

Louvain School of Management

An analysis of recurrent barriers to the implementation of sustainable mobility actions in Europe.

Case studies and recommendations for Brussels.

Author(s): Quentin Georges
Supervisor(s): Benoit Gailly
Academic year 2022.-2023.
Dissertation for the master of Business Engineering
Master subject and focus International Finance
Daytime schedule

Acknowledgement

I would like to thank all the people who have contributed in any way to the realization of this study. Specifically, I would like to thank Ms. Dagmara Wrzesińska , MaaS & urban mobility specialist at Traffi, Ms. Laura Babío Somoza, Project Manager Just Transition Coordinator & Traffic Efficiency Co-Coordinator at POLIS Network, as well as Mr. Mario Cools, Professor of Transport and Mobility at University of Liège, for giving me their time and expertise to solidify my recommendations. I would also like to thank my mentor, Benoit Gailly, professor and advisor in innovation management and strategy at the Louvain School of Management, who supervised me throughout this journey by providing me with his experience and wise advices. Furthermore, I would like to thank my close circle, my family and friends, who have supported me from start to the end by providing me with their motivation and feedback.

Table of Contents

1. Introduction.....	1
1.1. Context and climate issues	1
1.2. Types of mobility	2
1.3. Origin and evolution of the concept of sustainable mobility.....	3
1.4. Obstacles to the development of sustainable mobility	5
1.5. Objective and structure of the research	6
2. Literature Review	7
2.1. Legal and institutional barriers	8
2.2. City-specific barriers.....	10
2.3. Financial/economic barriers	11
2.4. Knowledge-based barriers	13
2.5. Organizational barriers.....	15
2.6. Social and cultural barriers	16
2.7. Technological barriers	19
2.8. Political barriers	20
2.9. Unforeseeable/temporary barriers	22
2.10. Summary Table.....	22
3. Case Studies.....	26
3.1. City of Seville: Development of a bicycle network.....	27
3.1.1. Description of the city and the implemented action.....	27
3.1.2. Barriers to implementation	29
3.1.3. Outcome	33
3.2. The Nottingham Parking Levy	35
3.2.1. Description of the city and implemented action.....	35

3.2.2. Barriers to implementation	36
3.2.3. Outcome	38
3.3. MaaS : The model of Helsinki, Finland	39
3.3.1. Description of the city and the implemented action.....	39
3.3.2. Barriers to implementation	41
3.3.3. Outcome	45
3.4. Electric Vehicles Implementation : The Success Story of Oslo	46
3.4.1. Description of the city and the implemented action.....	46
3.4.2. Barriers to implementation	47
3.4.3. Outcome	50
3.5. Urban Freight logistics : A new governance model for the city of Turin.....	51
3.5.1. Description of the city and the implemented action.....	51
3.5.2. Barriers to implementation	52
3.5.3. Outcome	55
3.6. Analysis and results of case studies.....	56
4. Analysis of a current implementation.....	58
4.1. The Good Move Plan in the City of Brussels	58
4.1.1. Good Move : Description and origin.....	58
4.1.2. Current progress and future planning.....	59
4.1.3. Challenges following the similarities of case studies.....	61
4.2 Recommendations with expert advices.....	66
5. Conclusion	73
6. References	76
Appendix.....	91
1. Interview Guides.....	91
2. Interviews	95

1. Introduction

1.1. Context and climate issues

The European Union aims to be the first climate neutral continent by 2050. On September 16, 2020, during her State of the Union speech, Ursula von der Leyen, President of the European Commission, mentioned an ambitious proposal. The European Commission's goal is to reduce emissions by 55% by 2030. If achieved, this target would represent a major step forward on the EU's path to climate neutrality by 2050 and would allow the EU to meet its commitments under the Paris Agreement. A circular economy as well as carbon neutral production are already two themes promoted by the EU. According to the commission's report ([EU commission, 2022](#)): *"As a consequence of the ambition of the European green deal to achieve climate neutrality by 2050, the 2030 energy targets, which currently aim to achieve a 32% share of energy from renewable sources and improve energy efficiency by 32.5%, will be revised upwards. The aim is to make them "fit for 55", i.e., an increase from 40 to at least 55% of the 2030 emissions reduction target."* Thus, a complete energy package has been adopted by the commission. This includes a building renovation policy, the European methane strategy and the 2020 state of the energy union report ([EU commission, 2022](#)).

According to the Commission's report ([EU commission, 2020](#)): *"Transport currently accounts for a quarter of the EU's greenhouse gas emissions. The European Green Deal aims to reduce these emissions by 90% by 2050. The shift to more sustainable transport means putting users first and offering them more affordable, accessible, healthy and cleaner solutions. A key objective is to stimulate the adoption of clean vehicles and alternative fuels. Meeting ambitious climate goals also requires a shift to more sustainable modes of transportation, such as rail and inland waterways."*

The importance of the activity linked to transportation, which is an important component of our mobility, is evident in Europe. In the European Union, 33% of our total energy consumption comes from the transport sector. Similarly, 23.2% of greenhouse gas emissions come from this same sector ([Eurostat, 2020](#)). In addition to this, the destruction of certain natural habitats and ecosystems is due in particular to the construction of infrastructures related to these transportation modes, and the fact that many public transport systems are unable to keep up with the frantic pace of urban and

spatial development ([Berger et al., 2014](#)). Adding to this the fact that European citizens are moving more frequently over long distances while wanting to save as much time as possible, we have a small idea of the complex issues we have to face.

Greenhouse gas emissions by source sector, EU, 2020

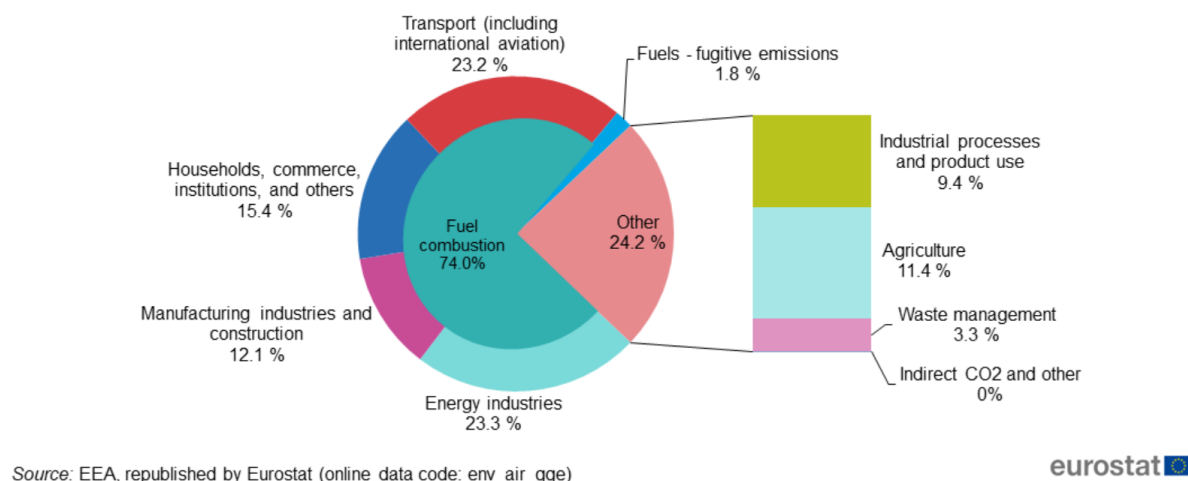


Figure 1: Greenhouse gas emissions by source sector, EU, 2020 (EEA, republished by [Eurostat, 2020](#))

We can therefore see the clear will of the European Union to act in the transport sector to make it more sustainable. However, transport itself is linked and often interchanged, or even confused, with another broader and more encompassing concept, that of mobility.

1.2. Types of mobility

It is important to know that the concept of mobility can be applied in different ways. According to [Walzer \(1990\)](#), four forms can be distinguished:

- Geographic mobility, which summarizes the change of physical locations and thus mobility in the form of transportation.
- Social mobility, which is associated with a change in social position.
- Marital mobility, which is associated with a change in status (marriage, divorce, etc.)
- Political mobility, such as floating voters, institutional instability, etc.

According to [Walzer \(1990\)](#), these four types of mobility are interrelated, and a significant reduction in any one of them would have substantial effects on the others.

The concept of mobility that we will discuss throughout this thesis is, however, specifically centered on "geographic" mobility. Moreover, as in [Hoyer's \(1999\)](#) study, the focus here is not on the change of residence but on the recurrent movements of individuals and goods in our society in general. Again, according to [Hoyer \(1999\)](#): *"It is thereby linked to a concept of transportation and is within a tradition found in physical planning and transport research"*. However, it is important to highlight the difference between the terms mobility and transportation, transport being just one component of the more global concept of mobility. For example, can one really say that one is mobile if one only has public transport every two hours or if one has a car to drive on congested roads? Thus, having a means of transport does not necessarily mean having access to good mobility. Mobility is not about having access to a single mode of transport, but about having access to quality transport options wherever one wants to go. Therefore, we can identify two aspects of this mobility. The first one, then, is the tangible realization of travel needs in the form of actual movements. The other one, referred to as the potential for movement, is a personal and societal categorization functioning as a limitation of the first ([Jones, 1987](#)).

In order to put the terms on this concept, we will therefore use the definition set up by [Hoyer \(1999\)](#):

"Mobility is an expression for both the potential for movement and the volume of the actual movement taking place. It can be linked to persons, goods, and resources. It can be applied at an individual level, that is, for a person or a commodity. However, it can also be applied within sectors, or at a superior societal level."

1.3. Origin and evolution of the concept of sustainable mobility

The concept of sustainable mobility is not new and we can trace its origins back to the 1970s. This concept comes directly from another widely known concept today, that of sustainable development. This is described as such by Our Common Future ([World Commission on Environment and Development, 1987](#)): *"Development that meets the needs of the present without compromising the ability of future generations to meet their own needs"*. The term sustainable mobility was first used in the Green Paper on the Impact of Transport on the Environment ([1992](#)). This Green Paper addressed environmental protection, safety and security, consumer protection, labor rights and

social policy, and the external costs of transport were explained, but little consideration was given to climate change. The negative societal and environmental aspects of transport development were largely camouflaged by its beneficial aspects.

Although this report has put forward the undeniable advantages of this evolution of the transport sector such as the benefits on the global economy as well as the opening of the world to international exchanges and travels, it also puts forward the costs that this development implies. These costs are of an environmental nature, such as CO₂ emissions which contribute to the greenhouse effect and therefore to climate change, but also the social aspect which highlights the various accidents which have direct or indirect effects on our communities, not forgetting the fact that we are totally dependent on the limited resources that our planet can offer us. However, as these negative aspects became more and more important, it was concluded that this model was not sustainable, which forced us to imagine other aspects to exploit concerning our mobility.

Subsequently, the concept of sustainable mobility will encompass and combine sustainable transport with the sustainable development and will be defined by the Council of European Union in the Review of the EU Sustainable Development Strategy ([2006](#)) as follows:

"To ensure that our transportation systems meet the economic, social and environmental needs of society while minimizing their undesirable impacts on the economy, society and the environment."

Moreover, it is important to note that the concept of sustainable mobility has evolved and is not only related to the transportation model, which is again only a component of it. As pointed out by [Banister \(2008\)](#), sustainable mobility is a combination of actions that aim to reduce the need of travel, reduce trip lengths, promote greater efficiency in transport systems as well as promote modal shift. Therefore, following [Banister \(2008\)](#), this paradigm can be really effective if these four key elements are taken into consideration:

- Best possible use of technology, including investment in technology in transport modes, information systems and in the transport system itself, and in giving

industry directions on priorities (e.g., on alternative fuels). But this is also linked with a behavioral change in ecological driving.

- Regulation and pricing means that the external costs of transport should be reflected in the actual costs of travel through higher fuel prices or through some form of road user charging. Demand management reduces congestion and improves environmental quality, but it does require public support to work effectively. This would help reduce the numbers of trips, trip distance, change modal shares and promote more efficient vehicles.
- Land-use development, including planning and regulations, needs to be integrated, so that physical restraint measures and development patterns are used to support shorter travel distances. Improved levels of proximity would help reduce distance travelled and contribute to trip reduction and modal split changes.
- Clearly targeted personal information, including social pressure, awareness raising, demonstration, persuasion and individual marketing, is also crucial. Acceptability is an essential (yet often neglected) element of sustainable mobility.

1.4. Obstacles to the development of sustainable mobility

Even if the awareness of the stakes related to the development of sustainable mobility plans is more and more generalized, we have to admit that the implementation of this one remains a long and tedious process, and that in spite of the studies already carried out, the stakes and constraints are of variable importance according to the localization of these. Indeed, each country and city, even within the European Union, has its own challenges to overcome, which we will describe in this thesis as barriers.

To further define the nature of these barriers, we will use and adapt the definition established by [Sen & Ganguly \(2017\)](#), itself constructed via the work of [Verbuggen et al. \(2010\)](#). Our definition of a barrier to sustainable mobility development is as follows:

Any obstacles or impediments to the development, use or implementation of sustainable forms of mobility that can be overcome through new policies or programs, as well as through technological advances.

These barriers can be of very different nature and importance but can be grouped into categories, which we will develop in section 2 of this research.

1.5. Objective and structure of the research

The objective of this research is to analyze and understand what are the main barriers to the development of sustainable mobility in Europe, in order to provide a solid basis for future research and to propose recommendations that are already usable for other European cities.

The main contribution of this thesis is to provide an overview of the recurrent barriers to the development of sustainable mobility in Europe. Indeed, many studies have already identified barriers, but often related to a single project, a city, or in the best case, to a whole country. With this study, we will establish a summary table of the known and recurrent challenges during this process, thus saving time for future work. In addition, previous studies have often focused on a specific category of project-related barriers (e.g., socio-cultural barriers). This study aims to identify all types of barriers that previously implemented projects have faced, regardless of their nature.

The second main contribution of this thesis concerns the barriers themselves. Through case analysis, we will be able to confront theory with practice. We will be able to study to what extent the challenges listed in some cities or countries are already solved, under study, or not feasible depending on the location. This part will allow us to establish differences but also similarities between cities and thus to better identify the main issues they have to face. The stakes and barriers are indeed different according to the cities and each one grants a different degree of importance to them.

The third important aspect of this thesis relates to future issues. Through the opinions of the experts we met, we will be able to gather their recommendations and confront them with the current situation and the plans already established. This will allow us to understand whether the current theory used is indeed effective or whether it only responds to contemporary issues. It would indeed not be surprising if the measures taken by the main actors do not fully respect the expert recommendations. Therefore, our results will allow future cities or smaller entities to prepare themselves and

anticipate the environment in which they will enter, and thus facilitate their implementation as much as possible.

Regarding the methodology, we will start our research with a review of the existing literature in order to cite and list the different themes and results found by our predecessors, which will take the form of a table. To do this, we will conduct our research on the various computer libraries available online as well as on official reports and press articles. The case studies methodology will be based on this literature review and we will use our constructed grid in order to keep a common thread during our analyses. We will therefore use this theoretical grid to carry out our practical analysis, as well as to draw our conclusions. Regarding the recommendations of the experts, an interview guide will be pre-established and will serve as a structure for our interviews.

The rest of this report will be presented as follows: Section 2 will consist of a review of the existing literature on the subject and will allow us to make a summary table of the main obstacles. Section 3 is associated with the practical part of the research and will draw on the literature to carry out different case studies on medium and large metropolises located in Europe. Section 4 will analyze the implementation of an ongoing mobility plan in the city of Brussels and provide recommendations based on expert opinion. Section 5 is the concluding section that will summarize the important findings and results of the study.

2. Literature Review

The objective of this section is to review the literature on the barriers that are recurrently encountered in the implementation of a sustainable mobility development plan. We will see in this chapter that these barriers are indeed numerous, can be distinguished in several categories and can evolve with time, some dissipating, others being created following the evolution of our society. Therefore, we will divide these different barriers into several categories based on their nature and which will be divided as follows according to the different environments: legal and institutional, city-specific, financial and economic, socio-cultural, knowledge-based, organizational, socio-cultural, technological, and political. In addition, there are the so-called unforeseen barriers, which will be discussed but will not be included in our study because of their unpredictability and therefore their irrelevance in a stable and continuous environment,

which is the desired objective. To build our framework, we will use several practical cases in order to identify similarities. The aim here is not to carry out case studies but to create a summary table, which is why these obstacles will be listed and theorized.

2.1. Legal and institutional barriers

An institutional or legal barrier to sustainable mobility refers to any policy, rule, regulation, or practice within a societal institution that impedes the adoption or use of sustainable mobility practices or technologies. Institutional barriers can be found in various institutions, such as government agencies, public and private organizations, and cultural norms. Examples of areas facing legal and institutional restrictions include road construction, pricing, and land use ([Institute of Transport Economics, 2001](#); [May et al., 2006](#); [Lindau, Hidalgo & Lobo, 2014](#)). Land use here refers to land acquisition, an area in which the lack of legislation is strongly present in Eastern European countries, as [Brůhová-Foltýnová and Jordová \(2014\)](#) point out who also recognizes the lack of technological standards in the cities of Aalborg, Coimbra and Zagreb or in [Wolek \(2018\)](#), supporting the fact that legislation in Poland failed to follow the natural process of metropolization, thus prevailing the uncontrolled development of suburban areas.

If such legislation does exist, however, it is not automatically effective. In Germany and the UK, the policies, although in place, are very weak and inadequate in the real world, as [Marsden & Groer \(2016\)](#) reveal. These weak policies can refer in particular to taxation, for instance in Sweden, where tax laws are described as an obstacle, as they have not taken into account the idea of the sharing economy ([Trafikanalys, 2016](#); [König et al., 2016](#)).

Other policies such as parking regulations are also a subject of disagreement. In Germany, the management of local parking regulations has been assigned by the federal level to the individual states, which in turn have delegated this to the municipalities. However, these municipalities are still dependent on the federal pricing and regulatory framework ([Kirschner & Lanzendorf, 2020](#)). In addition, the authors stated that municipalities needed to wait for the federal carsharing act in order to allocate parking space for it. This carsharing stations problematic is also stated in [Kogling \(2016\)](#), mentioning that in Sweden, many municipalities feel that federal legislation does not give them permission to allow parking spaces for carsharing.

Another challenge is that, according to [Serrano-Lopez et al.,\(2019\)](#), current standards and policies favor the use of cars and therefore include a barrier to any other type of transport. These policies favoring the car sector are also listed by [Bardal et al., \(2020\)](#) in his study of three Norwegian cities, adding that these measures may even be disruptive to any new implementation of other types of mobility. Indeed, this system means that local means of transport are less favored, as well as the respective development of bicycle and pedestrian routes. This makes the realization of experiments concerning these other means of transport less frequent and therefore the place for other methods of transport such as new motorized instruments like electric bicycles are less studied. This obstacle is confirmed by [Loorbach et al \(2021\)](#), who argue that the development of new technologies inevitably involves the development of new legislation. These institutional problematics are summarized by [Schwanen \(2018\)](#) as follows: *"Shared bike schemes or mobility cooperatives, for example, face difficulties related to permits, parking licenses, ownership structures, responsibilities and insurance. The new regulatory and policy challenges that are part of this transition are related to new technologies and at the same time challenge the dominant discourse that revolves around optimization, support of individual choice, separation between public and private, and a broad set of rules and regulations that have developed around current infrastructure and their use."*

Moreover, industry and infrastructure monopoly can also be an institutional barrier to the adoption of smaller, distributed supply technologies. Monopolies in an industry can limit competition and prevent new players from entering or exiting the market. For example, in the energy sector, regulated networks such as electricity, gas, and heat transmission networks, are natural monopolies because they are more efficient and less costly when operated by a single supplier. Many countries still have policies that protect dominant centralized power generation, transmission, and distribution, making it difficult for renewable energy to compete. To promote renewable energy technologies, changes in existing laws and regulations are needed, particularly with regard to the integration of renewable energy into the power system ([Sen&Genguly, 2017](#)).

Overall, institutional and legal barriers to sustainable mobility are policies, rules, regulations or practices within societal institutions that impede the adoption or use of sustainable mobility practices or technologies. These barriers can be found in various institutions, such as government agencies, public and private organizations, and cultural

norms. Road construction, pricing, land use, and parking regulations are all examples of areas facing legal and institutional restrictions. Weak policies, tax laws, industry and infrastructure monopolies, and policies favoring car use can be examples of barriers to sustainable mobility.

2.2. City-specific barriers

City-specific barriers to sustainable mobility are those challenges that arise from a city's unique characteristics, such as its size, density, geography and existing transportation infrastructure. These barriers can make it difficult to implement sustainable transportation practices or infrastructure in a way that is effective and efficient in the city's unique context. According to the literature, it is possible to identify four main types of barriers when it comes to establishing a mobility plan in a metropolis.

The first challenge depends on the layout of cities which, as [Serrano-Lopez et al. \(2019\)](#) points out, influences the travel behavior of individuals. The abusive use of high-rise buildings or other private condominiums negatively influences the rest of the policies in place, which therefore prove to be unsatisfactory in terms of land use. The same problem has been observed in Bucharest and its "dormitory districts" where one can only access by private vehicle ([Cavoli, 2021](#)). The author points to the construction of low-density peripheral areas in the post-communist period as the cause. Infrastructure may also be simply impossible to adapt such as bicycle lanes in the cities of Thessaloniki, Elefsina, and Karditsa in Greece, where the streets simply do not allow it ([Bakogiannis, et al., 2017](#)). However, there are also natural barriers such as the sea separating the cities of Reggio Calabria and Messina in Italy ([Musolino 2022](#)).

A second constraint can also be purely topographical. We have, for example, cities that are getting bigger and bigger. If we take the case of Barcelona and the study of [Miralles-Guasch & Domene \(2010\)](#), we show that 30% of students do not go to university by bike only because the distance is considered too high. Another topography concern is also under study by [Fitzsimons et al. \(2013\)](#) pointing to the challenge that flood-prone areas reveal during times of flooding.

Several climatic aspects are the third main barrier that can be taken into account as pointed out by [Sen & Genguly \(2017\)](#). Thus, a wind too weak for the use of wind

turbines, a river with too little flow for the implementation of a hydropower station, or a sunshine too weak to be able to produce photovoltaic energy are climatic factors that can prevent the implementation of one or the other technology. The recurrent rainfall in the city of Bergen, for example, does not favor the development of bicycle paths and is not strongly advocated by the population ([Bardal et al., 2020](#)).

Finally, these constraints can also be historical. The city of Elefsina in Greece, for example, faces difficulties in linking its waterfront with its city center due to the presence of an archaeological zone ([Bakogiannis et al., 2017](#)). The authors also add that systems of mobilities in historical centers have their own challenges. This point is supported by [Gori et al., \(2012\)](#) in their study of the city of Rome, pointing out that the historic center of the capital proposed a limited traffic area accessible only to residents.

To sum up, barriers to sustainable mobility specific to a city may result from its size, density, geography, existing transportation infrastructure and historical or cultural factors. These barriers can make it difficult to implement sustainable transportation practices effectively and efficiently. Examples of these barriers include city layout, topography, natural factors such as climate, and historical or cultural aspects such as archaeological areas or historic centers.

2.3. Financial/economic barriers

A financial or economic barrier to sustainable mobility refers to challenges posed by the cost and affordability of sustainable mobility practices or infrastructure. Economic and financial barriers can make sustainable transportation options inaccessible or unaffordable for individuals and communities, particularly those who are economically marginalized.

The first economic aspect refers to the costs of the infrastructure to be set up. Indeed, this challenge is of great importance in Europe. According to [May et al. \(2001\)](#) and his study of 54 European cities, 80% of them face a budgetary problem when it comes to the development of roads and public transport infrastructure. This problem was also found in Edinburgh and was repeated in a later study ([May et al., 2006](#)), where the cost of implementation was too high compared to the benefits. More recently, the study by [Richter et al. \(2021\)](#) reported that the cost of launching a technology was too high

compared to the return, even if it was profitable. This aspect is also mentioned in the report of the [European Commission \(2020\)](#), highlighting the lack of public or private funding when it comes to implementing mobility plans.

This last point is also raised by [Bardal et al. \(2020\)](#), as the costs of these infrastructures are consequent and therefore require important financing. The fact that renewable technologies are often in the public domain is also a barrier to private investment, as it may be less attractive and therefore generally undervalued ([Sen & Gulengy, 2017](#)). The lack of involvement of private financing is also pointed out by other authors such as Gil, [Gil et al. \(2011\)](#), but also by [Hickman et al. \(2013\)](#), the authors adding that managing these inputs and expenditures from a local perspective will always be easier to achieve than if they were decentralized.

This local management of funding is, however, constraining as [May et al. \(2008\)](#) reveal in their study of the United Kingdom. Both revenue-based and capital-based funding methods have experienced problems in meeting the divergent demands of financial actors, partnering for funds, meeting deadlines, and limiting delays and uncertainties in decision making. In addition, cities in the UK are heavily dependent on national resources for funding transport projects. This funding is therefore mainly for national infrastructure ([Mardsen & Groer, 2016](#)). In Germany, administrative costs are highlighted by [Ackerman et al. \(2011\)](#).

Even though incentives for the use of green technologies are increasingly present in Europe, the literature ([Barissa et al. \(2016\)](#); [Faria et al. \(2014\)](#); [Daziano & Chiew \(2012\)](#)) point out that the high price of implementing electric cars compared to standard models remains a problem in cities. This challenge is found, for example, in the city of Krakow as highlighted by [Bielińska-Dusza et al. \(2021\)](#). A finding also made by [Biresselioglu \(2018\)](#) highlighting the fact that this dimension is present from a macro as well as a micro perspective.

Other aspects highlighted by [Sen & Genguly \(2017\)](#) are that underinvestment in the renewable energy sector is partly due to intellectual property issues. Environmental costs are not priced and therefore have less impact on people's consciousness. The high costs of investment required for this development is also problematic, especially in

developing countries. In addition, the uncertainty of the capital markets and in particular of the variation of energy prices requires a greater return on investment.

Finally, another aspect highlighted by [Bardal et al. \(2020\)](#) is that budgeting is often more consistent in the automotive sector than elsewhere. In their study of three Norwegian cities, the authors showed that the maintenance budgets for bicycle and pedestrian paths were far too low, and that the priority was on car roads.

Overall, economic and financial barriers to sustainable mobility relate to the cost and accessibility of sustainable transportation practices or infrastructure. Infrastructure implementation costs are often high and may not provide sufficient return on investment, making private financing less attractive. Financing transport projects is difficult because of the differing requirements of financial actors, administrative costs, and the heavy reliance of cities on domestic resources. Incentives for the use of green technologies exist, but the high cost of introducing electric cars remains a problem. Budgeting for sustainable mobility is often more consistent in the automotive sector than elsewhere, resulting in underinvestment in bike lanes and pedestrian walkways. Moreover, underinvestment in renewable energy is partly due to intellectual property issues, lack of environmental cost pricing, high investment costs, and uncertain capital markets.

2.4. Knowledge-based barriers

A knowledge-based barrier to sustainable mobility refers to challenges that arise from a lack of awareness or understanding of sustainable mobility practices, technologies and policies. Knowledge-based barriers can impede the adoption or implementation of sustainable mobility practices or infrastructure, particularly when individuals or organizations lack the knowledge or skills to make informed decisions about sustainable transportation options.

Access to information by individuals is essential and does not come naturally, as [Banister \(2008\)](#) points out. We must transmit it to them and not wait for them to find it themselves. Communication of policies is therefore crucial to the global population as well as to local stakeholders in order to get their acceptance, which for instance, is essential for the success of parking policies ([Papanikolaou et al., 2017](#)).

However, this information seems to be more accessible and generalized in smaller cities as [Mozos-Blanco \(2018\)](#) and his study on the mobility plans of different Spanish cities indicates. The information and knowledge would therefore be more complicated to spread in a larger city and therefore more difficult to gain acceptance. Acceptance of a measure by different actors is also a major point in the study of [Bakogiannis et al. \(2017\)](#), adding that a series of marketing measures to extend global knowledge is essential and should be combined with participatory planning programs.

The literature has already highlighted several aspects related to knowledge information that could be barriers to the implementation of a sustainable mobility plan. For example, [Shao et al \(2016\)](#) noted that facing a new or unfamiliar market, a lack of motivation, or a lack of confidence are recurrent barriers. This lack of trust is also supported by [Barissa et al. \(2016\)](#) indicating for example that stakeholders may doubt the environmental efficiency and real benefits of electric cars. Trust must therefore be felt between those who provide the data and those who use it ([Finger et al., 2015](#)).

A key issue to address is also the lack of communication of global information. Indeed, according to [Biresselioglu \(2018\)](#) there is a lack of general and multi-dimensional understanding in the decision-making process. This lack of information and data is also strongly felt from a local perspective. [Sen & Genguly \(2017\)](#) refer in particular to topographic data that is generally accessible from a national but not local perspective. The implementation of technologies such as wind turbines and solar panels are indeed dependent on such data and its quality, thus representing a barrier. The lack of contact and information transfer between the different authorities and actors involved complicates the implementation of data processing, modeling or documentation ([May et al., 2008](#)). This lack of information transfer is also evaluated by [Bardal et al. \(2020\)](#) as a major barrier.

This aspect therefore directly engenders another barrier mentioned by [Bardal et al. \(2020\)](#) and which concerns the evaluation of these data and measurements. The lack of efficient data processing tools means that it is not possible to evaluate them efficiently and this has consequently an impact on the measures implemented.

Overall, it is clear that knowledge-based barriers can significantly impede the implementation and adoption of sustainable mobility practices and infrastructure.

Access to information is essential, but it can be difficult to communicate effectively with individuals and stakeholders, particularly in large cities. Lack of trust and motivation can also hinder the adoption of sustainable mobility practices. In addition, there is a need to improve communication and information transfer between the different authorities and actors involved in sustainable mobility initiatives. Finally, the lack of effective data processing tools can also affect the evaluation of sustainable mobility measures. Addressing these knowledge-based barriers will be essential to promote sustainable mobility and reduce the environmental impact of transport.

2.5. Organizational barriers

Organizational barriers refer to problems of collaboration within and between the different institutions that design and implement policies. Unclear responsibilities, lack of capacity, and conflicts within and between these institutions are examples of such barriers ([Bardal et al., 2020](#)).

In the area of transportation, [Hickman et al. \(2013\)](#) emphasize the importance of establishing a strong regional and sub-regional transportation and urban planning framework, which allows integrated strategies to be developed and pursued more effectively. The authors add that if this is not achieved, development remains ad hoc and unorganized. This problem is found in particular in [Cavoli \(2021\)](#) and his study of several eastern cities, highlighting unmanaged city expansion and non-existent coordination between regional and local authorities in urban planning. The fact of having many municipalities, as in Poland, implies a weak coordination in the establishment of spatial policies. Therefore, [Okraszewska \(2014\)](#) describes us that: *"The spatial and functional chaos observed in the Polish cities results from weak planning system and excessive liberalism in management"*.

The lack of coordination between stakeholders is a major barrier in the literature ([Brůhová-Foltýnová & Jordová, 2014](#); [Koglin, 2017](#); [Lindau, Hidalgo & Lobo, 2014](#)), which result in a waste of time and energy in negotiation instead of conceiving and designing projects. The lack of alignment of stakeholders such as potential users, businesses, landowners, administrators, politicians, transports operators and affected non-users implies therefore protracted planning processes ([Lindau, Hidalgo & Lobo, 2014](#)). The implementation of electric vehicle for example requires effective

coordination between all stakeholders whether it is consumers, power system and distribution network operators, manufacturers and services providers or mobility and urban planners ([Newbery and Strbac, 2016](#)). This multi-stakeholder involvement is also described as necessary by [Gigler and Weeda \(2018\)](#) in creating a plan for transitioning to hydrogen-based mobility.

However, this collaboration remains complicated as highlighted in the study by [May et al. \(2008\)](#). Indeed, transportation departments are often seen as working in a silo and unwilling or unable to contribute to the health or economic development impact of transportation. In addition, post-implementation monitoring of a measure seems to be an area of great difficulty between institutions. This requires large planning strategies and programming activities, which can be very complicated for small municipalities, having to involve many public and private stakeholders as told by [Gil et al. \(2011\)](#). Having many collaborators becomes even more challenging when they start to have different professional interests as explained by [Bardal et al. \(2020\)](#), the authors adding that managing and integrating different planning cultures, professional views and routines becomes an important aspect to consider.

In summary, organizational barriers in mobility refer to problems of collaboration and coordination among the various institutions and stakeholders involved in policy design and implementation. These barriers include unclear responsibilities, lack of capacity, conflicts and planning cultures, and differing professional perspectives and routines. Overcoming these barriers requires establishing a strong regional and subregional framework for transport and urban planning, aligning stakeholder interests, and involving all stakeholders in planning and implementing measures. Overcoming organizational barriers can help to develop and pursue integrated strategies more effectively and efficiently, thereby contributing to sustainable transport and urban development.

2.6. Social and cultural barriers

A socio-cultural barrier to sustainable mobility refers to societal attitudes, beliefs and cultural practices that impede the adoption or implementation of sustainable mobility practices or policies. These barriers can result from a variety of social and cultural factors, such as lifestyle choices, cultural norms and social structures.

A very important aspect of this socio-cultural dimension is social acceptance. This social acceptance described as public acceptance by [Banister \(2008\)](#), itself influencing political acceptance, justifying that actions will be taken when sufficient public support is present. However, while political acceptability is influenced by the level of public acceptability, public acceptability is neither a necessary nor a sufficient condition for political acceptability ([Börjesson et al., 2012](#)). The author further adds that this public acceptance itself has two parts. On the one hand, the acceptance that policy measures work and are effective. On the other hand, that these measures are fair and just to society as a whole. This acceptance is not easy to gain, as [Mardsen & Groer \(2016\)](#) reveal in their studies in the UK and Germany, where the public did not clamor for measures that reduce carbon impact, causing opposition and therefore delays in some implementations.

In order to convince a user to change these habits, it is therefore necessary to convince them of the benefits of this transition. Thus, [Mozos-Blanco et al. \(2018\)](#) and [Masoumi \(2019\)](#) refer to the comfort of public transport that can motivate or discourage ridership where [Lindau, Hidalgo & Lobo \(2014\)](#) highlight the perceived lower quality mode of buses compared to rail systems. Inadequate infrastructure is also a big factor influencing user perceptions as revealed in several studies ([Axsen et al., 2013](#); [Azadfar et al., 2015](#); [Bakker and Trip, 2013](#); [Barisa et al., 2016](#); [Laurischkat et al., 2016](#); [Sierzychula et al., 2014](#); [Tan et al., 2016](#)) which often refers to the lack of electric mobility infrastructure such as charging stations.

Moreover, it has been analyzed that current benefits tend to be overestimated by consumers, while potential gains are underestimated. This phenomenon is referred to as status quo bias by [Koglin \(2017\)](#). The author also adds that the perceived risks of a new solution also tend to be overestimated. This phenomenon is best illustrated by switching from owning a private car to using an intangible mobility service, such as public transport.

This dispossession of a private means of transport is often presented as a barrier in the literature and is justified in several ways. Moving from a private to a shared car, perceived insecurity of access, having children and therefore needing special seating, and having to share a private space are generally the main and most cited barriers ([Kent](#)

[et al., 2017](#); [Koglin, 2017](#); [Holden et al., 2020](#); [Loorbach, et al., 2021](#)). While one might associate these justifications with a purely practical point of view, there is another equally important aspect of cultural origin. Indeed, car ownership is associated with a certain social status. The private car is indeed a symbol of independence, identity and even well-being ([Brůhová-Foltýnová & Jordová, 2014](#); [Loorbach et al., 2021](#))

This cultural difference may also simply be manifested in a country's routine. Norway, for example, is very attached to its automobile mobility and tends to prioritize its development of fully electric vehicles over cycling or pedestrian infrastructure ([Bardal et al., 2020](#)). The implementation of a car-free city is therefore a challenge at the socio-cultural level. The types of electric mobility also imply a major behavioral change on the part of consumers, while not guaranteeing satisfactory accessibility to transport needs and equal access to these services ([Holden et al., 2020](#)). This is particularly true in Rotterdam, where limited access to affordable mobility services limits the freedom and movement of lower-income communities ([Loorbach et al., 2021](#)).

Overall, socio-cultural barriers play an important role in the adoption and implementation of sustainable mobility practices and policies. Public and political acceptability is an important factor, and public acceptance itself has two components: acceptance of the effectiveness of policy measures and acceptance of their fairness to society as a whole. However, public acceptance is not always easy to achieve, as studies show opposition and delays in implementing measures to reduce carbon impact. To convince users to change their habits, it is important to convince them of the benefits of switching to sustainable mobility practices. This can be done by highlighting the convenience of public transport, improving infrastructure and highlighting potential gains that may be underestimated by consumers. Dispossession of a private means of transport is often presented as a barrier, as car ownership is associated with social status and independence. Cultural differences may also play a role, with some countries being more committed to car mobility than others. Implementing sustainable mobility practices and policies therefore requires a thorough understanding of the socio-cultural context and cultural factors that influence mobility behavior and attitudes.

2.7. Technological barriers

A technological barrier to sustainable mobility refers to challenges that arise from the development, availability and accessibility of sustainable mobility technologies or innovations. Technology barriers can impede the adoption or implementation of sustainable mobility practices or infrastructure, particularly in cases where existing technologies are inadequate or unavailable. The lack of engineering design or availability of technology itself are such barriers.

In the automotive sector, for example, the number of hardware engineers is higher than the number of software engineers, which limits the space for innovation and creates a real challenge for companies that want to convert their offer from powered vehicles to mobility services ([Hannon et al., 2016](#)). This lack of innovation in technology is mentioned by Arthur ([1989; 1994](#)) as a technology lock-in, meaning that the supremacy of incumbent technologies indeed creates barriers to the implementation of new ones.

Regarding infrastructure, the lack of implementation of bicycle lanes or parking facilities adapted to the environment is often cited in the literature ([Bardal et al., 2020; Mozos-Blanco et al., 2020; Masoumi, 2019; Bakogiannis et al., 2017](#)). The inefficiency of transport modes is also a barrier for users as revealed by [Miralles-Guasch & Domene \(2010\)](#), where student in Barcelona does not use public transport due to recurrent delay and incertitude of availability. Still concerning the infrastructure, a recurrent point is the lack of refueling stations as well as the electric terminals present in too small quantities. This aspect is directly linked with the storage capacities that can be difficult to implement due to the construction cost or the nature of the component to be stored ([Calisse et al. 2019; Farla 2010; Huetink 2010; Biressougli 2019](#)).

A recurrent technological barrier is related to the new fuels themselves as mentioned by [Farla et al. \(2010\)](#). The development of hydrogen cars for instance is still in its infancy and other biofuels are not as successful and efficient as traditional fossil fuels. Regarding electric batteries, the use of rare metals needed to manufacture them is restrictive and subject to irregular deliveries ([Flury & Frischknecht, 2012; Holden et al., 2020](#)). The inevitable batterie degradation is also a concern for the future implementation of electric vehicles ([Tan et al., 2016](#)).

Moreover, electric mobility requires a considerable amount of energy, which sometimes cannot keep up with demand. Given the fact that many economies are planning to phase out nuclear energy, increased electricity demand is considered a possible barrier. Large gas power plants and imported electricity generally can meet the surplus demand, but renewable energy sources alone are not sufficient ([Holden et al., 2020](#)).

In summary, technological barriers to sustainable mobility can result from difficulties in developing, making available and accessing sustainable mobility technologies or innovations. Lack of engineering design, availability of technology, or inefficiency of transportation modes are such barriers. The development of new fuels, such as hydrogen cars, and the use of rare metals needed to manufacture electric batteries are also cited as technological barriers. In addition, electric mobility requires a considerable amount of energy that sometimes cannot meet the demand, and renewable energy sources alone are not sufficient.

2.8. Political barriers

A political barrier to sustainable mobility refers to obstacles or challenges that arise due to political decisions, actions or inactions, and beliefs that impede the implementation or adoption of sustainable mobility practices or policies. Political barriers can be created by elected officials, political parties, or political processes that favor certain interests over others. Political barriers therefore differ from institutional barriers in their origins. According to [May et al. \(2006\)](#), the two sectors most commonly facing political barriers are road building and pricing. This is confirmed by the [Institute of Transport Economics \(2001\)](#).

According to [Hickman et al \(2013\)](#), strategic planning for major infrastructure development is essential. This planning must have a long-term vision and include both national and local stakeholders. This should not be done through a cumulation of policy documents but through a comprehensive understanding of the way forward. This aspect is found in several studies and in particular in [Brůhová-Foltýnová & Jordová, \(2014\)](#), pointing out that this problem is found both in post-communist countries and in more established democratic regimes. The same authors also add that some barriers were caused by a missing common vision, strategy or political documents at the city level.

This problem is also found in the UK and is pointed out by [Mardsen & Groer \(2016\)](#). Indeed, local authorities have no obligations and can choose which measures to implement and with what degree of involvement. Strategic programs are therefore not directed at lower levels of government. Similarly, the carbon targets are national and not sectoral, implying that the nominal contribution of transport was important to local authorities but not to their political leaders.

Policies on taxes and tolls are often contested by the people. This can lead to the rise of political parties seeking to thwart these measures, as in the city of Bergen ([Bardal et al., 2020](#)). The local uproar has also reached national politics, causing one of the coalition parties in the national government to demand a halt to the implementation of new transport policy packages ([Anderson, 2019](#)). This short-term aspect of political issues and decisions was also noted by [May et al. \(2008\)](#) and [Ackerman et al. \(2011\)](#), where political tensions between key parties have also been noted in the cities of Manchester and Stockholm.

Other political barriers concerned collaborative spatial and transport planning between municipalities. This observation was made in the cities of Thessaloniki, Elefisa and Karditsa ([Bakogiannis et al., 2017](#)) and this was also present in Trondheim and Bergen, where neighboring municipalities had a lower acceptance for restrictive policy measures against car use than those living in the city centers ([Bardal et al., 2020](#)). Moreover, elected officials who promote measures that reduce car use would also be less likely to be re-elected ([Bardal et al., 2020](#)). Due to political cycles, timelines are also often unrealistic and costs underestimates to facilitate decision making which provokes rushes into projects inauguration ([Lindau, Hidalgo & Lobo, 2014](#)).

In summary, political barriers are obstacles that impede the implementation or adoption of sustainable mobility policies due to political decisions, actions or inactions, and beliefs. Road construction and pricing are the two areas most often confronted with policy barriers. Strategic planning for major infrastructure development is essential and must be part of a long-term vision that includes national and local stakeholders. Collaboration between municipalities in land use and transport planning is also crucial. Short-term political tensions and the lack of a common vision, strategy or policy documents at the city level pose additional problems.

2.9. Unforeseeable/temporary barriers

An unforeseeable barrier is an obstacle or challenge that cannot be predicted or anticipated. It can occur suddenly or unexpectedly and have a significant impact on an individual's, organization's or company's ability to achieve a particular goal or objective. By temporary barriers one can think in particular of the effect that the construction of an infrastructure has on the rest of mobility. Thus, [Bakogiannis et al. \(2017\)](#) highlight in their study the fact that the construction of a metro in Thessaloniki has a strong influence on the development of other mobilities and technologies.

As an unpredictable barrier the first example that comes to mind is of course the Covid-19 pandemic. As [Das et al. \(2021\)](#) point out, this pandemic has strongly changed the behavior of users and the measures must therefore be impacted. According to the authors, 80% of car owners surveyed in their study will continue to travel by car after the pandemic. Similarly, the proportion of respondents using public transport drops from 18% pre-pandemic to 6% post-pandemic. However, regardless of the behavioral aspect, Covid-19 has accelerated the process of many policies related to sustainable mobility as pointed out by several authors ([Griffiths et al., 2021](#); [Schmidt et al., 2021](#); [Loorbach et al., 2021](#))

To sum up, unpredictable barriers can be caused by a variety of factors, including natural disasters, economic crises, pandemics or other unforeseen events. As such, they can pose a significant challenge to sustainable mobility and other related initiatives, making it important to have contingency plans in place to mitigate their effects.

2.10. Summary Table

Sustainable mobility is an essential component of modern city development, and its implementation has become increasingly important. Sustainable mobility focuses on creating an efficient and sustainable transportation system that reduces negative environmental impacts and improves accessibility while providing a convenient and safe means of transportation for people. However, despite the obvious benefits of sustainable mobility, there are several barriers to its implementation in cities around the world.

The first type of barrier is institutional or legal and is characterized by the lack of legal and regulatory frameworks to support sustainable mobility. For example, cities may not have appropriate legal frameworks that encourage the use of alternative modes of transport, such as cycling and walking. The lack of regulations and incentives for public transport use, as well as the absence of supportive policies, can also hinder the implementation of sustainable mobility.

The second type of barrier is city-specific and is characterized by specific conditions that make it difficult to implement sustainable mobility. For example, some cities may have high levels of congestion and limited space available for infrastructure changes. Others may have steep topography, making it difficult to promote cycling and walking.

The third type of barrier is financial or economic. The cost of sustainable mobility infrastructure, such as public transport, bicycle lanes and pedestrian zones, can be a significant challenge for cities. This cost can discourage investment in sustainable mobility and favor more traditional, unsustainable modes of transport such as the private car.

The fourth type of barrier is knowledge-based which refers to lack of knowledge and awareness of sustainable mobility that can hinder implementation. For example, city planners and policy makers may lack information on the benefits of sustainable mobility or may not be aware of best practices for implementing sustainable mobility.

The fifth type of barrier is organizational. In many cases, implementation of sustainable mobility requires inter-agency coordination, and lack of cooperation and coordination between different government agencies can be a significant challenge.

The sixth type of barrier is socio-cultural, that is, social and cultural factors can influence transport behavior. For example, the preference for private cars over public transport is often related to cultural norms and values. In addition, the lack of social acceptance of a measure or new mode of transport may discourage the use of a sustainable mode of transport.

The seventh type of barrier is technological and is characterized by the lack of appropriate technology to support sustainable mobility. For example, the lack of electric

charging stations for electric vehicles and the limited technology of intelligent traffic management systems.

The eighth and final type of barrier is political and is characterized by a lack of political will and support for the implementation of sustainable mobility initiatives. Political will is critical to overcoming the other barriers, as it drives the policy, financial and regulatory reforms that support sustainable mobility.

In general, it is essential that cities around the world address these barriers to successfully implement sustainable mobility initiatives. By identifying and removing these barriers, cities can create sustainable transportation systems that improve environmental sustainability, enhance accessibility and improve overall quality of life.

Through this first analysis and research we were able to identify the different types of barriers and their components. Thanks to this, we were able to build our theoretical framework on which we will base our approach during our case studies. [Table 1](#) summarizes these different barriers by giving concrete examples.

Type of Barrier	Barriers	Examples
Institutional/Legal	• Lack/non-existence of an appropriate legal and regulatory framework • Weak/insufficient legal and regulatory framework • Legal and regulatory framework unfavorable to micro mobility and alternative transport modes • Monopolistic institutional system complicating the development of other technologies	Lack of coordination between different levels of government, complex permit procedures, inadequate legal frameworks
City-specific	• Layout of the city (natural or human-based geomorphic constraints) • Topography of the city (relief or specific landforms constraints) • Climate conditions • Historical monuments and archaeological sites to be preserved and therefore complicating the implementation of surrounding infrastructures	Narrow or congested streets, hilly topography, high population density
Financial/Economic	• Insufficient budget allocation compared to high cost of infrastructure implementation and maintenance • Return on investment too low compared to the high cost of investments • Undervaluation of renewable technologies and unpriced environmental costs leading to a lack of public and private funding • Purchasing power to acquire new technologies too low at the macro and micro levels • Perceived excessive cost of using a new measure (transport ticket, parking fee, etc.)	High initial costs of low-emission vehicles, limited financing options, inadequate pricing policies for public transportation
Knowledge-based	• Weak communication of global information and policies to the population and local stakeholders leading to a lack of motivation or trust in new measures benefits in an unfamiliar market • Lack of general and multidimensional understanding of the decision-making process. • Information unevenly distributed among actors • Weak data evaluation and measurements due to low availability of quality data	Limited knowledge about the benefits of cycling or walking, lack of information about public transportation options, limited knowledge about the environmental impacts of transportation
Organizational	• Weak collaboration between national and regional institutions which does not allow integrated strategies to be developed and pursued efficiently • Large number of municipalities or authorities which implies coordination issues • Difficulty in satisfying the different professional interests of stakeholders in the creation of procedures • Post-implementation monitoring requiring significant capacity	Limited integration of different modes of transportation, inadequate planning and coordination among different stakeholders, lack of public participation in decision-making processes
Socio-Cultural	• Choosing to take the car over another transport mode because of habits • Acceptance of the public of a new technology or measure • Lower perceived quality of an alternative transport mode • Low availability of infrastructures demotivating the population of using a transport mode • Current benefits overestimated and potential gains underestimated • Overestimated risk of transfer to a new technology or measure • Feeling of disposing of an asset for a public service • Car acting as a social status • Inequality of access to public transport for lower income communities	Car-oriented culture and lifestyle, lack of interest in active transportation modes, limited awareness of the social and environmental impacts of transportation
Technological	• Technology lock-in created by incumbent technologies • Inefficiency of implemented technology • Lack of availability of infrastructures for population • Storage capacities issues leading to a lack of refueling stations and electric terminals • Lack of engineering design in some sectors	Limited availability of low-emission vehicles, inadequate charging or refueling infrastructure, limited availability of real-time transportation information
Political	• Rise of political parties searching to thwart measures • Forming of coalition with non-common vision and objectives • Political cycles imply short term vision and therefore rushed projects • Elected officials willing to reduce car use are likely to be less re-elected	Limited political support for sustainable transportation policies, competing political priorities, insufficient public engagement in decision-making processes

Table 1: List of recurrent barriers to sustainable mobility with classification and examples.

3. Case Studies

In order to identify the presence and relevance of these potential barriers we decided to study different projects already implemented in Europe. These projects are of different nature and are located in cities with specific characteristics. This diversity among our case studies will allow us to identify similarities in the challenges encountered, thus allowing us to flesh out our theory. In more detail, we will study the cities of Seville, Nottingham, Helsinki, Oslo, and Turin, which have all offered sustainable mobility solutions in recent years.

The city of Seville was chosen for the successful implementation of its bicycle network which, despite a non-existent cycling culture, allowed the city to start a modal shift to sustainable mobility. The city of Nottingham was chosen for the implementation of a workplace parking levy, the first of its kind in Europe, and thus implementing an integrated pricing and financing solution. Both actions have been recognized as "Good Practice" by the Interreg Europe ¹cooperation program, recognizing the success and transferability of the project to other cities.

The next city is Helsinki and was an obvious choice because of its actions in the mobility as a service sector. The implementation of the "Whim" project was and still is one of the pioneers of innovation in this sector, and has become a reference for other cities, justifying the study of this one. Another world reference is the city of Oslo, which is currently one of the top leaders in terms of deployment of electric vehicles and accompanying infrastructure. Oslo was for a long time the world leader in terms of sales of electric vehicles, available models, and deployment of charging stations. This philosophy, resulting from a long and responsible work by the Norwegian government, has made Oslo the capital of electric cars, thus justifying the interest in this city.

The last city studied is Turin in Italy, which has implemented measures regarding its urban freight logistics, consisting of a new legislative framework, justifying a flexible and adapted use of the pre-existing infrastructure and recognition schemes. This approach

¹ Interreg Europe is an interregional cooperation program co-funded by the European Union, which contributes to reduce disparities in the levels of development, growth and quality of life in and across Europe's regions ([Interreg Europe, 2022](#)).

has also been recognized as "Good Practice" and is part of the CIVITAS² report ([CIVITAS, 2020](#)), hence the interest in this one.

These choices also correspond to a desire to explore in a broader way the different types of possible actions of sustainable mobility. Through these different projects taking place in various environments, we can therefore analyze people's mobility from several points of view. Thus, the city of Seville proposes the development of new infrastructures, Nottingham implements a new policy measure, while Oslo makes an intelligent mix of these two components in addition to incorporating new technologies. The city of Helsinki offers an innovative alternative in terms of transport system and finally, the city of Turin brings this aspect related to freight transport, allowing us to broaden our considerations. The rest of this section will be composed for each case of a description of the project and the environment, followed by an analysis of the barriers and finally, a highlighting of the benefits and the success of this implementation.

3.1. City of Seville: Development of a bicycle network

3.1.1. Description of the city and the implemented action

Seville is a city in southern Spain and the capital of the province bearing its name as well as of the autonomous community of Andalusia. With a population of approximately 700,000 inhabitants and reaching 1.5 million in its metropolitan area, it is the fourth largest city in Spain. Its surface area is 140 km² with a population density of almost 5,000 inhabitants per km². The city has the only major river port in Spain due to the presence of the Guadalquivir River, which flows around the city to the west, and the Alfonso XIII Canal, which runs through the city. Seville is located 7m above sea level and dominates the Guadalquivir plain, offering a slightly undulating topography. The climate of the region is clearly Mediterranean, with an average annual temperature of 19.2°C, and can reach peaks of over 40°C in summer. The sunshine of more than 3000 hours per year makes Seville one of the warmest and driest cities in the country.

² CIVITAS is a European Union initiative to promote sustainable urban mobility by supporting and developing innovative transport solutions in European cities. The initiative was launched in 2002 and has since provided funding and expertise to over 80 cities in Europe to help them improve their urban mobility systems. The objective of CIVITAS is to create more sustainable, safe and efficient urban transport systems that reduce greenhouse gas emissions, improve air quality and promote healthier lifestyles ([CIVITAS, 2023](#)).

Between 2006 and 2010, the city of Seville began the construction of a large-scale bicycle network, increasing the use of bicycles from a marginal role in urban mobility to a participation rate of 6% in overall modal split and 9% in mechanical travel ([Interreg Europe, 2022](#)). This transition follows the approval of the Bicycle Master Plan by the City Council in 2007, defining a 120km bicycle network and other measures to promote bicycle use, including a public bike sharing system with 2,650 bikes and 260 stations around the city ([Ayuntamiento de Sevilla, 2014](#)). By 2016, the network had grown to 175km following subsequent expansions. This effective growth is based on active policies to build a continuous and homogeneous network of segregated bike lanes, having main guidelines ([Interreg Europe, 2022](#)):

- Segregation from motorized traffic.
- Connectivity between the main poles of attraction and the main residential areas.
- Continuity, without gaps along the network.
- Consistency of design and surfacing.
- Bi-directional: Almost all bikeways are bi-directional.

This separation of motorized and bicycle traffic increases both the perceived and actual safety of users. Connectivity makes daily use easier and the continuity of the network allows for comfortable, barrier-free travel. Homogeneity allows for a recognizable and attractive network for beginners. Overall, this network has been designed for potential and not current users, which has largely influenced the mobility culture of the population ([Interreg Europe, 2022](#)).

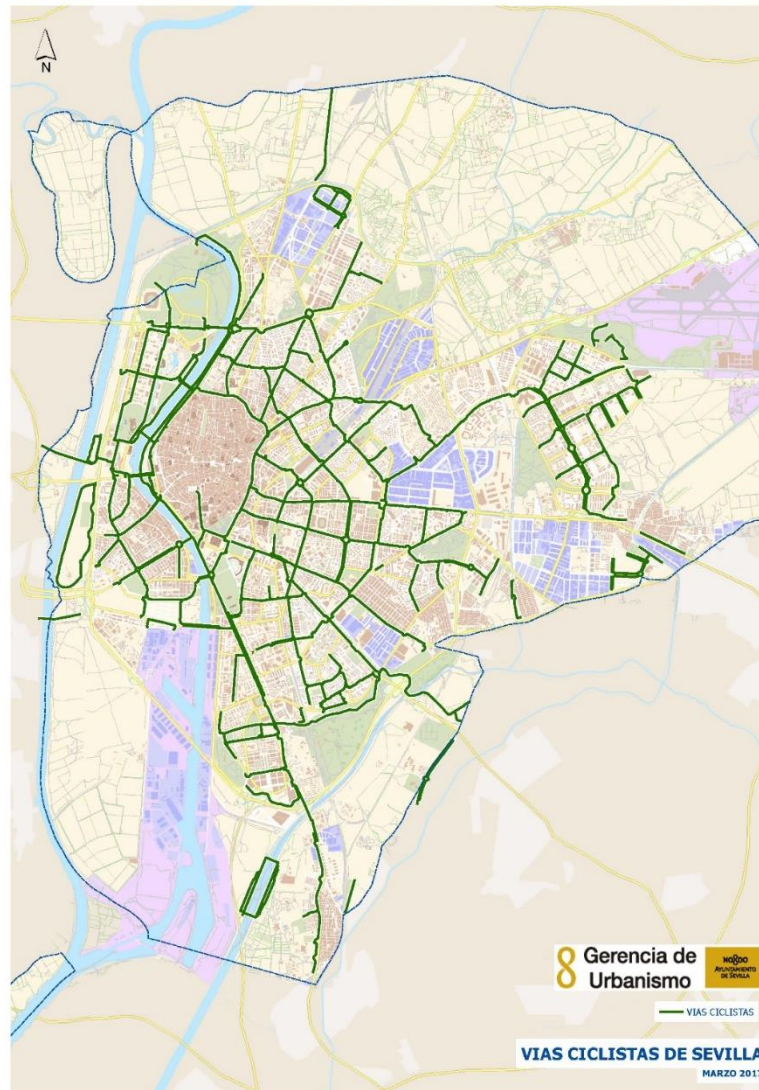


Figure 2 : Cycling network of the city of Seville ([Plan andaluz de la bicicleta, 2022](#))

3.1.2. Barriers to implementation

Seville has a rich and dense historic core with no less than 56,000 inhabitants. Therefore, in order to preserve this center, which is made up of very narrow streets and relational and commercial spaces, both the City Master Plan and the Bicycle Master Plan had to determine measures that would greatly reduce traffic. Due to the nature of this environment, there were no bicycle lanes or zones before. This lack of a culture promoting the use of bicycles has made it difficult to build new urban infrastructure, especially bicycle parking facilities. This lack of parking areas for cyclists has been a major impediment to the use of the bicycle network, as has the lack of infrastructure at points of connection with other modes of transportation ([Marqués et al., 2014](#)). The lack

of stations present at the beginning and end of a trip was widely contested by users. This feeling was especially felt in the outlying parts of the city, where leaving one's bike outside at night or for a long period of time during the day, created a fear of theft among private bike owners ([Castillo-Manzano, 2015](#); [Marqués et al., 2015](#); [Fernandez Heredia, Fernandez Sanchez, 2020](#)). In addition, the measures in place do not promote indoor bicycle parking as well as the development of parking of such kind. In some neighborhoods, it is even forbidden to park one's bicycle in the courtyards. Some measures have been implemented, such as allowing a user to attach his or her bicycle to a tree or urban infrastructure if there is no parking within 50 meters, but this has also generated another type of protest.

Aesthetic concerns were put forward, judging that new modern developments did not coincide with old and historic buildings, thus having a detrimental effect on the cultural and religious activities of the city center ([Castillo-Manzano, Sánchez-Braza, 2013b](#)). Regarding the bicycle network, the city of Seville faced many protests regarding the creation of bicycle routes, which was perceived as reducing pedestrian spaces. However, the infrastructure was built on already existing road spaces and it would be the location close to pedestrian routes that would create this distorted perception. A feeling of loss of safety for pedestrians has also been perceived since 2006, due to this proximity. However, this feeling would be due to a political ideology ([Marqués et al., 2015](#)).

We can also cite the protests of local residents blocking the streets, the complaints filed in court, or the protests of cab associations judging the bicycle rental system as unfair competition (although a future awareness will make them back down). Commercial associations have also protested, judging the removal of car parking (8,000 parking spaces have been removed and replaced by bicycle lanes) as the removal of a strategic weapon to face competition from shopping centers. These associations are very powerful in the Mediterranean and have a very strong car culture in southern Spanish cities. The bicycle was more often associated with a modest social class, where the individual freedom of the car was emphasized, which is a brake on the promotion of the bicycle. However, this classification seems to have disappeared nowadays ([Fernandez Heredia, Fernandez Sanchez, 2020](#)).

Since then, the city has had to deal with numerous protests and incidents when implementing certain policies. Facilities were sabotaged, making the use of bicycles impossible. After 15 months of operations, 62% of the bikes had been stolen, of which 12% were never recovered. Stations and bikes were damaged and by early June 2008, 12% of the bikes had flat tires. These incidents jeopardized the financial stability of the project and according to JCDecaux³, after 3 years of implementation, all the bikes had to be replaced, due to vandalism or theft ([Castillo-Manzano, Sánchez-Braza, 2013b](#)).

The various appeals were primarily due to disagreement between the pedestrian and cycling communities, involving the withdrawal of several articles by the Court of Andalusia and the banning of bicycles from certain areas during busy periods. In general, these protests from associations could therefore often be associated with a lack of coordination and information about the policies in place to promote cycling. The problem here was therefore a lack of information and understanding by the population ([Castillo-Manzano, Sánchez-Braza, 2013b](#); [Marques et al., 2015](#)). To overcome this problem and provide the necessary information in a uniform manner among the population, the city therefore organized workshops involving stakeholders ([Fernandez Heredia & Fernandez Sanchez, 2020](#)).

The importance of the participation of all stakeholders was essential to the successful completion of the project. However, they almost stopped contributing. The continuation of active participation is mainly due to the creation of a civil committee (Comision Cívica de la Bicicleta) with representatives of all stakeholders, open to all. This allowed the progress of negotiations to satisfy everyone's interests and unify pedestrian and bicycle projects, which was and still is of paramount importance ([Marqués et al., 2015](#)).

The promotion of cycling as a means of urban travel was therefore mainly linked to measures aimed at reducing and calming traffic. Policy measures such as the implementation of pedestrian zones, motor vehicle restrictions and speed limits have been introduced. However, it has been found that different local governments have followed the guidelines in approximate ways, implying a relative effectiveness of the

³ JCDecaux is the world leader in the outside advertising industry and is specialized in three main areas: street furniture, transport advertising, and billboard advertising. JCDecaux is a pioneer in self-service bicycle hire and was a major player in the implementation of the bicycle network in the city of Seville, providing its services and infrastructure and therefore acting as a significant financial supporter ([JCDecaux, 2022](#)).

new regulations ([Marqués et al., 2015](#)). Policy measures regarding speed limits and shared traffic space proved to be very weak, and restrictions against motor vehicles, implemented in 2011, were withdrawn a few months later due to a change in government. Indeed, following the victory of the Conservative party in 2011, one of the first measures was to dissolve the bicycle promotion offices and implement a marketing campaign for alcohol using the cycling infrastructure. This controversial measure, given its opposition to Spanish advertising law⁴, led to a social rejection of the bicycle rental system, as users saw an ecological mode of travel associated with a lifestyle far from respecting the same values ([Castillo-Manzano, Sánchez-Braza, 2013b](#)). Fortunately for the city, the morphology of the city due to its narrow streets, naturally limits the speed of travel and favors areas prioritizing pedestrians, thus making itself more effective than any established measure ([Marqués et al., 2015](#)).

The meteoric success of the project has also been a challenge for the city, which has had to deal with a demand that is much greater than the supply available at the beginning. Having only SEVICI⁵ as its main client, the city had to find and implement agreements with other public institutions in order to promote enrollment in the service. This led to the saturation of the system at the beginning and contributed to the creation of a bike-sharing service specific to the University of Seville, which suffered the most from this saturation due to the high percentage of participation of its community (30% of users in November 2009 were members of the university) ([Castillo-Manzano & Sánchez-Braza, 2013a](#)). Therefore, the city had to face problems of congestion at some stations, having to revisit the layout and supply of it, thus requiring a number of bicycles proportional to the need of the area. The stations also had to be implemented with connectivity to other means of transportation in mind, requiring a layout close to other connection points. The stations had to be designed to both self-regulate capacity, as well as provide easy transfer to another mode of transportation.

The city of Seville has therefore had to face several types of barriers in the implementation of its bicycle network and shared mobility service. The city, with a strong car culture before it, has had to create new measures and adapt its legislation in

⁴ Spanish advertising law prevents alcohol and cigarette advertising at any sporting activity ([Castillo-Manzano, Sánchez-Braza, 2013b](#)).

⁵ SEVICI is a unisex bicycle rental company promoting several types of subscriptions in the city of Seville. The service was launched in 2007 and is owned by JCDecaux ([Vallauré, 2022](#)).

order to promote the use of bicycles in its urban center. However, not all of these policies proved to be effective and some were even withdrawn shortly after implementation. In particular, adjustments have been made as a result of a renewal of the existing policy, which did not continue the efforts of its predecessors, and therefore lacked a common vision and objectives. This directly implied the perception of the population regarding the promotion of such a system, which had already been slow to accept and adopt the new practices. The lack of availability of certain infrastructures, particularly parking, discouraged many from changing modes of transport, and the perceived risk of using the bicycle as opposed to the car, a symbol of individual freedom, was significant. This second point refers directly to a lack of uniform information received by the population and therefore communicated by the authorities, which in turn created difficulties in the negotiations of the many different stakeholders. It should be noted, however, that the city of Seville does not seem to have experienced any fortuitous events in the implementation of its project. The economic stakes have respected expectations and do not seem to have been penalizing, the project being cost effective ([Brey et al., 2017](#)).

3.1.3. Outcome

The case of Seville is proof that a fast implementation of a segregated cycling network is a powerful first step in the implementation of bicycling as urban mobility where no previous culture of cycling was implemented. The real strength of this process has been to make the infrastructure safe, easy and comfortable for everyone, allowing an increase in the use of bike-sharing from its inception (see [Figure 3](#)) and will subsequently be recognized as a good practice by [Interreg Europe \(2022\)](#), thus defining the project as an example to follow.

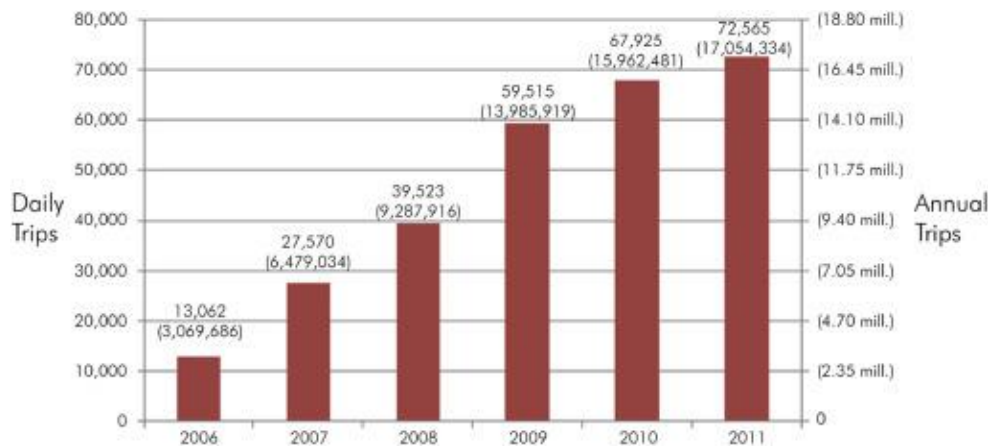


Figure 3 : Increase of daily and annual bicycle trips in Sevilla ([Castillo-Manzano, Sánchez-Braza, 2013b](#)).

This project has also several indicators of success like a daily commuting of 72,500 users, 9% of the mechanized travels and 5.6% of all movements, and a fuel reduction estimation has been evaluated at 27,151 barrels of oil per year (with an estimated cost of 2 million Euros) and a greenhouse gas emissions diminution of more than 8,000 tons of CO₂ equivalent per year. This innovation has also been studied and many key factor success have been adopted by other municipalities in Spain such as ([Interreg Europe, 2022](#)) :

- A well-planned development of cycling infrastructures.
- The rapid construction of the network, avoiding the construction of sections without connection.
- High quality in its construction (pavement, signage, parking).
- Associated facilities, such as bike workshops, being the main one the bike sharing system.
- Specific regulation of the cyclist circulation.
- Participation and awareness processes.
- Intermodality with public transport.
- Safe indoors bike parkings.

With many related benefits:

- The bike network has promoted a new kind of tourism.
- The improvement of the accessibility to the city center due to bike and pedestrians' policies has benefited the shops.
- Many small business linked to bikes have been created along the network.

3.2. The Nottingham Parking Levy

3.2.1. Description of the city and implemented action

Nottingham is a city in the United Kingdom located in the East Midlands region of England and is the county town of Nottinghamshire. Nottingham has a population of approximately 310 000, climbing to more than 700,000 in its global agglomeration, making it the seventh largest city in the UK. The city has an area of about 75km² with an average population density of 4000 inhabitants per km². The topography of Nottingham is quite varied, with a mix of lowland and upland areas. The city is situated on the River Trent, which flows through the center of Nottingham, and there are also a number of smaller rivers and streams in the vicinity. The highest point in Nottingham is Wollaton Hall, which stands at around 250 meters above sea level, while the lowest point is at the River Trent, which is just over 50 meters above sea level. Nottingham has a number of parks and open spaces, as well as a number of hills and valleys. The city has a number of historic buildings and monuments as well. Nottingham has a temperate climate, with relatively mild weather throughout the year. The average maximum temperature in summer is 21.5 °C and the average maximum in winter is 7.5 °C. The city experiences a fair amount of rainfall, with an annual average of 857.1 mm. Snow is not common but does occur occasionally.

Nottingham has an award-winning public transport system which has won several times the award of UK bus operator of the year ([Nottingham City Transport, 2022](#)). Nottingham has a comprehensive bus network operated by Nottingham City Transport, and a network of over 640 km of cycle routes. The city also has a park-and-ride scheme with over 5,000 parking spaces at 28 sites. However, the city has distinguished itself by another action implemented in recent years.

The Workplace Parking Levy (WPL) is a policy implemented by Nottingham City Council in the United Kingdom that requires businesses with more than 10 parking spaces to pay an annual fee for each space they provide for their employees. The goal of the WPL is to reduce traffic congestion and encourage the use of alternative modes of transportation, such as public transportation, biking, and walking. The WPL was introduced in 2012 and has been successful in reducing car traffic in the city and raising funds to improve public transportation ([Council N.C., 2011](#)). Under the WPL, businesses

are required to pay an annual fee for each parking space they provide for their employees. The fee is based on the type of business and the location of the parking spaces. There are exemptions and reductions for certain types of businesses, such as charities and small businesses, and for parking spaces used for car-sharing or electric vehicles.

The WPL has been controversial, with some businesses believing it places an excessive burden on them and unfairly targets companies that provide parking spaces for their employees. However, supporters of the WPL say it helps reduce traffic congestion, improve air quality and encourage the use of alternative modes of transportation.

3.2.2. Barriers to implementation

One of the main barriers to the implementation of the Workplace parking Levy (WPL) in Nottingham was public and business acceptance ([Dale et al., 2014](#)). As a result, the city council had to take steps to facilitate this integration, setting up a public consultation process involving businesses and other stakeholders to analyze proposals for pricing and other issues. A "public review" was then conducted entitled "The Proposed Nottingham Workplace Parking Levy, Report of the Examination" which included recommendations for the project. These recommendations included the need for business support. During this public review, three criticisms often emerged regarding the WPL ([Dale et al., 2014](#)):

- An additional cost to businesses that is detrimental to the city's economy.
- Ineffective against congestion.
- Unfair to some motorists who already bear a high tax burden.

One of the major reluctances of the companies was that since the WPL was the employers' responsibility, this was an additional cost, which could be a barrier to future investments ([Ison & Burchell, 2012](#); [Dale et al., 2014](#)). As a result, many large companies passed this cost on to their employees. However, medium-sized firms would tend to absorb this cost. Despite a PWC study showing that this cost will represent less than 1% of sales ([Dale et al., 2017](#)), the companies affected remained very critical. Indeed, 60% of them reacted to the consultations stating that they would relocate their activities and 50% of them said they would reduce their investments. This problem was solved by minimizing the companies' responsibility for the WPL charge through a reduction in

parking demand and the proposal of a personal and adapted workplace travel plan for employees.

The WPL has been perceived as a very brutal and unfair measure towards some residents. Indeed, a major criticism from the population is that it does not distinguish between those who travel in times of congestion and those who do not, nor does it distinguish between those who have access to feasible public transport alternatives and those who do not. Moreover, those who already have free parking space have a significant advantage over those who have to pay for their space. One concern was whether those who already had this advantage had their compensation adjusted to be fair to others ([Frost & Ison, 2008](#)).

A perceived risk was also that employers would not manage and value their parking spaces, thus not taking into account the mobility needs of their employees. Localities therefore also had to consider the potential for uncontrolled shifting of parking onto nearby streets. The public transport system therefore had to be efficient, and a ticketing service that was perceived as acceptable to those who needed to switch modes of transport had to be provided. This last point created uncertainty, caused by laws requiring competition between operators and thus making it difficult to implement an efficient ticketing system ([Frost & Ison, 2008](#)).

The City of Nottingham is surrounded by a number of distinct suburbs all belonging to the Nottingham County area. These boroughs have their own council with which they share responsibilities with the county council. Cooperation is therefore complicated between the authorities, both politically and legislatively. In addition, there are different electoral cycles for each area, which makes the coordination of the different councils quite complicated when it comes to large measures like the WPL ([Frost & Ison, 2008](#)). This large number of institutions creates political opportunism and rivalries, slowing down the implementation and optimization of county projects. These conflicts of interest also add to a time constraint due to different election cycles, which influences the decision-making processes of the entities, making it difficult for them to align allocated funds with planned programs in a timely manner.

In the end, once the measure was established and integrated into the city, questionnaires were conducted and submitted to the local population in order to

measure the real impact of such a measure on congestion and employee travel habits. However, some biases were identified among the studies. These questionnaires were found to have some shortcomings that made it impossible to analyze the situation and the effects of the measure in a fully reliable way ([Dale et al., 2019](#)). The quality of the data could be questioned, making it difficult to draw conclusions about the effectiveness of the project.

The main barrier faced by the city of Nottingham was therefore the acceptance of this new measure, especially by the business community. This was to be expected as it would impose an additional cost on businesses. However, the various fears from the business sector were quickly proven to be unfounded and referred to a lack of understanding of the long-term benefits of the implementation. The public saw some aspects of the new directive as unfair in comparison to others, as it added to an already high tax burden. The project faced organizational and political challenges due to the large number of participating entities that had to comply with programs spread over different respective periods. However, the implementation of this project was feasible due to its very low technological risk and minimal initial investment.

3.2.3. Outcome

The city of Nottingham has been struggling with congestion and pollution for years, and the workplace parking levy was seen as a way to help alleviate these problems. The levy works by charging businesses for each parking space they have, and the money raised is used to improve public transport and cycling infrastructure.

In the first three years of operation, the WPL raised £25.3m. This has been reinvested in various projects such as ([Interreg, Europe, 2022](#)):

- Two further lines of the Nottingham Express Transit tram system (local contribution to £570m scheme)
- The upgrading of passenger facilities at Nottingham Station (local contribution to £60m scheme)
- Ongoing support for Link bus network which fills in gaps in the commercial network serving key employment sites, hospitals, and Park and Ride services (now developed into the UK's largest electric bus fleet with 45 electric buses in operation) (approx. £2m per year).

The plan has also been associated with some indirect impacts from increased investment in public transport, such as the two tram lines increasing net passenger capacity to 20 million per year. Thus, for every pound raised, the levy raises at least £3 of external funding. Those who still use the roads benefit from the reduced traffic and time savings. In addition, the construction of other public transport projects has created 1500 new jobs.

WPL is an effective measure for sustainable mobility and has been qualify as “good practice” by [Interreg Europe \(2022\)](#), meaning that it can be transferred to other cities for funding public transport improvements. Key lessons learned and points for other cities ([Interreg Europe, 2022](#)) :

- The WPL is a flexible demand management tool that can be tailored to meet local requirements in terms of coverage, charge levels, exemptions, support package etc.
- WPL income has been tied to a very specific set of measures, most notably expansion of the Tram network. This has been a strength in articulating what the introduction of the scheme will achieve.
- Fears that the WPL would have a significant impact on business location decision and inward investment do not appear to have materialized.

3.3. MaaS : The model of Helsinki, Finland

3.3.1. Description of the city and the implemented action

Helsinki is located on the southern coast of Finland, on the Gulf of Finland, which is part of the Baltic Sea. The city is located on a peninsula that is bordered by the sea on three sides. Helsinki is also surrounded by a number of islands, which are connected to the city by bridges. The city is built on a series of low-lying islands and peninsulas, separated by a network of waterways, including the Vantaa River, which runs through the city. The city is relatively flat, with an average elevation of about 20 meters above sea level. Helsinki is located in the Uusimaa region, known for its forests, lakes and coastal landscapes.

Helsinki's climate is temperate, with warm summers and cold winters. The city has four distinct seasons, with average temperatures ranging from about -5°C in winter to about

20°C in summer. Helsinki is located at a high latitude, which means that it experiences relatively short, cool summers and long, cold winters. The city is also affected by the Gulf Stream, which helps moderate its climate and keep temperatures relatively mild. Despite its northernmost location, Helsinki does not experience extreme temperatures, thanks to the influence of the Gulf Stream. The city enjoys an average of about 1,100 hours of sunshine per year.

In 2021, the population of Helsinki was approximately 667,000 people. Helsinki is the most populated urban area in Finland, and it is also the most populated capital city in the Nordic countries. The city has a diverse population, with people of many different nationalities and backgrounds living and working there. Helsinki is an important business and commercial center, and it is also home to many universities and other educational institutions, which contribute to its diverse and vibrant culture. In recent years, the city of Helsinki has also taken an innovative and daring approach, setting up its own MaaS.

MaaS, or Mobility as a Service, refers to a user-centered system in which various modes of transportation, such as buses, trains, cabs, car rentals, and bike sharing, are integrated into a single network and are accessible through a single platform or app. MaaS is designed to make travel and access to different mobility options easier. The integration of several transport modes can provide more flexible and adapted sustainable mobility solutions to these users, while respecting their preferences and needs, as well as potentially reducing car dependency. Simplified trip planning also contributes to promoting sustainable mobility and can reduce barriers to entry for new sustainable transport options. Optimizing the use of resources and infrastructure also has the potential to reduce congestion and emissions. Thus, MaaS is a potential key player in the promotion of sustainable mobility ([Mladenovic & Haavisto, 2021](#)).

In Helsinki, the MaaS system launched in 2018 is called "Whim" and offers users a variety of transportation options accessible through a single app. Users of the Whim app can choose from different subscription plans, which offer a variety of transportation options and allow users to pay a flat fee for unlimited travel. The app also provides real-time information about transportation options, including schedules, routes and prices. In addition to accessing various modes of transportation, the Whim app also offers

additional features, such as the ability to book hotel rooms and purchase tickets to events ([MaaS Global, 2022](#)). The goal of the Whim app is to reduce the need for personal car ownership and encourage the use of sustainable modes of transportation.

3.3.2. Barriers to implementation

Mobility as a Service (MaaS) is a relatively new system in the world of sustainable mobility. It has already been the subject of several implementation tests in Europe, but one of the first is in Finland, more precisely in Helsinki, and has the particularity of being one of the most complete services in Europe and still in use. Due to the relative youth of such an innovation, the different barriers encountered are those most often mentioned in the existing literature. Nevertheless, we can identify some barriers specific to the city of Helsinki.

Legislation has been a big obstacle to the creation and implementation of MaaS in Finland. This legislation has raised some fears, both among private and public actors, who have different apprehensions about the current and future frameworks. In addition, apart from central government officials, local government actors and those belonging to certain interest groups revealed a cruel lack of knowledge about the project. The main criticism was that the established regulations did not take into account the day-to-day implementation challenges related to transport services ([Mladenovic & Haavisto, 2021](#)). Criticism of the implementation also focused on the lack of transparency, as the views of the parties responsible for the implementation of the law were not taken into account, as the Association of Finnish Local and Regional Authorities pointed out: "*there is a feeling that decisions have been made behind closed doors*" (Association of Finnish Local and Regional Authorities). As a result, the law was considered unrealistic, and the knowledge of actors at the government level about the day-to-day planning and operation of transport systems was considered insufficient. The Act was also criticized for its apparent non-uniformity among Finnish cities with different needs.

In addition to this regulation, the roles and responsibilities of the different actors were not well established. In addition, the perception of their mandate, especially in the public sector, was uncertain. This subsequently led to problems of leadership, not knowing whether the initiative should come from the public or private sector. Apart from the lack of a clear division of responsibilities and leadership, attempts at

collaboration were also found to be obstructed by an underlying degree of mistrust, or even fear, on the part of some operators that they would be dominated by other actors and lose control of MaaS development ([Karlsson et al., 2020](#)). These uncertainties led to a reduction in cooperation and collaboration between different public and private organizations in the development of the project, which was seen as a major barrier. One example is the divergence of final goals regarding MaaS implementation between MaaS Global⁶ and HSL⁷, resulting in the initial refusal to collaborate to establish the Whim solution ([Audoin & Finger, 2019](#)).

The organization of public transport in Finland thus acts as an institutional barrier to MaaS. Indeed, Finland does not have political regions. Therefore, the responsibility for public transport and its subsidies lies either with the state or the municipalities. In Finland, individual tickets are not subsidized, and each municipality is responsible for intervening financially in the public transport subscriptions of its respective residents. Therefore, the agency responsible for public transport in the Helsinki region (Helsingin seudun liikenne-HSL), which is run by eight municipal political bodies, has to take into account the residence of its customers when selling other types of tickets than one-way tickets ([Smith et al., 2018](#)). The fact that municipalities could not organize transport services outside themselves was therefore a challenge and was one of the main causes of conflict, limiting coordination and forcing municipalities to have separate individual contracts with MaaS operators ([Mladenovic & Haavisto, 2021](#)).

Another uncertainty was the ability of the project to be viable and to promote business opportunities, with an acceptable profitability margin. The project implies a high economic risk with high marketing costs and a long-term return on investment with the obligation of the partners to support the risk during the development, which was therefore considered problematic by the stakeholders. The lack of existing business models was also seen as ambiguous, requiring the collaboration of many public and private actors, who themselves had little experience in the field ([Mladenovic & Haavisto, 2021](#)). This questioning of the efficiency of the business model is mainly motivated by

⁶ MaaS Global is a private company defining itself as the first real MaaS operator in the world. MaaS Global is the developer of the Whim app ([MaaS Global, 2022](#)).

⁷ Helsingin seudun liikenne-HSL, is a joint local authority merging municipalities in the Region of Helsinki. HSL is responsible of organizing and managing the Helsinki Region Transport System Plan (HLJ) ([HSL, 2022](#)).

the uncertainty of the market size, itself caused by the lack of knowledge of the potential number of users and of their real willingness to adopt MaaS as an alternative to the car. Due to the new nature of the system, public transport agencies express a sense of risk aversion and protectionism, resulting in their reluctance to allow the resale of tickets by a third party, and a lack of open data ([Smith et al., 2018](#)). However, Finnish legislation has grown with the development of MaaS and has had time to develop the regulations and deregulations necessary for the development of MaaS, such as requiring public transport organizations to make individual public transport tickets available for resale ([Karlsson et al., 2020](#)).

The implementation of Whim also faced an economic challenge, due to the great need for funding in the public transport sector ([Arias-Molinares & García Palomares, 2020](#)). However, this barrier was quickly overcome thanks to the funding raised from the innovation agency TEKES⁸, which was then distributed in an intelligent way among the different actors, thus avoiding the phenomenon of "funding to death" which, as described by [Weber et al. \(1999\)](#), occurs when niche actors have to provide a large amount of their own financial and human resources in order to meet government support.

In order to gather public opinion, several surveys were conducted ([Mladenovic & Haavisto, 2021](#)). These revealed that one of the barriers to the use of the service was the reluctance of the inhabitants to learn how to use a new service. A constraint therefore linked to habits. In order to be able to change the habits of the inhabitants, the service had to be easy to use and very efficient, allowing them to forget the comfort of using a car. This barrier has been overcome by the great flexibility of the service, given the possibility of easily changing subscriptions, and the fact that access to different modes of transport is possible from a single connection point. In addition to the practical use, some users did not feel involved in the service and felt that they did not fit the target group that the service was aimed at, thus not seeing a real benefit ([Karlsson et al., 2020](#)). This phenomenon can be explained by the fact that the participation of citizens' associations and networks was very low during the decision-making process of MaaS, thus making the development laborious ([Audoin & Finger, 2019](#)). Among most

⁸ TEKES is the Finnish funding agency for technology and innovation. The agency is part of the Finnish Ministry of Employment and the Economy and is the leading public research funding agency in Finland ([Fundit, 2023](#)).

interviewees, the sheer effectiveness of MaaS was strongly questioned, as they had no concrete comparisons to relate to. Some wondered if demand would be met or if trips would be lengthened, thus increasing energy consumption. There were fears that the presence of abundant service for the first/last mile would reduce walking and thus impact the health of individuals. There were also concerns about possible increases in traffic congestion and noise and particles emissions ([Mladenovic & Haavisto, 2021](#)).

A new challenge was the management of the data collected as well as its compliance with regulations ([Cottrill, 2020](#)). In order to provide an efficient service, data collection is essential to identify needs and optimize solutions. To this end, a reform has made the opening of routes, stops, timetables, prices, availability and accessibility data in a computer-readable format, as well as the opening of their single ticketing APIs⁹, for any transport provider and any transport authority in Finland, thus operating as a legislative tool for the deployment of the MaaS concept, and thus as a governance measure by authority ([Audoui & Finger, 2019](#)). Public, commercial, and personal data were collected. This use of data had to be in accordance with the GDPR ¹⁰legislation, imposed by the [European Union \(2016\)](#). As the sources of data flow multiply, managing data in compliance with protection policies and different legislations has become a complex and sensitive issue. According to [Arias-Molinares & García Palomares \(2020\)](#), the implementation of MaaS was also a technological challenge due to the standardization of data and Application Programming Interfaces (APIs).

To summarize, the implementation of a MaaS in the city of Helsinki, in the form of the Whim application, revealed several institutional challenges, due to the legislation that needed to be created and the existing legislation that created obstacles to the effective implementation of the service. The intervention of both private and public actors made collaboration between them complicated, making decision-making and the allocation of different roles and responsibilities laborious among the many actors involved. The new aspect of this service, due to its lack of knowledge and experience, generates a certain

⁹ An API, or application programming interface, is a set of defined rules that enable different applications to communicate with each other. It acts as an intermediary layer that processes data transfers between systems, letting companies open their application data and functionality to external third-party developers, business partners, and internal departments within their companies ([IBM, 2022](#)).

¹⁰ Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and repealing Directive 95/46/EC (General Data Protection Regulation) (Text with EEA relevance) ([EU regulation, 2016](#)).

aversion for the actors responsible for the implementation but also for the future users, not knowing the real value of the potential results. This impacts on the economic viability of the project, which already requires significant funding and therefore sees a return on investment possible only in the very long term. The technological stakes are also consequent, because of the important data collection required and the standardization of these.

3.3.3. Outcome

The Whim service has demonstrated great efficiency after only 2 years of implementation. Passenger comfort has been greatly improved by the ease of use of the application and the centralization of ticket purchases. MaaS facilitates the use of transport modes while making it more dynamic and inclusive than the traditional system. More than half of all trips in Helsinki are made by sustainable modes of transport (walking, cycling, bus, streetcar, metro). The number of trips made by Whim users compared to non-users remains equivalent, but Whim users use public transport much more. This has a clear carbon impact, although further studies are needed. Initial findings show that the new mobility methods and platforms seem to be successful in a mode-rich, densely populated urban environment, with high accessibility to stores, businesses and jobs. In addition, the popularity of MaaS is strongly correlated with bicycle accessibility ([Ramboll, 2019](#)).

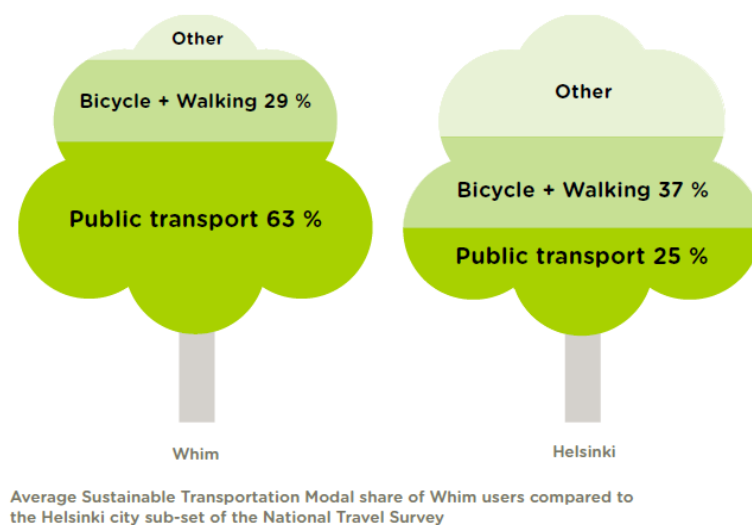


Figure 3 : Average Sustainable Transportation Modal share of Whim users compared to the Helsinki city sub-set of the National Travel Survey in 2019 ([Ramboll, 2019](#)).

3.4. Electric Vehicles Implementation : The Success Story of Oslo

3.4.1. Description of the city and the implemented action

Oslo is located in the southeast of Norway and is the capital of the country. In 2022, its population was just under 700,000 inhabitants, 25% of whom were immigrants, spread over an area of 450 km², with a population density of 1,540 inhabitants per km². The city is crossed by the Akerselva river and is surrounded by hills, with a relief varying from 0 to 630m of altitude. The surroundings of the city are mainly forests, lakes and islands. Norway is one of the coldest countries in Europe and its capital regularly reaches temperatures below 0°C. The city has a wide range of transport services, including a subway, streetcars, trains, an airport and ferries, as well as a large road network.

However, the city is known to be the world capital in terms of electric cars with the largest market share in the world. In 2016, this stood at 30% of sales and one of Norway's goals is to move to 100% sales by 2025 ([Hall & Lutsey, 2017](#)). This is the result of an ambitious policy of the country and has been undertaken for many years in order to reach the goal of being climate neutral by 2050. The city of Oslo has adopted several strategies over the years ranging from promoting electric vehicles and implementing numerous charging stations as shown in [Figure 5 \(Eltis, 2023\)](#), to a policy aimed at reducing the overall use of cars in its city center, implementing various measures promoting public transport or walking and cycling ([Hall et al., 2017](#)). In 2016, the capital had the highest density of electric vehicles in the world as well as the highest density of charging stations per capita ([Tietge et al., 2016](#)).

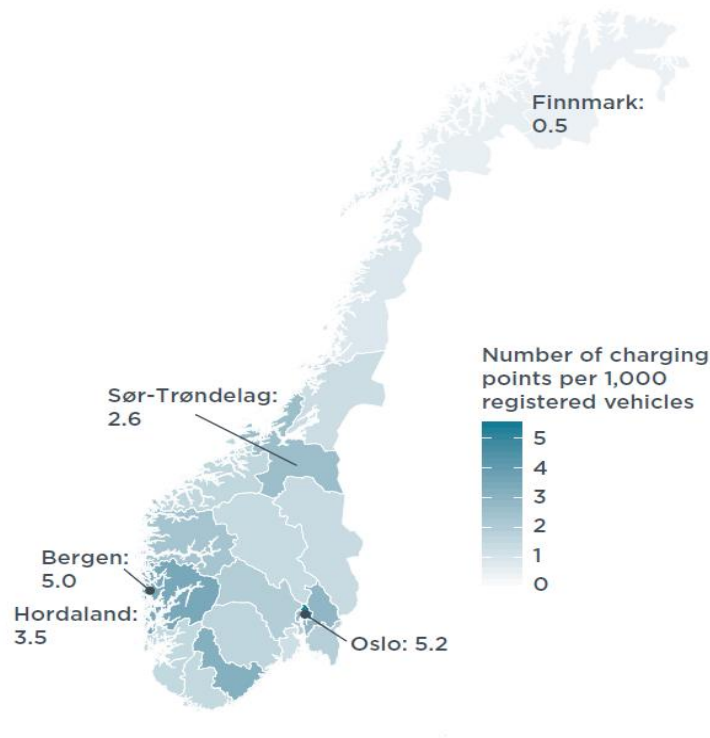


Figure 5 : Number of charging stations per 1,000 registered vehicles in Norwegian counties in 2016 ([Tietge et al., 2016](#)).

3.4.2. Barriers to implementation

Measures promoting the use of electric vehicles are highly effective in Norway but also alleviate the inconveniences of the various challenges and instruments implemented in this specific transport system ([Bjerkan et al., 2016](#)).

The charging infrastructure was, and still is, a technological challenge for the development of the electric car network in Norway. Indeed, as a result of the different incentives put in place, the demand for electric vehicles has greatly increased, which has created another challenge, the implementation of a sufficient number of charging stations to meet this growing demand ([Noel et al., 2020](#)). This demand is combined with the problem of the autonomy of the current batteries, requiring a large number of charging stations at strategic points in order to avoid congestion and peak periods at the charging stations, which was pointed out as a main barrier to the adoption of this mode of transport by new customers ([Hovi et al., 2019](#)). Finally, another concern that was often echoed among the experts was the capacity of the network to handle recharging.

They reveal that the problem is not the quantity of energy to be supplied, which would remain minimal, but the capacity of the grid to supply and feed the distribution networks efficiently ([Noel et al., 2020](#)).

Another challenge related to the implementation period was the lack of infrastructure and maintenance services for the operational vehicles and the long supply periods. This was widely felt by drivers of electric buses and trucks, pointing to the lack of back-up capacity, which is necessarily more important for operations with electric vehicles. ([Hovi et al., 2019](#)).

This need for infrastructure is not only felt in charging stations but also in shared building complexes, where each apartment should have access to a charging station for its car. New buildings must have this, and older buildings should be allowed to install a charging station on demand. These charging points have also revealed uncertainties regarding costs and fire risks ([Noel et al., 2020](#)).

However, according to some experts, these technical apprehensions are in fact only due to poor knowledge of the environment and therefore take the form of mental barriers. ([Noel et al., 2020](#)). The same is true for concerns about the range of electric cars. Indeed, the distance that can be covered remains too important an issue for users to take the plunge, as it is often considered insufficient. However, the capacity of the batteries is sufficient for the vast majority of average trips, so this fear of a lack of autonomy would also be a mental barrier due to the ignorance of consumers. Governmental bodies must therefore provide the necessary information in a neutral and correct manner in order to limit this barrier ([Lorentzen et al., 2017](#)).

The city of Oslo installed 400 charging points between 2008 and 2011, followed by another 300 in 2014 ([Eltis, 2014](#)). The city has also facilitated access to subsidies from the Climate and Environment Fund for organizations wishing to implement charging stations up to 60% of the initial costs of the installations, targeting private companies, apartment complexes and shopping centers ([Eltis, 2014](#)). The city has also implemented initiatives to increase global awareness and knowledge of the subject as well as collaborations with other European cities to share knowledge in the field of sustainable urban development ([Tietge et al., 2016](#)). In order to increase the introduction of electric vehicles, the purchase of these vehicles is exempt from tax and VAT and has a lower

registration tax than fossil vehicles. However, these exemptions from charges stopped in 2019. In spite of this, by 2021, electric vehicles were still receiving discounts and costing less than half as much as a vehicle running on diesel, gasoline, or even a hybrid ([Bernard et al., 2021](#)).

The national policy measures are highly beneficial to Oslo as free access to the freeway when owning a car, saving 4€ for each toll crossing. In addition, access to bus routes as well as the many free parking and free public charging stations have a direct impact on the Oslo region, in contrast to the discounts for ferry travel ([Tietge et al., 2016](#)). Access to bus routes, however, has raised questions and strong political debates, already revealing problems for public transport due to the increasing number of electric cars, which cause delays on the routes and imply a higher cost for public transport users ([Bjerkan et al., 2016](#); [Bernard et al., 2021](#)). Similarly, the exemption from highway tolls raises the question of the ability to finance road infrastructure in the long run ([Aasness & Odek, 2015](#)). These economic barriers have been overcome by the many actions taken by the Norwegian government, including the establishment of Transnova, an entity providing financial support for charging facilities ([Aasness & Odek, 2015](#)).

Despite the many incentives put in place to promote the purchase of electric vehicles, the purchase price remains one of the main barriers to the adoption of this new technology as revealed in the study lead by ([Noel et al., 2020](#)). According to the study by [Berkeley et al. \(2017\)](#), a trend would be evident in the population purchasing electric cars. Indeed, the majority of consumers involved are found to be higher wage earners, better educated, looking to save money and concerned about environmental issues. It is therefore reasonable to conclude that this technology is currently reserved for a certain clientele and is not yet accessible to lower-income communities.

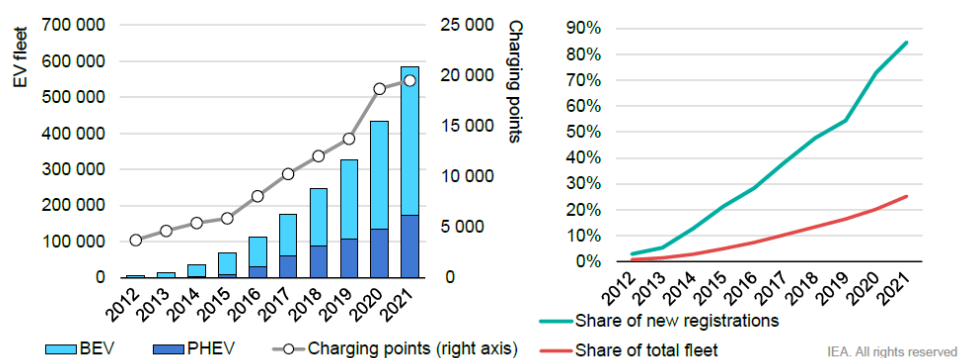
The development of electric cars in Norway and Oslo in particular has not encountered any insurmountable barriers so far. The main challenges to the implementation are technological and related to the industry in its globality, such as the ability of electric cars to travel long distances and the availability of sufficient recharging infrastructure to meet the demand. This second point has however been widely evaluated and has proven to be a great contribution by the Norwegian government. Therefore, the main barrier would be the knowledge of potential users on the subject. A lack of technical knowledge

has indeed been noted in the population and would be the first brake to the adoption of this new technology as well as the economic aspect which comes back very often. The possession of an electric car is therefore less accessible for communities with lower incomes. The municipality of Oslo also has to face the availability of charging points in new and old buildings, which are essential for a good development.

3.4.3. Outcome

Norway is undoubtedly a leader in electric vehicles and Oslo has been called the electric car capital of the world. This is due to the initiatives put in place by the Norwegian government and by the city of Oslo. By 2022, more than 28% of Oslo's private cars are zero-emission and fully electric. The city's goal is that by 2030, all cars in circulation will be electric. In 2021, 71% of the new cars purchased were electric, which proves that the target is being met ([EVS35Oslo, 2022](#)).

The city has become a reference in terms of the implementation of electric vehicles, with a hundred different models and a constant margin of progression. The various incentives put in place by the country and the city have enabled the city to progress from a market share of 22% in 2015 to a share of 79% in 2020, which is even slightly faster than the country's progress from 22% to 75% ([Bernard et al., 2021](#)). The city even intends to achieve zero emissions in terms of public transport by 2028 ([City of Oslo, 2011](#)).



Between 2010 and 2021, there has been a sharp increase both in registered electric vehicles and public charging points. In 2021, there was more than one electric car per ten inhabitants.

Notes: BEV = battery electric vehicle; PHEV = plug-in hybrid electric vehicle.

Figure 6 : Registered electric vehicles and public charging points in Norway ([IEA, 2022](#)).

3.5. Urban Freight logistics : A new governance model for the city of Turin

3.5.1. Description of the city and the implemented action

The city of Turin is located in the northwest of Italy and is the capital of the province of Piedmont. The city has a surface area of 130 km² and a high population density of about 6,500 inhabitants per km², with a population of about 1,700,000 in the urban area and 2,200,000 in the total metropolitan area. The city is crossed by the river Po and is surrounded by the Turin hills to the east and the Alps to the west. The climate of the city is declared as humid continental with hot summers and large temperature differences between winter and summer, which is characteristic of northern Italy. The city is an important cultural and commercial center in Italy, which attracts a large number of people and goods to the city.

The city of Turin has a limited traffic zone (LTZ) in its center with a surface area of 2.62 km² and a population density twice that of the city itself (12,600 inhabitants/Km²). This area is the object of a strong involvement of the city in terms of sustainable mobility, supported by its commitment to the European Commission in developing a medium-term sustainable urban mobility plan (SUMP), defining guidelines, targets, and operational measures in order to improve the flow of transport, increase the average speed, reduce pollution as well as congestion and quantity of emissions, and stimulate the renewal of the fleet of vehicles, in order to achieve a better quality in terms of operational logistics ([Marcucci et al., 2017](#)). This commitment is made possible by one of the most comprehensive network of Intelligent Transport System (ITS) in Italy, directed and managed by the company 5T¹¹, which is directly involved in the actions related to the project as an in-house agency. In this perspective, the city of Turin has developed a policy framework resulting in a New Governance Model for urban logistics in the LTZ of Turin. This model was developed and shared in a very efficient way and signed in partnership with the Chamber of Commerce of Turin so that the objectives and policies mentioned are correctly applied and implemented.

¹¹ 5T is a public in-house company operating in collaboration Città di Torino, Regione Piemonte, and Città Metropolitana di Torino which is working on the development of the MaaS and Smart Road ecosystem in the region of Torino. The company is responsible of mobility systems and services planning, design, and management in the area ([5T, 2022](#)).

Using pull measures and implementing a new permission scheme, from restricted areas to access control, the Urban Freight Logistics (UFL) measures in Turin aim to analyze and model a more efficient and environmentally friendly mobility paradigm for freight transport. This involves integrating different modes of transportation while implementing new mobility pricing systems and reduction policies. In this regard, the new regulatory framework integrates intelligent transport systems (ITS¹²) and recognition systems to enable the flexible use of public infrastructures. Following the directives set out by the SUMP of Turin, the city's mobility offices have been working on a plan for the last kilometer within the traffic-limited zone (LTZ) since 2012. Since 2014, Turin has developed and implemented interdependent political measures of the UFL to achieve the EU's goals by 2030 ([CITIVAS, 2020](#)).

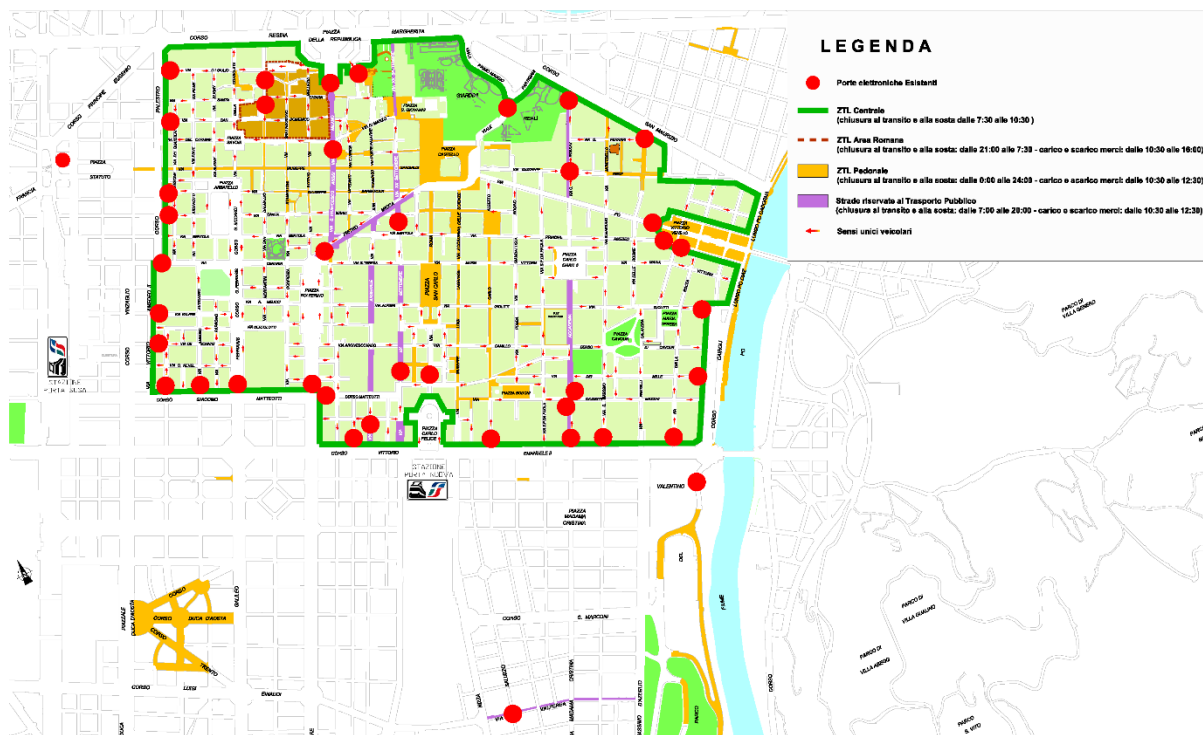


Figure 7 : Limited traffic zone in the city of Turin with delimitation of areas ([Parkimeter, 2023](#))

3.5.2. Barriers to implementation

The first step in developing this type of model is to convince and encourage the participation of all stakeholders. In order to do this, the city of Turin involved the active

¹² Intelligent Transport Systems (ITS) have the purpose to make transport safer, more efficient, and more sustainable by applying various information and communication technologies to all modes of passenger and freight transport ([European Commission, 2023](#)).

participation of the comity officers from the very first stages of the project, which made it possible to establish a relationship of instant trust, allowing the stakeholders to share their ideas and hopes concerning their respective problems. This feeling of listening to the stakeholders helped to develop their motivation to participate in the project development.

Despite the collaboration of the different stakeholders, the large number of participants in the project posed problems of coordination between them, which was necessary for the discussion and elaboration of future measures ([Marcucci et al., 2017](#)). Therefore, it was decided to create a Task Force (TF) including the representatives of twenty involved organizations. This Task Force is composed of the Municipality of Turin, the Piedmont Region, and the Ministry of Infrastructure and Transport, as well as sectoral organizations such as the automotive industry, real estate, express couriers, large retail, resident associations, shopkeepers, vehicle sellers, professional logistic operators, maintenance and artisans, and the local Chamber of Commerce.

There was also a certain lack of knowledge of the issues and potential benefits on the part of stakeholders, given the new nature of the project. This lack of knowledge implied very different claims between the operators and therefore caused conflicts of interest. However, expert studies highlighted the different possible approaches and tools to be used, which greatly facilitated understanding of the subject and created a consensus on the deployment of the project. Similarly, training sessions were set up within the TF, allowing the different representatives to have all the required qualifications ([Marciani et al., 2016](#)). It is important to note that the Chamber of Commerce has had an essential role as a clearing house between public and private interests.

With the city's desire to tighten the standards for vehicle emissions, a transition to more eco-friendly delivery vehicles and new distribution methods was inevitable. Like many cities, Turin faces several challenges in terms of urban logistics, such as growing demand, congestion that lengthens delivery times, and a lack of infrastructure to facilitate these depots ([Letnik et al., 2018](#)). Moreover, the city did not want to offer any financial assistance for operators to modify their delivery vehicles. This did not suit the operators involved (Italy was at that time coming out of a major economic recession that had a strong impact on the country), forcing the city to find an alternative, which found

its resolution in the implementation of non-monetary compensations in order to offset the necessary investments of the logistics operators. These constraints led to a number of actions to modify the regulations, which in turn led to the adoption of a selective management of access to the flow of goods.

This new regulation implied big changes and the city had to issue new permits to control access to the areas concerned. To facilitate this, the city of Turin has developed a new web interface (named Travet) to collect information from operators and determine whether they are complying with the various measures for the allocation of a permit. This platform is effective given the possibility for stakeholders to provide their data on their own, or with the help of stakeholder associations ([Marciani et al., 2016](#)). Following this, the issue of operators coming from outside the city was raised, whose access could pose a problem at first. This challenge was overcome by the intervention of the Piedmont region, which led to a large communication campaign to inform all potential actors in the form of newsletters, articles and Visitor Management System (VMS¹³) installed at the city borders. The real time collection was facilitated by the use of ITS already implemented in the city.

This will of ecological transition imposed by the city for its logistic operators will take all its sense in the creation of the so-called Municipal Recognition Scheme (MRS). Operators who join the scheme and comply with the new regulations are entitled to numerous non-monetary compensations, such as the authorization to use bus lanes for logistics operators, free admission to the LTZ for two years, access to reserved lanes between the center and the suburbs, no restrictions on time windows, and the availability of six additional loading/unloading docks (in addition to the 14 already present in the LTZ). These measures have largely offset the operators' investments in both clean vehicles and the incorporation of the On-Board Unit (OBU¹⁴) to communicate real-time data to ITS. These measures have proven to be beneficial to both the local government's air quality objectives and the productivity of the operators, reducing their costs and resulting in potential future benefits ([Marcucci et al., 2017](#)). However, these investments

¹³ A visitor management system is designed to register visitors in a database and issue a temporary access card that can be used at gates equipped with special readers ([Norman, 2012](#)).

¹⁴ An On-Board Unit (OBU) is a device on vehicles used for electronic toll collection that communicates with toll systems to pay tolls and fees without the need for manual payment, thereby improving traffic flow and safety. ([Marcucci et al., 2017](#)).

are still important for smaller operators, who are unwilling to take the plunge and prefer to export their operations to the periphery.

The implementation of this new governance system faced many challenges in the city of Turin. The usual problems related to urban logistics were present, which forced the city to completely review its legislative framework and create new measures. These measures involved a transition to cleaner modes and management of deliveries in order to reduce CO₂ emissions. However, as Italy was just coming out of a major economic recession, the various logistics operators (and more specifically the smaller ones) were reluctant to invest in cleaner vehicles as well as tracking software, not seeing the return on investment for sure. This apprehension was largely due to a lack of knowledge and underestimation of potential future benefits. To counter this, the city called in many experts to conduct studies to prove the existence of these benefits. A task force with representatives of the 20 major stakeholders was created, allowing both learning and knowledge transfer through training sessions, but also collaboration of the many stakeholders to establish a consensus on the deployment of the project and thus limit conflicts of interest. The various logistical problems of congestion and lack of infrastructure for delivery vehicles have both been addressed thanks to strong political support and funding received from the numerous partnerships of the Horizon 2020 projects (NOVELOG¹⁵, Solez¹⁶, and SETA¹⁷), freeing up a budget dedicated to SUMP-specific measures ([CITIVAS, 2020](#)).

3.5.3. Outcome

As a result of the actions undertaken by the city of Turin, several strong points related to this implementation have been noted by the logistics operators. First of all, great satisfaction has been perceived by the operators using the SUMP's lines. They consider that this possibility reduces the congestion in the city center, allowing deliveries to be

¹⁵ NOVELOG project aimed to advance the knowledge and understanding of freight distribution and service trips. This guidance supports the implementation of effective and sustainable policies and measures and formulating detailed business plans for Urban Freight Transport measures, in a multi-stakeholder partnership. NOVELOG reaches out to the key public and private players to ensure a stakeholder-oriented and coordinated approach to city logistics. ([POLIS, 2022](#))

¹⁶ SOLEZ was project ran between 2016 and 2019, which designed and pilot tested innovative ICT based tools to help local public administrations to reduce CO₂ emission in urban area and give a contribution to achieve these ambitious results ([Central Europe, 2022](#)).

¹⁷ The SETA project has pushed the smart city concept to the next level by exploiting existing single purpose devices for the greater goal of improving urban mobility. Applications in health and wellbeing are also expected ([European Commission, 2019](#)).

more efficient by minimizing their delays and thus improving the daily operations, especially during peak hours. The increase in efficiency, the reduction in rush hour traffic, and the compliance of operators with their permits make these measures a success and encourage the renewal of the delivery fleet.

These modifications have a direct impact on the emissions produced by the transport of goods, which have been greatly reduced. Thus, for the 43 vehicles analyzed during the pilots, the reduction in CO₂ emissions amounts to 12%, which corresponds to 33.6Kg of CO₂ less than with the standard vehicles, and 281.2g of NO. These figures show a reduction of about 70% in daily emissions. If this implementation were to be expanded to 10% of the total fleet (250 vehicles), this would be equivalent to a reduction in CO₂ emissions of 71 tons and NO emissions of 0.6 tons per year ([CITIVAS, 2020](#)).

3.6. Analysis and results of case studies

Through these case studies, we have seen that despite the different environments and projects, each with their own characteristics, similarities can be seen when it comes to implementing a sustainable mobility measure. Barriers related to the political, economic, city-specific and technological environment can be very different depending on the project or the location of implementation, but do not seem to be insurmountable. In contrast, institutional, knowledge-based and organizational, and socio-cultural barriers are much more present in the cities studied and would even be considered among the main barriers to the implementation of sustainable mobility measures.

The most recurrent and constraining barriers would therefore be related to; the absence or lack of an appropriate legal framework, weak communication of global information and policies to the population and local stakeholders leading to a lack of motivation or trust in new measures benefits in a unfamiliar market, insufficient quality of data and information collection leading to weak evaluations, and a large number of actors causing coordination problems and conflicts of interest from an organizational point of view. In addition, socio-cultural barriers are also present in our analyses, like the public acceptance of a new measure or technology and the often false precepted implications of this measure being the main issues. [Table 2](#) illustrates the different barriers found in our case studies.

Type of Barrier	Barriers	Sevilla	Nottingham	Helsinki	Oslo	Turin
Legal and institutional	Lack/non-existence of an appropriate legal and regulatory framework	+	+	+		+
	Weak/insufficient legal and regulatory framework			+	+	+
	Legal and regulatory framework unfavorable to micromobility and alternative transport modes	+				
	Monopolistic institutional system complicating the development of other technologies	+		+		
City particularities	Layout of the city (natural or human-based geomorphic constraints)	+				+
	Topography of the city (relief or specific landforms constraints)					
	Climate conditions	+			+	
	Historical monuments and archaeological sites to be preserved and therefore complicating the implementation of surrounding infrastructures	+				+
Financial/Economic	Insufficient budget allocation compared to high cost of infrastructure implementation and maintenance			+		+
	Return on investment too low compared to the high cost of investments			+		
	Undervaluation of renewable technologies and unpriced environmental costs leading to a lack of public and private funding		+			+
	Purchasing power to acquire new technologies too low at the macro and micro levels				+	+
Knowledge-based	Perceived excessive cost of using a new measure (transport ticket, parking fee, etc.)		+	+		
	Weak communication of global information and policies to the population and local stakeholders leading to a lack of motivation or trust in new measures benefits in a unfamiliar market	+	+	+	+	+
	Lack of general and multidimensional understanding of the decision-making process.	+		+		+
	Information unevenly distributed among actors	+			+	+
Organizational	Weak data evaluation and measurements due to low availability of quality data		+	+	+	+
	Weak collaboration between national and regional institutions which does not allow integrated strategies to be developed and pursued efficiently	+		+		+
	Large amount of municipalities or authorities which implies coordination issues	+	+	+		+
	Difficulty in satisfying the different professional interests of stakeholders in the creation of procedures	+	+	+		+
Social and Cultural	Post-implementation monitoring requiring significant capacity					
	Choosing to take the car over another transport mode because of habits			+		
	Acceptance of the public of a new technology or measure	+	+		+	+
	Lower perceived quality of a alternative transport mode			+		
	Low availability of infrastructures demotivating the population of using a transport mode				+	
	Current benefits overestimated and potential gains underestimated			+		
	Overestimated risk of transfer to a new technology or measure	+		+	+	+
	Feeling of disposing of an asset for a public service	+				
Technological	Car acting as a social status	+				
	Inequality of access to public transport for lower income communities		+	+		+
	Technology lock-in created by incumbent technologies					
	Inefficiency of implemented technology				+	
	Lack of availability of infrastructures for population	+			+	+
Political	Storage capacities issues leading to a lack of refueling stations and electric terminals				+	
	Lack of engineering design in some sectors			+		
	Rise of political parties searching to thwart measures	+				
	Forming of coalition with non common vision and objectives		+	+		
	Political cycles imply short term vision and therefore rushed projects		+	+		
	Elected officials willing to reduce car use are likely to be less re-elected					

Note* : Confirmed presence of a barrier is mentioned by a “+.”

Table 2 : List of recurrent barriers to the implementation of a sustainable mobility measure and their presence in the implementation of the actions of the cities studied.

4. Analysis of a current implementation

After having analyzed several sustainable mobility projects in different European cities, it was time to use and transfer our results to provide recommendations for a city in transition. This city was not difficult to choose and our eyes quickly turned to the city of Brussels, which has long been categorized as one of the most congested cities in the world, and which is currently implementing its new regional mobility plan. This section aims to define and explain the progress of the implementation of the regional mobility plan, while analyzing the environment in which it is being developed, thus allowing us to theorize the potential barriers that the city of Brussels is facing or is about to face. This analysis will follow the same methodology as the one established with our [Table 1](#), with a particular focus on the categories of barriers that emerged the most from our case studies: Institutional, Knowledge-based, Organizational, and Socio-cultural. Finally, we will provide recommendations based on our findings and supported by expert advice received during various interviews.

4.1. The Good Move Plan in the City of Brussels

4.1.1. Good Move : Description and origin

The city of Brussels has seen over the last forty years a meteoric growth in terms of mobility. This is characterized by the rise in power of the automobile and its relative disadvantages, namely pollution, noise pollution and accidents. The Brussels Capital Region has therefore had to anticipate this growth in order to regulate its evolution. This was done through two mobility plans, named Iris I and Iris II, implemented respectively in 1998 and 2010. Even if these two mobility plans did not have the expected effects, they were the basis for the development of a sustainable mobility in the city of Brussels and allowed to establish notable advances serving as a pillar for future projects.

This is how the new Regional Mobility Plan for the Brussels-Capital Region (BCR) was born, with a horizon of 2030. This plan, called Good Move and approved in 2020 by the Brussels government, is the result of a vast participatory process spread over a period of four years and involving all the potential Brussels actors, namely: the mobility and institutional partners, the economic agents and associations, the municipalities and finally the citizens. The plan defines the major policy orientations in the field of mobility

and aims to accompany the economic and demographic development of the Brussels-Capital Region in order to improve the living environment of Brussels citizens.

The city's mobility plan is defined by the creation and development of a pleasant and safe city, with calm neighborhoods, themselves connected by intermodal axes, and centered on efficient public transport and a more fluid traffic flow ([Brussels mobility, 2022](#)). This vision aims to provide easy, integrated and adapted mobility solutions to each citizen, allowing them to organize trips in the most appropriate way. This will of the city to improve the quality of life of its inhabitants but also of its visitors has received an international recognition, concretized by the attribution of the eighth SUMP Award by the European Commission under the prism of the Safe Walking and Cycling theme in 2020 ([Good Move, 2020](#)).

The Good Move plan is based on six main themes that include all the actions to be implemented ([Good Move, 2020](#)):

- Good Neighborhood : manage mobility in neighborhoods and improve the quality of life of residents.
- Good Network : organize transportation networks and ensure efficient service.
- Good Service : to offer the inhabitants and users of the Region a range of integrated services.
- Good Choice : guide individual and collective choices without infringing on the freedom of each individual.
- Good Partner : ensure a partnership governance of the mobility plan.
- Good Knowledge : update mobility data and regularly evaluate the Good Move plan.

4.1.2. Current progress and future planning

The implementation process of the good move mobility plan in the Brussels-Capital Region follows a very precise pattern. First of all, the city is divided into 63 application zones, called meshes, corresponding to large districts and which are delimited by the main roads of the Region. Recently, the city of Brussels launched the process for six meshes in 2020 (Pentagon, Cureghem, Dielegem, Saint-Gilles, Flagey-Etangs, and Colignon Joshphat) and for five other meshes in 2021 (Chant d'oiseau, Léopold-

Pannenhuis, historic Molenbeek, Neerstalle, and Roodebeek). It should be noted, however, that the city also concentrates on the mesh known as the Bois de la Cambre, which we will leave out of this study simply because of the non-urban nature of this area.

These meshes then follow three distinct stages of the implementation process ([Bruxelles Mobilité, 2023](#)): a diagnostic phase, a phase of determining and implementing measures, and finally, a monitoring and evaluation phase.

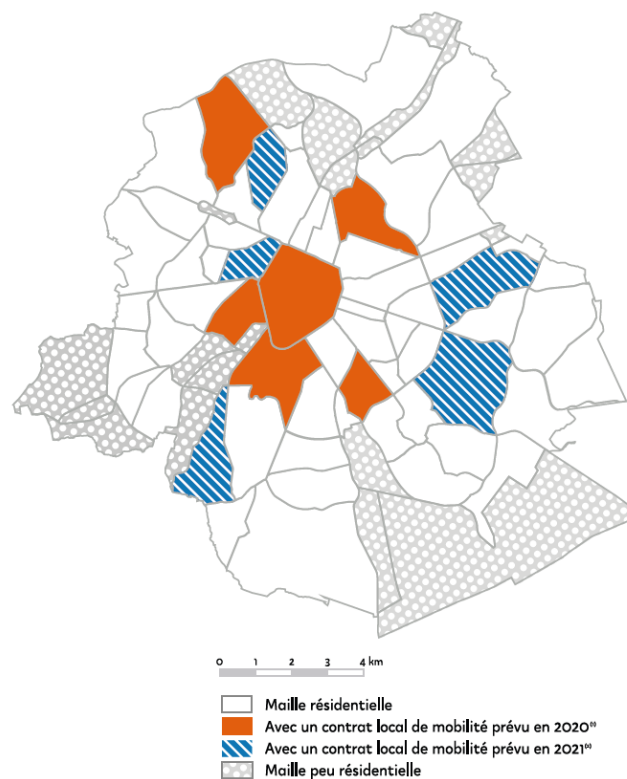


Figure 8 : Presentation of the different BCR meshes with project launch period ([Bruxelles Mobilité, 2023](#)).

The diagnostic phase, which extends over several months, consists of the valorization of the knowledge of the different stakeholders in order to determine their respective needs and wishes, thus allowing the experts to draw up the most complete list possible of the challenges to be addressed. For this purpose, an online platform has been set up to collect as many opinions as possible, as well as several neighborhood meetings to present the projects to the interested parties and to answer any questions.

The second phase consists of the establishment of measures to respect the data collected in the first phase. This phase also lasts several months and is carried out by a technical working group. The implementation of these measures is preceded by information sessions via different communication channels.

Finally, the last phase consists of the supervision of the implemented measures and the collection of data in order to evaluate the success or not of the second phase. It should be noted, however, that the evaluation phase starts as early as the diagnostic phase and is therefore more of a continuous evaluation throughout the implementation.

At the time of writing, only the Colignon-Josaphat, Cureghem and Pentagone meshes have reached the stage of effective development. The mesh of Flagey-Etangs has selected its preferred scenario and will start the developments. The meshes of Dielegem, Neerstal, Roodebeek and Saint Gilles are still in the discussion phase in order to determine an optimal scenario, while the meshes of Chant d'oiseau, Léopold-Pannenhuis and historic Molenbeek are still in the diagnosis phase.

4.1.3. Challenges following the similarities of case studies

First of all, the city of Brussels, like the other cities studied in this study, has to agree with a large number of stakeholders, both public and private. These include the federal government and the 19 municipalities in the region, each of which has an independent municipal council, as well as the four mobility operators in Belgium: La Tec (bus operator in the Walloon region), de Lijn (bus operator in the Flemish region), STIB (bus, metro and tramway operator in the Brussels region), and SNCB (train operator throughout the country). The collaboration and especially the coordination between the different stakeholders is therefore complicated by the large number of stakeholders and their action areas, and it seems relevant to raise the question of the harmonization of the different measures and regulations across the Brussels Region.

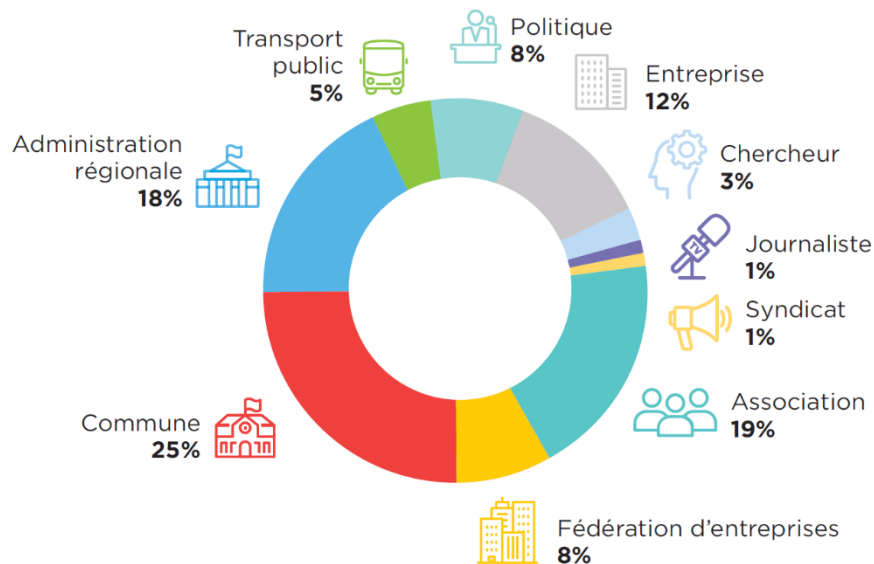


Figure 9: Share of involvement of different project stakeholders ([Good Move, 2020](#))

The design of a task force seems therefore essential for good communication and understanding between them and was included as an objective of the Good Move project and named Metropolitan Mobility Council (MMC). However, there still does not seem to be such a unit at present. This lack of a common vision is particularly noticeable in the establishment of the objectives of the Good Move mobility plan. Indeed, even though the long-term visions and the action plan have been praised internationally, some actions lack concrete vision and intermediate objectives, which is often reflected in the report by an empty box or a mention "to be determined". This lack of explicit objectives is reflected in as many as 26% of the measures included in the action plan (13 actions out of 50 proposed) by the regional mobility plan.

This failure to identify intermediate objectives can be explained by two aspects. First, the fact that some actions are difficult to organize until others have been completed, and therefore resemble cascading actions. Second, the fact that the various project teams are not composed of sufficient experts. According to the Good Move report, 68% of the measures (34 out of 50 actions) are limited in terms of human resources and therefore require either the creation of a team or the reinforcement of existing teams. However, this observation does not seem to highlight a lack of staff, but rather a problem of allocation and coordination of tasks. It would seem however that the implementation of the mobility plan in the capital is progressing well and has even been helped by the onset of the Covid-19 pandemic, freeing up the streets and allowing the identification of

important action points. Nevertheless, the principle of monitoring every 30 months should be reviewed from a methodological point of view, adding other methods of review in addition to the existing peer review as mentioned by our experts.

In addition, the success of these objectives is all the more uncertain because of the upcoming political environment. In 2024, municipal, regional and federal elections will take place in the same year for the first time, which could have an influence on the continuity of the implementation of the mobility plan, especially with regard to new or prospective regulations. In addition, the implementation of the Good move plan does not seem to be unanimously supported at this time. From a political point of view, the Mouvement Réformateur (MR) and its deputy David Weytsman recently described the Good Move project as "bad for mobility" ([Le Soir, 2023](#)). These words are supported by his party colleague and chair of the mobility commission in the regional parliament, Anne-Charlotte d'Ursel, denouncing a plan that is *"ill-adapted to the realities of thousands of inhabitants directly affected, and unacceptable in the way it has been imposed."* Other protests are also being felt from the point of view of the population but also of the communes. In the district of Cureghem, recent infrastructures have been vandalized, while the municipality of Anderlecht decided to backtrack after having given its approval for implementation. Another example, the municipality of Woluwe-Saint-Lambert decided not to accept the results of the study mandated by the region concerning the implementation of its mesh ([Le Soir, 2023](#)). The municipality of Jette has been aware of numerous citizen protests since the fall of 2022, which led it to conduct a satisfaction survey regarding the new mobility plan. The results are obvious, according to 1260 inhabitants, 61 companies and 131 schools, the percentage of results opposed to the project is 74,6%, while those in favor is 20,1%, completed by a neutral percentage of 5,3%. Moreover, 67% of the traders judged the plan as having a negative impact on their turnover ([RTBF, 2023](#)).

These results are evidence of a clear lack of communication about the new measures and their future benefits. One of the reasons for this unevenly distributed information seems to be the participatory process that was advocated when the project was presented. In fact, the Brussels Capital Region received very few opinions from the population by contesting the participation of only 4762 inhabitants over the whole of the BCR in the internet platform set up and a panel supposed to represent the citizens but comprising

only eight members selected in advance ([Good Move, 2020](#)). Even if this process is commendable, these protests prove that the city of Brussels must collect much more opinions and data concerning these inhabitants in order to limit protests and inform the population as much as possible about the future of urban mobility. Another point mentioned during our interviews is that the collection of these opinions has not been adapted to a part of the population, namely those who do not speak one of the official national languages. Moreover, the data collected is becoming more and more outdated due to the changing environment and would merit recurrent diagnosis.

This data problem reveals another source of challenges for the city, namely, its outdated or inefficient infrastructure. Many current mobility infrastructures would need to be modified or adapted to achieve the sustainable goals pursued by the city. A prime example of these aging facilities is the city's ITS, which experts say has been unusable and has not provided quality data for some time. This problem is also visible from the perspective of bicycling, which is strongly encouraged by the city but fails when it comes to having safe and usable bicycle lanes. It is therefore essential to move towards a more developed network of sustainable mobility infrastructures in order to achieve this modal shift for the part of the population and thus, attract new users.

Another recurring protest about the project is the budget allocated to it. Once again, it is the MR deputy David Weytsman who adds that *"in addition to being bad for mobility, it is bad for the wallet of the people of Brussels"* ([Le soir, 2023](#)). These words have obviously been taken up by the population, which does not hesitate to use them to fuel the demonstrations. However, when we take a closer look at the good move project, we see that the funds needed to develop such a mobility plan were substantial. Indeed, of the 50 actions included in the good move plan, 25 of them did not have a sufficient budget beforehand ([Good Move, 2020](#)). The budgets are divided between several bodies, mainly:

- Brussels Mobility: 894 million euros (excluding allocation for Port of Brussels and Water).
- The budget of the municipalities allocated by Brussels Local Authorities: 94 million euros.

- The amendments to the Beliris Cooperation Agreement, defined in collaboration with the federal government: 50 million euros.

Of the total of these major budget items, 71% is spent on the public transport network (STIB) and 27.5% is spent on the road network or on public space development. Other measures not related to infrastructure or public spaces account for about 1.5% of the budgets ([Good Move, 2020](#)). In order to perpetuate the development of the regional mobility plan, it seems essential to prioritize projects with the highest return and immediate effectiveness in order to raise new funds and optimize their allocation. However, it would appear that fundraising is not as constrained as it seems and depends mostly on the project to be funded as revealed during our interviews. The private company Traffi, for example, received a significant amount of funding from the BCR last year after winning the MaaS implementation project, allowing for a rapid development of the service and a first implementation with a test period in 2023.

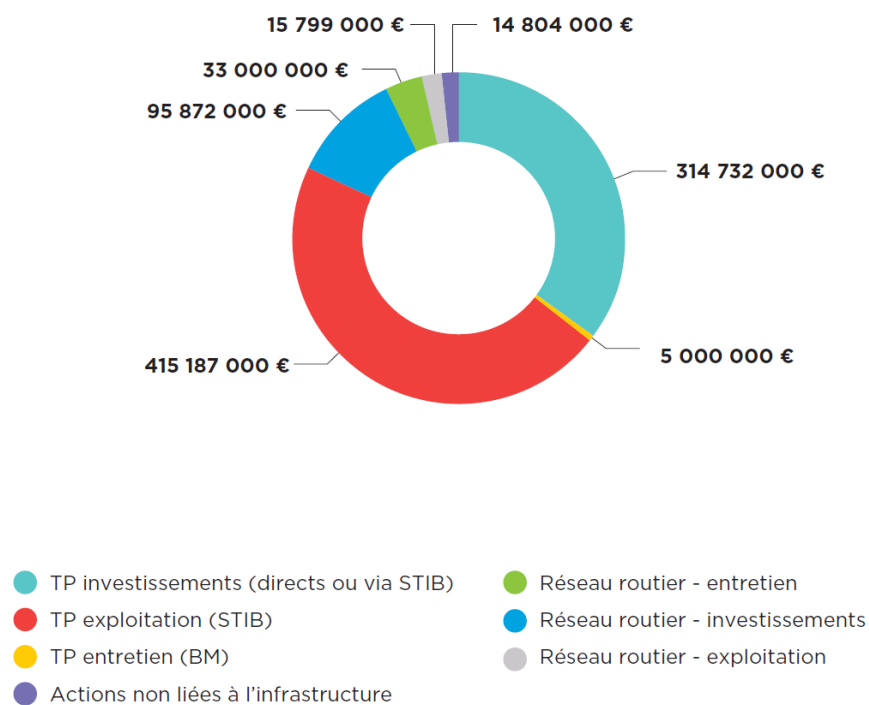


Figure 10 : Major budget items of Brussels Mobility (budgetary liquidations 2017) ([Good Move, 2020](#))

After analyzing the Brussels environment through the available documentation as well as through the point of view of our interviewees, we were able to identify different barriers that seem to emerge. Due to the recent and ongoing nature of the mobility plan

of the city of Brussels, it is difficult for us to fill in the same table as used in our case studies ([Table 2](#)). Indeed, even if some of the meshes are progressing satisfactorily, the project as a whole is far from being completed and therefore does not have the necessary studies and, above all, the necessary hindsight to assess its effectiveness. However, we were able to observe that the different categories of barriers highlighted in our case studies seem to be repeated for the city of Brussels. Thus, the institutional, knowledge-based, organizational and socio-cultural barriers seem to be a concern for the Good Move plan, which is why the following recommendations will mainly focus on these points.

4.2 Recommendations with expert advices

The following recommendations are based both on the analyses of the other cases studied, which highlight potential barriers for the city, but also on the current situation of the city of Brussels, which we have analyzed and which seems to emerge from our various interviews of people working in this sector. These recommendations are therefore the fruit of our analyses and results carried out in the various cities studied, leading to a personal reflection inspired by the proposed solutions, and confirmed by the various experts interviewed in order to adapt them to Brussels. We have therefore grouped these recommendations into several categories, each addressing one or more specific types of barriers. Thus, the recommendations in the Public Awareness and Education section address challenges related to knowledge and socio-cultural issues, which are very closely related, the Collaboration and Coordination section speaks for itself in addressing organizational issues, while the Monitoring and Evaluation section addresses challenges related to the collection and analysis of data. This third section differs then from the first in its nature, aiming at knowledge gathering while the first section provides solutions for knowledge transmission. This recommendations part is itself completed by other general recommendations, addressing institutional and financial barriers. The information gathered from our experts is the result of semi-structured interviews, addressing general themes for each of them and then tailored questions related to their area of expertise. More information about our experts and interviews is available in [Appendix 1](#).

Public awareness and education

- Develop targeted education campaigns on sustainable mobility for different audiences such as school children, drivers and businesses.

The ecological transition depends above all on the habits of the population. It is therefore vital to transmit knowledge and relative education to initiate this behavioral transition. According to Ms. Wrzeńska, this transition is above all through schools and not through various information campaigns: *"Absolutely. [About the lack of information given and then lack of understanding of the real impact of choices] And it's probably the fact that the economic part of education is, in most countries, nonexistent. (...) it means that people don't understand exactly the external cost of their choices and like the full framework."* However, this education must be provided at all levels as mentioned by Ms. Babío Somoza: *"We have a huge issue in communication besides the EU level and the people of everyday, people that use the transport system are not very well informed about the impacts of their choice and the way they move (...) I see it [misunderstandings or lack of knowledge] from the top level, definitely. Sometimes I feel we are all in the same bubble, but as soon as you get out of the bubble, the reality is very different."* Another important aspect is, according to Mr. Cools, to raise awareness about the use of this new type of mobility and its safety: *"So, clear communication, education and awareness campaigns are important to emphasize that unsafe behavior by vulnerable road users can result in penalties for the responsible party."*

- Organize events and activities to promote sustainable mobility and showcase the benefits of different modes of transportation.

The propagation of the information necessary for this paradigm shift will not happen naturally. The creation of small events, such as fairs, can be a solution and is already used in some sectors as mentioned by Ms. Babío Somoza: *"That's what we do and, in addition, we have personal relationships, working relationships with the members of the Commission. We keep that, they appreciate it. They want to be educated and they appreciate the input as long as it is constructive."* This measure should therefore be developed in an important way across all social strata in order to reach a maximum of communities.

- Use social media and other communication channels to disseminate information about sustainable mobility and encourage behavior change.

The use of modern means of communication is essential to reach the largest part of the population. This phenomenon is increasingly understood by companies, which, as Ms. Babío Somoza mentions, are expanding their methods beyond the traditional channels: *"We have published, we always, well, not always, we regularly publish position papers on issues related to our resource concerns. We have done so on several occasions. The idea of the proposal was to use new means of communication, such as social media, and reach out to a younger population to try to spread the word and then build from there."* But a good communication does not only pass by social networks, but also by the relevance and the effectiveness of a measure as underlined by Ms. Wrzesińska: *"I am convinced that the app [MaaS], that if robust, is gonna defend itself without extra efforts from the marketing department."*

In conclusion, achieving sustainable mobility requires a multifaceted approach that involves educating and informing different stakeholders at different levels. Targeted education campaigns need to be developed for school children, drivers and businesses, while events and activities need to be organized to present the benefits of sustainable mobility. The use of social media and other communication channels should also be maximized to disseminate information and encourage behavioral change. These measures will be crucial in promoting sustainable mobility and initiating the behavioral transition necessary for the green transition.

Collaboration and coordination

- Create an interdepartmental working group to ensure coordination and integration of the various agencies and stakeholders involved in the implementation of the Good Move mobility plan.

Working with many actors is a difficult task because of the organization and the consideration of everyone's interests. As Ms. Babío Somoza says: *"there is definitely a disconnection between the cities and their own national level in terms of supporting them and between the national level and the EU. Because we see that not all ministries are involved in all, in all initiatives. Even if they are the ones that are going to have the*

responsibility.” This sentiment is confirmed by Ms. Wrzesińska: (...) regional competences versus local competences versus federal competence, it's such an unclear business, no one knows how far it goes. So, it's gonna be difficult to bring everyone on board as usually, you know, more people at the table, more complex it gets.” The creation of a task force in Brussels seems to be an interesting idea in order to centralize the issues and interests of everyone. According to Mr. Cools: “we should have one policy for the entire Belgian region. (...) the different governments have a different vision of this. And that's the real challenge, how to harmonize this. And in my opinion, this is only one way, that's with one.”

- Hold regular meetings and workshops to facilitate communication and collaboration among stakeholders.

Having multiple entities working on the same project can be a real headache when it comes to tracking the overall progress. Poor communication can be counterproductive as Ms. Wrzesińska points out: *“the problem is that, because of so many administrative layers that are like overlapping and it is super counter efficient, they often don't know that they already do have something. And it happened on multiple occasion that like someone was willing to pay us for the data that they already have.”* Establishing regular meetings to discuss the progress of the project among the stakeholders is therefore recommended as it seems to be effective according to Ms. Babío Somoza: *“we establish a conversation with many private providers and operators that have to be in a discussion, which have to provide, to be in the argument, even if they're not members. So, they're invited to the events when their input is valuable.”*

In conclusion, effective coordination and collaboration are essential for the successful implementation of the Good Move mobility plan. Establishing an interdepartmental working group and organizing regular meetings and workshops between stakeholders can help overcome the difficulties of working with many actors and improve the effectiveness of the project. Addressing the disconnect between cities and their national level, clarifying administrative competencies, and establishing effective communication channels are essential to the success of the project. By adopting these strategies, the

stakeholders involved in the Good Move mobility plan can work together to achieve their common goal of improving urban mobility in Brussels.

Monitoring and evaluation

- Develop a monitoring and evaluation framework to track progress toward the Good Move mobility plan goals and identify areas for improvement.

The best way to identify an anomaly or a trend is to analyze the data on a recurring basis. The implementation of continuous monitoring and evaluations more frequently than every two and a half years is therefore recommended. This point deserves more attention according to Ms. Wrzesińska: *"Because for some of the projects, the only collaboration needs to have is the exchange on the progress of the Ministry and receiving the data and you know there has to do on your own, you have some kind of peer review after and like pretty much it"*. This rather poor monitoring is also found at the European level, where the projects are very little monitored. According to Ms. Babío Somoza: *"I think this is really the weakness. We don't monitor that much old projects. It's really, we haven't found a system to work this. There is, it really depends on the results of the projects and on the willingness of the partners to continue pushing this."*

- Use data analytics to identify patterns and trends in transportation use and adjust the plan accordingly.

The determination of issues and opportunities depends first and foremost on the understanding of the environment and therefore the data collection. The city would be inspired to develop tools for this collection and processing of data in a continuous way. This goes through the ITS in Brussels for example, which needs a lot of improvement in order to be efficient and useful as revealed by Ms. Wrzesińska: *"National access points, yeah. Like, let's give it 10 more years and maybe it's gonna be usable."* This problem in the collection and access to data is also taken up by Mr. Cools, who compares Belgium to its neighboring countries: *"if you compared to our neighboring countries data availability and data sharing from the government, simply, it's ridiculous here. (...) Whereas a good data collection, like in the past, the last real*

good data in Wallonia was collected in 2010. (...) you need to have a behavioral service data, ideally every year that you can see how it evolves."

- Conduct regular surveys and focus groups to gather feedback from users and stakeholders.

Once an evaluation and monitoring method has been constructed, it is important to apply it on an ongoing basis so that results can be identified as quickly as possible. According to Ms. Wrzesińska: *"numbers never lie people do. So, I'm very much more convinced about the surveys than the panels."* However, Mr. Cools raises another issue when it comes to collecting public opinion: *"If the majority doesn't speak your local, the official language here, then you need to discuss and integrate them in another way, and that's what they failed horribly."*

In summary, to effectively monitor and evaluate progress toward the goals of the Good Move mobility plan, it is recommended that ongoing monitoring and evaluation be implemented more frequently than every two and a half years. Data analysis should be used to identify patterns and trends in transportation use and adjust the plan accordingly, and data collection and processing tools should be developed. Regular surveys and focus groups should also be conducted to gather feedback from users and stakeholders, making sure to include those who do not speak the local language. By implementing these strategies, the city will be better able to monitor progress and identify areas for improvement in the Good Move mobility plan.

General recommendations

- Seek external or alternative funding sources, such as grants or subsidies, to support the implementation of specific sustainable mobility initiatives and projects.

Funding is of course an important factor when it comes to implementing a new measure, but it can be difficult for smaller entities to raise the necessary funds. According to Ms. Babío Somoza: *"The cities cannot really afford to continue on their own without a stream of funding, or that the innovation is not ready to be implemented operational every day. So, you have a lot of money spent on something that doesn't continue in many cases. I remember we have worked with many startups, in fact, that*

no longer in existing. (...) The EU imposes many regulations and sometimes does not take into account the costs of implementing these regulations at the local level. So, they impose a lot of things. Also, at the local level, they don't have an agency, they don't have access to certain funding. So, the improvement in access to funding that they would get is tied to the requirements that they have imposed."

- Continue to build up and expand the framework for micro-mobility.

Micro mobility in Brussels is a relatively new market and it is difficult for a new entrant to adapt quickly. This is partly due to the very weak legislative framework in place as mentioned by Ms. Babío Somoza: *"And that big issue for that is the lack of clarity on the process, on how the support is going to be given to them."* This framework is therefore essential for the arrival of new operators and new services facilitating their implementation and reducing barriers to entry. According to Ms. Wrzesińska: *"I would say the lack of framework was a barrier. (...) But for the long run it was evident that we do need the framework both for the industry and from the government. (...) So, in this case, the framework, the legislative framework was very well welcomed."* However, this transition in legislation is not yet welcome everywhere, as Mr. Cools reminds us: *"So, if you saw the election in Paris just recently, there was a population survey to see whether electric scooters were needed or not in the city. And they forbid electric scooters now. I guess it's just a lack. These things have popped up and it's good that we allowed this technology to develop, but legislation should follow."*

- Strengthen measures to promote behavioral change.

A behavioral transition cannot be achieved without the necessary predispositions. Brussels Capital Region needs to strengthen its mobility management measures and mobility services to meet the demand. Among these, the implementation of a MaaS is well underway as revealed during the interview of Ms. Wrzesińska: *"We are launching the platform sometime this year. The government allocated already last year quite a significant amount of money to develop the MaaS platform this is now in the test phase. So, there are a like a bunch of people that are using the app. And trying to like how it is performing and stuff like that. There was like a huge road map, how to develop further with infrastructure integration and things like that. So, it is happening."*

It's gonna be very cool. Stay tuned." This implementation is a very important step for the city, which must continue to move in this direction by constantly optimizing and improving this service. However, strengthening these measures also requires the development of more traditional infrastructures, as Mr. Cools reminds us: *"We need to invest in walking and cycling infrastructure considerably more. Because there are many gains to acquire."*

Overall, implementing sustainable mobility measures can be difficult for small entities due to financial constraints. Access to external or alternative sources of funding, such as grants or subsidies, can support the implementation of specific initiatives and projects. However, compliance with EU regulations can entail significant costs at the local level, especially for entities that do not have access to certain funding and agency support. Strengthening the micro-mobility framework is also essential to reduce barriers to entry and facilitate the arrival of new operators and services. In addition, promoting behavioral change and strengthening mobility management measures and mobility services are essential to meet demand. The implementation of a MaaS platform as well as other infrastructures is an important step towards this goal, which needs to be constantly optimized and improved.

5. Conclusion

In the course of this research, we have been able to address several points related to the development of sustainable mobility in Europe. By going through the origins of its concepts, we have been able to understand the meaning and the different steps related to the implementation of a sustainable mobility plan. During this study, we focused on the different challenges that this implementation may face, which we identified as barriers. Through our research, using all available and accessible sources, we were able to establish a list of the most recurrent barriers, allowing us to group them into several categories. Thus, the different categories of barriers found are the following: legislative and institutional, city-specific, financial and economic, knowledge-based, organizational, socio-cultural, technological, and finally, political. Note that we have also identified so-called unpredictable barriers, which we did not include in our analysis because of their discontinuous nature. This list and classification of recurrent barriers can be found in [Table 1](#).

Following this, we have carried out several case studies on different European cities that have implemented actions and measures that are deemed to be effective and should serve as examples for their counterparts. Thus, after analyzing the development of bicycle infrastructure in Seville, the introduction of a new parking levy in Nottingham, the creation of one of the very first MaaS in Helsinki, the growth of electric vehicle uses in Oslo, and a new governance system for urban freight logistics in the city of Turin, we were able to see similarities in the barriers to implementation encountered, despite the obvious differences in projects and environments. In this way, we were able to identify the different recurring barriers present in the projects of these respective cities, allowing us to observe a certain trend. These results are presented in [Table 2](#).

Thus, it would appear that barriers relating to the categories of institutional, knowledge-based, organizational, and socio-cultural types, would be more recurrently present when implementing action on sustainable mobility. More specifically, the lack or non-existence of an appropriate legal and regulatory framework, the weak communication of global information and policies to the population and local stakeholders leading to a lack of motivation or trust in new measures benefits in a unfamiliar market, the weakness of data evaluation and measurement due to the low availability of quality data, the large number of municipalities or authorities implying coordination problems, the difficulty of satisfying the different professional interests of the stakeholders in the creation of procedures, the public acceptance of a new technology or measure, and the overestimation of the risk of transfer to a new technology or measure, are recurring barriers that seem to be the most vexing when implementing a sustainable mobility action.

The next step of our research was to adapt our analysis and findings to a project that is currently being implemented. For this purpose, we studied the city of Brussels, capital of Belgium and the European Union, which is undergoing a major change in terms of mobility due to the launch of the regional mobility plan Good Move in 2020. Based on our previous results as well as our analysis of the city itself, we were able to identify the key points on which to focus our analysis and thus predict the different barriers that the city is likely to face. As expected, our research has identified barriers that are well within the categories highlighted above, allowing us to mobilize our acquired knowledge to

provide recommendations that will hopefully assist in the future development of the mobility plan.

In order to support our recommendations, we called upon experts in mobility who have been working in the field of mobility and the Brussels-Capital region for years and are therefore confronted daily with the challenges related to the implementation of a regional mobility plan. These opinions and points of view, collected during semi-structured interviews, allowed us on the one hand to have the vision of professionals as well as their experience necessary to the good understanding of the environment we had to face, and on the other hand, to have a feedback on the established recommendations, allowing us to complete our study in the most appropriate way possible.

In this way, we were able to construct recommendations regarding public awareness and education, collaboration and coordination, as well as monitoring and evaluation, allowing us to address knowledge-based, organizational, and socio-cultural barriers. These recommendations are complemented by general recommendations on institutional and economic issues.

Research limitations and possible future expansion

The main limitation of our study was to access the official reports which was sometimes complicated by the confidentiality of the projects or simply the deletion of them due to the year of implementation starting to date. Another difficulty encountered during our process was of course to analyze a project under development, namely that of the city of Brussels. Indeed, even if the plan is established, it is not exempt from modifications following the different results obtained, and moreover in a changing environment. It will therefore be interesting in the future to analyze the project and the barriers encountered once the project is completed. In order to provide a more advanced research, it would be interesting to build a larger study with a larger number of cities and to have more representative results. A study of failed projects would also be an interesting way to highlight some of the barriers that may be impassable for a certain category of project or company. Finally, an analysis of a more targeted sector, such as freight transport, would highlight results specific to that sector, thus providing a more in-depth analysis.

6. References

1. A winning policy: Nottingham's workplace parking levy. (s.d.). *Campaign for Better Transport*. Consulté 3 mars 2023, à l'adresse <https://bettertransport.org.uk/blog/winning-policy-nottinghams-workplace-parking-levy/>
2. Aasness, M. A., & Odeck, J. (2015). The increase of electric vehicle usage in Norway—Incentives and adverse effects. *European Transport Research Review*, 7(4), 34. <https://doi.org/10.1007/s12544-015-0182-4>
3. *About us / 5T*. (s.d.). Consulté 3 mars 2023, à l'adresse <https://www.5t.torino.it/en/about-us/>
4. Adhikari, M., Ghimire, L. P., Kim, Y., Aryal, P., & Khadka, S. B. (2020). Identification and analysis of barriers against electric vehicle use. *Sustainability*, 12(12), 4850. <https://doi.org/10.3390/su12124850>
5. Åkerman, J., Gudmundsson, H., Sørensen, C. H., Isaksson, K., Olsen, S., Kessler, F., & Macmillan, J. (2011). How to manage barriers to formation and implementation of policy packages in transport. In OPTIC. *Optimal policies for transport in combination: 7th framework programme: Theme 7 transport* <http://optic.toi.no/category1186.html>
6. Anastasiadou, K., Gavanis, N., Pyrgidis, C., & Pitsiava-Latinopoulou, M. (2021). Identifying and prioritizing sustainable urban mobility barriers through a modified delphi-ahp approach. *Sustainability*, 13(18), 10386. <https://doi.org/10.3390/su131810386>
7. Anderson, T. (2019). Electric vehicles in danish municipalities: An understanding of motivations, barriers, and the future of sustainable mobility. *Vehicles*, 1(1), 57-68. <https://doi.org/10.3390/vehicles1010004>
8. Andrei, L., & Luca, O. (2022). Towards a sustainable mobility development in Romanian cities. A comparative analysis of the sustainable urban mobility plans at the national level. *Management Research & Practice*, 14(1).
9. Annual activity report 2021—*Mobility and Transport*. (s.d.). Consulté 3 mars 2023, à l'adresse https://commission.europa.eu/publications/annual-activity-report-2021-mobility-and-transport_en
10. Antoni, J.-P., Bonin, O., Frankhauser, P., Houot, H., Nicolas, J.-P., Tomasoni, L., Toilier, F., & Vuidel, G. (2014). *VILMODEs, Ville et mobilité durables, évaluation par la simulation* [Report, PREDIT ; ThéMA ; LVMT ; LET]. <https://shs.hal.science/halshs-01676456>
11. Arias-Molinares, D., & Carlos García-Palomares, J. (2020). Shared mobility development as key for prompting mobility as a service (Maas) in urban areas: The case of Madrid. *Case Studies on Transport Policy*, 8(3), 846-859. <https://doi.org/10.1016/j.cstp.2020.05.017>
12. Arias-Molinares, D., & García-Palomares, J. C. (2020). The Ws of MaaS: Understanding mobility as a service from literature review. *IATSS Research*, 44(3), 253-263. <https://doi.org/10.1016/j.iatssr.2020.02.001>
13. Arthur, W. B. (1994). *Increasing returns and path dependence in the economy*. University of michigan Press.
14. Arthur, W. B. (1989). Competing technologies, increasing returns, and lock-in by historical events. *The economic journal*, 99(394), 116-131."
15. Audouin, M., & Finger, M. (2018). The development of Mobility-as-a-Service in the Helsinki metropolitan area: A multi-level governance analysis. *Research in Transportation Business & Management*, 27, 24-35. <https://doi.org/10.1016/j.rtbm.2018.09.001>

16. Audouin, M., & Finger, M. (2019). Empower or Thwart? Insights from Vienna and Helsinki regarding the role of public authorities in the development of MaaS schemes. *Transportation Research Procedia*, 41, 6-16. <https://doi.org/10.1016/j.trpro.2019.09.003>
17. Axsen, J., Orlebar, C., & Skippon, S. (2013). Social influence and consumer preference formation for pro-environmental technology: The case of a U.K. workplace electric-vehicle study. *Ecological Economics*, 95, 96-107. <https://doi.org/10.1016/j.ecolecon.2013.08.009>
18. Ayuntamiento de sevilla. (2023, mars 10). *Ayuntamiento de Sevilla*. <https://www.sevilla.org>
19. Azadfar, E., Sreeram, V., & Harries, D. (2015). The investigation of the major factors influencing plug-in electric vehicle driving patterns and charging behaviour. *Renewable and Sustainable Energy Reviews*, 42, 1065-1076. <https://doi.org/10.1016/j.rser.2014.10.058>
20. Bakker, S., & Jacob Trip, J. (2013). Policy options to support the adoption of electric vehicles in the urban environment. *Transportation Research Part D: Transport and Environment*, 25, 18-23. <https://doi.org/10.1016/j.trd.2013.07.005>
21. Bakogiannis, E., Kyriakidis, C., Siti, M., & Eleftheriou, V. (2017). Four stories for sustainable mobility in Greece. *Transportation Research Procedia*, 24, 345-353. <https://doi.org/10.1016/j.trpro.2017.05.101>
22. Banister, D. (2008). The sustainable mobility paradigm. *Transport Policy*, 15(2), 73-80. <https://doi.org/10.1016/j.tranpol.2007.10.005>
23. Bardal, K. G., Gjertsen, A., & Reinart, M. B. (2020). Sustainable mobility: Policy design and implementation in three Norwegian cities. *Transportation Research Part D: Transport and Environment*, 82, 102330. <https://doi.org/10.1016/j.trd.2020.102330>
24. Barisa, A., Rosa, M., & Kisele, A. (2016). Introducing electric mobility in latvian municipalities: Results of a survey. *Energy Procedia*, 95, 50-57. <https://doi.org/10.1016/j.egypro.2016.09.015>
25. Barr, S., & Prillwitz, J. (2012). Green travellers? Exploring the spatial context of sustainable mobility styles. *Applied Geography*, 32(2), 798-809. <https://doi.org/10.1016/j.apgeog.2011.08.002>
26. Berger, G., Feindt, P. H., Holden, E., & Rubik, F. (2014). Sustainable mobility—Challenges for a complex transition. *Journal of Environmental Policy & Planning*, 16(3), 303-320. <https://doi.org/10.1080/1523908X.2014.954077>
27. Berkeley, N., Bailey, D., Jones, A., & Jarvis, D. (2017). Assessing the transition towards battery electric vehicles: A multi-level perspective on drivers of, and barriers to, take up. *Transportation Research Part A: Policy and Practice*, 106, 320-332. <https://doi.org/10.1016/j.tra.2017.10.004>
28. Bernard, M. R., Hall, D., & Lutsey, N. (2021). *Update on electric vehicle uptake in European cities*. <https://doi.org/10.13140/RG.2.2.25050.26565>
29. Bielińska-Dusza, E., Hamerska, M., & Żak, A. (2021). Sustainable mobility and the smart city: A vision of the city of the future: the case study of cracow(Poland). *Energies*, 14(23), 7936. <https://doi.org/10.3390/en14237936>
30. Biresselioglu, M. E., Demirbag Kaplan, M., & Yilmaz, B. K. (2018). Electric mobility in Europe: A comprehensive review of motivators and barriers in decision making processes. *Transportation Research Part A: Policy and Practice*, 109, 1-13. <https://doi.org/10.1016/j.tra.2018.01.017>
31. Bishop, D. (2018, janvier 19). Idea Exchange: How Nottingham created the UK's first workplace parking levy. *Local Government Chronicle (LGC)*. <https://www.lgcplus.com/idea-exchange/how-nottingham-created-the-uks-first-workplace-parking-levy-19-01-2018/>

32. Bjerkan, K. Y., Nørbech, T. E., & Nordtømme, M. E. (2016). Incentives for promoting battery electric vehicle (Bev) adoption in Norway. *Transportation Research Part D: Transport and Environment*, 43, 169-180. <https://doi.org/10.1016/j.trd.2015.12.002>
33. Börjesson, M., Eliasson, J., Hugosson, M. B., & Brundell-Freij, K. (2012). The Stockholm congestion charges—5 years on. Effects, acceptability and lessons learnt. *Transport Policy*, 20, 1-12. <https://doi.org/10.1016/j.tranpol.2011.11.001>
34. Brey, R., Castillo-Manzano, J. I., Castro-Nuño, M., López-Valpuesta, L., Marchena-Gómez, M., & Sánchez-Braza, A. (2017). Is the widespread use of urban land for cycling promotion policies cost effective? A Cost-Benefit Analysis of the case of Seville. *Land Use Policy*, 63, 130-139. <https://doi.org/10.1016/j.landusepol.2017.01.007>
35. Brůhová-Foltýnová, H., & Jordová, R. (2014). Innovative tools of sustainable mobility in European urban areas: Experience with evaluation and role of political barriers. *Transactions on Transport Sciences*, 7(4), 135-142. <https://doi.org/10.2478/trans-2014-0011>
36. *Bruxelles: Le coût total du plan Good Move dévoilé.* (2023, février 10). Le Soir. <https://www.lesoir.be/494505/article/2023-02-10/bruxelles-le-cout-total-du-plan-good-move-devoile>
37. Butler, L., Yigitcanlar, T., & Paz, A. (2021). Barriers and risks of Mobility-as-a-Service (Maas) adoption in cities: A systematic review of the literature. *Cities*, 109, 103036. <https://doi.org/10.1016/j.cities.2020.103036>
38. Calise, F., Cappiello, F. L., Cartenì, A., Dentice d'Accadia, M., & Vicidomini, M. (2019). A novel paradigm for a sustainable mobility based on electric vehicles, photovoltaic panels and electric energy storage systems: Case studies for Naples and Salerno (Italy). *Renewable and Sustainable Energy Reviews*, 111, 97-114. <https://doi.org/10.1016/j.rser.2019.05.022>
39. Capuder, T., Miloš Sprčić, D., Zoričić, D., & Pandžić, H. (2020). Review of challenges and assessment of electric vehicles integration policy goals: Integrated risk analysis approach. *International Journal of Electrical Power & Energy Systems*, 119, 105894. <https://doi.org/10.1016/j.ijepes.2020.105894>
40. Castillo-Manzano, J. I., Castro-Nuño, M., & López-Valpuesta, L. (2015). Analyzing the transition from a public bicycle system to bicycle ownership: A complex relationship. *Transportation Research Part D: Transport and Environment*, 38, 15-26. <https://doi.org/10.1016/j.trd.2015.04.004>
41. Castillo-Manzano, J. I., & Sánchez-Braza, A. (2013a). Managing a smart bicycle system when demand outstrips supply: The case of the university community in Seville. *Transportation*, 40(2), 459-477. <https://doi.org/10.1007/s11116-012-9424-7>
42. Castillo-Manzano, J. I., & Sánchez-Braza, A. (2013b). Can anyone hate the bicycle? The hunt for an optimal local transportation policy to encourage bicycle usage. *Environmental Politics*, 22(6), 1010-1028. <https://doi.org/10.1080/09644016.2012.740936>
43. Cavoli, C. (2021). Accelerating sustainable mobility and land-use transitions in rapidly growing cities: Identifying common patterns and enabling factors. *Journal of Transport Geography*, 94, 103093. <https://doi.org/10.1016/j.jtrangeo.2021.103093>
44. *Climate change—Driving forces.* (s.d.). Consulté 3 mars 2023, à l'adresse https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Climate_change-driving_forces
45. Communications, M. of T. and. (2021, juin 22). *Norway is electric* [Redaksjonellartikkel]. Government.No. <https://www.regjeringen.no/en/topics/transport-and-communications/veg/faktaartikler-vei-og-ts/norway-is-electric/id2677481/>

46. Cottrill, C. D. (2020). MaaS surveillance : Privacy considerations in mobility as a service. *Transportation Research Part A: Policy and Practice*, 131, 50-57. <https://doi.org/10.1016/j.tra.2019.09.026>
47. Council of the European Union. (2006). *Review of the EU Sustainable Development Strategy* (EU SDS)—Renewed Strategy.
48. Council, N. C. (s.d.). *Cost of a wpl licence*. Consulté 3 mars 2023, à l'adresse <https://www.nottinghamcity.gov.uk/wpllicensingcostsandpayments>
49. Council, N. C. (2011). *Workplace Parking Levy Employer Handbook*.
50. Dale, S., Frost, M., Gooding, J., Ison, S., & Warren, P. (2014). A case study of the introduction of a workplace parking levy in nottingham. In *Parking Issues and Policies* (Vol. 5, p. 335-360). Emerald Group Publishing Limited. <https://doi.org/10.1108/S2044-994120140000005024>
51. Dale, S., Frost, M., Ison, S., & Budd, L. (2019). The impact of the Nottingham Workplace Parking Levy on travel to work mode share. *Case Studies on Transport Policy*, 7(4), 749-760. <https://doi.org/10.1016/j.cstp.2019.09.001>
52. Dale, S., Frost, M., Ison, S., Nettleship, K., & Warren, P. (2017). An evaluation of the economic and business investment impact of an integrated package of public transport improvements funded by a Workplace Parking Levy. *Transportation Research Part A: Policy and Practice*, 101, 149-162. <https://doi.org/10.1016/j.tra.2017.04.034>
53. Dale, S., Frost, M., Ison, S., Quddus, M., & Warren, M. P. (2017). Evaluating the impact of a workplace parking levy on local traffic congestion : The case of Nottingham UK. *Transport Policy*, 59, 153-164. <https://doi.org/10.1016/j.tranpol.2017.07.015>
54. Dale, S., Frost, M., Ison, S., & Warren, P. (2014). Workplace Parking Levies : The answer to funding large scale local transport improvements in the UK? *Research in Transportation Economics*, 48, 410-421. <https://doi.org/10.1016/j.retrec.2014.09.068>
55. Darda, S., Papalas, T., & Zabaniotou, A. (2019). Biofuels journey in Europe : Currently the way to low carbon economy sustainability is still a challenge. *Journal of Cleaner Production*, 208, 575-588. <https://doi.org/10.1016/j.jclepro.2018.10.147>
56. Das, S., Boruah, A., Banerjee, A., Raoniar, R., Nama, S., & Maurya, A. K. (2021). Impact of COVID-19 : A radical modal shift from public to private transport mode. *Transport Policy*, 109, 1-11. <https://doi.org/10.1016/j.tranpol.2021.05.005>
57. Daziano, R. A., & Chiew, E. (2012). Electric vehicles rising from the dead : Data needs for forecasting consumer response toward sustainable energy sources in personal transportation. *Energy Policy*, 51, 876-894. <https://doi.org/10.1016/j.enpol.2012.09.040>
58. Deflorio, F., Gonzalez-Feliu, J., Perboli, G., & Tadei, R. (2012). The influence of time windows on the costs of urban freight distribution services in city logistics applications. *European Journal of Transport and Infrastructure Research*, 12(3).
59. Department of Environmental Affairs and Transport, City of Oslo, 2011. *Urban Ecology Programme 2011-2026*.
60. *Developing sustainable land use and transport strategies : A methodological handbook : deliverable 14 of PROSPECTS ...* (2001). Institute of Transport Economics, Norwegian Centre for Transport Research.
61. *Dpg media privacy gate*. (s.d.). Consulté 3 mars 2023, à l'adresse <https://myprivacy.dpgmedia.be/consent?siteKey=atXMVFeyFP1Ki09i&callbackUrl=https%3A%2F%2Fwww.7sur7.be%2Fprivacy-gate%2Faccept-tcf%3FredirectUri%3D%252Fbelgique%252Fune-large-majorite-de-la-population-contre-le-nouveau-plan-de-circulation-a-jette~a39fbfd6%252F>

62. EUCOM (1992) *Green Paper on the Impact of Transport on the Environment. A Community strategy for "Sustainable mobility."* Commission of the European Community. COM (192) 46 final. Brussels.
63. *Electric cars get network of fast-chargers in Northern Norway.* (s.d.). The Independent Barents Observer. Consulté 3 mars 2023, à l'adresse <https://thebarentsobserver.com/en/2016/01/electric-cars-get-network-fast-chargers-northern-norway>
64. *Energy, transport and environment statistics: 2020 edition* (2020 edition). (2020). Publications Office of the European Union.
65. Enoch, M., & Ison, S. (2005). *Levying charges on private parking: lessons from existing practice.*
66. Esztergár-Kiss, D., & Kerényi, T. (2020). Creation of mobility packages based on the MaaS concept. *Travel Behaviour and Society*, 21, 307-317. <https://doi.org/10.1016/j.tbs.2019.05.007>
67. *Étapes du processus—Good move pentagone—Fairebxsamen.* (s.d.). Consulté 3 mars 2023, à l'adresse <https://fairebruxellessamen.be/processes/goodmove/steps>
68. European Commission. Statistical Office of the European Union. (2020). *Energy, transport and environment statistics: 2020 edition.* Publications Office. <https://data.europa.eu/doi/10.2785/522192>
69. European Commission. CORDIS EU Research results. (2019). *SETA: An open, sustainable, ubiquitous data and service ecosystem for efficient, effective, safe, resilient mobility in metropolitan areas.* <https://doi.org/10.3030/688082>
70. European Commission. Statistical Office of the European Union. (2023). *Key figures on European transport: 2022 edition.* Publications Office. <https://data.europa.eu/doi/10.2785/322262>
71. European Environment Agency. (2016). *Electric vehicles in Europe.* Publications Office. <https://data.europa.eu/doi/10.2800/100230>
72. EUROSTAT (Éd.). (2007). *Measuring progress towards a more sustainable Europe: 2007 monitoring report of the EU sustainable development strategy* (Ed. 2007). Office for official publications of the European communities.
73. Faghih-Imani, A., Hampshire, R., Marla, L., & Eluru, N. (2017). An empirical analysis of bike sharing usage and rebalancing: Evidence from Barcelona and Seville. *Transportation Research Part A: Policy and Practice*, 97, 177-191. <https://doi.org/10.1016/j.tra.2016.12.007>
74. Faria, M. V., Baptista, P. C., & Farias, T. L. (2014). Electric vehicle parking in European and American context: Economic, energy and environmental analysis. *Transportation Research Part A: Policy and Practice*, 64, 110-121. <https://doi.org/10.1016/j.tra.2014.03.011>
75. Farla, J., Alkemade, F., & Suurs, R. A. A. (2010). Analysis of barriers in the transition toward sustainable mobility in the Netherlands. *Technological Forecasting and Social Change*, 77(8), 1260-1269. <https://doi.org/10.1016/j.techfore.2010.03.014>
76. Fatima, K., Moridpour, S., De Gruyter, C., & Saghapour, T. (2020). Elderly sustainable mobility: Scientific paper review. *Sustainability*, 12(18), 7319. <https://doi.org/10.3390/su12187319>
77. Fernandez-Heredia, A., & Fernandez-Sanchez, G. (2020). Processes of civic participation in the implementation of sustainable urban mobility systems. *Case Studies on Transport Policy*, 8(2), 471-483. <https://doi.org/10.1016/j.cstp.2019.10.011>

78. Figenbaum, E. (2017). Perspectives on Norway's supercharged electric vehicle policy. *Environmental Innovation and Societal Transitions*, 25, 14-34. <https://doi.org/10.1016/j.eist.2016.11.002>
79. Find policy solutions / Interreg Europe—Sharing solutions for better policy. (2023, février 15). <https://www.interregeurope.eu/policy-solutions/good-practices>
80. Finger, M., Bert, N., & Kupfer, D. (2015). Mobility-as-a-Services: From the Helsinki experience to a European model. *European Transport Regulation Observer*, 1, 1-13.
81. Finnish funding agency for innovation(Tekes). (s. d.). Consulté 5 mai 2023, à l'adresse <https://fundit.fr/en/institutions/finnish-funding-agency-innovation-tekes>
82. Fitzsimons, J. K., Gerbeaud, F., Leroy, J., Williamson, R., Chifos, C., Ozaki, A. G., Tapie, G., Parent, O., Godier, P., Russell, F., Lima, C. de A., Pereira, M. de A., Schmid, A. L., Silva, J. M. M. E., & Sluter, C. R. (2013). *Métropoles et mobilités durables à l'épreuve d'un nouveau paradigme énergétique* [Report, Ministère de la culture et de la communication / Bureau de la recherche architecturale, urbaine et paysagère (BRAUP); Ministère de l'écologie, du développement durable et de l'énergie; Atelier du Grand Paris; Ecole Nationale Supérieure d'Architecture et de Paysage Bordeaux / Profession Architecture Ville et Environnement (PAVE); University of Cincinnati (Etats-Unis); Universidade Federal do Paraná (Brésil)]. <https://hal.science/hal-01740275>
83. Flachi, M., Popova, S., Konstantinopoulou, L., Pandazis, J.-C., Somma, G., Halatsis, A., & Stathacopoulos, A. (2016). *Urban Freight and Service Transport in European Cities* (3^e éd.). novelog. <https://ec.europa.eu/research/participants/documents/downloadPublic?documentIds=080166e5a7a1dead&appId=PPGMS>
84. Flury, K., & Frischknecht, R. (2012). Life cycle inventories of hydroelectric power generation. ESU-Services, Fair Consulting in Sustainability, commissioned by Oko-Institute eV, 51.
85. Foxon, T., & Pearson, P. (2008). Overcoming barriers to innovation and diffusion of cleaner technologies: Some features of a sustainable innovation policy regime. *Journal of Cleaner Production*, 16(1), S148-S161. <https://doi.org/10.1016/j.jclepro.2007.10.011>
86. Frost, M. W., & Ison, S. G. (2008, July). *Implementation of a workplace parking levy, lessons from the UK*. In 88th Annual Meeting of the Transportation Research Board, TRB (Vol. 9, No. 0249, pp. 1-17).
87. Gallo, M., & Marinelli, M. (2020). Sustainable mobility: A review of possible actions and policies. *Sustainability*, 12(18), 7499. <https://doi.org/10.3390/su12187499>
88. Gatta, V., Marcucci, E., Nigro, M., Patella, S., & Serafini, S. (2018). Public transport-based crowdshipping for sustainable city logistics: Assessing economic and environmental impacts. *Sustainability*, 11(1), 145. <https://doi.org/10.3390/su11010145>
89. Gatta, V., Marcucci, E., Nigro, M., & Serafini, S. (2019). Sustainable urban freight transport adopting public transport-based crowdshipping for B2C deliveries. *European Transport Research Review*, 11(1), 13. <https://doi.org/10.1186/s12544-019-0352-x>
90. Gebauer, F., Vilimek, R., Keinath, A., & Carbon, C.-C. (2016). Changing attitudes towards e-mobility by actively elaborating fast-charging technology. *Technological Forecasting and Social Change*, 106, 31-36. <https://doi.org/10.1016/j.techfore.2016.02.006>
91. Gigler, J. & Weeda, M. (2018) *Outlines of a hydrogen roadmap*. A publication of TKI Nieuw Gas, Optima Forma bv, Voorburg, Netherlands.
92. Gil, A., Calado, H., & Bentz, J. (2011). Public participation in municipal transport planning processes – the case of the sustainable mobility plan of Ponta Delgada, Azores, Portugal.

- Journal of Transport Geography*, 19(6), 1309-1319.
<https://doi.org/10.1016/j.jtrangeo.2011.06.010>
93. Gillis, D., Semanjski, I., & Lauwers, D. (2015). How to monitor sustainable mobility in cities? Literature review in the frame of creating a set of sustainable mobility indicators. *Sustainability*, 8(1), 29. <https://doi.org/10.3390/su8010029>
 94. *Good Move, c'est quoi ?* (2022, février 14). <https://www.bruxelles.be/good-move-cest-quoi>
 95. Gori, S., Nigro, M., & Petrelli, M. (2012). The impact of land use characteristics for sustainable mobility: The case study of Rome. *European Transport Research Review*, 4(3), 153-166. <https://doi.org/10.1007/s12544-012-0077-6>
 96. Griffiths, S., Furszyfer Del Rio, D., & Sovacool, B. (2021). Policy mixes to achieve sustainable mobility after the COVID-19 crisis. *Renewable and Sustainable Energy Reviews*, 143, 110919. <https://doi.org/10.1016/j.rser.2021.110919>
 97. Hall, D., & Lutsey, N. (2017). *Emerging best practices for electric vehicle charging infrastructure*. The International Council on Clean Transportation (ICCT): Washington, DC, USA, 54.
 98. Hall, D., Moutak, M., & Lutsey, N. P. (2017). *Electric vehicle capitals of the world: Demonstrating the path to electric drive*. <https://doi.org/10.13140/RG.2.2.20126.33603>
 99. Hannon, E., McKerracher, C., Orlandi, I., & Ramkumar, S. (2016). *An integrated perspective on the future of mobility*. McKinsey Report October <http://www.mckinsey.com/business-functions/sustainability-and-resourceproductivity/our-insights/an-integrated-perspective-on-the-future-of-mobility>.
 100. Heikkilä, S. (2014). *Mobility as a service-a proposal for action for the public administration, case helsinki* (Master's thesis).
 101. Hensher, D. A. (2017). Future bus transport contracts under a mobility as a service (Maas) regime in the digital age: Are they likely to change? *Transportation Research Part A: Policy and Practice*, 98, 86-96. <https://doi.org/10.1016/j.tra.2017.02.006>
 102. Hickman, R., Hall, P., & Banister, D. (2013). Planning more for sustainable mobility. *Journal of Transport Geography*, 33, 210-219.
 103. Hietanen, S., & Sahala, S. (2014). *Mobility as a Service. Can it be even better than owning a car*. ITS Canada.
 104. Hirschhorn, F., Paulsson, A., Sørensen, C. H., & Veeneman, W. (2019). Public transport regimes and mobility as a service: Governance approaches in Amsterdam, Birmingham, and Helsinki. *Transportation Research Part A: Policy and Practice*, 130, 178-191. <https://doi.org/10.1016/j.tra.2019.09.016>
 105. Holden, E., Banister, D., Gössling, S., Gilpin, G., & Linnerud, K. (2020). Grand Narratives for sustainable mobility: A conceptual review. *Energy Research & Social Science*, 65, 101454. <https://doi.org/10.1016/j.erss.2020.101454>
 106. Holden, E., Gilpin, G., & Banister, D. (2019). Sustainable mobility at thirty. *Sustainability*, 11(7), 1965. <https://doi.org/10.3390/su11071965>
 107. Holmberg, P. E., Collado, M., Sarasini, S., & Williander, M. (2016). *Mobility as a Service-MaaS: Describing the framework*. On Tuesday, February 16, 2016.
 108. *Homepage / Brussels Mobility Mailles.* Quartiersapaises.brussels, <https://quartiersapaises.brussels/>. Accessed 9 Mar. 2023.
 109. Hovi, I. B., Pinchasik, D. R., Thorne, R. J., & Figenbaum, E. (2019). *User experiences from the early adopters of heavy-duty zero-emission vehicles in Norway: barriers and opportunities* (No. 4446-MoZEES).

110. *How HSL operates : Organization and decision-making.* (s. d.). HSL.Fi. Consulté 8 mars 2023, à l'adresse <https://www.hsl.fi/en/hsl/hsl-as-an-organization>
111. *How to get there—Whim App.* (s. d.). MaaS Global. Consulté 8 mars 2023, à l'adresse <https://whimapp.com/>
112. Høyer, K. G. (1999). *Sustainable mobility: the concept and its implications* (Doctoral dissertation, Institute of Environment, Technology and Society, Roskilde University Centre).
113. Huétink, F. J., Der Vooren, A. V., & Alkemade, F. (2010). Initial infrastructure development strategies for the transition to sustainable mobility. *Technological Forecasting and Social Change*, 77(8), 1270-1281. <https://doi.org/10.1016/j.techfore.2010.03.012>
114. *Iea - international energy agency.* (s. d.). IEA. Consulté 3 mars 2023, à l'adresse <https://www.iea.org>
115. IEA (2022), *Norway 2022*, IEA, Paris <https://www.iea.org/reports/norway-2022>, License: CC BY 4.0
116. Improving public transport. (s. d.). *Transport Nottingham*. Consulté 3 mars 2023, à l'adresse <https://www.transportnottingham.com/projects/faster-more-reliable-bus-journeys/>
117. Intelligent transport systems. (2023, février 2). https://transport.ec.europa.eu/transport-themes/intelligent-transport-systems_en
118. IPCC, 2022: *Climate Change 2022: Impacts, Adaptation, and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change* [H.-O. Pörtner, D.C. Roberts, M. Tignor, E.S. Poloczanska, K. Mintenbeck, A. Alegría, M. Craig, S. Langsdorf, S. Löschke, V. Möller, A. Okem, B. Rama (eds.)]. Cambridge University Press. Cambridge University Press, Cambridge, UK and New York, NY, USA, 3056 pp., doi:10.1017/9781009325844.
119. Ison, S., & Burchell, J. (2012). *Business Attitudes Toward Workplace Parking Levy: Case Study of Nottingham, United Kingdom* (No. 12-2129).
120. *Jette : Une large majorité de la population est contre le Plan de circulation Lecharlier.* (s. d.). RTBF. Consulté 3 mars 2023, à l'adresse <https://www.rtb.be/article/jette-une-large-majorite-de-la-population-est-contre-le-plan-de-circulation-lecharlier-11149064>
121. Jiménez, P., María-Dolores, D., & Beltrán, S. (2020). An integrative and sustainable workplace mobility plan : The case study of navantia-cartagena(Spain). *Sustainability*, 12(24), 10301. <https://doi.org/10.3390/su122410301>
122. Jittrapirom, P., Marchau, V., Van Der Heijden, R., & Meurs, H. (2018). Dynamic adaptive policymaking for implementing Mobility-as-a Service (Maas). *Research in Transportation Business & Management*, 27, 46-55. <https://doi.org/10.1016/j.rtbm.2018.07.001>
123. Jones, P. (1987) Mobility and the Individual in Western Industrial Society. I: Nijkamp & Reichman (eds.) *Transportation Planning in a Changing World*. London: Gower Publ.
124. Karlsson, I. C. M., Mukhtar-Landgren, D., Smith, G., Koglin, T., Kronsell, A., Lund, E., Sarasini, S., & Sochor, J. (2020). Development and implementation of Mobility-as-a-Service – A qualitative study of barriers and enabling factors. *Transportation Research Part A: Policy and Practice*, 131, 283-295. <https://doi.org/10.1016/j.tra.2019.09.028>
125. *Key figures & worldwide presence | JCDecaux.* (2021, novembre 17). <https://www.jcdecaux.com/group/key-figures-worldwide-presence>
126. Kent, J., Dowling, R., & Maalsen, S. (2017). Catalysts for transport transitions : Bridging the gap between disruptions and change. *Journal of Transport Geography*, 60, 200-207. <https://doi.org/10.1016/j.jtrangeo.2017.03.013>

127. Kester, J., Noel, L., Zarazua De Rubens, G., & Sovacool, B. K. (2018). Policy mechanisms to accelerate electric vehicle adoption : A qualitative review from the Nordic region. *Renewable and Sustainable Energy Reviews*, 94, 719-731. <https://doi.org/10.1016/j.rser.2018.05.067>
128. Kirschner, F., & Lanzendorf, M. (2020). Parking management for promoting sustainable transport in urban neighbourhoods. A review of existing policies and challenges from a German perspective. *Transport Reviews*, 40(1), 54-75. <https://doi.org/10.1080/01441647.2019.1666929>
129. Koglin, T. (2017). *Drivers and Barriers for Integrated Mobility Services*.(2017:3 ed.) K2 - Nationellt kunskapscentrum för kollektivtrafik.
130. König, D., Eckhardt, J., Aapaoja, A., Sochor, J. & Karlsson, M. (2016). Deliverable 3: *Business and operator models for MaaS*. MAASiFiE project funded by CEDR.
131. Laurischkat, K., Viertelhausen, A., & Jandt, D. (2016). Business models for electric mobility. *Procedia CIRP*, 47, 483-488. <https://doi.org/10.1016/j.procir.2016.03.042>
132. Leonardi, J., Browne, M., Allen, J., Bohne, S., & Ruesch, M. (2014). Best practice factory for freight transport in europe : Demonstrating how 'good' urban freight cases are improving business profit and public sectors benefits. *Procedia - Social and Behavioral Sciences*, 125, 84-98. <https://doi.org/10.1016/j.sbspro.2014.01.1458>
133. Letnik, T., Marksel, M., Luppino, G., Bardi, A., & Božičnik, S. (2018). Review of policies and measures for sustainable and energy efficient urban transport. *Energy*, 163, 245-257. <https://doi.org/10.1016/j.energy.2018.08.096>
134. Li, Y., & Voegelé, T. (2017). Mobility as a service (MaaS) : Challenges of implementation and policy required. *Journal of Transportation Technologies*, 07(02), 95-106. <https://doi.org/10.4236/jtts.2017.72007>
135. Lindau, L. A., Hidalgo, D., & De Almeida Lobo, A. (2014). Barriers to planning and implementing Bus Rapid Transit systems. *Research in Transportation Economics*, 48, 9-15. <https://doi.org/10.1016/j.retrec.2014.09.026>
136. *LIVRE vert relatif à l'impact des transports sur l'environnement: Une strategie communautaire pour un developpement des transports respectueux de l'environnement : COM (92) 46 final*. (1992). Office des Publications Officielles des Communautés Européennes.
137. Loorbach, D., Schwanen, T., Doody, B. J., Arnfalt, P., Langeland, O., & Farstad, E. (2021). Transition governance for just, sustainable urban mobility : An experimental approach from Rotterdam, the Netherlands. *Journal of Urban Mobility*, 1, 100009. <https://doi.org/10.1016/j.urbmob.2021.100009>
138. Lorentzen, E., Haugneland, P., Bu, C., & Hauge, E. (2017). *Charging infrastructure experiences in Norway-the worlds most advanced EV market*. In EVS30 Symposium (pp. 9-11).
139. Lower, A., & Szumilas, A. (2021). Parking policy as a tool of sustainable mobility-parking standards in poland vs. European experiences. *Sustainability*, 13(20), 11330. <https://doi.org/10.3390/su132011330>
140. Lund, E., JOHAN KERTTU, & Koglin, T. (2017). *Drivers and barriers for integrated mobility services*. <https://doi.org/10.13140/RG.2.2.14619.26403>
141. Macioszek, E., Świerk, P., & Kurek, A. (2020). The bike-sharing system as an element of enhancing sustainable mobility—A case study based on a city in poland. *Sustainability*, 12(8), 3285. <https://doi.org/10.3390/su12083285>
142. Marciali, M., & Cossu, P. (2014). How the urbelog project will enable a new governance model for city logistics in italian metropolitan areas. *Procedia - Social and Behavioral Sciences*, 151, 230-243. <https://doi.org/10.1016/j.sbspro.2014.10.022>

143. Marciani, M., Cossu, P., & Pompetti, P. (2016). How to increase stakeholders' involvement while developing new governance model for urban logistic: Turin best practice. *Transportation Research Procedia*, 16, 343-354. <https://doi.org/10.1016/j.trpro.2016.11.033>
144. Marcucci, E., Gatta, V., Marciani, M., & Cossu, P. (2017). Measuring the effects of an urban freight policy package defined via a collaborative governance model. *Research in Transportation Economics*, 65, 3-9. <https://doi.org/10.1016/j.retrec.2017.09.001>
145. Margolis, R. M., & Kammen, D. M. (1999). Underinvestment: The energy technology and r&d policy challenge. *Science*, 285(5428), 690-692. <https://doi.org/10.1126/science.285.5428.690>
146. Marqués, R., & Hernández-Herrador, V. (2017). On the effect of networks of cycle-tracks on the risk of cycling. The case of Seville. *Accident Analysis & Prevention*, 102, 181-190. <https://doi.org/10.1016/j.aap.2017.03.004>
147. Marqués, R., Hernández-Herrador, V., & Calvo-Salazar, M. (2014). *Sevilla: A successful experience of bicycle promotion in a Mediterranean context*. 769-781. <https://doi.org/10.2495/SC140651>
148. Marqués, R., Hernández-Herrador, V., Calvo-Salazar, M., & García-Cebrián, J. A. (2015). How infrastructure can promote cycling in cities: Lessons from Seville. *Research in Transportation Economics*, 53, 31-44. <https://doi.org/10.1016/j.retrec.2015.10.017>
149. Marqués, R., (2011). Sevilla: Una experiencia exitosa de promoción de la movilidad en bicicleta en el Sur de Europa. *Hábitat y Sociedad*, 3, 107-130. <https://doi.org/10.12795/HabitatySociedad.2011.i3.07>
150. Marsden, G., & Groer, S. (2016). Do institutional structures matter? A comparative analysis of urban carbon management policies in the UK and Germany. *Journal of transport geography*, 51, 170-179.
151. Masoumi, H. E. (2019). A discrete choice analysis of transport mode choice causality and perceived barriers of sustainable mobility in the MENA region. *Transport Policy*, 79, 37-53. <https://doi.org/10.1016/j.tranpol.2019.04.005>
152. Matusiewicz, M. (2019). Towards sustainable urban logistics : Creating sustainable urban freight transport on the example of a limited accessibility zone in gdansk. *Sustainability*, 11(14), 3879. <https://doi.org/10.3390/su11143879>
153. May, A. D., Kelly, C., & Shepherd, S. (2006). The principles of integration in urban transport strategies. *Transport Policy*, 13(4), 319-327. <https://doi.org/10.1016/j.tranpol.2005.12.005>
154. May, A. D., Matthews, B., & Jarvi-Nykanen, T. (2001). *Decision making requirements for the formulation of sustainable urban land use-transport strategies*. In Selected Proceedings of the 9th World Conference on Transport ResearchWorld Conference on Transport Research Society.
155. May, A. D., Page, M., & Hull, A. (2008). Developing a set of decision-support tools for sustainable urban transport in the UK. *Transport Policy*, 15(6), 328-340.
156. Miralles-Guasch, C., & Domene, E. (2010). Sustainable transport challenges in a suburban university: The case of the Autonomous University of Barcelona. *Transport Policy*, 17(6), 454-463. <https://doi.org/10.1016/j.tranpol.2010.04.012>
157. Mladenović, M. N., & Haavisto, N. (2021). Interpretative flexibility and conflicts in the emergence of Mobility as a Service : Finnish public sector actor perspectives. *Case Studies on Transport Policy*, 9(2), 851-859. <https://doi.org/10.1016/j.cstp.2021.04.005>
158. Mobilité, B. (2020). Good Move': Plan régional de mobilité 2020-2030-Plan stratégique et opérationnel.

159. *Mobility solutions / civitas*. (s.d.). Consulté 3 mars 2023, à l'adresse https://civitas.eu/mobility-solutions?search_api_fulltext=
160. Mozos-Blanco, M. Á., Pozo-Menéndez, E., Arce-Ruiz, R., & Baucells-Aletà, N. (2018). The way to sustainable mobility. A comparative analysis of sustainable mobility plans in Spain. *Transport Policy*, 72, 45-54. <https://doi.org/10.1016/j.tranpol.2018.07.001>
161. Musolino, G. (2022). Sustainable mobility as a service: Demand analysis and case studies. *Information*, 13(8), 376. <https://doi.org/10.3390/info13080376>
162. Newbery, D., & Strbac, G. (2016). What is needed for battery electric vehicles to become socially cost competitive? *Economics of Transportation*, 5, 1-11. <https://doi.org/10.1016/j.ecotra.2015.09.002>
163. Nicholas, M., & Hall, D. (2018, July). Lessons learned on early electric vehicle fast-charging deployments. *ICCT*.
164. Nijkamp, P., & Reichman, S. (Éds.). (1987). *Transportation planning in a changing world*. Gower in association with the European Science Foundation.
165. Noel, L., Zarazua De Rubens, G., Kester, J., & Sovacool, B. K. (2020). Understanding the socio-technical nexus of Nordic electric vehicle (Ev) barriers: A qualitative discussion of range, price, charging and knowledge. *Energy Policy*, 138, 111292. <https://doi.org/10.1016/j.enpol.2020.111292>
166. Nordtømme, M. E., Bjerkan, K. Y., & Sund, A. B. (2015). Barriers to urban freight policy implementation: The case of urban consolidation center in Oslo. *Transport Policy*, 44, 179-186. <https://doi.org/10.1016/j.tranpol.2015.08.005>
167. Norman, T. (2012). Related security systems. In *Electronic Access Control* (p. 303-323). Elsevier. <https://doi.org/10.1016/B978-0-12-382028-0.00021-1>
168. Novelog. (s.d.). *POLIS Network*. Consulté 9 mars 2023, à l'adresse <https://www.polisnetwork.eu/project/novelog/>
169. Okraszewska, R., Nosal, K., & Sierpiński, G. (2014). The role of the Polish universities in shaping a new mobility culture-assumptions, conditions, experience. Case study of Gdansk University of Technology, Cracow University of Technology and Silesian University of Technology. In *ICERI2014 Proceedings* (pp. 2971-2979). IATED.
170. Olsson, L., & Fallde, M. (2015). Waste(D) potential: A socio-technical analysis of biogas production and use in Sweden. *Journal of Cleaner Production*, 98, 107-115. <https://doi.org/10.1016/j.jclepro.2014.02.015>
171. *Oslo: Electric vehicle capital of the world (Norway) | Eltis*. (s.d.). Consulté 9 janvier 2023, à l'adresse <https://www.eltis.org/discover/case-studies/oslo-electric-vehicle-capital-world-norway>
172. Paddeu, D., Parkhurst, G., Fancello, G., Fadda, P., & Ricci, M. (2018). Multi-stakeholder collaboration in urban freight consolidation schemes: Drivers and barriers to implementation. *Transport*, 33(4), 913-929.
173. Papanikolaou, A., Basbas, S., Mintsis, G., & Taxiltaris, C. (2017). A methodological framework for assessing the success of Demand Responsive Transport (DRT) services. *Transportation Research Procedia*, 24, 393-400.
174. Parkimeter. (s.d.). Turin's ZTL: Map, electronic accesses and permits (Updated 2021). *Parkimeter*. Consulté 10 mars 2023, à l'adresse <https://parkimeter.com/en/blog/torino-ztl-zona-a-traffic-limited-italy-center-story-map>
175. Perboli, G., & Rosano, M. (2018). A decision support system for optimizing the last-mile by mixing traditional and green logistics. In C. Temponi & N. Vandaele (Éds.), *Information*

- Systems, Logistics, and Supply Chain* (Vol. 262, p. 28-46). Springer International Publishing. https://doi.org/10.1007/978-3-319-73758-4_3
176. Perboli, G., & Rosano, M. (2019). Parcel delivery in urban areas : Opportunities and threats for the mix of traditional and green business models. *Transportation Research Part C: Emerging Technologies*, 99, 19-36. <https://doi.org/10.1016/j.trc.2019.01.006>
 177. Perboli, G., Rosano, M., Saint-Guillain, M., & Rizzo, P. (2018). Simulation–optimisation framework for City Logistics : An application on multimodal last-mile delivery. *IET Intelligent Transport Systems*, 12(4), 262-269. <https://doi.org/10.1049/iet-its.2017.0357>
 178. Pirra, M., & Diana, M. (2019). Integrating mobility data sources to define and quantify a vehicle-level congestion indicator : An application for the city of Turin. *European Transport Research Review*, 11(1), 41. <https://doi.org/10.1186/s12544-019-0378-0>
 179. *Plan andaluz de la bicicleta*. (s.d.). Consulté 3 mars 2023, à l'adresse <http://www.aopandalucia.es/planandaluzdelabicicleta/>
 180. PricewaterhouseCoopers. (s.d.). *Sustainable mobility ecosystems in smart cities*. PwC. Consulté 3 mars 2023, à l'adresse <https://www.pwc.com/gx/en/issues/reinventing-the-future/smart-mobility-hub/sustainable-mobility-ecosystems-in-smart-cities.html>
 181. Regulation (Eu) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and repealing Directive 95/46/EC (General data protection regulation) (Text with EEA relevance), 119 OJ L (2016). <http://data.europa.eu/eli/reg/2016/679/oj/eng>
 182. Rantasala, K. (2015, November). The impact of Mobility as a Service concept to land use in Finnish context. In 2015 International Conference on Sustainable Mobility Applications, *Renewables and Technology (SMART)* (pp. 1-7). IEEE.
 183. *Resources – lead project*. (s.d.). Consulté 3 mars 2023, à l'adresse <https://www.leadproject.eu/resources/>
 184. *Review and evaluation of the latest CIVITAS achievements / CIVITAS*. (2022, octobre 7). <https://civitas.eu/resources/review-and-evaluation-of-the-latest-civitas-achievements>
 185. Review of the EU Sustainable Development Strategy (EU SDS)—Renewed Strategy; 10917/06; Council of European Union: Brussels, Belgium, 2006.
 186. Reviewing the funding and finance options available to city and combined authorities. (s.d.). *Centre for Cities*. Consulté 3 mars 2023, à l'adresse <https://www.centreforcities.org/reader/funding-financing-inclusive-growth-cities/reviewing-funding-finance-options-available-city-combined-authorities/>
 187. Richter, M. A., Hess, J., Baur, C., & Stern, R. (2021). Exploring the financial implications of operating a shared autonomous electric vehicle fleet in zurich. *Journal of Urban Mobility*, 1, 100001. <https://doi.org/10.1016/j.urbmob.2021.100001>
 188. Rosano, M., Demartini, C. G., Lamberti, F., & Perboli, G. (2018). A mobile platform for collaborative urban freight transportation. *Transportation Research Procedia*, 30, 14-22. <https://doi.org/10.1016/j.trpro.2018.09.003>
 189. Rubini, L., & Lucia, L. D. (2018). Governance and the stakeholders' engagement in city logistics : The SULPiTER methodology and the Bologna application. *Transportation Research Procedia*, 30, 255-264. <https://doi.org/10.1016/j.trpro.2018.09.028>
 190. Schmidt, K., Sieverding, T., Wallis, H., & Matthies, E. (2021). COVID-19 – A window of opportunity for the transition toward sustainable mobility? *Transportation Research Interdisciplinary Perspectives*, 10, 100374. <https://doi.org/10.1016/j.trip.2021.100374>

191. Schwanen, T. (2018). Thinking complex interconnections : Transition, nexus and Geography. *Transactions of the Institute of British Geographers*, 43(2), 262-283. <https://doi.org/10.1111/tran.12223>
192. Scubelek, J. R. (2008). *Dutch urban policies that promote pedestrian and bicycle mobility: case studies of Rotterdam, Groningen, and Delft* (Doctoral dissertation, Dissertação de mestrado. Rotterdam, Países Baixos, Institute for Housing and Urban Development Studies, Erasmus Universiteit Rotterdam).
193. Sen, S., & Ganguly, S. (2017). Opportunities, barriers and issues with renewable energy development – A discussion. *Renewable and Sustainable Energy Reviews*, 69, 1170-1181. <https://doi.org/10.1016/j.rser.2016.09.137>
194. Serafini, S., Nigro, M., Gatta, V., & Marcucci, E. (2018). Sustainable crowdshipping using public transport : A case study evaluation in Rome. *Transportation Research Procedia*, 30, 101-110. <https://doi.org/10.1016/j.trpro.2018.09.012>
195. Serrano-López, R., Linares-Unamunzaga, A., & Muñoz San Emeterio, C. (2019). Urban sustainable mobility and planning policies. A Spanish mid-sized city case. *Cities*, 95, 102356. <https://doi.org/10.1016/j.cities.2019.05.025>
196. Shao, J., Taisch, M., & Ortega-Mier, M. (2016). A grey-DEcision-MAking Trial and Evaluation Laboratory (Dematel) analysis on the barriers between environmentally friendly products and consumers : Practitioners' viewpoints on the European automobile industry. *Journal of Cleaner Production*, 112, 3185-3194. <https://doi.org/10.1016/j.jclepro.2015.10.113>
197. Sheth, M., Butrina, P., Goodchild, A., & McCormack, E. (2019). Measuring delivery route cost trade-offs between electric-assist cargo bicycles and delivery trucks in dense urban areas. *European Transport Research Review*, 11(1), 11. <https://doi.org/10.1186/s12544-019-0349-5>
198. Sierzechula, W., Bakker, S., Maat, K., & Van Wee, B. (2014). The influence of financial incentives and other socio-economic factors on electric vehicle adoption. *Energy Policy*, 68, 183-194. <https://doi.org/10.1016/j.enpol.2014.01.043>
199. Smith, G., Sochor, J., & Sarasini, S. (2018). Mobility as a service : Comparing developments in sweden and finland. *Research in Transportation Business & Management*, 27, 36-45. <https://doi.org/10.1016/j.rtbm.2018.09.004>
200. Solez. (s.d.). Interreg CENTRAL EUROPE. Consulté 9 mars 2023, à l'adresse <http://programme2014-20.interreg-central.eu/Content.Node/SOLEZ.html>
201. Spadaro, I., & Pirlone, F. (2021). Sustainable urban mobility plan and health security. *Sustainability*, 13(8), 4403. <https://doi.org/10.3390/su13084403>
202. *Stackpath*. (s.d.). Consulté 3 mars 2023, à l'adresse <https://use.metropolis.org/case-studies/cycle-lane-network-seville#casestudydetail>
203. Stopka, U., Pessier, R., & Günther, C. (2018). Mobility as a service (Maas) based on intermodal electronic platforms in public transport. In M. Kurosu (Éd.), *Human-Computer Interaction. Interaction in Context* (Vol. 10902, p. 419-439). Springer International Publishing. https://doi.org/10.1007/978-3-319-91244-8_34
204. *Strategic plan sevilla 2010 | pdf | sustainable city | seville*. (s.d.). Scribd. Consulté 3 mars 2023, à l'adresse <https://www.scribd.com/document/59586406/Strategic-Plan-Sevilla-2010>
205. *Sump good practice fact sheets*. (2020). CIVITAS. <https://www.eltis.org/resources/tools/sump-good-practice-fact-sheets>
206. *Sumps*. (s.d.). *SUMP Central*. Consulté 3 mars 2023, à l'adresse <https://sump-central.eu/sumps/>

207. Surakka, T., Härrä, F., Haahtela, T., Horila, A., & Michl, T. (2018). Regulation and governance supporting systemic MaaS innovations. *Research in Transportation Business & Management*, 27, 56-66. <https://doi.org/10.1016/j.rtbm.2018.12.001>
208. Taefi, T. T., Kreutzfeldt, J., Held, T., Konings, R., Kotter, R., Lilley, S., Baster, H., Green, N., Laugesen, M. S., Jacobsson, S., Borgqvist, M., & Nyquist, C. (2016). Comparative analysis of european examples of freight electric vehicles schemes—A systematic case study approach with examples from denmark, germany, the netherlands, sweden and the uk. In H. Kotzab, J. Pannek, & K.-D. Thoben (Éds.), *Dynamics in Logistics* (p. 495-504). Springer International Publishing. https://doi.org/10.1007/978-3-319-23512-7_48
209. Tan, K. M., Ramachandaramurthy, V. K., & Yong, J. Y. (2016). Integration of electric vehicles in smart grid : A review on vehicle to grid technologies and optimization techniques. *Renewable and Sustainable Energy Reviews*, 53, 720-732. <https://doi.org/10.1016/j.rser.2015.09.012>
210. Ten years on : Nottingham's Workplace Parking Levy keeps the city moving ahead. (s. d.). *Transport Nottingham*. Consulté 3 mars 2023, à l'adresse <https://www.transportnottingham.com/policies/nottinghams-workplace-parking-levy-10-year-impact-report/>
211. Tietge, U., Mock, P., Lutsey, N., & Campestrini, A. (2016). Comparison of leading electric vehicle policy and deployment in Europe. *Int. Council Clean Transp*, 49, 847129-102.
212. *The workplace parking levy: Nottingham pioneers the way ahead*. (1612796880). <https://www.transportextra.com/publications/parking-review/news/68005/the-workplace-parking-levy-nottingham-pioneers-the-way-ahead/>
213. Theme and topics. (s. d.). *Itseuropeancongress.Com*. Consulté 3 mars 2023, à l'adresse <https://itseuropeancongress.com/theme-and-topics/>
214. Total market car sales by country. (s. d.). *Carsalesbase.Com*. Consulté 3 mars 2023, à l'adresse <https://carsalesbase.com/total-market-sales-country/europe-car-sales-data/>
215. Trafikanalys (2016) *Nya tjänster för delad mobilitet*. Rapport 2016:15. Trafikanalys, Stockholm.
216. *Trimis search hub / trimis*. (2018, avril 1). <http://trimis.ec.europa.eu/search>
217. University of Žilina Faculty of Operation and Economics of Transport and Communications Department of Railway Transport Slovak Republic, Dedík, M., Gašparík, J., Záhumenská, Z., Lupták, V., & Hřebíček, Z. (2018). Proposal of the measures to increase the competitiveness of rail freight transport in the eu. *Naše more*, 65(4), 202-207. <https://doi.org/10.17818/NM/2018/4SI.7>
218. Vallaure, S. (2022, mai 4). Sevici : Seville's municipal bike rental. Seville Traveller. <https://www.seville-traveller.com/sevici/>
219. Vassileva, I., & Campillo, J. (2017). Adoption barriers for electric vehicles : Experiences from early adopters in Sweden. *Energy*, 120, 632-641. <https://doi.org/10.1016/j.energy.2016.11.119>
220. Verbruggen, A., Fishedick, M., Moomaw, W., Weir, T., Nadaï, A., Nilsson, L. J., Nyboer, J., & Sathaye, J. (2010). Renewable energy costs, potentials, barriers : Conceptual issues. *Energy Policy*, 38(2), 850-861. <https://doi.org/10.1016/j.enpol.2009.10.036>
221. Walker, P. (2015). How Seville transformed itself into the cycling capital of southern Europe. *The Guardian*, 28.
222. Walzer, M. (1990). The communitarian critique of liberalism. *Political Theory*, 18(1), 6-23. <https://doi.org/10.1177/0090591790018001002>

223. Weber, M., Schot, J., Hoogma, R., & Lane, B. (1999). *Experimenting with sustainable transport innovations: a workbook for strategic niche management*.
224. Weinreich, M., & Riihelä, A. (2019). Insights from the world's first Mobility-as-a-Service (Maas) system. *Proceedings from the Annual Transport Conference at Aalborg University*, Vol. 26 No. 1 (2019): Proceedings from the Annual Transport Conference at Aalborg University. <https://doi.org/10.5278/OJS.TD.V26I1.5022>
225. Weisbrod, K. (2021, février 11). Inside clean energy : How norway shot to no. 1 in evs. *Inside Climate News*. <https://insideclimatenews.org/news/11022021/inside-clean-energy-norway-electric-vehicles/>
226. Wefering, F., Rupprecht, S., Bührmann, S., & Böhler-Baedeker, S. (2013, March). *Guidelines. Developing and implementing a sustainable urban mobility plan*. In Workshop (p. 117).
227. *Welcome to oslo—Evs35oslo*. (2022, janvier 18). <https://evs35oslo.org/welcome-to-oslo/>
228. *What is an application programming interface (Api) | IBM*. (s. d.). Consulté 8 mars 2023, à l'adresse <https://www.ibm.com/topics/api>
229. Whimimpact—Insights from the world's first Mobility as a Service solution. (s. d.). *Ramboll UK Limited*. Consulté 8 mars 2023, à l'adresse <https://uk.ramboll.com/news/ruk/whimimpact-study>
230. Whitelegg, J. (1986). Rural transport and planning A bibliography with abstracts. *Land Use Policy*, 3(2), 154-155. [https://doi.org/10.1016/0264-8377\(86\)90055-4](https://doi.org/10.1016/0264-8377(86)90055-4)
231. Wolbertus, R., Kroesen, M., Van Den Hoed, R., & Chorus, C. G. (2018). Policy effects on charging behaviour of electric vehicle owners and on purchase intentions of prospective owners : Natural and stated choice experiments. *Transportation Research Part D: Transport and Environment*, 62, 283-297. <https://doi.org/10.1016/j.trd.2018.03.012>
232. Wołek, M. (2018). Sustainable mobility planning in Poland. *Transport Economics and Logistics*, 76, 13-22. <https://doi.org/10.26881/etil.2018.76.01>
233. *Workplace parking levy | london city hall*. (2015, juillet 18). <https://www.london.gov.uk/who-we-are/what-london-assembly-does/questions-mayor/find-an-answer/workplace-parking-levy-1>
234. World Commission on Environment and Development (Éd.). (1987). *Our common future*. Oxford University Press.
235. Zawieska, J., & Pieriegud, J. (2018). Smart city as a tool for sustainable mobility and transport decarbonisation. *Transport Policy*, 63, 39-50. <https://doi.org/10.1016/j.tranpol.2017.11.004>
236. (2022). Our awards and achievements; *Nottingham City Transport*. <https://www.nctx.co.uk/our-awards-and-achievements>

Appendix

1. Interview Guides

The questions in our interview guide are directly related to our framework and the results of our case analyses. This one first retraces the path of our experts in order to be able to rebound on their experiences. Then, as we went through the interviews, we identified what we thought was relevant and related to the experiences of each person, mixing broad and specific questions. Ms. Dagmara Wrzesińska allowed us to have a first general approach of the environment as she has worked in several companies in this sector, allowing us to establish similarities and to have her point of view on the general environment. Ms. Laura Babío Somoza works at Polis network, so we focused our discussions on the institutional and legislative aspects as well as on the different collaborations with the concerned entities. Finally, Mr. Mario Cools brought us an analytical point of view due to his background, which gradually turned our discussion towards data management and project monitoring. Thanks to these interviews, we seem to have collected various points of view coming from different sectors, thus allowing a large but nevertheless relevant collection of information.

1.1. Interview of Dagmara Wrzesińska

Introduction

- Personal presentation
- Presentation of the thesis
- Presentation of the interviewee, field of study, seniority, etc.
- Motivations for doing this job?
- Why change jobs so much? Is it common?

VIAS Institute. Developing evidence-based policy recommendations for state and federal authorities

- How do you make recommendations? What are the steps to provide a recommendation? To whom?
- Do you provide specific or broad recommendation?
- What type of data do you use and how do you collect it? Enough data to make recommendations?
- Who do you collaborate with? Is it easy?
- Do you feel like your recommendations are being followed?
- Why did you leave?

TIER Mobility

- What was your role?
- Did you collaborate with other micro-mobility companies? Lime dott?
- What are the main challenges of the industry? Competitiveness?
- Have you seen an increase in usage of mobility services such as TIER? To what extent?

- What have you put in place to promote the use of TIER? Has it worked? What more would you do?
- What is the next step for the company? Develop a new service?

POLIS Network

- What was your role? On which projects did you work?
- To what extent the collaboration with the EU impact your job?

Traffi

- What was your role? On which projects did you work?
- What is the status of the MaaS implementation? How is the collaboration with the federal government? What is the advantage of being a private company in this?
- How do you collect the data?
- What services will you offer?
- What are the motivations? Are you watching the examples from other cities?

General questions

- Do you feel an improvement of sustainable mobility in Brussels?
- How does collaboration with stakeholders work? Between public and private?
- Do you have an expert group that collects data and provides studies?
- Do you think you have enough resources to create all these projects? Funding? Human resources? Technology? Do you receive outside help?
- What actions should be a priority for you?
- What do you think about the creation of a working group, including representatives of all stakeholders and addressing the interests of each?
- How do you evaluate projects? How often? Do you think this is sufficient?
- What do you think about good move? Is it realistic? Well described? Will the timeline be respected ?
- Do you think the upcoming political elections could have an impact on the implementation of the good move plan?
- What do you think of the public protests in some municipalities? What could be the origin of this? How can this be avoided in the future?
- Do you think that the plan can be effective if it is only implemented in certain parts of the city at first? What about harmonization?
- Do you think there is enough money allocated to the communication of these measures? Do you think that enough information is provided to the public so that they really understand the impact and importance of this change in mobility behavior?
- Do you think that politicians are playing their part in implementation? Is there sufficient support?
- To what extent has covid-19 had an impact on the action plan?
- Do you think that the current legislative framework is an obstacle to the successful development of the plan ?

2.2. Interview of Laura Babío Somoza

Introduction

- Personal presentation
- Presentation of the thesis
- Presentation of the interviewee, field of study, seniority, etc.
- Could you tell me about your background and actual job ?

Barcelona

- Tell me about your time in Barcelona. What did you do ?
- What were the main actors ? How was the collaboration?
- Did you receive external funding?
- What were the main challenges of the project?

DG Move Trainee

- What was your trainee at DG Move about? What were the steps ?
- Do you feel that there were lacks in some parts of your training?

Polis Network

- What are you doing at Polis?
- What is the process to choose a project/city?
- What are the decision factors? What about Start-ups?
- How works the collaboration with local authorities?
- What kind of expertise do you provide?
- Do they follow your recommendations?

General Questions

- What are the most complicated areas? Where there is the most conflict?
- What are your projects in Brussels?
- Is there a common challenge between your projects?
- At which frequency do you hold meetings with stakeholders?
- What is the most difficult challenge to overcome?
- How is established the public-private relationship?
- Is there some action to promote education and awareness to change behavior towards mobility?
- What about the post-implementation monitoring?

3.3. Interview of Mario Cools

Introduction

- Personal presentation
- Presentation of the thesis
- Presentation of the interviewee, field of study, seniority, etc.
- Could you tell me about your background and actual job ?

Market and innovations

- To what extent does sustainable mobility depend on new technologies?
- Do you think that deadlines will be reached?
- Do you think that there is enough space for innovation in this sector?
- What is the role of start-ups in this sector ?
- What would be a solution to lower entry barriers?

Collaboration and socio-cultural

- How could we improve the collaboration between stakeholders?
- How improve internal as well as external communication?
- What could be possible actions to promote this change of behavior?
- To what extent is the cultural factor playing?

General questions

- What about politics? Do you feel that there is enough actions and considerations ?
- To what extent the current legislative framework is effective towards micro-mobility?
- Have you any ideas about other/alternative sources of funding?
- Is there an effective framework to monitor projects?
- What do you think about our current data tools and measurements?

2. Interviews

Interview 1 : Dagmara Wrzesińska, MaaS & Urban Mobility Specialist at Traffi

Q: Quentin Georges (Author) / D:Dagmara Wrzesińska

Q: So, hello . Thank you. Um, I'll try to be quick because I think you have a lot of work, of course.

D: Don't worry about it.

Q: Yeah. Uh, first I'll introduce myself and I tell you why I need you. So, my name is Quentin. I'm 23 and I'm a final year student at the LSM and so I'm doing my thesis on, the recurrent barriers, which are present when you try to implement, mobility plan in Europe, in different cities in Europe. Um, so I will explain a bit about what I've done so far. Um, so I tried to establish a list of all recurrence barriers that you can find, any kind of projects, any kind of cities in Europe, and make a theory about this. Like, just make a list, you know, just basic concepts and what you can find. And so, to do that, I based myself on all I can find on the internet. So, scientific reports, official reports or article press or anything. I did that and then I did some case studies on different cities, on different projects that have already been implemented and are effective. So, for example, the MaaS in Helsinki or the implementation of the good development of electric vehicles in Oslo, for example. Then I confronted the theory with practice and see. Okay, so in survey we are supposed to face this kind of barrier. Did I face that? You know, so that was the first one. And then I could identify some barriers that are more recurrent than others independently of the projects or the cities. And the next step was to analyze our current implementation and to do that, I based myself on the City of Brussels and more precisely the mobility plan, Good Move, which is currently in implementation. And so, I needed you to first tell me about your experience. Tell me about what you live, what you faced, to have more information about and make my recommendations stronger, you know, with your advice and everything.

D: So, sure. Very good I like it.

Q: So first of all, just tell me a bit about you. What's your background and what are you doing now?

D: So, my initial background, so my minor is in business logistics, and after that I decided to move from logistics towards transport. But I was still thinking about the freight transportation, but I decided to do my master in Denmark. And since it was Denmark, I was very much, kind of push to focus on cycling, at the time, which was cool actually. I liked it very much. So, then I was focusing very much on the behavior change and the theories of how you implement different type of attitudes among commuters and stuff like that, different circumstances, how we can play around it. Then I moved to Belgium to do my PhD and that was about freight again, it was about the road cabotage. It's absolutely irrelevant. And like, just forget it. Um, but since I didn't like academia very much, I moved to the private sector and I started to work for VIAS, so the former National Road Safety Institute. And then I was advising the federal on the mobility policy in terms of road safety, micro mobility, and let's say like soft mobility in general, like the future of mobility, we could call it like that. After that I very much like that micro mobility ecosystem. So, I moved to TIER one of the micro probability providers, but then unfortunately, very shortly after

I was laid off, and I quickly got acquired by an NGO. The police network. But that was also not exactly what I wanted to do. It was, these were European projects, so it's very, long and slow. So now I'm working for Traffi, which is a Lithuanian scale up, actually probably not the startup anymore in mobility as a service. And I'm the MaaS and Urban Mobility specialist. So, pretty much convince, explaining to cities why they need to do that.

Q: Okay, great. I'd like to just come back a bit to your background. So, your first work was at the Vias Institute. I saw on your LinkedIn page that you were building evidence-based policy recommendations to authorities and regional and federal level. Tell me more about that. What is it? How do you make that?

D: Evidence-based recommendation? Yeah. This is pretty much a cool way of saying we did research before we say something. Ok. Yeah, it's, I mean, you know, the, the way that it works for VIAS is that VIAS is each year proposing a set of topics on which we could work, like different projects that we could carry out for the government. And the government also has its own list of ideas of what they would like us to cover. Then after a round of like 10 negotiations, we come up with some kind of coherent list of what works for both sides. And then they found this project, so they paid us to do that research. Okay. And let's say project usually lasts around two to three years, depending on the scope. And after that, based on the theses that you have, you build the recommendation for like, how they should address that in the future police.

Q: And, your recommendation, is that like a specific recommendation, so you need to do that, or is it more in a large sense?

D: That very much depends on the topic. Like for example, when we talk about micro mobility and we were looking at like the statistics on the safety and stuff like that, then we were like being very precise. Like you should. Then, you should increase the age of which this is allowed from 12 to 16, you should decrease the speed by this much or increase. Actually, it was increasing the speed by this much because this is simple of gravity and stuff like that. But very often it's, let me just think about like, the transition to electric cars, for example. It's more? you tell them from which angle to tackle it like you, which argument to use like you, is it more that you should incentivize, give them some money or more that you should start like making harder to have the combustion engine cars, you know? So, it's, there is not one golden rule. Of course, if it's more specific you are better. But the question is to which extent they're actually gonna take it into account anyway.

Q: Okay, good. And so, to make this recommendation, I mean, I guess you need to collect a lot of data. And so, do you have any group of experts dedicated to, to this part or do you do it yourself?

D: No, normally you need to, you need to come up with. How you gonna make the data collection yourself. And in most cases, it works on surveys, sometimes on the panels, but the quality data, it's, I mean, the quality numbers never lie people do. So, I'm very much more convinced about the surveys than the panels. But it's usually included in the project scope in that case. So, they do pay for it. In Belgium specifically, the problem is that, because of so many administrative layers that are like overlapping and it's super counter efficient, they often don't know that they already do have something. And it happened on multiple occasion that like someone was willing to pay us for the data that they already have.

Q: Do you think that you received enough quality data or is it something that was missing?

D: Oh, that, again, that depends on the topic of course, but, and if you say that you did not get enough, the quality of data was not good enough, then you're the only one to blame. I mean, if you design the study and you know you receive the results of the survey, then it's kind of your fault because no one actually intervenes into that. But yeah, sometimes it's very difficult to get enough of like granularity, let's say maybe not quality, maybe it's not the best way to say it, because like, what do you understand by the quality? Is it like social demographic representation, you know, but in terms of granularity of the data, sometimes it's very hard to have a proper representation. There are some topics that it's very hard to find enough sample of people that would, that would allow you to have like actually like good p value for it, for example. Like, you know, you can somehow assume that, okay, maybe this is going to be translatable to the large population, but actually we cannot say that. So, that is more the problem than, if you get, I mean, it's totally up to you and there is always a way around. So sometimes you know, you also, you never do it on your own. That's also something that you should probably know. You always work with the external provider, iVOS or something like that, because they already have some sort of like, like partner of people to which they send the surveys based on their characteristic and stuff. And they also, they will tell you immediately like, oh no, this is like, forget it, you know? This is never gonna work. Yeah. So, then you know that you need to somehow find a way around it. And of course, I mean, very often this is based on assumptions and as I said that it's not fully scientific evidence, let's say, but sometimes that's the best that we can see.

Q: And who did you collaborate with? So, you said there's an external provider who helps and is the collaboration with every stakeholders easy ?

D: Oh, no. It's a pain in the **s as hell. Yeah. I mean it. Of course, again, it very much depends on the topic, who needs to sit around the table? Because for some of the projects, the only collaboration you have is the exchange on the progress with the state and receiving the data and you know, the rest you do on your own, you have some kind of peer review after, and like, pretty much it. But there are some projects, like recently it has been published about the, the e-commerce impact on mobility, so like the DHL type of stuff. And then you actually need to have like all the companies, I mean not all, but as many as possible, engaged into the discussion so that their voice is represented and taken into account. They also need to provide you an input, so they need to reach out to their own employees and, you know, ask them to fill in some kind of survey. There are many organizations that often want to say a lot about the one, you know, like the heroes 4 zeroes and stuff like that. There are many, many, many of them. And whenever you have something to say, you need to double check. Like what is it gonna be? Backlash on their side because usually there is always some kind of like, you know, attention. Yeah. And the projects that are going, like on the federal level, there is like endless s**t show. The conflict, you know, on that, Walloon Flanders region, that is just like, that's beyond indescribable. There is always an issue about the representation, like who is going, you know, like you cannot really point out certain findings because it's politically inappropriate or stuff like that. So, it's very sensitive, I would say to our large extent and more people, you sit around the table more complex it gets. Yeah, of course. So, by definition, you only want to work by yourself. That's always the best setup.

Q: I see. And do you feel there is some kind of improvement between this collaboration between Walloon and Flanders, or is it worse?

D: I mean, I, it's been more than a year since I didn't do that. Like on the period level from what I see, I think there is an improvement in a way that there is stronger external push with the 55 green deal and stuff like that, the war in Ukraine and all that. Somehow, , it kind of forced all of the entities to work together, even though it hasn't always been easy. So, it's not like, you know, it's still not like my buddy, but they kind of like, okay, like let's be pragmatic and let's do it. So, I would say maybe in that way, but I mean the most successful measures are those at local level. That's always been the case and that's always gonna be the case, so, yeah.

Q: Okay. I see. And do you think that without this external pushes, there will be this collaboration or will this always be a fight like it always been?

D: Oh, hard to tell. You know, you can only speculate. That probably depends on who's gonna be elected in the next election, and how are we gonna raise the next generation of people so that they don't like jump to each other's pros on the first occasion. But I think that the better question to ask is, uh, to which extent do we need that collaboration. I mean, how many projects are being carried out in this? Like, you know, like federally, how many projects actually applied on the federal scale in mobility specific? Cause there is very context dependent area. A good example prior would be the national Regulation on speed, for example, which is different in the process, different in Walloon parts and different in Flanders, like, you know, you have different speed limits on each cycle. They're like, who can keep up with that. Like how do you know, where are you supposed to know that you're like, at this, this stretch of the road is in Flanders and this one is in like, that makes no sense. Probably they should collaborate more. But again, like on that, there are international frameworks that whatever she comes into first and they will, they will have no choice but to do so.

Q: Once you have made this recommendation, do you feel that every recommendations that you made was well followed and applied ?

D: I think all of them. I can only speak for myself. You know, like VS. Was making like billions of recommendations. From those that I was making. I think all of them have been taken into account. Some of them are still somehow in progress because that's a very long process, you know, like from the moment you carry out the research, you have the results you make the implementation like that. The time that they discuss, they make a proposal, it takes years. So that's probably longer than one could imagine, but maybe follow, you know, follow like step by step. Not exactly, but I do feel like it has been considered to a significant extent. I mean, they pay for it, so it would be very weird if they didn't listen after.

Q: And do you think there's some kind of priority put in?

D: You mean in terms of the topic that we are tackling? Yeah. I mean if it, if it's something that comes, by them, is it a priority or do you feel some are more or less consider. I think it, this is more a matter of discussion. So, they do have, like the government usually has its own idea. The research institution has its own ideas. So, there is like, there is that round of nego, like multiple rounds of negotiations that happen and then like you kind of work out the priority because you know, very often, like some of these are not exactly the same but overlapping. So, you manage

them together, you find a scope, but not always everything is possible to deliver. Like, you know, I can come to you and ask you how we are gonna establish, next village on Mars? Like, can you put it in two years? Like, you know, not really. So, it's a lot about the expectation management on both sides. I mean, it's subject of discussion and collaboration, but it's, I mean, you know, the client has always the, the final word in every industry. So, like, the one who pays is the one who decides.

Q: Now to your time at Tier Mobility, tell me more. What did you do there?

D: So, I was the manager of research and partnership for public policy. So it was, I like, I continued to work on public policy, but from the other side, let's say. So, at VIAS, I was more involved in shaping the policy for the industry as a like imply the policy on the industry. Well, from here we were lobbying for that industry to be a little bit tinted into the direction that we wanted. So, it hasn't been a very long time. I was managing the research that we were doing, so it was also like somehow evidence-based lobbying if we can. And, yeah, I mean, it was also the time when they were merging with Next Pike and Spin. So, there was also a little bit of that, but that's not exactly interesting for your project. That's more like a business angle to it. But yeah, I could just broadly say it was public policy.

Q: And, um, in this kind of company, do you collaborate with other kind of services like LIME or DOTTS ?

D: Um, that depends because there is, that you should see it in two direction. One is the performance of the, of the entity by itself. So, TIER is competing with LIME and all the others because of course we want to take all the clients that are there and we need to share them. But on the other hand, we need to uplift the industry as a whole. So, it's been, I think like since one year-ish, it became evident that one player cannot do it by itself. So, they become more and more popular and they would start to collabo. On research projects, or policy recommendation, like making the position on certain aspects. So there, there is a big angle of collaboration, but that collaboration is not to actually benefit one another, but rather the entire industry.

Q: I see. And so, there's a lot of competitiveness between them, you think, and don't you fear that the other gets full power, taking the markets over?

D: I mean, it's still a very young industry, and so far, only LIME has been profitable this year among all of these players, and most of them will actually go bankrupt by the end of this year. So, the problem was that the way that it started to roll was that it was a jungle. You know, you could just come to any city, like put 10,000 scooters and no one cared. Like there was no legislation, no framework. And then if you start pulling like, you know, for all of them, it was the same cities that were interesting. So, the capitals, you know, like those sexy places when there's a lot of tourists and stuff like that. And then the competition became very high and unsustainable because it cost you a lot of money to maintain this type of fleet. But now the city learned that, like that's not exactly the best way to do it. They have very strong licensing process and tendering, so they only allow few providers with a fixed number of vehicles to operate and then that is way, way healthier environment for them. And that competition is not so high. But before, there have been cases of that. I don't know. I mean, okay without putting names, but you know, that one was damaging the QR codes of the others, for example, so that people cannot unlock

and stuff like that. So, I wouldn't say that that was the rule, but it did happen. But with the regulations that are now in place it's definitely making things better.

Q: Do you think that the current legislation, the framework, was a challenge, was a barrier to the development of this kind of service?

D: I would say the lack of framework. Lack of framework, okay? Yeah, because I mean, it has been an opportunity of some sort, depending on how you see it. But in the long run, it was evident that we do need the framework both for industry and from the government. Like, that was the only way that there could have been some sort of like synergy, let's say, to avoid that shit storm of like, you know, the people tipping over the scooters that are like lying all over and stuff like that. So, in this case, the framework, the legislative framework was very well welcomed.

Q: And did you see any, any increase in terms of use of this kind of service? Because I didn't see any kind of advertising campaign or anything, that's kind of new. How did you proceed?

D: So, that's marketing, not exactly my role there, but you can find features online. There are a lot of reports showing how many rides per vehicle you have and stuff like that. The best way to increase, like, to attract the new riders is the, the word of mouth actually, because what I remember, any campaign that you make, it's like not even half as efficient because there are two different KPIs that you need to keep in mind. Here you have the new riders, which is like important factor like for your business, but you also have users user retention, so you're not like, it's cool that people are coming and trying, but you want them to stay and for them, most of marketing campaigns like, you know, have a right for free and stuff like, they do it, but they never come back. So, it's like there is more to be done than just nudge them with some kind of like free trial. It's yeah, we are very complicated machines as humans, you know, to convince us to do something. So, it is a big job.

Q: And so, what are for you, the main reasons that people are not staying ?

D: User friction. I think it's by definition, I mean, of course there is, we cannot see the whole population, you know, for like three simple criteria. But if we like really to generalize, Micro mobility has a very specific target of customers. I mean, you know, your grandmother is probably not writing on those. Like it's safe to assume, so it's mine. So those people are already like, very digital. Like, you know, they, all of these payments stuff, they have it figured out and, and all that. And the way that they see it is like that, it is the easiest way, or at least easier way. Not a car, not a bus, not whatever, and this is what they want to have as a customer user experience. So, you know, when there is an issue, like, you need to like, click 17 times before you can unlock the scooter because you know all, don't write on the pavement. Wear a helmet, don't double, right? Don't drink and write, blah, blah, blah. And then, there is like an all goes on, but it hasn't been announced. But, you know, the local government, for example, decided that here you cannot park your bike. And you cannot lock it. And then you need to take seven pictures of how well you place your scooter, and it's blocking you 10 euro on your card because like there is some other different regulation and all that. Then it's like kinda pain, like, you know. So, like, if this is the first experience that they get, then they don't see that benefit that it can bring for them. Because the only thing that they're gonna remember is that they kept being bothered at all times while they could sit on the bus and read a book.

Q: And so personally, do you, do you use that? What kind of services do you use ?

D: Oh yeah, of course I have my, I have my own and I also use the shared ones, the bikes and the trotinette, it's a fantastic tool.

Q: Now that's your time at POLIS. Why did you say that was slow ? What were the reasons?

D: It's the European, you know, if you have 50 partners in the project, like the pro, the projects are by definition, they're like, they're designed to be slow. The process is very like very, very long and complicated. But there are so many people always involved and like just aligning them together. It's super painful than like more people, you have less accountability. They actually show because it's somehow, you know, like it's just like vanishes among the whole consortium. The topics are also like, and yeah, that also depends on project per project, but very often they're like, I have a feeling that a lot of these project requiring a lot of efforts from people and eventually they became technology graveyards. Like, you know, have you ever heard about super successful projects like technology that came out of Horizon funding One.

Q: Don't remember no.

D: Yeah. I'm doing it for like 17 years, you know, and I don't know, not single. I mean, I do know some that are like actually applicable in certain areas, like post project life, but for most of them it is just, you know, like, you create that rocket to go to Mars and then it goes to Mars and it's like, you know, it's finished like it now. So, I think that a lot of companies have this type of mentality, like they have that feeling that in the end probability that they're going to scale up. It's very low and they don't invest time into that part. And that is like very often. I wouldn't say neglected, but not given enough attention. That post project life. So, it's like, you know, I mean, it's, it's kinda like a playground. Like yeah. I mean, we are gonna get Million euros and maybe we're gonna do something, maybe not. Like, who knows?

Q: Yeah. So, you think it's like the problem is at the origin, at the top, or is it more of the company's level?

D: I think the main problem is at the end of the funnel, so that scalability and that it's both the fact that, to some extent it's hard to predict, you know, like what, like how is it gonna evolve in five years? You don't know exactly what are going to be the outcome of your project because there's all, like, it's never, I mean, it's really something like, I'm gonna build a rocket to go to Mars. The research questions are gonna be more. How is gonna be the most efficient way to go to Mars? You know? So, for the three years you're gonna keep looking like what is the best way to do it? And then you're gonna try to actually implement it. So, because of that, you have a lot of uncertainty and it's hard to plan for that scaling up phase. But at the same time, I think there's something like the new framework should be accounting for this. There is the, the horizon 2020 is gone. Now. It's finished, now it's Horizon Europe. I don't know to which extent that has changed. I would imagine it did. That they will pay more attention to that post project performance. But yeah, I mean it's, it's always been like that. The European projects, like there are companies that are only doing that, it's always the same companies also because they know how to do it. You know, like technically everyone is good, but it's hard to actually get into that ecosystem and once you're there, you just don't leave. So, it's a very specific environment.

Q: And don't you think that they need a new vision? So new companies that enter the market and everything.

D: Yeah, of course. The more players we have, the better. The problem is that the, the process of applying for fundings is so complex. Like you need a year of working on a proposal, you know? So, there are very few entities that can actually afford to prepare like this robust proposal for the project. And then you need to wait like, you know, additional year for the project to be accepted. So, and like aside of the fact that it takes a lot of time, it's very complicated. Like the vocabulary, the legislative part and all that, it's like totally rocket science. So, the barrier to enter is huge. And there are like, you know, six companies that have been doing it for 10 years. They know exactly the drill. They know exactly what to say, where, what to write, you know, which questions to ask. And it's just much easier for them.

Q: Yeah. And what will you do to reduce the uncertainty, you know?

D: That's a very good question. I would switch the thinking process to backwards instead of forward. Okay. You know, to actually see like what do we want to get in order to have that scalability? And then walk backwards from the, like, how are we gonna get there? Rather than like, oh, let's see where can, where can we go? And then we're gonna figure it out. But yeah, I mean it's, that's probably a PhD thesis of how to change that approach.

Q: Now, your actual job. Tell me more about it.

D: Yeah, my actual job is super cool actually. Yeah, the mass industry is super interesting. Um, it's, like, you know, like a baby in the middle of the room. It was the same micro mobility actually. So, you know, like there is that baby in the middle of the room and there are all of these cities standing around. And everyone is thinking like, hmm, what is it gonna grow up to be like, uh, like how are we gonna see it? How are we gonna educate it? So now the industry has a strong role to play to actually maybe not exactly educate but shape their vision in the direction that is feasible to progress. Because we are, there was a time where we were hitting the same war as micro mobility. Not that the regulations were very much. But there was a period when they were overregulated and cities were not even able to enforce that regulations that they were imposing on them, but they were just doing it, you know, like, oh yeah, why not? Like, edit that in your face. So, this is what we need to avoid doing now because also contract to micro mobility MaaS is very modular and requires a lot of coherent standardization, cooperation, more unified, the system is better. It is gonna be for the end user and for the end effect. So, for that, we need all of these cities to have more or less the same idea. And right now, that's not the case, but yeah, working on it.

Q: And what about the situation in Brussels right now?

D: So, the situation in Brussels, I don't know how public is that information to be honest, I will double check that. So, the, the worst case, I will tell you not to use that information, but I'm quite confident that part is official. We are launching the platform sometime this year, the government allocated already last year quite significant amount of money to develop the mass platform. This is now in the test phase. So, there are like a bunch of people that are using the app. And trying, like how is it performing and stuff like that. There is like a huge roadmap, how to develop

further with the infrastructure integration and, and things like that. So, it is happening, it's gonna be very cool. Stay tuned...

Q: So Traffi is a private company and the Region of Brussels asks them to build their MaaS ?

D: They're not exactly with, when we are talking about this, numbers in terms of money, the government are being forced to do the public recruitment. So, they're releasing the tender in which they describe like what exactly do they want. And then there are different providers that offer to get that better.

Q: Ok so when you build the MaaS, you have to collect a lot of data. Do you use the national ITS or do you have your own way of collecting data ?

D: National data ? Like let's give it 10 more years and maybe it's gonna be usable. Now the quality of data, like seriously, very often open maps have better quality than the national access points. But the, the delegated act of its directive is in the revision now. So, like it's gonna get better, hopefully. Uh, normally we receive the data directly from the provider. So, Steve just shares whatever they have because it's in their favor that the app is asked, which in information as possible. And other than that, we just follow APIs from the, from the service providers.

Q: Okay. What are the inspirations to develop the business model?

D: To develop the mass. I think the motivation here is no different than anywhere else, as there are a few different factors. First one being that we need to provide a choice and MaaS is ultimately by offering the choice to people. Like us, you cannot expect a change if you like, keep swimming in the same in the same type of environment. So that is the first thing, makes it easy. It makes it accessible. It's the first step towards sharing economies, rather than private based economies because, I mean, you know, this is like not a new knowledge that the cars are like spending 99% of their time being parked, that people don't necessarily need to have a bike cargo a car, public transport and stuff like that. Somehow we were raised in that idea that if you have a car, you have to use it forever. Like, you know, there was just like everywhere by car, always like nothing else. And if you have the STIB abonnement you always go by metro and by bus, never anything else, like, how did we end up in that situation that, you know. So, and MaaS actually gives you that choice that like, okay, maybe for that particular trip it, it's easier to take the, the bus for this one. It'd be easier to take the bike for a lot of people. We'll still use cars for our large trip, which will be the default option, but the idea was never to like to put it down. No. Like the goal was always to actually just reduce that number of unnecessary. And the MaaS app is actually showing you that, like, what you're trying to do is useless. Like, think about it, you know, like, it's gonna take you more time, it's gonna be more expensive. You're gonna have a hustle with parking, just take a bus, dude. So, it helps people to understand, I think. Yeah.

Q: And so, what is the plan to convince people to use MaaS and to change their behavior?

D: I think that question goes to the marketing department of STIB. Not exactly to me, but I mean, I do imagine that there's gonna be some sort of promotion of which kind, I don't know, probably some classic free ride, you know, like win something type of. I am convinced that the app, that if robust, is gonna defend itself without extra efforts from the marketing department. And of course, you need to let people know that it exists, they're not gonna figure it out by themselves,

but if the app is going to be useful enough and support enough of the futures, you know, like the payments will be easy, the access to the real time information and stuff like that, then people will want to use it. If this is actually gonna save the purpose, meaning make the trip easier, then they will want to use it. If there is, if it doesn't work, then we need to see who's like, where the problem is for.

Q: Um, now a bit more about your overall experience. Do you think that there is a common challenge or common lacking in something, something that you find everywhere ?

D: Yeah. People. People, yeah. I mean, you know, we can go as advantage in technology as possible. We can do hip loops, autonomous cars, like flying to Mars, whatever. In the end of the day, there's always gonna be a person somewhere in the end of the journey that is gonna make something complicated one way or another, because it has a very specific needs. And this is not, this isn't a judgment also like, you know. We are just, we are so different. We have so many different needs from transportation, the way that we see the transportation, the context in which we consume the transportation. So that is always gonna be the most challenging factor of any mobility. Discussion is always human. And what is making it even more challenging now is that all the way until now, we were upgrading. People in a sense, you know, we were like, we're first to give them the horses, then we gave them the trains, then we gave them the cars like it was getting cooler, and then like, you know, we put them on the plane, it was getting cooler and cooler and cooler. And now suddenly we asked them like just, you know, just a little bit less like, yeah, please, like, just stop. And it's, it's very hard to convince people to give up the comfort that they got very used to. So that's why MaaS systems and this type of solution have a big role to play because they somehow need to provide as good quality of service as they are used to. Because otherwise how are you gonna get them out? Yeah. I mean, you know, if we look right now, I remember there was a time that we didn't have a car with my partner and by going to international, we had to take the train. Taking that train for the two of us and you know, like all the hassle, need to go, take the metro, then change, then go to there, then change, then go blah, blah, blah. It was twice as long and more expensive than taking Cambio, for example, and leaving on your private car. You know? So, like, how, how are you trying? And I am doing, in my entire life, I'm really going, willing to go the extra mile, you know, but I am not buying this, so why anyone else would. So here is like that. We need to give them something good, which is gonna be very challenging. And at the end of the day, they're still gonna be like a large proportion of people that are unhappy.

Q: Yeah. And don't you think the lack of use of all these kinds of services is due to a lack of information given to the people? Like they don't know the, the real impact that using this is going to make.

D: No, absolutely. And, to large extent probably the fact that the economic part of education is in most countries nonexistent. We don't like in high schools and stuff like that, we don't teach pricing economics. And in the long run, it means that people don't understand exactly the external cost of their choices and like the full frame of it, we don't need to go into details, but yeah, absolutely. That is a huge problem and there is no immediate solution to that.

Q: What do you think about the role of politics in it ? Do you think they do enough to promote that?

D: I think you should be aware that working in being politics active in mobility or transport is a very, very, very difficult role. And if we only talk, I mean, it's not only, it's exclusive to Brussels, but in most of the cities, you know, you receive death threats. They threaten your family because like you say that you remove parking or stuff like that. So, it's like emotionally and morally very challenging job to do. But yeah, they do, they do have a strong role to play. There is always something more that can be done. They're like, you know, show me one politician that we can tell like, yeah, you did all you could, like, seriously, that doesn't exist. But I think in the context of Brussels this is quite well organized and it's working quite okay. I think the main problem of politics and transportation is that the actions that they're going to take will not benefit anyone in the next election cycle. So, it is like, you know, there is no real interest if we talk about it very pragmatically, like, why would I shoot myself in my own feet knowing that if I'm gonna do that, I'm not gonna be reelected because it's gonna take more time for people to see the real benefit of it, and someone else will after take the credit. So that's like, you know, we're just humans.

Q: And so, Don't you fear, because like I saw that there is some protestation for the population about the government project, you know, changing things and stuff like always. And so, there is a huge election in 2024. There's a lot of change in every kind of level. Don't you feel that these new elections can, I don't know, jeopardize it?

D: It always can, like you cannot exclude that as an option. The thing is that those movements against good move, they are very loud, but they're very small. You see that, you see them because they shout very loudly and those people that support the project, they're like, you know, they don't do that. So, in terms of balance, who is going to, to have to say, I don't know. I think people are generally more motivated and driven by anger than they are by support. So it might be that those people that are against it, they're gonna be more vocal in the election. Meaning that the next, government will be elected in that direction. But I think it's, you know, I really, I very much would like to believe that ma the machine has started and it cannot be stopped now because it's, it's not only process. I mean this, like the climate urgency is so huge in Brussels, it's 26% of emissions, which are coming from transport. That is huge. Like we need to do something about it, you know? And also, you know, after Covid we changed our attitude to life so much and it opens so many possibilities. Like, you know, that we live in this like more 15 Bubble cities and stuff like that. So, this is the direction we're gonna be going, because, you know, at the end of the day, it just makes lives better. Like, is there, seriously anyone in the city that can sit in front of me and tell me, like, yes, I love standing in traffic jams. Like, leave my traffic jams alone. You know, like, that's my right. I wanna be there. Like, or I want to honk in front of my window all day long. And like suffocating from the, from the image. Is there really anyone like that? Maybe we don't do good, the good enough job to explain people like what is gonna be the long run? And indeed, I think that there has been a lot of harm done to all of these type of projects by creating women and creative, but allowing the narrative that we are going to like to go 100% against cars. That cars are like, you know, that we live in black and white. That cars are, or public transport or nothing, and people fear that they're gonna lose that choice, but they, they were not properly, properly explained that if we are gonna do all of that for the time when it's really for you necessary to take the car, it's gonna be easier. You know, like there's gonna be less people because they like choose something else when they can. So, probably, yeah. We are stuck at the, at the education side and I'm probably as guilty as anyone else working in the industry for that. Um, and so what next?

Q: Do you think that the goal of plan is always on the 2030 horizon? Do you think the timeline will be respected?

D: Yeah, I think we're gonna go even faster than, than foresee because the good move was originally foreseen to start 25, I think. And because of Covid it started to roll sooner than that. As a tech tactical, urban, I think there we can achieve something sooner than the initial plan.

Q: Okay. So, you think Covid didn't have a negative impact on the launch of the project?

D: Oh, no. The contrary. Oh, it's free things up so much. Like it, first of all, you know, it frees somewhere, space on the street. It opened a lot of eyes to see like we could do something different. And it really allowed the, the local governments to start implementing these changes before they were actually on the timeline.

Q: So, in all your projects, did you feel that, somehow you needed more resources, like it was financial, humans' technology? Do you think that some kind of projects, especially human resources, do you think you have enough people working on projects and stuff?

D: I think it's more than if you look at the public administration in this country, you definitely have enough people. Like we absolutely don't need more. I agree. Yeah. But the, the thing is that there were no people primarily allocated to these issues. Like it hasn't been a subject of discussion for a very long time, road safety, cycling, the signage, liability, you know, like that, that hasn't been re discussed before. So, it's more than yet there. We need to put people like the human force on this subject because there is none. Like, this is not something that we used to work for.

Q: And so, to do that, do you just relocate people working on a project to another or do you get more people, you know ?

D: I mean that depends on the project. Like where you get the findings for how, for how long the project is gonna long. It's easy to add people on the payroll, but like, what is the marginal cost for it? And like, it's again, you know, it's the economics of employment, like, how are we gonna do that? Like, also probably what is important to take into consideration is, do they know what they're doing? Like, can we say that a person, whoever always rides a bicycle can be responsible for a cycling policy? I'm not sure. You know, like do you have people that are competent enough to deal with it? That's probably the question.

Q: I saw during my research that some communes, well, they didn't act, as planned. Like some put the plan in place though others don't want to put it at first. Don't you fear that there's a lack of harmonization between them and will it work in the end?

D: Of course. Have you ever been to Brussels? There, harmonization is like an Asian soup. No one knows what's in it. It's a completely exotic concept here and the regional competencies versus local competencies versus federal competencies. It's such an unclear business. No one knows how far it goes. So, it's, um, it's gonna be difficult to bring everyone on board as usual, you know, more people at the table, more complex it gets. But that's just how it is. And you know, other cities are doing it. Copenhagen was not always Copenhagen; Amsterdam was not always Amsterdam. They did not wake up one day. I mean like, you know what, from today we're gonna be a cycling capital. It's a process and there's always gonna be people who are against. And this

is actually great because you know, it challenges you and makes people like maybe we can do something better. Maybe they actually advocate for the people and they know that this part of the project is not gonna work for. Like, you know, like every, every side of the discussion has a right to be vocal and to write the concerns and like, this is ultimately what the politicians are for. They speak for the people, so they should have that right to talk about it. How are we gonna progress after that? And in which way are they gonna express that concern? That's another discussion.

Q: So, do you think that's the project can be really effective if there is no harmonization between parts of the city?

D: I mean, you know, if you really wanna see a nice picture, you need to put all the puzzles. If some puzzles are gonna be missing, it's gonna not be good enough and it could have been better. So mostly in that direction. And I'm really sorry. I really love the discussion, but I need to run because I have another meeting.

Q: No problem thanks you very much for your time. Have a nice day.

Interview 2 : Laura Babío Somoza, Project Manager at POLIS Network

Q: Quentin Georges / L: Laura Babío Somoza

Q: So, I'm a last year students and I'm working on a thesis on the recurrence barriers that you can find when you try to implement any kind of actions related to sustainable mobility, in Europe. So, to do that, I just, of course, base myself on what's been done before. And I analyzed some, some cities that have implemented different actions like, for example, the mass in Helsinki. And, and my goal was to establish a kind of, uh, summary table of what you can find when you try to implement this kind of, of projects. And then I try to make recommendation for Brussels, which is currently right now, uh, implementing the Good Move plan. I'm sure you are aware of it, so and so, yeah, I was looking for some expertise and some advice of what I've done so far, so that's why I called you and thank you for that. So first of all, just tell me a bit about you. What's your personal background?

L: Yes. So, I'm a civil engineer and I specialized in transport systems with the masters in, in the technical University of Munich, and they already also studied the mobility as a service and accessibility as in Spain, where I'm from. And now I work as a project manager at Police Network. Do I need to give a bit of background on police or it is just, just few words?

Q: Yeah, a few words.

L: Okay. So, policy is a network of European cities and regions working for sustainable transport. We are involved in new projects, which is a lot of Baidu. I'm a project manager there, so I manage sustainable mobility projects focused on a lot of digitalization, new mobility services, things like this. But we also work on policy at bridge between the cities and the EU institutions. And I also work a lot there in, especially in the more sectoral policies like Intelligent transport systems directive, the ITS directive and the delegated regulations. That's a bit, yeah. A summary of what I do.

Q: Okay, great. Um, I just came back first on your, I saw on your LinkedIn pages that you did an internship in Barcelona about the train, right? Can you tell me a bit more about it? What did you do?

L: So, there, as I said, I'm a civil engineer. So that was a more technical position. Yeah. I was in one of the organizations that was doing the technical assistance of the project. They were building a new high speed train station that was going to focus really on long-distance travel. It's completely new. And I was just for the summer working really on the technical part. So, on the field, it was really the preparation of the infrastructure. Okay. And when I, when I was there, but it was a whole project. It was a long term. I think 10 years or so project.

Q: Okay. And just for information, is it done so far?

L: I think it's not finished. It's not yet finished. This was still four years ago and they hadn't even started with the building like they were in the preparation work, establishing the survey, the new sew and things like this.

Q: Okay. And so, there, what were the main actors? Who did you collaborate with? When you try to implement that?

L: I mean, so I was working in a technical assistant organization that really focused on the field. But of course, the ones that controlled the development were ADIF, which is the Public Authority for Infrastructure, the public company in Spain that manages railway infrastructure. So, we had to work with them and with Inco, which is a publicly owned company, let's say like it's the operational company from the ministry in Spain. So, they respond directly to the Ministry of Transport.

Q: Okay. And so, did you personally have relation with this kind of person?

L: Well, very briefly, you know, I was there only three months, so I did meet the, let's say the director of ADIF there, but not higher than that. That was true to fire removed.

Q: And at your level, did you see that this kind of collaboration with these different entities is easy to manage, or did you see any kind of problem between relations, conflicts of interest, etc.?

L: No, to be honest, no. There was also, I don't know if that's a conflict of interest, but there was also a flow of people, so the people, let's say at the technical assistance, they were the contracted and then there was a person that, from there, actually got a position in Inco, but just like a flow of natural. And besides that, there was a lot of communication, based on reports, you know? We would like to prepare the reports weekly, send them up and they would send up for corrections. But it flew. Yeah, it flew very nicely. Before that time, I was there, there were also no significant problems, you know, that we needed to deal with. There were just some everyday issues in the field, but nothing significant.

Q: Okay. And so, it was a project, made by only the city of Barcelona or was it sort kind of help from European Commission or something? ?

L: No, of course the city of Barcelona is involved, but they are not in any ownership, let's say of the project because this is an infrastructure from ADIF, which is a national level company. I'm

sure that there was funding from the EU to build this. But, I mean, beyond that, I'm not sure what the connection is, but I'm very sure that all of these big infrastructure projects get funding. But I wasn't aware, like I didn't look at that level of, yeah.

Q: Okay. Yeah. And so, after that, you did a training in DG move. What was the training about? Well, how does it work? What are the different steps in it, you know?

L: Yeah, so I was part of the Blue Book Traineeship. This is a very big program to work with in the commission. They have two rounds every year, and it's always a five-month traineeship and with industry it is very big. I think they have 800, 900 people distributed amongst all the digs. So, it's an application process, very wide, very open. And once you step, go through, similar step, just like verifying, let's say that you have some level of languages and things like this. That's when you can get in yeah. When you get the opportunity to select what interests you more. And then from then on, the commission is the one that picks the people based on the database that they do. And I was lucky enough to be chosen for the units that were primary chosen, like a very specific, which was the intelligent and transport systems unit, which doesn't really exist anymore. Now it has been separated into two units. Okay. Within the de move, which is the one, the director of Mobility and Transport. And this, when the unit was, how I was there three years ago, it was focusing on ITS on one hand, but also on the more mobility, SUMP kind, the European Mobility Week, these type of actions. And I was within that Urban Mobility team working directly with my coordinator who was the team leader within the urban mobility team.

Q: Okay. And why, did you decide to go on this European project, instead of a more local project in your home country in Spain, for example? What was the reason, did you choose that?

L: Well, I mean, on a personal level, I enjoy very much international environments and you cannot get more international than in Brussels and to working in these projects where you, from here, you connect with all the countries, including Spain, and in Spain you don't have this access. Opportunities, at least that I am aware of, like, on such a level, like for the ministry, so you immediately have the pass exam, etc. This was just a very long process that I wasn't maybe interested in, I didn't know. And working at EU level, working in Brussels, you really get to see the over or the overarching perspective. So that was very appealing, like the impact that you can have on that level. Whereas in Spain, technically the impact could be less just because, numbers.

Q: Okay. And so, during this training, what is your overall impression? Are you happy? Do you feel that you learned enough or do you feel that's, in some parts, there is some lack, you know?

L: I mean, of course there are always lacks, like, I mean, that comes with everything. Nothing is perfect, but I was one of the good ones. I got a good traineeship. But disclaimer, this is really a lottery. You don't know when you apply for this traineeship, you cannot know how good your traineeship is going to be because it depends very much on the coordinator that you get on a first level. And on a second level, on the DG that you are, because the DGs have very different environments, very different work cultures, so this can vary. DG Move in particular is a very good one where there is a very good environment and in general everyone is working on the same, but on the negative, also to mark some blacks there are. I got a lot. I enjoyed it a lot because of my previous position, because I already knew a lot about the topic. Most of the trainees specialize in international relations, not in transport. So, I got that in my advantage and because of that, I got opportunities that maybe. Other people wouldn't have gotten it. And it

made it worth my while. But there was clearly a lack of a structure as in like, what are we going to give these trainees? How are they going to contribute? It has to come a bit more from you and it should be more structured, clearer. Like, that you end up with your traineeship really having accomplished something. And this is not always assured.

Q: Okay. But so, you feel that globally, you were ready to start the journey at Polis?

L: Yes. Yes. Me personally. Absolutely. Yeah.

Q: Okay. And so, what do you do exactly at Polis? Tell me what are, what are your projects? What are you working on at Polis?

L: I do too many things maybe. Right now, I have worked on many projects. But right now, the projects that I have active are three. One is called Mobi Datalab about data sharing. It's a very technical project, working with a transport cloud, and seeing how this technology can help cities and can bridge the gap between innovators and cities, how can they help each other? I'm working on another project called Did4Trim, which is about traffic management innovation, also quite technical, academic I would say. And I work on a new project that is very exciting called AK, which is about unleashing the potential of public transport. And it's a very big project with quality partners and several cities. And besides that, the most interesting part of working at Polis, really the working group where I can, where we establish like peer learning activities between cities and we also brief them and help them through manage the past field of EU policy.

Q: And so, with all of this projects, you work in different cities at the same time, right?

L: In my case, I mean, yes. Like for instance, the upper one, it has eight cities that are very much centered around these eight cities. So, there are a series of tools that are going to be developed for these cities, although the ideas that the tools then will be open in the future for others, but within the project we do focus. Doing measures, developing guidelines, these tools to help the cities implement their measures with the idea. Then in the end it will be exploited by others and transferred to other cities.

Q: Okay. And so, you are always working with the governments of the country or not?

L: No, not at all. Many times, the cities are actually represented by, you know, let's say like the governments are represented by their public companies that are operational or by other type of stakeholders that the city collaborate with in different projects. For instance, in this upper project, France Mobility is represented by Instant system, which is a technology provider that they work with for their mass project because their measures very much relate to this specific project that they have, and this is often the case. The governments have limited capacity, so besides the high level and taking the decisions, they let a lot of the operational tools distributed.

Q: Okay. And so, when you start one of these projects, how do you choose which city you're gonna study? Do they come to you or do you study in this city and like, okay, you have lacks there and we can help you. What's the process?

L: Eh, it's both. It's both. It's a mixture. Sometimes you have already collaborated with the city in the past because even they started or for whatever reason, and then you just continue collaboration because it's a continuation of the project, just more advanced. All the time you

identify interest in cities to get a wider geographical coverage of a project. It was the case in our proposal that I worked with in January, where we really tried to have a wide coverage in terms of like size, but also geographical. And often, it's the cities that sometimes are interesting. Hey, do you have any projects on this topic? We want to come to work on this, but we don't have any funding so it would be interesting. And we help them. We really are. That nexus. That link.

Q: Okay. So, I'm sure that you sometimes had to refuse some projects maybe. What are the decision factors? You know, what project to choose, which project to do?

L: Well, in general, like content wise, we don't really refuse any projects because there is, we are always not going to be selected in all projects, so it just cannot hurt. We also have a, like we Polis itself is growing. So, we are getting more projects, but we are also hiring more people. So, it's not a problem to hire more people to work on these projects. Well, the market is difficult, so sometimes it's obviously a challenge. But we do refuse sometimes in terms of budget, we are a nonprofit association, so our budget is very limited. We don't generate anything. So sometimes if the budget conditions are 50% or 70%, that means that we have to cover the other. And if it doesn't have a strategic importance for Polis, then we might refuse that just because we can't, we don't have the resources, the capacity.

Q: Okay. And so, once you've decided, what do you provide as resources? So, do you provide, I don't know, experts to work on the project? Do you provide finance, of course, how the collaboration with this local parts works actually, do you just meet over table and see, okay, we need to do that?

L: Well, in terms of projects, so we, on the proposal part, we help the support building the proposal, so connecting right to people and building the text, let's say for the proposal and once the project goes forward, if the financial part is covered by the commission. With the projects that we most work with, like Horizon 2020, the different programs, usually the commission covers a hundred percent, so we don't provide them any money. And then in terms of the project, we always have staff people from the secretary. Working on the project, we are all experts in our field, so we help supporting the different tasks. Sometimes it's usually dissemination a lot right in the policy recommendations from the project that in the end we transfer to cities. So, we provide the people to work on the project and then nexus at the beginning to connect the city. And then during the project, depending on our task, we support the cities and we try to exploit the results after the project has ended for the cities. So, it's more capacity rather than actual financial support.

Q: And so, to do that, is there a cross entity group? Like a task force, something where you group all the representatives of entities and work on it? Or is it more like, okay, I see this one then when I talk to this one and then try to see what's, what's works or not and see, For example in the decision process, you know? Do you have regular meetings with representatives ?

L: Yes, we do, but not on a project level. More on the Polis activities. So, within our working groups, we also have a political group where we gather the political people, so really the representatives from the cities to work with them. But usually, at very high level these representatives are not usually the ones working in the transport department necessarily. So, with them, with the more technical people, with the more hands-on people, we work with them

through the working groups. And in these working groups. It's a mixture of project work, project results that we bring, and policy work and general, just peer learning.

Q: Okay. I see. So globally you just provide recommendations. You provide a plan for a city or a project to do. Do you feel that all you tell them or the recommendation are well followed some time or is this some kind of misunderstanding of just don't want to do what you work around?

L: No, I don't think, I mean, there is always a problem when you work in this, especially at EU level, like you produce recommendations and guidelines. There's always a question. You always have the question; is this being used? Is this useful? Is this impactful? The numbers say that they are. It's more difficult than that. When we provide recommendations in a project, it is usually already checked with the cities. You know, it's not that we tell them what to do, it's that we work together. How to solve an issue or what to recommend and definitely you can see some follow up from things that are picked up from the projects, but in many cases, these project things, specifically thinking our projects, they are left there once the project ends. So, it's a bit complicated. I do think that in the bigger picture, these projects help on some continuity, but in the small, if you look at the city specifically, it might feel like that they didn't move in that direction or that they stopped because also these are innovation projects. It's not necessarily things that are ready to be mass scaled, implemented.

Q: Okay. And do you feel that there are some, some parts, some areas where projects are more impactful than others?

L: I think that there should be more projects in areas where they would be impactful, but they are just not maybe innovative enough to direct resources there. I think that all projects that focus on active mobility on Ubers like pedestrianization, the start of changes. I think that they're the most impactful on a local level because they are noticed the most by the citizens, but they're maybe not the most attractive or innovative, so they are not the most popular, whereas you get a lot of projects. Automation in cities that maybe are the least impactful because they're the ones that the cities cannot really afford to continue on their own without a stream of funding, or that the innovation is not ready to be implemented operational on every day. So, you have a lot of money spent on something that doesn't continue in many cases.

Q: So, one of the main challenge when trying to implement that is like funding for you?

L: Yes, definitely. For innovation, absolutely. It's funding to get the continuity and if it's innovative and risky, then it's also about the political support to maintain it.

Q: Okay. Do you or do you have direct contact with political people or not?

L: It depends really on the, on the city. The politicians usually are briefed, let's say, by the people, and sometimes they attend high-level EU meetings. There is also usually a steering committee within projects that sometimes gathers the politicians and the high-level people from the organizations that meet less than the regular meetings but are informed so they can also appear at final events and things like this.

Q: Okay. And do we have some kind of relation or also with only private companies that can just, you know, submit you an offer, submit you an innovation?

L: I don't know. We at Polis, we don't have private organizations as members, as subconscious. They are mainly private organizations that work, in projects that they are working on research on their own, so they can also, they're interested in working in new projects and when they're not partners, the organizations are usually subcontracted to execute some of the project tasks. So that's very common. And besides that, at Polis, we establish a conversation with many private providers and operators that have to be in a discussion, that have to provide, to be in the argument, even if they're not members. So, they're invited to the events when their input is valuable. .

Q: So, I guess when you have this kind of relation, that's always kind of big companies, do you have some kind of help to these little more companies like startups, if they want to help?

L: There is a lot of contact with startups. In fact, this project Move Data Lab that I mentioned before, is purely about contacting startups and innovators that will participate in our activity. So, there is there like an actual activity, but besides that, we don't only, in fact, we work with many small organizations, small associations. I remember we have worked with many startups, in fact, which are no longer in existing, like the bike sharing that was here in Brussels, I don't remember the name, but they just stopped existing and we had included them in the conversation. So that's really, we actually avoid big companies monopolizing. It's an actual effort to not let this happen.

Q: Okay. Because when you work with the EU, you have the, this reputation that the process is very slow, that you need to, to have lots of administrative stuff and everything. So maybe sometimes some startup that just doesn't have the time to work with you or something like you said, like, so what would you do? What more do you think we could do to help these companies?

L: I mean, that's a very hard question, like to help them. I think that it's very important that the companies establish their networks locally, so they're involved in these projects through the local, because all of these projects, they launch usually to establish like their pilots and everything. They launch public tendering. So, it's really about establishing the local connection, the local connections and understanding the problem. I think it's more on the policy level that there are many things that are, there are many positions that I put on small companies and they don't have a voice to include this, and I think that the only way. It would be really through, like we do the same role that we do with cities, associations of startups, and really trying to maintain that collaborative because if the administration doesn't improve their dynamic and how they work, which looks hard, then it has to be an intermediary. And that's precisely the problem with cities. You know that they don't have the capacity to follow everything that has happened at the EU. So, we facilitate this as much as we can. And there are already some associations that do this in the mobility department, by the way, but maybe not focus on startups.

Q: Okay. So, you don't think that the process from you, from the EU, can be changed, can be more helpful?

L: I mean it definitely can be changed. It definitely can be changed. The commission when about policy parts and also for the projects, they are very complicated. So, they are complicated and at the same time simplified in the policy. Meaning that the processes that they do, they assume, they make many assumptions that maybe make visible these smaller parties. So, it should be more open, it should be more facilitated. I just don't have an answer on how this can happen because they are doing this cost-benefit analysis. Impact assessment, things like this that were

the startup should have a voice. Then imagine addressing all types of stakeholders in the 30 member states. I don't know if that's possible in practice. I think it's a trade-off between being open and involving as many people as possible, but also having the startups work in association, in collaboration, trying to come together to be able to manage the process.

Q: Okay. I see. And how do you manage the post-implementation of your projects? Do you have a recurrent monitoring?

L: I think this is really the weakness. We don't. The workplace is very fast, which means that there are always new things. I don't think I fully agree with the way that it works, I mean, there are just many projects and we are constantly sometimes reinventing the wheel a little bit, like repeating some projects instead of precisely focusing on continuing rather than just repeating. But at the same time, what is repetition for one city is a completely new thing for another city. So, it's a bit hard for us. We don't monitor that much old projects. It's really, we haven't found a system to work this. There is, it really depends on the results of the projects and on the willingness of the partners to continue pushing this. We do this once when results are strategic, they make sense, and they need to continue working. There are projects that are a continuation of other projects, like an actual continuation that they use what was created and they developed it further. And this is the case. We try to achieve this as much as possible and when we don't, we just rely on the willingness of partners and the importance that they put on the results. But there is not an efficient way that definitely that we are.

Q: Okay. But so, you don't provide monitoring by yourself, that's only cities that come to you and say, okay, that works. That are the results and stuff?

L: Yes, yes, basically.

Q: Okay. And so, what about the data then and how about the results, about everything. How is the collection done of everything? What tools do you use?

L: We don't collect at Polis, we don't usually take this role in the project, so we don't collect data ourselves. There's usually in the project, the data management plant, and this is done well in different ways depending on the project. We are doing an open repository where we are collecting different data sets and uploading open access, but it really depends on the sensitivity of the project. The cities have an open data framework that our legislation that makes them publish all sorts of data. So, this happened. This happens a lot. And for other types of data, it really depends on the project and on who is the source of the data. But in general, these projects all work with open access. It is just very rare that is not open access.

Q: Okay. And do you feel that you received enough data with this open access or do you need help from a private company for example? .

L: I mean, as I said, Polis doesn't work with data. I know that the cities always want more data, but there is still a lot that the cities want, but they don't know how to use the force. So, there is a lot of data. Cities want more data and there are different ways that they are acquiring this data with regulation, with buying data, acquiring. I guess there is never enough data.

Q: Okay. In all these projects, did you see any kind of common challenge between them?

L: Communication. Internal communication. Internal communication is definitely a challenge. There are, as I said, the cities a lot, not exclusively, but the cities have a lot of work, a lot of administrative work on their own. So, the projects, sometimes they just cannot keep up. And it really depends on city to city. If they do, usually the good projects or the better projects have already taken this into account and that is when they have the support of other entities, but internal communication is also always an issue. And I mean, for us specifically, and I think there are many, many, many organizations that work like us, where each person is working on two, three, even four projects at the same time. There's also always a problem with establishing the flow, like meetings which ultimately come down to internal communication. But the management, sometimes it can be a challenge. You are managing a lot of things. Sometimes they have all the deadlines altogether, and it's a problem. So, I think that affects not only Polis, but many organizations.

Q: Yeah. So, are you working on any projects in Brussels?

L: We are not working with Brussels on projects, but we do work with them a lot in policy activities. So not in a project directly, but yeah, with the activities that we do with our working groups and policy and such.

Q: Okay. And so, you said that you're working on, on policies of course, on framework. What are the main challenges when trying to implement a new framework in a country?

L: I mean, that's precisely one of the biggest issues right now because we work at policies at EU level. We are also working sometimes to get information on what happens at national level, but mainly just to feed the EU level. And there is a big disconnect right now. There are many of these EU policies that affect cities and affect the local level. But because of that, those who implement, those who are in charge of implementing these policies at the national level, the ministries, there is definitely a disconnection between the cities and their own national level in terms of supporting them and between the national level and the EU. Because we see that not all ministries are involved in all initiatives. Even if they are the ones that are going to have the responsibility. And we hear from cities that they don't get enough support from their ministry, and the EU cannot give direct support to the cities because of the subsid. So, you have this link that is broken.

Q: Okay. What would be the solution to that?

L: Improve the communication between the member states, the national level and the EU, and the national level and the cities. So, either between the cities and the EU to access funds to implement because EU imposes a lot of regulations and sometimes they don't consider the implementation cost of these regulations at local levels. So, they're imposing a lot. And because of the local level, they don't have the agency, they don't have access to certain funding. So, improving the funding access that they would get linked to the requirements that they imposed. This would definitely be one way, but also, improving like, putting some pressure on the ministries to give the support to the cities from the EU. So really improving that connection between that flow between the EU and the member states.

Q: And do you provide any ideas to improve this communication but also funding and everything?

L: Well, we do, we are. So now there is a new structure set out the expert group on mobility. So, we focus very much on transport and in this group they have divided it into the different transport domains and topics and they, the members of this group are ministries, cities, but also private stakeholders and also associations. So, you really get, and researchers of course, you get a wider rate of the representative and they are all going to be working on these issues precisely and come up with recommendations that EU supposedly will implement in their next strategy. This is already next year. So, there is a structure we are going to work on that. If this is in the end going to be implemented, I don't know, but this is the forum where we are going to give all of our ideas.

Q: Yes. So, we also know that transitioning to sustainable mobility is a lot about people. Of course. Do you promote any kind of campaign to just instruct them, to give them more information, to educate people about this transition?

L: Absolutely. Absolutely. We have published, we always, well, not always, we regularly publish position papers on issues related to our resource concerns. We have done so on several occasions. The last one we did for the new initiative that they're planning on integrated ticketing and the issues that this has for inclusivity. But also, activities yeah. That's what we do and, in addition, we have personal relationships, working relationships with the members of the Commission. We keep that, they appreciate it. They want to be educated; they appreciate the input as long as it is constructive. Yeah.

Q: But so, do you think that's really the people, more common people, if I can say that is well informed of the situation?

L: No, absolutely not, but I. Besides definitely in EU politics, no, like at EU level, but specifically on transport. We have a huge issue in communication besides the EU level, and the people of everyday, people that use the transport system are not very well informed about the impacts of their choice and the way they move. So, That's the first problem. And then on a higher level, they have no idea of what the EU regulation is imposing or trying to do. No.

Q: Okay. So even at a top level, we see that you have misunderstandings and lacks in this kind of topic?

L: Yeah. Yeah, absolutely. I see it from the top level, definitely. Sometimes I feel we are all in the same bubble, but as soon as you get out of the bubble, it's very, the reality is very, different. Yeah, yeah. .

Q: Okay. And yeah. Isn't it other ways of communication that you can use to just give this information to more common knowledge, you know?

L: I mean, I think that this is the aim of the new projects that are coming out of Horizon in Europe. These new projects, at least the one that I am in upper they from the project. Now we'll see the implementation. They're just starting this year. The idea of the proposal was to use new means of communication, such as social media, and reach out to a younger population to try to spread the word and then build from there. So, the aim is there, let's see how this translates. Let's see. Yeah, it's always hard to tell.

Q: Okay. Do you feel, I mean, you are still young, but do you feel that there are new challenges that you didn't see before when talking about policies?

L: I mean, I just think that it's getting maybe more complicated and more abstract, so, you know, now we are starting like the portfolio of initiative and everything is the digital side of things, and we are now very much immersed into data spaces, these kind of words that are not easy to grasp. They are not very intuitive and I think that this is creating a new challenge because if people had already a hard time to understanding normal concepts like walking and cycling and the benefits of this, imagine if you throw into the mixture data spaces, transport Cloud, APIs, etc. This is definitely going to increase just the difficulties of communicating. And it's going to be a challenge to how to make this information accessible and understandable to everyone that is going to be affected by it, which is everyone.

Q: And so, do you think that's, I mean time is changing really fast, so do you think that all the deadlines that you set will be respected in the future, or is it more and more like a really long-term process?

L: The deadlines, I think are wishful thinking. And, I mean, we are seeing, we are working very hard. Like the cities want to, respect many of the deadlines, but sometimes they also want just in a wishful way, like they are not doing enough to compliment the symptoms because they cannot, because there is a lot that is being imposed. And as you say, it's very fast and it just keeps it is cumulative. So, it just puts more pressure on them. So, I'm really not sure. I mean, now the city's mission that by 2030. From what I hear from many cities, no names, basically they themselves that were selected as the pioneers, are very aware that they're not going to fulfill this. That it's just not possible. It's not going to happen. And that big issue for that is the lack of clarity on the process, on how the support is going to be given to them. And definitely this is an issue.

Q: Okay. And about these ongoing projects, what about monitoring again, do you put new objectives every time after a meeting or do you keep like that if you see that's not going really happened, what is the process to that ?

L: I mean, like for the KPIs, I mean, we like the KPIs are established at the very beginning, and we usually just work throughout the project to try to achieve them. We don't really change them if they turn out to be very low. We can, of course, improve them. Like, in terms of communication, we are doing that with some projects. We have only 100 followers and we are already like 200. Okay. Well then put them at 500. So, we do that in a positive way, but I have never seen it in a negative way for this at project level.

Q: What would be the most challenging barrier that you had to face in your projects ?

L: I think it's really, again, communication and finding the compromise between the different stakeholders and trying to find the compromise in a positive way overall. And I think this is the most challenging part when coming up with projects in general. A problem that affects, especially the southern countries and maybe the eastern countries, there is still a big language barrier. And this still exist and maybe you know, you have a lot of you have so many German partners, like, I'm not sure if this is also based only on observation, so I'm not sure if the numbers match this, perhaps not. But from observation, being in this EU project, you see so many, partners from Germany. From the Netherlands, you really see even the smaller cities

taking advantage of funds. Whereas the southern countries in Spain, in Portugal, in Italy, in Croatia, etc., in these countries, you do see the big cities sometimes, but you don't see that the smaller cities that could definitely benefit and needs, like they have the same problems in many cases, even different than the big cities. And I think there are a lot of language barriers. And we suffer it also at Polis. We see it also at Polis in how much we can rely on center Northern European members and the southern ones, and the support that they need to, to be part of the conversation even.

Q: So, do you think that the cultural barriers are really big in this kind of countries ?

L: I mean, I don't think it's, I mean, language is culture, but when I think of culture, I think more of the way that people work or the way that people understand. I don't think that this is a problem. I really think it's just a problem of language. Like we really not being able to follow, not being able to have the capacity. There are some cities that don't even have this international department, you know? Because they don't have the people. So, I do think that this is an issue, but it's not like the culture as the way that people work. I don't think that this is a problem at all.

Q: Okay. Well, great. I think that's good for me. Thank you for much.

L: Well, I'm, I'm glad, I hope that it's helpful and well, thank you again. If I can help any other time, just let me know.

Q: Yeah thank you a lot. That was really helpful. Thank you. So, okay, great. I'll let you then.

L: Yeah, good luck for next and good luck with the project and have a nice weekend. Thank you. Bye.

Interview 3 : Mario Cools, Professor in Transport and Mobility at University of Liège

Q: Quentin Georges / M: Mario Cools

Q: Okay. So, thank you for receiving me and for your time, I will just start by explaining what I'm doing. So, I'm a last year student at the Louvain School of Management and I'm writing a thesis on the different barriers that you can find when you try to implement any kind of actions, relative to sustainable mobility in Europe. So, for that, I study different, implemented projects in different cities in Europe, and the final objective was to make recommendation for the city of Brussels, which is currently implementing the good move plan. So that's why I needed some expertise, some advice and any kind of recommendation. So that's it, and first of all, just tell me a bit about you, about your background and what you are doing now.

M: Okay, so, I have two master's degree and a PhD, so my first master's degree was actually in business economics. So, and then I had a second master in statistics and then my PhD in transport engineering. So, and I'm in Liège since 2012. I'm the professor of transport and Mobility and I'm also in another university in Hasselt University, the professor of sustainable logistics. Okay, so, my research is mainly on transport modeling and on policy evaluation, of policy measures. And I try to get the governments to get, implementing some of the ideas that are not, sometimes not that difficult to implement. But yeah, that's a big challenge and I try also to, to avoid, popular themes like, to give you one, the government says we need to have a switch

to public transport now for x percent of car troops need to be changed. Sorry but with the current public transport offer, that's a dream. Customer satisfaction is a horrible service. Quality is non-acceptable. And as long as this is the case, then you can have nice dreams about the target values that you want to have for the model shift, but they will remain a dream and they need to do main actions. And a recent study of my looks at why people are so dissatisfied with public transport. And there are three reasons. Reason number one and two are punctuality and uncertainty. So problem is there are too many buses and trains canceled. For a variety of reasons. One of them is the fact that there are not enough drivers. But that, that's traumatic. If you're not, if you're not sure that your buzzer train will drive, this limits your opportunity of taking this again, and moreover, when dealing with these kind of measures, we need to take into account of psychology and negative experiences, their duration in our mindset last way longer than positive experiences. So, if you have a bus that canceled, then the fact is way longer than when the bus was on time. So, this is something government should take into account, like, what I found striking is the day that the week of sustainability started last year was the day that public transport operators started striking is like, this is impossible. And unfortunately, there is not a single politician that dares to say like, if we really want to achieve the shift to public transport, then we need to make public transport, like the police, like the army, a guaranteed service. But there is not, but a single politician of not a single political party. There's to state this openly because, unfortunately, our public transport operators are ruled by fear of the unions. And instead of innovation. Now in the case, you say you are, you're looking at Brussels. One of the other things I teach in my course is that this is ridiculous for a small country like Belgium to have four ministers of transport. Yes, of course, because the solutions for Brussels are outside of Brussels. They are not in the Brussels capital region, so they cannot make judgments. If you saw the good move plan, one of the things that they were planning also is the taxation within Brussels. That failed horribly. And of course, it fails horribly. They wanted to have a very brutal system and communicated in an unfair way as well. They wanted to have a cordon tax plus a kilometer tax. The kilometer tax would require an invasion in your car because they need a GPS tracker or a smartphone app that traces you all the time. So, privacy was completely destroyed. Whereas if they just would use the low emission zone as a cordon like they did in Stockholm. Then it would help. The problem is in and for Brussels, and in comparison to Stockholm, for instance, in Stockholm, you have a clear area where there was public transport offered and park and ride at the border of the taxation zone. In Brussels, there is nothing there because the good zones for the park and rides, they're outside of Brussels. So, the solution is there, but solution means one minister for Belgium that can solve actually things outside of process. Then yeah, another thing, and that I forgot completely. In the Good Move project, you need to keep your people on board in the decision-making process. And in good move, in some communes that failed horribly because they didn't consult people. And one of the reasons for this is the ridiculous language laws in our country that they can only consult people in a certain language. But the problem is, we touch our French, but majority speak something else in Brussels. Not Dutch and French. Yeah. So, and then you miss out and then of course when they see the implementation afterwards, they were not consulted because you didn't really include them in the process. And then there will be protests that are there. Ideally you bring them on board, but the moment that the criteria are defined, you bring them on board of the decision-making process. Well-informed, but yeah, they're there. Brussels clearly saw the thing is, if you don't communicate, in this case, maybe even in Arabic for the neighborhoods where they are. If, if the majority doesn't speak your local, the official language here, then you need to discuss and integrate them in another way, and that's what they failed horribly. Same with Covid. If you

made one of the sub models for the government. One of the indicators was the presence of certain minority groups and that, showing that your language, your information campaign is not working. At the same time, when it broke out, I was in Asia and there the things were in four languages even in pictograms. So, everybody knew what to do, even if you didn't understand any language. Here it's unthinkable that in one region they will speak the language of another region or English even.

Q: Yeah, I agree and you said a lot of interesting things, I try to just be structured with that. Are you directly working with the government on some projects ?

M: Some projects, yeah. So, we are developing a digital twin for some provinces, for modeling the traffic flow. So ideally, policy is based on system support tools like transport models. But of course, yeah, the development of transport models costs money. So, the question is how much money you want to put into place and what, again, what are the hypotheses underneath these models? Yeah. Cause models are a tool that a decision making, but they're a tool. They're not replacing the decision maker. So, if you put as an input, wrong decision, wrong hypothesis, of course, will come out, will be wrong. So, but we are looking at, for instance, in the region, we are working together with all public transport operators to try to get better cross-border connections. Okay. Because in each country, the lines are mainly oriented towards their capital, and they're not necessarily thinking about crossing the border, whereas people living in the border areas, they are often having tax benefits to actually work on the other side. So, it's important that we also consider transport connections in that regard. Okay. So, with that, I work with the government sometimes. I'm consultant for them.

Q: So, you talk about the money that it was difficult to have sometimes. What would be for you a good way to liberate, to raise more money in this activity? Do we have alternative ways, alternative financing? Do you have any ideas?

M: Raising money is difficult. I think how to raise, free research. Cause if you compared to our neighboring countries data availability and data sharing from the government, simply, it's ridiculous here. There is no other word. We are in the stone age in terms of data sharing, which is dramatic. And if you look what the Netherlands or Germany do, they provide a data in a data archive where with a simple request, with the motivation, you get the data at least, and the latest 24 hours later you have all the data. In Belgium, it's a hurdle to get data if it exists. Like for mobility, data in Flanders they have the yearly collection of data, the OVG. I'm actually the one that automatized the OG when it started to become a continuous survey. And two or three years ago, Brussels Capital Region joined the effort. In Wallonia, we only have the, the online data from Monitor from Vs Institute. But that is an online commercial panel. It's crappy data basically. Whereas a good data collection, like in the past, the last really good data in Wallonia was collected in 2010. So, yeah, now we are 2023, so 13 years ago for modeling, they refer to this online panel, but yeah, somebody who is really into the forecasting, yeah. The new data is really rubbish. Sure. You cannot do anything about it. And the behavior is quite different between Wallonia, Brussel, and Flanders. So, we need to have decent data that, there's just not existing even. And one of the reasons is, at the level of the government, they believe too much in big data. Like data from cell phones. But they are useful, but they don't replace the context richness of classic travel survey data. So, I was invited as a keynote in the biggest conference in transport in every January there is the Transportation Research Board annual meeting in Washington. And then I did the same story. It's like, Big data is useful, but big data, the vendors of this data, they

don't show how they use, how they combine all the individual information. So, if there is no guarantee whatsoever on the quality, and yeah, it's not a ground through data. It's useful data, but neither like a survey, nor big data is ground through data either, or our government sometimes thinks too much that big data is ground through data. And that is not the case.

Q: And is it a problem with tools for collecting data or do you need to develop other kinds of tools?

M: It's got mainly, again, costs. Good data costs money. Like for the Flemish Travel Behavior Survey, for one household, it's hundred euro. So, it's a cost issue and, but how can you do plan if you don't have, if you don't have decent data decent basis on which you are saying, we want to have sustainable mobility and we want to impact the model share. Yeah. Then you need decent data on the model share. So, you need to have behavioral service data, ideally every year that you can see how it evolves. But if you don't have anything, then it's like, I sometimes consider the policy making like, that you're looking like in a, in a glass fair, and know the future. That doesn't work like that, unfortunately.

Q: Okay. Talking about the future. Do you think that, as it stands right now, the Sustainable Mobility Developments are really dependent on new technologies, of new ways of thinking, or is it something that you can do with what you have right now?

M: Actually, I think the most crucial thing, and that's the challenge, is there needs to be an integration between urban planning and transport planning. There should be one, because the only way of becoming more sustainable is if we are more careful about the mix of functions within ourselves, within our land use. And everything starts with why do we travel? And that's because we have a spatial separation between where we live and where we are doing our activities. If you get them closer somehow or mixed, we don't need to travel. But the problem is if you make decent urban planning, you need to keep it and not change it in function of a real estate developer that gives you some money. The effects of this are visible only after 2030. But the big changes towards sustainable mobility are there, the other things I call it always mingling in the margin. You can make some improvements. Yes. But the real sustainable things, not really. And that's a challenge. Of course, there are things we need to do, right? We need to invest in walking and cycling infrastructure considerably more. Because there are many gains to acquire. However, the fact that we are all scattered makes it difficult. In my rural village, the best connections are not good, but I cannot request better connections. Unfortunately, public transport serves two purposes: to transport masses of people efficiently from one place to another, and to provide accessibility to everyone. However, the solution is a mix that serves both purposes but inefficiently. Buses often take long and unnecessary routes to provide accessibility, making the journey longer. Public transport is becoming less of an option for many people. For instance, if I travel to the Solbosch campus in Brussels, by car it takes me one hour and 10 minutes, but by public transport it takes me two hours and 50 minutes, even if I get all my connections. I prefer to be early and comfortable, even if I'm stuck in traffic for half an hour. This ratio should be used as a tool to check the feasibility of switching to other transport modes, which is not discussed on a local level. Short-distance trips are mostly made by car, although there are alternatives such as walking and biking infrastructure that should be very safe. If we do not provide these alternatives, public transport is not a viable solution. There isn't a market there also, because the waiting time will be too long to be a real option. And where I live, close to Hasselt, we used to have free public transport here. The free public transport increased

ridership by a factor of nine or eleven. But the problem is, who are these riders? They came from pedestrians and cyclists that were coming to use the bus, and primarily some car users. That's not your target group, because you want them to keep walking and cycling for the benefits they provide to society in terms of health and cost savings.

Q: What is the main reason that people are still using cars? Even for short trips ?

M: One of the reasons why people choose to use a car is because it's more convenient. If you have a car, it's easier to deploy it whenever you need it. And if you're going to the grocery store, for example, you might need to buy a lot of things that are difficult to transport by bike or on foot. Cause it's too heavy. So, for grocery shopping, we all created these big super huge supermarkets. You drive there, buy everything, and go back. If we look back in history, we had a local supermarket on every corner that sold products for daily use. So, you went way more frequently than you could walk. But now we have to drive, basically they are all big. It changed with super cubic areas with a variety of goods. So, I think that's one reason. I believe it's a self-inducing cycle for school transportation. It's a virtuous cycle because it's not safe enough for children to bike to school and it's not safe for parents to accompany them on bike either. Therefore, we resort to driving, but that only increases the insecurity for others. Okay. Problem is, if you look at the location of many schools, unfortunately we were again, and that's again where urban planning plays a role. Many of our schools are located on the main corridors. On the main transport corridors. Yeah. They're my goal, my recommendation is really all the long term, there shouldn't be a single school on the main transport corridor. Yeah. Because what happens, we need to put, so dirt's zone or, or dynamic zone dirt's when the school is there. It's a transport corridor and there are some streets that really have a function transport and, of course, there shouldn't be small children on such an access. And that's a complete mismatch of course to solve this. You need many years, 20, 30, 40 years to solve this problem. When we are confronted with this today and we are confronted with this 10 and 20 years ago, we should put it into action. We should not just say, ah, yeah, okay. It's like that. No, you can't change it. You, the change is not emitted, but the change is possible. And that's something we are saying. Ah, yeah. But that takes too long. Yeah. But like that you will never really get to your target. And that's the challenge. And especially if we don't translate it to politics. Yeah. The duration is always way too small. Before there is another team that could reverse all the decisions. So, we should really have strategic thinkers and that's what an economic student, the principal agent problem. Our, unfortunately, politicians are mainly driven by gaining reelected. Rather than having a long, and irrespective of the political college, it is instead of long-term plans. Same couple of years ago, there was the discussion on the, on the company cars, our company cars bad, yes or no? For me, company, and I have a different vision than my colleagues, but for me, company cars are not a problem. The income physicality and the excess of company cars will disappear automatically. Company cars are fever, they are not good, but the, the excess of company cars are not good, but it's a symptom. The real problem is the income fiscal make it equally easy to give cash equivalent for a car. And what will happen is, at the size of the company cars, those that really want the car will shrink because if you get 600 euro, maybe you will drive around with 300 Euro car, which will be much smaller, and the other 300 you will use for other purposes. So, make it equally expensive for a company to give cash benefit instead of a car, for instance. The problem is for making that you need a gradual transit. Because you can, you need to fix, you need to change your physicality and you need to see how much are the values that you are really put and how to translate this into, into salary schemes. So, you need a gradual harmonization of what is possible.

Cause now you have a high variety of cars. You should string the level, but to make sure that nobody really loses economic power, you need to do that in a very gradual way. But that, you need 12 years, in my opinion. You need 12 years to do this, but 12 years is basically four governments by three or four. Governments that maintain the same philosophy. So, the way to do it is clear. But yeah, you need continuity in the vision. And you cannot do it in one move. If you do it in one shot, people will actually lose money and it's your hardworking people that will lose money. So, you cannot do that if you gradually do it. Nobody will be impacted financially, but gradually, that means at least 12 years to harmonize the differences. And then you can, in each wage scale, find a move towards common value, but not in one, not in a single shot. And that's how he burned himself into politics, whereas, we need to have visions on the long term. And the fact that we have every four- or five-years elections doesn't help in this long-term objective.

Q: And what's for you would be a way to change this behavior, either or top or lower level ? In terms of that just people are using cars and you say that politics don't want to promote actions, bet against that and everything. So that's actually a matter of behavior, you know, between people. So, kind of self-consciousness of all of that. So, what would be a way to change that?

M: I think there is a higher awareness already. So, the fact that the fuel prices are very high makes us more aware as well, and there is the role of Europe to play. If we really wanted to come to something then, the most efficient way of doing this would be by fuel tax. But the problem fuel tax is national and then you need to have a European thing. So that's one chance. The other thing is, we have too much, like I said in the beginning, we should have one policy for the entire Belgian region. And one of the failures of the tax in Brussels was the Brussels people would've got a reduction in their annual tax, but the rest. Which creates tension between the regions every, for a small country like ours, we should have one same vision and we should take into account that there are certain abbreviated regions and because we organized a seminar a couple of years ago with the BFI that is the Bens Association of Transport Researchers. Where we were, organizing a session on road pricing and to my big price, the Union of Enterprises, they said, yeah, we need to start with a flat. No, a flat kilometer tax is so everywhere at the same price is absolutely ridiculous. And this favors the provinces that are already having a lack of job employment like Limburg and then, because they will have, they don't have enough job options, so they are forced to travel to Brussel to find a job anyway. So, and then you're gonna say, good that you come and now we tax you because you come from there to Brussel. There is complete absurd. So, from an environmental economic point of view, you can calculate them. But then there needs to be zero in, in certain regions, and of course, near congested regions, you need to charge more, but not in the non-congested regions. But the problem is this means we need, and we need a coordinated system for all Belgium with intelligent politicians that understand the instrument. Sorry to say, but we don't have such politicians that have this level of knowledge and you should have coordinated principles, which is not at all the case because the different governments have a different vision of this. And that's the real challenge how to harmonize this. And in my opinion, this is only one way that's with one. So, in fact, I'm a real advocate for the revitalization of urban planning and transport planning, but if we see the current propositions of political parties, there is not a single party except one which never got 5% that proposes this. And I think that's the only way out to be honest. Especially for Brussels. Yeah, the solution is not in Brussels itself. Cause once they are already in Brussels, it's already too late.

Q: Okay. Yeah. I see. And so, there is obviously a problem in collaboration between all these broads. So, what would be a way to just improve this collaboration for you and this communication between parties?

M: It would help if we had similar parties in charge. But even that for certain ministers. Now this is actually finally the case, but then still there is no coordination between the regions. They should work together. They should get, I think, punishments by the European Union and they are on the verge of being given. I think that could be a steering force, but the problem is yeah, they need, they really need to develop things, and I will take OSUs as a good case. Sometimes it's just a matter of providing the solutions. Eh, if you see as an example, dedicated cycling infrastructure was given and then they are being used. So, if you give the solutions and you secure them, actually the users will pop up. So, the other thing is we sometimes need to be careful in legislation of what is happening. I'll give an example with electric scooters. Yeah. They're popping up everywhere and they're actually harming, especially for people with mobility restraints. So, if you saw the election in Paris just recently, there was a population survey to see whether electric scooters were needed or not in the city. And they forbid electric scooters now. I guess it's just a lack. These things have popped up and it's good that we allowed this technology to develop, but legislation should follow. Like if I look here next to where I live, at the moment, there is a problem with electric bikes. Even the normal ones, not only the pedals and the legislation didn't follow, but they are also driving at a very high speed, so they should be at least feasible. So, the normal electric banks or the Caminos from 10 or 20 years ago drive very fast and there is a problem with it. It's good that their data speed gets faster with the bank, but they're not feasible enough and often the users don't have the capabilities. So, if we see accident counts with electric banks, they have gone up, they have tripled in the last year, and one of the reasons is the capability of the users. Also, of course, the other road users are not used to it, but they are often considered weak modes. So, it, and I think there are easy rules to make it easier if, if they are driving an electric bike, force them you to use a helmet or to use at least the, the minimum yellow jersey. Yeah, the yellow jersey, it's not intrusive, but then they are at least visible either as a car user, you can see them more clearly. You don't anticipate that they will be there at such a speed. So, if you force the yellow jersey then they are clearly visible and then you have more, a higher, longer reaction time making everything safer. Same with the electric scooter. If you have an accident, you have 95% chance you will have head injury. Yeah, so for the electric scooters, 95% chance of head injury. So, we should provide, we should oblige the helmet because that way we could reduce the number of head injuries, but nobody proposes this. And then I have like the incidence rate show that this is. A crucial element. So why not do this?

Q: Yeah. I see. But don't, don't you feel that maybe they don't want to oblige this because people will use this kind of mobility less?

M: Yes. But then the question is, what is the end goal? So, one of my propositions is, the minute that they are not using that, they're not a weak user anymore. And they should have more, a higher responsibility to make them more aware of their actions. Now, often they are like, ah, we are prioritized anyway, where I think there we need to change. You are prioritized. If you take all the safety precautions, then yes. If you don't take safety precautions, you're just a risk taker. Okay? That's a fair deal. You are still allowed, but then you are not considered as a reach, anymore because you don't use your pro. You selfly defined not using the protection that was prescribed. In my opinion. There is a lack of respect even from, from these electric bikes towards

pedestrians. I walk, I'm somebody that walks actually quite a lot functional walking and yeah. Damn, just dangerous. And even with cycling when I go with my kid Yeah. My boy, he doesn't cycle straight. There is still variation in the path. Yeah. You need to give children an opportunity to improve their skills and if I see it, what speed they fly at is like, this is the rules. We're not intent for such behavior.

Q: Yeah, true. What would be a way to just improve this behavior, I mean, is it by education? Is it by promoting campaign? Any ideas?

M: Yes. Uh, making them aware, like, also good legal decisions. Like recently here, there was an accident between, speed lane and a cyclist. Where the family on the speed lane was accusing the pedestrian of couple of hundreds of thousands euros damages. And luckily the police judge made ruling. Yeah, even if the pedestrian was on the cycling infrastructure, there is no walking infrastructure. So, you should have respect for each other. So, it's not just that you can drive bump into it. This, the pedestrian was clearly visible. You just drove too fast and too wild with the electric bike. So, the electric bike was in this case, by the police judge. But that means this kind of thing makes people aware. We are, even if you're in the cycling lane, you don't own the cycling lane. And this is a very unfortunate event, but I think yeah, by such events, make it clear like the road is not for everybody. So, clear communication, education and awareness campaigns are important to emphasize that unsafe behavior by vulnerable road users can result in penalties for the responsible party. It is essential to communicate that vulnerable road users are not necessarily weak users and that they must take responsibility for their actions on the road. But I know that is a very delicate one because of many of these organizations. But then this mode will be less used. But now there is a problem with safety. The accident rates are increasing rapidly. So, the success of the mode has, this has its downside now. So, we need to at least tackle the downsides or the accident counts will keep on increasing. Yeah, and for me, the yellow jersey should be, with electric bikes, should be obliged. Recently in the Liège campus, there was a SPK coming on a roundabouts. When I entered, there was no spk when, when I was actually starting to drive again, he was in front of me and the only reason why I was able to brake was because he was clearly visible and was wearing the yellow jersey. If he wouldn't wear the wear jersey, he would be, I would've touched him. But, and that's why visibility is, in my opinion, a very underrated and crucial thing. Your speed is higher, so the, the importance of being visible also becomes much, much higher. So, and what is the problem of wearing it at the end of the day? It's for the helmet, then they're saying, yeah, the hair. Uh, but for the jersey, come on. This is really no, no brainer. Yeah, no, that's true.

Q: But so, you think that's, there's a clear problem in the legislative framework for this kind of micro mobility, right?

M: Yes. The fact that the legislation allows it is good on one hand, because we need to explore how these things go. But like for the, for the electric scooters, the parking behavior is a problem. So, the legislator should follow. Where can you park these things? Maybe it's also a question of infrastructure indicated clearly on the pavement where it is actually parking for these devices. So, it's both a legislation part and the space should be self-explanatory. And of course, if done behaviors are not good, then you should also see if people are not following decent behavior, what to do with it and who makes responsible, if you put it in the middle of nowhere.

Q: Is it some kind of action that is taken right now from businesses, related to sustainable mobility? Do they take action? Do they promote that? And is it something to do with business?

M: Ah, yeah. So, there are companies focusing on providing sustainable mobility solutions, and MoPac, for instance, is one that is active in Brussels. Uh, and that's the, the CEO is actually one of my former masters in DC students. So, and the artist, the like shared mobility is definitely one of the ways out if in in urban centers. I think this kind of shared mobility in two senses is shared in the sense that you don't own your car anymore and you can share a car between households or with a system that shares it for you. I think that's a good, good example. Or shift in the terms of ride sharing. Eh, if we see the average occupation of a car in Belgium, it's 1.2 people in a car. That means at least 3.8 spaces are free. And that, that are things that are currently not being used. So, I think there is huge potential, and focus on shared bikes. Some cities have real success with the bike sharing system. The thing I think that needs to be further developed is why you need to pay extra. If you ride your bike on board a train that seems strange that you have to pay extra for this. So, this core modality should be much, much wider.

Q: Couldn't companies do more for their employees to promote such actions ?

M: The question is there to have a general rule at depends also on what the alternatives in urban area that's clearly much easier to stimulate. Uh, these measures are in comparison to if you are in a more remote area and you're from Louvain-la-Neuve, right? Yes. So, we place in the middle of nowhere, some campuses. Okay. You have a train station in Louvain enough, so it's okay. I don't know whether you've ever been to the campus in Liege. So, the last hill on top of that hill at the famous hill on top of that hill is actually the university. That makes, so outside of the city, 12 kilometer from the city center. That's not accessible, huh? Things and, and many of our universities are placed in the middle of nowhere. So, these main attractors, it's clear that they should be next to main transport perhaps. And if that's not the case, then you are creating a problem. Yeah. And, and that's why it'll be very challenging to tackle our mobility behavior. Cause that means we have to find, redevelop our places where we are actually putting our main attractors. And there we did an unfortunately, very bad job. Many of these main attractions are in the middle of nowhere. And then, yeah. How you get there? How do you organize transport in an efficient way? And that, that's like for, for our campus cycling is impossible because you need to be trained cyclist to be, to be able to go up the hill. Yeah. And uh, the alternative is an electric bike, but for electric bikes you need safe infrastructure to shelter your bike. Cause it's an investment of two, 3000 euro for an active bike. You don't want people to steal or damage your electric bike. So, if I see my lab, my PhD researchers, they take their electric bike into the office, just out of fear, for not having, their bike stolen. So yes, we can do things. We need to make sure that like simple things like facilities. If you come back and you sweat that you can change that you, that you have lockers and showers. These are things that should be invested at the level of a company. So, we could stimulate and there are some actions and stimulations for getting these kind of rewards. So, there are things, but yeah, the thing is, these are options for people that don't live too far and that have this alternative.

Q: Okay. Do you think that all the deadlines about sustainable mobility will be achieved on the horizon? Like I see for example, the 2030, which is a lot of actions, right? Say, do you think that we are moving fast enough? We think that we are promoting enough to achieve all what we, all that we want.

M: Yeah but, I will return with the question is what we want, what we really want. For instance, the electrification of our fleet. A few days ago, Vias published a report on the total lifecycle equivalent emissions of electric vehicles, showing that they're by far the best, but everything falls and stands with the number of cyclists that the battery can charge. At the moment, electrification of our cars is not possible. Simply not possible. The peak demand for electricity will be way too high. And for this to be possible, we should be able to uncharge our cars as well to use the batteries for the demand at peak points. But this will imply that we have more cycles of them, because each time you charge and uncharge, if you charge again, it's another battery cycle. So, this will dramatically increase the number of battery cycles. So, reducing the battery life. And if you don't. The life cycle analysis, all of electric cars, then it's not that positive anymore because then the batteries, the generation of the battery is the thing that is the most pollutant. And then it means these cars will be barely better, if not worse than traditional cars. So, aren't we way too positive also? If we don't allow bidirectional charging, which we charge during the day at our work, cause that's when solar energy is available. If we are able to charge at our work and we plug it in back at home, then we are already half the life cycle of our battery because then we, we double already the number of cycles. So, these are things that in these scenarios, they don't take into account. Whereas, yeah, this already makes yours, then if you just double the emission of the battery in that calculation, then they are the same, like a diesel car, right? Like, from 2028 onwards, I cannot enter Brussels anymore, whereas I have a Euro six, diesel car, my fuel consumption is five liters per hundred kilometer. Why this car should not be able to drive. It's a very efficient car. It has a root filter, it has all the, all the technology that it needs. Why we wouldn't be able to drive in it because it's not an electric car? But if you take this high segment of, newer diesel car trip in the same margin as the electric cars. So why forbid them? I think they are too dogmatic. Of course, we should, we should aim for better technology in each segment. But why focusing on one segment alone, I think that's a huge error. Especially like, can you imagine that in the near future we will have blackouts. If, by the measures we are taking, we are putting ourselves in a country that is, that is more sensitive than ever to blackouts, for me, like in a developed country, is it really the path of sustainability that we want? I think sustainability has three dimensions. The social, the economic and environmental. Yeah. Focusing on the environment by blowing up the social and the economic. I don't know whether that is a really smart thing to do. Of course, we need to improve and that is crucial. But without being dogmatic, I think. Because at this moment, we are driving straight to blackouts because the peak hour demand, we cannot, do we have enough energy? That's not a problem. So, the ones that say we have enough energy, that's true, but we don't have enough energy during the peak hour. And this we will not solve in any way. The only way we can solve this is by directional charging. And for your information so far, there are zero Elec manufacturers that allow their vehicle to be uncharged. So, to put the power back on the grid, there is not a single electric car that allows this at this moment. Yeah. So then there needs to be a lot of changes in the coming years for the car to develop. And the big uncertain thing, if we are really gonna earn charge, what is the impact on the battery life? And you don't hear any of these lifecycle analysis talks about that. The only thing they say is, yeah, but batteries will improve. Yeah. Hopefully. But this is an uncertainty. So, we are doing an extreme gamble at the level of the European Union. Of course, there will. Perspectives, but why forbidding it isn't part of the solution. Just make sure that, that we become way more efficient and like one thing that I find surprising, one of the problems is that our cars get bigger and bigger and bigger. Why does Europe forbid classic cars, but why they don't forbid this type of vehicle? Even electric is way worse than a diesel, small diesel car. So, isn't part lamentation on the size? If we really want to go for the environment, they should do that. So, it's,

yeah, it's a bit biased. Also, electric vehicles. Some of our parking buildings will not support the weight if everything becomes electric. That is another structural question.

Q: Yeah, true. Um, but so you said that we should consider other options, other sectors. Do you think that there is enough space to promote innovation in this in different sectors, or is it like really hard barriers to entry in a new market?

M: Yeah. The thing is that we are depending on Europe, and even Europe is a market where, where you could argue that we are too small and we need to look global. But at least this is at a level of European thing. And then the role of some countries, they play a more dubious role and like Germany, that of course wants to protect its car industry. Because if we really want, like, and that's, that's my example of SUVs. If we really want environmental, why they didn't put requirements on the size of cars rather than which engine type. Cause the size of cars is way more important than the engine type. So, yeah. But that's of course, because they have their market niche and they want to sell their big brands everywhere in Europe. The thing is what they will develop also like for cars, and even if they are discussing our plane travel and there, nowadays there are like my university as well, and we cannot use the plane if within six hours we can reach there by train. Okay. But if we see the technological. The technological development in Belgium, in the world on short distance flights. There are actually a lot of developments on electric planes. And these electric planes will be way more efficient than a train. In terms of environment. So soon, not now, but in the near future, by, in at least 10 years, these electric planes will be there. So are we gonna fast update our travel plans then that we again, can fly for short distance at that moment because then it's more energy efficient and more environmentally friendly than the train. So, Okay. It's good that we forbid now but then we need to have enough flexibility to change when the new developments are there to update our plans and to update our strategies. I'm afraid that we are quite rigorous, strong and don't change enough. Like the same with the diesels, they will be banned in Brussels from 2028 onwards. Is that a smart thing? Because what happens with, especially people that don't have the financial means to update their vehicles, electric cars are still way too expensive. There are no, even small cars, they cost way more than a typical budget for a car. So, we are gonna isolate people and I think there will be a kind of divide. That's something we need to be very careful about.

Q: What about the, the monitoring of all projects? Do you think that do we do enough? Do we monitor enough? Do we collect enough data of past projects?

M: No, no, no. Like I gave the example I did, we have a travel behavior data collection that happens for Brussels and Flanders hasn't happened for ball. So now, the data needs to be accessed in open access so that researchers can work on it for free. Because if you have yours, if you're doing your master thesis and you have the data, yeah, then it's easy to do some analysis on it. But getting the data, finding where the data is horrible and, and especially if I compare it to Netherlands, the UK or Germany, there, everything is so far easy and you can get all the data in a very short amount of time. In Belgium, for traffic count data on the balloon highway, I'm asking for years. I'm requesting data. I don't get access to them. I find that very strange. They are dead maybe. The same happened in the Flemish case for the, for the FL Care Center, the Flemish Traffic Control Center. They need to give the data, but yeah. Is that the way we need to do that? We really need to sue the government before they will actually share. So, we are there. We really need to go much, much, much further. Okay. So, and of course, having a database, making them available that people can do objective analysis. And then the nice thing is, if the data are there,

yeah, people will use them and will analyze them. In the case of massive, this is in the case of PhD research. Not that they don't necessarily need to fund it, but yeah, if the data is not there, of course then what will happen is researchers will find another case study that they will do it for the Netherlands.

Q: Yeah. Okay. Um, well that's great. I think I have a lot of thing. Um, if you have to sum up all this. What would be the biggest barriers to sustainable mobility here?

M: Yeah. The fact that urban planning and transport planning are not integrated. Cause they should be one on the same team. So that's one. The fact that we are scattered into four ministers instead of one. That's the other. And then that due to this scattered system, there is a lack of long-term vision. So, there is no guarantee we would end up with the great visionary that makes a perfect plan. Even if we would have that, then we still need to require to be continued and the chance that they get screwed in the middle of the process is quite high.

Q: Okay. Thank you. I think that's all from me. I got a lot of interesting things. Thank you very much for that. Thank you for your time.

M: Great pleasure. Good luck with your thesis. Thank you very much. Have a nice day. Bye.

Abstract:

This study aims to provide a theoretical list of barriers encountered when implementing an action or measure related to sustainable mobility in Europe. Our theoretical basis is based on actions already implemented around the world to list and categorize the different forms of barriers encountered. This theoretical list is then confronted with several case studies in the cities of Seville, Nottingham, Helsinki, Oslo, and Turin. After analysis, it is found that institutional, knowledge-based, organizational, and socio-cultural barriers are the most common types of barriers encountered in the implementation of sustainable mobility measures, despite the different environments and contexts. This analysis is complemented by the study of a project currently being implemented in the city of Brussels, namely the regional mobility plan Good Move. After the analysis and interviews of experts working for a long time in this field, we were able to establish recommendations for the future development of the project.

UNIVERSITÉ CATHOLIQUE DE LOUVAIN
Louvain School of Management

Place des Doyens, 1 bte L2.01.01, 1348 Louvain-la-Neuve
Boulevard Emile Devreux 6, 6000 Charleroi, Belgique
Chaussée de Binche 151, 7000 Mons, Belgique

www.uclouvain.be/lsm