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The Present and the Future of Fare-Free Public Transport and Sustainable Public Transport: The Cases of Avesta and Tallinn and The Visions for Luxembourg and Uppsala

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THE PRESENT AND THE FUTURE OF FARE-FREE PUBLIC TRANSPORT AND SUSTAINABLE PUBLIC TRANSPORT: THE CASES OF AVESTA AND TALLINN AND THE VISIONS FOR LUXEMBOURG AND UPPSALA

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Abstract:
This research intends to illuminate the concept and application of the public policy named fare -free public transport (FFPT), using the cases of Avesta and Tallinn and analysing future applicability of it in the cases of Luxembourg and Uppsala city. The analysis explores the fare-free public transport policy and the theory of sustainable transport. The study presents the different benefits of the policy and its limitations, and how the FFPT is connected to sustainable transport and sustainable development theories and application. Through a case study analysis based in literature review, the analysis of both cities wants to elucidate the application of the FFPT as one important policy tool within cities both for the environment and for the people, and how the policy can develop in the future. Considering this, the presented research also opens the possibility of expansion of the policy to other cities and countries.

Keywords: Avesta, Fare-Free Public Transport, Public Policy, Sustainable Development, Sustainable Transport, Tallinn

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Summary: The constant growth of car ownership in the world and the proliferation of private transportation is a threat to the environment and to the most vulnerable people in society. A public and free access-based transport system can be one effective additional way to tackle both environmental and social issues within cities. This study wants to illuminate a growing policy named fare-free public transportation. To do that, two cities that implemented this policy were analyzed: Avesta and Tallinn. Avesta is a town in Sweden which implemented this policy with relevant results. Tallinn, capital of Estonia, is the biggest city in the world promoting complete free access to the public transport system to its citizens. The presented analysis will illuminate the concept of fare-free public transport and sustainable transport, also being possible to see its strong and weak sides and possible implementation in other cities. Moreover, Luxembourg will be presented as a future vision for policy implementation, as the first country to implement the fare-free public transport in its whole territory. Finally, Uppsala, the fourth biggest city in Sweden, will be analyzed as a possible future city that could consider implementing this kind of policy, reinforcing its efforts of becoming one of the most sustainable cities in the world. The fare-free public transport policy alone is not enough to solve all environmental and social problems in a city. However, it can work as an important element of public policy to the people and to the environment, and, most importantly, to the most vulnerable classes of society.

Keywords: Avesta, Fare-Free Public Transport, Public Policy, Sustainable Development, Sustainable Transport, Tallinn

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Contents

List of abbreviations, acronyms, and units

EC – European Commission

EEA – European Environmental Agency

EU – European Union

FFPT – Fare-Free Public Transport

GHG – Greenhouse Gases

ICT – Information and Communication Technologies

m^2 – Square meters

OPCC – One Planet City Challenge

PM – Particulate matter

PM2.5 – Particulate matter with a diameter of 2.5 μm or less

PM10 – Particulate matter with a diameter of 10 μm or less

PT – Public Transport

SDG – Sustainable Development Goals

SEK – Swedish Crowns

SSC – Smart Sustainable Cities

UL – Kollektivtrafikförvaltningen UL[1]

UN – United Nations

μm – Micro metre[2]

[1] Public Transport Administration UL, was formerly known as Upplands Lokaltrafik until January 2012.
[2] This corresponds to one millionth of a metre or 1×10^{-6} metre.

1. Introduction

This chapter raises awareness about private and public transportation, enlightening the reader with some environmental and social-political components existent in these systems. It is also presented a personal view and motivation to write about these topics. The Fare-Free Public Transport is presented in this chapter as a phenomenon, together with its potential benefits for different areas, such as health, environment, social and economic. The empirical problem is presented focusing on different examples of the FFPT application around the world and the connection of the FFPT and public transportation with the Sustainable Development Goals is presented. Finally, the chapter ends with the aim and research question for the study.

It is well known that urban traffic levels and private car's market share of transportation, throughout Western countries, are an urgent matter to a sustainable society. For Tuisk and Prause, there is a political agenda based on transforming urban transport to a more sustainable model growing in different parts of the world.

They argue that

> "Greening of urban transport is high on political agenda after increasing pollution problems in cities all around the world. Different strategies for sustainable city transport are discussed comprising e -mobility, reduction of vehicles in city centres or free public transport. All these approaches have their pros and cons, but with the integration of digital technologies into transportation systems and infrastructures free public transport has gained importance." (Tuisk and Prause, 2019, p. 3).

For the European Commission (2004), road traffic is one of the main factors affecting the quality of life and the quality of the environment in our cities and towns. This shows how transportation affects the three sustainability spheres: social, environmental, and economic. The social aspect refers to reduced mobility within the public spaces and welfare losses. The economic aspect embraces elements such as the inefficiencies in terms of external costs of transport and rising car traffic congestions. Finally, the environmental aspect includes local and global pollution through greenhouse gases (GHG) emissions and health problems, together with the direct impact in livelihood and nature when the construction of new roads are considered (Fearnley, 2013). Moreover, more than that, public transport and the fare-free public transport (FFPT) policy go beyond strict technical and urban planning reasoning, reaching a social and political spectrum of discussion and affecting people's lives in a multidimensional way (Kebłowski *et al.* 2019).

At one point, mobility is vital for the right to the city. At the same time, public transportation is also fundamental for sustainability and quality of life in cities. Considering both points, a third emerges: the subsidies from the State[3] for this service. It is somewhat accepted over the Western societies that the number of private cars and its market share is increasing. Hence, high urban traffic levels are not sustainable (Fearnley, 2013). At the same time, traditional social public services provided by the State and tax-based, such as education and healthcare, cannot be accessed without some sort of transportation. Therefore, transportation is a social, environmental, and economic issue and a Fare-Free Public Transport (FFPT) can be one possible solution for a sustainable, democratic, and solidary society.

The personal interest for public transportation arises from this public service being usually left out from the main important offered public services, such as education, security, and healthcare. In Brazil, my country of origin, public transportation was added to the Constitution as a social right in 2014, by a parliamentary amendment. After that measure, nothing really changed in practice. Public transportation in Brazil continues expensive, inefficient, and pollutant. Public transportation has different benefits for society, and this is a

[3] State here is defined as a "political organization of society, or the body politic, or, more narrowly, the institutions of government" (Encyclopedia Britannica, 2019).

strong motivation to understand better how this service can positively affect people's lives. Economic benefits are most often the main concern of policymakers and system operators. I have been myself a policymaker and had many arguments with elected officials reasoning on the importance to see public transportation beyond the numbers and figures of financial perspectives. Unemployed people in need to walk 10 kilometers per day in order to find a job was common to see, as they could not pay for the public transport fare. Even if using only the economic perspective to understand the public transport as an important gear for the societal system, it was clear that the local economy was being negatively impacted, as the most vulnerable populations had no access to services and opportunities.

Another important breakthrough in my life, including public transport, was the beginning of massive protests in Brazil, initially against the increase in public transport fares in São Paulo, the biggest city in Brazil. The Movimento Passe Livre[4] was leading the protests on the streets, which were violently suppressed by the Military Police of the State of São Paulo. This violence backlashed and the protests started to emerge in many other Brazilian cities and capitals, initiating what was later on named "The June Journeys" of 2013. This social movement, explains Kębłowski (2019, p. 11), "referred to the question of increased cost of using collective transport to highlight and contest stark inequalities between the highly-mobile car-driving urbanites and PT-bound urban poor, as well as to voice criticism against the continuing commodification of transport." Although I was not a member of the movement, I was, already in 2013, an effective political agent, not just as a citizen, but as a public servant, a political party board member and an activist to social equality. The demands of the Movimento Passe Livre for FFPT, according to Kębłowski, "constituted a radical attempt to create an alternative to capitalist modes of producing transport policy and infrastructure, and to lead 'the struggle for the new commons'– away from purely economic or 'sustainable' considerations" (Kębłowski, 2019, p. 11). On these terms, I was part of the protests in 2013 in Brasília, which culminated with dozens of thousands of people surrounding the Brazilian Parliament asking not just for the blockage of the fare increase, but many other popular demands. The diffuse character with which the protests developed, led to the collapse of the popular movements and the weakening of the public transport agenda.

Following these tendencies and perception of the socio-political components of the FFPT, the fare abolition plays a bigger role, outlined as an act of resistance to control and surveillance. Kitchin (2014) argues that smart cards and ticket personalization, barriers and identification systems used to admittance to public transport can be used to track and trace passenger travel, reducing people's freedom and anonymity. Finally, Kębłowski emphasizes the potential of the FFPT to "improve the working conditions of PT drivers, who can focus on greeting and driving passengers, and do not experience insecurity related to cash handling and confronting fare-dodgers" (Kębłowski, 2019, p. 11). In Brazil, for example, it is common to have a fare collector in the buses, besides the driver, which is a disqualified workforce position. This worker could be used in other positions, as a driver, for instance, allowing that an expansion in the number of buses would integrate this workforce in a more qualified and better-paid occupation.

The FFPT is far from being implemented in a continental country as unequal and corrupt as Brazil. However, there are a few good examples and efficient models running. In my hometown, Brasília, the Brazilian capital, students do not need to pay for public transportation up to four uses per day. It means they can make one round trip to school and one extra round trip per day, free of charge, including weekends. The financial cost for the State is likely to be below the social gains, in a city that some students live kilometres far from the school or have no access to leisure and culture without traveling long distances for that. This policy's implementation success was as consolidated that even political parties that were against it and made it to power could not revoke this right acquired by the student classes.

[4] Free Fare Movement, in direct translation.

In the European Union, it is common to see a solid infrastructure of public transport in many countries. Nonetheless, the fare system can still be a heavy burden for people to use public transport or have the option and opportunity to use it. The European Commission points that "a clear majority of Europeans believe the best way to improve urban transport is to lower the cost of public transport (59%) and to provide better public transport (56%)" (European Commission, 2013, p. 37). It gets clear that "pricing is one of the policy instruments that can be conceived to bring about a modal shift in favor of public transport" (Cats *et al.*, 2017, p. 1084). The authors continue saying that these measures had high support and accordance coming from all travel mode users, but with especially high approval and support amongst those that understand heavy traffic and road congestion as an important concern. The European Commission research also points out that lowering fares was the most frequently selected instrument for half of the 28 European Union member states. In contrast to it, only 9% of the respondents accept as true that road pricing is a good measure to enhance the quality of transportation (European Commission, 2013). The most impacting numbers in this section of the European Commission study is regarding the interviewed users in Sweden, that was "the most likely of all Europeans to report that urban transport could be improved by lower prices for public transport (79%), better public transport (84%), improved cycling facilities (65%) and charges for road use such as city tolls (24%)" (European Commission, 2013, p. 5). A transport system that can be reliable, punctual, cheap (or free), comfortable, clean, safe, fast and efficient would not just make it easier for private transport users to migrate to the public system, but also give an extra opportunity for those that are marginalized in society to have the right to move freely within cities.

1.1 Phenomenon

One of the main purposes of public transport is to offer accessibility to anyone in society, especially to those with limited choices of mobility (Manaugh and El-Geneidy, 2012). The authors continue, saying that in recent decades, "urban transportation planning has shifted in focus from increasing infrastructure capacity for automobile traffic to broader policies with environmental and social dimensions" (Manaugh and El-Geneidy, 2012, p. 4). Plans now include goals that express principles of sustainable development such as improving air quality, reducing automobile dependency, and promoting active modes of transportation, including public transit.

The term Fare-Free Public Transport is referred to as the policy that reduces the ticketing price of public transportation to zero. Therefore, this is the proper term to be used "rather than the common 'free public transport', since this policy is not free-of-charge" (Cats *et al.*, 2017, p. 1). The FFPT is not a totally new idea, historically. There is a public debate for decades, in many countries, which discusses whether public services and goods should be completely free, for many different reasons and arguments. In this sense, for public transportation, the idea would be "granting universal access for everybody, also handling this way road congestion, and reducing the negative environmental impact caused by various modes of urban transport" (Tuisk and Prause, 2019, p. 5).

This kind of service exists in a vast number of countries, however as exceptions. Public transport companies already supply subsidized services to society in all public transport systems. The FFPT proposition argues whether it should be rising the subsidy to 100 percent of the costs, or if the subsidy should continue at the level it is right now. This subsidy level varies in different countries and cities (Hulten, 2017). While passengers have no out-of-pocket costs, the public transport system does not run for free. The service provider will have to cover for the lost fare revenues in order to fully subsidize the service. Urban public transport systems are subsidized in virtually all European cities. However, the extent of the subsidy varies considerably among cities (e.g., 15 % in Hannover, 50 % in Stockholm, 68 % in Den Haag). Most Baltic cities, including Stockholm, Copenhagen, Malmö, and Turku, have a subsidy level between 30 and 60 % (Nielsen *et al.*, 2005 cited in Cats *et al.*, 2017). Note that this is true across various procurement strategies

as these cities have adopted different contracting schemes. Moreover, the public transport pricing scheme also varies considerably among these cities. One of the main priorities for policymakers and public authorities is to maintain and increase public transport market share (Cats *et al.*, 2017). Over the years, the payment for public transportation became institutionalized and accepted by society as something intrinsic to this kind of service. Take into consideration healthcare and education systems. In many Western democracies, it is well established the existence of both public and private hospitals and schools where the price for the service is usually fully covered by the State (through taxes and other public collection and income). However, the same does not apply to public transportation.

The word public became a synonym of collective and lost its connection with the State as a public service, getting a subsidy by the public budget and giving monetary profit, many times, to private operators. If not giving profit to private operators, just covering the system's expenses through the fare paid by the passengers. In other words, even though public transportation is a public service, it is not seen as public education, health, or lighting, to cite a few. There are also no payments for the use of public squares, parks, and many other public services. As Tuisk and Prause (2019) demonstrate, the notion of public services being free of fares is extended to many areas:

> "The idea of fare-free public services and goods addresses to the principle that access to the services like schools, libraries, museums, roads, green areas and Wi-Fi are free to use for everyone. By applying the same idea to public transport underlines that mobility as a "service", should be also fare-free as the rapid growth of cities forces people to settle more and more away from the city centre, further from the locations of schools and work places. Thereby, when the transport costs are high, this can be an obstacle for employees in approaching and participating in the labour market. In addition, an important argument that supports introducing of FFPT is improving social inclusion within the society." (Tuisk and Prause, 2019, p. 5).

On the same note, Kębłowski affirms that FFPT is a policy acknowledged both by academics and activists "for conceptualising collective transport not as a commodity, but as a common good - similar to many other public services including healthcare, parks, roads, sidewalks, cycling paths, streetlights and lamp posts, libraries, schools, and playgrounds" (Kębłowski, 2019, p. 10). This perspective of what is public and what is not, creates the perception that the simple abolition of the price for public transport tickets, could result in an alteration of the logic sustaining the public transport. This change would be important to transform power relations in society (Kębłowski, 2019). The author finishes his argumentation saying that different activist groups

> "claim that as FFPT moves collective transport away from the market-oriented focus on profitability and demand management, it challenges a liberal perspective that continues to envisage payment as a way of assuring that infrastructure is respected in the case of public transport." (Kębłowski, 2019, p. 10).

Although perceiving the universal FFPT as a model that could effectively change people's travel behavior, Hess (2017) does not believe in its feasibility. The author argues that

> "A fully fare-free public transport system – in which passenger fares are not collected at all times, for all routes, and for all riders – is assumed to be a highly effective approach to making significant change to people's travel habits, but it is seldom realistic or achievable. More prevalent than fully fare-free public transport systems – which is inherently a difficult policy change, politically and fiscally – is fare-free travel on certain routes or in specific zones (such as central business districts) or during limited service hours. Fare-free travel is also available in some cases to target subpopulations (such as students, youths, older adults, low-income people, and job seekers)." (Hess, 2017, p. 692).

Hess's opinion, however, is susceptible to questioning. If the groups he points as "subpopulations" and that could be included in the FFPT policy in specific zones and times could work, it would be a matter of better planning to make it work to the whole of the population in the whole of the city at all times.

Adding to it, charging for a service has a cost. When the transport companies have to collect the fare, there is also a cost involved in this system. Hess (2017, p. 691) also argues that the lack of a fare system "removes the transaction cost of fare collection, and savings can be significant". There are direct costs such as registering and administrating the income, paying personnel (ticket machines maintenance, ticket control, ticket selling, and administration employees, for example) and decision-making processes regarding the revenues created by the fare system. Furthermore, there are indirect costs such as time in line to buy tickets, confusion with different barriers to enter the system and different zones and prices for different modes of transport, for example.

A modal shift that can be used in favor of public transport is pricing. Pricing is one of the different policymechanisms that can be considered in this case. Nevertheless, only by reducing the price of public transport, even to a non-existent fare, is not enough to encourage car drivers to migrate to public transport. This is evident since "urban dwellers are more likely to replace using of their private car to public transport when the price of car usage increases and not likely due to the decrease of the cost of using the public transport" (Tuisk and Prause, 2019, p. 5).

Notwithstanding, regarding pricing, there are different activist groups, non-governmental organizations and politicians in Europe and around the world that support and promote the idea of a completely free and inclusive public transport system, revoking fares integrally (Cats *et al.*, 2017). The authors point the responsibility of public authorities and governments to take action on creating a more inclusive public transportation system (Cats *et al.*, 2017), since even though individuals have the power to choose public transport, it is the duty of transport service authorities and governments to make that choice feasible.

1.1.1 Health Implications

According to Banister (2008), sustainable mobility approach requires actions to reduce the need to travel (fewer trips), to encourage modal shift, to reduce trip lengths and to encourage greater efficiency in the transport system. It is also important to consider that transport-induced emissions are linked to declining public health, and there is now evidence of the strong links between lack of exercise and obesity (Pucher and Dijkstra, 2003). Walking, cycling and public transport are all more healthy than using the car and are promoted as active transport. There are indirect effects of pollution, which damages health and causes problems related to asthma, bronchitis, leukemia, and lung disease. Those are a few of the wider effects of increases in CO_2 and the other greenhouse gases (Banister, 2008).

The European Commission (2015) Report on air quality in Europe indicates that in the last decade, more than 400,000 premature deaths per year can be attributed to air pollution from all sources. The same report also affirms that only in 2012, GHG emissions from the transport sector were 21% above the sector's levels in 1990. The same report shows numbers that confirm the transport sector as the largest contributor to NOx[5] emissions in Europe, contributing with 46% of emissions in the 28 countries of European Union, followed by the energy and industry sectors. "Furthermore, the contribution of the transport sector to ambient NO2 concentrations, especially in urban areas, is considerably higher, owing to the fact that these are emissions close to the ground and distributed over large areas." (European Environmental Agency, 2015, p. 32). There are many other components of air pollution that are dangerous and harmful to health, as seen in figure 1.

The nitrogen oxides and the carbon dioxide (CO_2) are the most recognized harmful components to health. Furthermore, other substances present in air pollution that are seriously dangerous to the health, especially to vulnerable people as elderly and children are:

[5] NOx is a standard term for the nitrogen oxides that are most related to air pollution, such as the Nitric Oxide (NO) and Nitrogen Dioxide (NO^2).

- "Particulate matter (PM) are particles that are suspended in the air. Sea salt, black carbon, dust and condensed particles from certain chemicals can be classed as a PM pollutant;
- Sulphur dioxide (SO_2) is emitted when sulphur containing fuels are burned for heating, power generation and transport. Volcanoes also emit SO_2 into the atmosphere;
- Ground-level ozone (O_3) is formed by chemical reactions (triggered by sunlight) involving pollutants emitted into the air, including those by transport, natural gas extraction, landfills and household chemicals;
- Benzo(a)pyrene (BaP) originates from incomplete combustion of fuels. Main sources include wood and waste burning, coke and steel production and motor vehicles' engines;
- Nitrogen dioxide (NO_2) is formed mainly by combustion processes such as those occurring in car engines and power plants." (European Environmental Agency, 2015, p. 13)

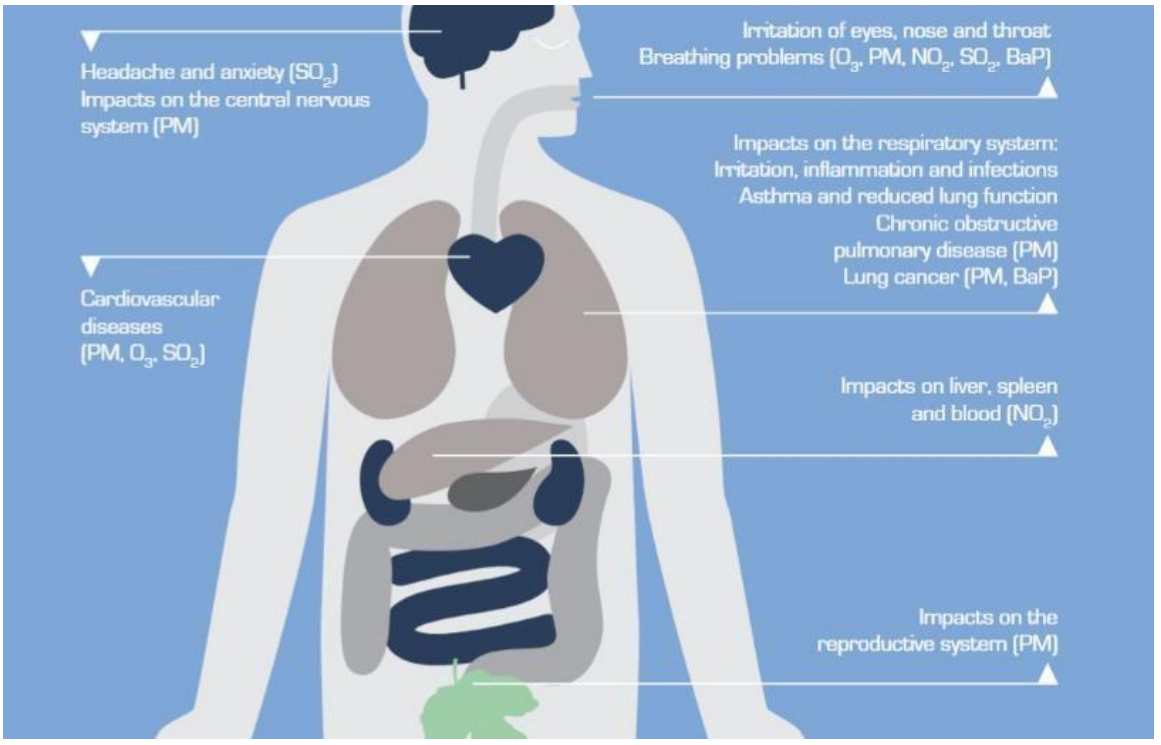

Figure 1. Health impacts of air pollution (figure adapted from the European Environmental Agency, 2013, p. 13).

The air pollutants are not exclusively coming from cars and the transportation sector. Nevertheless, it is clear to see that all the substances have at least a minimum connection to them. On a related note, "63% of Europeans say they reduced their car use in the last two years in order to improve air quality." (European Commission, 2013, p. 42). In the year of 2013, just transport was responsible for "13% and 15% of the total PM10 and PM2.5 primary emissions, respectively, in the EU Member States in 2013". (European Environmental Agency, 2015, p. 19). Figure 2, below, shows data regarding noise pollution and its effects on human health. Only the noise coming from traffic is responsible for the admission in hospitals of 43,000 people and 10,000 premature deaths per year, just in Europe.

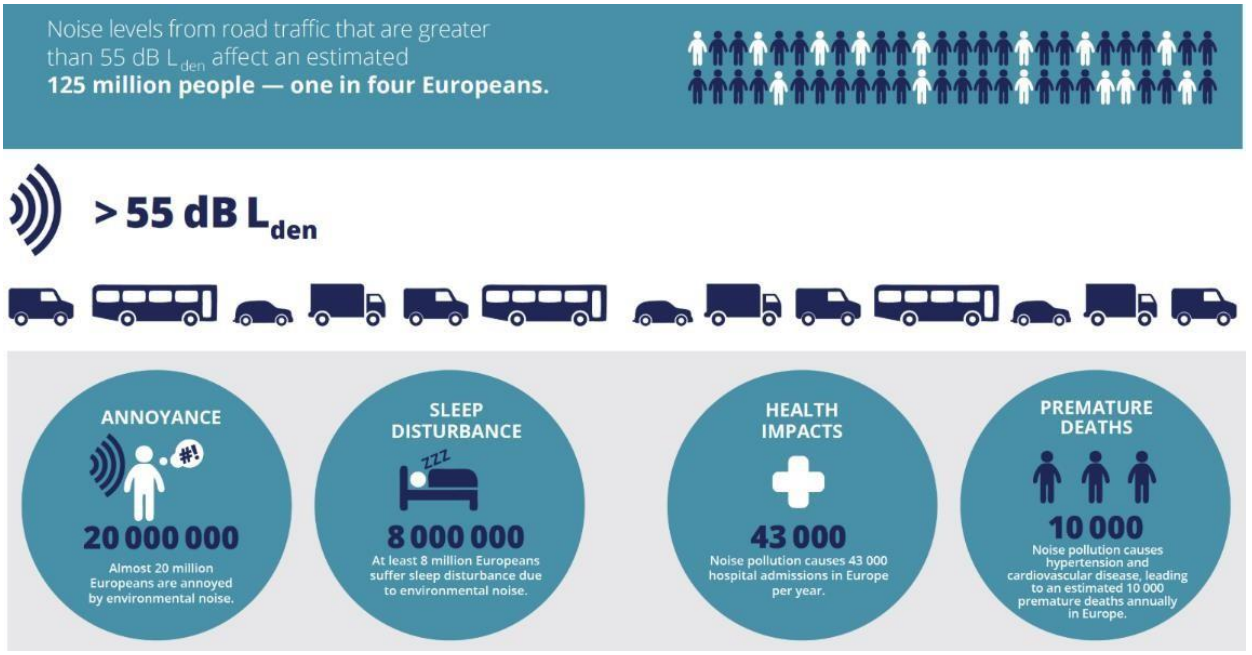

Figure 2. Noise levels from road traffic (figure adapted from the European Environmental Agency, 2014).

In addition to this, there are also other motivations that could justify further subsidization of public transportation. As it was mentioned, car traffic causes congestion, air pollution, and noise. In this sense, the subsidization would also benefit those who do not use public transport so often, by having an option the day the car or bicycle does not work, or the weather is bad. Finally, public transport should be subsidized because it benefits certain groups, e.g., low-income individuals[6] (Svensk Kollektivtrafik, 2018) and the elderly. Considering those arguments, Woodcock *et al.* (2007) argue that sustainable mobility offers improvements in individual health as well as a cleaner and healthier environment.

However, according to the Svensk Kollektivtrafik[7] (2018) report, exclusively commercial operation of public transport would result in higher ticket prices and those fares would be higher than ideal. At the same time, the frequency would be lower than today. The report also points to the demand for public transport would decrease, and car traffic would increase. The report's conclusion is, therefore, "that commercial operation of urban public transport is very much difficult to realize" (Svensk Kollektivtrafik, 2018, 13). The Swedish Public Transport Report on public transport's social benefits (2017) also shows that it is profitable for society to subsidize public transport.

1.1.2 Environmental Implications

The continuous growth of transport demand along with the increased traffic congestion has negative consequences on the environmental conditions and the economic competitiveness in Europe. An attractive and reliable public transport service, on the other hand, is considered an important element for creating sustainable mobility (European Commission, 2004). Consequently, many transport stakeholders, such as the Transport Administration of Stockholm County Council in Sweden, make the increase of public transport share as one of their main policy goals (Stockholm County Council, cited in Cats et al., 2017). Kębłowski (2018, pp. 4-5) makes clear that it is also important to observe that FFPT can be limited in terms of who can benefit from it and where it applies. Although discounts are common in many places, the author specifies

[6] The Svensk Kollektivtrafik (2018) uses the term, in Swedish, "låginkomsttagare", which is translated to persons with low-income.
[7] The Swedish Public Transport Association is the trade organisation of local and regional public transport in Sweden.

different social groups that would directly benefit from this FFPT policy, such as the elderly, students, and low-income people. These people are not only the ones who would benefit the most of this policy, but they are the most affected by the problem of urban transportation. Kębłowski (2018, pp. 4-5) also clarifies that geographic limits can (and should) exist, as in many cities free access to transport is available only for a specific service or in a specific area, which exists as an exception within a paid public transport network.

It is of importance to consider that environmental impacts also mean social-economic impacts of different sorts. Peter Söderbaum states that "ecosystems and natural resources are part of the economy, not outside of it" (2018, p. 31) and that "economics has to be democratized" (2018, p. 31). When analyzing emissions directly, studies reveal "that ca. 20% of EU emissions are related to transport, and 19% are related to CO_2 emissions from transport" (Tuisk and Prause, 2019, p. 6). The authors also illustrate that "public urban busses cause only about half of the CO_2 emissions for the same distance as a private car" (Tuisk and Prause, 2019, p. 6). With this in mind, Tuisk and Prause (2019) also argue that busses and trains become even more efficient in long distances. Figure 3, below, presents the overview of different modes in public transportation and their emissions.

		Private car	Long distance			Urban/short distance		
			Bus	Train	Plane	Bus	Train	Metro/tram
Greenhouse gases	g/Pkm	140	32	38	214	75	63	65
CO	g/Pkm	0.61	0.04	0.02	0.14	0.05	0.04	0.04
Volatile organic compounds (VOC)	g/Pkm	0.14	0.02	0.00	0.04	0.03	0.01	0.00
NOx	g/Pkm	0.35	0.18	0.05	0.57	0.32	0.18	0.06
Particulate matter	g/Pkm	0.004	0.003	0.00	0.005	0.002	0.002	0.00
Utilisation rate	g/Pkm	1.5 pers./car	60%	53%	80%	21%	27%	19%

Figure 3. Emissions of different modes of transportation (figure adapted from Bundesministerium für Umwelt cited in Tuisk and Prause, 2019, p. 6).

However, direct and indirect environmental benefits can come from a more reliable, attractive and accessible type of public transport and the perception of the problem should not be just measured by emissions and quality of air, as fossil-fuelled cars can be (and have been) replaced by electric vehicles. This type of substitution, although it appears to be a technological green revolution, relies on more mining and creation of new goods, in order to assemble new cars. Problems such as the space used in urban areas, and the inequality would remain the same, and the environmental benefits of this replacement could not be enough to overcome the disadvantages and new challenges that would be created.

1.1.3 Social Implications

Manaugh and El-Geneidy (2012, p. 3) state that as "issues of equity and fairness gain importance in transportation planning, understanding who benefits from new and existing transit services has become an increasingly important topic". On the other hand, the authors also claim that public transportation providers often struggle to provide a service that attracts new users at the same time that they try to better attend current users of the public transport (Manaugh and El-Geneidy, 2012). Another reason applies to positive effects on the labor market by subsidized public transport can lead to increased employment. The FFPT can reduce the costs for employers that need to pay transport assistance, the expenses for employees that need to cover transport from their salaries and connects labor force and organizations within the cities. There are

still a few more different reasons for subsidizing public transport. If the price and frequency of public transport are better organizes and enhanced, the demand and choice for public transport users ascend. The waiting time and congestion in public transportation vehicles, otherwise, decrease, making this transport mode more attractive (Svensk Kollektivtrafik, 2018). This effect, often called the Mohring effect[8], consists of shorter waiting times for existing road users. In areas with higher demand, subsidized transport become economically feasible, as the frequency of offered transport is increased, and this causes shorter waiting times for users. The Svensk Kollektivtrafik goes further and states that improving the price and developing and incrementing the frequency of public transport gives great welfare gains to the state and its citizens (Svensk Kollektivtrafik, 2018). The additional funding to cover the system's expenses would come through taxes.

One often forgotten aspect of strengthening public transport and creating policies to discourage the use of cars is regarding the city's spacial use. Besides air and noise pollution, stress, accidents, and other negative impacts, private transportation is a massive responsible for public space consuming. Roads are used in specific times of the day, being almost obsolete when it is not rush hour and consuming that space permanently. The same applies to parking spaces, that could have been used for other social and economic purposes. This issue is a matter of concern coming from city planners and transportation administrators for years (Tuisk and Prause, 2019).

1.1.4 Economic Implications

When discussing benefits of fare-free public transport policy, one might think directly about the economic (and financial) perspectives: who is going to pay the bill for the end of the fare charge to become feasible? Alternatively, how will the subsidy increase within the public budget without affecting other areas of public expenses? What is the cost-benefit to having such kind of policy implemented in a society, either a big city or a small town? However, economic benefits come from different sources, not only financial. In a democratic society, Economics plays a political role and the politics influence (and mold) economics. To Söderbaum, economists "are political actors in a democratic society" (2018, p. 11). As discussed earlier in this chapter, the costs to make the system running are important both for the policymakers and operators, as it is a matter of how much money is needed to make the system to operate. The cost is also important to the users, or the public in general, as a big part of what is not covered by the subsidies is reflected in the price of the fare.

Taking this in consideration, using neoclassical perspectives such as cost-benefit analysis is not relevant enough to understand the problem discussed in this study and not the best way to illuminate the problematics involved in a policy as the FFPT, as this kind of analysis focuses deeply in the monetary dimension of the problem and demands a single solution derived from specific values or ideological orientation (Söderbaum, 2018). This way, the economic benefits presented here will be interconnected with the social and environmental benefits, as in a multidimensional way of analysis, impacting those areas will impact economy and democracy, such as equality and access to labor and production. According to Bhatta and Drennan, some of the long-run economic benefits of investing in public transportation can include: "1. increases in output; 2. increases in productivity (output per unit of input); 3. reductions in costs of production; 4. increases in income, property values, employment, and real wages; 5. rate of return equal to

[8] The Mohring effect (1972) is the observation that, if the frequency of a transit service (e.g., buses per hour) increases with demand, then a rise in demand shortens the waiting times of passengers at stops and stations. Because waiting time forms part of the costs of transportation, this implies increasing returns to scale for scheduled urban transport services, making subsidies for the system more valuable and desirable. This view is neoclassical cost-benefit analysis and conservative economical perspective, which is acknowledged by this study however not relevant enough to understand and analyse all the perspectives needed for the FFPT policy.

or greater than the social cost of capital; and 6. reductions in noncommercial travel time, improved access, improved quality of life" (Bhatta and Drennan, 2003, p. 289). Although those benefits are important and need acknowledgment, they are not able to perceive all the social, behavioral and mindset changes that happen in society and, hence, affect the economy.

The FFPT needs a commitment from the actors in society that goes beyond economic and political agendas and orientation. As stated by Söderbaum, "Economics is always 'political economics' (…) all schools of thought in economics, (…) are varieties of political economics" (2018, p. 31). In this sense, the FFPT is not an optimal solution to solve all the problems of public transportation, environment and society. This is, however, one important piece of the puzzle. The FFPT is a political and democratic alternative that can act together with other decisions and policies to transform a public service such as transportation into something public in fact. Thus, helping to impact directly and positively the environment and society.

1.2 Empirical Problem

Although subsidies to public transportation systems exist all over the world, only a small amount of cities have tried or still have a fare-free public transport institutionalized. The number of cities experimenting with fare-free public transport increased from six, in 1980, going to fifty-six by the year 2000 and ninety-nine cities and towns in different parts of the world with FFPT in its "full" form by 2017 (Kębłowski, 2019). Kębłowski illuminates the concept, explaining that the "full fare abolition means that ticket-free rides are available for the vast majority of local public transport routes and services, for the vast majority of users, and for most of the time" (2017, §2.1). In several hundred more cities, fares are suspended in a partial way — either in specific city areas or modes of transport, or in specific periods of the day or year.

Table 1. Characteristics of Fare-Free Public Transport Programs, Including Goals (figure adapted from Hess, 2017, p. 692).

Location (Operation of Program) Population	Goals	Outcomes
Aubagne, France (2009–present) 100,000 population	Enhance mobility for all	Ridership doubled
Austin, Texas (1989–1990) 500,000 population (1990)	Promote public transport Educate potential riders	75% ridership increase
Changning, China (2008–present) 53,000 population	Conserve energy Protect the environment Improve public transport service Improve quality of life	550% ridership increase
Hasselt, Belgium (1996–2012) 72,000 population	Enhance mobility for all Efficiently allocate road space Improve quality of life	900% ridership increase 63% more public transport trips 16 to 40% mode shift
Templin, Germany (1997–present) 17,000 population	Reduce automobile dependency Reduce automobile externalities (pollution, noise, risk of crashes)	Ridership increased 13 times

Table 1 presents the example of five cities in different locations of the world, where the FFP was put in practice at least for one year. The goals and outcomes presented show a relevant similarity, even though the cities consist in different population sizes and are in different countries, with different political models and socio-cultural systems. Also consisting in different population sizes, Tallinn, Avesta and Luxembourg have similarities on the FFPT implementation.

Tallinn, capital of Estonia, is the first European capital abolishing fares for city residents (since 1 January 2013). Avesta, in Sweden, implemented the same system from July 2012, as a two-year trial period. After the two years, the experience was successful enough to keep it as a permanent policy. In the year 2020, Luxembourg will become the first country to implement a free transportation system within its territory completely. The tickets will be abolished, saving on the collection of fares and the policing of ticket purchases. Uppsala does not have a FFPT policy, but reduced prices for a few groups in society, and can be seen as a potential city for the policy development. In the world, there are approximately one hundred cities and towns with a fare-free public transportation system. The present study intends to evaluate the fare-free policy on the lenses of sustainable development. Transportation is an essential service and everyday necessity. It is also contributing to GHG emissions due to the petrol-fueled engines and the crescent number of cars – private transportation. The public policy of fare-free public transportation can be understood and analyzed as an environmental and social tool. There are direct and indirect impacts on the environment, health and socio-economic aspects. As a starting point, different views and identifications of Sustainable Development will be presented and conceptualized. Public transportation is also within the Sustainable Development Goals, "the blueprint to achieve a better and more sustainable future for all", accordingly to the United Nations (2019). The conceptualization of sustainable transportation will also be explored. By analyzing the socio-economic and environmental impacts of the fare-free system in Avesta, Sweden, and Tallinn, Estonia, this work aims to illuminate the understanding of public transportation as a sustainable development tool.

Table 2. Types of FFPT (figure adapted from Fearnley; Hess; and Kębłowski, cited in Štraub and Jaroš, 2019, p. 50).

FFPT type	Exemplar location	Main features
Unlimited	Tallinn (Estonia), Austin (Texas, USA), Aubagne (France), Frýdek-Místek (Czechia)	Public transport is free for everyone on all transportation routes
Specific groups limited	Corvalis, Oregon (Oregon State University, USA); Logan, Utah (Utah State University, USA)	Abolished fares for students, employees and visitors
	Scotland (United Kingdom)	Abolished fares for people over 60 or those with physical disabilities
Time limited	Milton (Canada)	Free public transport during off-peak hours (9-15h)
	Haag-Leiden (Netherlands)	Free public transport during weekdays (Mon-Fri)
Short-time promotion	Car free days, natural disasters, heavy smog periods, main touristic seasons (Szczyrk, Poland), weekends only (Gniezno, Poland)	Free public transport only during special events
Line limited	Haag-Leiden (Netherlands)	Specific fare-free bus line
	Emeryville (USA)	5 bus lines providing the connection with the regional transport system

On table 2, the authors outline the different types of FFPT, as it is not always provided with universal access and for all. The types are divided in different categories accordingly to aimed social groups, period for the gratuity and geographically. Finally, Kębłowski (2019, p. 11) presents a visualization of the evolution of the number of FFPT cases around the world (below on table 1).

Table 3. The evolution of the number of full FFPT cases worldwide (1970–2017)[9] (with minor modifications, Kębłowski, 2019, p. 11).

Year	Full FFPT cases					
	Total	Europe	North America	South America	Australia	Asia
1970	**1**	-	1	-	-	-
1980	**6**	2	4	-	-	-
1990	**13**	4	9	-	-	-
2000	**27**	8	17	2	-	-
2010	**60**	29	25	5	-	1
2017	**99**	57	27	11	1	3

Table 3 gives a glimpse of the constant growth of the FFPT as a policy, but also as a movement, all around the world. Groups that advocate for free transportation, as urban movements and NGOs, have an important role in this growth, as Kębłowski (2019) argues that passengers are rarely the ones demanding fare reduction or abolition. The author continues, saying that

> "Although full fare abolition - the form of FFPT that this section centres upon – may seem like a coherent and simple idea of abolishing fares, the rationale behind it appears to follow certain regional patterns, with variegating emphasis on specific economic, sustainable and socio-political arguments for FFPT." (Kębłowski, 2019, p. 14).

Those arguments will not be fully assessed in this research, not comparing the cases studied, but focusing on the FFPT implementation, impacts and results in both cities. There is no intention on making a direct comparison or deep analysis on the socio-economic realities of Tallinn and Avesta, however, they are not completely ignored in the analysis.

1.2.1 Public Transportation and the Sustainable Development Goals

The Sustainable Development Goals, also known as Agenda 2030, are seventeen main goals to be achieved by 2030 by the countries that are members of the United Nations. "They address the global challenges we face, including those related to poverty, inequality, climate, environmental degradation, prosperity, and peace and justice" (United Nations, 2019) and are interconnected.

There are two goals and two targets that are strongly related to public transportation:

- "Goal #10. Reduce inequality within and among countries" (United Nations, 2019).

"Target 10.4: Adopt policies, especially fiscal, wage and social protection policies, and progressively achieve greater equality" (United Nations, 2019);

- "Goal #11. Make cities and human settlements inclusive, safe, resilient and sustainable" (United Nations, 2019).

"Target 11.2: By 2030, provide access to safe, affordable, accessible and sustainable transport systems for

[9] Author's note: the figures provided are cumulative.

all, improving road safety, notably by expanding public transport, with special attention to the needs of those in vulnerable situations, women, children, persons with disabilities and older persons" (United Nations, 2019).

Target 10.4 addresses the importance of the State to implement policies and invest in public services to reduce inequalities within and among societies. Policies as the fare-free public transport could be considered as part of target 10.4, as it has considerable impacts in society, especially among the low-income parcel of the population. As the target implies, fiscal, wage and social protection policies would work progressively to achieve greater equality. In other words, increasing the already existing subsidies to public transportation could happen progressively, decreasing the fare price to the population until reaching zero-fare. This would be possible if a political preference or pact could be conformed, complying to all political interests.

In the same way, Target 11.2 states the importance to achieve safe, affordable, accessible and sustainable transport systems for all, with special focus on the most vulnerable people in society. Private transportation is responsible for an enormous use of space within the cities. Tuisk and Prause (2019) point alarming numbers that show the difference between private transportation (cars) versus different modes of public transport. The authors argue that

> "a tramway requires 85 m² and is able to transport 145 persons which equals 124 cars that would need 950 m² during transport and in addition to that they require parking lots. A closer look to the needed transport space for different transport modes shall be considered for the case of 50 persons. If 50 persons want to move from one destination to another they need by walking 50 m², by using a bike 580 m², by using a bus 70 m² and by using an average filled cars with about 1.3 persons per car 2375 m². Even by assuming a fully charged car the transport of 50 persons requires 610 m² of street space plus parking lots. In addition to that, the calculation of required public space is expressed by m²/h taking under account the number of hours the transport device participates in the public. This calculation yields very poor values for cars whereas public transport as well as car sharing delivers better results." (Tuisk and Prause, 2019, p. 6)

Those numbers make evident the lack of efficiency in space usage by cars within the cities. The authors comment on the lack of the numbers for the parking lots but do not consider a few other numbers, as the space used by gas stations within urban areas and the resources used to maintain private cars circulating. Another calculation that can be considered is the time inefficiency of the private transport modal. When cars are queued, the drivers have a time frame to react and respond to moving the cars. It generates a cascade effect, from the first car moving to the last one, taking a longer time to the whole queue to move and flow. Differently of people walking or public transport (especially in railways, as the vehicles flow is segregated from the normal traffic and controlled remotely).

The target 11.2 makes evident the importance of public transportation as a social tool to develop a sustainable society. In addition, this target also opens up to the opportunity to achieve free public transportation, in its essence. However, the Sustainable Development Goals address to underdeveloped concepts, as sustainable transport systems, for example. This lack of knowledge and choice of words both promote advances as it can provoke confusion. In other words, although important in the goals and targets of the Agenda 2030, it is important to understand what is desirable to develop and implement and what is important to avoid. Different interpretations of complex concepts such as sustainable transport for all can jeopardize social gains if mistaken or distorted to alternative policy implementations. For instance, sustainable transport system could be perceived as a system that is economically feasible and that sustains itself. On the other hand, it could be understood as a system that undervalues the financial value in favour of social development in health and environmental issues. This research intends to also illuminate concepts

like this, in order to clarify which kind of policy is FFPT and how to understand its application in a context of sustainable development and sustainable transportation.

1.3 Aim and Research Question

The aim of this study is to evaluate the implementation of public policy of fare-free public transportation as a policy that positively affects society and environment, and the concept of sustainable transportation. Using empirical and bibliographic documentation and analyzing different cases, this study investigates the current use of the mentioned policy in different proposed cases: Avesta and Tallinn. Additionally, the cases of Luxembourg and Uppsala will be analyzed and investigated as forms of implementation for the FFPT in the near future. Luxembourg has already announced the full execution of FFPT in its territory from 2020. Uppsala is scrutinized as a possible city to apply this policy and as a consideration of the future of FFPT in cities committed to the sustainability agenda. The research targets to contribute understanding how to apply the FFPT as a policy integrated with sustainability concerns and focusing on reducing social inequalities while positively influencing the environment. Advantages and disadvantages are presented both in the existing and future cases, in order to provide a harmonious view of the consequences of such policy in different scenarios. Searching connections with the Sustainable Development Goals will help to understand how public transportation is directly and indirectly connected to sustainable development and to the Agenda 2030. This way, this work aims to illuminate the knowledge about the fare-free public transportation policy and investigate its use as one of the different alternatives to influence society in the environmental and social aspects and deliver a more sustainable public transport. At the same time, the present study aims to elucidate the connections and impacts on the environment and social issues, analyzing the different offered cases. Why the Fare-Free Public Transport policy should be perceived as part of the Sustainable Transportation concept? How the implementation of FFPT can positively influence the environment and socio-economic changes despite of the population size in different cities and countries around the world? Those are two questions proposed by this study and to be evaluated in the revised and proposed cases.

2 Method

This chapter presents the methods used in the research. The criteria and motivation for using a case study, how data was collected and analyzed, and its purpose and delimitations.

2.1 Data Collection and Case Studies

For data collection, an extensive traditional literature review is used to compile information and data, and illuminate the concepts and their relation and impacts. This method is used to present the cases and to analyze their impacts on society and the environment. The literature review present in this study uses not only scientific publications, books and peer reviewed articles, but also policy reports from the European Union and from relevant public transportation authorities from each case studied and is a crucial part of case study methodology (Yin, 2014).

The method used in this research is a case study. “A case study investigates a contemporary phenomenon in its real-world context, especially when the boundaries between phenomenon and context may not be clearly evident, (…) and can be a useful method in doing an evaluation” (Yin, 2014, p. 2). The author also argues that case studies are “the preferred method, in comparison to others, in situations when (1) the main research questions include ‘how’ or ‘why’ questions, (2) a researcher has little or no control over behavioral events; and (3) the focus of study is a contemporary (as opposed to entirely historical) phenomenon” (Yin, 2014, p. 2). The three points presented by Yin (2014) are relevant and valid to use in this research. The research questions were presented in the end of last chapter and include “how” and “why”. There is no control of behavioral events attached to the implementation of the FFPT policy in different cities (either the ones that already implemented or the possible ones to implement in the future). Moreover, the phenomenon is not just contemporary, but ongoing and growing, as it will be discussed further in this research.

George and Bennett argue that there is a possibility for misperception between the terms “comparative methods” and “case studies”. They say that

> "comparative method (the use of comparisons among a small number of cases) is distinct from the case study method, which in this view involves the internal examination of single cases. However, we define case study methods to include both within-case analysis of single cases and comparisons of a small number of cases, since there is a growing consensus that the strongest means of drawing inferences from case studies is the use of a combination of within-case analysis and cross-case comparisons within a single study or research program" (George and Bennett, 2005, p. 18).

In the present study, the cases will be presented separately. However, comparisons may arise, as the specificities of each analyzed case will also be respected. For example, it is intrinsic to the analysis of the FFPT policy to compare in each case if the goals targeted by the different cities’ administrations were achieved, such as reducing pollution; at the same time, differences as the size and cultural aspects of the cities analyzed in each case must be respected and comparisons between them would not be relevant for the policy analysis.

Case study methods have strengths and limitations. Considering the FFPT is present in only about one hundred cities around the world, analyzing specific cases is a rational choice. Amongst the strengths of case studies to be considered are “their potential for achieving high conceptual validity; their strong procedures fostering new hypothesis; their value as a useful means to closely examine the hypothesized role of causal mechanisms in the context of individual cases; and their capacity for addressing causal complexity” (George and Bennet, 2005, p. 19). This way, this study is able to: use cases, and identify and measure indicators to representing the theoretical concepts presented; using the theoretical concepts, create new hypothesis of usage of sustainability and transportation theory for the implementation of the FFPT in new cases; build

historical knowledge through exploring causal mechanisms presented in each case, giving perspective and possibility of use in future cases; finally, assessing complex causal relations when analyzing environmental and socio-economic aspects of public transportation.

There are also inherent limitations on the use of case studies. Some of the challenges proposed by George and Bennet (2005) relevant to this study are the case selection bias and the potential lack of independence of cases. For the first, the criteria used are:

- Different population sizes: analyzing the biggest city in the world that implemented full FFPT and a small town that did the same and study the goals and achievements for each and compare results, deducting if the policy could be applied in different cities, independently how big or small they are;

- Similar year of application of the policy: Tallinn (2013) and Avesta (2012) initiated the FFPT almost at the same time, giving it not just enough time to analyze the impacts provoked in society by the policy implementation, but also bringing a closer perspective on how this impact could be perceived in the same (or very similar) time frame;

- Using cases in European cities, making it more fair and reliable not just to compare the data between them, but also taking in consideration the (democratic) political system, the participation in the same political and economic bloc (European Union) and the similar infrastructure for transportation, which would be consistently different if comparing an European city with a Latin-American one, for example;

- Tallinn and Avesta decided on implementing a similar model of FFPT: abolishing fares completely for the whole population (registered citizen, under a certain amount of similar rules);

- The criteria used to add Luxembourg as a case is that a future scenario vision would be appropriate for future studies and as the first country to implement in its territory the full FFPT with similar conditions as Tallinn and Avesta, enrich the analysis and the relevance of the study;

- The same criteria are applied to Uppsala, as it is one of the most sustainable cities in the world and for future reference could apply the FFPT policy to become even more sustainable. Similar conditions are applicable to Uppsala (European, population size is around the median compared to Tallinn and Avesta, among others) and the analysis can represent a beneficial academic knowledge-producing new hypothesis of implementation of the policy studied in cities that still do not have it.

Considering these criteria, future studies can be repeated on this same subject and using the same cases chosen. Even if the policy changes or with a possible variation on the size of the cities, the grounds for the analysis of the application, impacts, and results of the FFPT in those cases are determined. For Luxembourg, it will be relevant to collect the existent data, compare and analyze how the FFPT is impacting the country. For Uppsala or any city or country willing to apply a full FFPT model, the study sets basic sustainability, transportation, and socio-economic parameters of data collection and analysis that can be used by policymakers and scientists. The quality of the references used and the analysis made intended to give broad and dynamic view within-cases and between cases, ensuring a trustworthy process.

2.2 Purpose and Delimitations

The present study intends to illuminate the impact of public transport as one important tool to positively affect the environment and society. At the same time, this study aims to explore the concepts of sustainable

public transport and how fare-free public transport plays a major role in it. However, delimitations are important to be clearly stated.

This study will not use interviews as it was proven inefficient during its initial phase, as relevant actors that would make the type of research meaningful were unresponsive and unreachable. The phenomenon of fare-free public transport "remains an exceptional and marginal policy – which means that just a few cities in the world use the FFPT or tried using it in the past" (Kębłowski, 2017, 23). The same author, however, states, "the rising number of FFPT cases indicates that it is an established practice" (2017, 23), which keeps the subject not just relevant, but an important rising phenomenon to be researched, analyzed and discussed.

There are many ways to analyze the impacts of public transportation in society. It was already mentioned a few examples, such as health, environment, economy, and society. This dissertation intends to explore the fare-free public transport and the concept of sustainable public transport analyzing two specific cases: Avesta and Tallinn. The first one is a small town with a population of 23,256 people (Avesta.se, 2018) and Tallinn, the biggest city to the present moment using full FFPT, with a population of 441,245 persons (Tallinn.ee, 2019a). The focus of the analysis is in the environmental and social impacts, especially reducing inequalities within cities and including vulnerable parts of society in the transport system.

In addition to those cases, two future cases of reference: Luxembourg and Uppsala. Luxembourg will implement the full FFPT from 2020 and will become the first country to have free public transport for its residents, a population of approximately 600,000 inhabitants plus the possibility of workers that cross the borders every day (Luxembourg.lu, 2019a). And Uppsala, with a population of approximately 225,000 people (Uppsala.se, 2019) and advocating to be one of the most sustainable cities in the world and has in its Environmental and Climate Programme the goal to be fossil-free in 2030 and climate positive in 2050 (Uppsala.se, 2018)[10].

The analysis focuses on the environmental and social aspects of transportation, not ignoring other aspects, but limiting its scope. Economic aspects are constantly presented, although not following mainstream economic schools, offering alternative and non-monetary economic perspectives. Health issues are not going to be fully developed and analyzed in this research, even though they were briefly introduced and considered in the previous chapter. This choice was made because the impacts of FFPT are still ongoing and have a relatively short timeframe (around six to seven years) to consider relevant impacts on health, which demands years and decades of observations and studies. However, this limitation gives space to more detailed investigations in this field to come in the future.

Through an inductive approach, the research cannot unveil the results of a massive implemented policy of FFPT all over the world, but examines and analyzes existing cases and proposes future views on the implementation of the policy.

[10] Fossil free: not using fossil fuels and transitioning to a 100% renewable energy matrix. Climate positive: More than just achieving net zero carbon emissions, climate positive is going beyond and creating an environmental beneficial impact by removing carbon dioxide from the atmosphere.

3 Theory

This chapter presents the theoretical concepts of the research. First, it will present and analyze what is Sustainable Development and its different understandings and schools of thoughts. Secondly, it will conceptualize link the concept of Sustainable Development with Transportation and how they connect with each other and how Sustainable Development is included in Sustainable Transportation. Finally, it will present a model of Sustainable Transportation, considering the concepts analyzed beforehand.

3.1 Conceptualizing Sustainable Development

Sustainability as a policy conception has its foundation in the Report of the World Commission on Environment and Development: Our Common Future, also known as the Brundtland Report, published in 1987 (World Commission on Environment and Development, 1987). This report focused on the pressure between the ambitions of humankind towards a better life on one perspective and the boundaries enforced by nature on another perspective. Along the years and time, this concept has been interpreted in different ways by different schools of thought and research fields. One of the most spread concepts reunites three dimensions of sustainable development, specifically social, economic, and environmental (Kuhlman & Farrington, 2010). The definition of sustainability adopted by the United Nations is presented in the Agenda for Development as follows: "Development is a multidimensional undertaking to achieve a higher quality of life for all people. Economic development, social development, and environmental protection are interdependent and mutually reinforcing components of sustainable development" (United Nations General Assembly, 1997, p. 1).

The idea of sustainability having three dimensions stems from the Triple Bottom Line concept, coined by Elkington (1994). As the term bottom line suggests, it originates from the world of management science, and Elkington intended it as a way to operationalize corporate social responsibility. To the conventional bottom line (profit) should be added care for the environment (the planet) as well as being good to people, for instance by providing facilities for the disabled and employing minorities (the social dimension). The term is also often divided into two categories, as "weak" and "strong" sustainability. Markandya and Barbier (2013) point to a disagreement about whether natural capital has a unique or essential part of sustaining human prosperity. The authors explain that weak sustainability recognizes no difference between natural and other forms of capital. In other words, the conservation and improvement of the total amount of capital itself are enough to achieve sustainable development. On the other hand, the strong sustainability claims that human capital cannot replace all the environmental assets, such as ecological and forestry services fulfilled by nature and the natural capital stock. On those lines, sustainability is a matter of protecting nature and its resources that are indispensable for human survival (Daly, 1997).

Initially, the concept of sustainable development involved a distinct social directive. However, for decades, the social and human dimension was put aside, and sustainability was focused on biophysical environmental issues. It is also important to understand the standpoint of view of the concept labeled as "sustainable development." The importance of "development" and "economic growth" was conducting the idea of sustainability for many years (Vallance, Perkins and Dixon, 2011). Taking in consideration the three dimensions of sustainability, Kuhlman and Farrington (2010) explain that to the profit, should be included care for the environment and, at the same time, be good to people. In this view, the economic aspect of sustainability is clear, and the economic character of nature cannot be dissociated of sustainability. In other words, profit is an intrinsic idea of sustainable development, and to the authors it should consider that together with profit social benefits, nature preservation and wellbeing are important components.

However, when understanding sustainability in the private and public sectors, there is a need for different considerations. As Kuhlman and Farrington (2010) state, the goals of the business are different from the

goals of the public policy. In business, profit is a pillar. Nevertheless, governments should not pursue profit as their goal. The authors (2010) continue expressing that all the money generated by the whole country, also known as the gross domestic product (GDP), is the economic dimension of governments. The people are the social dimension and can be perceived as everything else that is not economical. This social aspect is associated with human ambitions, such as income distribution (equity) universal employment (inclusion) and access to healthcare and medical services (health). This way, sustainability for the public sphere can be summarized as a policy conception originated in the Brundtland Reported, in 1987, where the human ambitions are there at the same time as the respect for nature and social wellbeing.

When building a policy, multiple points of view must be respected, and several actors and groups in society are influencing and influenced by it. A policy that would bring a positive outcome to the whole of society could be understood as a good policy. As the public policy should consider the social aspect as its essence or *ratio essendi*[11], would be sustainable to integrate equity, health, and inclusion to its core.

3.2 Sustainable Development in Sustainable Transportation

By monetizing the public transport systems, the social perspective gets evident. An accepted narrative in modern society is that we should create value for public transportation, which is known as "fare". The fare system creates a social gap between those that can afford private transportation and those that use public transportation for practical reasons such as going to work or school. However, other possibilities are limited for the low-income classes that cannot access leisure and culture, for example, outside of the working time, becoming constrained geographically due to the high price of transportation. Not charging for access to the public transport system can improve the quality of urban life and restructure the automotive industry, having a direct impact on the environment. Electric cars, for example, can do less harm to the environment than regular cars. However, it is still based on private transport rather than collective transport, which uses fewer resources in production and maintenance. The economic aspect can be observed from the way the State spends its resources building new roads (for cars) and aiming bikers and pedestrians to become users of the public transportation system, instead of car drivers. For Dellheim (2016), introducing a model of free public transport can be seen as part of a bigger solution and a step towards socio-ecological transformation, playing a significant role of people's behavior change and acting as an essential part of environmental and social protection.

The subsidy level of public transport systems varies considerably among systems worldwide (Cats *et al.*, 2016), coming mostly from taxes and other fare-free incomes (such as advertisement and services within the system). The fare is partially covering the transportation service and can be abolished. Hence specific cities and towns can prioritize public transportation as one answer to growing urban poverty, social inequality, segregation, and climate change. There are dozens of initiatives of FFPT in the world where local public transport is being provided free of charge. Free public transport is a simple and efficient tool to tackle climate change in urban areas. Moreover, other than that, the transit democratization, mobility to all citizens, and replanning the urban model without the massive presence of cars will address gender, social, cultural, political and racial equality (Dellheim and Prince, 2018).

There are many concepts and different understandings in the literature about what is Sustainable Development, its impact, and importance in society and its mandate as a field of research. Bearing in mind that it is important to explore the term and its concepts for a better understanding of a sustainable transport system and how this connects with the Sustainable Development Goals, this study intends to analyze the concept over the socio-economic and environmental aspects.

[11] Latin for the main reason or primary function.

3.2.1 Conceptualizing Sustainable Transportation

Different authors define sustainable transport differently, and there is not one common definition for the term. Even though there is a plural view on this concept, "it is generally accepted that sustainable transport implies balancing current and future economic, social and environmental qualities" (Steg and Gifford, 2005,

p. 66). The people who cause environmental effects are usually not those most affected. Typically, high-income households own more cars and make more, and longer trips and so use more energy and generate more greenhouse gas emissions than low-income households generate. They also tend to live in quiet suburbs with clean air, whereas low-income households frequently live along noisy and polluted thoroughfares yet without compensation from the suburban commuters who use these highways. "The majority of victims of intraurban road accidents in Europe are pedestrians or cyclists and in particular children, the most defenseless participants in urban transport" (Black and Nijkamp, 2002, 37) and "approximately 69% of all collision partners in road accidents involving bicyclists are cars" (Otte et al., 2015, 29), adding to the transport issue a healthcare problem.

Tuisk and Prause (2019) point to different modes in urban transport regarding the sustainability issue. They display two main characteristics of sustainability within transport, which are:

1. The urban space for transport needs to be considered by different institutions and authorities;

2. The energy consumption and the relation with greenhouse gas emissions.

The first one "is important to investigate when it comes to the aim to reduce traffic jams and to minimize the needed space for urban transport" (Tuisk and Prause, 2019, p. 5) and the second influences in life quality and air conditions in the cities.

Cars are not only responsible for emitting GHG and micro rubber particles (from the tires), but also a major player in accidents that would be reduced simply by having less traffic, as it is exemplified in the figure below.

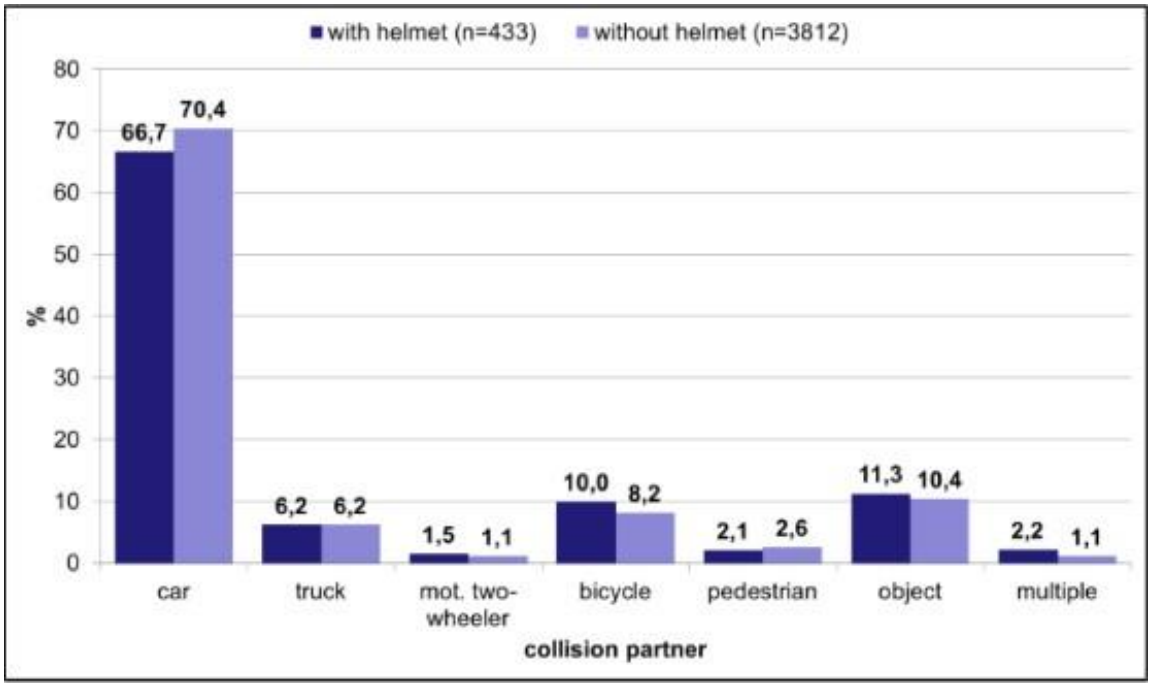

Figure 4. Percentage distribution of the collision partners of injured cyclists with and without a helmet (figure adapted from Otte et al., 2015, p. 29).

Figure 4 shows the collisions between bicycles and different transport modes. The use or not of helmets are not relevant for this study, but the number of collisions between the different modes. It is evident that cars play a major role in accidents involving bicycles if compared to any other mode (such as trucks, motorcycles, other bicycles, pedestrians, etc.). On this note, a reduction of cars would tend to play a relevant decrease in the number of accidents with bicycles.

In addition, some of the policies to mitigate negative environmental effects of transport may have undesirable distributional effects, in particular, transport demand management policies involving pricing, as sustainable transport: these policies may restrict certain forms of mobility (even more than today) to affluent people (Greene and Wegener, 1997, p. 180-181). The use and density of automobiles are continuously increasing in relation to transportation and sustainability. The number of vehicles continues increasing with fewer people in them, traveling longer distances instead of taking shorter ways. In other words, more cars are integrated to the system with fewer people using it (many times just the driver uses it) and traveling long distances individually through roads, instead of moving traveling smart and shorter, using different types of collective transportation (such as subway, buses, and trams, for example).

This dynamic creates a short-term gains vicious attitude to car users at the price of long-term losses to society. This way, a social dilemma emerges: a small part of society does bigger harm to environment and society using individual private transportation that has no direct or indirect concern to the wellbeing of the major public. Hence, the development of public transport support in this scenario of strong demand for car ownership and usage is responsible for setting a more significant challenge for developed economies and economies development. The decline of public transport in some countries occurs together with the easiness in owning a car. In this scenario, having a car is not only an affordable solution but also acts as a mark of success and status to the owner (Hensjer, 2007). This perspective magnifies with the car manufacturers' strategy of selling the symbolism, glamour, and enticement of owning a car. Cass *et al.* (2005) argue further that it does not matter how well public transport works, there will always be an extra motivation for still using a car. The accessibility to this good is also a matter of consideration, as the investment in a car becomes consistently more affordable over time, as pointed below:

> "Ownership of cars as with all other consumer goods will always become cheaper over time, so that more people can afford to own one. The main barriers to entry are not the cost of the vehicle, but the costs of insurance and the need to pass the driving test. Charges to use the car may increase substantially, but political pressures are always present to moderate any substantial rises in price, so that motoring remains relatively cheap" (Banister, 2008, p. 76).

Even though charges increase, there is still a relevant difference in how the Public Administration manages users of private and collective transport. One example of this is the difference in the punishment for a car user that gets a parking ticket and a public transport user that gets a ticket fee (for traveling without a valid ticket). In Stockholm and Uppsala, the parking ticket can vary from 500 to 700 Swedish Crowns. Alongside this, in Uppsala, a traveler by public transport without a valid ticket will need to pay the price of the ticket and 1200 Swedish Crowns fee. For Stockholm users of public transport, the fee is even higher, 1500 Swedish Crowns. Thus, a car owner that invades public space pollutes the air and possibly has more financial means gets a lenient punishment compared to a free rider. It is crucial to find other ways to reduce car use. However, much of the literature relates to the struggle or even impracticality of effective implementation of sustainable mobility (Banister 2008).

Banister (2008) points to cities as the most sustainable urban form and the main location where most of the

world's population will live. Accordingly to the United Nations (2018), the world's urban population in 2018 is of 55%. The projections point to 68% of the population living in urban areas in 2050. These increasing numbers of people moving to urban areas together with the increasing numbers of cars circulating in cities and towns are alarming. Not just because of the pollution, but this jeopardizes mobility as a whole, considering people do not use transportation only for work, but to have access to the city and its services (such as healthcare, leisure, education, running errands, and others). The notion of travel within cities is also a matter of class perspective. Travels are often understood as a derived demand, and it has different values to different social classes. To those with lower income, transportation is a need to move within the city specifically for matters of work and value-producing. This sense gets weaker as a time for leisure turn out to be more valued and cherished, and incomes grow, putting a different perspective to travels, now as a means to achieve pleasure, culture, ease, etc. in the perspective of higher economic classes (Mokhtarian and Salomon, cited in Banister 2008).

Escape theory (Heinze, 2000) hypothesizes that leisure mobility is an attempt to compensate for the declining quality of life and travel opportunities are sought to get away from one's everyday environment to do something completely different. A substantial amount of leisure travel is undertaken for its own sake, and the activity of traveling is valued (Banister, 2008). Banister (2008) also illustrates how the two visions of transport are compared. The conventional approach and the alternative approach also viewed as sustainable (below on table 4).

Table 4. Contrasting approaches to transport planning (with minor modifications, Banister, 2008, p. 75).

The conventional approach -transport planning and engineering	**An alternative approach – sustainable mobility**
Emphasis on the physical dimensions	Emphasis on the social dimensions
Mobility	Accessibility
Traffic focus, particularly on the car	People focus, either in (or on) a vehicle or on foot
Large in scale	Local in scale
Street as a road	Street as a space
Motorised transport	All modes of transport often in a hierarchy with pedestrian and cyclist at the top and car users at the bottom
Forecasting traffic	Visioning on cities
Modelling approaches	Scenario development and modelling
Economic evaluation	Multicriteria analysis to take account of environmental and social concerns
Travel as a derived demand	Travel as a valued activity as well as a derived demand

Demand based	Management based
The conventional approach -transport planning and engineering	**An alternative approach – sustainable mobility**
Speeding up traffic	Slowing movement down
Travel time minimisation	Reasonable travel times and travel time reliability
Segregation of people and traffic	Integration of people and traffic

On table 4, two contrasting overviews of transport planning are presented. The conventional approach is presented as part of "transport planning and engineering" and it is the technocrat approach, using cost-benefit analysis, focusing on issues like road efficiency for the vehicles and not for people, how it will cost and how to compartmentalize and segregate space for people and for traffic. On the other hand, the alternative approach is presented as "sustainable mobility", adding to the subject a human perspective, considering the social gains, inclusion and systematizing the dynamics between traffic and people, focusing on how to create spaces for human coexistence and not only mechanical transportation.

A concept often used to address environmental friendly and resources efficient cities is "smart city". According to (Höjer and Wangel, 2015, p. 342) a Smart Sustainable City is defined as "a city that meets the needs of its present inhabitants without compromising the ability for other people or future generations to meet their need, (…) and where this is supported by ICT[12]". The authors break the concept and analyze the concepts of the terms "smart", "sustainable" and "cities" building and conceptualizing a comprehensive notion that is further labeled as Smart Sustainable Cities (SSC). They point out that the terms that build the SSC concept can be perceived separately and in different interrelations. For example, cities do not necessarily need ICT to be sustainable or, on the other way, the use of ICT can have no effect or contribution to create a sustainable city. This technology can also be used outside cities. This way, the three aspects combined and interacting with each other are necessary to create Smart Sustainable Cities (Höjer and Wangel, 2015). Hence, a smart city relies on an efficient and effective public transport system, which can be used by as many as possible, fast, reliable and affordable, becoming, this way, a competitive against the individual transport. The influx and wellbeing of people within cities are connected to the efficiency and quality of transportation, as people need to move from point to point, and as smart a city can be, the better the transport will be for its users and for the environment, in a virtuous circle.

Finally, transport has a social or equity dimension, as those who cause transport issues, and those who are affected by it are unevenly distributed across socioeconomic groups (Greene and Wegener, 1997). This means that individuals causing congestions, pollution and other social, environmental and economic problems within the transport field, are, in general, less affected by its consequences than people in vulnerable social and economic positions are. This class distinction seen before on how car users and public transport users are punished for their transgressions is constant. The European Commission (2004) states that nearly 30 % of households in Europe have no access to a car. They pay the price of traffic without enjoying mobility benefits offered by car ownership, endorsing an equity perspective to the transport subject. In Sweden, roughly half of respondents (48%) believe that regional authorities should be mainly

[12] Information and Communication Technologies.

responsible for reducing traffic. In Europe, the rate is 56% (European Commission, 2004). Roads, traffic signs, infrastructure, planning, and many other humans and financial costs involved in car traffic are equally distributed to an unequal society. This means that the public money serves a parcel of a society that has, in the majority, more wealth, at the expense of a more fragile social group. At the same time, car owners do not share the same burden when not paying differently to cover public transportation costs. The ones paying for public transportation have, in most cases, no option to travel long distances and need to bear the costs of the fare, no matter how much it means to be charged. It does not matter how much it costs (or it is imposed to be paid by the decision of policymakers), to have the right to move, it is needed to pay for the service.

4 Empirics

In the empirics chapter, all the cases will be presented. There are two cases where the FFPT is already implemented, Tallinn and Avesta. Future cases are also presented, being Luxembourg the first country to implement the FFPT, in 2020; and Uppsala as a possible case to introduce the policy as a tool to transform its public transport system, hence develop the environmental issues and reduce social inequalities.

4.1 Tallinn

Tallinn is the capital of Estonia, and it has approximately 441,000 inhabitants and "is the first European capital and the largest city in the world so far that offers FFPT services to all of its inhabitants" (Cats *et al.*, 2017, p. 1091). The FFPT was introduced in Tallinn on January 1, 2013, as part of an agenda to stimulate a sustainable transport solution. This way, the city implemented a full and unlimited fare-free public transport system to its residents that need to register to get the benefit.

The city of Tallinn has in its official website a dedicated page to inform about the right of free travel and describes which documents a resident needs to present to evidencing the right. A city resident needs a personalized transport smartcard that can be purchased in different sales points for €2 (two euros). As it is provided on the website, the people that can have this benefit are:

> "You can only personalise your card if you are listed in Tallinn's population register i.e. you have a residence permit or you are an EU citizen who has registered with your local government and applied for an Estonian ID card. Stateless citizens residing in Estonia must also have a residence permit to do this. Citizens of countries outside of the EU must apply for a residence permit to live in Estonia. EU citizens who relocate to Estonia must register with their local government in order to be granted the right to reside here, and they can also apply for an ID card, on which it will be marked that they are an EU citizen. In both cases they are issued with a personal identification code and listed in the population register. Individuals who are not citizens of Estonia or the EU and who have not registered themselves or who lack a residence permit or a stateless citizen's passport and residence permit cannot personalize their Smartcard. Residence permit holders can purchase ID tickets, as can EU citizens if they have obtained an ID card" (Tallinn.ee, 2019b).

Other than that, Tallinn residents (composed by students and persons residing permanently in Tallinn, according to the population registration records) need "to validate their travel by swiping the Green Card each time they board a public transport vehicle. Personalized Smartcard will only be valid with a personal identity document. Person's permanent residence records in the population register will be checked once per month" (Tallinn.ee, 2019c). Once the person registers in an address in a different municipality, the travel benefits cease. Anyone registered outside Tallinn who needs to use the public transport system must pay the fare for the trip.

Before that, public transportation had a significant market share in Tallinn. Of all trips in the city, 40% were done by the public transport system and, additionally to it, 30% by foot and 26% by private cars. Cats *et al.* (2017) argue that despite the fact that the numbers show a favorable picture, this modal split (40%- 30%) trailed a negative tendency. They point out that public transport trips decreased dramatically after Estonia's independence in 1991 and the "motorization rate – the number of private cars per 1000 inhabitants – has more than doubled during the same period, up to the current level of 456 cars per 1000 residents" (Cats *et al.*, 2017, p. 1091-1092). Although the public transport system had a significant market share in the Estonian capital in 2012, the ticket sales covered a small parcel of the system operational costs. Since 2003 there were fare reductions for the public transport in Tallinn.

> "In 2012, the share of users that were exempted amounted to 36 % with additional 24 % of the users (e.g., students, low-income) having special concessions. The full-scale FFPT can therefore be conceived as the final

> stage in a sequence of steps aimed to make public transport in Tallinn more attractive and affordable. Nevertheless, public transport fares were identified as a primary problem area in Tallinn. On an annual municipal public transport satisfaction survey from 2010, fare was the most commonly mentioned source of dissatisfaction with 49 % of the respondents, followed by crowding (29 %) and frequency (21 %)" (Cats *et al.*, 2017, p. 1092).

The numbers elucidate that even though there were considerable cuts of the price for different societal groups, the fare was still a problem for almost half of the respondents of the survey in 2010. This dissatisfaction feeling together with the inefficiency in making the public transport attractive to the inhabitants of Tallinn made the city of Tallinn start a popular referendum to implement a full-scale FFPT system. The participation rate was of 20%, of which 75% voted in favor of the new policy. Consequently, the city council approved the policy and implemented it in 2013 (Cats *et al.*, 2017). The objectives of the Tallinn's FFPT were three: "(a) promoting modal shift from private car to public transport; (b) improving the mobility of unemployed and low-income residents, and; (c) stimulating the registration of inhabitants as residents of Tallinn in order to increase the municipal income tax" (Cats *et al.*, 2017, p. 1092). The increase of income tax was an important measure as the annual revenues from ticket sales in 2012 in Tallinn was around 12 million euros and needed to be covered by the state in this new policy. On this note, the authors clarify the order of the numbers and how the new policy becomes feasible:

> "While the exact number of Tallinn inhabitants that are not registered is unknown, municipal officials estimate it at about 25,000-30,000. It should be noted that the fare reduction for Tallinn residents in 2003 resulted with 30,000 newly registered residents. City authorities estimate that each registered resident contributes ~1000 euro in annual municipal tax. Hence, if the FFPT is successful in attracting more than 12,000 non-registered Tallinn inhabitants to register themselves in order to be benefit from the new policy, then the increased municipal tax collection can compensate for the lost ticket revenues" (Cats *et al.*, 2017, p. 1092).

Tuisk and Prause (2019) also point to those tax gains from the Municipality of Tallinn, arguing that when comparing 2012 to 2017, there was an increase from 53 to 63 million Euros. The 12 million Euros tickets revenue was composed of 5 million Euros from non-residents of Tallinn. This way, the authors affirm that when implementing the FFPT, the government's budget lost 12 million Euros per year "but by attracting new taxpayers to register in Tallinn the win was about 20 million Euros in a year. In total change added to the budget 8 million Euros" (Tuisk and Prause, 2019, p. 9). Most of the newly registered inhabitants of the Municipality of Tallinn, were already living in Tallinn, but without registration they were not contributing as taxpayers.

This policy shows to be attractive to people to move or to regulate their situation as a regular taxpayer and resident, to be able to the benefit of the policy. This adds to the city extra tax collection that cannot just be used to cover the system expenses, but also be invested in different areas of society and benefit an even bigger amount of the population. It is important to note that this example and "formula" is not the only one and not adaptable to all the cities and towns, but one important way to achieve change and feasibility for the FFPT policy. Kębłowski shows that as results of Tallinn's FFPT policy,

> "if FFPT indeed was responsible for having 'attracted' 25,000 tax-paying residents, the policy thus translated to €40 m of additional revenue per year. The decreased revenue from PT fares – which still have to be purchased by commuters and tourists – over the same period amounted to about €12.2 m per year. To respond to increased demand and higher PT frequency, its annual operational budget was further increased by €11.7 m from 2012 to 2016. Overall, this indicates a surplus of approximately €16.1m per year (Kębłowski *et al.*, 2019, p. 10).

Tuisk and Prause (2019) acknowledge immediate results of the FFPT implementation in Tallinn, regarding environmental aspects when they point that

> "one important result of the implementation of FFPT in Tallinn was the increase of use of the public transport by +10% which was accompanied by a slight decrease of car traffic in the city centre by −6% and a slight increase of car traffic around the City centre by +4%. One important parallel to the start of the FFPT in Tallinn was the increase of parking tariffs in the city centre which are currently 6 Euros per hour in the old town and 4.80 Euros in the city centre so that decrease of car traffic in the city centre can be considered as a combination of FFPT together with the increase of parking tariffs." (Tuisk and Prause, 2019, p. 10).

The authors show the important aspect of the introduction of additional measures to create the best conditions for people to use more transport that is public and less cars. The numbers above also illustrate how the variation of people using public transportation and less private transport can affect emissions of CO_2. They calculate that the 3% of car usage drop in Tallinn, between 2012 and 2013, "the emission of the CO_2 dropped 703 kg/Pkm in total" (Tuisk and Prause, 2019, p. 10).

Other immediate results were visible in Tallinn after a few months of the FFPT implementation. Impacts that are more tangible can be perceived in literature after one year or comparing 2012 to 2013, one year before and the year of implementation. Galbadón-Estevan *et al.* (2019) point out that approximately a year after the introduction of FFPT, public transport usage grew from a considerable high level of 55% to 63%.The car usage decreased from 31% to 28% and the numbers for walking as a primary means of transport decreased from 12% to 7%. According to the author the "results also show that user groups vary considerably, with people in the 15-19 and 60-74 age groups, people on very low incomes (up to €300net/month), and the unemployed using PT more often" (Cats *et al.*, 2017 in Galbadón-Estevan *et al.*, 2019, p. 4).

This escalation in passenger numbers can be especially seen on train passenger numbers. Train passengers increased by 300%, initially, and within 2 years, train travel within Tallinn's perimeters grew to above 700%. Galbadón-Estevan *et al.* confirm the reliability of the numbers "since train passenger numbers can be confirmed by the train inspector's records" (Galbadón-Estevan *et al.*, 2019, p. 8). This growth benefit also because the FFPT was applied to within-city train rides, integrating the train rides inside Tallinn with the other transport modes. However, the authors also state that "Despite this spectacular increase, these 1.5 million rail journeys account for only 11% of total PT journeys in Tallinn (of about 140 million trips)" (Galbadón-Estevan *et al.*, 2019, p. 8). At the same time that the author acknowledges the considerable rise in rail journeys, he criticizes the same number. This view can be alleged contradictory, as even if a higher increase was expected, 11% is not a number to be ignored. Continuing their analysis, Galbadón-Estevan *et al.* (2019) argue that it "is clear is that just introducing FFPT is not enough to produce a modal shift from private car to PT. Even accompanying measures (introduction of bus lanes, investments in new trams, priority signals for PT, etc.) may not suffice for a sustainable effect" (Galbadón-Estevan *et al.*, 2019, p. 11). He states the importance of connectivity between periphery and city center, especially for spread-out cities like Tallinn. This connectivity is also known as modal integration, where a passenger can use different modes of transportation simultaneously, (for example taking a bus and a train, a subway and a bus, etc.), saving time and costs for the system.

There are critiques relating to the FFPT policy in Tallinn. After 5 years of the implementation of this system, the controversy over the estimates of the success of the policy is found. Galbadón-Estevan *et al.* (2019) argue that "most decisions regarding the implementation of the public transportation measure improvement (…) that accompanied FFPTS implementation were already taken before the proposal for the FFPTS was launched and would have been implemented anyway" (Galbadón-Estevan *et al.*, 2019, p. 10) creating difficulties to measure and assess specific impacts of those measures one by one. Nevertheless, it becomes a matter of intellectual speculation to ignore the weight of the system change and its impact on the implementation of the measures that "would have been implemented anyway" and assume that the overall impact in society is not relevant because of the difficulties in assessing different targets and goals. Galbadón-

Estevan *et al.* (2019) also critique the increasing number of passengers in the system, as according to the authors the number was kept constant from 2013 until 2017, even though they point to an increase of around 7.7% in passenger numbers in 2013 compared to 2012. This critique also comes with no numbers about increase or decrease of car ownership and travels, which can be another weakness on the FFPT policy implementation and results, or a lack of knowledge that does not weaken the new system.

On this note, "when comparing the increase in private cars ownership between 2012 and 2013 the statistics show in Tallinn it dropped to 0.6%." (Tuisk and Prause, 2019, p. 8). This decrease in the year that followed the implementation of the FFPT policy becomes more significant when comparing the numbers of Tallinn before the policy and its neighbor contrasting statistics that

> "showed a continuing growth of annually 10% of private car ownerships in neighbouring municipalities like it was before also in Tallinn. Despite this quick change after implementation of FFPT the longer trend shows that the number of cars has not dropped in general. According to data from Estonian Road Administration (Eesti Maanteeamet) in 2013 Harju County (the area that surrounds the capital city Tallinn) had 254,222 private cars and of these 167,553 were registered in Tallinn. In2018 Harju county had already 310,686 cars and of those 197,922 belonged Tallinn. So, the growth in ownership in Tallinn was 15% during the first 5.5 years of FFPT while for Harju County it makes 23%. This difference in car ownership is clearly visible and can be at least partly attributed to FFPT in Tallinn." (Tuisk and Prause, 2019, p. 8).

Kebłowski *et al.* (2019) indicate that the literature analyzing Tallinn is limited and most of them takes in consideration the impacts of FFPT as an instrument of transport planning and its capacity to increase the public transport. Others focus on the environmental impacts and others on the social dimension. The present research tries to analyze the social and environmental impacts of this policy, acknowledging the economic and political dimensions, even though not placing them in the core of the analysis.

The Representative of Tallinn Municipality to European Union, Allan Alaküla (2017), argues that the impacts presented by the FFPT can be presumed in relations of indirect indicators and results. Alaküla (2017) continues affirming that there is no accurate technology to measure and estimate the impacts of FFPT in the environment and socio-economic areas. According to him, unemployed persons and the ones looking for better employment were positively affected, enhancing mobility through the FFPT. In addition, the use of public transport increased in evenings and weekends and, consequently, the consumption of local services and goods. Moreover, families started going out on weekends more often and emission of CO_2 decreased.

4.2 Avesta

Avesta is a city in the Dalarna region, Sweden, and it has approximately 23,000 inhabitants. In 2012, the city decided to implement a two-year trial period where public transportation would become free of charge in all local bus lines.

Kębłowski (2017) refers to Avesta's implementation of the FFPT policy as "a strategy working towards reducing car usage" and, similar to other European cities, and also "conceived as a social policy aiming at helping disadvantaged groups (…) and introduced unconditional use of collective transport redefined as common good" (Kębłowski, 2017, p. 20). The Mayor of Avesta, Lars Isacsson (2015), argues that the Municipality hoped to achieve the following impacts with this policy implementation:

1. more users to the public transportation system, by making it simpler, easier and cheaper (virtually zero cost) for people to choose the public bus;

2. reduce administration related services, considering the Municipality would no longer be required to manage the school bus passes;

3. enhance the efficiency of the current existent traffic, not having empty buses traveling;

4. increase social equality, not having travel zones anymore, which increased the price for those living far from town and also increase mobility for the elderly and low-income people;

5. reduce carbon dioxide emissions, as an outcome of more people taking the bus instead of riding the private cars.

The Municipality has also identified possible issues that would come with the implementation of this policy. Isacsson (2015) pointed out the following possible issues:

1. Buses used as a place for people to spend time in;

2. Constantly overcrowded buses, forcing the Municipality to offer more buses to different lines;

3. The necessity of more constant maintenance and reparation of buses, as results of use, also known as "wear and tear".

However, as the Mayor concluded, after one year of the experience, that only one of the issues became a reality. The buses got overcrowded and the solution found was to add extra buses on certain routes, lines and times, increasing costs for the Municipality (Isacsson, 2015). Despite the costs increasing (two additional buses by the extra cost of 2.7 million Swedish Crowns), the policy implementation was understood as successful, as the main objective was to make more people use the public buses. The Mayor also justified the measure adding "(…) we had a bus service that we previously couldn't have kept because not enough people were using it" (Isacsson, 2015).

The results after one year were that more people decided to ride the public buses under the fare-free policy. Isacsson (2015) points out that "based on traveler statistics and the results of interviews with bus travelers (…) the reduction in the number of car journeys were assessed". He also adds some more statistics to the first-year experience, affirming "that approximately 39% of bus journeys had replaced what would previously have been a trip by car and 22% replaced what would previously have been a trip by bicycle or on foot" (Isacsson, 2015). This can also be clarified as roughly every third person being part of the fare- free buses have previously chosen the car and now have migrated to the public transport system (Isacsson, 2015). This way, after the positive numbers and experience, Mayor Isacsson (2015) concluded that they should make that policy permanent after the trial period, as the advantages outweighed the disadvantages.

In the official Avesta Municipality website, it is stated that "the municipality has free public transport to promote sustainable travel" (Avesta.se, 2017). Per capita, the fare-free public transportation, nowadays, around an extra of 200 Swedish Crowns and for the entire municipality approximately an extra annual costs of 4.6 million Swedish Crowns. Since the introduction of this policy, travel increases reached over 200 percent in the municipality, proving to be a huge success (Avesta.se, 2017). The only requirement to have access to the system is that passengers need a travel certificate that costs 30 Swedish Crowns and can be bought in supermarkets or on the bus. However, if the passenger chooses to use the card as a mobile app, there is no cost and the access is completely free of charge.

There were considerable environmental and social benefits for Avesta. After one year of the policy implementation, the overall decrease in car traffic led to a decrease in carbon dioxide emissions by 64 tonnes per year. Taking into consideration the increase in bus services, there was an increase of 24.5 tonnes of carbon dioxide emission per year. In the end, the policy results was a net decrease of 40 tonnes of carbon dioxide

per year (Isacsson, 2015). Accordingly to a report made by Ramboll[13]

> "The evaluation shows that the attempt with toll-free public transport in Avesta has resulted in a sharp increase in travel. This is also in comparison with other municipalities that have or have had free travel. The increase in travel has taken place in all age groups and categories of cases. The experiment has contributed to reduced carbon dioxide emissions since the increase in bus travel has meant that car trips are replaced with bus journeys. Based on the results of the evaluation of travel and the effect on the environment, the experiment with toll-free public transport in Avesta may be considered to be successful" (Ramboll, 2013, p. 16)[14].

Adding to those numbers, Isacsson (2015) listed other impacts on the socio-economic areas and pointed the existence of social benefits as an outcome from this policy, although it is difficult to measure them in numbers. The Mayor of Avesta enumerated some of the significant social benefits in Avesta, for example: "(…) people get together - easier for the elderly with limited economy to 'get out of the house' and meet people; easier for the citizens to access services and places in the municipality; easier for immigrants to travel to language classes; and promotion of equality (…)" (Isacsson, 2015).

4.3 The Future of Public Transportation

There are many studies and specialists analyzing and suggesting what could be the future of public transportation. While some go to a tragic outcome, where public transportation is in decline, others go to the opposite way. Buehler (2018) argues that technology can threat public transport, as connected and automated cars are convenient and will become cheaper with time. However, this is still not close to being a reality, as there are many technical challenges to be solved and public transportation is still more efficient and effective in urban areas, especially in the rush hours (Buehler, 2018). Holmgren, Jansson and Ljungberg (2008), in their paper, ask the question if public transportation is inevitably on the decline in towns. Their answer to this involves, at least, a partial implementation of FFPT in their case studied city,

Linköping, in Sweden. They answer the proposed question by saying

> "that by regarding a basic supply of local bus services as merit goods, and providing a level of service above the basic minimum level to the extent that the incremental benefits exceed the incremental costs, and pursuing an optimal peak-load pricing policy would break the declining trend and evoke a virtuous spiral in the case study town of Linköping. The pricing policy would involve zero-fares in off-peak, which would raise off-peak demand so much that the same frequency of service should apply all day." (Holmgren, Jansson and Ljungberg, 2008, p. 72).

No matter what view is right, it is not possible to predict the future of public transportation. In fact, the existing possibility is to shape the future of public transportation with the actions and choices made now. Elevating the costs of car usage and decreasing the costs of accessing public transport was shown in this study to be a possible efficient way to make car owners and users migrate to collective transport. Public transport systems are also linked with wellbeing, and it is one of many indicators used to rank the development and sustainability of cities. One of the most important ranks is the One Planet City Challenge, promoted by the World Wild Fund for Nature (WWF) since 2013 and advertised as the "largest and longest running competition of its kind. More than 400 cities on 5 continents have participated at least once" (WWF, 2019).

[13] "Ramboll is a leading engineering, design and consultancy company founded in Denmark in 1945" (Ramboll, 2019).
[14] Free translation from Swedish to English.

4.3.1 The Future of Public Transportation: Luxembourg

The present research focused on two cities, different in population size and other contexts, and also showed the possibility of expansion of the FFPT to other cities, using Uppsala as an example. However, the FFPT is not only applicable to cities, isolated. In 2019, Luxembourg announced that it will become the first country in the world with totally free public transport. Luxembourg is a country with around 600,000 people, as of January 2018, which almost half is composed by foreigners (48%) and "around 177,110 cross-border workers from France, Belgium and Germany" enter the country on workdays (Luxembourg.lu, 2019a). In the context of the Paris Agreement and the Agenda 2030, among other decisions on the environment sector, Luxembourg announced free transport as a way to tackle climate change. In its official government website, Luxembourg affirms that "two-thirds of the emissions of greenhouse gases are produced by road vehicles, an increase in taxes on fuel is only logical. Most of the revenue from these taxes will be allocated to the climate and energy fund" (Luxembourg.lu, 2019b) in a way to create new funding to consider possible future alternatives. Following this, the Great Duchy's government argues that "Another way to reduce emissions is to promote public transport and electrically-powered vehicles. So the aim would be to introduce sustainable mobility generally, with solutions that include the tram[15] and free public transport, starting in 2020." (Luxembourg.lu, 2019b). This concern is especially valid for Luxembourg as this is the country with the highest concentration of cars per capita. According to Eurostat[16], in 2016 Luxembourg had most cars per inhabitant amongst the Member States in the EU, "with 662 cars per 1 000 inhabitants, followed by Italy (625 cars), Malta (615 cars), Finland (604 cars) and Cyprus (595 cars)" (Eurostat, 2018). The average in the EU that year was 505 cars per 1 000 inhabitants.

Since 2017, Luxembourg has implemented partial FFPT policies in its public transport system. Young students had free universal access to the public transport in Luxembourg, which was expanded to students up to 30 years old, enrolled in universities or post-secondary education institutions. In addition to those, everyone up to 20 years old, regardless of occupation, have granted university free access to public transport in the country. This way, the government of Luxembourg aimed at young workers and students, that only needed to register to get the smart card that gives access to "a season ticket enabling the user to travel free of charge on all means of public transport, throughout the entire Luxembourg network." (Luxembourg.lu, 2017). This card, named mKaart, gives to the passenger "unlimited travel on all forms of public transport throughout the Grand Duchy of Luxembourg. The scheme thus covers buses, as well as trains in 2nd class (…) also be valid on the tram (…)" (Luxembourg.lu, 2017).

Academic sources regarding FFPT in Luxembourg are scarce by the simple fact that this is a policy that will start in the future. Carr and Hesse (2019) have a pessimistic view of Luxembourg's ambitions in expanding the FFPT. The authors claim that the fact that the fares are already heavily subsidized (a single ticket costs €2 and daily passes €4) and there are already gratuities for parts of the population, the impact would be insignificant. They continue arguing that "the notion that free transport is a means of wealth redistribution and social inclusion doesn't square. It's already cheap – and far outweighed by exploding housing costs – the country's real inequality challenge." (Carr and Hesse, 2019, p. 3). However, the authors seem to ignore that one issue does not cancel the other and that inequality can be tackled through a diverse array of actions. They affirm that policies to reduce car usage are considered a taboo in Luxembourg, and the low price of fuel combined to the high income of the citizens would make the FFPT ineffective, considering the policy as a simplistic action for Luxembourg (Carr and Hesse, 2019). As it was seen in this study, the FFPT cannot solve all the urban issues and transportation problems within cities, neither solve environmental and social issues by itself. Thus, FFPT is one piece of a bigger puzzle in a complex and intricate reality, with many layers of cultural, sociological, economic, environmental reflections to be raised and deliberations to be

[15] When completed in 2020/2021.
[16] Eurostat is the statistical office of the European Union.

made.

The case of Luxembourg remains impossible to be assessed and judged, as it is, so far inexistent in practical terms and this research does not intend to create positive or negative expectations or to speculate without data and observation simply. However, the symbolism of the case cannot be ignored. As the first country to implement a full and universal system of fare-free public transport, Luxembourg stands in front of the other nations as a pioneer and carries considerable responsibility. This responsibility is due to the fact that if the policy is well implemented and helps the country to tackle climate change and inequality, it can serve as an example to other countries to follow. However, if this policy turns to be a failure, it can put in check FFPT as a functional policy and lower the possibilities of expansion in other cities and countries.

4.3.2 The Future of Public Transportation: Uppsala City

The city of Uppsala is the WWF's One Planet City Challenge (OPCC) last winner, in the year of 2018. Uppsala is the fourth biggest city in Sweden, with a population of 225,164 people (Uppsala.se, 2019). This is the city where this research has been done and where I live since 2016. It is also a city with relevant ambitious in becoming environmentally friendly and carbon positive in the next few decades. Lastly, it was chosen to be analyzed in this discussion, as it is an intermediate city, in population size, compared to Tallinn and Avesta.

The city of Uppsala was chosen by the WWF as the "global winner of WWF's 2018 One Planet City Challenge" (WWF, 2018a), competition between 132 cities, representing 23 countries, and is recognized as the "most environmental" city of the year. The focus of the OPCC's 2018 edition was "in sustainable transport, and the jury will be paying special attention to cities that present ambitious mobility plans and actions" (WWF, 2018b). The prize was given to Uppsala city based on an international jury of urban sustainability experts, according to the WWF, using the following criteria:

> "Demonstrate determination to align with a transparent and science-based GHG emission reduction trajectory; Have ambitious and strategic action plans to meet stated commitments; Integrate actions into coherent and overarching climate action plans; Lead, with respect to local and conditions; Highlight sustainable mobility efforts." (WWF, 2018b).

The public transport in Uppsala is managed by the *Kollektivtrafikförvaltningen*[17] UL. According to its official website,

> "UL has the overall responsibility for public transport in Uppsala County. It is Public transport and Community within Region Uppsala that is the regional public transport authority that is responsible for, procures and develops public transport in Uppsala County. Under the UL brand public transport is carried out. Public transport and society is governed by Traffic and the community development committee." (UL, 2019a).

Hence, it is the responsibility of this Public Transit Department to observe the criteria evaluated by the WWF's OPCC prize. On the UL website, the environment and sustainability's vision and philosophy of the Department is presented. Their vision is advertized as it follows:

> "We want as many people as possible to leave their car at home and travel by bus or train. The greater the numbers who travel with us, the better it is for our environment. Our aim is to double the number of trips by 2020. This means an average increase of about seven percent per year, which would be amazing. The road ahead is twisted and full of obstacles, but we are nonetheless confident that we will be able to accelerate much more than we have to brake.

[17] Direct translation would be "Public Transport Administration".

> We do our best to influence every decision within the transportation sector that affects environmental impact. The choice of vehicles at purchase, traffic planning, how our buses and trains are driven, various infrastructure measures, the choice of technology and fuels and, naturally, how each of us chooses to travel are just some of the decisions we can and should participate in. Our goal is for public transit to be structured so that it contributes to sustainable travel and a good environment." (UL, 2019b).

Continuing, they present in their philosophy that

> "The mere fact that we are here and that many people make use of our services means the environment does better. It's something we're proud of. This doesn't mean we can relax and be satisfied with what we've done. We naturally want to do everything we can to reduce today's environmental and climate impact – emissions,
>
> noise pollution, congestion, etc. There is a lot to think about and a lot to consider. Although a trip by public transit that replaces a trip by car means that the environment does better, emissions from buses also impact the environment. We must naturally take responsibility for this and do our best to improve." (UL, 2019b).

They want to double public transport use and be completely fossil-free by 2020. Both challenges are enormous, and the impacts it can produce will be important for the continued sustainable development of the Uppsala city. However, when it regards to attract more people to use public transport, UL will need to become bolder in its decisions and strategies. Going on the opposite direction of a FFPT policy or constant decrease of the fare, UL increases the price of tickets every year. On table 4 there is a fare timeline, containing the last 7 years of ticket pricing (since 2013, when the system started to be shared between Upplands Lokaltrafik – UL – and Uppsalabuss) to analyze how the economic impact is managed by UL.

The UL Board makes decisions on the ticket pricing and structure. At the end of 2013, the Board decided to change the ticketing system and pricing for implementation in the first half of 2014. In connection with this decision, it was also determined when the decided price increase of 3% would start to be charged. Before 2013, the methods to calculate the number of passengers in the system varied, as the system to charge tickets was different. From 2013 and 2014, UL implemented the *automatiskt passagerarräkningssystem*, or "APR"[18] (Regionuppsala.se, 2013).

Table 5. Evolution of ticket price in Uppsala (Adapted from several pages in UL.se, 2019c, Regionuppsala.se, 2019 Unt.se, 2013 and Unt.se, 2014).

Year	2013	2014	2015	2016	2017	2018	2019
Price (SEK/per month)	Varying from 525 to 1580	790	750	795	795	840	880

Table 5 shows the history of evolution on the fare prices in Uppsala and its constant increase in the past years. This analysis shows that UL could add different strategies to its attempts to achieve its visions. In fact, there are, already, reduced fares, i.e. for youth, students and for retired people. Those fares are reduced, but still can be considered high for low-income persons.

In 2019, the UL (2019d) fares are:

- Annual (8,360SEK);
- 90-day (2,380SEK);

[18] Automatic Passenger Counting System.

- Summer (1,760SEK, from June to August);
- Monthly (880SEK);
- 24-hours (from 95 to 210SEK, depending on the amount of zones chosen);
- and single (from 39 to 195SEK, depending on the amount of zones chosen).

The reduced fares are:

- Youth – To UL, Youth is classified as people that are "7 up to and including 19 years (…). Also for those who reach 20 years during the ticket's validity period." (UL, 2019e).
    - Monthly (580SEK);
    - Leisure ticket (335 to 820SEK depending on the type chosen) – "The leisure ticket VT/HT is valid Monday - Friday 16.00-04.00. Leisure ticket 30 days is valid 14.00-04.00. The tickets are valid 24 hours a day on Saturday, Sunday, holidays and study days." (UL, 2019e);
- Student – "Those who study full-time (…). The ticket is uploaded on a UL card and is valid every day and 24 hours a day." (UL, 2019f). It requires a valid student card and ID to confirm student status.
    - The only option is the Monthly card (580SEK);
- Retired, Pension or Beneficiaries – The ticket is valid for those who are 65 years and over or have the certificate from *Försäkringskassan 'Intyg för förmånstagare'* or the Swedish Pensions Agency's *'Pensionärsintyg'*. (UL, 2019g).
    - Monthly (560SEK);
    - Summerticket (1,120SEK).

Although reduced fares at present exist, UL gives no clear sign of walking a path to reduce the fare continuously or to evolve the already existent discount system. Another mixed sign regarding UL's discourse is the fee charged for those traveling without a valid ticket. As it was said before, traveling without a valid ticket in Uppsala is punished with a 1200SEK fee. As a transportation department ruled by a political board, UL could make pressure on the authorities in other departments to raise the price for parking lots and punishment for illegal parking, which is almost three times cheaper in comparison to the punishment from UL, for instance. This influx of money in the public budget could be used to strengthen the FFPT project and reduce the already existent fare. As the number of people using public transport increases, it could mean fewer people using their private cars, as UL advocates. Furthermore, the non- monetary benefits were showed previously and could be of great benefit for the city of Uppsala and UL's ambitions.

A reasonable midway point that can work as a transition to the implementation of the FFPT policy is to use the existing subsidy and the possible ways to increase it in the public budget, catalyzing the shift of the existing system to FFPT, consequently lowering the fares every year until it reaches zero. For example, making a budget and action plan to cut the fare price in half every year until it reaches zero. Another possibility is a transition through reducing the fare to the payment of a symbolic fare. One example of symbolic fare is the price of the fare in Vienna, Austria, where annual travel pass for all the public transport system costs 365 euros (advertized as 1 euro per day). For this price, the passenger has unlimited travel in

any transport mode in the city of Vienna within 12 calendar months (Wiener Linien, 2019).

As it was seen in the previous chapters, there are many other possibilities to work through the public budget, and the most important step is political. The regional public transport in Uppsala County (which encompasses Uppsala city) is partly financed by society and partly commercial. The publicly financed traffic is financed partly by travelers through ticket revenues (operating revenues) and partly by the county residents via the regional tax (community financing), as one of the most common models seen before. The publicly financed public transport in Uppsala County cost just over 1.8 billion Swedish Crowns in 2016, of which 54 percent was community funding (Regionuppsala.se, 2016, p. 10).

Finally, Uppsala has a plan to become fossil free in 2030 and climate positive in 2050, following a plan called "Environmental and Climate Programme 2014-2023", first published in November 2014 and lastly updated on February 2019 (Uppsala.se, 2014).

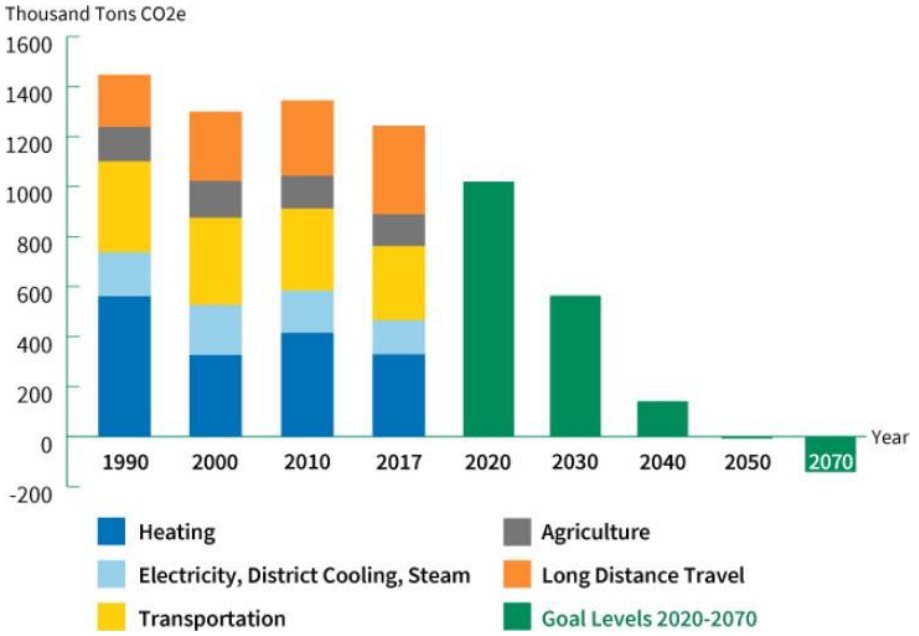

Figure 5. Greenhouse Gas Emissions in Uppsala (Uppsala.se, 2014).

Figure 5 shows the greenhouse gas emissions in Uppsala in different fields, from 1990 to the intended goals in 2070. The Municipality claims that:

> "No later than the year 2030, emissions of greenhouse gases from energy use, transport and work machines within the geographical area of Uppsala Municipality shall be zero and based on renewable energy sources.
>
> The total emissions of greenhouse gases shall:
>
> - by the year 2020 have decreased by about 30 %
> - by the year 2040 be close to zero, i.e. have decreased by about 90 %
> - by the year 2050 have decreased with the equivalent of more than 100 %
> - by the year 2070 have decreased with the equivalent of about 110 %" (Uppsala.se, 2018).

Although the numbers are bold and represent a significant change, a few points need closer consideration.

Comparing the presented figure and the data showed on it, it is possible to see that the Transportation, in yellow, barely changes from 1990 to 2017, while other areas suffer a considerable reduction, such as heating. There are many explanations for the good development in the efficiency of the heating sector from 1990 to 2017. Nevertheless, the marginal difference in Transportation is alarming. 2017 levels show Transportation as a sector that emits similar quantities of greenhouse gas as Heating and Long Distance Travel. For the future predictions, there are no clear numbers or estimates in the different sectors, as the graphic Considering that the busses in Uppsala run with biogas, biodiesel, ethanol and that there is a massive effort on reducing fossil fuels to a level of zero by 2020, it is accurate to assume that the policies on transportation in Uppsala need to be enhanced urgently. Especially, the development of the conditions to use more public transport and less private transport vehicles. The term "public transport" also appears on the "Environmental and Climate Programme 2014-2023" report only twice. Two times in the whole report, in the last page, without any clear vision, targets or goals for the area.

This lack of vision to strengthen, develop and enhance public transport and its usage, as an environmental and social tool, at the same time as creating the conditions to decrease the use of cars in Uppsala, can be seen as an opportunity to drastically change what Uppsala is prioritizing nowadays in this sector. The future of transportation in Uppsala is unclear as in many other places in the world. However, a drastic review of the pricing policy for public transport could bring positive results to UL's plans. Moreover, further on the possibility of implementation of FFPT in Uppsala, could be a possible step forward to UL and Uppsala city to meet their ambitions and goals in being one of the most environmentally friendly cities in the world.

5 Analysis

The analysis chapter will provide an overview of individual and collective transport in the discussed fields, providing a critical perspective on the impacts of individual and collective transport on the environment and socio-economic issues. A frame of reference for the analyzed cases is presented in order to organize the data collected and clarify the argumentation.

5.1 Analysis of Individual and Collective Transport

Cars are not just a practical issue to be analyzed, discussed, and problematized when discussing public transportation. Private transportation is also a strong social privilege symbol in many societies. Driving a car is a symbol of inequality in society, beyond pollution, land usage and health issues. When analyzing numbers provided by the European Commission, it is possible to see a broad and general perspective on numbers and issues regarding public transport in Europe. The numbers are valid to an extent and represent a picture of a moment and an idea of the whole, being, however, of important use for a better understanding of the public opinion and behavior. These numbers are also present in many other peer- reviewed articles and researches. Some of them are cited in the present study and come from the European Commission, which is a solid democratic institution, part of the European Union's core. There is an exclusion of part of the population to access equally different opportunities in the cities, which means an alienation of those that have no access to transportation as they wish. At the same time, a small part of the population that own means of transportation can use the benefits of transport to access and enjoy the city's spaces, resources and services.

The FFPT has in the literature most of its criticism towards the considered small effect on drivers' behavior and modal change from private to collective transport, together with the effect on accidents, noise, and air pollution. For Kebłowski *et al.* (2019), the FFPT is criticized because in different places the free transport system attracts more pedestrians and cyclists than car users. However, they also argue that a different overview of this issue is presented, where several urban scholars and activist groups think in opposition to the strict technical and economic critiques of FFPT coming from transport scholars. These groups understand the FFPT as a political proposal and project that acts to enable a more just use of urban space. The authors say that opening public transport to all has a great impact on society and it "has been recognised outside academia as an important ingredient of 'just mobility' that 'shows solidarity with the weak, with those who cannot afford a car, with those who are dependent on PT, who are particularly affected by its drawbacks'" (Brie, cited in Kebłowski *et al.* 2009, p. 6). They continue arguing that FFPT has the means "to provide PT with the status of a 'common good' that cannot be subscribed to market rules and the resultant commodification" (Prince and Dellheim; and Schein, cited in Kebłowski *et al.* 2009, p. 6). Finally, Kebłowski *et al.* affirm that discontinuing the policies and politics of fares for public transport "is thus interpreted as an element of a wider political and spatial strategy aiming to transform urban power relations" (2009, p. 6).

In the social and political arena where transport is now placed no more like a mere technical matter, we can see the difference in the behavior of different classes. People in higher economic classes usually drive a car more than those in lower social classes: "around seven in ten of the self-employed or white-collar workers (71% and 68% respectively) drive at least once a day. These figures contrast with homemakers (37%), unemployed respondents (35%), retired respondents (30%), and students (31%)." (European Commission, 2013, p. 13). The report continues, stating that the use of cars has a relation with income levels: "respondents who almost never have difficulties paying bills are more likely to use a car on a daily basis (52%) than those who have difficulties paying their bills most of the time (37%)". There is also a connection between the usage of public transportation and private transportation. Respondents in the study that use public transport more often are less likely to drive less. "A quarter of respondents who use public transport once a week

drive daily (25%) while roughly two-thirds of respondents who never use public transport drive daily (67%)" (European Commission, 2013, p. 19) points the study. A broader view on car and other modes of transport usage, in Europe, is showed in table 6, below.

Table 6. How often do you use a car (whether as a driver or a passenger)? (figure adapted from European Commission, 2013, p. 19).

QD1.1 How often do you...?

Use a car (whether as a driver or a passenger)

	At least once a day	A few times a week	A few times a month or less often	Never	Don't know
EU28	50%	27%	12%	12%	0%
Use public transport					
Min.1 time/week	25%	36%	18%	20%	0%
Less often	59%	23%	11%	8%	0%
Never	67%	21%	5%	7%	0%
Use a motorbike					
Min.1 time/week	57%	27%	7%	9%	0%
Less often	63%	23%	10%	3%	0%
Never	48%	27%	12%	13%	0%
Use a bicycle					
Min.1 time/week	47%	32%	11%	10%	0%
Less often	66%	21%	8%	5%	0%
Never	45%	26%	13%	16%	0%
Walk					
Min.1 time/week	47%	28%	12%	12%	0%
Less often	69%	18%	7%	6%	0%
Never	59%	22%	5%	13%	0%

Table 6 gives an overview of how the culture of car usage is present in the daily routine of people in Europe, in comparison to the use of public transport, motorbike, bicycle, and walk. It is also possible to conclude from the respondents' answers that the ones "who use public transport less often are more likely to drive daily. A quarter of respondents who use public transport once a week drive daily (25%) while roughly two-thirds of respondents who never use public transport drive daily (67%)" (European Commission, 2013, p. 19).

On the other hand, public transport users are concentrated, in Europe, among young people on a rate of 38% of Europeans aged 15-24 using it at least once a day, which is 21% higher than the following group in the study aged 25-39 year-olds (European Commission, 2013). On this note, the European Commission (2013) points out that students have 49% of its occupational group using public transportation at least once a day, becoming the largest group using this kind of transportation. Therefore, it is noticed that students, belonging to the lower-income classes, use this type of transportation probably because they cannot afford the individual transportation costs. Unemployed people and homeworkers or retired are the ones using less public transportation (13% and 7% respectively, at least once a day), according to the research (European Commission, 2013). This contrast can be justified as students have often discount to travel in public transportation, while unemployed do not have the same benefit. It means that despite students are more likely to be low income, they also use more transport that is public because they have a considerable cut in the fare costs (if not full discount). This example shows the efficacy of the FFPT policy implementation on helping vulnerable societal groups, while other low-income groups are put aside of the system.

On the environmental point of view, more public transportation means less space misused within urban spaces and less emission of greenhouse gases.

> "167,553 cars in Tallinn emitted 140 g CO_2/Pkm in 2012 while after the modal shift (2012/2013) from where car usage dropped 3%, the emission of the CO_2 dropped 703 kg/Pkm in total. This means that 7540 persons who had previously used cars started to use public transportation. The same number of persons saved 151 x 610 = 92,110 m² of space on the streets of Tallinn if their cars were full before their modal shift, but if they used 1.3 people in cars in an average car, then there was saved 151 x 2375 = 358,625 m² of street space. The savings are remarkable despite a small drop of car passengers. The issue is not only about saving public street space during congestions, but in combination with emission gases and psychological factors which concern all city inhabitants (e.g. causing stress) who participate in traffic not depending what type transport they use." (Tuisk and Prause, 2019, p. 10).

For the authors, "it became visible that the introduction of FFPT impacted positively the use of public transport in Tallinn." (Tuisk and Prause, 2019, p. 11). They also affirm that data show that the use of public transport in Tallinn has increased by 14% after the FFPT policy was implemented and the modal shift towards public transportation was increased from 55% to 63% (Tuisk and Prause, 2019).

5.2 Frame of Reference for Analysis of Cases

Below it is presented a table produced to compile a frame of reference for the analysis of both cases of Avesta and Tallin and also presenting the existent data for Luxembourg and Uppsala.

Table 6. Overview of policies and impacts in the two cases (table organized using data from the Empirics and other previous chapters).

Cases	Population	Political Situation	Modes of Public Transport	Impacts
Tallinn	441,245	Elected politicians represent the citizens	Tram lines (5) Trolley bus lines (8) Bus lines (57)	Extra tax collection and cash flow for the city; Increase in passengers using public transportation; More people using public transportation on weekends and evenings; The decrease in car usage Increase in train trips Decrease in CO_2 emissions.

Avesta	23,256	Elected politicians represent the citizens	Bus lines (7)	39% of bus journeys had replaced what would previously have been a trip by car; 40 tonnes of CO_2 net decrease per year; Promotion of equality and accessibility to places and services; Enhanced social activity (especially for the elderly); More people using buses, hence no empty buses circulating.
Luxembourg	600,000	Elected politicians represent the citizens	Bus lines (59[19]) Tram lines (1) Train lines (6)	Impacts cannot be assessed as this policy is to be implemented from 2020.
Uppsala	225,164	Elected politicians represent the citizens	Bus lines (15) Train lines (3)	Impacts cannot be assessed as this policy is not yet considered by the city of Uppsala.

[19] These numbers account to all lines across the country. For city buses, there are 34 different municipalities that offer bus routes that run in different ways (fixed schedules or on demand), according to the network operated by regional carriers (Mobilitéitszentral, 2019).

Although Tallinn and Avesta have considerable differences in population size, culture, economy, environmental challenges, and many other perspectives, the FFPT was implemented in both through a political agenda and political will to make it happen, together with strong popular support. Both cities implemented the policy in about the same year (Tallinn in 2013 and Avesta in 2012) and kept it until present days. Despite the criticism and difficulties to measure the impacts and results, the policy continues to get popular support in a sense, as the parties in power are getting elected and keeping the FFPT. There are, however, numbers and testimonials presented in this study that show that the policy offered positive impacts both to the population, in a socio-economic perspective, as for the environment, reducing emissions and using fewer resources, as seen in table 6.

5.2.1 Socio-Economic Reference of Analysis

When comparing the information in Table 4 (pages 22 and 23), regarding the impacts in both cities, it is possible to see that regardless of the clear difference in the size of the population and the complexity of the transportation system as modes in both cities, there are very similar impacts. Both Tallinn and Avesta presented, after the implementation of the FFPT, promotion of equality and accessibility to services, goods, and spaces within the cities. This promotion of equality is critical to decreasing inequality within cities, giving all a just setting and starting point to explore the opportunities offered in society, such as culture, education, and labor. Furthermore, the table shows an improvement in social activities to vulnerable parts of society, such as elderly people and a growing chance to people under unemployment and unsatisfactory employment conditions to circulate freely within the city and pursue new opportunities.

Finally, considering urban planning and physical practicalities, the results of the FFPT show that there is less obsolete space in public transport, with more people using buses and railways in both cities that implemented the policy. The better use of public space carries a non-monetary significance, due to land value and social use of the space. Less obsolete space in cities provides the opportunity to enhance the livelihood of its residents and give them more opportunities for leisure and recreation, impacting, directly and indirectly, the economy, production, and health of people.

Avesta and Tallinn show many possible solutions to solve the cost-benefit concerns coming from the ones worried about the financial aspects of the FFPT. These examples and the preparation of Luxembourg to implement FFPT in the whole country are learning opportunities to other cities, like Uppsala, or even countries, to identify the positive aspects and avoid the negative when considering to implement FFPT.

5.2.2 Environmental Reference of Analysis

Environmental impacts are complex and difficult to measure. Environmental components that can be assessed, directly or indirectly, linked to transport, among others, are air quality; climate; land and groundwater; ecological impacts; noise and light pollution. Considering the FFPT has been presented and analyzed as a phenomenon intrinsic to cities, ecological impacts, land, and groundwater, and light pollution would not be relevant to assess, considering FFPT is not increasing construction of roads and using more space, but rather the opposite. Climate can not be assessed in the presented time frame, considering the policy is in practice running only for seven years in Avesta and six years in Tallinn. Data regarding noise pollution and its effects on humans have been presented in the first chapter and reducing the use of cars due to the policy means affecting this component positively. Finally, air quality is the most considered environmental issue tackled by studies and targets settled in the different cases of implemented FFPT. Most specifically the emission of greenhouse gases, with a focus on the carbon dioxide emissions.

In both cities analyzed, it was possible to observe a reduction in car usage, which impacted directly in

decreasing greenhouse gases emissions and positively in the quality of air. The efforts of FFPT alone can decrease emission of CO_2. However, when associated with other measures, the impacts catalyzed by the FFPT can be even bigger. For example, when the increase of passengers in the system, encourages the public authorities to enhance their existing system, renewing the fleet and offering new services. Tallinn offered a significant example when the city aimed to increase the number of passengers in public transport (or to avoid the decline of those numbers) and to reduce car traffic and congestion together with the use of fossil fuels and greenhouse gas emissions. In conjunction with the FFPT, the city of Tallinn also implemented many other measures

> "to support the transition to more sustainable transportation. In addition to free transportation, the following measures were introduced to make the use of PT more attractive and efficient: (1) bus priority lanes (before 2012, there were only 12 km of lanes and these did not cross the city centre); (2) trams and trolleybuses merging with buses under the same management unit; (3) installation of traffic control equipment; (4) introduction of a contactless green card ('*ühiskaart'*, a card passengers are required to scan before while boarding so local authorities can monitor the use of PT); (5) adjusted traffic control, such as new one-way streets with two-way traffic for PT, removal of car traffic from tram tracks, and double lines to limit parking;
>
> (6) automatic passenger counting in some vehicles to provide information on passenger flows and optimize timetables; (7) acquisition of new vehicles (trams and buses) with CO_2 quotas; (8) renovation of the tramway; and (9) establishment of 'Park & Ride' facilities". (Galbadón-Estevan *et al.*, 2019, pp. 5-6)

The integrated measures make the FFPT catalyze and improve the possibilities to increase the use of public transport and tackle environmental issues. Cars emit almost the double amount of CO_2 than buses and almost three times more than subway or trams, as shown in figure 3 before. Hence, offering a faster public transport (bus priority lanes and traffic control equipment); more comfortable (new trams and trolleys, consequently more space and less noise); more reliable for users and planners (contactless card and the optimization of timetables); more just (new vehicles bought with CO_2 quotas were more efficient and less polluting, raising the price for parking and providing "park & ride" facilities); altogether with no fare required, makes the public transport more attractive to more people. More policies on making it less attractive to car rides and enhancing as much as possible the conditions for public transport are necessary and should be considered to help to create a new conscience on the use of collective transport.

In Avesta, the numbers were calculated closely, as a city almost twenty times smaller than Tallinn could provide better conditions for it. The 40 tonnes of reduction in CO_2 net emissions is a result of fewer car rides and the increase in passenger in the public transport system. The virtual numbers to other cities or countries can be substantial and even small percentages at the beginning of the policy implementation can make the whole difference when it is about CO_2 emissions. As figure 5, in the previous chapter, shows, Uppsala city's transport system has a vast space for improvements. The case of Luxembourg can be even more impactful, as long-distance travels will also be part of the FFPT and people will be able to freely move within the country. Long car rides could, in the future of Luxembourg, be switched by a train ride, for example.

6 Discussion

The discussion sums the theory, empirics and analysis chapters, providing argumentative propositions and hypothetical recommendation for a transition to the fare-free public transport system in Uppsala city.

The cases of Avesta and Tallinn offer a vision of the potentials and possibilities for application of the FFPT policy in both a small town or a big city. Taking into consideration Luxembourg, the policy is also considered feasible for the national level, even though Luxembourg has a small population and territory if compared to many other countries and even cities around the world. However, the technical, socio-cultural and financial challenges and dilemmas are similar and constant, independently of the population size. When this kind of policy is implemented in a country, even if in a small one, many complex factors are subject to consideration. In a country scale, there are several different regions, municipalities, interests, and many other complexes and complicated dynamics could be used negatively to discredit the FFPT as a feasible policy. Nonetheless, with Luxembourg's pioneering FFPT implementation in the whole country's territory, a vast field of knowledge and learning is open to future policymakers and state representatives to consider stepping into this policy. The impacts and effectiveness of this policy, however, is still an open issue and cannot be judged just within a few years of its implementation. Nevertheless, its process and first years of transition to a society used with free transportation give to the advocates of public and sustainable transportation broader perspectives on the subject.

The cases of Avesta and Tallinn have impacts on society and the environment. Nevertheless, the measurement of those impacts are difficult to quantify, and academic production is limited to a small community of researchers interested in the subject. Most of these researchers analyze the economic impacts and benefits using a traditional economic scope. They are, usually mainly concerned (if not fully and exclusively concerned) with the financial aspects and the costs related to the application of this policy in society. On the other hand, there are also a few researchers that understand and analyze the FFPT policy in complex socio-economic and environmental perspectives. For those, the cost-benefit traditional analysis is not completely sufficient to specify all the positive and negative aspects related to the implementation of such policy. The social benefit of being able to freely circulate within the cities (or countries, considering Luxembourg) is taken as a trampoline to increase social inequalities and injustices. The financial aspects *per se*, are not powerful enough to surpass the political will, and the difference left after considering the fare price, making the subsidy to the system to be reduced to a budget calculation that can open a "Pandora box". This "Pandora box" is to ponder public transport as an inherent social right for all, hence fully subsidized by the State. This subsidy, which this research has shown in previous chapters to exist in every public transport system around the globe, varies in percentage, but always exist. At the same time, in many different places in the world, the operation of bus companies, for instance, is controlled by private profit- seeking companies, while the structural expenses (such as maintenance of the system, roads, signs, among others) are kept under the public money umbrella.

The economic feasibility to implement the FFPT policy in different cities shows to be weaker in importance in comparison to the political will to make this policy a reality. Avesta and Tallinn chose to apply the FFPT as a political decision, supported by their citizens. The public support is important not just for the validation of the decision coming from the politicians and policymakers and followed by its realization. This public confirmation also works as an endorsement of the need for a more accessible and democratic public transportation provided by the state as other public services such as education, security, and healthcare. It was clear that a class clash exists within the current operating logic of public policies. Examples seen in cities like Uppsala that choose to punish a free rider in the public system with a 1,500 Swedish Crowns and punishing a car owner that parks illegally around three times less, reflects a system that protects the ones harming society in a different level. Either by the pollution emitted by a car or the space it takes from

other activities in the city. This way, considering the feasibility for the implementation of FFPT in a city as rich and with ambitious pretensions to become one of the best environmental friendly in the world exclusively or crucially connected to financial and public budget issues is a short-sighted justification. Other elements in society could, if not solve the issue, significantly help to make public transport free for all, such as:

- controlling and elevating the price of fuel to the private people, not affecting business and the economy, hence creating a bigger tax income to the State;
- increasing the taxes on cars assembled to private use and decreasing possible State's subsidies or compensations to big car manufacturer companies;
- surveillance, inspection, control and charging to enter predetermined locations in the city;
- to forbid private cars to access predetermined locations in the city;
- fewer spaces to park in the cities and higher prices to the existing and the ones left;
- the already cited "park & ride" locations, connecting private cars to public transport options in different points around and in the city;
- higher payment for illegal parking and other traffic offenses;
- higher taxation for luxury cars and high-income individuals;
- increase the efficiency of space used for advertisements and commerce within the public transport system, considering that more people using the system means more consumers to the companies announcing in the system;
- among others.

Many of these recommendations already find resistance in society due to powerful social pressure and lobby groups, and other measures that are not yet existent would suffer the same. A midpoint presented in chapter 4 is to have a symbolic fare, which would be a reduced price for the year. This way, it is easier for the public authorities to calculate how much income flux will be provided in the year, as people would buy an annual ticket. A negative point in this solution is that low-income people would still struggle to afford in one payment the cost for the whole year, opposing one of the main justifications for the application of FFPT. This can also become a trap where the transport will continue to be perceived as a commodity to be priced, and no effective changes would arise.

The environmental perspective of this policy's impact is relatively simple to identify, although hard to measure. Reducing car usage and using the city's space for other purposes than roads and parking lots (for instance, for parks, gardens, catwalks, and others) has direct impacts on how people use the city and how the city use resources. Promoting accessibility to all to a transportation system gives people the prospect to access different services, goods and opportunities they would not have, for financial incapacity or even disinterest. As Kębłowski asserts,

> "A purely technical, mono-sectorial analysis of fare abolition – for instance guided by the perspective that considers transport as contributor to sustainable urban development – may contribute to (mis) understanding it as a strategy that produces significant revenue for the municipality, yet does not challenge the dominance

of private vehicles" (Cats *et al.*, cited in Kębłowski *et al.*, 2019, p. 12).

However, the authors argue that there are more perspectives to be considered such as spatial (geographically) and political, bearing in mind the way the FFPT was chosen in a top-down political choice by the politician in power by that moment. As a multifaceted and interdisciplinary issue, public transport has several layers of direct and indirect impacts, goals, problems, achievements, targets, etc. Policymakers must consider this complexity and choosing to implement the FFPT should not be only a populist political decision. However, the political pact involving this decision is crucial to make it flourish and get developed and enhanced over time, not being discontinued or critically modified according to possible political swing over elections.

The fact that the FFPT is still a rare exception in a few dozens of cities around the world is a limitation to this research. However, even though those cities and countries have plenty socio-cultural and economic differences between then, the FFPT is a policy tool implemented with similar goals for almost all of them. This policy intends to positively affect society and environment and create new opportunities for people while providing a public service as free and universal, but following rules and regulations. The cases presented are still recent and demand time and continuous observation of deep impacts (positive and negative) to be measured and considered.

Nonetheless, the FFPT is still in the analysis and possible expansion all over the world, and the cases of Tallinn and Avesta show the socio-economic feasibility of its implementation either in a big city or a small town. Future studies might be required to revisit the goals, targets, impacts, and results in a society of this policy. Meanwhile, popular and political groups emerge in different cities and countries advocating in favour of the FFPT. The last impacting announcement in this field was the declaration coming from Luxembourg, which intends to be the first country implementing a full FFPT system in the whole territory and for all of its transport modes (Luxembourg.lu, 2019).

7 Conclusions

This research proposed a literature review and case analysis of Tallinn and Avesta, to investigate and to illuminate the concepts and applicability of fare-free public transport. Additionally, the future cases of Luxembourg and Uppsala were introduced and discussed, giving a broader perspective and future overview for the policy. It was also needed to understand and conceptualize sustainable transport and how it is integrated into society and future plans. For this, it was used as an analysis to understand how public transport is included in the Sustainable Development Goals and how it could influence society and the environment.

This way, this work aimed to clarify FFPT as a policy that can be used as one of many integrated alternatives to make people's lives more just and protect the environment, delivering a more sustainable public transport model, reducing private car ownership and use and mitigating greenhouse gases emissions. As this policy continues to be improved, and its application in different places in the world might need to respect inherent diversity to different cultures and governance models, more research and observation is needed.

At this point, although many questions will not be raised and answered by this study, some facts can be perceived along with the cases proposed and analyzed. FFPT is still present in just a few cities around the world, and it is considered a risky policy to be implemented due to the difficulties to measure its impacts on society and nature and to the traditional way to connect policies to neoclassical economic perspectives of cost-benefit. Nevertheless, the cases of Tallinn and Avesta show that the FFPT implemented in both cities is still thriving and have political and social support. The positive impacts measurements are challenging, as there are no reliable, or even existent, tools to do the data collection. Hence, many criticisms rise against the FFPT as a populist policy without effects worth its expenses.

On the other hand, there are not only social groups supporting this policy as a liberating kind of policy that works as a systems change of perspective breaking the commodification of public transport, but also academics that identify potential and already existing impacts in society and environment. Researchers show that in the cases analyzed, numbers and figures can show the FFPT as a tool of governance in the public transportation sector to transform society and nature to a more sustainable reality. Thus, this transformation will not happen with the simplistic implementation of FFPT without other policies to backup and support the desired behavior change and transport mode shift (from cars to public transport). Decisions and policies involving the increase in the cost and convenience of using cars seem to be key to make people choose using public transport.

At the same time that is not simple to isolate specific numbers that clarify FFPT as an efficient and effective policy to tackle climate change, protect the environment and to reduce inequality in society, there are not enough data and argumentation that prove it as harmful to nature and ineffective in society's behavioral change. Critiques will always exist, and they are important in order to create an environment of checks and balances and to keep improving pioneer policies. The main argument against the FFPT policy observed was the allegedly low impact or irrelevant changes that the FFPT provokes in the analyzed cases. Another perspective on this point of view is to see that, although considered small changes, there are changes being made, and a question that could be raised is how to strengthen FFPT impacts together with other policy implementations, society educational campaigns and the pursuit of behavior change in the face of a society living in a climate crisis context? Fare-free public transport is a subject that provokes passionate opinions. Besides critics and supporters, it is a fact that FFPT is a tool that can be, or not, used by governments around the world. Hence, as a policy tool, it cannot alone be responsible for creating enormous impacts in society and environment if not followed by serious planning, execution, and evaluation. In Tallinn and Avesta, FFPT is being absorbed in culture among last years. However, it is relevant to repeat that this is still a new policy that requires observation, evaluation and constant development to keep up with the expectations and goals imposed to this policy when applied in a city or country. It was also possible to see

that the constant growth of FFPT policies around the world does not tend to decrease. Hence, this expansion should continue with prudence. Scientific observation and analysis and the constant discussion in society about this policy might be an important tool to make FFPT flourish sustainably and avoiding simplistic populist tendencies. This research made clear that other parts of the world have plans or could add FFPT as part of their governance tools when analyzing Luxembourg and Uppsala.

Taking all of this into consideration, the Fare-Free Public transport system is part of the Sustainable Transportation concept because it is responsible for structural changes in areas such as environmental, socio-economic, behavioral, health and others. This policy can also be seen as catalyst to other alternative implementation to enhance public transport systems, promoting public transport and making it more attractive and reliable, such as modifications in the traffic system and policies to reduce the use of cars. Making public transport more reliable, efficient, effective and on top of it, free of fare costs, has the potential to, over time, go beyond the examples presented as cases in this study. The example of Luxembourg, becoming a pioneer country to implement the policy, can cause not only financial but also psychological results to other countries around the world and create a bigger impact over the leadership by example. It is also relevant to understand the FFPT not just as free public transport, but rather a transition in the priority of the use of public money, tax expenses and public budget organization and development. The possible effects of a lasting implementation of FFPT are still to be investigated and developed in society. However, the present situation already gives enough space to consider this policy a relevant piece of guiding principle to improve public transport systems and for a constant modal shift and behavior change.

The results presented in this research, together with the prospects for amplification of the policy application, show that the implementation of FFPT can positively influence the environment and socio-economic changes, despite the population size in different cities and countries around the world. The mainstream vision of Economic schools can argue if this influence is quantitatively big or small. Nevertheless, even small pattern changes are relevant when it is considered in sustainability issues. The fact that the FFPT is a still new as a policy and concept in development and enactment presents us today results that can be improved and developed with time, education, improvement, and education both for policymakers and to the users and population in general. Like any new technology or policy, the development of FFPT requires time to get revision and amelioration, until it can get to its full potential and to become normalized in society. It is pertinent to consider, also, that the FFPT is a policy that affects directly and indirectly the environment and socio-economic fields, not only because this is a transportation policy. More than that, it is a conceptual tool to rethink the idea of pricing public services and social rights as the right to come and go, inherent to all people. It can also develop, in a long-term vision, a sense of belonging and social justice, integrated with other public services such as education and healthcare. Finally, not only reducing greenhouse gas emissions, tires nanoparticles and noise pollution among other environmental impacts, the FFPT has the possible future effect to organize cities better and develop their economy considering social justice, when giving the prospect to all to access the services and opportunities intrinsic to the cities, such as labour and leisure, enhancing the livelihood, health and socio-economic conditions to a vast number of marginalized people.

The approach outlined in this research shows that the universalization of access through FFPT policies can be used to point toward a scope where public transport projects are distributed among those with the most need in society. Hence, FFPT is not only an urban planning tool but also an instrument capable of a deeper social transformation that also affects the environment. The climate crisis that is hitting the planet also creates the opportunity for people to design new alternatives and to walk forward in the face of progress and pioneer ideas. In a complex society, where social inequality is one of the biggest challenges to be solved among nations worldwide, solutions that aim to increase accessibility to basic needs should be investigated and discussed. This is what this dissertation aimed to create, a discussion and analysis to provoke reflection on the use of a transportation policy that can surpass the simple implementation in moving people from point A to B. Hence, FFPT can be discussed and analyzed as a transformational tool to influence positively

the life of those who need the most care of public authorities and society and to help preserving the nature and tackling climate change.

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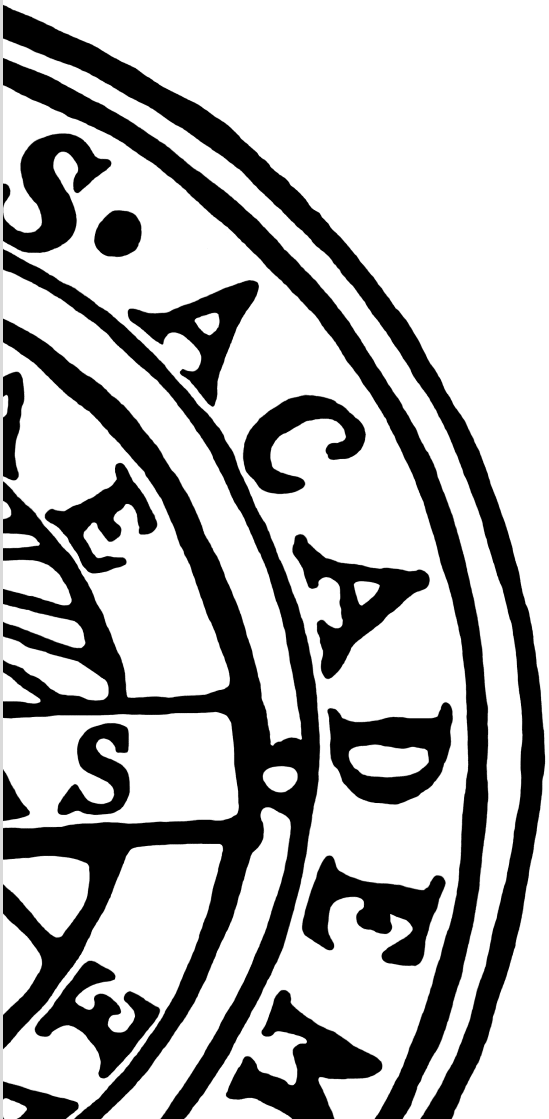
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