

Louvain School of Management

What are the key success factors for Smart Mobility in Amsterdam ?

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GLOSSARY

AI: Artificial Intelligence

Airbnb: A community platform service that pays for the rental of accommodations

AMS Institute : Amsterdam Institute for Advanced Metropolitan Solutions, a scientific institute located in Amsterdam, they create solutions in the field of science, education, government, business partners and societal organizations

API : Application Programming Interface

Apple: American multinational company that creates and markets consumer electronics, personal computers and software

ARM : Amsterdam Metropolitan Region

BPM: Belasting van Personenauto's en Motorrijwielen (Taxation of Passenger Cars and Motorcycles)

CO2: Carbon dioxide

Covid 19: an emerging infectious viral disease caused by the SARS-CoV-2 coronavirus

Ealdorman : term in Anglo-Saxon England which originally applied to a man of high status whose authority was independent of the king

EU: European Union

EEA: European Economic Area

Google Maps : Web mapping platform

GPS : Global Positioning System

IBM: International Business Machines, American multinational company active in the fields of computer hardware, software and computer services

ICT: Information and Communication Technologies

IoT : Internet of Things

LEZ : Low Emission Zone

NGO : Non-governmental Organization

P+R : Park and Ride

Repair Café: a workshop dedicated to the repair of objects and organized at a local level

RGPD: General Data Protection Regulation

Smart City Institute: research institute of the University of Liege

Suburb: refers to a suburb of a large city

Uber: American technology company that develops and operates mobile applications that connect users with drivers who provide transportation services.

Urban Cycling Institute: Institute that brings cycling knowledge from science to practice and back

WHO: World Health Organization

Wi-Fi: wireless technology used to connect computers, tablets, smartphones and other devices to the internet.

1. INTRODUCTION

Whether from a technological, ecological or economic point of view, the smart city has become a very interesting city model for the future. Smart cities have been developed with the aim of analyzing and managing a large number of aspects of a city in order to respond to important issues. A smart city includes mobility, business innovation, education, administration for citizens, employment, power plants, waste, public services (hospitals, schools, justice, etc.), integration of direct and participatory democracy, quality of life, environmental protection, security. This thesis will focus on the aspect of mobility: smart mobility.

Since 1930, the population living in urban areas has doubled, bringing many new and complex challenges for cities (Fernandez-Redondo, n.d.). Since the industrial period, economic life has been developing in cities, leading more people to work and live in urban areas. This urbanization creates many challenges for city managers. Mobility within cities is becoming an important concern (Sharma, 2022).

Mobility is an important aspect of living in a city, as it determines how easily people can move around and access various facilities and services. Good mobility allows people to easily get to work, school, access health care, and participate in social and cultural activities. It also enables the efficient movement of goods and services, which is essential for the functioning of a city's economy. In addition, mobility can have an impact on the environment, as the way people travel can contribute to air pollution and traffic congestion. It is therefore important for cities to have a well-designed, efficient, accessible and sustainable transportation system. Thus, mobility must satisfy environmental, economic and social issues. Many challenges must be considered to satisfy the greatest number of people.

It is becoming increasingly difficult for mobility actors to find solutions to improve mobility and reduce car congestion in cities. Making this means of transport as unattractive as possible has become a major challenge. Environmental, economic and social problems must be addressed simultaneously. We need to rethink public transport, city plans and solutions to ease mobility. The main challenge for cities such as European capitals is to build an intelligent mobility while keeping a historical center. By adding some innovations, changing some mobility plans, having a better organization, it could improve mobility in general. Moreover, at the moment, global warming is a worrying issue. Indeed, it is an important phenomenon that

has consequences on the whole planet. It is caused by the increase in the levels of greenhouse gases in the atmosphere which causes an increase in the average temperature of the Earth. If global warming is not addressed and greenhouse gas emissions continue to increase, it could have serious consequences for the environment (Zhang and al., 2022).

This work will focus on smart mobility which is part of the smart city concept. The latter can be divided into 6 different themes: governance, economy, environment, housing, society and mobility (Smart City Institute, n.d.). Of course, this work will focus on the last theme, but the other five will be mentioned because they are all related to each other. When we talk about smart mobility it is very difficult to focus on one aspect only because the very principle of a smart city is not to think about something in particular but it is a set of parameters to be taken into consideration. This work will mainly study the city plans, the problem of car congestion and how to make cars as unattractive as possible. However, smart mobility also includes: public transport, trucks, cabs, bikes, scooters, pedestrians, shared mobility, etc. All these elements will be discussed because they are also closely related when talking about car mobility. Indeed, to dissuade citizens from using the car, it is essential to talk about other means of transport to find an alternative to adopt.

Amsterdam is a city with a long history of transportation innovation. It was one of the first cities to adopt bike-sharing programs and has a strong network of canals and waterways used for transportation. The city is also known for its sustainability efforts, and studying mobility in this city could uncover innovative transportation approaches to reduce the environmental impact of moving people and goods. The capital of the Netherlands is a dynamic and diverse city with a rich culture. The city is home to many world-class universities and research institutions that focus on transportation and mobility issues. The city is known for its sustainability efforts, and mobility research in Amsterdam can contribute to the development of more environmentally friendly transportation solutions. Amsterdam is a diverse and multicultural city, and conducting mobility research there is an opportunity to gain a broad perspective on transportation issues (Werkman and al., n.d.).

After the literature review, the following practical analysis of the research question will follow: "What are the key success factors for smart mobility in Amsterdam?" A qualitative analysis was conducted through qualitative research. I conducted semi-structured interviews in order to be able to gather the key answers to my research question. The difficulties encountered during

this work were mainly contacting mobility actors in Amsterdam. A second difficulty was to create a framework for my topic and not to spill over into too many closely related topics.

2. LITERATURE REVIEW

2.1. Smart City

A Smart City is a city that aims to improve the quality of life of the population, ensure a sustainable transition of a territory, contribute to the improvement of the quality of life of its citizens, manage the efficiency of city services and optimize urban resources. To achieve this, the city uses innovative means and information and communication technologies (ICT). These technologies use data that are collected by electronic sensors located in the city to gather as much information as possible about the population. The Smart City faces many challenges because it must satisfy the needs of the population while respecting economic, social, environmental and cultural aspects. It is also an abstract concept and it differs from one city to another according to its own context. Another difficulty with this concept is that the various researchers who talk about smart cities do not all agree on the same definition (Azevedo Guedes and al., 2018).

According to Giffinger (2007), the Smart City can be classified into 6 main areas: smart economy, smart mobility, smart environment, smart inhabitants, smart lifestyle and smart administration. These 6 areas are to be worked on separately, but are still closely linked. For example, in the case of this work, we are talking about intelligent mobility but we will have to take into account the intelligent environment, the intelligent governance, the intelligent economy, etc. According to him, these different axes would define growth through its openness to the future and urban development. This classification of the fields of application proposed by Giffinger is one of the concepts of the Smart City for which the practitioners and the academic sphere agree. According to him, a Smart City is above all an efficient and modern city thanks to the involvement of the citizens and the elements provided to them (Giffinger and al., 2007).

This definition joins that of Bouinot who sees the Smart City as a city that employs skilled people and manages to maintain an efficient economic activity (Bouinot, 2004).

Azavedo Guedes and al (2018) published an article where the concept of Smart City is instead defined as a city that uses technology wisely, has a governance that takes into account the different stakeholders (the ICT sector, citizens and authorities), and combines sustainability and ICT. This would provide a better understanding of the city and a more current and

comprehensive approach (Azevedo Guedes and al., 2018). This definition joins that of Woods and Goldstein by adding the economic dimension. Indeed, it defines the Smart City as a combination of ICT, sustainability, citizen welfare and economic development (Woods & Goldstein, 2014).

Another interesting definition is that of the Federation of French Cities: A Smart City is a city that improves in terms of services for citizens, ecological impact and access to resources (Villes de France, 2018). According to the European Commission, a smart city is a city that, thanks to ICT, is characterized by more efficient networks and services to improve the well-being of its citizens and businesses. The city in question to be more responsive and interactive, and tries to minimize its carbon footprint as much as possible by making its public transport smarter, which has better management of water, waste, heating, lighting, safety of citizens, etc. (European Commission, 2022).

According to Cohen (2015), 3 generations of Smart City exist. First, the first generation of the Smart City is based on the use of ICTs that allow technologies to be used to improve certain aspects of the city. However, technologies are not used in an optimal way, they are used because they exist. This could be compared to buying an Apple product, people buy their products because they exist but do not use them fully. The companies that sell the technological tools push the cities to buy them even if they are not really able to use them and understand their implications. These Smart Cities do not take into account the interaction between the city and its citizens (Townsend, 2014). The Smart City 2.0 has emerged by integrating local authorities into decisions. This makes it possible to better manage a city because now the government has a say in deciding where ICT will be used. The authorities can influence the development of the city by applying policy measures and choose which project they want to support to increase the well-being and quality of life of its residents. This development is crucial because it gives the authorities the power to accelerate the change of a city towards a more sustainable and intelligent city. However, decisions are difficult to make because many stakeholders are part of the city and it is not always easy to satisfy all aspects of the city (economic, social, environmental and cultural). For example, the mayor of Rio decided to call on IBM to use sensors to reduce landslides in the favelas located near the hills. The third generation is based on introducing the role of the citizen in the city, social inclusion and equity. The citizen is now an important element in the Smart City because it is ultimately the one who will benefit from the Smart City in his daily life. Moreover, the citizen can make his voice heard and give his opinion on the changes in the city and thus make the authorities understand

what is important and what has value in a city according to him. This latest generation of the Smart City involves the most vulnerable citizens in projects in the city by using new technologies, this brings out local sharing activities. This latest version of the Smart City encourages smart solutions rather than focusing on the concept of technologies because a smart city is not only technological. For example, Airbnb and Uber are massive platform companies that are not especially compatible with Smart City projects, it would be Repair Café or tool lending libraries that would support a Smart City 3.0. Indeed, this would allow to optimize less used resources to ensure collective welfare and social inclusion (Cohen, 2015). Amsterdam and Seoul are the cities that are pioneers in this field and it works well by promoting sharing start-ups (Cohen, 2015).

2.2. Smart Mobility

2.2.1. Origin

Over time, cities have changed a lot, whether it is their layout, the habits of the population to get around or the modes of transportation. Before, people used to walk to work, so they lived close to their place of work and the urban agglomerations were very dense. Later on, there was an urban expansion thanks to the industrial revolution (Buchet, 2019). Buses, subways and trains arrived, which allowed people to travel farther and faster and cities expanded greatly (Buchet, 2019).

An interesting example is the United States with the emergence of suburbs. The culture of the car is widespread and Americans are therefore very dependent on their cars. Indeed, the emergence of the car has allowed Americans to expand their cities and live further from the center. However, this has created a problem because now in the American suburbs it is necessary to have a car because of their environment. The normalization of car use greatly slows down a sustainable lifestyle. These people living in the suburbs are more resistant to a change that would influence their comfort. However, rising gasoline prices may slowly change the minds of Americans to limit themselves in car use (Asteur America, 2012).

With these major changes, instead of having access through proximity, it has resulted in access through movement. Dense, compact cities have turned into sprawling cities. This evolution has given rise to a major problem: workplaces are increasingly distant from homes, resulting in congestion and time lost on the roads. Indeed, workplaces are mainly established in the city centers and housing in the outskirts of the city. This also leads to social segregation, as not everyone can afford to drive or use public transport. There is also a public health problem because these modes of transport are highly polluting and also because of less physical fitness because the trips are less sporty. And finally there is a problem for the environment because the demography is increasing and the population wants more and more resources. This evolution has given rise to many challenges and this is where Smart Mobility was born and its goal is to efficiently improve urban travel (Lebas, 2020).

Nowadays, mobility plays a major role in our society, we need to get from A to B very quickly. Innovation and new technologies make it possible. There has been a real evolution of mobility,

which is still growing thanks to the ever-increasing offer of transport. However, it has been noted that if a resident changes his or her transportation habits, this will very quickly be compensated for by a new motorist entering the market (Pomonti, 2004). The demand is constantly higher than the supply, and the slightest decrease in traffic is accompanied by the arrival of new motorists who see this as an improvement in traffic conditions. Because of this effect, traffic does not improve in the long term. Other solutions have to be found. Lifestyles have also changed, now it is a fast-paced world where people want to be everywhere all the time. The changes are not ready to stop. For example, during the COVID-19 pandemic, people changed their lifestyles dramatically and started shopping locally, walking or biking. The city must be prepared to be able to continually change according to what the future may hold. On the other hand, from one society to another, the needs can be very different and each city has its own particularities with its specific context. It is therefore important to ensure that mobility is developed for each city based on its different needs and lifestyles (Pomonti, 2004).

2.2.2. Definitions

It is important to understand the difference between mobility and transportation. Transportation is the act of moving someone or something and mobility is the ability of a person to move or be moved. Mobility does not imply one transportation to be moved, it is having multiple transportation choices to have the choice between these different means of mobility (McKay, 2019).

According to Azavedo Guedes and al. (2018) mobility is the ability to move or be moved freely and easily. This can involve people or goods but in this thesis it will be about the mobility of people. Smart Mobility can be defined as the set of solutions to optimally use infrastructures and vehicles. For the Smart City Institute, it is also a concept that wants to promote the sustainable transition of a city by optimizing transportation services and satisfying technological, societal, economic and environmental issues. The technologies used can be applied to improve transportation efficiency but also to change the behavior of the population or to support the governance of transportation systems (Smart City Institute, n.d.).

In the Robert dictionary (2022), the definition of mobility is the following: "Character of what can move or be moved, change place, position".

2.2.3. Issues

When we talk about smart mobility, the concept of sustainability is often linked to it because before smart mobility came along, it was sustainable mobility (Lyons, 2018). Indeed, the main concern was the environmental issue. Many studies agree that sustainability is associated with smart mobility (Maldonado Silveira Alonso Munhoz and al., 2020). For this reason, different authors emphasize that smart mobility first focuses on the impact of transport on the environment and how to decrease its emissions. However, even though the ecological importance emerged many years ago, this challenge is still very much alive around the world (Zawieska & Pieriegud, 2018). Over time, although ecology remains a major challenge, other aspects have been added, such as health, social, safety, welfare, etc. The concept of smart mobility has become a question of balancing environmental protection, economic growth and social justice. For example, collecting data in relation to public transport can not only help to improve transport and infrastructure from an environmental point of view, but it can also help to understand from a societal point of view who is taking these transports (Davidsson and al., 2016). However, ICT is not the optimal solution because using all these technologies is also very polluting. A simple Google search consumes almost as much CO₂ as heating water to boiling (Sterling, 2009). Indeed, Google stores a lot of data and therefore consumes a lot of energy. Booting up a computer consumes about 60g of CO₂ per hour (Sterling, 2009). This is why it is not so simple to say that new technologies will allow us to consume less. It is necessary to take into account the balance between what the technologies bring as solutions for the environment and what these technologies consume. By this example, we see that it is not so simple to manage mobility and 5 major issues arise: environment, economy, health, security and society.

The main issue that naturally comes first is the climate and the environment. To better understand why, here are some figures that reflect this important challenge. A quarter of the world's greenhouse gas emissions are due to mobility and the transport sector in general and this represents 15% of carbon dioxide emissions (Ritchie, 2020). Highly polluting components

(carbon dioxide, methane and nitrous oxide) are released from different urban transport and according to Zawieska and Pieriegud (2018), road transport emits the most. The Paris Agreement aims to decrease these figures but it is not won because Belgium predicts an increase of 2.8% in 2040 (Guerreiro and al., 2015). This challenge is really complex and difficult to counter completely. However, Davidsson and al (2016) write that it is possible to improve direct emissions from transport by optimizing trips, adapting one's driving, reducing vehicle size, using alternative fuels, etc. They also say that emissions can be significantly reduced if car use becomes less attractive by reducing car space, removing parking spaces.

A second important issue to consider is the economy. Indeed, this is explained by the fact that the more economic activity increases, the faster and easier it is to move. Unfortunately, with the industrial revolution that arrived at high speed, mobility has not been able to follow and a lot of congestion on the roads has appeared, a loss of time has resulted. An economic and productivity loss was born because important delays occurred both in deliveries and in reaching somewhere on time (Lebas, 2020). Traffic jams are the biggest source of delay and people lose an average of one week of work per year (Lebas, 2020). When we talk about smart mobility, we must also build the city with the understanding that the needs of the population will change over time with new generations and that it is important for the city to be able to evolve over the long term. Now smart mobility uses technological means to meet the needs of cities, but not only on sustainability but also on economics. Zawieska and Pieriegud (2018) state, "Smart mobility is a broad concept to achieve sustainable development by optimizing transportation services taking into account technological, societal, economic and environmental challenges."

In terms of health, many direct emissions such as fuel combustion and indirect emissions such as electricity and fuel production are related to mobility. Because of these emissions, the air is polluted and this increases the number of respiratory and cardiovascular diseases. Elderly people and children suffer the most because they are weaker people. The increase in obesity is also related to mobility, a car driver walks about 8 minutes per day while it is recommended to walk 30 minutes per day (Barjonet and al., 2023). In addition, traffic increases fatigue and stress, which leads to depression and traffic accidents. Traffic congestion can also cause insomnia in some people and hypersensitivity (Barjonet and al., 2023).

Safety is also an issue for smart mobility. Many road accidents are recorded every year. The causes are mostly related to drivers driving too fast, driving under the influence (alcohol, drugs), fatigue or not wearing a seat belt (World Health Organization, 2018). To counter all of

these accidents, technology can help with speed limiters and smart sensors to deter people from driving too fast. Enforcement, penalties, awareness, education, and vehicle adaptation can also be used to improve road safety (Van den Berghe, 2022).

A final major issue that smart mobility must address is society. Non-efficient mobility can create dispersion on the transport network, creating a car dependency on the outskirts of the city, which leads to a large budget for households, be it for car purchase, maintenance, insurance, gasoline, etc. This creates a social disparity between the population of the city and the population of the city. This creates a social disparity because not everyone has the same budget and some people may find themselves socially and professionally isolated. People with a disability often have problems getting around the city and we need to think about infrastructures that are more inclusive. Still others may feel isolated: people with cognitive concerns, people who do not speak the local language, the elderly, ethnic minorities, etc. (Lebas, 2020). Davidsson and al (2016) proposes some solutions to decrease the gap between different social classes. What will promote social inclusion is to provide access to public transport for the more vulnerable and weak. This has already been improved in the UK by implementing the Transreport application (Transreport, n.d.). This is an application to help people with disabilities, users can book assistance in 5 minutes. Another way to facilitate social inclusion is to implement a transportation network that serves the whole city in a homogeneous way so that everyone has the same ability to move anywhere in the city. In addition, this would provide access to different activities for the entire population and this will increase collective satisfaction (Karasu Aşnaz, 2019).

2.2.4. Morphology of a city

The morphology of a city is the articulation and distribution of the different fields of activity that a city can have. These areas are mainly energy, mobility, accessibility, economy, social inclusion, health, etc. The shape of the city has a big impact on the degree of flexibility of these sectors because the morphology of pre-industrial cities are hard and static. Fernandez-Redondo shows the differences between a monocentric and polycentric city, which he defines as "the sprawling, segregated-use city" and "the compact, mixed-use city" respectively (Fernandez-Redondo, n.d.). The sprawling city is a city with segregated sectors of activity. The work area,

the residential area, the area where people meet (going to the movies, going out to eat or going out at night), the area for shopping, etc. are very distinct areas that do not intersect. This city morphology requires a significant travel time and the use of transportation between each zone. The mobility network that results from a sprawling city is very extensive and inefficient because the population is dependent on individualized motorized transport, which requires more and more space and leads to increased sprawl. An example of a sprawling city is the city of Los Angeles. The compact city is a city where all areas overlap. The population can then easily travel by bicycle or on foot to get to their homes, their workplaces, to meet each other or to do their shopping. Indeed, as all these zones intersect, the distances between each of them are short. This encourages the use of bicycles or public transport and minimizes the distances to be covered. An example of a compact, mixed-use city is the city of San Francisco. In Appendix 1, you will find a representation of these two types of city morphology, on the left a so-called sprawling city and on the right a compact city with mixed use (Fernandez-Redondo, n.d.).

2.2.5. Topography

Topography, or the physical characteristics of a landscape, can have a significant impact on mobility. The shape of the terrain, the presence of mountains, hills, valleys, and other features can affect how easy or difficult it is to move through an area. For example, mountainous terrain can be difficult to navigate, especially if there are steep slopes or limited roads or trails. This can complicate vehicle traffic and make it more difficult to walk or bike in these areas. In contrast, flat terrain with good road infrastructure can be much more conducive to efficient and easy mobility (Johnson & Sori, 2020). In addition, topography can also affect the routes people take to get around. In areas with natural barriers such as rivers, mountains, or large bodies of water, transportation routes may have to be built around these barriers, which can increase the cost and time of travel. In urban areas, topography can also affect mobility. For example, hilly neighborhoods may be more difficult to navigate for people who use wheelchairs or other mobility devices, while flatter areas may be more accessible. Topography can have a significant impact on the ease and efficiency of mobility, and transportation planners should consider the

natural features of an area when designing and building transportation infrastructure (Johnson & Sori, 2020).

Amsterdam is located in the western part of the Netherlands and is built on a network of canals, which crisscross the city. A map of the city of Amsterdam can be found in Appendix 2. The city is located at an elevation of about 2 meters above sea level, and much of the city is built on reclaimed land called polders. The city is located in the province of North Holland, which is characterized by flat, low-lying topography (Beauplet and al., 2004). The Amsterdam region is crisscrossed by a network of waterways, and one of the notable features of Amsterdam's topography is its network of canals, which were dug in the 17th century to create more land for development. The canals are connected by a series of bridges, and many of the city's iconic narrow houses are built along the canals. Amsterdam's topography is characterized by a flat, low-lying landscape and its network of waterways (Beauplet and al., 2004).

2.2.6. Difficulties

The emergence of autonomous cars brings many difficulties concerning the safety of passengers but also of people outside the car. Autonomous cars were born because human errors are involved in many road accidents and autonomous cars can therefore act to avoid a large number of accidents. However the new cars are made to be as autonomous as possible but this becomes complex when they face several different dangers (Dupuy, 2020). Indeed, if there is a pedestrian crossing the road suddenly, the car has the choice to either continue the road and run over the pedestrian or to go around the pedestrian and throw itself on the side at the risk of killing the passengers inside the car. This becomes a safety issue but also an ethical issue. This means that instead of making a natural instinctual choice, we should already know whether we are protecting the passengers inside or the other road users. Another problem is that of multiple simultaneous dangers, the current cars are already efficient but still have several defects. A big problem is also the overconfidence in the autonomous car. Instead of having a partially autonomous accompaniment to warn of hazards, in some cases the cars become the only ones to make choices because the driver puts too much trust in the autonomous capabilities of the car. In addition, the public may have overconfidence in the development of autonomous

car manufacturing and thus not have enough hindsight, testing, and road safety policy regarding the technologies before using these cars (Dupuy, 2020).

Another problem encountered in smart cities is that of scalability. Indeed, smart mobility is not always easily scalable from one city to another or from one project to another. Often projects are difficult to replicate because they are developed with different actors, it may be a joint partnership with different companies, the municipality and the city. However over the years, projects become more replicable and for these different projects to come into being there needs to be collaboration between different parties (Kankaala and al., 2018). A project will not be replicable if it has limitations, if there are macro factors to consider, if there is a lack of a threshold for success (Sigrist and al., 2016). The fact that a project may have limitations is very common because when new technologies are used, there are often many limitations to them. Macro factors are often overlooked when replicating a project. Indeed, the context related to a city, the politics that prevail there or the way the population lives are really important factors when developing a project. If, for example, a project is possible thanks to a partnership, it must be taken into account that this partnership will certainly not exist in another city. Also, one should not forget that a project that is feasible in one city may not be possible in another because the objectives set for one city are not the same for another or on a larger scale. All these factors make the scalability of Smart Mobility projects complicated and sometimes even impossible. If we focus on one city in particular, there should be no problem, but the scalability problem also concerns smaller projects at the scale of a neighborhood that would not be replicable in another. It is important that projects can be replicable but with attention to certain factors so that they are replicable in the entire city (Hollands, 2015).

Another ethical challenge also arises regarding the exploitation of user data and the loss of jobs due to technology (Mobility Nation, 2018). Neirotti and al. (2014) say that if the population does not trust the technologies or feels too observed, it can be completely counterproductive. In addition, if the data is poorly protected, hacks can occur and use the population's data. In addition, the standards related to the General Data Protection Regulation (GDPR) are strict and companies have to make efforts to not violate the law (Lee and al., 2014). It happens very often that in the excitement of new technologies, companies forget to consider the use of data and this ultimately works against customers, forcing them to take steps to rectify their mistakes (Neirotti and al., 2014).

Another difficulty is that cities might have top utopian ambitions for their cities. Indeed, it is not always feasible to think, for example, that all the different services of the city are automated (Hollands, 2008). If there is no balance in the way a city is thought of, there will be increased social inequalities, both for the companies linked to the smart city projects and for the city (Roberts, 2022).

A final difficulty that Smart Mobility faces is that of competition between services. Indeed, at the moment there are a lot of services that are proposed to improve mobility in the cities such as electric scooters, shared cars, electric bicycles, etc. These services are becoming more and more efficient. These services are becoming more and more efficient and are therefore competitors to public transport services. There is a need to find a balance so that these private services do not encroach on public transport (Neirotti and al., 2014).

It is therefore very important to pay attention to all these difficulties that smart mobility can encounter. Indeed, the impacts of such a mobility are numerous and it is necessary to think about all that it can generate. Each project undertaken must be well analyzed and see if the project in question does not jeopardize in one way or another a sector mentioned above. The risks of doing big projects are that the investments are lost and that the stakeholders have wasted time and money.

2.2.7. Electric Vehicles

Electric vehicles are cars that run on an electric motor rather than a gasoline engine. They are becoming increasingly popular because they produce no emissions, which makes them better for the environment. They can also be less expensive to operate than gasoline-powered cars because electricity is often cheaper than gasoline. There are several types of electric cars, including all-electric vehicles, which run solely on electricity, and hybrid electric vehicles, which combine a gasoline engine with an electric motor (Cleveland & Morris, 2014).

The hybrid electric vehicle is a vehicle that uses both an internal combustion engine, an electric motor, and a battery to propel the car. The internal combustion engine is used to power the car

when it is in motion and the electric motor can be used to decelerate and brake. Hybrid vehicles usually have a rechargeable battery that can be recharged using the energy produced by the internal combustion engine or by plugging the car into a power outlet. Most often it is an electrically powered vehicle. Hybrid vehicles are generally considered less polluting than ICE vehicles because they use less fuel when in electric mode (Cleveland & Morris, 2014).

An electric vehicle is a vehicle that uses electricity as its primary power source. These vehicles run on electric motors powered by electricity stored in batteries and therefore do not have a fuel tank. The energy comes from different sources such as coal, wind power, nuclear power or solar power. They have several advantages over traditional vehicles. For example, they are generally quieter and produce fewer emissions, making them a more environmentally friendly transportation option. However, they are not carbon dioxide neutral. While they are emission-free when the vehicle is running, the production of the battery uses a lot of energy. To manufacture a battery, rare metals must be extracted from the ground and then processed. We must also take into account the transportation of these batteries, which are mainly manufactured in China. Moreover, as far as hydrogen electric vehicles are concerned, the process to make hydrogen in the battery also needs electricity. We must not forget that to make a battery work we need a source of electricity. If you live in a country that does not know how to use renewable energy to produce electricity, you have to use coal, for example. For example, in China, people are charging their cars at the same time, so there is an excess of activity in the coal plants. In this case, using fossil fuels to electrify vehicles will become limited. However, despite all this, electric vehicles are still more environmentally friendly than thermal vehicles over their entire life cycle. It is still important to improve electric innovations and to power them with more renewable energy linked to an intelligent storage. In addition, battery recycling also needs to be improved to minimize the environmental impact (Cleveland & Morris, 2014).

One challenge for electric vehicles is the supply chain issue and the difficulties of scaling up production. This is because the production of electric cars can be more complex than traditional internal combustion engine vehicles. For example, electric cars require more advanced batteries and electrical systems, which can be difficult to manufacture and integrate into the vehicle. For electric cars to be widely adopted, there must be a sufficient number of charging stations available to support them. This can be a challenge in some regions where the infrastructure for electric cars is not yet well developed (Bonnaure, 2018).

Another challenge is that the production of electric cars is that the initial manufacturing costs can be quite high. This is partly due to the fact that the batteries used to power electric cars are still quite expensive to produce. Some of the materials used in the production of electric car batteries, such as lithium and cobalt, can be difficult to obtain in large quantities. Indeed, global production is currently insufficient and unevenly distributed around the world. The largest reserves of lithium are in Bolivia, Chile and China. To refine and process lithium, China and the United States form a duopoly. China could be the only importer of critical materials such as neodymium and dysprosium, which are materials used in the manufacture of electric car engines. Thus, China could have a monopoly on electric car batteries made of cobalt and lithium. This raises questions about whether China could use its control over these resources as leverage in geopolitical negotiations and conflicts. For example, China could restrict its exports of materials to countries it considers strategic competitors, impose tariffs or other trade barriers. It should be noted that China's dominance in lithium and cobalt production is not absolute, and that other countries, such as Australia and the Democratic Republic of Congo, also produce significant amounts of these materials. However, China's position and significant investment in the industry means that it is likely to play a key role in shaping the future of the global electric vehicle market (Contestabile and al., 2020).

There are also hydrogen fuel cell vehicles that use a fuel cell to convert hydrogen into electricity to power the vehicle's electric motor. Fuel cell vehicles offer a number of potential advantages over traditional electric vehicles, including faster refueling times and greater range. In addition, fuel cell electric vehicles produce only water as a byproduct of their operation, making them a potentially cleaner transportation option than gasoline-powered vehicles. These vehicles can also be more fuel efficient than gasoline-powered vehicles, as they convert hydrogen into electricity more efficiently than internal combustion engines. However, there are significant barriers to the widespread adoption of fuel cell electric vehicles. One major challenge is the limited availability of hydrogen infrastructure. Another challenge is the cost of producing hydrogen fuel. Currently, the majority of hydrogen is produced from fossil fuels, which generates greenhouse gas emissions. There are also costs associated with the transportation and distribution of hydrogen fuel. Despite these challenges, some experts believe that fuel cell electric vehicles could play a role in the future of transportation, such as in long-distance trucking or public transportation (Trink & Monville, 2022).

2.2.8. Shared Mobility

Shared mobility refers to the use of a shared mode of transportation by several people, rather than using a private vehicle. It can include a variety of transportation options, such as bike sharing, car sharing and carpooling services. The goal of shared mobility is to increase access to transportation while reducing the number of private vehicles on the road, which can help reduce traffic congestion and improve air quality. Shared mobility options are often more convenient and cost-effective than private vehicle ownership, and they can also be more environmentally friendly. To improve mobility, it is important that mobility shifts from self-centered to integrated mobility use and thus minimizes the use of private cars for public transport. When it is not possible to use walking, cycling or public transport because of long distances, inadequate schedules, or poorly served areas, shared mobility would be a solution. Shared mobility can help reduce carbon dioxide emissions and minimize congestion and accessibility problems through clean, cheap and flexible alternatives (Garau and al., 2016).

However, shared mobility has several issues regarding carpooling in particular. It can be difficult to find a car to rent when you need one, especially if you are in a location with low demand for carpooling. Carsharing can be more expensive than owning a car if you need to use the car for long periods of time or for frequent trips. There is a trade-off between the convenience of having a car available for immediate use and the cost of that convenience. One way to think about this trade-off is to consider it in terms of the friction of using the carsharing service. If the friction is low (e.g., cars are available on demand and easy to access), more people are likely to use the service, but the cost of that amenity will be higher. On the other hand, if friction is high (e.g., cars are less available and difficult to access), fewer people are likely to use the service, but the cost of providing it will be lower. In practice, ridesharing companies must balance these competing factors to find the optimal level of friction that maximizes the overall value of the service for both the company and its users. This may involve adjusting the pricing of the service, the availability and location of cars, and other factors that affect the convenience and cost of using the service (Vélez, 2022).

2.2.9. Connected Mobility

Connected mobility refers to the use of technology to improve the efficiency and convenience of transportation systems. This can include things like real-time traffic updates, ride-sharing services, and self-driving vehicles, as well as a variety of other services designed to make transportation more convenient and accessible. Connected mobility aims to reduce congestion, emissions, and the need for personal car ownership, while improving accessibility and the overall transportation experience (Commission of the European Communities, 2008). This objective can be achieved through a variety of means, such as promoting the use of public transport, encouraging the use of electric or hybrid vehicles, and developing innovative transport systems that are more efficient and less dependent on fossil fuels. In addition to improving the environmental sustainability of transportation, connected mobility also aims to improve the overall transportation experience of users. This includes providing real-time updates on traffic conditions, offering a variety of convenient transportation options, and making it easier for people to get around without the need for a personal car. These technologies that enable connected mobility involve the Internet of Things (IoT), artificial intelligence (AI), Application Programming Interfaces (APIs), vehicle machine learning capabilities, real-time data processing that connect transportation networks and 5G networks. This works in part through trip optimization algorithms and computing systems that match mobility supply and demand. Data collection, connection and use are key elements of connected mobility. This data is generated via different sources such as Big Data, mobile sensors or the Internet. The data is then connected to a network and used. It can be adapted for better efficiency, optimization, fluidity, prediction and personalization. For example, GPS data can very well solve problems related to traffic jams. There are also license plate detection cameras that can identify vehicles entering and leaving a certain location. It is also possible to use cell phone data, cameras, or Wi-Fi hotspots to monitor pedestrian and bicycle flows (Baunach and al., 2018).

However, it is not that simple to use people's data. The General Data Protection Regulation (GDPR) is a regulation of European law relating to the data protection and privacy of all individuals within the European Union (EU) and the European Economic Area (EEA). It also addresses the export of personal data outside the EU and EEA. The GDPR strengthens and expands the rights of individuals to control their personal data and how it is collected, used and shared. Under the GDPR, organizations are required to protect individuals' personal data and be transparent about how they use it. This includes obtaining explicit consent from individuals

before collecting their data and collecting only the data necessary for the specific purpose for which it is collected. Organizations must also ensure that personal data is secure and kept only as long as necessary. The GDPR applies to any organization that processes the personal data of individuals in the EU and EEA, regardless of where the organization is located. This includes businesses, government agencies, and nonprofit organizations. Failure to comply with the GDPR can result in fines on an organization's annual turnover (Thelisson, 2019).

2.2.10. Autonomous Mobility

Autonomous mobility refers to the use of technology to enable vehicles to operate with little or no assistance from a human driver. These can be fully autonomous vehicles, capable of operating without any human intervention, or partially autonomous vehicles that require a human driver to take control in certain situations. Autonomous vehicles are equipped with sensors, cameras, and other types of technology that allow them to perceive their environment and make decisions about how to travel in it. Not all connected cars are necessarily autonomous, but by definition, every autonomous car is connected. One of the main benefits of autonomous mobility is the potential to reduce accidents and fatalities on the road. Autonomous vehicles are able to make decisions based on real-time data and can react faster than human drivers, which can help prevent accidents. Connected and autonomous vehicles can communicate with other vehicles and people around them, automatically recharge and manage their maintenance regimen. Autonomous mobility is also expected to improve the efficiency of transportation systems, as self-driving vehicles can be programmed to follow optimized routes and make better use of available road space. They can also suggest the best route avoiding traffic jams, provide important information such as the need for maintenance or repair, automatically pay parking lots or tolls, inform which parking spaces are free, contact help, avoid drowsiness or fatigue during a long trip, and adapt the vehicle speed (Aguilera & Rallet, 2016).

Autonomous mobility has the potential to revolutionize the way we think about transportation and could have a significant impact on the way we live and work. However, a number of challenges must be addressed in order to realize the full potential of autonomous vehicles, such

as ensuring their safety, developing the necessary infrastructure, and addressing concerns about job replacement. In Appendix 2, you will find the level of autonomy of vehicles and what the human must have as a level of action based on each autonomy (Smart City Institute, n.d.).

Connected and autonomous vehicles can reduce congestion in the long run because unlike non-autonomous cars, these vehicles can follow each other very closely and can also require less space for parking. However, in order to have a fully autonomous car network, road infrastructure must be modified to accommodate these modern vehicles (Mobility Nation, 2018).

However, autonomous mobility also creates a number of issues. On the one hand, a person who previously used public transportation might be encouraged to turn to the private car due to the traffic becoming smoother again and the fact that the car trip could be made worthwhile by doing something else. Thus, the space freed up by autonomous vehicles could have a reverse effect (Pignel, 2019).

2.2.11. Mobility Taxes

In Amsterdam, vehicles are subject to road tax and a tax on passenger cars and motorcycles. The road tax is the tax levied by the government on the use of the road network. It is based on vehicle weight, engine size and emission levels. This tax is usually paid annually, and the amount can vary considerably depending on the specific characteristics of your vehicle. The second tax is the vehicle ownership tax: the BPM (belasting van personenauto's en motorrijwielen). This is a tax levied on the import, registration and transfer of ownership of passenger cars and motorcycles. The BPM is calculated according to the value of the vehicle, its CO2 emissions and other factors. This tax is usually paid by the person who imports the vehicle into the Netherlands or by the person who registers the vehicle for the first time in the Netherlands. This tax is generally not due for vehicles already registered in the Netherlands that are transferred to a new owner in the country. The difference with the road tax is that the BPM is levied once for each car registered in the Netherlands, whereas the road tax is levied

every year to compensate for the use of the road network. It is important to be aware of this tax and to pay it on time, as failure to do so may result in penalties (Ministerie van Binnenlandse Zaken en Koninkrijksrelaties, 2022).

2.3. Mobility in Amsterdam

2.3.1. Introduction

Amsterdam is the capital of the Netherlands with more than 850,000 inhabitants and is the most populated city in the country (Amsterdam.info, n.d.). In the Middle Ages, Amsterdam grew quite rapidly thanks to its port, which became very famous. The city developed around the oldest part of the city (De Wallen) in the shape of a spider's web: a network of semi-circular canals connected by perpendicular canals. The Royal Palace of Amsterdam is located in the center of the old town and is an important symbol for the capital. This city is very important, both from an economic and financial point of view. Many multinational companies (Philips, ING, Netflix, Uber and Tesla) have their economic headquarters and/or European offices in Amsterdam (Velthuis, 2021). It is also a very touristy city thanks to the Rijksmuseum, the modern art foundation Stedelijk Museum, the Van Gogh Museum, the Hermitage Art Museum, the Eye Film Institute, the Dutch Maritime Museum and the Anne Frank House. Amsterdam is one of Europe's most innovative capitals, but also a city with a comfortable lifestyle (Bloom, 2017), a city that ranks in the top 5 in terms of safety in the world (The Economist, 2019). Most trips in Amsterdam are made by metro, streetcar, bicycle or on foot. The car being the least used means of transportation. Since 2016, Amsterdam has been part of the Fab City movement, which aims for all cities in the world to become self-sufficient (FabCity, 2022).

Amsterdam's origins date back to the 13th century, when the city was founded as a small fishing village on the banks of the Amstel River. Over the years, the city grew and expanded and new neighborhoods were added to the city plan. In the 17th century, Amsterdam experienced a period of rapid growth and prosperity becoming one of the most important commercial and cultural centers in Europe. During this period, the city underwent a major expansion with the construction of new canals. In the 20th century, Amsterdam continued to grow and evolve to accommodate the growing population. In recent years, the city has focused on sustainability and livability by promoting alternative modes of transportation and revitalizing the city's older neighborhoods. Today, Amsterdam is a vibrant and successful city known for its innovative and sustainable approach to urban development (Benson and al., 2022).

Improving mobility and making it smarter must be done thoughtfully. Indeed, improving mobility often has unintended and undesirable consequences. Improving the ease of travel

tends to induce demand for more travel (Lyons, 2018). This can lead to more negative impacts such as congestion and pollution. Therefore, some experts argue that people should be encouraged to travel less and work or consume closer to home. Citizens should have all the public services they need close to where they live. This is the idea behind the "15-minute city" concept, where citizens have access to most of their daily destinations within a 15-minute walk or bike ride. This may be part of the solution because by doing so, people's trips would be shorter or fewer because they would have access to more public services close to where they live. However, as cities evolve into smart cities, mobility will have to follow. We live in a fast-paced world where mobility is inevitable. People will always need to move around for one reason or another. The point is that the city of Amsterdam can help them move in a more efficient, fluid, and sustainable way (Benson and al., 2022).

There is an increasing amount of travel in the city and region. As the population in the city and region increases, the number of trips also increases. The city is seeing public transportation become more popular, and bike and walking paths are becoming more popular. The number of car trips will also continue to increase without intervention. In combination with the building ambition, substantial and sustainable investments in urban and regional accessibility are needed. The number of cars per household in Amsterdam is declining and is well below the Dutch average. Almost 30% of car owners use their car only once a week or less (van der Velde, 2017). At the same time, the car is by far the main mode of transportation for residents and visitors to and from the city. Among Amsterdam residents, 58% use the car for travel within the region (van der Velde, 2017). Although visitors to Amsterdam choose public transport more often, 52% still travel by car (van der Velde, 2017). This is especially true for people who work in Amsterdam. More than half of the jobs in Amsterdam are held by people from other municipalities (Vervoerregio Amsterdam, n.d.).

The wishes of residents, entrepreneurs and visitors are changing. Staying, meeting and relaxing are taking place more in public spaces. Residents want more greenery on their streets, according to interviews with neighborhood councils (Gemeente Amsterdam, 2022).

As far as car traffic in Amsterdam is concerned, there is still room for improvement. Annex 3 shows the distribution of motorized traffic by vehicle category in the environmental zone area (Gemeente Amsterdam, 2022). This annex shows that 40% of the motorized vehicles are private cars and about 20% are delivery trucks. Appendix 4 shows the number of car trips made by Amsterdam residents on an average weekday by trip purpose and distance class. For trips

of less than 5 km, the car is used mainly for shopping and social events. For trips longer than 5 kilometers, the car is used mainly for commuting to work and also for social events (Gemeente Amsterdam, 2022).

2.3.2. Current projects

One of Amsterdam's main goals is to leave more space for alternatives to the car: wide sidewalks, bicycle lanes and streets, public transport and shared mobility. The city wants to make the transition to sustainable mobility. This section focuses on the plans that Amsterdam already has in place for car mobility and is based on the reports that the city of Amsterdam has published. Amsterdam seems to be well able to adapt to changing circumstances. It all started in 1992 when a majority of residents voted for a car-free city center. A large part of Stadsdeel Centrum is now car-free and currently. In 2019, they have already exchanged at least 1,000 parking spaces for bike parking, greenery and more sidewalk space. They have greatly expanded the charging infrastructure for electric cars, worked to make the city more bike-friendly, and offered good public transportation. When they expand the city, they immediately take the opportunity to make public space livable and accessible and to limit the role of the car as much as possible (Gemeente Amsterdam, 2022).

a. Less cars

In Appendix 2, the map of Amsterdam gives an indication of the pressure on public space and therefore the urgency of the car ban. For the different facilities, they looked at where there was a need for space. They considered space for: pedestrians, cyclists, bicycle parking, public transport, accessible stops, car traffic, equipment, playground, narrow channels, quality of space, trees, and rain protection measures. In the last decade, a shift towards cleaner and more active travel is visible. Amsterdam is encouraging this trend by taking measures that help reduce car travel, by better distributing traffic over time and by adapting infrastructure (Gemeente Amsterdam, 2022).

b. Delta plan

The Delta Plan is a project that was conceived by Johan van Veen, among others, and implemented following the North Sea flood of 1953 in the Netherlands. The flood killed 1,835 people and forced the evacuation of 70,000 others. The Delta Plan is the world's largest water defence system. It is intended to combat maritime flooding, especially for the provinces of Zeeland, South Holland and North Brabant (Watersnoodmuseum, 2022).

c. Logistic

Logistics are crucial to the functioning of the city but have a great impact on livability. About one in eight vehicles on the A10 ring road is a truck or van. In addition, logistics traffic is responsible for a large portion of nitrogen oxide, particulate matter, soot and CO₂ emissions. Freight transport also has a significant impact on the city's infrastructure. Bridges and quay walls are under additional stress due to heavy traffic and the storage of construction materials on the quays. The fact that the logistical supply of the city is on people's minds was reflected in the enormous attention paid to this topic in discussions about the city. Amsterdam residents experience a lot of nuisance from trucks and vans in the city and many people perceive trucks as unsafe. At the same time, the population is buying more and more online and becoming more demanding. To properly supply the city in the future, urban logistics should become cleaner, lighter and more efficient. The goal is to create an emission-free zone for vans and delivery trucks on the A10 ring road by 2025. Making urban logistics more efficient is part of Amsterdam's Car Calm program, as logistics flows use the same limited public space as other traffic flows. Several areas in Amsterdam have time slots for loading and unloading. Window hours can vary by district and area, and are often in the morning. As the city becomes busier, the hours of operation increasingly clash with traffic peaks, such as the morning rush hour for cyclists. The municipality sets the hours while business owners in the areas decide when they want to be delivered. This is not efficient for transporters, who have to make sure they get to

an area on time and then have to wait for the moment when a party wants to receive the ordered goods (Gemeente Amsterdam, 2022).

d. Reduction of the number of locations

About 11% of Amsterdam's public space is occupied by parked cars. Cars are parked most of the time (Gemeente Amsterdam, 2022). More than 40% of residents' cars do not move from their spot on a given day (Gemeente Amsterdam, 2022). This space can be much better used. Reducing the demand for parking spaces, would offer the possibility of removing 10,000 parking spaces by 2025. Amsterdam also encourages residents to park more indoors or in all-terrains. Currently, the municipality makes more than 4,100 parking spaces in garages available to permit holders. Not all garages are already optimally used (Gemeente Amsterdam, 2022).

e. Park and Ride

In 1996, the first transfer parking lot was opened at the Amsterdam Arena. There are now 4,400 P+R spaces available and the number of users has increased considerably. Every year, about 550,000 P+R are used by more than one million people. The P+R concept was adapted in 2012. Since then, the parking fee is €1 per 24 hours at all P+R facilities (entry after 10 am). The P+Rs are mainly used by visitors to Amsterdam, which creates additional traffic pressure on the A10 ring road. At night and on weekdays, many P+R spaces are still available. Although they mainly want to encourage visitors to use public transport close to home, they are looking to expand the P+R points in and around Amsterdam. In this way they anticipate the future where there will be less and less space in the city center for vehicles with high space requirements. For good accessibility in the Amsterdam area, it is beneficial that there are more possibilities to switch from car to another means of transport and thus more multimodal transfers. Therefore, they are working to strengthen the network of P+Rs in the region. About half of the people who park their cars use the P+R with transfer to the train or bus and another final destination. The rest have their final destination on site and do not use public transport in their journey. Amsterdam now creates the possibility for permit holders to park at the P+R. They are

experimenting with a discount on the permit price, which will increase the frequency of parking at the P+R. They are also looking at other target groups. New target groups and other forms of transport transform the P+R into a multifunctional interchange: a hub for both the incoming city (visitors) and the outgoing city (residents). Tourists, day-trippers, out-of-towners, commuters and business visitors can always use an Amsterdam P+R. The P+R is intended to relieve congestion in the busiest areas of Amsterdam, not to facilitate commuter traffic to Amsterdam. If the discount zone becomes too close to the P+R, there is a risk that the P+R will become a garage for nearby businesses (Gemeente Amsterdam, 2022).

f. Smart Work Centers

One way in which Amsterdam has already reduced the number of commutes is by introducing Smart Work Centers. Traffic congestion due to commuting (daily migration between work and home) can be reduced to a large extent by bringing the workplace closer to the home. This is why Smart Work Centers have been developed, an initiative that is already up and running. The term Smart Work Center refers to a coworking and teleworking space where one can temporarily set up one's professional activity. In other words, the worker no longer has an office, but offices scattered throughout the urban space, which he or she chooses to occupy depending on the location. This implies that the linear model linking point A (living area) to point B (working area) is broken down into a network of possibilities linking A to points B1 (office 1), B2, B3 etc. The city of Amsterdam has deployed a network of about 30 Smart Work Centers spread throughout the city with different subscription regimes ranging from year to day of occupation of these mobile offices. This pricing flexibility allows expanded access to these spaces for temporary activities and smaller budgets (Baynes and al., 2017).

3. EMPIRICAL SECTION

3.1. Methodology

3.1.1. Choice of study

The literature review showed all the issues that mobility can have. It is important to understand how to improve mobility based on the issues that are related to it. We understand that mobility has a big impact on our daily life. Analyzing mobility in Amsterdam, which is an innovative city, can help to understand how it works and what are the key success factors of such a city. Smart Mobility, which is a branch of the Smart City, encompasses a lot of concepts and is a very broad topic. Since it is very complex to analyze all aspects of mobility, this thesis focuses on the problems related to car congestion and approaches to make the car less attractive. Therefore, the analysis part of this work will focus on the identification of the key success factors of mobility in Amsterdam and more specifically how to improve congestion in the city center and how to make people choose another means of transport than the car.

I chose to conduct a qualitative study because I wanted to find out how Amsterdam developed their smart mobility and to understand via the mobility actors what their key success factors were, what projects needed to be improved as well as their opinions on the challenges to be realized. I think that it was through qualitative research that I could gather this information for my analysis.

Initially, the idea was to compare the key success factors with those of the city of Copenhagen in Denmark. However, after contacting 30 people, only 2 people responded to my request for an interview and these 2 people could not give me adequate answers. Indeed, ... was not available for 3 months and ... only worked for mobility for a few months and did not feel able to answer the questions I had sent him. It was therefore difficult to find the key answers for this analysis and to make it complete enough to compare the different key points with the city of Amsterdam. The list of people I contacted can be found in Appendix 5 and the beginning of the research I did on the city of Copenhagen can be found in Appendix 6. Due to time constraints and the assumption that contacting stakeholders for Copenhagen would be just as feasible as with Amsterdam, I did not conduct a comparison with another city. I therefore

focused on the city of Amsterdam and analyzed the scalability of the city's projects and under what conditions it is possible to replicate the different mobility projects in Amsterdam.

3.1.2. Qualitative Research

This practical analysis studies the research question in a qualitative way because it allows to understand the events and projects in a specific and uncontrolled context. This method ensures the validity and relevance of the question addressed and allows for a more in-depth analysis of the problem. With qualitative research, we obtain more information on the attitudes and behaviors of respondents and we obtain a wealth of results. This allows for an understanding of the respondents' perceptions, thoughts, experiences, and emotions about the research question as well as identifying the causes of specific situations for a certain phenomenon (Harris and al., 2009).

The qualitative approach is "a discursive process of reformulation, explanation or theorisation of testimonies, experiences or phenomena. The instruments and methods used are designed on the one hand, to collect qualitative data (testimonies, field notes, video images, ...) and, on the other hand, to analyse these data qualitatively (i.e. to extract meaning from them rather than transform them into percentages or statistics). The very nature of qualitative research is to be comprehensive, i.e. to show (description, narration) and analyse the actors thinking, experiencing, acting and interacting" (Paillé & Mucchielli, 2012).

My practical analysis is an inductive research because according to Gaudet and Robert (2018), a research is inductive when there is an observation and description of a pattern by establishing interpretations in order to understand and explain a specific phenomenon.

The choice of the field is of course the municipality of Amsterdam as well as the metropolitan area of Amsterdam because these 2 entities are closely related.

To conduct the interviews, I conducted individual semi-structured interviews. Semi-structured interviews are a type of qualitative research method that allows flexibility in the questioning process. They fall between structured interviews, which follow a strict question-and-answer format, and unstructured interviews, which are more open and conversational. I followed an interview guide that I created and which can be found in Appendix 7. The interview guide is a

method adapted to learn about positions, understandings, and attitudes about a topic. This interview guide was intended to be able to cover all topics and as the interviews resembled discussions around mobility, my questions were not asked in the same order with the stakeholders. Semi-structured interviews allow for flexibility in interviewing, it encourages comparative and cumulative analysis strategies between respondents and allows for the interview guide to be enriched based on themes that emerge as the interviews progress. It also provides more detailed information than can be obtained with other data collection methods, such as surveys.

3.1.3. Choice of interviewees

To carry out this qualitative research, a list of people was compiled and then contacted by email. The people contacted for the interviews were people working for the city of Amsterdam, the Amsterdam Institute for Advanced Metropolitan Solutions and the University of Amsterdam in order to have the testimony of direct actors of mobility in the city. I also contacted people working in companies related to mobility in order to have a diversified sample. Indeed, I contacted the NGO BYCS which promotes and supports via programs mobility by bike, Goudappel which is a company that offers its customers perspectives of action and understanding of mobility, MyWheels which offers shared cars in Amsterdam as well as the company Felyx which offers shared electric scooters in the city.

It was not always easy to contact the mobility actors in Amsterdam. Indeed, it was necessary to find the way to contact them, which was done exclusively by e-mail. Then, most of them simply did not answer my request and some of them answered by saying that they did not think they were the right person to answer my questions and others could not grant me an interview in time. The people I tried to contact can be found in Appendix 5 with the response I received.

Four people responded positively. The stakeholders who participated in this practical analysis were Boen Groothoff, Daan van der Tas, Petar Koljensic, and Tina Harris.

Boen Groothoff's main interests are in sustainability, politics and technology. Since 2019 he has been working for the city of Amsterdam as Project Manager of Smart Mobility. His mission is to implement the latest mobility concepts in the streets of Amsterdam.

Daan van der Tas works for the city of Amsterdam in the field of digitalization and innovation. He is Project Leader for "Mobility as a Service", together with his team they are working to ensure the supply and use of shared mobility and mobility platforms as services.

Petar Koljensic is part of the Smart Urban Mobility team. He creates usable solutions and products using his knowledge base with a combination of ideas and concepts, analytical tools and visualization skills. In particular, he has researched the 15-minute city concept trying to discover relationships between bicycle travel times and various amenities and spatial features and used Amsterdam as a case study.

Tina Harris received her PhD in anthropology in 2009 from the Graduate Center in New York City. She is currently an Associate Professor in the Department of Anthropology at the University of Amsterdam and a member of the AISSR Moving Matters research group. She is interested in mobility and congestion issues in Amsterdam.

All of the speakers, except Tina Harris, have worked for the city of Amsterdam and are experts on mobility in that city. The interviews allowed us to understand their views on the subject thanks to the interviews, which lasted about an hour each. They have all, at some point in their professional careers, worked or still work for the Amsterdam Institute for Advanced Metropolitan Solutions.

Amsterdam Institute for Advanced Metropolitan Solutions is a company that works for the research of city challenges. They mainly work around 6 different projects: "Smart Urban Mobility", "Urban Energy", "Climate Resilient Cities", "Metropolitan Food Systems", "Responsible Urban Digitalization" and "Circularity in Urban Regions". These 6 themes aim to become more innovative and sustainable. Each theme is developed by a team to understand more about the city with the objective to improve it while taking into account the issues developed in the literary review. The 4 speakers who gave me an interview worked in one way or another for the "Smart Urban Mobility" project. This project is defined as follows: « *In this era of urbanization, the metropolitan area of Amsterdam continues to grow. While it is a positive sign that the City of Amsterdam is flourishing, the increase of transport leads to more pressure on urban space and infrastructure. Smart Urban Mobility plays an important role in future urban developments to keep the city of Amsterdam livable and accessible. Over the past few years there has been a shift in the field of mobility, moving away from building new infrastructure, to optimizing the performance of existing infrastructure. With the increased availability of mobility data, real-time traffic data and the full-scale adoption of digital*

technologies, cities are increasingly experimenting with digital mobility management tools, to improve the city's mobility, enhance mobility flows and repurpose the public space. Research on transport preferences shows that the citizens of Amsterdam don't necessarily feel the need to own a vehicle. They find it more important to get from A to B in a fast, easy, and efficient way. This calls for innovative mobility solutions that stimulate cities and citizens to explore alternatives to (private) car usage. Mobility hubs are one of the potential solutions. Shared mobility hubs are central points in the transport network that seamlessly integrate different options of transportation to maximize first to last miles connectivity. These hubs should offer a better and more sustainable alternative to stimulate citizens to convert from private car owners to shared mobility users. In the long term, this transition to shared mobility is expected to significantly reduce emissions as citizens own fewer cars. The added benefit is that it will free up scarce urban space for other functions and usage.» (AMS Institute, n.d.).

3.1.4. Data analysis

The research question of this dissertation is: "What are the key success factors of mobility in Amsterdam?"

The hypothesis is: The different key success factors of mobility in the city of Amsterdam effectively improve mobility and best address the related issues.

Once the interviews were conducted and recorded with their consent, the next step was to analyze all these interviews and extract the information needed for the research question. The audio recording allowed me not to forget what was discussed and not to miss any information from the interviews, it also allowed me to listen again to the different key points and to avoid subjectivity as much as possible. This consists of summarizing, classifying and organizing the information obtained. The interviews were first transcribed and then analyzed in depth to answer the hypothesis and the research question in order to identify the key success factors of mobility in Amsterdam. The transcripts of all interviews can be found in Appendix 8.

I conducted a thematic analysis by identifying the key success factors of mobility in Amsterdam through the testimonies of the stakeholders and my personal analysis. Indeed, I

targeted the relevant themes of the different topics discussed. After that, I compared the different interviews with each other to identify similarities and differences in each theme. I have classified the different key mobility projects in Amsterdam.

3.1.5. Limitations of the methodology

Like any research method, semi-structured interviews are subject to interviewer bias. This may include unconscious bias, as well as the influence of one's own beliefs and assumptions. Because I had some flexibility in the questioning process, it is possible that not all relevant topics were covered and that some important topics were not addressed. With the questions I was asking and the context of the interviews, it is possible that respondents may have difficulty properly developing their ideas in relation to a topic. This can lead to incomplete data and a lack of depth in the results. Secondly, the interpretation of the data collected in a semi-structured interview is largely dependent on my subjective perspective. This can make it difficult to replicate the study and validate the results. The findings of a semi-structured interview are usually specific to the participants and the context in which the interview took place. And finally there was a time constraint, semi-structured interviews are time consuming to conduct and analyze.

3.2. Identification of key success factors

In this section, we will identify the key success factors of mobility in Amsterdam through the interviews conducted. We will also analyze the different opinions of the stakeholders with my point of view as well.

3.2.1. Parkings

a. Reduction of parking spaces in the city

One of the main key success factors according to van der Tas (2022) and Koljensic (2022) is the reduction of parking spaces in the city. They removed parking spaces in the city to free up space. Indeed, the government and municipalities are trying to develop new ideas for the citizens and make the city more attractive for them. This idea works well because it reduces the availability of parking in the city center. In addition, it reduces congestion. Removing parking spaces can reduce the number of cars on the road, which can help relieve congestion downtown. Another positive aspect of this measure is that it improves air quality: cars emit air pollution, which can have negative health effects. Removing parking spaces can also help reduce the number of cars on the road and improve air quality in the downtown area. It also creates more pedestrian-friendly areas: removing parking spaces can create more space for pedestrians, which can make the downtown more attractive and enjoyable for people to walk through. In addition, it encourages the use of alternative modes of transportation: removing parking spaces can encourage people to use public transit, cycling or walking, which can be more sustainable and less polluting than driving. And finally, it can generate revenue: In some cases, cities can remove parking spaces and replace them with paid parking or other developments to generate revenue (van der Tas, 2022).

b. Parkings Park and Ride

A P+R parking facility is a public transportation system that allows people to park their vehicles at a transit station or center and then continue their trip using public transportation. These types of facilities are often located on the outskirts of cities or in suburban areas, and are designed to help reduce traffic congestion and improve air quality by encouraging the use of public transportation. They are often used by commuters who live in areas where it is difficult or impractical to use public transportation for the entire trip to work or school. Some P+R parking lots offer free or reduced-price parking to people who use public transportation, while others may charge for parking. P+R parking facilities are also a good way to reduce the number of cars in the city. To make this attractive, they make these parking lots very cheap. It costs 1€ per day from Monday to Friday before 10am, weekends and holidays. Before 10am on weekdays it costs 8€ for the first 24 hours, then for the next 3 days it costs 1€ per day (Amsterdam, n.d.). Currently, parking fees in the historic center are €7.50 per hour, and Amsterdam increases these fees every year to discourage people from using their cars in the city, and even at night these fees apply (Groothoff, 2022). After parking in one of the P+R parking lots, there are connections to streetcars and buses, mopeds and bicycles. These parking lots are very successful and already greatly improve the use and efficiency of the public space (Groothoff, 2022).

However, according to van der Tas (2022), this is not the optimal solution because it is important to design Amsterdam in such a way that people do not have to travel by car at all. Indeed, in the 1970s and 1980s, the Dutch created beautiful suburbs where people have a nice house with a garden and their car parked in front of their house but they have to use their car every day to go shopping or to work. That is why van der Tas (2022) thinks that P+R parking is not the solution but one of the solutions.

My opinion on P+R parking is that it is a good idea and that it is also easily replicable for other cities that have the means to build them. However, it is important to have a good public transport network from the P+R parking lots to the city center. Otherwise this project would not be useful and profitable.

3.2.2. Attractive public transport in the center

A key element in minimizing car use is public transport in central Amsterdam. Users need to have the best possible experience of switching modes of transportation. Public transport in Amsterdam is widely available and covers most parts of the city. This makes it easy to get around without having to worry about traffic. Public transportation in Amsterdam is generally safe and well regulated, so you can feel safe using it. In addition, using public transportation in Amsterdam can also be a fun and interesting cultural experience, as you will have the opportunity to interact with locals and see more of the city. According to Harris (2022), the quality of public transportation in Amsterdam is generally high. The city has an extensive network of streetcars, buses, and subway lines that cover most areas of the city and provide frequent service. Vehicles are generally clean, modern and well-maintained, and there are also several options for alternative modes of transportation, such as ferries and bike-sharing programs. In addition, Amsterdam's public transportation system is well-organized and easy to use, with clear route information and signage. Overall, Amsterdam's public transportation system is reliable and efficient, making it a convenient and pleasant way to get around the city (Koljensic, 2022).

3.2.3. Governance

a. National governance

Amsterdam is the capital of the Netherlands and as such does not have a separate national government. The Netherlands is a constitutional monarchy and the national government of the Netherlands is located in The Hague. Amsterdam, like other cities in the Netherlands, is administered by a municipal government that is responsible for the management of the city and the enforcement of municipal laws and regulations. The Amsterdam municipal government is

headed by a mayor and a city council composed of members elected by the citizens of Amsterdam (van der Tas, 2022).

At the level of national governance, it is noticeable that large cities in the Netherlands, such as Rotterdam or Amsterdam, receive money from the government. This greatly facilitates the means to develop smart mobility and to support new projects. And although the city of Amsterdam is a municipality with different sections and urban districts, it is well centralized and organized. Indeed, depending on the district you live in there will be small differences, but they are not major and do not cause a big problem (Harris, 2022).

Van der Tas (2022) agrees. It is the Amsterdam Transport Authority that is responsible for public transport. They have the same Ealdorman for the city and he also chairs this organization, and for that reason they have a good cooperation. It gets better because in because the department understands that they need each other to solve the different problems. And regarding carbon dioxide emissions, they have so many challenges that they can only solve them if they work together. So van der Tas thinks that this is a strength of the city of Amsterdam (van der Tas, 2022).

Regarding Groothoff (2022), he mentions: "The city is responsible for most of the traffic within the city. Only the highways are part of the national government. But of course, deciding whether a certain vehicle is allowed is also determined at the national level. So, for example, the small scooters that you see in many European cities, are not allowed in the city because of the national government. The national government department has decided that we do not allow them at this time." For Groothoff, this is also a key success factor because the city and the national government cooperate well and it shows in the impact of the city's projects.

In my opinion, a government plays an important role in planning and implementing mobility policies. It can influence the way people move around an area by creating transportation infrastructure, setting safety standards, and implementing programs to encourage walking, biking, and public transit. The government is also responsible for building and maintaining roads, bridges and highways, as well as planning public transportation, such as buses, trains and subways. In addition, they help develop policies to reduce traffic congestion and greenhouse gas emissions, or to promote mobility for the mobility impaired or elderly. In addition, transportation pricing policies, financial incentives for electric vehicles, and transit development projects are also managed by governments. A government can have a significant impact on the quality and accessibility of travel options for the citizens of a region, and it is

therefore important that it plays an active role in the planning and implementation of mobility policies.

b. Citizen involvement

Citizen involvement is also a strong point of mobility in Amsterdam. In fact, according to Harris (2022), there is a smart city initiative. They have five or six different types of areas in which Amsterdam is trying to process smart data from smart mobility. Within smart mobility, there are a few people running these experiments and there are always open houses for citizens to get involved however you have to find them yourself. You have to say you are interested or you have to go to an event. Sometimes what the city does is they ask citizens to vote on particular things like a new bridge or a ferry. This is both for smart mobility and mobility in general. She says, "Compared to other cities I've lived in, I feel like citizens are much more involved. It's like voting and seeing the projects come to fruition. There are meetings, there are all kinds of city meetings about new transportation options. I think Amsterdam is great with that. But to be honest, you know where I come from, I come from America where the infrastructure is falling apart. I also grew up, I lived in Japan where the infrastructure is pretty good, but there's not as much citizen involvement." (Harris, 2022).

Amsterdam has normal democratic processes, but there have been hearings and sessions that they have organized regarding the speed regulation standard from 50 to 30km/h, and they support this project by organizing meetings in the city, where civilians are involved, but the main decision making is done through the normal democratic process with the Council and the representatives (van der Tas, 2022).

Regarding Groothoff (2022), he and his team have made a lot of effort to include citizens in discussions and have tried to initiate new projects.

3.2.4. Traffic flows

a. Analysis of bicycle and car flows

One of Harris' strengths is that there is a lot of monitoring of passenger flow. For example, they have cables on the ground, and every time bikes pass by, they count the number of bikes riding on a particular section during the day. They pay attention to the parts of the city that are very busy, especially with bikes, cars and streetcars. Sometimes, from there, they rearrange the route planning around those choke points, for example. The University of Amsterdam has an urban bicycle institute. They are very well integrated with some of the city and mobility experiments. They also have an urban planning department. They are pretty well connected and they do a lot of things for mobility in Amsterdam. They also involve their students in this research. However, it is not new and it is not necessarily smart, the wires have been in the field forever, it may be new for other cities but it is certainly not new for Amsterdam. In terms of smart mobility, there are organized experiments. For example, there is a self-driving boat experiment. There are all kinds of urban smart data (Harris, 2022).

b. Smart traffic lights

A key success factor in decongesting car mobility was the reorganization of traffic signals. Amsterdam really monitored how traffic flowed through the city and they changed the traffic lights to be more fluid. In other words, they got rid of a lot of red lights and put markings on the ground so that all vehicles and cyclists would pay attention to each other. So you have to be very aware. And instead of stopping, starting and stopping again and starting, it is a continuous flow. The Urban Cycling Institute has a lot to do with this (Harris, 2022).

Van der Tas (2022) thinks that what is important is to communicate directly through service providers, for example, Google or TomTom. To manage traffic flows, these companies inform them about road closures, but also about preferred routes. Indeed, Google Maps does not always know what is the best route to take. Google Maps sometimes drives people through very narrow streets or in places where it knows there is a lot of traffic, especially, for example, around events. They have implemented smart traffic lights that. But it is not to a standardized

flow, it is based on the information presented, they have a traffic management system that influences the traffic lights in the streets (van der Tas, 2022).

c. Traffic Circle for cyclists

One thing that is not smart, but is mobility and has been successful, is bicycle traffic circles (Harris, 2022).

From my perspective, traffic circles are traffic circles designed to improve traffic flow and reduce accidents at intersections. They are common in many countries and can be an effective way for cyclists to navigate intersections. For cyclists, traffic circles can be a safer alternative to traditional intersections because they generally have lower speeds and fewer conflict points. When approaching a traffic circle, cyclists should follow the same rules as motorists and yield to vehicles already in the traffic circle. It is important that cyclists signal their intentions to other road users and be aware of their surroundings at all times. In some cases, traffic circles may have separate bike lanes or paths that allow cyclists to bypass the main traffic circle. It is important for cyclists to follow the designated route and be aware of other cyclists, pedestrians and vehicles. Overall, traffic circles can be a convenient and safe way for cyclists to cross intersections, as long as they follow traffic laws and pay attention to their surroundings.

3.2.5. More place, priority and security for bikes

Amsterdam has implemented bicycle streets where cyclists have priority. Cars have to pass behind the bikes and the idea is that cars can not pass bikes. On the streets, there are big signs that say that the car is a guest. They have gotten better in the center because there are more and more people in the center. Some places feel a bit precarious because bikes have to share the road with cars. The urban planning is such that most roads have been separated. There are separate bike lanes dedicated specifically to bikes. Moreover, with the history of Amsterdam, one can notice that this city has not always been friendly with cyclists. In fact, at one point

there was a big demonstration, it was a citizen's movement to get rid of the cycling infrastructure to make it safer. That is usually the example that people in Amsterdam set for other cities, saying, if we could do it, you can do it too (Harris, 2022).

Van der Tas (2022) concurs with Harris: Amsterdam has introduced bicycle streets, so that the streets used by cars have a very low priority, and so that the whole street layout is oriented towards cycling, which makes it much less attractive for cars to go there because motorists have to drive very slowly. They have to give priority to all cyclists. This is an excellent key success factor for Amsterdam (van der Tas, 2022).

In my opinion, there are several reasons why giving cyclists more space on the street is a key success factor. Cyclists are vulnerable road users, and giving them more space on the street can help reduce the risk of accidents. Dedicated bike lanes, shared-use lanes and other infrastructure can help separate bicycles from other traffic, making it easier and safer for cyclists to travel. Providing more space for cyclists makes it easier for them to get around, especially those who do not have access to a car or who prefer to use an active mode of transportation. In addition, cycling is an excellent form of exercise, and making cycling more accessible can help encourage physical activity. This can have a positive impact on public health. Cycling is a low-emission mode of transportation, and promoting it can help reduce traffic congestion and improve air quality. Overall, giving cyclists more space on the streets can benefit individuals, communities, and the environment. In addition, I think there are several ways that cities and communities can provide more space for cyclists on the streets. One way is to provide access to lanes on the road that are specifically for bicycles, which can be separated from the rest of the roadway by a painted line, a raised median or a physical barrier. Another solution is to provide shared-use paths, which are multi-use paths shared by pedestrians and cyclists. These can be found along roadsides or in parks and green spaces. An obvious solution is bicycle lanes physically separated from the roadway by a median or barrier. These could be found on busy streets or in areas with high pedestrian traffic. Infrastructure such as bike racks, bike share stations, and bike repair facilities that facilitate the use of bicycles as a means of transportation can make life easier for cyclists and thus promote cycling. Programs that raise awareness of bicycling and encourage more people to bike can also help create a more bike-friendly environment. Finally, by implementing these types of infrastructure and programs, cities and communities can create a safer and more convenient environment for bicycling, which can help encourage more people to bike.

3.2.6. Technologies

a. Data

Amsterdam mainly uses the data they get from sensors. Some are bike-centric, some are pedestrian-centric, but most of them, of course, are car-centric. They have public transportation registration data, which gives a first look at what is really going on. Then with that they can see operationally when the mobility system still has capacity or when it reaches its limits. In the long term, they can use this information to make investments or adapt policy to meet demand. It is more from the city's perspective than the user's. What they are trying to do is to ensure that travel is multimodal, i.e., travel using different modes of transport. Amsterdam is trying to get everyone to speak the same language so that it is easier to interact with mobility providers and application providers. To provide a service here in the city, you have to share data with the city about usage so they can see if it is being used in the right way. What they want is for all the proposals to be able to fit into an app. Right now, most of the proposals or those from mobility providers have their own app, which makes it difficult for the user to have 20 different apps. To have the easiest way of transportation, what they have already done is that they integrate their data, so the user can open an application and send the link later. By opening the app, one can see where the different vehicles are available and book some of them, but most of them still want the user to go to their app and book through their system. Ultimately, what Amsterdam wants is to get rid of that barrier (Groothoff, 2022).

b. Sensors

About the sensors, they have two main sensors that they use. One is the traffic lights under the road. They have a sensor to see if anyone is waiting in front of the light. Every time a car goes by, they get a signal and they can use the data to get an estimate of how many cars are passing and it is very accurate. The second type of sensor is license plate recognition cameras. They are mainly used to see if the cars are not all diesel cars that are not allowed in the city, but it also allows you to see how many cars or what kind of cars are entering the city and in which areas. Amsterdam also buys a lot of data from different navigation applications. They sell the

data that gives an overview, on the one hand, of the amount of money, and on the other hand, of the average speed over time. So it is possible to see when there are delays in the traffic, but this is only for bicycles. It also exists for traffic lights, the city has installed sensors that use a radar to see how many bikes are passing at a given time and how fast they are going. Pedestrians, it is usually video with an algorithm that counts the number of people present or using 3D imaging (Groothoff, 2022).

3.2.7. Open data

Amsterdam makes a point of working as much as possible from national data sources. They have the national data, where every local municipality should feed in all their rules and regulations and road closures. They also have the maximum speed limits, which are more flexible, but they have to be centralized so that everyone, whether it is a truck driver, a planner, or Google, can use that data. So they have some industrial optimization, to manage streets to make sure tunnels work, bridges can open and close. But all the information that should be more publicly available for others to work with, they provide nationally (van der Tas, 2022).

In my opinion, making data about transport systems and services available to the public in a transparent and accessible way brings a big benefit to mobility in Amsterdam. Open data can provide valuable information to policy makers, planners and other decision makers, helping them to make more informed decisions about transport systems and services. Open data can help increase transparency and accountability in the transportation sector, making it easier for the public to understand how transportation systems and services work and how they are funded. In addition, open data can be used by developers, researchers, and other innovators to create new tools, applications, and services that can improve transportation systems and services. In addition, open data can be used to identify inefficiencies and opportunities to improve transportation systems and services, leading to more efficient and cost-effective operations. Finally, open data can facilitate access to information about transportation options, schedules, and routes, thereby helping to improve mobility and access to transportation for all users.

3.2.8. Low Emission Zone

A Low Emission Zone (LEZ) is a designated area where vehicles must meet certain emission standards to reduce the amount of air pollution caused by vehicle emissions. In Amsterdam, the LEZ applies to most vehicles, including cars, motorcycles and vans. In order to qualify for the LEZ, vehicles must meet certain emission standards, which vary depending on the type of vehicle and its age. If a vehicle does not meet the required standards, the driver must pay a fee to enter the LEZ. The LEZ is in effect from 7:00 a.m. to 7:00 p.m., Monday through Friday, and is enforced by cameras and license plate recognition technology. The goal of the LEZ is to improve air quality in Amsterdam and reduce the negative health effects of air pollution.

Today, it is a low emission zone. But they are moving toward zero emissions in 2030, for private cars and engines. And in 2050 for everything else, like trucks, buses, boats (van der Tas, 2022).

One of the benefits of low-emission zones (LEZs), in my view, is that they reduce air pollution by limiting the number of high-emission vehicles on the road. Reducing emissions from transportation can also help combat climate change by reducing greenhouse gas emissions. This can lead to improved air quality in the area, which can have many health benefits, including reducing the risk of respiratory problems and other illnesses. By encouraging the use of low-emission vehicles, LEZs can also help reduce traffic congestion on the roads. This can improve mobility and reduce travel times for all road users. LEZs can also have economic benefits, such as creating jobs in the clean transportation sector and reducing costs associated with air pollution, including health costs and lost productivity. Overall, LEZs can have a range of benefits for both public health and the environment.

3.2.9. Topography

According to Koljensic (2022) and Van der Tas (2022), the topography of Amsterdam can have a significant impact on mobility in the city. Many places are accessible only by boat, which has led to a strong tradition of boat transportation in Amsterdam. As the city was historically built on a network of canals, it was designed to be pedestrianized in the first place, and this is still felt today. The city is fairly flat and the streets are narrow, making it easy to get around on foot

and by bike. In fact, Amsterdam is considered one of the most bikeable cities in the world, and many residents use bikes as their primary means of transportation. Amsterdam's topography, with its canals and low-lying terrain, has played an important role in establishing a tradition of a bicycle culture. It has also contributed to the creation of a pedestrian environment, with narrow, flat streets facilitating travel on foot (Van der Tas, 2022).

3.2.10. Culture

Amsterdam has a major advantage over other non-Dutch cities, because they are already used to using bicycles. Most trips under 5 kilometers are actually done by bike. We ended up with cars so that is a big advantage and now they are trying to get rid of the other cars (Groothoff, 2022).

In my opinion, Amsterdam is known for its strong bicycle culture and is often referred to as the "bicycle capital." In Amsterdam, bicycles are used for both transportation and recreation. There are also many bicycle parking lots throughout the city. Bicycles are a popular mode of transportation in Amsterdam because they are efficient, environmentally friendly and allow for easy travel through the city's narrow streets and canals. Amsterdam's flat terrain and compact size also make it an ideal city for cycling. In addition to being a convenient way to get around, cycling is also a popular recreational activity in Amsterdam. The city is home to many cycling clubs and events, and the surrounding countryside is dotted with bike paths and scenic routes. Bicycles play an important role in Amsterdam's culture and daily life, and the city has a long history of promoting and supporting cycling as a means of transportation.

3.3. Discussion

3.3.1. Challenges

a. Implementation

In my opinion, implementing mobility projects in any city can be a challenge, and Amsterdam is no exception. Amsterdam is a densely populated city with a limited amount of space for infrastructure projects. Therefore, it can be difficult to find space for new roads, bike paths or other mobility projects. Amsterdam is a city with a rich history and culture, and any infrastructure project must take these considerations into account. This can make it more difficult to implement projects that may result in changes to the city's built environment. Funding is always a challenge when it comes to infrastructure projects, and it can be difficult to find the resources to fund new mobility projects. Implementing mobility projects can often require the involvement and cooperation of a wide range of stakeholders, including local residents, businesses and government agencies. Ensuring that all stakeholders are on board with a project can be a challenge. Infrastructure projects are often controversial and can be influenced by political considerations. This can make project approval and implementation difficult. The implementation of mobility projects in Amsterdam, or any other city, requires careful planning and the ability to address a range of challenges. In addition, consistency between different measures taken is also important. As with road works, not all measures can be implemented at once. A verification of mutual and joint effects is always necessary. This can be done through research or sometimes through a pilot project. Ultimately, this may mean that a measure that works well in one area still needs to be adjusted because of possible negative effects in another area.

b. Shared cars

Car sharing has a positive image, but it is possible that car sharing will increase the number of car trips in the city. This can be an effective way to reduce traffic congestion and improve air quality in cities. However, implementing a successful carpooling program can be a challenge.

The fact that there are now many more on-demand services would pose a new problem. It would compete with public transport, while public transport would be very efficient in terms of space use, these car trips would be less so. Finding the right balance remains a major challenge for mobility in Amsterdam. Also, shared cars are not always available when you need them, especially if they are in high demand. This can be frustrating if you are trying to make a last-minute trip or are running late. Shared cars may only be available in certain areas or along certain routes. This can be an inconvenience if you need to get to a location that is not served by shared cars. Also, carshares may be limited in time, which can be a disadvantage if you have a long trip.

c. Unforeseen

One has to be careful that innovations can suddenly place very different demands on the city's needs. Social developments are difficult to predict. Cities around the world are facing major challenges around the themes of climate, mobility, inclusion, security, economy and health. Most projects contribute to making the city livable, but can also have unforeseen effects. It is important to consider issues such as socio-economic divisions in relation to mobility.

d. Electric bikes

Electric bikes are a clean and green mode of transportation that produce no emissions and their use can help reduce your carbon footprint and contribute to a healthier environment. However, the introduction of e-bikes on the bike lanes brings many new challenges to the city of Amsterdam. First of all, people who are on a so-called "normal" bike feel unsafe because e-bikes go much faster and also require extra attention while driving. It is a very different way of being mobile and it has really created tensions. Now that the city is expanding, it is becoming very expensive to live in Amsterdam, people have to live in the suburbs, around Amsterdam and therefore have to travel further and therefore prefer to use an electric bike that goes faster. The bicycle lanes are not made for this type of bicycle (Harris, 2022).

According to Groothoff (2022), e-bikes are becoming a big concern because it is becoming really dangerous. Most people who ride bikes do about 15 kilometers per hour. However, electric bikes usually go around 25 kilometers per hour. Also, you can not always tell when a bike is coming and it is an electric bike. Groothoff says that when someone is coming in one direction, he can go first, but it turns out that it is an electric bike that is coming quite fast. So that leads to accidents very frequently and especially among older people who wouldn't otherwise ride a bike. Children get an electric bike at a very young age and without a license or helmet. To counter this, it is not so easy to regulate the speed because most bikes are limited to 25 kilometers per hour but it is easy to hack. You can get up to 40 kilometers per hour, which is pretty fast. What they are trying to do now is to see if they can limit it by working with the manufacturers of these bikes and make sure that once they get into the city (Groothoff, 2022).

According to Groothoff, there are many electric bikes in the city. At first, they were happy that it worked. However, they now notice that the electric bike is used instead of public transport and the non-electric bike. This is obviously not what they want to achieve. He thinks that one solution would be to ban them and therefore backtrack. In his opinion, there should be a limit, but it is important to know how to impose it. Indeed, the idea is that people should walk, then cycle, then use public transport, then only use electric mobility, and finally use the private car (Groothoff, 2022).

e. New approach to the problem of car congestion

The conventional way of managing traffic or mobility is to look at the cars and see if there are traffic jams. Then look at how to solve that problem. A lot of people have been working for 30 years on solving traffic jams for cars and now Groothoff asks his teams not to work on that anymore and just to make the mobility of cars as unattractive as possible, so they ask them not to make the life of the drivers easier, which gives a whole new aspect to the mobility problem (Groothoff, 2022).

f. Underserved public transportation

There are many areas that are poorly served in terms of public transport and are very busy. In the city center everything is fine, but in the periphery the quality, frequency, etc. are much lower (van der Tas, 2022).

However, accessibility for disabled and weaker people is still a big weak point for streetcars, buses and trains in Amsterdam. According to Harris (2022), this should be improved so that as few people as possible have to use the car. If fewer and fewer people are forced to use cars because of the accessibility of these, it would make life easier for these people and decrease the number of cars for this category of people. Amsterdam's public transport is quite efficient in the center, but the transport is less efficient in the outlying areas. Indeed, there is much less of it, it is crowded, the quality of service is not good, the transport arrives not on time and its frequency is low. This is a big problem because Amsterdam is a city with a dense center where social and economic activity has developed, but the residential areas are more out of the way, so transport should be well served so that cars are used less to get to work or to shop or to go to events (van der Tas, 2022).

g. More and more people

Amsterdam is creating more living spaces within the city limits. The city is becoming more and more dense. Therefore, there is less and less space and at the same time they want to give a lot more space, not for mobility, but for people to live, to play, to meet and of course to move and get from point A to point B in a way that is inclusive, safe, space efficient and non-polluting. So it is a challenge that's really fundamental and requires some pretty big changes, but the challenge is of course how they can do it, because a lot of these changes do not have a legal basis, not locally, not nationally, not even at the European level (van der Tas, 2022).

h. Logistic

A good part of the city's cars would be used for business purposes: logistics, cab transport or group transport. There are still no clear agreements with these sectors about where they can and cannot go and at what time. Moreover, this should happen with the whole chain: from the supplier to the recipient.

3.3.2. Recommendations

a. Scalability

Just because all the projects mentioned are successful in Amsterdam, it does not mean that this can be the case in every other city in the world. Harris says, "Mobility here has changed my life. I mean, I've lived in New York and Tokyo, and of course you can still take public transportation there, but I would never ride a bike there. I know people do it, but I wouldn't feel safe. In a city where there is a big center, it's easy to have a bike because the distance is not so big. In some ways, our mobility might not work in other cities." (Harris, 2022).

From my perspective, I would recommend being careful that not all of the key success factors identified above can be applied everywhere. Indeed, funding can be a major constraint for cities seeking to implement new transportation projects. In densely populated cities, or a city with a different topography, it may be difficult to find the space to build new bicycle lanes, pedestrian paths or public transport infrastructure. In some cases, transportation projects may face resistance from residents or local politicians, which can make it difficult to get approval and implement. Some transportation technologies, such as autonomous vehicles, may require significant infrastructure investments and face regulatory or technical challenges. Finally, in some cities, there may be cultural barriers to the adoption of certain transportation modes, such as a preference for personal vehicles over public transit.

b. Shared cars

Regarding shared cars, Groothoff (2022) proposes that in the future private car owners should pay for shared cars because it is still very expensive and therefore difficult to convince the population to switch to this mode of transport. The business case for shared mobility, like the business case for other preferred modalities, should become better than the business case for private car use. Therefore, not only parking fees, but also other fees for the private vehicle should increase and then use this money to improve the business case for other mobile modalities. Now for shared mobility in the city, parking is free. This is also a form of subsidization that Groothoff says is good, but it is all about balancing everything and that's why data collection is so important to really see what is going on (Groothoff, 2022).

In my opinion, it is important to carefully assess the demand for car sharing in Amsterdam, as well as the potential barriers to its adoption. A clear set of policies and procedures should be developed and the terms of use of the carsharing program should be clearly defined. There are also many carsharing platforms available, so it is important to choose one that meets the needs of your community. Consider factors such as ease of use, reliability and cost. Finally, I recommend monitoring and evaluating the program, i.e., regularly tracking the usage and performance of the carsharing program, and using this data to make adjustments as needed.

c. Less attractiveness of cars in the city

- Removal of parking spaces

Van der Tas (2022) thinks that Amsterdam can be much more aggressive in removing parking spaces.

In my opinion, removing more parking spaces in Amsterdam could be a way to discourage car use and encourage the use of alternative modes of transportation. This could be done by converting on-street parking spaces into bicycle lanes or pedestrian zones, or by reducing the number of parking spaces in city garages or other off-street parking facilities. We would need a downtown without parking and the pressure on the downtown is high. Space for pedestrians, cyclists, public transportation and loading and unloading is in my opinion absolutely necessary

in these locations. There should also be urban streets without parking. On city streets, it is about finding the balance between staying and moving. Removing parking spaces allows for more walking and living spaces. More loading and unloading facilities and bicycle parking spaces are entirely feasible, as their use is flexible. Another project would be narrow docks with no parking in the city. Because of the limited space on these docks, removing parking spaces is often a good measure to improve the situation for pedestrians and cyclists. This should be done in a step-by-step fashion, as removing all parking along the narrow piers will have a major impact on the surrounding neighborhoods. Reducing parking along the canals and docks would also be a good step.

However, it is important to note that removing parking spaces can also have negative effects, such as making it more difficult for people who rely on their cars or for businesses whose customers drive to work.

- Parkings P+R

As far as P+R parking is concerned, the facilities are still not big enough. If Amsterdam really wants to increase their quantity, the city needs to have many more of these places. Also, these sites are quite old, they were planned at a time when the city limits were around this place, but now that the city is getting bigger, the parking lots are no longer at the city limits and are sort of in the city. Amsterdam has to find new places, bigger places where they could park, but also of course have good connections to the city, preferably by public transport (van der Tas, 2022).

According to Groothoff, P+R parking facilities are a very useful tool. Most of them work quite well. However, the biggest one they have is inside the soccer stadium but every time there is an event, they have to empty the garage and since there are a lot of events, it doesn't work as well as it should. So Groothoff recommends that the logistics be reviewed in relation to the events that are taking place (Groothoff, 2022).

- More taxes

In Amsterdam, there is currently a system of taxes in place. In addition to the congestion charge and the parking permit system, there is the motor vehicle tax (motorrijtuigenbelasting), an annual tax that must be paid for all vehicles registered in the Netherlands. The amount of this

tax depends on the type and age of the vehicle and its CO₂ emissions. Another tax that may apply to car owners in Amsterdam is the road tax (wegenbelasting), which is an annual tax that must be paid on all vehicles used on public roads in the Netherlands. The amount of this tax is based on the weight and type of vehicle, as well as its CO₂ emissions. Both taxes are administered by the Dutch Tax and Customs Administration.

It is imperative to make the city less attractive for car owners because many of the measures are focused on people coming to Amsterdam, but not on people living there. Even if it's about €300 to have your own car in front of your house, that's a lot of money, but not that much in a big city. Also, what would be good for the future is to continue to make the car less attractive. Van der Tas (2022) thinks that smarter, more entry-oriented texts would be a good idea. When you take fuel in your car, there are taxes on fuel but since there will be less fuel in the future and because they are going to switch to electric, van der Tas recommends to introduce a tax per kilometer. But it will be on a national level and not only for Amsterdam. It would not be differentiated according to time, and place (van der Tas, 2022).

In my opinion, more taxes should be introduced in the city of Amsterdam. The city has already implemented a congestion charge, there should be a higher price for cars entering the city center. Parking fees should also be increased. Amsterdam could increase the cost of parking in certain areas, such as the city center, to discourage people from driving to these areas and to encourage the use of alternative modes. Then providing incentives for alternative modes of transportation would be another recommendation on my part. Amsterdam could provide subsidies or other incentives for people to use public transportation, bike share programs, or other alternative modes of transportation. However, it is important to note that these measures can be controversial and it is important for Amsterdam to carefully consider their potential impact on residents and businesses.

d. Attractiveness of bicycles and public transport

According to van der Tas (2022), it is still a case of the carrot and stick regarding the attractiveness of bicycles and public transport. Efforts must be made to make the right alternative much more attractive. Van der Tas explains: "I was in Brussels two weekends ago and if you see how many streets you go from house to house and you take the width of the

street, you have a very narrow pedestrian street and all the space between is for cars. If you're in that situation, no one is going to take a bike. But I think that should be completely redesigned. Of course, in the first years after this change in the city plan, it will lead to a lot of congestion and agitation but I think in the end Brussels would be much better." In the Netherlands, public transport is not really good in van der Tas' opinion. Because of the corona virus crisis, it has deteriorated. The prices are also high, the capacity of the employees is low. So at a time when you should have better public transport, in fact they have worse public transport, so van der Tas recommends to improve and go back to the quality before covid (van der Tas, 2022).

Groothoff explains that in the 1970s there were almost no cyclists and there were a lot of cars in the city. Many children playing in the street were killed by cars. At some point, people said that this was no longer acceptable and people started to protest saying that they wanted cars out of the city. They wanted to have bikes and that's when everything changed, and they started making bike lanes to get rid of a lot of parking lots. Now if you drive a car and you hit a bike, even if the cyclist is at fault, you're to blame. The accidents were the catalyst. That's when everything started to change and they started to make it easier to ride a bike. Another thing is that once you start cycling, you understand that it is good for your health and once people start cycling, they don't want to go back (Groothoff, 2022).

In my opinion, there are many ways to make public transport more attractive to potential users. One way would be to increase the frequency of service, if people know that buses or trains come regularly, they are more likely to use public transport. Making the system more reliable is also a recommendation. If people can rely on the system to get them to where they need to go on time, they are more likely to use it. Another idea would be to make the system more convenient. If the system is easy to use and gets to the places people want to go, they will be more likely to use it. This can include a variety of transportation options (e.g., buses, trains, bikes), a user-friendly ticketing system, and amenities such as Wi-Fi and comfortable seating on board. Also, people will be more likely to use them if the cost of public transport is more reasonable. This can include reduced fares for low-income people, discounts for frequent users, and multi-trip passes. And finally, if the overall experience of using public transport is pleasant and enjoyable, people will be more likely to use it. This may include clean and well-maintained vehicles, friendly and helpful staff, and a safe and comfortable environment.

e. One-way streets

If there are too many cars, congestion will increase and livability will deteriorate. In these cases, traffic measures can reduce the amount of car traffic, such as introducing one-way traffic, partially closing side streets, or creating a street cut-off. Introducing a one-way street is certainly a very effective way to not only reduce the amount of cost but also to increase the safety dialogue because it is much easier to see which way the cars are coming. You don't have to look both ways anymore. (Groothoff, 2022)

In my opinion, one-way streets can have several advantages, my recommendation would be to introduce more of them in the city of Amsterdam. One-way streets can reduce the risk of accidents, especially head-on collisions, because all vehicles drive in the same direction. One-way streets can improve traffic flow because there are fewer conflicts between vehicles turning or crossing into oncoming traffic. This can reduce traffic congestion and make it easier for drivers to navigate the road. One-way streets can also reduce fuel consumption because vehicles can maintain a constant speed and there is less braking and accelerating. The introduction of one-way streets can also be safer for pedestrians, as they only have to watch for oncoming traffic in one direction. One-way streets can provide additional parking opportunities, as cars can park on only one side of the street, allowing for more spaces. In addition, this can make it easier for emergency vehicles to navigate through traffic and respond to emergencies. One-way streets can provide many benefits, but they are not appropriate for all situations. It is important to carefully consider the specific needs and characteristics of a location before deciding to implement one-way streets.

f. 30km/h

It is possible to use space more efficiently by mixing traffic types. If the car accompanies the streetcar, or if the bicycle and car use the same road, this creates more space. However, this is only possible when the number of cars on a street is low enough. Too many cars is not comfortable for cyclists and hinders public transport too much. To mix cars and cyclists, the speed should be 30 km/h maximum. Changing to a 30km/h speed limit would reduce accidents by 20-30%. In case of an accident the consequences are less serious, as a driver he has more

reaction time and a wider field of vision, the traffic noise is reduced by half. In any case, this contributes to road safety and the image that the car is a guest on the street. With low speed limits and generous street layouts on many streets, there would be plenty to do on foot or by bicycle. Reducing the speed limit increases the safety of pedestrians and cyclists and reduces the use of cars (Binnenlands Bestuur, 2021).

The number of casualties among vulnerable road users continues to rise throughout the country. In Amsterdam, cyclists are the largest group of victims. Nearly a quarter of all fatal traffic accidents occur on 50 km roads. Pedestrians are three times more likely to die at 50 km/h than at 30 km/h. Moreover, a speed difference of 20 km/h does not cause any significant increase in speed on short journeys, such as those made in the city. The decrease in speed will have almost no effect on the duration of trips in the city: only a few seconds (Binnenlands Bestuur, 2021).

However, opinions differ regarding this regulation. Indeed, according to some, it risks increasing traffic jams. The generalization of 30 km/h zones risks creating more traffic jams in the city, by slowing down traffic. This will have a counterproductive effect on air pollution. Another counter-argument is that it may reduce business traffic. Lowering the speed limit has a significant economic impact on the area concerned. The less you are allowed to drive fast, the less you want to drive far. Motorists who take longer to travel (especially those living in the suburbs), give up shopping in the city center or applying for certain jobs that are too far from their homes. This could lead to a "loss of economic efficiency". Finally, it is expensive to develop. For a 30-km zone to be effective, elected officials and experts insist on the necessary improvements. Making the street safer for all uses requires rethinking the space and redesigning the roadway. According to a 2008 report by the Interdepartmental Land Transport Research and Innovation Program, it costs one million euros per kilometer to build a 30 km/h zone.

According to Groothoff, the idea of making Amsterdam a 30km/h city is an excellent one. They are currently thinking about it and admit that the idea comes from the city of Brussels, which has already taken the step of lowering the speed limits in the city. It is a project that works in Brussels, he says (Groothoff, 2022).

g. Topography

Van der Tas (2022) says: "I think that even though Brussels has hilly parts, especially now that electric bikes are more popular than ever and are rapidly increasing in number and share compared to normal bikes, I think that many cities, Brussels, Paris, Barcelona, all can be as successful as we are with cycling, I always try to take the bike when I am in the city. But you see how difficult it is, there are no lanes. In Barcelona, it was ridiculous. There was a bus stop on the bike lane, there are terraces on the bike lane, the bike lanes stop in one shot somewhere. You don't know what to do, the layout of all these cities is so car-oriented. I think traditionally we have always created much more space for the bicycle and I think it has to do with our flat nature, the flat countryside. And also by the fact that the distances are not so big inland, so you can even take the bike to the nearby cities." (van der Tas, 2022).

In my opinion, the topography of the city of Amsterdam, and the Netherlands in general, plays a fundamental role on the use of bicycles. Therefore, I would recommend other cities to pay attention to the key success factors that relate to bicycle lanes and bicycles in general because these projects might not work for a different topography.

4. LIMITATIONS AND FUTURE RESEARCH

This section explores the limitations of this dissertation as well as potential future research that can be conducted as a result of this work.

In terms of limitations, the interviews conducted for the practical analysis were semi-structured interviews. I believe that a larger number of stakeholders would have added value to this work. However, I was under a time constraint and I tried to contact as many people as possible. It is not easy to get an interview because the people contacted do not always respond to their email either because of lack of interest or lack of time. More interviews could have provided more information and key elements to answer the research question. Nevertheless, the 4 stakeholders I interviewed gave me many key answers. I think I almost reached semantic saturation because the last interview I conducted did not provide me with more than one or two new elements. I think I had enough interviews for the Amsterdam city area. For future research, I think it might be interesting to interview people who work in the private sector. This could be people working for electric scooter rental, electric scooter rental, car sharing and city residents. This would bring a different view and perspective.

A second point is the fact that the semi-structured interviews are partly subjective. This was avoided as much as possible, but it is almost unavoidable when conducting interviews that allow freedom to both the interviewer and the respondent. For future research, it would be interesting to conduct quantitative interviews. Indeed, studying the issue by conducting a quantitative survey of people living in Amsterdam would be a good idea for the continuation of this work.

Secondly, mobility is a very broad concept and it was very difficult to cover all aspects at the same time. I mainly focused on the problem of car congestion and how to make cars less attractive. It could be interesting to work on one aspect in particular, such as public transport, the emergence of electric bicycles, freight transport or accidents related to mobility.

A final limitation is access to information. Although the speakers were experts, they responded with the knowledge they had. Their answers may not be complete or correct. They are probably biased by the projects they are working on.

5. CONCLUSION

Mobility will always be an important aspect of people's lives. It concerns everyone, all the time. Every project undertaken in a citizen's life will include mobility at some point. Mobility management is essential for the economic and social development of a region or country. People need to move to work, study, play, and access basic services such as health care and utilities. Mobility is linked to the quality of life of citizens. Efficient and accessible transportation systems can improve access to educational and economic opportunities and reduce social barriers. Mobility is a critical environmental issue. Greenhouse gas emissions and high levels of air pollution caused by transportation can contribute to climate change and have negative effects on human health. Governments, businesses and individuals must therefore work together to promote more sustainable forms of transport, such as public transport, cycling and walking.

In order to solve part of the mobility problem, this work focused on the congestion of cars in the city of Amsterdam and how they can become as unattractive as possible. To answer this problem, I decided to study the case of Amsterdam because this city is one of the best in terms of smart mobility and reduction of carbon dioxide emissions. Through this study, the key elements of a mobility that works were highlighted. In other words, what are the key success factors for smart mobility in Amsterdam?

As a first step, a literature review of smart mobility was conducted in order to understand all related concepts. Indeed, it was important to describe what smart mobility is by addressing the different definitions of it. The related issues helped to understand that five distinct aspects must be combined to satisfy the mobility of a citizen of a city. First, there is the environmental issue, which is obvious in today's world. Mobility is also linked to the economy, which is also an important point because it can have a considerable impact if mobility is not efficient. Then, the health of the citizens is at stake because all the particles emitted by non-electric cars can worsen the health of the weakest. The safety of citizens is obviously an important issue because road accidents are numerous and can be serious. Finally, the societal issue is also to be taken into account because if all citizens are not equal in front of mobility, it can lead to increased differences for equal opportunities.

The different types of mobility that are emerging thanks to innovations such as electric vehicles, shared mobility, connected mobility, autonomous mobility can be solutions to improve mobility. This is why these concepts have been explained in the theoretical part.

Amsterdam is considered one of the most sustainable and accessible cities in Europe in terms of mobility. The city has many policies and initiatives in place to promote alternative and sustainable modes of transportation, including their many cyclists. Amsterdam is widely regarded as one of the most bike-friendly cities in the world. Bicycles are often considered the fastest and most convenient means of transportation for many daily trips. Amsterdam has an efficient and reliable public transportation system consisting of streetcars, buses and subways. The system is extensive in the city and its suburbs, and is accessible at affordable fares. The capital of the Netherlands is a city with many public spaces designed for walking and well-defined pedestrian streets. Amsterdam has succeeded in creating a sustainable and balanced mobility system that allows citizens to travel conveniently and safely while limiting negative environmental impacts.

To answer the research question, a qualitative analysis was conducted. Several key points can be taken from the interviews and from my personal point of view are the following.

One of the key success factors of the city of Amsterdam is the plan to reduce parking spaces in the city. This creates more space for pedestrians, public transport and cyclists. In addition, in order to discourage car use within the city by people coming from outside the city, Amsterdam has implemented Park and Ride facilities on the outskirts of the city. However, the infrastructure needs to be improved to be as efficient as possible.

Another important issue is to attract citizens to use public transport more by making it more pleasant and better served. The government also has an important role to play in trying to involve the citizens as much as possible in order to share their opinions on different issues. Another way to discourage people from using cars is to give more space, priority and safety for bicycles.

The traffic flow within the city is a key element in understanding which areas of the city need to be improved. This can be done through traffic analysis, using intelligent traffic signals, bicycle traffic circles and various technologies.

The introduction of a low emission zone is also important because it forces drivers to have a less polluting car. This makes them more responsible for the environment.

According to the different speakers, Amsterdam's topography and bicycle culture make it one of the best cities. Indeed, this facilitates alternatives to the car.

Several challenges remain. With the emergence of innovations, shared cars and electric bikes have become increasingly popular, but they pose a real challenge for Amsterdam. Unforeseen events are also a challenge to anticipate when developing projects. In addition, there are more and more people living in the city and it becomes complicated to manage mobility for so many people.

Finally, mobility is a broad topic with many aspects. This work has highlighted the key success factors for mobility in Amsterdam. It is important to keep in mind that smart mobility is a broad concept to be seen in a whole and in a context unique to each city.

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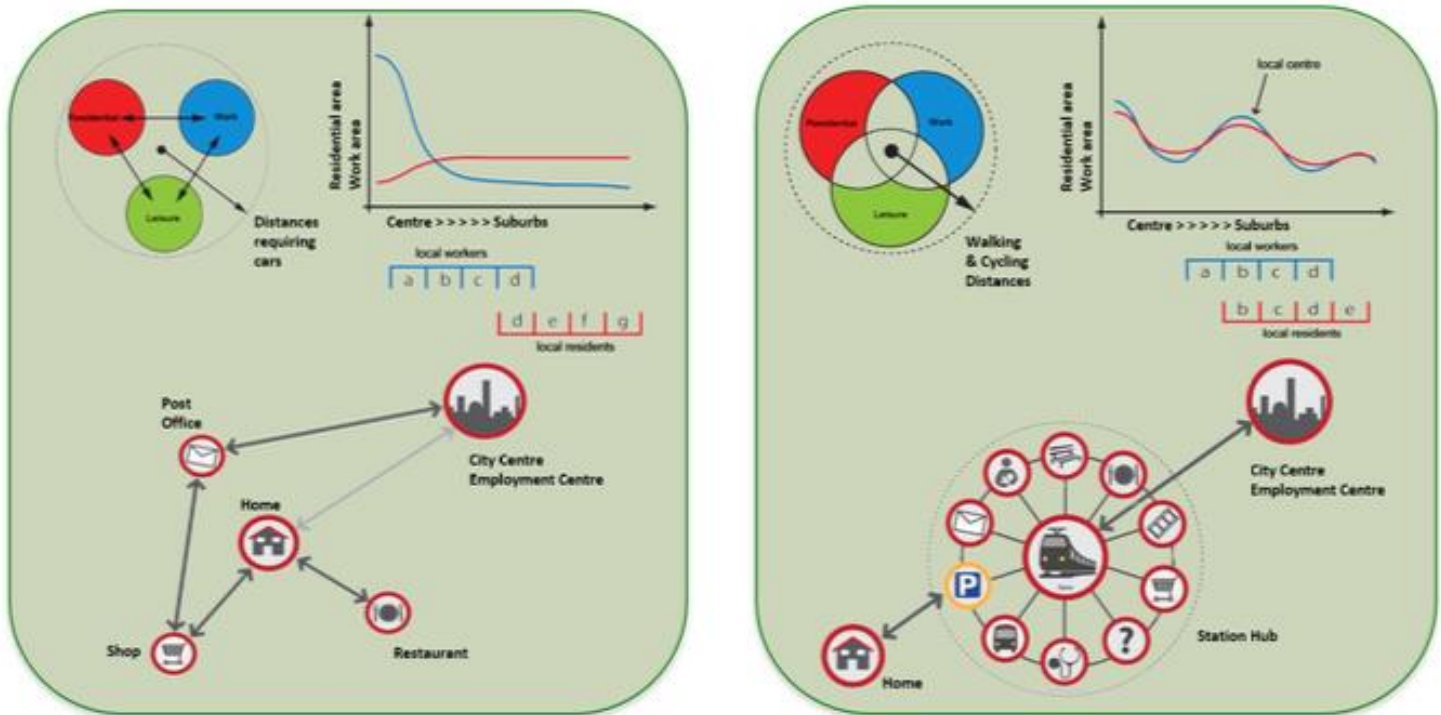
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7. APPENDICES

7.1. Appendix I : 2 different city morphologies



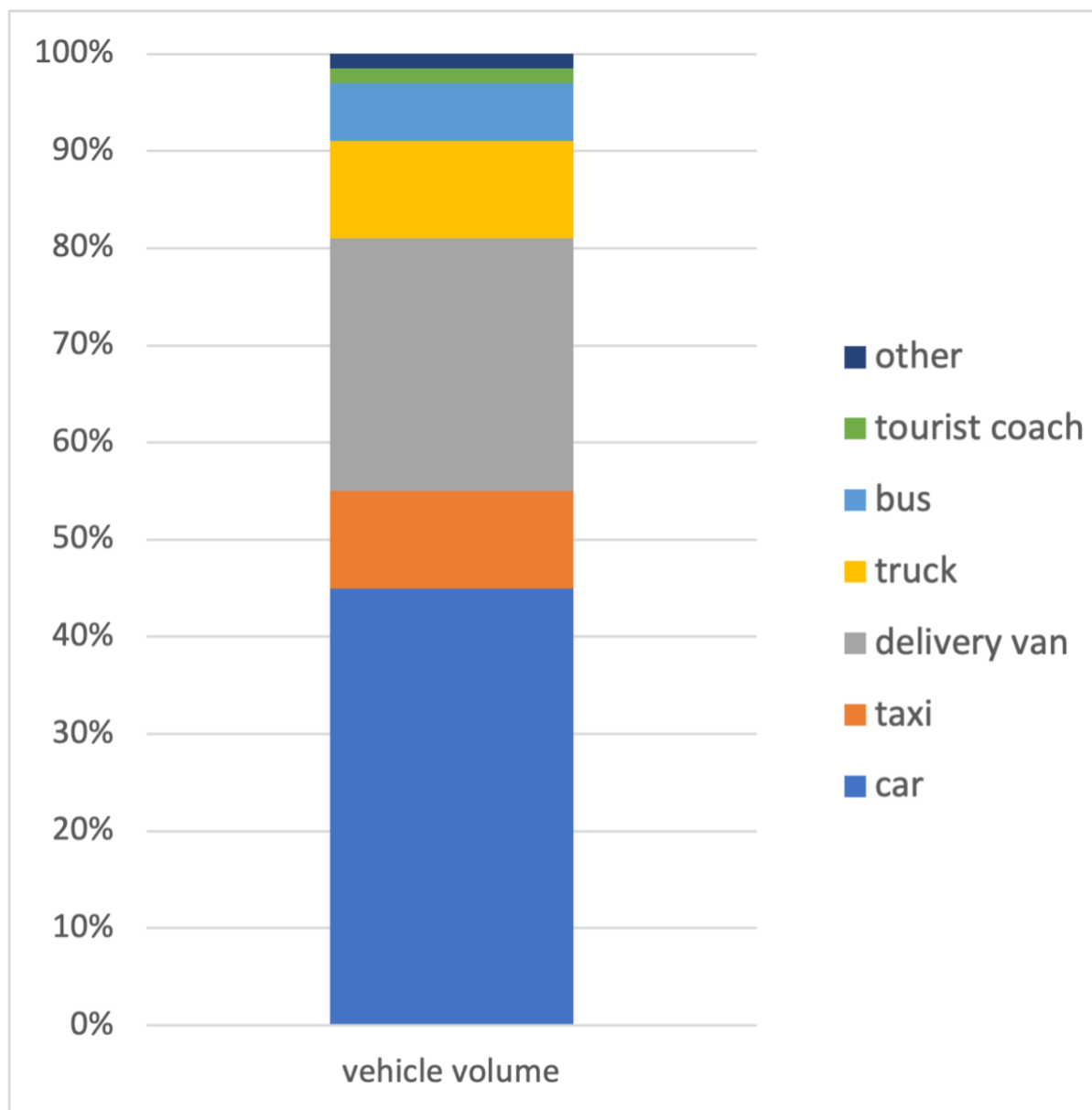
Source : Fernandez-Redonod, n.d.

7.2. Appendix II : Map of the city of Amsterdam



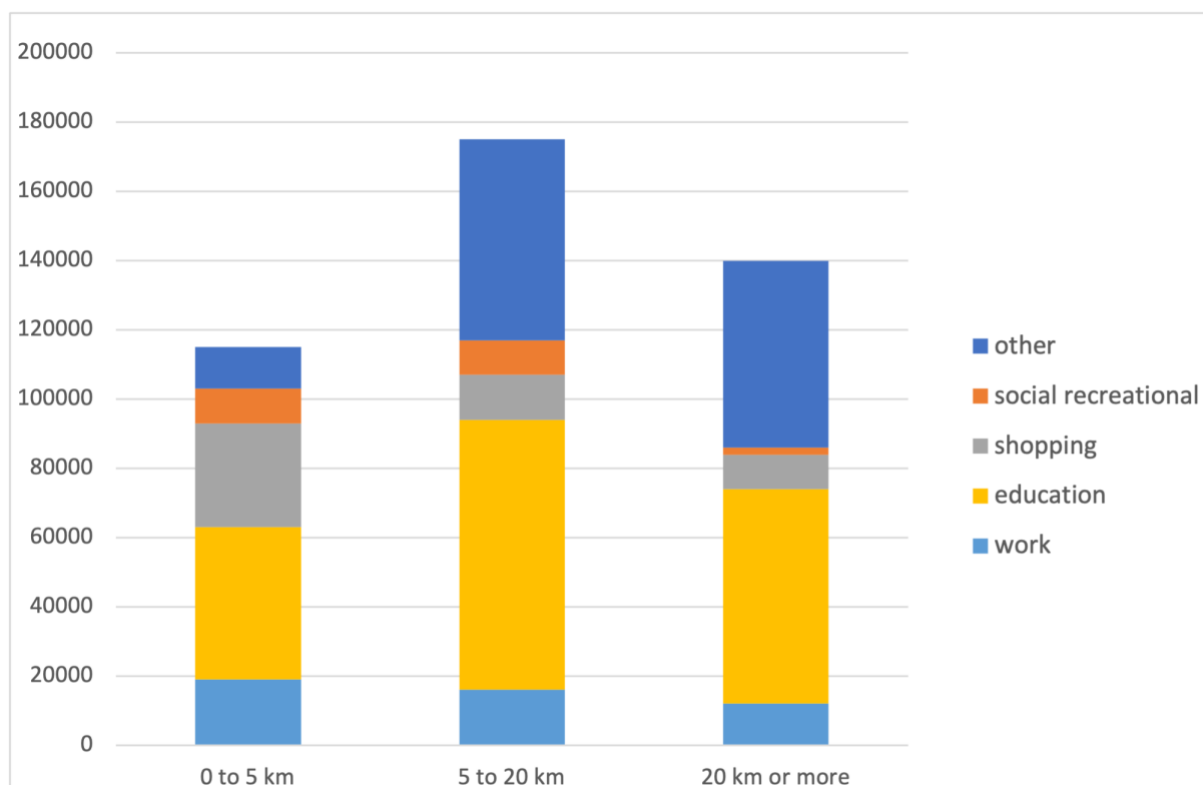
Source : Gemeente Amsterdam, 2021

7.3. Appendix III : Distribution of motorized traffic by category (November 2016)
within the environmental zone



Source : Gemeente Amsterdam, 2020

7.4. Appendix IV : Number of car trips by Amsterdam residents on an average weekday, by purpose and distance class



Source : Gemeente Amsterdam, 2020

7.5. Appendix V : List of people contacted

Nom	Job	Réponse
Bertolini Luca	University of Amsterdam	No, not available
Green Eduardo	City of Amsterdam	No answer
Groothoff Boen	City of Amsterdam	Yes
Snaije Lucas	BYCS	No, not available
Wismans Luc	Goudappel	No answer
Lees Mike	University of Amsterdam	No answer
Nikolaeva Anna	University of Amsterdam	No answer
van der Vossen Guusje	City of Amsterdam	No answer

Rutten Nanet	City of Amsterdam	No answer
Mulder Albert	City of Amsterdam	No
van Gelder Suzanne	City of Amsterdam	No, sick
Boeve Marilise	City of Amsterdam	No
Roelofs Tijs	City of Amsterdam	No answer
Tjon Lizann	City of Amsterdam	No answer
Polderman Ruben	City of Amsterdam	No answer
Tol Yuki	City of Amsterdam	No, vacation
Vinogradov Robbie	City of Amsterdam	No answer
van Os Joost	City of Amsterdam	No answer
Berndsen Jet	City of Amsterdam	No answer
van de Werfhorst	University of Amsterdam	No
Basta Diederik	City of Amsterdam	No answer
Tiekstra Karina	MyWheels	No answer
Harris Tina	University of Amsterdam	Yes
Brommelstroet Marco	University of Amsterdam	No
Ozogul Sara	City of Amsterdam	No
Tasan-Kok Tuna	University of Amsterdam	No
Dekkers Debbie	City of Amsterdam	No answer
van Dijk Stephan	AMS Institute	No answer
van Leeuwen Eveline	AMS Institute	No answer
Heijns Kenneth	AMS Institute	No answer
Hendrik Deinema Ynse	AMS Institute	No
van Driel Joppe	AMS Institute	No answer
Dufourmont Joke	AMS Institute	No
Egas Caspar	AMS Institute	No answer
Kuipers Tom	AMS Institute	No
Oudbier Sander	AMS Institute	No answer
Simmes Maike	AMS Institute	No answer
Koljensic Petar	AMS Institute	Yes
Devis Clavijo Juanita	AMS Institute	No answer
Kreike Muriel	City of Amsterdam	No answer
Vossen Guusje	City of Amsterdam	No answer
van der Tas Daan	City of Amsterdam	Yes
Verhoeven Sofie	City of Amsterdam	No answer

Valenti Damiano	Felyx	No, not available
Birk Christiansen	Jaja Archi	No answer
Cecilie Kiilerich	Mobility Planner	No answer
Josefine Lykke Jensen	CEO Jaja	No answer
Robert Martin	Head Of Mobility	No answer
Susanne Krawack	Mobility Advisor	No answer
Dimitri KONSTANTAS	Project Coordinator	No answer
Lizanne Hessels	Shaping Society Research	No answer
Geraldine Houtschilt	Shaping Society Research	No answer
Minke Snels	Shaping Society Research	No answer

7.6. Appendix VI : Comparison with the city of Copenhagen

1. Introduction

Copenhague est la capitale du Danemark. La ville compte près de 600 000 habitants. Elle est située sur la côte orientale de l'île de Zélande et est reliée à Malmö en Suède par le pont de l'Oresund. Copenhague est connue pour sa riche histoire, ses attractions culturelles et sa qualité de vie élevée. La ville abrite de nombreux sites historiques, dont le palais d'Amalienborg, la statue de la Petite Sirène et le parc d'attractions Tivoli Gardens. Elle est également connue pour ses nombreux musées et galeries d'art, notamment le Musée national du Danemark et le Ny Carlsberg Glyptotek. C'est un centre important pour les affaires et la technologie, avec de nombreuses entreprises internationales présentes dans la ville. (Copenhagen.com, s. d.)

Copenhague a une longue histoire en matière d'urbanisme et de développement urbain. La ville a subi plusieurs transformations majeures au cours des siècles, chaque nouvelle ère apportant de nouveaux défis et de nouvelles opportunités de croissance et de développement. L'un des premiers plans de ville de Copenhague remonte au Moyen Âge, lorsque la ville a été fondée en tant que colonie viking sur l'île de Zealand. La ville originale était construite autour d'une place de marché centrale et protégée par une ceinture de murs et de fortifications. Au fil des ans, la ville a grandi et s'est étendue au-delà de ses murs d'origine, et de nouveaux quartiers et districts ont été ajoutés au plan de la ville. Au XIXe siècle, Copenhague a connu une période d'industrialisation rapide et de croissance démographique, ce qui a entraîné le développement de nouvelles banlieues et la construction de nouvelles infrastructures, telles que des routes et des chemins de fer. Au 20e siècle, la ville a continué à croître et à évoluer, avec de nouveaux quartiers et districts développés pour accueillir la population croissante. Dans l'après-guerre, la ville a connu un processus de modernisation et de reconstruction, qui comprenait la construction de nouveaux logements et le réaménagement des zones plus anciennes de la ville. Aujourd'hui, Copenhague est une ville prospère et dynamique, connue pour ses pratiques de développement urbain innovantes et durables. La ville dispose d'un plan global pour sa croissance et son développement futurs, qui met l'accent sur la durabilité, l'habitabilité et la qualité de vie de ses habitants. (Copenhagen.com, s. d.)

2. La mobilité à Copenhague

Copenhague dispose d'un vaste réseau de transports publics, comprenant des bus, des trains et le système de métro. La ville dispose également d'un grand nombre de pistes cyclables, ce qui

permet de se déplacer facilement à vélo. Le vélo est un mode de transport populaire pour les habitants et les touristes de Copenhague. La ville dispose également de plusieurs programmes de covoiturage et de partage de scooters électriques, ce qui permet de se déplacer facilement sans posséder de voiture. Copenhague est connue pour ses efforts visant à promouvoir le transport durable, et la ville a pour objectif de devenir neutre en carbone d'ici 2025. Dans le cadre de cet effort, la ville a mis en œuvre un certain nombre d'initiatives visant à encourager l'utilisation des transports publics et des transports actifs, comme le vélo et la marche. (Krogsgaard, 2019)

En 2019, Copenhague a ouvert une nouvelle ligne de métro avec 17 nouvelles stations, qui relie à peu près toutes les parties du centre-ville. La ville espère que cela va convaincre la population d'utiliser d'avantages les transports en commun et que cela change ainsi leur façon de se déplacer. Les habitants de la ville sont jusqu'à présent satisfaits des infrastructures des transports en commun. Les 2 principales priorités de la ville sont la pollution atmosphérique et la neutralité carbone. Ils ont comme ambition de devenir la première ville à avoir la neutralité en carbone, comme le recommande l'OMS. Pour se faire, la ville aimerait réduire la congestion avec des rues interdites aux véhicules polluants, des zones réservées à tous excepté les voitures et de nouvelles mesures de stationnement. En 2019, 15% des bus de la ville étaient électriques et les bus diesel seront interdits en 2025. 49% des trajets entre le domicile et le lieu de travail se fait à vélo, c'est une force majeure de la ville. Un chiffre qui illustre l'importante utilisation dans la ville est que près d'1,5 millions de kilomètres sont parcourus à vélo en une journée, cela équivaut à 2,5 kilomètres par habitant par jour. (Krogsgaard, 2019)

Un premier projet que Copenhague aimerait réaliser est un parking plus intelligent. En effet, la ville souhaite donner un accès gratuit aux parkings pour les voitures électriques et que les taxis soient la priorité sur certaines routes.

7.7. Appendix VII : Interview Guide

Introduction

- First, can I record our interview?
- Can you introduce yourself ?
- How are you actually involved in smart urban mobility ?
- How do you define smart mobility?

Context, Challenge

- What is the context of Amsterdam in terms of mobility?
- How can you describe the mobility in Amsterdam?
- What are the challenges of the mobility in Amsterdam?

Governance

- How does it work in Amsterdam with all the responsibilities? How is actually the governance in Amsterdam? How does it work?
- Would you say that the cooperation between the institutions is quite good or?
- How are the citizen involved?
- Who has the responsibilities in the city? Does it work well? Do they cooperate?

Technology

- What are the technologies or the digital tools that you use in smart mobility in general?
- How do they use the data? Are they efficient in this or not really?
- Does the city use data well or do they have like an open-source data platform or not really?
- How does Amsterdam collect the data? Do they have like sensors or things like that in the city?

Car projects

- Do know a projects that are implemented in Amsterdam to reduce de congestion of cars in the city ?
- Do know a projects that are implemented in Amsterdam to make the cars less attractive ?

Other projects

- Do you have examples of projects that Amsterdam has implemented in the city and that you think that they are really successful to make the mobility more efficient?
- Do you have other concrete examples of smart mobility that are implemented in Amsterdam and that are successful and that maybe other cities could inspire them from these examples?
- Are there anything that you put in place in the city and that didn't work? How could you actually do it better?

Strengths

- If you had to mention only one thing or two that are really your strengths in Amsterdam in terms of mobility, what would you say?
- What are actually the incentives that Amsterdam has put in place in order to make it smarter and more efficient in terms of mobility?
- What is your competitive advantage compared to other cities?

Recommendations

- What are actually the 3 recommendations that you would do to Amsterdam in terms of smart mobility for the future?

Conclusion

- Do you have something to add?

7.8. Appendix VIII : Transcription of the interviews

1. Interview Daan Van der Tas

Daan van der Tas

Hi alexia.

Alexia

Thank you very much to take the time for me.

Daan van der Tas

You're welcome.

Alexia

Do you agree I recorded our conversation?

Daan van der Tas

That's OK.

Alexia

OK, thank you so maybe we can begin. Or maybe you have a question for me before.

Daan van der Tas

No, you can just start.

Alexia

Ok. So first can you introduce yourself, your study, your job, your research?

Daan van der Tas

I work for the municipality of Amsterdam since 2020, two and a half years now and I have been working on mobility as a service and on the question how can we use data and decision to make better agreements with the different actors in our city. Think of taxi drivers, lorry drivers, our public transport system. So that's what I have been doing last two now years.

Alexia

And how do you define smart mobility?

Daan van der Tas

Oh, that's a good question. I think smart mobility is the mobility system, including our own role in that field, which makes our mobility system much more inclusive, safe, clean, space efficient and interoperable.

Alexia

How are you actually involved in smart mobility?

Daan van der Tas

Well, I just explained to you what I have been doing up to now, but now much more involved in indeed seeing how can we use digital and data facilities to make our mobility as well as I said more inclusive, clean, space efficient, circular et cetera. So that's what.

Alexia

How can you describe the mobility in Amsterdam?

Daan van der Tas

Since Corona of course we were in Corona times and it was much more quiet on the streets but with Corona coming to an end, we are now even at levels of mobility above the situation that before Corona. A lot of bikes of course. You must have seen. Still a lot of cars in our streets, not per say driving around but a lot of parked cars still and so even in our historical center, which is a UNESCO World Heritage, you find cars parked everywhere. So we're really trying to push that back to make those canals and quays much more. Of course, canals itself are free but especially the quays and the enclaves to clear them from car traffic and so on. The description side so a lot of active mobility has a lot of cycling and walking. Still a lot of cars, especially taking up idle space just by doing nothing. And I think a quite OK public transport system. Why do I say not perfect? Because a lot we do have some neighborhoods that are quite underserved in terms of public transport, and it's quite busy. City Center it's all fine, but in the outskirts it's way less the quality, the frequency, etc.

Alexia

According to you, what are the biggest challenge for Amsterdam in term of mobility ?

Daan van der Tas

Well, the biggest challenge is that since we are like many cities, we are creating more places to live within our city boundaries. It's getting more dense and dense. As a consequence, less space and at the same time we want to give much more space, not per say to mobility but to people to live, to play, to meet each other and of course to get around and going from A to B. In a way that is indeed inclusive, safe, space efficient and not polluting so that is a kind of challenge which is really fundamental and asked for quite big changes but the challenge is of course, how can we do that since a lot of those changes don't have a kind of legal basis, not on local law, but also not on country or even EU law. So that's our biggest one of our biggest challenge.

Alexia

Who has the responsibilities in the city? Do they cooperate?

Daan van der Tas

Which players are you then referring to? Because it's a quite broad question.

Alexia

I was thinking about the government.

Daan van der Tas

Well, I think and then as we have of course federal, so the Country Wide Ministry which is taking some responsibility, for example, to grant National Railway concessions or taxi law is Countrywide law. Although 50% of the caps in the Netherlands ride in Amsterdam, it is low that is being that's hardly anything in our local heuristics. And then of course you have all the municipalities like we have local legislation which is because we are responsible for the streets and for safety and in public space here and then we have third body which it's the local transport authority. Because we also have provinces, we have province instability. The province also has some responsibility in maintaining the roads, also granting concessions to more regional public transport but for bigger cities like Amsterdam and for example combined Rotterdam, we have two separate government bodies, which is authority with their own summer Democratic

Council, et cetera. So these are the main bodies that are responsible for well interacting with all parties.

Alexia

Does it work well ?

Daan van der Tas

Quite so, the transport authority in Amsterdam, which is responsible for especially regional transport, public transport, and we have the same Ealdorman for our city is also chairing this organization so all only for that reason, but also for others, we have a good cooperate. And with Countrywide and the ministry it's improving because I think, in this time frame, we understand that we need each other to solve those issues and with CO2. We have so much challenges that we only can solve them if we work together, so I think it's rapidly improving. Of course it's a little bit difficult to see because I'm not so long working for the city of Amsterdam because before I was working for a bank. So it's totally different there.

Alexia

Are the citizen involved in the decisions or not ?

Daan van der Tas

Well, of course Amsterdam had the normal democratic processes but we do have kind of hearings or some our sessions that we organized. We are also moving towards from 50 to 30 as kind of the norm where so a lot of streets will be limited to 30 and then supporting this intents with organized for meetings in the city, for where civilians are involved, but the primary decision making is via the normal democratic process with the Council and representatives, et cetera.

Alexia

According to you, what are the technologies or the digital tools that is used in smart mobility?

Daan van der Tas

That's a broad question. I will not stipulate name because that's such an interesting more on the functional side. So what we do is communicate directly via service providers. So for example Google and TomTom and others. And so to manage our traffic flows, we inform them about

what's, for example road closures but also preferred routes, because you might think that Google always knows best which route to take. Well, in fact, that's not true, and Google Maps sometimes leads you to very narrow streets or where it can know we have a lot of congestion, especially, for example, around events. So that's what we do. We have intelligent traffic lights set where for example if on some streets, if you have a big truck, it's facilitates you from just going, having green all the time. But that's not at a standardized flow, but on the information that's presented via the truck, we have traffic management system, that influences traffic lights across the streets, displays around the streets. I find it a little bit hard to be exclusive here or exhaustive or really not exhaustive. But this gives it some kind of something of an impression.

Alexia

And how do they collect those data?

Daan van der Tas

I think that we make our heart a strong point of working as much as possible from countrywide data sources. So we have the NDW, which is the national data. We stands for May, which is Dutch, but roads as a way of kind of national database, where every local municipality should feed into all their rules and regulations and road closures. Max speed limits also when they are more flexible, but has to one central point so that everyone if they're a truck driver, a planner or Google could take that data from them. So that's what we do. So we do have some I'd say industrial optimization for us to have to manage our streets to make sure that the tunnels operate, that the bridges can open and close. But all information that should be more publicly available for others to work with that, we source that on a countrywide level. And also in the home data space and initial access point discussion we will of course want to do that as we should do that.

Alexia

And about the projects that Amsterdam implemented, do you have examples of projects that you think are successful and that make mobility more efficient?

Daan van der Tas

We are doing a few things. We are taking parking spots away and so that's one thing, the second thing is that we have shared mobility. Some operation where we really from the government from our municipal side try to develop and make it also more attractive for civilians to use. We

have some experiments where we also are taking away parking spots at the moment that people change towards shared mobility. We are reducing maximum speed as I already said. We have introduced and will be continued to introduce what we call cycle streets so that our streets that are used by cars, they have a very low priority, so the whole layout of the streets is geared towards cycling, so making it much less attractive for cars to go there because you have to ride very slow. You have to give priority to all the bicycles. So that's another thing in of course intelligent access is something that we do too. Now today is more about your emission, not precise 0, it's a low emission zone. But we will be moving towards 0 emission in 2030, for the private car and motor. And in 2050 for everything else, as trucks, buses, boats. What do we do? Also make car driving less attractive. Of course parking rates, parking tariffs, they are quite high. They're now at €7,50 an hour in the historical center. We are also developing what we call Park and Ride sites, so where you can park your private car and take a tram, bus or share the moped or bike. We don't have kick scooters in Amsterdam and we won't, we will not have them. What else? Well, I think it's the main things.

Alexia

Do you have anything that Amsterdam implemented and that did not work?

Daan van der Tas

Well, I think shared mobility is still very small. That's our share car mobility. It's growing and so it's in two years' time it doubled, but at the same time it's still a very minor portion. And I think, but that's more personal opinion that we can be much more aggressive in taking parking spots away. Making the car that the city less attractive to car owning because I think that a lot of our measures are kind of focused on people coming to Amsterdam, but not per say so much to the people living themselves, because although it's about €300 to have your own car in front of your house. And of course it's a lot of money, but not that much in a big city. And one thing that I forgot to mention when you asked me what do you do to make car driver less attractive is of course in all new developments set, is all new housing developments. We have a very low parking quotes. So basically meaning that only a very few people can have their cars in those newly developed neighborhoods.

Alexia

And about the plans that Amsterdam tried to implement in the city, like the one-way street. Do you think it's efficient?

Daan van der Tas

I must say, I'm not so much aware. If you ask me, I think that we should do it much more because then you can already free up one lane for other uses. But it's a good question. I don't know.

Alexia

About the parking P+R that are outside the city, do you think it's efficient for the city?

Daan van der Tas

Well it could be the thing that is already so attractive and facilities are not yet as where big enough so if we want to really scale this up we have to have much more from of these locations. What we also see is those locations are quite old, so they were planned in a time where the city boundary was around that place, but now since the city is large, they're not at the edges of the city anymore. They're kind of in the city, so we have to find new places, bigger places where they could park, but also then of course to have good connections for preferably by public transport, to the city. And that's not a concern that's I don't know how it is in Belgium, but in the Netherlands, our public transport is not really good. It's OK but especially after Corona is getting worse and also due to the fact that prices are high, the ability of employees is low and people riding the buses and the trams. So in a time where you should have better public transport, in fact we have worse public transport, so that's not a good develop.

Alexia

And do you think that the car sharing is a solution for the mobility? Should Amsterdam do the offer of car sharing more attractive ?

Daan van der Tas

Well, I don't think it's the solution because in the end we don't want cars. So in the end we want to have much less car ridership in Amsterdam. And of course, it already improves the efficiency of the use of public space. If we indeed have instead of eight cars, one shared car, so that's already a big improvement, but I don't think it's the solution. It's one of the solutions. And making planning for more and planning our cities in such a way that people don't have to move at all is important. And that's not only on a local scale, but also on a regional scale because we, in the Netherlands, have in the 70s and 80s we made all those nice suburbs where people work

and have another good life and have them park car in front of the house and at the front of the garden, at the back of the house. But all those people move to the work almost by car. So that's we are doing that differently today, but that should be even better.

Alexia

OK, and if you had to mention only one thing that are really the strength of Amsterdam in terms of mobility, what would you say?

Daan van der Tas

Our cycling culture and the whole cycling proposition, I would say.

Alexia

And do you think it's because of the topography of Amsterdam ?

Daan van der Tas

Yeah, I think it's also a cultural thing. For example, I think that even though Brussels has some hilly parts, especially now with e-bikes being more popular than ever and rapidly increasing in number and share of the towards normal bikes, I think that many cities, Brussels, Paris, Barcelona, whatever. All can be as successful with cycling as we can be, the only thing is I always try to take the bike when I'm in cities. But you see how difficult it is, there are no lanes. In Barcelona it was really ridiculous. There was a bus stop right at the cycling lane, there are terraces right on the cycling lane, cycling lanes stop somewhere. And you don't know what to do it's the whole layout of all those cities is so much geared towards the car. And I think that traditionally we always have in the islands we have created much more room for this bike and that I think has to do with our flat nature, the flat countryside indeed. And the fact that the distances are inland, are not so big so that you can even take the bike towards neighboring cities or a village.

Alexia

And do you think that if Amsterdam introduced more tax for cars, it will improve the mobility?

Daan van der Tas

Well, I do if you say more texts not per say, but I think that more intelligent text and more geared towards entering the city. And especially when it's for example, very crowded that could

really help but that's one of the obstacles there, so we don't have that. That we will have, because now we have tax based on your car and you pay a certain amount per month. And of course, when you have taken fuel in your car there are taxes on the fuel. But well since there will be more or less fuel in future times. Because we're going to electric or we will introduce kind of per kilometer tax. But that will be at a national level. Right? But that's not differentiated per time per place and so. That's not really helping us. And you might imagine that because as a consequence, probably the fixed cost of car will be much lower so the fear is that we will have more cars standing idle.

Alexia

To conclude, do you have a recommendation that Amsterdam can do for cars to improve the mobility?

Daan van der Tas

I think it's always the stick and the carrot. So you have to make cars less attractive, but also put much more emphasis on making the good alternative much more attractive. Again, I was in Brussels the two weekends ago and if you see, in how many streets you go from house to house and you take the width of the street you have a very narrow foot street and then all the space in between is for the cars. And if you are there, nobody will take a bike. But I think that should be redesigned completely and then, of course in the first years after this really sign it probably will lead to a lot of congestion and turmoil. But I think in the end, for example, you will be much better.

Alexia

I finished my interview, do you have something to add ?

Daan van der Tas

No, that's fine.

Alexia

Thank you very much.

2. Interview Petar Koljensic

Alexia

Hello, thank you to take the time for me.

Petar Koljensic

No worries, hello.

Alexia

First, do you agree I record our conversation ?

Petar Koljensic

Of course you can. You can record whatever you want.

Alexia

OK, thank you, maybe you have a question for me before we begin.

Petar Koljensic

Yes, I just want to let you know that I have to go at 11:50. I just had a small overview of some questions. I can answer pretty well I guess and some absolutely not. So we're just going to. I'm sorry I have a problem with the sunlight, yes, so we will see how this how this goes. And thank you for reaching me out. This thing is for your master thesis, right?

Alexia

Exactly, so yes, I'm in Master 2 in Business Engineering and I'm writing my thesis about the smart mobility in Amsterdam. So how to improve the mobility and how to make the car less attractive?

Petar Koljensic

OK, I see yes.

Alexia

So first, can you introduce yourself?

Petar Koljensic

Yes, of course I can start with my studies. I did my studies in Vienna in Austria at the Technical University of Vienna. I did studies called spatial planning. The general about the urban planning and the regional planning and so on. Then masters. I also continue my masters there, but the double degree together with Tongji University in China. It means that I got some experience also from China and also some from Vienna. And what's interesting is that I kind of focused in masters and also in bachelor a bit on the mobility topics so I could have gotten the urban mobility and also have to decrease the use of the cars. I was also really locked into the cycling for example I've got during my studies, even if I go to the landscape planning or to the urban design where I went to do mobility aspect. My last experience I was working in the AMS Institute but I'm not anymore involved with the AMS Institute. You found me over the website I guess. I was just being an intern there for seven months. So I didn't have like a full time position. But I was very involved in everything and I could do a lot of different tasks focus on mobility and also get an understanding of Amsterdam, so I guess I could give you quite some relevant answers. And also there was a question about my research I guess. My last research was about a 15 minute city. So you can reach everything in the 15 minutes. I was kind of thinking that topic and I was doing an accessibility study using the data using the GIS programming tools and so on in order to provide better understanding of the situation in Amsterdam. I can maybe send you the my thesis and I can maybe send you the presentation about it.

Alexia

Was it an experiment for Amsterdam or for every city ?

Petar Koljensic

No, it's Amsterdam only. It's the case study focused on Amsterdam. So I was doing the case of Amsterdam and I was also describing my thesis. Why to do it? Because there is like a huge amount of cars still and the cars have the certain bad effects on the society and on the environments. And then I was doing these studies in order to provide the possibilities for cycling or for walking because 15 minutes it is focused on the active modes. My study is going to showing how to use more cycling. How to use more bikes? How to use more walking by foot? And to show where the problems and how to improve them?

Alexia

It would be very interesting to read that.

Petar Koljensic

Sure I will send you that thing to your address.

Alexia

OK, thank you. Do you still work for AMS Institute ?

Petar Koljensic

I worked for AMS Institute. So I guess that you found me over the over the website of the AMS Institute because you wrote to my e-mail from the AMS. I was involved in the AMS Institute in the Smart Urban mobility team. So the AMS Institute is an institute in Amsterdam that is founded by free universities. And by the city of Amsterdam. And they are being a think tank for the city, providing the solutions from the scientific aspects in several urban challenges. And one of these six urban challenges is the smart mobility. So this is the reason why I landed to the smart mobility team. And then within the team we would investigate how to make the mobility in Amsterdam smarter and better. Of course in the future and for that purpose we made certain domestic lines. We made our visions. We made the whole way how to reach this. I want to send you to show you later this document. OK, this is our internal document that is kind of showing how we perceive the smart mobility.

Alexia

According to you, how do you define smart mobility?

Petar Koljensic

I think the term smart is a bit like kind of brought. And it's kind of used for everything. And also it has kind of a negative connotation in the past years. I defend smart mobility as efficient mobility, meaning that you can use less resources in order to achieve more, to provide more. Or just a small example is like if you go with a car somewhere, it's better maybe like three or four of us are inside the card instead of 1, meaning sharing is smart. Smart mobility is also, let's say, green mobility, meaning that we do not pollute our environment and provide low emissions. Like to be smart, with our environment also smart mobility is sustainable mobility, meaning that if we move in a certain way today, we should move in that same way in 100 years

or in 1000 years to be smart and think about the future. What else could be a smart like everything? Everything that's good for us and for our environment and for the future. So I would define it like that.

Alexia

How can you describe the mobility in Amsterdam?

Petar Koljensic

I've been living in Amsterdam for seven months and I'm going to move again to the Netherlands to work in the future. The first impression is that it's really cycling dominated, there are still a lot of cars. It's not that there's only the cycles around there. It's still car dominated, but compared to the other cities it's much better. Considering active modes of transport, they're cyclers, pathways all around the city. If you're cycling for the first time, it's also hard to manage to find a way or to move in a certain way, or to take care. There are so many cyclers that you have also the safety issues sometimes by cycling for example. It's really cycling dominated, they're cycling paths all around the city and the places where there are no cycling paths, there are the cycling lanes, but the cars are only allowed to drive 30 km/h at these points. It's also safe for so-called feed struts like the bike streets. That's kind of preliminary for the cyclers, and the cars are the guests there. So the cars have to take care of the cyclers. They're not allowed to go next to them, and to go faster than them. So it's really cycling oriented, and that's beautiful. That's the first thing I could see there. Also really pedestrian friendly because there's like a lot of 30 km/h, this like slow zones where the cars are only allowed to go 30 kilometers per hour, so this is also very good. I can spot the whole planning of the Netherlands and all the neighborhoods and the structures are made in that way. That they've been planned smart and they're really people oriented. So Netherlands is very specific for this reason in Amsterdam too, so I could say that it's really friendly considering active modes of transport. That's a big plus for that. But still there are a lot of cars. There, the Netherlands isn't like one big highway like you have the highways all around. Everything is connected with the highways. There are no classical streets where you go from a village to a village from a city to a city like 2 lanes, and the traffic and the nature around. It's all a big highway. Which is on one side very efficient, but on the other side the car emission is for sure very high. You can travel all the time from one city to another city. They change their places a lot. You're from the South of Belgium, right?

Alexia

I'm from Brussels.

Petar Koljensic

Ok, and the university is not in Brussels or is it the Brussels?

Alexia

My university is in Louvain-la-Neuve, in the South, yes.

Petar Koljensic

They commute a lot, they live in one place, work in another place, have family in the third place. I'm sure in Belgium is not like that. It's a really special place and Amsterdam has a big ring around it, like the A10 ring of the highways. Amsterdam is kind of surrounded through a big highway. And of course, there are a big connecting streets in the city. That certain spot there is a lot of car traffic in the city one negative aspect is the public transport. I've been living in Vienna a lot and in Vienna the public channel is very smooth. Everything is very well connected. You go faster with the public transport than a car, and you go faster with the purchaser than a bike. It's also really cheap and in Amsterdam I've been using bike all the time. But not only because I wanted to use the bike, but also because it was more convenient for me to use the bike because the metro lines are really strange, like they're not very well connected. I used metro only two times within the seven months in Amsterdam and I used the tram only when I had the problem with my bike and when I used the tram I needed 40 minutes to get to my workplace. When I use the bike, I needed only 18 minutes. So like the time was double and the price was like 4 euros to go there for one direction. And it's over the €10 per day for the public transport only tram used it's a lot, so this is what they spotted. I'm talking to you now right now without any kind of literature sources. You know I'm talking as an expert in the smart mobility, but also as somebody who's private personal experience of the city. So this is how I saw it. The public transport is missing some element of accessibility and of efficiency. But with this whole possibility of use of the bike is totally convenient at the end.

Alexia

Do you think you would use public transport more if it was better served?

Petar Koljensic

I think if it would have been cheaper maybe, and if I would have a better connection next to my house. Very late, I live at the suburb of the city. I didn't have a metro line in front of my place. And some specific points, I had a problem that I couldn't take my bicycle on the metro always so I couldn't use two modes of transport for a single trip. And this was also a problem. So I think yes, but there's like some interesting thing about Amsterdam to say there is a ferry. There is a public transport ferry now because there's this North Sea Canal connecting in the city. There are dividing northern and other parts of them, and there is no connection. This is also maybe a minus. There is no bridge, there is only a car bridge, not the tunnel going under the canal. But there is no bridge for cycling or for the pedestrians, so you have always to wait for a ferry to go over. Ferry is free, that's a good thing. Either have to pay for it, but you have to wait for it sometimes and you have to wait to go on the other side and it was really convenient. That it exists, but you also have to calculate and to know that every 20 minutes there is a ferry you have to go with a bike to go there. I was doing kickboxing at the other side of the city and I always have to go like an hour before to catch the ferry and to go there. So there is maybe this problem with the connectivity in the city. That could be a problem. This is my overview of the different aspects of the mobility in the city.

[Alexia](#)

Do you know a little bit about the governance in Amsterdam? So who has the responsibilities?

[Petar Koljensic](#)

According to my previous question, I'm going to send you my research that it did. My research is showing the quality of the 15 minutes city and then you can clearly see around the Central River that there are problems with the connectivity. The accessibility is lower and you can then see these parts and the things they talked about. I think that my work is going to give you a very good overview of everything and you're absolutely free to you use the graphics and the things as long as you make a reference. About the governance, I've been involved in this AMS Institute that is made as a government as a project between different governmental organizations. And we are very involved and we were been working all the time with the municipality. I didn't have a lot of interaction with people from there. There are a lot of people that they've been working with us from the city of Amsterdam and I've been like talking to them. They were pretty open and we can always ask them everything and there are a lot of conferences and meetings in the city about the smart city platform. Do you know about that? I'm going to show you this, it's called smart city. This is maybe interesting for you, because

then you can follow the topics you like and then you can see every week what's happening in the city. And this is organized by the city of Amsterdam, because Amsterdam is kind of pointing itself as a smart city. What we had at the AMS Institute is that the projects are made with the municipality. Some projects are made with the bargaining university. Some project are made with MIT from the states. Some projects are made using the private stakeholders, mobility providers, sharing providers in the city. We always try to combine different players. And use this triple Helix approach where we combine the public stakeholders ,where we combine the private stakeholders and also combined academia and the research, and this is the way how to make the project. And they also try to find citizens and to see what's their opinion on that to make this cooperation between the different stakeholders. How all of this works? I really don't know because I didn't have time to get. I was doing more simpler tasks, more concrete tasks. I just know that all of these processes usually take very long and there is a lot of things change and a lot of nice words. But sometimes not sure how productive is the corporation. There's a lot of effort to talk to cooperate between the players, but I'm just not sure if the product is really going to be implemented or it's just going to be a concept or it's just going to be a nice looking publication or something about the smart city and so on, but I'm not sure what's the impact on the city of this full cooperation. Please have a look. Did you have a look at the smart urban mobility ?

[Alexia](#)

Yes, I'm on the website.

[Petar Koljensic](#)

This is the concept of the city of Amsterdam. It's a whole brochure about the development of the Amsterdam as a smart mobility. I think this is also good for your work. I'm going to send this to you. This is really nice looking for sure it's smart mobility Amsterdam 2000 something until 2025 or something like that. It's the one that is currently active. It's a development program. What they wanted to say is there are a lot of these programs and there are different players that are inside, but I'm not sure if this is really efficient. This is what they know about the government and the way they have how they work. I saw that you have a question about the citizens involvement. Personally, I didn't see any of involvement of the citizens from the city of Amsterdam not only for the mobility, but for anything But when I lived there maybe I spent less time, maybe I wasn't really involved in the Dutch speaking community things. But I didn't see a big citizen participation campaign going on. I just know that in my smart urban

mobility team, fellow of mine, I can maybe send you. He did some nice experiment to see how the citizens feel about making their city limits from 50 to 30 in their neighborhoods and to see what's the impact of this on the city. So he made some questioners service observations of the citizens, of the people living there, so this is a small way to involve the citizens but this was from the institute side. This was not from the municipality side.

Alexia

Do you have examples of projects that Amsterdam has implemented and you think that was successful?

Petar Koljensic

What I was dealing with is this future project that's right now going to be on top and there's a lot of talk about this and this is the implementation of 50 to 30 city limit. So maybe you can have a look at these things because I think that is like whole 50 to 30 topic because you are dealing with the cars and this is directly having an influence on the cars. It is good for your work, and what Amsterdam did in past years. They reduce the limit from 50 to 30 in the residential zones in the side streets and so on. But what are they doing now from January 2023? Is that they're implementing the third city limit on the most of their main streets. These main connecting streets in the city that have 6 lanes and fast cars on them are going to be 30 kilometer streets. This is like a big change and this is something that's not so natural for a driver to sound and drive 30 on these streets. And please have a look at these projects. I'm also going to send you something about what we made : a blog on this topic. You can read it and you can see how this whole topic is developing. I know that Brussels did something like that too. Right? Brussels did it like a few years ago or something, or maybe 2019. And maybe you can have a look at these things and see how Amsterdam want to do this thing. I know that you mentioned something about the data. I can maybe tell you more about the data and the technology because I was involved in that projects.

Alexia

Yes, for sure.

Petar Koljensic

Honestly, I know a lot of things in Amsterdam but I don't know any mobility based project. I just know that Amsterdam is constantly changing the design of the streets. They're doing right

now, if you have a look a very important street in the first district, it's a whole big construction site. Changing really physically, changing how the street looks like, the width of the streets, the patterns, the benches, the trees, the canals, the cycling paths, the organization of the traffic. For example more pedestrian. And then cycling friendly. Of course, reducing the speed limit, reducing the size of the car lane. It's constantly taking the parking places away from the city. This is maybe also projects like there is no kind of big project like the specific projects for me are kind of building bridge, making the new Urban Development in the city, but these mobility things are always kind of territorial. They're happening in a lot of places at the same time, and then changing the city. Maybe you can have a look also this like taking the parking away from the cars, they're giving it to the local stores, coffee shops, kids for the playground for the park and from the green space and they have really a strong an anti-car policy. About the parking, where the parking you have to pay a parking per minute and for an hour of parking is €7.00 or something like that in the city. So it's extremely expensive. But what do they do? About the park and ride facilities, I don't have a lot of experience how effective it is, but they know that the group of students are doing the project. Right now I'm going to contact them and I can maybe connect you there right now, making a whole project : how to make the parking ride facilities better, more efficient? Because they meant that. I've been listening to their presentations that they are parking facilities that are offering cheaper parking, but they are not functioning well because the people living in Amsterdam or parking their cars, for example there, then people coming from the outside of the Amsterdam are not able to park at these facilities, for example. There are certain problems, but I'm going to write this down to myself and I can connect to you. Maybe if you want to know something more about the parking library project. And from my personal story I have experienced it, a family I met here, this is a woman with two kids. They're like 7 and 10 and sometimes we would like to go to the city center because I lived also in the suburbs close to them and there the parking is so expensive and it's so hard to find a parking space and she was with two kids. We couldn't just go four of us with a bike like for 25 minutes cycling and just like walk for a lot of time to go to the train station and go to the city. Car is sometimes the most convenient mode of transport and I don't think nobody should use car, but I think that we should make the policies the way that people who really needs to use the car can use the car and that they don't have to go through all the stress and to find the methods to make car also inclusive in the city. So if I can go with the tram and the car, it would just be a luxury for me, then I have to pay for the parking 10 or €20. But if kids need to go with the car there to buy something for them and it's the most convenient way then she should be able to. To find the parking spot and to pay a lower amount of the money

for the parking, so I think that Armstrong has really card parking policy about these things, and I mentioned that because you asked me about the projects and I think like a big project is the reducing of the car parking in the city. I just thought about the your data collection. The data question is really the technology and is really interesting for me because I was involved in that. And I think that Amsterdam is using a lot of digital tools in the city. They have for example 3D Amsterdam, it is a digital tool where you can see the 3D buildings of the city. There's also digital tool about the 15 minutes in Amsterdam to see how far you can go within the 15 minutes by walking and driving or cycling. There's also app for everything for sharing for the public transport for everything, for the apps from City app, for the booking and appointment there and whatever. So it's like a really smart digital city. Overall, I've been using a lot of data. Amsterdam is providing data with open data apps and platforms. There is also this Central Bureau for Statistics, CBS or CSB, you can download a lot of data sets and then use them if you know how to use it but there you can really do a lot of research. So I think that Amsterdam is really strong about it. And it's really trying to make the city more and more digital and to use that data for the future. I wanted to tell you to check out if you don't know the sensible Amsterdam lab, I'm going to send it here. It's a lab from MIT and there's lamps for them and they're doing this sensoring, they're checking the air quality, they are tracking the different bikes in the city. They're usually machine learning to see how many cars being on a specific lane, so they cannot build the data gatherers. They're gathering data from the city, and they want to make enter the carbon neutral in next 50 years and they want to reduce the use of the car of the fossil fuels so maybe having a look at their website and their project in the city would be something good.

[Alexia](#)

Do you know a project that they wanted to do and did not work ?

[Petar Koljensic](#)

Look what we did at the Institute is that we did the research. We have been always doing research but I didn't spend a lot of time there. You know to see a project waking up and living it and dying. The things that are happening at the moment and in the research everything is even going faster or slower, but they're not stopping because of the South Pacific thing. They can only stop if the researcher say I don't want to cooperate anymore or there are not enough funds, but the research goes on. And I think that this question would be more oriented at the municipality and just see if it is something specific would be stopped because of the politics or

the funds or because of some other specific reason. I can't give you the answer to this to these things specifically.

Alexia

OK, no problem. What do you think about the mobility in general about the cars in Amsterdam?

Petar Koljensic

Yeah, I think that the models played in Amsterdam for the car is lower than for the bike. People are using more and more for trips to per cycling for example. But still there is a problem with the cars. I think that I gave you before kind of a bit way how it works and how is it structured.

Alexia

And what do you think about the plans of Amsterdam? Do you think it could influence the car mobility? Or do you think the plans of Amsterdam is not efficient for cars?

Petar Koljensic

No, I think that Amsterdam is certainly investing a lot of money in the infrastructure for the cars in order to make it more efficient and also on the other side, they are thinking about the other modes of transport, so it's not car dominant. There is this good example from the 60s I think where Dutch called some American planners to totally reinvent the look of the city. And then they made a whole new plan of Amsterdam where they want to demolish a lot of buildings to make the highways like in the states through the cities. And at that point people started protesting and they took their bikes out and this was car oriented society. People started using bikes, so it's not that. The Dutch was always using bikes. You can still see some first phases of this implementation from the 60s and some dominant really broad car streets and were started to be implemented, but they stopped, so this was before and since then cycling people oriented turn started and since then Dutch are always and Amsterdam is always planning for people in first place. Still there is like a lot of congestions. I didn't experience much. I didn't drive a car enough. I also haven't been really driven by the car now answering my time. I used a lot of trains. There's like a beautiful one of the most dense networks in the world in the Netherlands, in the north, North and South Holland provinces. And then you can literally go every 15 minutes with the train. The destinations you want so I've been avoiding going with a highway with the car in the city. I think that the infrastructure for the car is good enough but I think that Amsterdam and the municipality planning is really focused to decrease the use of the car. And

Alexia

I wanted to know if you have an opinion about the car sharing ?

Petar Koljensic

We had a four thematic lines. I'm just going to send them now to you. I think this is also maybe can I can share my screen? Maybe this could be relevant for you. You can see there's some vision 2022, right? So this is what they did when I was at the Institute for the team. This is still not published, but it's going to be soon I hope. So we have the vision The Smart Mobility team vision for 2022 and we had the four thematic lines. This was important topic for us and then we did later we made for each of these we filtered how our hubs and share mobility connected to the city, and then we can say, ok, the ambition of the hubs and your mobility is a clean, inclusive and accessible city. The research stuff because our alternative mobility service for example. Car independency use the mobility data and then we have the relevant projects that we were working on for these things. The hubs and the share mobility are important topic. We always focus to make these hubs where you can switch between the modes between the public transport and then take a shared car or take a E scooter that was for the step that's actually banned in the Netherlands, but it's going to be, I think. It doesn't benefit free. There is a new rule about and you can change the bike. You can also use the city bikes of Amsterdam. Amsterdam is also full of the small micro mobility providers, giving this possibility to pay and to share and to pay as you ride and also there are this initiatives to make mobility as a service is a big topic in the shared mobility where the different mobility providers would be unified in one app and where you could with the subscription in one app, speech from share card to the share by cycling to the public transport to the train and then go back with the E scooter to your home or something like that. So combine different mode of transport by paying by subscription. So yeah, this was what we did and I think that sharing is a big topic in the mobility because especially sharing a car is much better than using your own private car because of specific reasons that it takes less space. It's more occupied, it's more used and also you share a car and use it and you fill out the car with more people. You can then save the resources. So sharing is a really big and important topic in the mobility. It's all around different scooters, different things, so different providers. So I think this is a big topic and a really good answer is to reduce the use of the currency.

Alexia

What do you think about car taxes ? Do you think it's a solution to put some tax?

[Petar Koljensic](#)

I know that in the Netherlands it's really expensive. Having a car per month, the cheapest car, the cheapest possible solution, the smallest car, the most eco-friendly car is like €180 a month. To pay the insurance to pay the tax, the road tax, highway and whatever you have to pay. So the Netherlands is always already having this like strong policy that you just have a car. If you really need a car and this is one solution that works for sure, but in order to be able to make such a high tech and the things you on the other side have to provide an alternative. So if you would do this thing in Serbia right now and just increase the tax to the maximum and people couldn't afford it, they're protesting because there is no such a good public transport. No such cycling paths, no trains between the cities, only the buses that are expensive zone. So you need to provide the solutions. What Dutch did in order to implement such text. What they do is that they tax the money. Take the money from the tax from the car and they are investing all of that money in the public transport. And also the intelligent access policy and the charging for entering some parts of the city that could be something that could be a potential thing. I also made a blog about these things and it's still not published. I cannot send you but this could be an alternative like introduction of this intelligent access management to be the cameras. Or these geofencing things to track who is entering which zone. Sorry, I have to go soon.

[Alexia](#)

No worries, if you have something to add or something to conclude, feel free.

[Petar Koljensic](#)

Thanks, I wrote a small list I'm going to send you different things that may be interesting for your project and I want to send you my project.

[Alexia](#)

If you know people I can contact to have more specific point of view, do not hesitate.

[Petar Koljensic](#)

Maybe write to Kaï. He was also an intern in the company. I'm going to send you his e-mail and I'm going to contact him. He do something maybe more specific on the 50 to 30 topic, which is really important.

Alexia

Thank very much.

Petar Koljensic

I'm going to drop you a few more things. I hope that you can use also my work that I'm going to send to you and please if you need some assistance, more explanation. Please text me or we can also have a small chat again if you need something specific. I hope I can provide you some information. Amsterdam is really a beautiful place. If you can go and visit and I'm not sure if you've been to Amsterdam yet or how is your experience. But if you want to get kind of more feeling about it, go there when you can. It's not far away, you can also visit the institute, they're always welcoming. You can maybe go there. You can have a talk there with the people. There is a guy, he's the boss and he is the main guy in charge of the smart mobility team. Maybe you can go there. Ask him to have a small meeting out there with him. I'm going to be in the office.

Alexia

Thank you very much and we will keep in contact for all the contact. Have a good day, bye.

Petar Koljensic

Thank you. Bye.

3. Interview Boen Groothoff

Alexia

Hello.

Boen Groothoff

Hi Alexia.

Alexia

Thank you to take the time for me.

Boen Groothoff

Yes, sorry I'm a bit late and I'm going outside because my neighbors should do construction and I thought I'd better do it like this and.

Alexia

Ok. So first do you agree I record our conversation?

Boen Groothoff

Yes, sure.

Alexia

Can you introduce yourself ?

Boen Groothoff

Yes, I work for the innovation department at the city. And within the Innovation Department we have a team focusing on mobility, small mobility and I'm the data guy. I have a team of data scientists and engineers and we built products with data. One hand to get more insight in what is happening so are people actually using their car less? Is it busy somewhere? So that's the other side that we can we provide people with more insight into. How to use mobility using data? How to use more sustainable mobility?

Alexia

And according to you, what is the context of Amsterdam in terms of mobility?

Boen Groothoff

So Amsterdam has one major advantage over other non-Dutch cities because we already are quite used to using our bicycle. So there's one, actually, if you look around here. I don't know the numbers exactly anymore, but most trips under 5 kilometers are actually made by bicycle. We're done by car so that's a big advantage and now we're trying to get rid of the other cars.

Alexia

And about the governance, do you know a little bit who has the responsibilities and how is it working?

Boen Groothoff

Well, basically the city has governance over most of the traffic inside the city. Only the highways are part of the national government. Or the ministry that covers that. But of course, deciding whether a certain vehicle is allowed that's also determined nationally. So, for instance, the little scooters, the step scooters that you see in a lot of European cities they are not allowed because of the national government. The Ministry of the national government decided we're not allowing them at this point.

Alexia

And do you know how are the citizens involved?

Boen Groothoff

Yes, so actually my team is trying a lot for that, so we put our surface but also we tried to initiate new projects where it's really in your face so my colleagues are working on what you call e-bike. So those are the neighborhood mobility hubs which have a couple of different share probability options, but they are stationary and they're actually put across people's homes and then that starts the dialogue and then we have open nights where people can tell what they think about it, so if you look here this is not the mobility here. So these are the donkey bikes, which is a different but similar initiative. These bikes you can take and you can put them at other donkey hub.

Alexia

What are the technologies or the digital tools that are used for the mobility in Amsterdam?

[Boen Groothoff](#)

So if we cut it up then we start with just we want to see what's happening right? So for that we use mainly two types of data. One is data that we actually get from sensors. So there's a lot of sensors around the city, some are focused on bicycles, others are focused on pedestrians, but most of them, of course, are focused on cars. And of course we have the check-in check-out data from public transport so that gives us the first insight of what is actually happening. Then of course, with that we can see operationally when does the mobility system still have capacity or when does it run to its limits. And that you can on the long term, you can use that to make investments or chase policy to meet the demand basically. So that's more from a city perspective than if you look from the user perspective. What we try to do is to make sure that traveling multimodal. So travelling using different modes of transportation. In your journey to facilitate that, so mobility as a service, I should probably, you know the term right? What Amsterdam is doing there is we're trying to make sure that everyone basically speaks the same language, that's the first thing, so it becomes easier between providers of mobility and providers of a certain app or a different proposal to integrate. Then what we're doing? We're trying to force them to. If you want to provide your service here in the city let me say ok, then you need to share data with the city about the usage so we can see whether it's being used in the right way. And which is not yet done, which is actually a very delicate thing we are trying to pressure them to open up. So right now, here's another example. This is this cargo bike. Did you see it? Yes, this one is called guroo, so this one has a spot here and it always needs to come back. To the spot ok, but what we want is for all these different propositions to be able to integrate in other apps so right now most of these propositions what they're trying to do or most of these mobility providers they try to have their own app and which makes it quite difficult for the user because they need 20 different apps. If you want to just have the easiest way of transportation what they already have done is they already integrated their data so I can open an app and I can send you the link later or the app of NS, which is the public railroads company. If you open that then you can see where the vehicles are. Some of them you can already book, but most of them they still want you to go to their app and book through their system. Eventually what we want is to get rid of that barrier.

[Alexia](#)

You talked about the sensors in the city for the bicycle, the car, and the pedestrian way. Do you know how the sensors look like? How do they collect the data with the sensors?

[Boen Groothoff](#)

Yes, there's so many different ones. So if we start with cars, basically we have two main sensors that we use. One is most traffic lights underneath the road. They have a sensor to see if someone is waiting in front of the traffic light. Well, every time a car passes out for it, we get a signal so we can use the data to get an estimate of how many cars pass by. That's super accurate, but as well then we have a lot of cameras that are number plate recognition cameras. They are primarily used to see if cars are not all diesel cars which are not allowed in the city, but that also allows us to see how many cars or which type of cars are entering the city and are entering certain areas. The third is future data, so we buy a lot of data from different navigation apps. I don't think I can disclose which ones they are. I don't know if that's a lot, but there's different application apps. They also sell the data which gives us insight one into the amount of cash, but two and the average speed over time. So you can see when there's traffic delays. So that's just for bicycles. You have basically the same with the traffic lights. But we also put sensors that use radar, so those sensors they use radar and they can see how many bicycles are passing at a certain point and what speed they're travelling with and also we get data from apps like Strava. Pedestrians is usually also video with an algorithm that counts the amount of people in there or it is using 3D imagery.

[Alexia](#)

Do you know the projects that Amsterdam implemented to reduce the car in the city?

[Boen Groothoff](#)

Yes, there's quite a lot actually. So first of all, parking fees. That's the 1st and most important one. So what they do with now almost all of the city except for some parts have paid parking and every year they increase the price. Now in the city center it's I think €7.50 to per hour and that's now for 24/7, so. Even at night you have to pay.

[Alexia](#)

Do you think it is efficient to put taxes?

[Boen Groothoff](#)

Yes, that's very efficient because people from outside. So for instance I don't have a car, but I share a car with my siblings and with my mother but I never use it, I only use it if I go outside of the city which is exactly what we want. Right? So people can still use cars, but only use it when it's absolutely necessary. Because it goes to the city center it's just it would be cheaper for me to take an Uber. Yes, so that's one. And of course the number of parking spots is also greatly reduced, everywhere we take out parking spots to create more room for walking and for bicycle parking or for just nice green area. Then we are going to reduce the maximum speed within two years there will be 30 kilometers an hour in I think 90% of the roads. So that also means it becomes faster, it is already usually faster to go by bike. The damage will be a lot faster and it will be safer.

Alexia

And do you think to put more one-way streets is efficient to reduce cars in the city?

Boen Groothoff

That's also something we're doing, not enough if you would ask me. But yes, making one way-street is definitely very efficient way of reducing not only reducing the amount of cost but also increasing the safety dialogue because it's much easier to see from which way the cars are coming. You don't have to look both ways.

Alexia

Do you think that parking P + R outside the city is working well?

Boen Groothoff

I think that is a very useful tool. Most of them are working quite well. However, the biggest one we have is inside of the football stadium and I do a lot of work there but every time there's an event, they have to clear the garage and since they have a lot of events it's not working as well as it should be but the idea for parking, that's very low.

Alexia

Do you work on project that will be implemented in Amsterdam?

Boen Groothoff

Yes, so my role is basically to provide people with the right insights so I get our data for what is happening and then I try to show them with the data. This measure we're taking is working or this is not working. So we are measuring other. Increasing the parking fees, how well that is working in different areas. When there's a lot of more things that's being done, putting shared mobility at certain areas. Closing off circular streets. What we want to do is quantify what that impact, what impact that has on that area on the car usage and car ownership.

Alexia

Do you have examples of project that was implemented and did not work?

Boen Groothoff

Well, one of the discussions we have now is there's a lot of shared scooters in the city, not the step scooters, but more like a motor scooter. The electric ones they are being used very well, so because of that we thought it's being used very well. Well, that's a success, but basically we're finding out more and more that it's being used instead of cycling instead of public transport. And that's of course not what we want. So another city is already banned them. We haven't done that yet, but we're trying to limit that now because the idea is you want people walking, then cycling, then taking public transport, then taking any mode of electric shared mobility, and then taking the private cars. The shared mobility is creating lines. It should not cannibalize on the first tree walking, cycling, and public transport. Obviously that we need to dial back a bit.

Alexia

I think that car sharing is a solution for people who have to take the car. But in Brussels where I live, it's still very expensive to share a car with someone. So do you think a solution would be that the government would pay for it ? To promote the car sharing instead to have our private car.

Boen Groothoff

Yes, sounds great. I think the private car owners should pay for that. So what I mean is the business case of shared mobility, just like the business case of other preferred modalities should become better than the business case of using your private car. OK, so that's why raising parking fees, but also raising other fees concerning your private vehicle they should go up and then you could use that to improve the other mobile modalities business case. But I would

suggest first spending it on public transport, but for sure, mobility what we of course can do is now for shared mobility in the city, for shared cars, the parking is free which is also a form of subsidizing which I think is good, but it's all balancing it out to the mix that you actually want, and that's why gathering data is so important to actually see what's happening.

Alexia

About the plans of Amsterdam is still there a lot of congestion in the city or not? And how do Amsterdam deal with that?

Boen Groothoff

Yes, there's a lot of congestion. And actually, there's also congestion with bicycles, a lot congestion with bicycles which what we then want is to say ok, then we should give the bicycles more space. It is a tricky part because we are the conventional way of doing traffic management or mobility management is looking at cars and is looking at whether they have congestion. And then looking how to fix that. Right now we have this whole conversation, should we even try to fix that or is letting these cars stand still in a traffic jam? Very nice way of getting those drivers out of their cars in the future. That is difficult. Because a lot of people who I work with their job has been for 30 years to solve traffic jams for cars. And then here I come and say yes wait, we should stop doing that. We shouldn't facilitate that. Yes, that's kind of against their nature, should say.

Alexia

What is the strength of Amsterdam concerning the mobility?

Boen Groothoff

The bicycles sure. So back in the 70s, there were hardly any cyclists and there were a lot of cars in the city and what was happening is there is actually a lot of kids playing in street got killed by cars. At some point people just said it's not and I went to sit on the street and I protested that I said, we want to have the cars out of city. We want to have bicycles in there, and that's when everything changed, so that's when they started to make bicycle path. To get rid of a lot of parking area and even change the laws. Here, so now if you drive with the car and you hit the bicycle or hit beside this, even though the cyclist was wrong, you are to blame.

Alexia

What are the reasons that Amsterdam are so strong with cycling? Do you think it's because of the topography or because another reason?

Boen Groothoff

Well, the accidents were the catalyst, right? So that's when everything started to change to and we start to facilitate the bicycle. But the other thing is that once you cycle, you start to notice, hey, this is good for my health. This is nice. People don't want to go back. We have one problem that is there's an awful lot of rain here that is a big problem. But other than that, it's also it's like a small flat country, so I have cycled before in, for instance, that's quite heavy. So then you cycle to get it, but here we just cycle, get from A to B.

Alexia

If you have something to add or a recommendation for Amsterdam?

Boen Groothoff

Yeah, so can you tell me a little bit more about why you chose this topic and how you're going to use this interview.

Alexia

So I study business engineering and I have to do a thesis and I choose the smart mobility because I think this subject is interesting and I choose Amsterdam because it's one of the best city in Europe concerning mobility. So I wanted to understand how and why it is the best?

Boen Groothoff

Ok, well it's nice to hear you look. You mentioned you live in Brussels, right?

Alexia

Yes, exactly.

Boen Groothoff

So actually, the 30 kilometers per hour we stole that from you.

Alexia

It works well and a lot of people who drive a lot they are so angry with this new rule and actually now with a bicycle you can ride even faster than with a car in Brussels. So yes, I think a good idea.

[Boen Groothoff](#)

Yes that's good. I do remember from Brussels that there's quite some hills. And that's maybe something to also look out for now in the Netherlands the sales of electric bicycles is exceeding the sales of regular bicycles which sounds really good because a lot of people who otherwise would. But it has some drawbacks, one of the drawbacks is to help if you ever said that on an election. It's not really cycling. It's more or less sitting on the scooter so. There's one over there. But the most important thing is that it becomes dangerous. Most people, when they cycle the cycle around 50 kilometers per hour. But the electric bicycles usually go around 25 kilometers per hour. And it's not always apparent when a bicycle is coming and it is an electric bicycle. For instance, I see a guy here I think it might be electric. That's get really close. No, it's not. But what often happens for me, someone is coming one way I think. Ok, I can go first, but then it turns out to be electric bicycle only is coming in quite fast, so there's a lot of accidents happening now. Especially also with old people who otherwise wouldn't cycle. Videos of little kids are getting an electric bicycle without any permit or helmet or anything because we don't wear helmets.

[Alexia](#)

Yes, it's like a shame to have a helmet in Amsterdam, right?

[Boen Groothoff](#)

We just don't. Yes, we think it looks stupid, so that's probably that is quite stupid that we think is stupid. But yes, it's just the culture so people, children or old people, they're getting on an electric bicycle, they're going to go very far just without any extra training thinking it's regular bike and then that leads to a lot of accidents.

[Alexia](#)

And is there a limitation for the electric bike?

[Boen Groothoff](#)

Yes, most bikes are limited at 25 kilometers per hour. But then that's easy to hack. So what they do is they change it to American and then it becomes 25 mph. Then you're already at like 40 kilometers per hour, which is quite fast, yeah?

Alexia

And is there a law to ban it?

Boen Groothoff

Yes, but it's just people hack up themselves. What we're trying to do now is to see can we limit it? Can we work with the builders of these bicycles and then make sure that once they enter the city there will be a limit on the speed. Because some of these bicycles they are allowed to go 45 but that's actually outside of the city.

Alexia

And why outside the city they can drive fast and inside not ?

Boen Groothoff

Yes, because outside of the city, of course there's not really that much danger. Inside of the city we just have traffic jams here, so it's just really crowded. My mom is getting a bit older. She doesn't dare to cycle anymore because of the electric bikes are going so fast.

Alexia

Thank you for taking the time for this interview. If you want I can send you my thesis when I'm done with it.

Boen Groothoff

Yes, sure. I'll be interested.

Alexia

So thank you very much and have a good day.

Boen Groothoff

Enjoy the holidays, thank you. Bye.

4. Interview Tina Harris

Alexia

Thank you very much to having me. Do you agree I record our meeting?

Tina Harris

Yes. You have my consent.

Alexia

Okay. Thank you. So if you're okay, we can begin or if you have a question before ?

Tina Harris

No, just maybe if you could tell me a little bit about your thesis ?

Alexia

So I'm in the second year of my master. So to finish my master I have to write a thesis and the subject is the mobility in Amsterdam and I focus on the cars point of view. So my research is about the plans in Amsterdam and how to improve it. What's the key success factors to improve the Smart Mobility in Amsterdam.

Tina Harris

That's fine. And have you done any field work in Amsterdam? Have you been to Amsterdam?

Alexia

Yes. I've been twice, I think. First I wanted to do the research about Brussel because I live in Brussels but this thesis was already done, so I was thinking about another city and Amsterdam is the second city I wanted to do and which is interesting for me. I like very much this city and I think it's one of the best city for mobility in Europe. So it's interesting to see how it works.

Tina Harris

Yeah, it is interesting. Well, what I'll do is I'll do my best to try and answer your questions.

Alexia

Okay, so first, can you introduce yourself?

Tina Harris

Sure. My name is Tina Harris and I'm an associate professor at the University of Amsterdam. What's interesting is most of my research in the past has been on infrastructure, but infrastructure in the Himalayas. So into Tibet, in Nepal, in India. I would say about, I don't know, about five to seven years ago, I switched my research topic to infrastructure, but aviation infrastructure and then I switched a little bit to spending more time in Europe mainly because I have a family now and also during the pandemic, it was difficult to go anywhere and for various reasons. That's kind of where I do my research and what I do my research on. And then I teach courses on infrastructures and technology.

Alexia

So you worked in India and after that you came back in Holland ?

Tina Harris

Yes. So most of my research has been in the mountains of India.

Alexia

Very interesting. So about the smart mobility, how are you actually involved in the smart mobility?

Tina Harris

Well, it's interesting. I'm not exactly involved in smart mobility. I've talked a little bit on smart cities. The research that I do is on and I've done some research as triple airport trials and experiments in smart mobility. And again, it depends on how you define smart mobility. So, Most of the experiments I've been looking at have been on cutting down emissions, carbon emissions. And vehicles that are now being used that will eventually be electric, eventually be automated so they're thinking of self eventually having automated vehicles at Triple Airport.

Alexia

And how do you define Smart City in Amsterdam now?

Tina Harris

Wow, that's a good question. Okay. I'm going to be probably more cynical than maybe some of the other people you speak to or maybe not, who knows? But the thing is that the smart city or the smart smartness is not really a concept that is clearly defined. The thing is, I would just call it mobility. I mean, If you think of something as smart, smart mobility is usually used to describe sort of increasingly networked vehicles or places. That and smart vehicles are smart. Mobility is usually used to describe networked, but also vehicles that increase efficiency. But you know, in my opinion, it's often very much a marketing tool. As well, because of course, like, I can't remember who said this, but some scholar, somebody once said, well, who wants to live in a dumb city? You know, you call it smart city, you call it smart vehicles. The thing about smartness is that it's not, it doesn't really describe a single thing. It's almost a lot of these smart concepts are really just in the experimental stage so it's not a really a coherent thing. There's no sort of smart entirely smart city or entirely smart mobility. It might be that like there's an experiment with one or two trams, or there's an experiment with one or two cycle lanes and then they call it a smart, smart mobility, but it's a not there yet but it's in process I think. But they use technology to do it better or I would say use technology to increase efficiency and maybe some sort of, you know, not just efficiency, but to create, they're trying to do so many things at once to increase efficiency, to increase sustainability. And sometimes those things don't overlap, right? You can increase efficiency, but sometimes that doesn't deal with sustainability. Or you can make something very sustainable, but it might not give you efficiency for instance. And, and efficiency could be about profit, but it could be about getting places faster. So I'm always having to look at exactly what the smart mobility is. And then, you have to take it by on a case by case basis, I think.

[Alexia](#)

What is the context of mobility in Amsterdam now ?

[Tina Harris](#)

So I've lived in Amsterdam since 2011, so I'm not necessarily from here, but I have a fairly good idea of mobility around the city. I think Amsterdam is extreme. I think it's very well connected. There's lots of different options for mobility and that's what's nice. It's a very sort of mixed use mobility trams, metro canals, for boats, cycling, cars, trains. And what's wonderful about it is that in terms of getting around, especially for public transport, you just need one card around the entire country. I think that's very wonderful compared to other places. But one thing I think is negative is that it's not so great for accessibility. So in other words,

people in wheelchairs have a very hard time getting on the tram. The metro is pretty good actually for mobility, but other vehicles like the tram for instance, is not. I've noticed with people who have difficult time or who are differently abled have a difficult time.

Alexia

My next question is what is the challenge according to you for Amsterdam ?

Tina Harris

I think to really pay more attention to accessibility. So it's a wonderful city when it comes to mobility but that's for people who are able to get around without help. So I think that one of the challenges is that to make it more accessible. I think that would be the major challenge. Another one is now, and maybe, I don't know if you've heard other people talk about this, but the increase in e-bikes. And of course, because this is a city that's heavily dependent on cycling. The introduction of the e-bikes in the cycle lanes makes it so that people who are on a regular bike, they don't have time to look because it's a very different embodiment, right? Very different way of being mobile and it's really created some tensions. I think another challenge was to think about. Now that the city's basically expanding, it's very expensive to live here, people have to live all the way out, you know, in the sub, in around Amsterdam. And then they buy e-bikes to get into the city. These are people who are wealthy more or less, right? So I wouldn't say it's the poorest of the poor. I think it's people who are fairly middle class or relatively wealthy, then they get these e-bikes and then they're speeding along the bicycle thing. It creates a lot of tension. So now that's one of the things I think that people have to really think about. You know, do you set a different speed limit? So that's another challenge, I think. Because, the roots, the way for bicycle are not done for that kind of bike.

Alexia

Exactly. About the governance, do you know who has the responsibilities in the city? How is it working between the players ?

Tina Harris

That's a good question. It's not really my expertise. I know that the municipality, so the Amsterdam City municipality is involved. And one thing I can probably say, and you might hear this from other people, is that in terms of the national governance, there's a sense that the big cities that are like Amsterdam or Rotterdam, they get the money. So there's a real tension,

again, between the national and the city level. So when it comes to the city itself, Amsterdam, it's a municipality with different studs, tales, what are they called? Different sections, different city districts. They are city districts and depending on which city district you live in, there's a little bit of difference but otherwise I think it's fairly centralized. But again, this is not my expertise.

Alexia

Do you know how the citizen are involved in the city ? Because the smart mobility and the smart city is about to involve more people and not only the government.

Tina Harris

There's all sort of smart city initiatives. So there are a bunch of them. There's a smart city initiative and they have maybe five or six different kind of sectors in which they're trying to deal with smart data and smart mobility. Within smart mobility, there are a couple of people that are running these experiments and there's always sort of open days for, for citizens to be involved. But you have to find it. You have to say, I'm interested, or you have to go to an event. Or sometimes what the city does, and I find this good, is that they ask the citizens to vote on particular things like a new bridge or a ferry. That's not so much for smart mobility but that's more for mobility in general. So in where I live, we just recently had to vote whether or not, we wanted a bicycle bridge or a ferry. So compared to other cities I've lived in, I feel like there's a lot more citizen involvement. It's like let's take a vote and see. There's meetings, there's all sorts of city meetings about new transportation options. I think that's, I mean, to be honest, I think Amsterdam is very good with this. But to be honest, you know where I'm coming from, I'm coming from America where the infrastructure is like crumbling. I also grew up, I lived in Japan where the infrastructure's quite good, but there's not as much citizen involvement.

Alexia

About the project in Amsterdam, do you have examples of project that Amsterdam has implemented in the city and that you think is successful ?

Tina Harris

Yes. So what I know of, and again, you might want to talk to more people who are involved in the cycling experiments or cycling infrastructure. But what I do know that there's a lot of monitoring passenger flow. So, for instance, monitoring the flow of traffic, I know more about

the monitoring of the flow of bicycles. So they have wires on the ground and every time the bicycles go over, basically count how many bicycles go over a particular section during the day. And they pay attention to which parts in the city are very crowded. Especially with the bicycles, cars and trams. And then sometimes what they do from there is that they rearrange the planning, the roads based on these choke points, for instance. There's one thing, and I think they do that fairly, the University of Amsterdam has what they call an urban cycling institute. They're very well integrated with some of the city experiments and mobility. There's a planning department, urban planning department within geography. So I think they're fairly well connected and they do a lot of things. They also bring their students out to this research. So I think that's actually, you know, they're not new and it's not necessarily smart. That's the thing. I mean these wires have been on the ground forever, you know? It might be new to other cities. But it's certainly not new to Amsterdam. In terms of smart, and this is probably also answering one of your other questions, is that there are experiments. So for instance, there's a self-driving boat experiment. There's all sorts of data, urban data intelligence or something like that. There's initiative there. I don't know much about that. I don't know whether or not it's open source or anything like that but there's not really many sensors necessarily. I mean, I think, again, not that I can, I know of sometimes they have these, they have another experiment that's about smart traffic lights in Amsterdam. There's a quite a few of these experiments in places like in Eindhoven but this city is where the technical university is so it's easy for them.

[Alexia](#)

Do you have concrete examples of projects of smart mobility implemented in the city ?

[Tina Harris](#)

Let me think. The one that I know of is the one that I've been working on, but that's at the airport. I don't know if you're interested in that. There's basically when you take off at an airport, you sometimes have to be taxied. You've got a taxiing vehicle and the one that I've been sort of involved with, not in great depth, but I've been doing some ethnographic research with the people who are involved in testing out a new vehicle called the taxi bot. And the taxi bot is supposed to cut down on 50 to 65% of carbon and nitrogen emissions. And the way it works is that the pilot turns off the engines of the airplane, basically, of the aircraft, and then they attach it to the taxiing vehicle. So the taxiing vehicle drives. Because there's a lot of fuel that's being used in emitted when an aircraft has its engines on. They have these new experiments with it. Eventually they say that these vehicles are going to become electric, and

then eventually after that they're going to become automated. But it's in a very early stage. They have two now. They have two at Cripple, and they're going to be, they're just using them and experimenting with them.

Alexia

Do you have an example of project that Amsterdam put in place and did not work ?

Tina Harris

I don't know if this is really a city project, but it is something that was put in place that didn't work. So one example I couldn't say that the taxi bot thing is working or successful yet. I think it's an experiment that they're trying to scale up with, so it's in the process, so I can't say anything about that. One thing that's not smart, but is mobility that I think has been successful are the cycle roundabouts. Where again, they really monitored how traffic was flowing within the city and they changed the stop lights, to be free flowing round. So in other words, they got rid of the stop lights and then they just made marks on the ground so that all the vehicles and the cyclists have to basically pay attention to each other. You have to be very aware. And instead of stopping and starting and stopping and starting, it's a continual flow. And there's a few intersections where they've changed it to be like that. I think it works, it keeps the flow of cycle traffic going. I think that, again, the Urban Cycling Institute had a lot to do with that. This is only talking from a personal perspective because I cycle that route every day. I think it works. So those are the ones that worked, the ones that I think don't work was the shared one and that just made people so angry.

Alexia

Why are shared bicycles a problem ?

Tina Harris

I think the problem is that everybody has at least one bicycle here. So it was this sort of thing where like it might work in other cities where you see everywhere. Here they just were completely littering the streets. And one of them, there were various companies, and this is maybe three years ago or so, where there was just everywhere. One I think was a Chinese company and it didn't work in China either. I think there's sort of all these pictures of bicycled graveyards with all these share bicycles. It works in London. It works in some ways in New York, but not in Amsterdam where everybody already has a bicycle. It just wasn't convenient

and it took up a lot of space in this city where bicycle parking is already really crowded so there's already trouble, you know, you have trouble finding enough bicycle parking and then adding these to the mix was a disaster. That's one example. Again, whether or not that's smart mobility. I don't know. They now have these shared mopeds, these sort of shared kind of scooters and people are a little bit grumpy about those two. But they seem to be a little bit more successful. They're also a little bit similar in that they get dumped anywhere. And they're not necessarily green or sustainable either.

Alexia

Do you see a difference over the years with the traffic in Amsterdam ?

Tina Harris

That's a good question. They're trying to implement more underground parking. So that's another thing that they're trying to do. Parking is always a problem for people in Amsterdam. Driving through the city is becoming more and more difficult for car owners. I should probably say also that I'm biased because I don't own a car and I don't drive. What's been wonderful, so again, I'm afraid, this is my own opinion now, but I'm going to say it, they implemented cycle streets where the bicyclists have priority. I think you've seen these streets with the entire street. The cars have to go behind the bicycles basically and the cars are allowed, but certainly you know, the idea is that the cars can't just speed past the bicycles. On the streets there are these big signs that say the car is a guest. They've been wonderful and they've really improved. So I can say again, this is just from experience and from opinion that they've really improved.

Alexia

Do you feel unsafe when you ride your bike?

Tina Harris

Not so much, but more and more in the center. So it's becoming a little bit more crowded in the center because there are a lot of bikes or because of the cars. I would say actually mostly during the tourist season. It's always been like that, but things are just getting a bit more crowded because of the cars. There are certain places that feel a little bit precarious, but they're really only where you have to share the road with the cars. What I think is really, and I will say this is one of the best things about Amsterdam, is that the urban planning is such that most, not all,

but most roads have been separate. And that's wonderful. That's obvious. There are separate dedicated cycle lanes. And that, I think is one of the greatest things that Amsterdam is.

Alexia

The fact that Amsterdam is a historical city is a problem because the center is very dense and the houses are further and further away, this increases the traffic. What are the solutions to counter this problem in your opinion ?

Tina Harris

I think it's becoming more difficult now, especially for students, it's really difficult now to live in the city itself and that means that people have to take other kinds of transportation. But most people, especially if you live on the outskirts of Amsterdam, most people will take public transportation unless you live in a different, or work in a different city. So either you'll take public transportation or you'll have a long bike ride which is another reason why I think some people, again, those who are middle class, upper middle class are buying more of these e-bikes because they're living further.

Alexia

And if you had to mention, only one thing or two that are really the strength of Amsterdam, what would you say?

Tina Harris

The cycling infrastructure and then also to keep in mind that actually the reason why it's so, and you probably, you might know this already, I mean, you know the history of Amsterdam, so you know that this is actually not something that, it has not always been a wonderful cycling city. There was a moment where they had a big protest and it was a citizen's movement to get rid of to create safer cycling infrastructure. That is usually the example that people in Amsterdam give other cities by saying, listen, if we could do it, you can do it too. You know? So I think that is perhaps one of the best things. Because it's not really nationalized, but public transport system at least is connected, the entire country is connected by the same transport.

Alexia

And if you have a recommendation for Amsterdam, what would you say to improve smart mobility for the future ?

Tina Harris

I think what I said earlier was sort of really pay attention to sort of accessibility on all mobility vehicles, all transport. Think about a better way of incorporating e-bikes. Regulating perhaps the speed or requiring helmets or requiring to be on the road, maybe not requiring helmets so much, but something to regulate the speed, because right now it's just getting to be, I think, hard also for children when they cycle. You have to learn also that there's going to be, now there're going to be fast bikes on your left coming on your left.

Alexia

If you have anything to add that would be useful for me, feel free.

Tina Harris

I've done some research at the airport but a lot of this is probably more my own experience living in Amsterdam. It's not so much coming from a scholarly perspective, just to keep that in mind. Mobility here changed my life. I mean, I used to live in New York and I used to live in Tokyo, and of course you can always take public transportation there, but I would never cycle there. I know people do, but I just wouldn't feel safe. For a city like where there's a big center, it's easy to have a bike because the distance is not that much. In some ways maybe it wouldn't work in other cities.

Alexia

So thank you very much for your time.

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