COPENHAGEN:
How bicycles can become an efficient means of public transportation

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“Any observation is construct by the culture of the observer”
Bachelard
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ABSTRACT

Private and public transports are important elements in a city. Transport gives a face to the city. For this project, Copenhagen was a good example. First this city knew how to obtain a powerful transport system. Moreover, the culture, in particular the culture of the bicycle, is acquired by many people. This is why starting from this postulate, we wanted to see how it is possible to combine bicycle and public transport. We know that the old system of city bikes has some problems and is not a success with Copenhageners.

We had the idea to create a new system, which would be in the same time an individual and a public transport. I.e., it would be public because it can be offered to everyone without discrimination. Some of the improvements would include better choice in the movements and in the timetable.

We describe the field of the problem with references to qualitative and quantitative research to know general data and the problem with the city bike system. We have conducted two interviews which help us to understand how the existing bike system in Copenhagen functions. We have given an outline of the theories of geography with special emphasis on mobility, urban planning and sociology in relation with the individual choice. Last, we took into comparison other European cities in order to have an overall view and to have more references from which to show the possibility of our system.
1- INTRODUCTION

- Context: XXI Century and cities

Today, cities have a place which incorporates all of our hopes and sadness. Cities are the mirror of the society. We are trying to plan or manage our cities. They are like a wild animal that tries to control. Between re-population and gentrification of centre and extension outside the boundaries, some cities are exploding. With the increasing of population and urban people who hope to get a private house; cities are places with lots of contradiction. Cities are a multi-using place, home, work, shop, leisure... and these different places are totally scattered throughout. More and more people are flocking to the cities, and for these reasons, mobility is increasing quickly. People use a variety of transportation methods to move into and through the cities. This increase of mobility needs to be controlled and planned strategically. To create and maintain harmony between the different kinds of transportation, it is crucial that urban planners work out the better ways to combine all means of transportation so to lose the least possible amount of energy, time, money, and stress; eventually to improve the people’s welfare. The congestion in the cities creates major problems, notably during the rush hours.

We can see the emergency of this lifestyle’s phenomenon, and more particularly since cities have grown up around automobiles. To limit this increase of automobile traffic and coinciding pollution problems, the urban planners of Copenhagen have decided to promote the common transport like bus, metro or train, but it was inefficient. That is why, in many European towns, we have seen, and we do again now, a general increasing of the parking prices and lot of others urban policies to stop people from using theirs cars in the historical centers. But nowadays, with the augmentation of the pressure groups about the environment’s safeguard and the people’s volitions to change their lifestyles, there are new environmental actions. In few European towns, we can see new attractive alternative kinds of transportation (tram-way, electricity car’s rent, bicycle’s rent) which are cleaner and less noisy, but they will have to show their proof.

- The Copenhagen / bicycle’s rapport

Copenhagen is not significantly different than other European towns, but she has always had a particular relation with her transportation means. This is because Copenhagen is a city where the citizens have been, for more than one century, use to use an alternative means of transportation: the bicycle. It was the beginning of a long story. Since this time, bicycles have never ceased to exist in the Danish hearts.

Despite that it was expensive and a luxury afforded only to the upper classes of society, the bikes has been introduced in Denmark in the late 1800s.
The quaint size and plain layout of Copenhagen was perfect for cycling to flourish. But with mass production, bicycle costs fell and popularity increased dramatically. Between 1890 and 1900 the number of cyclists increased from 3,000 to 30,000 and the bikes dominated the streets.

This occurrence would have been impossible without the creation of the Danish Cyclist Federation in 1905, which played a great role in the development of many infrastructures and good conditions. From 1912, Copenhagen had 50km of bicycles tracks. Moreover, the first Road Traffic Act in 1923 and the traffic rules of 1910 provided for the origination of a real culture.

More than a culture, the bikes became a necessity during the Second World War. In effect, even when public funds were limited, the government financed routes and recreational bikes tracks around Copenhagen to reduce unemployment.

The cycling’s using fell, with the pronounced migration from the central parts to the outlying areas, between the period 1950 and 80, while which the Copenhagen city’s population fell from 770,000 to 500,000.

The car revolution began slowly in Denmark because cars were not affordable or easy to use. Also, the motor lobby has never been as strong as in other countries, that why the sales tax on cars and so the car’s prices are immoderate. But the urban scattering have quickly compelled the Copenhageners to use cars or others common transports.

In the 1960’s, authorities rebuilt many roads and planned motorway systems, and these ten years are still known to have succeeded in removing the bicycles in many places. However, it was not forgotten.
Motoring projects therefore required many years of work and much financing, and beginning in the 1970s, the stretch of motorway opened, followed by many wide scale protests. When the first energy crisis hit in 1973, it became clear that a society based on fuel consumption was not sustainable and the protests of the pollutant car’s society flourished. Also, cycling in Copenhagen, alongside cars become dangerous unhealthy. The 1970s provoked mass popular demonstrations pro better conditions for cyclists. These demonstrations followed the 68’s manifestations context.

By early 1980s, Copenhagen saw a 50% increase of the bicycle traffic from its lowest ebb during the late 1960s. Now, since 1981, a lot of public budget has contained money to improve conditions for cyclists. The renewing popularly of cycling in the 1970s led to resumed construction and extension of bicycle tracks. By 1980, the city had built 240 km of tracks, and the city of Copenhagen made a bicycle track plan, reviewing all sections of road where there were none. And by 1982, many efforts were made to build bicycle tracks on these roads.

Today there are almost 390km of bike roads, of which 320 are cycle tracks, 15 of cycle lane, 40 of green cycle route (see the part concerning the urban planning for the differences kinds of cycle paths).

For 2025, the invests shall represent about DKK 123 million to improve the old and dangerous bicycle tracks, build about 50km of new tracks and other works. The Copenhagen’s commune committed to construct an additional 54km of bicycle tracks before the year 2012 in the Bike Track Priority Plan passed in council in 1997. These invests show the great Copenhagen’s city to give the opportunity to the bikes to reinvest the town of Copenhagen.

For one hundred years, Copenhagen has lived with bicycles, and much as the ups and downs, bicycle have always been in the streets of Copenhagen and the lives of the Copenhagener, thus making a bike culture: a culture that ensures the continuing presence of bikes in the Danish capital. Nowadays, problems of energy and pollution have added an international perspective to the Copenhagen cycling tradition.

- But how the Copenhagen’s citizens see the bicycle?

Where as in many countries, cycling has lost social status and cyclists can appear like poor or strange people. However, the Danish culture maintains a tolerance for minority groups, and cyclists were respected even when cars dominated the streets.

The enthusiasm for cycling in Copenhagen is due in part to the historical development of the town, described earlier. Most Danes associate bikes with something positive and they view the bicycle as mean of transport which is convenient and affordable. This daily utilisation of bicycles reflects a research of a healthy lifestyle and utmost consideration for the environment. Also, the bikes can appear as a part of gaining independence for young kids. For the Danes, cycling is also very “hygge”. Actually, the bicycle is included in Copenhagen’s society, with some offices and companies offering
bicycles to staff to go to meetings outside the outside instead of cars or taxis. Also, the stolen bikes can be fixed by the repair shops or, if they are not, these bikes are sent to the jails to be fixed by the prisoners. These two examples are perfect illustrations of the bike’s integration into the Danish society. The majority of Danes view bicycling as a daily way to move in the city and sometimes outside the boundaries of the old centre. They also view it like a means of transport: enjoyable, fast, healthy, respectful of the environment, and serviceable.

- Nevertheless, there are still problems

Despite the positive view of Copenhagen the inhabitants, there are still a few black points about functionality of bicycle system.

The main problem seems to be the lack of space to park the bikes. And we can see this need in the front of the main station of Copenhagen, where the bikes are piled up anarchically. The blocking of sidewalk by the bicycles doesn't stimulate bicycle use. This blocking of bikes in the Copenhagen’s streets and plazas, which we can also see in Højbro plads, is one of the features needed in the public areas. It’s an important project for the planners to reorganise the public area’s functionalities.

In these public areas we don’t have just the plazas but also the streets which we can see as flux. The streets and the traffic have also to be improved. In effect, the combination between buses, bikes, cars and pedestrian tracks does not work very well. Frequently, cyclists are used to stopping, because they have to stop at the red lights, because the bike tracks are always along the car’s routes. And when the bus is stopping, it’s all the traffic's fluidity which is trapped.

Also, the proximity between the two kinds of tracks (motor’s track/bike’s track) causes problems of safety, especially on the crossings where the car’s drivers don’t always pays attention. The problem of this proximity is also that the fumes exhausted by cars make the cycling in Copenhagen unhealthy. This is why the routes need to be more attractive.

For lot of cyclists the main problem when they are cycling is simply the other cyclists. That means the widths of paths are maybe not enough or the general traffic rules for cyclists are not known. As Bicycle Account 2004 can show it, the maintenance of the roads seems to be one of the worst deals concerning the cycling for theirs users. This is a matter for the safely of the cyclists and it may be uncomfortable too.

Short and long trips by bicycle cannot be addressed in the same way. We cannot design a bicycle plan without thinking about it as a part of an urban transport’s hub, which has to be designed strategically in order to make an attractive alternative to cars.

The crucial matter needed to be addressed by the commune is creating a harmony between all the different means of transport in a sustainable way.
COPENHAGEN: HOW BICYCLES CAN BECOME AN EFFICIENT MEANS OF PUBLIC TRANSPORTATION

2- METHODOLOGY

The project was carried out by doing a series of interviews, fieldwork, research, and web site inspections.

- Interview

In Copenhagen, we made numerous interviews. The goal of these interviews was to help us understand the global politically, financially, and the functioning of the bike system. They also gave us insight into the problems of the system and how it can be improved.

Our first interview with Niels Jensen from the department roads and parks in Copenhagen was really certain for the continuation of the project. This interview gave us much information on the current situation as much of answer for the question that we are posed for us. In more than one very satisfactory meet, Niels could provide us data and results of research which had been realized within this department.

The second interview was with Chritian Christiansen. As a secretary for the mayor of transportation and parks, Mr. Christiansen provided us with an important perspective on the operation. The information was more general, and included the global politics of the city. Some information in this interview was similar as the first. Nevertheless, Mr Christiansen included a global view of the city and told about the relation between the different politics level and how it is possible to elaborate a public politics.

Within each interviews a few questions were standard. Some of the questions were the same. And for some similar question, some answers and points of view were different. So we saw the different stake in the city. Some of the common questions included:

- What is your responsibility with the CBP?
- Are you pleased with the current program?
- Who are the targeted users of the bike program?
- Who currently uses the city-bikes?
- Do you have any plans to change the program or your relationship with the program in the near future?
- Do you have any suggestions on ways in which this program could be improved?

As we conducted interviews, we began to learn which topics have greater importance to the inner workings of the city-bike system. Some of these topics included: location of the bike racks, vandalism, smart-bike possibilities, and the general Danish mentality towards the program as a whole.
- **Research**

In more of the interviews, we undertook research through specific works. But also grace has Web sites, we could find various brief replies. This research enabled us to find qualitative and quantitative data. We found general data about statistic for the population and traffic for example and general theories to explain the mobility, the urban planning and transport system. Knowing that the system suggested with the GPS was like a starting point for us, we thus prepared our research and our perspectives around this postulate. Maybe that we fell into certain determinism, but that enabled us to find several field of research. Nevertheless from this idea about the GPS, we have to direct our questions and our research from that, which enabled us to have a precise objective and not to lose ourselves in too much data.

Moreover, we undertook research in order to find similar ideas and systems as our one. With the various systems of public cycle, which exist in various cities, there was the idea to introduce them into a part, in order to compare and to be inspired to find this time a product coherent for Copenhagen.

- **Comments**

With interviews, data and research, we were able to carry out the project presented. We have conscious that the project would have to be more provided and more completed. It will be hopefully, if we made some interviews in to the public in order to have their opinions on the current system, and on of any new systems. But the time was running out so we chose to focus more on research.

Moreover, our research was not in Danish, so maybe we missed some important data, notably to understand specific fieldwork like the Danish lifestyle and the bike culture. But the fact to be foreign, was the opportunities for us, to find some data, contact and example in own countries. For example we can cite the French company data-mobiles. We contacted this company to understand the process of the ship tracking and ask if a project like this it is possible. They answered yes and they proposed us money and staff to make a prototype. SO why not continue this project in this direction.
3- THEORETICAL FRAMEWORK

3.1- TRANSPORTATION THEORY

- Introduction and comments

The theory is an effort of unification of a group of phenomena which gathers law functions. The explanatory theory tries to construct a representative and explanatory model which rises, above the observable and therefore is condemned; not ever to be verifiable.

Thus, it should be affirmed that if the experimentation is determined by the theory than it is determined by the specified object. We are in front of an indecomposable whole where the perfect objectivity cannot be reached. Also the reality cannot be applied in some global theories.

Theories succeed when the theoretical observation deduced from the theory and the measurable real observation corresponds. It gives a truth but not more.

Today, the large cities and their inhabitants can suffer. It would seem that the efforts to maintain a human dimension are dedicated to the failure. Congested by circulation, disfigured by the same roads, the organizing principles of the city are at fault. The city remains an obsolete ideal of measurement in a time of disproportion and without values. But disproportion is the destiny of the cities.

- Is using theories to define the city a paradoxical method?

The theory can be seen as a fixed, explanatory object or a situation, which reveals truths and continuities. We can take the example of mathematical theories. The theorem of Pythagoras will remain the same, even if the times and the ways of life change.

But if there is a field which is not stable, it is the “City”. The city is in constant evolution and change. It is the interface of systems and the interactions between them. Contrary to a mathematics object, the city is not inert and will not remain inert. Moreover, the city functions by gathering some activities, individual’s choices and personal opinions which are often difficult to theorize. The city is a place of innovation.

The purpose of choosing theories to describe the city is to place themselves in a context, and to include and understand its function, but that remains only theories and not truth. This is why, each time we use theories or a concept to carry out this project, one should not lose view of the fact that that is only one assumption. And one tries to find assumptions relating to the theories in order to approach a truth.
The theory is a truth, an assumption, a lie. Did our behaviours within the city create theories or the theories dictate our acts?

Today, transports are a response to the growing cities. Transport is a convenience for many personas. People can use different means of transport for their needs because cities and activities create a demand. The movement of people creates the city. The number of people and the hour in the city change the distance between two points for a different moment in the day. Some movements will ask more of the transport system than others. Transportation is important for the geographer because it is one of the principal actors in the economic activity and social distribution. The transport has a direct effect in the cities distribution. Transport is in relation with the life-style in the city, and is integrated. So, we can see how transport systems are geographic.

- Transport system in geography

The historical approach grows with the development of technologies and innovations. Notably, it is the case with the creation of the rails network in UK and European industrial countries. Then, the quantitative revolution in 60's gave the geography new methods and new techniques to study transports. It was better to consider the complexity of the city and the statistical approach was a complement which gave a new tool to compare different kinds of transportation in the city and between cities. Today, transport in geography rests in continuing evolution, and the technique growth up continually too; we can use new systems like GIS to study the interaction between transport systems, city systems, individual demands and public supply. We can describe the relationship and the geographer must to look at the transport system in its whole.

In geography, the concept of transport is underlined with the mobility: an important concept in this estate. The relation is easy; people to move need transport systems. The mobility depends on the potential that people have to move. Because we are the uneven side of the mobility. In some ways it depends on the social standing and the life-style of each one and the resource to move (money, car...). And in another way, it depends on which types of mobility we want to make in relation to arrival and the starting places. The mobility by people gave the potential of transport. We can measure the mobility when it is physical, like trips, distances, times... and also, in qualitative which different purpose of the quality, the comfort and the time of the trip. The potential of mobility is harder to know, because it can be the potential or the non-potential of everybody to have contact, a relation, the capacity or no to be mobile and to do it or not. It depends of the offer of transport and the need of it.

In geography some concepts have been thought to explain the mobility and the relation in the city. We can see the concept of Christaller derived from the theory of the central places which accounts for the size, the spacing and the number of the cities. The model describes the hierarchical organization of a network of cities according to the level of the services which they offer, and their regular space provision. The model is subdivided in three different approaches: economic, space and transport. For us, we
are interested in the model of transport, this organization results from the cost that represents the distance to traverse of a secondary city towards a centre. So today, from this theory, maybe we can explain the organization inside the city and between the city and its districts and suburbs. There are different places. Some elementary and some second created and they are in relation between its. If we consider that in a city like Copenhagen, we can have different cities represented by the district (Nørreport Osterport...), we can see the relation, the localisation and the function for everyone. Even if this model is only a theory, it can help us to show the impact on the transport system.

![Fig2, Second model of Christaller. Source hypergeo.free.fr](image)

From this Christaller theory and to accrue our subject, we can show the central place theory, from Christaller too and Löch, explain the transport system in city. This theory makes a distinction between centre and peripheries. The centre supply goods and services, and in peripheries, population with demands. So principally there is mobility between centre peripheries and a second move between close peripheries.

![Fig3, Theory of central place. Source hypergeo.free.fr](image)

From their concept, we can make a hypothesis in the transport organization of Copenhagen. We can see the different relation in Copenhagen, between the city centre and the different district which are closed and a second relation between there district. When we look the transport organisation, roads, rail network, and metro are coming together from the city to irrigate the different district.
It is just to describe some relation between the center of Copenhagen and the close district. We can see that the centre (the city) has relation with every district, and each district has a relation with its neighbors. We need to take in note that two districts: Islands Brygge and Christianshavn are marked differently because the relations with their neighbors are less important owing to the fact that they are laid-off by one natural element, the presence of water. Bring back that it is just a hypothesis, and we try just to show how the different area of he city are connected and how this connexion have been made be cheaper.

Moreover the city of Copenhagen, or the finger plan, is famous. This plan is a regional plan in order to control the growth of the city. The establishments of the new various activities have been built along the five principal communication axis. In fact this scheme had as an aim of facility displacements in the metropolitan surface and ensuring a clean environment. The scheme proposed "a finger plan," according to which the new establishments would follow the five principal regional railway lines. New industries and tertiary sector will have to be established close to the intersection between the fingers and the agglomeration itself. The area close to the stations will be inhabited in an intensive way; on the other hand the more distant area will remain with low density of population. The zones between the fingers should remain unbuilt and held for leisure. The regional plan has remained the framework for the town-planning for 50 years. In 1960, the revision of the plan allowed the establishment of two new regional centres to relieve the centre town. During the Seventies, an important growth of the agglomeration threatened to stop the plan. Nevertheless the five units of the regional planning preserved it. Among the other actions were considered: the end of new installations and road and motorway establishments, the end of the arteries extension of communication to the centre town, a tariff system of dissuasive car park, pedestrian area, promoting the bicycle.
This policy of decentralization, the tertiary sector out of the two most important centres (Copenhagen and Frederiksberg) more than 75% of the new offices were established since 1980 outside these two cities. The number of pendulum works in Copenhagen decreased by 150 000 to 100 000 during the Eighties. Today the city of Hoje Tastrup, one of the regional centres indicated to delocalise the centre of Copenhagen, is located in one of the fingers identified in the plan.

The action was not a total success. It was difficult to convince the communities to impose this policy. For example, the communities had evilness to limit the new zones of employment close to the stations. More than 70% of the offices built since 1980 outside the centre were installed with more than one kilometre of a stop of transport. The control of the establishments in the centre led to an increase in the use of the car. The daily mobility from the home to work in Copenhagen is around 20 km whatsoever the place in the metropolitan surface. On the other hand only 20-25% of the inhabitants use a car in centre town, between 40 and 50% use some to go to work close a station in the suburbs, and 75-80% use one of them elsewhere. Nevertheless, the installation of Copenhagen followed great measurement in the scheme. Even if it did not achieve total success, the ratio utilisation of the car in Copenhagen is below the average of the country and other similar countries. The whole of these measurements slowed certainly down the growth of motorized circulation.

With this plan, Copenhagen can control mobility in the city. Even if it is not easy to impose a restrictive politic for the other municipality, this plan averted to have a city with a lot of car. In the same time, this plan was regulated by the offer of the public transport which helps the circulation in the plan and in the centre of Copenhagen. In fact, public transport was constituted in every “finger” and between this to connect the activity areas one to one with bus train and metro in the centre.

- Mobility in the transport system

The transport system in a city is the response to the mobility and the needs of mobility. The mobility can be described like the moving in the time and in the space. We can calculate this, in distance and in time. Today, in the city, mobility looks like a time, wasted time, or gain time when we move between two points. Activities in the city created and create dynamics for the mobility. Mobility represents a symbol, because it is a potential or not to move for everybody. Some people can have a low mobility, so they need help to settle this problem. It is the role of the politician to give a good
transport system which different kind of transport in order to everybody can profit of the city.

From the nineteenth century and the industrial revolution, the mobility is increasing. The transport growth too, it becomes easier and easier to move in the city because there is a great number of means set up. This increase influenced the localisation and the organisation of the activity, the production and the places of lives.

![Mobilities increasing in urban environment](image)

*Fig 6, Personal source. Created from Adobe illustrator, export to JPG format in November 2006*

From this graphic, we can see how the creation of a new transport system changes the city, and how the city activities and places of life create a transport system. We can take for starting point the places of life. Every day, people move in direction of places of work, or leisure... This mobility is carried out by means of transport. It is the authorities which organize, creates and control this system. A system gives the activity a certain flexibility to be established. And in the same way, these activities make need new forms of transport, which will also give new place of life.

So we can see how the mobility and the system transport are related. We cannot dissociate them one without the other. There is an intimate relation between these two concepts. Today, the mobility is increasing considerably, particularly in the city, which is why the authority must control the mobility. Urban planning, consequently, has to be efficient in controlling the enlargement of the city. The transport system must to have
superb organization in order to limit the pollution in the city. Today, the transport must to be thought to make the city look sustainable. Therefore, we will see the importance of the urban planning to control the various aspects of the urban growth.

- **Transport competition inside the city and the role of the State**

The theory holds that public transport can reduce traffic congestion, air pollution and energy consumption. The reality is that traffic congestion, air pollution and energy consumption are increasing. Today, the competition is hard. It is the case between public and individual transport and between the different kinds of transport. Moreover, governments are having difficulty finding funding for every transport. The demands are increasing and the competition is strong for the public funding. Public transport loses market and shares to the automobiles. This loss is the result to the dispersion of the travel. Cities are growing and the urban sprawl gives more destinations to people. So the tendency is to use the car which is a rational response to the urban development. And we know that the car is a symbol of impersonal freedom, so people choose more and more to travel by car. The personal choice is applied by a variety of situations and some criteria such as prices, speed, comfort, safety...For every trip, people will use that they think the greatest utility. This personal choice was studied by Jeremy Bentham and Daniel Kahneman in the “utility theory”. This neo-classical theory believes that the individual’s choice is the best judges of their own needs. People are responsible and they make the choice to travel and how to travel.

The planner and the politician mediate between the collective interests and the particular interests. The urban transport policies can have the possibility of choosing between two models of urban structures to ensure a balance between the two.

Two approaches are opposed when it comes time to establish a policy in transport: interests of the free-market and interests public. This raises the question: is it necessary for transport is to be profitable at all costs? There are both partisans of profit and those of public utility.

The questions surrounding transport have become quite a political debate. This has led to difficult choices which are often disputed and which can be called into question when there is a change of a political party.

- Types and the forecast of costs during the installation of great infrastructures.
- Localization of the infrastructures and their fastening.
- Services to be ensured to minority groups and poor people.
- Control of pollution, air, noise, as well as the protection of the landscapes.
We can use two kinds of policies as examples:

a) Ratemaking policies. These policies are concerned with the infrastructures (roads, parking) and the users (cost of displacement-travel). Various methods of tariffs are used, which in turn play a part in competition between the different modes of transportation. A toll is a simple means to recover the costs of the infrastructures from the users. The advantage of tolls is that they can be an important source of financing. The disadvantage of tolls is that they can affect poor people in their various types of trips.

b) Public policies and competition of the modes. Competition can exist between the rail and the road for the interior carriage of goods, between the train and the plane for interurban people transport and between the car and public transport for the travellers of urban transport. The roles of the State are to preserve the equality of the citizens, the safety of the people and goods, and the working conditions while at the same time respecting of the environment. It also has a role in the investment (for much of the infrastructures), in the financial assistance and the tax policy.

If the planner wants to integrate a new system in the city, they need to know how it functions. Nowadays it is known that in spite of the presence of public transport, the use of the car does not cease to increase. In spite of this growth, the planner must attempt to adapt to the new transport and they need to know the risks. Naturally, a public investment always involves some sort of risk.
3.2- POLICIES AND URBAN PLANNING

Previously, we saw that the city has some issues concerning the mobility of its people. Urban transport can be a problem in the city: noise, pollution and a sprawling city are just some examples. Because of this, authorities in relation with civil engineering need to find a solution and develop some regulation to control traffic. Moreover, with the recent concerns to the environment, more restriction has been made within an ecological framework.

First, we can look at the planning process and the process for developing polities. The process and the method are the same despite the location (ex: rural or urban area). The basic components of this analytical approach are subdivided into seven parts.

1- **Definition** What problem is the plan intended to solve?
2- **Projection** How will the situation develop if the problem continues?
3- **Constraints** What are the limits of finance, time, etc. Within which planning must take place?
4- **Option** What are the alternatives and their pros and cons?
5- **Formulation** What are the main alternatives plans, i.e. packages of available option within the prevailing constraints?
6- **Testing** How would each of the alternative plans work out in practice?
7- **Evaluation** Which plan gives the greatest value (within the constraints) in terms of solving the problems already defined?

*Fig 7, Rodney Tolley and Brian Turton: Transport systems, policy and planning. Longman group, Singapour, 1995*

First, we can look at the planning process and the process for developing polities. The process and the method are the same despite the location (ex: rural or urban area). The basic components of this analytical approach are subdivided into seven parts.

Of course, this process is theoretical and while it can reflect reality, it also can sometimes fail to address certain points like lack of time or finances. Also, the final part about evaluation of policies is not often recognized. However, public policy can come from problems which are shaped by the media. In the event of this problem, authorities will create some options to address it. The time of this cycle varies and it often depends on the problem at hand. Our project is concerned with the bicycle rental system in Copenhagen. Addressing this concern area can take up to ten years because one has to consider the problem, organize a solution, create the answer to the problem and afterwards conduct fieldwork to test and evaluate a new system. Furthermore, this cycle is time consuming because these stages are done by different public actors who will work together to find the best solution. This process becomes more complicated if political and/or service area opinions on how to approach the matter differ. That is why when we create an alternative to a problem, the framework must be well known and generally accepted.
In urban areas, the planning can be seen another way. There are relationships between different aspects, the population, the mobility and transport system, and the urban condition. Urban planning requires proper knowledge of data. An inventory must be done on transport and travel taking into consideration which trip, where, which route to use, economic activity, population growth and places of living. Urban planning has certain preconditions that must be addressed. We need to know the traffic flow, the distribution of houses in relation with the use of the land, employment levels, and urban economy. The objectives are to have an estimate of the city for now and for the future in order to find the best solution to the problem. The city and its different features (shopping, work, museums, etc.) draw people to it like a magnet and this complex transportation system must connect these people and places. The planning in urban areas can be more complex because it integrates a lot of these factors. That is why it is important to have a good working knowledge of the problem before the start.

- The multimodal exchange against the exclusion of mobility

Today, the multiplication of the means of transportation used by the population must be regarded as a positive phenomenon in order to integrate a dynamic and renewed strategy of transportation. The objective must be to facilitate mobility and to improve the current conditions by associating them with several means of transportation. Thus, the transportation development strategies must be not only be multimodal but also facilitate the passage of one mode to another.

Transport in the city is organized around places of exchange where the intermodality is played. These places are excellent points of mobility and they just as easily give the technical conditions of the passage of one mode to another. The environment is conducive for multimodal transport. The stake of this pole of exchange is that it is all at the same time a technical challenge, an institutional challenge and an architectural challenge. The poles of exchange - these places of mobility - are also places of the city.

For the individuals, the use of means of fast and flexible transports makes it possible to access the necessary services like the daily newspaper, transportation to and from work, to make a trip, to visit friends, go out and socialize, etc. In other words, the freedom and capacity to move easily, giving the possibility of benefiting fully from life. However, certain social groups, for various reasons, do not control their mobility completely and, so difficulties arise in ensuring the quality of their life.

In addition, other social groups are concerned with the difficulties of moving: they are the individuals who are in poor situations and may be excluded very often for economic reasons. Their exclusion results primarily from their incapacity to reach suitable transportation when necessary. In particular, they are the people who live in districts on the periphery of cities badly served by public transport which may not have means of individual or personalized transport, like a car (which could also be because the use of this mode is to too expensive). Thus, social exclusion and the exclusion of space are often associated. To meet the needs for these social groups, the offer in transport must
be reconsidered and adapted: it is a question of proposing systems of transport in order to ensure maximum accessibility - no district of the city must be badly served by transport. If we speak about mobility, that infers the existence of non-mobility. And this non-mobility reveals the difficulty of the society in dealing with these individuals who undergo social exclusion. On one side, the city and public transport must reduce motilities which are not used as often or not at all. On the other hand, public transportation must be sustainable and effective by ensuring mobility and access to all these places for the entire population.

“The various modes comprise very diverse combinations of the pleasure, hope, feared, kinaesthetic, suitability, trouble, slowness, comfort, speed, danger, risk, sociability, and joviality, health, surprised and so on.” John Urry.

More than the intermodal mode and the offer of public transport, the English sociologist, speaks about the choice, interpretation and social practice of everybody.

We can speak about personal choice. Given the means and options of transportation, the choice remains personal and depends on each citizen's vision of the city. This choice is dictated by codes and values which one acquires throughout their life. These codes and values are gathered in a single unit which dictates our conduits and ways of thinking. Each individual thus sees situations and experiences differently, and pronounces different judgements for a single means of transport. So it is the goal of a public transport to assemble these different ways of thinking. That is why an intermodal system is a great solution; in one unique pole, we can have different kinds of transportation and increase the odds of bringing people together.

When considering the different modes of transportation, Urry states that one single trip can be a moment of freedom and give the feeling that the trip could have no limits. During one trip, we can choose to continue, to stop, to change the direction... So the mobility can be hard to know and to calculate because it exits every time somebody chooses to use a mode and is left with countless options. Public transportation needs to address these issues in order to stay competitive because the private car continues to be the ultimate mean in allowing freedom during a trip.
4- URBAN PLANNING CONCERNING THE BICYCLE’S POLICY

Firstly, we can say that the cycling is integrated into all the levels of the Copenhagen’s planning.

In 1980, Bicycle Network Plan agreed by Copenhagen municipality after has been proposed in 1974.

By 1997, a planning called traffic and environment plan started to speak about few instruments concerning the improvement of Copenhagen’s traffic. The objectives were clear: the total rate of city motor traffic may not increase and using of public transport and bicycles had to increase.

Whit the City’s traffic improvement plan by 2000, the futures actions was more precise and explicit, especially with the subsection sub plan for the improvement of cycling conditions, which concern more the cycling. This sub plan formulated five mains which should be achieved before 2012. These aims are findable in the Cycle Policy 2002-2012 edited by the city of Copenhagen, building and construction administration, roads and parks department and are the following:

- The proportion of people cycling to workplaces in Copenhagen shall increase from 34% to 40%.
- Cyclist risk of serious injury or death shall decrease by 50%.
- The proportion of Copenhagen cyclists who feel safe cycling in town shall increase from 57% to 80%.
- Cyclist traveling speed on trips of over 5km shall increase by 10%.
- Cyclist comfort shall be improved so that cycle track surfaces deemed

Fig 8, Cycle Policy 2002-2012

To fulfill these aims, which are a subjective view of Copenhageners, the city of Copenhagen have formulated several concrete plans like cycle track priority plan (2001-2016), proposal for green cycle routes or again traffic safety plan for Copenhagen.
4.1- INFRASTRUCTURAL ELEMENTS

- **Cycle tracks and cycle lines**

The bicycle tracks of Copenhagen are the backbone of the bicycle traffic infrastructure of the city. Before 2001, date from which the plan which govern the building of new tracks and reinforced cycle lanes (*cycle track priority plan 2001-2016*), the cycle tracks were 307km and the cycle lanes, 9km.

The difference between cycle tracks and lanes is the morphology or the path:

a) The tracks are raising the height of the floor by two kerbs separating the bicycle paths from roadsides and pavement for pedestrians.
b) The lanes are in the same level than the roadside and in the pavement. The cycle lanes are more dangerous than the traditional tracks (not always, see the improving intersections part), that why the reinforced of these 9km of lanes is a road marked cycle lanes, building of short sections of cycle tracks.

![Fig 11, Copenhagen City of Cyclists](image)

By 2002, the objective was to build bike lanes where car speeds can be kept at 51km of cycle paths shall be built before the next 15 years and this program is estimated about DKK 123 million. With DKK 1.6 million per km for reinforced the cycle lanes and DKK 6.2 million. The cycle track priority plan sets DKK 8 million per year.

Every five years the road sections where the tracks and reinforced lanes have to be built are revised.

For the moment, cycle tracks and reinforced cycle tracks are projected for the roads Søndre Fasanvej, Enghavevej, Østrigsgade, Hammerichsgade at the Royal Hotel and at the TownHallSquare between Jernbanegade and Vesterbrogade. Major improvements for the cyclists in the historic city centre could be achieved by building bicycle tracks against one way-traffic in Bremerholm and Gothersgade. Today the track and lane length represent 343km.
- Improved intersections

Improve intersections has as goal to improve the cyclists safety, and also to facilitate the traffic for cyclists. That’s for this that the action plan is helped by two different plans: Traffic Safety Plan for Copenhagen and Traffic Improvement Plan. We know since a long time the cyclist casualties are more often happen on intersections.

To improve intersections safety, the municipality has few solutions, whose “set-back stop lines for cars” and “blue marked crossings for cyclists”. For the set-back stop lines the principle is to placing the stop line for cars roughly 4meters from the pedestrian crossing. Like that the motor drivers can see easier cyclists.
The blue marked crossing makes it clear that cyclists have the right of way and cyclists feel themselves more reassured

![Fig 13, Copenhagen City of Cyclists](image)

But put set-back stop lines is not always useful because some cycle tracks are shortened on intersections. Nevertheless, shortened or not, blue marked crossing improve significantly safety.

Recently, the planners have found that around crossings (30meters) it was more safety to put bicycle lanes in lieu of bicycle tracks. So it is another plan to put in place.

The *Traffic Improvement Plan* devote DKK0.5 million annually. The action plan to find intersection solutions are not only safe, but also make cyclists feel secure, that to answer to the goals that Copenhagen’s city has to attain for 2012.

- **Green cycle routes**

These kinds of cycle paths will exist principally for the long trips by bikes. The green cycle routes will be a new answer for the people who live outside the Copenhagen boundaries. The high standard of these paths with theirs width and comfort is also design to favour a traffic more fluent. In effect, the design of green cycle routes has been conceived to minimize the stops cyclists caused by the others traffics (stop of the bus or light lights). The green cycle routes will serve as perfect home-work routes.

The plan which govern these constructions, *proposals for green cycle routes (2000)*, plans to build 21 routes, a total of 110km. 30% of this network already exists but the standard and the plotting of the paths is not the future’s ones. In effect, these new routes will have a recreational function. For that, the Building and Construction Board and more precisely the Roads and Parks Department plans to build cycle route’s sections in connection with other construction like stations (to see the part referring the combination : bicycle and others means of transport), building projects, linear parks, squares or others attractive places.
We can already take cycling routes outside the city centre, such as the Vigerslev route, but may be it will be on the upgrade for make a higher standard. Also a connection will be establish between Ørestad new cycle routes and the so called new urban area.

The first green cycle route was approved to be built in Nørrebro (Nørrebro route) in 2000, and it should pass through Ryparken, Frederiksberg, Valby and vigerslev.

Another example could be the project set up in 2001, where a green cycle route should pass by the same plotting than the disused railroad track of the old Amager. This last example is mix two different plan, the proposals for green cycle routes and public transport plan from 1998.

4.2- BETTER CYCLE TRACK MAINTENANCE AND CLEANING

From 2000 to 2002, a maintenance action plan has been introduce to improve the tracks maintenance standard to a reasonable level. This comes from the Bicycle Account for 2000, in which cyclists continued to express their dissatisfaction with roads maintenance in general. After the survey, the Roads and Parks Department estimated, at their turn, that 10% of the tracks were clearly unacceptable. The goal of the cycle policy is that cycle tracks surfaces deemed unsatisfactory, measured by the comfort meter mounted shall not exceed 5%. The Bicycle Account 2004 showed that the unsatisfactory surface was 2%.

Usually, DDK 5 million are available each year for the cycle track maintenance, and for 2000 and 2001, it’s DKK10 million which has been gave, in addition of the DKK 5 million. If the surface is to be renewed every 15 years, the amount necessary for annual maintenance will be DKK 8 million.

The maintenance of the cycle’s network concern as the tracks maintenance as the intersection maintenance and consist in the repairing of the potholes and in the providing of many cycle track sections with new surfaces. And to know which section has to be improved, the Copenhagen’s municipality send a post card survey where cyclists could either declare they satisfied or say three cycle track sections which they want to see improved. In 2001, 4500 questionnaires post cards were distributed to cyclists.

The cycle track sections pointed to by cyclists has immediately been restored with a high priority. Also, for technical reasons, several months may pass before the final surface is laid down.

The maintenance of cycle tracks cost lot of money which spends energy and disquiet the traffic. But yet, the Bicycle Account 2004 showed just a little decreasing of the cyclist unsatisfactory. This action plan to improve the cycle track maintenance stays for the moment a miscarriage.
Also the cycle track maintenance concerns the action plan to improve cycle tracks cleaning. This action plan consists chiefly in the cleaning of the broken glass and others rubbish on the weekend and, the leaves and snow clearance for every weekday. The weekend clearance concern principally, 50km of cycle tracks along shopping streets and places of entertainment.

The snow clearance be made into 15 routes of 20km each, and cost an annual expenditure about DDK 4.2 million. Altogether, the clearance of cycle tracks is about DKK5 million per year, and is according to the City Plan 2001.

4.3- IMPROVING CYCLING NETWORK IN THE CITY CENTRE

The traffic cycling conditions on the centre are not satisfactory. In effect, we can’t cycle everywhere. The problem is the one-way traffic, caused by the scarcity of space itself caused by the car roads and the pedestrian paths.

For the network problem, the municipality of Copenhagen want to insert cycle link-ups, cycle rings along the city centre, and remove whenever possible the one-ways restrictive. But cycle link-ups are designed with a special regard to pedestrians interests. However, the traffic car can be remove in the centre, that’s why, Traffic Calming in the City Centre – After a Harbour Tunnel is Built has been created, with a potential idea to implanted a city centre without cars (see the part: how can we develop a new system), or again a harbour tunnel which keep the car’s drivers to through the city centre to go to work.

Before these entire plans grow up, the municipality has started to build the layout of link-ups which make possible to cycle from a place to another in both way, and one has been established in Nørregade. Then the Copenhagen's City wants to build future ones in Strædet to make possible so traffic Rådhuspladsen and Kongens Nytorv in both way. The same kind of deal will be possible on Vestergade from Gammeltorv to Rådhuspladsen, or again on Bremerholm. The municipality is also enthusiastic with the idea to plan cycle ring around the historic city centre, like by example a short section on Gothersgade and try to limit the access for cars and buses.

This action plan is not without relation with the three action plan above, that prove that the policies are thought together and that is a work of group which can be possible just in combining the work cellules.
4.4- CAMPAIGNS AND INFORMATION

The differences campaigns and others information about cycling and cyclists in Copenhagen continues to be an integral part of the city’s strategies. Cycling promotion campaigns are generally carried out by the city of Copenhagen in co-ordination with few other organizations, such as Copenhagen Health and Care Administration, for the winter cycling and health campaigns.

Since 1996, the “we bike to work” campaign is an event co-operated by the Danish Cyclist Federation, may be one of the bigger event as in 2001, 15,000 participants was in the city of Copenhagen for his event.

Also information is often edited such as Bicycle Account or the map cycling in Copenhagen. In 2001, like in 2000, the city organized an environment transportation week, but conclude by a “car free” weekend. Upon several occasions the City of Copenhagen has asked to point out cycle tracks which have to improve (the survey which we have spoken in cycle tracks maintenance).

Despite these initiatives, it’s difficult to reach a large public with cycling information. That’s why the municipality wants to target theirs information on specific group, by example immigrants who probably cycle less than the other Copenhageners. The municipality of Copenhagen is also involved in the diffusion process of the City Bike to improve advertisement for Copenhagen as a tourist city. But the information and the results of these two last planning or wish of the City of Copenhagen has again to make our proofs, because it’s not very tawdry, when we walk in Copenhagen and the more important for advisement of information is to be seen.

4.5- BICYCLE PARKING

In the last Bicycle Account we can see that bicycle parking is the worse thing about the cycle infrastructures, more than 65% of the Copenhagen’s cyclists are unsatisfied by the bicycle racks situation. The question of bicycle parking is not new, for long time ago we speak about how resolved this problem. And the problem is not finished because there are again lots of needs in cycle racks mostly in the densely populated urban areas.

To keep a straight face to this lack of parking bicycle parking, they think about where and how set up the racks. For that they work on fore principal cases: install a connection with public transport, the way work-home, at the shop centres, and on streets in general. The question to put bicycle parking at homes and workplaces is a private affair by can be influenced by lows and planning. Inn effect, the City can set up restriction about the implantation of parking spaces for cars in order to established bicycle parking, especially in residential areas. But in the reality, this eventual plan to favor cycle racks appear as contradictor because house owners have to pay to installed racks. That’s why we can sometime see heaps of bicycles in streets.
For the bicycle racks implanted in a front of institution frequented by a large public, the rack infrastructures are very popular. It’s not without surprise that all the areas frequented by a large public needs bicycle tracks. But we also must to think if other means of transport service these large public’s areas because we have to see, as every time, bikes like an tool serving to the traffic in general. More over racks must not to be on the way of the pedestrian like it could be the case in shopping streets. The needs of place are more and more a preoccupation for urban planners and for the urban traffic’s planners as well. But also the demand for bicycle parking places is feeling in all Copenhagen’s City. But we can see on the table below that Copenhageners cyclists are less and less satisfied about the bicycle parking condition.

<table>
<thead>
<tr>
<th>Year</th>
<th>Bicycle Parking Places</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004:</td>
<td><img src="image1" alt="Bicycle Parking" /></td>
</tr>
<tr>
<td>2002:</td>
<td><img src="image2" alt="Bicycle Parking" /></td>
</tr>
<tr>
<td>1995:</td>
<td><img src="image3" alt="Bicycle Parking" /></td>
</tr>
</tbody>
</table>

Fig, 14, www.vejpark.kk.dk

At this time, we can count about 3300 places of bicycle parking and 500 new other ones should set up in the centre of Copenhagen. If for a long time ago the needs in bicycle tracks is feeling, the problem of the bike’s heaps still here, and as well as to give cycling a bad name, this problem harm to all the traffic and so to the whole of the Copenhageners and not just the cyclists. The question of where we should put racks is asking outside the city centre, to favour the switching with other transport publics for the longer trip.

4.6- COMBINING CYCLING AND PUBLIC TRANSPORT

Behind this action plan many plans combines themselves with many organisms. In effect City of Copenhagen, Copenhagen Transport and Danish State Railways try to collaborated together to find the better way to make a combination of cycling and public transport. For that they refer to the City plan 2001, but also the Public Transport Plan 1998 and the Traffic Improvement Plan. They stared to works about how to implant bicycling parking at stations and terminals. This being just a prerequisite, they want after make a combination between cycling and public transport with on eye to last a flexible solution which could be an alternative to private cars.

We can also see trains where bikes are allowed on commuters, but with restriction while rush hours. However, with the most developments bikes can be allowed during rush hours but in the opposite direction to the mean traffic. Moreover bicycles are
permitted in the new red metro (S-tog) around the clock. Carriage of bikes in the train and new metro is helped by wheeling ramps.

The Danish State Railway’s objective for the suburban train system was that 25% of parking spaces at stations should be lockable and 50% covered, the rest will be ordinary bicycle racks. In the same idea Copenhagen Central Station and Østerport station has tried the cycle centres to improving facilities. That consisted to set up covered and locked bicycle parking, affiliated by cycle shops proved repair service. But folks didn’t use it, because this service was not free and Copenhageners was not yet ready to pay for bikes parking.

Lot of the others action plan converge to this last plan. It’s the case of the green cycle routes plan which speaks about transport cyclists by these green routes to stations. It’s also the case of the bicycle parking which the planners want to put near the public transport’s stations.

\[
\begin{array}{|c|c|c|c|c|c|}
\hline
\hline
\text{Proportion who cycle to work (%) } & 36^* & 32^{**} & 34 & 30 & 30 \\
\text{Cyclist risk (serious casualty per 1 million cycle km) } & 0.30 & 0.38 & 0.38 & 0.52 & 0.74 \\
\text{Cyclist sense of security (%) } & 58 & 56 & 57 & 58 & 60 \\
\text{Cyclist travelling speed (km/h) } & 15.3 & - & - & - & - \\
\text{Cycling comfort (unsatisfactory surface in %) } & 2^* & 5 & 10 & - & - \\
\hline
\end{array}
\]

Fig 15, Bicycle Account 2004. City of Copenhagen

The urban planning concerning the cycling is as well planed to improve the cycling conditions as the whole of urban traffic in Copenhagen. Also, we can see the different action plans are not separated each others. Some similitude and interactions can be seen what show a certain confirmation of the same interest’s convergence. Even, few problems are still here. In split the weighty investments, cyclists still unsatisfied about cycling conditions (bicycle parking, roads maintenance or feasibility of combining cycling with public transport). City of Copenhagen and planners has until 2012 to fulfill Copenhagener’s cyclist’s needs. Do not they need another life?
5- PUBLIC BICYCLES IN COPENHAGEN

To work on a new system to rent bikes, we first need to study the old one. Actually it’s still going, but not properly. For this reason our goal is to get information and try to describe our ideas for make it better. So, the first step is know all about it and for this we have used different sources: books, articles, internet and interviews.

5.1- THE CITY-BIKE SYSTEM

- Precedents: bicycle-sharing programs

According to P. J. DeMaio there have been four generations of public use bicycles since his implementation. The first bike share program was launched in 1968 in Amsterdam (Netherlands). It was called ‘white bikes’. It was basically a supply of donated bikes, painted white for easy identification, which you could use and left in the streets. This was a plan related to the discussion for removing all motorized vehicles from the city center. However, bicycles were stolen and the program was collapsed in few time. Something similar was tried in Milan (Italy) but with the same consequences.

The second generation of public bikes was launched in Copenhagen (Denmark) in 1995. As we will analyse, the difference between the first system is that bikes were specially manufactured and also you had to pick up and return them at specific locations. The way of tacking the bicycle was a novelty, because they have an integrated coin operated locking system, similar to use like supermarket trolleys.

Nevertheless, the problem of theft continued. So it gave rise to the third generation, also called Smart Bikes. New technologies offer a solution on customer honesty, because the using of magnetic cards to get bicycle allow to know the customer identity. So the bike should not be lost. There are two kinds of locking systems. In the first you can get the bike from an automated rack by using a special magnetic card. Companies as Clear Channel Adshel, JC Decaux and Gewista use this technology; we can find examples in Rennes (France) or in Porsgrunn (Norway). In the other one, bikes are checked out also from an automated rack but using the mobile phone for get a code. The enterprise Deutsche Bahn uses it; we can find examples in London (United Kingdom) and in Berlin (Germany).

Fourth generation of public use bicycles are still beginning to be implemented. The system pretends to integrate the magnetic card used for locking bikes in the public transport system (buses, metro, commuter train). The advantage for the costumer is the coordination of all the commuting transit in a single card. It seems to be a good strategy to encourage people to use less the car. This new project has been implemented in Washington DC (USA).
- History of City-Bike

The existing system of public use bicycle in Copenhagen is called City-Bike and it was born in 1995. However, if we wanted to know the precise date of creation, we would go back until 1989. It was a private initiative founded by Morten Sadolin and Ole Wessung. They received support from the municipality, because the administration thought it was a good idea to stop the theft. Also they wanted to offer to inhabitants the possibility to use public bicycles for commuting. As Niels Jensen explain to us “...for example, they could go by train and at the train station they could pick the City-Bike and then go to work place.”

Copenhagen has become widely famous due to this project. Some other cities has taken the idea for establish a system of free bikes to ride in the city. The basic idea of City-Bike is to have a fleet of public bikes which can be used by everybody on payment of a small deposit.

The original project was commercially based. The bikes and associated maintenance activities have been paid for by advertisements on the City-Bikes and special racks have been made for them. Several attempts to find private investors were made, but the result was only a significant input of public money and practical support. So in 1991 the project went bankrupt due to funding problems.

In 1995 a private company (Fonden Bycyklen i København) was established and gradually this Foundation started to run the project. They had a deal with the municipality, so City-Bike finish to be responsibility of the municipality. However, they has supplied the project with parking racks as well as the necessary space for them all over the city centre at no cost. According to Niels Jensen, “the City didn’t want to be involved. It was no problem really; it was decided that they should run it and the City shouldn’t do anything, only helping them with the parking spaces.”

The new owner is a non-profit foundation created by the Municipality, the Ministry of Communication and Tourism, the Ministry of Culture, and the ‘Wonderful Copenhagen’ tourism organisation.

So in late 1994 the project re-emerged with a funding from the organisation for green interests ‘The Green Fund’, the Ministry of Environment and two pioneer sponsors (the Supermarket chain ‘Netto’ and the newspaper ‘Politiken’). One year later, they put 700 City-Bike in the streets of Copenhagen.

In 1996 Copenhagen became the cultural capital of Europe, and this gave a lot of popularity to the system. The City-Bike remains the subject of great public focus both in Denmark and internationally. Christian Christiansen has told to us: “City-Bike was very popular in this time, but it increased even more during this cultural year. The sponsors came in that time and during two or three years more”. In 1997 there were 2000 bicycles and it was the maximum during some years. But gradually the problems

1 To see the context of the literal words, all interviews are available in the Annex.
started, especially related to the bad use of bikes; thief and vandalism were the major challenge. From this moment, after the growth phase of the project, it has been going down because they lost several bikes and also the sponsors went out.

We can read in ‘Copenhagen City of Cyclists’, a publication of the Municipality from 1997 that “…there are still not enough City-Bike to satisfy demand. The aim is to increase the City-Bike fleet to 5000 by the year 2000.” Nowadays the total number of bicycles is only 2000, the same quantity than in 1997. The maximum was 2500, just half of the expectation. Moreover, in words of Christian Christiansen “we have 2000 bicycles and that’s the level we want to keep it on”. So it’s clear the project doesn’t work with the same force than at the beginning. Something it's wrong because the will of the municipality was continuing to improve it. This is our purpose, studying why not?

It’s also important to know that City-Bikes are removed from late autumn to early spring, because that’s the period when some team specialized repair them.

- How to use it

Using the City-Bike is easy. The user just have to find one of the 110 racks with a available bike. Then deposit 20 DKK coin (2,7 EURO) in a slot, found on the handlebar of the bike, to unlock the bike from the stand. After using it all the time you need, but without crossing the borders of the inner city, you must return the City-Bike in one of the special racks (not necessarily the same) for getting back the money. After this, the bicycle is ready for another customer. It’s exactly the same procedure that supermarket trolleys system.

So the freedom for using it seems to be enormous. That’s it. However, the user must be carefully to some restriccions. It’s not possible to ride it during the night because there aren’t lamps. It’s no legal to use it as an own bike, so the user have to return it in the appropriate stands and don’t lock it with the own locker. Also it’s forbidden to cross over the delimited boundaries; then police might fine the cyclist.

This bikes are designed specially for have a long duration. They are provided with solid tires to make more difficult a puncture. The seats can be adjusted depending on the user. They are economic because they don’t have extra facilities, like speed change, lamps, basket or brake on the handlebar (only by pedaling backward). This absence of extra parts also are useful to avoid theft. The general dessign has the premise to not be a confortable bike to ride so much time, with the purpose of being used more for commuting between near places. The components of City-Bike also are incompatible with common bikes and needs a special tool to disassemble them.

Fig 16, City-Bike rack with one bicycle broken.
Source: own photo.
The appearance of City-Bike has to be totally different from a common bike, also because one of the objectives is to be flashy. The sponsoring company’s advertisements are located on the disk wheels and in the horizontal panel between both wheels. Due to this the project receives money.

- **Why we want to change it?**

As we have seen it, City-Bike project has a long history and very irregular. But in general we can describe his life as a first growing produced by a novelty; and after his success, it went down until now. It seems to be stable but with a lot of problems behind that maybe threaten to finish with the project. For this reason we think we need to analyse the troubles and write a optimal solution.
We base our motives for change it in different kind of theories, especially economics, than explain how a product reacts: the Product Life Cycle (T. Levitt) and the Theory of Economic Development (J. A. Schumpeter).

It’s well-known the theory of Product Life Cycle, which describes the natural process of a product in a normal market environment. We are conscious that our area of study it’s not like a market situation, but a public service. So it could be possible to discuss if this theory is applicable to City-Bikes. However we think that the concept of this project has lost his identity, so it could be comparable to a product you can buy for few time; although it’s true it’s not based on demand of marked and it’s an enterprise the responsible to decide how many bikes will be available. Our perception of theory of Product Life Cycle is based on the desire of people (commuters, and not tourists) to use it. So in this sense we want to compare a service like this to other products that people (Copenhageners in this case) consume.

This concept has significant impact upon business strategy and corporate performance. So we take this as our base of study, because we think than after 11 years City-Bike need another impulse before it arrive to the withdrawal phase.

*The Product Life Cycle*

It’s based upon the biological life cycle. For example, a seed is planted (introduction); it begins to sprout (growth); it shoots out leaves and puts down roots as it becomes an adult (maturity); after a long period as an adult the plant begins to shrink and die out (decline).

In theory it’s the same for a product. After a period of development it is introduced or launched into the market; it gains more and more customers as it grows; eventually the market stabilises and the product becomes mature; then after a period of time the product is overtaken by development and the introduction of superior competitors, it goes into decline and is eventually withdrawn.

However, most products don’t follow this phases. Or the length of each stage varies enormously, because the decisions of marketers can change the stage.
Another author useful for explain the necessity to introduce a change in the City-Bike project is the theory writed by J. A. Schumpeter. His vision is centred into the business world, however the final goal of his theory is apply it to the general economy. So, taking this example of macroeconomy we think it's possible to understand it for our purpose.

J. A. Schumpeter (Austian economist, 1883-1950) talks about conception of ciclic and irregular features of the economic growth, developed in 1911 on *The Theory of Economic Development*. He write about the 'stationary state' of the economy. Although he believes that an innovation can make possible to change it into a 'developing state'. Only the innovative activities can break the equilibrium of the 'stationary state'. And as we see in the next frame, there are five different types.

So in his opinion, the application of this function distinguishes the enterprising businessman from the simple manager than make routine decisions. That’s good to reflect about the necessity of re-adjust City-Bike project, and also about the hardworking nature of the idea for being more ambitious.

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**The Theory of Economic Development**

For Schumpeter, an innovation consists in a productive utilisation of an invent. In this sense there are five kind of innovations:

a) Introduction of new goods or goods with a new quality.

b) Introduction of a new productive method existent in another sector.

c) Opening a new market.

d) Try to find new sources of raw material.

e) Establishment of a new organisation.

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Another author useful for explain the necessity to introduce a change in the City-Bike project is the theory writed by J. A. Schumpeter. His vision is centred into the business world, however the final goal of his theory is apply it to the general economy. So, taking this example of macroeconomy we think it's possible to understand it for our purpose.
As follows, we want to show a own made graphic that draws the evolution of City-Bike project. The intention is trying to prove both theories just explained. The principal part of the figure in red line is the real evolution of the program, according to the number of bikes available during the period. The shape of the line could be comparable to the theory of Product Life Cycle, although keeping the differences of the applicability because that’s a service and not a product. But concerning to the desire of users, the result is that the project is going down. Also we can see the perspective of the municipality of Copenhagen, which in 1997 hoped an increase until 5000 bikes from next years.

The question mark of the graph permits us to imagine three different scenarios in the future. The ‘future A’ could be a continuity of the present policy, thinking in the worst views. The ‘future B’ could be something as an extension of the current situation also, but not so much pessimistic. And the ‘future C’ should be the correct way. But this improvement only can be possible with a new strategy to develop the program, as introduction of technology or working in new challenges. This is exactly what Schumpeter says: an innovation is the responsible of the change from the ‘stationary state’ to the ‘developing state’. According to these theories we will put forward our suggestions.
- Problems of City-Bike

According to our explanations for why City-Bike project need to make a change, it’s clear it’s necessary also a part of critique. We have know the history of the project. But if we stop the history in today, we will find some problems. With the fieldwork it’s easy to understand some of them, but also our interviews help us to have a more deep opinion. This is the list of problems we find as relevants: theft, vandalism, kind of users, economic support, ambition of administration, lack of incentives for inhabitants, design of bikes, design of racks, lack of information.

a) Theft

Perhaps that’s the most important disadvantage because the spirit of the system is that bikes should be publics. Sharing bikes must be the essential concept, but if people steal them nobody more can use them. If a bike remains in the house of someone, this bike maybe could lose tens of customers. And unfortunately that happen, so something have to avoid this.

This fragment of the interview with Niels Jensen it’s so explicit: “when we were still involved in the project we made an investigation to see how it works... we tried to follow some of the City-Bikes, because we counted how many bicycles could we find in the parking. We counted in the day time and in the night time, because they should all be back during the night. But we could only find 100 bikes in the parking stands, while there were 1000 City-Bikes. So, where were all the other ones? That was what we ask our selves... And then we tried to follow some people using them. And some people crossed the border without leaving the bikes, when there were supposed to don’t cross over the border. And this people went back where they live and took it into the back garage, using it as their own private bike! And when it’s broken you just throw it away…”

b) Vandalism

This problem is still related with the theft, as we have seen in the fragment. People, specially young people, don’t respect the urban furniture. And City-Bike are part of this. But this is a social and global problem. So the solution pass to make more education, something complex. But there are some indirect solutions to reduce this.

Broking some part of a bike, throwing it away somewhere, breaking the locks, painting it, etc. This makes the reparations expensive and increase the total cost of the project. Also it’s bad for the image of bikes, and finally the sponsors want to stop contracts.

c) Kind of users

The purpose of the initiative was that City-Bike should became another option for people who commute. But reality shows that customers are people without this
intention. Tourists are people who use them more often, because it’s a really good idea to ride the city with them. Of course it should not be forbidden, but this was not the idea. And perhaps that makes the system even more unreliable for the inhabitants of Copenhagen.

Niels Jensen also described this perfectly: “we went out in the street for interviewing people which using the bicycles. And we find out that half of the users where tourists and other half were young Danish kids that use the bikes as a toy, just for fun… They used for 500 meters and then they left it again. So it was no good, because few people uses it as part of commuting.”

d) Economic support

The basis of the project is to have economic support from sponsors and advertisements. It’s difficult to pay all only like this, but it should be an important part of the budget. As Christian Christiansen has told us, “from then (year 2000) it has gone little down, because we have lost a lot of City-Bikes and sponsors.” So the strategy should be to increase the sponsors for try to re-activate the project as the beginning. And for make this, all the system should work properly because all is related; finally the image is the most important.

In relation of this, a team for repair some damages should work with more effectively. We know that this service exists, but we think it could function better. Because in fact the destroyed bikes are a kind of urban pollution.

e) Ambition of administration

The support of the administration also is very relevant, because in fact the space for using City-Bikes concern to the municipality. And repeating the same idea, the image is a problem of everybody, also for the town. The municipality of Copenhagen was really involved at first. After the direction change into a private company. However both interests are related, so they should work more hard and with more ambition. Also the municipality of Frederiksberg have to participate in this program; is a question of proximity.

Another time we use the words of Niels Jensen to clarify: “we are not trying to make it better because it’s not our responsibility, but I think Road and Parks Department should be more interested in the project; because it has to do with the image of the city as Copenhagen as the City of Cyclists. I think we should be more interested in the City-Bike project, really. But it’s just what I think and not the attitude in the Department.”

f) Lack of incentives for inhabitants

The quantity of bikes today (2000 of them) is not really enough to cover all inhabitants’ needs of Copenhagen. There are no more bicycles because the first idea of the project was failed, so it could be a flop putting more bikes. However the aim should be to have
more available City-Bikes, because as a public service the availability and accessibility are an essential points. Of course this is a bad symptom because for a commuter that’s not a guarantee. Finally it produce that inhabitants don’t believe on the project and they choose to ride own bikes.

This is the opinion of Niels Jensen: “if you want to have a system which could work as it was intended, I think you need much more City-Bikes. Now we have between 1000-2000 bikes and that’s too few to work as a reliable system for people commuting into the town, because they never know if there is a City-Bike available. So that’s a problem... And usually you need two bikes, because you go to the station on your own bicycle, and then after taking the train you have to use another one for going to the work place. So instead of your own one, you could have a City-Bike of course.”

Actually inhabitants of Copenhagen are used to ride their own bike and it’s difficult to change the mind of people who have a tradition. But we think that the idea it’s good, or was good. For this reason we work for improving it, but not for now. Our ideas have been thought out for the future, not so far, but not for now because introducing a GPS system on public bikes, building underground parkings for bikes around the city or thinking in close to cars the city, are something that need a reflection and a process. So we also think that it’s possible to work on this because we will think in the new generations, that don’t have a deep culture of using own bike.

g) Design of bikes

Even though the design of City-Bikes is thought for avoid the theft, data confirm that anyway people continue to stealing them. The bicycles are very uncomfortable to ride, so that’s useful for using it for short trips, but moreover produce the effect that people don’t like to use it. Too many people reproach the design and a sit uncomfortable. Also there aren’t space for personal belongings. Unlock the bike with a coin of 20 DKK can be a problem too, if the user doesn’t have it.

h) Design of racks

The problem with the racks is that his design is very simple. It could be more complet with more space for advertisements. Also there aren’t support for bikes, so many times you can find them on the floor. It’s too easy to lock a private bike, and this should not be like this. This decreases the quality for sponsors.

i) Lack of information

We think that also is not so much clear the general function of City-Bikes. Specially if you don’t know too much the city, it’s difficult to know where find bikes and where putting when you finish to use them. It’s not easy to find a map with all the racks availables. Also the explanations about how to use it and the prohibition to cross the borders are not very clear. The web page also could be better.
5.2- HOW CAN WE DEVELOP A NEW SYSTEM?

- Reflection about the bike program

As we have seen, the problems of City-Bikes are several. In general all of them are very related, so we think that for improving the system it is necessary to work on make progress in all the factors. It's like a circle of problems and improving only one of them it's not enough.

The City-Bikes are the image of the city, so the municipality needs to find a new solution, to repair the system. There must be a dialogue with all the populations concerning the different political levels, the private partners and especially the users. A new system must to be guided by a deal of the politician to the citizens. In first, politicians need to know what are needs and requests for the users. So, the municipality must to make different survey to know the entire different requests.

Previously, we have seen some problems. Studies as well as the future project must be able of diminish these misses. One of the main problems was the fact of not knowing where there was a bicycle available. So many people did not use the system for this reason. To answer these requests, a new system will need a great number of bicycles, which users can borrow in the strategic places of Copenhagen: train and bus stations, central places close to shops and pedestrian streets, leisure places, etc.

Nevertheless we can keep the same perimeter initially that the old model, a space restricted known. This space is suitable to this function. The streets are more or less adapted to the cycle utilisation, there is a relationship to the other types of public transport, etc. So this space can be use as initial area for the new system. Thereafter, it could be increased in order to concern even more people.

Moreover to respond the needs of the citizens, it could be good find new population to conquest to use of bikes. The new system should help to create new approaches to the culture of cycling. The innovation should have an image of revival from the old model, and it should have a message of modernity in the renewable urban planning. Thus new system has to attract the generations to become a success in the future.

In order to have a simple system, we can use the new technologies. And GPS (Global Positioning System) can do it. In first, used and developed by the army, today GPS has become a vital global utility, indispensible for modern navigation on land, sea, and air around the world. Different means of transport use this navigation system to find the way. But GPS can also be used to locate an object. On this point we are interested and we think we can find several applications.

The new system can connect different attributes like the user of the bike, the mobile phone and the bicycle. Starting from the cell phone, the user can find an available bike (which has a chip), that can be near his necessities.
For instance we can take an example from somebody who lives in Roskilde and takes the train every day to go to Copenhagen to work. When he arrives in the station, he consults with his mobile phone, and due to GPS and mapping system, he can easily know where there are available bicycles. With this public bike, he can commute easily and use train and bike for going to his work place, for instance in Islands Brygge.

People who wish to use these bicycles could subscribe into the system, for receiving the information on their mobile phone. From this system, we can imagine different assumption for the future. As for example, with the activation of the system, users can use the mobile and the GPS system to find their ways and some other information related to the city: opening hours of public offices, location of restaurants, etc.

This system is not an individual mean of transport, because these bikes should be publics, so it must be considered like a new collective mean of transport in the city. It can be a new transport in the urban renewal. Each inhabitant will be able to benefit from this system. This system of borrowing a bike is an assumption for the future, which could be realizable after 10 years for instance.

This new public system can be ambitious in so far as it’s very flexible and simple to use. However that requires an enough quantity of bicycle in disposition for everybody. For this, the municipality should make an effort, perhaps in collaboration with private investors. As the old system, this could be free if some private sponsor invests on it. So to reduce the first cost, it could be good. The sponsors will be able to put their publicity on the bicycle like in the old model, but also in the cell phone for the people who get the information.

In first, this system is addressed initially to the people who use every day the city of Copenhagen, which makes live the city whatever are the place and the time. This people are called commuters. This system, like an alternative mean of transport, it could be a priority to decrease in the long term the number of car circulating in the center.

Secondly, this system can be used by tourist and visitors who stay in Copenhagen temporally. It could be possible to buy temporal subscriptions in places like the tourist information, the municipality, the train station or in some hotels.

This system has a price. As we have said, launch a big quantity of bikes is something expensive. Moreover, the GPS system has a price too. When we ask to this in our two interviews, both told us that it’s something really expensive. But after listening again the interviews we realized that they thought we were talking about the possibility to put a navigator to the bikes. So this was a mistake of communication that we need to remark. So, integrate a chip in the cycle will not suppose a high spending of money. For example, it’s known that some animals have this kind of chips in order to follow their traces. And also there are enterprises that offer system which allows tracks vehicles. A chip transmitter like this doesn’t cost more than 50 Euros.
The organization around the GPS system is maybe more expensive because it needs a lots of people working behind. The information and the data of the city should be adapted to use in the mobile phone. And information has to be updated in real time. For example, to know if a road is under construction.

This GPS system could be useful for the municipality too. The city can decrease the number of stolen bicycles due to the chip tracking. And also the police could be in alert if a bike leaves the boundary permitted.

- Parking considerations

Apart from the costs commented, the municipality also should take care into the parking problem. As we have seen, City-Bike has several problems in this sense. Therefore we think that also there might be improvements in this sense. A new parking generations are available in the marked, with more facilities and safety.

We thought in a system called Biceberg, which consist in an automatic and underground parking. This is the line that municipality of Copenhagen seems to follow, according to Niels Jensen words: “In fact we intend to try a Spanish system called Biceberg to see how it works… But the problem with the automatic system is that you must wait. So we don’t think it’s very useful close to the train station for example, but maybe it could be useful in the centre of Copenhagen. We have two possible locations to put it up: Rådhus-pladsen or Højbro Plads. Here there are a lot of bicycles on the ground, where people move around. We need some experiences and try out to see if it’s working … In fact we are in touch with this company, and we are adjusting details as the space for the bikes.”

Actually we knew this system before having the interview, and we thought it could be very useful for our project. And it was surprising to discover that the technicians in the municipality are thinking about this. So it seems to be a good idea to prove if it works in this city. Their idea is doing it for private bikes; however the adaptation for offering public bikes it would not be difficult. It’s correct make a pilot project for knowing the answer of the people. However it seems a fine strategy, because also is in keeping with the plans of the municipality to close the central inner city to cars; does it means more space for people and cyclists. Nevertheless, the problem of waiting time that Niels Jensen told to us, it seems not to be so long, as we have read in the web page of the company that the user should wait around 30 seconds to get his bike. But it’s only a question to put in practice for prove it. As follows we are going to show more information about this system (the next information has been extracted from the official web page of the company: www.biceberg.es):

The limited company ma-SISTEMAS, s.l. was created in 1994 to develop a safe system for the storage of bikes. The invention, called Biceberg, is an automatic underground bike parking. It was patented on 2/12/94. There are several Bicebergs already installed in Spain, and expansion into the rest of Europe will begin shortly.
Biceberg is an automatic underground bike park. It collects bikes from, and returns them to street level. It can also be used to store accessories such as a helmet or backpack. The user carries out the operations using a microchip card with a secret personal code, in a process as straightforward as using cashpoints. The time given for access to each parking place is 30 seconds, both for storage and retrieval.

Biceberg parks can hold 23, 46, 69 or 92 bikes. Even though the capacity can change, the impact on the surface is the same. The urban furniture has a few visual impact and it’s functional. It’s not pollutant and moreover optimizes spaces, because where you can find 4 cars in a traditional underground parking, in the same space it’s possible to park until 92 bikes. Easy, fast, clean, safe and comfortable. Also it’s possible to use this element point as an advertising vehicle.

This global system is in some way utopian, to have a city with a lot of bikes like a mean of public transport. But we have read some theories of transportation that shown us that it’s possible. And we will try to discuss it according to the study of other cases. However we can see that in Copenhagen there are several elements that could make it easy: the city like a frame, the culture of cycling, the precedents of the old program, the need of reduce the number of cars, etc.

- Urban reorganization context

Of course this new system will be introduced in a global project of reorganization and mutation of the urban universe of Copenhagen. Today some debates are taking place about the city. The municipality wants to close the central city to cars and also
politicians are debating the question about the tunnel under the harbour. We want to discuss also these topics.

We can see the relation between the new generation bikes and the public debate about close to cars the center of Copenhagen, in the sense that it should change the city into a place more sustainable. The perspective is to reduce the car dependence. However that’s difficult because car have been given a sensation of more flexibility for user, although some displacements are useless by car. But before we should go to the context.

Copenhagen has a medieval center, although currently it not visible, with a little radius which gives a compact area. Nowadays it’s a pedestrian area. However there are several parts of the city where cars can circulate. In the Middle Age people use the city by walking. During the XIX century, the Industrial Revolution was modelling the city by the train infrastructure and corridors had been created. And today the using of car gives another conception to the city, with an extra distance in every direction.

This overture of the city limits has had a price, especially in the environmental sense. There are several problems due to using of cars. For decreasing cars there are different options, as the promotion of public transport. Another tendency, like many cities in Europe are discussing, it is to close the center of the city in response to the global movement.

If we look the evolution of the pedestrian streets in Copenhagen between 1962 (15.800 m²) and 1996 (95.750m²), we can see a great evolution. However, in the same time Copenhagen have a pedestrian zone reduced in relation to the global road system. So in first, the municipality must continue to close some streets. But they must take a radical solution too, in the sense of closing the central part.

Our suggestion is working in different phases, because a project like this needs a lot of time and a gradually adaptation. We have proposed two scenarios that mean two big projects for limit the car traffic in the city. The objective should be to have a car free area in the inner Copenhagen, also called area within the Lakes. The first scenario should be developed around the existents pedestrian streets and that could be in few years. However, the second one is something more ambitious that need a deep debate and conscience of people. If the city will be closed, this area will need a big increase of public transport to guaranty a fine mobility. Therefore the new bike system of bikes has an important role in a project like this, because it is probably one of the best responds to improve the mobility.

Of course there are several positive elements. It can be a good solution for the pollution in the city to reducing the smog and the noise. It can be good for the inhabitants healthy. Also a car free area with an easy transport system by bikes, could improve the safety life of inhabitants, without a risk of motorized traffic and with a public space of urban vitality.
A POSSIBLE URBAN REORGANIZATION OF COPENHAGEN

Fig. 23

Source: Image from Google Earth, for the tunnel: www.cowi.com, for the "car-free": personal data create by adobe illustrator in december 2006.
The debate about closing the center is including in a general debate about the restructuration of the city. In fact many projects are proposed to involve the urban lifestyle of Copenhagen. Among different ideas, we can speak about a tunnel under the harbour, as the project most important. It has proposed to build a tunnel under the harbour between the Northen and the Southern of Copenhagen. Today, the main justification is related with the development of the Oresund region, to create a large metropolitan region in connection between the possible tunnel and the bridge to Sweden. A lot of opinions are opposed, some other are favourable.

For the partisan opinion, the tunnel will develop the city and it will mean that among housing can be built for 100,000 more inhabitants thus creating 80,000 jobs in Copenhagen in about 40-50 years. According to the most optimistic estimates the first vehicles can drive the Copenhagen tunnel in year 2017. But this project is very expensive, close to 2.5 billion Euros and financed by private companies.

There is a relation between the tunnel project and close city to cars. It exists a report called “Traffic Calming in the City Centre - After a Harbour Tunnel” (2002) that explains the relation between both projects. Actually it says that the construction of the tunnel will be the cause of the traffic calming in the old city and consequently it will reduce the pollution. And in fact, if the car free area will be carried out, the tunnel can be a solution for the drivers that want to cross the city. However, people as Niels Jensen have shown to us his disagreement: “but my opinion is that this strategy will increase the numbers of cars in the city…The politician thinks that this tunnel could suppose fewer cars in the city and more calm. So for this reason this report exists. It shows how it can work. But in fact practically 90% of the consequences could be done also without tunnel.”

But the principal reason of the tunnel is maybe to develop economically the city, more notably in the Southern. The ministry of Environment is trying to get answers to questions such as who is going to use the tunnel, what kind of trip, the frequency, etc. Because this tunnel perhaps will increase the mobility around the city; and it could bring more traffic through the old city also. That is why, with this project, the old city and the center, need to be protect against the circulation. So, close this part and improve the public transport by the bike system can be good solution.

If it will be impossible to close totally the center, we can find other solution like road pricing. “Road pricing is term that refers to the charging for the use of streets and roads. This is usually done by charging motorists directly for its use.” Taxes can be installed in order to reduce the circulation in downtown. This solution has several advantages. The perimeter of this can be more important than close the centre town to cars. There can be a better relationship to public transport out from the city boundaries. And it’s also possible to build important infrastructure like parking which need more space.

Due to high levels of congestion, European cities are giving serious consideration to road pricing schemes. This application has a lot of critics, because for some sectors
driving is the basis of individual rights. They argue that freedom of movement is a fundamental right. In fact can be thought as a financial barrier. And road pricing can be a disadvantage for poor people. Although all drivers pay the same tax and receive the same service. A solution like this, need a really good cheap and competitive public transport to don’t affect some population.

5.3- HOW THE USE OF GIS CAN HELP US

- GIS and urban planning, between tool and solution

We have seen the important role of the transport in the cities. In fact the economic and social aspects depend about how is organised the transport system. Consequently, transport and mobility is a capital stake for the cities.

To know what a city need, the authority must to work in relation with the public. So the public participation is essential for a good planning transportation. To have a good public participation, and to collect a lot of data, the municipality requires time and money, and also an appropriate tool to analyse. That’s why, the computer technologies and the Geographic Information System (GIS) are becoming popular in the transportation planning. GIS are “computer based information systems that attempt to capture, store, manipulate, analyze and display geographically referenced and associated tabular attribute data, for solving complex research, planning and management problems” (Fischer and Nijkamp, 1993). GIS is a fundamental tool, where we can anticipate the effect of the city increasing for instance. And the public participation has strengthened this idea about the territory managing. Indeed, this process calls PPGI, Public Participation in GIS.

Transportation planning must to be able to reduce the negative impact of the mobility, like noise, pollution, congestion, less safety, etc. With the public participation, the planner can recognize the positive and the negative aspect in the system. Transport planning is using to be all those activities involving the analysis of past, present and future problems. These are associated with the demand for the movement of people and goods, especially to have a fine accessibility. GIS can help us to find new solution or test some scenario inside the city. Transportation planning with the GIS it is able to make good decisions. Therefore planners can analyze information on existing and future travel models. So they can develop and evaluate alternative solutions to find these needs. In addition with GIS we can include different scale: regional and local, so we can see the relation between the different kind of transport and how people can switch between that.

We can take a first example to show the relation between the planning, the transport system and the people who use it. The next map, extracted from Esri webpage, shows the distance between the main station of Copenhagen and the region. Besides, we can see also the “finger plan” which is draw by the train. In the center of the capital, the time is few and in the other spaces, the time is related to the distance, the frequency of
the train and the proximity to a station. We can know where people need more or less time to go to Copenhagen. If we had compared this map in relation with a demographic map, we would have seen where the authority must develop more public transport or not. This first example shows us a simply using of GIS. But this example reveals the importance to know the functioning of the territory. GIS can describe the territory, but also can analyze it.

**Example of time spending for going to Copenhagen by train**

Secondly, in the following part we can see how to apply GIS like a tool for planning, as a result of using this technology is the realisation of our work. So as we will see, GIS can be a tool to analyse the need.

- **Case of study: bike parking location in central Copenhagen**

Our case study refers to the location of parking for the new rent system of public bikes. The objective is to find the best zones to position parking, in relation to people’s needs and preferences.

Our area of study is basically the same where City-bike project is working currently, that means basically the area within the Lakes. The reason is because the central part is the most used and easier for starting a project like this. However, this analyze should be applied to the rest of the city.
The information that we take into consideration as relevant for our analysis are: the density of population, the network of public transport (mainly train, metro and bus stops) and the most concentrated workplaces. There are the reasons that let us to divide the parking location. In consequence we have three motives to decide a parking location, so we have three different sub-cases. Nevertheless, we have worked with a common hypothesis in all of them. That's the accessibility to take the train in the main stations of Copenhagen. We consider the Central Station, Nørreport and Østerport, since there are the most used and the ones that have more frequency of trains. Our hypothesis is that people who live around this area (with a distance of 500 meters) can be able easily to use the train, so they don’t need so much alternative ways of transport. We consider 500 meters as a measure for satisfy the needs of a service like this; however this distance has been chosen under our personal point of view.

In the following pages we will show the maps created by ArcMap and that permits to understand the analysis. We present four maps: the first shows the entire proposal parking location according to the three cases. The next three maps are each case individually.

The first sub-case is the 'proposal bike parking location in accordance with the density of population’. The reason for this is to cover the necessity of people excluded from the possibility to walk up till the train station, in other words, to satisfy the request of people who live out of the perimeter of 500 m. It is the case of commuters that need to take the train or the bus to go outside the city.

According to fieldwork and analyse tool of GIS (as we will see in the next point), we have decided to locate four parking in the next places: Rådhus pladsen, Højbro Plads, Landgreven and Ved Linden. All this zones are surrounded by a big density of people so the service could arrive to several users. Also people who live around will have a more easy connection to arrive in the train stations for instance. With the exception of the Rådhus pladsen location, which is inside the area of 500 meters, but as a central and crowed place we think it will be useful.

The second sub-case is the 'proposal bike parking location in accordance with the network of public transport'. Now the motive is to cover the necessity of users that are inside of 500 meters perimeter and need to go outside of them. So this is the case of people who move inside Copenhagen, or mainly commuters that come from other cities or areas by train and they need to go somewhere far from the main places. Having available public bikes in the stations means to create an intermodal point of transportation, where users can choose between different means of transport.

We have illustrated the location of train stations, metro and bus stops. We have considered that commuters which arrive from outside the city will need a bike available in the three main stations (Central Station, Nørreport and Østerport) and also into Rådhus pladsen. This last location concerns to the large number of bus stops around
and also to support the availability in this central area; it's a parking located for demographic motives too.

The third sub-case is the ‘proposal bike parking location in accordance with the workplace situation’. This kind of parking location refers to the destination points of workplace, used basically from people who take the bike in the second case (commuters coming from other cities by train). In this case the redistribution of bicycles it’s easier, because it will be supposed that a user who arrive to the city by train and go to work by bike, will repeat the same way but in the opposite direction.

For decide this locations we have used a land use map of Copenhagen. The interest is that we can know where the services are centred. Since services are the work areas that concentrate more people, we think it’s a correct strategy to focus the availability of bike parking in a zone with these characteristics. The aim is arrive to the maximum of people possible. Our choose locations have been Højbro Plads, Landgreven, Asiatisk Plads and Thorshavnsgade. The two first of them are coincident points with the density of population motives; so these parking will be located by two reasons.

With this strategy it is possible to understand better the needs of the citizens and to obtain accessibility closest to a homogenous distribution. Although we divide the analysis into three sub-cases, all of them are really connected. Therefore the aim is to get the maximum of users. As we can see in the global map of all the sub-cases, the central part of Copenhagen will be covered by nine parking locations. Of course this is our interpretation and it could be different. However, we have been shown how Geographic Information Systems can be a tool for helping into takes decisions like this.

The localisation of different parking around the city should permit to citizens to have a better public transport network. The existent one (train, bus and metro) is very rigid. As theories has shown to us, sometimes it makes people to decide to use the car, because his flexibility. A large network of public bikes should be a possible solution to decrease the using of car in the city. According to John Urry, also that means give to people more possibility to choose the mean of transport. And definitely it should be an incentive to encourage people to cycling or use public transport. This reflection is hold up by the intermodal points created into the train stations.

As we will see below, the maps can explain better our discussion.
Proposal bike parking location in central Copenhagen
Global map of three cases

Fig. 25

Source: Data comes from Department of Geography of RUC and it was symbolized and labeled by ArcMap software. The finished layout was exported as a 300 dpi image in JPG format. It was created in Geography Department of RUC (December, 2008).
Proposal bike parking location
in accordance with the density of population

Source: Data comes from Department of Geography of RUC and it was symbolized and labeled by ArcMap software.
The finalized layout was exported as a 300 dpi image in JPG format. It was created in Geography Department of RUC (December, 2006).
Proposal bike parking location in accordance with the network of public transport

Source: Data comes from Department of Geography of RUC and it was symbolized and labeled by ArcMap software. The finished layout was exported as a 300 dpi image in JPG format. It was created in Geography Department of RUC (December, 2008).
Proposal bike parking location
in accordance with the workplace situation

Fig. 28

Source: Data comes from Department of Geography of RUC and it was symbolized and labeled by ArcMap software. The finished layout was exported as a 300 dpi image in JPG format. It was created in Geography Department of RUC (December, 2006).
- **Extra analysis: density of population sub-case**

For making the first sub-case we have used a specific tool of the ArcMap software. This tool called ‘select by location’ has permitted to us to make a better location of parking in accordance with the density of population.

The fact is that the program makes a calculation from a selected point (specified by the user) to the area of density around. Thus we were being choosing different possible location from parking according to the best result. The best result is the bigger among of people surrounded by the area. The distance has been 500 meters always, like the perimeter used in the train stations.

These are the results of our locations, based on copies screen from the program:

a) Rådhus pladsen

![Map of Rådhus pladsen](image)

This point with a perimeter of 500 meters it is supposed to be an opportunity for 15800 people as statistics shown.
b) Højbro Plads

This location, according to the same distance of 500 meters around, it could attract the total quantity of 19092 people.

\[ \text{Selection Statistics of urban} \]

<table>
<thead>
<tr>
<th>Field</th>
<th>Count</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Sum</th>
<th>Mean</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>DENSITY</td>
<td>95</td>
<td>0.000000</td>
<td>931.738990</td>
<td>19092.300000</td>
<td>200.47211</td>
<td>122.443018</td>
</tr>
</tbody>
</table>

\[ \text{Fig. 30} \]

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c) Landgreven

This point could attract the sum of 17582 people, in a surrounding area of 500 meters.

\[ \text{Selection Statistics of urban} \]

<table>
<thead>
<tr>
<th>Field</th>
<th>Count</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Sum</th>
<th>Mean</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>DENSITY</td>
<td>94</td>
<td>0.000000</td>
<td>12892.130000</td>
<td>17582.300000</td>
<td>162.044575</td>
<td>112.563732</td>
</tr>
</tbody>
</table>

\[ \text{Fig. 31} \]
d) Ved Linden

This point with a perimeter of 500 meters it is supposed to be an opportunity for 8260 people as statistics shown.
6- STUDY OF OTHER CASES

As discussed before, Copenhagen is known throughout Europe as a good city for cycling. However, to make further improvements of the system we can consider other countries from which we can draw inspiration. In general Europe has more of a culture of cycling than other parts of the world, so we will focus on this continent. We will examine 4 cases in particular which offer more modern systems and show the way to progress: Netherlands, Lyon, London and Odense.

6.1- THE URBAN TRANSPORT BENCHMARKING INITIATIVE

Before entering each case it’s relevant to mention a recent project celebrated across different cities of Europe, called The Urban Transport Benchmarking Initiative. It was a three year project that concluded in August 2006. The 45 cities participating in it were working in themed groups of research to arrive at individual urban transport solutions.

This project provided the opportunity to compare cycling facilities in different cities. The final reports offer information pertaining to the proportion of cyclists to total traffic, risk of casualty per million cycle kilometres, the cyclist infrastructure, bicycle parking, integration with the public transport system, etc. We want only to consider what we think is relevant information. For instance, the graph of the next page shows something interesting for our understanding of the context of these cities.

Data of graphic is divided in two important groups. The green bars show total length of cycling road network in relation to the area of the city. As we can see, Copenhagen is on the top of the list. Other cities from north-eastern Europe have fine indexes, such as Aalborg, The Hague, Oulu, Cologne, Helsinki, Malmo and Vienna. Lyon too has a good score, as we will see below. It can be observed that all of these countries have relatively less cars in relation to the total population (as shown by the orange bars). So, it clearly reaffirms that where the greatest cycling network is available, the number of cars is distinctly lower. The exceptions to this are Helsinki (due to lack of data) and London. However, London is a special case because although it gets a high score for cycling road network, the number of cars is also extremely high.
**Fig. 33 Relative traffic data in different cities (2004)**

Graph created using data from http://www.transportbenchmarks.org
6.2- CASE 1: NETHERLANDS (OV-fiets)

The Netherlands has a long cycling tradition and culture. It was the first country to launch a bicycle-sharing system. In 1968 Amsterdam launched the ‘White Bikes’ program, but it failed in a short span of time. However, the Netherlands are always trying to improve the bicycle way of life. In the capital they tried to implement a new modern system called ‘Depo’ in the late nineties. Actually it was a replacement of the first program (‘White Bikes’), but unfortunately it folded again. It consisted of a network of parking lots where you picked up bicycles by using a magnetic card. The users could go everywhere using the same system. It was possible to book a place for parking and a service that redistributed bikes around the city when some parking lots were full. But, this program failed and was closed due to theft and lack of funding.

A new program is now being tested and implemented across the Netherlands. It is called ‘OV-fiets’, which means ‘public transport bicycle’. It is run by ProRail, a company which works for the maintenance of Dutch railways, since 2001. The concept of this recent project is defined by its meaning: the customer can rent a bike as a part of the Dutch public transport. It’s inside the third generation of public use bicycles, because it uses smart cards and automated racks. The idea is to enable people to cover short distances, mainly between the train station and the work place. For this reason at the moment it’s only possible to find these kinds of bikes in stations. Currently around 1000 such bicycles are available in 100 railway stations in the Netherlands, with more to come in the future.

The operation is simple. The user rents a bike automatically, located inside white stalls. These bikes are rented for a maximum period of 60 hours, for 2.75 €. There is an annual subscription fee of around 10 €. So the price is not expensive. The user must be member of this program and it’s only possible to do it with a Dutch bank account. So, this system is aimed at commuters and not tourists.

The program is already running with a good web interface with all the locations. It is also possible to rent these bikes in some common bike-rental shops. Additionally, the white stalls which are found near railway stations have added to the nation’s character.
Fig. 34, Interface in the web with the locations of ‘OV-fiets’ bikes for rent. In yellow with automatic system, in blue the normal shops.
Source: http://www.ov-fiets.nl/watisovf/index.htm

Fig. 35, Parking of white stalls in Rotterdam station.
Source: http://www.ov-fiets.nl/watisovf/index.htm
6.3- CASE 2: LYON (Vélo‘v)

Since the 2 June 2005, a new plan has been put in place to cope with the agglomeration of Lyon and its problems concerning urban traffic: air pollution, noise, unhealthy and dangerousness of traffic. In effect, 75% of Lyon’s workers use cars between home and their work. It’s only recently (2 June 2005) that the city has introduced a UDP (Urban Displacement Plan).

To eliminate the traffic problem, which is similar to Copenhagen’s situation, Lyon has the same kind of action plans as Copenhagen: restrictions for cars in the city (speed limited and one-aways), improved traffic conditions and safety through elevation of cycling tracks, planting trees between different kinds of tracks: cars, cycling, tramway, pedestrian ways, pedestrian path enlargement and improvement of coordination between other means of transport. The new tramway track was inaugurated on 4 December 2006, and alongside it a cycling track has been set up, as we can see in the following figures:

Like Copenhagen, Lyon needed to improve availability of bicycle parking. For that, Lyon decided to install bike racks in public places such as sporting venues, some residential areas, etc. Also, the ‘Lyon Park Auto’, allows cyclists to park theirs bikes for free (availability: 300 bike tracks).
Since 2005, Lyon has seen bicycle numbers increase by 41%. This increase would not have happened without a program called ‘Vélo’v’, which was introduced on 19 May 2005, covering the cities of Lyon and Villeurbanne. ‘Vélo’v’ puts forward a bicycle rent system of 3000 bikes can be used all the year round. The ‘Vélo’v’ bike works with season tickets. Users have two card choices - long duration (1 year) or short duration (7 days). After this period users must pay extra when they want to use bikes. We can see below that it’s free use for a continuance of 30 minutes or 1 hour.

<table>
<thead>
<tr>
<th></th>
<th>Cost of card</th>
<th>30 min</th>
<th>1h 30</th>
<th>Per additional hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Long duration card</td>
<td>5 €</td>
<td>0 €</td>
<td>1 €</td>
<td>1 €</td>
</tr>
<tr>
<td>Short duration card</td>
<td>1 €</td>
<td>0 €</td>
<td>1 €</td>
<td>2 €</td>
</tr>
</tbody>
</table>

*Fig.37 Table of prices*

When users buy their card, they receive a code, which is used when they want to take a bike at one of the 250 electronic lockable parking terminals.

To use these bikes people need to be more than 14 years old and have a civil risk assurance. Also users must pay a refundable deposit costing 150 € for the long duration card. For the short duration card, people must pay by bank card in order that the Vélo’v’s team can identify the people who don’t bring back or break bikes.

One of the user-friendly features of ‘Vélo’v’ kicks in when electronic racks are unavailable. Instead of wasting time (and money) to find another terminal, cyclists can insert their cards in the electronic devise of the busy rack and be granted an additional fifteen minutes to find another rack.

One of the advantages of the Lyon system is that with bus, train or other public transport cards, you can benefit from discounted bicycle rental rates. This and the new tramway line project prove that there are relations between means of transport and rental bike systems.

‘Vélo’v’ and this Lyon cycling system is going to be exported to other cities of France (Marseille, Paris) and other countries (Belgium).
6.4- CASE 3: LONDON (OY Bike)

As we can be observed in the first graphic above, London has a high number of bicycles as well as cars. The huge size of London and the privatization of its transport systems make it a special city, where the urban plans concerning transportation cannot be the same as those implemented in other European towns. The facilities for transportation of bikes vary in trains, buses, or tubes vary according to the different public transport companies.

Since August 2004 a new automated bicycle hiring system for the general public has been launched in London. This system and these prototypes are based on the one which was introduced in Rennes (France) in the 1980’s. Its inventor, Bernie Hanning, wanted to implement this system which could “become another component in the public transport system”. Similar to Lyon, the principle is that one buys a card for about £10, and after that the bicycle can be used during 30 minutes for free and pay the extras like below, according to the next prices:

<table>
<thead>
<tr>
<th>Hire time</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 – 30 Minutes</td>
<td>FREE!</td>
</tr>
<tr>
<td>31 minutes – 60 minutes</td>
<td>£2.00</td>
</tr>
<tr>
<td>61 minutes - 120 minutes</td>
<td>£4.00</td>
</tr>
<tr>
<td>121 minutes – 180 minutes</td>
<td>£6.00</td>
</tr>
<tr>
<td>Over 181 minutes (Whole day charge- 24h)</td>
<td>£8.00</td>
</tr>
</tbody>
</table>

Fig.39 Table of prices. Source: www.oybike.com

In 2000, he brought in the use of cellular phones as a medium of infrastructure. A person who wishes to use the bike can call the OY Bike control centre who gives to the subscriber a pin code to release the bike. This new mobile phone operated bicycle rental scheme tries to introduce new technological and communication perspectives in the cycling system. When the subscriber has his pin code he can introduce it in a keypad furnished by ‘Homeport Ltd’. This keypad is on a terminal which includes a locking system for security and is not too expensive for cities.

To end his usage the user needs to call the ‘OY Bike’ control centre, to signal that the bike is to be locked and available for the other subscribers.

This system has been introduced in west London (Hammersmith and Fulham) as a test bed in 2000 and finally launched for the general public in 2004. There are currently 28 terminals in the west of London.
6.5- CASE 4: ODENSE (*Denmark’s National Cyclecity*)

Odense is situated on the island of Fyn and, with a population of 185,000 inhabitants, is the third largest city in Denmark. It’s among other things famous for its promotion of cycling and cycle safety, due to a fine budget that support all the projects (20 million of DKK for four years including 50% support from the state). Moreover it has a long tradition of planning for cyclists and has almost the same length of cycle network than Copenhagen (350 km).

The municipality has created a strategy which considers 50 sub-projects to improve bicycle conditions in the city. Some of them will be described in the following paragraphs.

Improvements of roads and cycle tracks are being carried out. One of the most innovative of these has been the installation of a row of small light posts along the paths. These help cyclists avoid stopping at red lights. The guide lights are adjusted to the traffic lights so cyclists can increase their speed if it’s green. In fact there are also some speedometers that can help cyclists to adjust the speed instead of stopping when the light is red. It is called green wave when cyclists can flow fluently.

Parking facilities have also been developed around the city. For instance, a central square was converted from car parking to bicycle parking, with weather protection and alternative design. A module system of automated parking will be established too, as we will see below. At the moment they have a plan to improve parking in specific places like train stations (underground rooms) or in bus stops (normal racks). Also special care has been taken to give it a pleasant appearance and make it environment friendly.

Odense has invented a meter that counts cyclists every day. That means all trips coming in and out of the city are registered. It could be used as a gimmick to drum up interest and encourage people to ride bikes. Around 5000-10000 cyclists pass every day the barometer.

Recently, the city has introduced a modern system to detect problems in the cycle tracks. A little car (Smart brand) checks the paths for holes, bumps, etc. by using a laser. Then this data is registered into digital map, making the process of repairing them a lot quicker.

Another famous project is the promotion of safe routes to school, which aims to popularise trailerbikes for transporting children to and from kindergardens and schools. More campaigns aimed at popularising bicycle usage are being tested, such as the one which allows local inhabitants to borrow special bikes from the municipality.
The Odense municipality has good maps of cycling networks and routes, not only for the city, also for the countryside. They have been distributed to all inhabitants. On the web page there is a tool for calculating the distance of a trip between two locations, and for locating the shortest route. The user can also access this system using a mobile phone. So, it’s possible to get cycling routes on a map with descriptions using WAP technology. And all this is for free.

As we have seen, Odense is a city totally adapted to cyclists and cycling culture, with a lot of facilities and the use of the latest technology. Some of these new developments have been introduced for the first time, so they have been hard working. Also, it’s quite ambitious, because the goal for the city is to be the best ‘cycle-city’ in Europe.

However, at this point we must observe that as far as bike-sharing programmes are concerned, there is not much to be learnt from Odense. This is because they don’t have any programme as such. However it’s very interesting to understand general operating systems for bikes in general, even though all the improvements have been made with private bicycles in mind. It is the spirit that Copenhagen would do well to copy.
VIP-parking for shoppers

Odense Cycle City has invented an automatic parking system. In this secure house you can park your bicycle and prevent it from being stolen, getting wet or ruined. You can also leave your luggage behind along with the bicycle because the house is locked.

It functions by you putting 5 DKK in the slot. Then you place your bicycle in a booth in a kind of carousel and close the door. You are the only person with access to the bicycle. After three hours the 5 DKK is spent but if you park longer than three hours you pay the rest when you fetch your bicycle.

Today the parking system has been rebuilt and is now a house of safe boxes where you can leave your luggage.

Fig. 42 The barometer and a promotion to get the cycle route in the mobile phone. Two inventions from Odense.
Source: own photo and image from http://www.cyclecity.dk

Fig. 43 Source: http://www.cyclecity.dk
7- CONCLUSIONS

Once we have seen all the chapters and we have analysed the problems, it’s possible to add up to the final ideas writing. In order to do it this section will include the suggestions already formulated, the contribution of other cases from other countries, the theoretical framework and, of course, the weak points of the old system.

The approach of this project was formulated with the intention to be a great opportunity for us to get some knowledge from Danish way of life. Our wish has been to learn specially about urban planning, since it’s our interest in Geography. We were very fascinated about the bicycle culture around the country. Moreover we focus our attention on the public bikes in Copenhagen. As a good capacity of observation that geographers have, we wanted to know more about it and why the program didn’t work properly. As we have seen it, we have been studying extensively the topic. Also we have been writing about some suggestions and new developments. As follows, we will summarize and clarify our entire hypothesis.

At the beginning we got very enthusiastic with our answer about the research question (how to improve the present bike share program called City-Bike in Copenhagen city?). However the ideas were too much vast and sometimes had seemed a few utopian for us. But after reading literature on the theme, making interviews and studying other cases, we realised that it is possible work on this research area. The city planning is something very subjective and unlimited according to the common sense. Sometimes it’s only a problem of unwillingly; although without economic support projects like that we have presented will be difficult to do it. Besides, we would like to inform that our focus on the future characterizes all the work. The planning stage takes into consideration ten to fifty years approximately and in different phases, because the project is complex and needs to be developed in different velocities. The first that have to change is the public bike system; a parallel but longer step is to close the city to the cars.

- Public bike system

According to the theory of public use bikes’ generation (P. J. DeMaio, 2004), we think that Copenhagen must goes to the third or fourth generation, because if it remains too much time in the second one, it could be very easy to see the end of the program. In the nineties City-Cike was a developing invention very acclaimed; now it's time to update.

The system called Smart Bikes provides more capacity to manage the program. It offers advantages such as the control of the theft and the vandalism. The one, who does not return the bike in some parking, can be traced. As a consequence, it’s possible to know who used it the last time. Therefore, this mechanism could be
appropriate to limit the bikes’ stealing. Also the technology of this kind of system could help with the introduction of a GPS transmitter and the automated rack parking. The modernisation also may arrive to the bike design, which is not enough comfortable.

The suggestion of introduce GPS system in public bikes is useful since it will offer a lot of advantages and it will not be too much expensive. A transmitter similar that animals or cars can have it not cost so much, since GPS facilities are in expansion and prices are going down. Moreover the bike only needs the chip. With a GPS all bicycles could be mapped in real time, so we can find a lot of applications, both for users and for people that would manage the project.

Software could connect the bikes available in parking using the WAP technology of cellular phone; so the user can know always if there is a bike for him without going to the place for check it. To support our analysis we can consider that similar cases already exist in the city of London and Odense. In fact in the latter city it is possible to ask by the cellular phone for the faster cycle track route to go somewhere. These facilities can be also on a web page, where the information is constantly updated. For instance, there is the possibility to make the portal interactive and to permit the user to book a bike. In Netherlands a similar system permit to book the parking place when you get your bike to go in some planned place.

Another potentiality of GPS consists in the capacity of bikes’ redistribution to avoid that some parking spaces are full, meanwhile other empty. Specialized teams should work to get an equal distribution in all parking. The fact of knowing if each parking is available is due to the transmitter chip. The possibility to know if a bike is broken is another advantage for the system management, because that means it would stay too much time stopped somewhere. The system will give warning also if the bike cross the boundaries fixed in the program.

As theories of transportation has shown to us, it’s very important the availability concept. In accordance to them, in fact, the number of bicycles available is one of the main problems that caused the failure of the current system. People prefer take their own bike since the total amount of them is limited to 2000 bikes. It cannot assure one bicycle for each person. So with more bikes, Copenhageners will have the possibility to use them. The quantity should be around 5,000 bikes at the first launch and more of them in the successive years. An optimal number of bicycles should be around 50,000, but it’s difficult to precisely this number since the project will be adapted according to the evolution of situations and the answer of the people. However, the introduction of more bikes should be faster than the complete realization of City-Bike project, because it was too slow for make to inhabitants believe in it.

The accessibility is another concept as important as the availability. John Urry theories argued that, the mobility can be hard to calculate because it closely depends on people’s habits. Fortunately some daily routines are possible to study and plan. In order to realize it a powerful action has to be taken so public transports can become more competitive than private cars.
For these reasons we think that it’s useful the implementation of GIS as a tool of analysis. We have been studying a case for finding the best location of parking, according to the needs of the inhabitants. The result is a map of the central Copenhagen with nine locations for parking. We think it’s a fine network of availability for this new public transport. Moreover it’s possible to have intermodal points of mobility in some places; so combined with the other means of transport give to people the possibility to choose, as John Urry says.

The design of the parking is another element important for a properly function of the system. In the previous sections we illustrated the cases around Europe and more precise in Copenhagen, where there are a lot of problems with the bikes in the street. For this reason new generations of public bicycles are turning into automated racks which are more secure. By knowing the identity of the user, the vandalism acts and the theft should decrease. In this sense, our opinion is that Copenhagen should make a strong bet in valid parking design, apart from considerations concerning in availability and accessibility above mentioned. The solution and design that we propose is called Biceberg, an automated and underground parking.

From our point of view, another aspect that should change from the City-Bike system is the focus on the type of users. The aim of this first program was addressed to commuters; however it did not work before. Therefore the new system should continue with this idea but trying to carry out it properly. A good method can be the one used by Netherlands since the user needs of a back account for the subscription. And only people from the country or with the resident permit can have it. This policy could permit to keep away tourists and to make the project more credible for commuters. Nevertheless, also it could be used by tourists, like a kind of temporary subscription, for example through the use of the system applied in London (asking for code activation via mobile phone). Something like this could be useful and more organised than nowadays.

We didn’t make an economic study to discover the real practicality of this project. However we know that the perspective of underground parking, use of GPS system or launch of a first important quantity of bikes, have an influence on the costs of this project that should be expensive. However the price for a transmitter it’s not really expensive. So in our opinion it does not seem impossible. Moreover is a plan for the future so there is time to think about its applicability. And Copenhagen is a city with a long tradition of cyclists and the budget dedicated to improve the system is every year bigger. There are many formulas to make the system cheaper, like subventions from Danish Parliament, collaboration with private sector, advertisements on the stands and bikes, sponsors, the way to pay for the subscription (but not a lot of money), etc.

It’s also relevant the fact that behind this project apparently really automatic, with a GPS system and automated racks, it is necessary a human management team to watch over the daily running. The group to take care of bike conditions, the bikes’ redistribution, the control of the bikes that cross the boundaries (maybe in touch with the police), all the technicians, people available to solve problems immediately, etc. All
the points should work perfectly to maximize the system conditions and it can be improved if the commuters really start to believe in it. Moreover another challenge is try to change the habit of people who are used to ride their own bicycle. The project should be focused to new generations.

After the discussion about the future opportunities offered by the system proposed, we need also to define the limits of this project. Our work has been focused in the same area of the old program (City-Bike), for the reason of incapacity to cover all Copenhagen with this work and because also it's good to experiment first in the central city. Of course the idea is to expand the system to the entire city to avoid the differentiation of areas. The finality of this project is to offer another kind of public transport to citizens, more flexible than metro, train or bus, but totally compatible.

Finally, the information problem also should be improved. As we mentioned previously this was not appropriate for City-Bike program; so users have to know always where they can find a parking, if the parking is full, where are the boundaries, how works the system, etc. In the parking stands should be specific information, but perhaps also around the city. Besides, another problem of this project consists in its credibility and in acceptance of it in the mind of people. So a frequent advertisement should improve the knowledge among society.

- Close the city to cars

The proposed system of public bikes extensively discussed has to be framed into another superior structure of city reorganization. As we presented before, we thought that it's necessary to control the traffic in the city. Also in the interviews we found the same request. Data confirms around the world that motorized traffic is growing dangerously. In Copenhagen the number of cars is grew the 6% in the last six years. It's evident that a control should be carried out, because traffic affects the global warming and welfare of inhabitants who live close to the city.

Copenhagen seems a representative city to apply a project which other cities can follow, because this is a global problem. The pedestrian streets and the relatively little number of cars in contrast with other European cities, are two elements that help in this sense. Also the long tradition of cycling should be a strong point to reduce the traffic. For this reason we believe that a properly system of public bikes could function.

There are two main topics discussed nowadays to make Copenhagen a sustainable city: the car free area or the road pricing, and the harbour tunnel project. Both of them has been discussed, and with pros and contras we should work with them, because as we have seen in the interviews it will be possible to see this in the future, because the municipality is already working on it.

According to the theories of transportation, mobility is very associated to system transportation. In fact, there is a positive relationship between mobility and the growing
rate of population. Therefore, the planning of transport systems has to be a significant point. However, according to some authors it could be difficult to apply theories in cities, because these spaces are constantly changing. It could be a clever strategy to work on estimation of the city and on the future, in order to find the best solution to the problem.

The theories of Walter Christaller and John Urry have been useful. The first author proposed the relation between areas in the city. The central one always will receive more positive elements, so mobility will be easier. However, there is a relation with other areas around or periphery; and there are many exchanges. The fact is that the relations must be equal, and from the point of view of mobility, the public transport has to offer opportunities for everybody. A spatial exclusion is probably the effect of a social exclusion. To this aim an extended plan of public transport should be useful.

Although theories of Urry have a sociologic perspective, they can support our reflections. In fact the planning of urban transportation has several social elements. One of them is about the personal choosing. That's why we thought that theories of multimodal exchange points could be useful for a good plan of mobility. If the user has several options to choose the way to travel (train, metro, bus, public bike) it should be an incentive to promote the using of public transport in Copenhagen. So the cars must be reduced drastically. That's why car free areas or road pricing can be the ideal complement; another incentive to avoid unnecessary trips with the car. Also the role of the harbour tunnel is important, because several part of the traffic will not cross the central of Copenhagen. However, as we have said it's unclear if this will not have the contrary effect and encourage more people to travel by private car. More discussion about it should be do it before a final decision.

Also we think that a big debate in all the levels should be carried out. Politicians should bring the discussion in the street and people should participate on it, because the global project could affect deeply the population of Denmark. And of course more research and studies must be do it, because our work is not able to arrive into a perfect level. However we tried to understand the situation all the best we can, and write with logic and always thinking into a positive way to improve little, but big things.
8- ANNEX

8.1- INTERVIEW TO NIELS JENSEN

When: 15 of November of 2006
He works on: Vej & Park Københavns Kommune

What's your post? How long have you worked in the municipality?

I am a planner for some 7 or 8 years.

Can you explain us how the City-Bike project starts?

Is not a project which the town is responsible for that. It runs by a private group now, but not at the beginning. It was started by some very enthusiastic people, who thought that Copenhagen should have a system where you could offer people, the inhabitants, the possibility to use bicycles when they are commuting. For example, they could go by train and at the train station they could pick the City-Bike and then go to work place.

In the beginning it was a City project, but seven or eight years ago it was separated from the town responsibility and a firm was set up, which got the income from advertising on bicycles and on parking stands. The separation was done gradually; they took it over and the City didn’t want to be involved. It was no problem really; it was decided that they should run it and the City shouldn’t do anything, only helping them with the parking spaces.

Who use these rent bicycles? Does it work the system?

When we were still involved in the project we made an investigation to see how it works. It was part of an E.U. project, because we had to report how the City-Bikes worked. So, we went out in the street for interviewing people which using the bicycles. And we find out that half of the users where tourists and other half were young Danish kids that use the bikes as a toy, just for fun… They used for 500 meters and then they left it again. So it was no good, because few people uses it as part of commuting.

We also tried to follow some of the City-Bikes, because we counted how many bicycles could we find in the parking. We counted in the day time and in the night time, because they should all be back during the night. But we could only find 100 bikes in the parking stands, while there were 1000 City-Bikes. So, where were all the other ones? That was what we ask our selves... And then we tried to follow some people using them. And some people crossed the border without leaving the bikes, when there were supposed to don’t cross over the border. And this people went back where they live and took it into the back garage, using it as their own private bike! And when it’s broken you just throw it away...

And now you think about solutions, to make it better?

We are not trying to make it better because it’s not our responsibility, but I think Road and Parks Department should be more interested in the project; because it has to do with the image of the city as Copenhagen as the City of Cyclists. I think we should be more interested in the City-Bike project, really. But it’s just what I think and not the attitude in the Department.
We have been thinking about it, and we are trying to find our particular solution. We are looking for the main disadvantages for cyclists in general, and we think that the principal problems are the theft and the parking spaces. We know that our ideas are expensive, but it's a thought... like the next step for the future. We think that it could be possible a rent system for commuters, but learning about the mistakes from the past. As you can see in the document we give you, we think about underground parking and GPS system integrated in the bikes. Also the possibility to use the mobile phone for find available bikes in these special parking. What do you think?

You are speaking about the possibility to find the bicycle in case of theft... Also this system could be more organised, because you should return the bike in this kind of parking... but no so much flexible. And the parking should be automatic and underground, isn't it?

In fact we intend to try a Spanish system called Biceberg to see how it works in København. And there are some Japanese systems also. But the problem with the automatic system is that you must wait. So we don't think it's very useful close to the train station for example, but maybe it could be useful in the centre of Copenhagen. We have two possible locations to put it up: Rådhus-pladsen or Højbro Plads. Here there are a lot of bicycles on the ground, where people move around. We need some experiences and try out to see if it's working.

But it's a very expensive system you are building, because you need the GPS and the structure (the automatic parking system). It's too much expensive I think.

But if we think as a hypothesis for the future, in 30 years for example, it could be good? Image that something change and with advertisements you can afford it.

Yes, but who will use it? Because the idea is the same as the initial idea with the City-Bikes and this had not work. I think it could maybe work in other towns where you don't have a cycling tradition. I mean, most people in Copenhagen have their own bicycle. So they don't need a City-Bike really.

If you want to have a system which could work as it was intended, I think you need much more City-Bikes. Now we have between 1000-2000 bikes and that's too few to work as a reliable system for people commuting into the town, because they never know if there is a City-Bike available. So that's a problem... And usually you need two bikes, because you go to the station on your own bicycle, and then after taking the train you have to use another one for going to the work place. So instead of your own one, you could have a City-Bike of course.

But I think it's interesting that you are working on this, because it's not so much interest in the town... it's good to have a discussion about it.

Do you think that parking in general is bad? Because we have read in the last Bicycle Account that people is not so contented (mark = 3/10).

Yes, it’s true. Almost two third of the cyclists are unsatisfied with the infrastructure of parking in town. We are totally agree that parking is too bad, so as you can see in the Cycle Policy one of our strategies is to improve parking facilities.

We have been asking this question in Bicycle Account every two years since it starts to work. Also we make other questions that after we don’t publish. For example, we also ask about City-Bike. But we use it as internal information.
Will the municipality close the central city to the cars?

This is another relevant topic which politicians are already discussing. It could be good to reduce traffic in the central city. We consider as centre the medieval part of Copenhagen, which actually is not medieval but in the past it was. So, the area within the Lakes is what about we are talking. As you know there are several pedestrian streets.

Also here is where there are more people, and we think that the experience of Biceberg (underground parking) could change space on the ground; because something stands for bicycles are getting in the way. In fact we are in touch with this company, and we are adjusting details as the space for the bikes, because our bicycles need more space; many of them have baby-sits or boxes in the laterals, so they have to change a little the design. But we will see if the experience works ok.

Now we have few parking underground because we don’t want more cars in the City. But there is a lot of pressure for building it more. For instance, you know that we are building a new theatre? So it’s in front of the Opera, but in the other side of the river. Some private company has offered for paying the construction of a bridge, but with the condition for creates more underground parking for cars. There are plans also to have more parking around urban areas.

Another discussion is the pricing road. The municipality of Copenhagen wants to do it, but the Danish government doesn’t want. The problem is that they are different politicians that come from different teams. We have ideas to make the streets of the centre not free for the cars; but we need the permission.

From the document Cycle Policy, the chapter Improving cycling conditions in the City Centre, it talks about a report called Traffic Calming in the City Centre-After a Harbour Tunnel is built. What’s exactly this tunnel project?

That’s a report I can give to you if you want, and that study the possibility of building a tunnel underground all around the sea for connecting the north (Østerbro) and the south (Tårnby) of Copenhagen. The idea is that the commuters don’t need to cross with the car the city centre. But my opinion is that this strategy will increase the numbers of cars in the City. Also is really expensive, even though there are other possible itineraries planed.

The politician thinks that this tunnel could suppose fewer cars in the City and more calm. So for this reason this report exists. It shows how it can work. But in fact practically 90% of the consequences could be done also without tunnel.

Do you think that combination with public transport in general is good? Because we have read in the last Bicycle Account that people is not so contented (mark = 5/10).

Well, it could be good... yes. Now in the Metro there are some restrictions in the rush hours. However, it will be permitted to carry bikes always in the new Metro. In the trains you have a special room for bicycles. In the bus there is no possibility to carry the bike. But with taxi you can bring it with special racks.

Actually the main thing is to improve the facilities of parking in train stations. Especially in Central Station and Nørreport Station, the parking areas are really chaotic.
Do you have other ambitious plans?

Yes, for example we have something called *Proposals for Green Cycle Routes*. This plan wants to improve the kind of routes that cyclists can use also as a recreational function. We will have 110 km of green routes, but not in the City Centre, because is not possible. Here, the strategy is to have a powerful network of cycle tracks, but parallels to the main streets. And also with several cycle links-ups between their. The intention is to make a good network but respecting pedestrian streets.

We have made a list of we consider as the main problems or disadvantages for cyclists: vulnerability to traffic, high speed of cars and fumes/noise, theft, parking (availability, bad localisation…), combination of bike with public transport, broken bikes in the street (kind of pollution). Do you think there are some more?

Well, it’s quite good. We don’t have theft in our list… But I can say to you that when we ask to cyclists, several of them consider the other cyclists as a problem! Also we have a real conflict between the bus passengers and cyclists, when people go up/down to/from the bus, because they invade the cycle tracks.
8.2- INTERVIEW TO CHRISTIAN CHRISTIANSEN

When: 17 of November of 2006
He works on: Fonden Bycyklen i København

What’s your post?

I am secretary to the Mayor of Transportation, so I work in the Roads and Parks Department. Also I am a member of the board of Fonden Bycyklen i København (City Bike Foundation of Copenhagen), the company that makes run City-Bikes.

Can you explain us a little the history of City-Bikes?

The idea became around 1990 by privates guys and this administration thought it was a good idea and help this two guys to get along with the idea. In 1995 this Foundation was established, privately. And they had a deal with the City about how to run it. In few time the two guys were out and in came some guys from the public relational world, those who makes advertisement. They use their background in the company, what City-Bike needs it. So they found money from private sponsors.

In nineties every city of Europe was appointed ‘Cultural Capital of Europe’ or something like that. And in 1996 it was Copenhagen. City-Bike was very popular in this time, but it increased even more during this cultural year. The sponsors came in that time and during two or three years more. From then it has gone little down, because we have lost a lot of City-Bikes and sponsors. Then again from 2002 we got a fund by agreement with a sponsor for put up the commercials; and it will be long time running. One time also we got money from state; we got 1 million DKK to re-establish the system.

At that time we got 2500 City-Bikes. Now we have 2000 bicycles and that’s the level we want to keep it on. Since 2002 we have been living by this auto commercial agreement. They pay us 2/3 of the budget. And the last 1/3 of the budget comes from the private sponsors that you can see on the City-Bikes.

The first idea was the commuters could use them?

That was an ideal for some time. The two guys that got the idea, first they thought “ok, my bike it’s stolen again... So, why not having a City-Bike?” A bike that you can use it for commuting, from stations or bus stops to the places where people work. Maybe the insurance companies that pay for the stolen bikes, maybe they might have an interest in putting money in the City-Bike system... They never did it. But that was the original idea. It never became...

Why not?

Because you need a lot of bikes to convince people that they can do it. You have to put a lot of City-Bikes in the city, because you have to be sure that there will be a bike for you, to take it when you want.
That's not this idea now?

No...People who know about these bikes in Copenhagen, they also know where to find bikes, because some places are easy to find than others. I know for instance and sometimes I am used to ride them, because I am hurry and I know where to find them. Probably other people do the same. But it's not common.

Perhaps City-Bikes are more used by tourists?

Yes, it's true... And if someone wants to use it is more by chance. If you see a City-Bike and you know you have to go from A to B, and the alternative is the taxi, you might take the City-Bike. But almost always you must take the taxi because there are not City-Bikes.

So there aren't ambitions or goals?

No at the moment, because the problem always is the economy. And it's not an integrated project in the traffic system of the city. It's more like by having the bikes, for eventual users that have own bikes and also for tourists.

We thought about a system which integrates a GPS transmitter and it could solve problems about the theft. Also turning it into a modern system similar to the Smart Bikes. We have sent to you but we want to know your opinion.

My suggestion is that you should try to describe an idealistic system. Try to describe what people need, how it functions, how many racks, how make bikes, what will it cost... if you can describe that, it might be useful actually.

Do you think that there is a lack of parking for bike?

Maybe, because now the administration is thinking in renovate the space between houses. They don’t think about streets, they think about space between houses if you look from up. In this context is decided that we should take away all the cars and put it underground, for having more space above the streets. And then this space you can use for another things, like for instance racks for bikes. The parking strategy of the Commune is to take away 4000 parking car places, mainly in Nørrebro and Vesterbro.

And you are thinking something about close the City to cars or put restrictions in traffic?

At the moment they are trying to fix the road pricing, which makes you pay if you want to get into the city. It’s a little bit difficult because it’s not legal at the moment. It would be decided in the Parliament, but here (in the municipality) the majority wants like that. But it’s a small area, the most inner city.

If the strategy is to build more parking for cars, does not it mean more cars in the city?

These parking, that will be underground, are from people who lives in the city not from people who comes from outside. It's only for liberate space on the ground and restricted to people who lives around them, not from commuters. And the way to keep commuters away is the road pricing, but that’s not decided yet.
And if we think about problems of cyclists in general, do you think that the traffic, the pollution and the theft are the most important? Anything else?

The wheatear of course! One guy that wanted to be politician tried to cover the bicycle lanes to make them better in winter… but it was only one person.

Do you think that Copenhagen is one of the best places for bicycles? Do you learn something from other countries?

I think so, but I really don’t know. However, Roads and Parks Department know very well what’s going on in the rest of Europe. Every year there is a meeting between cities about bikes topics. Administrators and politicians discuss how to improve the situations. This year will be in Munich.

What do you know about the harbour tunnel project?

A private enterprise had this idea about making a tunnel from Nordhavn to Sjællandbroen; to makes possible the people who life in the south or in the north, to cross the city without the necessity to enter on it. There is a conflict about where to stop the tunnel in the north area, because a lot of people live here and they don’t know exactly where to come up to the surface again.

And what’s your opinion? Do you think that’s a good project in an environmental way?

I don’t know… the point is that they want to keep out the cars of the city, and that’s something good environmentally. However I don’t know what could happen with the tunnel. The smoke must to get up otherwise…

Do you have some political promotion strategy for bicycles? In the school for instance?

Generally the city promotes cycling. In relation to the school I think it’s quite common that children go to the school either by walking or by bike. I think it’s a part of the culture. Of course more and more parents drive the children to school, but still people use their bicycles. When I was a child it was not a problem going by bike to the school, but now people want to be sure that their kids go safe to the school.
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