



Heading towards car-free cities

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A study on car-free cities initiatives and their applications

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Preface and acknowledgement

This thesis is the final result of the Bachelor degree in Urban Dynamics followed at AERES University of Applied Sciences in Almere. Along with this study program I have improved my knowledge in urban development, planning but also in various fields such as urban food and the future trends in this topic.

I would like to thank my coordinator and thesis coach Istvan Boros who have been following and advising me through the elaboration of this thesis. I would also like to thank Dinand Ekkel and Kiran van Branden for their time and their advice.

During my whole study program I have encountered more people than I could thank in this short preface. Nevertheless, I would like to thank my classmates and friends, my internship coaches Amal Abbass-Saal, Sandra Manintveld and Madhat Qattaf, but also my family who has always been present despite the distance that was separating us.

Summary

Nowadays, the air pollution caused by car-use in urban environment has led cities to look for a reduced use of motorised transportation means. The concept of car-free cities is for this reason emerging with the intend to shift mobility systems toward a new, healthier and less oriented towards fossil fuels system. This report researches ways to implement car-free areas and more precisely key elements or guidelines through European initiatives and examples.

Studying the cities of Almere, in the Netherlands, and Lille, in France, this work intends to come up with comparison means and ways to implement measures on areas that are different in their urban development but similar on their scale.

Finding out that Almere Stad, the city centre, is not a car-free area the research shows that some measures applied in the original planning of the Dutch city were strongly connected to the key features of the CiVitaS initiatives started by European cities in accordance with the European Union. Together they came with a list of criteria in need of improvement for the development of car-free areas, among these criteria list, the research determined five criteria. It comes out from these criteria, those applied in Almere and the lack of initiatives in their sense for Lille what the French city can learn from Almere in changing its mobility plan.

In the end, it turns out that Lille would need to improve its parking facilities and find a way to catch people's interest and involvement for a shift in mobility toward car-use reduction towards car-free cities.

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1. Introduction

Gain height and look from the sky what you will see from any large urban area of the world in the morning, some may say that this would be sufficient to call our modern society “car-dependent”. Most of the people in this urban environment are car owners, and a major part of the transportation system is based on motorised vehicles like cars, motorbikes, scooters and buses that are using fossil fuels as an energy source such as gasoline or diesel. In the beginning, car use has been a real benefit for cities enhancing employment rates, providing better access to services and improving the economy, all leading to a better liveability. Nevertheless, the exponential growth of car use over the past century has created new issues in the urban environment starting with health issues through many traffic crashes and pedestrian deaths in the first place, decreasing safety in the cities. Car use also implies a reduction of the air quality caused by air pollution that is now the fourth main cause of death (World Health Organisation, 2016; 2018) with more than 7 millions of deaths in the world. It has also impacted physical activity and has created sedentary lifestyles that impact economic productivity and reduce the global quality of life in cities (Welle, 2017).

The first impact of car-dependent cities is, as explained, on safety with more traffic issues such as accidents reducing the living conditions in urban environments (Szarata, 2017). In order to face this issue governments throughout the world have been working on limitations techniques to improve traffic safety. These techniques include changes in the traffic design and legislation to start, such as speed limits or routes for pedestrians and cyclists, but also higher penalties for infractions. This safety issue can be related to the health of city’s inhabitants with a high number of victims due to car traffic, but the health issues caused by car-dependent cities is also and mostly seen through air pollution because of pollutants generated by the use of cars. The main components of air pollution caused by motor vehicles and their impacts are:

Greenhouse gases (CO₂). Motor vehicles emit pollutants, predominantly carbon dioxide, that contributes to the greenhouse gases and global climate change.

Carbon monoxide (CO). This gas is invisible, has no smell or colour and is poisonous. Carbon monoxide is created by the combustion of fossil fuels such as diesel or gasoline and is emitted primarily from cars and trucks. When inhaled, CO blocks oxygen from the brain, heart, and other vital organs.

Particulate matter (PM). Fine particles that can penetrate the lungs and create many health issues especially for the breath. Diesel fuels are generating much more particulate matter than gasoline, but it is less used in North America than in European countries.

Nitrogen oxides (NO_x). NO_x is a pollutant that can cause lung irritation and weaken the body's defences against respiratory infections such as pneumonia and influenza.
(sources: Jerrett, 2013; CARB, 2016)

Different values have been measured in order to understand more precisely the impact of motor vehicles. The main assessment of this impact is the automotive life-cycle emissions that can be divided into three parts: the production, the energy production of the fuel used to run the vehicle, and the use of the vehicle with the pollution generated by the fuel combustion for example. What came out of this study showed that among the existing motorised transportation means, the life cycle emissions are not so different between cars using fossil fuels and electric cars for example (Faiz, 1996).

Table 1. Aggregate Life-Cycle Emissions from Cars for Conventional and Alternative Fuels
(grams per kilometre) Source: Lewis & Gover 1996

	Greenhouse Gases (CO ₂)	Carbon Monoxide (CO)	Particulate Matter (PM)	Nitrogen oxides (NO _x)
Gasoline	287,8	3,453	0,032	0,558
Diesel	227,1	0,489	0,131	0,981
Electricity	228,1	0,068	0,040	0,520

This study has enlightened one fact, showing that electric cars are not less polluting than conventional fuel cars on their overall life-cycle emissions, the main reason for that residing in the energy consumption needed for the batteries' production. In fact, that tends to show that the shift toward electric car would not be the best solution to reduce air pollution caused by vehicles. Still, the pollution generated by these cars is lower than gasoline and diesel fuels within the city which would, at least, reduce the air pollution in the urban environment without providing a sustainable solution. Hence, the changes that would have more visible results would have to be oriented toward another element than the energy used in the transportation means. For this reason, another impact of car-dependent cities needs to be studied.

The other impact of car-dependent cities on their inhabitants is visible on people's physical activity. Indeed, there is a positive association between the use of car to go to work with obesity and overweight prevalence (Chen, 2017). On the other hand, active transportation (walking and taking public transports) has shown a negative association with obesity and overweight prevalence showing that a lower dependency on cars can increase physical activity and improve health conditions. The increase of car-dependency is visible with a rise of 14% car owners in the United States between 1970 and 2010 (U.S. Department of Transportation, 2010), an increase that could be seen on a global scale. As a partial consequence of this car dependence and in accordance with the evolution of the working environment the main criteria to go committing to work has become the time spent in transports. This would mean that cities should encourage its inhabitants to go to work using active transportation and combine it with a time efficient transportation offer through an effective public transport network. Nevertheless, most of the cities have not shown so far, a successful initiative in public transports to answer this need in order to face the physical activity's impact of car-dependent cities.

Cities need to find another way to reduce air pollution caused by cars and its other negative impacts. Hence, many of them recently came with a new idea: car-free cities. Trying to face the issues from a new perspective, without starting with a new energy or public transport network but by limiting the use of cars in the cities. If some cities want to shift their transportation system towards a partly car-free system such as Hamburg, Helsinki, Madrid or Oslo, other cities like Brussels, Copenhagen, Milan or Paris only aim at reducing the use of motorised traffic and not implementing such measures to the whole city yet, but to specific areas (Cathkart-Keays, 2015). Following the example of existing initiatives such as London's attempt to limit car use in its city centre by making its access payable for more than 20£ per day. It can be considered that an existing city can be turned into a car-free city by strategic closures of streets and squares to car traffic. Moreover, this city would need to arrange specific routes and areas for pedestrian and cycling use in order to maintain a good connectivity (Minh, 2016). Nevertheless, some issues can result from the planning of car-free cities starting with the Braess' paradox that states that "a new route can increase travel time for all" (Steinberg, 1983) and that will be developed and explained furthermore in this research. This would then tend to show that planning a car-free city could cause some issues which city-planners will need to solve.

These city-planners have had to face new issues since the beginning of the 21st century with an important urban growth, they started to elaborate Action plans on a European scale and promoted by the European Commission since 2009 with the APUM, Action Plan on Urban Mobility followed by the Transport White Paper (2011) that both joined the other initiatives started years before in the European Community Framework Programmes that were started in 1984 and are still discussed every 4 to 6 years. The Sustainable Urban Mobility Plans (SUMP's) are now seen as new planning concepts able to address transport-related challenges and problems of urban areas in a more sustainable and integrative way (Wefering, 2013).

In 2002, the European Commission launched an initiative that has crossed in some ways the SUMP's over the past years, this initiative is called the CiVitaS. Indeed, the City-Vitality-Sustainability initiative is a project started to build a network of cities focused on cleaner, better and more sustainable transports in Europe. These cities are working in accordance with the 80 city-labs that are also part of the CiVitaS initiative and that have experienced hundreds of measures in mobility to help determining the best ways to shape the future transportation system. Another benefit of this initiative is that the participants have had to create methodologies to assess mobility within these living labs cities. These criteria are numerous but were limited in the recent study of the city of Burgos in Spain (Diez, 2018), in which they limited the 29 criteria in 17 measures that they considered needed to be assessed in order to determine the outcomes of the city's mobility policies. These measures were listed in a table (see table 2) with the objectives of these criteria.

Table 2. Measures and Objectives in the local CiViTAS project for the city of Burgos. (Diez, 2018)

Measure	Objectives
Clean fuels and clean public and private fleets	Increase supply and consumption of clean fuels: compressed natural gas and biodiesel
Integrated access restriction strategy	Establish a "clean" area in the historic centre, control and monitoring of pedestrian areas.
Parking strategy and management	Increase the capacity and efficiency of surface and underground parking
Clean high-mobility services	Improve the quality of urban transport services
Collective mobility services	Improve public transport services for university and industrial areas
Mobility services for visitors	Improve information in public transport and accessibility for tourists
Car pooling	Provide a reliable system of shared vehicles for urban travel
City bike scheme	Increase the use of bicycles as a means of transport
New goods distribution scheme	Improve freight
Sustainable mobility marketing	Raise public awareness in transport
Mobility Forum	Establish a permanent forum for stakeholder participation
Accessibility	Improve accessibility: roads, public transport and public places
Safe access to peripheral neighbourhoods	Improve pedestrian access conditions and cycling areas in suburbs
Increasing bicycle use	Improve conditions for promoting bicycle use
Safety and accident prevention	Accident prevention and safety improvement strategies
Info-mobility tools	Integration and use of information technologies to improve mobility in urban areas
Traffic visualisation system	Update the traffic control centre and integrate the information systems

After leading the research in Burgos, researchers came with assessments on the different measures and these results will be studied and analysed as part of this project. In order to understand more clearly what will be the focused points used to assess cities' mobility in this research work, the 17 criteria used in the Spanish research are gonna be grouped in the following 5 categories (Perra, 2017; Diez, 2018):

Integrated access restriction strategy. Gathering « Accessibility » and « Safe access to peripheral neighbourhoods » factors

Parking strategy and management.

New Mobility services. Criteria grouping « Clean high-mobility services », « Collective mobility services », « Mobility services for visitors », « Car pooling » and « Increased bicycle use ».

Communications about Mobility. « Mobility Forum », « Info-mobility tools » and « Sustainable mobility marketing » are forming this new criteria.

Prevention and Visual Mobility schemes. « City bike scheme », « Traffic visualisation system », « Safety and accident prevention » are forming this last point studied.

Moreover these criteria will be used as starting points to assess the mobility in the cities concerned by this study. They will be assessed in different ways explained in the following part about Material and Methods. This research will try to find answers to the previously cited issues, caused by car-dependency focusing on two cities, the French city of Lille and the Dutch city of Almere. Working on the matter of car-free city, the scale of this study will consist of the city centres of these two places.

Almere is a new town built during the 1970's on the Flevoland polder. Almere's development aimed to supply housing for people who were working in the Randstad area (Amsterdam, Utrecht, The Hague, Rotterdam). In 40 years Almere's growth has been a European and even worldwide example in urban planning going from a non-existing land to a place where more than 200,000 people are living in such a short time (Bertolini, 2003; Appendix 1).

Until the end of the 1980s, Lille was, on the other side, an old city. Historic, blocked in an industrial past and aside from Paris, the city had lost its strategic importance in France until the city's policy-makers decided to help initiating a development programme called Euralille. including a train station with an HST (High Speed Train) station, a World Trade Centre and 100,000 square meters of space devoted to offices, parks, residential buildings, hotels and cultural facilities (Van Der Hoeven, 2009).

The choice of these two cities, in particular, was made because of their differences, Lille being a historic city that has grown over centuries with its specific urban growth which has decided to start developing itself and which is working actively on mobility and urban planning initiatives. And Almere, being a recent city that did not exist 60 years ago which was developed with city planners who were inspired by worldwide urban growth examples. The profile of Almere enabled it to be shaped on the most efficient way in accordance with policy makers and its inhabitants from its very beginning. In order to understand both of these cities functioning, two main categories of stakeholders will be involved in this research: policy makers and inhabitants who entirely participated in the development of Almere while Lille's current evolution is trying to reconnect with its inhabitants. Moreover, the sizes of the two areas are close to each other (3km² for Lille Centre and 1 km² for Almere Stad) also enabling the study to use scale comparisons between the two cases.

Over the past few years, Lille has developed new land use and circulation plans in order to reduce the car use in the city centre with the need of conciliating its ancient urban design and the new means of transport to access the heart of the city. On the other hand, Almere has developed an efficient transport system in its city centre without removing cars from the area but giving priority to walkable paths, biking and bus lanes. Hence, one could think that these two cities could not learn from each other when looking to improve their transportation systems.

However, this research will aim to determine if this affirmation is true or not by answering the following question: **How could Lille benefit from the experience of Almere as a car-free city?**

The main research question is being supported by three sub-questions which are as follows:

- In what way could Almere Stad be defined as a car-free space?
- What are the main learning points from existing practices of car-free cities?
- What can Lille learn from Almere practices and how could the city apply them?

2. Material and methods

This thesis aims to define strategies and initiatives existing in the city of Almere with the intent to find out if there could be a way to apply them to the city of Lille and how to do it. The research then concerns urban mobility, car-use in cities and ideas of how to change this point in the specific city of Lille which could help understanding how to apply such ideas in other cities. In order to present the research methodology and its results, a plan is needed for a logical realisation of the research which was found based on a preliminary research work intending to come up with the main research question as follows (see Figure 1). Along with the preliminary research work, a literature study has been done using specific keywords related to the topic. These keywords were « car-free cities », « mobility », « air pollution », « car-use », « urban mobility » and « connectivity ». The articles selected thanks to the findings on the website sciencesdirect.com have then highlighted the focus points that will need to be answered through the different research methods.

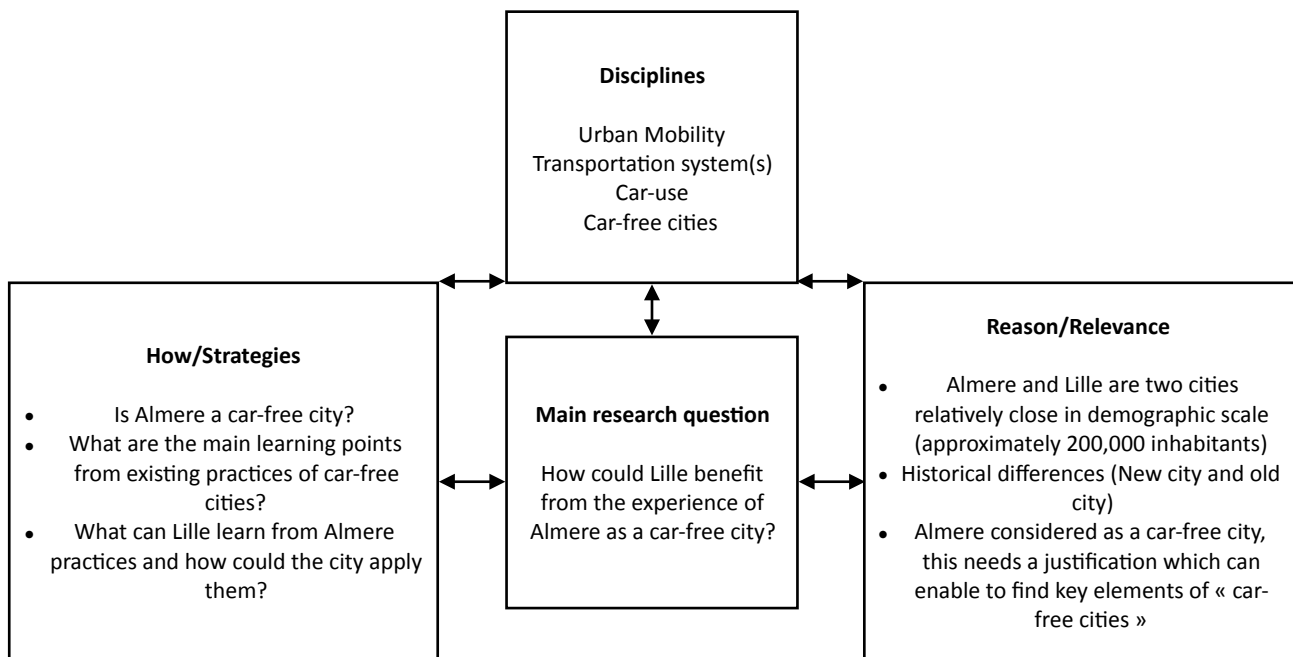


Figure 1. *Picturing your research!* based on de Jong's figure (De Jong, 2015).

To answer the research question « How could Lille benefit from the experience of Almere as a car-free city? » a clear research methodology is needed. In this purpose, it is important to describe properly the material and methods that will be used for the elaboration of this research. Therefore, this part is a description of the research elements and strategies that are going to be needed in order to answer the main- and sub-research questions. To find answers for the subquestions « Is Almere a car-free city? », « What are the main learning points from existing practices of car-free cities? » and « What can Lille learn from Almere practices and how could the city apply them? » and therefore to the main question. The methodology chosen for this study will be a comparative case study between the city of Almere and the city of Lille, through desk research in a first time, interviews led with specific stakeholders such as municipalities in a second time and data analysis to identify key elements that will lead to answers.

The introduction of this research sets the broad frame of the studied subject as it defines the causes leading to the need for new developments in the field of urban mobility and especially on the relevance of reducing car-use in cities. This material and methods part will help in a second time to determine the needed elements for the research such as precise examples of people with whom an interview would benefit the thesis. The decision makers that will be reached in this research belong to two governmental organisations: the MEL (European Metropole of Lille) that is in charge of the urban planning of Lille and the Urban planning office of Almere's municipality. In order to determine who would be the best persons to interview, a first contact will be made with a manager from each structure.

In order to understand better the broad frame of the topic and the stakes for the analysed cities, the third chapter will highlight these elements through a literature review from the desk research.

This will aim to gather as many informations as possible about the different aspects of the research such as car-free initiative examples, mobility strategies in cities, the policies led in each city in terms of car-use and transportation but also about global urban history of both cities in order to understand the differences and similarities between the two cases. In this chapter, the interviews led with stakeholders from each city will also be used in order to support this overview of the case studies key elements in the field of mobility and car-free implementation.

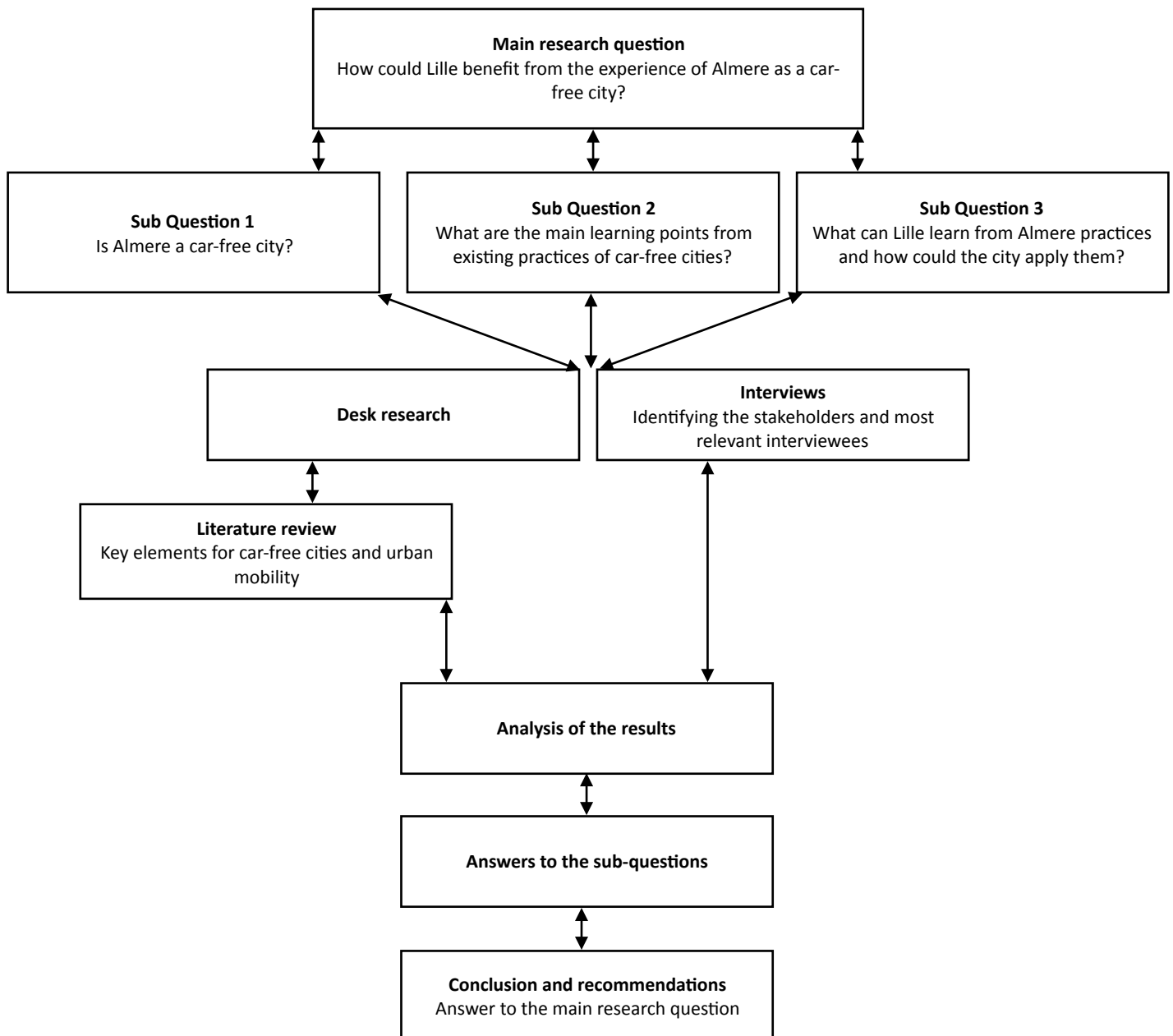


Figure 2. *Material and methods plan.* source: author's elaboration

In the fourth chapter, the case studies will be analysed and compared in order to come up with answers to the sub-questions. As a way to summarise the whole methodology of this research, the following figure (see Figure 2) shows the steps that will lead to answering the main research question.

The final product of this thesis is aimed to be used by students, policy-makers or whoever would be interested in the evolution of car-use in cities and the way to implement car-free strategies in any urban environment. It might be available on the internet with full open access.

3. Planning of proposed research

The planning of the proposed research is described in table 3 below. The planning aims to give the author a realistic action plan with deadlines to follow. This action plan provides a realistic overview of the time distribution that will be spent on each step of the thesis.

Table 2. Planning of the proposed research

Deadline	Task
29 November, 2018	Finishing the Research proposal
3 December, 2018	Final deadline for the Research proposal
4 December, 2018	Writing part on Almere case study (key elements, ...)
5 December, 2018	Writing part on Lille case study (key elements, ...)
6 December, 2018	Set appointments with interviewees
13 December, 2018	Improvements on the Research proposal in case of a fail or from feedbacks of the coach
14 December, 2018	Literature review combining founding on Almere and Lille
15 December, 2018	Checking the interviews advancement
16 December, 2018	Limit date to get at least one of the interviews + transcription of the interview and first analysis
19 December, 2018	Limit date to get a second interview + transcription of the interview with analysis
20 December, 2018	Finishing analysis of the results + sending a draft version of the final thesis
5 January, 2019	Finishing the analysis/discussion and conclusion parts if not done
8 January, 2019	Feedbacks on the draft version of the thesis
14 January, 2019	Final deadline for the thesis
18 January, 2019	Finishing thesis presentation
31 January to 2 February, 2019	Presentation of the thesis

4. Results

4.1 Case studies

In this chapter, the case studies are more introduced than in the first part of this report. The profiles given for each city are based on the CiVitaS criteria used to give a broad picture of the cities. Each case is then described on three levels: their history, the city planning and their approach to mobility for a better understanding of the study. Then the results from the desk research on car-free cities and the approach of each case towards the use of car are given.

4.1.1 The city of Lille

First historical mention:

1060 AD approximately (Lebecq, 2004).

Population:

230,000 inhabitants in the city

Geographical location:

Lille is located in the north of France near the border with Belgium and the city of Tournai.

Political and cultural role:

Lille is the capital city of the Hauts-de-France region and the Nord department. Lille forms the heart of a larger urban area, consisting of Lille, Roubaix, Tourcoing and Villeneuve d'Ascq, which is France's 4th-largest urban conglomeration.

Lille European Metropole, a wider conglomeration of which Lille is a member, is divided into 87 communes and about half of the population lives on its Belgian side.

Economy:

From the Industrial revolution until the end of the 20th century, Lille and its surrounding cities have been major actors in textile manufacturing. Nowadays, the companies are more oriented towards services and commerce, only a few enterprises remain part of the industrial sector. Lille has a central position for distribution in the centre of Northern Europe and is one of the main route to travel in the north of Europe from the continent's southern countries and France.

Transport:

Lille is an important crossing point in the European high-speed rail network. It has a strong connection with Paris thanks to the French TGV (High-speed train), it is connected to London with the Eurostar line and the Thalys network connects it to Belgium and the Netherlands. Lille also has a dense confluence of highways. Nevertheless, the airport of Lille, located in Lesquin, is only of regional importance.

Public transport:

Lille Metropole is responsible for the urban public transport system. Public transport consists of 2 lines of the driver-less metro system (known as the 'VAL'), 2 tramway lines, more than 60 bus routes and many main rail routes connecting the city to its urban conglomeration (including regional connections to cross the border with Belgium). The city also has a bike renting service called V'Lille that offers short and long-term bike rent.

The history of Lille and its city centre

Historically, Lille was born on the edge of the Deûle river as harbour city where trading was very active during the middle age and later. At its beginning, the city was originally owned by the Earls of Flanders and coveted by France and other European countries because of its strategic position forcing the city to face conflicts. For this reason, the historical part of the city (the « Vieux Lille ») was a fortified place. In the 14th century, the city was taken by alliance by the French for a century until the Spanish Netherlands took it in 1477 with a new alliance. Lille remained Dutch for another century known as the « Golden Century » of the city during which some major urban expansions occurred outside the historically fortified part of the city.

In 1667, Louis the XIVth conquered back Lille, the city became French again and has remained French since then. A new expansion started after that, introducing the French classic architectural style in Lille with the royal district designed by the french engineer Vauban that is named after him nowadays. This third layer on the city's urban growth is nowadays one of the last part of the city centre.

In the 19th century, after the French revolution, Lille became one the main actor of the industrial revolution in the metal, chemical and textile industries. Along with this rise, the city knew a major urban growth and the cities of Wazemmes, Esquermes, Moulins and Fives became part of Lille. Hence, the city surface was tripled and its population doubled. This growth gave one of the last layer of the city centre that is nowadays defining the edge the city.

In the 1970's the industrial crisis stroke Lille and the city had to evolve on an economy more oriented towards the tertiary sector that only gave a new economic growth to Lille in the 1990's with the building of Lille Europe train station that connected Lille to Paris with the TGV railway but also to the Eurostar in 1994. This growth was part of the Euralille project, a building plan on the North of the city providing offices and commercial spaces to Lille and shaping the city as it is finally known nowadays.

The city's urban planning

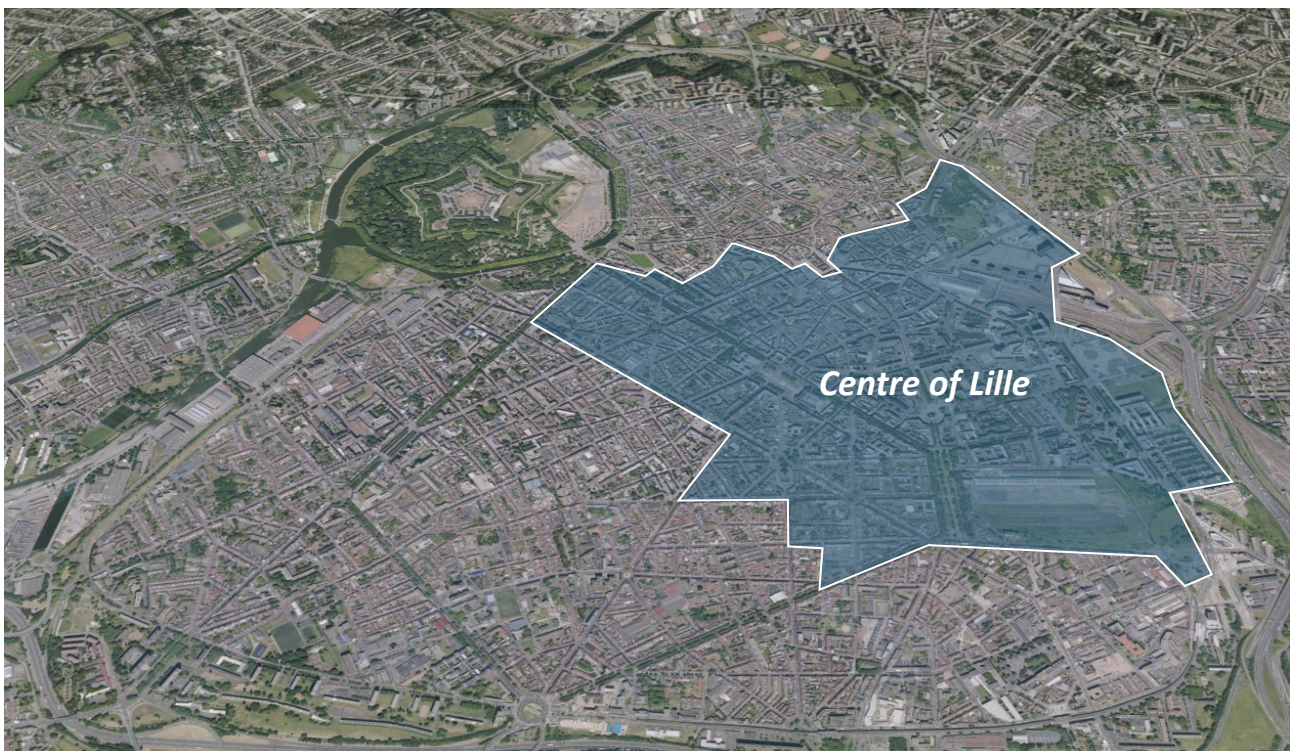


Figure 3. Map of the city centre of Lille. source: <https://www.geoportail.gouv.fr>

The city centre (see figure 3) is nowadays considered as the part developed between the 18th and the 19th century, it does not include the urban expansion that occurred with Vauban nor the old part of the city or the districts of Wazemmes, Esquermes, Moulins and Fives. Nevertheless, the city centre is strongly connected to the « Vieux Lille » and to the other districts because of the city's size, Lille being only 3.5 kms from South to North and 3 kms from West to East, the overall scale of the city is very accessible even by feet.

The urban evolution of Lille (see figure 4) has occurred on four different times, as explained before, the original fortifications were consisting of the actual old part of the city. The second one, occurred in the 15th century with the arrival of the Spanish Netherlands during the « Golden Century » of Lille. In a third time, the city was expanded by Vauban under the reign of Louis the XIVth with a part of the city that is built in the French classic architectural style. The fourth layer, of the city's urban growth happened during the industrial revolution in the 19th century with the absorption of the cities of Wazemmes, Esquermes, Moulins and Fives that became the southern districts of the city.

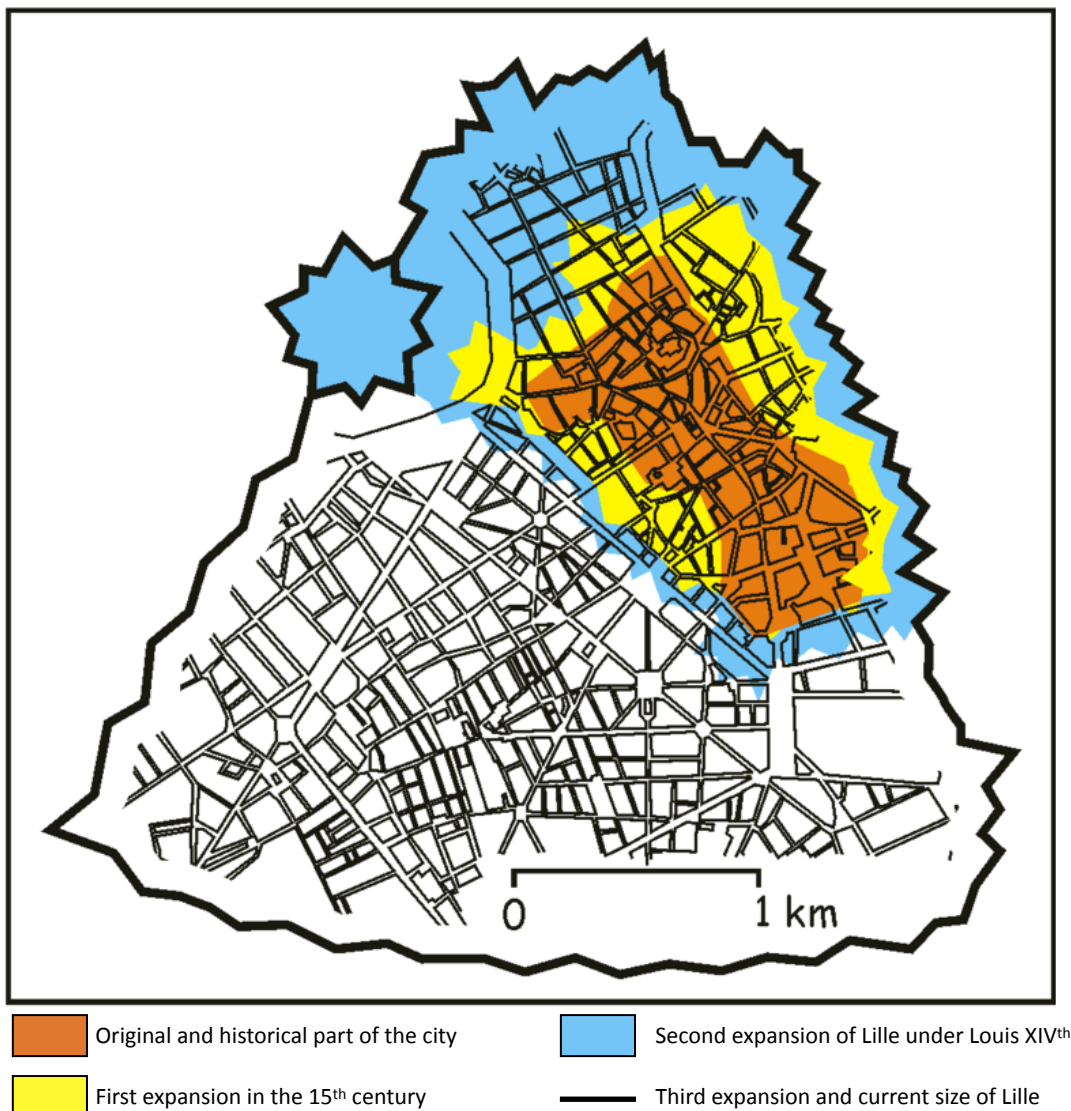


Figure 4. *Progressive urban growths of Lille*. source: Laurent Deschodt, National Institute of preventive archeological researches (INRAP)

Nowadays, the urban planning of Lille is focusing on a more important scale with the growth of the city as part of the European Metropole with major surrounding cities such as Roubaix, Tourcoing and Villeneuve-d'Ascq.

The city's approach to mobility

Lille intends to become a greener city when it comes to mobility by enhancing the use of soft transportation means such as bicycles, skating or walking. Nevertheless, the city has to face an intensive use of cars with more than 300,000 motorised vehicles crossing the inner city every day (Lille Metropole, 2016). The city offers a great transportation service thanks to its subway and bus lines for the inner city mobility while the tramway and TER (regional trains) are supporting the daily trips between Lille and its surrounding cities.

Besides, the city is facing car traffic with a new mobility plan since 2010 in order to reduce traffic jam, noise pollution, air pollution and improve pedestrians and bicyclers' safety. In accordance with this plan, the routes have been changed in the city in order to achieve a better traffic flow.

4.2.1 The city of Almere

Founding year:

1976

Population:

205,596 inhabitants (July, 2018)

Geographical location:

Almere is located in the centre of the Netherlands, in the province of Flevoland located in the North of Amsterdam.

Political and cultural role:

Almere was designed to provide housing for the growing population of Amsterdam and Utrecht after World War II and made agreements with the Dutch government to expand its population to 350,000 inhabitants by 2030. It is the 7th biggest urban area of the Netherlands and it is divided in 5 city districts: Almere Stad, Almere Haven, Almere Buiten, Almere Hout and Almere Poort with one main city council.

Economy:

Initially designed for housing purpose, the city has managed to grow and has now more than 18,000 active businesses, employing more than 80,000 people. The majority of companies are involved in sectors such as business services, wholesale and retail, followed by IT/tech and construction.

Transport:

The city of Almere is connected by train to the national railway and highway networks. Indeed, most of the population is still working outside the city in Amsterdam or Utrecht for example and requires a convenient access to the rest of the country. Nevertheless, the city is located on the North of the country's main cities, hence most of its transportation needs are meant for people going from Almere to other parts of the country and less on the other side.

Public transport:

The city was designed with an efficient public transport system with central bus lanes connecting every districts with each other with more than 20 bus lanes. Train is connecting a few parts of the city through 6 railway stations. Almere has separate cycling paths from car and bus lanes.

The history of Almere and its city centre

The story of Almere started in the early 1970s, when in need of space to house workers from Amsterdam and its region, the country started building this polder. The date of the 1st of December 1975 can be considered as the very beginning of the city as the 24 first residents started living in houses at that moment. These inhabitants arrived in the first part of Almere that was developed Almere Haven. In 1979, the first housing projects were finished in the second district of the future city: Almere Stad, known nowadays as the city central district. A third district was initiated in 1980 with the first projects for houses in Almere Buiten. The reason for such fast development of different district came from the initial plan of the founders of the city that imagined a growth for city over forty years in number of nucleus.

In 1984, Almere became an official municipality and in 1986 along with the other parts of the polder, the new land reclaimed from the water became the twelfth province of the Netherlands: Flevoland. Almere is the most recent city in the Netherlands and has known since its creation a very fast growth in approximately 40 years by going from an inhabited place into the home of more than 200,000 people.

Almere Stad, is the centre of the city concentrating most of the city's economical activity with many shops and the main places such as the city hall, the central station, the market place and cultural activities such as a cinema and a theatre. The core part of the area is built on multiple levels, the underground and first level is meant for car and bus lanes under a pedestrian area where are located the shops and facilities. The last level located on top of the shops is meant for housing with buildings and rooftop gardens. The rest of the district is a mix of housing, offices, shops and important parking lots.

The city's urban planning

The urban planning of Almere has been thought at the very beginning of the city's creation, the aim was to build an independent city that would emancipate itself from the cities it was initially built for: Amsterdam and Utrecht. In the process of the city development, planners had to connect Almere to the rest of the Netherlands thanks to the country's efficient railway and highway networks. Nevertheless, the city did not managed yet to succeed in becoming independent and is still seen as a « dormitory town » because over its 200,000 inhabitants only about 75,000 are working in Almere.

Originally, the urban planning of Almere was meant to ensure its independence thanks to a poly-nuclear city model. The idea was to create different city centres (see figure 5) with Almere Haven, Almere Stad, Almere Buiten, Almere Poort and Almere Hout. An additional nuclei was imagined for the time Almere would grow with a population bigger than 250,000 inhabitants, Almere Pampus. This model of urban planning was chosen in order to give the opportunity to each core the chance to build their own identity, which has in fact happened with Haven that is like a small village, Stad as the main urban area and city centre and Buiten that is closer to a more important amount of greenery and seen as a more rural space. In addition to the planned urban growth of each nuclei, the plans for Almere were to provide the inhabitants with greenery and water places between each district. This way, inhabitants would have kept a space for leisure and recreation within the city's boundary and a connection with nature. In the end, the final expected growth of the population would have created a city with several strong district having a strong social cohesion and identity connected to each other with a great connection to green.



Figure 5. *Planned urban growth of Almere in a polynuclear model.* source: Zhou, J. 2009

The area of Almere Stad was designed in the middle of the city in order to ensure a good division of traffic over the city, people coming from different parts of Almere to access the city centre. The district has known a two-time growth, firstly with the creation of the district in the 1980s and after 1997 when the city decided to develop a new centre based on the Weerwater space and connected to the built Almere Stad district. This new area was designed to be an area for shops, housing, cultural and entertainment facilities on a vertical separation of functions as explained before. As the becoming living centre of the city, Almere Stad had to ensure a good mobility planning in order to keep its first goals of ensuring a good division of the traffic and providing new access to its visitors.

The city's approach to mobility

Almere is a broad city of approximately 250 km² because of the size of the city, the distance between each nucleus is quite important. Hence, the city was designed to connect the city centres together thanks to a main car axis the N702 and a highway that also connects the city to Amsterdam and the surrounding southern region of Almere, but also its northern area and the cities of Lelystad and Dronten. Some smaller roads are providing access to the inner city and centres but these car lanes are built separately from a central dedicated bus lane that provides access to every parts of the city to the inhabitants with bus stops designed to be accessible to every inhabitants in less than 400 meters.

The whole transportation network is also surrounded by bike and pedestrian lanes that give access to every part of the cities apart from the motorised lanes. Moreover, a railway connects the city from its South-West station of Almere Poort to its North-East station of Almere Oostvaarders, with several train stations in between including the Central Station. This train line connects Almere on a bigger scale to Amsterdam and the rest of the Netherlands in direction of the South and to the North of Flevoland in the other direction.

The city was designed in the 1970's and has followed its original planning on mobility ever since, while intending to follow this plan until the population growth would force the city to evolve and adapt. Since some parts of Almere are still in development such as Almere Pampus and Almere Hout with the Oosterwold project, this expected growth in the population size is not expected until 2030. In Almere Stad, the studied area of Almere, the design of the city is meant to provide parking lots to the inhabitants on the edges of the district in order to limit the access of cars. Hence, it is easier for people to cross the city centre by feet rather than by car except on a single road for cars and buses that goes under the pedestrian level as explained before. The arrangement of the mobility in Almere Stad will be more explained in the following parts of this report.

4.2 The concept of car-free city

The concept of car-free city, or at least car-free area, is based on the idea that city planning has to evolve in a relation between human and environment rather than in the current man-car-space strategy applied in most the world's urban areas. This situation is a consequence of the car-dependency that people have developed during the past century that has created a need of cars for human mobility.

Because of the traditional urban planning based on car use, many cities that want to shift their mobility practices towards a reduced use of cars need to face the challenge of changing their transportation strategies while using an existing network. Hence, many of these cities such as Oslo, Paris, Copenhagen, Berlin, ... besides announcing their willingness for change have initiated car-free days in their city centres. Thanks to these initiatives some measurements have been made in order to show the benefits of reducing traffic, these studies showed that up to a 40% reduction in NO₂ levels were reported on car-free days (Nieuwenhuijsen, 2016), proving the strong impact of car-use reduction.

Measures intending to restrict car use have started to be developed, from the creation of car-free centres to changing car access in residential areas, in these areas parking spaces are no longer located next to the housing facilities but organised in parking facilities outside of the residential space (Borgers et al., 2008). Different conceptions of the term « car-free cities » have been implemented throughout the world, in UK policies were developed with an approach to the term as the absence of parking in the city and its residential areas. On an other hand, some countries' conception of « car-free city » was more related to a « traffic-free » environment and is more or less the approach mainly used in several current projects.

In the frame of the CiVitaS initiative presented in the introduction of this research, some cities have been focusing on the use of cars and its reduction as a pathway to car-free spaces and cities. Thanks to this project, urban planners have been able to come up with tools to implement car-free strategies with principles that were introduced before in this study. As explained, the criteria selected by the several researches led on the matter of mobility changes in cities have highlighted five main points to focus on the reduction of car-use:

Integrated access restriction strategy. First and main point implemented in car-free spaces, the restriction of specific areas in cities for the benefit of more pedestrian areas. This kind of strategy aims to limit the access of cars to an area out of the space intended to become car-free and can already be observed or planned in many cities such as Oslo that has announced that its city centre would be completely car-free by 2019.

Parking strategy and management. Improving the parking lot offer on the edge of car-free restricted areas in order to provide a direct transition from car to walking or other soft transportation means preferably without requiring the use of public transports. This strategy aims to come with a transiting solution from traditional access with motorised transports to a car-free space.

New Mobility services. In order to insure a transition similar to the implementation of car parking solutions, developing the mobility services such as public transports is a key element in the transition towards car-free cities. It is only with an efficient network that cities can decide to reduce the use of car and offering an alternative to its inhabitants and visitors.

Communications about Mobility. The communications about mobility are a point that can encourage the acceptance of car-free strategies by population. Nevertheless, even if cities can not expect people to change their behaviour towards the use of car only by communicating about the need of traffic reduction, the implementation of good communication is necessary to come with effective and concrete measures.

Prevention and Visual Mobility schemes. This last element is close from the need of communication about mobility since it is also not sufficient to create a shift towards car-free areas, but is necessary to come with the other strategies. Changes in mobility schemes can also be a starting point by changing people's habits in traffic routes first and then encouraging them to abandon the use of car in a second time. Moreover, prevention is important when changing mobility schemes because of the risks involved by this measure for people who are driving by habits in areas where directions can be changed for example.

Hence, three main focuses are visible from the CiVitaS initiatives: access restriction, parking solutions and improved public transport offer, supported by two key elements: communication and prevention.

Is Almere a car-free city?

In order to answer this question, Arjan Weterings, advisor for the board of Almere on the regional mobility and strategic planning, was interviewed (see Appendix 1). In his opinion, if you compare Almere with other cities in the Netherlands, not many people would qualify Almere Stad as a car-free city centre. Many cities in the Netherlands having historic city centres have small streets, which are not suitable for cars at this time which is why many of them have created areas with a reduced use of car in favour of cycling and pedestrian spaces. On the other hand, Almere city centre has been built in the 1970s and 1980s when cars existed already which is why **the city was built first as a car and public transports city**. Hence, many people are coming to the city centre by car, which is even the main transportation mean used to access Almere Stad. Most of Almere Stad's visitors are coming from the other parts of Almere and only a few people from other regions of the country. Nevertheless, the city centre could be defined as a low-car use space because most of it is pedestrian.

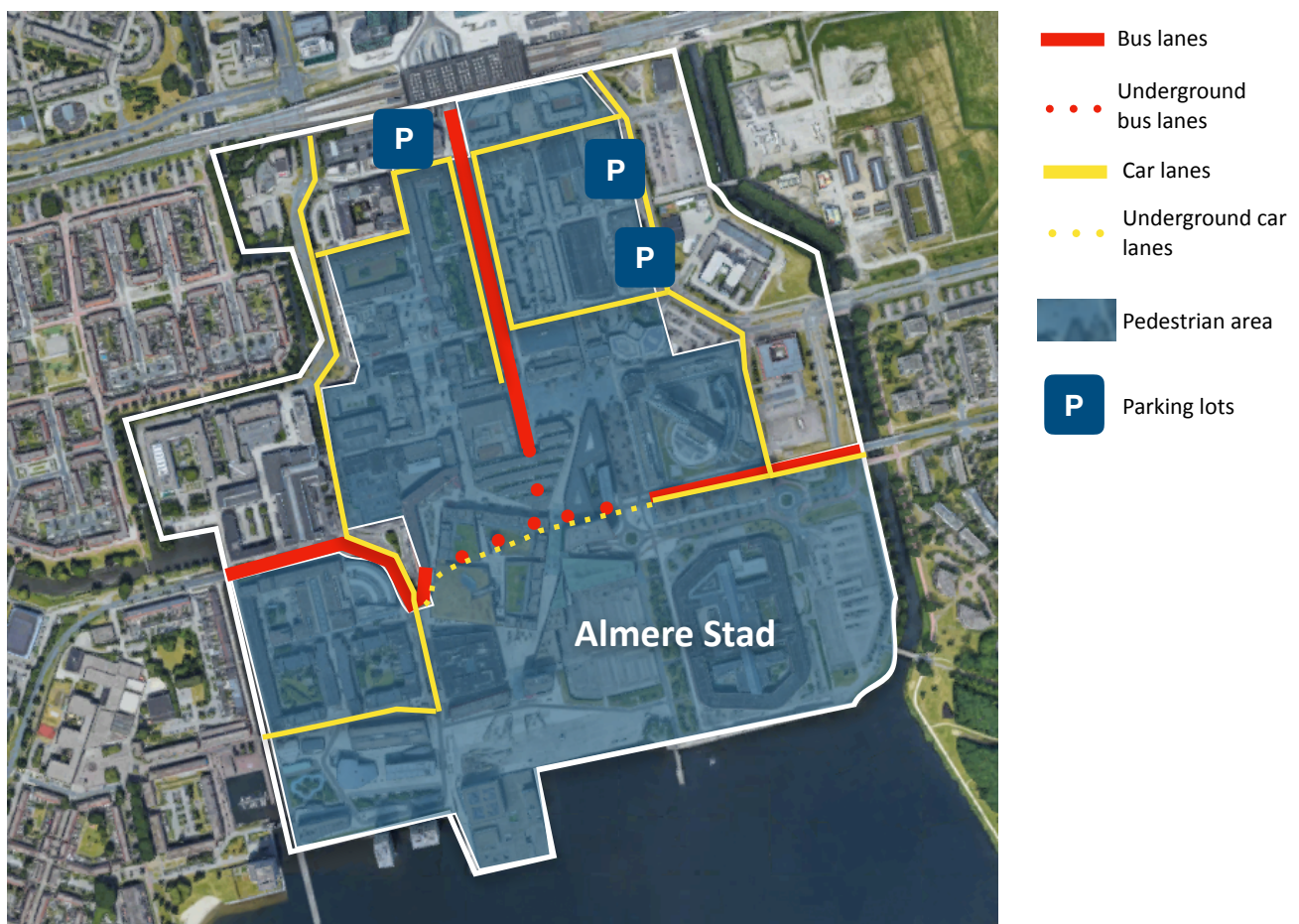


Figure 6. Mobility plan in Almere Stad. source: Google maps

In fact, around the city centre (see figure 6), a ring structure is surrounded by parking lots so people can easily come with their car from the other parts of the city and park it outside the city centre. Parking lots are located on both sides of Almere Stad, in fact, the city centre is designed as a central space providing big parking plots on each side of its structure. People coming from the west part of Almere can park their car on the Spoordref parking while people from the east can park at Landdrostdreef. This way the connection for people from West to East have to drive outside the city centre and this enables the area to be left for public transport, and more precisely bus lanes, and pedestrian users. The planning of the traffic lanes in Almere Stad are made in a way that cars do not go through but around its centre.

Mobility in Lille in comparison

Lille does not have the same planning as Almere, firstly because as an older city, the urban development of the inner city has evolved before the use of cars and has had to adapt through time. After decades of car use the city cannot change its mobility schemes easily. In fact, even if Lille intends to implement car-free spaces, it still struggles to have a few pedestrian areas (see figure 7).

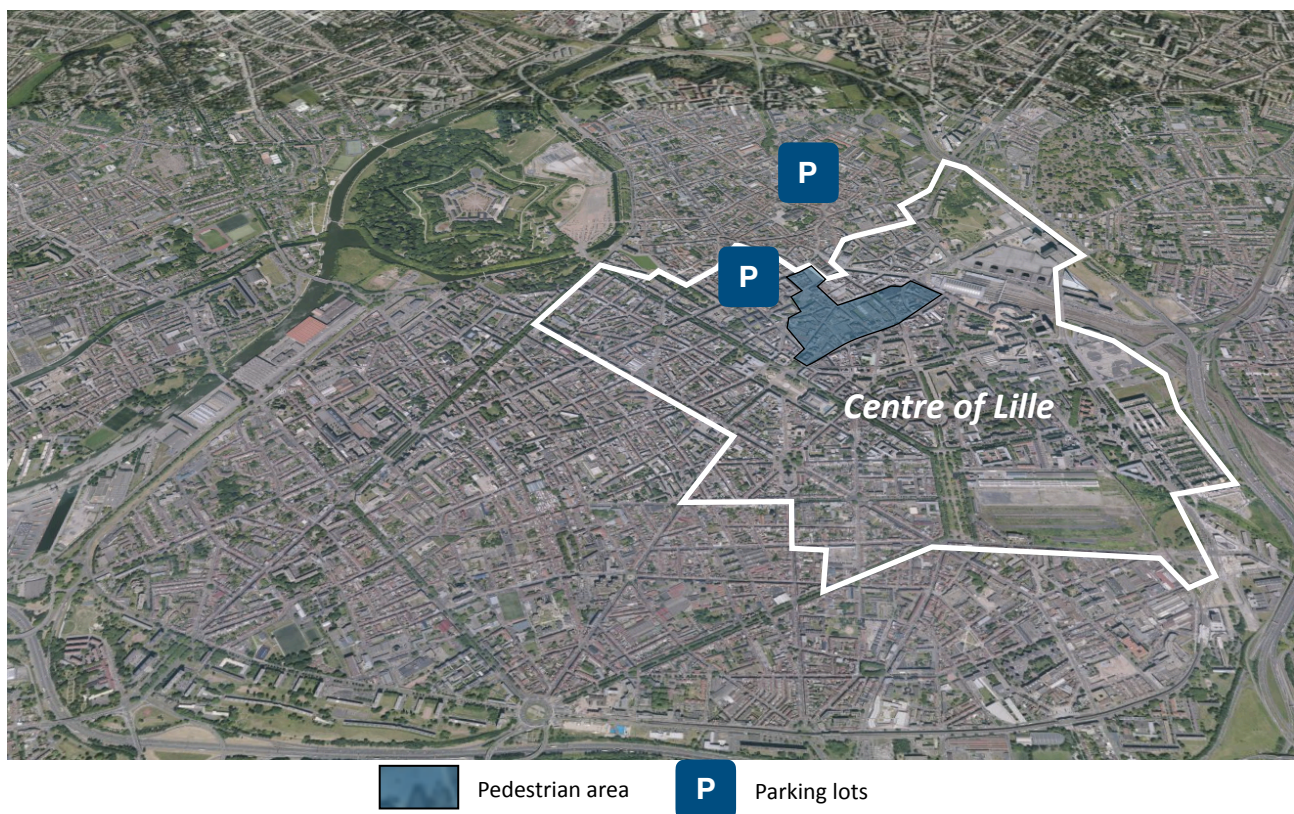


Figure 7. Map of the city centre of Lille. source: <https://www.geoportail.gouv.fr>

Indeed, the whole city of Lille is accessible by car except a small area that includes the Grand Place and the commercial street of Bethune. The city aims to reduce its car-use as part of its mobility plan for 2020 but still has to face issues starting with the willingness of the inhabitants who are used to the actual accessibility of the city. Martine Aubry, the mayor of Lille has had to reconsider her decision to start implementing pedestrian streets in the historic part of city because of the complaints of the inhabitants and shop owners. Nevertheless, the city has initiated its transition attempt with a parking lot located on the edge of the city centre.

5. Discussion of the results

Car-free cities learning points

As seen in this research, the CiVitaS initiative has provided the city planners with many key points on which a car-free city development can be based. In this work, five elements were highlighted:

- Integrated access restriction strategy
- Parking strategy and management
- New Mobility services
- Communications about Mobility
- Prevention and Visual Mobility schemes

It has been determined that in the matter of building car-free spaces three of these elements were concrete measures that enable a city to shift its mobility scheme towards a reduced car-oriented one. Cities can indeed develop restrictive strategies, improve their parking facilities or improve their public transport networks as starting point for change. They then have to support the applied measures with communication about mobility encouraging people to reduce their use of car and implementing a clear prevention on road's changes in order to avoid danger of accidents in the first time.

Even though Almere is not seen as a car-free city, the mobility plan of the city centre is built on some of these key elements which tends to state that Almere Stad might at least be using a car-free strategy since its creation. The policy of the city for the moment is that "Nothing is restricted", the aim is to facilitate every mode of transport, from cars to buses and trains, as well as cycling and walking. There are almost no restrictions on the use of cars in the city except the costs imposed by car parking or the price of public transports, and the access to a few streets in the city centre (Appendix 1). This being said, another vision of car-use reduction can clearly be identified, as most people are car-dependent, the best way to implement a shift towards the use of cars consist of going in the side of users while encouraging a reduced use of their motorised transportation means.

In what way can Lille learn from Almere practices?

So far, the city of Lille has tried to change its mobility by restricting the users access by car in multiple projects and did not manage to get its inhabitants approval. The reason for that is the development of the city in the first place, that has been car-oriented since decades and this is the reason why Lille has not managed to apply its intended mobility policy fully yet.

In comparison with historic cities such as Lille, Almere does not have extensive policy for mobility because there are not many issues faced by the users but also because the city has been designed as a city for 350,000 people while there are currently 200,000 inhabitants. For this reason, there is not a real need of policy changes in regard to the city's original planning. Lille on the other has to evolve constantly to answer the needs of its important population and also deals with more users because of its economic activity that is way more considerable than Almere's one.

Nonetheless, Almere's practices in mobility planning are not very different in the city centre than the focus points highlighted by the CiVitaS initiatives and would tend to encourage Lille's development in building more efficient and bigger parking facilities as an alternative to the current parking service. Moreover, Lille would need to find a way to implement the planned restricting strategies in regard of car-use that are already part of the mobility plan but have not yet been applied. In that sense, the point of view of Almere as « Nothing is restricted » would be interesting for Lille in order to find a better understanding with the users.

5. Conclusion and recommendations

With the increase of urban demography and as a consequence of the use of cars in cities, Sustainable Urban Mobility Plans have been developed by major cities. A part of these plans of action focuses on the use of cars that is impacting dramatically the pollution in these cities, and most of them intends to reduce their inner traffic in order to reduce air pollution levels. This research has been focusing on the concept of car-free cities and has shown the main focuses on the implementation of car-free policies.

As it has been shown, the main aspects when planning a car-free area are the restrictions in access by car to specific parts of the city, the improvement of the car parking facilities on the close range of the future pedestrian area and the improvement of the public transport accommodations. This turned out to be measures implemented by Almere at its very beginning in the 1970s while the concept of car-free city was not even started yet. This research has also shown that the case of Almere was very special in the sense that the applications of these measures were more easy in such city developed on bigger streets with a more thoughtful urban planning, while the case of an old city such as Lille was presenting more issues because of its development through time.

It also turned out that the choice of these cities, even if it was explained and made sense at the beginning of the research, was not the best to realise a comparison since their history was symmetrically opposed. Nonetheless, it appeared that Almere despite its fast urban growth could bring new insights to an old city as Lille, being aware of the need of facilitating mobility instead of restricting it which has mostly been the approach of Lille towards its mobility changes. On the other hand, Lille as a major economic actor could bring Almere some insights on how to improve its working activity development.

If the municipality of Lille wanted to use this report to find insights on how to develop its Sustainable Urban Mobility Plan, it could take in consideration the need of more efficient parking facilities of which the city lacks so far. In fact, the matter of public transports is not an issue in Lille since the city has a well developed subway network combined with sufficient bus lines. In the last part, the strategic closure of parts of the city is already considered by the city but this research did not focus on how to help implement such measures, indeed the application of these measures is one of the main issues faced by the city so far since the inhabitants are not satisfied with the changes looked for by the municipality.

What also appeared from this research was in the first place that the short amount of time given to realise the data collection, between the end of November when the subject was narrowed enough and January, was a bit short in comparison to the expected outcomes. In fact, at first the research intended to realise an interview with a stakeholder from Almere but also one from Lille which in the end has not been manageable. It turned out that the methodology planned was a bit too optimistic compared to the results of the research. Nevertheless, the research was helped by the fact that the desk research provided more answers on the case of Lille than Almere for which most of the literature was actually written in Dutch.

In case, a research would be led in similar conditions, it would be advised to compare cities that are more similar on the urban development plan than on the scale. Moreover, the data collection could be more oriented towards a quantitative research since the qualitative research led, counted more on the answers of only a few people.

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Appendix

Appendix 1. Interview of Arjan Weterings led on the 3rd of January 2019 in Almere's city hall

Author

Hello, could you introduce yourself and explain to us the work you are doing here in the city of Almere?

Arjan Weterings

Hello, my name is Arjan Weterings, I studied at the University of Amsterdam and I have worked now for 6 years, first for the regional public transport company and now for the city of Almere for over two years. My specialisation is strategic planning and traffic planning which are the fields I have worked on as an advisor for the board of Almere on the regional mobility, so the mobility of Almere with its region. The bigger Amsterdam and Utrecht's region being the most important areas connected to Almere. So I try to improve accessibility for the people and companies of Almere with these regions (Schiphol airport, Amsterdam, Utrecht, ...). And the main focus, for now, is to improve the public transport connections. Those are the worst conditions and needing the main improvements, for train and buses connections mainly. And I've also been part of the improvement plans for the station Almere Centrum and the urban plans for densifying the city centre, in residential function first but other functions too. The station was built in 1985 when the train line from Amsterdam to Almere and Lelystad was initiated and there has not been any development on it for 30 years. People experience it as an unpleasant environment, especially in the night time, which is why as a municipality we see it as a key project in the way to improve the living conditions of the people living in the city centre.

Author

Do you think Almere Stad could be defined as a car-free space? Or do you think cars would need to be moved further from the city centre to define it this way?

Arjan Weterings

If you compare Almere with other cities in the Netherlands, not many people would qualify Almere Stad as a car-free city centre. Many cities in the Netherlands having historic city centres have small streets, which are not suitable for cars at this time. On the other hand, Almere city centre has been built in the 1970s and 1980s when cars existed already which is why **the city was built first as a car and public transports city**. In comparison to other cities, there are not so many problems with car transportation in Almere and the city is even recognised as a place where parking is quite easy for a non-expensive price compared to other cities in the region.

Author

I thought people were actually coming to the city centre with public transports or by bike, would you say that in fact, people are actually coming to the city centre by car?

Arjan Weterings

Yes, many people are coming to the city centre by car, which is even the main transportation mean used to access Almere Stad. There are also mostly people from Almere coming to the city centres and only a few people from other regions of the country. It is mainly a local place but nonetheless, many people come with a car. In fact, around the city centre, you have a ring structure and everywhere around this ring there are parking spots so people can easily come with their car and park it close but outside the city centre. Some parts of the city centre are also forbidden for cars and pedestrian-only making them **car-free spaces**.

Author

Are there also other measures that intend to limit or reduce the use of cars in Almere Stad or would you say that the efficient access to car park and the creation of pedestrian areas is sufficient?

Arjan Weterings

The policy of Almere for the moment is that "Nothing is restricted", the aim is to facilitate every mode of transport, from cars to buses and trains, as well as cycling and walking. There are almost no restrictions on the use of cars in the city except the costs imposed by car parking or the price of public transports, and the access to a few streets in the city centre.

Author

Would you say this is also caused by the size of the city? Are people living in the other centres of the city, such as Almere Buiten or Almere Haven, coming to Almere Stad for shopping and leisure or are they mostly going to their closest city centre?

Arjan Weterings

When Almere was founded, the founding fathers thought the city as 5 smaller cities, among which 4 centres are existing nowadays starting with Almere Haven, then Almere Stad, Almere Buiten and Almere Poort. They were thought as being separate cities, with green spaces between them.

I think one of the main reason why this idea has changed over the past 10 years, is that we have now focused on the city centre, Almere Stad, as the centre of the whole Almere. Also in the mobility patterns, you can now observe that people are intensively coming from other parts of the city to Almere Stad, while the other centres are becoming smaller.

I think it also has to do with the scale enlargement of the retail sector and also that mobility in Almere is so easy that people choose to go to Almere Stad which is the most developed part of the city in the economic function with the main shops and cultural services.

Author

How does the planning of the city centre manages to provide sufficient parking plots to its visitors who are coming from the different part of Almere?

Arjan Weterings

The parking lots are located on both sides of Almere Stad, in fact, the city centre is designed as a central space providing big parking plots on each side of this structure. People coming from the west part of Almere can park their car on the Spoordref parking while people from the east can park at Landdrostdreef. This way the connection for people from West to East have to drive outside the city centre and this enables the area to be left for public transport, and more precisely bus lanes, and pedestrian only.

Author

So when you were mentioning the preference of the municipality in implementing strategies that are facilitating mobility instead of restricting it, this appears to be a good way to avoid cars in the city centre while providing convenient car access to the city centre for the visitors.

Arjan Weterings

This is the aim of the city centre's design yes. Thanks to this, people can indeed access conveniently the city centre and are so far satisfied with Almere Stad's accessibility.

The only difference in Almere so far will be the Oosterwold that will not have the same ease to access the city centre but this difference is part of the project. The self-sufficiency of people who are going to live there also agree with the idea of having an access not as good as the part of the city to Almere Stad while having the opportunity to develop the community of Oosterwold.

Author

Would you say that the city of Almere is looking for changing its mobility planning in the future towards a lower use of cars or is it so far not considered?

Arjan Weterings

The people of Almere are very much oriented toward the use of car, which is why deciding to diminish the use of car in the city would not be seen as a good choice by the inhabitants right now. Nevertheless, in some parts of the city as a municipality we think this change is needed since more and more people get to live in the city centre, the city gets bigger and bigger and more and more people come to the city centre which tends to create traffic issues. Hence, as a city we want to think about a new mobility vision and as part of this vision we think of encouraging the use of public transports, even if the city centre is the only area so far where these thoughts are being developed for.

Author

And how does the city intends to influence the use of public transports in order to improve it? Are the public transports companies private or does the government get to impact the prices?

Arjan Weterings

The public transports in Almere and the Netherlands are actually concessions ran by several organisms, the French company Keolys is in charge of the bus transports for example in Almere and the company in charge of train transportation is owned by the Dutch government. As a public decision making organism, the city of Almere and the Netherlands in general, leave a lot of freedom to the companies in charge of the concessions for the prices they want to implement. Even if, we encourage them to prefer higher prices for an efficient network rather than lower prices if it means a lower quality transportation network for a lower price.

I think in comparison with historic cities such as Lille, Almere does not have extensive policy for mobility because there are not so many problems but also because the city has been designed as a city for 350,000 people while there are currently 200,000 inhabitants. For this reason, there are not so many mobility issues faced by Almere in regard to its original planning. The most important things that have to be changed are the prices applied in regard to mobility with the aim to reduce the price of parking places and public transport. In almost every part of the city people can find a bus stop in less than 400 meters from their house with a quite direct access to the other parts of the city which is why the public transport network is considered so far as very sufficient. Bus transportation is even considered as one of the main success of Almere in mobility thanks to dedicated bus lanes that have a central position in the whole city as designed originally in the 1970s.

Author

It seems that Almere is not part of the CiVitaS or any other European initiative, is it a choice made by the city not to develop or ask fundings to the European Union for projects? Or maybe are you familiar with the CiVitaS initiative but did not want to be part of it yet?

Arjan Weterings

Yes we are aware of this initiative the point is Almere is located in quite a wealthy area and as a new city has not yet the need to change its mobility strategy.

We do not have any plans to work together with the European Union, most of the work of the mobility department of Almere is oriented towards finding resources to improve mobility in Almere and most of the means come from the Dutch government and not from the European Union. We do not see how Almere could be helped yet by the research programs of the European Union since the city is very young.

In the end, Almere was designed like I said to reach a population of 350,000 inhabitants which is why the city would only have to implement new policies in mobility until it reaches about 250,000 inhabitants which is expected to happen around 2030. At this point, maybe the evolution of our policies would have to evolve in order to have a better mobility depending on the issues the city would face at this time. But until then, no further research or development is needed in the field of mobility in Almere.

Author

What are then the present needs in terms of mobility for the inhabitant of Almere and the development that are meant to be implemented in the city?

Arjan Weterings

The current aim of our department is to develop the train transportation and the connections with the region of Almere. In fact, Almere was built to provide housing to people from Amsterdam and Utrecht mostly which, in the 1970s, could not accommodate more inhabitants. Even if Almere was then originally built for a housing function, it was also designed to be a working place. Nowadays, the residential goal is so far a success but the work did not come with it which is why only 70,000 people work in Almere whereas 200,000 are living here. This means that a lot of the people who are living here, need to travel each day, mostly to Utrecht, Amsterdam and Schiphol airport, and that is why one of the main challenge in Almere is to attract more companies and then more people to work in the city.

Author

Well, thank you very much for your time, and we will keep in mind that "the best way to improve the mobility in the city centre is not to restrict or forbid cars from the area but to facilitate the access and provide efficient alternatives".

Arjan Weterings

Thank you.