actions	Early stage
Bursa	LTZs, heavy-vehicle bans	PT discounts	Tourism corridors; pedestrian–cycling enhancements	Seasonal & safety campaigns	Intermediate
Varna	Heavy vehicle restrictions	None	Cargo-bike pilot projects; multimodal planning	Awareness + EU research projects	Early stage

Table 3.11.1 - Comparative overview

Summary

The analysis shows that while measures such as access restrictions and public transport improvements are widespread, their scope and enforcement vary greatly. Large metropolitan areas like CMTO demonstrate structured and integrated approaches supported by strong governance. Intermediate cities such as Bursa and Manresa advance through targeted regulatory and planning actions.

Smaller municipalities, including Lucca and those in Kriti/Chania, rely mainly on soft measures and awareness initiatives. Varna represents a transitional case, combining selective restrictions with pilot EU-funded mobility projects. Regional entities like Castilla y León face the challenge of balancing urban and rural needs, combining flexibility and coherence.

3.12 Opportunities and needs for the SMILE City project

Following the comparative analysis of mobility policies and actions implemented by the participating cities and regions, this section shifts the focus toward their expectations and needs for the future. It aims to capture how local authorities perceive the SMILE City project as a driver for innovation, capacity building, and the advancement of sustainable urban mobility strategies, and to understand the expectations that local administrations have of the project. This reflection allows for the identification of key areas where the project can generate added value, both through innovation and through support for local capacity building and governance.

The synthesis of these findings reveals that cities and regions share similar priorities, centred on digitalisation, knowledge exchange, and the development of integrated and sustainable mobility systems capable of addressing their specific territorial challenges.

3.12.1 Innovative solutions expected

Across all partners, expectations primarily focus on four main areas of innovation:

- Development and testing of digital tools for soft mobility. Local administrations express strong interest in operational, user-friendly digital solutions such as mobile apps, smart displays at charging and interchange points, and integrated management platforms. Lucca, Chania, Bursa, and Varna

This project has received funding from the European Union's Horizon Programme (HORIZON-CL6-2023-CIRCBIO-02) under grant agreement No 101135406

explicitly emphasise the value of real-time information systems and shared digital dashboards supporting route planning and service accessibility.

- Technological innovation for sustainable and circular cycling infrastructure. Several partners—including Manresa, Chania, and Istanbul—highlight the importance of innovative materials, digital diagnostics, and modular components capable of improving maintenance, durability, and environmental performance. The use of recycled materials is seen as particularly relevant by Chania and Bursa in connection with circular economy objectives.
- Integrated and interoperable data systems. Turin, Castilla y León, and Belgrade stress the need to develop platforms capable of linking cycling, public transport, and environmental indicators. Interoperability is considered essential for planning, impact assessment, and real-time decision-making.
- Tools for communication, education, and behavioural change. Lucca, Castilla y León, and Kriti/Chania underline the importance of user-engagement tools, including participatory apps, digital surveys, and educational platforms to improve awareness, promote active mobility, and support inclusive mobility strategies. Together, these priorities point toward a strong preference for practical, scalable, and digitally integrated solutions that improve service quality, support monitoring activities, and provide measurable evidence of progress toward sustainable mobility goals.

3.12.2 Needs that the project can address

Beyond the identification of innovative solutions, the analysis highlights a set of recurring needs and structural gaps that the SMILE City project could effectively address:

- Technical and strategic planning support. Several cities and regions—including Castilla y León, Manresa, and Varna—report limited internal resources to update or coordinate sustainable mobility plans. The project is expected to provide methodological guidance, decision-support frameworks, and analytical tools.
- Capacity building and staff training. A shared need across almost all partners, especially those with smaller administrative structures such as Manresa, Chania, and Lucca. Bursa and Belgrade also emphasise the importance of training on EU mobility standards, digitalisation, and user-oriented planning.
- Improved integration across planning and governance levels. Turin, Castilla y León, and Kriti/Chania call for tools and processes that enhance vertical coordination between municipal, provincial, regional, and national strategies.
- Peer-learning and cooperation networks. All participating cities express interest in structured exchanges among European municipalities. Kriti/Chania, Istanbul, and Belgrade explicitly underline the value of comparative learning and replicable models.

Overall, partners expect SMILE City to act as both a technical facilitator and a governance accelerator, providing support not only for innovative digital solutions but also for institutional capacity building and policy alignment.

This project has received funding from the European Union's Horizon Programme (HORIZON-CL6-2023-CIRCBIO-02) under grant agreement No 101135406

3.12.3 Summary and final considerations

A cross-cutting interpretation of all information collected throughout the analytical process points to several recurring and complementary themes:

- Data governance and shared indicators. Many cities point to the lack of standardised and digitalised monitoring systems for mobility and environmental indicators, stressing the need for harmonised metrics and integrated data platforms.
- Integration of soft mobility with public transport. Across all territories, respondents emphasise the need to strengthen interoperability between cycling, walking, and public transport, moving toward a cohesive mobility system.
- Smart and sustainable infrastructure. Partners highlight growing interest in recycled and low-impact materials, modular components, and digital maintenance systems as part of future-proof infrastructure planning.
- Territorial cohesion and sustainable tourism. Castilla y León, Kriti/Chania, Varna, and Bursa consider cycling an essential tool for improving accessibility in rural or peripheral areas and for supporting tourism-based economies.
- Training on EU policies and replicable planning models. Cities express strong demand for training on European standards, funding opportunities, and impact assessment methodologies.

From these findings, two complementary directions emerge where SMILE City can generate concrete added value:

1. *Technical and digital innovation* – through the creation and testing of operational tools (apps, interoperable platforms, smart interfaces, monitoring indicators) that improve the efficiency, safety, and environmental performance of soft mobility systems.
2. *Local capacity building and governance reinforcement* – through shared methodologies, multilevel coordination instruments, and tailored training programmes.

Cities and regions perceive SMILE City not only as a provider of innovation but as a catalyst for institutional transformation, capable of bridging gaps in expertise, governance, and data management.

Ultimately, the project is expected to support:

- pilot experimentation and the evaluation of scalable solutions;
- standardisation of data collection and performance indicators;
- structured peer-learning processes among European partners;
- evidence-based governance and planning;
- a cultural shift toward integrated, inclusive, and resilient mobility systems.

Through these dimensions, SMILE City can play a decisive role in guiding urban and regional partners toward mobility models aligned with EU climate and public health objectives.

This project has received funding from the European Union's Horizon Programme (HORIZON-CL6-2023-CIRCBIO-02) under grant agreement No 101135406

4. Comparative analysis of local contexts

Following the methodological framework outlined in Chapter 3, this chapter provides a comparative analysis of the nine participating cities and regions, based on the data collected through the T2.1 questionnaire. The objective is to explore how different local contexts address soft mobility planning and implementation, highlighting shared challenges, innovative approaches, and emerging patterns across territories. The comparative perspective allows for a broader understanding of how mobility strategies evolve in relation to geographic, institutional, and socio-economic conditions.

For these four cases, the Key Strengths and Key Challenges were also reassessed when the additional information provided substantial new insights. For all other cities and regions, the profiles reflect only the information collected in the first phase of analysis.

Section 4.1 now presents the extended profiles of all nine local contexts, enriched — where available — with the additional analytical elements mentioned above. Section 4.2 deepens the comparison through selected indicators and comparative tables, identifying strengths, challenges, and potential areas for improvement in soft mobility planning and implementation.

4.1 Extended profiles of target cities and regions

[13 – PERIFEREIA] Kriti (EL) – Focus on Chania

Region of Crete participated with a focus on the city of Chania, designated as a pilot city within the SMILE project. Chania faces challenges typical of historic Mediterranean cities, such as “automobile congestion, lack of cycling culture, and fragmented cycling networks”. The SUMP is still in early stages, and the current infrastructure is concentrated in a few coastal and central areas.

Although detailed traffic and accident data remain limited, the city acknowledges “the need to establish comprehensive data collection systems”. Pollution levels are not systematically monitored, and digital tools are at the development stage. Recent initiatives include the introduction of GPS monitoring for public buses and early testing of mobility-related digital platforms, which reflect an emerging interest in strengthening real-time information systems and interoperability with existing services.

The municipality shows strong engagement with the circular economy concept: “implementation requires regulatory instruments and resources that are currently lacking”. Collaboration with local universities has begun to explore the potential use of recycled or low-impact materials adapted to coastal and touristic environments, indicating a progressive alignment with SMILE City’s environmental goals.

Soft mobility is framed as a cultural and infrastructural transformation, with specific mention of the need to engage “especially youth and commuting workers”. Pilot awareness initiatives linked to seasonal tourism flows have recently been introduced, highlighting the role of behavioural change in reducing car dependency. Chania’s case offers a unique opportunity for prototyping SMILE innovations in a setting that blends tourism, history, and modern urbanisation.

Key Strength. Chania expresses the strongest cultural repositioning effort towards cycling and sustainable mobility, explicitly targeting behavioural change among youth and commuters.

Key Challenge. It has the most fragmented and underdeveloped cycling infrastructure, with limited integration into broader urban planning frameworks.

This project has received funding from the European Union's Horizon Programme (HORIZON-CL6-2023-CIRCBIO-02) under grant agreement No 101135406

[17 – LUCCA] Comune di Lucca (IT)

Lucca stands out for its compact urban form and historical identity. Its entire historic centre is pedestrian-friendly, enclosed by Renaissance walls. The city adopted its SUMP in 2018 and launched the "Lucca Bicipolitana" project to expand the cycling network beyond the city walls. As a "Fellower City" in the Circular Cities and Regions Initiative, Lucca aligns with European climate neutrality goals.

The city identifies cycling as "strategic to increase accessibility of peripheral districts and reduce car dependency". However, financial constraints persist: "there are objective problems in managing financial resources". Recent updates provided by the municipality confirm that funding limitations continue to represent a critical barrier, especially for long-term maintenance and service-oriented measures.

Air quality data are provided by ARPAT, and the city actively promotes health-environment-mobility integration. A flagship experience is the EU-funded LIFE ASPIRE project, which implemented a reward platform (LOCMAP) for logistic operators based on emissions reduction and an important pilot experience with the first Italian cargo-bike sharing stations for the delivery operator of the historical centre. The project ended in 2022 but it raised new policy ideas for freight measures in the RTZ.

While recycled materials are not yet widely used, there is "ongoing reflection on their adoption in future infrastructure". The municipality expressed interest in testing eco-materials for cycling paths when regulatory and technical frameworks will allow it, particularly within upcoming small-scale interventions.

A recent Electric Mobility Plan foresees 32 new charging stations with smart interfaces. Additional digital developments are ongoing, including the integration of soft-mobility data within municipal ICT tools and the exploration of user-friendly wayfinding solutions, in line with broader objectives of accessibility for residents and tourists. These steps illustrate Lucca's gradual transition toward more interconnected mobility services.

Lucca's integrated, yet resource-constrained approach demonstrates the challenges and opportunities of sustainable mobility in small historic cities.

National regulatory frameworks for cycling and sustainable mobility

Lucca operates within the Italian regulatory framework for sustainable mobility, which has progressively strengthened national requirements for cycling infrastructure and urban accessibility. The city aligns its actions with the National Cycling Mobility Law (Law 2/2018), which establishes cycling as a mode of public interest and promotes the development of regional and municipal cycling networks. In addition, Lucca follows national guidelines on SUMPs (Ministerial Decree 397/2017) and the "Piano Generale della Mobilità Ciclistica" (PGMC) adopted at national level. These frameworks support the city's efforts to expand the "Bicipolitana" network, promote intermodality, and improve safety standards for cycle paths within constrained historic environments.

Health, education, tourism, climate and socio-economic strategies

Lucca integrates cycling policies with broader intersectoral strategies. The city emphasises the health–mobility nexus through campaigns encouraging active transport and cooperation with schools to promote cycling among children and teenagers. Tourism is also a central dimension: Lucca's historic and cultural assets attract significant visitors, and cycling routes are increasingly designed to connect the city centre, green corridors, and peri-urban destinations. The city's climate and energy strategies promote soft mobility as a lever for reducing emissions and improving air quality, particularly within the historic walls. From a socio-

This project has received funding from the European Union's Horizon Programme (HORIZON-CL6-2023-CIRCBIO-02) under grant agreement No 101135406

economic perspective, cycling is considered a tool to support accessibility in peripheral areas, while fostering sustainable tourism and local economic development.

Key Strength. Lucca benefits from one of the most compact and walkable urban morphologies among all partner cities, which naturally supports cycling and active mobility, particularly within the historic centre. This structural advantage is reinforced by the city's strong alignment with the national regulatory framework for cycling mobility and by its growing integration of mobility, health, education, and tourism policies.

Key Challenge. Lucca shows the weakest financial capacity to sustain long-term investments in cycling and soft mobility, explicitly reporting recurrent difficulties in mobilising stable and adequate resources. This limitation affects the pace of network expansion, the adoption of digital tools, and the ability to ensure continuous improvement of sustainable mobility services.

[19 - BURSA] Bursa Buyuksehir Belediyesi (TR)

Bursa, one of Turkey's largest metropolitan municipalities, presents a rapidly expanding urban structure characterised by strong industrial activity, growing suburbanisation, and significant pressure on the transport system. The city's mobility challenges primarily stem from congestion in central districts, increasing motorisation, and the need to harmonise mobility development with environmental goals.

The metropolitan administration is currently updating its Urban and Transportation Master Plan, which identifies cycling and soft mobility as emerging priorities. Existing cycling infrastructure extends for approximately 120 km and is largely concentrated in green corridors and recreational zones. According to the additional information provided, Bursa is progressively expanding this network, integrating coastal and peri-urban routes into a broader metropolitan strategy.

Traffic and accident data are collected but remain partially aggregated, with limited cyclist-specific monitoring. Digitalisation is advancing through the Smart City Directorate, which coordinates traffic signals, parking systems, and shared mobility services**.** Recent updates highlight ongoing testing of IoT-based sensors for bike-usage monitoring and air-quality integration, marking an important step toward data-driven planning.

Environmental monitoring follows national protocols, although pollution levels in dense industrial and commercial areas remain a concern. Bursa emphasises the role of soft mobility in reducing traffic pressure and improving environmental quality.

The city demonstrates growing interest in circular and sustainable materials. The integration document confirms the use of recycled rubber and other eco-materials in pilot cycling infrastructure projects, aligned with national circular economy guidelines.

Soft-mobility adoption is reinforced by public campaigns and discounts for public transport, reflecting a combined regulatory and behavioural approach. Seasonal campaigns target tourist flows and awareness around cycling safety, as noted in the integration document**.**

Despite ongoing progress, Bursa still faces structural limitations such as car dependency, discontinuity of the cycling network, and limited inclusiveness for vulnerable users—though efforts are underway to address these issues through public-awareness initiatives and infrastructure upgrades.

This project has received funding from the European Union's Horizon Programme (HORIZON-CL6-2023-CIRCBIO-02) under grant agreement No 101135406

National regulatory frameworks for cycling and sustainable mobility

Turkey's national mobility and transport legislation plays a central role in shaping Bursa's policy environment. The city aligns its planning framework with several national norms and strategic documents issued by the Ministry of Transport and Infrastructure and the Ministry of Environment, Urbanisation and Climate Change. These include regulations governing cycling infrastructure standards, urban transport planning obligations, and sustainability-driven investments in metropolitan areas. Bursa explicitly references the national mandate for metropolitan municipalities to develop Transportation Master Plans, which must integrate sustainable mobility and active transport objectives. The city's new Urban and Transportation Master Plan follows these national requirements, incorporating guidelines on cycling lanes, pedestrian safety, and public transport prioritisation. Furthermore, Turkish legislation supporting smart city development and low-emission mobility has influenced Bursa's adoption of ITS systems, green corridors, and emerging circular-economy-oriented infrastructure pilots. In the context of cycling, national directives provide technical guidelines for lane geometry, signage and safety, which Bursa uses as the foundation for its expanding cycling network. While the regulatory framework enables strategic investment, Bursa reports that enforcement mechanisms and national funding streams remain uneven, affecting implementation continuity.

Health, education, tourism, climate and socio-economic strategies

Bursa presents an increasingly integrated approach linking mobility with health, education, tourism, and climate objectives. Cycling and soft mobility are framed as tools to promote healthier lifestyles and reduce pollution in one of Turkey's fastest-growing metropolitan areas. Awareness campaigns and school-based programmes aim to improve cycling culture among youth, while community initiatives encourage active mobility among women and new riders—groups traditionally underrepresented in cycling. The city also embeds cycling within its tourism and green-corridor strategy, creating recreational routes and multimodal connections between urban centres, historical sites, and natural landscapes. This approach supports local economic development by enhancing access to cultural destinations and improving the visitor experience. Bursa's climate policies, including renewable energy and air-quality goals, increasingly rely on modal shift to reduce traffic emissions. Investments in green corridors, pedestrian zones, ITS systems, and e-mobility form part of an integrated response to congestion, urban heat, and air pollution. The socio-economic context—characterised by rapid population growth and suburban expansion—makes cycling a strategic tool to improve accessibility, reduce transport costs, and strengthen social cohesion across the metropolitan area.

Key Strengths. Bursa is among the most dynamically evolving metropolitan areas, integrating ITS systems, IoT pilots (bike-use and air-quality sensors), and smart-city functions into its mobility framework. The city is advancing innovative eco-material solutions, including rubberised asphalt and recycled-content surfaces, aligning cycling infrastructure with circular-economy goals. Cycling and green corridors are increasingly linked to tourism, recreation, and environmental strategies, strengthening multi-sector benefits. Awareness initiatives targeting youth, women, and seasonal users indicate a growing cultural shift toward active mobility.

Key Challenges. Car dependency remains high, and cycling routes still suffer from fragmentation and lack of continuity across the metropolitan area. Data gaps—particularly on cycling accidents, modal share, and behavioural trends—limit evidence-based planning and monitoring. Financial and institutional continuity of cycling investments is not fully guaranteed and often relies on project-based initiatives. Rapid urban expansion and suburbanisation make it difficult to provide safe, connected, and attractive cycling alternatives.

This project has received funding from the European Union's Horizon Programme (HORIZON-CL6-2023-CIRCBIO-02) under grant agreement No 101135406

[21 - VARNA] Obshtina Varna (BG)

Varna is a major urban centre on the Bulgarian Black Sea coast, characterised by a mix of dense coastal districts, peri-urban residential areas, and strong seasonal variations due to tourism. The mobility system reflects this dual character: high traffic pressures in central and waterfront areas coexist with emerging efforts to promote sustainable and active mobility.

The city has begun strengthening its cycling network, which currently includes approximately 60 km of urban and peri-urban routes, connecting the city centre with residential neighbourhoods, parks, and coastal zones. These infrastructures support both daily mobility and tourism-related use, though continuity and safety remain partially limited. Plans for additional connections, particularly toward educational institutions and recreational areas, have been outlined but not yet implemented.

Public transport is based on an extensive bus network, progressively modernised through EU Cohesion Policy funding. Varna has expanded digital systems for public transport monitoring, including real-time arrival information and a local mobility platform integrating bus services with micro-mobility and parking data. Bike-sharing services operate through hybrid public-private models, combining station-based and free-floating bicycles.

Environmental challenges persist, especially along main corridors and port-influenced areas. Air quality is monitored through national systems, but integration with mobility planning is still limited. Varna acknowledges the need to improve data availability and harmonise pollution, traffic, and cycling indicators to support more accurate assessments.

The city is experimenting with small-scale innovations, including recycled plastic elements and eco-friendly paints in cycling pilot projects. It also participates in European research programmes promoting cargo-bikes and multimodal connections, reflecting a growing interest in sustainable logistics and last-mile innovation.

Soft mobility adoption is increasing, particularly among students and seasonal populations, but cycling modal share remains low. Safety perception and infrastructure continuity are identified as the main barriers. The municipality highlights the need for better user engagement, awareness campaigns, and accessible cycling education.

Varna views the development of sustainable and active mobility as a strategic opportunity for coastal resilience, tourism development, and improved quality of life. However, institutional capacity and monitoring systems need further strengthening to translate strategic intentions into long-term structural change.

Key Strengths. Varna demonstrates the strongest integration of soft mobility with coastal regeneration and tourism strategies, supported by hybrid bike-sharing schemes.

Key Challenges. Data availability and monitoring capacity remain weak, limiting evidence-based evaluation of mobility and environmental impacts.

[24 - IMM] Istanbul Metropolitan Municipality (TR)

Istanbul represents one of the largest and most complex urban environments in the SMILE City partnership, characterised by a rapidly growing population, intense urbanisation dynamics, and high reliance on private motorised mobility. The mobility framework is shaped by significant congestion challenges, strong spatial inequalities, and the need to integrate cycling within a multimodal and high-density metropolitan system.

This project has received funding from the European Union's Horizon Programme (HORIZON-CL6-2023-CIRCBIO-02) under grant agreement No 101135406

The city operates a highly developed and articulated public transport network, including metro, tram, BRT (Metrobüs), ferries, funiculars, and extensive bus services. Cycling infrastructure has expanded significantly over the last years: *the updated Cycling Master Plan (2023) identifies over 350 km of cycling routes, of which approximately 170 km are already operational*, connecting central districts, coastal areas, and suburban neighbourhoods.

From a governance perspective, Istanbul has adopted one of the most advanced strategies in the project partnership. Its Green Mobility and Climate Action Strategy 2035 establishes a clear framework for decarbonisation, sustainable transport, and active mobility. Cycling is framed as part of an integrated ecosystem comprising shared mobility, public transport electrification, and digital services.

Road safety and environmental monitoring are supported by the municipal Trafik Kontrol Merkezi, which manages real-time data flows on congestion, accidents, and public transport performance. Air pollution levels—especially NO_2 and PM10—remain among the highest in the partnership, though recent municipal actions have contributed to gradual improvements in exposure and emissions.

Digitalisation is a defining strength of Istanbul. The Smart Istanbul platform integrates multimodal data, route planning, real-time public transport information, and bike-sharing availability (ISBIKE). New features are being developed to include accessibility tools for vulnerable users and environmental indicators connected to cycling and e-mobility.

Regarding circular economy, Istanbul is experimenting with recycled materials in cycle lanes, including permeable pavements derived from recycled rubber and low-temperature asphalt mixes. These initiatives align with a broader national approach to integrating circular practices into infrastructure.

Soft mobility adoption is growing, though cycling modal share remains relatively modest (around 3%). The expansion of ISBIKE—with over 3,000 bicycles and 300 stations—demonstrates a strong commitment to improving access and supporting everyday use.

The city recognises major priorities for future progress: expanding safe and continuous cycling corridors, promoting behavioural change, improving multimodal integration, and strengthening data-driven monitoring. Istanbul thus represents a highly advanced but still evolving case, where large-scale investment and innovation coexist with substantial structural challenges tied to size, geography, and socio-economic disparities.

Key Strengths. Istanbul demonstrates the most advanced integration of mobility digitalisation in the partnership, through the Smart Istanbul ecosystem and real-time cycling data management.

Key Challenges. Despite substantial infrastructure and planning improvements, Istanbul continues to face high congestion levels and air pollution, which limit the overall speed of modal shift toward active mobility.

[26 - BEOGRAD] Grad Beograd (RS)

Belgrade presents a rapidly evolving metropolitan context shaped by high motorisation rates, increasing suburbanisation, and substantial pressure on its transport network. Although the city does not yet have a fully operational SUMP, it recently adopted **the** Sustainable Urban Mobility Strategy 2030, which provides a medium-term framework for rebalancing mobility priorities, improving public transport, and introducing soft

This project has received funding from the European Union's Horizon Programme (HORIZON-CL6-2023-CIRCBIO-02) under grant agreement No 101135406

mobility measures. The city is undergoing major urban redevelopment along the Sava and Danube rivers, where several cycling and pedestrian corridors are planned.

Cycling infrastructure currently amounts to approximately 120 km, largely concentrated along riverside axes and main boulevards, but discontinuity remains a major challenge. Belgrade reports a growing public interest in cycling, supported by awareness campaigns and municipal training programmes for seniors. However, the city acknowledges that "systematic data collection on cycling accidents and traffic volumes is still under development", limiting evidence-based planning.

Environmental monitoring is strengthening through national frameworks, and Belgrade stresses the relevance of air quality and climate objectives, which guide its shift toward electrified and shared mobility. The city is testing smart mobility dashboards integrating GIS mapping, traffic analytics, and pollution data, although cycling information is still being incorporated. Belgrade also highlights the importance of linking sustainable mobility with public health, particularly in reducing exposure to air pollution in dense districts.

In terms of circular economy approaches, Belgrade is collaborating with universities to pilot recycled polymer signage and eco-materials in cycling infrastructure. Future plans include expanding green corridors and improving multimodality through intermodal hubs.

National Regulatory Framework for Cycling and Sustainable Mobility

Belgrade operates within the national mobility framework defined by the Republic of Serbia, which includes the Law on Planning and Construction, the Law on Road Safety, and the National Transport Strategy that promotes decarbonisation and public-transport modernisation. Although no national legislation specifically targets cycling, the strategic direction supports sustainable mobility, enabling Belgrade to introduce cycling plans, safety guidelines, and multimodal initiatives. The city highlights the need for stronger national coordination and more targeted regulatory instruments supporting active mobility, particularly regarding design standards, maintenance obligations, and data monitoring requirements.

Health, Education, Tourism, Climate, and Socio-Economic Strategies

Belgrade's cross-sectoral integration reflects its position as a rapidly transforming post-industrial metropolis. Cycling is increasingly linked to environmental policies such as the Local Environmental Action Plan (LEAP), which prioritises air-quality improvement and climate adaptation. The city collaborates with health institutions to promote physical activity, and with educational sectors through awareness initiatives and free cycling lessons for seniors. Tourism strategies emphasise riverfront redevelopment and active mobility corridors along the Sava and Danube, supporting urban regeneration and new economic opportunities. Socio-economically, cycling is framed as a tool to reduce inequalities in peripheral municipalities with limited transport alternatives.

Key Strengths. Belgrade shows growing strategic alignment with climate and sustainability goals, supported by its Sustainable Urban Mobility Strategy 2030 and expanding smart mobility tools. Cycling is increasingly linked to environmental, health, and tourism policies, and pilot initiatives—such as programmes for seniors—reflect a stronger focus on behavioural change and inclusive mobility.

Key Challenges. Monitoring capacity remains limited, with fragmented data that constrain evidence-based planning. The cycling network is still discontinuous and weakly connected to public transport. National regulations for cycling are not fully defined, and peripheral districts continue to face accessibility and multimodality gaps.

This project has received funding from the European Union's Horizon Programme (HORIZON-CL6-2023-CIRCBIO-02) under grant agreement No 101135406

[29 – CMTO] Città Metropolitana di Torino (IT)

The Metropolitan City of Turin (CMTO) encompasses a wide and diverse territory, including urban, hilly, and mountainous zones. The local context is described as complex due to the “presence of natural barriers and areas poorly served by public transport” which complicates the implementation of soft mobility strategies. CMTO approved its Sustainable Urban Mobility Plan (SUMP) in 2021, covering the entire metropolitan area and integrating with the municipal SUMPs. The plan includes targeted interventions to increase cycling modal share and improve intermodality with public transport.

In terms of recent actions, CMTO has launched multiple initiatives, including a “Metropolitan Cycling Plan”, aimed at extending and connecting cycling networks with public transport nodes. However, data availability remains a challenge: “a systematic monitoring system for cycling is not yet in place”. Road safety statistics are collected at the municipal level, but “data are not harmonised” which limits comparability.

Environmental monitoring is robust, supported by ARPA Piemonte, and there is an increasing effort to align mobility with public health goals. While no regulatory requirement exists, CMTO has piloted the use of recycled materials in cycle paths. Regarding future vision, CMTO links the circular economy with infrastructure sustainability: “assessments are ongoing to adopt circular economy models in the construction cycle of cycling infrastructure”. Several digital tools, including interactive maps and user apps, are in use or under development.

Key Strengths. Among the five target areas, CMTO demonstrates one of the most comprehensive regional planning frameworks for cycling, as reflected in its dedicated “Metropolitan Cycling Plan” and harmonisation efforts across municipal SUMPs.

Key Challenges. Despite the advanced planning, CMTO reports the least systematic monitoring of traffic and cycling accident data, limiting the effectiveness of evidence-based interventions.

[33 - MANRESA] Ajuntament de Manresa (ES)

Manresa is a medium-sized urban centre in Catalonia showing strong commitment to sustainable mobility. The city approved its SUMP in 2019, aligned with regional strategies and focused on “safe and continuous connections between peripheral districts and the historic centre”. The plan identifies gaps in the continuity of the cycling network and prioritises safe infrastructure.

Cycling infrastructure includes segregated and mixed-use paths, bike parking at key destinations (schools, sports facilities), and a municipal bike-sharing service is currently planned but not yet in operation; no municipal stations or bicycles are presently available. Some non-municipal or private services may operate locally, but these are outside the scope of the present data set. The city also prioritises intermodal connectivity with public transport.

Air quality and environmental data are collected through real-time monitoring systems, and the integration of health and mobility objectives is emphasised: “especially to reduce inequalities in access to sustainable mobility”. Manresa provides a well-articulated definition of a circular city as "a city that reduces environmental impacts through reuse and reduction of resource consumption at all phases of infrastructure life cycle".

Best practices include the use of rubberised asphalt and ongoing eco-incentive schemes. Digital innovation is relatively advanced, with mobile applications supporting user access to mobility services.

This project has received funding from the European Union's Horizon Programme (HORIZON-CL6-2023-CIRCBIO-02) under grant agreement No 101135406

Positive Highlight: Manresa registers the most structured implementation of circular economy principles in infrastructure development, including the documented use of rubberised asphalt.

Negative Highlight: Compared to other cities, Manresa has the lowest total length of segregated cycling infrastructure, limiting safe long-distance connectivity.

[34 – FPN] Castilla y León – Fundación Patrimonio Natural (ES)

The region of Castilla y León presents a polycentric and predominantly rural context, with a strong focus on green infrastructure and sustainable tourism. The mobility policy framework is guided by regional strategies rather than a formal SUMP, and soft mobility is promoted particularly around natural parks and cultural routes. The additional information provided by the region reinforces this picture, highlighting that mobility planning must adapt to a heterogeneous territory composed of medium-sized cities, small municipalities, and extensive low-density rural areas.

Cycling infrastructure development follows a "greenway" model, reusing abandoned railways and creating peri-urban cycling routes. As noted in the questionnaire, "soft mobility infrastructure is largely concentrated in tourist areas and environmentally sensitive zones". The integration document further specifies that greenways represent not only mobility corridors but also *multifunctional ecological routes*, used for tourism, environmental education, and local development. Several projects combine soft mobility with heritage valorisation, linking natural parks, cultural attractions, and rural communities.

Socio-demographic and environmental data are available at the regional level, and atmospheric monitoring is conducted by the Junta de Castilla y León. According to the integrative contribution, the region operates one of the most structured environmental monitoring systems, but mobility and environmental datasets are not yet fully integrated, limiting the ability to analyse correlations between transport patterns, air quality, and public health.

Circular economy approaches are incorporated through the reuse of materials in greenways: "disused quarry materials are reused in the construction of cycling infrastructure". The integrative document also highlights experimentation with secondary raw materials and the use of recycled aggregates in some pilot projects, confirming a strong alignment with circular economy principles. These practices position Castilla y León as a relevant reference for sustainable infrastructure in rural and peri-urban contexts.

Although digital tools are not yet widespread, there is growing interest in GIS platforms and tourism-linked apps for sustainable travel. The integration document reinforces this point, noting that the digitalisation of mobility services is still fragmented, with more advanced solutions in cities such as Valladolid or León, and limited adoption in rural areas. The region expresses interest in tools that combine tourism, environmental indicators, and soft mobility data—an area where SMILE City could provide methodological support.

The regional approach is characterised by strategic integration of environment, mobility, and tourism. While challenges exist in harmonising urban and rural mobility needs, Castilla y León offers valuable insight into landscape-based sustainable transport planning. The integration document also underlines the need for capacity building, particularly for small municipalities with limited technical staff, and identifies multi-level coordination as a major challenge for implementing coherent regional mobility strategies.

This project has received funding from the European Union's Horizon Programme (HORIZON-CL6-2023-CIRCBIO-02) under grant agreement No 101135406

National regulatory frameworks for cycling and sustainable mobility

In Castilla y León, the regulatory framework for cycling mobility is strongly influenced by national Spanish legislation, particularly the *Ley de Movilidad Sostenible* (in preparation) and the *Estrategia Estatal por la Bicicleta*, which promote cycling as a strategic mode for decarbonisation, safety, and territorial cohesion. These national guidelines complement the regional competences of Castilla y León, where mobility planning is not organised through a formal SUMP but through sectoral strategies and territorial planning instruments. Within this structure, the region integrates national directives into its own green infrastructure policies, emphasising the reuse of disused railway corridors, greenways, and peri-urban paths. A key aspect emerging from the integrative contribution is the explicit link between national circular economy guidelines and the regional practice of using secondary raw materials—such as reclaimed quarry materials—in cycling infrastructure, making Castilla y León one of the most advanced regions in embedding circular principles into public works.

Health, education, tourism, climate and socio-economic strategies

Castilla y León positions cycling at the intersection of environmental protection, sustainable tourism, and territorial cohesion. The region emphasises the role of cycling in improving population health—especially in rural communities with ageing demographics—although health-related monitoring remains fragmented. Cycling is integrated into educational programmes promoting environmental stewardship and outdoor learning, particularly in municipalities near natural parks. Tourism represents one of the strongest complementary sectors: cycling routes are embedded in major cultural and environmental corridors, such as the *Vías Verdes* and Camino de Santiago, reinforcing soft mobility as an economic resource for rural development. Climate strategies adopted at regional level align cycling mobility with broader adaptation and mitigation priorities, including air-quality monitoring and protection of sensitive landscapes. Socio-economically, cycling is seen as a tool to counter regional depopulation by enhancing accessibility and supporting local economies through nature-based tourism.

Key Strengths. Castilla y León stands out for its extensive use of natural landscapes in cycling mobility planning, with greenways representing multifunctional ecological, tourism, and mobility corridors. Integrative inputs confirm that these routes serve simultaneously as sustainable transport infrastructure and as strategic assets for regional tourism and territorial cohesion.

Key Challenges. The region exhibits the lowest level of digital integration supporting sustainable mobility, with significant gaps in data systems and ICT tools. The integration document highlights that this digital divide is particularly pronounced in small municipalities and rural areas, where insufficient connectivity and limited technical capacity hinder the development of modern mobility services.

4.2 Summary sheets and comparative interpretation of cities and territories

Chapter 3 and section 4.1 provide the analytical framework for Deliverable D2.1. Chapter 3 develops a thematic analysis of the policies, infrastructure and contextual conditions relating to soft mobility in the territories involved in the project, based on data collected through questionnaires, additions and complementary sources provided by the cities/regions and project partners. The previous section of Chapter 4, in turn, offers an initial evaluative summary of these results, identifying a series of key strengths and challenges for each city or region.

This project has received funding from the European Union's Horizon Programme (HORIZON-CL6-2023-CIRCBIO-02) under grant agreement No 101135406

Starting from these two analytical levels, a further level of processing was necessary, with an explicitly interpretative purpose, aimed at re-reading the data collected through a systematic comparison between the territories. This section responds to this need. It does not introduce new data, but reorganises and interprets the information already analysed in order to support a more structured and strategically relevant comparative understanding.

The approach adopted goes beyond simply consolidating territorial profiles. Instead, it focuses on analysing the relationships between territories, considering how specific elements, themes or critical issues emerge as significant in relation to the other project partners. In this sense, the focus shifts from the absolute characteristics of individual territories to their relative relevance in the overall context of the project.

On this basis, four key themes have been identified for each city or region. These themes have been selected not only for their intrinsic importance in the local context, but also for their comparative positioning in relation to the other eight participating cities and regions. The selected themes may represent areas of particular advancement, distinctive characteristics, structural weaknesses or data gaps; in all cases, however, they are considered significant insofar as they contribute to differentiating the territorial profile within the broader SMILE City landscape.

The key themes were identified through a cross-reading process combining:

- the thematic evidence emerging from the horizontal analysis developed in Chapter 3;
- the specific assessments for each territory outlined in Section 4.1;
- a systematic comparison between all territories, aimed at identifying convergences, divergences and recurring patterns.

This approach allows the analysis to take into account the considerable heterogeneity of institutional and territorial contexts, as well as differences in terms of data availability, quality and level of detail. Under such conditions, the application of uniform quantitative parameters would be methodologically inappropriate. The comparative assessment is therefore based on explicit qualitative criteria, focusing on the relevance and robustness of the available information and its ability to guide project priorities.

The results of this interpretative process are presented in a series of summary tables that form an integral part of this section (Annex I). These tables provide a structured representation of the key themes associated with each territory and their importance in the comparative framework of the project. They should not be interpreted as rankings or performance assessments, but rather as analytical tools to support comparative interpretation, highlighting similarities, differences and areas of strategic interest.

In this way, this section provides a coherent basis for understanding the different conditions for the development of cycling mobility in the SMILE City territories and for informing the identification of priorities and pilot actions in the subsequent phases of the project.

This project has received funding from the European Union's Horizon Programme (HORIZON-CL6-2023-CIRCBIO-02) under grant agreement No 101135406

5. Summary of insights and perspectives for Pilot Actions

Chapter 5 presents the main results of the comparative analysis carried out within Deliverable D2.1. Building on the methodological framework described in Chapter 3 and detailed in Annex III, this chapter provides a structured synthesis of the information; its purpose is to consolidate a coherent baseline on soft mobility across the five SMILE City target cities/areas, highlighting both common challenges and context-specific dynamics that can inform future pilot actions.

5.1 Key Lessons from the local contexts

Section 5.1 develops the core analytical framework for understanding the starting conditions of the target areas. It is articulated into three complementary subsections: 5.1.1, which defines the reference framework for the analysis; 5.1.2, which identifies cross-cutting strengths, weaknesses, and priorities; and 5.1.3, which summarises city/area-specific baselines and formulates cross-cutting reflections. Together, these provide a comprehensive foundation for interpreting the implications discussed in Section 5.2.

5.1.1 Reference framework for the analysis

The analysis of the nine SMILE City target cities and regions – Kriti/Chania, Lucca, Bursa, Varna, Istanbul Metropolitan Municipality (IMM), Belgrade, the Metropolitan City of Turin (CMTO), Manresa, and Castilla y León – reveals a diversified landscape shaped by governance maturity, geographical configurations, infrastructure quality, regulatory environments, and cultural attitudes towards cycling. While all contexts share a growing commitment to soft mobility, the breadth and depth of available data, institutional capacity, and the scale of mobility challenges vary significantly, requiring a nuanced and adaptive analytical framework.

1. Governance and Strategic Frameworks. Across all nine areas, strategic planning instruments for sustainable mobility are in place or under development, though with considerable heterogeneity in scope, maturity, and operational readiness. CMTO offers the most advanced multilevel governance structure, integrating metropolitan and municipal SUMPs with a dedicated Cycling Plan, while Istanbul and Bursa present large-scale metropolitan strategies that combine cycling with extensive multimodal transport reforms. Lucca and Manresa operate through updated SUMPs aligned with regional and national priorities, whereas Castilla y León adopts a decentralised approach consistent with its territorial structure and rural dimension. Belgrade has strategic guidelines for mobility but still faces fragmentation in implementation. Kriti/Chania and Varna are at earlier stages of strategic consolidation, often relying on sectoral plans or preliminary frameworks. Overall, planning intentions are strong across the partnership, but the degree of operationalisation varies significantly, reinforcing the importance of capacity-building and multi-level coordination.

2. Infrastructure and Network Continuity. Cycling networks range from extensive metropolitan corridors (CMTO, IMM) to emerging and discontinuous systems (Chania, Varna, Belgrade). Bursa and Istanbul demonstrate well-developed or expanding networks supported by large urban populations and multimodal infrastructures. Manresa and Lucca show consolidated cores but limited extension into peripheral areas; CMTO continues to develop a metropolitan-wide system including peri-urban and intermunicipal connections. Castilla y León stands out for its territorial-scale greenways, while

This project has received funding from the European Union's Horizon Programme (HORIZON-CL6-2023-CIRCBIO-02) under grant agreement No 101135406

Varna and Chania rely on fragmented coastal or tourist-oriented routes lacking full integration with urban networks. A recurring pattern across the nine areas is the difficulty in ensuring continuous, well-maintained, and safe cycling paths, hindered by funding limitations, complex governance structures, and competition with motorised traffic for road space.

3. Safety, Intermodality, and Data Systems. Safety issues and the low perception of cycling as a safe everyday mode emerge as universal challenges, regardless of city size. CMTO and IMM offer examples of intermodal hubs integrating cycling and public transport, but harmonised monitoring systems remain weak or incomplete. Lucca, Manresa, Bursa, and Belgrade are strengthening intermodality, though often with limited secure bike parking and insufficient multimodal digital tools. Castilla y León's greenways support safe tourism mobility but are less integrated into daily transport systems. Varna and Chania face substantial gaps in safety data, traffic monitoring, and enforcement. Across all nine areas, the lack of standardised and comparable data on cycling flows, accidents, exposure to pollution, and intermodal patterns limits evidence-based policymaking and undermines the capacity to evaluate impacts or track behavioural change.

4. Environmental Context, Regulations, and Policies for Reducing Combustion-Engine Vehicles. Air quality pressures remain a major driver for promoting active mobility in several partner contexts – particularly Turin, Lucca, Istanbul, Bursa, and Belgrade –, where pollution levels are concerning and regulatory frameworks increasingly incorporate LEZs, traffic restrictions, or emission-based measures. The need for concrete action in cities is demonstrated by the high levels of PM10 and PM2.5, as seen in Turin and Lucca, where data on pollution is available[1] Manresa and some parts of Castilla y León display lower pollution levels but still link mobility policies to climate neutrality and environmental health. However, across the partnership, data on the environmental benefits of cycling (emissions avoided, improved exposure levels) remain scarce. The deployment of ZTLs, LEZs, parking regulations, and 30 km/h zones is uneven: CMTO presents the most structured regulatory environment, while cities like Varna, Bursa, or Chania face enforcement challenges. Istanbul is promoting ambitious long-term climate goals, but implementation is gradual. Overall, regulatory tools for reducing fossil-fuel traffic exist in various forms but require stronger coordination, monitoring, and social acceptance to maximise effectiveness.

5. Cultural Acceptance and Public Engagement. Cultural readiness for cycling varies markedly among the nine cities/regions. Lucca and Manresa show consolidated cycling cultures in compact urban areas, while Turin and Istanbul rely on growing community engagement supported by health, climate, and urban accessibility goals. In Bursa, Varna, and Belgrade, cycling is gaining acceptance but still competes with car-oriented habits and safety concerns. Castilla y León's cycling culture remains predominantly leisure-oriented, although growing efforts aim to expand everyday use. Kriti/Chania actively promotes behavioural change with targeted campaigns, but uptake is highly seasonal and linked to tourism patterns. Across all contexts, communication and awareness-raising initiatives exist but are typically short-term, lacking long-term strategies for reducing car dependency or addressing gender, age, and socio-economic disparities in cycling uptake.

1 In 2014, the European Commission initiated infringement procedure 2014/2147 concerning the systematic exceedance of PM_{10} limit values, which culminated in the judgment of the Court of Justice of the European Union (Case C-644/18, 10 November 2020). Among the areas formally included in this procedure was the Turin agglomeration. Subsequently, in 2015, infringement procedure 2015/2043 was launched regarding the exceedance of NO_2 limit values, leading to the judgment C-573/19 of 12 May 2022, which addressed several major Italian urban areas, including the Turin agglomeration. More recently, in March 2024, the Commission opened a new infringement procedure pursuant to Article 258 TFEU concerning the exceedance of PM_{10} limit values recorded in 2022 across 24 Italian zones. Although the detailed list of affected areas has not yet been formally disclosed, it is considered highly likely that both the Turin agglomeration and the Piana di Lucca are encompassed, given their persistent and well-documented criticality in relation to air quality standards.

This project has received funding from the European Union's Horizon Programme (HORIZON-CL6-2023-CIRCBIO-02) under grant agreement No 101135406

6. Resources, Capacity, and Innovation. Institutional capacity and availability of financial and human resources are highly uneven, shaping both the scope and pace of intervention. Large metropolitan areas (Istanbul, CMTO, Bursa) benefit from more structured technical offices and diversified funding. Medium-size cities (Lucca, Manresa, Belgrade, Varna) often operate with constrained budgets and rely heavily on external programmes. Castilla y León's regional framework ensures multi-territorial reach but requires coordination to manage dispersed rural contexts. Kriti/Chania faces the most significant constraints in staffing and technical capacity. Innovation is a shared opportunity: digital mobility platforms, GIS tools, participatory apps, and circular-material approaches appear across the partnership, but adoption is uneven. Circular economy applications – recycled materials (Manresa, Castilla y León), reuse-oriented procurement (Lucca), or sustainable maintenance models – show promising alignment with EU objectives but require systematic mainstreaming. The diversity in capacity levels reinforces the need for shared tools, peer-learning, and modular solutions adaptable to different administrative and financial conditions.

5.1.2 Cross-cutting strengths, weaknesses and priorities

Strengths:

- *Presence of formal planning instruments*. All nine cities and regions have at least one mobility planning instrument—SUMPs, cycling strategies, regional mobility plans or sectoral programmes. The Metropolitan City of Turin (CMTO) and Istanbul Metropolitan Municipality (IMM) exhibit the highest degree of institutional integration, combining metropolitan and municipal SUMPs with cycling strategies. Lucca, Manresa and Belgrade rely on local SUMPs with varying levels of implementation, while Castilla y León operates at a regional scale with a strong focus on tourism mobility. Even cities with more limited planning capacity, such as Chania and Varna, have initiated processes toward structured mobility governance. This shared presence of planning tools provides a common foundation for the development of soft mobility strategies.
- *Alignment with cross-sectoral objectives*. Across the nine contexts, sustainable mobility policies are increasingly linked to broader goals in public health, tourism, education, air quality improvement, climate neutrality, and urban regeneration. Castilla y León leverages greenways to valorise natural and cultural heritage; Lucca integrates soft mobility with historic-centre accessibility; Manresa and CMTO connect mobility with environmental and health targets; IMM associates cycling strategies with congestion reduction and climate objectives. These cross-sectoral connections enhance policy coherence and enable diversified funding opportunities.
- *Pilot experiences and experimental initiatives*. Several cities have launched pilot actions that support replicability and practical learning. Examples include EU-funded sustainable mobility projects in Lucca, experimental interventions using recycled materials in Manresa, real-time monitoring pilots in CMTO, digital-tourism mobility tools in Castilla y León, and smart-payment prototypes in Chania. Although the scale varies, these initiatives demonstrate how innovation can emerge even in resource-constrained contexts.
- *Local innovation ecosystems and emerging best practices*. Beyond individual pilots, some territories are developing broader innovation ecosystems: CMTO and IMM integrate mobility platforms and ITS; Manresa and Castilla y León experiment with circular materials; Lucca tests low-cost approaches for historic urban environments; Belgrade explores multimodal improvements; Varna and Bursa introduce

This project has received funding from the European Union's Horizon Programme (HORIZON-CL6-2023-CIRCBIO-02) under grant agreement No 101135406

smart management in limited traffic areas. These ecosystems offer a diversified portfolio of emerging best practices relevant to SMILE City.

- *Growing public awareness and cultural openness*. Across markedly different socio-economic and territorial contexts, public demand for sustainable mobility is increasing. Youth, tourists, students, and commuters in congested areas are particularly receptive. CMTO, Lucca and Manresa show structured awareness campaigns, while in Varna, Bursa, Belgrade and Chania awareness emerges primarily in response to congestion, safety, or environmental pressure. Despite their diversity, all contexts show a positive trend in acceptance of cycling and soft mobility measures.

Weaknesses & criticalities:

- *Discontinuity and fragmentation of cycling networks*. Across all nine partners, cycling networks show gaps, fragmented segments, insufficient protection, and inconsistencies between central and peripheral areas. Maintenance remains a challenge where infrastructure is present (Lucca, Manresa, Castilla y León). In Varna, Bursa, Chania and parts of Belgrade the network is still embryonic or oriented mainly to tourism, limiting everyday use and safety.
- *Insufficient intermodal integration*. Despite isolated best practices (CMTO, IMM), most cities lack effective links between cycling and public transport: limited secure bike parking, weak intermodal hubs, minimal real-time information, and scarce integrated planning. Even cities with active cycling strategies still need to structurally embed intermodality as a core mobility principle.
- *Limited resources and uneven technical capacity*. Financial and staffing constraints strongly affect implementation capacity in several municipalities (Lucca, Manresa, Chania, Varna, Bursa, Belgrade). Castilla y León faces the added challenge of scale, with small municipalities requiring differentiated support. These limitations slow down infrastructure delivery, maintenance and innovation.
- *Safety concerns and weak accident data systems*. Perceived and actual risk remains a major deterrent to cycling. The coexistence with heavy traffic, discontinuous protection, limited enforcement of speed limits, and poor visibility at intersections generate safety concerns. Accident data are often incomplete or non-standardised, particularly in Varna, Chania, Bursa and Belgrade, hindering evidence-based responses.
- *Fragmented governance and uneven regulatory frameworks*. Metropolitan and regional contexts (CMTO, IMM, Castilla y León) face coordination challenges among many municipalities, while smaller cities often lack sufficient administrative capacity. Regulatory heterogeneity in speed limits, ZTL/LEZ enforcement and design standards leads to inconsistent implementation and limited replicability of interventions.
- *Limited monitoring, evaluation, and harmonised indicators*. Most cities lack systematic data on cycling flows, infrastructure usage, modal share, accident rates and emissions impacts. Air-quality data exist in some contexts (CMTO, Lucca, IMM), but are rarely integrated with mobility indicators. Automated counters, participatory sensors and interoperable data platforms remain underdeveloped.
- *Slow and uneven implementation of measures to reduce fossil-fuel vehicle traffic*. While some cities (CMTO, Lucca, Castilla y León, IMM) are expanding traffic-regulation policies (LEZs, ZTLs, 30 km/h zones), enforcement varies significantly. In Varna, Bursa, Belgrade and Chania these measures remain limited or in early stages, reducing the potential impact on air quality and sustainability.

This project has received funding from the European Union's Horizon Programme (HORIZON-CL6-2023-CIRCBIO-02) under grant agreement No 101135406

Priority Areas for Intervention

Turning weaknesses into opportunities requires an integrated and modular strategy acting simultaneously on infrastructure, digital tools, governance capacity, regulatory measures, and societal engagement.

First, Closing network gaps and strengthening protected routes. Priority should be given to completing missing links, building protected lanes in high-demand corridors (schools, stations, employment hubs) and improving last-mile connections. Traffic calming (30 km/h zones, raised crossings, protected intersections) is essential to address perceived and actual risk.

Second, Developing structural intermodality between cycling and public transport. Actions include secure bike parking in all major hubs, integration of real-time information, multimodal digital platforms, and pilot "bike-on-transit" schemes. Regulatory measures (ZTL/LEZ) should support modal shift and strengthen the link between cycling and collective transport.

Third, strengthening governance and technical-operational capacity. Capacity-building programmes, shared regional/metropolitan design tools, joint procurement frameworks, and green public procurement models are required. Innovative financing (public-private partnerships, regional co-funding, eco-incentives) can stabilise planning continuity.

Fourth, establishing harmonised monitoring systems and shared indicators. A common baseline across all nine areas (traffic flows, usage patterns, accident rates, BSS metrics, emissions) is needed. Participatory data collection (apps, sensors) can complement institutional monitoring and support user engagement.

Fifth, enhancing communication, behavioural change strategies and co-design approaches. Sustained campaigns, school programmes, user incentives and co-design processes are essential to support behavioural change. Emission-reduction policies (LEZs, congestion restrictions, zero-emission zones) should be integrated with cycling promotion for maximum environmental and health benefits.

5.1.3 Baselines by Cities/Area and cross-cutting reflections

Kriti – Focus on Chania (Kriti/Chania). Chania represents a context characterised by strong tourism dynamics, a fragmented cycling network, and an emerging governance capacity for sustainable mobility. The baseline reflects a scenario where cycling is increasingly recognised as a strategic opportunity but still requires targeted interventions to strengthen safety, continuity and data availability. *Operational baseline*: (i) Pilot development of protected connections between coastal areas, tourist hubs and the historic centre, (ii) introduction of participatory digital tools (monitoring apps, user feedback systems) to compensate for the lack of structured data, (iii) targeted safety and information measures in high-demand corridors, with attention to seasonal variations and the behaviour of tourists and commuters. *Operational priorities*: (j) development and testing of replicable small-scale infrastructure prototypes, (jj) strengthening civic participation and basic monitoring systems, (jjj) implementation of urban-scale traffic calming and safety measures. Chania continues to face congestion, limited air-quality monitoring and weak enforcement of restrictions on polluting traffic; pilot actions could integrate emission-reduction objectives with the promotion of active mobility.

Municipality of Lucca. Lucca benefits from a compact urban structure and a high-quality pedestrianised historic centre, but lacks stable resources to extend infrastructure and ensure continuity beyond the walls. The baseline confirms the need to balance heritage conservation, daily mobility, and tourism flows.

This project has received funding from the European Union's Horizon Programme (HORIZON-CL6-2023-CIRCBIO-02) under grant agreement No 101135406

Operational baseline: (i) completing connections between the historic centre and peripheral districts, (ii) developing integrated "heritage–mobility" routes supporting both residents and visitors, (iii) piloting circular-material solutions for low-cost, low-impact interventions. Operational priorities: (j) securing structured and multiannual funding, (jj) improving centre–periphery cycling continuity, (jjj) establishing incentives for home–school and home–work commuting. Air quality concerns and recent planning guidelines (SUMP, Electric Mobility Plan) emphasise the importance of more consistent restrictions on polluting traffic to consolidate the shift toward soft mobility.

Bursa Buyuksehir Belediyesi. Bursa presents a rapidly growing metropolitan context with emerging attention to cycling but limited continuity in infrastructure and monitoring. The baseline reflects a mobility system still dominated by private vehicle use, with initial steps toward traffic regulation and shared mobility. *Operational baseline*: (i) developing protected cycling links in high-demand corridors and between major urban hubs, (ii) improving basic intermodality through parking facilities and integration with public transport nodes, (iii) strengthening data availability through systematic monitoring and traffic/safety analysis. *Operational priorities*: (j) defining enforceable traffic-calming policies (30 km/h areas, restrictions for heavy vehicles), (jj) expanding and integrating bike-sharing services, (jjj) embedding cycling components in the new transportation master plan now under development. Bursa faces significant challenges related to congestion and heavy-vehicle flows; pilot actions can support the consolidation of sustainable alternatives and strengthen regulatory frameworks.

Obshtina Varna. Varna displays a primarily car-oriented mobility system, with embryonic cycling infrastructure and limited regulatory tools. The baseline highlights a context where restrictions focus mainly on heavy-duty vehicles, while soft mobility policies remain at an early stage. *Operational baseline:* (i) establishing first protected cycling routes connecting central areas with coastal and residential zones, (ii) improving multimodal nodes, particularly around the railway station, through secure bike parking and wayfinding, (iii) leveraging ongoing EU-funded initiatives to pilot cargo-bike use and multimodal accessibility schemes. *Operational priorities*: (j) defining regulatory measures for access control and low-emission mobility, (jj) strengthening shared-mobility services and integrating them with public transport, (jjj) introducing structured planning tools for cycling and traffic management. Given Varna's limited experience with traffic regulation, pilot actions may serve as catalysts to introduce coherent soft-mobility strategies at city level.

Istanbul Metropolitan Municipality. Istanbul presents a megacity context with high congestion, complex morphology, and ambitious planning for modal shift. The baseline highlights the coexistence of advanced initiatives and structural challenges linked to scale and demand pressure. *Operational baseline*: (i) strengthening protected cycling corridors along coastal and major metropolitan axes, (ii) expanding intermodal integration with the extensive rail and BRT system, (iii) consolidating monitoring systems for safety, cycling flows, and environmental indicators**.** *Operational priorities*: (j) promoting low-traffic and low-emission areas in critical districts, (jj) scaling up bike-sharing and e-bike charging infrastructure, (jjj) improving enforcement and communication to address risk perception and encourage behavioural change. Due to its scale, Istanbul can benefit from modular, high-capacity pilot actions that combine infrastructure, digital systems and regulatory tools.

This project has received funding from the European Union's Horizon Programme (HORIZON-CL6-2023-CIRCBIO-02) under grant agreement No 101135406

Grad Beograd. Belgrade exhibits an evolving mobility framework with growing recognition of cycling as a strategic mode, but major gaps in safety and network continuity. The baseline highlights the city's commitment to integrating soft mobility into broader environmental strategies. *Operational baseline*: (i) improving continuity of existing corridors and expanding protected routes in high-risk areas, enhancing public transport accessibility through secure bike-parking solutions, (iii) establishing data-driven evaluation systems for air quality, traffic and safety. *Operational priorities*: (j) integrating cycling measures with low-emission and traffic-restriction policies, (jj) fostering intermodality through improved interchange facilities, (jjj) strengthening institutional cooperation and technical capacity for planning and monitoring. The city's environmental challenges (air quality, congestion) underline the urgency of coupling infrastructure with regulatory and behavioural measures.

Metropolitan City of Turin (CMTO). The Metropolitan City shows a solid governance framework, combining metropolitan and municipal SUMPs with a dedicated metropolitan cycling plan (RCM). Its baseline confirms strong strategic capabilities but highlights the need to harmonise data and operational tools across municipalities. *Operational baseline*: (i) completion and connection of main metropolitan cycling corridors, (ii) enhancement of interchange nodes with secure bike parking, management services and e-bike charging, (iii) development of shared, comparable impact indicators (safety, modal shift, avoided emissions). *Operational priorities*: (j) ensuring digital interoperability across mobility platforms, (jj) strengthening protection and maintenance of urban infrastructure, (jjj) achieving metropolitan-scale data harmonisation for system-wide interventions. Air quality remains a driving factor: low-emission zones and multimodal restrictions already support emission reduction, but require coordinated monitoring to maximise their effect.

Ajuntament de Manresa (Manresa). Manresa demonstrates strong attention to safety, social equity, and circular-economy applications. The baseline reflects an urban system that is compact but still requires improved service integration and network protection. *Operational baseline*: (i) consolidation and protection of the existing cycling network, (ii) introduction of the municipal bike-sharing system with full digital integration, (iii) improved public transport connections to promote daily, non-leisure cycling. *Operational priorities*: (j) extending protected corridors in high-demand areas, (jj) launching the BSS with user-monitoring tools, (jjj) implementing inclusive mobility policies alongside awareness campaigns. Air-quality monitoring already supports mobility decision-making; additional traffic-calming and restriction measures could strengthen cycling uptake.

Castilla y León – Fundación Patrimonio Natural (Castilla y León). Castilla y León presents a vast and polycentric context, where cycling is linked primarily to tourism, natural heritage, and rural accessibility. The baseline highlights the strategic role of greenways and large-scale territorial routes. *Operational baseline*: (i) development of territorial-scale infrastructure (greenways, cycle-tourism routes), (ii) improved rural accessibility and multimodal connections to local services, (iii) digital tools for promoting and managing the cycling-tourism offer. *Operational priorities*: (j) creating connecting networks between tourist hubs and municipalities, (jj) adopting sustainable and cost-efficient maintenance models, (jjj) standardising indicators for tourism-oriented cycling initiatives. While air quality is less critical than in urban areas, low-emission mobility and traffic regulation could support future urban nodes and complement tourism strategies.

This project has received funding from the European Union's Horizon Programme (HORIZON-CL6-2023-CIRCBIO-02) under grant agreement No 101135406

Cross-cutting considerations for the baseline

The baseline developed from the comparative assessment of territorial factors, governance structures, and the extended dataset now available across nine cities and regions reveals substantial diversity in maturity levels, resources, and operational capacity. However, it also confirms the existence of shared priorities that can consistently guide SMILE City pilot actions. All contexts show the need to combine physical interventions (network continuity, safety conditions, secure parking and charging points), digital measures (interoperable platforms, participatory monitoring systems, Digital Product Passports), and institutional strengthening (technical capacity, multi-level coordination, stable financial mechanisms).

Air quality, road-safety risks, and the regulation of fossil-fuel traffic emerge as cross-cutting issues. Most cities explicitly link cycling strategies to environmental and health outcomes, yet enforcement of traffic restrictions, monitoring of emissions, and integration between mobility and air-quality strategies remain uneven. In several non-EU contexts, regulatory frameworks are evolving, while in medium-sized EU cities implementation is hindered by resource constraints and limited data availability. Across the nine territories, gaps persist in systematic monitoring, harmonised indicators, and evaluation frameworks, especially regarding traffic flows, intermodality performance, and accident data.

The proposed baseline consolidates these common elements into an operational sequence: mapping and standardising indicators (including emissions, safety and usage data), implementing short-term priority infrastructure in high-demand corridors, deploying digital systems for monitoring and user experience enhancement, and parallel capacity-building, governance reinforcement and communication programmes. This integrated strategy enables both context-specific responses and the development of replicable, scalable solutions across European and neighbouring cities, leveraging modular approaches adaptable to diverse morphological, socio-economic, and institutional conditions.

5.2 Implications for the SMILE City Pilot Actions

The comparative analysis across the nine target cities and regions, combined with the integrated baselines developed in the previous sections, identifies a coherent set of operational and strategic implications for the SMILE City project. These insights are central to the design of pilot actions and relevant to local, regional, and European stakeholders engaged in advancing sustainable and circular cycling mobility.

1. Strengthening the link between planning frameworks and implementation capacity. Strategic mobility planning tools—such as SUMPs, cycling plans, regional mobility strategies, and urban development frameworks—are widely present across the partner territories. However, the capacity to translate planning into continuous, safe, and well-maintained infrastructure is often constrained by financial limitations, procurement complexity, institutional fragmentation, and uneven governance skills. Future actions should reinforce mechanisms that connect planning to execution by:

- establishing dedicated funding streams for short-term, high-impact investments that close critical gaps in cycling networks;
- securing multi-annual budget commitments aligned with local and regional mobility strategies;
- integrating cycling infrastructure into broader urban regeneration, tourism, public health, and climate adaptation programmes, thereby broadening access to complementary funding sources;

This project has received funding from the European Union's Horizon Programme (HORIZON-CL6-2023-CIRCBIO-02) under grant agreement No 101135406

- promoting traffic demand management measures—including expanded 30 km/h areas, access-regulated zones, and low-emission policies—as operational levers that support modal shift and contribute to air quality improvements.

2. Enhancing intermodality as a core principle of mobility system design. The baselines highlight the structural importance of aligning cycling infrastructure with public transport systems, both to increase daily mobility options and to minimise car dependency. Key priorities for the pilot phase include:

- deploying secure, weather-protected bicycle parking at key interchange hubs (railway stations, bus terminals, metro stops), integrated into accessibility plans;
- delivering real-time multimodal information that links cycling routes, bike-sharing availability, and public transport timetables through interoperable digital tools;
- testing bike-on-transit solutions—such as racks on buses or trains—where feasible, supported by monitoring frameworks to evaluate user uptake;
- synchronising intermodality improvements with local traffic regulation measures (LEZ, ZTL, traffic calming), which can reinforce shifts toward shared and active mobility.

3. Building a shared European knowledge base for monitoring and evaluation. Across all contexts, the availability and comparability of data on cycling flows, infrastructure conditions, safety indicators, and emissions remain limited. This represents an opportunity for SMILE City pilot actions to serve as laboratories for harmonised monitoring approaches. Potential contributions include:

- developing shared indicator frameworks to be adopted across partner territories;
- testing low-cost, scalable data collection methods, including mobile apps, automated counters, participatory mapping, and lightweight sensor technologies;
- integrating environmental and mobility metrics—such as CO_2 reduction, air quality improvements, and noise levels—into a unified evaluation system;
- establishing periodic public reporting practices to foster transparency, informed participation, and public engagement.

4. Leveraging circular economy principles for infrastructure delivery. Several cities have initiated innovative approaches to integrate recycled or low-impact materials into cycling infrastructure. The pilot phase can systematise and scale these efforts by:

- embedding minimum environmental criteria into procurement for cycling infrastructure and related services;
- designing maintenance and renewal cycles that reduce resource consumption and waste production;
- piloting circular-material prototypes alongside digital monitoring systems to enable life-cycle assessment and performance optimisation;
- aligning circular infrastructure solutions with traffic reduction policies to maximise environmental and health benefits by acting on both embodied and operational emissions.

This project has received funding from the European Union's Horizon Programme (HORIZON-CL6-2023-CIRCBIO-02) under grant agreement No 101135406

5. Addressing safety and risk perception through combined infrastructure and engagement strategies. Safety concerns - both real and perceived - remain one of the primary barriers to widespread cycling uptake. Pilot actions should therefore adopt an integrated approach built on:

- *infrastructure measures*, expanding protected lanes, safe intersections, raised crossings, and traffic calming in mixed-use streets;
- *engagement and behavioural measures*, launching targeted awareness campaigns addressing safe interaction between road users, visibility, and inclusiveness;
- focusing on children, youth, elderly people, and first-time cyclists;
- linking communication efforts to air quality and public health benefits to reinforce behavioural change.

6. Strengthening adaptive governance, technical capacity, and cross-sector coordination. Variations in institutional capacity, staffing levels, and governance structures influence the ability to deliver coherent mobility policies. To address these gaps, recommended actions include:

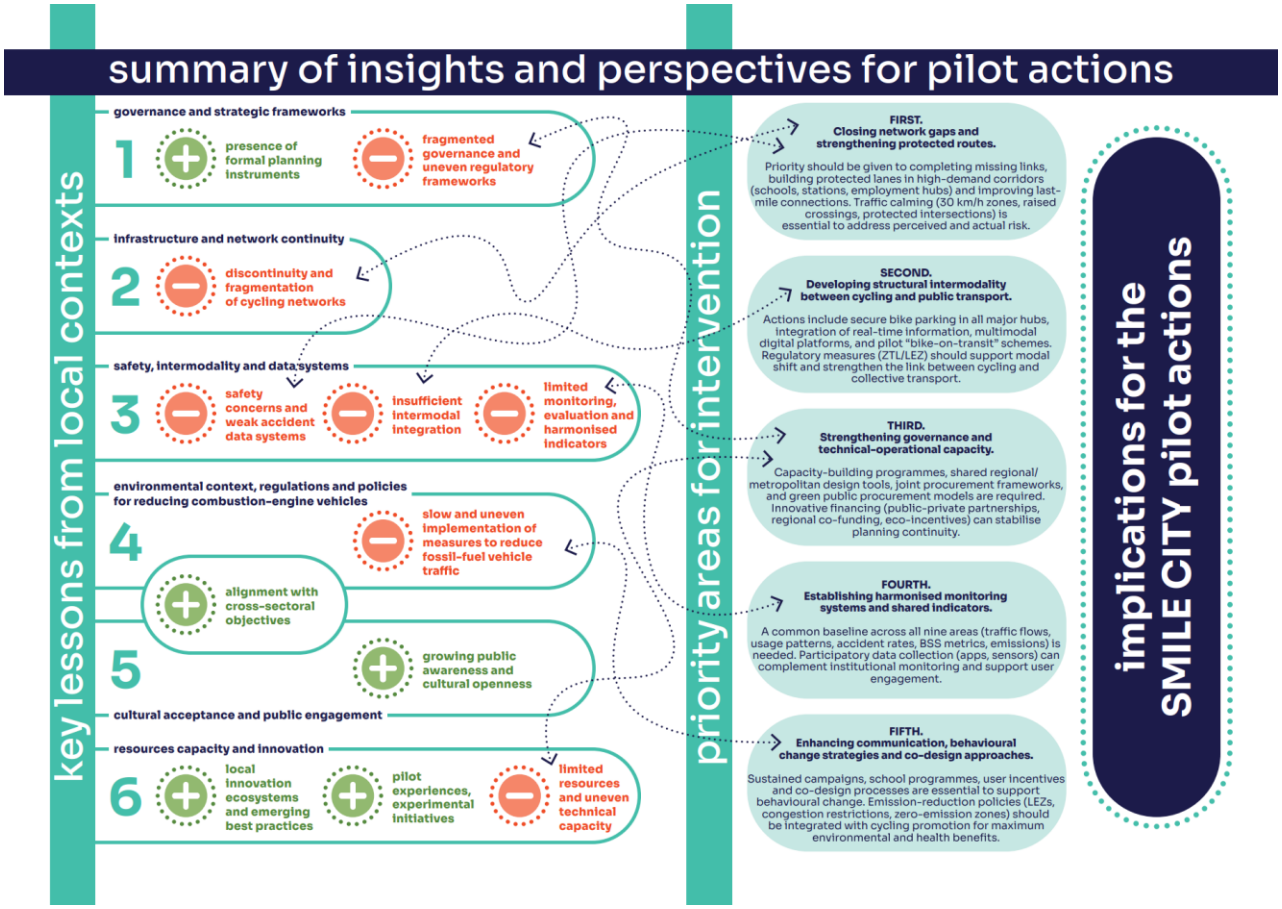
- establishing mobility competence centres at metropolitan, regional, or inter-municipal levels to provide shared technical assistance;
- implementing cross-training programmes on sustainable infrastructure design, circular procurement, digital tools, data governance, and impact assessment;
- reinforcing coordination across municipalities to ensure consistency, economies of scale, and replicability;
- fostering structured collaboration between mobility, environment, health, education, and tourism departments, enabling policies that simultaneously address emissions, safety, accessibility, and cultural change.

Strategic relevance for SMILE City

The operational directions identified above align directly with the project's mission to deliver modular, scalable, and replicable solutions consistent with European policy frameworks, including: the EU Urban Mobility Framework, the European Cycling Declaration, the Sustainable and Smart Mobility Strategy, the Zero Pollution Action Plan, and the Vision Zero principles on road safety.

The baselines and analyses developed in this deliverable provide a robust starting point for WP4, ensuring that pilot actions respond to the specific morphological, institutional, and socio-economic conditions of each area. At the same time, the shared challenges—ranging from infrastructure gaps to governance fragmentation, from data scarcity to air quality concerns—create a common ground for cross-cutting pilots capable of generating comparable results and transferable methodologies across Europe.

This project has received funding from the European Union's Horizon Programme (HORIZON-CL6-2023-CIRCBIO-02) under grant agreement No 101135406



This project has received funding from the European Union's Horizon Programme (HORIZON-CL6-2023-CIRCBIO-02) under grant agreement No 101135406

6. Conclusions

6.1 Overall conclusions and main findings

The elaboration of Deliverable D2.1 within Task 2.1 provides a comprehensive overview of the state of soft mobility across the SMILE City partner cities and regions. The material analysed reflects contributions submitted by partners at different times and with varying levels of detail, which required a structured and transparent methodological process to ensure consistency, comparability, and coherence across all sections.

A dedicated assessment procedure — outlined in Annex III — was used to harmonise heterogeneous data sources, integrate city-specific updates, and consolidate a comparative framework capable of capturing both shared trends and context-specific conditions. This process combined questionnaires, planning documents, local datasets, and supplementary inputs provided during the integration phase.

The comparative assessment confirms that, although all participating cities and regions share a clear ambition to strengthen soft mobility, their starting conditions, territorial characteristics, and governance capacities differ substantially. Compact historic cities such as Lucca face challenges linked to limited space and conservation constraints; large metropolitan contexts such as the Metropolitan City of Turin must coordinate across multiple municipalities; regional and rural areas such as Castilla y León deal with low-density settlements and wide territorial scales; while coastal and tourism-driven cities such as Chania must balance seasonal pressures with residents' mobility needs. Additional contributions from Bursa, Varna, Istanbul, and Belgrade further enrich this variability, highlighting diverse institutional capacities and levels of advancement.

Across this complexity, several cross-cutting trends clearly emerge. First, governance frameworks — including SUMPs, cycling plans, and regional mobility strategies — are increasingly shaping local agendas, providing a common strategic foundation even where implementation capacity differs. Second, the fragmentation of cycling networks remains a shared and persistent limitation, often compounded by limited maintenance resources and the absence of long-term investment programmes. Third, the lack of harmonised monitoring systems continues to constrain evidence-based planning: comparable data on safety, cycling flows, intermodality, and environmental impacts are still limited across the majority of contexts. Fourth, digitalisation and circular economy approaches are gaining relevance, although their adoption remains uneven and mostly at pilot stage.

These findings outline both the structural challenges and the operational opportunities that can orient the design of SMILE City pilot actions. They provide a coherent analytical baseline for understanding local priorities, identifying replicable solutions, and linking mobility strategies with broader objectives related to public health, climate action, and territorial cohesion.

6.2 Main findings

Building on the comparative results presented in Chapter 5, three overarching insights emerge, reflecting both the diversity of local conditions and the progressive alignment of partner cities and regions with the objectives of sustainable soft mobility.

Macro-trends shared across contexts. All analysed territories increasingly recognise soft mobility as a strategic lever for climate neutrality, social inclusion, health promotion, and overall urban liveability. Despite differences in scale and governance maturity, a set of common obstacles persists: discontinuity of cycling

This project has received funding from the European Union's Horizon Programme (HORIZON-CL6-2023-CIRCBIO-02) under grant agreement No 101135406

networks, weak intermodal integration with public transport, limited or uneven safety measures, and fragmented or inconsistent data collection systems. These gaps confirm the need for modular pilot actions that combine physical interventions—such as protected corridors, safer intersections, and enhanced interchange nodes—with digital tools for monitoring and user engagement, alongside targeted behavioural change strategies.

Territorial divergences. Different morphological, socio-economic, and governance conditions shape distinct mobility challenges and opportunities. Compact urban centres display favourable geometries for cycling but often face financial or institutional constraints. Metropolitan or multi-municipal areas show advanced planning capacity but struggle with territorial heterogeneity and harmonised monitoring. Regional contexts with low population density highlight the strategic potential of greenways and tourism-oriented cycling, while other areas illustrate the challenges of initiating cultural and infrastructural transitions where cycling has yet to become a consolidated daily mobility option. These divergences reinforce the need for flexible approaches adapted to scale, governance structures, and local demand patterns.

Implications for pilot actions. Pilot interventions should therefore respond simultaneously to context-specific needs—such as strengthening peri-urban accessibility, improving centre–periphery connections, enhancing interchange facilities, or supporting tourism-oriented cycling—and to cross-cutting priorities identified across the partner territories. These include safety and risk reduction, intermodality, the integration of circular economy principles in infrastructure delivery, and the establishment of shared data and monitoring systems. Addressing these dimensions in a coordinated manner will maximise the replicability and scalability of SMILE City outcomes, supporting effective pathways toward more sustainable, resilient, and inclusive mobility models.

6.3 Contribution to the project and Horizon Europe objectives

This Deliverable provides a significant contribution to the overall objectives of the SMILE City project and to the wider goals promoted by Horizon Europe. Through the systematic consolidation of information on cycling and soft mobility across the participating cities and regions, it offers a coherent and evidence-based starting point for designing and implementing the project's pilot actions.

By establishing a shared analytical baseline, the Deliverable reinforces the integration between local mobility practices and the strategic dimensions of the project — innovation, sustainability, circular economy, safety, and digitalisation. The comparative assessment enables the identification of common needs and context-specific challenges, ensuring that subsequent project activities are anchored in real conditions and capable of addressing diverse territorial, institutional, and socio-economic contexts.

Furthermore, by highlighting both convergences and divergences among the analysed territories, the Deliverable supports the development of solutions with high potential for replication and scalability. This strengthens the project's contribution to Horizon Europe priorities, including the promotion of climate-neutral and resilient cities, the reduction of pollution, the enhancement of safe and healthy mobility, and the advancement of digital and circular approaches in urban infrastructure.

Overall, the Deliverable positions SMILE City to generate concrete, measurable, and transferable impacts, contributing to sustainable, inclusive, and innovative mobility systems across Europe.

This project has received funding from the European Union's Horizon Programme (HORIZON-CL6-2023-CIRCBIO-02) under grant agreement No 101135406

Synthesis table

The following table summarises the main connections between the results of this deliverable, their implications for the SMILE City project, and their relevance to the Horizon Europe framework:

deliverable D2.1 results

Implications for SMILE City and Horizon Europe

KEY RESULTS FROM D2.1	IMPLICATIONS FOR SMILE CITY	RELEVANCE TO HORIZON EUROPE OBJECTIVES
Fragmentation of cycling networks and weak intermodality	Pilot actions to close network gaps, strengthen connections with transport hubs, test modular multimodal solutions	EU Urban Mobility Framework; Sustainable and Smart Mobility Strategy
Limited and fragmented data on cycling flows, safety, and pollution	Development of harmonised indicators, participatory monitoring, and interoperable digital platforms (incl. DPP)	European Cycling Declaration; Vision Zero Road Safety Policy; Zero Pollution Action Plan
Uneven technical capacity and limited financial resources in several cities/ regions	Shared competence centres, capacity-building programmes, innovative financing and procurement models	EU Urban Mobility Framework; Cohesion Policy; Climate Adaptation Mission
Emerging but uneven circular economy practices in infrastructure delivery	Piloting recycled materials, green public procurement, LCA-based approaches	EU Green Deal; Circular Economy Action Plan
Safety concerns and cultural barriers limiting uptake	Integrated infrastructure + behavioural campaigns; inclusive policies for vulnerable groups	Vision Zero; EU Road Safety Policy Framework
Fragmented governance and lack of regulatory harmonisation	Multilevel governance models, shared standards, alignment between municipal/regional regulations	EU Urban Mobility Framework; Governance principles of the EU Urban Agenda
Weak integration between traffic reduction measures and cycling strategies	Pilots linking LEZ/traffic regulation with cycling promotion and digital monitoring	Zero Pollution Action Plan; Sustainable and Smart Mobility Strategy
High potential of digitalisation for service quality, monitoring, and user engagement	Testing smart interfaces, DPPs, interoperable mobility apps	European Digital Strategy; Data Spaces for Mobility
Relevance of tourism-oriented and peri-urban cycling (greenways, coastal routes, heritage sites)	Pilot actions connecting tourism nodes, multimodal access, and digital tourism platforms	EU Tourism Transition Pathway; Green Deal

This project has received funding from the European Union's Horizon Programme (HORIZON-CL6-2023-CIRCBIO-02) under grant agreement No 101135406

Deliverable: D2.1

ANNEX I

Summary sheets and comparative interpretation of cities and territories

This project has received funding from the European Union's Horizon Programme (HORIZON-CL6-2023-CIRCBIO-02) under grant agreement No 101135406

Introduction

This annex provides an operational and visual synthesis of the interpretative framework developed in Section 4.2 of the Deliverable. It translates the comparative reading outlined in the main text into a set of structured tables that support both integrated and stand-alone consultation of the results.

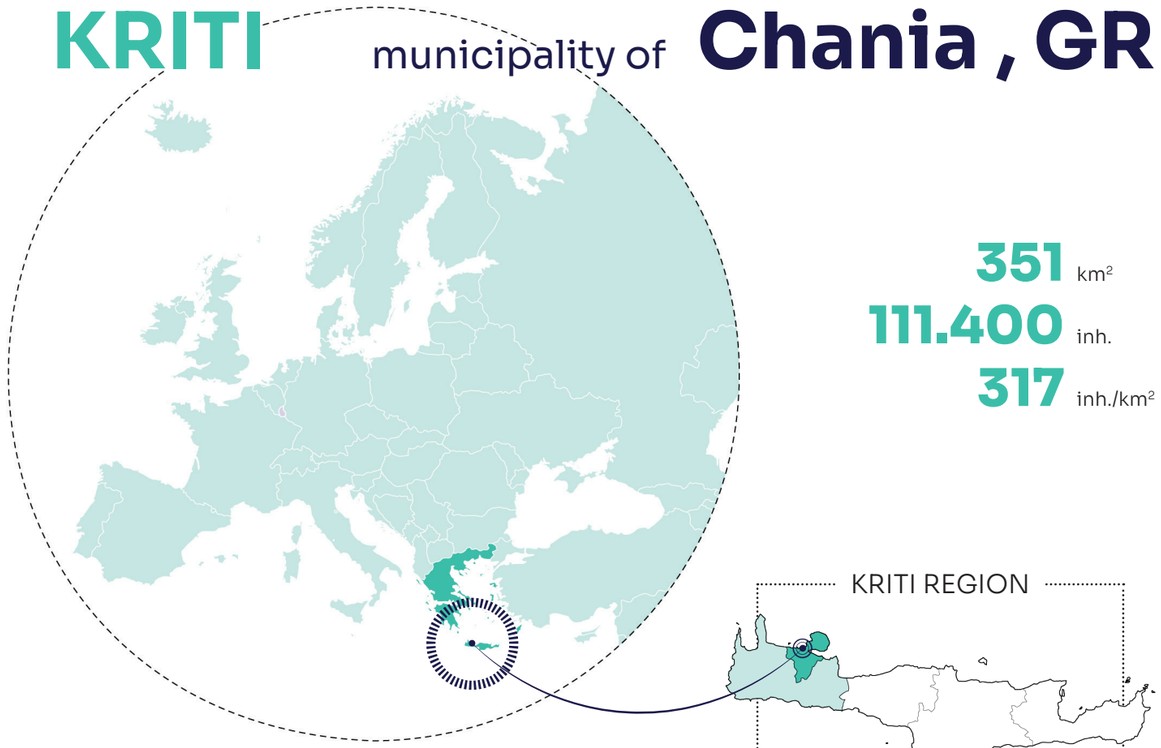
The tables included in ANNEX I are designed to facilitate a focused comparative understanding of the nine cities and regions involved in the project. For each territory, they highlight a limited number of key themes that emerge as particularly significant when analysed in relation to the other project partners. These themes are not intended to represent a comprehensive overview of all aspects of cycling mobility in each territory, but rather to capture those elements that contribute most clearly to differentiation, convergence, or divergence within the overall project landscape.

Each table should be interpreted as an analytical device, not as a ranking or performance assessment. The qualitative labels and categorical indications used reflect the relative positioning of each territory within the project context, taking into account the robustness, completeness and relevance of the available information. Differences across territories therefore point to areas of relative strength, distinctiveness or criticality, rather than to absolute levels of development or policy effectiveness.

By providing a compact and systematic overview of the key comparative findings, ANNEX I supports multiple reading paths of the Deliverable. It complements the analytical chapters for readers interested in methodological continuity, while also serving as a practical reference tool for those seeking a rapid understanding of similarities, differences and priority issues across SMILE City territories.

This project has received funding from the European Union's Horizon Programme (HORIZON-CL6-2023-CIRCBIO-02) under grant agreement No 101135406

KRITI municipality of Chania , GR



351 km²
111.400 inh.
317 inh./km²

› medium-sized city
› compact historic centre
› recent suburban expansion
› located on a coastal plain, with hilly surroundings
› fragmented and underdeveloped cycling mobility

key features

"A historic Mediterranean city undergoing a cultural shift toward sustainable mobility".

01 Cultural shift towards cycling

city / area	citizens' cultural awareness & behavioural shift toward sustainable mobility
Chania	**emerging mixed awareness, with strong resistance to modal shift**
Manresa	growing social demand among younger groups
Lucca	strong receptiveness + more rational, needs-based mode choice with cars less central
Torino	widespread acceptance of modal shift
Castilla y León	broad transition towards sustainable mobility
Beograd	strong dissonance between plans and reality
Istanbul	behaviour shifting within specific social groups
Varna	minimal awareness, with limited cycling use
Bursa	emerging awareness, driven by necessity

low — **growing** — high

soft-mobility culture growing among young people and commuters

local-level cultural change driven by schools, neighbourhoods and participatory urban regeneration

02 Limited cycling infrastructure

city / area	total kilometers of cycling infrastructure
Chania	**~ 5 km / fragmented urban network**
Manresa	~ 10 km / urban network
Lucca	~ 60 km / urban scale with a high presence of greenways and a widespread network
Torino	~ 800 km / metropolitan multi-level network urban and territorial scale
Castilla y León	~ 850 km / mixed network of urban routes, cycle tourism, and greenways
Beograd	~ 100 km / mostly along rivers and parks
Istanbul	~ 550 km / urban network
Varna	no data available
Bursa	~ 400 km / urban network

minimal — growing — extensive

very short and fragmented cycling network

minimal daily use with limited integration into broader urban planning frameworks

03 Evolving investment definition

city / area	definition of future investments
Chania	**Partial / investments under definition through VAA, funds not quantified**
Manresa	Yes / PMUS with detailed budgets, clear funding sources and mix of resources
Lucca	Partial / limited funds with external dependence
Torino	Yes / scenario-based investments with identified differentiated funds
Castilla y León	Yes / strong regional strategy, clear EU support
Beograd	No / no active planning in place
Istanbul	Yes / planned, multi-source investments
Varna	No / no data available
Bursa	No / investments still undefined

none — **partial** — structured

emerging commitments within a flexible investment framework

funds allocated according to emerging priorities, with clear and binding planning foundations, but without precise financial assignment

04 Minimal digital services

city / area	digital mobility tools
Chania	**very limited digitalisation, lack of public digital services, only basic private apps**
Manresa	well-developed PT ecosystem + parking services
Lucca	minimal and experimental tools
Torino	national best practice with fully multimodal app and an advanced MaaS pathway
Castilla y León	strong regional platform with a rich mix of PT, ticketing, bike sharing and rural mobility solutions
Beograd	good PT + e-bike apps, no integrated ecosystem
Istanbul	mature and integrated digital ecosystem + MaaS
Varna	almost no dedicated digital tools
Bursa	solid PT app, limited sharing options

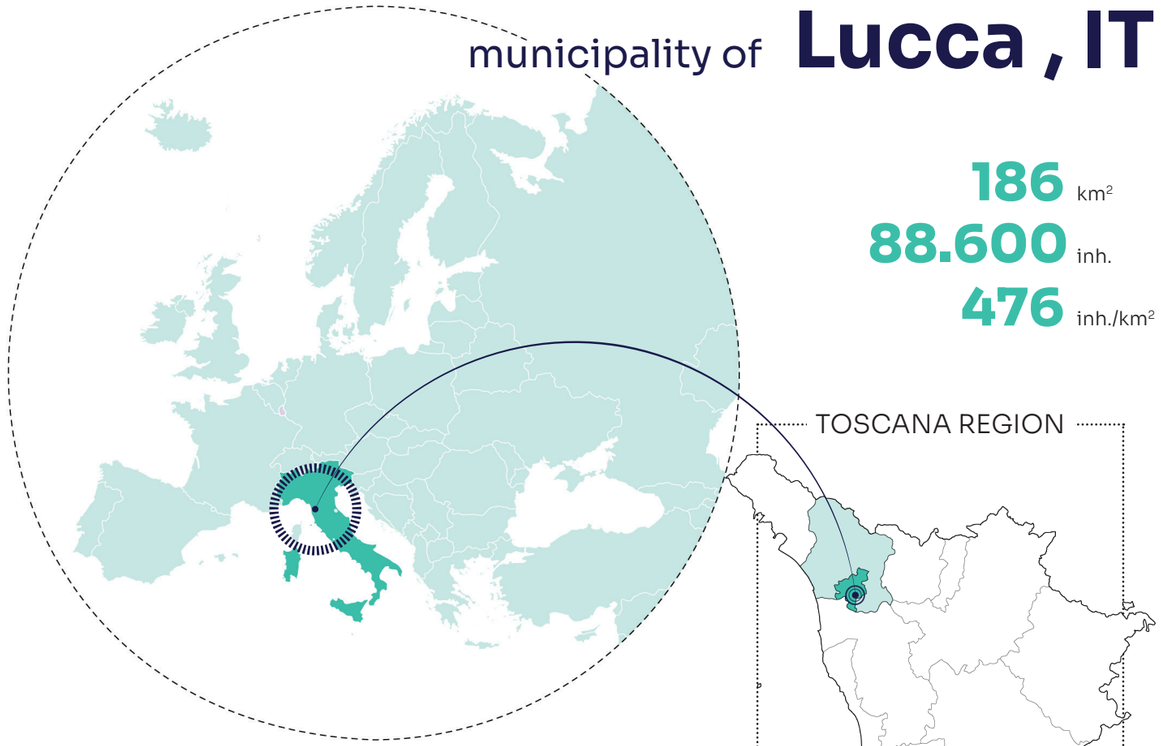
early stage — intermediate — advanced

minimal integration and scarce real-time information across transport services

only linked to private bike sharing + proposals include smart mobility apps

municipality of Lucca , IT

186 km²
88.600 inh.
476 inh./km²



- compact, medium-sized city
- dense historic center enclosed by renaissance walls
- more recent peripheral urbanization
- mainly developed on an inland plain, surrounded by hills
- multi-scale integrated cycling system

key features

"A walkable historic city balancing heritage, soft mobility, and circular innovation ambitions".

01 Health-environment-mobility integration

city / area	integration between air quality monitoring and mobility planning
Lucca	**Yes / strong integration between the SUMP and air quality plans**
Manresa	Yes / connections in place to improve the environment and citizens' health
Torino	Yes / advanced integration with clear objectives
Castilla y León	Partial / moderate integration at the urban scale
Chania	No / potentially impactful measures, no explicit link
Beograd	Yes / air quality plan linked to mobility and incentives
Istanbul	Partial / potential integration but lacking detail
Varna	No / potential future inclusion in strategies
Bursa	No / advanced monitoring but still weak linkage

low — moderate — **high**

strong orientation towards climate neutrality

flagship experience is the EU-funded LIFE ASPIRE project which implemented a reward platform (LOCMAP) for logistic operators based on emissions reduction

02 Strategic network of integrated transport

city / area	integration between public transport and cycling infrastructure
Lucca	**High / Bicipolitana integrated with shuttles, station and P&R**
Manresa	Low / growing network with poor connections
Torino	High / structured links + bike-on-PT policies
Castilla y León	High / fully intermodal BIKI bike-sharing
Chania	Low / poor PT, minimal integration
Beograd	Medium / Park&Bike + connections, but no public bike sharing
Istanbul	Medium / bike parking, bicycle access on vehicles
Varna	Low / cycling network not linked to PT nodes
Bursa	Medium / feeder lines and dedicated planning

weak — growing — **advanced**

integration of transport systems as a strategic network to balance tourism and everyday life

use of flexible free-flow systems suited to a mixed tourist-residential centre, supporting inclusive territorial planning

03 Limited financial capacity

city / area	definition of future investments
Lucca	**Partial / limited funds with reliance on external financing**
Manresa	Yes / PMUS with detailed budgets, clear funding sources and mix of resources
Torino	Yes / scenario-based investments with identified differentiated funds
Castilla y León	Yes / strong regional strategy, clear EU support
Chania	Partial / VAA-based planning, funds not quantified
Beograd	No / no active planning in place
Istanbul	Yes / planned, multi-source investments
Varna	No / no data available
Bursa	No / investments still undefined

none — **partial** — structured

difficulty sustaining long-term structural investments

fragmented and hard-to-quantify investments continue to represent a critical barrier, though targeted and concrete projects are underway

04 Engagement in crcular economy

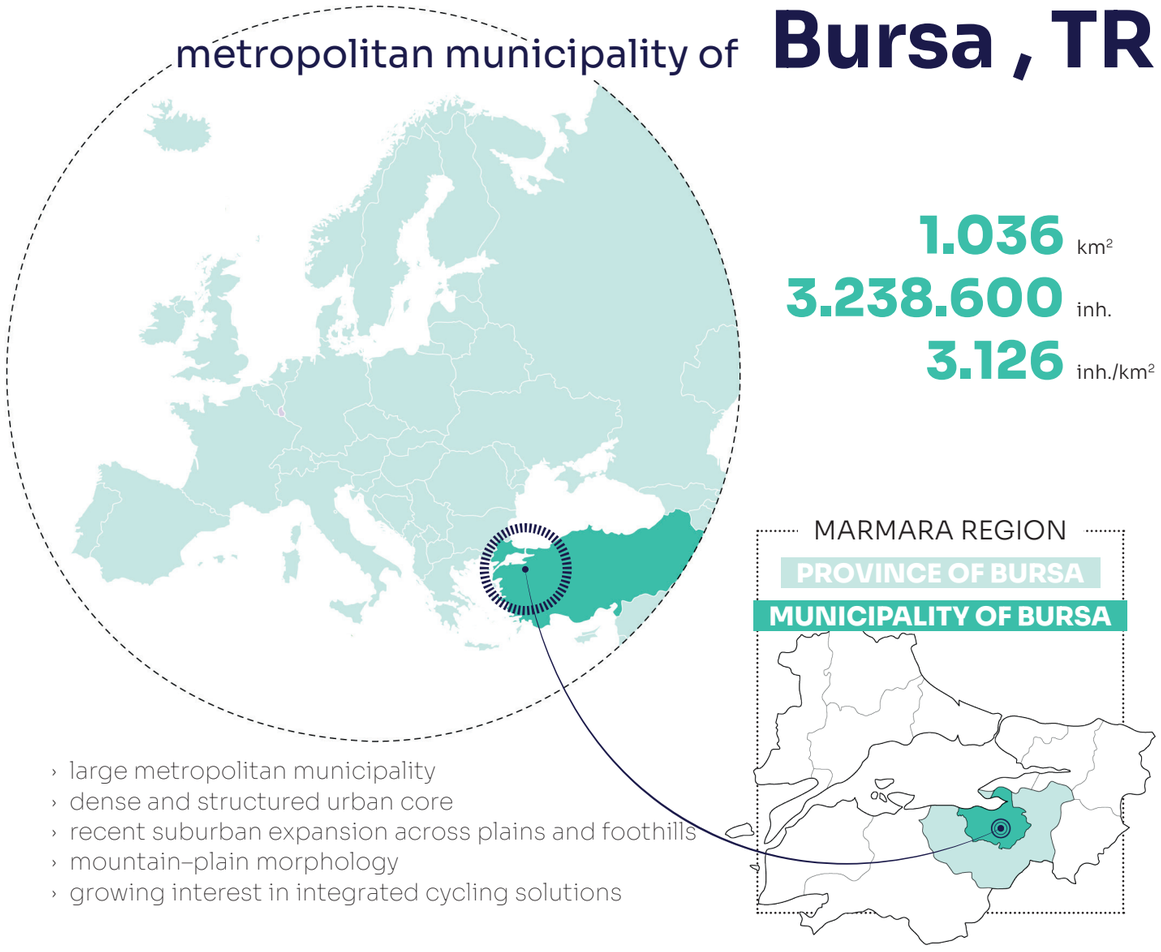
city / area	circular city vision
Lucca	**explicit and strongly oriented vision as a Circular Cities and Region Initiative fellow**
Manresa	clear, structured and formalised approach
Torino	not yet defined, in development
Castilla y León	formal regional strategy in place with strong collaboration and EU alignment
Chania	early-stage and theoretical, not yet structured
Beograd	no local framework
Istanbul	growing, mobility-focused approach stil partial but consolidating within an integrated urban vision
Varna	partial, mobility-oriented
Bursa	emerging via mobility planning

in development — partial — **defined**

european-level commitment to circular transition as a CCRI fellow

strong cultural vision rooted in local, participatory dynamics and ongoing plans to integrate recycling in future infrastructure

metropolitan municipality of Bursa , TR



1.036 km²
3.238.600 inh.
3.126 inh./km²

- large metropolitan municipality
- dense and structured urban core
- recent suburban expansion across plains and foothills
- mountain–plain morphology
- growing interest in integrated cycling solutions

key features

"A fast-growing metropolitan area aligning large-scale mobility with sustainable goals".

01 Extensive network, minimal cycling uptake

city / area	cycling modal share and usage
Bursa	**0.5% / very low use despite large network, cycling barely adopted for daily mobility**
Manresa	1.8% / cycling perceived mainly as leisure
Lucca	no data available / cycling supported mainly through leisure/tourist routes
Torino	2% / mixed urban + tourist cycling culture
Castilla y León	2-4% / strong recreational/tourist cycling
Chania	< 1.5% / cycling used minimally for daily trips
Beograd	0.75% / low current uptake, cycling culture still emerging
Istanbul	< 2% / limited everyday bike use
Varna	no data available / cycling mostly recreational

low — medium — high

minimal everyday cycling use, despite a very extensive network

absence of bike-sharing and e-bike charging services highlights strong cultural and practical barriers to cycling uptake

02 Emerging intermodal integration

city / area	integration between public transport and cycling infrastructure
Bursa	**Medium / feeder lines and dedicated planning**
Manresa	Low / growing network with poor connections
Lucca	High / Bicipolitana integrated with shuttles, station and P&R
Torino	High / structured links + bike-on-PT policies
Castilla y León	High / fully intermodal BIKI bike-sharing
Chania	Low / poor PT, minimal integration
Beograd	Medium / Park&Bike + connections, but no public bike sharing
Istanbul	Medium / bike parking, bicycle access on vehicles
Varna	Low / cycling network not linked to PT nodes

weak — **growing** — advanced

feeder lines and stops designed to planned to connect PT and cycling network

PT–cycling intermodality still weak and under development due to minimal cycling use

03 Emerging circular orientation

city / area	circular city vision
Bursa	**emerging via mobility planning**
Manresa	clear, structured and formalised approach
Lucca	explicit and strongly oriented vision as a Circular Cities and Region Initiative fellow
Torino	not yet defined, in development
Castilla y León	formal regional strategy in place with strong collaboration and EU alignment
Chania	early-stage and theoretical, not yet structured
Beograd	no local framework
Istanbul	growing, mobility-focused approach stil partial but consolidating within an integrated urban vision
Varna	partial, mobility-oriented

in development — partial — defined

circularity only implicit and linked to future mobility planning, without a formal citywide strategy

low and early-stage level of definition and application, with no multi-sector circular framework

04 Basic multimodal digital coverage

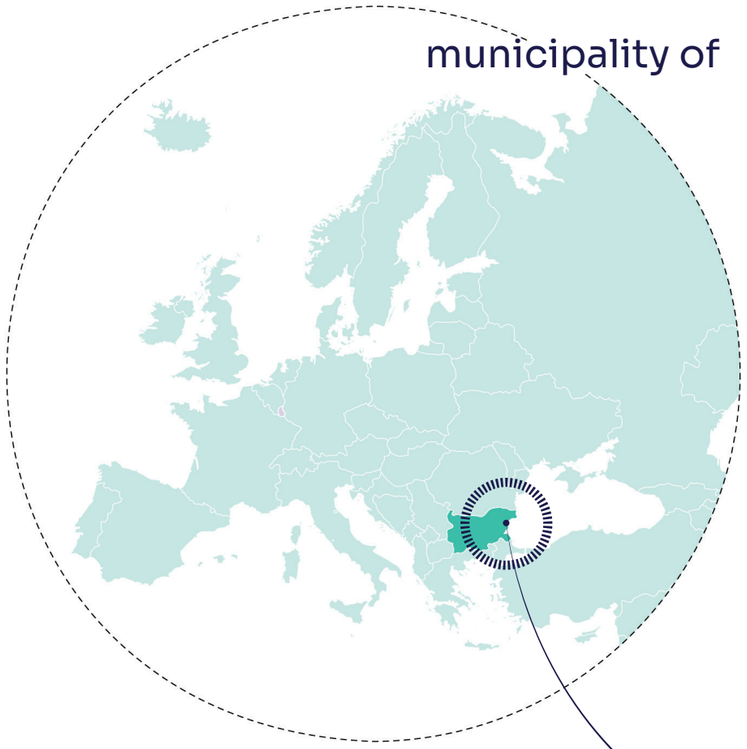
city / area	digital mobility tools
Bursa	**solid PT app, limited sharing options**
Manresa	well-developed PT ecosystem + parking services
Lucca	minimal and experimental tools
Torino	national best practice with fully multimodal app and an advanced MaaS pathway
Castilla y León	strong regional platform with a rich mix of PT, ticketing, bike sharing and rural mobility solutions
Chania	very limited digitalisation, only basic private apps
Beograd	good PT + e-bike apps, no integrated ecosystem
Istanbul	mature and integrated digital ecosystem, progressing toward MaaS
Varna	almost no dedicated digital tools

early stage — **intermediate** — advanced

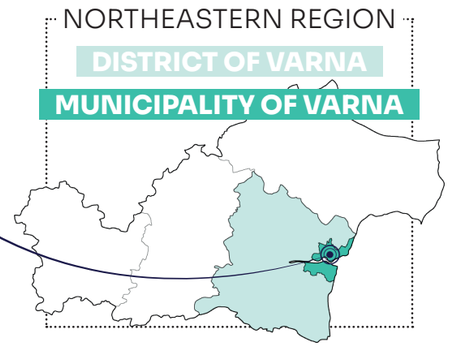
digital tools are mainly centred on public transport, with basic access to route information

limited integration with shared mobility services, resulting in a functional but transit-focused digital ecosystem

municipality of Varna , BG



238 km²
327.400 inh.
1.376 inh./km²



- medium-sized coastal city
- compact and consolidated urban structure
- peri-urban areas with recent expansion,
- coastal plain with gentle hilly surroundings
- cycling mobility oriented to tourism and leisure routes

key features

"A coastal urban hub balancing tourism flows and soft mobility potential converge".

01 Limited cultural uptake of active mobility

city / area	citizens' cultural awareness & behavioural shift toward sustainable mobility
Varna	**minimal awareness, with limited cycling use**
Manresa	growing social demand among younger groups
Lucca	strong receptiveness + more rational, needs-based mode choice with cars less central
Torino	widespread acceptance of modal shift
Castilla y León	broad transition towards sustainable mobility
Chania	emerging mixed awareness, with strong resistance to modal shift
Beograd	strong dissonance between plans and reality
Istanbul	behaviour shifting within specific social groups
Bursa	emerging awareness, driven by necessity

low — growing — high

weak potential due to scarce infrastructure and absent public narrative, keeping active mobility marginal

minimal behavioural change, with cycling used mainly in a functional, non-cultural way

02 Emerging governance framework

city / area	SUMP status
Varna	**No / SUMP in development, general traffic plan approved in 2018**
Manresa	Yes / 2023-2029
Lucca	Yes / SUMP approved in 2018 + Bicipolitana Plan approved nel 2021
Torino	Yes / metropolitan-wide SUMP approved in 2022 as a ten-year plan + Biciplan
Castilla y León	No formal SUMP / regional strategies in place
Chania	Yes / approved in 2023 with a 2030 horizon
Beograd	Yes / 2020-2030 aligned with EU guidelines
Istanbul	Yes / approved in 2021
Bursa	No / BUAP 2035 adopted in 2019

emerging — intermediate — advanced

lack of an approved SUMP and funding-dependent implementation leading to fragmented, slow progress

basic traffic plan guiding cycling development, with incremental improvements and a SUMP currently in preparation

03 Circular practices not yet implemented

city / area	use of recycled materials
Varna	**No / no use so far, potential future integration**
Manresa	Yes / recycled materials used in granular bases
Lucca	No / not yet applied, potential in future planning
Torino	Yes / pilot use of tire dust in asphalt, furniture made from recycled plastic/asphalt
Castilla y León	Yes / mandatory use of recycled aggregates, eco-friendly materials in cycling paths
Chania	No / conceptually supported, not yet implemented
Beograd	No direct use / positive examples from companies
Istanbul	Yes / pilot projects with recycled asphalt
Bursa	No / only Zero Waste projects at the national level

not yet explored — emerging — advanced

no recycled materials used so far in soft-mobility infrastructure

future commitment stated, but circular practices remain at an early and undeveloped stage

04 Partial and mobility-driven circular vision

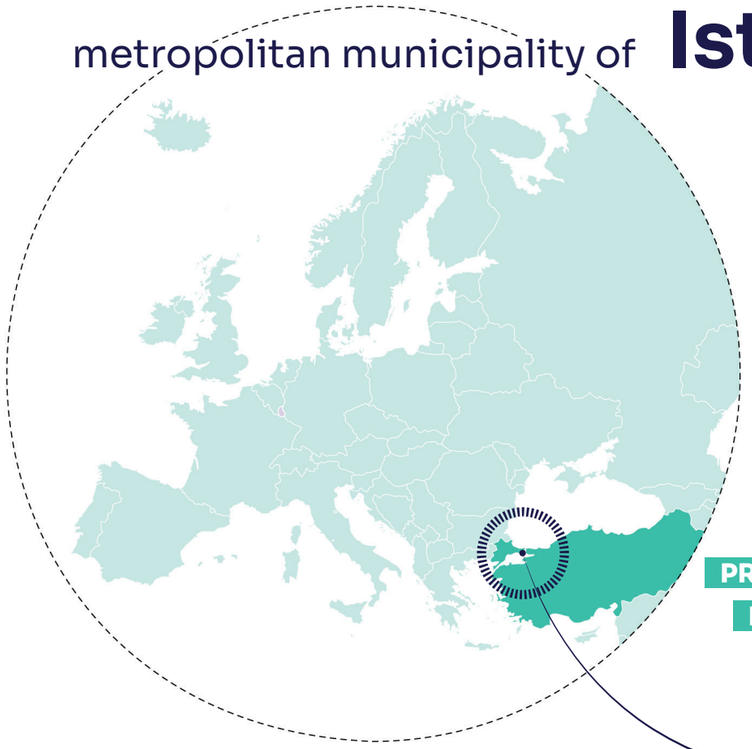
city / area	circular city vision
Varna	**partial, mobility-oriented**
Manresa	clear, structured and formalised approach
Lucca	explicit and strongly oriented vision as a Circular Cities and Region Initiative fellow
Torino	not yet defined, in development
Castilla y León	formal regional strategy in place with strong collaboration and EU alignment
Chania	early-stage and theoretical, not yet structured
Beograd	no local framework
Istanbul	growing, mobility-focused approach stil partial but consolidating within an integrated urban vision
Bursa	emerging via mobility planning

in development — **partial** — defined

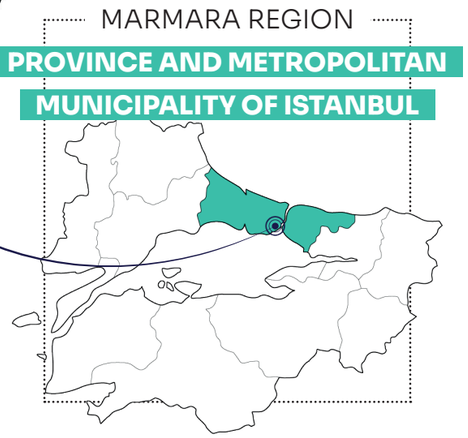
circular principles present only in mobility and liveability goals, without a formal circular strategy

low and sector-specific level of definition and application, with no citywide framework in place

metropolitan municipality of Istanbul , TR



5.343 km²
15.701.600 inh.
2.939 inh./km²



- major European metropolitan area
- highly dense and stratified urban structure
- wide peri-urban expansion across both continents
- strong topographical discontinuities
- discontinuous cycling network

key features

"A vast, multi-center metropolis where scaling soft mobility is a pressing urban challenge".

01 Emerging use of recycled materials

city / area	use of recycled materials
Istanbul	**Yes / pilot projects with recycled asphalt**
Manresa	Yes / recycled materials used in granular bases for pavements
Lucca	No / not yet applied, potential in future planning
Torino	Yes / pilot use of tire dust in asphalt, furniture made from recycled plastic/asphalt
Castilla y León	Yes / mandatory use of recycled aggregates, eco-friendly materials in cycling paths
Chania	No / conceptually supported, not yet implemented
Beograd	No direct use / positive examples from companies
Varna	No / no use so far, potential future integration
Bursa	No / only Zero Waste projects at the national level

not yet explored — **emerging** — advanced

pilot experiments in bike-lane construction, supported by emerging green-procurement principles

recycled-material adoption remains limited, with most infrastructure still built using traditional methods

02 Advanced multimodal mobility system

city / area	sharing services availability
Istanbul	**High / extensive well-used system, public bike sharing, additional shared services**
Manresa	Low / ecosystem absent but in early development
Lucca	Medium / well used single bike-sharing service
Torino	High / mature and multimodal market
Castilla y León	Medium / widespread network, moderate use
Chania	Low / absence of public systems
Beograd	Low / no municipal service, unstructured offer, no usage data
Varna	Low / complete absence of sharing
Bursa	Low / regressive ecosystem

low — medium — **high**

structured shared mobility ecosystem with active public bike sharing and strong uptake in defined districts

user base dominated by 18-35 year-olds, gender-balanced, highly educated, and primarily urban residents

03 Air quality–urban planning integration

city / area	integration between air quality monitoring and mobility planning
Istanbul	**Partial / potential integration, lack of detail**
Manresa	Yes / connections in place to improve the environment and citizens' health
Lucca	Yes / strong integration between the SUMP and air quality plans
Torino	Yes / advanced integration with clear objectives
Castilla y León	Partial / moderate integration at the urban scale
Chania	No / potentially impactful measures, no explicit link
Beograd	Yes / air quality plan linked to mobility and incentives
Varna	No / potential future inclusion in strategies
Bursa	No / advanced monitoring but still weak linkage

low — **moderate** — high

regular monitoring of key pollutants provides the evidence base for planning

low-emission zones and e-mobility measures translate air-quality objectives into urban and transport-planning actions

04 Micromobility & digital tools

city / area	digital mobility tools
Istanbul	**mature integrated digital ecosystem evolving towards MaaS**
Manresa	well-developed PT ecosystem + parking services
Lucca	minimal and experimental tools
Torino	national best practice, fully multimodal app + MaaS
Castilla y León	strong regional platform with a rich mix of PT, ticketing, bike sharing and rural mobility solutions
Chania	very limited digitalisation, lack of public digital services, only basic private apps
Beograd	good PT + e-bike apps, no integrated ecosystem
Varna	almost no dedicated digital tools
Bursa	solid PT app, limited sharing options

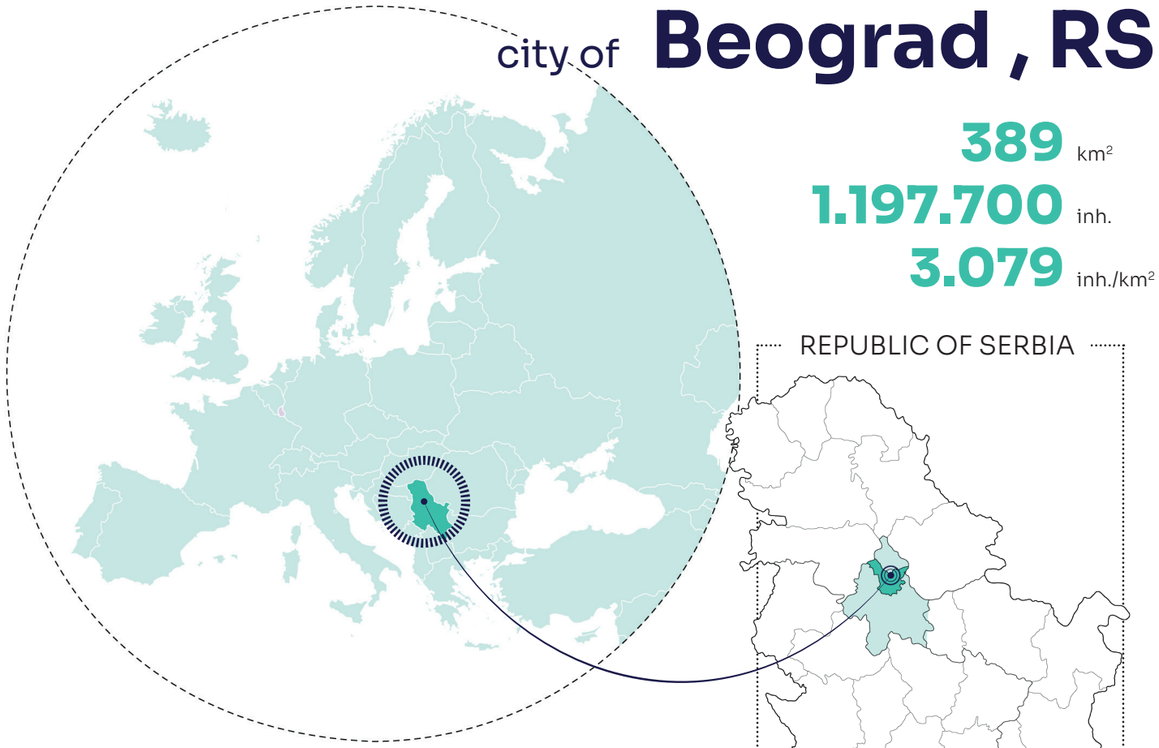
early stage — intermediate — **advanced**

broad set of digital tools for bike sharing, traffic, environmental data and cycling infrastructure

ongoing shift toward a more integrated, MaaS-oriented ecosystem

city of Beograd , RS

389 km²
1.197.700 inh.
3.079 inh./km²



- large metropolitan city
- polycentric and consolidated urban structure
- peri-urban expansion, proximity to smaller settlements
- hilly and fluvial morphology
- fragmented cycling mobility

key features

"A polycentric river city steering a complex shift toward sustainable mobility".

01 Lack of shared mobility services

city / area	sharing services availability
Beograd	**Low / no municipal service, unstructured offer, no usage data**
Manresa	Low / ecosystem absent but in early development
Lucca	Medium / well used single bike-sharing service
Torino	High / mature and multimodal market
Castilla y León	Medium / widespread network, moderate use
Chania	Low / absence of public systems
Istanbul	High / extensive and well-used system, public bike sharing + additional shared mobility services
Varna	Low / complete absence of sharing
Bursa	Low / regressive ecosystem

low — medium — high

organised systems or app-based sharing solutions not yet in place

mobility options based on private ownership or informal arrangements; no official usage data, demographic profiles or performance indicators are available

02 Ambitious planning, weak implementation

city / area	SUMP status
Beograd	**Yes / 2020-2030 aligned with EU guidelines**
Manresa	Yes / 2023-2029
Lucca	Yes / SUMP approved in 2018 + Bicipolitana Plan approved nel 2021
Torino	Yes / metropolitan-wide SUMP approved in 2022 as a ten-year plan + Biciplan
Castilla y León	No formal SUMP / regional strategies in place
Chania	Yes / approved in 2023 with a 2030 horizon
Istanbul	Yes / approved in 2021
Varna	No / SUMP in development, general traffic plan approved in 2018
Bursa	No / BUAP 2035 adopted in 2019

emerging — **intermediate** — advanced

solid and EU-aligned mobility planning framework with clear targets for modal shift and cycling network expansion

implementation lag and difficulty translating strategic ambitions into concrete on-ground results

03 Air quality-mobility integration

city / area	integration between air quality monitoring and mobility planning
Beograd	**Yes / air quality plan linked to mobility actions and cycling incentives**
Manresa	Yes / connections in place to improve the environment and citizens' health
Lucca	Yes / strong SUMP/air-quality-plans integration
Torino	Yes / advanced integration with clear objectives
Castilla y León	Partial / moderate integration at the urban scale
Chania	No / potentially impactful measures, no explicit link
Istanbul	Partial / potential integration but lacking detail
Varna	No / potential future inclusion in strategies
Bursa	No / advanced monitoring but still weak linkage

low — moderate — **high**

robust air-quality monitoring system providing reliable evidence for planning

Air Quality Plan 2021–2031 links monitoring to mobility actions: cycling incentives, infrastructure expansion, safety enforcement, and sustainable transport measures

04 Limited cultural change in urban mobility

city / area	citizens' cultural awareness & behavioural shift toward sustainable mobility
Beograd	**cultural potential held back by strong dissonance between plans and reality**
Manresa	growing social demand among younger groups
Lucca	strong receptiveness + more rational, needs-based mode choice with cars less central
Torino	widespread acceptance of modal shift
Castilla y León	broad transition towards sustainable mobility
Chania	emerging awareness, with strong resistance
Istanbul	behaviour shifting within specific social groups
Varna	minimal awareness, with limited cycling use
Bursa	emerging awareness, driven by necessity

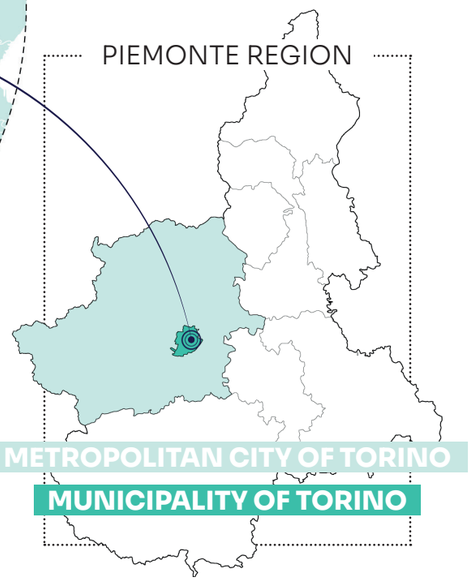
low — **growing** — high

strategic commitment to non-motorised transport but weak implementation

latent public awareness with limited behavioural change, as car-oriented projects undermine the potential for a sustainable mobility shift

CMTO metropolitan city of Torino , IT

6.827 km²
2.211.100 inh.
324 inh./km²



- complex territorial system
- consolidated urban structure
- wide peri-urban and natural areas
- flat, hilly and mountainous zones
- cycling mobility both in urban areas and for tourism

key features

"Structured multilevel mobility planning in a territorially complex metropolitan system".

01 Multilayer mobility governance

city / area	SUMP status
Torino	**Yes / metropolitan-wide SUMP approved in 2022 as a ten-year plan + Biciplan**
Manresa	Yes / 2023-2029
Lucca	Yes / SUMP approved in 2018 + Bicipolitana Plan approved nel 2021
Castilla y León	No formal SUMP / regional strategies in place
Chania	Yes / approved in 2023 with a 2030 horizon
Beograd	Yes / 2020-2030 aligned with EU guidelines
Istanbul	Yes / approved in 2021
Varna	No / SUMP in development, general traffic plan approved in 2018
Bursa	No / BUAP 2035 adopted in 2019

emerging — intermediate — **advanced**

structured governance & planning architecture

multi-level planning framework with metropolitan SUMP, Biciplan and Piano Clima 2030, supported by ongoing efforts to harmonise municipal SUMPs for stronger inter-municipal coherence

02 Strong investment capacity

city / area	definition of future investments
Torino	**Yes / scenario-based investments with identified differentiated funds**
Manresa	Yes / PMUS with detailed budgets, clear funding sources and mix of resources
Lucca	Partial / limited funds with external dependence
Castilla y León	Yes / strong regional strategy, clear EU support
Chania	Partial / VAA-based planning, funds not quantified
Beograd	No / no active planning in place
Istanbul	Yes / planned, multi-source investments with no quantification
Varna	No / no data available
Bursa	No / investments still undefined

none — partial — **structured**

strong financial commitment to future investments

comprehensive and advanced planning approach with interventions planned at all scales + consolidated capacity to attract national and EU funding

03 Integrated digital mobility ecosystem

city / area	digital mobility tools
Torino	**national best practice with fully multimodal app and an advanced MaaS pathway**
Manresa	well-developed PT ecosystem + parking services
Lucca	minimal and experimental tools
Castilla y León	strong regional platform with a rich mix of PT, ticketing, bike sharing and rural mobility solutions
Chania	very limited digitalisation, only basic private apps
Beograd	good PT + e-bike apps, no integrated ecosystem
Istanbul	mature and integrated digital ecosystem, progressing toward MaaS
Varna	almost no dedicated digital tools
Bursa	solid PT app, limited sharing options

early stage — intermediate — **advanced**

integrated digital ecosystem connecting real-time data across all mobility services

unified access point offering seamless information on public transport, traffic and shared mobility

04 High supply but low cycling uptake

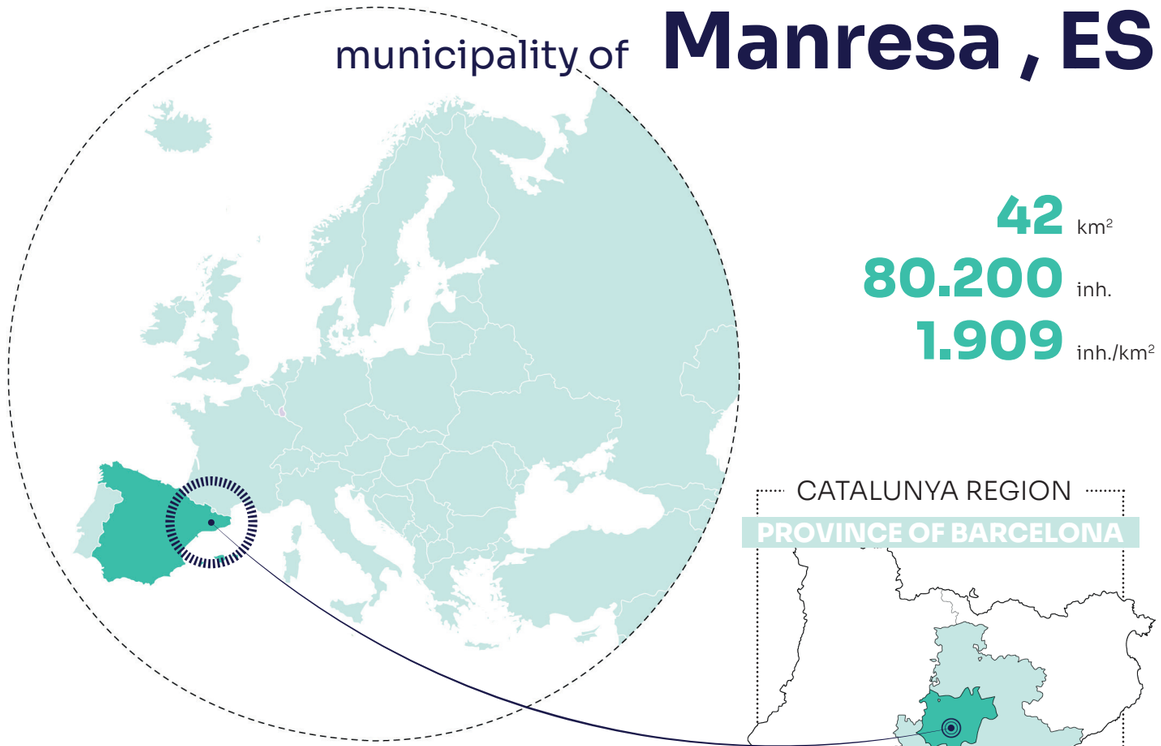
city / area	cycling modal share and usage
Torino	**2% / mixed urban + tourist cycling culture**
Manresa	1.8% / cycling perceived mainly as leisure
Lucca	no data available / cycling supported mainly through leisure/tourist routes
Castilla y León	2-4% / strong recreational/tourist cycling
Chania	< 1.5% / cycling used minimally for daily trips
Beograd	0.75% / low current uptake, cycling culture still emerging
Istanbul	< 2% / limited everyday bike use
Varna	no data available / cycling mostly recreational
Bursa	0.5% / very low use despite very large network, cycling barely adopted for daily mobility

low — medium — high

despite ambitious planning, cycling still plays a marginal role in daily mobility patterns

high cycling infrastructure length but low modal share

municipality of Manresa , ES



42 km²
80.200 inh.
1.909 inh./km²

- medium-sized city
- compact urban structure
- proximity to other smaller centers
- located in a hilly basin
- cycling mobility mainly urban and proximity-based

key features

"A living lab for sustainable mobility and integrated urban planning".

01 Air quality & health-driven mobility

city / area	integration between air quality monitoring and mobility planning
Manresa	**Yes / connections in place to improve the environment and citizens' health**
Lucca	Yes / strong integration between the SUMP and air quality plans
Torino	Yes / advanced integration with clear objectives
Castilla y León	Partial / moderate integration at the urban scale
Chania	No / potentially impactful measures, no explicit link
Beograd	Yes / air quality plan linked to mobility and incentives
Istanbul	Partial / potential integration but lacking detail
Varna	No / potential future inclusion in strategies
Bursa	No / advanced monitoring but still weak linkage

low — moderate — **high**

health-integrated mobility planning

clear vision of soft mobility as a driver of reduced inequalities and improved public health

02 Circular materials in mobility infrastructure

city / area	use of recycled materials
Manresa	**Yes / recycled materials used in granular bases for pavements**
Lucca	No / not yet applied, potential in future planning
Torino	Yes / pilot use of tire dust in asphalt, furniture made from recycled plastic/asphalt
Castilla y León	Yes / mandatory use of recycled aggregates, eco-friendly materials in cycling paths
Chania	No / conceptually supported, not yet implemented
Beograd	No direct use / positive examples from companies
Istanbul	Yes / pilot projects with recycled asphalt
Varna	No / no use so far, potential future integration
Bursa	No / only Zero Waste projects at the national level

not yet explored — emerging — **advanced**

structured implementation of circular economy principles in infrastructure development

despite setbacks, the city remains committed to circular solutions as a strategic example for future mobility projects

03 Limited cycling infrastructure

city / area	total kilometers of cycling infrastructure
Manresa	**~ 10 km / urban network**
Lucca	~ 60 km / urban scale with a high presence of greenways and a widespread network
Torino	~ 800 km / metropolitan multi-level network urban and territorial scale
Castilla y León	~ 850 km / mixed network of urban routes, cycle tourism, and greenways
Chania	~ 5 km / fragmented urban network
Beograd	~ 100 km / mostly along rivers and parks
Istanbul	~ 550 km / urban network
Varna	no data available
Bursa	~ 400 km / urban network

minimal — growing — extensive

short and discontinuous cycling network with limited segregated paths and weak intermodality

cycling uptake remains low and is primarily associated with leisure rather than daily transport due to cultural barriers

04 Small-scale mobility governance

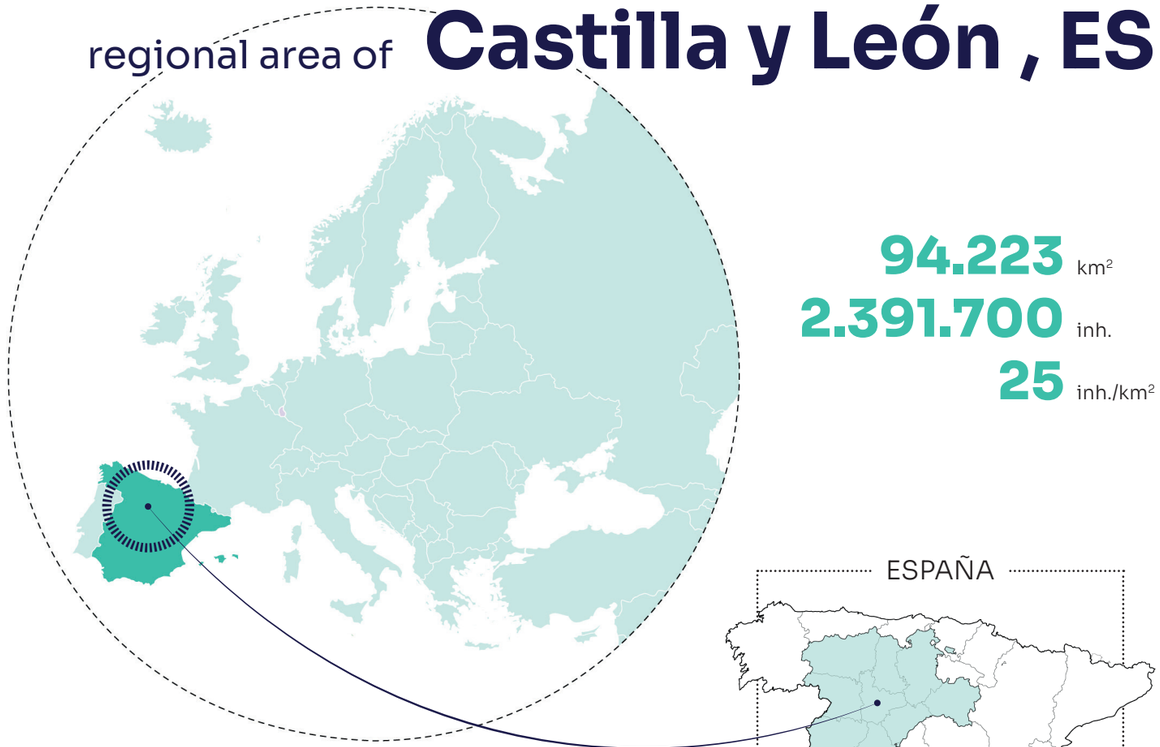
city / area	SUMP status
Manresa	**Yes / 2023-2029**
Lucca	Yes / SUMP approved in 2018 + Bicipolitana Plan approved nel 2021
Torino	Yes / metropolitan-wide SUMP approved in 2022 as a ten-year plan + Biciplan
Castilla y León	No formal SUMP / regional strategies in place
Chania	Yes / approved in 2023 with a 2030 horizon
Beograd	Yes / 2020-2030 aligned with EU guidelines
Istanbul	Yes / approved in 2021
Varna	No / SUMP in development, general traffic plan approved in 2018
Bursa	No / BUAP 2035 adopted in 2019

emerging — **intermediate** — advanced

SUMP built on data analysis and public participation, with a growing focus on cycling and intermodal integration

cycling network remains limited and further operational investment is needed to unlock its full potential

regional area of Castilla y León , ES



94.223 km²
2.391.700 inh.
25 inh./km²

- regional and polycentric context
- economy focused on agriculture, tourism and culture
- dispersed settlement pattern, low population density
- mostly rural territory with fragmented morphology
- cycling mobility oriented towards nature and tourism

key features

"A vast rural region where landscape-driven cycling meets emerging circular innovation".

01 Greenways leadership & recycled materials

city / area	use of recycled materials
Castilla y León	**Yes / mandatory use of recycled aggregates, eco-friendly materials in cycling paths**
Manresa	Yes / recycled materials used in granular bases for pavements
Lucca	No / not yet applied, potential in future planning
Torino	Yes / pilot use of tire dust in asphalt, furniture made from recycled plastic/asphalt
Chania	No / conceptually supported, not yet implemented
Beograd	No direct use / positive examples from companies
Istanbul	Yes / pilot projects with recycled asphalt
Varna	No / no use so far, potential future integration
Bursa	No / only Zero Waste projects at the national level

not yet explored · emerging · **advanced**

systematic use of recycled materials in greenways and infrastructures

mature approach to the circular economy, well integrated and already applied through tangible urban solutions and eco-design experimentation

02 Growing cycling uptake

city / area	cycling modal share and usage
Castilla y León	**2-4% / medium uptake, mostly recreational and tourist cycling**
Manresa	1.8% / cycling perceived mainly as leisure
Lucca	no data available / cycling supported mainly through leisure/tourist routes
Torino	2% / mixed urban + tourist cycling culture
Chania	< 1.5% / cycling used minimally for daily trips
Beograd	0.75% / low current uptake
Istanbul	< 2% / limited everyday bike use
Varna	no data available / cycling mostly recreational
Bursa	0.5% / very low use despite very large network, cycling barely adopted for daily mobility

low · **medium** · high

variable modal share and uneven urban network

challenges in ensuring equity due to a vast territory marked by strong urban-rural polarisation between advanced cities and weaker inner areas

03 Strong regional mobility investments

city / area	definition of future investments
Castilla y León	**Yes / strong regional strategy with structured EU support**
Manresa	Yes / PMUS with detailed budgets, clear funding sources and mix of resources
Lucca	Partial / limited funds with external dependence
Torino	Yes / scenario-based investments with identified differentiated funds
Chania	Partial / VAA-based planning, funds not quantified
Beograd	No / no active planning in place
Istanbul	Yes / planned, multi-source investments
Varna	No / no data available
Bursa	No / investments still undefined

none · partial · **structured**

centralised regional vision with large-scale public investment in public transport and active mobility

use of EU funds to support investments in sustainable rural mobility and greenways

04 Landscape-based mobility model

city / area	total kilometers of cycling infrastructure
Castilla y León	**~ 850 km / mixed network of urban routes, cycle tourism, and greenways**
Manresa	~ 10 km / urban network
Lucca	~ 60 km / urban scale with a high presence of greenways and a widespread network
Torino	~ 800 km / metropolitan multi-level network urban and territorial scale
Chania	~ 5 km / fragmented urban network
Beograd	~ 100 km / mostly along rivers and parks
Istanbul	~ 550 km / urban network
Varna	no data available
Bursa	~ 400 km / urban network

minimal · growing · **extensive**

mixed regional network with a strong cycle-tourism and nature-oriented component

cycling conceived as a tool for landscape enhancement and rural development through an integrated environment–tourism–mobility approach

Deliverable: D2.1

ANNEX II

Data extract

This project has received funding from the European Union's Horizon Programme (HORIZON-CL6-2023-CIRCBIO-02) under grant agreement No 101135406

Introduction

This annex provides a structured compilation of the quantitative and qualitative data collected within Task 2.1, based on the questionnaires submitted by the participating cities and regions, the additional information provided during the integration phase, and selected partner contributions. Its primary purpose is to preserve and systematise the full set of data received during the data collection process, including elements that could not be fully integrated into the main body of the Deliverable due to issues of comparability, level of detail or analytical focus.

ANNEX II therefore functions as a technical data repository, ensuring transparency and traceability of the analytical work and avoiding the loss of potentially relevant information. It complements the interpretative and comparative assessments presented in the main text and in ANNEX I, without duplicating their contents, and provides a reference base that may support further analysis and project activities.

This project has received funding from the European Union's Horizon Programme (HORIZON-CL6-2023-CIRCBIO-02) under grant agreement No 101135406

summary

Data extract relating to the Deliverable D2.1.

Introduction

This Data Annex accompanies Deliverable D2.1 with the aim of providing additional analytical detail to the content already summarized in the main document and in ANNEX I. The annex systematically collects and organizes data, informative tables, and quantitative insights from the questionnaires administered to the cities and regions involved in the SMILE City project, from subsequent additions provided by the territories, and from thematic contributions from project partners.

In order to avoid duplication and ensure consistency with the summary documents, the annex includes only data and tables that are not already presented in Deliverable D2.1 or ANNEX I. For each city, region, or partner, a brief introductory note clarifies which thematic areas have already been covered in the main documents and, consequently, are not repeated in this annex.

The annex is organized by source, with subsections dedicated to each city, region, and partner, so as to ensure full traceability of information and transparency of sources. Each subsection contains only the detailed tables deemed relevant for in-depth and comparable analysis, including information on road safety, digital tools, regulatory frameworks, funding, environmental indicators, and circular economy aspects, where available.

The Data Annex is designed as a technical reference tool and support for the analyses presented in Deliverable D2.1. It aims to facilitate further in-depth analysis, cross-comparisons, and future data updates, while maintaining a clear distinction between summary and detailed levels within the SMILE City project.

A. CITIES / REGIONS CONTRIBUTIONS

A.1 13CH – **Kriti / Chania**

Data and information related to the general framework of sustainable mobility planning, the description of the existing and planned cycling network, and the overall qualitative assessment of cycling mobility policies are already analysed and summarised in the main body of Deliverable D2.1 and in ANNEX I, and are therefore not repeated in this annex. This subsection includes exclusively detailed tables and analytical information not previously included, with specific reference to data availability, existing digital tools, and the applicable national regulatory framework.

Table 13CH-T1 – Availability and constraints of road safety data

The table describes the availability of data related to road safety and accidents involving cyclists within the administrative area of the Municipality of Chania.

Data type	Availability	Level	Notes
Accidents involving cyclists	No	Local	Data held by the Police and not accessible to the Municipality
Total road accidents	Partial	National	Data not disaggregated by transport mode
Cyclist fatalities and serious injuries	No	Local	Absence of shared databases
Georeferenced accident data	No	Local	Not available for planning purposes

Source: T2.1 questionnaire and additional inputs provided by the Municipality of Chania

Table 13CH-T2 – Digital tools for traffic and mobility management

The table lists the digital tools currently used by the Municipality of Chania for traffic management and urban mobility support, including applications relevant to cycling mobility.

Area	Digital tool	Main function	Implementation status
Access control	Smart barriers (Old Town)	Limitation of vehicular traffic	Operational
Traffic regulation	Intelligent traffic lights	Traffic flow optimisation	Operational
School safety	Smart pedestrian crossings	Protection of vulnerable road users	Operational
Electric mobility	E-bike charging stations	Support to electric cycling	Operational (8 stations)

Source: Municipality of Chania, post-questionnaire integrations.

Table 13CH-T3 – National and regional regulatory framework for cycling mobility

The table summarises the main national and regional regulatory and strategic instruments applicable to cycling mobility in Greece, with specific reference to the Region of Crete and the Municipality of Chania.

Level	Regulatory instrument	Year	Scope	Implications for cycling mobility
National	Greek Highway Code (KOK – Κώδικας Οδικής Κυκλοφορίας)	1999 (as amended)	Road circulation and safety	Legal framework regulating cyclists' rights and obligations
National	National Road Safety Strategic Plan	2018	Road safety policy	Measures targeting vulnerable road users
National	National Energy and Climate Plan (NECP)	2019	Climate and energy policy	Promotion of sustainable and low-carbon mobility
National	National Sustainable Mobility Framework	n.a.	Mobility policy	General reference to active mobility
Regional	Regional Spatial Planning Framework of Crete	2018	Spatial and transport planning	Integration of cycling within regional planning
Local	Municipal mobility planning tools (e.g. SUMP-related measures)	n.a.	Urban mobility	Local support to cycling and soft mobility actions

Source: Greek national legislation; Region of Crete; Municipality of Chania; T2.1 questionnaire and additional inputs.

Note: where available, regulatory instruments are referenced by their official denomination; in several cases, cycling-related provisions are embedded within broader transport, safety, or climate frameworks rather than in dedicated cycling laws.

A.2 17LU – **Lucca**

Data and information related to the general framework of sustainable mobility planning, the description of the existing and planned cycling network, and the overall qualitative assessment of cycling mobility policies are already analysed and summarised in the main body of Deliverable D2.1 and in ANNEX I, and are therefore not repeated in this annex. This subsection includes exclusively detailed tables and analytical information not previously included, with specific reference to the national regulatory and technical framework, funding instruments, and the integration of cycling policies with other relevant sectors.

Table 17LU-T1 – National and technical regulatory framework for cycling mobility (UPDATED)

The table summarises the main national, regional and technical regulatory instruments applicable to cycling mobility in Italy, with specific reference to the Municipality of Lucca

Level	Regulatory instrument	Year	Scope	Implications for cycling mobility
National	Italian Highway Code (Codice della Strada – Legislative Decree No. 285/1992)	1992 (as amended)	Road circulation and safety	Legal recognition of bicycles as vehicles; rules for cycling circulation and safety
National	Regulation implementing the Highway Code (DPR No. 495/1992)	1992 (as amended)	Technical standards	Design and signage standards for cycling infrastructure

National	National Cycling Mobility Plan (Piano Generale della Mobilità Ciclistica – Law No. 2/2018)	2018	Strategic planning	Promotion and development of cycling mobility at national and local level
National	Guidelines for the design of cycling infrastructure (Ministerial Decree)	2020	Technical guidance	Harmonised design criteria for cycle paths and cycling facilities
National	National Sustainable Mobility Framework (PNRR-related measures)	2021	Investment policy	Funding support for cycling and active mobility projects
Regional	Regional Mobility and Transport Planning Framework (Tuscany Region)	n.a.	Regional planning	Coordination of cycling policies at regional scale
Local	Municipal Urban Mobility Planning instruments (e.g. SUMP and sectoral plans)	n.a.	Urban mobility planning	Local implementation of cycling infrastructure and measures

Source: Italian national legislation; Ministry of Infrastructure and Transport; Tuscany Region; Municipality of Lucca; T2.1 questionnaire and additional inputs.

Note: where available, regulatory instruments are referenced by their official legal denomination; cycling-related provisions are often embedded within broader transport and mobility regulations rather than in stand-alone cycling laws.

A.3 19BU – **Bursa**

Data and information related to the general framework of urban mobility planning, the description of the existing and planned cycling network, and the overall qualitative assessment of cycling mobility policies are already analysed and summarised in the main body of Deliverable D2.1 and in ANNEX I, and are therefore not repeated in this annex. This subsection includes exclusively detailed tables and analytical information not previously included, with specific reference to the national regulatory framework, funding instruments, and technical standards for cycling infrastructure design.

Table 19BU-T1 – National and metropolitan regulatory and strategic framework for cycling mobility

The table summarises the main national and metropolitan regulatory and strategic instruments applicable to cycling mobility in Türkiye, with specific reference to Bursa Metropolitan Municipality.

Level	Regulatory / strategic instrument	Year	Scope	Implications for cycling mobility
National	Turkish Highway Traffic Law (Law No. 2918)	1983 (as amended)	Road circulation and safety	Legal framework for cyclists as road users
National	Highway Traffic Regulation (implementing Law No. 2918)	1997 (as amended)	Technical and operational rules	Traffic rules, signage, and road safety provisions
National	National Cycling Strategy and Action Plan	2015	Strategic mobility policy	Promotion of cycling as sustainable transport mode

National	National Road Safety Strategy and Action Plan	2021	Road safety policy	Measures addressing vulnerable road users
National	Climate Change Action Plan	2011	Climate policy	Reduction of transport-related emissions
Metropolitan	Bursa Transportation Master Plan (BUAP)	2011 (updated)	Metropolitan transport planning	Integration of cycling into the urban transport system
Metropolitan	Bursa Sustainable Urban Mobility measures	n.a.	Urban mobility	Support to cycling infrastructure and services

Source: Turkish national legislation; Ministry of Transport and Infrastructure; Bursa Metropolitan Municipality; T2.1 questionnaire and additional inputs.

Note: cycling-related provisions are mainly embedded within broader transport and road safety regulations rather than in stand-alone cycling legislation.

Table 19BU-T2 – Technical standards and design guidelines for cycling infrastructure

The table lists the main technical standards and design guidelines applicable to cycling infrastructure in Türkiye and used or referenced by Bursa Metropolitan Municipality.

Level	Standard / guideline	Year	Reference	Application
National	Regulation on Road Traffic Signs and Signals	n.a.	Ministry of Transport and Infrastructure	Cycling signage and road markings
National	Urban Roads Design Standards	n.a.	General Directorate of Highways	Cross-sections and safety elements
National	Cycling Infrastructure Design Guidelines	2015	Ministry of Environment and Urbanisation	Design criteria for cycle paths
National	TS EN standards for road equipment	Various	Turkish Standards Institution (TSE)	Materials and safety components
Metropolitan	Bursa Metropolitan Municipality technical specifications	n.a.	Bursa Metropolitan Municipality	Local adaptation of national standards

Source: Turkish Standards Institution (TSE); Ministry of Transport and Infrastructure; Bursa Metropolitan Municipality; T2.1 questionnaire.

Note: where explicit cycling-specific standards are not available, general road design and traffic safety standards are applied and adapted at local level.

A.4 21VA – **Varna**

Data and information related to the general framework of urban mobility planning, the description of the existing and planned cycling network, and the overall qualitative assessment of cycling mobility policies are already analysed and summarised in the main body of Deliverable D2.1 and in ANNEX I, and are therefore not repeated in this annex. This subsection includes exclusively detailed information describing the general context of traffic and road safety, as well as clarifying the availability and limitations of quantitative datasets at municipal level.

Table 21VA-T1 – Availability of traffic and mobility data

The table summarises the availability of the main quantitative data related to traffic and mobility, with reference to the administrative area of the Municipality of Varna.

Data type	Availability	Level	Notes
Vehicle traffic flows	Partial	Local	Data available on main road corridors
Cycling flows	No	Local	Absence of counting systems
Modal split	No	Local	Not monitored at municipal level
Road accidents	Partial	National	Data not disaggregated by transport mode
Georeferenced mobility data	No	Local	Not available for spatial analysis

Source: T2.1 questionnaire – Obshtina Varna.

Table 21VA-T2 – Vehicle traffic flows on main road corridors

The table reports average daily motorised traffic volumes on selected main road corridors within the Municipality of Varna, identified as key urban crossing routes and strategic connection axes. Data refer to the year 2022.

Road corridor	Road type	Urban function	Average daily traffic (vehicles/day)
Blvd. Vladislav Varnenchik	Primary urban arterial	East–west connection, access to city centre	~45,000
Blvd. Tsar Osvoboditel	Primary urban arterial	Radial axis, residential area connection	~38,000
Blvd. Slivnitsa	Urban distributor road	Urban traffic distribution	~32,000
Asparuhov Bridge	Strategic crossing infrastructure	North–south city connection	~50,000

Source: Obshtina Varna – traffic monitoring data.

Note: data refer exclusively to motorised vehicle traffic and do not include cycling or pedestrian flows.

Table 21VA-T3 – Road accidents

The table reports the total number of road accidents recorded within the Municipality of Varna, without modal disaggregation.

Year	Total road accidents	Injured persons	Fatalities
2019	1,245	1,510	42
2020	1,030	1,210	35
2021	1,180	1,390	38
2022	1,260	1,480	41

Source: National road safety statistics; Obshtina Varna.

Note: accident data are not disaggregated by transport mode; cyclist-specific accident data are not available at municipal level.

A.5 24IS – **Istanbul**

Data and information related to the general framework of sustainable mobility planning, the description of the existing and planned cycling network, and the overall qualitative assessment of cycling mobility policies are already analysed and summarised in the main body of Deliverable D2.1 and in ANNEX I, and are therefore not repeated in this annex. This subsection includes exclusively detailed tables and analytical information not previously included, with specific reference to digital mobility tools**,** road safety actions at metropolitan scale.

Table 24IS-T1 – Digital mobility tools and platforms

The table lists the main digital tools and platforms developed or managed by the Istanbul Metropolitan Municipality to support urban and cycling mobility.

Area	Digital tool / platform	Main function	Status
Mobility information	Istanbul Mobility App	Real-time multimodal information	Operational
Traffic management	Traffic Management Center (TMC)	Traffic monitoring and flow management	Operational
Shared mobility	Bike sharing system (ISBIKE)	Public bike-sharing service	Operational
Open data	Istanbul Open Data Portal	Access to mobility-related datasets	Operational
Planning support	Digital mobility dashboards	Decision-support tools	Under development

Source: Istanbul Metropolitan Municipality, T2.1 questionnaire and additional inputs.

Table 24IS-T2 – Road safety actions and programmes

The table summarises the main actions and programmes implemented by the Istanbul Metropolitan Municipality to improve road safety, with potential positive effects on cyclist safety.

Type of action	Description	Area of application
Traffic calming	Traffic calming measures	Consolidated urban areas
Safe intersections	Safety improvements at intersections	Critical junctions
Speed management	Speed control and reduction measures	Urban road network
Awareness campaigns	Road safety awareness campaigns	Metropolitan scale
Infrastructure upgrades	Infrastructure safety improvements	Main road corridors

Source: Istanbul Metropolitan Municipality, technical documentation

A.6 26BE – **Belgrade**

Data and information related to the general framework of sustainable mobility planning, the description of the existing and planned cycling network, and the overall qualitative assessment of cycling mobility policies are already analysed and summarised in the main body of Deliverable D2.1 and in ANNEX I, and are therefore not repeated in this annex. This subsection includes exclusively

detailed tables and analytical information not previously included, with specific reference to the national and local regulatory framework**,** environmental and health-related indicators.

Table 26BE-T1 – National and local regulatory framework for cycling mobility

The table summarises the main national and local regulatory and strategic instruments applicable to cycling mobility in Serbia, with specific reference to the urban context of the City of Belgrade.

Level	Regulatory / strategic instrument	Year	Scope	Implications for cycling
National	Law on Road Traffic Safety	2009 (as amended)	Road circulation and safety	Recognition of bicycles as vehicles within traffic
National	National Sustainable Development Strategy	2008	Cross-sectoral policies	Promotion of sustainable mobility
National	Transport Development Strategy of the Republic of Serbia	2015	Transport planning	Support to modal integration
Local	Belgrade Urban Development Strategy	2021	Urban planning	Inclusion of cycling within urban development
Local	Sustainable Urban Mobility measures	n.a.	Urban mobility	Support to cycling-related interventions

Source: Relevant ministries of the Republic of Serbia; City of Belgrade.

Note: for some local measures, the year of formal adoption is not specified in the available sources.

Table 26BE-T2 – Air quality and health-related indicators

The table reports selected air quality and health-related indicators referring to recent annual averages for the urban area of Belgrade, based on the most recent data available at national and city level.

Indicator	Value	Reference area	Notes
Annual average PM2.5	~20 µg/m³	Urban area	Above WHO guideline values
Annual average PM10	~35 µg/m³	Urban area	Close to EU limit values
Annual average NO_2	~40 µg/m³	Urban area	High traffic-related pressure
Mortality attributable to air pollution	High	Urban population	Epidemiological estimates

Source: National environmental statistics; UNITO contributions; T2.1 questionnaire.

A.7 29TO – **Metropolitan City of Turin**

Data and information related to the general framework of sustainable mobility planning, the description of the existing and planned cycling network, and the overall qualitative assessment of cycling mobility policies are already analysed and summarised in the main body of Deliverable D2.1 and in ANNEX I, and are therefore not repeated in this annex. This subsection includes exclusively detailed tables and analytical information not previously included, with specific reference to road safety indicators involving cyclists**,** monitoring tools and data sources.

Table 29TO-T1 – Road accidents involving cyclists

The table reports the trend of road accidents involving cyclists within the Metropolitan City of Turin, based on the most recent available time series.

Year	Road accidents involving cyclists	Injured cyclists	Cyclist fatalities
2018	~1,250	~1,180	~28
2019	~1,300	~1,220	~30
2020	~1,050	~980	~22
2021	~1,150	~1,080	~24
2022	~1,280	~1,200	~26

Source: ISTAT / ACI official statistics, elaborated by UNITO; T2.1 questionnaire – Metropolitan City of Turin.

Note: values are aggregated at metropolitan level and derived from harmonised official sources; minor deviations may occur due to subsequent data processing.

Table 29TO-T2 – Monitoring tools and data sources for cycling safety and mobility

The table lists the main monitoring tools and data sources used by the Metropolitan City of Turin for the analysis of road safety and cycling mobility.

Tool / source	Type	Scope of application	Status
ISTAT–ACI databases	Official statistics	Road accidents	Operational
Regional databases	Integrated systems	Road safety	Operational
Cycling counters	Automatic monitoring	Main cycling corridors	Partial
UNITO studies	Analysis and data processing	Cycling mobility	Periodic

Source: Metropolitan City of Turin; UNITO contributions; post-questionnaire integrations.

A.8 33MA – **Manresa**

Data and information related to the general framework of sustainable mobility planning, the description of the existing and planned cycling network, and the overall qualitative assessment of cycling mobility policies are already analysed and summarised in the main body of Deliverable D2.1 and in ANNEX I, and are therefore not repeated in this annex. This subsection includes exclusively detailed tables and analytical information not previously included, with specific reference to road safety indicators**,** digital tools and monitoring systems**.**

Table 33MA-T1 – Road accidents involving cyclists

The table reports data on road accidents involving cyclists within the urban area of the Municipality of Manresa, based on the most recent information available at municipal level.

Indicator	Value	Territorial scope	Notes
Road accidents involving cyclists	~45 / year	Urban area	Recent annual average
Injured cyclists	~40 / year	Urban area	Mainly on urban road network
Cyclist fatalities	0–1 / year	Urban area	Sporadic events

Source: Municipality of Manresa, T2.1 questionnaire and local road safety data.

Table 33MA-T2 – Digital tools and monitoring systems for mobility

The table lists the main digital tools and monitoring systems used by the Municipality of Manresa to support urban and cycling mobility.

Area	Tool / system	Main function	Status
Urban information	Municipal app	Information on services and mobility	Operational
Planning	Municipal GIS	Infrastructure analysis and planning	Operational
Traffic monitoring	Traffic sensors	Vehicle flow monitoring	Partial
Cycling mobility	Cycling counters	Monitoring of cycling flows	Partial

Source: Municipality of Manresa, technical documentation and additional inputs.

A.9 34CY – **Castilla y León**

Data and information related to the general framework of sustainable mobility planning, the description of the existing and planned cycling network, and the qualitative synthesis of digital tools and the overall maturity level of cycling policies are already analysed and summarised in the main body of Deliverable D2.1 and in ANNEX I, and are therefore not repeated in this annex. This subsection includes exclusively quantitative data, detailed tables and thematic insights that were not previously included, and that are relevant for an in-depth and comparable analysis.

Table 34CY-T1 – Road safety indicators (2015–2024)

The table reports the total number of road fatalities and cyclist fatalities recorded on the entire road network of the Castilla y León Region over the period 2015–2024.

Year	Total road fatalities	Cyclist fatalities	Cyclists as % of total
2015	132	9	6.8%
2016	116	7	6.0%
2017	118	8	6.8%
2018	110	6	5.5%
2019	102	5	4.9%
2020	82	4	4.9%
2021	97	6	6.2%
2022	106	7	6.6%
2023	112	8	7.1%
2024*	109	7	6.4%

Note: 2024 data are provisional.

Source: National road safety statistics, elaboration by Fundación Patrimonio Natural de Castilla y León.

Table 34CY-T2 – Digital tools for sustainable mobility (regional and urban level)

The table lists the main digital tools supporting sustainable and cycling mobility implemented at regional and urban level in the Castilla y León Region, with reference to major cities.

Level	Area / City	Digital tool	Main function
Regional	Castilla y León	Open Data Portal	Access to mobility-related data
Regional	Castilla y León	Smart signage	Dynamic user information
Urban	Valladolid	Bike sharing (BIKI)	Bicycle sharing service
Urban	León	Bike sharing (Nextbike)	Urban cycling mobility
Urban	Burgos	Mobility App	Multimodal information
Urban	Salamanca	Cycling route apps	Support to cycling and tourism

Source: T2.1 questionnaires and additional inputs provided by FPN.

Table 34CY-T3 – National and regional regulatory framework for cycling mobility

The table summarises the main national and regional regulatory and strategic instruments applicable to cycling mobility in Spain, with specific reference to the Autonomous Community of Castilla y León.

Level	Regulatory instrument	Year	Scope	Implications for cycling mobility
National	Spanish Road Safety Law (Ley de Tráfico, Circulación de Vehículos a Motor y Seguridad Vial)	2015 (as amended)	Road circulation and safety	Legal framework for cycling as a road user; safety rules and obligations
National	Spanish Sustainable Mobility Strategy (Estrategia de Movilidad Segura, Sostenible y Conectada)	2021	National mobility policy	Promotion of active mobility and cycling integration
National	Climate Change and Energy Transition Law (Ley 7/2021)	2021	Climate and energy policy	Reduction of transport emissions; support to sustainable mobility
Regional	Regional Transport and Mobility Strategy of Castilla y León	2014	Regional transport planning	Integration of cycling within regional mobility planning
Regional	Regional Road Safety Plan of Castilla y León	2016	Road safety	Measures to improve safety of vulnerable road users
Regional	Urban and Territorial Planning Instruments	n.a.	Spatial planning	Inclusion of cycling infrastructure in urban development

Note: where available, regulatory instruments are referenced by their official legal denomination; for some planning instruments, a single formal adoption year is not specified in the available sources.

Source: National legislation of Spain; Autonomous Community of Castilla y León; T2.1 questionnaire and additional inputs.

Table 34CY-T4 – Economic impacts of cycling and cycle tourism

The table reports estimates of the economic and employment impacts associated with cycling and cycle tourism in the Castilla y León Region.

Indicator	Estimated value	Reference year
Annual cycle tourists	~1.2 million	2023
Economic expenditure generated	~€200 million/year	2023
Related employment	~2,000 jobs	2023
Expected growth of cycle tourism	+30%	2030

Source: Regional estimates by FPN and sectoral studies.

B. PARTNER CONTRIBUTIONS

B.1 ECF – **European Cyclists' Federation**

The contribution provided by ECF within Task 2.1 has a cross-cutting and interpretative role, focusing on the qualitative assessment of cycling policies, data robustness, and alignment of local approaches with European cycling policy priorities. ECF's analysis is primarily narrative and comparative, aimed at interpreting and contextualising the information provided by cities through the questionnaires rather than producing new primary datasets.

All tabular outputs originally developed by ECF (including comparative tables on cycling infrastructure typologies, policy approaches, and cross-city gaps) have already been fully incorporated and synthesised in the main body of Deliverable D2.1 and in ANNEX I. Therefore, in order to avoid redundancy and maintain a clear distinction between analytical synthesis and data annexing, no additional ECF tables are reproduced in this Annex.

Table ECF-T1 – Quality and completeness of cycling mobility data

The table summarises the qualitative assessment of the completeness and robustness of cycling mobility data provided by partner cities, according to the criteria applied by ECF.

Area of analysis	Recurring assessment	Key observations
Infrastructure data	Medium–high	Good qualitative descriptions, limited quantitative detail
Demand data	Low	Frequent absence of modal split and cycling flow data
Road safety data	Medium	Data often available but rarely disaggregated
Monitoring systems	Low	Limited standardisation of indicators
Data comparability	Medium–low	High heterogeneity across territories

Source: ECF – Narrative analysis of mobility questionnaires (Task 2.1)

Table ECF-T2 – Alignment with European cycling policy priorities

The table links local cycling policies and actions described by partner cities with key European cycling and sustainable mobility priorities.

European priority	Level of alignment	Evidence
Safety of vulnerable road users	Medium	Measures present but often fragmented
Continuity of cycling networks	Variable	Strong differences between cities
Multimodal integration	Medium–low	Limited integration with public transport
Governance and monitoring	Low	Lack of harmonised KPIs
Data-driven approach	Low	Predominantly descriptive data

Source: ECF – elaboration based on SMILE City questionnaires.

Table ECF-T3 – Key gaps and recommendations

The table summarises the main recurring gaps identified by ECF and the related policy recommendations.

Identified gap	Implications	Recommendations
Lack of quantitative data	Limited impact assessment	Strengthen monitoring systems
Low data comparability	Weak cross-city analysis	Harmonise indicators
Weak regulatory integration	Fragmented actions	Link local plans to national frameworks
Sectoral planning approaches	Reduced effectiveness	Enhance cross-sectoral integration

Source: ECF – Task 2.1 analytical contribution

B.2 CIE – **Cycling Industrie Europe**

The contribution provided by CIE within Task 2.1 has a thematic and policy-oriented focus, emphasising the links between cycling mobility, public health, air quality, and climate objectives. CIE's analysis is mainly narrative and evidence-based, drawing on European policy frameworks and scientific literature rather than producing original quantitative datasets. The tables included in this subsection represent structured syntheses of key analytical messages emerging from the CIE contribution and are intended to support cross-cutting interpretation within the Data Annex.

Table CIE-T1 – Health and environmental impacts of cycling mobility

The table summarises the main health and environmental impacts of cycling and active mobility highlighted in the CIE analysis.

Impact area	Key evidence	Policy implications
Public health	Reduced premature mortality	Promotion of active mobility
Physical activity	Increased daily activity levels	Prevention of chronic diseases
Air quality	Reduction of NO_2 and PM	Health and environmental benefits
Noise	Reduced urban exposure	Improved well-being

Road safety	"Safety in numbers" effect	Systemic approach

Source: CIE – Task 2.1 analytical contribution

Table CIE-T2 – Alignment of local mobility actions with EU climate objectives

The table links sustainable mobility actions discussed in SMILE City with key EU climate and environmental objectives.

EU objective	Strategic reference	Contribution of cycling mobility
Climate neutrality	European Green Deal	Reduction of transport emissions
Air quality	Zero Pollution Action Plan	Lower pollutant concentrations
Urban health	EU Health Strategy	Improved public health outcomes
Liveable cities	New European Bauhaus	Safer and more inclusive public space

Source: CIE – elaboration based on EU policy frameworks

Table CIE-T3 – Key messages and policy recommendations

The table summarises the key messages and policy recommendations emerging from the CIE analysis.

Key message	Identified issue	Recommendations
Transport as a climate lever	Car dependency	Strengthen urban cycling
Multiple co-benefits	Sectoral approaches	Integrate health, climate and mobility
Need for measurable targets	Limited monitoring	Define clear KPIs
Urban equity	Unequal access	Promote inclusive policies

Source: CIE – Task 2.1 analytical contribution

B.3 UNITO – **University of Turin**

The contribution provided by UNITO within Task 2.1 has a technical and methodological role, supporting the comparative analysis of territorial data, road safety indicators, and environmental impacts of mobility. UNITO's work is based on the reprocessing and interpretation of official datasets and methodological frameworks, rather than on the production of original standalone tables.

The tables included in this subsection represent formalised analytical frameworks and indicator groupings derived from UNITO's methodological contributions and are intended to support data interpretation and comparability within the project.

Table UNI-T1 – Road safety indicators and vulnerable road users

The table summarises the main road safety indicators related to vulnerable road users considered in UNITO's comparative analyses.

Indicator	Description	Analytical use
Total road accidents	Overall number of accidents	General safety context
Accidents involving vulnerable users	Cyclists and pedestrians	Risk assessment
Injured persons	Number of injured users	Severity assessment
Fatalities	Number of deaths	Impact indicators
Temporal trends	Multi-year evolution	Trend analysis

Source: UNITO – elaborations based on official statistics (ISTAT, ACI, national sources)

Table UNI-T2 – Environmental and health-related indicators linked to mobility

The table lists the environmental and health-related indicators used by UNITO to assess the impacts of urban and cycling mobility.

Indicator	Domain	Relevance for mobility
PM2.5	Air quality	Health impacts
PM10	Air quality	Traffic-related pressure
NO_2	Air quality	Vehicle emissions
Attributable mortality	Public health	Social costs
Physical activity	Health	Benefits of active mobility

Source: UNITO – elaborations based on environmental and health datasets

Table UNI-T3 – Analytical framework for data comparability

The table summarises the analytical framework applied by UNITO to assess data comparability across partner cities.

Dimension	Evaluation criterion	Objective
Data availability	Presence / absence	Identification of data gaps
Data quality	Level of detail	Analytical robustness
Homogeneity	Methodological coherence	Cross-city comparability
Territorial scale	Local / regional	Alignment of datasets
Data update	Recent / outdated	Reliability

Source: UNITO – Task 2.1 methodological framework

Table UNI-T4 – Links between mobility data and policy design

The table highlights the links between data typologies analysed by UNITO and their use in policy design for sustainable mobility.

Data typology	Policy area	Use
Road safety data	Vision Zero	Intervention prioritisation
Environmental data	Climate policies	Impact assessment
Mobility data	Planning	Network definition
Health indicators	Public health	Co-benefit assessment
KPIs	Monitoring	Performance evaluation

Source: UNITO – Task 2.1 analysis

Deliverable: D2.1

ANNEX III

methodological criteria for the construction of deliverable D2.1

This project has received funding from the European Union's Horizon Programme (HORIZON-CL6-2023-CIRCBIO-02) under grant agreement No 101135406

summary

Methodological annex to Deliverable D2.1.

Introduction

This methodological annex accompanies Deliverable D2.1 of the "SMILE City" project under the Horizon Europe programme. It aims to provide a clear and structured explanation of the process used to collect, analyse and interpret data on sustainable mobility in the territories of the participating partners.

The SMILE City project **promotes sustainable and inclusive urban mobility solutions** with a focus on cycling infrastructure, digital tools, environmental sustainability and behavioural change. Deliverable D2.1 contributes to this objective by providing detailed overviews of the current *'state of the art'* and *'future plans'* in ten European territories. The final version of this Deliverable analyses nine cities/regions, following an intermediate document that examined only five contexts which, in the first phase, had provided structured and comparable information. One of the ten expected cities/regions did not submit any usable material and was therefore excluded from the analysis.

Task 2.1: Objectives and scope

The focus of TASK 2.1 is to collect and analyse existing data from the partner territories in order to identify priorities relating to soft mobility and support the definition of pilot actions. The task defines a common framework for comparing local contexts and collecting structured, comparable information that is useful within the various work packages. The key output of the task is Deliverable 2.1.

Purpose of Deliverable D2.1

Deliverable D2.1 aims to:

- provide a framework for policies, infrastructure and the social and environmental context in the selected cities and regions;
- define a structured baseline on which to base future actions;
- identify strengths, weaknesses and critical issues related to soft mobility;
- support the design of pilot actions (WP4).

A. Methodological process

Phase 0: Questionnaire design

The first phase involved the design of a common questionnaire to be submitted to all project partners. Its structure was based on the objectives of the SMILE City project and was divided into two main thematic blocks:

- *State of the Art*: to explore mobility policies, infrastructure, socio-demographic data, digital tools, environmental data, and existing planning frameworks;
- *Future Plans*: to investigate strategic visions, future investments, expectations regarding digital innovation, circular economy practices, and political orientations.

The questionnaire was organised into thematic sections, later reflected in Chapters 3 and 4 of the Deliverable:

- Local governance and mobility strategies
- Road safety and traffic
- Urban and environmental context
- Cycling infrastructure
- Accessibility and inclusion
- Digital tools and innovation
- Circular vision
- Investments and financial tools

Phase 1: Contextualisation (Chapters 1 and 2)

Before analysing the data, a preliminary phase was developed to frame the European regulatory context (Chapter 1) and to provide a concise description of the territories involved (Chapter 2). The contents were selected based on their consistency with the project's objectives, their relevance to European policies, and the specificity of local contexts.

Phase 2: Definition of the analytical framework (Introduction to Chapter 3)

(2.1) The analytical framework used to structure Chapter 3 was defined through a two-step process, reflecting the progressive availability and consolidation of the material provided by the partners. In an initial step, a preliminary analytical structure was developed to draft the intermediate version of the document, analyzing only five cities/regions - *Kriti* (with a focus on the *city of Chania*), *Municipality of Lucca*, *Metropolitan City of Turin (CMTO)*, *Ajuntament De Manresa*, and *Fundacion Patrimonio Natural De Castilla Y Leon*- which had provided information that was sufficiently complete, consistent, and comparable to support a structured cross-sectional assessment. The analytical axes, classification criteria, and initial comparability assessment were then constructed on this subset, ensuring methodological consistency while recognizing the partial nature of the dataset.

In the second step, the analytical framework was validated and expanded to produce the final version of Deliverable D2.1, integrating information from four additional cities/regions – *Bursa Buyuksehir Belediyesi, Obshtina Varna, Istanbul Metropolitan Municipality (IMM),* and *Grad Beograd* – which provided material at a later stage. No questionnaire was received from *Gmina Sosnowiec*, so the document was closed with nine contributions.

The information was incorporated into the thematic areas following the same methodological criteria applied in the interim version, without altering the structure of Chapter 3 and ensuring full comparability of the information, completing the consistency screening and assessing, for each section of the questionnaire, the "quality" of the data provided (exhaustive, sufficient, deficient or missing, as summarized in Table 1 in the appendix). This two-stage process allowed the analytical framework to remain stable and methodologically sound, progressively expanding its empirical basis and ensuring that the final version of Chapter 3 reflects the complete set of contributions available from nine participating cities/regions.

(2.2) A methodological framework was then developed to assess the comparability of the data and information collected, summarised in three tables:

- *Questionnaire comparison table*: associate each section of the questionnaire with the relevant thematic area of the Deliverable by evaluating the data collected and their mutual "comparability" (see Table 2 in the appendix);
- *Summary table on data comparability*: summarizes the strengths and weaknesses of the information collected from the questionnaires in relation to the themes and cities/areas (see Table 3 in the appendix).

As a summary we can summarize:

Level of comparability	**Sezioni tematiche**	**Summary and interpretation**
1. Fully comparable information	3.1 – Policy and strategic vision; 3.2 – Governance and planning instruments; 3.4 – Socio-demographic and territorial context; 3.6 – Cycling infrastructure; 3.9 – Digital tools for mobility; 3.12 – Opportunities and needs for the SMILE City project	Data available for all 9 cities/regions, with coherent structure and similar conceptual approach. Direct comparison is possible across content and governance models.
2. Partially comparable information	3.3 – Traffic safety and accident data; 3.5 – Air quality and environmental impacts; 3.7 – Accessibility and inclusion; 3.8 – Shared mobility and user behaviour; 3.10 – Circular solutions and recycled materials; 3.11 – Investments and resources	Data available in at least half of the cities/regions, but heterogeneous in format, level of detail, source, or timeframe. Comparisons can be made cautiously, mainly at qualitative level.

3. Non-comparable information	None fully classified in this category	Some topics (e.g., 3.3, 3.7, 3.8) show such differences in methodology and data format that direct comparison remains limited or requires secondary harmonization.

The methodological framework thus defined was used in the comparative evaluation of documents, useful for identifying themes and topics suitable for direct comparison with information that is more difficult to correlate or process analytically. This "qualitative" comparison of the received data aims to provide the most balanced view of the information, both in its management and subsequent processing.

Phase 3: Thematic and territorial analysis (Chapters 3 and 4)

(3.1) Based on the defined methodological process, an analysis model was developed according to a double level of evaluation, reflected in the two main chapters of the Deliverable:

- *Chapter 3*: provides a cross-thematic analysis, comparing key information for each reference area across the target cities/regions;
- *Chapter 4*: develops a vertical analysis for each city/area, consisting of:
    - a descriptive “qualitative” profile (Section 4.1);
    - a graphic summary with tables and indicators for key parameters (Section 4.2).

(3.2) Subsequently, a content integration phase was launched involving contributions from project partners (local institutions, agencies, associations, universities, or technical stakeholders active in the analysed urban contexts). Based on their expertise, they provided important contributions to Chapter 3 with the aim to:

- enrich the collected information with complementary perspectives;
- validate and refine existing analyses;
- identify additional good practices and relevant cases.

The received contributions were integrated into the Deliverable according to the criteria detailed in Section B “Criteria for integrating external contributions” of this annex, with the purpose of ensuring greater openness and representativeness, thus strengthening the collaborative and multi-stakeholder dimension of the SMILE City project.

(3.3) Finally, following the drafting of the interim document, a series of potential additions were identified that could strengthen the document itself, defining a second phase of requests to all parties involved, with the procedures detailed in section C “Additions to complete the Deliverable” of this annex.

Phase 4: Strategic interpretation and synthesis (Chapters 5 and 6)

The final phase focused on translating analytical results into strategic guidance:

- *Chapter 5*: summarises strengths, weaknesses, and lessons learned, with reference to future implications;
- *Chapter 6*: provides general conclusions and outlines future activities, particularly the planned pilot actions.

This approach allows Deliverable D2.1 to serve not only as a descriptive document but also as a practical tool to define the operational framework for the next project steps of SMILE City.

B. Criteria for integrating external contributions

During the drafting of Chapter 3 of Deliverable D2.1, external contributions provided by project partners and associated stakeholders were taken into account. These contributions offered additional data, analyses, and interpretative insights that enriched the contents already elaborated. For the final version of the Deliverable three external contributions had been received (from ECF, UNITO, and CIE). Any further contributions will be integrated into subsequent versions of the document.

Given the heterogeneity and varying structure of the received documents, a *dedicated methodology* was developed to ensure consistent and transparent integration of these contents within the main body of the Deliverable.

As a first methodological choice, in order to align the information with the rest of the document, information relating to cities/areas not included among the five target territories was excluded, as already foreseen in the general methodology of Deliverable D2.1. In particular, sections relating to Istanbul and Bursa were removed, except for supporting comparative references.

The external contributions considered were divided into two main types:

1. *Cross-thematic contributions*, addressing several aspects of sustainable mobility and requiring integration across multiple sections of Chapter 3;
2. *Monographic contributions*, focused on a specific theme and linked to a single section of the chapter.

Among the contributions received in this drafting phase, the following falls into the first category:

- the **ECF – European Cyclists' Federation** contribution, addressing cross-cutting themes such as governance, infrastructure, user profiles, and economic tools;

The following fall into the second category:

- the **UNITO – University of Turin** contribution, related to Section 3.3 (Urban and environmental context and sustainable solutions);
- the **CIE – Cycling Industrie Europe** contribution, related to Section 3.8 (Cycling infrastructure and use of recycled materials: planning and sustainability).

Each contribution was analysed in detail and integrated according to the following criteria:

- maintaining the structure and thematic logic already defined for Chapter 3;
- full and faithful use of external content, avoiding omissions or arbitrary reductions, except in justified cases;
- terminological, linguistic, and editorial uniformity, consistent with the project glossary and editorial guidelines;
- discursive and thematic integration, avoiding mere juxtaposition of texts and ensuring narrative coherence between the original and external content.

The methodology was applied to each contribution as follows:

- The *ECF contribution* was integrated in discursive form into five sections of Chapter 3 (3.2, 3.4, 3.5, 3.6, and 3.9), adding analytical elements on user behaviours, strategic planning, economic tools, and infrastructure design. The content was incorporated into the original

text without creating subsections, maintaining the logical flow of the sections and integrating ECF content into existing paragraphs;

- The *UNITO contribution* was inserted in full into Section 3.3, with the creation of dedicated thematic subsections. The narrative text was reorganised by cross-cutting topics, and the tables from the original document were preserved with precise in-text references, in line with the original structure;
- The *CIE contribution* was integrated into Section 3.8, with the creation of new subsections and tables. The tables from the original document were numbered and titled based on content, and new summary tables were added to improve comparability among target cities.

The integration process was designed to enhance the scientific and technical value of the contributions while preserving the unity and readability of Chapter 3. The main objective was to ensure a coherent and informative comparative analysis, maintaining the integrity of data and the original articulation of sections.

The adopted method aligns with the general methodological section of the Deliverable and is justified by the need to preserve comparability among the five target territories, which represent the empirical core of the analyses under Task 2.1 of the SMILE City project.

C. Additions to complete the Deliverable

Based on the data collected through the questionnaires and the drafting of the intermediate version of the Deliverable, potential additions were identified that would improve the document's completeness and operational value. These potential additions were communicated to the cities/regions and project partners through a second round of targeted requests, which were specific to any shortcomings identified in individual cities or cross-cutting if useful for completing or enhancing analyses and assessments.

To strengthen the analytical robustness and operational value of Deliverable D2.1, several priority integrations were identified. These include the introduction of quantitative indicators (e.g., cycling network length, modal split, disaggregated safety data) and the development of harmonised monitoring frameworks with shared KPIs and digital tools to track infrastructure usage, safety performance, and modal shift. It is also useful to include a national regulatory framework to situate local data within the wider set of policies governing cycling and sustainable mobility.

Additional needs concern the collection of user behaviour and perception data, a deeper assessment of digital integration (interoperability, data governance), and a more detailed economic and financial analysis of mobility investments. Finally, the Deliverable can be further strengthened by assessing the replication potential of practices through contextual indicators and by enhancing the integration of soft mobility with cross-sectoral policies such as health, education, tourism, and climate strategies.

This second data collection campaign provided a series of very diverse responses, which were integrated into the document following the same operating procedures described in the previous points of this methodological annex, in particular in chapters 3 and 4, in order to broaden the knowledge base that led to a revision of chapters 5 and 6. The main cross-cutting additions were finally summarized in section 4.1, introducing, in those cities/regions that provided comprehensive information, the paragraphs "*National regulatory frameworks for cycling and sustainable mobility*" and "*Health, education, tourism, climate, and socio-economic strategies*."

These additions confirmed the methodological validity of the synthesis and analysis process, thereby expanding the analytical robustness of the results and strengthening the supporting role of WP4 pilot actions, WP3 data governance and the broader strategic trajectory of SMILE City. They also ensured alignment with Horizon Europe objectives and EU policies on sustainable mobility.

APPENDIX

D21	Question Number	Question in Brief	13 - PERIFEREIA (EL) KRITI (CHANIA)	17 - LUCCA (IT) COMUNE DI LUCCA	19 - BURSA (TR) BURSA BUYUKSEHIR BELEDIYESI	21 - VARNA (BG) OBSHTINA VARNA	24 - IMM (TR) ISTANBUL METROPOLITAN MUNICIPALITY	26 - BEOGRAD (RS) GRAD BEOGRAD	28 - GMINA (PL) GMINA SOSNOWIEC - MIASTO NA PRAWACH POWIATU	29 - CMTO (IT) CITTA' METRO DI TORINO	33 - MANRESA (ES) AJUNTAMENT DE MANRESA	34 - FPN (ES) F. P. N. DE CASTILLA Y LEON
DELIVERY TIMES			sufficient	good	good	late	sufficient	late	non consegnato	good	good	good
3.1	Q1.A1	1. Local policies on soft mobility implemented in the cities/areas: does your City/Area have a long-medium term mobility Plan? If yes, provide basic information about it...	comprehensive	comprehensive	sufficient	sufficient	comprehensive	comprehensive		comprehensive	comprehensive	comprehensive
	Q1.A2	2. Main mobility issues to be addressed according to Local mobility Plans; identify and explain in a few words	comprehensive	comprehensive	lacking	lacking	sufficient	sufficient		comprehensive	comprehensive	comprehensive
	Q1.A3	3. Are there any regulatory obligations, at regional and/or national scale...	comprehensive	comprehensive	lacking	sufficient	sufficient	comprehensive		comprehensive	comprehensive	comprehensive
	Q1.A4	4. How is the public transport system organized in your City/Area?...	comprehensive	comprehensive	lacking	lacking	comprehensive	sufficient		comprehensive	comprehensive	comprehensive
	Q1.A5	5. What kind of investments in the transportation system have you made in the city in the last decades?	comprehensive	comprehensive	lacking	lacking	comprehensive	comprehensive		comprehensive	sufficient	comprehensive
	Q1.A6	6. What activities for the development of Sustainable Mobility...	comprehensive	comprehensive	lacking	lacking	comprehensive	sufficient		comprehensive	comprehensive	comprehensive
	Q1.A7	7. How many resources have the City/Area allocated to the development and implementation of Sustainable Mobility Solutions...	comprehensive	sufficient	lacking	lacking	sufficient	sufficient		comprehensive	comprehensive	comprehensive
3.2	Q1.A8	8. Provide main relevant traffic data...	sufficient	sufficient	lacking	lacking	sufficient	lacking		comprehensive	sufficient	lacking
	Q1.A9	9. Number of accidents with deaths and serious injuries of cyclists...	sufficient	sufficient	lacking	lacking	sufficient	lacking		comprehensive	sufficient	absent
	Q1.A10	10. Security data and actions implemented to reduce mortality on local roads network	sufficient	sufficient	lacking	sufficient	sufficient	sufficient		comprehensive	comprehensive	sufficient
3.3	Q1.B1	1. Brief context data on socio-economic and geographical aspects of the City/Area...	comprehensive	comprehensive	sufficient	comprehensive	sufficient	sufficient		comprehensive	comprehensive	comprehensive
	Q1.B2	2. Data relating to the concentration of some pollutants in the air...	sufficient	sufficient	lacking	sufficient	sufficient	sufficient		comprehensive	sufficient	sufficient
	Q1.B3	3. Eco-design solutions and best practices. Has the City/Area used recycled materials...	sufficient	sufficient	sufficient	sufficient	lacking	sufficient		comprehensive	sufficient	sufficient
3.4	Q1.C1	1. Quantify and assess the existing cycling infrastructure in the City/Area...	comprehensive	comprehensive	comprehensive	sufficient	comprehensive	comprehensive		comprehensive	comprehensive	comprehensive
3.5	Q1.D1	1. Measuring and understanding e-bike riders...	lacking	sufficient	lacking	absent	sufficient	lacking		absent	comprehensive	sufficient
	Q1.D2	2. Data relating to people who use sharing services...	lacking	lacking	lacking	absent	sufficient	lacking		lacking	lacking	sufficient
	Q1.D3	3. Accessibility relating to socio-economic needs...	lacking	sufficient	sufficient	absent	sufficient	sufficient		sufficient	lacking	comprehensive
3.6	Q1.E1	1. Describe APPs available or relevant digital solutions applied so far to mobility measures or infrastructures	sufficient	comprehensive	sufficient	lacking	comprehensive	sufficient		comprehensive	comprehensive	comprehensive
3.7	Q2.A1	1. How does the Municipality interpret the concept of a Circular City?...	sufficient	comprehensive	lacking	lacking	sufficient	sufficient		lacking	comprehensive	sufficient
	Q2.A2	2. Which sectors of the future city's transportation system have priority?...	sufficient	sufficient	sufficient	lacking	comprehensive	sufficient		sufficient	sufficient	sufficient
	Q2.A3	3. Which types of the future city's transportation system have priority?...	sufficient	sufficient	sufficient	lacking	comprehensive	sufficient		sufficient	sufficient	sufficient
	Q2.A4	4. According to the City/Area feeling/experience, what does Sustainable Mobility means to city dwellers?...	sufficient	sufficient	lacking	lacking	sufficient	sufficient		comprehensive	sufficient	sufficient
	Q2.A5	5. How is soft mobility changing in your City/Area?...	sufficient	sufficient	lacking	lacking	sufficient	sufficient		comprehensive	sufficient	sufficient
3.8	Q2.B1	1. How does the City/Area plan and build the future local cycling infrastructure?...	comprehensive	comprehensive	lacking	lacking	comprehensive	sufficient		comprehensive	sufficient	comprehensive
	Q2.B2	2. Does the city support the circular economy and the use of products made from recycled materials...	sufficient	sufficient	lacking	lacking	sufficient	lacking		comprehensive	sufficient	sufficient
3.9	Q2.C1	1. How many resources will the city allocate to the development and implementation of Sustainable Mobility Solutions...	sufficient	sufficient	lacking	lacking	sufficient	absent		sufficient	comprehensive	sufficient
	Q2.C2	2. Are they financed with external resources?...	comprehensive	sufficient	lacking	lacking	sufficient	absent		comprehensive	comprehensive	sufficient
	Q2.C3	3. Is the develop of eco-accounting model... considered useful by the Cities?	sufficient	sufficient	absent	lacking	lacking	absent		sufficient	sufficient	lacking
3.10	Q2.D1	1. Is the develop of user-friendly tools like interfaces for a screen placed on the charging station...	comprehensive	sufficient	absent	lacking	comprehensive	sufficient		sufficient	sufficient	lacking
3.12	Q2.E1	What useful innovative solutions do you expect from SMILE City Project and what do you need from the Project...	comprehensive	sufficient	lacking	lacking	sufficient	absent		sufficient	comprehensive	sufficient

MET.T2_Questionnaire comparison table

Code	Question / Topic	Kriti/Chania	Lucca	CMTO	Manresa	Castilla y León	Belgrade	Bursa	Istanbul	Varna	Comparison Evaluation
3.1 Local Governance and Strategies for Sustainable Mobility											
A1	Local policies on soft mobility and mobility planning (SUMP or others)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓ Comparable
A2	Main issues to be addressed in Local Mobility Plans	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓ Comparable
A3	Regulatory obligations at regional/national scale on sustainable mobility	✓	✓	✓	✓	△	✓	△	✓	△	△ Partially comparable
A4	Public transport organization and connection with cycling infrastructure	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓ Comparable
A5	Past investments in transportation system	✓	✓	✓	✓	△	△	△	✓	△	△ Partially comparable
A6	Sustainable mobility actions implemented in the last 5 years	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓ Comparable
A7	Resources allocated to sustainable mobility in the last 5 years	△	△	△	✗	△	✗	△	△	△	△ Partially comparable
3.2 Traffic, Accidents, and Road Safety											
A8	Main traffic data and actions to reduce car use	△	✓	△	✗	△	✗	△	△	△	△ Partially comparable
A9	Number of cyclist-related accidents	△	✓	△	✗	✗	✗	✗	△	✗	✗ Not comparable
A10	Security data and road mortality prevention actions	✓	✓	△	✗	✗	✗	✗	△	△	△ Partially comparable
3.3 Urban and Environmental Context and Sustainable Solutions											
B1	Socio-demographic and geographic context	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓ Comparable
B2	Air pollution data, monitoring, plans, integration with health and environment	△	✓	△	✓	△	△	△	✓	△	△ Partially comparable
B3	Use of recycled materials in soft mobility infrastructure	✓	✓	✓	✓	✓	✓	△	✓	✓	✓ Comparable
3.4 Existing Cycling Infrastructure											
C1	Existing cycling infrastructure (modal share, km, charging, parking, etc.)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓ Comparable
3.5 Accessibility, User Profiles, and Inclusiveness											
D1	User types and use cases of soft mobility	✓	✓	✓	✓	✓	△	△	✓	✓	✓ Comparable
D2	Bike/car sharing user profiles (age, gender, SES)	△	△	✗	✗	✗	✗	✗	✗	△	✗ Not comparable
D3	Accessibility and role of infrastructure in reducing car dependency	✓	✓	✓	✓	✓	△	△	✓	✓	✓ Comparable
3.6 Digital Tools Currently in Use for Urban Mobility											
E1	Digital tools and mobility-related apps already in use	✓	✓	✓	✓	✓	△	✓	✓	✓	✓ Comparable
3.7 Strategic Vision and Future Scenarios for Sustainable Mobility											
F.A1	Circular city vision	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓ Comparable
F.A2	Priority sectors in future mobility systems	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓ Comparable
F.A3	Priority transport types for the future	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓ Comparable
F.A4	Citizen perception of sustainable mobility	✓	✓	✓	✓	✓	△	△	✓	✓	✓ Comparable
F.A5	Long-term morphological and demographic changes due to soft mobility	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓ Comparable
3.8 Cycling Infrastructure and the Use of Recycled Materials											
F.B1	Planning and placement of future cycling infrastructure	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓ Comparable
F.B2	Circular economy and recycled materials in future mobility infrastructure	✓	✓	✓	✓	✓	△	△	✓	✓	✓ Comparable
3.9 Future Investments and Economic Tools for Sustainable Mobility											
F.C1	Future resource allocation to cycling infrastructure	△	△	△	✗	△	✗	△	△	△	△ Partially comparable
F.C2	External funding and presence in binding planning documents	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓ Comparable
F.C3	Eco-accounting models and incentive schemes	✓	✓	✓	✓	✓	△	△	✓	✓	✓ Comparable
3.10 Future Digital Tools for Sustainable Mobility											
F.D1	Interest in future digital tools (interfaces, apps, product passports, etc.)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓ Comparable
Final considerations											
F.D2	Expected contributions from SMILE City project	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓ Comparable

MET.T3_Summary table on data comparability

Section	Theme	Cities/areas with available data	Data comparability	Critical notes
3.1	Policy and strategic vision	All (9/9)	**Good – comparable overall framework**	Minor differences in terminology and scale (regions vs. cities); Belgrade and Bursa less detailed.
3.2	Governance and planning instruments	All (9/9)	**Good – all refer to planning instruments**	Some cities provide more structured information (e.g., Lucca, CMTO, Castilla y León); limited details in Bursa and Belgrade.
3.3	Traffic safety and accident data	Lucca, CMTO, Istanbul, Castilla y León, Kriti/Chania, Varna (6/9)	**Partial – heterogeneous data by source and time period**	Most cities lack consistent or recent safety indicators; Belgrade and Bursa have no quantitative data.
3.4	Socio-demographic and territorial context	All (9/9)	**Good – structured and comparable data**	Some cities use local statistics, others regional/national; differences in update frequency.
3.5	Air quality and environmental impacts	All (9/9)	**Fair – general presence but limited comparability**	Data formats vary; Lucca and CMTO provide detailed monitoring; Turkish cities show general values only.
3.6	Cycling infrastructure	All (9/9)	**Good – all report extension and typology**	Lucca and CMTO have very precise classifications; other cities lack standardized measures.
3.7	Accessibility and inclusion	Lucca, CMTO, Kriti/Chania, Varna, Manresa (5/9)	**Partial – non-homogeneous definitions and approaches**	Often merged with other sections; Belgrade and Bursa lack socio-demographic indicators.
3.8	Shared mobility and user behaviour	Lucca, CMTO, Kriti/Chania, Istanbul, Varna (5/9)	**Partial – limited quantitative data**	Absence of gender, age, or income data; qualitative descriptions prevail.
3.9	Digital tools for mobility	All (9/9)	**Good – despite varying levels of digitalization**	Some tools are still in testing or pilot phases; Belgrade and Bursa report early-stage initiatives.
3.10	Circular solutions and recycled materials	All (9/9)	**Fair – strategic approaches but limited implementation**	Most cities in the initial phase; Lucca, CMTO and Crete show planning integration.
3.11	Investments and resources	Lucca, CMTO, Kriti/Chania, Castilla y León, Manresa, Istanbul (6/9)	**Partial – heterogeneous and often qualitative data**	Difficulties in collecting precise financial indicators; Belgrade and Bursa missing quantitative data.
3.12	Opportunities and needs for SMILE City project	All (9/9)	**Good – coherent across all partners**	Strong alignment with project objectives; differences mainly in level of detail.