The Cycling Campus & City Manual

A Guide for Promoting and Institutionalizing Active Mobility in European Universities and Cities.

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The Cycling Campus & City Manual

A Guide for Promoting and Institutionalizing Active Mobility in European Universities and Cities

The 3Cs Manual aims to compile the project's results and provide concrete, actionable measures to support policy-makers and stakeholders in promoting active and sustainable mobility. It serves as a comprehensive guide that encapsulates best practices, findings from studies, and recommendations for enhancing urban mobility with sustainability as the core principle

List of figures

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3Cs
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List of tables

Table of Contents

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3Cs
CYCLING
CAMPUS
& CITY

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1. Introduction

1.1. Overview of the 3Cs Project.

The Erasmus+ Cycling, Campus & City project aims to promote well-being and sustainability through sport and ecological mobility and to identify, promote, improve, and enhance active and green mobility. It primarily focuses on bicycles, whether electric or conventional, as a means of transport to university campuses. It examines the obstacles and levers to cycling using a comparative and multi-scale approach, and identifies cycle routes to connect campuses by bike, both from their city of establishment, and internally, as well as between European university cities. Other forms of healthy and active mobility, such as walking, are also explored, since they complement other trips (namely bicycle trips).

The aim is to identify good practices, collect data from a pilot group of participants using a dedicated tool and two studies (on habits and behaviours, and on optimal routes), gather practical and educational content, promote sustainable travel habits, encourage behavioural change for greater local and European impact, and raise awareness of the importance of contributing to a greener world through sport and the use of sustainable means of transport.

Specifically, the activities covered include the implementation and evaluation of the two studies, the development of the 3Cs tool to support circulation, the definition of a European route for active mobility as a means of disseminating the objectives and potential of the initiative and sharing educational content, and finally the production of the 3C Handbook, designed to support the 3Cs tool with educational tips and serve as an online manual for sharing knowledge and best practices.

1.2. The role of the manual in fostering transdisciplinary collaboration for sustainable mobility.

The 3Cs Manual is conceived as a central tool to bridge knowledge, practice, and innovation across disciplines and institutions. By combining insights from sports sciences, urban planning, transport geography, environmental studies, digital technologies, and education, it fosters a holistic approach to sustainable mobility. The manual not only compiles good practices and empirical evidence gathered from the project's studies and pilot actions but also translates them into practical recommendations accessible to diverse stakeholders. In doing so, it strengthens collaboration between universities, local authorities, policymakers, and civil society, ensuring that scientific evidence, community needs, and institutional capacities inform sustainable mobility strategies. This transdisciplinary

orientation is essential for addressing the complexity of mobility challenges and for creating inclusive, scalable, and replicable solutions across Europe.

1.3. Expected impact and audience: universities, local governments, and European policy-makers.

The primary impact of the 3Cs Handbook lies in its capacity to influence both individual behaviours and institutional strategies. For universities, it provides a framework for integrating sustainable mobility into campus life, thereby strengthening health promotion, environmental responsibility, and student engagement. For local governments, it offers actionable guidance on connecting campuses with cities through active mobility infrastructures, reducing carbon emissions, and enhancing urban quality of life. At the European level, it serves as an evidence-based resource for policymakers, demonstrating how higher education institutions can act as laboratories of innovation and social change. The Handbook's reach therefore extends from local communities to the European agenda, contributing to the Green Deal, the Sustainable Development Goals, and the promotion of healthier, more resilient societies.

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2. Background and Context

European universities and municipalities are confronting pressing challenges linked to climate change, public health, and urban mobility. Rising motorization, congestion, and sedentary lifestyles generate significant environmental and social costs, which call for innovative, sustainable responses. This context is shaped by Europe's ecological transition agenda, including the Green Deal, the Sustainable Development Goals, and Fit for 55, as well as numerous local initiatives such as bike-sharing schemes, improved cycling infrastructure, and mobility management programmes. Together, these policies and practices reflect a growing cultural shift towards healthier and more sustainable forms of urban travel.

Within this landscape, the 3Cs project positions itself as part of a broader European movement to link university campuses and cities through active and ecological mobility. By fostering transdisciplinary collaboration between universities, municipalities, businesses, and citizens, it contributes to greener and healthier futures.

The following section presents four case studies that have guided the project's research simultaneously in France, Italy, Portugal, and Spain. Each examines the context of sustainable mobility at national, local, and campus levels, providing concrete examples of challenges and opportunities and offering insights into how policies and practices can be adapted to different scales.

2.1. Case studies

2.1.1. National level

France

In France, the General Commission for Sustainable Development (CGDD) estimated that in 2018, 24% of trips were made by walking compared to 3% by bicycle. According to the French National Institute for Statistics (INSEE), the development potential of cycling remains considerable: in 2021, 60% of home-to-work journeys of less than 5 km were made by car and 5% by bicycle. However, the trend in bicycle use is on the rise: the network of Cycling Departments and Regions (*Vélo et territoires*) estimates that bicycle trips rose by +28% in 2021 compared to 2019, while the Sport and Cycle Union (which brings together companies in the sports, leisure, cycle, and active mobility sectors), estimates that sales of electrically assisted bicycles increased by +29% between 2020 and 2019 in the country. Recognizing that cycling with electrically assisted bicycles typically results in longer and more frequent trips compared to

conventional bicycles[1], these figures suggest that an increasing share of home-to-work journeys could be made by bicycle.

In 2018, the French Government launched the first national cycling and active mobility plan as part of the Mobility Orientation Law (LOM), which was renewed for the 2022-2027 period. Following the Prime Minister's announcement on September 20, 2022, the Active Mobility Fund has been endowed with 250 million euros for the year 2023 to extend the financial support of contracting authorities in their creation of safe cycle routes and the reduction of route discontinuities. Other key measures are part of the mobility plan: the French State has, in particular, set up a sustainable mobility package of a maximum amount of 600 euros per year for employees in the private sector and 200 euros per year for employees in the public sector and provides financial aids (subject to financial resources) for the purchase of a bicycle. This financial aid can be combined with regional, departmental, or city funding, depending on the local context.

Italy

The share of active mobility in Italy is relatively low if compared to European standards, and has remained stable in recent years, with a feeble increasing trend. The most recent ISFORT report on mobility in Italy (21° Rapporto sulla mobilità degli italiani, ISFORT 2024[2]), counts the percentage of all trips that were performed in each mode: in the period 2019-2024 cycling hovered between 3.3 and 4.1% (the most recent value), with the most substantial jump being recorded in 2020 (Covid outbreak) passing from 3.3 to 3.8%. In the meantime, trips made on foot fluctuated between 18 and 21%, again except for of 2020, when a 29% peak was recorded.

Of course, many different approaches to the evaluation of the incidence of active mobility can be used: for example, other surveys report that 37% of Italians use a bicycle at least once a week (Cycling around the world, Ipsos 2022[3]), while a good 10% of Italians use bicycles to commute to school/work: such figures, however, lag well behind those for northern European countries, which for decades have implemented strong policies in favour of cycling. For example, the commuting modal share stands at 30% in the most virtuous case of Holland, or 20% in Sweden.

[1] Castro et al, 2019. Transportation research Interdisciplinary Perspective. V.1, June. https://doi.org/10.1016/j.trip.2019.100017

[2] https://www.isfort.it/wp-content/uploads/2024/11/RapportoMobilita2024.pdf

[3] https://www.ipsos.com/it-it/3-giugno-giornata-mondiale-bicicletta-2022-italiani-mobilita-sostenibile

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In Italy, attention to environmental sustainability in city mobility governance is still in its infancy, having spread only in recent years, and often in contexts where the physical structure of the road network remains primarily focused on cars. For a long period of time, no strong initiative at the national level was undertaken. Italian legislation on cycling has evolved gradually since the late 1990s, incorporating specific laws alongside planning instruments. Despite the slowness and lack of systematic policies, however, things have been changing in recent years. With Law 366/1998, for the first time, the State recognized cycling mobility as part of sustainable transport policies, allocating dedicated funds for the construction of cycling infrastructure. In 1998, the role of the mobility manager was first introduced by the Ministry of the Environment's Decree of 27 March 1998, as part of measures to reduce urban traffic and pollution. The Environmental Code (Legislative Decree 152/2006) identified cycling as a useful measure to reduce polluting emissions, while since 2015, the Law n. 221/2015 on environmental issues has emphasized the opportunity to encourage sustainable choices for daily commuting from home to school and work, while introducing the figure of the school mobility manager. At the local level, the Sustainable Urban Mobility Plans (PUMS), introduced in Italy in 2017, made it compulsory for metropolitan cities and large municipalities to include cycling within urban mobility planning.

A significant turning point came with Law 2/2018, which created a comprehensive national framework for the development of cycling mobility: the Law n. 2/2018 on cycling lays down for the first time the foundations for a consistent medium-long-term national strategy of structural and urban facilitation of the use of bicycles for urban and tourist travel. The law requires Italy to adopt targeted planning tools, including the general plan for cycling, the regional plans for cycling, and urban plans for cycling (Biciplan). The Bicitalia National Cycle Network, compromising cycle routes of national interest with an overall development of at least 20,000 km and integrated into the EuroVelo trans-European cycle network, is considered an infrastructure of national strategic importance.

In 2020, Law 77/2020 (conversion of the "Relaunch Decree") made the appointment of a mobility manager mandatory for all public administrations and private companies with more than 100 employees, located in municipalities with a population of more than 50,000 inhabitants. This figure is responsible for preparing the Home-to-Work Travel Plan, designed to encourage sustainable commuting through cycling, walking, public transport, carpooling, and other low-impact modes. Today, the mobility manager is regarded as a key tool to embed sustainable mobility strategies within organizations and supporting national climate and environmental objectives.

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This framework was further reinforced with the National Cycling Mobility Plan 2020–2024, formally adopted in 2022, the first nationwide strategy entirely devoted to cycling. The plan sets objectives such as increasing cycling's share in daily mobility, improving safety, and fostering integration with other transport modes. It distinguishes between urban networks for everyday use and long-distance routes with a tourism function, and it sets priority investments and common technical standards. Beyond infrastructure, the plan also links cycling policies with broader sustainability, public health, and local economic development goals.

Not all new legislation, however, can be considered favorable to active mobility. The National Traffic Laws (Codice della strada in Italian, DL 177/2024) were recently updated, as the previous ones were outdated (dating back to 1992) and no longer suitable for present-day road and mobility conditions. The outcome, however, cannot be considered fully satisfactory from the point of view of cyclists and walkers: nothing was changed to limit the speed of motor vehicles (for example, with the systematic introduction of "30 zones" in urban areas) in all contexts where the road use is mixed, even if speed is demonstrably one of the leading causes of major accidents where cyclists and pedestrians are the victims. Also, the installation of tools to help in sanctioning overspeeding (called "autovelox" in Italy) was hampered by further bureaucracy; as were the creation of most new devices to facilitate cyclists, such as bike lanes, two-way cycling, "Advance Space Lines" or "Bike-Boxes", and use of bus lanes.

At the same time, projects are spreading to promote the bicycle as a solution for urban home-school/university and home-work commuting: i.e. several important cities such as Turin, Milan, and Rome have joined the European project Bike2Work-Smart choice for commuters, with the involvement of municipal administrations, universities (the University of Turin was one of the promoters), and numerous companies. It is vital to notice that in cities where investments in cycling have been made consistently for some time, adapting them to bicycle use and promoting this choice, the modal share has grown a lot (i.e., in Ferrara, Bolzano, and Pesaro, 30% of the population regularly uses bicycles) in Italy as well.

According to the 2023 Urban Environment Report from the National Institute of Statistics, Italy's[4] 109 provincial capitals and metropolitan cities have a total of 5,758.9 km of cycle paths. The report highlights increase of 6.4% compared to the previous year and 27.4% compared to the previous five years.

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[4] https://www.istat.it/wp-content/uploads/2025/07/Ambiente-urbano_Anno-2023.pdf

Portugal

The modal distribution of passenger transport in Portugal reveals the dominance of road transport. Also, the study on sustainable mobility promoted in 2022 by the Portuguese Sustainable Campus Network demonstrated that private cars are the dominant mode of transport with a 52% share of commuting trips at Higher Education Institutions (HEIs), while bicycles are used in 3% of trips. Health was highlighted as the most crucial reason for the modal choice by the users of active modes. Most daily trips (62%) to the HEIs take less than 30 minutes, and the distance is less than 15 km for 65% of these trips. These data were obtained based on questionnaires implemented in 16 establishments involving Portuguese Universities and Polytechnical Institutes.

In 2019, the Portuguese Government approved the National Strategy for Cycling Mobility 2020-2030 (ENMAC 2020-2030, through Resolução do Conselho de Ministros n.º131/2019). ENMAC is a 10-year-long national strategy aimed at promoting bicycle usage and the adoption of healthier lifestyles. It comprises a total of 51 measures pertaining to four general areas – a) Legislation and regulatory framework, b) research and development, c) monitoring and progress assessment, d) financing – and three axes of specific intervention – #1. Infrastructure and intermodality, #2. Training and support, #3. Culture and behaviors. ENMAC defines ambitious targets for 2030 such as a 10% modal share of cycling in Portuguese cities, and a 50% reduction in cyclist fatalities.

Spain

The international context of public policies related to urban mobility can be established both in the United Nations 2030 Agenda, whose Sustainable Development Goal seeks to "Make cities and human settlements inclusive, safe, resilient, and sustainable", and in multiple European policies and directives related to decarbonization and sustainable mobility. Of particular note is the European Green Pact, which is a roadmap for achieving the goal of a carbon-neutral Europe by 2050. To achieve this goal, it proposes, among other sectors, to deploy cleaner, cheaper, and healthier public and private transport systems. With the clear goal of decarbonizing our economy by 2050 at the latest, the Spanish Government has considered that in the current circumstances of the need to activate our economy, it is necessary to take advantage of the social and economic opportunity provided by the reduction in the cost of renewable generation technologies and to accelerate the energy transition in our country. In this sense, the Recovery, Transformation, and Resilience Plan represents a

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16

unique opportunity to promote a green exit from the crisis caused by COVID-19 and, at the same time, to bring forward the achievement of the objectives set out in the Strategic Energy and Climate Framework. For its part, the Climate Change and Energy Transition Law, sent by the Council of Ministers to Parliament on 19 May 2020, sets targets for reducing greenhouse gas emissions and the penetration of renewable energies, and also includes a series of measures to facilitate the achievement of these targets. Law 7/2021 of 20 May on climate change and energy transition. The aim of this regulation is to help Spain meet its international commitments in the fight against climate change in order to achieve "before 2050″ the so-called "climate neutrality" (i.e. that the country can only emit greenhouse gases that can be absorbed by sinks, for example, forests).

The main objective is to achieve by 2050 "a fleet of passenger cars and light commercial vehicles with no direct CO_2 (carbon dioxide) emissions". To this end, by 2040 at the latest, no new non-commercial passenger cars and light commercial vehicles emitting CO_2 may be sold.

All municipalities with more than 50,000 inhabitants must adopt sustainable mobility plans that, among other things, include low-emission zones similar to those implemented in Madrid and Barcelona. And they can only be reversed with a favorable report from the regional government. In addition, municipalities with more than 20,000 inhabitants will also have to approve low-emission zones if their air quality is not good.

The regulation also establishes obligations for petrol stations to place electric car charging points and to facilitate their installation in buildings and car parks. From 2023, all buildings that are not intended for residential use and with more than 20 parking spaces must have charging infrastructures. In addition, the Ministry for Ecological Transition will draw up a national public access catalogue of recharging points available to drivers. And European recovery funds will be channeled to incentivize the installation of recharging infrastructure.

The government will also set targets for the integration of alternative fuels in transport, with "special emphasis on advanced biofuels and other renewable fuels of non-biological origin". And it opens the door to limiting first-generation biofuels (those made from food crops). It will draft a law on sustainable mobility and financing of public transport, which will also include targets for the penetration of the railway in freight transport over distances of more than 300 kilometers.

At present, the draft bill on Sustainable Mobility and Transport Financing is in the pipeline.

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2.1.2. Local Context

Montpellier, France

Montpellier Méditerranée Métropole (3M), an intermunicipality of 491 417 inhabitants in 2019 (INSEE), has set up a subsidy of a maximum amount of €500 for all inhabitants of the Metropolis over the age of 18 who will acquire a new electrically assisted bicycle (VAE) purchased in a store located in 3M territory between November 1, 2020 and June 30, 2023. At the beginning of 2023, more than 30,000 people have already benefited from it. The inhabitants of the metropolis have also been able to benefit from financial aid (subject to financial resources) from the department of Hérault (up to 250 euros) and the Occitanie region (up to 200 euros).

This financial aid by 3M is part of a broad active mobility plan amounting to 150 million euros (i.e. 40 euros per inhabitant per year, while the French average for inter-municipalities with less than 500,000 inhabitants is €7.5 per year and per inhabitant and €13.25 per year/inhabitant for cities with more than 500,000 inhabitants) to increase from 4.1% of bicycle trips to 10% by 2026. The 3M active mobility plan aims, in addition to aid for the acquisition of an electric bike, to help workers buy a cargo bike, assist with bicycle repairs, extend the current cycle network (160 km of cycle paths actually exist in the 31 municipalities of the Metropolis), and create an express cycle network: the « Vélolignes Montpelliéraines », which should connect each city of the metropolis to the core city and provide cycle ring roads to improve inter-city connections (70% of a total of 235 km are planned by 2026). Recently, due to the pandemic crisis, 3M created 22 km of temporary infrastructures, much of which has since been made permanent. Two-way four-lane motorized roads have been replaced by one-way two-lane motorized roads. The space gained has made it possible to introduce shared lanes for bicycles and buses. These developments were carried out primarily on the roads connecting the main traffic generation hubs (city core, hospitals, universities, etc.). This strategy made a big change in the metropolis with more congestion on rush hour for drivers and more efficiency for public transport and active mobilities. In this, it appears as a strong political decision and message for car drivers and riders.

As shown in the land use map below, the cycling network of Montpellier follows the road network, with a majority of cycling paths along the city's main roads. There is also a certain disparity among the districts. The northwest, where the universities and most of the hospital buildings are located, as well as the southeast, which is the area of the new residential neighborhoods, seem to be

the best equipped. It should be noted that the city center (the old town) is pedestrian but lacks cycling paths. The map also shows the metropolitan area's intention to extend beyond the central city to connect the first-ring towns to the north and west, as well as the cycling infrastructures that allow reaching the coastal area to the south, partly through a network of greenways. Ultimately, although significant cycling infrastructure exists in Montpellier, efforts are still needed to ensure more consistent spatial coverage and to reduce discontinuities.

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Land cover categories
- Agricultural areas
- Parks, nature, and leisure areas
- Service and commercial activities
- Residential area
- Water surfaces

- University campus
- Stretch of bike line
- Roadways and major axes
- Municipal boundaries

* The area of study extends to a 7 km radius around the university campuses.

0 1 2 km

Paul Valéry

Saint Charles

02,55 km

Land cover classes are created by interpreting satellite images, organized into a standardized European system with three hierarchical levels: broad categories, subcategories, and detailed classes

Source: Corine Land Cover (CLC) 2018, European Environment Agency (EEA).Montpellier Méditerranée, Open Data Portal, 2025. Road data: © OpenStreetMap — primary and secondary roads, ODbL license. Author: HANNAOUI Rezlene, 2025.

Figure 1: Presentation of the case study of Montpellier with the urban morphology, the cycling lines, and the two campus of Montpellier Paul Valéry University

Regarding the parking needs, 19 cycle parks have been located along the tramway lines, and new secure shelters for professional, personal, or occasional use are developed at the request of users after an evaluation study. Moreover, since the French "Grenelle 2" law of 2010 and its implementing decree of 2011, all new buildings (permit filed after January 1, 2012) are obliged to provide a secure bicycle parking, whose surface area was specified by a decree of 2012. For those residing in older buildings who are unable to park their bikes in the common areas or in the outdoor spaces, the possibility remains to use the metropolitan area's free-access bike service: VéloMagg. VéloMagg self-service allows you to rent a bike freely (for non-subscribers, the service costs €0.50/hour), 7 days a week and 24 hours a day, for up to 24 consecutive hours from 57 automatic velostations providing "intelligent" bicycles equipped with an electronic box. Data on availability by station is shared in real time via the metropolitan area's open data. VéloMagg adapts to the summer period to offer self-service bicycles near the beaches. The service is free of charge on presentation of a validated public transport card from the Transports de l'agglomération de Montpellier (TAM).

To measure the performance of the actions carried out on the territory and of societal developments towards cycling, 3M has installed 21 permanent bicycle counting stations ("éco-compteurs") located on the cycle routes, 3 of them with electronic displays. The cumulative counting of the day before is filled in by the counter on the metropolitan open data platform. The Vélocité association offers an interactive application for exploring the city bicycle counting data. Albert 1er station, located in the city centre and near one of the campuses of the Montpellier Paul Valéry University, is one of the busiest in the network, with more than 1,800 cyclists counted on average each day in February 2023. However, a study of the number of cyclists at the Albert 1er crossroads carried out by the VéloCité association between November 2020 and February 2021 established that 36% of bicycle crossings at this crossroads were not counted by the counter.

In addition, 3M has signed a partnership with Geovelo, a free online route calculator, to facilitate cycling travel and optimize future developments, which provides:

- a bike route engine adapted to users' preferences (speed, safety, …) and allowing to share itineraries,
- a dynamic map locating the cycling facilities in the 3M territory and beyond,
- a social network via the sharing of news feeds and challenges between users,
- a company component to facilitate cycling among employees.

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The 3M community of users of the GéoVélo application includes 7,884 cyclists, who have accumulated more than a million kilometers. The community of users working at the Montpellier Paul Valéry University counts 25 people and has covered more than 9,600 km since its creation in June 2022.

Turin, Italy

Turin is the capital city of the Piedmont region and one of the most important economic centres in Italy. With regard to bicycle mobility, in 2013 the city approved the ten-year strategic cycling masterplan (Biciplan) with the aim of increasing the cycling modal share from 3% to 15%. The Plan includes the construction of 10 main bicycle corridors from the city centre to the suburban area and 4 circular ways with a collector and distributor function for different origins/destinations.

The following land use map, centred on the city centre, gives us a better idea of the morphology of the cycling network in 2019. First, we observe a set of infrastructures that run along the waterway and display no discontinuity. This network allows traversing the city from north to south but does not serve all neighborhoods well, as the waterway actually forms an interface with the eastern part of the city, consisting of hills, parks, and low-density housing, mainly villas. This entire part of the city lacks cycling infrastructure, even though these are spaces conducive, at least, to recreational cycling. Regarding the urban core, we observe, as in Montpellier, cycling paths that follow the main arteries of the road network and suffer from discontinuity and lack of uniformity across different neighborhoods. Finally, we note the cycling infrastructures that connect the peri-urban areas of the Turin agglomeration.

The investment plans for cycling mobility deployed by the Turin metropolis had helped balance the network across different parts of the city and improve the continuity of the infrastructures. Some of these improvements can be observed on the official info-mobility website of the City of Turin that offers an interactive map of cycle paths[5].

In an urban area of 130 square kms, the City of Turin has developed a 290 km cycle path network, including dedicated cycle paths, cycle/pedestrian paths, and priority vehicle lanes. With ongoing and upcoming construction projects, the City of Turin aims to reach 340 km of cycle paths by 2026. The new cycling infrastructure is designed in accordance with regional planning tools, the Sustainable Urban Mobility Plan, and the Bicycle Plan approved in 2013. Among

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[5] https://www.muoversiatorino.it/en/bike_lanes/

the construction sites already operational are those for the construction by 2025 of 15 km of new cycling connections between the city railway stations and the main university campuses. At the same time, the Metropolitan City of Turin carried out a participatory planning process to design a cycling network connecting Turin with the neighbouring municipalities. The main cycling thoroughfares are planned to promote active mobility for commuting to work or school.

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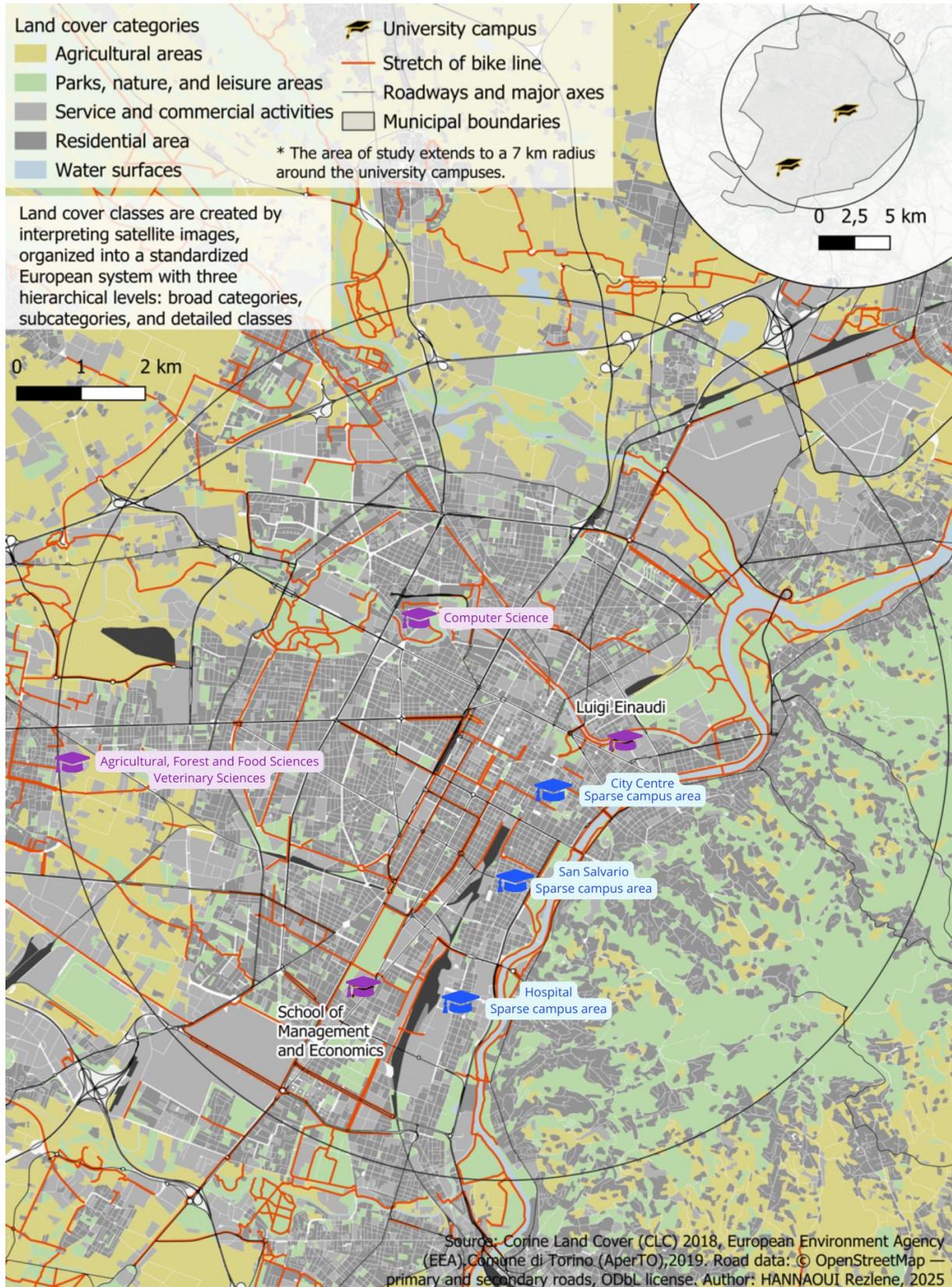
Figure 2: Presentation of the case study of Turin with the urban morphology, the cycling lines, and the main campuses of the University of Turin

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In 2017, the Council for Cycling Mobility and Traffic Moderation was established as an advisory and proactive body of the City Council, including members of cycling and environmental associations. The Council aims to influence urban policies to improve sustainable mobility and plays an active role in proposing solutions and providing opinions on mobility projects, as well as monitoring data on the use of bike lanes.

Since 2019, the City of Turin has been monitoring cycling traffic with a network of 12 fixed sensors along cycle routes at various points throughout the city. The trend is steadily growing, reaching 22,197,578 bicycle trips as of September 2025, with a daily average of 1,023 trips[6]. According to the Council for Cycling Mobility, the three cycle routes that have had constant sensor readings since 2020 have seen significant growth of 83% in five years[7].

In Turin, bike sharing services have been available since 2010, when the city was mainly served by the [TO] Bike station-based bike sharing service of the City of Turin with over 140 stations where to pick up and drop off the bike, 24/7, as well as some additional stations in the neighbouring municipalities. In 2018, several free-floating bike sharing services were introduced, which did not provide fixed pick-up locations and allowed the final release of bicycles anywhere along city streets. Finally, at the end of 2019, electric scooters and e-bikes were added to normal bicycles. The pricing policies vary widely among providers, but always involve time- or distance-based variable rates right from the start of the journey. The municipality has recently introduced some regulations to stabilize the market and avoid overcrowding of public spaces, given the large number of new service operators that were spreading their vehicles— particularly e-scooters— around the city. In 2023, the [To]Bike was terminated, as the sharing services available in the city were more than abundant, and the normal bicycles managed by [To]Bike were suffering from the competition of the e-bikes offered by the private services. Nowadays, the active operators are Bird, Cooltra, Dott, Lime, RideMovi, and Voi, offering a combination of e-scooters and e-bikes.

The City of Turin and the Metropolitan City of Turin have also implemented B.U.NE.T - Bike's Urban Network in Turin, a bicycle-specific info mobility app (in the territory of Turin and the Province). It is a system for planning personal trips that allows you to combine three variables: speed, the slope of the route, and the safety of the stretch to be travelled. It was created by 5T - Telematic Technologies for Transport Traffic Turin with the collaboration of the bike sharing operator

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[6] https://data.eco-counter.com/ParcPublic/?id=6771#

[7] http://consulte.comune.torino.it/bicitraffico/wp-content/uploads/sites/5/2025/04/2025-04-13-Consulta-MCMdT-20-milioni-di-passaggi-di-biciclette-sulle-ciclabili-di-Torino.pdf

[TO]Bike. The service, the first in Italy to be entirely promoted and supported by local authorities, was developed using Open-Source technologies. In addition to the creation of new cycle paths, implementation of safe crossings, and the completion of connecting sections between paths, the city has adopted other initiatives to promote cycling. The municipality set a speed limit of 20 km/h along the side streets of Turin's main avenues to encourage shared use of the road and facilitate cycling. Furthermore, it has introduced two new tools for street planning: advanced stop lines or bike boxes at major intersections (this is a type of road marking at junctions that gives bicycles a dedicated space in front of the waiting queues for traffic lights) and shared service lanes, roadways where bicycles and cars/scooters share the same travel lane without distinction between vehicle and bike lanes, equipped with specific road signage on pavements displaying the image of a bicycle, so as to remind motorists of the frequent passage of cyclists.

Another interesting project by a large group of towns belonging to the metropolitan area of Turin has offered their citizens the opportunity to try a folding bicycle for free for a period of two months, using it for the first and last mile - or the whole journey - in commuting to work or other endeavours. At the end of the trial period, each individual could choose to finalize the purchase of the folding bike at a significantly reduced price or return it to the affiliated shops.

Coimbra, Portugal

The case study of Coimbra stands out from the other three for two main reasons. Firstly, because it has the smallest population (140,796 inhabitants in 2021, which is half that of Montpellier), and also because its city center is much smaller than the other three case studies, while its perimeter is very extensive (319.4 km², which is six times larger than Montpellier). Secondly, as shown in the map below, Coimbra is the case study with the least developed cycling infrastructure. Although the data used to create the map do not come in total from official sources (due to lack of availability), they give an idea of the sparse cycling network at the municipal level. This network is mainly concentrated along the waterway that runs alongside the city center on a north-south axis.

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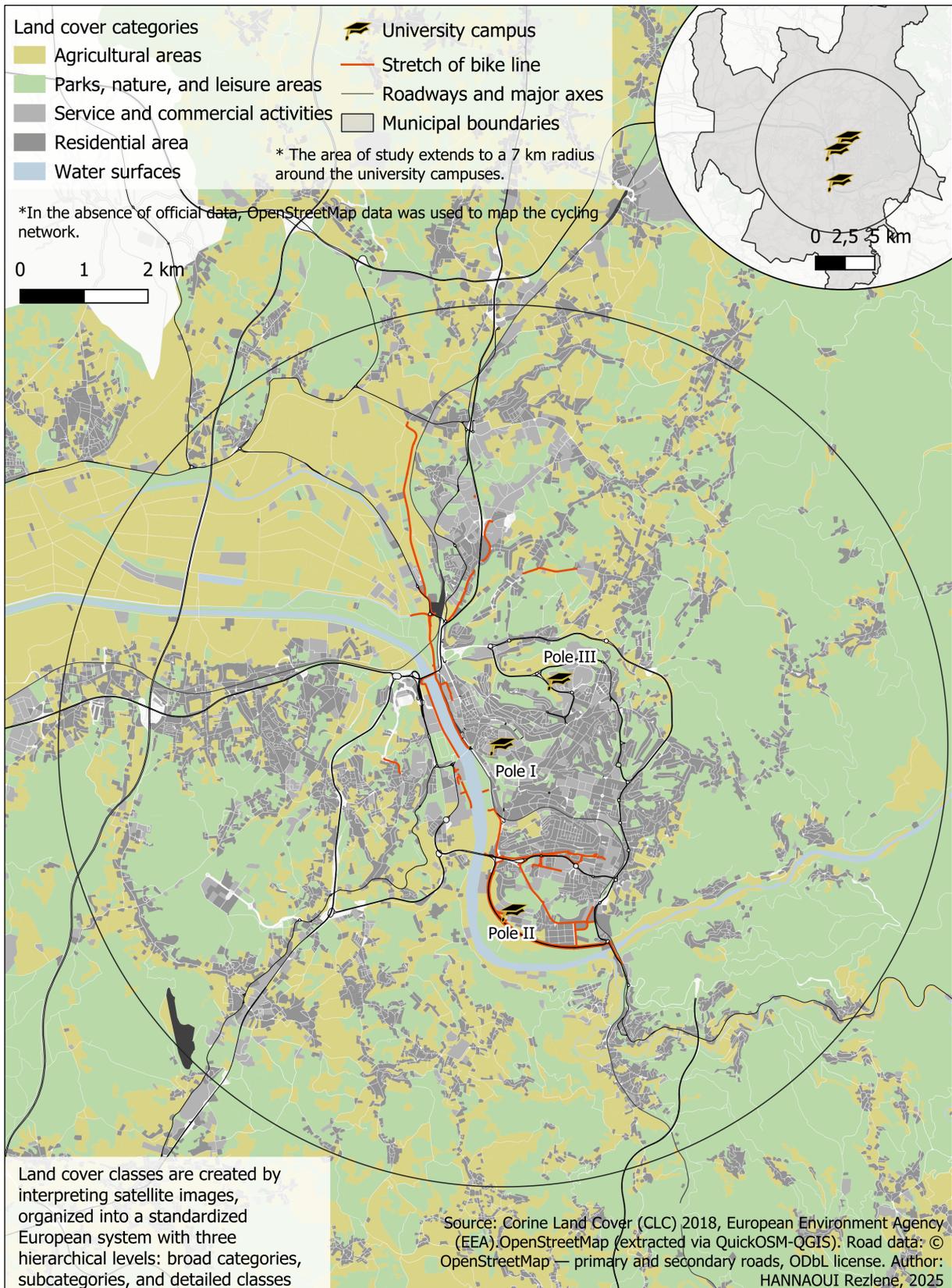
Figure 3: Presentation of the case study of Coimbra with the urban morphology, the cycling lines, and the main university poles

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The city installed a network of parking stations distributed along the 20 kilometres of the cycling network, crossing main tourist points, public transport interface, hospitals, schools, health facilities, sports facilities, commerce, and service centres. The municipality also hopes to make progress this year with the construction of another 18 kilometres of cycle paths along the right peripheral riverbed of the Mondego, connecting the villages, which will now total 38 km of lanes for cyclists. In terms of sustainable mobility, the University of Coimbra uses the network of infrastructures provided by the municipality and, through its Sports Services, provides to the entire University community a bicycle loan programme called 'UCicletas'. The University of Coimbra is a member of the Sustainable Campus Committee and within the EUROPEAN MOBILITY Week framework. In academic terms, the University of Coimbra also offers a Master Course in Urban Mobility Management that intends to create a training offer on urban mobility management. The proposed course is designed to provide knowledge in the specific fields of spatial and transport planning and integrated mobility management of urban areas, supported by the concepts of innovation and sustainability. These themes are focused on Urban and Metropolitan problems, also giving attention to the inter-municipal mobility in areas of "low density" (at the scale of the Inter-municipal Communities). In summary, the institution and the city have good practices in the area of sustainability to share; however, there is still a great need to optimize resources and systems so that bicycling or sustainable means of transportation become a habit in the community. This is a challenge that cuts across the country. However, Coimbra municipality is planning to implement a more extensive and connected network.

Madrid, Spain

In recent years, Madrid has made significant strides in mobility management to reduce emissions. A key development is the Sustainable Mobility Executive Order, approved on September 13, 2021, which focuses on improving air quality, road safety, and integrating various modes of mobility. It emphasizes efficiency and innovation, with the creation of Low Emission Zones being a pivotal tool to reduce city emissions. The entire city was declared a Low Emission Zone, with traffic restrictions progressively applied from January 1, 2022, until 2025. Specific areas like the Downtown District and Plaza Elíptica have been designated as Low Emission Zones of Special Protection due to severe pollution problems. These zones enforce restrictions on vehicle access and circulation based on

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environmental classification and other factors, utilizing automatic control systems for monitoring[8].

The Executive Order also reinforces road safety, particularly for pedestrians and vulnerable groups. It introduces measures such as increasing the distance cyclists must maintain from pedestrians and facades, reducing bicycle speeds on bike paths, and allowing bidirectional bicycle traffic in certain areas. Additionally, it mandates helmet use for minors and those involved in commercial activities, and sets specific speed limits for various types of vehicles in different zones.

Regarding bicycles, the Order regulates their use comprehensively, including considerations for different types of cycles, road safety measures, and general circulation conditions. Bicycles are granted access to Low Emission Special Protection Zones and are prohibited from certain high-speed roads like the M-30. The Order also promotes advanced stop lines at traffic lights for bicycles and regulates bicycle parking in municipal lots. It mandates the removal of unsafe bicycles and regulates the municipal bicycle rental service, BiciMAD, including its operation and user obligations.

Madrid's Cycling Routes Network, part of the 2008 Cycling Mobility Master Plan and updated in 2016, includes various types of cycling infrastructure such as the Green Cycle Ring, exclusive bicycle lanes, and shared-use paths. The network aims to promote cycling by providing well-defined and safe routes throughout the city. The Green Cycle Ring, a prominent feature, is a 65-kilometer circular route around urban Madrid, mostly segregated from vehicular traffic[9].

The construction of the Castellana bike lane, a key project under the Madrid 360 Environmental Sustainability Strategy, began in April 2022. This project is expected to significantly increase daily bicycle trips and reduce car and motorcycle usage, thereby improving environmental quality. It is projected to reduce car trips by over 1 million kilometers annually, cutting CO2 emissions by 187 tons and NOx by 319,000 kilograms[10].

The map below clearly highlights the circular cycling network and the major north-south axis represented by the Castellana Boulevard. The map also shows a significant network covering the municipal territory, particularly in the city center. More so than in the other case studies, it is evident that the cycling network follows the road network, but it also extends into the city's main green spaces. It

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[8] https://www.madrid360.es/movilidad-sostenible/ordenanza-de-movilidad-sostenible/
[9] https://geoportal.madrid.es/IDEAM_WBGEOPORTAL/visor_ide.iam?ArcGIS=https://sigma.madrid.es/hosted/rest/services/OBRAS/INFRAESTRUCTURA_CICLISTA/MapServer
[10] https://diario.madrid.es/blog/notas-de-prensa/comienza-la-construccion-del-primer-tramo-del-carril-bici-de-castellana/

is worth noting that Madrid is renowned for the quantity and quality of its urban parks.

However, two important points should be noted: first, among the four case studies, Madrid is the most populous city (with over 3 million inhabitants) and the most extensive (covering over 600 km²). Second, the map reveals a quite marked disparity between the city center and the surrounding residential neighborhoods, which are densely populated. These observations underscore the importance for the metropolis to continue developing its cycling network.

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Land cover categories
- Agricultural areas
- Parks, nature, and leisure areas
- Service and commercial activities
- Residential area
- Water surfaces

University campus
Stretch of bike line
Roadways and major axes
Municipal boundaries

* The area of study extends to a 7 km radius around the university campuses.

Land cover classes are created by interpreting satellite images, organized into a standardized European system with three hierarchical levels: broad categories, subcategories, and detailed classes

0   1   2 km

02,55 km

Castellana

Almagro

Source: Corine Land Cover (CLC) 2018, European Environment Agency (EEA).City infrastructure.Open Data Portal of Madrid City Council.2025. Road data: © OpenStreetMap — primary and secondary roads, ODbL license. Author: HANNAOUI Rezlene, 2025

Figure 4: Presentation of the case study of Madrid with the urban morphology, the cycling lines, and the campus of Camilo José Cela University

BiciMAD, Madrid's public bicycle sharing service, has been a significant initiative to promote cycling. Managed by the Municipal Transport Company of Madrid (EMT), BiciMAD currently offers 7,500 bicycles and 611 stations across the city's 21 districts. The service has been updated with new features such as GPS, improved battery life, and a new application, MPass, for easier access and payment. The service was offered free of charge from March 7 to July 31, 2023, to encourage usage[11].

Shared mobility is another major focus, with services like carsharing, motosharing, and bike sharing being regulated under the Sustainable Mobility Executive Order. These services provide flexible and affordable transportation options, reducing the need for private vehicle ownership. The Order also regulates the use of shared electric scooters, specifying where they can be ridden and parked.

The Sustainable Mobility Plan Madrid 360, approved in July 2022, outlines the city's mobility policies until 2030. It aims to achieve safe, healthy, sustainable, and efficient mobility, with strategic axes focusing on public transportation, active mobility, parking management, and technological innovation. The plan sets ambitious targets for 2030, including reducing public transport travel time by 32.5%, traffic congestion by 10%, CO2 emissions by 65%, and road fatalities by 50%. It also proposes actions such as providing 35 kilometers of new bike lanes by 2025 and reserving 20,000 spaces for bicycle and VMP parking.

2.1.3. University level

Montpellier Paul Valéry University, France

Under Article 51 of the 2015 Energy Transition Law for Green Growth (LTECV), any company or public service employing more than 100 workers on a site within a territory covered by an Urban Transport Plan (PDU) must implement an Employer Mobility Plan; this requirement applies to Montpellier Paul Valéry University. The Employer Mobility Plan aims to optimise work-related and commuting trips, promote sustainable transport modes (such as cycling, public transit, and car-pooling), reduce greenhouse gas emissions and other pollutants,

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improve accessibility and safety, and enhance the well-being and quality of life of university staff.

The university's Employer Mobility Plan is additionally designed to support the objectives defined in its Carbon Assessment action plan, focusing on reducing CO2 emissions by promoting soft mobility. According to the university's latest carbon footprint assessment study (published in 2020 for the year 2019), approximately 61.2% of CO2 emissions, or 8,156 tCO2e, come from home-work and international travel. Daily commuting to the university accounts for 23% of emissions (1,890 tCO2e), while international travel represents 73% (5,990 tCO2e). The plan aims to address these sources by developing cycling infrastructure on campus, implementing various sustainable initiatives, and rethinking the organization of the working environment, notably through the promotion of teleworking.

To meet its commitments, the University has led the landscaping operation "Aménagements Cœur de Campus". This project has been supported financially and technically by the Opération Campus initiative, known locally in Montpellier as Plan Campus, with contributions from the French State, the Occitanie Region, Montpellier Méditerranée Métropole (3M), and the City of Montpellier. Opération Campus is a national program launched in 2008 by the French State to modernize and revitalize university campuses, making them more attractive, accessible, and better integrated into urban and socio-economic environments. In Montpellier, the program's funding specifically aims to redevelop campus facilities, improve accessibility, and enhance the international visibility and appeal of higher education institutions. Within this framework, the "Aménagements Cœur de Campus" project has enabled the installation of 573 bicycle parking spaces, 6 electric bicycle charging points, 1 bicycle inflation station, and the development of new pedestrian and cycling pathways to promote soft mobility across the campus.

Besides, the university initially has set up a fleet of 8 electric bicycles to connect its different campuses and encourage inter-site travel. However, difficulties in managing the service, such as reservations and parking, limited its use, and the program was gradually abandoned after remaining largely confidential. In the meantime, the bicycles have been repurposed for voluntary electric bike training sessions. As of spring 2025, the Montpellier Paul Valéry University has relaunched its electric bicycle loan program through the Hector application. The platform allows students and staff to reserve and manage e-bike loans directly through the app, with the aim of simplifying the process and promoting sustainable transportation on campus. The bikes are available at the reception

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desks of the campuses, can only be used for professional trips within Montpellier, and must be returned by 8:30 p.m.

Another emblematic and particularly successful action implemented by the university is the bimonthly organization of bicycle repair workshops from September to June of each year, in partnership with a local association (Atelier 34). This initiative is described in detail in Section 5.1 of the manual.

In addition, the Montpellier Paul Valéry University provides financial support to employees who commit to using sustainable transportation methods for commuting. This support is offered within the framework of the Sustainable Mobility Package (Forfait Mobilité Durable), a French legislative scheme introduced on May 10, 2020, to encourage low-carbon commuting. At Paul-Valéry University, staff who declare at least 100 round trips per year by bicycle or carpooling are eligible for financial aid of up to €200.

Finally, Montpellier Paul Valéry University has established a monitoring framework to evaluate the effectiveness of its sustainable mobility initiatives, using tools such as mobility barometers and surveys. Over the years, these studies have highlighted significant trends in commuting behaviors: car use among staff and lecturers has decreased (from 72% in 2016 to 54% in 2022) while cycling has increased (from 11% in 2016 to 29% in 2022), whereas the modal share for public transport and walking remained low and stable. Following the introduction of free public transport for residents of the Montpellier metropolitan area in December 2023, a flash survey was conducted in spring 2025 to assess the impact of this policy on students and staff. About one-third of respondents living in the metropolitan area reported using public transport more frequently. At the same time, the use of active modes—either alone or combined with public transport—continued to grow for home-to-university trips, driven by the ongoing cycling policies, tram overcrowding during peak hours, and restrictions on carrying non-folding bicycles and scooters on free public transport, which led some people to switch to walking, cycling, or using scooters instead.

University of Turin, Italy

The University of Turin (UniTO) is one of the oldest, largest, and most prestigious Italian public universities, with about 85,000 students, 4,000 employees, and 1,800 research fellows. A large mega-atheneum with a sparse structure, it has about 120 branches in different locations around the city and the suburbs. Its daily activities induce a significant part of the Turin metropolitan area's mobility. Research and teaching activities are carried out by its 27 Departments,

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encompassing all fields of study except engineering and architecture. UniTO offers a wide range of both bachelor's and master's courses, plus a significant number of PhDs and other teaching and training activities. A significant number of teaching courses dealing with sustainability issues, as well as some degrees fully focusing on them, allow it to educate and train a large number of students with the ability to tackle environmental sustainability problems in all areas: industry, public service, administration, and research.

The Athenaeum in 2016 launched the Green Office (UniToGO), dedicated to the development of sustainable initiatives in six areas (climate change, energy, food, green public procurement, mobility, and waste management) collected in an Action Plan and in an annual Sustainability Report. The Working Group on mobility, including the University Mobility Manager, aims to strongly increase the modal share of sustainable transport modes and active mobility in home-university trips. The modal share for active mobility (walking and cycling) as well as regional and local public transport (road and rail) and standard or emerging forms of sharing mobility regarding home-to-work and home-to-study transfers should increase. To reach this goal, the mobility working group, as well as the whole Green Office, adopted a 3-step approach:

- Learn: acquire data and information on the present status of mobility choices and on the accessibility of all university buildings;

- Engage and motivate: increase the community awareness on the potential for cleaner, more efficient mobility, create a vast network with other education institutions, local authorities, firms, and associations to develop and share a joint approach to sustainability combining scientific, technical, and administrative know-how;

- Change: elaborate incentive policies with economic bonuses and tariffs, regulation of car parking spaces, creation of bike parking; promote the creation of cycle paths reaching the university locations; develop proposals to improve the local transport network that serve university locations.

In the global GreenMetric ranking, which annually measures the performance of universities on environmental sustainability, the University of Turin in 2024 is third in Italy (among 35 institutions) and fifteenth among the more than a thousand participating universities from all over the world. UniTO has a leading role in RUS (Network of Universities for Sustainable Development - Mobility), the main university network on sustainable mobility at the national level, and at the European level (U-MOB Life Project - Green in Motion).

Since 2019, the University of Turin has been part of the European Network for Sustainable Mobility at University U-MOB LIFE, which groups 85 universities committed to promoting sustainable mobility in their communities. U-MOB's primary objective is to create a university network thar facilitate the sharing of best practices in the field, as well as to raise awareness of the need to reduce CO2 emissions in European universities.

Aiming to acquire in-depth knowledge of its community's mobility behaviour, UniTO conducted two extensive surveys on mobility choices in 2016 and 2020, which are now the basis for the intervention strategy to change its modal share. Both surveys were conducted in coordination with the RUS network at the national level and collected data from very large samples of around twenty thousand respondents for Turin alone.

In 2020, 78.6% of the University of Turin community made fully sustainable journeys on foot, by bicycle, o by public transport, either unimodally or in a combination of the three modes (up from 76% in 2016). 13% of the community made totally unsustainable journeys using a private car for the entire trip, while the remaining 8.3% made moderately sustainable journeys by combining private cars with other, more sustainable means of transport.

Regarding cycling mobility, the 2016 survey shows that in the summer, 8.98% of the community chose the bicycle for commuting from home to university, while in winter, the percentage dropped to 3.9%. The 2020 survey shows some improvement, with the percentage of the whole community cycling from 3.9% to 5.8%. The figure was then 4.9% for students, 12.9% for teachers, and 8.38% for the administrative staff. The fact that young students cycle less than teachers may be striking, but it shows that there is certainly room for improvements.

To encourage the use of bicycles for commuting between home and university, approximately 700 bike parking spaces have been installed in university areas. The University's bicycle racks are added to those installed by the Municipality on public land and used by students and workers. The University has also built a secure bicycle park in the underground garage of one of the main campuses. It is hoped that the possibility of parking the bicycle easily and safely, reducing the risk of theft or damage, will encourage the adoption of bicycles as a means of daily travel. UniTO organises numerous events and seminars to raise awareness on the use of bicycles as a means of transport.

Every year, UniTO joins the European Week for Sustainable Mobility and World Bicycle Day with engagement events, in collaboration with students and environmental associations. In 2021, UniTO won the inaugural European universities torunament for sustainable mobility, organised as part of the U-Mob

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Life project. The challenge between 16 universities involved tracking their sustainable travel (active and shared public transport mobility) through the MUV (a partner of the 3Cs project as well) app. A large team - 1,098 members - was formed to cover a total of 164,783 km. Eighty-one percent (81%) of the players from Turin preferred public transport, 11% walked, 6% chose a bicycle or e-scooter, and only 2% shared a car with another team player.

In addition to initiatives to support cycling, the University is active in various areas of sustainable mobility: support for sharing mobility (agreements with discounts for the university community for sharing services like bicycles, electric scooters, electric moped, and cars); support to mobility with public transport and to inter-modality (discounts rates on urban and suburban public transport passes for employees and students and can park for free in some interchange parking lots in the city, activation of shuttles and/or bus lines for the connection of some decentralized seats); communication (communication activity to promote a friendly environmental travel from home to university with official websites and social networks).

University of Coimbra, Portugal

In 2022, the Portuguese Sustainable Campus Network (RCS) promoted a survey about Sustainable Mobility in Higher Education in Portugal developed by the RCS working group on Mobility. The survey results show that the modal share for the University of Coimbra users: car (69%), car passenger (4%), walking (13%), bus (13%), and train (1%), with no relevance for the bicycle. A similar situation can be observed at the Coimbra Polytechnic Institute users: car (55%), car passenger (5%), walking (26%), bus (10%), train (3%), and motorcycle (1%). However, concerning the possibility of a modal change to the bicycle, 11% of the respondents at the University of Coimbra and 8% at the Coimbra Polytechnic Institute are willing to use it.

A previous report concerning the city of Coimbra and based on a mobility survey done in 2006 - for the planned system of Coimbra Light Rail – contains similar information for university students (including Polytechnic and University of Coimbra): car (20%), walking (54%), bus + train (25%), and taxi (1%). However, the global modal share for the City of Coimbra presented in this 2006 study is car (69%), walking (12%), bus + train (18%), and taxi (1%). Therefore, there was no significant evolution in sustainable mobility at the University of Coimbra during these last 15 years.

Several initiatives have been developed at the University of Coimbra focusing on sustainable mobility, including activities within the EUROPEAN MOBILITY Week framework, for example « Is Coimbra cyclable? » (September 2021) and Workshop on Mobility Habits and Health (September 2022), different surveys on mobility habits and physical tests on bicycle users.

Camilo José Cela University, Madrid, Spain

Camilo José Cela University comprises several distinct campuses, each offering unique locations and environments. The Villafranca Campus, situated at C/Castillo de Alarcón, 49 in Villanueva de la Cañada, Madrid, Spain, serves as the central campus of the university. It is a non-urban campus located in the northeast of the Madrid metropolitan area. It is provided with charging stations for electric vehicles and carpooling services. The Madrid-Almagro Campus is located at C/ Almagro, 5, in the heart of Madrid. Housed in a historic building dating back to 1920, this campus acts as a bridge between the university and the professional world. Its central location provides excellent accessibility via public transportation, placing it close to the socioeconomic, business, and cultural hubs of Madrid. The Madrid-Castellana Campus is the newest addition, located on Juan Hurtado de Mendoza Street, adjacent to the Paseo de la Castellana, between Cuzco and Plaza de Castilla. This campus spans four floors and covers an area of 11,319 square meters, with 3,226 square meters dedicated to green outdoor work areas. Designed with sustainability in mind, the Castellana Campus features bicycle parking facilities, including showers for cyclists, and parking spaces for carsharing vehicles and eco-friendly cars. Additionally, it offers parking spots equipped with charging stations for electric vehicles. The Madrid-Espacio Alameda Campus is another integral part of the university, although specific details about its facilities and focus areas are not provided here. Opening in the academic year 2023-2024, the Campus de la Salud-Montepríncipe is located in Boadilla del Monte, within the facilities of the HM Montepríncipe Hospital. This campus is poised to become a significant center for health-related studies and research. The Campus Goleta Cervantes Saavedra, operational since 2007, is situated in the Marina of the Port of Valencia. This campus houses the Center for Maritime Studies (CEM) of the Camilo José Cela University, focusing on marine research and professional training related to the sea.

Since the 2022-2023 academic year, the university has provided a shuttle service connecting the Villafranca Campus with the HM Puerta del Sur Hospital in Móstoles and the Plaza de Moncloa, in the city centre.

In terms of sustainable mobility, the UCJC has been proactive in promoting accessibility to its campuses through sustainable modes of transportation. The university organizes the UCJC Sustainable Mobility Day annually, encouraging the use of carpooling and carsharing. Additionally, since 2017, a mountain biking group has been active at UCJC, further promoting eco-friendly transportation options among its community.

2.2. Collaborative efforts among universities and organizations.

2.2.1. Collaboration between Montpellier Paul Valéry University and Montpellier Metropolis.

The collaboration between Montpellier Paul Valéry University and the Metropolis of Montpellier stands as a model for university-city partnerships focused on sustainable mobility and urban integration.

Central to these collaborative efforts is Plan Campus, the local implementation of the national Opération Campus program, mentioned earlier in this report, and led by the Metropolis to modernize the university's facilities and enhance its physical and functional integration with the city of Montpellier. In parallel, the Metropolis and the University are collaborating on the development of infrastructure around the new Tram Line 5, which will serve the main campus and is scheduled to open in December 2025. These efforts aim to facilitate active mobility and encourage cycling, including the creation of dedicated bike lanes, optimized traffic light management, and the installation of additional bicycle parking racks. The development of multimodal mobility hubs, improved signage, and participatory urban design processes further exemplify the commitment to fostering a campus environment that is open, accessible, and environmentally responsible.

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Figure 5: Line 5 at the 'Université Paul-Valéry 'stop, in front of the Atrium building – campus route de Mende (photograph taken during testing in August 2025) © C. Marson. Source: En Commun Magazine, 2025 (https://encommun.montpellier.fr/articles/2025-08-30-ligne-5-le-tramway-en-test-de-luniversite-paul-valery-clapiers)

The University is a member of the Club Mobilité Employeur (Employer Mobility Club) of the Montpellier metropolitan area. This initiative brings together employers, local authorities, and transport professionals to promote sustainable commuting practices among employees. The club provides a platform for sharing experiences, accessing resources, and implementing employer mobility plans. Regular meetings focus on topics such as active transportation, carpooling, and public transport options, aiming to reduce single-occupancy car use and improve the quality of life at work.

Besides, a series of academic workshops, jointly organized by the university and metropolitan authorities, have played a pivotal role in strengthening ties between academic stakeholders and municipal actors. These workshops serve not only as forums for exchanging best practices and identifying shared challenges, but also as incubators for innovative projects in mobility management and urban planning. Participants include students, university staff, officials, and representatives from local organizations, fostering a multi-actor approach that encourages active engagement and co-creation.

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A key facet of this collaboration is the integration of university students directly into the metropolitan administration through structured internship programs. Students from Montpellier Paul Valéry University are regularly placed as interns within the Metropolis of Montpellier, where they contribute to the design, implementation, and evaluation of mobility policies. This practical immersion enables students to gain first-hand experience in public administration while providing the metropolis with fresh perspectives and research-driven solutions. The driving forces created by these internships enhance the capacity of both institutions to respond to the evolving needs of the city and its academic community.

2.2.2. University of Turin collaborative efforts

In recent years, the University of Turin has consistently collaborated with local institutions, serving as a partner and consultant to enhance infrastructure and services for the home-to-university commuting of its community. This effort has been facilitated through the mobility unit of the Green Office in coordination with other university departments.

For example, through the project SUSTAIN (Specific User Sustainability Through Accurate Index Number), developed jointly with the Metropolitan City of Turin, an advanced web-based tool was built to regulate access to car parking spaces owned by the university, using data on the whole public transport network of the Piedmont Region to allocate them only to members that must travel along routes which are difficult to cover with a sustainable modal combination (active plus public transport). For each community member requesting a parking permit, the car journey option (defined involving the characteristics of the actual roads to be used) is compared to the most efficient sustainable travel options. The parking permit is then awarded only if the sustainable travel options are significantly slower and reliable than the car journey. All the process is performed by a web server and is based on the OpenTripPlanner 2 (OTP2) open-source multi-modal trip planner, suitably adjusted to allow also for mixed travel solutions (car + active + public transport) when fully sustainable options are not available.

Another example of joint collaborative efforts with the Metropolitan City of Turin regards the implementation of carpooling services. Carpooling is an effective solution to decrease air pollution, alleviate traffic congestion, and consequently make roads safer for cycling.

2.2.3. University of Coimbra collaborative efforts

The University of Coimbra (UC) has positioned itself as a key driver of sustainable mobility in Portugal through close collaboration with local, regional, and national stakeholders. Central to this effort is its long-standing partnership with the Municipality of Coimbra, which has enabled the alignment of academic initiatives with municipal strategies for cycling infrastructure, active commuting, and sustainable urban development.

Beyond the local level, the UC has also forged a productive relationship with the Portuguese Secretary of State for Sports, whose involvement has been instrumental in connecting active mobility with sport and public health promotion. The Secretary's participation in the 3Cs cycling routes launch underscores the university's recognition as a national reference point for linking mobility, sport, and sustainability. This partnership not only reinforces the relevance of the project's relevance but also provides visibility and political support on a national scale.

Figure 6: 3Cs route launch (source: DCM/UC, 2025)

The 3Cs cycling routes themselves served as a living demonstration of multilevel cooperation. Along the journey, several municipalities offered direct support,

exemplifying how local authorities can actively contribute to a European ecological mobility network. In Fundão (Portugal), the municipality showcased its strong commitment to cycling by presenting investments in cycle paths and the adoption of e-bikes for municipal employees, including the police. The presence of local police officers who accompanied sections of the route highlighted the integration of active mobility into institutional culture. It conveyed a strong message of public endorsement for sustainable commuting.

Figure 7: Police officers supporting 3Cs route (source: DCM/UC, 2025)

Figure 8: Fundão mayor and 3Cs representative talking with regional media (source: DCM/UC, 2025)

Complementing these public partnerships, the UC has also sought private-sector engagement to strengthen the long-term impact of its projects. Notably, the collaboration with Banco Santander has expanded opportunities for financing and supporting sustainable campus initiatives, from mobility to sport and education. By mobilizing resources from both public institutions and private enterprises, the UC has ensured that its mobility strategies are not isolated efforts but part of a broader ecosystem of innovation, investment, and shared responsibility.

Through these collaborations, the University of Coimbra has demonstrated that active and sustainable mobility requires more than isolated infrastructure: it thrives when anchored in partnerships that bring together academia, government, municipalities, and enterprises. This collaborative approach has not only advanced the goals of the 3Cs project but also set the foundations for replication in other European contexts.

2.2.4. Camilo Jose Cela University collaborative efforts

Universidad Camilo José Cela (UCJC) is continuously collaborating with organizations and companies to develop joint initiatives in the areas of mobility and sustainability.

Some examples include:

UCJC University, together with the Asociación Empresas por la Movilidad Sostenible (Companies for a Sustainable Mobility), organized the think tank titled "Educational Mobility: The Missing Link Slowing Down the Progress of Sustainable Mobility."

The event brought together 17 high-level experts from leading organizations and companies that are driving change and promoting more sustainable educational mobility aligned with emerging challenges.

The experts shared experiences, success stories—such as the case of the Nouvelle-Aquitaine Region in France—best practices, short-, medium-, and long-term visions, as well as the challenges they face and proposals to address them. The event identified more than 20 barriers hindering the development of educational mobility and proposed over 30 solutions to promote it, which have been compiled in a White Paper. A video about the meeting can algo be found on the YouTube page.

Moreover, UCJC is a member of 'Madrid Green Urban Mobility', an association of Madrid-based companies and public institutions — including notably the Madrid City Council — which serves as a forum for the emergence of innovative ideas in urban mobility for the city.

Figure 9: Empresas por la Movilidad Sotenible meeting (UCJC, 2024)

Figure 10: Madrid Green Urban Mobility Lab (MGUMLab) logo.

2.3. 3Cs actions

2.3.1. Transversal survey among partner universities

The 3CS project aims to foster a comprehensive understanding of mobility behaviors and needs across its partner institutions through the implementation of a transversal survey. This survey is designed not only as a diagnostic tool for the universities directly involved—University of Turin, Montpellier Paul Valéry University, Universidad Camilo José Cela, and Universidade de Coimbra—but also as a model for broader academic comparison and knowledge transfer.

Central to the survey's conception is its reproducibility and potential for generalization. The methodology, carefully co-constructed by a panel of experts representing diverse disciplinary backgrounds—including urban studies, sociology, transport engineering, and environmental sciences—ensures that the questionnaire addresses a wide spectrum of mobility-related issues. This interdisciplinary approach guarantees that the resulting data are rich, nuanced, and robust, facilitating both intra- and inter-university comparisons.

A key feature of the 3CS survey is its open architecture and standardized framework. The instrument has been designed to be readily adaptable and replicable by other academic institutions, thus promoting methodological consistency and enabling benchmarking at local, national, and international levels. By encouraging external universities to adopt and adapt the survey, the project aims to build a larger comparative dataset, which can support meta-analyses and contribute to evidence-based policy recommendations in the field of sustainable mobility.

The survey development process itself exemplifies co-construction and collaborative knowledge production. Researchers and practitioners from all partner institutions participated in iterative workshops, jointly refining questions to ensure cultural sensitivity, relevance to local contexts, and scientific rigor. The inclusion of multiple disciplinary perspectives not only enriches the questionnaire content but also promotes the emergence of new research questions and hypotheses.

Beyond methodological rigor and adaptability, the transversal survey offers a strategic opportunity for partner and external universities alike to situate their mobility practices within a broader European and international context. Cross-national comparison is especially valuable in identifying shared challenges, innovative solutions, and emerging trends in sustainable campus mobility. Such benchmarking supports the dissemination of best practices and the harmonization of mobility strategies, fostering mutual learning and continuous improvement across institutional and national borders.

In conclusion, the 3CS transversal survey stands as a replicable, co-produced instrument designed for comparative and generalizable research. Its open and interdisciplinary design not only serves the immediate needs of the 3CS consortium but also provides a valuable resource for the wider academic community seeking to advance sustainable mobility in higher education settings.

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2.3.2. Intervention studies: MUV, Online tool to support sustainable and active mobility:

MUV Game is the core service of the Italian startup MUV B-Corp, where MUV Game for 3C's project will be part of.

It is a phygital game, i.e., a digital game played in the real world, and it aims to enhance the experience of navigating the city by encouraging more conscious choices regarding individual mobility and guiding the transition towards more sustainable options. This is achieved through a mobile app that enables users to track their sustainable trips (including walking, cycling, using public transport, carpooling, and driving electric vehicles) and earn points for each verified trip. The points are then used to create sport-inspired game dynamics such as training sessions, individual challenges, or team tournaments in which players compete, and the most sustainable individual or team eventually wins the rewards (real or virtual). In addition to involving the user in the different game modes, the service collects mobility data made available to companies, schools, universities, or cities to draw up mobility management plans or improve mobility policies after being aggregated and anonymized. Thus, in addition to acting directly on individual behavior, the tool can also enhance mobility planning at both public and private levels.

Finally, thanks to the certified methodology for calculating CO2 savings, MUV Game can measure the impact (in terms of kilograms of CO2 saved) at both individual and community levels and offer further important feedback to guide a change in the behavior of individuals. The mobility data collected is finally released as open data and made available to administrations or organizations that may be interested in using it to increase the positive impact of the service in this way. MUV app and MUV Game for 3C's project will be available in 4 languages (English, French, Spanish, and Portuguese) and will be adapted to each participating university.

How MUV Game can be successfully exploited in the 3C's project?

MUV Game will be one of the solutions implemented within the project to actively engage students, professors, and staff from the four partner universities, guiding them towards more conscious and sustainable mobility choices by creating dedicated competitions and measuring the impact produced. This can be done by enabling the following four-step process:

Creation of a university community in MUV

Each of the four universities (University of Turin, Montpellier Paul Valéry University, Universidad Camilo José Cela in Madrid, and Universidade de

Coimbra) will be able to choose whether and when to use MUV Game for the 3C's project within their university. The MUV game for the 3C's project will have the necessary information of each institution (logo, email domain, faculty list, etc.), and a dedicated community will be created and added to the app. From this moment on, all students, professors, and staff, after downloading the app and creating their account, will be able to enter their university community where they will be able to take part in dedicated game dynamics and know in real time the impact produced by the community as a whole in terms of CO2 saved. This phase involves the university promoting the initiative by communicating that it has joined the MUV Game for the 3C's project and inviting everyone to join the community and participate in the initiative. In this regard, dedicated promotional materials will be produced to make communication even more effective.

Launching dedicated challenges for the university

Once university communities are created and populated, competitive and collaborative challenges will be launched to promote the use of the app to track users' sustainable journeys and reward the most consistent and courageous. Each university will be able to define the characteristics of the challenge it wants to launch to its community, i.e. duration, game dynamics (competitive or collaborative), sustainable mobility systems to be used, and type of rewards and promote it through its official channels to increase participation. Rewards will be raffled by MUV and made available via the app. In addition, during or at the end of the challenge, push notifications can be sent to participants via the app to ask them to complete other tasks required by the project, such as filling in a survey or expressing willingness to be interviewed.

Inter-university team tournament

Should all universities decide to enable the use of MUV Game for 3C's project for their community in the same period, then a team tournament might be designed. The four teams would clash in a tournament of 1-on-1 matches where each team's score is given by the sum of the scores produced by the ten best players of each team plus the average of all the others. The goal is for students, professors, and staff from the four universities to interact with each other and identify the most virtuous community among them.

Data analysis and sustainability reporting

All mobility data collected during experiments using the MUV app will be anonymized and made available to the relevant universities for research purposes. Similarly, each university will have access to a web dashboard where aggregated data showing MUV Game for 3C's project usage and impact can be

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48

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accessed in real time. Finally, information on CO2 saved and modal split recorded by users will be condensed into a report made available to universities.

2.3.3. Intervention studies: Health survey

The methodology employed in this study involved a comprehensive approach to measure the impact of healthy mobility on participants' anthropometric measurements, skinfold measurements, and cardiovascular capacity. The study was conducted at two different universities, Camilo José Cela University and the University of Coimbra, with a total of 54 participants. The participants were measured at two distinct points in time: baseline (initial measurement) and post (after several days of healthy mobility by bicycle or walking).

Initially, the baseline measurements were taken before the participants started the healthy mobility program. These measurements included anthropometric data such as weight, height, and body mass index (BMI), skinfold measurements to assess subcutaneous fat in various parts of the body, and the Ruffier-Dickson test to evaluate cardiovascular capacity. The participants were selected based on specific criteria to ensure comparable characteristics and lifestyles. High-performance athletes and individuals who regularly cycled were excluded from the study, as were those with any medical pathology.

After several days of engaging in healthy mobility activities, such as commuting between home and university by bicycle or walking, the post measurements were taken. The same parameters were measured again to assess any changes resulting from the healthy mobility program.

The anthropometric measurements revealed no significant changes in weight or height, with only slight variations observed in BMI. The skinfold measurements showed a decrease in subcutaneous fat in certain areas, indicating a positive impact of healthy mobility on body composition. The Ruffier-Dickson test results demonstrated an improvement in cardiovascular capacity, with a decrease in the Ruffier-Dickson index, suggesting better heart recovery after exercise.

Overall, the methodology employed in this study provided a detailed analysis of the impact of healthy mobility on various health parameters, highlighting the benefits of engaging in regular physical activity through cycling or walking. The results suggest that healthy mobility can be an effective strategy to improve overall health and physical condition, although the effects may vary among individuals.

2.3.4. Connecting universities by bicycle: 3CS routes

The 3Cs Cycling Route's Goal

The 3Cs – Cycling, Campus & City Program aims to foster sustainable travel between cities and university campuses while promoting the health and well-being of the academic community. Funded by the European Union under the Erasmus+ programme, this initiative focuses on advancing sustainability through sport and ecological mobility. The project prioritizes bicycles—both electric and conventional—as the primary mode of transport, emphasizing the development and promotion of cycle paths to, from, and within university campuses and urban areas. It also explores other forms of active mobility, such as walking. By identifying best practices, collecting data from participants through dedicated tools and studies, and creating educational content, the program seeks to encourage sustainable travel habits, shift behaviors, and raise awareness about the importance of contributing to a greener world through sport and eco-friendly transportation.

A Sustainable Route Connecting the Four Campuses

As part of the project, a pilot route will link the four partner campuses: Universidade de Coimbra, Universidad Camilo José Cela, Montpellier Paul Valéry University, and Università degli Studi di Torino. This route, currently in test mode, is designed to showcase the feasibility and benefits of sustainable travel. It serves as a practical example of how universities can collaborate to create environmentally friendly connections, encouraging students, faculty, and staff to adopt healthier and more sustainable commuting options.

Criteria for Planning the Routes

The routes are carefully planned using strict sustainability criteria. Only eco-friendly transportation methods—such as walking, cycling, trains, and ferries—are considered. Each destination along the route offers essential amenities, including food, camping, and accommodation, ensuring comfort and accessibility for travelers. The stages are designed to be manageable, ranging from 35 to 70 kilometers in length, and the route profile is tailored for an easy ride, making it accessible to all participants regardless of their fitness level.

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3. Key Findings and Insights

The implementation of the 3Cs project across various European contexts has yielded valuable insights into mobility habits, institutional practices, and behavioural change. The transversal survey conducted among partner universities revealed both shared challenges and local specificities: a persistent reliance on private cars, uneven availability of cycling infrastructure, and cultural barriers to adopting active mobility. At the same time, the project demonstrated the potential of targeted interventions—such as gamified apps, bicycle loan schemes, and university–city partnerships—to accelerate change.

A key insight is that sustainable mobility cannot be achieved solely through infrastructure. Behavioural engagement, political support, and institutional integration are equally necessary. Initiatives like UCicletas in Coimbra, Atelier Vélo 34 in Montpellier, or the Green Office in Turin highlight how universities can mobilize their communities and build lasting habits. The 3Cs cycling routes further reinforced the importance of visibility and symbolic actions, showing that collaboration between institutions and municipalities generates broader awareness and legitimacy.

Overall, the findings suggest that while barriers remain significant, particularly in terms of cultural resistance and infrastructure gaps, universities hold a strategic role in leading the transition towards ecological mobility. By aligning education, research, and practice, they can act as catalysts for change not only on campus but also in the urban ecosystems they inhabit.

3.1. Practicability level of cycling infrastructures to reach the campuses

3.1.1. Montpellier Paul Valéry University

This study analyses urban mobility patterns around the two main campus of Montpellier Paul Valéry University, using GPS traces collected during two mobility challenges organized via the MUV Game app. The focus is on identifying route preferences among users employing sustainable transport modes, particularly in the context of a recent infrastructural redevelopment project involving the installation of a tramway line.

Data were collected during two periods of mobility challenge participation, the first (February- March 2024) encompassing a variety of sustainable transport modes (walking, cycling -including electric bikes, scooters and e-scooters, public transit

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51

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and e-cars), the second (March-April 2025) being restricted to cycling and walking. At the time of data collection, the area surrounding the campus was undergoing extensive construction to prepare for a new tramway line. While recent photographs suggest the project is now complete, the works were likely a major deterrent to route usage at the time—especially for cyclists who are more sensitive to disruptions and detours.

Route de Mende campus

The Route de Mende campus of the Montpellier Paul Valéry University (Figure 9) is situated in the north-eastern sector of Montpellier, within the Hôpitaux-Facultés district. This location positions the campus at the interface between the urban core and the more suburban and natural surroundings of the city. The campus spans approximately 10 hectares and serves as the primary site for the university's faculties of arts, languages, and social sciences. The campus includes multiple lecture halls, teaching and research buildings, administrative offices, a central library, and dining facilities run by the CROUS (Regional Centre for University and School Services).

The campus is accessible by public transport via several nearby lines. Tramway Line 1 (stop Saint-Éloi) lies approximately 800 meters southwest of the campus and offers direct connections to the city centre and the main train station. From this stop, most students access the campus via a newly developed pedestrian plaza (parvis March Bloch) located in front of the Atrium Library, which serves as the primary entrance for pedestrians and cyclists. Bus lines 10 (stop Moulin de Gasconnet) and 15 (stop Faculté de Pharmacie) provide additional access routes. Three secondary entrances for pedestrians and cyclists are located at the west and north of the campus. For those arriving by car, three parking areas are available within campus, though motorized access is restricted to university staff. The main entrance for motor vehicles is located on Avenue du Val de Montferrand to the east. Parking lots are located along the roads surrounding the campus but are chargeable.

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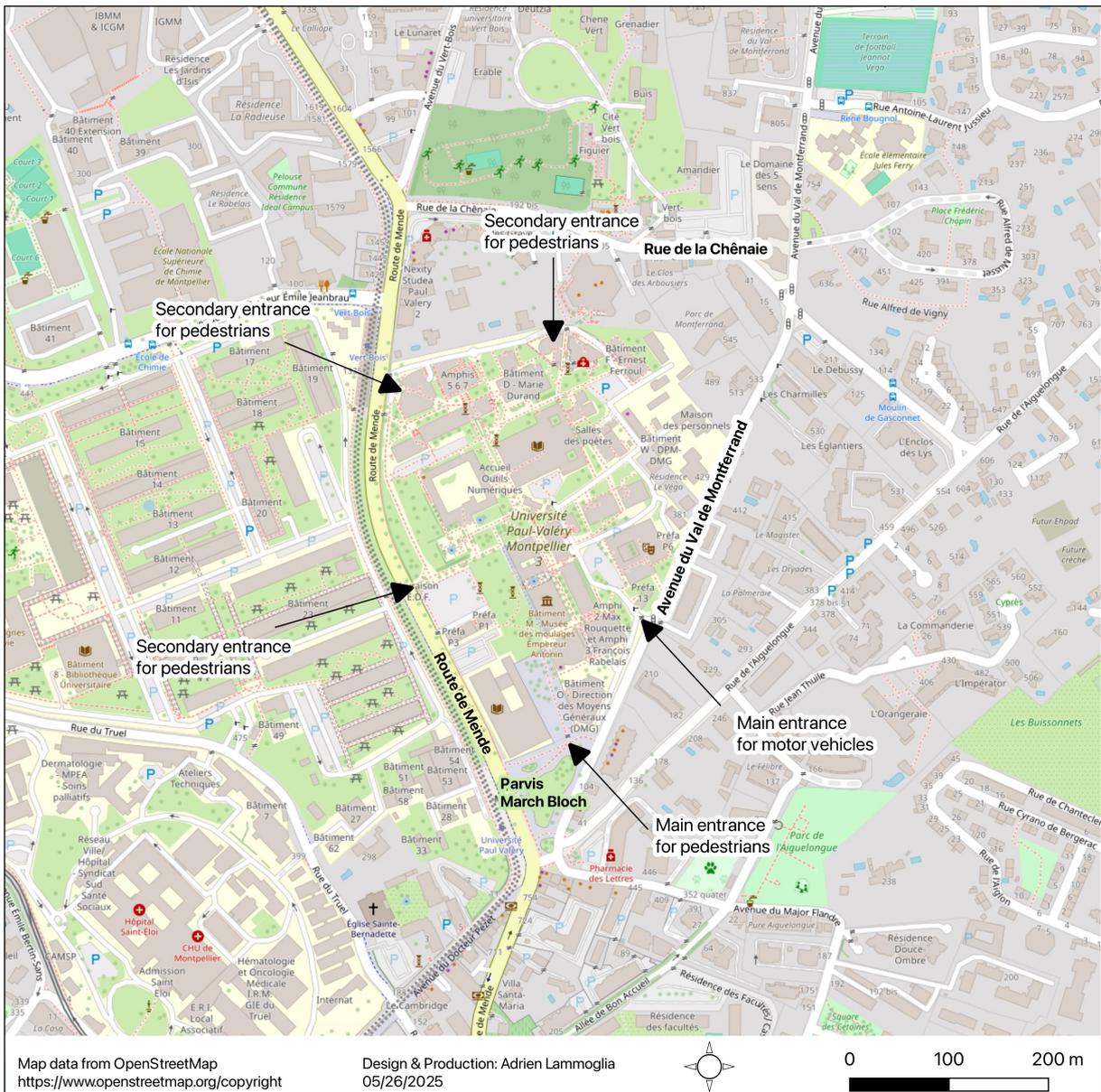
Figure 11: Aerial view of the Route de Mende campus located between Route de Mende to the West, Rue de la Chênaie to the North and Avenue du Val de Montferrand to the East (Source: Google Maps)

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Figure 12: Modal breakdown of trips around the Route de Mende campus (Source: MUV,2024/2025)

The dataset includes 1930 trips, all terminating within a 400-meter radius around the route de Mende campus centre (Figure 12).

A modal breakdown (Table 1) reveals a predominant reliance on walking (1410 trips), with significantly fewer trips by bicycle (421) and e-bike (62). The average cycling trip spans about 7.5 km, while walking trips are shorter but still represent a significant time commitment (average 22.7 minutes). The data suggest a preference for specific access routes to the campus—such as Avenue du Val de Montferrand—over others like Rue de l'Aiguelongue.

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Table 1: Average distance, time, and number of trips by transportation mode for Route de Mende campus

	Average distance (in km)	Average time (in min)	Number of trips
All modes	2.95	25.3	1927
Bike	7.50	34.4	421
e-Bike	7.70	28.4	62
Walk	1.34	22.7	1410
Bus and tram	4.57	13.1	32
e-Car	11.82	26.3	2

Despite being geographically proximate and featuring infrastructure comparable to more heavily used roads, Rue de l'Aiguelongue shows virtually no usage by cyclists. This underutilization is not correlated with the infrastructural issues highlighted in the 2021 Cyclability Barometer (Figure 13), nor is it supported by recent photographs (Figure 14) indicating no apparent deficiencies in safety or accessibility. In contrast, Avenue du Val de Montferrand, which shares similar physical characteristics, is notably busier, while their slopes and infrastructures are again comparable (+/- 20% difference in altitude). It seems that this is mainly a difference in the use of the areas to which these roads provide access: the Aiguelongue district is an isolated residential area, while the surrounding roads provide access to other centres in the metropolitan area.

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Figure 13: Location of improvement points (marked in green) and vigilance points (in red) around the Mende road campus (Source: 2021 Cycling Cities Barometer, Bicycle Users Federation)

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Figure 14: Photographs of Rue de l'Aiguelongue (Source: Le Texier, 2025) on the left and Avenue du Val de Montferrand (Source: Le Texier, 2025) on the right. Shot from the south of the campus on Route de Mende

To accommodate the future Line 5 of the Montpellier tramway (starting in December 2025), the Route de Mende has been restricted and the university-city connectivity strengthen. The redesign includes the installation of tram tracks, safer crossings, and improved cycling and pedestrian infrastructures, thereby reinforcing the campus's accessibility and its integration into the wider urban mobility network (Figure 15). The university, through its annual mobility barometer, will soon be able to quantify the impact of these changes on the mobility behavior of its staff and students.

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57

Figure 15: Panoramic view of the Southern part of the campus from route de Mende on the left to rue de l'Aiguelongue on the right (Source: Le Texier, 2025)

Campus Albert 1er Saint Charles

The Saint Charles campus of the Montpellier Paul Valéry University is a smaller site located in the centre of Montpellier. It is primarily dedicated to research, administration, and certain master's programs. The campus also hosts doctoral schools, making it a significant location for advanced studies and research activities within the university.

The Saint Charles campus of the University of Montpellier Paul Valéry is accessible via the Place Albert 1er tram stop on line 1, which is located right in front of the campus. Additionally, the Albert 1er / Cathédrale tram stop on line 4 is approximately 300 meters away. Both tram lines provide convenient access to key locations in Montpellier, including the Gare Saint-Roch, the city's main railway station.

The Saint Charles campus is well-connected to Montpellier's cycling network, with a Vélomagg' bikesharing station located approximately 100 meters away, providing easy access to bicycles for shortterm use. Additionally, the campus is situated along several key bike lanes that integrate into Montpellier Métropole's extensive cycling infrastructure, facilitating safe and efficient travel by bike throughout the city (Figure 16).

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Figure 16: Bike path on Avenue Buisson Bertrand (top) and Place Albert 1er (bottom) (Source: Poisson, 2025)

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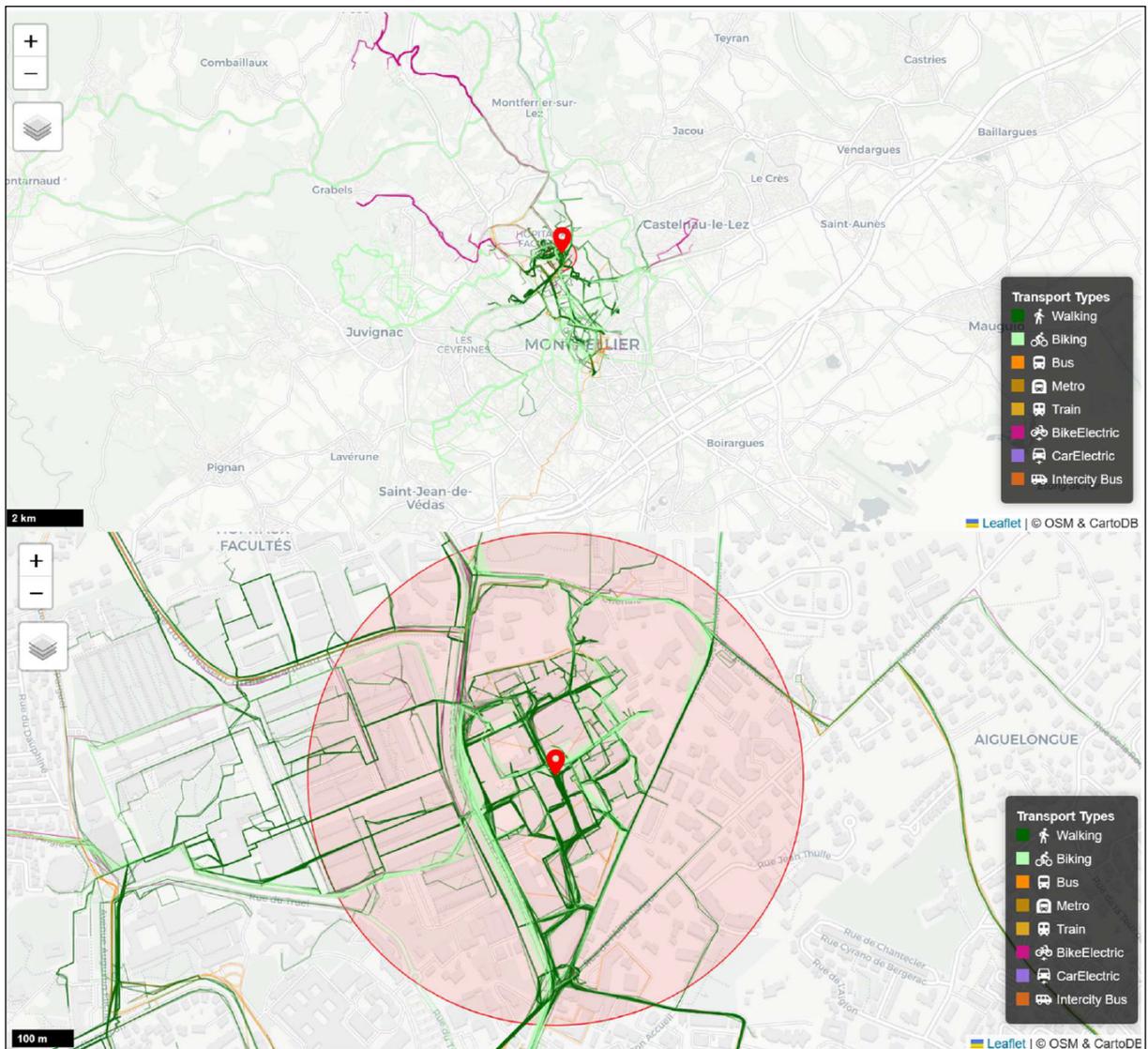
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Figure 17: Modal breakdown of trips around the Saint Charles campus (Source: MUV, 2024/2025)

The dataset compromises 277 trips, all terminating within a 120-meter radius around the route de Mende campus centre (Figure 17).

Comparing the distance and travel time between the two campuses raises points of analysis (Tables 1 and 2). Cycling is faster for the Saint-Charles campus than for the Route de Mende campus, and the distances traveled by bike are shorter. Cycling traffic conditions in the central parts of the metropolis seem to favour better traffic speeds. It is also possible that the greater spatial ranges lead cyclists to reduce their average speed in order to distribute their energy expenditure better. Conversely, the electric bike is slightly faster for the Route de Mende campus, despite a longer distance, which seems to indicate that the maximum speeds allowed by the electric bike are more challenging to achieve in the city

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centre, where cycle paths are heavily used and regularly cross pedestrian paths (or are used by pedestrians). More surprisingly, walking is faster around the Saint-Charles campus. It is possible that the roadworks around the Route de Mende campus is the cause of these differences, with numerous obstacles on pedestrian paths and for road crossings.

The relatively low number of recorded walking journeys, however, requires caution in interpretation, since it is possible that this is a bias linked to the walking speed of the participants, some preferentially frequenting the Route de Mende campus and others that of Saint-Charles. Finally, buses and trams appear to be faster for the Saint-Charles campus, probably because the proportion of journeys made by tram is even higher on the Saint-Charles campus than on the Route de Mende campus.

Table 2: Average distance, time, and number of trips by transportation mode for Saint Charles campus

	Average distance (in km)	Average time (in min)	Number of trips
All modes	2.96	19.6	277
Bike	3.67	20.5	140
e-Bike	3.58	29.3	39
Walk	1.34	17.8	70
Bus and tram	2.54	6.4	28

In conclusion, the analysis of urban mobility patterns around the Route de Mende and Saint Charles campuses of the Montpellier Paul Valéry University reveals distinct preferences and challenges associated with different modes of transportation. The Route de Mende campus, situated in a suburban area, shows a reliance on walking (notably from the tramway station Saint-Eloi) and cycling, with significant underutilization of certain routes such as Rue de l'Aiguelongue, despite its comparable infrastructure to more frequently used roads like as Avenue du Val de Montferrand. Conversely, the Saint Charles campus, located in the city center, benefits from shorter travel distances and times, particularly for walking and cycling, due to its central location and better integration with the public transport network. The analysis indicates that electric bikes are slower at the Saint Charles campus, likely due to the high density of pedestrian and cycling traffic, as well as frequent interactions between different types of road users. Implementing dedicated cycling lanes that are physically separated from pedestrian pathways could help reducing conflicts between cyclists and pedestrians, allowing for smoother and faster cycling, particularly for electric bikes.

Both campuses will be directly connected to the tramway in December 2025, and the mobility behaviour of their users will certainly become more uniform, even if the off-centre location of the route de Mende campus and the central location of the Saint-Charles campus lead to constraints in modal choices that will persist for some.

3.1.2. University of Turin

The University of Turin (UniTO) is a large athenaeum (around 85,000 individuals) scattered among over one hundred locations in the metropolitan area and Piedmont municipalities. The university locations are diverse: large complexes built specifically for the university are flanked by sites in buildings, including historic ones, as well as structures with mixed functions, such as hospitals housing faculties of medicine. This route study analyses two locations, Campus Luigi Einaudi and the School of Management and Economics, where over 22,000 people study and work, representing over 30% of the University of Turin's total population. Data were collected during two periods of participation in the mobility challenge: the first in October 2024 and the second in March-April 2025.

Luigi Einaudi Campus

The Luigi Einaudi Campus is one of the main sites of the University of Turin. Built in 2012 on a former industrial area along the Dora River, it covers a total surface of approximately 45,000 square meters and is located in a semi-central area (Figure 18). The modern campus houses the departments of social sciences, law, and economics, accommodating around 15,500 people including students and staff. The campus offers 318 bicycle parking spots, located at street level and in the underground parking lot, as well as 427 car spaces and 58 motorcycle spaces.

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62
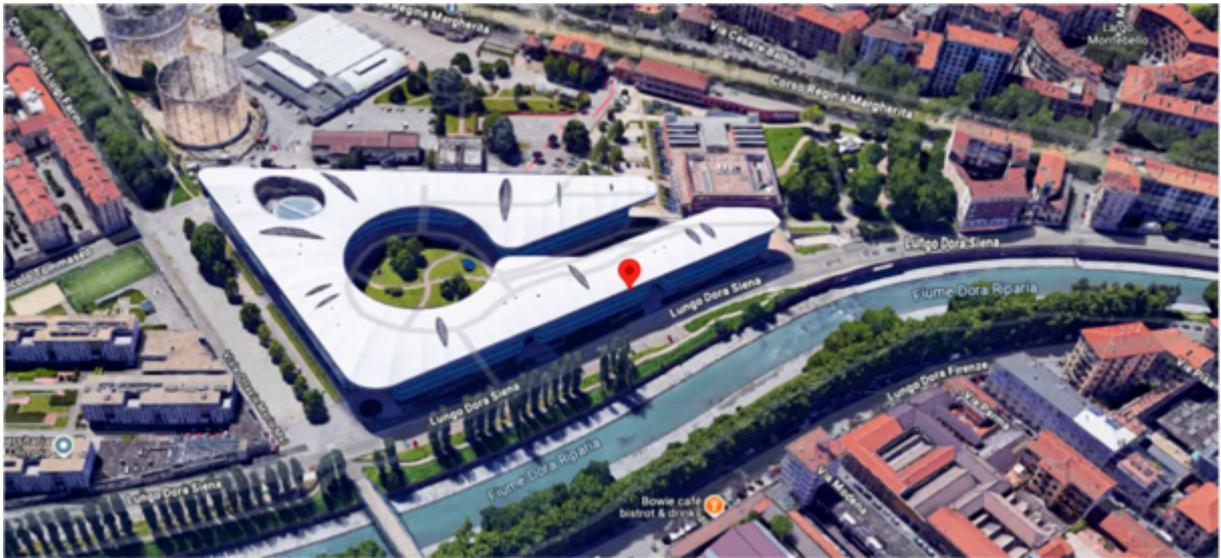
Figure 18: Campus Luigi Einaudi

The Campus is easily accessible by local public transport — 9 urban bus lines and 2 suburban bus lines have stops within a 500-meter radius of the campus — and numerous shared bicycles and scooters are also commonly available in the area.

Figure 19 shows that the Luigi Einaudi Campus is well connected to the city's cycle network. There are five cycle paths within a 500-metre radius: the Viale Primo Maggio/Viale Partigiani cycle and pedestrian path, which connects to the Lungo Dora Siena cycle path; the Lungo Dora Firenze cycle and pedestrian path; the Corso Regina Margherita cycle path; and the new Corso Verona cycle path. In addition to the cycling infrastructure, the presence of 30 km/h zones in the surrounding areas toward the city centre further supports bicycle mobility by providing an additional connection to the south.

Figure 19: Map of bike lanes, 30 km/h zones, and pedestrian areas

Main cycling and walking trips

The dataset of routes recorded with the MUV App includes 857 trips that start or end within a 250-meter radius around the Luigi Einaudi Campus.
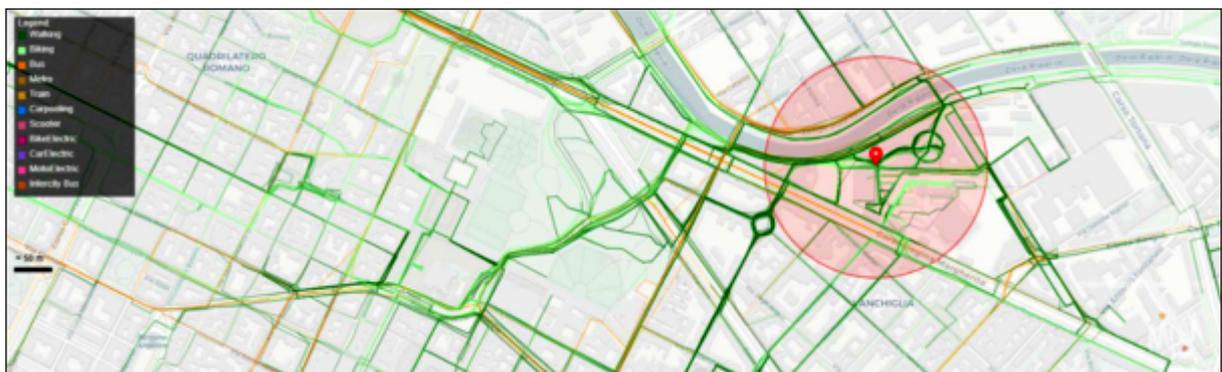
Figure 20: Modal shift of trips around Luigi Einaudi Campus

Table 3: Number of trips, average distance, and average travel time for the Einaudi Campus

	Number of trips	Average distance (in km)	Average time (in min)
Walk	457	1.77	35.5
Bike and *e-Bike*	326	6.48	66.9
Bus and tram	72	4.10	21.0
e-Car	2	67.94	79.3
All modes	857	3.91	46.3

The modal split shows a predominance of walking trips (53%), followed by a significant share of bicycle trips (38%), and only a residual share of trips by public transport (8%). The average bicycle trip covers approximately 6.4 km, while walking trips are shorter, averaging 1.77 km, with an average duration of about 22.7 minutes.

Figure 21 shows that pedestrians travel to the Einaudi Campus primarily from the city centre, where several other university facilities are also located. The most frequently chosen routes are the most direct ones: the pedestrian and bike path from Piazza Castello along Viale Primo Maggio and Viale dei Partigiani through the Royal Gardens, as well as Montebello and Rossini streets, are used to reach both the entrance on Corso Regina Margherita and the main entrance on Lungo Dora Siena. Pedestrians coming from the area north of the Campus, across the Dora River, tend to concentrate on Via Modena, then follow a short stretch of the pedestrian and bike path along the river (Lungo Dora Firenze), and use the pedestrian and bike bridge to access the main entrance of the Campus.
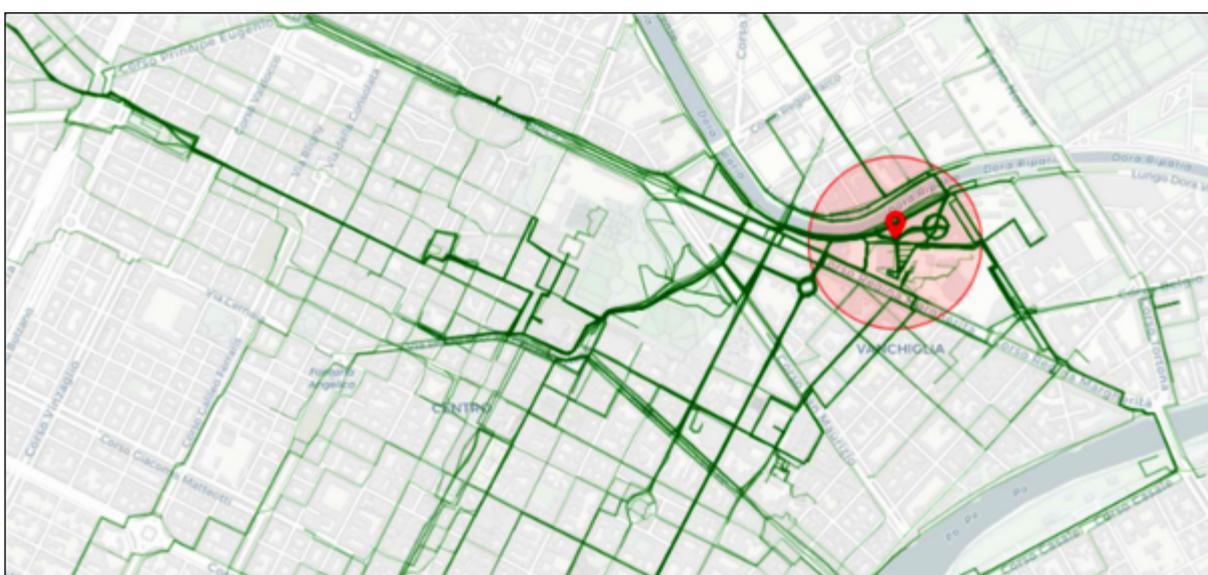
Figure 21: Most frequently walked streets around the Luigi Einaudi Campus

Figure 22 shows that cyclists prefer the cycle routes around the campus, particularly the cycle paths on both sides of the Dora River (Lungo Dora Siena and Lungo Dora Firenze), the cycle route to the city centre (Viale Primo Maggio/Viale dei Partigiani), and the cycle route on Corso Regina Margherita. These paths are described below, indicating the improvements needed.

Figure 22: Most frequently cycled streets around the Luigi Einaudi Campus

The Cycle path Viale Primo Maggio – Lungo Dora Siena

The cycling connection from the central Piazza Castello to the Einaudi Campus represents the fastest and most direct route between the city center—and the many university buildings located in the historic buildings of the city center—and the university campus. The route is divided into two parts: the first is a shared pedestrian and bicycle path (from Piazza Castello – Viale Primo Maggio/Viale dei Partigiani to Corso San Maurizio), created by sharing the sidewalks under the tree-lined Royal Gardens; the second part (from Viale Partigiani/Corso San Maurizio to the Campus on Lungo Dora Siena) features a protected two-way cycle lane, separated from the roadway by horizontal signage and curbs that discourage cars from encroaching, and also distinct from pedestrian sidewalks.

Figure 23: Cycle path Viale Primo Maggio – Lungo Dora Siena

The main critical issue in the first section (Figure 23) is the absence of horizontal signs clearly separating the space for cyclists and pedestrians. Shared use of the route is indicated only by vertical signs. This creates conflict situations and significantly increases the risk of accidents, especially given the slope of the path, which increases the speed of cyclists who are forced to slalom between pedestrians convinced (not entirely wrongly) that they are on a traditional pavement.
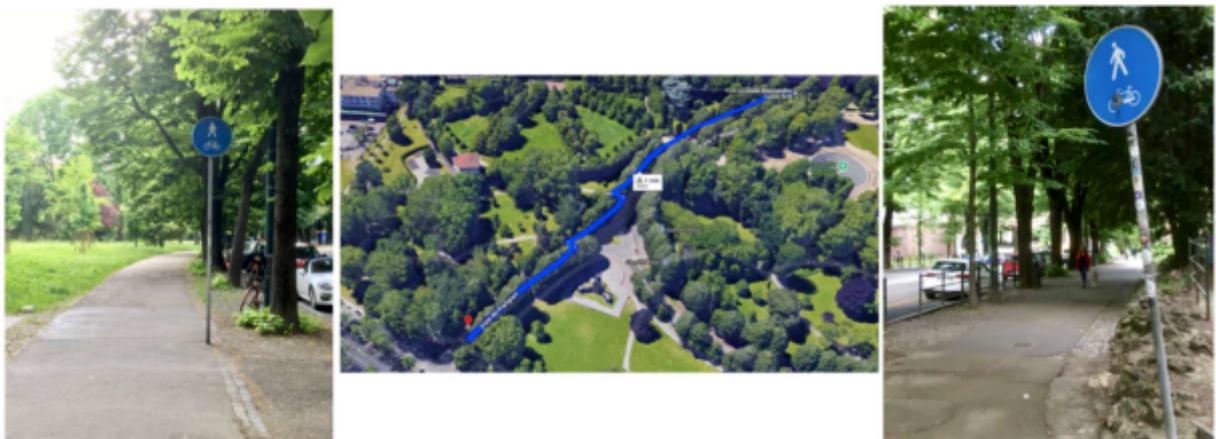
Figure 24: Viale Primo Maggio/Viale Partigiani cycle-pedestrian path

In the second section, along the cycle path of Lungo Dora Siena which extends to Colletta Park, the main issues concern the maintenance of the cycling

infrastructure: the curbs show significant signs of wear, and the road markings are dangerously faded and barely visible. This greatly reduces cyclist safety, especially at intersections with roads that experience heavy vehicular traffic, such as Corso Regina Margherita (Figure 25).

Figure 25: Lungo Dora Siena cycle path – wear and tear on road signs

A particularly critical point is the main entrance of the campus, which connects the pedestrian and cycle bridge linking the campus with the neighborhood on the opposite side of the river and the cycle path along Lungo Dora Firenze. Figure 26 shows, on the left, the severe fading of the road markings in front of the main entrance to the campus toward the bridge over the Dora River, and on the right, the recently implemented pedestrian and cycling crossing on the opposite side of the river at the end of the bridge. It is hoped that a similar intervention will be carried out on the campus side to significantly increase the safety of cyclists and pedestrians.

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Figure 26: Cycle-pedestrian crossings on each side of the river walkway.

Overall, the Lungo Dora Siena cycle path represents one of the city's main cycling corridors, as confirmed by the City of Turin's bicycle flow monitoring system[12]: one of the 12 city counters is located on the Lungo Dora Siena cycle path, approximately 250 meters from the Einaudi Campus, recording an average of 790 daily passages and a total of 1,741,921 since monitoring began in 2019 (Figure 27). Restoration work on the road markings and the curbs separating the cycle path from the roadway is therefore both important and urgent.

Figure 27: Municipality of Turin's monitoring of cycling flows on cycle paths

The Pedestrian and Cycle Path along the Dora River (Lungo Dora Firenze)

The pedestrian and cycle path connects two major city parks (Parco Dora and Parco Colletta) and stretches for nearly 6 km along the bank of the Dora River.

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[12] https://data.eco-counter.com/ParcPublic/?id=6771

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Relative to the Einaudi Campus, the path is located on the opposite side of the Dora River and is connected to it by the aforementioned footbridge that leads directly to the main entrance.
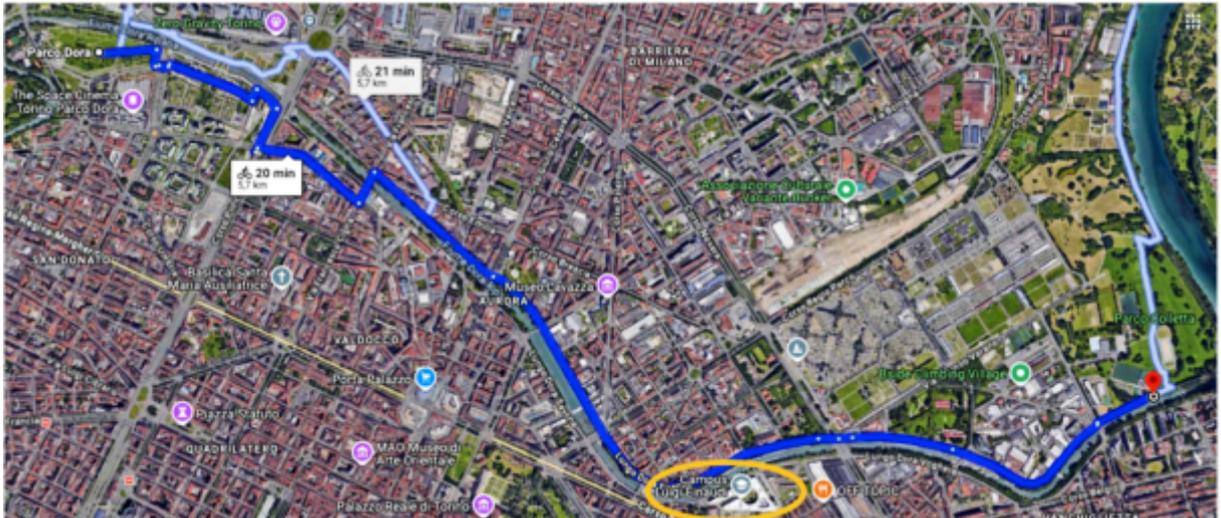
Figure 28: The Pedestrian and Cycle Path along the Dora River

The path is separated from the roadway, and in recent years, measures have been implemented to improve coexistence between pedestrians and cyclists and to enhance safety: in many sections, horizontal signage has been improved to distinguish between pedestrian and cycle lanes, separate pedestrian and cycle crossings have been created, and conflicts with public transportation stops have been reduced by widening sidewalks. However, cyclist-pedestrian coexistence still requires attention, especially during peak hours.

Although there are no particularly problematic elements, there is still room for improvement, particularly with regard to the horizontal signage. It is therefore necessary to maintain and strengthen the road markings both in areas where the pedestrian and cycle paths are clearly separated, and above all, in areas where such separation is absent due to narrowing of the route and the space temporarily becomes shared again (Figure 29).

Figure 29: Separate (left) and shared (right) cycle-pedestrian paths

Additionally, consistent and regular maintenance of horizontal signage at street intersections is essential, particularly where the paving is made of stone rather than asphalt, which further reduces cyclist stability during crossings. In some intersections, there are already significant signs of wear that reduce the visibility of the cycle crossing, posing clear safety risks (Figure 30).

Figure 30: New cycle and pedestrian crossing a and old one to be restored

Cycle Path on Corso Regina Margherita

Figure 31: Cycle Path on Corso Regina Margherita

The cycle path along Corso Regina Margherita runs along the service roads of one of the city's main traffic arteries. It is marked by horizontal and vertical signage but lacks physical barriers, exposing cyclists to the risk of intrusion by motor vehicles. To promote coexistence between vehicle traffic and cyclists, the speed limit is set at 20–30 km/h, and vertical signage designates the road as "shared" (Figure 32).

Figure 32: Shared road and bike boxes in Corso Regina Margherita

At some intersections, "bike boxes" are also present—red-painted areas with a bicycle symbol placed ahead of the vehicle stop line. These allow cyclists to position themselves visibly at traffic lights and start ahead of cars when the light turns green, thus improving safety. By positioning themselves in front of the vehicles, cyclists also avoid inhaling exhaust fumes from idling engines. Due to the narrowness of the service roads, it is difficult to install physical barriers to separate the cycle lane without removing parking spaces on one side of the street—an area already affected by significant parking issues. As a result, the choice to reduce speed limits appears reasonable.

However, the poor maintenance of horizontal signage (Figure 33) compromises the visibility of the bike lane and the reduced speed limits.

Figure 33: Faded and poorly visible road markings

To make the road truly shared between vehicles and bicycles and improve safety, a comprehensive restoration and enhancement of horizontal signage (lane markings, arrows, bicycle symbols) is necessary, along with improved vertical signage to increase the visibility of the path. Some localized interventions are currently underway, but not in the sections of the cycle path near the Campus.

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73

Cycle Path on Corso Verona

Figure 34: Cycle Path on Corso Verona

A new cycle path has been built on Corso Verona, connecting the northeastern areas of the city with the Luigi Einaudi Campus and the pedestrian and cycle path along Lungo Dora Firenze. It is a bidirectional cycle path separated from the roadway and located on the tree-lined median, which has been redeveloped by removing vehicle parking. Pedestrians have separate sidewalks, set apart from the cycle path. The clear separation from both the road and pedestrian areas ensures safety and comfort for cyclists.

The new path, inaugurated just a few months ago, does not currently require any improvements. However, it is worth noting that it was constructed along a street not characterized by heavy vehicular traffic and which did not appear to have an urgent need for a protected route. At present, the Corso Verona cycle path is not heavily used by cyclists, as shown by the complete absence of usage data from the university community survey. This may be due to a lack of awareness of the new cycling infrastructure, but also to the fact that it does not seem to provide a direct connection to the broader cycling network in the northern part of the city (for example, there is an 850-meter gap in the connection to the cycle path on Corso Novara).

Economics and Management Campus

The Campus of Economics and Management is housed in a renovated and expanded historic building, covering an area of approximately 25,000 square meters. It consists of a central body and four lateral wings. Located in the

southern area of Turin, it has its main entrance at Corso Unione Sovietica No. 218-220 and a rear entrance at Via Filadelfia No. 73, which leads to the newly developed section.

The Campus offers 128 bicycle parking spaces near the entrances on Corso Unione Sovietica and Via Filadelfia, as well as 200 unguarded car parking spaces available free of charge for staff.
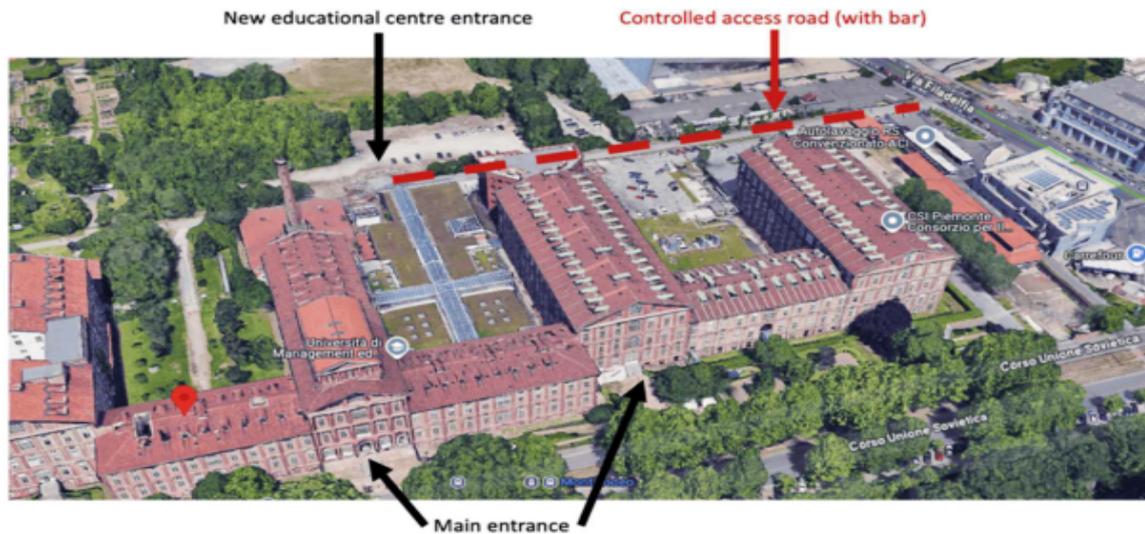
Figure 35: Economy and Management Campus

The accessibility and transportation options of the Economics and Management Campus are adequate. The campus is quite accessible by local public transport - 2 city bus lines and 2 suburban bus lines have stops within 500 metres of the campus - and shared bicycles and scooters are also quite available in the area.

Pedestrian access is ensured by sidewalks and pedestrian crossings near the entrance of the facility.

Cycling access to the Campus is good, thanks to the presence within a 500-meter radius of major bike lanes along Via Filadelfia, Corso Giovanni Agnelli–Corso IV November, Corso Cosenza, and the cycle-pedestrian path on Corso Galileo Ferraris, which connect to the city's cycling network (Figure 36).
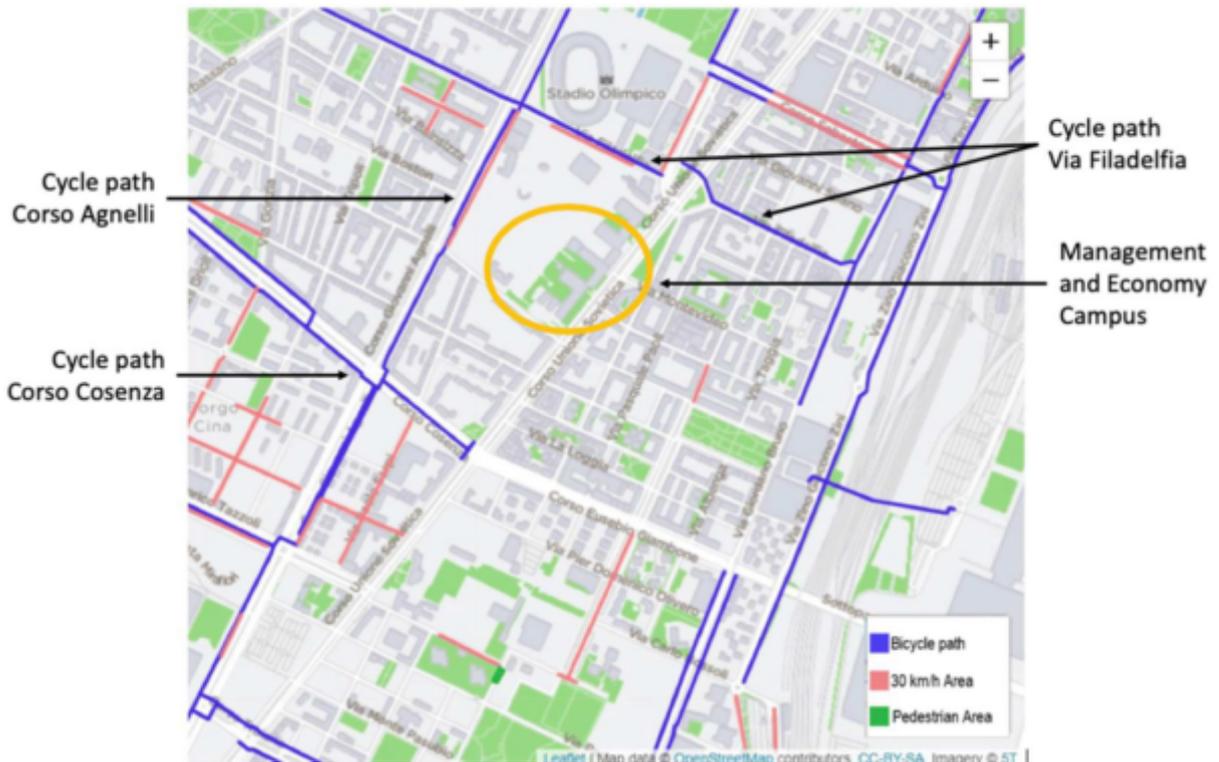
Figure 36: Map of bike lanes, 30 km/h zones, and pedestrian areas

Main cycling and walking trips

The dataset of routes recorded with the MUV App includes 260 trips that start or end within a 250- meter radius around the Economy and Management Campus.
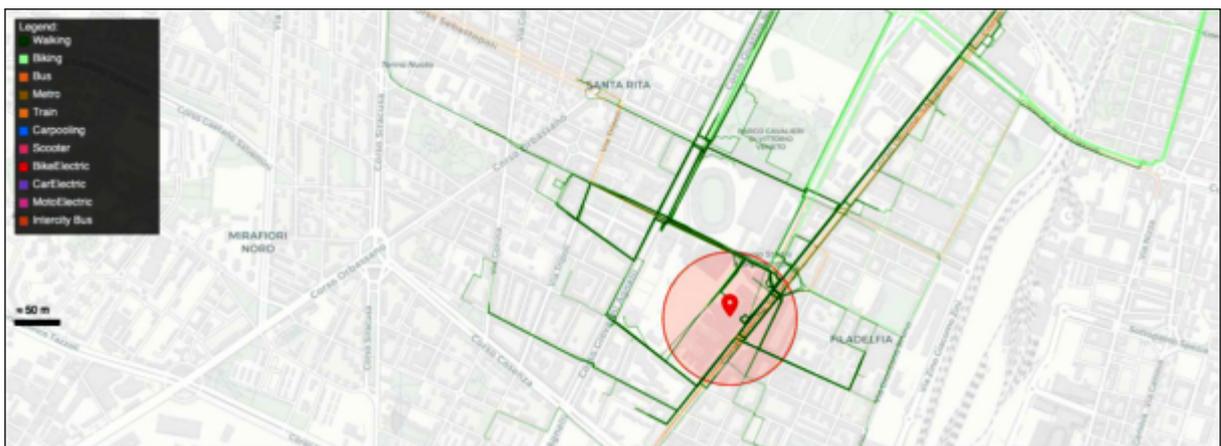
Figure 37: Modal shift of trips around Economy and Management Campus

Table 4: Number of trips, average distance, and average travel time for the Economy and Management Campus

	Number of trips	Average distance (in km)	Average time (in min)
Walk	181	1.25	16.9
Bike	65	3.17	36.6
Bus and tram	14	2.33	11.9
All modes	260	1.79	21.5

The modal split shows a predominance of walking trips (70%), followed by a significant share of bicycle trips (25%), and only a residual share of trips by public transport (5%). The average bicycle trip covers approximately 3.17 km, while walking trips are shorter, averaging 1.25 km, with an average duration of about 16.9 minutes.

Figure 38 shows that the majority of people attending the Campus of Economics and Management move northwards towards the city centre. The streets with the most foot traffic is Via Filadelfia, likely due to its connection with public transport stops at the intersection with Corso Giovanni Agnelli, Corso Unione Sovietica and Via Montevideo, which leads directly to the main entrance. Numerous routes are also recorded on both sides of the Cavalieri di Vittorio Veneto park. The map highlights a preference for major roadways, while pedestrian mobility on secondary neighbourhood streets is very limited.
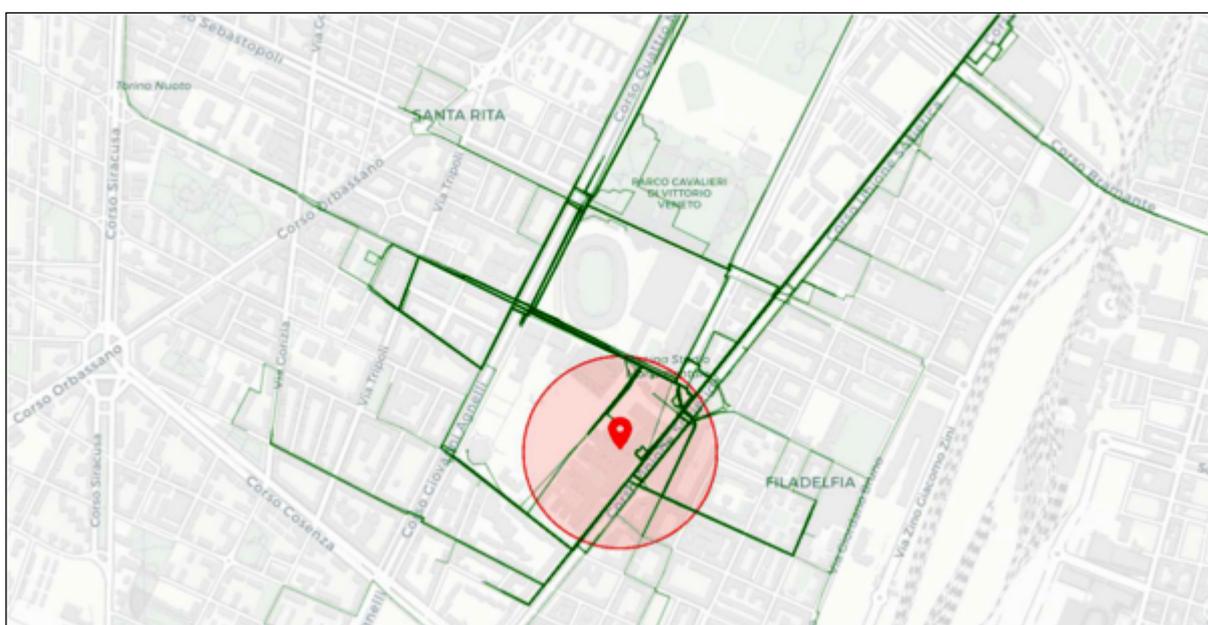
Figure 38: Most frequently walked streets around the Economia and Management Campus

The cycling routes most commonly used by the university community head almost exclusively north of the campus, toward the city centre (Figure 39). Most recorded routes follow the bike lane on Via Filadelfia to reach one of two cycle-pedestrian paths that extend for about 1 km along the sides of the large Parco Cavalieri di Vittorio Veneto (Piazza d'Armi). These cycle-pedestrian paths are quite wide and, although they do not have a clearly marked separation between cyclists and pedestrians, they do not present significant issues of space conflict between the two user groups. Cyclists who follow the side of the park along Corso Galileo Ferraris reach the bicycle overpass at Corso Bramante at the end of the green area, reconnecting to the bike lane along Via Nizza. Those who follow the opposite side of the park, along Viale IV Novembre, continue onto Corso Tirreno. A smaller number of cyclists reach the Economics and Management Campus via Corso Unione Sovietica, Via Tunisi, or the bike lane on Via Giordano Bruno. The latter also take the Corso Bramante overpass and then the bike lane along Via Nizza. It is therefore not surprising that, between the two entrances to the Economics and Management Campus, cyclists tend to use the Via Filadelfia entrance more than the main entrance on Corso Unione Sovietica.
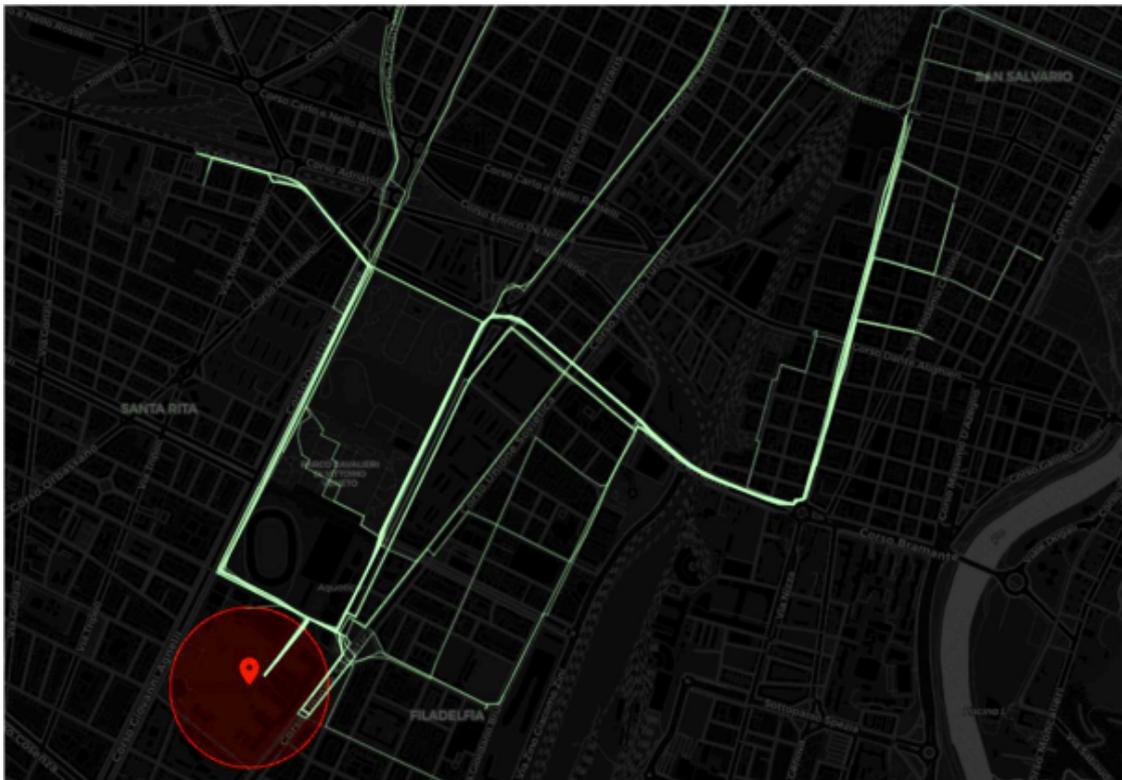
Figure 39: Most frequently cycled streets around the Luigi Einaudi Campus

Cycle path Via Filadelfia

The bike lane on Via Filadelfia, in the stretch closest to the Campus, runs along the road that separates the university from the Olympic Stadium. Around the stadium area, there are fences that can be closed during sporting events.
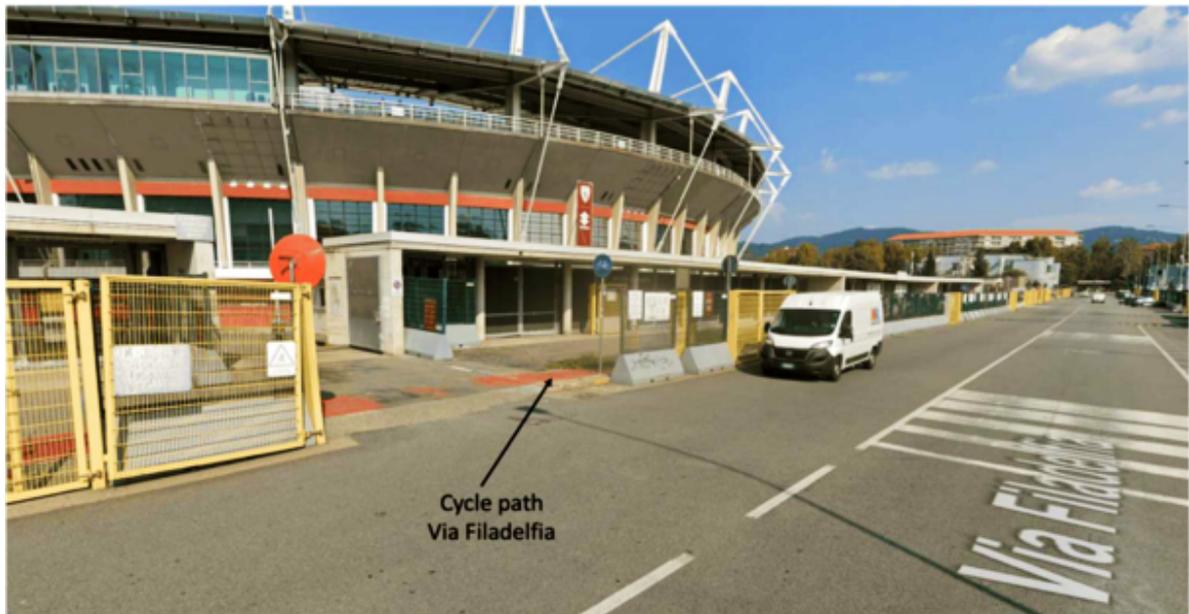
Figure 40: Via Filadelfia cycle path

These fences separate the road from the bike lane, and cyclists often cross Via Filadelfia diagonally to reach the road leading to the Campus entrance (Figure 41). This crossing is not safe, as there is no dedicated signage and the fences obstruct drivers' visibility of cyclists.
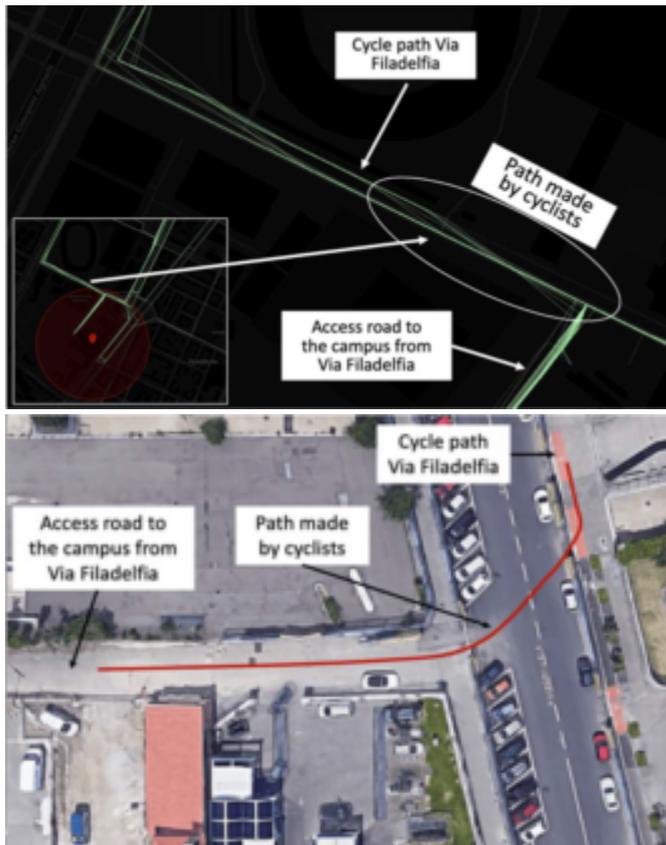
Figure 41: Cyclists crossing in via Filadelfia

As part of a project to improve connections between the railway stations and the university campus, the City Council and the Metropolitan City of Turin are currently carrying out the redevelopment of the Via Filadelfia cycle path.

The redevelopment work involves resurfacing the track from Via Giordano Bruno to Corso Siracusa and includes widening the track, adding landscaping and ensuring the crossings are safe. Ideally, a solution should be found to enable safe crossing of the street from the cycle track to the access road at the rear of the university campus.

As part of the improvements to the Via Filadelfia cycle lane, work is also planned at the intersection with Corso Unione Sovietica (Piazzale di San Gabriele da Gorizia). It would also be desirable to create a 200-metre cycle lane leading to the main entrance of the Economics and Management campus (Figure 42).

Figure 42: Suggested new cycle stretch for the Economics and Management Campus

3.1.3. University of Coimbra

This study describes cycling infrastructures in Coimbra in relation to the main travel demand patterns of cyclists and pedestrians from MUV challenge. Coimbra is exceptionally well-organized around four main university campuses (Polo I, Polo II, Polo III, and the Sports Faculty); the identified routes are spread throughout the city. These routes were determined using GPS traces collected during the MUV mobility challenge from a gamification perspective. The routes identified represent one of the first studies of real demand for active modes in a country where the modal share of cycling does not exceed 1% in most cities. However, as Coimbra's central area has the potential to become a 15-minute city, pedestrianization is particularly important, accounting for around 13% of Coimbra's modal split.

Therefore, we assumed that almost all identified routes are used when one of the university's Polos is in use. Recently, the city has been experiencing the effects of constructing a new metro bus line (BRT), but this has not yet resulted in a substantial modal split favoring active modes. In any case, Coimbra has been constructing various cycle lanes throughout the city.

The data was collected during two periods of participation in the mobility challenge: the first (February-March 2024) and the second (March-April 2025). This study examines data restricted to walking and cycling.

This study provides information about recorded routes in the central areas of Coimbra, without specifying whether one of the polos is the destination, assuming that these paths are included within the radius of influence of those polos. The maps clearly show the roads most commonly used for both modes, which are analyzed briefly ahead.

This study also suggests infrastructure modifications along these routes to enhance safety/quality for cyclists and pedestrians.

Coimbra University Campuses

Modal share

A previous report concerning the city of Coimbra and based on a mobility survey done in 2006 - for the planned system of Coimbra Light Rail – contains similar information for university students (including Polytechnic and University of Coimbra): car (20%), walking (54%), bus + train (25%) and taxi (1%). However, the global modal share for the City of Coimbra presented in this 2006 study is car (69%), walking (12%), bus + train (18%) and taxi (1%). Therefore, sustainable mobility at the University of Coimbra did not significantly evolve during the last 15 years. In 2022, the Portuguese Sustainable Campus Network (RCS) promoted a survey about Sustainable Mobility in Higher Education in Portugal developed by the RCS working group on Mobility. The survey results show that the modal share for the University of Coimbra users: car (69%), car passenger (4%), walking (13%), bus (13%) and train (1%), with no relevance for the bicycle. A similar situation can be observed at the Coimbra Polytechnic Institute users: car (55%), car passenger (5%), walking (26%), bus (10%), train (3%) and motorcycle (1%). However, concerning the possibility of a modal change to the bicycle, 11% of the respondents at the University of Coimbra and 8% at the Coimbra Polytechnic Institute are willing to use it. However, the panorama in Coimbra is about to change with the new BRT line and many cycle lanes, existing or to be built. There are also several projects to improve pedestrian safety.

Existing cycleways

There are several cycle ways in Coimbra, already built, as it is possible to check in Figure 43.
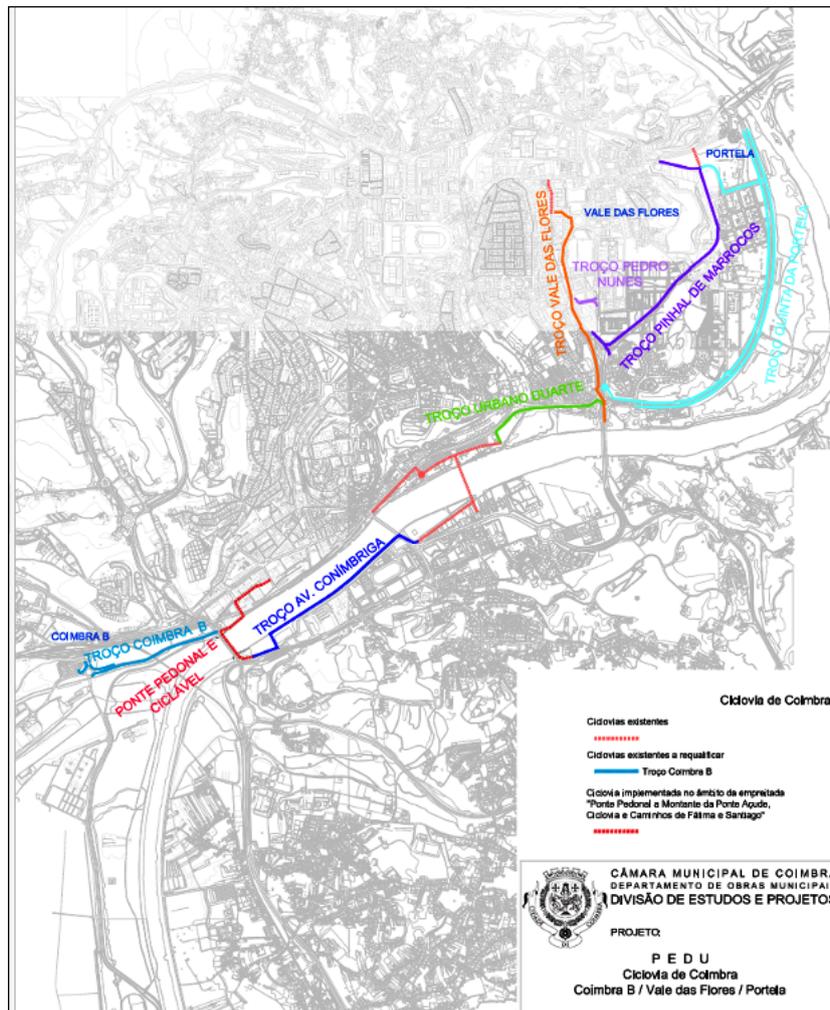
Figure 43: Existing Cycleways in Coimbra (source: Coimbra City Council, 2025)

These cycleways represent quite an interesting offer for connecting the main collective transport terminals, the university campus (namely with PoloII), and residential areas, all in the lowest slope areas, close to the river Mondego. All these sections suffer from gaps in their connections, conflicts with road traffic, and conflicts with pedestrians. However, they started to be used recently.

« Troço Coimbra B » – It is used for connections with the central station (Figure 44).

Figure 44:' Troço Coimbra B '(source: Ribeiro, 2025)

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Recently it was built a continuity for this section, close to the river (Figure 45).

Figure 45: Contiguity for section 'Troço Coimbra B '(source: Ribeiro, 2025)

« Troço de Conimbriga » – Close to the river, it serves the Sports Faculty. Some sections have strong conflictss with traffic and pedestrians, and the pavement is sometimes inadequate (Figure 46).

Figure 46: Troço de Conimbriga (source: Ribeiro, 2025)

85

« Troço de Urbano Duarte » – Between this section and the continuity of the 'Troço Coimbra B' is the Green Park 'Parquer Verde Mondego'. It might be seen as a continuity, but the pavement is not adequate inside the park (Figure 47).

Figure 47: Troço Urbano Duarte (source: Ribeiro, 2025)

« Troço Vale das Flores » – This section represents a good example inside a residential area and along with green parks. There is special care in the crossings with traffic roads (Figure 48).

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Figure 48: Troço vale das Flores (source: Ribeiro, 2025)

« Troço Pinhal de Marrocos » - This area suffers from several problems. Some roads are steep, and the pavements are sometimes inadequate. However, crossing is adequate in most cases (Figure 49).

Figure 49: Troço Pinhal de Marrocos (source: Ribeiro, 2025)

'Troço da Portela' – This cycle lane serves directly the POLO II of the University, the onlyone that does not have the problem of too steep roads (although some roads clime a bit inside the Polo II) (Figure 50).

Figure 50: Troço da Portela (source: Ribeiro, 2025)

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In addition to cycle lanes, the city council has implemented some bicycle parking all around Coimbra city (see Figure 51).
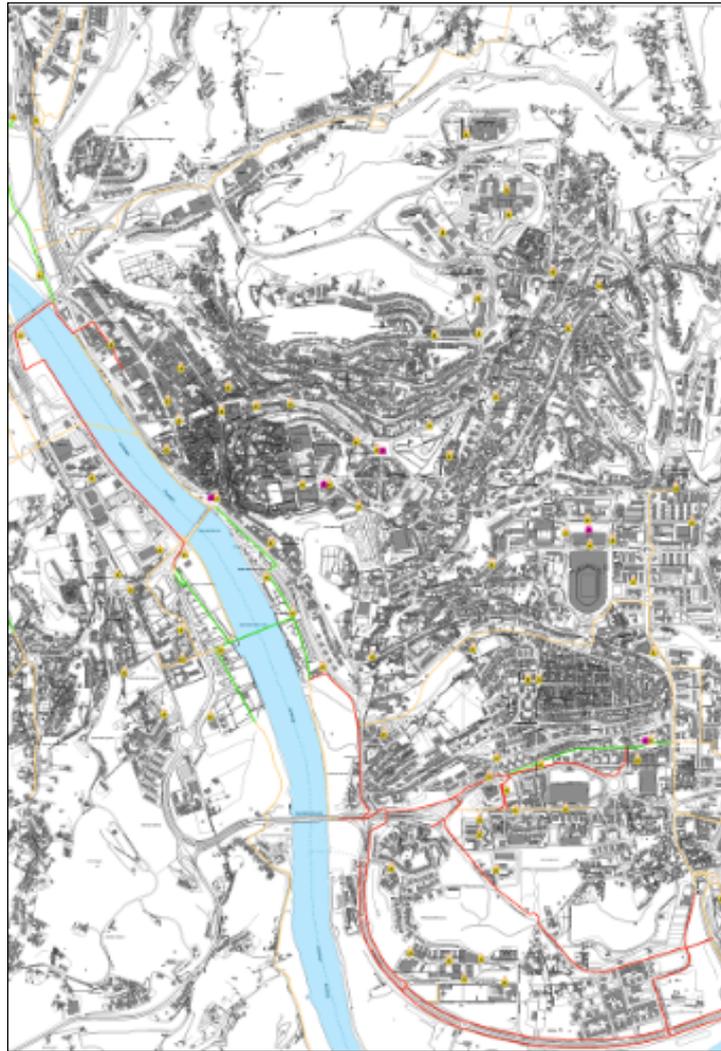
Figure 51: Existing cycleways and parking for bicycles (source: Coimbra City Council, 2025)

MUV Challenge results

This study accounted for active mobility, namely walking and biking (including electric bikes).

As can be seen in Table 5, most of the recorded trips are related to walking. On average, walking trips were 1,64 km in distance and 31 minutes in time, while bike trips were 5,41 km in distance and 25 minutes in time. This is related to the usual threshold acceptance for these trips, both in time and in distance (walking, 1,2km, and biking 5 km).

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Table 5: Trips recorded in Coimbra though the MUV challenge

	AVERAGE DISTANCE (KM)	AVERAGE TIME	NUMBER OF TRIPS	%
ALL MODES	1,94	00:31:26	5115	
WALKING	1,61	00:31:58	4664	91,2
BIKE	5,41	00:25:25	404	7,9
BIKE ELECTRIC	5,34	00:29:24	47	0,9

Of the recorded active mobility trips, 4664 represent walking (91%), 404 biking (8%) and 47 (1%) bikeelectric (Figure 52).
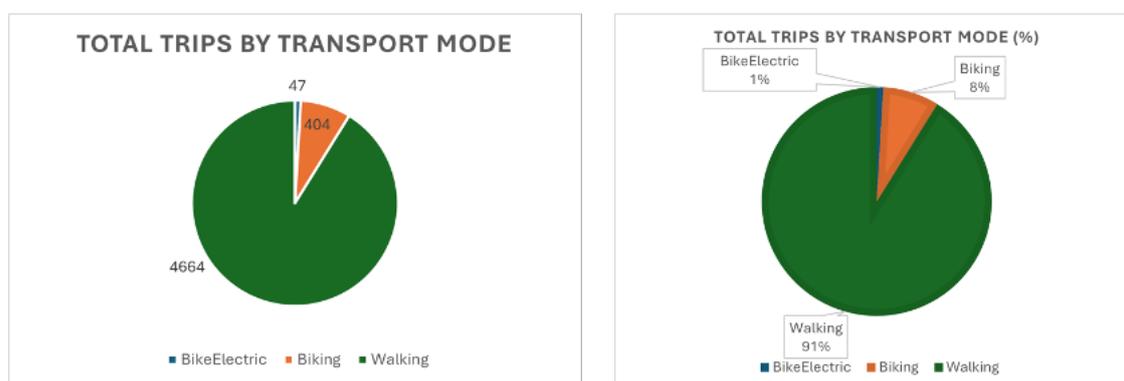
Figure 52: Active Modes Mobility share

As Figure 53 shows, there is a relationship between the number of active trips recorded, the University Campuses in Coimbra, and existing cycleways.
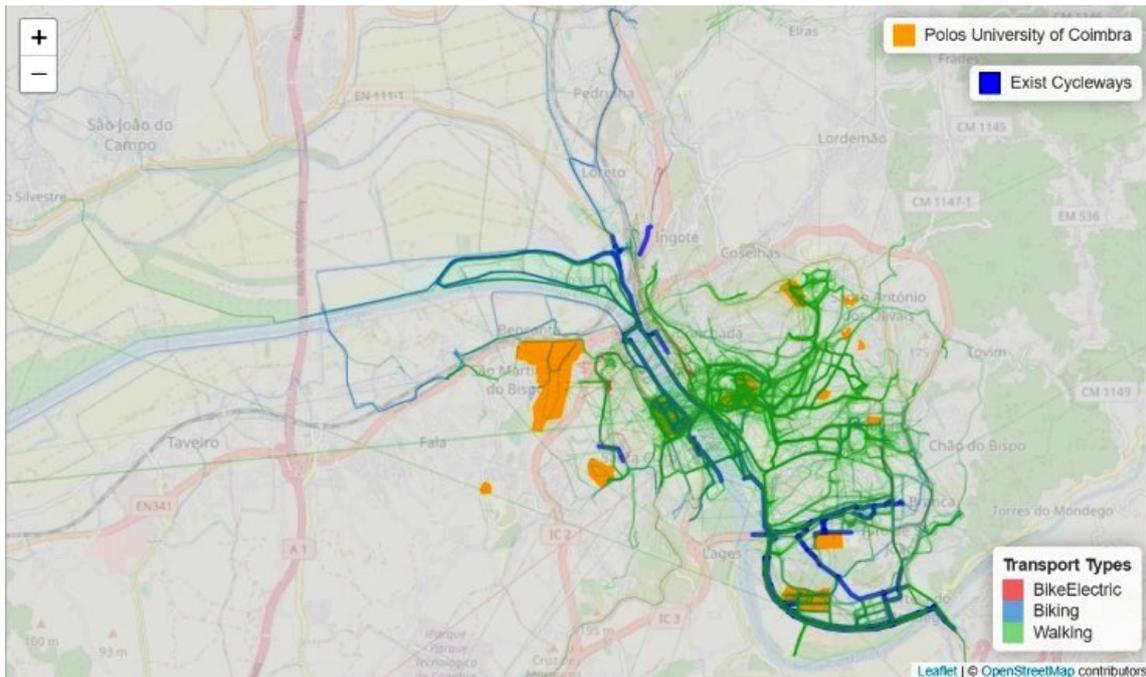
Figure 53: University campus, existing cycleways and Muv recorded trips(source: MUV-B Corp, 2025. Map elaborated by Maria João Beirão).

Looking at the active modes trip types recorded (points), walking is mainly observed in the central city area, as happens with the electric bikes. Biking shows some more extensive trips (Figure 54).

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91

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Figure 54: Muv recorded trips (source: MUV-B Corp, 2025. Map elaborated by Maria João Beirão)

Figure 55: MUV recorded trips (left biking, right walking) (source: MUV-B Corp, 2025. Map elaborated by Maria João Beirão)

By observing biking and walking separately (Figure 55), it is possible to state the apparent influence of the existing cycleways on biking, namely between central areas and collective transport terminals and Polo II of the University (polo II and

Polo II are in high wills and therefore there are no while walking is spread all around the city, namely around all the university campuses.

<u>Infrastructural Suggestions</u>

The Coimbra cycling network has been implemented for several years.

There are still several gaps, mainly in their aspects:

·   Continuity of the network;

·   Pavement;

·   Relation with pedestrians and traffic

To overcome these difficulties, we must promote continuity, address pavement issues, and, above all, establish a comprehensive network that is properly organized to solve conflicts between traffic and pedestrians.

The Coimbra City council is paying special attention to this, promoting a future cycling network that includes a system of electric bicycles to overcome slopes – this is particularly mandatory for Polo I and III of the University of Coimbra.

The design of the municipality's cycle route network must integrate with the existing and planned pedestrian and road networks, establishing links to public transport, facilities, and public spaces.

Of great importance to the successful use of the infrastructure is that the network meets cyclists' requirements and expectations, as outlined in the Portuguese Normative Document for application to urban streets.

In conclusion, the University of Coimbra's experience within the 3Cs project demonstrates both the barriers and the possibilities of active mobility in cities with high car dependency. Through integrated efforts—upgrading infrastructure, fostering cultural change, securing political endorsement, and leveraging public–private partnerships—UC is gradually transforming itself into a reference for sustainable university–city integration in Portugal and across Europe.

3.1.4. University Camilo José Cela

The study of the UCJC is focused on the two main campus: Villafranca del Castillo, and Madrid-Castellana.

Villafranca Campus

Situated on an area of 100,000 m², the Madrid-Villafranca campus is located in the Villafranca del Castillo development, which is part of the municipality of Villanueva de la Cañada. The urbanization has only two entrances, both for

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93

motorized traffic and active mobility: one from the north, from the road connecting Majadahonda and Villanueva del Pardillo, and another from the south, from the road connecting Majadahonda with Villanueva de la Cañada. It is a predominantly residential neighborhood with single-family homes on large, independent plots and high incomes.

The campus' location, far from urban areas with larger populations and access designed only for motorized transport, reduces the possibilities of walking to the campus in a reasonable time. Therefore, the pedestrian trips that occur to access the campus are the initial or final journeys of people using public transport. There are several bus lines that connect the campus with the city of Madrid and the most important neighboring municipalities. We can differentiate between the lines that pass through the Villafranca urbanization and a stop at the main entrance to the campus (less than 300 meters away).

Constraints for Cycling

Due to the location, mobility model, and infrastructure design, the current use of bicycles to access the campus is minimal. The areas near the campus are few and of relatively low density, with high-capacity infrastructures designed for motorized traffic dominating the territory, and the terrain is hilly.

There is no specific bicycle infrastructure either on the campus or nearby, although there are several paths that are theoretically suitable for cycling. As shown in the following figure, within a 3 km radius, there is no cycling route to facilitate access to the university campus. Some surrounding municipalities have implemented dedicated cycling paths, but these are not part of a network; some are isolated segments, while others are leisure-oriented and not very functional for daily commuting.

Additionally, the cyclability of the main access roads to the campus/Villafranca urbanization (M509 and M503 roads) is very low, given the high traffic volumes and speeds, and the design of the main intersections (large roundabouts) is very dangerous for cycling.

An added problem is that paths crossing the territory, which could theoretically facilitate access to the campus, have been closed for public safety reasons.

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Figure 56: Bicycle Infrastructure Around the Villafranca Campus.

Additionally, the nearest railway stations are quite far away, and, combined with the lack of good bicycle infrastructure, this discourages intermodality between the train and the bicycle.

Figure 57: Distances from the Villafranca campus to nearby train stations

Main Bicycle Trips

According to the MUV survey, there is only one recorded journey: a trip of just 900 meters originating from the urbanization itself. This suggests that either the person lives there or uses a car or bus for the main part of the journey and then cycles around the campus.

Figure 58: Main bicycle routes around the Villafranca campus according to the survey conducted

The only positive aspect regarding current cyclability is that the internal roads of urbanization are quite favorable, as they have little slope and low traffic volumes and speeds. Therefore, even though there are no specific segregated bicycle lanes, sharing the roads can be considered safe, comfortable, and attractive.

Proposals to Improve Cyclability

To enhance cyclability, the following measures are proposed:

- Implement segregated bike lanes along all main access routes to the campus (Alberto Alcocer Street, Sor Ángela de la Cruz Street, Bravo Murillo Street, Príncipe de Vergara Street, and Avenida de Concha Espina).

- Extend the segregated bike lane on Paseo de la Castellana further south and toward Chamartín Station.

- Continue the bike lane on Avenida del General Perón through Ávila Street.

- Install bicycle parking facilities in front of the university campus.

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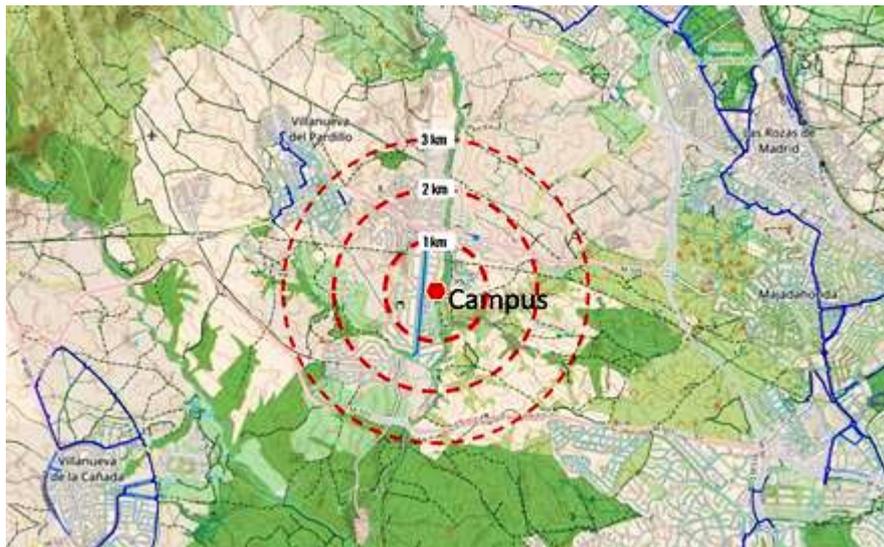CYCLING CAMPUS & CITY

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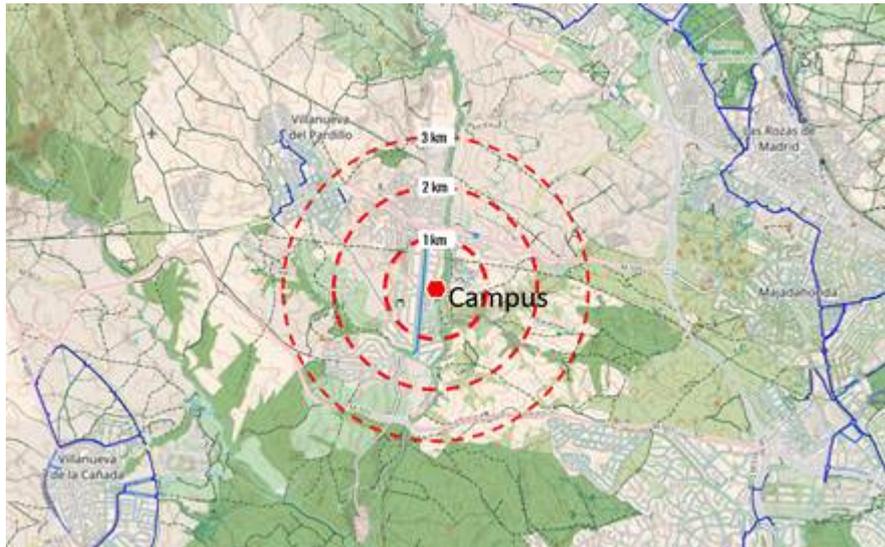
Figure 59: Bicycle Infrastructure Around the Villafranca Campus.

Additionally, the nearest railway stations are quite far away, and, combined with the lack of good bicycle infrastructure, this discourages intermodality between the train and the bicycle.
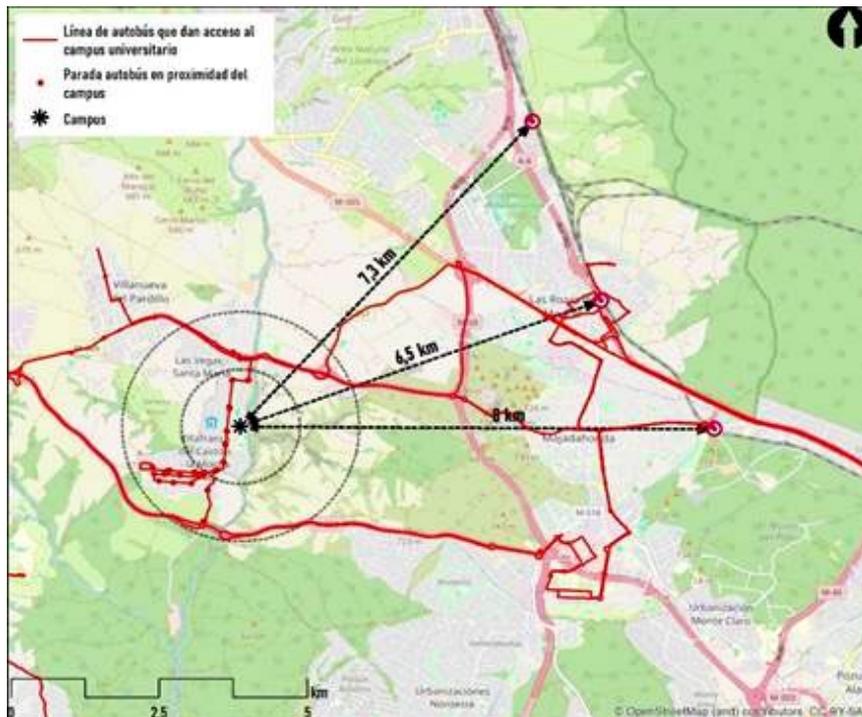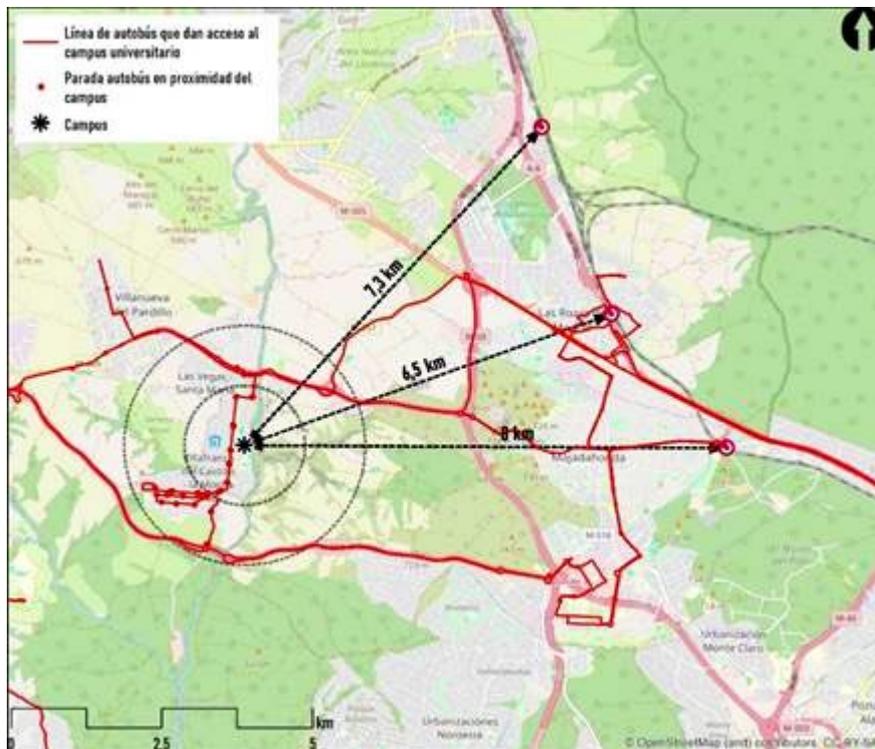

Figure 60: Distances from the Villafranca campus to nearby train stations

Main Bicycle Trips

According to the MUV survey, there is only one recorded journey: a trip of just 900 meters originating from the urbanization itself. This suggests that either the person lives there or uses a car or bus for the main part of the journey and then cycles around the campus.

Figure 61: Main bicycle routes around the Villafranca campus according to the survey conducted

The only positive aspect regarding current cyclability is that the internal roads of urbanization are quite favorable, as they have little slope and low traffic volumes and speeds. Therefore, even though there are no specific segregated bicycle lanes, sharing the roads can be considered safe, comfortable, and attractive.

Proposals to Improve Bicycle Access to the University Campus

As explained in the previous sections, measures to improve bicycle accessibility should focus on enhancing connections from outside and linking the campus with the existing or planned cycling network. A priority measure should be to connect the university campus with the urban centres of Villanueva de la Cañada and Villanueva del Pardillo, as well as with the Alfonso X El Sabio University located in the same municipality (connections 1, 2a, and 2b).

Figure 62: Proposed cycling routes to enhance bicycle access to the campus

Connection 1 uses a series of existing paths in the area, including a trail called "Senda Botánica La Vilanosa," which crosses the Aulencia River and connects both urban centres. To enhance bicycle use, it is advisable to improve certain aspects such as the pavement and remove steps or other irregularities along the path.
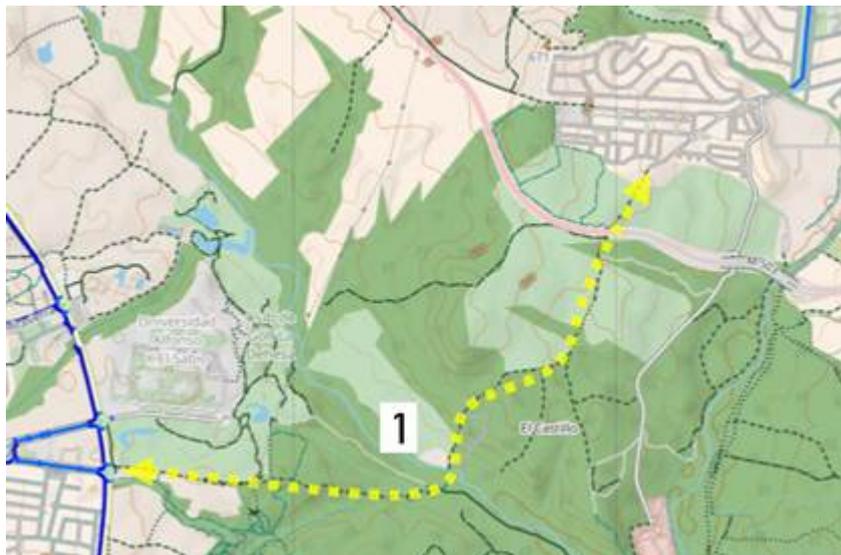
Figure 63: Indicative route of itinerary 1 (connection with Villanueva de la Cañada)

Connections 2a and 2b have been partially addressed in the section on pedestrian accessibility. These involve improving the routes that connect with the

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99

urban centre of Villanueva del Pardillo. It is necessary to enhance aspects such as lighting, pavement, and providing shade (a row of trees) to improve the cyclability of these routes and create new access points to the urbanization.
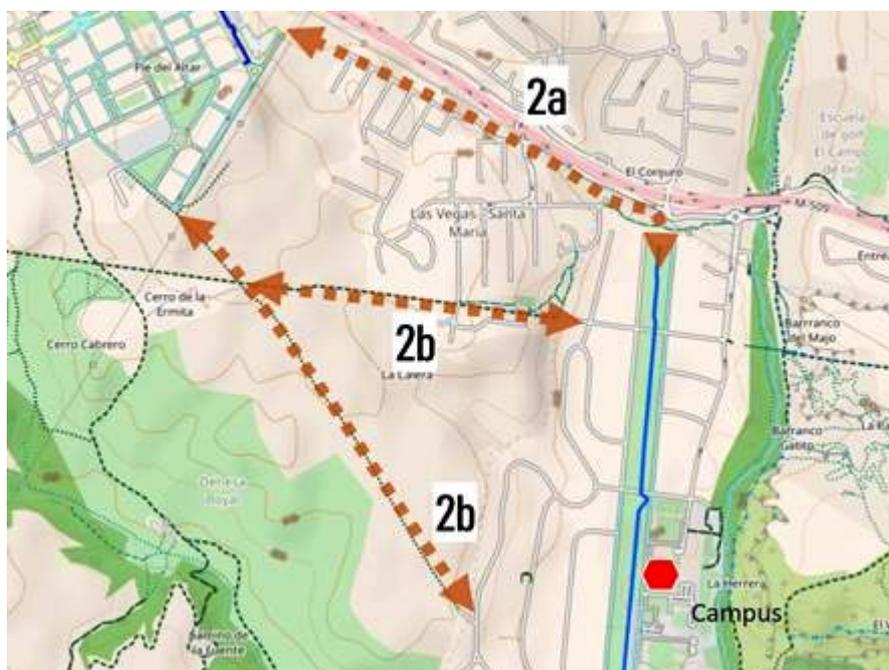
Figure 64: Proposed cycling routes to access the urban centre of Villanueva del Pardillo

Castellana Campus

The Castellana Campus of Camilo José Cela University is located at 4 Juan Hurtado de Mendoza Street, next to Paseo de la Castellana, between Cuzco and Plaza de Castilla. The building has four floors and a surface area of approximately 11,300 square meters. Due to its central location in the city of Madrid, the campus has excellent public transport connections: within a 1 km radius, there are 6 metro stations from three different lines (1, 9, and 10), and within a 500-meter radius, there are 27 bus stops. Finally, the commuter and train stations of Nuevos Ministerios and Chamartín are located 1.5 km away.

Additionally, nearly 690,000 people live within a 3 km radius[13], which means there is significant potential for accessing the Castellana campus on foot or by bicycle.

Constraints for Cycling Access

Although the university campus is located in a central area of Madrid and close to high-density residential neighborhoods, the facilities for accessing it by bicycle are limited. This is partly due to the high volume of car traffic in the area, the

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13 "Calculation carried out through the 'Tom Forth' website."

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speed of motorized traffic on certain roads, and the lack of a complete cycling network in the city center. As shown on the map, segregated bike lanes exist only along certain sections of the main road network, despite the fact that traffic volumes on these roads are generally very high.

Figure 65: Existing cycling infrastructure in the area

Most of the cycling "infrastructure" consists of shared lanes with motorized traffic, where the speed limit is set at 30 km/h and horizontal road markings indicate the possible presence of cyclists.

Figure 66: Road marking of the shared lane and segregated bike lane on Paseo de la Castellana
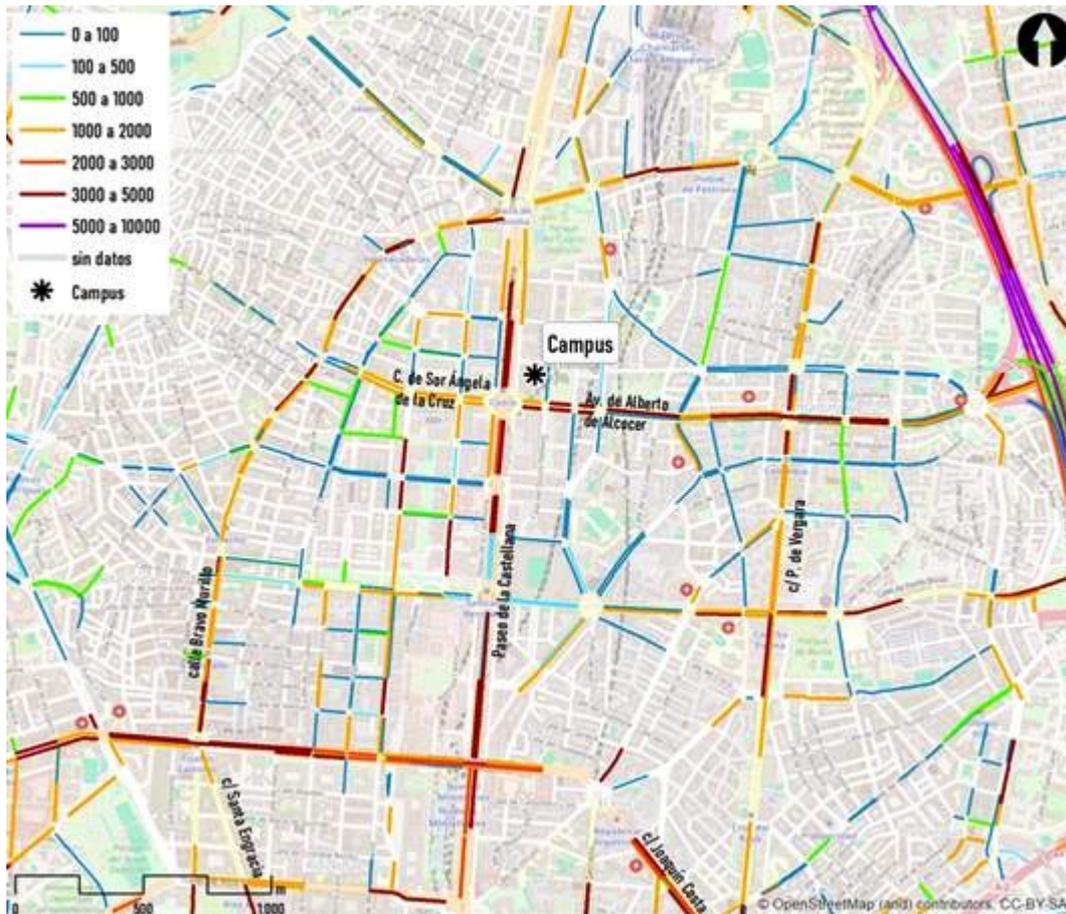
Figure 67: Average hourly motorized traffic volumes in the area.
Source: Madrid City Council, 2023 data

According to the MUV survey, most trips are concentrated along the Castellana axis and the East/West axis of Alberto Alcocer Street and Sor Ángela de la Cruz Street. The results show that most cyclists use the main roads to access the campus despite the obvious drawbacks (lower safety, pollution, and noise). This may be explained by the fact that riding along main roads is faster, orientation is easier, and there is less disruption from the one-way systems that are more common on local streets.

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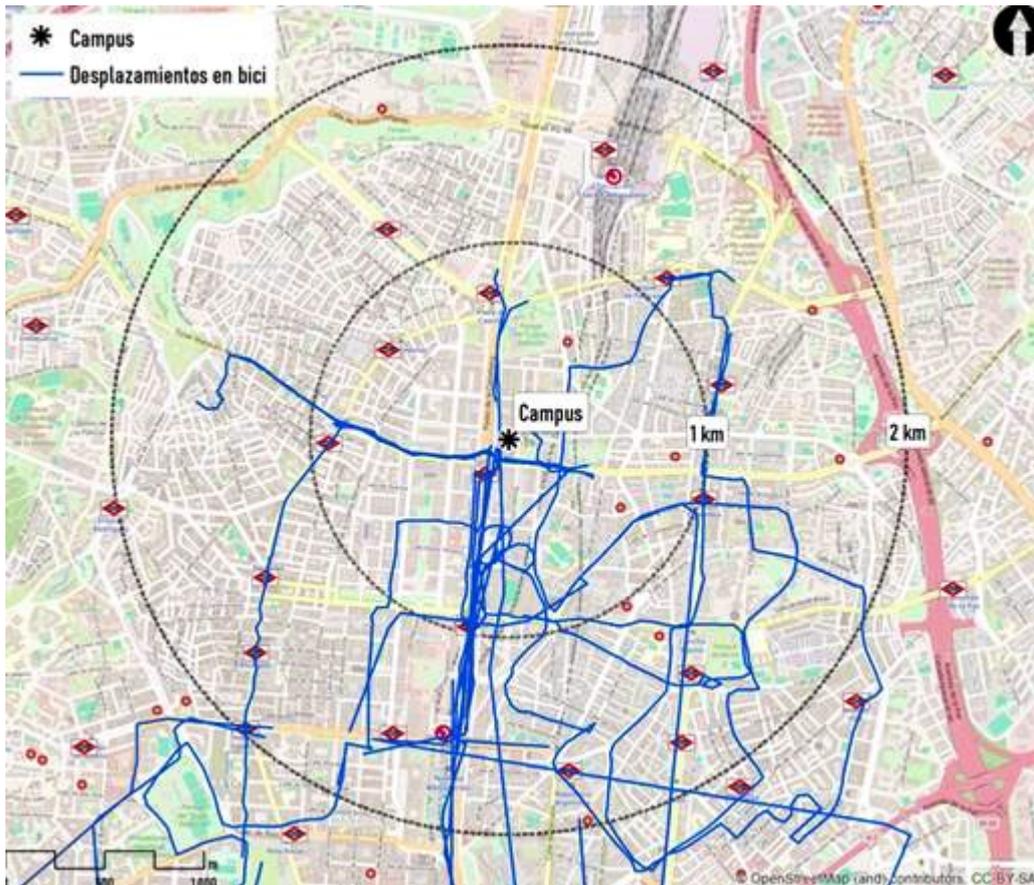
Figure 68: Cyclist movements near the Castellana Campus

Cyclability Analysis

The cyclability analysis focused on the North/South axis of Paseo de la Castellana and the East/West axis of Alberto Alcocer Street and Sor Ángela de la Cruz Street.

The main issues identified are:

- Noise and air pollution.
- Unfavorable traffic light regulation at some intersections.
- Narrow sidewalks in certain sections.
- Loss of recreational quality of Paseo de la Castellana towards Plaza de Castilla (discontinuity of the central promenade).
- Barrier effect of the Cuzco roundabout.

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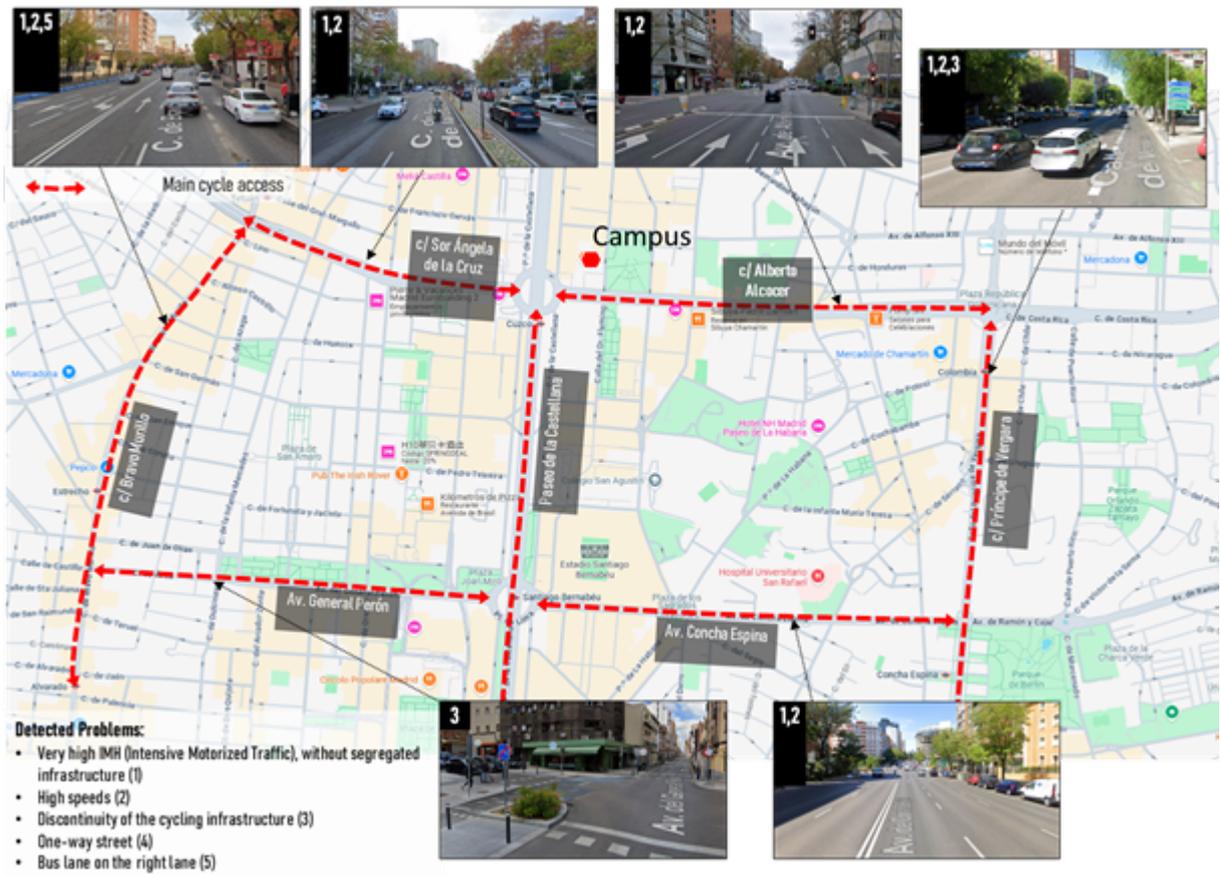
Figure 69: Identified issues along the main access routes to the Castellana Campus

3.2. Perceptions and attitudes of cyclists

A small section of Survey 1 was devoted to explore the subjective perceptions that inspired or motivated people to make certain decisions about active mobility adoption/non adoption. For example, non-users of active mobility were invited to select the main reasons for this choice among a pre-made list of ten items, resulting in the distribution depicted in Figure 68.

The comfort that a car should provide is the top reason in Madrid and Coimbra (over 80% of the Spanish sample agree on that), while it keeps only half such importance in Montpellier and Turin. Of course it could be noted that you need the "comfort" of a car just because traffic is chaotic and dangerous due to having too many cars around… so this looks very much like a vicious circle.

If comfort if widely considered the most important positive factor about cars, what follows in the list are the perceived advantages of public transport: namely, affordability and speed. These can vary significantly from place to place, but they look at their best in Montpellier, where they motivate nothing less than 85% of those not using active mobility. Madrid public transport is a close second on this

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too (73%). However, the exact figure drops down to little more than 50% in Coimbra. Having noted the perceived comparative advantages of the main modal alternatives, what follows are the (perceived) difficulties of active mobility in itself: physical effort causes excessive perspiration; it is slower and exhausting. These three items get about 50% of the votes everywhere, with predictably the highest rate in Coimbra (the hilliest of the four). The position of Coimbra is a bit critical as well on the issue of the car being "cool": there is still a surprising 40% that has such a feeling, while in Turin and Montpellier it is just a small ten percent.
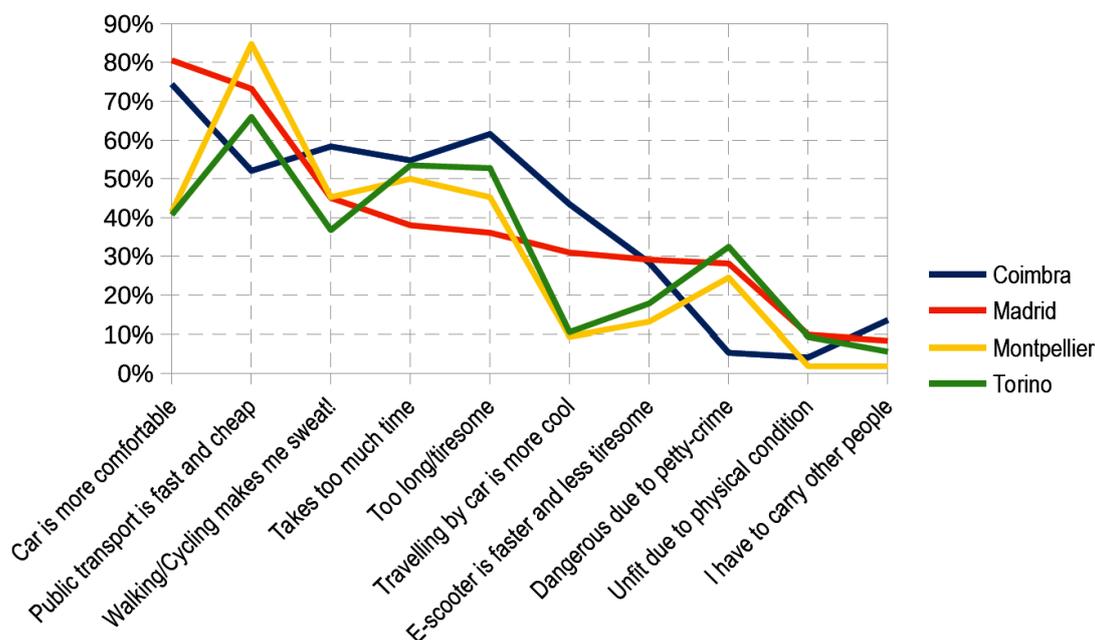
Figure 70: Factors discouraging active mobility - Survey 1

Next, the same subgroup was asked to evaluate the importance of a series of factors in pushing people to shift their modal habits towards active mobility. This time the response was not just a bivariate Yes/No, since the question entailed the choice of a level of importance/urgency for each item. To obtain a synthesis similar to the previous one here it will be necessary to convert the Likert ordered scale of importance assigning numerical values to be able to compute averages:

Totally unimportant = 0

Not important = 1

Quite important =2

Very important = 3

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With this preparation, Figure 69 shows what would constitute the better incentive to cycling in the four academic communities. A first general observation is that Coimbra seems more interested in all incentives than people from the other city, while Montpellier, at the opposite extreme, has a generally lower curve. This could indicate that, in general, Portuguese in the sample are more in need of incentives to make switch to bike mobility.

Regarding instead the relative position of the single items submitted, people everywhere look out for solid, infrastructural improvements first: protected cycle paths, but also cycle lanes, with due importance also to the "greener" routes (especially in Coimbra); immediately after those, the tangible, personal economic incentives both in the shape of initial bonuses for the purchase, as well as the small contributions linked to the length of the routes done by bicycle.

Figure 71: Importance of possible incentives to cycling - Survey 1

Given the relatively limited sample size for Survey 2, with a very small number of responses for some cities, the subgroup of cyclists will be treated as a whole, dropping the distinction between the four cities. This is unavoidable, as proceeding as before would result in local distributions based on only a handful of observations, rendering them fully unreliable.
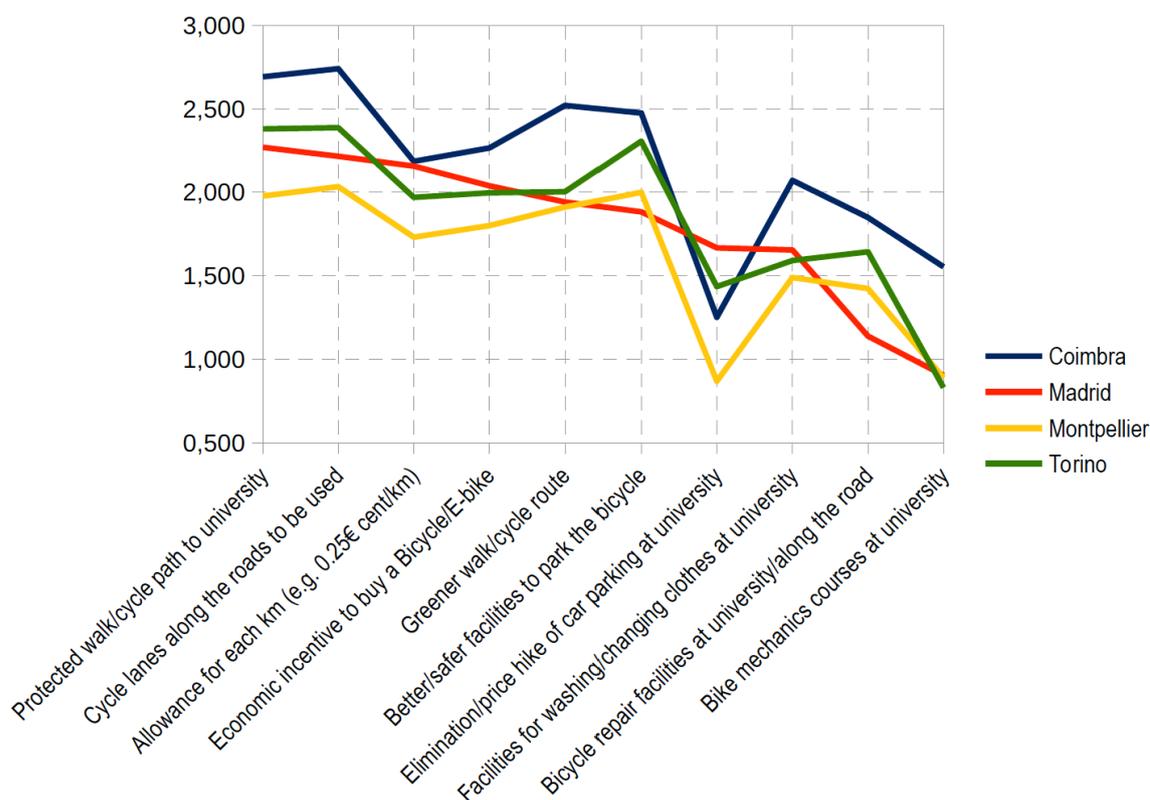
What are the maximum distances typically covered by cyclists? The average in kms. is slightly more than 10 kms. when riding to reach places, do things, etc., while this goes up to 39 kms. for rides that have a leisure/sport logic. Using an approach similar to that used for walkers, we submitted a list of statements under the general question "Does your decision to cycle when going somewhere depend on…?", and asked respondents to tick all that applied to their own case. Results are reported in Table 6, and coupled with the corresponding items submitted to walkers. This comparison allows us to spot similarities and differences: the sustainable nature of the choice is much more apparent to cyclists; the same holds true for the safety and quiet of the route. On the contrary, petty crime is much more of a problem for walkers than cyclists, as is the case for the agreeableness of the surroundings. Other factors matter to both camps, in addiction to the distance to cover, but also the healthy nature of active mobility.

Table 6: Does your decision to cycle when going somewhere depend on… - Survey 2

	Cyclists	Walkers
the distance to cover	70.3%	71.1%
the fact that is environmentally friendly	61.8%	38.4%
how safe is the route in terms of bicycle lanes/paths, intersections, traffic lights	56.8%	28.8%
the fact that it is healthy	51.7%	49.7%
the fact that it is cost-free	48.9%	34.1%
how quiet is the route in terms of traffic congestion	47.9%	29.9%
if it is dark or daylight	25.6%	42.8%
how safe is the route from petty crime	23.3%	49.2%
whether the route is flat	19.9%	16.2%
how green are the surroundings I have to go through (gardens, parks, countryside)	17.7%	29.7%
in the city, how lively is the neighbourhood you go through (shops, cafes and restaurants, other cyclists)	12.0%	31.0%

As respondents are aware of the health benefits of active mobility, let us check in detail the reaction of cyclists to the same aspects of this topic submitted to walkers. Table 7 reveals that cyclists are also generally more willing to stress the health benefits of their active mobility, as all percentages are larger for them than for walkers, with the strength of leg muscles enjoying 21 percentages point more for cyclists.

Table 7: Do you feel you get clear, perceivable health benefits
from your walking activity? - Survey 2

	Cyclists	Walkers
I feel more satisfied psychologically when I walk than when I move around by car or other sedentary means	77.3%	65.6%
It's just a feeling of general well being	68.1%	61.6%
I have stronger leg muscles	56.5%	35.9%
I feel less tired when doing any physical efforts	36.0%	34.8%
I breathe more easily	36.0%	23.6%

Further explorations were made for cyclists in Survey 2. First, the exact type of bikes owned were recorded. In Table 8 percentages do not sum up to 100, since individuals could own more than one type of bicycle. A small proportion (1.9%) even declared to own no bike at all, so we can assume they are cycling with those available through bike sharing services. Notwithstanding the huge market growth for e-bikes in recent years, their share is still relatively small here; this is linked to the prevalence of students in the academic community, a group that in most cases lacks the budget needed for their purchase. This is confirmed by the information regarding the value of the bicycles used for commuting to the campuses: for students, the average price is around 180€, while for personnel (including teaching and technical-administrative staff) it goes up to over 600€.

Table 8: Types of bicycle owned by respondents - Survey 2

Bicycle type	Owned by...	Bicycle type	Owned by...
City bike (with gears)	42.3%	Gravel bike	6.9%
Mountain bike	31.5%	E-city/travel e-bike	4.4%
City bike (no gears)	30.0%	E-mountain bike	2.2%
Road sport bike	17.4%	None	1.9%
Folding bike	7.9%	E-folding bike	1.3%

A total of 8% ownership of e-bikes, however, is on the increase when compared to data from previous years. Figure 72 show the distribution of approximate prices of the bicycles used for home-to-university travel6. It is clear that very cheap bikes are prevalent, but the right tail is still significant, due to the much more expensive bicycles owned by some of the staff.

The issue of the economic value of bicycles brings us to the related phenomenon of bike theft, an issue that plagues more or less all major cities. In fact, bicycles are much coveted by thieves since they are not registered in any way and thus it is generally difficult to recover a stolen one, proving that it was your own property.

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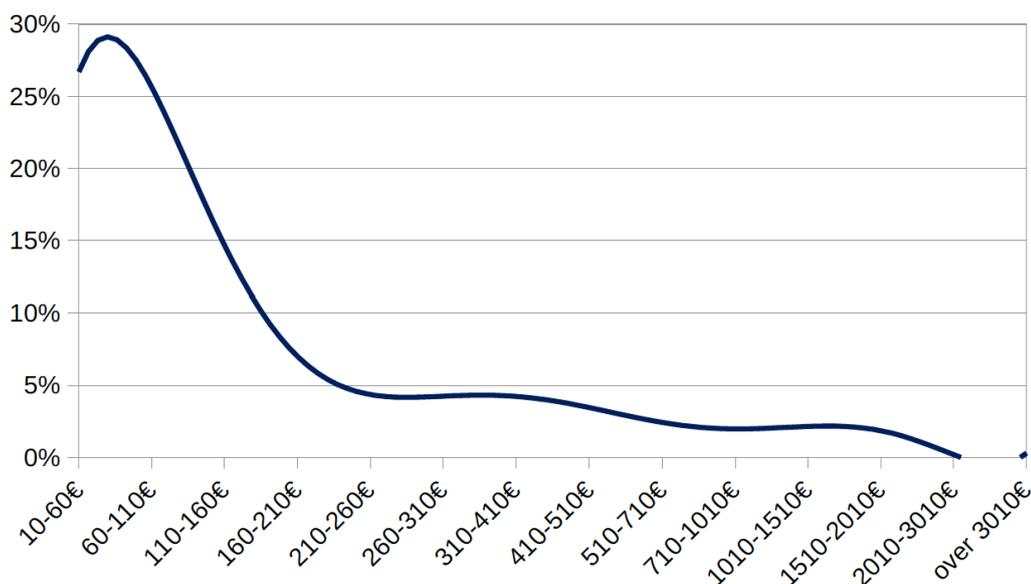
Figure 72: Approximate price of bicycles used in commuting - Survey 2

On this issue, respondents were asked to evaluate the risk of theft in/around the campus, and to indicate whether they had actually been a victm. Both answers are reported in Table 9.

In the first, the goal was to understand if campuses were at-risk location, and in this case, whether the situation was even worse than elsewhere around the city. Fortunately only a minority (6.6%) feel that is the state of things, but a much larger proportion do not feel any more secure than other places. In other words, some 60.7% of the university community coming by bike to campuses do not find them to be a safe haven for their two-wheeler. And this is justified by the alarming rate of larceny in or around campuses, where a total proportion 23% have seen their bikes disappear at least once. There are quite good reasons to commute using very cheap one, therefore.

Table 9: Bicycle larceny at university - Survey 2

Do you feel parking the bicycle at university is safe from theft?	%	Has your bicycle ever been stolen while parked inside or around your university?	%
Yes	39.2%	No, fortunately never	77.1%
No, the risk is there, just anywhere else in the city	54.1%	Yes, once	18.8%
No, the risk is even higher than in other places in the city	6.6%	Alas, more than once!	4.2%
Total	100.0%	Total	100.0%

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We can again move from these last considerations to examine another related topic, i.e. bicycle parking settings. This was investigated both at home and at university locations.

In general, we can reasonably say that in Southern Europe parking bicycles in the open along the streets near home, like you would probably do with cars, is considered unsafe and not a good option. The first question submitted was thus investigating what arrangements for keeping the bike at home respondents adopted (Table 10), On this matter a sizeable minority (17.4%) is in distress, a similar proportion has arrangements that make using your bicycle frequently not such an enjoyable experience, being forced up and down stairs with your two-wheeler to put it on the road.

Of course, this could for some people be an obstacle that at least partly motivates *not* using a bicycle, although it is not possible here to infer the relevance of such a disincentive.

Table 10: How do you keep your bicycle(s) at home? - Survey 2

I have a garage/other convenient closed room available and keep it/them inside it	61.2%
I have to take it/them upstairs or downstairs, but I can use a lift	4.4%
I have to carry it/them up/down the stairs	17.0%
I have no safe space and have to leave it parked outside	17.4%
Total	100.0%

At university the situation is somehow better, with only 9.5% of the sample declaring that bicycle parking there is totally left to chance. But then, it would of course be a reasonable goal to bring the 65.8% of cases that can park their bikes inside campuses up to full 100%, as this is a crucial part of a bike-friendly policy. This holds true also for the availability of unoccupied rack, as a sizeable minority (more than 27%) tends to find racks overcrowded when they arrive at their destination.

Table 11: Bicycle parking settings at university - Survey 2

Is bicycle parking available at your university destination?	%	Generally, can you find space for your bike in the racks?	%
No, you have to park outside in the street and there are no nearby bicycle racks	9.5%	No, it's hard to find one since they are normally full or almost full	27.3%
No, you have to park outside in the street but there are nearby bicycle racks	24.7%	Yes, it's always easy to find one	72.7%
Yes, there are bicycle racks inside the university location	65.8%	Total	100.0%
Total	100.0%		

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The last issue about the behavior of cyclist that we consider is the weather, obviously a factor that many feel is an obstacle to systematic bike use. The question was very simple, enquiring whether or not people cycled under the rain. Responses were mixed: a good 45% declared their resilience, confirming the use of bikes when it rained; the remaining 55% indicated a prevailing fallback on public transport (more half of them), or resorting to walk or car (the latter being the smallest group).

Table 12: Do you cycle also in case of rain? - Survey 2

	%
Yes!	44.8%
No, in that case I generally walk	16.7%
No, in that case I generally use public transport	29.3%
No, in that case I generally drive my car	9.1%
Total	100.0%

The last comprehensive topic to be analyzed is the perception on the quality of the bicycle infrastructure in the university city, which was investigated in detail in Survey 2. While cycling paths are recognized as not always being the best - or feasible - solution for any urban environment, they are, of course, important and widely seen as a tangible indicator of a bike-friendly city. Thus, the first request was an assessment of their mere presence, with the result of Table 13.

The split we observe has one third of the sample which finds their diffusion is adequate, while two-thirds think they may be there, but certainly not with the expected density and connections between them.

Table 13: Let's discuss cycling paths in your city. First, are they available? - Survey 2

Statement	%
Yes, a good network of cycle paths is in place	32.9%
Yes, but they are few and far between. There should be more of them	61.7%
No, they are practically non-existent	5.4%
Total	100.0%

However, since almost 95% of the cases do have at least some cycle paths available, it is reasonable to delve deeper into their characteristics. Again, a series of statements were submitted to check which ones were agreed upon significantly. All opinions are summarized in Table 14, ordered by the level of agreement, except the first one, which represents the opinion of a person who is globally happy with the cycle paths features; all others are possible defects.

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Table 14: How do you like the features of the existing cycle paths? - Survey 2

Statements	%
I think they are OK: well made and comfortable to use	**14.8%**
They could be smoother in terms of surface	51.4%
They are not protected enough from abusive car parking	50.5%
There are too many holes and gaps	42.3%
They are too narrow, should be wider	32.5%
They are too jammed with walkers to be of real use when cycling	30.9%
The routes they follow are too convoluted, longer than necessary	18.9%
They are not properly maintained, with dirt and litter accumulating along the way	14.8%
They are so strongly separated from other streets than is is often difficult to access or leave them when you need	12.6%

Fully satisfied opinions are few (around 15%); the most relevant issue with them is the uneven surface (51.4%), a problem that affects the well-being of cyclists much more than of motorists), reinforced by the presence of holes and gaps (42.3%) as well as dirt and litter (15%), all mirroring the insufficient maintenance work being done. The nuisance of larger vehicles parking and obstructing them is a close second (50.5%), In comparison, around 30% of the sample finds them to be relatively narrow, especially when their location makes them busy with pedestrians as well. It must be remembered that when cyclists travel to reach some destination rather than for leisure, speed is a key factor just as it is for any traveller. Finally, some 19% complain also about the routes not being efficient in their length and linearity, forcing the cyclist to make a longer journey than is necessary.

Since a precious complement to any route is the existence of clear indications about its destination, possible detours, intermediate stops, etc., the survey also asked about the presence of signposting along the cycle paths. As documented by Table 15.

Table 15: Is there a reasonable system of signposts to indicate cycle paths, their destinations, distances etc.? - Survey 2

	%
Yes, it is quite easy to go around even if you do not know your way	25.4%
There are some signs but they are few and far between	51.8%
There is no specific signaling, you must know where cycle paths are and where they lead	22.7%
Total	100.0%

Again, results are mixed, as only a quarter of respondents finds the situation to be really satisfactory. The majority acknowledges that some signs are present,

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but is still complaining about their scarcity; and a full 23% finds that signposting is yet to be installed practically from zero.

In conclusion, the vast activity of data collection put in place for the 3Cs project has offered numerous insights on the active mobility perspectives; among those deserving more attention:

- Not everybody owns one or more bicycles nowadays - but the prospects look good, based on the declared purchasing intentions, especially regarding e-bikes, for which a relevant growth is to be forecasted. There is, however, the increased competition of e-scooters to be considered. Also, students tend to use very cheap bicycles if compared with personnel.

- Also, incentives/bonuses to foster bicycle purchase do work.

- Students are not everywhere the keenest bicycle users; in Montpellier and Turin, professors and staff boast a much higher modal share than students.

- Bicycle modal share in university commuting is in fact stronger in those two cities, while remaining relatively low in Coimbra and Madrid.

- The unimodal versus multimodal nature of travel depends significantly on the environment - in vast cities, multimodality is stronger, since distances are often too big to be wholly covered by bike, let alone walking.

- Walking is right now much more widespread than cycling, especially in small cities, where a large share of the community adopts unimodal walking commuting.

- There appears to be no strong substitution effect between bicycle and car: in other words, those who own a vehicle that they could use to commute to university choose the bicycle with an incidence that is similar to those who do not own a car.

- The MUV gamification initiative has met with considerable success, and the indication of participants suggests that at least more careful consideration for active mobility will be triggered.

- Thanks to the recent improvements of the MUV dashboard, requested explicititly by 3Cs, it is now possible to isolate and study all routes to/from a specific location, really helping in identifying the preferred routes to the campuses.

- Regarding the infrastructural issues examined in each city through the Route study and the Survey 2 of the Impact study, the main highlights are:

- Bicycles go where there is a network of itineraries, not isolated ones that force the cyclist to dig into dangerous traffic suddently.

- Cycle paths must be well surfaced and maintained - if the cycle path is full of holes and irregularities, and the road is perfectly even, cyclists will go on the road, or not go by bike at all.

- Cycling routes must be reasonably efficient - if to follow the cycle path you have to lengthen your journey significantly, cyclists will choose the road instead.

- Signposting is essential. Inform cyclist about the destinations they will reach when following a certain route, and how long it will take, and they will be satisfied.

- Bike lanes, i.e., corridors along streets which are not separated from the rest of the road, but just signaled with horizontal painted stripes, are welcome, too. Just make motorists respect them, avoiding systematic invasion both when moving as well as when parking abusively.

- Safe bike parking matters, since one cyclist in 5 has had at least one bicycle stolen, and universities are not exempt from the risk.

3.3. Heath and environmental impacts

The findings of the MUV challenge and the pilot study of the 3Cs project highlight the potential for CO2 (and other pollutants) savings, which promote both individual health improvements and environmental sustainability.

Moreover, the environmental impact is evident in the significant total CO2 savings of 1,049 kg achieved by the four universities through the monthly challenges plus the 523kg of the pilot study. These savings underscore the potential to make a meaningful contribution to reducing greenhouse gas emissions, particularly in urban environments where transportation is a significant source of air pollution (European Environment Agency, 2021). Beyond CO2, the reduced emissions of harmful pollutants such as particulate matter (PM2.5 and PM10) further emphasize the role in improving air quality and public health, particularly in urban areas where vehicle traffic is dense.

Reducing PM2.5 and PM10 levels leads to substantial public health benefits. Lower levels of particulate matter in the air are associated with decreased incidences of:

- Respiratory diseases (e.g., asthma, bronchitis, COPD),

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114

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- Cardiovascular diseases (e.g., heart attacks, strokes),

- Premature mortality, especially among vulnerable populations such as children, the elderly, and individuals with pre-existing health conditions.

According to MacArthur et al. (2017), reducing vehicular emissions, including particulate matter, through the increased use of e-bikes not only helps alleviate the environmental burden of pollution but also improves quality of life by reducing medical costs and improving public health outcomes.

In addition to health and environmental benefits, using more sustainable modes of transport can alleviate urban traffic congestion, reduce noise pollution, and decrease the demand for parking space, offering broader urban sustainability solutions. As cities face growing populations and environmental challenges, widespread adoption of more sustainable modes of transport can be part of a comprehensive strategy to promote healthier lifestyles while addressing the climate crisis.

In conclusion, using more sustainable modes of transport presents a powerful tool to achieve both personal health and environmental goals. Future research should explore long-term adoption patterns, examining how more sustainable modes of transport can be integrated into daily routines and transportation systems. Cities seek innovative solutions for sustainable mobility and environmentally friendly alternatives for addressing both health and environmental challenges, and universities can significantly contribute to the promotion and adoption of sustainable mobility practices leveraging their educational, research, and community resources.

MUV Game had been one of the solutions implemented in the context of the Cycling Campus & City (3Cs) Project to actively involve students, professors, and staff of the four partner universities and guide them towards more conscious and sustainable mobility choices by creating dedicated competitions while measuring the impact produced.

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4. Actionable Recommendations for Policy Makers: Strategic Priorities to Accelerate Sustainable and Active Mobility

The transition toward sustainable mobility demands more than isolated initiatives—it requires integrated, multi-level policy frameworks that align European ambitions with local realities. This section highlights the role of the UE for embedding active mobility into transport, health, and urban planning. It also distills evidence-based recommendations to enhance safety, attract new cyclists, and foster collaboration across jurisdictions, ensuring that cycling becomes a viable, equitable, and attractive mode of transport for all.

4.1. Policy frameworks for supporting active mobility initiatives.

EU has shifted from financing isolated infrastructure projects to formulating integrated policy frameworks that link transport, health, environmental and urban development objectives. Flagship initiatives, such as the European Green Deal, the Sustainable and Smart Mobility Strategy and, most recently, the 2024 European Declaration on Cycling, signal a clear institutional determination to embed active modes within mainstream European transport policy.

Adopted on 3 April 2024, the European Declaration on Cycling constitutes the first inter-institutional policy document at EU level explicitly dedicated to elevating cycling to a fully-fledged mode of transport. It was signed by the three principal EU institutions — the European Commission (Adina Vălean, Commissioner for Transport), the European Parliament (Karima Delli, Chair of the TRAN Committee) and the Council of the EU (Georges Gilkinet, Belgian Deputy Prime Minister) — during the informal Transport Council under the Belgian Presidency. Building on a process launched by the Commission in October 2023 in response to requests from Parliament and several Member States, the Declaration outlines eight core principles and 36 specific commitments spanning the EU, national, regional and local levels. These include the development of safe and coherent cycling networks, stronger integration with public transport, secure parking and charging facilities for e-bikes, and enhanced connectivity between urban and rural areas. Although non-binding, it serves as a strategic guide for policy and investment, aligning priorities across jurisdictions, providing a common reference for transport and climate strategies, facilitating access to EU funding programs and supporting the monitoring and benchmarking of progress.

While the European Union can set strategic orientations, allocate funds, and coordinate knowledge exchange, the actual implementation of active mobility policies remains primarily within the competence of Member States and sub-

national authorities. This interaction between EU-level guidance and national legal frameworks creates a multi-level governance environment in which active mobility initiatives can be scaled up and adapted to local contexts.

France offers a telling example of this multi-level dynamic: its current policy framework for active mobility combines national legislation and strategic plans with local initiatives. At the national level, measures such as the 2019 Mobility Orientation Law (LOM) and National Plan for Cycling and Active Mobility set ambitious targets for increasing the cycling modal share, mandate the provision of safe cycling infrastructure and encourage a shift away from private cars. Complementary schemes, such as the National Cycle Route Plan and earlier provisions of the Air and Rational Energy Use Law (LAURE) create a legislative backbone for long-distance routes and urban cycling facilities. At the local level, municipalities such as Montpellier have translated these national orientations into concrete action through Active Mobility Master Plans (SDMA), backed by substantial investment in cycling infrastructure. Together, these instruments demonstrate how European-level guidance influences national and local policymaking to scale up active mobility initiatives and adapt them to local contexts.

4.2. Recommendations for enhancing bicycle infrastructure and safety standards.

The physical environment is foundational to cycling uptake and safety. Substandard infrastructure is a primary deterrent, while high-quality, continuous, and inclusive networks are known enablers.

4.2.1. Adapting infrastructures

Users of all modes of transportation are fewer outside urban areas than within them, but the reduced width of roads and the high speeds of motorized vehicles make cohabitation between different modes more difficult.

The question of whether or not to share spaces with pedestrians should be considered based on expected usage, but sharing will need to be considered more often than in urban areas where pedestrians generally have sidewalks. When facilities must be reserved for cyclists and similar users, it must be ensured that pedestrians otherwise have practicable pathways; otherwise, they will have no choice but to use these facilities intended for cyclists.

Drivers of motorized personal mobility devices and light mopeds are not cyclists. The rules that apply to them differ outside urban areas. Unless decided by the

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authority holding police power, they are not allowed to travel on roads or facilities other than cycle paths and greenways. This decision can only be made subject to conditions regarding the state of the road and its safety; the maximum authorized speed must not exceed 80 km/h.

The relationship with automobile traffic is the most delicate. Road space is limited, and the coexistence of cyclists with fast and heavy vehicles can only be done safely under conditions of reduced traffic volume, sufficient width available for crossings and overtaking, adequate speed, and good visibility. When these conditions are not met, a more or less marked separation is necessary in the form of cycle lanes or multifunctional lanes or cycle paths, depending on the case. When motorized traffic exceeds 10,000 vehicles or 500 heavy goods vehicles per day, it is often preferable to seek an alternative nearby route that provides the same functions for cyclists. Initially unwelcoming alternative routes can be made attractive through a redesign of the traffic plan and the hierarchization of road networks. Intersections are less frequent than in urban areas. However, each can be a place of conflict if visibility is insufficient or if expected behaviors are misunderstood. The safe crossing of roads with traffic of more exceeding 4,000 vehicles per day by cyclists and pedestrians requires suitable facilities.

4.2.2. Hierarchizing the cycling network

Hierarchizing the cycling network involves defining categories of cycle paths and applying them to the different components of the network. By classifying cycle paths as secondary, primary, or high-level service, a better level of service can be offered on paths where cycling traffic tends to concentrate. Directional signage on these routes should accompany this classification.

It is rare for cyclists to complete their entire journey on the leading cycling network. More often, their starting and ending points are not directly served. Therefore, a complete secondary network with a sufficient level of service and without discontinuities or dangerous points is just as essential for developing the practice, especially for daily commutes. Without this, many potential cyclists will forgo their trips.

Cyclists and motorists essentially use the same roads. The hierarchies for these two modes of transportation interact strongly, and their combination is reflected in the types of facilities that are recommended. Overlaying the projected hierarchies helps identify incompatibilities and reduce the need for heavy infrastructure. Alternative routes or actions on motorized vehicle traffic can provide better travel conditions for cyclists. Revising traffic plans and the network

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hierarchy can lead to the emergence of alternative routes for bicycles that are relevant and beneficial.

Relationships with other schemes related to people's movements should also be considered, particularly in relation to departmental plans for walking and hiking routes. There can be competition, for example, if cycling and pedestrian traffic on the same path is high, or complementarity to ensure the crossing of a natural or artificial obstacle via a footbridge whose access must be adapted to both modes.

It is not always necessary to proceed with a hierarchization of the network: in a small territory that does not present significant cycling or motorized flows to manage, a policy of giving satisfactory characteristics to the entire road network can be just as relevant.

4.2.3. Increase route efficiency

The European Parliament's resolution on the EU Road Safety Policy Framework 2021–2030 highlights the critical role of infrastructure in promoting safe and efficient cycling. It calls for a systematic integration of cycling considerations into the design, planning, and maintenance of road networks at both national and regional levels. Dedicated cycling lanes, separated from motorized traffic, are emphasized as essential to reducing conflicts and improving safety, while secure parking facilities and well-designed intersections are recommended to enhance the usability and attractiveness of cycling. The resolution also stresses the importance of continuity and coherence in cycling networks, ensuring that urban, suburban, and rural routes are well connected and accessible.

The increase in distances can measure the efficiency of a route or the overall performance of a network travelled, time spent, or energy consumed by cyclists compared to a more direct route or a theoretical straight-line route.

The CROW guide and the "Design of Cycling Routes" manual[14] define elongation factors to aim for in primary or secondary cycling networks. These factors are based on a comparison with what occurs in a network with rectangular grids, such as the road network in American cities. In such a network, having to follow the grid rather than cutting a straight line results in an average increase in travel distance of 27%. For an urban network, they consequently propose aiming for an average elongation of 20% for the primary network and 30 to 40% for the secondary network. The better performance of the primary network is allowed by more direct routes.

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[14] https://crowplatform.com/product/design-manual-for-bicycle-traffic/

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These objectives are considered too ambitious in rural areas or in regions with relief. The less dense road network there imposes more significant detours.

Moreover, the routes proposed by calculators for automobile traffic between two randomly chosen points are often longer, as these calculators prioritize faster roads.

The issue of slopes is only addressed for partuclar specific developments, such as access to structures, in the CROW guide. It is discussed in the OFROU manual[15], which supplements the calculation with a factor related to elevation changes: the length of the route is increased by 25 times the positive elevation change. This formula is well-suited for cyclists with a leisurely practice on routes where the slope is limited to 3%.

4.2.4. Attract new cyclists

Cycling usage in Europe has experienced varied trends since 1990, with national policies and urban development playing significant roles. However, comprehensive longitudinal data across Europe is limited. The study by Schepers et al. (2021)[16] utilized aggregated data from national travel surveys across 14 countries, covering seven 4-year periods between 1990 and 2017. The analysis revealed that the distance cycled per capita remained relatively constant over the decades, with some countries such as Germany showing a notable increase of approximately 150 km per capita, representing a 50% rise. In contrast, other nations exhibited minimal changes. Urban areas, particularly capital cities, saw more significant increases in cycling distances compared to rural regions. Interestingly, the study found no evidence that cycling replaced travel by foot, public transport, or car; instead, it appeared to be an additional mode of transport. These findings underscore the need for more detailed and consistent data collection to understand better and promote cycling across Europe.

Promoting cycling requires action on multiple levels, including the network's consistency and completeness, efficiency and performance, safety, attractiveness, and comfort. Complementing these infrastructural considerations, scientific evidence highlights a variety of strategies that can effectively encourage cycling and attract new users. Many of these are behaviour-based cycling promotion initiatives, which focus on changing individual and community

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practices rather than solely on infrastructure. Savan et al. (2017)[17] emphasize the importance of community engagement, educational campaigns, and context-specific interventions, highlighting that active involvement of local populations and targeted training programs can significantly enhance cycling adoption and sustain behavioural change over time. Building on these insights, Doğru et al. (2021)[18] demonstrate that across 39 interventions involving a total of 46,102 participants, strategies such as self-monitoring, goal setting, and the provision of supportive objects were associated with measurable increases in cycling, with psychosocial interventions generally proving more effective than purely infrastructural measures.

4.3. Work together: Foster and Institutionalize University-Municipality Collaborations

The skills related to mobility planning, construction, management, and traffic policing on roads and cycling facilities are distributed among multiple actors within the same territory. Local mobility organizing authorities, the state, regions, intercommunalities, and municipalities may all share responsibilities. This distribution of competences is generally designed to manage motorized traffic efficiently; however, it often does not align with the needs of cyclists. To ensure the coherence, continuity, and safety of cycling routes, strong cooperation between these authorities is essential. This cooperation can be concretized through the development of mobility plans or cycling master plans that engage a broad range of stakeholders, including representatives from the socio-economic sector and user associations (for example, FUB in France).

Therefore, integrated governance plays a pivotal role in fostering cycling practices by aligning these diverse stakeholders and administrative levels towards common objectives. Building on the insights of Ingeborgrud (2024)[19]. A recommended best practice is to establish formalized multi-level cycling coordination bodies, where municipal planners, regional authorities, cycling associations, and citizen representatives meet regularly to co-develop cycling

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[17] Beth Savan, Emma Cohlmeyer, Trudy Ledsham, 2017, Integrated strategies to accelerate the adoption of cycling for transportation, Transportation Research Part F: Traffic Psychology and Behaviour, 46, Part A, 236-249, https://doi.org/10.1016/j.trf.2017.03.002

[18] Onur Cem Doğru, Thomas L. Webb, Paul Norman, (2021) What is the best way to promote cycling? A systematic review and meta-analysis, Transportation Research Part F: Traffic Psychology and Behaviour, 81, 144-157, https://doi.org/10.1016/j.trf.2021.06.002

[19] Ingeborgrud, L., Suboticki, I., Ryghaug, M., & Skjølsvold, T. M. (2023). Planners as middle actors in facilitating for city cycling. Mobilities, 19(1), 103–115. https://doi.org/10.1080/17450101.2023.2186799

strategies and oversee infrastructure projects. Such bodies can ensure that planning decisions account for both technical feasibility and user needs, facilitating the creation of coherent, continuous, and safe cycling networks.

Institutional collaboration formalizes roles and resources across institutions/universities and municipal governments. By institutionalizing this collaboration, cities can replicate the successful integration observed in Norwegian contexts, enhancing both the adoption and sustainability of cycling as a mainstream urban transport mode. Joint management structures with clear mandates optimize infrastructure investment, program development, and behavioural interventions. Shared data systems enhance monitoring and responsiveness.

4.4. Integrate Active Mobility in Public Health, Environmental, and Educational Policies

Active mobility represents a critical nexus between public health, environmental sustainability, and formal education, and its integration within these interconnected policy domains is foundational to transformative urban mobility systems.

From a public health perspective, regular engagement in active transport such as walking and cycling substantially mitigates the burden of chronic noncommunicable diseases—including cardiovascular disease, type 2 diabetes, obesity, and certain cancers—by addressing physical inactivity, one of the leading preventable risk factors globally. The World Health Organization estimates that physical inactivity contributes to over 1 million premature deaths annually in Europe alone. The economic implications are stark; sedentary lifestyles incur an estimated cost exceeding €80 billion annually to European economies due to healthcare expenses and productivity losses.

Integration of active mobility into health policy involves explicit recognition of transport-related physical activity as a preventive health intervention. This extends to embedding active mobility promotion programs within public health strategies, health impact assessments of urban planning initiatives, and leveraging frequent touchpoints such as primary healthcare settings to advocate and educate on active travel benefits. Moreover, health-focused cost-benefit analyses provide powerful evidence to justify public and private investment in active mode infrastructure.

Environmental policy integration is critical given transport emissions contribute substantially to urban air pollution and greenhouse gas emissions. Active mobility

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122

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displaces motorized trips, markedly reducing transport-sector CO_2 emissions. Outcomes include quieter, less polluted urban environments, directly benefitting community health and biodiversity. National climate strategies, including the European Green Deal, stress sustainable urban mobility as central to achieving carbon neutrality by 2050.

The educational systems offer unparalleled platforms for embedding active mobility norms from early life stages, thereby shaping lifelong behaviors. Incorporating active mobility education—encompassing safe cycling skills, environmental literacy, and health benefits—within school curricula and university programs promotes awareness and social acceptance. Educational interventions extend beyond formal curricula to extracurricular programs, mobility challenges, and infrastructure such as safe routes to school. Universities furthermore serve as living laboratories for behavioral studies, digital innovation pilots, and community engagement efforts to mainstream sustainable travel.

Cooperation across these sectors demands formalized inter-ministerial coordination mechanisms to ensure policy coherence, funds alignment, and joint monitoring. Multi-stakeholder platforms empowering municipal, academic, civil society, and private actors promote integrated planning and amplify impact.

4.5. Strengthen Economic and Fiscal Incentives

Economic and fiscal measures are definitive levers capable of accelerating modal shifts toward active and sustainable mobility modes by reducing financial barriers and rewarding sustainable choices.

Effective incentive frameworks operate at multiple governance levels, blending direct subsidies, tax incentives, employer-based benefits, and infrastructure investment programs. Subsidies for purchasing bicycles, particularly electric bicycles (e-bikes), are paramount, as cost remains a key barrier for many potential users. Governments may provide direct purchase grants, interest-free loans, or voucher schemes to lower acquisition costs. Italy's bicycle purchase incentive program and France's Sustainable Mobility Package exemplify such interventions.

Employers play a critical role by instituting bike-to-work benefits, flexible working schedules, and providing facilities such as showers and secure bike parking. Mobility management agreements can formalize employer commitments, linking participation to financial rewards or workplace recognition schemes. These employer-centric programs, when combined with regional funding allocations, can create systemic incentives reinforcing active commuting habits.

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On the taxation front, credits or deductions for commuting costs involving active transport or shared mobility reduce effective expense burdens. Policy must ensure equitable access; translating regional and local funding availability into transparent, streamlined application mechanisms encourages uptake.

Infrastructure funding programs should prioritize secure, widely available parking, repair services, and maintenance workshops, which sustain cycling over the long term. Public-private partnerships can unlock additional resources, with shared investment frameworks linking cycling promotion to economic development and green job creation.

Comprehensive fiscal schemes demand robust monitoring to verify impact and avoid unintended consequences like benefit stacking or resource misallocation. Widely publicized successes foster social legitimacy and encourage further participation.

4.6. Digitalize Active Mobility, Data, Application, and Gamification

Digital technologies have rapidly emerged as enablers of efficient, user-centric, and adaptive mobility solutions. Effectively harnessing these tools enhances both policy capacities and individual user engagement in active mobility.

At the planning level, robust data collection through sensor networks, GPS tracking, and big data analytics empowers evidence-based decision-making. Dynamic data on mobility flows, infrastructure performance, and user behavior inform infrastructure design, policy targeting, and impact evaluation. Platforms sharing open-access data foster innovation ecosystems and public transparency.

For users, mobile applications facilitate personalized route planning adapted to preferences for safety, time efficiency, and comfort, as well as real-time updates on infrastructure status or hazards. Integrating social networking features enables community-building, peer motivation, and shared challenges that foster sustained behavior change.

Gamification—embedding game-like elements such as rewards, progress tracking, and competitions—proves highly effective in increasing active travel by instilling motivation and reinforcing habits. The 3Cs project's MUV online tool exemplifies this, allowing users to log trips, compete in challenges, and visualize environmental benefits.

Digital platforms also bridge gaps between mobility modes, supporting multimodal journeys by aligning cycling with public transport schedules, car-

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sharing availability, and smart parking systems. Emerging technologies such as augmented reality may further enhance navigation and safety.

Policy frameworks must address digital equity, ensuring access across age, socioeconomic status, and spatial divides to avoid exacerbating inequalities. Data privacy and ethical management of collected personal mobility data constitute critical governance priorities to maintain public trust.

4.7. Cultivate an Active Mobility Culture Through Education and Communication

Changing social norms to embrace active mobility as desirable, convenient, and essential requires strategic, sustained educational and communication efforts.

Education must move beyond imparting knowledge about cycling and walking to embedding active mobility into identities and lifestyles. Early childhood through tertiary education provides entry points for curricular inclusion of topics such as road safety, environmental consciousness, and health awareness related to active travel.

Community-based participatory programs and campaigns targeting families, workplaces, and marginalized groups extend culture-building efforts. Using evidence-based messaging that highlights co-benefits—such as improved mental health, environmental stewardship, and economic savings—enhances resonance.

Communication strategies should utilize multidisciplinary media channels, including traditional outlets, social media, and event-based platforms such as bike-to-work days or mobility fairs. Influencer engagement and grassroots leadership foster peer-to-peer norm creation.

Tailored campaigns account for barriers such as gender safety concerns, cultural attitudes, and misinformation. Collaborative approaches engaging healthcare providers, educators, transport authorities, and civil society enhance reach and credibility.

Furthermore, embedding mobility education within workplace wellness programs and employer incentives aligns organizational interests with societal goals, promoting a culture of health and sustainability.

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4.8. Ensure Sustainability and Replicability Through Institutionalization and Monitoring

Sustainable impact demands systemic embedding of active mobility initiatives within institutional frameworks that secure resources, mandate actions, and provide adaptive governance.

Institutionalization encompasses formal inclusion of active mobility targets in municipal transport plans, university sustainability policies, and regional climate strategies. Mandated responsibilities, such as appointment of mobility managers and regular reporting obligations, enhance accountability and continuity.

Monitoring frameworks establish standardized performance indicators covering modal shares, safety metrics, equity dimensions, and environmental impacts. Integration of qualitative and quantitative methods ensures comprehensive evaluation.

Open-access databases, regular stakeholder reviews, and transparent dissemination of findings enable continuous learning and public engagement.

Replicability arises from codification of best practices, evidence-based toolkits, and networked knowledge sharing platforms enabling cross-regional adaptation and scaling. Funding models emphasizing multi-year allocations over project-based grants enhance stability.

Adaptive governance encourages iterative policy refinement driven by emerging data and stakeholder feedback, fostering resilience to changing social and technological contexts.

4.9. Conclusion

In conclusion, this section has outlined concrete, evidence-based recommendations for policymakers to scale up cycling and active mobility. Effective implementation requires adapting infrastructure to local contexts, hierarchizing networks for safety and efficiency, and fostering multi-level governance. By integrating these measures—supported by EU frameworks and tailored to regional specificities—policymakers could create coherent, accessible, and attractive cycling network that encourage modal shift and contribute to broader sustainability objectives. The transition to active mobility hinges on collaboration, targeted investment, and continuous evaluation to ensure policies deliver measurable impacts.

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5. Good Practice Examples

This section presents concrete case studies of university-led initiatives designed to promote active mobility through accessible bike services. From Montpellier's Atelier Vélo 34, which provides free on-campus bike repairs, to Coimbra's UCicletas bike-sharing program and Turin's Bike-to-Work incentive scheme, these examples illustrate how institutions can foster sustainable transport by addressing practical barriers—such as maintenance, cost, and infrastructure—while encouraging long-term behavioral change. By integrating repair workshops, financial incentives, and educational components, these programs demonstrate scalable approaches to enhancing cycling uptake, improving campus mobility, and aligning with broader sustainability goals.

5.1. Montpellier Paul Valéry University : Atelier Vélo 34, bike repair sessions

Atelier Vélo 34, a bike repair service commissioned by the university since 2018, plays a crucial role in promoting active mobility on campus. Operating twice a month, the service is available at the two main sites of the university: the Route de Mende campus and the Saint-Charles site at Albert 1er Square.

Students, professors, and staff members receive regular emails informing them about the bike repair sessions provided by Atelier Vélo 34. These communications include details about the availability and locations of the service. No appointment is necessary; individuals simply need to bring their bike to the repair stations during the scheduled sessions. However, spots are limited, and this has been a recurring issue highlighted in satisfaction surveys. Some participants expressed disappointment at missing the opportunity to have their bikes repaired due to the lack of available slots. According to the bike mechanic, at the launch of the service, around twenty cyclists benefited from the service at each session on the Route de Mende campus. Today, there are about thirty, which would require adding sessions during the month or hiring a second mechanic.

Figure 73: students and university staff waiting in front of Atelier Vélo 34, and explaining their needs to the bike mechanic (photograph : Adrien Poisson, april 2025)

The service is free of charge and exclusively reserved for university students and staff. However, the cost of replacement parts, such as tires, inner tubes, chains, or brake pads, for example, is borne by the beneficiaries. Some individuals occasionally bring their own parts to be installed. For example, a university staff member noted: "*Today I came with a new bottom bracket. Since I don't have the tools, the mechanic can replace it for free, whereas I would normally have to pay for this service in another shop.*" The beneficiaries of this service are diverse. Nearly half of them are students, with women representing approximately three-quarters of the users (according to the DD&RS survey). Many people take advantage of this service at least once a year, with the Route de Mende campus being the most frequented location, related to the fact that it concentrates 90% of the students.

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Figure 74: Atelier Vélo 34 bike mechanic in work, at Saint Charles site
(photograph : Adrien Poisson, april 2025)

"*The concept is amazing! [Bike] maintenance is not a priority for me; I don't have the time or the money... So it's great to be able to ride safely!*"

Many individuals who benefit from the service report that they lack the time or skills to carry out basic bike maintenance tasks, such as adjusting brakes or checking tire pressure. Atelier Vélo 34 addresses this needs by providing accessible bike repairs, ensuring that users can enjoy a well-functioning bicycle without investing their own time in upkeep. The convenience of having these adjustments carried out during university hours or while attending classes allows students and staff to focus on their academic or professional responsibilities while simultaneously promoting safe and sustainable commuting practices.

This initiative not only addresses immediate repair needs but also sparks interest in bike mechanics among participants. One individual interviewed expressed, "It would be great if the mechanic could explain the repair process. It's cool to understand how the bike works, and it could help me do it myself at home." This feedback highlights the potential for introducing self-repair workshops or even structured repair courses, empowering users to gain hands-on skills and fostering a deeper connection with sustainable transportation.

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By offering accessible and reliable bike repair sessions, Atelier Vélo 34 supports students and staff in adopting sustainable transport modes while fostering a culture of eco-friendly commuting.

5.2. UniTO: Bike to Work and other initiatives

In 2025, the University of Turin launched a pilot bike-to-work initiative called 'Cycle, the University of Turin will reward you', aimed at encouraging sustainable and active travel among employees who cycle to work. Participation requires the installation of the "Pin Bike" kit, an anti-fraud certified system connected to the Pin Bike App, which verifies cycling trips between home and the University. Participants receive a per-kilometer refund for certified bike trips: €0.20 per kilometer for home-to-University trips; up to 2 trips per day, with a daily cap of €1 and a monthly cap of €20; cycling segments within multimodal trips (e.g., bike + train) are also eligible. The initiative is open to 300 UniTO workers, including both employees and non-employees (such as research fellows, scholarship holders, PhD candidates, and collaborators). The selection of beneficiaries focuses on those who can make long-term behavioural changes to their mobility decisions, such as university faculty and administrative staff with long-term employment contracts. However, the initiative also includes those who work for the University of Turin for a shorter period of time, e.g. doctoral and postgraduate students. The initiative promotes an alternative to travelling to university by car, with the aim of changing habits and culture. It also aims to reduce traffic congestion during rush hour and lower air pollution and greenhouse gas emissions caused by the university community's travel, while improving individual well-being.

In addition to its bike-to-work initiative, the University of Turin has added nearly 300 new bike racks across its various campuses in 2024 and organized the first bicycle mechanics course in 2025 to support active mobility. Consisting of three sessions for students, faculty, and university staff, the 'Ride a Bike, Repair, Ride again' course was organized in collaboration with the FIAB Torino Bike Pride Association (Italian Federation for the Environment and Cycling). The main daily bicycle maintenance tasks for safe, sustainable, and independent mobility were explained by FIAB instructors during the workshop. Puncture repairs, brake adjustments, and transmission checks were carried out. The sessions were organized as practical interactive laboratories, where participants were actively involved in directly experimenting with the operations to be performed on their own bicycles. The course is also part of the University of Turin's activities within the UNITA Universitas Montium Alliance, a network of 12 universities from seven

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countries. It is one of 64 European alliances funded by the European Commission under the Erasmus+ European Universities Initiative programme.

In conclusion, the initiatives presented illustrate how such interventions can effectively promote cycling as a viable and sustainable mode of transportation within university communities. By addressing key barriers such as maintenance costs, skill deficiencies, and infrastructure deficiencies, these programs not only facilitate immediate access to cycling but also foster long-term behavioral change. Their success underscores the importance of combining practical support, financial incentives, and educational components to create inclusive and scalable models. These examples provide valuable lessons for institutions seeking to enhance active mobility, but they also highlight the necessity to continue efforts to reduce car dependency and contribute to broader environmental and public health objectives.

5.3. UCicletas - bike rental program to promote sustainable mobility and well-being at the University of Coimbra

UCicletas is an innovative project that provides temporary access to bicycles for the entire academic community of the University of Coimbra. This initiative is designed for faculty, technical staff, researchers, and students, offering a practical and sustainable alternative for transportation on and around campus. The term UCicletas is a creative blend of "UC" (University of Coimbra) and "Bicicleta," the Portuguese word for bicycle.

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Figure 75: UCicletas (source: Desporto UC/UC, 2024)

The objectives are:

- Promotion of Active Lifestyles: UCicletas directly encourages the adoption of healthy habits centred on physical activity and sports. By integrating cycling into daily commutes and routines, the project offers a practical solution to counteract sedentary lifestyles, enhancing the physical and mental well-being of UC's students and employees.

- Sustainable Campus Mobility: The initiative serves as a key strategy for reducing reliance on traditional public transport and personal motor vehicles. This practice effectively decreases traffic congestion, lowers noise levels, and minimizes pollutant emissions within the university's urban environment, contributing to a cleaner and more pleasant campus for all.

- Advancement of Sustainability Goals: UCicletas is firmly aligned with the global Sustainable Development Goals (SDGs). It fosters environmentally conscious attitudes and behaviours, demonstrating how a university community can actively contribute to critical objectives such as ensuring sustainable cities and communities (SDG 11) and taking urgent action to

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combat climate change (SDG 13). It stands as a tangible example of how institutional policy can drive positive environmental change.

The UCicletas project exemplifies a holistic approach to modern university challenges. It successfully integrates health promotion with environmental sustainability, creating a low-cost, high-impact program that benefits individual users and the broader community. Its inclusive nature, serving all members of the academic community, ensures wide-reaching benefits and fosters a shared culture of responsibility and well-being.

Furthermore, the UCicletas program has directly led to the creation and improvement of dedicated bicycle parking facilities across campus, significantly enhancing safety and security for all cyclists.

5.4. UCJC: "La Colmena", innovative programme to foster active mobility

La Colmena is an innovative program at Camilo José Cela University (UCJC) designed to develop key competencies in students, both personally and professionally. This program focuses on the comprehensive training of students, combining knowledge, values, and action to face real-world challenges.

Main features of La Colmena:

• Micro-certifications: Students can obtain micro-certifications that validate their competencies in various areas, which are accumulative and valued in ECTS credits.

• Learning experiences: It offers semester-long experiences where students interact with peers from different degrees and solve real problems in an interdisciplinary manner.

• Ambassadors: Professors from different degrees act as ambassadors, ensuring interdisciplinarity and alignment with the needs of each career.

The program is designed to foster creativity, effective communication, and ethical commitment, preparing students to be well-rounded professionals and engaged citizens.

The Department of Transport and Logistics, involved in the Erasmus+ 3Cs project, has been developing the learning experience "Contribute to designing a Sustainable Mobility Plan at UCJC" since October 2023 until April 2025 (five editions).

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Figure 76: "Contribute to designing a Sustainable Mobility Plan at UCJC" divulgation (source: UCJC, 2025)

The experience has been designed according to a series of objectives:

•   Disseminate the principles of sustainable mobility.

•   Bring the 3Cs project closer to the students.

•   Encourage participation in the various activities associated with the project: mobility survey for the university community, MUV Challenge, conducting measurements, etc.

•   Raise awareness about the importance of changing mobility habits towards more sustainable and healthy modes.

•   Co-create initial guidelines for the development of the future UCJC Sustainable Mobility Plan.

•   Generate dissemination material for the 3Cs project within the UCJC university community (videos, graphic material, actions, etc.).

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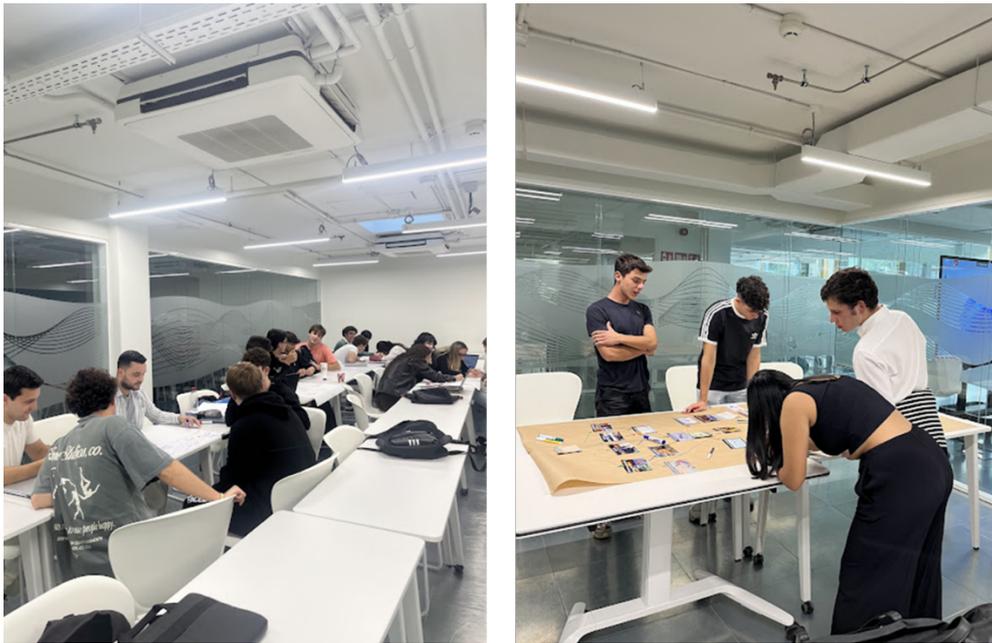
Figure 77: Students in "La Colmena" (source: UCJC, 2025)

Students participating in the La Colmena experience "Contribute to designing a Sustainable Mobility Plan at UCJC," in addition to taking part in the various associated activities, must complete the online course "Unraveling the Cycling City" from the University of Amsterdam on the Coursera platform.
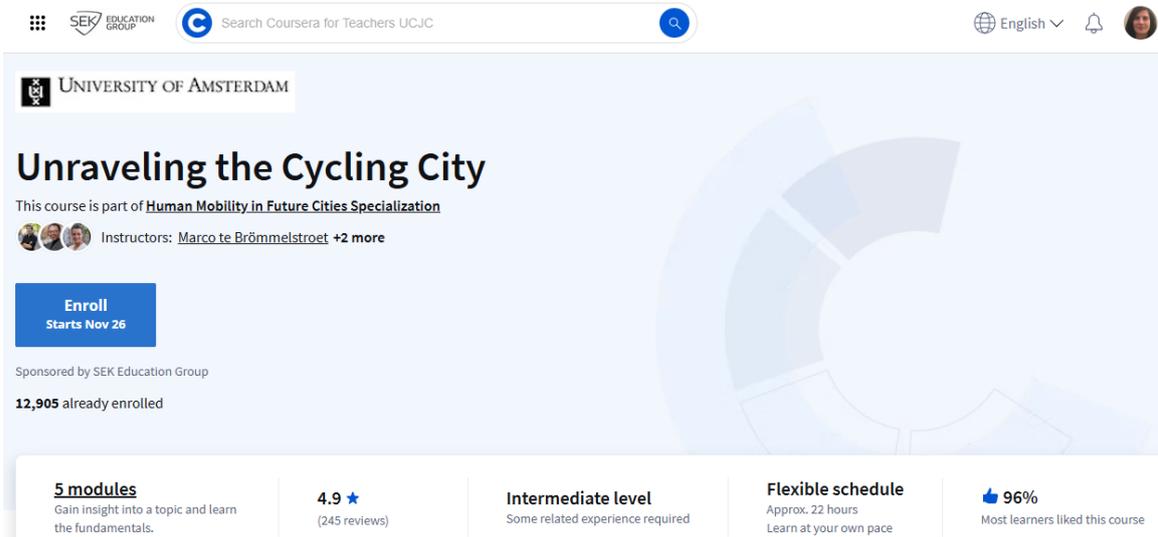
Figure 78: "Unravelling the Cycling City" platform (source: UCJC, 2025

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6. Educational and Training Resources

Promoting cycling as a sustainable and healthy mode of transport requires not only infrastructure and incentives but also accessible educational resources and targeted training. This section presents a comprehensive overview of the tools, workshops, and digital materials developed to support individuals, universities, and local authorities in adopting and scaling active mobility initiatives. From evidence-based toolkits—such as the 3Cs project's resources—to practical guidance on safety, maintenance, and behavioral change, these materials address the multifaceted benefits of cycling, including health improvement, environmental sustainability, cost-effectiveness, and community building.

6.1. Overview of toolkits, workshops, and digital resources

The 3Cs toolkit and all contents created under the 3Cs project are a collection of resources, materials, and instructions designed to assist everyone who wants to start being more active and use the bicycle as a primary source of transportation, providing an initial overview related to the main aspects of urban and non-urban bicycling.

The goal is to help the user achieve their own goal faster, safer, and in a more efficient way.

6.1.1. The Benefits of Bicycling

The benefit of bicycling extend far beyond the physical stimulation and cardiorespiratory conditioning. Cycling, of course, includes the health promotion aspects, as well as the safer and inexpensive kind of transportation that impacts very positively in our society, mainly in the community where it is, where it can improve the air quality, car transit congestion, park accessibility and availability, strengthen the sense of community/belonging, and help to save money.

Briefly, bicycling, a versatile form of physical activity, confers a multitude of health, environmental, and societal advantages. These benefits have been extensively studied and documented in scientific literature.
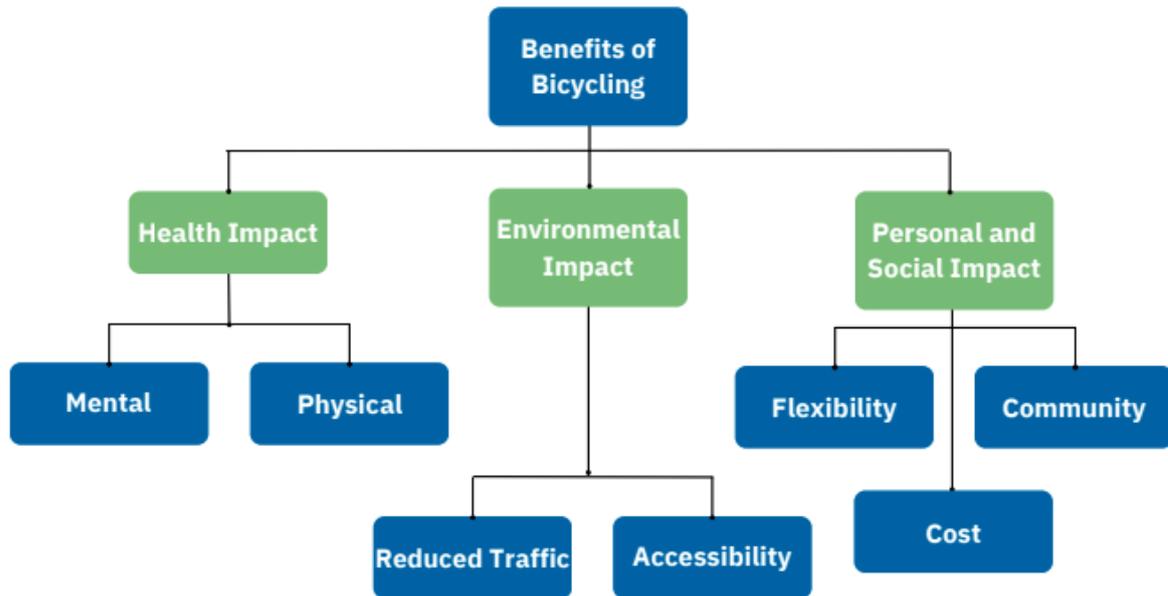
Figure 79: The Benefits of Bicycling

Health Improvement

Active transportation, such as cycling to work, school, or university, seamlessly integrates regular physical activity into daily routines without requiring dedicated time. This incorporation of physical activity promotes overall health by strengthening muscles, joints, and bones, enhancing mental well-being, and reducing the risk of health issues associated with sedentary behavior, which can lead to conditions like diabetes, cardiovascular diseases, and certain types of cancer [20], [21]. Engaging in regular bicycling yields significant health benefits. Individuals who cycle for more than 30 minutes a day have a lower risk of developing cancer and overweight-related problems[21]. Bicycling improves physical fitness and mental well-being, contributing to a longer and healthier life [22].

Physical Fitness

Regular cycling has a profound impact on physical fitness and overall well-being. This low-impact aerobic exercise engages major muscle groups, promoting

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[20] Oja, P., Titze, S., Bauman, A., et al. (2011). "Health benefits of cycling: a systematic review". Scandinavian Journal of Medicine & Science in Sports, 21(4), 496-509.

[21] Woodcock, J., et al. (2009). "Public health benefits of strategies to reduce greenhouse-gas emissions: urban land transport". The Lancet, 374(9705), 1930-1943.

[22] WHO. (2022). Fact Sheets "Physical Activity ". World Health Organization. Available at: https://www.who.int/news-room/fact-sheets/detail/physical-activity

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balanced development of strength and endurance[23]. It notably enhances cardiovascular health by improving heart function and endurance, particularly during moderate to intense sessions[24].

Cycling also serves as an effective weight management tool, aiding in calorie expenditure and body fat reduction when combined with a balanced diet. It caters to various fitness levels and age groups[25]. Long-term benefits include a reduced risk of chronic health conditions such as obesity, diabetes, hypertension, and cardiovascular disease. Moreover, regular cycling leads to lower resting heart rates, improved blood pressure, and favorable cholesterol profiles, crucial indicators of cardiovascular health. This not only reduces the risk of heart disease but also enhances overall well-being and vitality[26]. In essence, cycling offers a multifaceted approach to fitness, accommodating individuals of varying fitness levels and providing long-lasting health benefits.

Improved Mental Health:

Regular bicycling not only benefits the physical body but also profoundly impacts mental health. Research shows it reduces reported stress levels, thanks to the release of endorphins, known as "feel-good" hormones, during the rhythmic motion of cycling [27]. Additionally, cycling enhances cognitive function, improving concentration and problem-solving abilities [28]. The meditative quality of cycling fosters mindfulness and relaxation, reducing symptoms of anxiety and depression [29]. In summary, cycling is a valuable tool for promoting both physical

[23] Tainio, M.; Andersen, Z.J.; et al (2021). Air pollution, physical activity and health: A mapping review of the evidence. https://doi.org/10.1016/j.envint.2020.105954

[24] Mileva, K.N., Zaidell, L. (2022). Sport and Exercise Science and Health. In: Naidoo, J., Wills, J. (eds) Health Studies. Palgrave Macmillan, Singapore. https://doi.org/10.1007/978-981-16- 2149-9_4

[25] Ried-Larsen M, Rasmussen MG, Blond K, et al. Association of Cycling With All-Cause and Cardiovascular Disease Mortality Among Persons With Diabetes: The European Prospective Investigation Into Cancer and Nutrition (EPIC) Study. JAMA Intern Med. 2021;181(9):1196–1205. doi:10.1001/jamainternmed.2021.3836

[26] Garrard, J., Rissel, C., Bauman, A., & Giles-Corti, B. (2021). Cycling and health. Cycling for sustainable cities, 35-56. LIVRO

[27] Ma, L., Ye, R., & Wang, H. (2021). Exploring the causal effects of bicycling for transportation on mental health. Transportation research part D: transport and environment, 93, 102773. https://doi.org/10.1016/j.trd.2021.102773

[28] Zheng, G., Xia, R., Zhou, W., Tao, J., & Chen, L. (2016). Aerobic exercise ameliorates cognitive function in older adults with mild cognitive impairment: a systematic review and meta-analysis of randomised controlled trials. British journal of sports medicine, 50(23), 1443-1450. http://dx.doi.org/10.1136/bjsports-2015-095699

[29] Scott-Hamilton, J., Schutte, N. S., & Brown, R. F. (2016). Effects of a mindfulness intervention on sports-anxiety, pessimism, and flow in competitive cyclists. Applied Psychology: Health and Well-Being, 8(1), 85-103. https://doi.org/10.1111/aphw.12063

and mental well-being, reducing stress, enhancing mood, and boosting cognitive function.

Reduced Environmental Impact:

Cycling is an eco-friendly mode of transportation with minimal environmental impact. Bicycles produce zero greenhouse gases and pollutants, making them a sustainable choice for commuting and leisure. This reduction in emissions helps mitigate air pollution and alleviate traffic congestion in urban areas[30, 31]. Additionally, the production and maintenance of bicycles have significantly lower environmental costs compared to motorized vehicles. This includes reduced resource demands, manufacturing, fuel consumption, and the need for extensive infrastructure. Opting for cycling as a primary mode of transportation contributes to a more sustainable and livable urban environment. It aligns with broader efforts to combat climate change and reduce the overall environmental footprint associated with daily travel[32].`

Reduced Traffic Accidents:

Cycling significantly reduces the number of traffic accidents and associated injuries. Bicycles' lower speeds lead to less severe accidents, and their smaller footprint on the road reduces the potential for collision. Areas with more cyclists have fewer accidents and fatalities, as the increased presence of cyclists heightens road safety awareness[33, 34]. Altough there has been an increase in the number of road fatalities involving cyclists in Europe between 2022 and 2023[35]. Dedicated cycling infrastructure like lanes and separated paths further enhances safety by providing designated spaces, reducing conflicts with motorized vehicles. This encourages more people to choose bicycles, reducing traffic

[30] Gössling, S., Choi, A. S., Dekker, K., Metzler, D. (2019). "The social cost of automobility, cycling and walking in the European Union". Ecological Economics, 158, 65-74.

[31] Environmental Protection https://doi.org/10.1016/j.landurbplan.2019.103598

[32] Blondiau, T., Zeebroeck, B.V., Haubold. (2016) Economic benefits of increased cycling. Transportation Research Procedia. V.14, 2306-2313. https://doi.org/10.1016/j.trpro.2016.05.247

[33] Reynolds, C. C., Harris, M. A., Teschke, K., Cripton, P. A., & Winters, M. (2009). The Impact of Transportation Infrastructure on Bicycling Injuries and Crashes: A Review of the Literature. Environmental Health Perspectives, 118(1), 61-67.

[34] Ma, L., & Dill, J. (2015). Associations between the Objective and Perceived Built Environment and Bicycling for Transportation. Journal of Transport & Health, 2(4), 495-503.

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congestion and accident likelihood [36, 37]. Promoting cycling-friendly policies and infrastructure creates safer road environments for all users, resulting in fewer accidents and improved road safety overall.

Accessibility and Inclusivity

Cycling is an inclusive mode of transportation, adaptable to various needs and abilities. It provides an accessible option for individuals who may face challenges with traditional transportation. Adaptations such tricycles, hand-cranked bikes, and electric-assist bicycles offer alternatives for individuals with mobility impairments. Tandem bicycles allow visually impaired individuals to cycle with the guidance of a sighted partner [38] [39]. Additionally, the low physical impact of cycling compared to other exercises makes it suitable for varying fitness levels. Electric-assist bikes provide a power boost, enabling comfortable navigation of hilly terrain or longer distances, accommodating individuals with differing abilities [40, 41]. Well-designed cycling infrastructure benefits a wide range of users, including children, the elderly, and those with mobility challenges.

By creating safe and accessible cycling networks, communities ensure that cycling is a viable mode of transportation for all residents [42, 43].

Cost-Effectiveness

Cycling is a highly cost-effective mode of transportation. The expenses associated with purchasing, fueling, insuring, and maintaining a bicycle are

[36] Lusk, A. C., Furth, P. G., Morency, P., Miranda-Moreno, L. F., Willett, W. C., & Dennerlein, J. T. (2010). Risk of Injury for Bicycling on Cycle Tracks Versus in the Street. Injury Prevention, 16(2), 96-101.

[37] Elvik, R. (2009). The Non-linearity of Risk and the Promotion of Environmentally Sustainable Transport. Accident Analysis & Prevention, 41(4), 849-855.

[38] American College of Sports medicine. (2020). The ACSM Releases Official Statement on Diversity, Equity and Inclusion. Available at: https://www.acsm.org/news- detail/2020/06/09/the-american-college-of-sports-medicine-releases-official statement-on- diversity-equity-and-inclusion.

[39] Malwina, K. A., Krzysztof, M., & Piotr, Z. (2015). Visual impairment does not limit training effects in development of aerobic and anaerobic capacity in tandem cyclists. Journal of human kinetics, 48, 87. doi: 10.1515/hukin-2015-0095

[40] Fishman, E. (2016). Bikeshare: A Review of Recent Literature. Transport Reviews, 36(1), 92-113.

[41] Van Cauwenberg, J., De Bourdeaudhuij, I., De Meester, F., Van Dyck, D., Salmon, J., & Clarys, P. (2013). Relationship Between the Physical Environment and Different Physical Activity Domains in European Adults: A Systematic Review. BMC Public Health, 13(1), 1-16.

[42] Winters, M., Brauer, M., Setton, E. M., & Teschke, K. (2010). Built Environment Influences on Healthy Transportation Choices: Bicycling Versus Driving. Journal of Urban Health, 87(6), 969-993.

[43] Dill, J., & Voros, K. (2007). Factors Influencing Bicycling Demand: Initial Evidence Built Environment and Perceptions. Transportation Research Record: Journal of the Transportation Research Board, 2031(1), 9-17.

significantly lower than those of owning a motorized vehicle. Bicycles have minimal ongoing costs, primarily occasional maintenance and repairs, in contrast to the substantial expenses of car ownership [44]. Additionally, bicycles do not require costly specialized infrastructure like roads, highways, and parking spaces. This leads to significant savings in public resources and taxpayer dollars. Moreover, the cost of environmental damage caused by motorized vehicles, such as air and noise pollution, is markedly reduced with increased cycling [45]. Choosing cycling as a primary mode of transportation leads to improved economic stability and reduced financial burden on individuals and society as a whole.

Community Connection

Cycling builds community and social ties. Research shows cyclists tend to have stronger neighborhood connections, with shared experiences and encounters. Group rides, events, and advocacy efforts provide platforms for bonding over a love for cycling [46]. Cycling-friendly infrastructure, such as lanes and trails, not only enhances the cycling experience but also promotes active transportation and community engagement. Events bring diverse groups together, fostering inclusivity and stronger bonds [47]. Promoting cycling-friendly policies creates spaces that encourage social interaction, enhance quality of life, and bolster community unity.

Flexibility and Efficiency

Bicycles in urban settings offer unmatched flexibility and efficiency in transportation, navigating through traffic congestion for timely short to medium-distance travel. This leads to time-saving benefits for individuals and contributes to reduced traffic congestion and a more efficient transportation system overall [39]. In congested urban environments, bicycles offer an agile means of transportation, allowing access to areas that larger vehicles can't reach, making them ideal for urban exploration. Their compact size allows for easy parking and

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[44] Sharifi, A. (2021). Co-benefits and synergies between urban climate change mitigation and adaptation measures: A literature review. Science of the total environment, 750, 141642. https://doi.org/10.1016/j.scitotenv.2020.141642

[45] Pucher, J., Buehler, R., & Seinen, M. (2011). Bicycling Renaissance in North America? An Update and Re-appraisal of Cycling Trends and Policies. Transportation Research Part A: Policy and Practice, 45(6), 451-475

[46] Garrard, J., Rose, G., & Lo, S. K. (2008). Promoting Transportation Cycling for Women: The Role of Bicycle Infrastructure. Preventive Medicine, 46(1), 55-59.

[47] Dill, J., Carr, T. (2003). "Bicycle commuting and facilities in major U.S. cities: if you build them, commuters will use them". Transportation Research Record: Journal of the Transportation Research Board, 1828(1), 116-123.

storage, reducing time and stress associated with finding parking spaces [39]. For daily commuting or errands in congested urban areas, bicycles often outperform cars, utilizing designated bike lanes and routes to bypass traffic and arrive at destinations faster with fewer delays[37].

By recognizing and addressing the diverse needs of cyclists, communities can create environments that foster inclusivity and provide accessible transportation options for everyone.

6.1.2. The 12 Must-Know for bicycling from The League of American Bicyclists

The League of American Bicyclists[48], a prominent advocate for safe cycling, outlines twelve crucial principles for responsible and safe bicycling. These principles are grounded in empirical research on road safety and cycling behavior.

1) When riding in traffic, be calm, alert, confident, and predictable.

2) Take time to practice, ride with others, and take notes.

3) Safety is sexy: wear a helmet, ride with lights, and ditch the headphones.

4) Obey signs and traffic laws. Stop at stop signs and stop lights.

5) Don't be a salmon. Ride with the flow of traffic.

6) Though you may feel comfortable on the sidewalk, you are safer in the street.

7) If a bike lane or facility isn't present, it's in your interest to take the lane.

8) Turn like a car using the whole lane and signals or turn like a pedestrian in the crosswalk.

9) Communicate passing and turning with eye contact, verbal cues, and hand signals.

10) Try to bike three feet or more from parked cars to avoid the "door zone".

11) Always slow down and yield to pedestrians and joggers.

12) Most importantly, remember to relax and enjoy your bicycle ride.

In the same way, the 3Cs consortium has included 3 extra tips as follows:

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[48]   The   League   of   American   Bicyclists.   2023.   Available   at: https://bikeleague.org/sites/default/files/Women_Bicycles_Workbook.pdf

1) Think Ahead: Anticipating potential hazards on the road and planning actions accordingly is a key element of safe cycling.

2) Ride Ready: Regular maintenance and checks of the bicycle's components are crucial for safe and trouble-free rides.

3) Scan for Traffic: Consistent awareness of one's surroundings is vital for accident prevention. Frequent visual checks are a proven safety measure.

These twelve must-know and the 3 3Cs tips are rooted in scientific understanding of road safety and human behavior, providing a comprehensive guide to responsible and safe bicycling, ensuring an enjoyable and secure experience for cyclists and others on the road.

6.2. Guidance for replication and scaling of resources by universities and local authorities.

The 3Cs project has functioned as a living laboratory, demonstrating how active and sustainable mobility can be promoted, measured, and integrated into both academic and urban contexts. By combining interdisciplinary research, participatory methods, and practical interventions, it has produced a set of resources that are now ready for replication and adaptation in other European settings.

Based on our pilot experiences in Coimbra, Madrid, Montpellier, and Turin, we have identified several essential steps for universities and local authorities seeking to replicate and scale the 3Cs approach.

6.2.1. Start with evidence-based diagnosis.

The Transversal Mobility Survey, developed by the 3Cs consortium, has proven to be a powerful tool to understanding mobility habits, attitudes, and infrastructure gaps. By adopting this survey, universities and municipalities can generate comparable baseline data. For example, at the University of Coimbra, we confirmed that car dependency still accounts for nearly 70% of commutes, while only 3% of trips were made by bicycle. Such evidence is crucial for informing priorities, designing incentives, and measuring progress.

6.2.2. Integrate health and environmental indicators.

Our intervention studies showed measurable improvements in cardiovascular capacity and reductions in subcutaneous fat after only a few days of active

commuting. At the same time, the MUV tool enabled us to quantify CO_2 savings in real-time. Replication of these tools enables local authorities and universities not only to promote behavioural change but also to demonstrate tangible health and environmental benefits—strengthening legitimacy for investment in active mobility.

6.2.3. Use digital engagement for behavioural change.

The MUV Game, piloted in our project, successfully engaged students and staff through gamified competitions, linking everyday mobility choices with collective rewards. Universities and municipalities adopting similar approaches should establish dedicated digital communities, launch challenges tailored to their cultural context, and offer symbolic or material incentives. The key lesson from our pilot is that behavioural change becomes sustainable when it is fun, visible, and linked to community identity.

6.2.4. Develop university–city partnerships.

Our case studies revealed that structural change occurs only when academic institutions and municipalities collaborate. In Montpellier, the partnership between Montpellier Paul Valéry University and the Metropolis accelerated the integration of campuses into the metropolitan cycling network. In Coimbra, the UCicletas program complements municipal investments in cycle paths. Other universities should actively pursue co-created mobility plans with local authorities, aligning infrastructure development, student services, and city-wide strategies (must be adapted after the document is complete).

6.2.5. Ensure replicability through open resources.

All tools developed by the 3Cs consortium—including the survey, handbook, and digital platforms—have been designed to be open and adaptable. For replication, institutions should not attempt to "copy-paste" but to adapt resources to local geography, governance structures, and cultural attitudes towards mobility. The flexibility of our outputs ensures scalability across diverse contexts, from large metropolitan universities to smaller, peripheral institutions.

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6.2.6. Prioritize inclusivity and accessibility.

Lessons from Turin and Madrid highlighted the importance of designing routes and policies that serve not only central campuses but also peripheral locations and vulnerable groups. Replication must therefore emphasize equity: providing secure infrastructure for cyclists, ensuring walkability, and integrating multimodal connections that reduce dependency on private cars for students and staff living further away.

By using our project as a model, universities and local authorities across Europe can replicate the methodology, scale the interventions, and collectively contribute to a continental shift towards sustainable and healthy mobility.

6.3. Dissemination of initiatives and good practices linked to active and sustainable mobility

This part outlines the activities conducted under Work Package 6 (WP6) to disseminate and promote good practices and healthy and sustainable lifestyles, briefly illustrating the website highlights and the materials produced. This includes integrating physical activity with active mobility, promoting sustainable mobility and environmental awareness into daily practices, both during and after the project. The activities are designed to have a lasting impact on participants, ensuring the project's goals continue to be pursued beyond its formal end.

6.3.1. 3Cs Website

The 3Cs project website (https://www.uc.pt/en/3cs/) is designed to maximize engagement and knowledge-sharing through four strategically organized sections. The 3Cs Directory offers a stakeholder database with comprehensive profiles of participating universities, sports organizations, local communities, and political decision-makers, alongside dynamic content such as updated institutional information and documented case studies showcasing successful collaborations.

The Take Action section serves as a dynamic educational hub, providing users with good practice guides, research publications, and integration with the 3Cs Mobile App, which features MUV app functionalities and challenges to incentivize active mobility. This section features a series of educational modules covering essential cycling skills, including the ABC Bike Check for pre-ride safety, introductory videos on safety equipment and balance, practical tips for learning

to pedal, techniques for cornering and control, and guidance on cycling safely in urban areas.

Additionally, the Good Practices: Partner Showcase Section highlights the contributions of each project partner, offering institutional profiles, detailed descriptions of their sustainable mobility initiatives, visual documentation (photos and videos), and downloadable resources and case studies.

The Research & 3Cs Mobile App section further enriches the platform by providing links to published studies aligned with the project's goals, as well as documentation of university challenges, including instructions on using the app, sustainability initiatives at partner universities, and collective challenges undertaken by the consortium. It also features results and impact metrics for each initiative.

To foster community interaction, the Community subsection includes an interactive Q&A forum for stakeholder dialogue. Finally, the Routes section equips users with GPS files, safety guidance, stage-by-stage descriptions, and participant testimonials, complemented by photo galleries to inspire and inform cyclists. This well-rounded structure ensures the website is both a resource hub and a platform for action, empowering users to engage with sustainable mobility in a meaningful way.

6.3.2. Extra Educational Material Produced

To further support training and awareness, the 3Cs project developed a comprehensive video toolkit designed to promote active and sustainable mobility. These videos address key topics and complement a series of online classes focused on cycling mobility and the development of cycling-friendly cities, expanding participants' understanding of active mobility and its broader community impact.

The project's workshop dissemination strategy ensured maximum reach and accessibility. All workshops were actively promoted through targeted digital campaigns and partner networks, while recordings were archived on the 3Cs website for on-demand viewing. To enhance inclusivity, the content was optimized with multilingual subtitles and supplemented with downloadable resources. This dual approach—combining live sessions with digital accessibility—enabled the project to engage a wider audience beyond in-person attendees, build a permanent knowledge repository, and facilitate asynchronous participation across different time zones, making sustainable mobility education more flexible and impactful.

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6.3.3. The Toolkit

The toolkit can be easily found on the 3Cs website under the "take action" menu, under Toolkit (https://www.uc.pt/site/assets/files/1445503/3cs_-_versa_o_final.pdf).

The development and widespread dissemination of this toolkit play a crucial role in advancing the project's goals of promoting sustainable mobility and fostering healthier lifestyles. It is designed to be an enduring resource, continuing to benefit new cyclists and contributing to the community's commitment to sustainability and active living, even beyond the formal conclusion of the project.

FISU, whish featured the toolkit in its newletter on 11th march 2024. This newsletter reached 1095 universities, sports federations, and FISU-affiliated organizations, and 58% of these participants opened the document. The newsletter is available below.

6.3.4. 3Cs Partners Videos

We have produced five episodes as part of the 3Cs project, each focusing on one of the university partners and an additional episode featuring FISU, which provides a broader overview of the project.

These episodes aim to highlight the realities of active mobility in each university city, showcasing unique perspectives and initiatives. The content includes contributions from individuals with diverse backgrounds, such as students, staff members, and key figures in university leadership positions (e.g., rectors). Each participant shares their personal experiences, feelings, and thoughts on the importance of cycling and its role in promoting sustainable mobility within their communities.

By presenting these perspectives, the episodes not only emphasize the challenges and opportunities of adopting active mobility in different contexts but also underline the shared commitment of all partners to fostering healthier and more sustainable lifestyles.

In summary, the 3Cs project website stands as a centralized, dynamic platform that systematically documents and disseminates the project's comprehensive strategy for promoting active and sustainable mobility. By organizing content into dedicated sections—such as partner showcases, research outputs, educational

modules, and university-led challenges—the platform has successfully preserved and shared critical knowledge through case studies, workshop recordings, and replicable good practices. It has also fostered collaboration among universities, policymakers, and local communities while extending engagement to a broader audience through open-access resources.

The integration of interactive tools, including the 3Cs mobile app and MUV platform, has been instrumental in incentivizing behavioral change and amplifying the project's impact. As a living archive, the website ensures that the 3Cs initiative's legacy endures, continuing to inspire and support sustainable mobility efforts across Europe.

Recommendations for Future Work:

- Regularly update content to reflect evolving best practices and maintain relevance.
- Expand the partner network to include new stakeholders and amplify collective impact.
- Develop additional multilingual resources to enhance accessibility and inclusivity for diverse audiences.

7. Sustainability and Legacy

Ensuring the long-term impact of active mobility initiatives requires institutional integration, strategic partnerships, and scalable solutions. This section outlines how the 3Cs project's achievements can be sustained and expanded through institutional policies, curricular integration, and the provision of permanent services at universities, as well as through municipal investments, digital engagement, and alignment with European priorities. By embedding cycling and sustainable transport into the core operations of academic and urban systems, the project aimed to create a lasting legacy. Additionally, plans to expand the network to new European universities and communities—through academic collaborations, municipal engagement, and the development of a transnational Ecological Mobility Route—highlight opportunities to amplify impact and foster a continent-wide shift toward greener, healthier mobility. These strategies ensure that the project's innovations endure and inspire broader adoption across Europe.

7.1. Strategies for sustaining project impact.

The legacy of the 3Cs project depends on embedding its results into the permanent structures of universities, municipalities, and European networks. Sustainability cannot rely on project-based funding alone; it requires institutionalization, cultural change, and long-term alignment with European priorities.

At the university level, three strategies are essential:

- Institutional policies and plans. Each partner institution has begun developing or strengthening its own mobility plan. Coimbra, for instance, has already integrated sustainable commuting into its Sustainable Campus Strategy, while Montpellier has used the project to reinforce its mobility plan under national law. Other universities should formalize these commitments, ensuring that cycling and walking are prioritized in resource allocation.

- Curricular integration. Embedding sustainable mobility into teaching and research ensures continuity. Montpellier Master's in Transportation, Mobility and Networks, Coimbra's graduation and Master in Cities Management and Transport Planning, with and emphasis on Urban Mobility Management, as well as Turin's Green Office initiatives, exemplify how universities can educate new generations of professionals equipped to carry forward the project's principles.

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- Permanent services. The bicycle loan schemes (UCicletas), repair workshops (Atelier Vélo 34), and shared mobility incentives tested in the project must be maintained beyond the funding cycle. These services provide continuity and visible daily reminders of institutional commitment.

At the municipal level, sustaining impact requires long-term policy and financial investment. Low-emission zones in Madrid, subsidies for e-bikes in Montpellier and in Portugal, and new cycling infrastructures in Turin illustrate how municipalities can lock in progress. We recommend that local authorities institutionalize collaboration with universities by establishing joint mobility committees and co-financing infrastructure that directly connects campuses with the urban fabric.

Digital engagement is another key strategy for sustaining impact. The MUV Game and its CO_2-tracking capacity provide continuous motivation and measurable evidence. By maintaining this platform and expanding its challenges, universities and municipalities can keep communities engaged while generating annual reports on impact.

Finally, European alignment ensures continuity through funding and policy support. By linking our outputs to the European Green Deal, the Fit for 55 package, and the Sustainable Development Goals, we position our work within broader frameworks that secure both visibility and opportunities for scaling.

7.2. Plans for expanding the network to additional European universities and communities.

The 3Cs consortium has demonstrated that sustainable mobility challenges transcend national borders and benefit from shared solutions. Expansion of our network is both feasible and necessary.

Our plan involves three main pathways:

1) Widening the academic network. Building on connections with the U-MOB LIFE network and the RUS (Italian Sustainable Universities Network), we will invite additional universities to adopt the 3Cs survey and digital tools. This expansion will generate comparable datasets across Europe, creating a robust evidence base for policy advocacy. Priority will be given to institutions located in regions with underdeveloped cycling infrastructure, where the potential for change is most significant.

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2) Engaging municipalities and regions.
By demonstrating the benefits of joint university–city collaboration, we will encourage municipalities across Europe to replicate the Coimbra and Montpellier models. Regional governments and metropolitan authorities will also be targeted, as they can ensure connectivity between multiple campuses and cities. The European Covenant of Mayors for Climate & Energy provides a natural entry point for aligning with existing local commitments to decarbonization.

3) Building a European Ecological Mobility Route.
One of the project's most innovative legacies is the definition of a transnational route connecting the four partner campuses by bicycle and sustainable transport. This route can be expanded progressively, linking additional universities into a European Ecological Mobility Network. It will serve as both a symbolic and practical tool, demonstrating the feasibility of long-distance sustainable mobility and promoting cultural exchange among students.

Future steps include partnerships with European student associations, NGOs, and mobility startups, ensuring that expansion is co-created and rooted in diverse realities. This wider network will not only reinforce the visibility of sustainable mobility initiatives but also accelerate the cultural shift towards greener lifestyles across Europe.

In fine, this section has outlined evidence-based strategies to ensure the sustainability and scalability of the 3Cs project's impact. By institutionalizing mobility policies, integrating sustainable transport into academic curricula, and maintaining permanent services, universities can embed active mobility as a long-term priority. At the municipal level, continued investment in infrastructure, policy alignment, and university-city collaboration further solidifies these efforts. Expansion plans—including network growth, regional partnerships, and the development of a European Ecological Mobility Route—provide a structured framework for replicating and scaling successful interventions. These approaches collectively support the transition toward systemic, durable changes in mobility behavior, aligning with broader European sustainability goals.

8. General Conclusion

The 3Cs project demonstrates that sustainable mobility transitions require not only innovation but also institutionalization and scalability. Through the development of standardized surveys, gamified behavioral tools, educational resources, and university-municipality partnerships, the project has established a replicable framework for promoting active mobility—particularly cycling—as a viable, healthy, and low-impact transport mode. Its findings underscore the necessity of a multi-level governance approach, where European strategic guidance is operationalized through national policies and localized interventions tailored to diverse territorial contexts.

Key to its success is the integration of infrastructure adaptation, network optimization, and stakeholder collaboration, addressing both physical barriers (e.g., safety, connectivity) and behavioral challenges (e.g., perception, skills). The project's pilot initiatives reveal that combining infrastructural investments with community engagement and digital incentives yields measurable increases in cycling adoption, provided that policies are evidence-based, monitored, and adaptable to local needs. The alignment of these efforts with broader EU priorities—such as the European Green Deal and Sustainable Development Goals—further ensures continuity and access to funding.

Looking forward, the project's legacy hinges on three critical pathways:

- Institutional embedding of mobility plans, curricula, and permanent services within universities and municipalities;

- Network expansion to include additional European institutions and regions, leveraging shared tools and comparative data;

- Systematic scaling of successful interventions, such as the proposed European Ecological Mobility Route, to foster cultural and structural change.

By prioritizing safety, accessibility, and cross-sectoral cooperation, the 3Cs model offers a scalable roadmap for universities and local authorities to reduce car dependency, improve public health, and strengthen urban-rural connectivity. Its long-term impact will depend on sustained political commitment, robust data collection, and the ability to address both practical constraints (e.g., infrastructure gaps) and perceptual barriers (e.g., user confidence and awareness). In doing so, it contributes to a broader transition toward equitable, low-carbon mobility systems across Europe.

9. Appendices

9.1. Online resources and digital tools developed during the project

9.1.1. 3Cs Website

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Website Structure: Top Page Overview

The 3Cs project website (https://www.uc.pt/en/3cs/) was strategically organized into four core sections to maximize engagement and knowledge-sharing:

3Cs Directory

- **Stakeholder Database**: Comprehensive profiles of participating:
  - Universities
  - Sports organizations
  - Local communities
  - Political decision-makers

- **Dynamic Content**: Regularly updated institutional information
- **Case Studies**: Documented success stories and collaborations
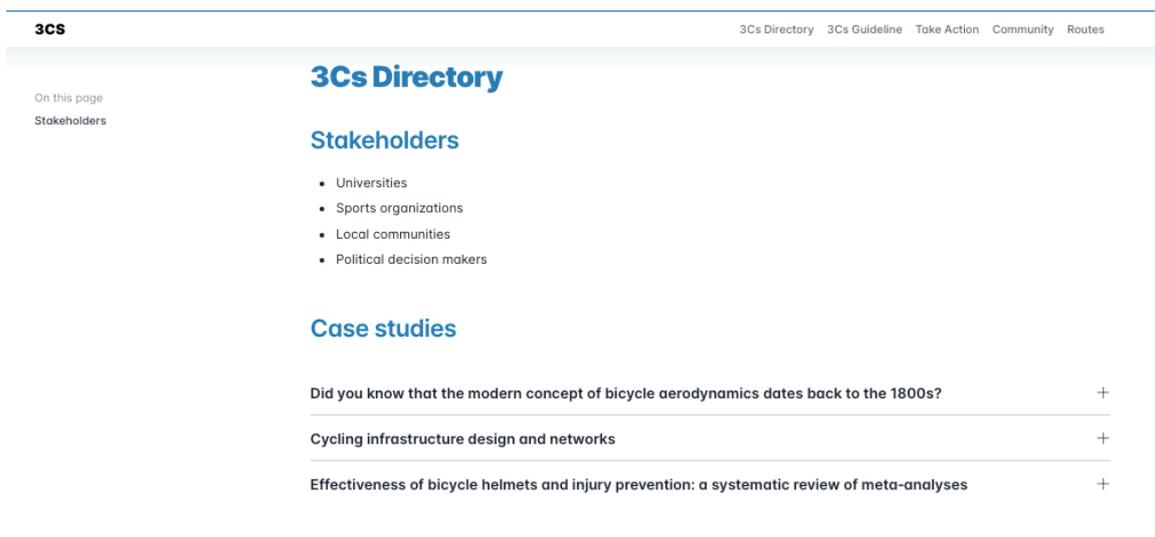
Take Action

- **Educational Hub**:
  - Good practice guides for sustainable mobility
  - Research publications
  - 3Cs Mobile App integration (featuring:
    - ✓ MUV app functionalities
    - ✓ 3Cs challenges to incentivize active mobility)

UNIVERSIDADE D COIMBRA   PT **EN**   1 2 9 0   Q   SIGN IN

3CS   3Cs Directory   3Cs Guideline   Take Action   Community   Routes

Take Action

EDUCATIONAL CONTENT   GOOD PRACTICES   RESEARCH   3CS MOBILE APP

In this section the following information can be found:

Educational Modules

1. **ABC Bike Check**
   - A practical guide teaching users how to perform a basic check (ABC: Air, Brakes, Chain) before using their bicycles, ensuring safety and functionality.

The ABC Quick Check

https://www.youtube.com/watch?v=bgTJaWFQD9A

2. **How to Ride a Bicycle – Introduction – Safety Equipment**
   o An introductory video covering the basics for those learning to ride a bicycle.

How to Ride a Bike | Safety Equipment

https://www.youtube.com/watch?v=O9GpWl-E7RY&list=PLu6gjdynl9Z9bzEOG2U9ZxKsMiwLjhsbr&index=1

3. **How to Ride a Bicycle - Balance**
   o Techniques to improve balance, essential for beginners or those looking to build confidence on a bike.

How to Ride a Bike | Find the Balance

https://www.youtube.com/watch?v=PmvqyoUS_hk&list=PLu6gjdynl9Z9bzEOG2U9ZxKsMiwLjhsbr&index=2

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4. **How to Ride a Bicycle – Learning to pedal**
   o Practical tips for learning how to pedal safely and effectively.

How to Ride a Bike | Learning to Pedal

https://www.youtube.com/watch?v=Ktek84pz0PY&list=PLu6gjdynl9Z9bzEOG2U9ZxKsMiwLjhsbr&index=3

5. **How to Ride a Bicycle – Cornering (Turn and Control)**
   o Strategies for navigating corners safely and with control.

How to Ride a Bike | Turn and Control

https://www.youtube.com/watch?v=ZHZX62OI1LA&list=PLu6gjdynl9Z9bzEOG2U9ZxKsMiwLjhsbr&index=4

6. **How to Ride a Bicycle - Cycling Safely in Urban Areas**
   o Focused on rules and best practices for riding in urban areas, promoting safety and respect for traffic regulations.

How to Ride a Bike | Road Safety Rules

https://www.youtube.com/watch?v=LWsNhBDTruY&list=PLu6gjdynl9Z9bzEOG
2U9ZxKsMiwLjhsbr&index=6

Good Practices:
Partner Showcase Section

This dedicated section of the website features comprehensive profiles of all project partners, highlighting their unique contributions and sustainable mobility good practices. Key components include:

For Each Partner:
✓ Institutional profile and role in the 3Cs project
✓ Detailed description of implemented good practices
✓ Visual documentation (photos/videos) of initiatives
✓ Downloadable resources and case studies

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Research & 3Cs Mobile App:

This section highlights two key components of the 3Cs project:

Research

- Links to published studies related to our goals

University Challenges

- How to use the App
- Documentation of sustainability challenges initiated at each partner university
- Collective challenges undertaken by the entire consortium
- Results and impact metrics for each initiative

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Community

- **Interactive Features:**
  - o Q&A forum for stakeholder dialogue

Routes

- **Route Resources**:
  - o GPS files and safety guidance
  - o Stage-by-stage descriptions
  - o Participant testimonials and photo galleries

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9.1.2. Extra Educational Material Produced

These videos are part of a toolkit designed to support the training and awareness of participants, fostering active and sustainable mobility.

To raise awareness about other related and important topics, and to better inform people about active mobility and its impact on the community, we also organized online classes on cycling mobility and cycling-friendly cities, as detailed below.

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162

Cycling Mobility

https://www.youtube.com/watch?v=nuNILJ2mTrA

Workshop on Sustainability Mobility: Workshop Dissemination Strategy

To maximize impact and accessibility, all project workshops were:

- **Promoted** through targeted digital campaigns and partner networks
- **Recorded and archived** on the 3Cs website for on-demand access
- **Optimized for reach** with multilingual subtitles and downloadable resources

This dual approach (live + digital) allowed us to:

✓ Engage broader audiences beyond physical attendees

✓ Create a lasting repository of knowledge

✓ Enable asynchronous participation across time zones

Part 1: **Sustainability through Active Mobility**

Active Mobility | Sustainable Cities

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https://www.youtube.com/watch?v=jvTbmzkItnY

Responsible: Professor Anabela Ribeiro
Goal:

- Raise awareness about active mobility's environmental and health benefits (e.g., walking, cycling) as sustainable alternatives to motorized transport.
- Encourage the adoption of sustainable commuting habits among the university community.
- Highlight the connection between active mobility and reduced carbon emissions, contributing to the university's overall sustainability efforts.

Part 2: **Active Mobility and Health Promotion**

Active Mobility | Health Benefits

https://www.youtube.com/watch?v=0iNKr9WdcVo

Responsible: Professor Amândio Santos
Goal:

- Promote the health benefits associated with active mobility, including improved physical and mental well-being.
- Educate participants on how active commuting can reduce sedentary lifestyles and lower the risks of chronic diseases.
- Foster a culture of health-consciousness linked to sustainability by integrating physical activity into daily routines.

ToolKit

The toolkit can be easily found on the 3Cs website under the "take action" menu, under Toolkit (https://www.uc.pt/site/assets/files/1445503/3cs_-_versa_o_final.pdf).

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Guide to the 3Cs Route

The guide was developed based on the expected needs for the routes and can be easily found on the 3Cs website under the "Routes" menu, under "Guide to the 3Cs Route" button (https://www.uc.pt/site/assets/files/1445503/en_e-book_3cs_1.pdf).
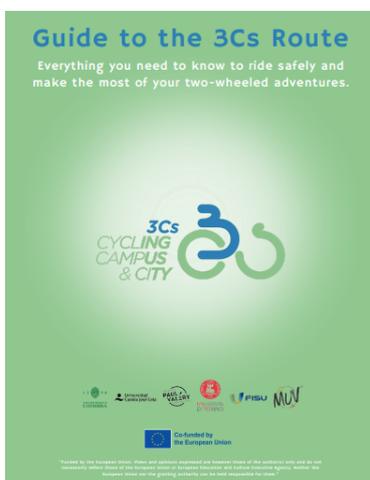
Summary of Legal Cycling Rules in France, Italy, Portugal and Spain

To ensure all participants and interested parties are informed of the rules and legal requirements for using the bike and promoting a safe, sustainable 3Cs route, we have created a summary document of the legal cycling rules in each country. This information sheet is available on the 3Cs website under the

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"Routes" menu, via the "Legal Cycling Rules" button (https://www.uc.pt/site/assets/files/1445503/summary_of_legal_cycling_rules.pdf).

3Cs Green Route – Climate and Seasonal Planning Guide

Given the route's geographical diversity—from coastal areas to mountain passes—understanding seasonal and climatic factors is essential for a safe, enjoyable, and efficient journey. To assist with this, we have created a comprehensive information sheet, which is available on the 3Cs website under the "Routes" menu via the "Climate and Seasonal Planning" button (https://www.uc.pt/site/assets/files/1445503/1__3cs_green_route_climate_and_seasonal_planning_guide.pdf).

3Cs Project Videos

We have produced five episodes as part of the 3Cs project, each focusing on one of the university partners and an additional episode featuring FISU, which provides a broader overview of the project.
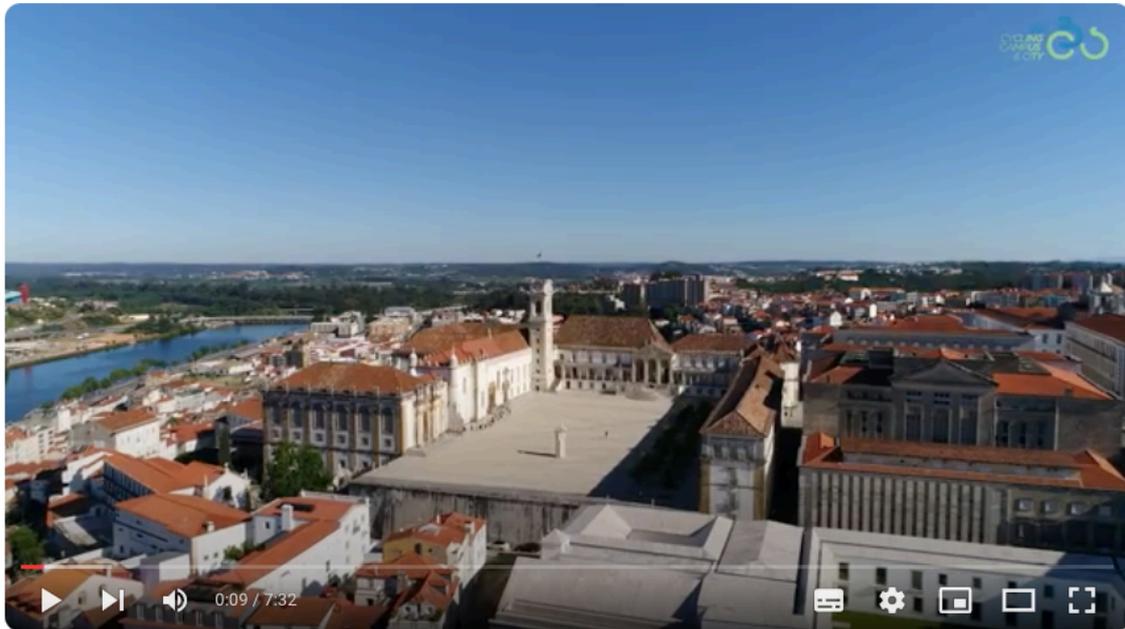
These episodes aim to highlight the realities of active mobility in each university city, showcasing unique perspectives and initiatives. The content includes contributions from individuals with diverse backgrounds, such as students, staff members, and key figures in university leadership positions (e.g., members of the rectory). Each participant shares their personal experiences, feelings, and thoughts on the importance of cycling and its role in promoting sustainable mobility within their communities.

By presenting these perspectives, the episodes not only emphasize the challenges and opportunities of adopting active mobility in different contexts but also underline the shared commitment of all partners to fostering healthier and more sustainable lifestyles.

Below are the videos along with their respective links:

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3Cs - Episode 1 – University of Coimbra: https://youtu.be/rR3F0YI7tkM

3Cs - EP1 - University of Coimbra

3Cs - Episode 2 – Universidad Camilo José Cela:

https://www.youtube.com/watch?v=isN0Q0SxYT0&list=PLQDKJiiZKH5LKStIp7wZEoS
-wpJE3GzIz&index=3

3Cs - EP1 - University of Coimbra

3Cs - Episode 3 – Université Paul-Valéry Montpellier:

https://www.youtube.com/watch?v=aYEqk889Z5s&list=PLQDKJiiZKH5LKStIp7wZEoS-wpJE3GzIz&index=4

3Cs - EP3 - Université Paul Valéry - Montpellier

3Cs - Episode 4 – Università di Torino:

https://www.youtube.com/watch?v=du4db8nTlb4&list=PLQDKJiiZKH5LKStIp7wZEoS-wpJE3GzIz&index=5

3Cs - EP4 - Università di Torino - Turin

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3Cs - Episode 5 – Fédération Internationale du Sport Universitaire:

https://www.youtube.com/watch?v=SWlwIYxx3IQ&list=PLQDKJiiZKH5LKStIp7wZEoS-wpJE3GzIz&index=6

3Cs - EP5 - FISU - Lausanne

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169