

**MASTER DEGREE THESIS IN URBAN PLANNING AND POLICY DESIGN
POLITECNICO DI MILANO**

**SCHOOL OF ARCHITECTURE, URBAN PLANNING AND CONSTRUCTION
ENGINEERING
ACADEMIC YEAR 2016/2017**

**AUTHOR: GIANLUCA RUGGIERI
SUPERVISOR: GIANCARLO VECCHI**



**THE STATE OF ART OF
COPENHAGEN'S CYCLING
INFRASTRUCTURE AND POSSIBLE
APPLICATION IN
OTHER URBAN CONTEXTS**





INDEX

ABSTRACT

1	INTRODUCTION	1
1.1	PRESENTATION OF THE THESIS THEME	1
1.2	METHODOLOGY AND TOPICS FOLLOWED	3
2	THE CASE OF COPENHAGEN	6
2.1	CYCLE PLANNING MODEL	7
2.2	THE CENTRALITY OF THE CYCLE THEME IN URBAN POLICIES	9
2.3	THE STRATEGIC PLANS OF COPENHAGEN BEFORE THE VISION 2025	11
2.4	COPENHAGEN 2025	13
2.5	THE PLUSNET OF THE CITY	16
2.6	ACADEMIC OPINIONS ON THE CYCLING PLAN	19
2.7	CONCLUSION	20
3.	DAILY AND LEISURE CYCLING	21
3.1	DAILY CYCLING	22
3.2	COPENHAGEN INTERVIEWS RESULTS AND DATA	26



3.3 ACADEMIC OPINIONS	27
3.4 LEISURE CYCLING	31
3.4.1 GREEN CYCLE ROUTES	31
3.5 TOURISM CYCLING	33

4. COST-BENEFIT ANALYSIS 36

4.1 COST-BENEFIT IN RELATION TO CYCLING INFRASTRUCTURE	38
---	----

5 DESIGNING THE CYCLE INFRASTRUCTURE 40

5.1 CYCLE LANES	41
5.2 CYCLE TRACKS	44
5.3 INTERSECTIONS	47
5.4 MATERIALS AND PRICE CALCULATIONS	51
5.5 BRIDGES , TUNNELS , HILLS AND STAIRS	52
5.5.1 BRIDGES	52
5.5.2 FUTURE DEVELOPMENTS	57
5.5.3 TUNNELS	58
5.5.4 STAIRS AND HILLS	58



6. BYCICLE PARKING, BIKE SHARING AND ITS	59
6.1 BYCICLE PARKING	60
6.2 BIKE SHARING SYSTEM	64
6.3 ITS INTELLIGENT TRANSPORT SYSTEM	66
7.TRANSFERABILITY IN THE ITALIAN CONTEXT	70
7.1 CAMPAIGNS AND COMMUNICATION	71
7.2 ITALIAN CYCLING POLICIES AND LAWS	73
7.3 THE CYCLING POLICIES OF LOMBARDY REGIONAL GOVERNMENT	79
7.4 MILAN CYCLING POLICY	80
7.5 MILAN PARKING CYCLING FACILITIES	84
7.6 MILAN BIKE SHARING	87
7.7 HOW REACH THE DANISH LEVEL	89
7.8 RECIPE FOR SUCCESS IN COPENHAGEN	97
7.9 SWOT ANAYSIS	98
8. CONCLUSION	101
9. BIBLIOGRAPHY AND WEBSITES	104

PICTURES INDEX

P.2 - Pic.1 Leisure infrastructure in Copenhagen(Ruggieri Gianluca)

P.4 - Pic 2. The cycle Snake of Copenhagen (Ruggieri Gianluca, 2016)

P.4 - Pic.3 Design cycling facilities in the city (Ruggieri Gianluca, 2016)

P.5 - Pics 4-5 Bicycles parked in the city center (Ruggieri Gianluca, 2016)

P.5 - Pic.6 A building designed for the bicycles 5 (www.skyscrapercity.com)

P.7 - Pic.7 Bicycles Urban Grid of Copenhagen

P.7 - Pic.8 Copenhagen is historically the city of bicycles (www.skyscrapercity.com)

P.8 - Pic 9. The map show the successful cycling travel from a point A to B (Vision 2025 Municipality of Copenhagen)

P.8 - Pic 10. Bicycles in the port of the city (Ruggieri Gianluca, 2016)

P.9 - Pic 11. The principles of a Cycle policy (Collection of Cycle Concepts 2012)

P.10 - Pic 12. The technicians of the Cycling Embassy of Denmark (Collection of Cycle Concepts 2012)

P.11- Pic 13. The European map of the North Cycle Cities (European Smart cities)

P. 12 - Pic 14-15 Intermodality is an important factor of success of cycling infrastructure (Ruggieri Gianluca , 2016)

P.13 - Pic 16. The graph show the reduction of Co2 (Collection of Cycle Concepts, 2012)

Pic 17. The graph show the Share of Total Carbon Reduction 14

P.14 - Pic 18. The Mobility Initiatives (Vision 2025)

P. 15 - Pic 19. Half of Copenhagers use the bike Daily (Ruggieri Gianluca, 2016)

P.15 - Pic 20. The map show the Super Cycle Highway (Copenhagen website municipality)

P.15 - Pic 21. View from Google Earth of Copenhagen 2017

P.17 - Pic 22. The Map show the Plus-net Network (Vision 2025)

P. 19 - Pic 23. A cycling counter in the city (Ruggieri Gianluca)

P. 22- Pic 24. The map show the Traffic Flow Daily , more the Line is big , more is the Intesity of the Bicycles (Municipality of Copenhagen)

P.22 - Pic 25. The 50 % of Copenhagers use the Bicycles daily to go work (Municipality of Copenhagen)

P. 23 - Pic 26. Cycle Tracks Plan 2002-2016 (Vision 2025)

P.24 - Pic 27 . An example of Route of the Questionnaire (Journal of Geography)

P.25- Pic 28. Geographic distribution of positive (to the left) and negative (to the right) spots (Journal of Geography)

P.25 - Pic 29. Example of an erroneously drawn route (blue) (Journal of Geography)

P.26 - Pic. 30 The first graph show what will make cycling Copenhagers feel more safe; (Vision 2025)

P.26 - Pic. 31 The second graph show the satisfaction with the parking facilities; (Vision 2025)

P. 26 - Pic 32. The third graph show the Satisfaction with the amount and width of cycle tracks (Vision 2025)

P. 27 - Pic. 33 The first graph show the proportion of Copenhageners that feel safe when cycling; (Vision 2025)

P.27 - Pic. 34 The second graph show the satisfaction with the amount and width of cycle tracks; (Vision 2025)

P.27 - Pic 35. The third graph show the Satisfaction with maintenance. (Vision 2025)

P. 28- Pic 36. The Break-down of journeys in 2016 (Vision 2025)

P.29 Pic 37. A normal day in Copenhagen (Ruggieri Gianluca)

P. 30 - Pic 38-39 The Cargo Bikes of Copenhagen ; the graphs show some data of the Cargo solutions in the city (Ruggieri G.)

P. 31 - Pic 40. The map show the green cycle routes (Municipality of Copen.)

P.31 - Pic 41. The graph show How Copenhageners rate the importance of keeping Green Cycle Routes away from main roads (Vision 2025)

P.31 - Pic 42. The distribution of funding (Municipality of Copenhagen)

P.32 - Pic 43. The Noorebro District , example of urban cycle design (www.skyscrapercity.com)

P.33 - Pic 44. Some Copenhageners in a park in the city (www.skyscrapercity.com)

P.34 - Pic 45. A green routes in a park in Copenhagen (Collection of Cycle Concepts)

P.35 - Pic 46. The city of Copenhagen developed a special sign system consisting of posts and bollards to signpost green cycle routes (Collection of Cycle Concepts)

P.37 - Pic 47. Society save at least DKK 3 per cycled compared to driven kilometer (Collection of C.)

P37 - Pic 48. The Boat cycle Bridge in the capital (Ruggieri G.)

P.37 - Pic 49. Cost of new car journey in rush hour (Dkk/km at 16 km/h). (Vision 2025)

P.37 - Pic 50. Cost of new car journey in rush hour (Dkk/km at 50 km/h). (Vision 2025)

P.38 - Pic 51. Socioeconomic effects on cycling (Collection of C.)

P.38 - Pic 52. The Bryggebro Bridge (www.skyscrapercity.com)

P.39 - Pic 53. The table shows transport costs. A minus sign indicates a socioeconomic benefit. The assumption is 1.54 persons per car (Collection of Cycle C.)

P.41 - Pic 54. Speed humps are a particularly effective traffic calming measure (Collection of Cycle C.)

P.42 - Pic 55. The standard Plusnet cycle track has 3 lanes and is 3 m wide. (Collection of Cycle C.)

P.42 - Pic 56. A good cycle gap is 1.4 m wide, if the gap is too narrow cyclists use the carriageway and if it's too wide, cars may use the gap (Collection of Cycle C.)

P. 42 - Pic 57. A curve radius that was too small was modified (Collection of Cycle C.)

P.42- Pic 58. Cycle lanes are often used to park unlawfully (Collection of Cycle C.)

P.43 - Pic 59. The new cycle Track in the Norrebro District (www.skycrapercity.com)

P.45 - Pic 60. Cycle tracks of varying widths (Collection of Cycle C.)

P.45 - Pic 61. Two-way cycle track along Kragholmen in Frederikshavn. The solution works well as there are no side roads. (Collection of Cycle C.)

P.45 - Pic 62. A short section of a two-way cycle track and a signalized cyclist crossing makes the Nørrebro cycle route (Collection of Cycle C.)

P.45 - Pic 63. Cyclists on stormgade appreciate their new cycle track even though it's only 1.7 m wide (Collection of Cycle Concepts)

P.45 - Pic 64. This kerbside bus stop has no passenger platform and a cycle track runs through it; cars must wait for the bus to leave. (Collection of Cycle Concepts)

P.45 - Pic 65. 2.5 m wide cycle track is standard outside the Plusnet (Vision 2025)

P.46 - Pic 66. The cycle track runs behind the waiting area (Collection of Cycle Concepts)

P.46 - Pic 67. Two-way cycle path along the road segregated by a crash barrier (Collection of Cycle Concepts)

P.46 - Pic 68. Pre-green for cyclists (Collection of Cycle Concepts)

P.48 - Pic 69. Green right-turn arrow for cars at the end of the phase to prevent conflict (Collection of Cycle Concepts)

P.48 - Pic 70. This attempt at establishing a waiting space for left-turning cyclists (Collection of Cycle Concepts)

P.49 - Pic 71. Waiting space delimited by blue cycle crossing. The blue cycle crossing makes it clear to leftturning cyclists that they can wait between the cycle crossing and the zebra crossing. 4 (Collection of Cycle Concepts)

P. 49 - Pic 72. Narrow cycle lane leading up to the intersection (Collection of Cycle Concepts)

P.49 - Pic 73. Up to two blue cycle crossings are an option in signalized Copenhagen intersections (Collection of Cycle Concepts)

P.49 - Pic 74. Traffic island that allows cyclists to ride straight ahead past the island without extra waiting time (Collection of Cycle Concepts)

P.49 - Pic 75. Traffic calmed roundabout with tarmacked cycle lane all the way around (Collection of Cycle Concepts)

P.50 - Pic 76. A section of correct cycle track close to a bus stop (Collection of Cycle Concepts)

P.51 - Pic 77. A Bicycle traffic light in the city (Collection of Cycle Concepts)

P. 51 - Pic 78. The tabel show the quoted contractor prices are at 2016 levels and are used to estimate and calculate cycling infrastructure prices. 20-80% should be added to cover preliminary studies, projecting, inspection , administration, and unforeseeable expenses. (Municipality of C.)

P.52 - Pic 79. The Bicycle Snake of the city (Ruggieri Gianluca)

P.53 - Pic 80. The map of the cycle Bridges in the city (Municipality of C.)

P.54 - Pic 81. The butterfly Bridge (www.skyscrapercity.com)

P.54 - Pic 82. A pedestrian and cycle bridge in the city (Collection of Cycle Concepts)

P.54 - Pic 83. This bridge connect two new part of the city (Collection of Cycle Concepts)

P. 54 - Pic 84. A cycle bridge in a park (Collection of Cycle Concepts)

P.54 - Pic 85. The butterfly Bridge open (Ruggieri G.)

P.55 - Pic 86. A view of the Cycle Super Highway of the city (Collection of Cycle Concepts)

P.56 - Pic 87 The Cirkelbroen bridge during a day (Collection of Cycle Concepts)

P.57 - Pic 88-89. The future Nordhavn Tower Bridge (Municipality of C.)

Pic.58 - Pic 90. A tunnel in the city , opening the sides slope outwards and there are roof windows to let in daylight. (Collection of Cycle Concepts)

Pic.58 - Pic 91. A solution for stairs in the city (Collection of Cycle Concepts)

P.60 - Pic 92. One-sided butterfly rack by the wall of a residential building (Collection of Cycle Concepts)

P.60 - Pic 93. Two-sided butterfly rack (Collection of Cycle Concepts)

P.60 - Pic 94. A bicycles parking in a Mall (Collection of Cycle Concepts)

P.61 - Pic 95. A bicycles parking facilities with a front wheel spaces with 1000 two-tier spaces 61(Collection of Cycle Concepts)

P.62 - Pic 96. The City of Copenhagen has installed several brightly coloured bicycle parking facilities for carrier bikes, demonstrating that where there was only room for one passenger car before, there is now room for 4 cargo bikes. 6(Collection of Cycle Concepts)

P.62- Pic 97. A Hoop stand (Collection of Cycle Concepts)

P.62 - Pics 98 - 99 - 100 - 101 The Norreport Bicycles Parking Station during day and night with the innovative LED solution (Collection of Cycle Concepts)

P.64 - Pic 102. Lockable bicycle parking facility, Randers. Solar cells on the roof power LED lighting in the facility. (Collection of Cycle Concepts)

P.64 - Pic 103. A Bicycles parking station of the Bike Sharing System (Collection of Cycle Concepts)

P.65 - Pic 104. Some of the bikes parked (Ruggieri G.)

P.65 - Pic 105. A tablet is installed in the bikes 65 (Ruggieri G.)

P-66 - Pic 106-107. Some innovative solutions of the new Bike parking facilities (Collection of Cycle Concepts)

P.66 - Pic 108-109 Modular LED running lights help cyclists maintain proper travel speed and and the signal that indicates the start of the green wave (Collection of Cycle Concepts)

P.67 - Pic 110. A bicycle LED counter in the city (Collection of Cycle Concepts)

P.68 - Pic 111-112. Before the green wave was installed and after and below during the night (Collection of Cycle Concepts)

P.69 - Pic 113-114. A LED system help the cyclists during the night (Collection of Cycle Concepts)

P.69 - Pic 115. The city of Copenhagen makes it easier for cyclists to hit the rubbish bin by placing it at an angle (Collection of Cycle Concepts)

P.69 - Pic 116.Variable signs warn cyclists of turning lorries (Collection of Cycle Concepts)

P.72 - Pic 117. The police distributed hugs and helmets to cyclists, viewed all over the world on YouTube, as part of the "Use a helmet because we love you" campaign (Collection of Cycle Concepts)

P.72 - Pic 118-119 The Facebook page of Aarhus Cykelby page , below the website of the campaign "We bike to work" (Collection of Cycle Concepts)

P.73 - Pic 120. The smart objectives of high level of motivation campaign (Collection of Cycle Concepts)

P.73 - Pic 121.The behaviour modification process (Collection of Cycle Concepts)

P.74 - Pic 122. The minister for Climate and the environment (Collection of Cycle Concepts)

P.74 - Pic 123. The graph show the Percentage of overweight 10 year olds compared to percentage of children that cycle in the same countries (Vision 2025)

P.74 - Pic 124. A survey carried out by the city of Odense shows that people who cycle feel they are in better shape than people who don't. (Vision 2025)

P.74 - Pic 125-126. Some example of Cargo bicycles initiatives in Milan (www.Skyscrapercity.com)

P.74 - Pic 127. Some cyclists to Expo 2015, held in Milan

P.75 - Pic 128-129. As Italians perceive the car and how it really should be

P.75 - Pic 130-131 The web site of one of the main promoters sites in Italy. Down a bike path at Lake Garda (FIAB)

P.76 - 132-133-134-135 The VENTO project; one of the main projects of creation of a great cycle in the Po valley with its costs and location (VENTO Project)

P.78 - Pic 136 A bike path in a protected park (www.skyscrapercity.com)

P.78 - Pic 137. A stretch of bike path near the canals in Milan (Ruggieri G.)

P-78 - Pic 138. A pedestrian-cycle bridge in the Po valley (www.skyscrapercity.com)

P.79 - Pic 139-140. A cycle route in a park, and the bike lane of the Po River

P.80 Pic 141-142 The new bike path of Milan Porta Nuova , in the pictured below unfortunately often bike lanes are occupied by cars with serious risks for cyclists (Ruggieri G.)

P. 81 - Pic 143. A cargo bike in Milan (www.skyscrapercity.com)

P.81 - Pic 144.-145 A part of the bike path in the north part of Milan. Below a cycle bridge

P.82 - Pic 146. A bike path near the central station (www.skyscrapercity.com)

P.82 - Pic 147. Bicycle path near the Duomo (ATM)

P.82 - Pic 148. Existing network of cycle routes (Pums)

P.82 - Pic 149. A bike sharing parking in the center of Milan

P.84 - Pic 150. A bicycle parking in Assago Metro station

P.84 - Pic 151. The largest parking for bikes at the Comasina metro station

P.85 - Pic 152. The bicycle station of Milano Porta Garibaldi: design of preliminary draft in 2014 by the architectural firm T SPOON (Pums)

P.86 - Pic 153. Bike sharing for children, an initiative to raise awareness to cycling (ATM)

P.86 - Pic 154. A bike sharing parking in front of the cathedral (ATM)

P.87 - Pic 155-156 Combined effect of modal split in blue bicycle, red car, green public transport, yellow motorcycle (PUMS)

P.88 - Pic 157 . Number of subscribers from 2009-2014 (PUMS)

P.88 - Pic 158. Number 2008-2014 stations (PUMS)

P.88 - Pic 159. Historical levy bicycles 2009-2014 Series (PUMS)

P.90 - Pic 160-161-162 Different possible development in future of the Cycle paths in Milan

P.91 - Pic 163. Bike routes of the PGT and interventions planned in the reference scenario(PUMS)

P.92 - Pic 164 . Priority directions of cycling, PUMS Scenario: average volume of bicycle traffic attracted (PUMS)

P.93 . Pic 165. Fundamental routes of bike paths in milan (PUMS)

P.94 - Pic 166. BikeMi, completion of phase 2 and the realization of phase 3 Expansion of bike sharing programmed to the reference scenario(from 205 stations in January 2015 283 active stations) (PUMS)

P.94 - Pic 167. Cyclability in the urban area, scenarios of the Pums Plan (PUMS)

P.94 - ic 168. BikeMi, bike sharing service Hypothesis expansion in two phases - 2020 and 2025 (PUMS)

P.94 - Pic 169. Priority directions of cycling: priority interventions (PUMS)

P-95 - Pic 170 The principles to modify the behaviour (Collection of Cycle Concepts)

P.96 - Pic 171. Principles for environment friendly siting (Collection of Cycle Concepts)



ABSTRACT

The cycling infrastructure plan of Copenhagen, Danish capital, is the end point of policies aimed at the realization of a plan with a central cycling as its cornerstone. Through the study of the urban cycle plan I talked about the importance of the cycling theme in a context such as the Italian still poor of excellence of this kind.

The first chapter talks about the early strategic plans of the city to Vision 2025. The message of this part is the importance of including the cycle Plan not as superficial part but central to the construction of a strategic plan in cooperation between the municipalities, planners and the citizens.

In the second chapter I analyse the movements Cycle diaries and those for Pleasure. Through an analysis of the experiences of positive and negative cyclists, I got a statistical analysis that you can apply it in other urban contexts. Later I speak of cycling pleasure, tourism linked to the bicycle and cycling green corridors in a context such as the Italian would bring a great advantage socio - economic.

In the third chapter I analyse the cost - benefit related to infrastructure that contrary to what is thought to have led to savings results in economic terms to the entire community.

In the fourth chapter I talk about the design of cycling facilities, the structure of paths and bicycle parking, the Bike Sharing innovative and ITS-Intelligent Transport Systems. Analyze the innovative solutions of the city to make them an example for our urban reality and a possible transfer in the context of the city of Milan.

In the seventh chapter I speak of the construction decision process that led to the success of the Danish case and through a study of the major bike and sustainable mobility documents, the PGT, the PUMS, and Danish plans analyze the cycling theme according to the regulations in the various contexts.

In the last part a final SWOT analysis of the two different contexts of the city of Milan and Copenhagen with different opportunities, strengths, critical points, and fragility. My goal is to transfer and transform the Danish model in the Italian context, the use of bicycles in everyday movements, and not only in his spare time.

Il piano infrastrutturale ciclabile di Copenhagen , capitale Danese, è il punto finale di politiche volte alla realizzazione di un piano con al centro la ciclabilità come suo cardine . Attraverso lo studio del piano urbano ciclabile ho parlato dell'importanza della tematica ciclabile in un contesto come quello italiano ancora poco ricco di eccellenze di questo tipo.

Il primo capitolo parla dai primi piani strategici della città alla Vision 2025. Il messaggio di questa parte è l'importanza dell'inserimento del piano ciclabile non come parte superficiale ma centrale nella costruzione di un piano strategico in collaborazione tra la municipalità , i planner ed i cittadini.

Nel secondo capitolo analizzo gli spostamenti Ciclabili diari e quelli per Piacere. Attraverso un analisi delle esperienze dei ciclisti positive e negative , ho ottenuto un analisi statistica che è possibile applicarla in altri contesti urbani . In seguito parlo della ciclabilità del piacere , il turismo legato alla bicicletta e i corridoi verdi ciclabili che in un contesto come quello italiano potrebbe portare un grande vantaggio socio – economico.

Nel terzo capitolo analizzo i costi – benefici legati alle infrastrutture che contrariamente a quello che si pensa hanno portato a risultati di risparmio in termini economici alla intera collettività.

Nel quarto capitolo parlo del Design delle infrastrutture ciclabili, alla struttura delle piste e dei parcheggi per biciclette, al Bike Sharing innovativo e agli ITS Intelligent Transport Systems . Analizzo le soluzioni innovative della città per farle da esempio per le nostre realtà urbane e con un possibile trasferimento nel contesto della città di Milano.

Nel settimo capitolo parlo del processo di costruzioni decisione che ha portato al successo del caso danese ed attraverso uno studio dei principali documenti di mobilità ciclabile e sostenibile, del PGT, del PUMS , e dei piani danesi analizzo la tematica ciclabile secondo le normative vigenti nei diversi contesti.

Nell'ultima parte un analisi finale SWOT dei due differenti contesti della città di Milano e di Copenhagen con le diverse opportunità , punti forti , punti critici, e fragilità . Il mio obiettivo è trasferire e trasformare il modello danese nel contesto italiano , per l'utilizzo della bicicletta negli spostamenti quotidiani e non solo nel tempo libero.

1. INTRODUCTION



GEOGRAPHICAL FRAMEWORK



1. INTRODUCTION

1.1 PRESENTATION OF THE THESIS THEME

The study of the infrastructure plan in Copenhagen, the Danish capital, was born from my passion for cycling mobility. The interest has been consolidated since my early studies here at the Polytechnic and was raised in the course of the Master in Urban Planning and Policy Design: it is during a journey to Copenhagen that the idea came to investigate and study the case of mobility Danish cycling as an example of soft mobility excellence, forced displacements and leisure, studying infrastructures reserved for bicycles and observing and interviewing citizens and municipalities for their Vision of the Danish city. My research interest is to analyze the characteristics of the design of the Copenhagen Strategic Plan and the actors that sustained its decision and implementation; after that, whether it can be transferred in the Italian context.

Returning to Italy, I decided that this should become the topic to be treated in my thesis. Through a study of the infrastructure and the construction process of the Danish policies, my attention was mainly devoted to the forced displacements in bicycle and later to those for pleasure, analyzing the context of the capital with intent transferability of this example of excellence in a context such as the Italian that despite his efforts the past few years is far from the levels of the northern European countries. Dealing with cycling is a challenge for the century in which we live, a hint to European policies for cycling is a must as the EuroVelo program, the European cycle route network, is a project of the ECF to develop an extensive network of 12 cycle routes journey through the whole European continent. which provides more than 70000 km of cycle network including more than 40000 km already in place. The European network saw the light at the end of the '90s, but only in 2007 have become available is an ad hoc working group is the first funding which enabled the project to start in practice.

Cycling is able to offer a useful contribution to the urban transport aimed at home-school-work-services.-social relationships movements etc. and on this potential of the bicycle as an alternative means of transportation it develops the main theme of my thesis with the presentation of a network of urban cycle routes efficient, secure, comprehensive and well-structured. The creation of urban networks of bicycle paths can become an opportunity for both a general reorganization of mobility both for a redevelopment of public spaces in many neighborhoods creating pleasant and safe surroundings, basic elements to promote the use of walking and cycling routes. In many European countries the creation of urban networks was an opportunity to redevelop many urban areas whose public spaces were free of livability features that entice people to use them. Interventions insertion of the green and the use of traffic calming techniques, the realization of compact roundabouts, Zone 30 and Residential roads, revitalized degraded areas allowing citizens to reclaim those parts of the territory that were previously intended for use exclusive of vehicle traffic.

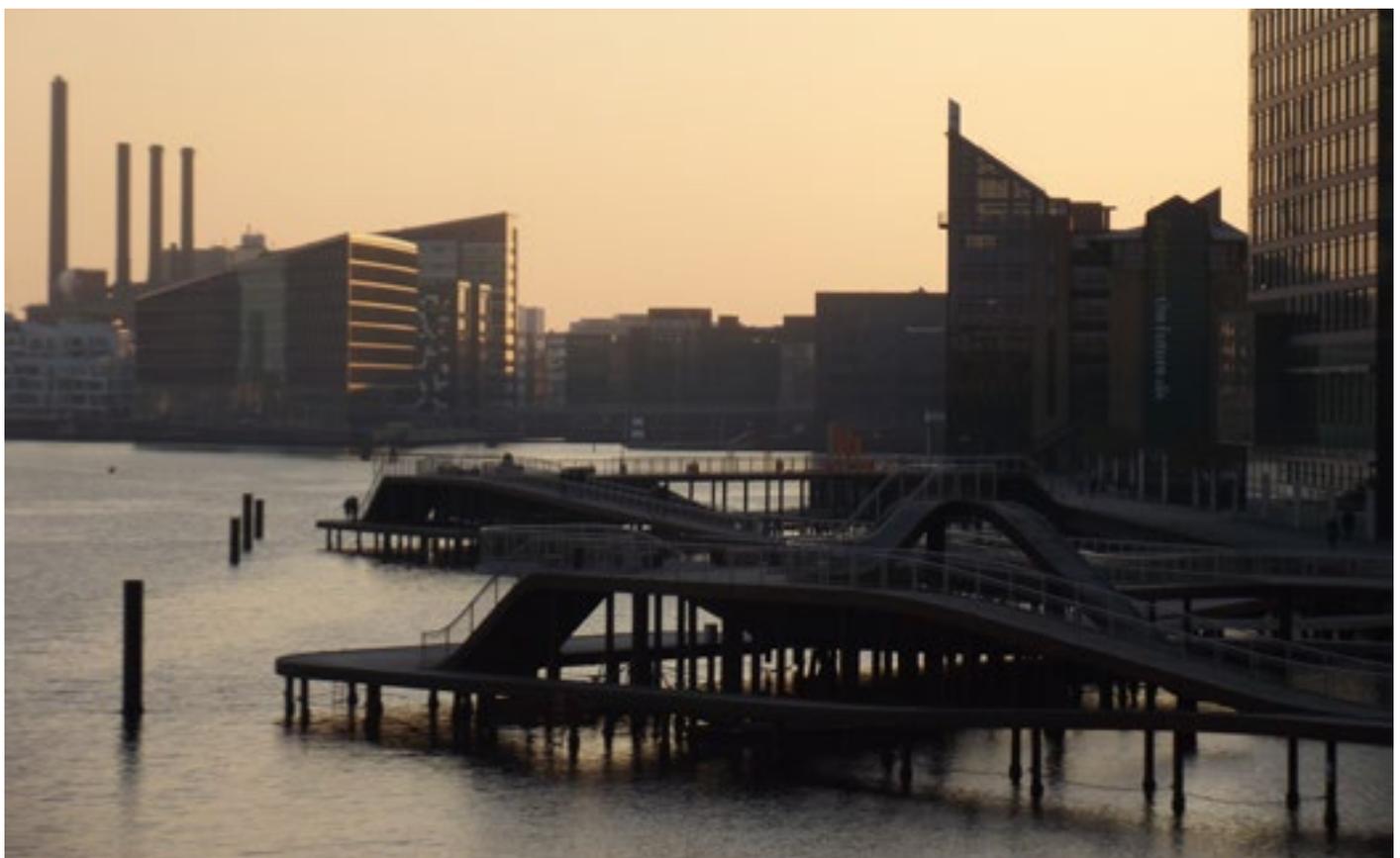
Currently the urban mobility of bicycles is generally motivated by aiming movements, is the type Periphery-center of a local nature. In recent years it has grown in every social class of citizens the need for daily contact with the natural environment and, for this, both within the city and in its immediate vicinity, it has developed the need to equip spaces pleasant to run to walk, stroll, "doing a bike ride" in the green, in an area with little pollution and little noise. The presence of citizens in the streets, whether by bike, walking or just sitting on a bench, must also be activated through the redevelopment of neighborhoods. Only if the environment is pleasant, inviting and secure the citizen is inclined to move around the city on foot and by bicycle both for reasons related to small daily purchases and for the need for simple sociality, precisely why Copenhagen is a perfect example of safety and safe and planned cycling infrastructure. If the around, the streets and the green are messy, no places of interest en route, with traffic and noise, then the city will move by car even for short trips. But what is cycling?

“Cycling can be divided into three broad categories: daily commute, cycle-tourism and, in another context, sporting activities. These shift modes have different conditions, which arise from different requirements, origins and purposes. Commuting by bicycle generally take place throughout the year, with seasonal fluctuations, and involve large numbers of users, a more or less high proportion of the population that makes regular trips to get to work, to school, to services etc. In the case of developed countries with cyclability is orders of magnitude of millions of people, with modal distribution ranging from 10% to over 50% of the total mobility as in the case studied by myself. Commuting by bicycle have character “transport terms” and not recreational (or only very secondarily), thus similar to other forms of mobility (public transport, car and so on.)” (Collection of Cycle Concept , Cycling Embassy of Denmark, 2012).

The cycling activity touches numbers and orders of magnitude much less the daily commute, but in some particularly attractive regions and adequately equipped (receptivity, cycle ways etc.) Also reflected a share of wide use especially in mild or hot months of the year. Sporting activity contributes to the overall numerically modest cycling. For cycling infrastructure that is needed is the appropriate regulations, designed to permit and facilitate travel from point A to point B, Newspapers, sporadic or occasional.

Origins and destinations of bicycle traffic are identical to those of any other type of traffic (cars, public transport etc.). For this reason, the existing road network in many cases already provides a possibility of use by the bicycle traffic. Being muscular traction it requires direct and short distances without significant deviation or circumvented, with surfaces suitable and easy transitivity. Even in cases in which the need for a separation of the flows (eg for safety reasons, dictated by differences in speed, intense motorized traffic etc) the road network provides almost always the directions of displacement of the bicycle traffic. For tourist cycling instead roads are preferred locations outside and often on different paths from those with heavy motor traffic. Often, therefore, they take less direct routes between two locations, in favor instead of the passage in attractive tourist places. Also the road surface of cycleways can be for example non-paved or otherwise not to have sliding characteristics.

Plan the cycling means proposing a interpretation of the places still not quite usual, careful land use patterns probably more suited to the delicate textures that characterized the multiform civilization cycles that have taken place in our country. The formulation of a reticular interpretation of infrastructure assets, has now assumed the characteristics of an increasingly common strategy in recent planning tools.



Pic.1 Leisure infrastructure in Copenhagen

1.2 METHODOLOGY AND TOPICS FOLLOWED

The first part of my thesis in fact develops the relationship between 'planning' and 'cycling'. The planning of cycling as urban planning, is drafted in the technical administrations. In fact, the urban and planning cycle should be closely coordinated; the construction of a network capable of ensuring an adequate spatial continuity to widespread environmental values then becomes the supporting matrix for an infrastructure process aimed to different modes of use of the territory. In particular the attention of local operators has been urged by the potential afforded to the network planning of itineraries multi-use processes to a slow spatial scale mobility. Then it is desirable for the promotion of research aimed at defining content and ways of planning to respond to one of the recurring objectives: to ensure widespread environmental quality of large social accessibility. The primary step of such a use of the territory project involves the definition of the criteria that inform the planning of a network of routes for bicycle and pedestrian mobility. These criteria must necessarily refer to the deepening and the specification for the Italian case of the most recent and relevant European experiences, especially Copenhagen.

The planning of cycle routes presupposes the identification of cycling offer in the area and the demand side. The offer is linked to territorial factors that constitute attraction for cycling, the use of the territory networks, the presence of supra-municipal routes accessible and safe. one of the research methods was the analysis of the demand for cycling offer in Copenhagen. Through representative profiles of cycling, preferably supported by local timely analysis on the quantity and type: frequency, motivation, the average path length. A special mention must be the theme of the ride my bicycle safety: secure means in itself, strongly affected by mingling with other transport modes (especially cars and heavy vehicles).

Since the nineties the lattice approach applied to the planning and programming of cycle routes has become a great success. They were designed and promoted many projects of national networks of cycle routes and each design manual and infrastructure management. The first experiences of cycling planning have often clashed with strong operational difficulties must be limited to declarations of principle and sterile enumerations of the duties of the institutions or of the different players in some way affected by the plans forecast. The analysis of the consolidated processes of cycling planning allows you to attribute the success of these experiences and the development of the programs they contain three fundamental principles. The first principle assumes a comprehensive and cooperative concept aims to combine four areas: planning and design of cycle route networks, with the aim to modify the system of transport networks to facilitate safe and profitable use of cycling, including through the realizations of new independent routes by road network; promotion of cycling; education and knowledge; promotion and enforcement of laws on cycling;

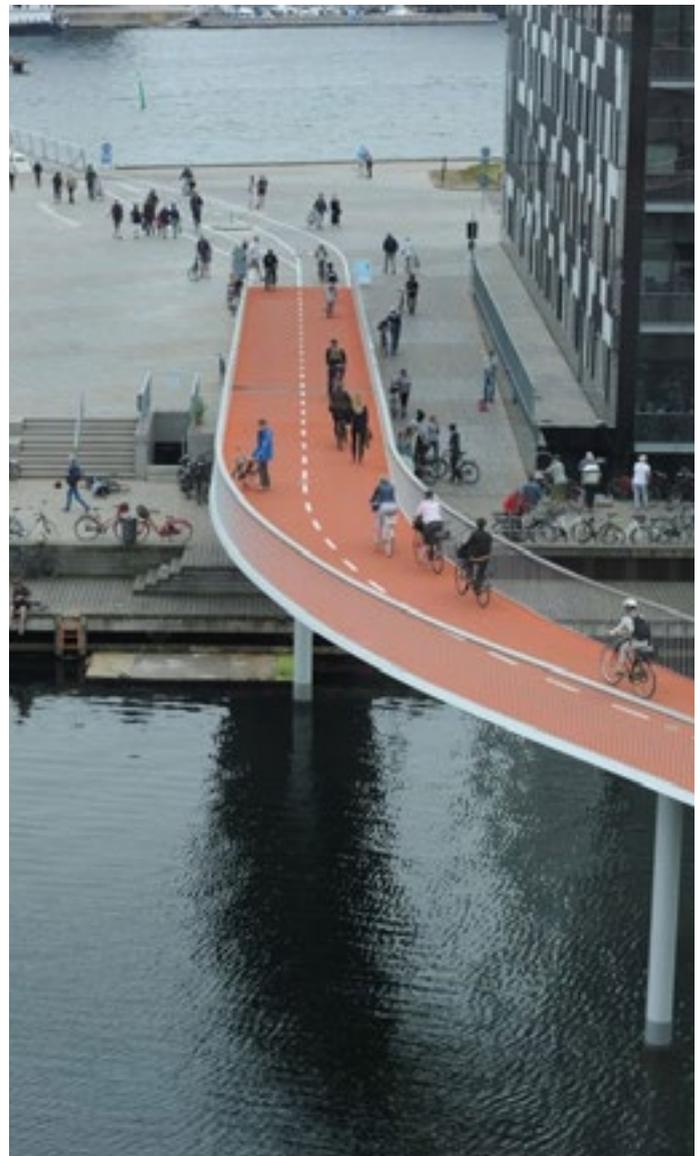
The municipal primary objective of the Danish capital is to make the city environmental capital. Through a good standard of living and making the city CO2-free by 2025. The use of the bicycle is a police designed tool for a more livable city. Copenhagen is the city of bicycles, each day thousands of people use the bike for all types of transfers. Is a surprising to many foreigners and a source of interest to journalists, politicians, researchers and planners from all over the world.

Copenhagen thanks to continuous constants and full efforts have achieved this status. About 35% of population use the bicycle going up by a third in recent years. The first municipal strategy was of 2002-2012. A more livable city a bicycle-friendly city is a city with more space, less noise, cleaner air, healthier people and better economy. A city in which individuals have a better quality of life. The bicycle traffic is an effective tool to create a livable city, with room for diversity and development. Through the use of bicycles has created less congestion due to road traffic, life expectancy has increased, less wear on roads and less pollution. Many planners and politicians now have their eyes focused on Copenhagen. The residents of the city choose the bicycle because it is the fastest and easiest way to move, as a result of the following chapters present data and through interviews with the inhabitants the data collected in the capital.

Giving more space to bicycles is indispensable in order to increase the sense of security, through the extension of runways and focused policies to improve the traffic respectful behavior. Through ambitious priorities such as tunnels and bridges on the water, railroads with access to bicycles and real highways for bikes my intention was then turned on the design of cycling infrastructure, on an analysis of the costs and benefits of that citizenship through these works will benefit later. The street design should be determined by the road speed, road surface, signaling. my attention is then directed on separate bicycle paths, shopping streets, residential, primary and highways. Later on road junctions, bus stops and parking areas for bicycles, if a single lane or double lane. A deepening deserve parking lots for bicycles with innovative systems and next-generation signaling systems with ITS - Intelligent Transport System.

After an analysis of the strategic plan, the various actors who have contributed to the achievement of the strategic plan of the capital, an analysis on the design and cost, my attention is being paid to what is the transferability, or how to apply the policies of the capital in other contexts outside of Denmark. Research and analysis of good practices, including the Danish Plan provides two main phases. The first step is to do some research on the configuration model, explaining the effects. Here , the analyst should identify the characteristics and mechanisms that is useful to replicate and design the extrapolation processes.

In this part is interesting to understand the identification of the relevant factors for the representation of good practice aimed the policy transfer through the question “How Does it works? And “how it was obtained”. An analysis of the social mechanisms is at the centre of the analysis: it is necessary to study the mechanisms that explain how an unsatisfactory ex-ante condition can be changed in a positive one , changing the actors behavior with positive results . The three stages of reconstruction of the design and implementation are the chronology, the analysis of the actors involved, analysis of interaction models and the definition of success factors. If and how it is possible to export the Danish model is one of Copenhagen’s strategic plan goals, whether it is feasible in terms of cost and if you can apply it to a context as, for example , the Italian urban areas.



Pic 2. The cycle Snake of Copenhagen



Pic.3 Design cycling facilities in the city

If you think that cycling is a part of everyday mobility with equal dignity than others, you need to think about a city that allows widespread circulation of safe bike on all roads, with all that this implies in terms of equipment , facilities, services, . If, however, we consider it a residual medium, or a component of all accessory, then you can also make do with a handful of kilometers of bicycle paths chopped, uninviting and not much else as often happens in the territory of Milan and many other reality Italian urban. Think of the Fiera di Rho: a colossal economic investment is essentially still not accessible by bike from Milan, which, moreover, has produced a fracture in the area, making it dangerous to bike mobility for citizens of neighboring countries (Rho Pero). Or to Milan Central Station, the subject of a long and expensive restoration work that has not been able to conceive of the station as well as place of interchange between cycling and public transport. Or the Porta Nuova tunnel, adjacent to the Garibaldi Station, inexplicably forbidden to bikes, forced to alternative non-existent. Or the ZTL in via Paolo Sarpi, which does not present the opportunity for bikes to pass through, bike in either direction (except that this will finally be granted as the next remedy to strong protests that have been raised). And finally Corso Buenos Aires, where the implementation of a redevelopment has not found a way to concretely promote cycling, forcing in this case the citizens to take action with instances, petitions and protests are often unheard.

A reality that of Milan, and urban Italian still far from that of excellence of the Danish model, but we must first learn from excellence to improve, do research and try to pay more attention to bicycle in the strategic plans not as an accessory but as to whether an integral and central part of the traditional Italian strategic plan. One of my objectives also was precisely to try to focus on the forced displacements that in the Danish capital represent 50% of the total, and transfer to an Italian context still too tied to cars; perhaps through policies to promote the use of bicycles in Italy in many years we will reach for type obliged Labor movement - House the percentage of the Danish reality, through incentive policies and infrastructure creations, already the first signs such as spreading the Bike sharing and increase reserved bicycle lanes, with the use of the bicycle policy, the development of a municipal bicycle plan are the first signs of change that timidly emerge in a context such as that Lombardo still too tied to the use of road transportation vehicles, but small steps that demonstrate the long-awaited change in a city such as Milan.



Pics 4-5 Bicycles parked in the city center



Pic.6 A building designed for the bicycles



2. THE CASE OF COPENHAGEN



2. THE CASE OF COPENHAGEN

2.1 CYCLE PLANNING MODEL

Copenhagen represents a model for the cycling planning, one of the purposes of my thesis is surely through the city's Bike plan presentation to highlight the importance of mobility path becoming the mainstay of the urban plan, and how and what part of the plan's possible transfer to the Italian context. It's important to understand how it was possible to realize a Urban Plan with a Cycle Plan as central theme. The municipal plan should CONTAIN a road NETWORK plan and a cycle network plan. If this has not been done yet, it might be useful to start out by drawing up a cycling infrastructure sector plan which can then be integrated into the next municipal plan. Better cycling facilities can also be written into a traffic or mobility plan.

A cycling infrastructure plan is partly based on a survey of cyclist issues and proposals, knowledge of existing cycling patterns, siting of primary corridors/links and major cyclist destinations (workplaces, service institutions, shops,). In a number of Danish cities, the cycling infrastructure is almost entirely cohesive, whereas in other cities and rural areas it is less so. To understand Copenhagen is important says that there is a strong Danish cycling tradition. Improving existing cycling facilities, making high quality additions to the cycling infrastructure, and introducing untraditional measures encourage more people to cycle. The cycling infrastructure can be improved by linking existing circulation areas, upgrading facilities to a contemporary standard, and actual expansion. All such initiatives should be based on a bicycle infrastructure plan, sometimes referred to as a "cycle track plan", or should be an integral part of a "cycling action plan", which includes many different aspects of cycling promotion. Traffic calmed road or slow-speed zones and secondary roads with little motor traffic may be include in the cyclist circulation area.



Pic.7 Bicycles Urban Grid of Copenhagen



Pic.8 Copenhagen is historically the city of bicycles

“Copenhagen aims to increase cyclist travel speed by 10% over a few years. When a cycling action plan is politically approved and initiated it will often be insufficiently funded. Sometimes co-financing with the State is possible of Eu Funding . Danish communities are in great demand for EU Projects and experience shows that local politicians are very interested in getting their share. A well thought out plan is often needed so as to be able to grasp any opportunity for improving the cycling infrastructure that may arise. High political ambitions for cycling should be reflected in higher standards for new infrastructure design. The existing infrastructure can be improved , too. Focusing on security and passability is an excellent starting point for an upgrade, but of course safety concerns are paramount too” (Cycling Embassy of Denmark , 2012, Troels Andersen) .

The functional requirement for a successful cycling infrastructure is that traveling from point A to point B should be convenient and quick , and the journeys should be safe and pleasant experience. This applies especially to daily cyclists, the cyclists that i focused my attention, but all types of cyclists appreciate not having to make major detours. Daily cyclists destinations are schools, institutions, workplaces, shops, parks, leisure facilities, train stations, and bus stops.

Many journeys are relatively short, but particularly commuters are willing to cycle further, perhaps 6-8 km between home and work. Since many people are now focusing on exercise and health , perhaps more people will be willing to commute even further, some with the assistance of an e-bike. For Sunday cyclists a convenient link between the city’s infrastructure and the activity destination plays an important role. Typically , 10-30 km are cycled often in combination with a public transport mode. The starting point for cyclists on holiday is a home, train station, bus terminal, bike rental shop at the holiday destination , etc. but on daily and leisure cycling i will talk later more in detailed.

Pic 9. The map show the successful cycling travel from a point A to B



Pic 10. Bicycles in the port of the city



2.2 THE CENTRALITY OF THE CYCLING THEME IN URBAN POLICIES

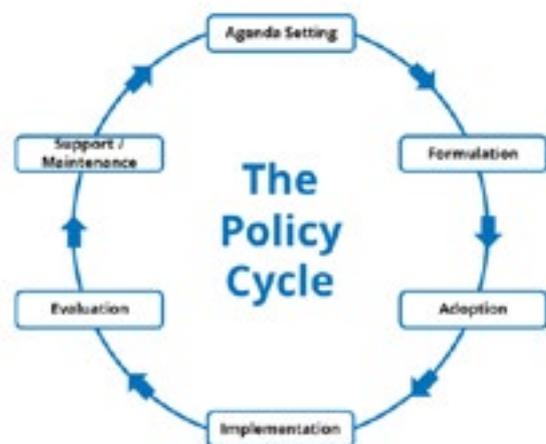
Today cycling expresses the conscious choice of an efficient transport mode that benefits the individual and society as a whole. Cycling is not merely a question of transport- it involves health , safety , a better environment, climate and urban life. Cycling cuts across administrative boundaries and is relevant for children, young people, adults and the elderly. It is thus crucial that all relevant administrations and sections dealing with planning, urban life, health, prevention, the environment and climate work together to promote the use of the bicycle in daily life. Add to this, investing in bicycle traffic is relatively cheap in relation to the socioeconomic benefits: healthier citizens, cleaner air and a more flexible infrastructure.

Experience shows that campaigns are effective in moving road users away from other transport modes to cycling so campaigns can be used to great advantage by the local planning authorities, associations and businesses to modify the behaviour and attitudes of selected target groups. Not all the campaigns, however , are successful in changing the target audience's ingrained habits. Campaigns are taken in the broader sense of ranging from national TV spots to the local community handing out muffins and coffee. If communications and campaigns are to be successful the priorities must be clear: developing a communications strategy is therefore a must. A communications strategy need not be a long document drawn up by communications experts.

“One of these big projects is the Nordic cycle Cities, in which 11 Danish , Swedish and Norwegian cities work together to increase the modal split of cycling, came up with a form that all parties would be required to complete when planning a communications initiative. Knowing where citizens stand is crucial to the behaviour modification process otherwise resources are wasted on campaigns that miss the target. The initial goal of communications strategy is to affect citizens enough for them to switch transport modes and to travel more safely for the least amount of money . Afterwards it is essential to maintain the behaviour change. Credibility plays a major role in the success of cycling campaigns. For example there is no point in directing cyclists to unsafe roads or combating irritating but safe traffic habits.

It is a great advantage to coordinate the different campaigns for better physical cycling conditions, motor vehicle restrictions, road safety and police control of road users; a coordinated strategy has the greatest chance of success.

Research and experience show that information in itself is not enough to change people's habits ; most people , for example , know that cycling is healthy and eco-friendly, but more is needed before they change their habits. Consequently a key objective in most Danish cycling campaign is to get the participants actively engaged; they have to get out there and bike. People need to feel that they themselves have a say in changing their transport habits or attitudes if they are to get actively involved in a campaign. The choice to change transport mode or behaviour is up to the individual , no one else. Cycling campaigns should therefore never lecture, apply pressure or preach to potential participants, campaigns need to offer something the participants want, and campaigns have to show that here is a choice worth considering. Is important the annual ,nationwide “we cycle to work” campaign draws attention to cycling as a potential transport mode to and from work by means of communications and marketing, but what actually involves people actively is an enjoyable common activity that participants wish to be part of. Every year 10,000 new cyclists are inspired to cycle by the campaign, and they continue cycling after the campaign is over” (Bicycle Strategy Plan 2011-2015, City of Copenhagen).



Pic 11. The principles of a Cycle policy

One of the most important actor in Denmark is the municipal cycle network that focuses on knowledge sharing among municipal practitioners while the Cycling Emassy of Denmark consolidates cooperation between the private , public and civil sectors. In addition there are a number of other platforms that consolidate cooperation and knowledge sharing, such as conferences and minor networks. But what is the Municipal Cycle Network?”

The municipal cycle network functions as a professionals platform for municipal practitioners working with bicycle promotion projects. There is no Danish tradition of close cross-municipal cooperation at this level , and one of the network’s aim is to ensure such cooperation. The municipal cycle network provides a platform for: mutual inspiration and exchange of ideas; communication experiences; testing ideas; establishing a references base of tested measures aimed of decision makers, politicians and police . Developing Denmark into a cycle friendly country is largely a decentralized , local process. It is a therefore crucial that the many valuable initiatives and experiences from all over the country are collected, systematized and passed on. For a number of years Danish municipalities received state funding, financed by the so-called Trafikpuljen, to promote cycling initiatives. A requirement for receiving the grant was to communicate results and experiences to the other local authorities.

The Danish Road Directorate withdrew from providing secretariat services for the cycle network in 2001. At present the Danish Cyclist federation has assumed responsibility for the secretariat, including preparing agendas, sending out invitations and all practical arrangements. The network works around the two annual meetings and study trips. A main theme is decided on in advance of each meeting. 17 municipalities are members of the network as of 2011. An other important actor is the Danish Cyclist Federation , that is a member organization with 40 local branches located all over the country.

Local authorities can benefit from collaboration with the local branches and the Copenhagen secretariat in a number of areas:

-Impartial assessment of local cycling conditions; list of measures with the greatest impact ; formulate an overall cycling strategy; mobilize citizens support for new cycling initiatives; cycling initiatives as municipal promotion; provide cycling inspiration from Denmark and the rest of the world.” (Collection of Cycle Concepts, 2012, Troels Andersen).

Collaboration between the local authorities and the Danish Cyclist Federation is most successful if project expectations are in sync from the start. Meetings held early on in the process can clarify whether the authority and the local branch of the Danish Cyclist Federation can make common cause. In addition to the local branches located all over the country , the secretariat in the capital is available for advice, guidance and to test ideas. An other important key actor is the Cycling Embassy of Denmark that is a network of different players in the field of cycling. No tradition of close collaboration formerly existed between private companies, local authorities and other organizations, but it makes sense to consolidate resources earn the playing field is so small compared to the rest of the world. It’s the cycling embassy’s vision that Denmark shall be the world’s leading country and the primary source when it comes to knowledge, dialogue and innovation in the field of cycling.

Pic 12. The technicians of the Cycling Embassy of Denmark



The organization wishes to encourage cycling all over the world and its members work together to develop and promote Denmark as a cycling country through exchange of ideas, development and communication of bicycle . In concrete terms contributes to Joint promotion as a cycling country; making Danish cycling knowledge available to non-Danes; supporting events at Danish embassies and other Danish agencies abroad; ensuring a platform for network formation. Ever since 2005 the interest in daily cycling , one of the main point of my thesis, has been growing slowly but surely all over the world. This had put a certain amount of pressure on Denmark and Holland , where the cycling modal share is high. In 2009 start the Cycling Embassy of Denmark; the network saw the light of day at the European cycling conference Velo-city in Brussels. In 2011 , there were 17 members , including 6 municipalities , 6 private companies and other types of organizations, such as VisitDenmark, DSB, the Danish Cancer society, and the Danish Cyclists Federation.

The Cycling Embassy is a network in practice, it has a formalized structure with a board of directors and a work plan. The federation has assumed the function of the Cycling Embassy's secretariat. It prepares meetings and coordinates many of the activities .

“Since 2008 the Danish Road Directorate has held an annual , two-day national conference at which projects, promotional campaigns and new knowledge are presented and discussed . the event provides and excellent overview of the many activities taking place. Cycling is increasingly becoming a subtopic at conferences on other themes, such as health the environment , mobility, urban planning. It's possible also apply for Eu funding for cross-municipal or cross-national projects. Among other things , this has given rise to such projects as Nordic Cycle Cities , that I wrote before, and Bike without Borders that is a collaboration between 4 Danish and 2 German cycle cities. An other project called Smart cities compared 70 medium-sized European cities, including the Danish Aalborg, Aarhus and Odense. The cities are compared on the basis of 6 indicators: economy , mobility , environment , people , living and governance” (Strategic Plan of Copenhagen , 2009, City of Copenhagen).



Pic 13. The European map of the North Cycle Cities

2.3 THE STRATEGIC PLANS OF COPENHAGEN BEFORE THE VISION 2025

Copenhagen is known far and wide as the “City of Cyclists” – due to its longstanding and lively cycling tradition and, in recent years , its City Bikes. In Copenhagen, cycle planning is an integral part of main-stream traffic planning. The cycle track network was already partially completed in the 1960s and 70s although there were much fewer link-ups between cycle track sections then than there are today. Despite the fact that many people bought cars in the 60s and 70s, Copenhageners continued to cycle. Cycling is a socially acceptable means of transport and it is not uncommon to see Danish ministers or mayors riding their bicycles to work. Currently bicycle traffic accounts for a significant proportion of Copenhagen traffic – comparable to public transport and private cars. One out of three Copenhageners cycle to work. The Copenhagen cycle track network was built over the course of almost a century. The cycle track network consists of cycle tracks on both sides of the major roads with a total cycle track length of over 300 kilometres. Normally cycle tracks are wider than two meters across, in Copenhagen bicycle traffic is thus considered a distinct traffic category with its own separate road area – on a par with motor traffic and pedestrian traffic; Bicycle traffic in Copenhagen has grown in recent years, this has occurred in spite of the fact that the national trend is that people cycle less.

A sustained effort on the part of the City is a prerequisite for maintaining the level of bicycle traffic and an even greater effort is necessary to increase the number of cyclists. “In 2002 the City budget for road construction was DKK 60 million, one third of which was earmarked for the improvement of cycling conditions. For the first time the City of Copenhagen had published a cycle policy, the purpose of which was to draw attention to the fact that cycling is an environmentally desirable and effective means of transport and also to coordinate initiatives for improvements of cycling conditions. For the past five years the city has published a Bicycle Account which has already provided an input for cycle planning. The cycle policy goals are to increase the proportion of the workforce who cycle to work, to improve safety and a sense of security when cycling and to increase travelling speed and cycling comfort , The goals were to met within 11 years” (Strategic Plan of Copenhagen, 2012, City of Copenhagen).

“An overall action plan for the improvement of cycling conditions shall be drawn up, the plan shall contain provisions for the extension of the cycle track network and proposals for new cycle routes and include proposals for the improvement of general passability, cyclist safety and comfort, including necessary maintenance” Was one of the objective of the City of Copenhagen in 2000-2003. The Subplan for the Improvement of Cycling Conditions is a subsection of the City’s Traffic Improvement Plan of 2000. The plan was approved as the basis for all further work and the subplan may be considered a blueprint for an action plan for the improvement of cycling conditions.

The aim was to achieve the following goals by 2012:

- 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 travelling speed on trips of over 5 km shall increase by 10%.
- Cyclist comfort shall be improved so that cycle track surfaces deemed unsatisfactory shall not exceed 5%.

The Subplan for the Improvement of Cycling Conditions was passed in 2000 including an appropriations bill earmarking funds for implementation. Along with Proposals for Green Cycle Routes (2000) and the Cycle Track Priority Plan (2001), it forms the basis of the cycle policy and action plan presented. Quantitative goals make it possible to carry out a continuous assessment of the cycle policy.

This will be done, as hitherto, in the Bicycle Account. In order to fulfill the objectives, work was concentrated on nine focus areas:

- Cycle tracks and reinforced cycle lanes
- Green cycle routes
- Improved cycling conditions in the City Centre
- Combining cycling and public transport
- Bicycle parking
- Improved signal intersections
- Better cycle track maintenance
- Better cycle track cleaning
- Campaigns and informations.



Pic 14-15 Intermodality is an important factor of success of cycling infrastructure



2.4 Copenhagen 2025

“After different strategies and visions from the municipality for the last past years, Copenhagen had wrote his vision for the 2015-2025 . The goal was firmly set by a unanimous city council as an integral part of the vision of Copenhagen as an Environmental Capital; above par conditions for cycling are also an important element in Copenhagen’s goal of having a good city life and making Copenhagen CO2 neutral by 2025. Good conditions for cycling are also part of the city’s official health policy, in other words, cycling is not a goal in itself but rather a highly prioritised political tool for creating a more liveable city. Every single morning hundreds of thousands of Copenhageners choose the bicycle as the most natural thing in the world, it’s amazing and interesting for journalists, researchers, politicians and urban planners from every corner of the world. Copenhagen couldn’t have achieved this status without a steady and comprehensive effort. Cycling in Denmark has fallen by 30% since 1990. The numbers for Copenhagen, however, head in the opposite direction. The number of kilometres cycled has risen by around 30% since 1998 and the bicycle’s modal share for trips to work or educational institutions has risen to over a third in the same period. This makes the bicycle the most popular transport form for commuting in Copenhagen, this strategy replaces the municipality’s former bicycle strategy” (Cycle Policy 2002-2012).

“A bicycle-friendly city is a city with more space, less noise, cleaner air, healthier citizens and a better economy. It’s a city that is a nicer place to be in and where individuals have a higher quality of life, where accessibility is high and there is a short route from thought to action if one wants to head out into nature, participate in cultural or sports activities or buy locally; bicycle traffic is therefore not a singular goal but rather an effective tool to use when creating a liveable city with space for diversity and development. Fortunately, it pays off to invest in urban cycling, increased cycling levels give society less congestion, fewer sick days, longer life expectancy, less wear and tear on the roads and less pollution. Cycling initiatives are also inexpensive compared with other transport investments” (The city of Copenhagen Strategy 2011-2025 , City of Copenhagen, Technical Administration).

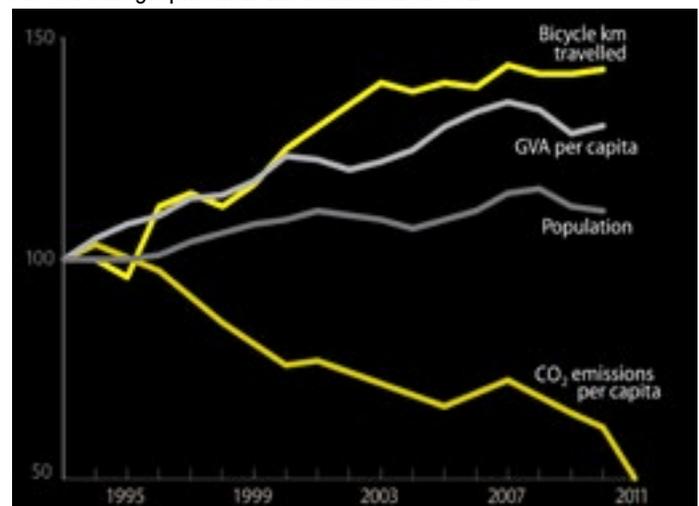
The eyes of the world are already focused on the city –. By continuing the ambitious work towards becoming the world’s best cycling city, they maintain the many positive stories about the city.

Stories that brand Copenhagen as a liveable, innovative, sustainable and democratic city with a political will to lead the way in the battle for an improved quality of life for the citizens.

By aiming to be the best in the world they can show the way for other cities around the world and raise the bar for what is possible in the area of urban cycling. Copenhageners choose the bicycle because it’s the fastest and easiest way to get around. If the numbers of cycling citizens are to increase it is all about making the bicycle the fastest and easiest way to get around for even more citizens than today. This is not possible without a strong prioritising of bicycle friendly infrastructure and a will to think out of the box, these are therefore the two central principles in the bicycle traffic area: prioritising and innovation.

The cycle tracks of Copenhagen are already under pressure during rush hour, it’s necessary to give more space to cyclists on the main arteries. In order to increase the sense of security, make it possible for people to ride at their preferred speed and, not least, to make it more attractive for those who are too insecure to cycle today, in some places the existing cycle tracks will be widened, in other places alternative routes is necessary to move some of the bicycle traffic away from the congested routes. Infrastructure expansion is accompanied with campaigns focused on more considerate behaviour in traffic. It is therefore necessary to improve travel times by bicycle compared to other transport forms that requires prioritising ambitious short cuts like tunnels and bridges over water, railways and large roads. In addition, it requires many small speed improvements, including allowing contraflow cycling on one-way streets, allowing cycling across squares, implementing more Green Waves for cyclists, etc. Finally, traffic calming - on quiet streets near schools, for example - is also necessary if the bicycle is to have a serious advantage in traffic.

Pic 16. The graph show the reduction of Co2

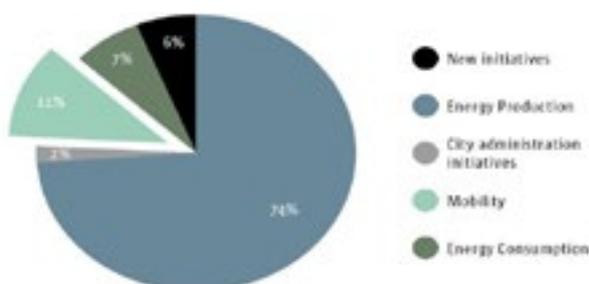


“The municipality is working to expand and develop the cycle track network continue, they encourage many new cyclists to get onto their bicycles it is crucial that are open to new concepts. Regardless of whether it is infrastructure or other types of solutions, it could be, for example, making certain streets oneway for cars in order to create improved space for better cycling conditions, new types of bicycle parking – including cargo bike parking – and initiatives that make streets with cobblestones into attractive cycle routes. Infrastructure like footrests at intersections and air pumps have both a practical and a communication value, partnerships within the municipality put the bicycle in the agenda as a way to improve health and integration. In addition, external partnerships with companies, shopping districts, public transport providers, neighbouring municipalities, etc., ensure optimal effect and anchor the various initiatives. Finally, they work systematically with communication campaigns aimed at specific target groups with the potential to cycle more like i talked before.” (Cycle Policy 2002-2012 , City of Copenhagen, Building and Construction Administration, Roads and Parks Department). The keywords that define cycling in Copenhagen are safe, quick and comfortable to achieve the goal of becoming the world’s best bicycle city. I give examples of how each of them can improved through prioritising and innovation. The complete recipe for becoming the world’s best bicycle city, including the specific political goals, is summed up at the end of the vision of 2025. First, a few statistics, in the City 150,000 people cycle each day to work or educational institutions. Copenhagen’s overall goal for cycling include goals for the number of cyclists as well as the quality of cycling (sense of security, safety, travel time and comfort). One of the more ambitious goals is increasing the modal share for bicycles to 50% of all trips to work or educational institutions by the end of 2016. In 2010 the modal share was 36%. Raising that to 50% means encouraging 55,000 citizens to cycle. An increase to 45% means 35,000 citizens must hop into their bicycles, choosing the bicycle happens regardless of age, wage or gender.

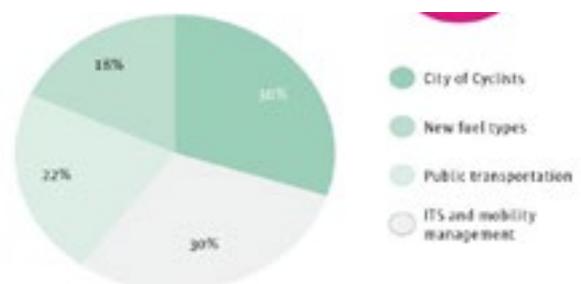
The modal share for bicycles has been stable for the past five years, this is impressive in a period with increased car ownership and the opening of a new metro and it is the result of the many improvements for cyclists that have been implemented over the past few years. An increased effort, however, is still necessary if the modal share is to rise. They are also heading into unexplored territory, as no city in the western world has a modal share for bicycles, used to travel to work or educational institutions, that is higher than 40%. In addition, factors that are not directly related to cycling have a great influence on the possibility of reaching the goal. The strength of the goal is that it forces Copenhagen to aim high, if it isn’t reached by 2016, there is still something to aim for in 2025. Today, there are roughly 45,000 people who drive 2-10 kilometres to work in Copenhagen – most of them reside outside of the municipality. If half of those trips, as well as a third of car trips between 10-15 kilometres - are moved over onto bicycles then the modal share will rise to 45%.

“A reduction of 10% in travel times for bicycles gives 1-2% more bicycle trips. Wider cycle tracks on all streets with more than 10,000 daily cyclists and/or alternative routes separated from motorised traffic are estimated to lead to a rise of 3-5% in the modal share of bicycles. A prerequisite for the full effect is that the initiatives are marketed both to the general public and to specific target groups. Ambitious short cuts like Bryggebroen – the bicycle and pedestrian bridge over the harbour – are necessary and something that Copenhageners appreciate greatly . The bridge has provided many people with a shorter trip between home and work, as well as increasing sense of security and comfort greatly, as the route is separated from car traffic, and not least because it is a beautiful route. Bryggebroen is well-placed for accessibility to the new urban developments Havneholmen, Havnstaden and Ørestad North (about infrastructures i will talk more in detailed later).” (Collection of Cycle Concepts, 2012, Cycling Embassy of Denmark).

Pic 17. The graph show the Share of Total Carbon Reduction



Pic 18. The Mobility Initiatives



There is no one route to an increased modal share for bicycles, a broad array of initiatives must be put into place. Both physical and non-physical, both expensive and inexpensive, the central idea regarding infrastructure is thinking about a coherent, high-quality network without weak links in the chain. Just one intersection that doesn't feel safe is enough for the elderly to leave the bicycle at home, stretches without cycle tracks are enough for parents to not let their children cycle to school, just one missing shower will discourage long-distance commuters from cycling to work.

Bryggebroen also illustrates that there are still missing links in the Copenhagen bicycle network, is a part of an important route from Østerbro/Nordhavn - around the outside of The Lakes - to Amager; Some of the missing links on this route include crossing Østerbrogade, crossing Åboulevard, the section below Det Ny Teater, lack of cycle tracks on Gasværksvej and Skelbækgade, a ramp from Dybbølsgade to the north side of Fisketorvet, a good connection from Bryggebroen to Axel Heides Gade and over Amager Fælled to Ørestads Boulevard.



Pic 19. Half of Copenhageners use the bike Daily

Pic 20. The map show the Super Cycle Highway



Pic 21. View from Google Earth of Copenhagen 2017



2.5 THE PLUSNET OF THE CITY

The modal share for bicycles is also affected greatly by the quality of the other transport forms. For example, congestion charges for motor vehicles will cause the cycling share to rise. The quality and price of public transport also has an effect for the growth of bicycle traffic, these issues are covered in another context, including "Action Plan for Green Mobility" and therefore are not covered in the bicycle strategy. "In 2025 there will be a PLUSnet for cyclists in Copenhagen, consisting of chosen Green Routes, Bicycle Superhighways and the most congested bicycle routes. The PLUSnet ensures a high level of quality for space, intersections and maintenance so that many cyclists can travel securely and comfortably at the time that suits each individual. On the PLUSnet, Copenhageners can converse with a friend or cycle next to their mum or dad without being disturbed by the bell ringing of people who want to get past, the goal is 3 lanes in each direction on 80% of the network (4 lanes in total on stretches where the cycle tracks are bi-directional). The map that i putted shows examples of large-scale improvements that have been approved and other improvements between now and 2025 that have a high priority. The exact routes and capacity will be adjusted on an ongoing basis, based on traffic and city development." (The city of Copenhagen's Bicycle Strategy 2011-2025, The Technical Administration Traffic Department).

Shopping trips made up 34% of all trips made by Copenhageners in 2009 and the bicycle's share of these trips was 27%. In 2025, there will be a standardised and reoccurring campaign directed at encouraging more shopping by bicycle. The campaigns will be supplemented with minor physical improvements (bike-thru shopping and parking, for example). The efforts will be done in collaboration with local businesses and citizens, on shopping streets, bicycle parking is included in the design from the beginning. The 17% of Copenhagen families have also a cargo bike, they are not so common in Italy, in Copenhagen are especially used for transporting children and shopping and are often an alternative to having a car. One fourth of all cargo bike owners say that their cargo bike is a direct replacement for a car, in 2025 there will be excellent parking facilities for cargo bikes outside of homes, institutions and shops. In addition, cargo bikes will be an integral part of Copenhagen's City Logistics system." ,

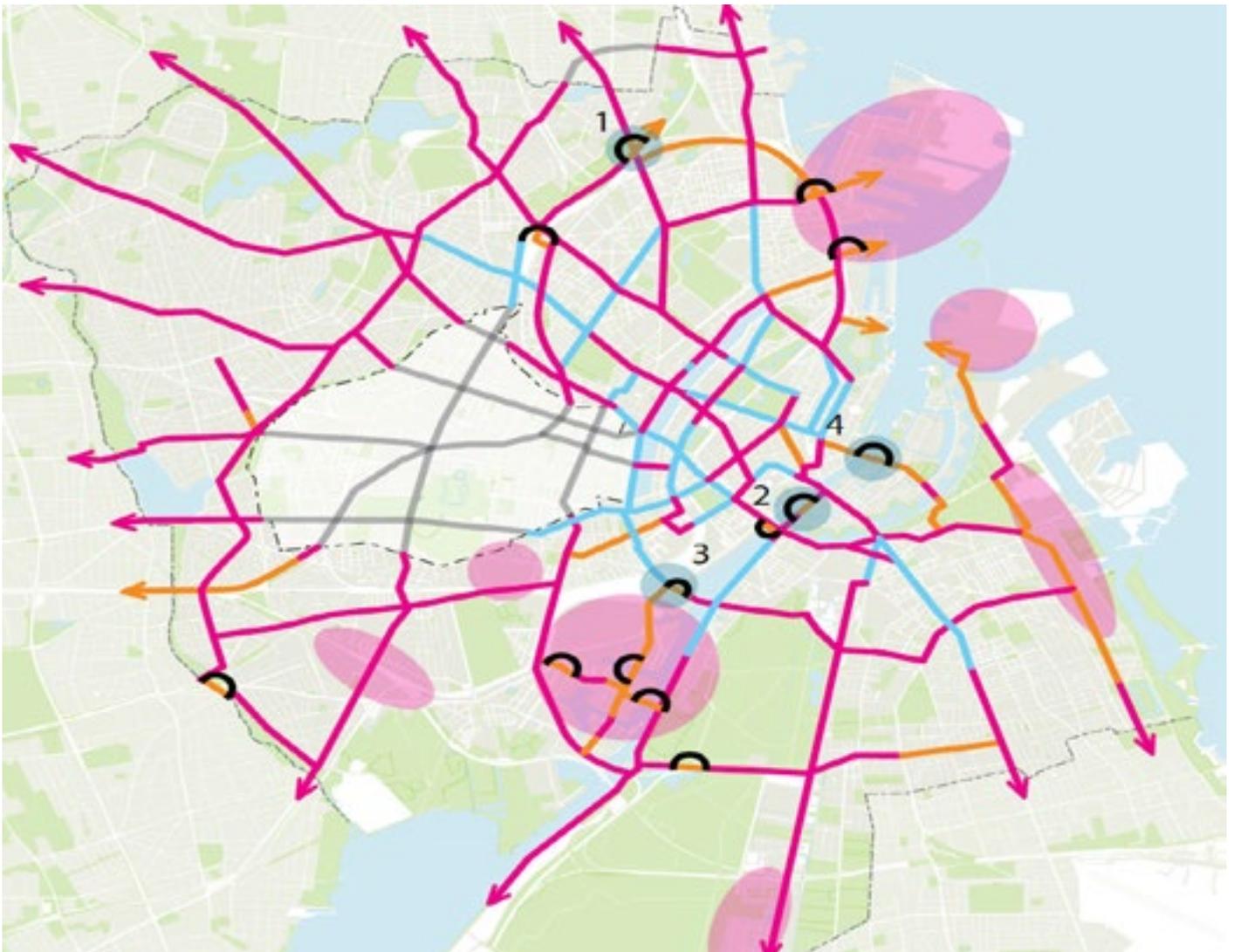
In 2011 Requirements for bicycle parking for new buildings – including cargo bike parking – have been included in the "Municipal Plan 2011", it has been decided to develop and implement more cargo bike parking in 2012-2013.

"The streets in 2025 can handle rush hour, peak shopping hours, evening life and night activities, by using ITS (Intelligent Traffic System), the street will be transformed from being static to being dynamic. LED lights in the asphalt signal which transport form has priority and when, certain stretches, for example, can be made oneway for cars for some periods of the day, just as cycle tracks can be widened during the morning rush hour by taking over space from the sidewalk. The sidewalks can then be widened during the middle of the day when there are more pedestrians and fewer cyclists, by letting the street follow the natural rhythm of the city and not vice versa, there will be more vitality and a more pleasant urban space. The bicycle is a flexible and space-saving transport form that both invites more city life, as well as contributes to it. Especially in densely-populated areas, the bicycle provides the easiest access to shops, homes, workplaces and educational institutions, in addition, bicycles takes up much less space in the city compared with other transport forms; By encouraging more people to ride bicycles, they free up more space for city life for everyone." (Collection of Cycle Concepts 2012, Troels Andersen, Cycling Embassy of Denmark).

In The City of Cyclists in 2025, more city streets are designed with pedestrians and cyclists in mind, the many cyclists contribute to a more liveable city that is rich in experiences. Switching between walking and cycling is easy and effortless and there is even more space in the city for recreation. It is easy to shop by bicycle and there are excellent parking facilities – including for cargo bikes – and there is room for everyone on the cycle tracks when it is needed. IN 2011 Funding has been allocated to ITS solutions for cyclists. Pilot projects with LED lights embedded in the asphalt, perhaps with alternating use of space like virtual bus stop islands (2012-2013). Even though Copenhagen's cyclists are generally pleased with Copenhagen as a cycling city, there are some areas where satisfaction is falling. For example, only 3 out of 10 think that the city's bicycle parking facilities are satisfactory, and only 5 out of 10 are satisfied with the maintenance of the cycle tracks. If they reach the goal of having more people cycling to work and educational institutions in 2025,

the comfort level will be improved across the board so that both the current and the potential cyclists find it easy and attractive to cycle in Copenhagen; a cycle track is not just a stretch of asphalt. It can be both a dream and a nightmare to ride on. In 2025, Copenhageners can ride comfortably through the city, transporting infants, loved ones and groceries without having to worry about bumps or potholes. Snow clearance in 2025 still has a high priority – with a special A+ priority level given to the PLUSnet so that snow is cleared in wider swathes. In 2025, a bike share system is an integral part of the public transport system in the capital region and enjoys an equal footing with buses, trains and metro. This applies to the payment system, running the system and marketing it. Combining the bicycle with public transport is a competitive alternative to cars in the region, good bicycle parking is a benefit for pedestrians and cyclists and it improves the aestheticism of the city. In 2025, there will be still more bicycles in Copenhagen than parking spots but through a coordinated effort to improve conditions and facilities – in partnership with shops, workplaces and public transport providers – Copenhageners are far more satisfied with bicycle parking.

In 2011 Bicycle parking at Svanemøllen Station was improved, was redesigned Nørreport Station, with easier access and more bicycle parking, finished in 2014. The Bicycle Butler project, where bicycles are moved and serviced at six metro stations, has been expanded and the efforts to clean up abandoned bicycles has been intensified from 2011. In that year Copenhagen has started the process of inviting bids for a new bike share system that start operating in Spring 2013. The new bicycles are dependable and comfortable, with new technology like smartphone apps, are easy to find available bicycles, receive information about the shortest route, the weather and things to do in the city. A positive bicycle experience is important if more people are to cycle, good parking facilities are vital – especially if we want to reduce bike theft and the number of toppled bicycles that are a nuisance for passers by. The quality of the cycle tracks and of maintenance is of great importance for comfort levels, if more citizens choose the bicycle it will result in a better everyday life for many because of increased accessibility, reduced pollution, less noise and safer traffic conditions.



Pic 22. The Map show the Plus-net Network

In the City of Cyclists in 2025, there is a markedly better level of comfort for cyclists, there is a high level of maintenance of the cycle tracks and you can ride around most of the city with a cup of coffee on the handlebars - without spilling it. Better parking facilities make it easier to park and there are air pumps and fountains in busy areas, especially around train and metro stations and bus terminals, the parking conditions are tip top. In addition, partnerships with workplaces ensure that the journey from "kitchen counter to desk" is smooth and a modern bike share system makes it easier to combine your bicycle with the bus, train and metro. 48% of Copenhagen cyclists say that the main reason they choose the bicycle is that it's the fastest and easiest way to get around.

In order to encourage more people to ride, it is paramount that the travel times on bicycles are competitive with the other transport forms. Travel time isn't just about speeding through the streets, it's also about being able to choose your own tempo and direct routes. Too many brief stops, detours and stretches where overtaking is impossible make travel times much longer. In order to ensure the shortest possible travel time from A to B, the existing cycling network must be further developed, with extra focus on PLUSnet and establishing short cuts. Redesigns like new cycle tracks, traffic calming and speed bumps will contribute to improving the travel times for cyclists and improve both safety and sense of security. On many routes the bicycle is the fastest and most flexible form of transport. By reducing the travel times for cyclists, citizens can save even more time when they move about the urban landscape, this requires a coherent network of attractive bicycle routes criss-crossing the city, more space must also be created on the most congested stretches so cyclists don't get caught on cycle tracks that are too narrow during rush hour.

"In the City of Cyclists in 2025, the bicycle is the fastest form of transport in many parts of the city and the travel time from A to B is reduced by 15%. Short cuts like bridges over water and large roads and routes through green areas give cyclists a considerable advantage, even more intersections are equipped with Green Waves for cyclists and a coordinated effort with the police makes it possible to ride contraflow on most of the city's one-way streets. There are cycle tracks on all stretches with many cyclists and the speed limits for cars has been reduced on several smaller roads, for example by schools; Work continues with new technology, including long distance commuting and promotion of e-bikes and real-time traffic information connected to a travel planner for cyclists.

Data about bicycle traffic is freely available via digital platforms, which have created the foundation for innovative products and smartphone applications that benefit cyclists, travel time is even more important for long distance commuters, they have no interest in stopping constantly en route.

It can also be more enjoyable when several people cycle together. In 2025, there will be more e-bikes and an intelligent traffic system on the regional network of Bicycle Superhighways will provide Green Waves for cyclists who ride in groups. Sensors embedded in the asphalt register the number of cyclists and the traffic lights adjust to give green lights to groups of cyclists. One of the requirements for choosing the bicycle is that the individual citizen has the impression that cycling is safe, one of the goals was that in 2016, 80% of cyclists in Copenhagen feel safe in the traffic and in 2025, that number will be 90%. In 2010, the number was 67%. A city that feels safe to cycle in means more people will ride – not least newcomers to the city, children, the elderly and others who find cycling during rush hour to be an overwhelming experience today." (Copenhagen Bicycle Strategy 2011-2025, City of Copenhagen).

Many transport habits are established at an early age and children who are used to cycling are more inclined to keep cycling and will be better at navigating through the traffic when they are older, bicycle connections along the water and through green areas separated from car traffic offer an increased sense of security and open up new ways to enjoy the city's green and blue areas. At the same time, they are an important alternative to the busy streets where bicycles compete for space with the other transport forms. In 2011 The Svanemølle Route from Østerport Station to Ryparken Station, the promenade connection in Havnegade and the bicycle route along the old Amager railway were completed in 2013. Traffic safety has been greatly improved over the past few years, statistically, the risk of being involved in a serious accident has fallen by 72% per cycled kilometre since 1996. Copenhageners' sense of security in the traffic has also improved of late. If this sense of security is to rise even further among current cyclists and potential cyclists alike, the most important areas of focus are creating more space on the cycle tracks, making intersections safer and using behavioural campaigns to improve consideration in traffic – including on the cycle tracks. The general traffic safety efforts are also very important, for example, reducing speed limits for cars where necessary.

In The City of Cyclists in 2025, both young and old feel safe on bicycles, It is a normal sight to see parents and children cycling alongside each other in rush hour and that many more cyclists are able to ride alongside each other and chat. The infrastructure makes it possible to ride at the speed that suits the individual best and improvements at intersections allow cyclists to cross feeling safe, cycle track etiquette has been established and the citizens share a common understanding of what considerate behaviour is Between 2011-2018, Copenhagen is affected by the construction of the Metro City Ring, Nordhavnsvej and the redesign of Nørreport Station (now completed), as well as a long line of other projects that will and make Copenhagen an even better city. Large areas are now closed for building sites for years. These building sites are affect traffic – especially the transport forms that require a lot of space like cars, buses and trains. There is less street space available than normal, for the sake of accessibility in the city, it is important that the available space is used with care, instead of making the conditions worse for all transport forms, they work strategically with closed-off areas and temporary solutions in order to ensure that there is still flexible and quick transport in Copenhagen during this period so the bicycle plays a central role.

2.6 ACADEMIC OPINIONS ON THE CYCLING PLAN

It's good to know the thought of Marlene Freuendal, from the Roskilde University , in her article Cyclists as Part of the City's Organism : Structural Stories on Cycling in Copenhagen , My approach says her, “in Denmark, , to viewing cycling as everyday mobility is primarily inspired by Bech-Jørgensen's notion of everyday life. In her view, everyday life is not divided into different spheres, she writes: “Everyday lives are the lives we live, maintain and renew, re-create and transform each day. What can be defined are the conditions of everyday life and the way these conditions are handled”. Thus, activities — herein referred to as mobility, recreated and transformed by the conditions of everyday life— are the starting point for analysis. This article examines Copenhagen cyclists' emotional and rational stories about cycling in the city. Copenhagen is branded as a city of cyclists, nevertheless, the car still plays a dominant role in both policy and planning and thus everyday life.



Pic 23. A cycling counter in the city

Building on this, Gullestad (1992) argues we construct everyday life through many different roles and places. We create a personal identity through everyday life praxis in our home, in the city, at work, in civic engagement, in shopping, and so forth. What surrounds all of this are the mobility of people, things, and ideas that shape modern lives (Urry 2000, 2007). Even if this research is focused on cycling, other modes of mobility are present when they impact how cycling is carried out and thought about. Indeed, Copenhageners are rarely only cyclists. They drive cars and use public transportation too” .

“Of course, there exist countries where cycling is strongly attached to national identity. One such is Denmark. Writing from the high-cycling city of Copenhagen, Jensen explores the potentially exclusionary side of a context where cycling is associated with dominant city mobilities. She uses a Foucauldian framework and the concept of ‘borderwork’ to explore how meanings associated with urban mobile subjectivity shape experiences of cycle routes. She finds that policy and policy-makers target three categories of mobile subject, all presented as representing something essential about Copenhagen identity; commuters, active urbanites and middle-class families. While Copenhagen’s cycling policies are in many ways very progressive, they simultaneously embody the needs and approaches of particular groups, with Copenhageners with immigrant backgrounds making relatively little use of the cycle track network.

Jensen challenges us to explore the potentially negative impacts of pro-cycling policies, which is important if we are to mitigate these effects. In many cities, for example, high land prices force poorer citizens out of the central and even inner city areas. Distance and generally poorer bike infrastructure can then limit their access to what should be an empowering and democratic form of transport. Research could explore ways of counteracting this, whether through land use planning, investment in very high quality cycle infrastructure and public transport connections, and/or policies aimed at countering growing income inequalities. Also writing about Copenhagen, Snizek and colleagues map and analyse cyclists’ experiences, good and bad. Snizek et al’s online survey enabled cyclists to map their routes, finding significant associations between cycling experiences and the road environment, cycling facilities, environmental factors, annoyances, congestion and deviations from the most direct route. As the authors comment, these kinds of methods are increasingly popular.

Processes affecting advocacy, referred to above – the growing use of social media and sharing of information about cycle routes – have opened up promising avenues for research. Snizek et al’s approach could be used to model how infrastructural changes might affect cycling experiences, positively or negatively, although in lower-cycling environments it would need some adaptation to take account of the preferences of those currently excluded from cycling.

However, if such adaptation were made this could be a useful tool in exploring how changing infrastructure (or other changes such as creating a park or a market) might enhance the experience of cycling particular routes, perhaps to the extent of attracting a substantial number of new cyclists. Combined with knowledge about journey patterns, this could help prioritise investments in countries seeking to increase cycling from a low base. All these papers help us think about cycling in its social context, challenging us to consider (and counteract) potentially negative impacts of cycling policies (here, discussed in relation to infrastructure provision, but one could also consider policies such as cycle training, or land use policies aimed at facilitating cycling), even at their most progressive” (Aldred, R., 2012. The role of advocacy and activism. In: Parkin, John (Ed.), *Cycling and Sustainability*. Emerald, Bingley, pp. 83–108).

2.7 CONCLUSION

To understand Copenhagen and the construction of its articulated strategic plan was important to describe the various strategic plans that have occurred in the Danish city, from tradition for the bicycle to its first strategic plan that led to the construction of the Vision 2025 that the city was set the goal for the now present and near future. Through a pedagogical path of academic reconstruction of opinions and points of view I quoted some opinions on the Danish bicycle mobility, Marlene Freuendal, from the Roskilde University, in her article *Cyclists as Part of the City’s Organism*, and through the Jensen articles and Snizek I tried to bring out the importance of cycling in the social context also considering the negative aspects related to it. Later on in the next chapter my attention will be given to that which is the cycling obliged and pleasure, to a cost-benefit analysis of infrastructure recently completed in the city and to the research and interviews conducted on site in Copenhagen.

3. DAILY AND LEISURE CYCLING



3 DAILY AND LEISURE CYCLING

3.1 DAILY CYCLING

Encouraging motorists to stop using the car for daily urban trips on behalf of the bicycle is one of the major challenges cities currently face in order to enhance the liveability of cities. However, convincing motorists to choose the bicycle as the major means of transport is a significant challenge. Understanding the way cyclists perceive their environment as well as mapping and analysing these perceptions could be the key to designing positive cycling experiences which may well encourage more people to travel by bicycle, thereby contributing to sustainable urban environments.

“Recently, several studies have treated cycling as a special phenomenon, which differs both from motorised as well as pedestrian traffic in a number of ways. However, only a few of these studies deal with the quality of cycling in relation to the cyclists’ surroundings” (Mapping bicyclists experiences , Snizek ,University Of Copenhagen).

From the paper “Mapping bicyclists’ experiences” in 2012 of Bernhard Snizek , Thomas Alexander Sick Nielsen and Hans Skov-Petersen, I analysed the approach of the collection, mapping, and analysis of cyclists’ experiences in Copenhagen. By spatially relating located experiences to the availability of bicycle facilities and other aspects of the urban environment, their influence on cyclists’ experiences can be analysed. 400 cyclists responded to the Snizek Questionnaire and sketched their most recent cycle route and a total of 890 points to locations along the route where they had positive and negative cycling experiences. The survey was implemented thanks to an online questionnaire built on Google Maps, and allowed up to three positive and three negative experience points to be mapped and classified. By relating the characteristics of the experience points and the routes to the traversed urban area in general, the significance of the preconditions for obtaining positive or negative experiences could be evaluated.



Pic 24. The map show the Traffic Flow Daily , more the Line is big , more is the Intensity of the Bicycles

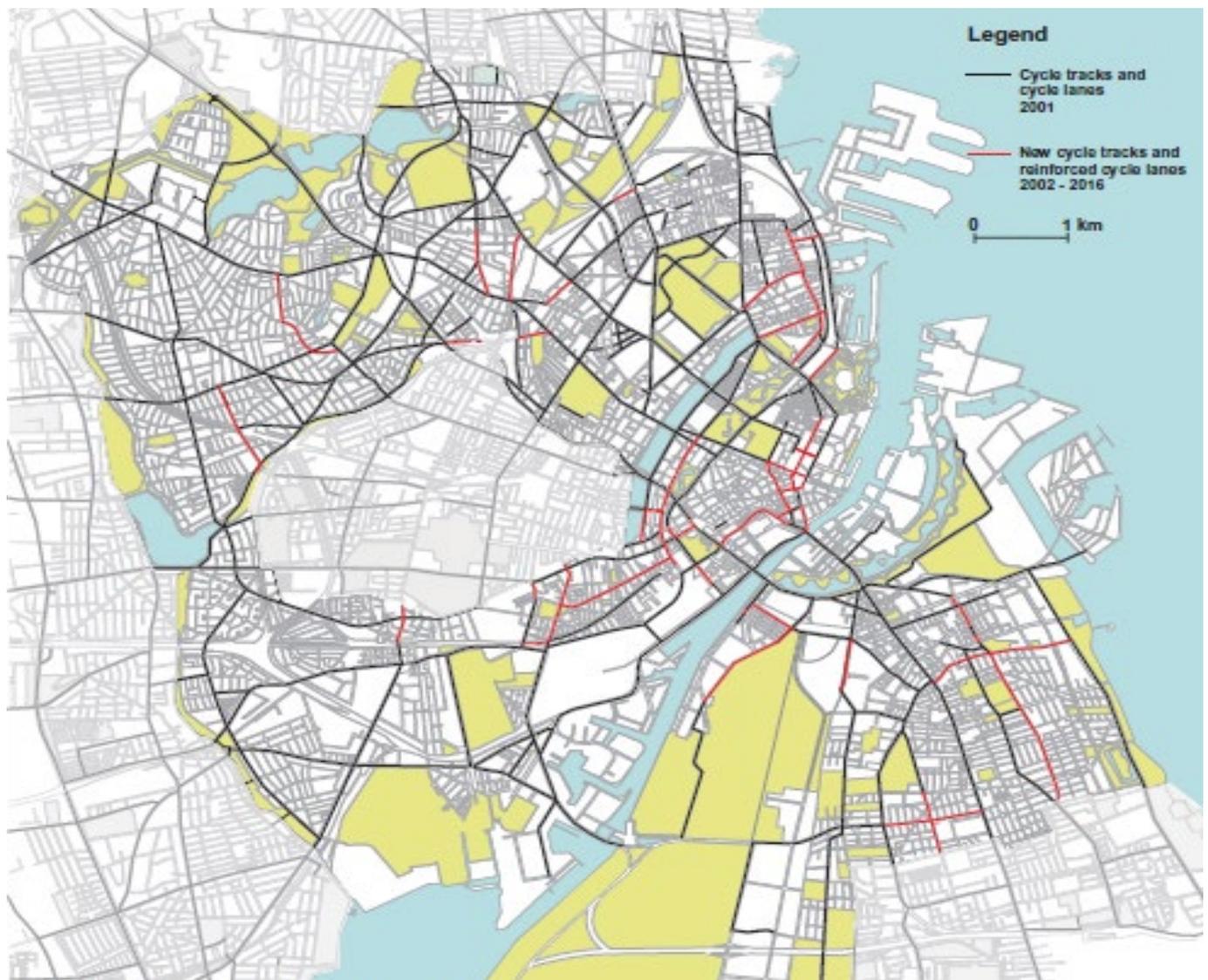
Thereby urban spaces was mapped according to the potential promotion of positive or negative experiences. Further, the method was applied to assess the effect of proposed changes to the urban design in terms of cyclists’ experiences. Statistical analysis of the location attributes, traffic environments and conflicts, bicycle facilities, urban density, centrality, and environmental amenities indicates that positive experiences, or the absence of negative experiences, are clearly related to the presence of en-route cycling facilities, and attractive nature environments within a short distance of large water bodies or green edges along the route.



Pic 25. The 50 % of Copenhagers use the Bicycles daily to go work

Affective computing systems are a recent development within emotional mapping. They developed an electronic device, which constantly measures a respondent's state of arousal via a galvanic skin device and his/her current location while walking in a city. "By storing the measurements in a spatial database and overlaying several respondents' tracks, unpleasant locations can be identified. In this way, a map was constructed, they refer to as an arousal map that visualises the city's psychogeography. This map could provide important background information for city planning and applied during the knowledge-gathering phase of the planning process. In the context, emotional maps are generated by means of both stated (semantic mapping of experiences) and revealed (geospatial recording of skin resistance) preference after having completed a particular trip. They also developed a methodology for constructing what they call emotional neighborhood portraits by applying a similar approach. Rantanen and Kahila presented Internet-based methods to gather, examine, and analyse local knowledge within what they called SoftGIS.

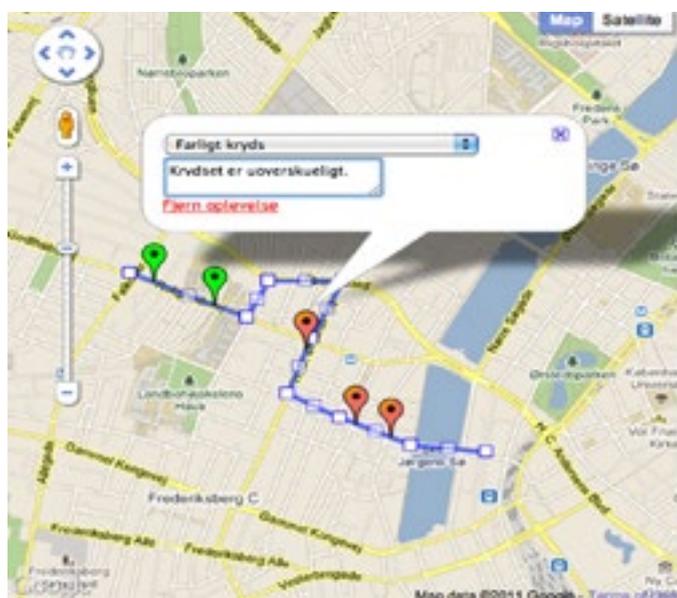
Positive and negative quality spots were analysed regarding hotspots and clustering, which were used as the foundation for participatory, planning processes. Emotional mapping and SoftGIS approaches are, however, still new in the context of bicycling" (Mapping bicyclists experiences, Snizek ,University Of Copenhagen). Cyclists' experiences differ to some extent from those of motorists on the one hand and pedestrians on the other and are influenced by several factors: The existence and design of cycling facilities play a great role in both attracting cyclists in the first place and how they subsequently perceive safety and appreciate the route. Furthermore, other roadway characteristics such as physical characteristics, on-street parking and operational characteristics as well as land-use and proximity to retail establishments also contribute to the overall cycling experience.



Pic 26. Cycle Tracks Plan 2002-2016

Within the literature, quite a diverse range of data collection methods can be found, methods, where respondents actually draw their routes, was it on paper or via computational representations, are quite rare. A rather uncommon, specialised and distributed system for real time data acquisition which makes it a tool for revealed preference studies is described in, whereby a sensing system collects data on pollution level, allergen levels, noise levels and the roughness of terrain. They also employ video clips which are shown to respondents as a means of conveying information on different road environments, and they describe a methodology that through collecting data leads us to an understanding of the relations between stated experiences and urban elements. An interactive, web-based questionnaire was developed. Up to three locations, a number, which was found a reasonable number for the respondents to end answering the questionnaire, of positive or negative experiences, as well as the route on which they were experienced, was entered. Post processing and data cleansing were applied to the raw data, every point was then related to elements of the urban environment as well as to selected route metrics.

In the next section, is interesting present the map-based is of interest to show the questionnaire, that explain the process of data cleansing and processing and justify my selection of urban elements and route metrics. The research start looking the collection of spatial data via online media and the availability of Application Programming Interfaces (APIs) enables software developers to build map applications based on different map technologies such as Google Maps or maps from OpenStreetMap with an online questionnaire about cyclists preferences;



Pic 27 . An example of Route of the Questionnaire

The cyclists explained the locations where they had positive experiences and where they had negative; In total, 554 positive and negative locations were registered by the system and stored for further data processing, the area of analysis was defined to be composed of the municipalities of Copenhagen and Frederiksberg, the same area of my research study A road network was used .and data describing cycle-related infrastructure like bicycle paths, segregated cycle paths were extracted from OpenStreet- Map.

Part of the study of Snizek was processing the points, dots with a distance of over 100 m to their respective projection onto the road network were deleted and set of points was generated in order to compare points of experience; with 4700 respondents , 625 routes were drawn and 1677 dots were entered ,They produced a series of thematic GIS layers and a series of calculations regarding directionality and distance , Based on the cycling facilities available in Copenhagen, they classified the cycling infrastructure in street with no cycling facilities; cycle path by the side of the road , cycle lane on the road , path exclusively for cyclists, and path shared by cyclists and pedestrians. In this study, Street types, as a proxy for traffic volume and speed, have a significant impact on route choice and how cyclists value their environment and the trips themselves and The Distance to the closest bus stops was an other important element like the Distance to nearest intersection, tells something about the position of the current experience point to a potential obstacle on a cyclist's route; the distance to town hall was taken as an indicator of the traffic environment in general.

Copenhagen, with its medieval urban core have a rare cycle infrastructure combined , in the city centre there are the typical 1900s block structure with a high level of cycle infrastructure while At the fringe of the city, single housing is concentrated around roads with cycle infrastructure at collector roads, the streets within the housing areas are characterized by low traffic speeds. In this study, the distance from the experience points to the town hall varied from about 50 m to 8000 m. Another interesting element was the number of companies within a distance of 100 m to the experience point, . The data for this indicator was extracted from The Central Business Register.

In the current study, the location of water and green areas contributes to a positive experience. A statistical analysis of environmental correlates a logistic multinomial regression model explaining the probability of a positive experience versus no experience. The model results for the probability of a positive experience point to a significant contribution from the road environment, cycling facilities, environmental factors, factors that can be interpreted as annoyances and congestion and finally deviations from the most direct route.

Cycling on primary or secondary roads reduced the probability of a positive experience, while cycling with the availability of cycling facilities, especially a separate 'Copenhagen style' cycle path, increased the probability of a positive experience.. Most major roads in Copenhagen are equipped with bicycle paths adjacent to the sidewalk and conflicts with busses only take place when buspassengers crosses the bicycle paths to enter a bus. The negative effect of distance to the town hall appears to be somewhat counter intuitive to this,. The correlation of distance to large water bodies such as the lakes, which surround central Copenhagen or the harbour, indicates that attractive environments and views make a significant contribution to positive experiences. As for positive experiences, cycling along a primary road is related to a lower probability of a negative experience, a result that may reflect the general character of these environments as linear connectors, with large volumes of separated traffic and in the absence of a similar correlation with the probability of a positive experience, this is likely to reflect lower traffic volumes and speeds.

The aim of the research was to map cyclists' positive and negative experiences and to analyse the correlation of these experiences with environmental qualities and attributes as an input to planning aimed at promoting cycling, a Statistical analysis of the location attributes, traffic environments and conflicts, bicycle facilities, urban density, centrality, and environmental amenities indicates that positive experiences, or the absence of negative experiences, are clearly related to the presence of en-route cycling facilities, and attractive nature environments within a short distance of large water bodies or green edges along the route.

Factors, which contribute to negative experiences, are bus stops, high traffic densities along the route, as well as signalled and nonsignalled intersections, Bus passengers are often in conflict with cyclists, as they have to cross cycle paths to enter buses, while high urban densities imply congestion and related conflicts on the sidewalks as well as cycle paths. The effects of intersections very likely reflect the annoyance of delays as well as the conflicts and dangers associated with the crossings. In the Copenhagen/Frederiksberg case study area, the large roads make up the main 'arterials' of the cycling network and are thus frequently traversed to get from origin to destination by bicycle.

The results of this study may be applied to develop a cycling environment surface based on predicting cycling experiences from environmental and infrastructure variables, in particular, the mapping of hot-spots of certain experiences, both positive and negative, would be interesting for planning purposes, analysis and visualization of experience data may aid planning processes and improve the distribution of planning funds, computer-based cycle models could also use the study's results as an input to model experience both on a larger scale as well as on an individual level.

Pic 28. Geographic distribution of positive (to the left) and negative (to the right) spots



Pic 29. Example of an erroneously drawn route (blue)



3.2 COPENHAGEN INTERVIEWS RESULTS AND DATA

Cycling Copenhageners' satisfaction with the amount of cycle tracks has steadily been on the rise over many years. "The satisfaction level has increased from 64% in 2004 to 80% in 2014. The satisfaction level with cycle track width has also seen a positive trend although the curve is flatter: from 50% in 2004 to 53% in 2014. Satisfaction with maintenance Smooth asphalt and snow removal during the winter are crucial for cycle track comfort. The millions that are annually invested in maintenance are a major factor for cycling Copenhageners' satisfaction level, which is greater today than ever before. The level of satisfaction with cycle track maintenance in 2014 was 63%.

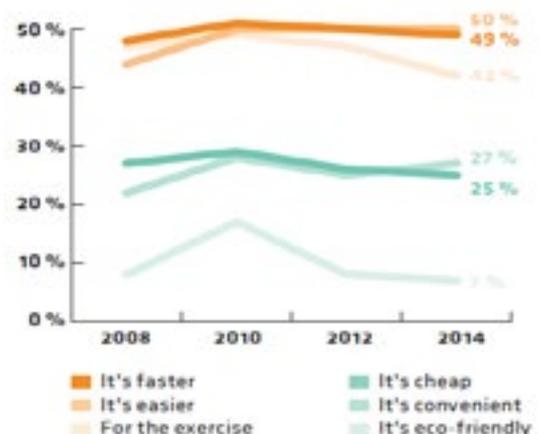
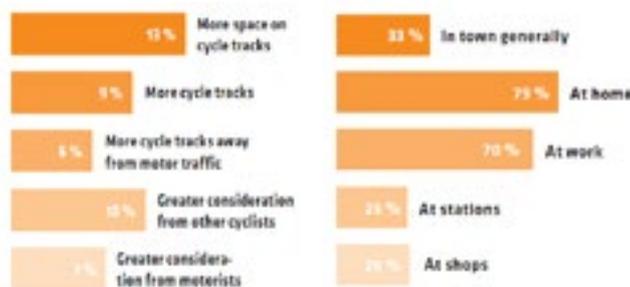
However, a great deal of cycling takes place on minor roads without a cycle track. The satisfaction level here is lower, although this too is on the rise, from 27% in 2004 to the current 36%. Many bicycles require space Copenhageners own 678,000 bicycles, which puts a lot of pressure on bicycle parking facilities. Approx. 75% are satisfied with bicycle parking at home and at work, but when it comes to stations, shops and in town generally the satisfaction level is 1/3 or lower. A total of DKK 14 million has been earmarked for bicycle parking upgrades in the coming years. This is underpinned by a pilot project involving innovative solutions and partnerships with shops and housing associations, including a project to deal with the large number of abandoned bicycles that fill the city's bicycle racks. In 2012 the proportion of Copenhageners who felt secure when cycling rose by more than 50% compared with 2008. The strong sense of safety still holds in 2014: 74% of cycling Copenhageners state they feel safe. This high level is primarily due to infrastructure upgrades, but the large number of cyclists is significant too; the many bicycles are highly visible in the street scene forcing drivers to pay greater attention to the cyclists.

Campaigns focusing on more considerate bicycle behavior are another factor" (Copenhagen Cycle Account, 2014, Morten Kabbell, Mayor, Technical and Environmental Administration).

What will make more Copenhageners feel safe? Low sense of safety is a primary factor when Copenhageners choose not to cycle. More space, more cycle tracks, and cycle tracks away from motor traffic are among the factors mentioned that would make Copenhageners feel safer cycling. However, the behaviour and courtesy of other cyclists is also significant. Cyclist behaviour is a hot topic In November 2014 the users of the City of Copenhagen's Facebook page were asked for their recommendations to others on the cycle tracks. More than 900 users commented, making the post the page's most commented ever, a clear indication that cycling culture, safety and behaviour are issues in which many people are engaged in and have an opinion about. The excellent recommendations and the high degree of commitment could be used by Copenhagen planners in their work to improve behaviour and maintain the sense of safety, for example in campaigns and by testing innovative traffic solutions that encourage to signal and to be more attentive. As the population of Copenhagen grows, the transport system comes under a lot of pressure. The fact that so many people choose to cycle has a significant positive impact on Copenhagen road congestion: the greater the number of journeys made by space-saving transport modes, the greater the passability. The large number of bicycles, for example, makes it easier for necessary basic motor transport such as tradesmen, goods transport and buses to get through more easily.

Here some of the comments of the people surveyed: Robert, 59, project manager in a bank, along the University route, he said: "I love the cycle route, there's no traffic, you're close to nature, and I really love the new bridges, In the evening it's a bit scary though so I think I'll go home another way because of the lack of lighting."

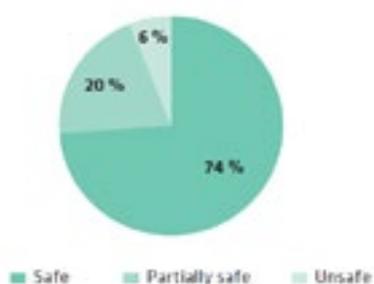
Pic. 30 The first graph show what will make cycling Copenhageners feel more safe; Pic. 31 the second graph show the satisfaction with the parking facilities; Pic 32. The third graph show the Satisfaction with the amount and width of cycle tracks.



Ana, 47 shop owner, was on her way to work on the University route, she said: "I like cycling across Amager Commons. It's fun with my dog, but I cycle here when I'm alone, too. The only bad part is that the route is so successful; there's barely enough room for all the cyclists - it's total chaos around Dybbølsbro."

Katia, 29 Student. "I love cycling to do Shopping. Is healthy and faster than use the car and go from my home to the university".

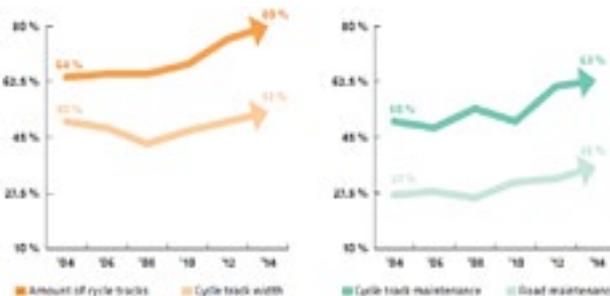
"However, bicycles alone cannot take credit for the city's efficient transport system. A green growth study carried out by the London School of Economics in 2014 indicates that good cycling conditions combined with a focus on public transport, such as investment in the new Metro line and integrated transport and cycling solutions, as well as the optimisation of pedestrian conditions all have a major impact on the city's total transport. The report further emphasizes Copenhagen's compact urban form which means that the proximity principle plays a major role in urban planning. The city layout is planned so that all the things people need for their daily lives are close by: groceries and convenience stores, stations, schools, leisure activities, etc. Copenhageners themselves stress the efficiency of cycling as a transport mode. For many years Copenhageners' main reason for cycling has been that it's fast and easy, especially concerning daily commuting" (London School of Economics, 2014, The Copenhagen Case). More and more people cycle, The number of bicycles that enter or leave the inner city (the so-called lake and harbour ring) has more than doubled, and the trend is expected to continue. The growth of bicycle traffic means that capacity is strained in many sections where bicycle traffic is heaviest. Cycle track congestion impedes cycling, increases travel times and results in a feeling of insecurity. It is consequently crucial to continue to expand the cycling infrastructure so it can handle the growth of bicycle traffic and thereby continue to contribute to the city's overall passability.



3.3 ACADEMIC OPINIONS

It's interesting the opinion of daily cycling in the article of Marlene "Structural Stories on Cycling in Copenhagen" of 2013. She explores the tension in the city's image and the experiences of Copenhageners through cyclist' perspectives and stories about their mobility in Copenhagen. This research which I based my study is part of a larger project called Urban Cycle Mobilities funded by the Danish Council for Independent Research. The research was done in 2013, and explored why people bike and the documentation of structural stories related to cycling is based on 30 qualitative interviews and five focus groups consisting of five to seven people in each group, with an equal number of men and woman between 22 and 73 years of age, and a group of 14 years olds.

Many of the interviewees were found through friends of friends, and then additional contacts were made through their networks. Some of the interview were approached through the bicycle library, established by the Bicycle Innovation Lab (BIL). BIL sees itself as an organization building "cycling communities" in Copenhagen, aiming to get more people on bikes by utilizing a bicycle library and by bringing cycling issues to a political platform. Initially, the in-depth qualitative interviews were conducted to capture the praxis of everyday life. Through a methodologically controlled interplay between abstract and concrete questions, it was possible to approach difficult questions of responsibility, meaning, freedom, and communities in everyday life. This is where the structural stories appear. Following the interviews, she conducted focus groups which provided knowledge on the negotiation of these structural stories, their meaning and significance. Focus group participants were also prompted to reflection why structural stories are used. All the interviewees use a variety of transport modes. Approximately half have children and all have or are studying toward a college-level education and belong to the middle class.



Pic. 33 The first graph show the proportion of Copenhageners that feel safe when cycling; Pic. 34 the second graph show the satisfaction with the amount and width of cycle tracks; Pic 35. The third graph show the Satisfaction with maintenance.

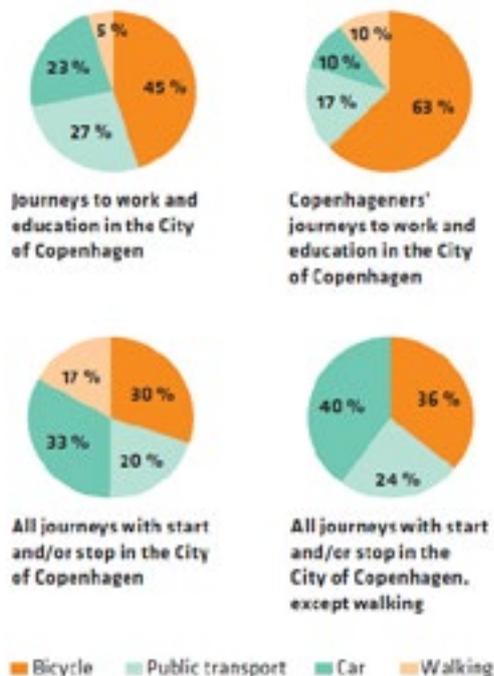
A goal of this study is to understand how power is produced and reproduced in relationship to mobilities of everyday life. Since Denmark is a country with a very high Gini coefficient and a very large and powerful middle class, it made sense for this research to largely focus on a middle-class population. The focus on structural stories was inspired by an interview that she conducted approximately ten years ago with a couple whose kids had “flown the nest.” She asked why they had a car, and they replied, “When you have kids you need a car.” They immediately realized their slip of tongue and quickly adjusted their answer. By directly answering questions that challenged their “right” to have a car, they responded by evoking a popular narrative that contradicted their actual situation. She later termed this type of utterance “the structural story.”

A structural story is a narrative that is spoken by many, and may be truer for some than it is for others. It is also a narrative that does not focus on material explanations for behaviors. For example, there are instances when it may be impossible to travel to a distant work place or to complete complex chores without a car. Her focus, therefore, is on mobility as it is created through conflicting interpretations and options, and discussed and negotiated among the members of society. This is not to say that gender, class, or other specific social markers do not play a role in mobilities. My aim is not to discuss particular individuals per se. Rather, it is to uncover and examine the ideologies that shape mobilities in Copenhagen, particularly mobilities afforded by the bike and car.

When Copenhagen cyclists discuss their cycling praxis, the high quality of infrastructure is often mentioned as a reason why they cycle. It is common to hear cyclists say, “Cycling is a priority in Copenhagen. There is a lot of talk about it, and they also do something about it. There are a lot of cycle lanes and that makes a big difference.” The municipality has made many “simple” improvements to the infrastructure that makes a difference for cyclists. For instance, they implemented cycle lanes against one-way traffic. In many streets in the inner city, cycling against one-way traffic is also allowed (without cycle lanes). These streets most often have a 30-km/h speed limit, which creates possibilities for visual contact between cars and bikes increasing the safety. Another improvement is the design of Nørrebrogade, a main arterial road where cars have to give way to cyclists and busses. The design of this road is significant for cyclists who often feel queezed by cars. One cyclist says, “One of the really cool things is Nørrebrogade—it’s really, really cool that you feel you are a priority and privileged and that people have considered you, that there is room for you. There are many places where the bike path is as wide as the road. It is a real priority.”

Another cyclist describes the pleasure that comes from taking advantage of the city’s biking infrastructure. The cyclist says, “I am so happy they made these very broad cycle lanes where it is possible to overtake others. It is a real pleasure because you can get into a genuine flow, you are constantly moving”. Evident in Copenhageners’ thoughts about cycling is the observation that moving around the city on a bike is experientially different from moving through it in a car or a bus.

Pic 36. The Break-down of journeys in 2016



Many of the interviewees see themselves as being part of a movement creating a “better city” with space for people and the lived life: “My wish is that Copenhagen in the future becomes a city where trees grow and there is green grass, and where there are no roads, but of course, bike trails. A city with more peace, instead of hearing cars, you would hear people, it would be fantastic.” When moving around Copenhagen there are a lot of cyclists, and at most times of the day many more cyclists than car drivers, and in these situations cyclists often feel underprioritized.

All of the interviews points to the car as the most prioritized mobility in Copenhagen as mentioned by one of the interviewees the car is the “adult mode of mobility.” So even if Copenhagen is in many ways a cyclist’s city, there is still a fight going on beneath the surface between bikers and drivers. This resonates with Bauman’s view of the city. He writes: “Urban territory becomes the battlefield of continuous space war, sometimes erupting into public spectacle of inner-city riots, ritual skirmishes with the police, the occasional forays of soccer crowds, but waged daily just beneath the surface of the public (publicized), official version of the routine urban order”.

Copenhagen is a city for cyclists in many ways. The infrastructure is good and the cyclist is framed (and frame themselves) as an important part of the city, as a living organism that defines the city spaces. But this priority, meaning that so many people cycle, at the same time creates problems when the issue of space comes into the everyday consciousness of the cyclist. So far, the cyclists’ reaction to this is producing structural stories that support the dominance of cars in city spaces. This is problematic when it results in limiting kids’ opportunities to cycle by driving them around. At the same time, it might be a way to finally open up the discussion as to whether or not the car should have the right to so much city space”. (Cyclist as Part of the City Organism , Marlene Freundendal-Pedersen, Roskilde University, Denmark).

Katia, 26 student. “ I love cycling to do Shopping and go from my home to the university . Is healthy and faster than use the car”.



Ana, 47 shop owner, “I like cycling across Amager Commons. It’s fun with my dog, but I cycle here when I’m alone, too. The only bad part is that the route is so successful; there’s barely enough room for all the cyclists - it’s total chaos around Dybbølsbro.”



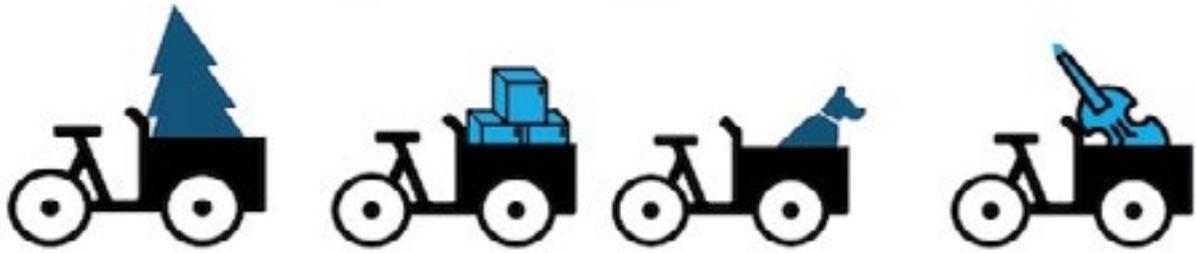
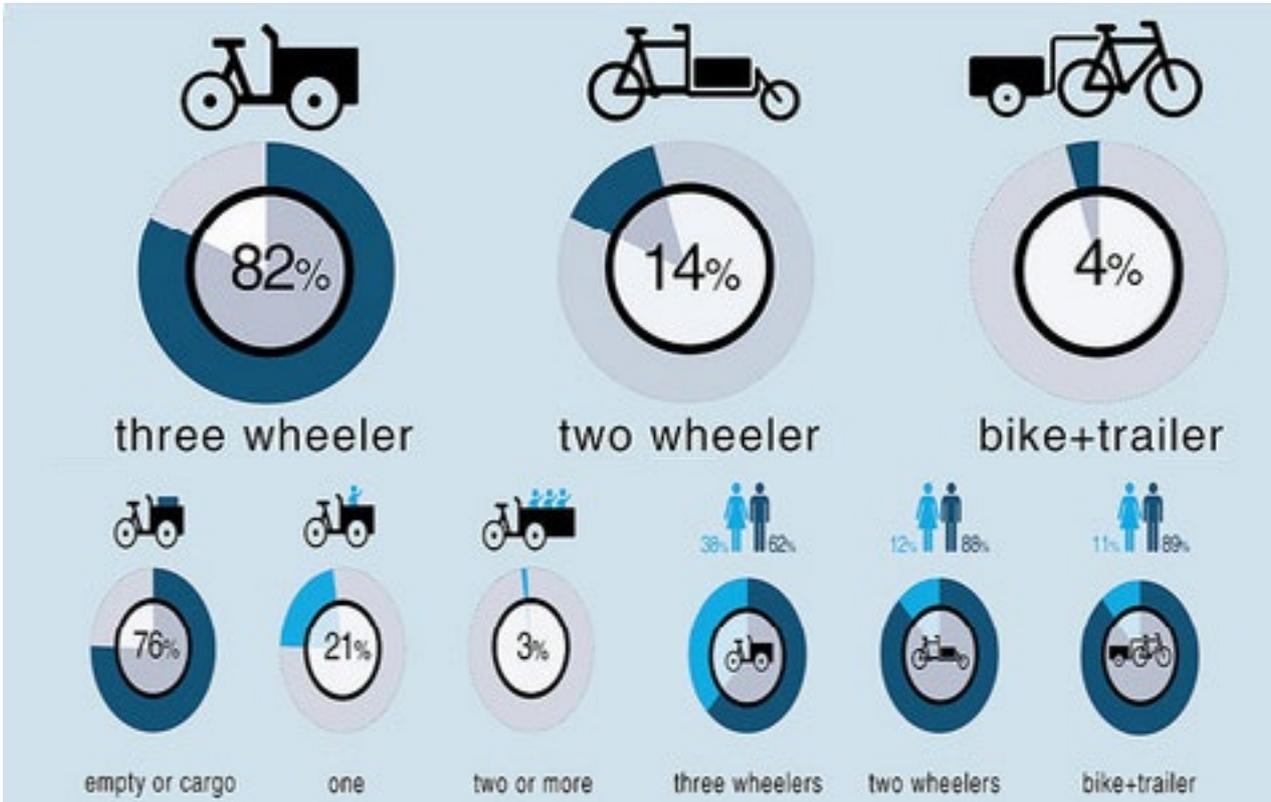
Robert, 59, project manager in a bank, along the University route, he said: “I love the cycle route, there’s no traffic, you’re close to nature, and I really love the new bridges, In the evening it’s a bit scary though so I think I’ll go home another way because of the lack of lighting.”



17% of Copenhagen families have a cargo bike. Cargo bikes are especially used for transporting children and shopping and they are often an alternative to having a car. In the next page some Cargo Solutions.

Pic 37. A normal day in Copenhagen





Pic 38-39 The Cargo Bikes of Copenhagen ; the graphs show some data of the Cargo solutions in the city



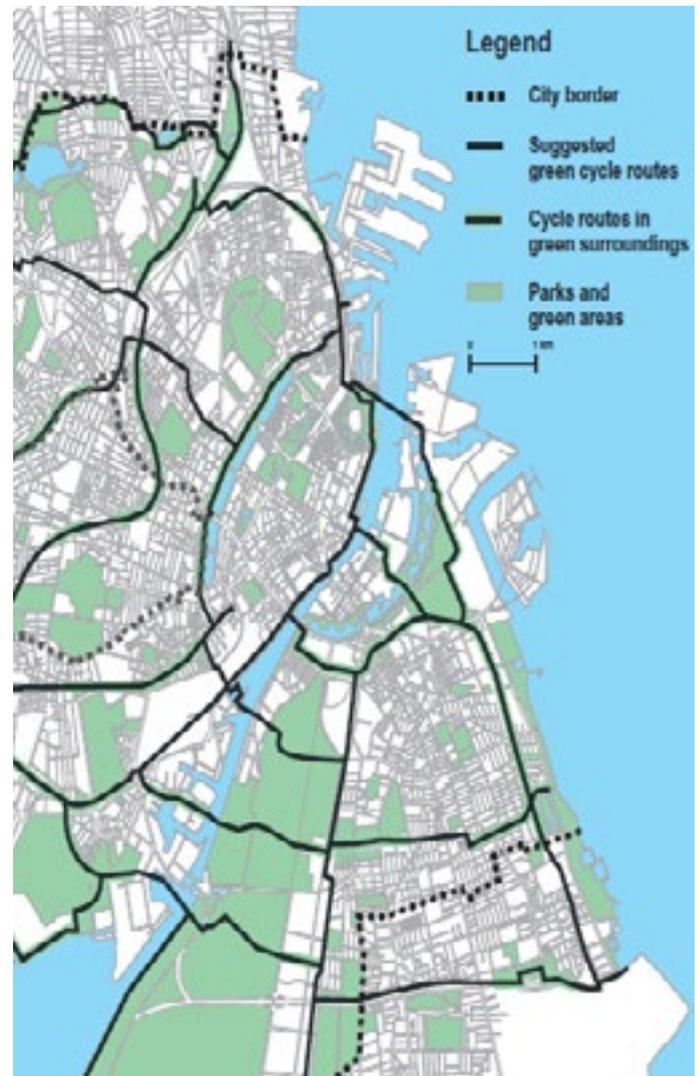
3.4. LEISURE CYCLING

After Speaking on daily cycling, is interesting speak about Leisure Cycling, on Cycle Tourism and Green cycle routes . Cycle routes are built with an high standard, and usually include a wide cycle path and separate pedestrian walkway. When possible cycle routes run in their own separate area through green surroundings and are designed to minimize the stops cyclists have to make because of other traffic. In addition to serving as home-workplace routes, they are also intended to have a recreational function.

3.4.1 GREEN CYCLE ROUTES

First I will talk on Green Cycle Routes ; The report Proposals for Green Cycle Routes, “Home-Workplace Routes and Recreational Routes” was approved in 2000 by the Building and Construction Board as the foundation for further planning and development of green cycle routes although nothing specific was decided concerning priorities or details. The plan includes 21 routes, a total of 100 km , the length of the routes varies from under 2 km to over 8 km and one third of the network already exists, although the standard is lower than could be wished, cycle routes were incorporated into the City Plan and has already proved its viability by preventing new building projects from blocking future routes. On those promenades along the harbour which serve as cycle routes and on promenade sections with heavy bicycle traffic in general, separate cycle tracks will be established.

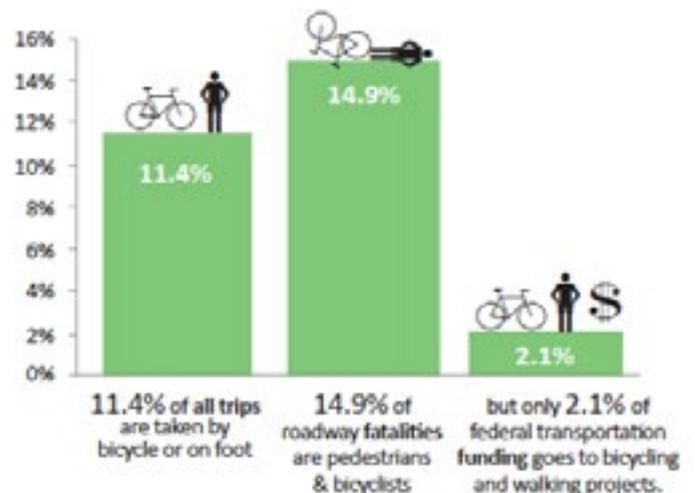
In the long run bridges across the harbour may link up the promenades along both sides of the harbour, It will also be possible to establish subsidiary sections linking up several existing sections. The existence of an approved and continuous plan for green cycle routes makes it easier to do this. Whenever possible, sections of a cycle route may also be built in connection with other construction, such as building projects, stations, squares, linear parks, etc.



Pic 40. The map show the green cycle routes



Pic 41. The graph show How Copenhageners rate the importance of keeping Green Cycle Routes away from main roads



Pic 42. The distribution of funding

Existing cycle routes, such as the Vigerslev route, may be gradually upgraded to a higher standard. In the entirely new district of Ørestad new cycle routes will be established in connection with the planning of this brand new urban area. The Proposal for Green Cycle Routes may also be used to select the routes that will be built by planned stages. The plan for building the first green cycle route, the Nørrebro route, was approved by the Municipal Council in 1997 and revised in 2000. The purchase of space from the Danish State Railways received financial support from the Ministry of Transport.

The Nørrebro route will pass through Ryparken, Nørrebro, Frederiksberg, Valby and Vigerslev. The first four of the ten stages have been completed. It is also intended stage-by-stage, to turn the disused railroad track of the old Amager railway into a cycle route. Work on the Amager route was initiated in 2001 when building was being done on the Ny Tøjhus site. Another section has been set up as a temporary walkway. The section past Kløvermarken also received political approval in connection with the culture and sports scheme for the Holmbladsgade district.

Further space for this cycle route was secured in connection with building the third stage of the Metro, and the route has also been integrated in the plan for the housing scheme of the Vølund site.” (Copenhagen City of Cyclists, 2014, Municipality of Copenhagen).

The green cycle routes are coordinated with the main cycle path network within the Greater Copenhagen Area. Future European cycle routes (to Malmø, Elsinore and Berlin) and the existing national routes will be adjusted to the green cycle routes as the occasion arises. Green cycle routes will eventually be signposted in accordance with the new rules for road signage as soon as a major portion of a route has been set up. Slightly under DKK 5 millions were spent annually on green cycle routes in the period 1997- 99. It is expected that completion of the network will take many years and the cost of realizing the green cycle route plan is estimated at around DKK ½ billion.

Pic 43. The Noorebro District , example of urban cycle design



3.5 TOURISM CYCLING

“Denmark is a flat country, and so is an obvious destination for cycle tourists. They are working to create a credible industry and attractive for tourists. The potential is enormous and is growing, and is a big great example for the Italian context. In Denmark a big interest in green tourism, environmental and climate considerations plus a growing interest in health issues and activity holidays contribute to telling a stronger story of Denmark as a cycle friendly country.

For Sunday cyclists a convenient link between the city’s infrastructure and the activity destination plays an important role. Sunday cycling takes place within the course of a day, often in a group. typically, 10-30 km are cycled often in combination with a public transport mode. Holiday routes need not necessarily be direct but on the other hand should never take cyclists in the opposite direction of their destination. The starting point for cyclists on holiday is a home, train station, bus terminal, bike rental shop at the holiday destination, etc. Lodging and shopping facilities as well as active fun play an important role of this group.

Neither Danish nor international cycle tourists choose Denmark as a destination for a cycling despite the fact Denmark is extremely well suited for cycling and has a long and extensive cycling tradition. In the years 2004-2008 cycle tourism in Denmark dropped from a DKK 3.6 billion turnover in 2004 to DKK 3 billion in 2008, and annual drop of approx. 4%. During the same period cycle tourism in Germany and Switzerland enjoyed an annual increase of almost 10%. Let’s take a look at the situation in Germany and Switzerland. In Germany the total turnover generated by cycle related tourism is over Euro 9 billion, the equivalent of almost total tourist turnover in Denmark.

Pic 44. Some Copenhageners in a park in the city



In Germany the average daily consumption per one-day cyclist is euro 16 while a long distance cyclist spends euro 64.60. One-day cyclists are responsible for 63% of total cycle related turnover. German calculations show that 7 out of 8 cycle tourists are one-day cyclists. This means that the quantitative potential lies primarily among tourists who take a cycling day trip during their holiday, whereas only 1 out of 8 are actual cycle tourists, cyclists who cycle long distances and who go on holiday in order to cycle. The estimates for Denmark indicate a similar distribution. Another interesting point is that one-Day cycling was not a specific focus area in Germany ; the focus was on developing long distances routes aimed at long distance tourists . in spite of this , one-day tours are the predominant segment. Cycle tourism in Germany is more less on a level with camping tourism , the 10% of total tourism. Visit Denmark estimates that tourist turnover will amount to DKK 85 billion by 2017. If cycle tourism is given high priority in Denmark it is realistic to assume that cycle tourism could constitute 10% of tourist turnover, which is more than twice as much as today. German experience provides the basis for assuming that it is possible to create a turnover of at least DKK 3 billion” (Cycling Embassy of Denmark, Collection of Cycle Concepts, 2012).

Every 3 years Visit Denmark asks a large number of tourists what made them travel to Denmark. 30% of them state that being able to cycle is a primary factor. Unfortunately this is not put into practice when the tourist is actually there; access to good cycling experiences is too difficult. Denmark was a pioneer country at the time the national cycle routes were established; the mere existence of the national routes put Denmark in the lead, other countries took up the idea , and developed it in terms of essential parameters such as activity themes, visibility, clarity, and easy access to all information during the planning phase.

The cycle routes in themselves are not enough , they can of course still be used promotionally to attract long distance cyclists who go on holiday in order to ride several hundred kilometers on a Danish cycle route. The aim of most tourists is not merely to cycle; they want to experience the Danish outdoors, Danish culture and history.

However if Denmark wishes to attain a higher level of tourist volume and turnover, we have to market more than the mere route. Experience shows that routes in themselves do not generate traffic ; good facilities and interesting activities are what attract tourists. Marketing should aim at giving tourists the necessary information on their options.

The next four sections discuss the development prospective: - Activity options should be developed as destinations ; - Organizational coherence should be developed ; - the concept should be marketed with a focus on attracting new groups of cycle tourists ; - the cycle tourist should be guaranteed a minimum standard for the quality of the offered product, including the infrastructure.

First Developing destinations: if Denmark like Italy compete on the European level there are two prerequisites that need to be in place. First, a product has to be created that can be marketed and that the tourist industry feels is exciting to market. Second, the products should make the potential guest feel that an activity is being offered that cannot be experienced elsewhere.

Second Thematization; the existing Danish cycle routes can in principle be further developed into theme based activity clusters and destinations in two ways: if a cycle routes already has a story; if the cycle routes runs through areas that refers to major historical figures and events beyond the local level , the stories should be collected and communicated on a regional basis.



Pic 45. A green routes in a park in Copenhagen

Third Signage. Denmark is privileged in having a national, a regional and a local route network characterized by consistent, uniform signage. When the signage was introduced it served as an inspiration abroad because it was easily recognizable and logical. Signage is crucial, particularly for the inexperienced user. Another crucial factor is the allocation of funding to maintain and develop existing routes. The routes are a product that can be used to promote Denmark as a bike friendly country; the use of GPS and smart phones gradually reduce the demand for physical signage in the landscape. There are 3 categories of users: those who prefer a digital solution, those who are completely dependant on signage to find their way, those that always bring a map.

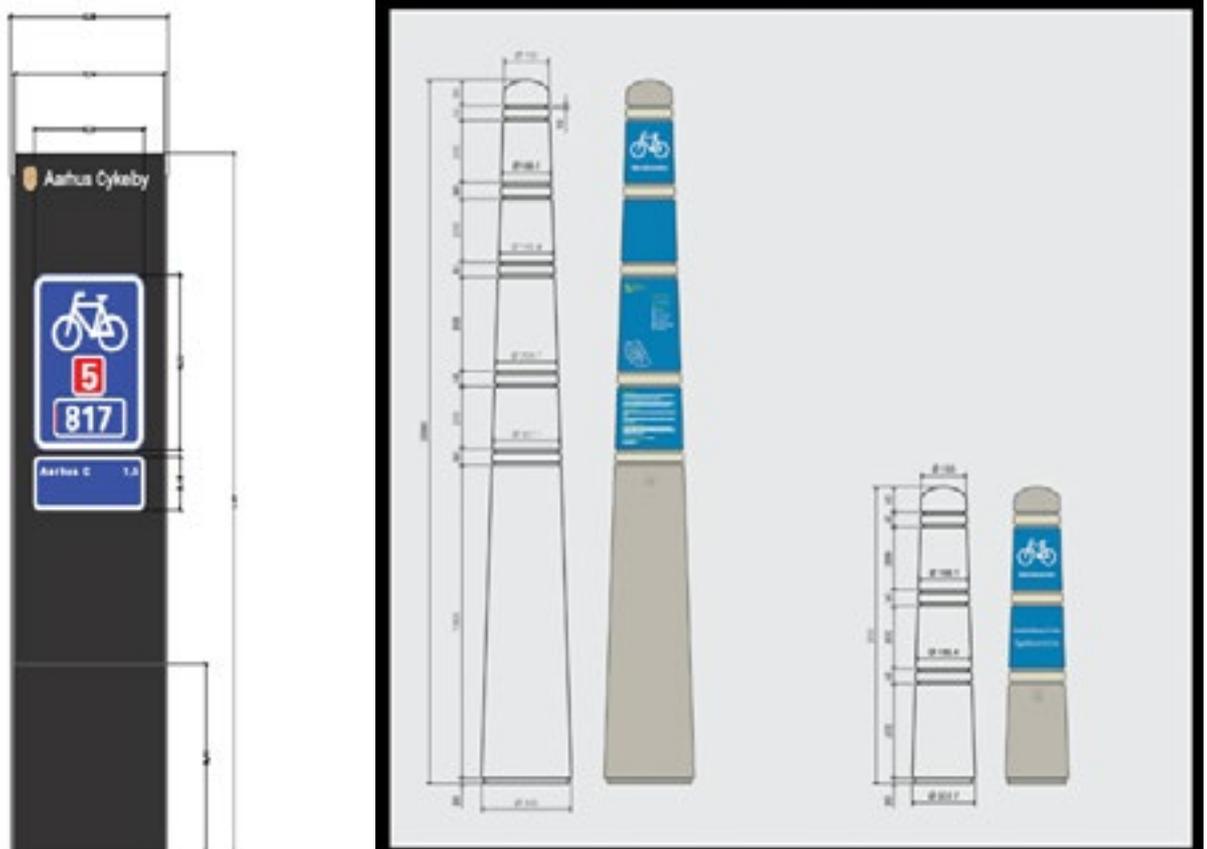
The organizational framework is the fourth. It is not easy to market a product whose ownership is distributed across 98 municipalities all of which have different priorities. The aim should be to develop the product to a level that is interesting to private investors in the industry. In Denmark a liaison committee for tourist road signage already exist. The first step toward further product development can be taken by establishing a cycle industry partnership in which all relevant stakeholders participate. The second step is to create a framework and conditions that make it attractive for professional tour operators to develop a wide range of cycling holiday products.

Information on cycling options is distributed over different platforms and even if the tourist is successful in finding all the information no coherent picture emerges. The Danish cycling infrastructure is excellent and there are many accommodation and activity options. The Danish cyclists Federation has therefore taken the initiative to implement a digital communication platform to function as an intelligent planning tool for the cycle tourist and render activity options visible.

Exploiting the inherent potential of cycle tourism will create economic growth and employment even in the peripheral areas. The following prerequisites must be met: - activities and destinations should be marketed rather than cycle routes; - the experience should be as seamless as possible for the cycle tourist, from the planning stage to the field;

- User should be actively involved in maintains and development; -public and private services should be developed and coordinated so they support each other.

Pic 46. The city of Copenhagen developed a special sign system consisting of posts and bollards to signpost green cycle routes



4. COST-BENEFIT ANALYSIS



4 . COST-BENEFIT ANALYSIS

The cycling infrastructure and other cycling facilities are of tremendous benefit to society, and in relation to health impact bicycle transport far out distances other transport modes. New studies quantify the benefits, providing a firm, quantitative basis for prioritization of cycling infrastructure. Further, traffic models can be used with great advantage to model bicycle traffic, particularly in large cities where bicycle traffic constitutes a significant modal share. Basically, what society wants is maximum value for public money, which is why economic considerations and cost-benefit analysis have become an integral part of the political prioritization process in a number of areas, including the infrastructure.

For many years cost-benefit analyses have been mandatory when assessing the profitability of major infrastructure projects, just as medical technology and third world development projects are subject to cost-benefit analysis in order to determine the project's value to society. In a cost-benefit analysis a project's advantages (benefits) are compared with its disadvantages (costs), and if the benefits outweigh the costs the project is of benefit to society. Every relevant type of advantage and disadvantage is assigned a monetary value if possible.

Costs are primarily incurred in the initial phases (establishment phase), whereas benefits are recurrent as long as the infrastructure is in use (operational phase). Thus, the choice of time horizon in the calculations is of primary importance. Typically, a payback period of 5-8 years on cycling infrastructure is considered satisfactory. The Technical University of Denmark published a number of assumptions and parameters for calculating socioeconomic costs and benefits, Unit prices that include assumptions regarding economic growth, car ownership and transport costs.



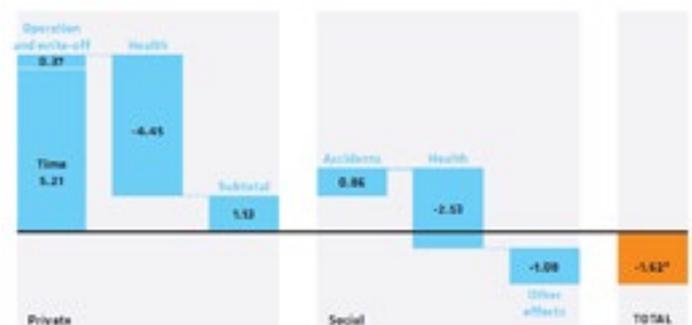
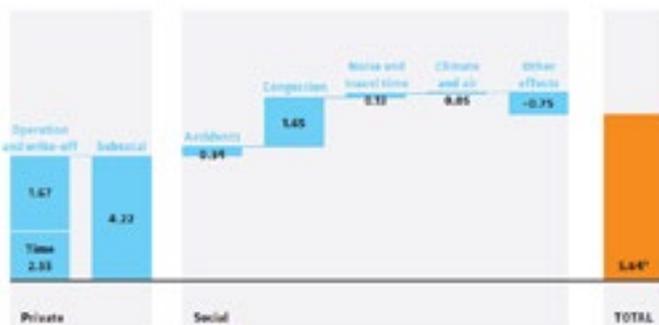
Pic 47. Society save at least DKK 3 per cycled compared to driven kilometer

Pic 48. The Boat cycle Bridge in the capital



Pic 49. Cost of new car journey in rush hour (Dkk/km at 16 km/h).

Pic 50. Cost of new car journey in rush hour (Dkk/km at 50 km/h).



4.1 COST-BENEFIT IN RELATION TO CYCLING INFRASTRUCTURE

Cost-benefit analysis can be used to assess the value to society of cycle projects. If bicycle traffic is to get equal treatment with other transport models it is crucial to have a solid planning basis to help decision makers prioritize transport spending. A preliminary set of unit values methodology for cost-benefit analyses of cycling initiatives was established for a project in the City of Copenhagen. The unit values can be used to perform cycling specific cost-benefit analyses, including new infrastructure construction, renovation of existing infrastructure, and campaign implementation. In addition, unit values can be used to compare the different transport modes costs and benefits. Unit costs consist of two parts:

a) the individual making the transport mode decision considers significant and b) the impact that decision has on the rest of society. In economic terms these are referred to as internalized and externalized costs. Internalized costs include value of time, vehicle attrition, petrol (for cars) and health, while externalized costs include expenses in connection with traffic accidents, hospital costs, negative environmental impact congestion, etc.

“When all these factors are added up, each kilometer of cycle path cycled costs society 0,081 Euro, whereas each kilometer driven by car costs 0,50 euro. The highest cycling related cost per kilometer is time, namely Euro 6,70 per kilometer. The monetary value of time is based on the population’s willingness to pay in relation to time, based on a Danish time-value study. People’s willingness to pay typically increases with increasing prosperity.

Accidents cost 0,10 Euro per kilometer while the direct maintenance and depreciation costs of cycling are roughly 0,044 Euro per kilometer. However, cycling provides many advantages to society in the form of health and life expectancy benefits. Taken as a whole, the benefits roughly amount to 0,74 Euro per kilometer. Most of these benefits affect the individual cyclist, calculated to approx. 0,51 Euro per kilometer, while other sectors of society benefit by about 0,24 Euro per kilometer. The benefits include saved costs for medical treatments and increased work value due to less sick leave. The health effect is based on the assumption that 50% of cyclists are already in good shape and derive no added benefit, while another 50% are in poor shape and achieve the full benefit.



Pic 51. Socioeconomic effects on cycling



Pic 52. The Bryggebro Bridge

Taken as a whole the costs per kilometers from cycling are approx. 0,081 Euro , which includes all effects assigned monetary value. This means that the cost to society of cycling is much lower than the cost of motor transport, assuming there are no more than 1-2 persons per car; society saves at least 0,40 Euro per cycled compared to driven kilometer. Switching from car journeys to cycle journeys is thus an excellent investment. Moreover, in some instances the results is even better. For example, it is assumed that cars travel at a rate 50 km an hour. In many large cities. However, cars move much slower during peak hours, not counting the time spent finding a parking space and walking from there to the final destination, making it even more profitable to invest in cycling. One conclusion was that the fact that the citizens were cycling more had a positive impact on public health and thus a positive socioeconomic effect. Some cases are interesting to understand this analysis.

In September 2006 the city of Copenhagen opened Bryggebro Bridge, a roughly 200 meter long pedestrian and cycle bridge over the Copenhagen harbour. The bridge links central Copenhagen via Fisketorvet with Islands Brygge and Amager. A cost-benefit analysis was used to evaluate the bridge, and showed that the bridge is very likely an excellent investment. There have been significant benefits to cyclists, primarily in terms of time saved, estimated to exceed project costs. The bottom line is that the bridge has yielded and expected profit to society of 4.437.601, 36 Euro and a return rate of 7.6% .

The cost-benefit method was also used when renovating the Gyldenlovergade intersection in the city. The analysis shows that there is a high probability that the renovation is a fine investment.

There have been major benefits to cyclists in terms of heightened welfare and to society in terms of saved medical costs and increased tax revenues. Taken as a whole, the benefits of the project are estimated to vastly exceed the costs. The bottom line is that the intersection has yielded an expected socio economic profit of 7.933.893,35 Euro and a return rate of 33%.

A dutch analysis supports the findings of the Copenhagen study quantifying the enormous health benefits associated with cycling. The analysis shows that if 500,000 persons switch to cycling instead of driving for their short, daily journeys, they will achieve a huge health benefit, vastly exceeding the small reduction in life expectancy due to enhanced exposure to air pollution and a greater risk of accidents . British economists are also devising methods to establish the value of cycling. Researchers at SQW Consulting have discovered that at 20% increase in bicycle traffic means a that society saves 354.092.291,58 Euro , and a 50% increase means a savings of 1.534.399.930 Euro due to reduced congestion, air pollution and health expenses. The cost-benefit ratio is estimated to be at least 3 to 1 in favour of cycling. In other words, 3,54 Euro are saved for every 1,18 Euro invested, over a 30 year period.

Cost-benefit considerations will probably become increasingly widespread and come to play a greater role in relation to infrastructure investments as a whole in coming years. Socio economic considerations can be used to great advantage by local planning authorities as well as the State when dealing with cycle projects,

	Bicycle (16 km/h)			By comparison: Car (50 km/h) in city			
	Internalized	External	Total	Internalized	External	Fees	Total
Time cost (travel time, private)	5.00	0	5.00	1.60	0	0	1.60
Mileage cost	0.33	0	0.33	2.20	0	-1.18	1.02
Increased life expectancy	-2.66	0.06	-2.59	0	0	0	0
Health	-1.11	-1.80	-2.91	0	0	0	0
Accidents	0.25	0.54	0.78	0	0.22	0	0.22
Insecurity	+(?)	0	+(?)	?	?	0	?
Comfort and discomfort	7	0	7	7	7	0	7
Branding, tourism	0	-0.02	-0.02	?	?	0	?
Air pollution	0	0	0	0	0.03	0	0.03
Climate change	0	0	0	0	0.04	0	0.04
Noise	0	0	0	0	0.36	0	0.36
Road attrition	0	0	0	0	0.01	0	0.01
Congestion	0	0	0	0	0.46	0	0.46
Total	1.81	-1.22	0.60	3.80	1.13	-1.18	3.74

Pic 53. The table shows transport costs. A minus sign indicates a socioeconomic benefit. The assumption is 1.54 persons per car

5. DESIGNING THE CYCLING INFRASTRUCTURE

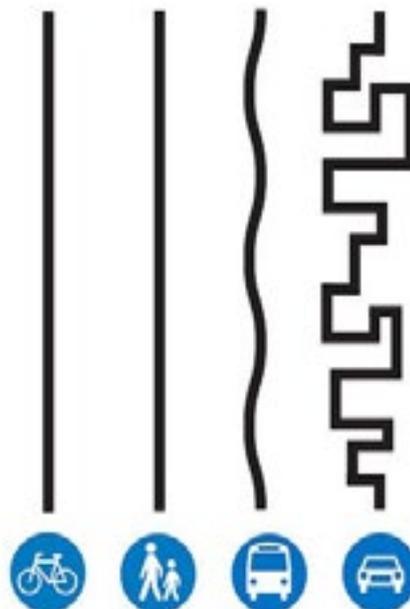


5. DESIGNING THE CYCLING INFRASTRUCTURE

5.1 CYCLE LANES

After the analysis concerning planning processes, costs, it is time to describe how to design a good cycling infrastructure ; for cyclists , a well designed circulation area is easily passable, safe and secure . “A good design should be functional and easily understandable. For safety reasons the traffic system must be designed so as to minimize the possibility of making mistakes, and minimize the consequences to prevent serious casualties. As a basic principle, road design should be self-explanatory. Everyone should have a clear perception of his or her natural place in traffic at all time, the road’s design should be determined by road user speeds and traffic composition; road surface, signage and road markings are not the same in a pedestrianized zone as on a country highway. These basic principles combined with the fact that roads and paths have a diversity of functions means that designing circulation areas appropriately is an extremely complex process.

First I will talk about Segregated paths , Cycle lanes and in the second part I will focus on the Cycle bridges. The Segregated paths are established for the sole use of cyclists and walkers, cyclists do not like hills or stops so the paths should be designed without many inclines and stops. Cyclist passability is increased in trafficked areas when the cycle paths continues through the intersection and cars have to give way to cyclists. Shopping street must have an adequate space for pedestrian ; on shopping streets where pedestrians can cross the road without difficulty car speeds should be 30 km/h maximum and cycle tracks are necessary in such cases, the street becomes divided into two separate shopping areas, a solution will be traffic tracks, traffic calming and integration of crossing pedestrians. In residential roads security must be the key , and low speeds a must. In the primary roads the traffic is determined , in this happens the 70-80% of urban traffic accidents , this is where major conflicts between safety, the environment and passibility arise , cycle tracks are often essential part of the solution. In high speed areas it is crucial to segregate cyclists from motor traffic. Safe cycling facilities are a prerequisites for increasing bicycle traffic over greater distance.



Cyclists often feel insecure in mixed traffic, especially when there are a large numbers of cars . consequently , bicycles and cars should only be mixed on road sections with little motor traffic and suitably slow speeds. On roads with cycle tracks the main problem areas for cyclists are at intersections and side streets, in mixed traffic is the situation in which cyclists most experience conflicts. About the cross profile , the width of the carriageway has little impact on the cyclist’s experience of the road in urban areas. Danish studies support that urban road width has little or no impact on cyclists safety whereas cyclist risk in open country drops as lane width increases. When the road width in urban areas is less than 6.5 m , the motor traffic speed limit should be 30-40 km/h maximum. At speed higher than 40 km/h traffic calming measures or segregated facilities should be considered, on road where motor vehicles pass cyclists at 30-50 km/h the choice between segregating cyclists from cars or allowing cyclists and cars to mix depends on traffic volumes, parking conditions, space, etc and to the presence of children and elderly.



Pic 54. Speed humps are a particularly effective traffic calming measure

Cyclists often perceive parked cars as a problems in mixed traffic , and the accident risk for cyclists in mixed traffic is increased even when car and bus bays have been established , parking should either occur in a parking lane or else speeds should be slowed to approx. 30 km/h . when parking is angled or perpendicular car speeds should only be 10-20 km/h. Parking restrictions result in an approx.. 20-25% drop in the casualty rate even though parking restrictions may mean that cars drive faster. Sometimes , it may be necessary to limit parking to one side so as to create space for a cycle track ; In mixed traffic , bus bays prevent confrontation accidents between cyclists and cars, cyclists don't have to look back and check for buses and cars in streets with many parked cars , the parking and waiting prohibition at bus stops can be supplemented by a pedestrian refuge.



Pic 55. The standard Plusnet cycle track has 3 lanes and is 3 m wide.



Pic 57. A curve radius that was too small was modified



Pic 56. A good cycle gap is 1.4 m wide, if the gap is too narrow cyclists use the carriageway and if it's too wide, cars may use the gap

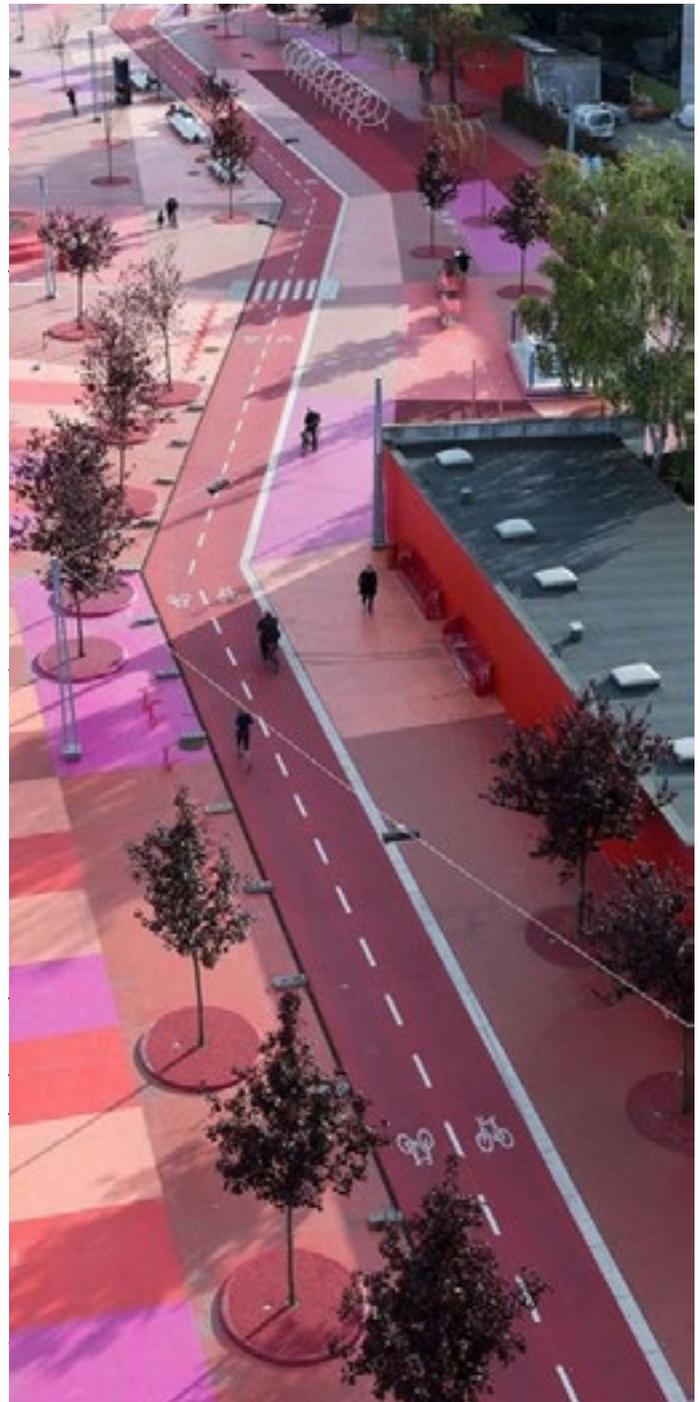


Pic 58. Cycle lanes are often used to park unlawfully

“Physical traffic calming is often necessary in mixed traffic to improve road safety and make cyclists secure, at road narrowings it is important that there is a designated cycling area such as a cycle gap, cycle track or cycle lane. 10-15 m should be kept clear of parked vehicles before and after the cycle gap, by means of islands or 30-40 m long cycle lanes. The cycle gap should be minimum 1.4 m . an English accident study of 72 slow-speed areas shows a 60% drop in the number of accidents, the average speed of motor vehicles was reduced from 40 km/h before speed reduction to 26 km/h after.

Cycle lanes are primarily used in urban areas, are a good alternative to cycle tracks when space and funding make it difficult to install cycle tracks. Cycle lanes are more common abroad and are used to mark the cycling area, what Danes call a “proper” cycle track. A recent study in Copenhagen shows a 5% accident increase on road sections and intersections, and a 15% increase in personal injuries. Studies indicates that accidents on road sections involving parked cars are not addressed by installing cycle lanes. The most serious accidents take place when cyclists turn left. Mini-roundabouts, clearly designated cycle tracks, and motor traffic speed limit reduction are measures which seem to prevent some intersection accidents on roads with cycle lanes .

A cycle lane is marked on the carriageway by a 0.3 m, solid white line, and painted cycle symbols placed at intervals of approx.100 m , and after each break in the solid white line (after intersections). Cars may not park on the cycle lane, but may use the carriageway outside the cycle lane, unless parking is prohibited . cycles lanes should be at least 1.5 m wide including a 0.3 m solid white line. When the lane is narrower than 1.5 m , overtaking cyclists often use the carriageway. A more acceptable width for passing is 1.7 m. the white line itself should be solid, but may be profiled to increase driver vigilance. Thermoplastic is an excellent road marking material due to good visibility, durability, friction and cost . cycle lane surfaces can be installed using contrast colours, such as red or brown, to emphasize the cycle route’s continuity. A coloured surface is important when cycle lanes are wider than 1.8 m as the cycle lanes can otherwise be mistaken for a carriageway or a parking lane.” (Dansk Cyklistforbund 2007).



Pic 59. The new cycle Track in the Norrebro District

A Danish before and after study shows that the number of accidents on country highways drops as shoulder lane width increases. Wide kerb lanes in urban areas particularly are often subject to undesirable parking, which means that waiting and parking restrictions and prohibitions are advisable. In urban areas one should always consider designing kerb lanes as cycle lanes with painted cycle symbols, to prevent parking in the lane. “ (Cycling Embassy of Denmark , Danish Road Directorate, 2000).

5.2 CYCLE TRACKS

One way cycle tracks should be established along roads with high motor traffic volumes and/or fast moving traffic. The standard Danish solution is designed so that cycling area has its own level between carriageway level and the pavement level, segregated by a kerb on each side. One-way cycle tracks should be established along roads with high motor traffic volumes and/or fast moving traffic. The standard Danish solution is designed so that the cycling area has its own level between the carriageway level and the pavement level, segregated by a kerb on each side.

Choice of cycle track category and width should not be solely dependent on such criteria as road safety and funding, but also on passability, security, comfort and general enjoyment. Cycle tracks reduce the number of accidents between cyclists and motorized traffic on road sections. When roads are dimensioned for speeds of over 50 km/h, cycle tracks help reduce the severity of cycling accidents. There are four main categories of one-way cycle tracks along roads, defined on the basis of differences in funding, space requirements, drainage, and perceived level of service. When it comes to cycle tracks in open country, wide tracks have a greater safety effect than narrow tracks. The cyclist accident rate is reduced by half when cycle tracks are established on highways, while the effect in urban areas partly depends on traffic volumes: the greater the number of cars, the greater the impact. A Copenhagen study showed that cycle tracks increase the total number of accidents by 10%, but that this covers a drop in road section accidents and an increase in intersection accidents. Furthermore, bicycle traffic on road sections increased by 20% and motorized traffic dropped by 10%, cycle tracks have a modest, speed reducing effect on both cyclists and motorists. In cities, cycle tracks may be used to create a narrower road profile, better crossing options, etc., and thus have a broad safety impact. Motor traffic speed reductions of approx. 1-5 km/h can be anticipated depending on traffic lane width and whether the number of lanes is reduced. Cyclists ride approx. 1-2 km/h slower on cycle tracks compared to mixed traffic,

Cyclists prefer cycle tracks along the road (or segregated, off-road cycle paths), and they like them to be well lit and to have an even road surface. For cyclists the perceived level of service provided by cycle tracks is significantly higher than for cycle lanes. Counts carried out before and after the establishment of 25 km of cycle track along 10 Danish highways showed a jump of 37% in the number of cyclists. On Cross profile The width for one-way cycle tracks segregated from the carriageway by a kerb, verge, or lane delineator is 2.2 m in both urban and rural areas with a guideline minimum width of 1.7 m. In practice, however, it is not recommended to go under 2 m. When a cycle track is part of a shared-use path the guideline width is 1.7 m and the guideline minimum width is 1.5 m.

A cycle track width of 2.2 m makes it possible for cyclists to overtake safely, since cycling speeds vary greatly, overtaking is very common among cyclists. In cases of large numbers of cyclists it may be necessary to create space for 3 cyclists to cycle abreast, with a minimum width of 2.8 m, preferably 3.0 m. Grass verges along the carriageway are assessed positively by cyclists for reasons of security and comfort. Danish experience shows that the positive impact of verges on perceived service levels occurs at speed levels of 60 km/h and up. To prevent parking on the verge and to improve drainage, a kerb is advisable between the verge and the carriageway on city streets.

Talking on Divided tracks should be established when there are few cyclists and pedestrians and not a lot of space is available; the risk of accidents in this case is greater when the cycle track and pavement are on the same level. One alternative to a divided track is a shared space track ;the use of delineators may be practicable for economic reasons, cyclists feel more secure on tracks with delineators. Cycle lanes delineators are in a wide variety of shapes and materials including rubber, plastic, concrete, stone and asphalt. Should not be used where many pedestrians cross the road. Other types are bollards, it is important to set them 30 cm back into the pedestrian area rather than at the normal kerb line.



Pic 60. Cycle tracks of varying widths



Pic 61. Two-way cycle track along Kragholmen in Frederikshavn. The solution works well as there are no side roads.



Pic 62. A short section of a two-way cycle track and a signalized cyclist crossing makes the Nørrebro cycle route



Pic 63. Cyclists on stormgade appreciate their new cycle track even though it's only 1.7 m wide



Pic 64. This kerbside bus stop has no passenger platform and a cycle track runs through it; cars must wait for the bus to leave.



Pic 65. 2.5 m wide cycle track is standard outside the Plusnet

For the standard cycle track , the height should be 7 cm and 12 cm max, between the cycle track and the pavement , the kerb height should be 5 cm min and 9 cm max. the stated kerb heights offer a number of benefits like most drivers of motor vehicles refrain from parking on cycle tracks or drainage can function perfectly well. On sections where there is a high demand for waiting and parking, a longitudinal island can be placed between the carriageway/parking lane and the cycle track , a pedestrian refuge between the cycle track and the carriageway improves pedestrian safety on roads . cycle tracks may increase the number of bicycle accidents at bus stops , studies of bus passengers and cyclists without a waiting area have shown that zebra crossings reduce cycling speeds . it's a good idea to establish a section of standard cycle track, with a kerb with delineated cycle tracks, so bus stops with a waiting area make it easier for passengers to cross the cycle track without coming into conflicts with cyclists. Also the cycle track's start and finish is a key element of the detailed project design, ramps to and from the track should provide a transition with the kerbs.

Terminating the cycle track can be done by a 15-20 m wedge shaped traffic lane expansion, and a solid white line should be painted 15-20 m into the traffic area from where the cycle track terminates. Two-way cycle paths may be established through recreational areas , and often function as a shared-use path for pedestrians and cyclists. Can be divided into two main groups: - two way path along a road, and segregated off road cycle path or greenway through green open spaces; should include options for other solutions for vulnerable road users and after a safety assessment of conditions.



Pic 66. The cycle track runs behind the waiting area

In the countryside should be on densely trafficked roads with ample space , and is often best to place the two-way cycle track on the side of the road with the least amount of side roads and driveways. A segregated off-road cycle path usually means that is far away from motor traffic , small children can use a segregated off-road cycle path without adult accompaniment ; the path should be dimensioned so that two cyclists can pass each other, the space should be 3 m wide minimum , with a separated walking area alongside. In urban areas the verge should be 1.0 m wide minimum.

When we talk on intersecting paths is important that cyclists and moped riders can see oncoming traffic , when speeds at cycle path intersections are too high, traffic calming measures for cyclists can be used, such as speed hump crossings or ramps. When there is a intersections between paths and roads and when cycle path terminate, conflict arise. Segregated off road paths can be designed in many different ways to encourage cyclists to observe their give-way duty in situations where the cycle path crosses a road. Various stop signs, compulsory give-way signs or give way lines may be used in connection with other solutions. Some innovative solutions in Denmark are cycle path barriers were replaced by speed humps, bollards and give way lines. Barriers may be used to compel cyclists to observe their give-way duty. Cyclists seldom use inlit segregated off-road paths and greenways in the dark , lighting should illuminate the entire path in such a way that a cyclists riding at 25 km an hour can easily distinguish the path from the surroundings area, solar powered LEDs provide a reasonable alternative, but I will talk more later about this new systems. It is relevant to design the infrastructure after a focus on city lanes, with a specific attention to the different cycle tracks etc. and now I will talk about intersections.



Pic 67. Two-way cycle path along the road segregated by a crash barrier

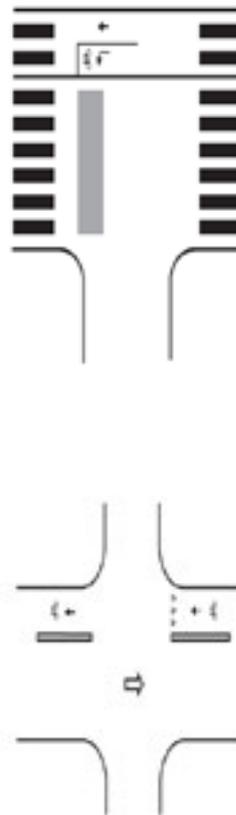
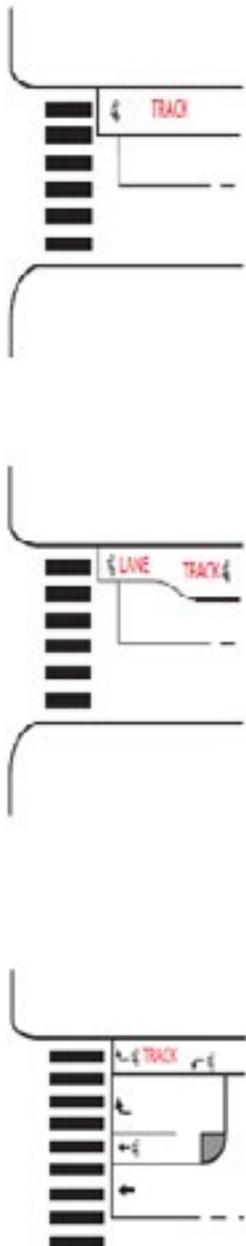
5.3 INTERSECTIONS

There are two types of intersections: - duty to give way to the right, when the road user has to give way to traffic coming from the right, and duty to give way, when the road user coming from a secondary road has to give way to all traffic on the primary road. A third option are the intersections regulated by a stop sign. It is crucial that give-way rules are very clear. Line of sight is crucial to the traffic safety of all road users. Parked cars close to the intersections make it difficult for road users to view traffic clearly. Cyclists on the primary road should be visible and motorists turning off the primary road at least 20 m before the intersection. When there is a longitudinal incline on the primary road the distance should be greater, the intersections should be recognizable by prohibiting parking, some planting and by road markings.

At intersections with small amounts of traffic on the secondary road, the cycle track should be continued through the intersection; a study of cyclist safety in minor intersections further showed that the number of bicycle accidents dropped by up to 50% when secondary roads were crossed on continuous cycle track and / or pavement, to make the cycle track more visible as it runs through the intersection, the cycle track can be made of another surface, or cycle symbols, can be painted on the road surface. At intersections with a great amount of traffic the cycle track can be dropped to the level of the carriageway before the intersection.

A shortened cycle track can be continued as a cycle crossing through the intersection so as to clearly identify the cyclist circulation area. When a cycle lane along a primary road continues to the intersection, a marked cycle crossing should be established through the intersection, in intersections with dense traffic it's good to set the cycle track 5-7 m back from the road and run the track over the secondary road, while in mixed traffic is good to establish crossings on secondary roads. Two-way cycle tracks and intersections are a bad combination, because of safety issues, space permitting the cycle track should be set 5-7 m back from the primary road. The intersection may be constructed on a raised surface.

Signalized intersections are often established to improve traffic flows, road safety and security, signalization has a highly favourable impact on safety outside the intersection; at intersections without a separate cyclist signal, cyclists have to use the motor vehicle signal, according to the Road Traffic Act, one of the principal acts of Denmark cyclist rules, cyclists may not follow the motorists left turn arrow since they have to turn left in two phases, when they have to proceed to the opposite corner and only then may they complete their left turn. Cyclist signals are used to shorten the green phase for cyclists in order to make the intersection more easily passable for motor traffic, in Copenhagen cyclist signals with a countdown function and the waiting time perceived are reduced and counteract cyclist to cross on red.

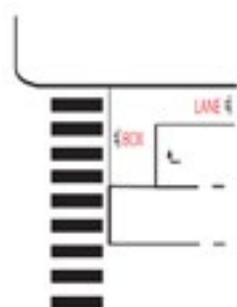


In vehicles actuated systems the length of the green phase is controlled by traffic coming from different directions, motor vehicles activate the signal by a loop or wire buried in the road, bicycles may be detected by loops, or manually by pressing a pushbutton.

The optimal solution for cyclists is both a magnetic loop and a separate, manual cyclist pushbutton, which should be mounted on a low post at the stop line, when a cyclist has been detected a small light on the post flashes. To prevent crossings cyclists from falsely activating the signal, the loop has to be kept covered to at least 2 seconds, the advantage of magnetic loops is only to wait for shorter periods and don't have to press a pushbutton. In signalized T-intersections when the cycle track continues to and through the intersection and there is a set-back stop line for cars, cyclists may be allowed to ride past the traffic signals. An other option is to install an island between the cycle track and the carriageway to indicate the different give-way rules.



Pic 68. Pre-green for cyclists



“The bike boxes may be established at signalized intersections by painting the cycle symbol in front of the motorist stop line in turning lanes, this enables cyclists stopping at red to get ahead of cars. A study of left turning cyclists in bike boxes in Copenhagen showed that bike boxes make cyclists feel more secure and more satisfied. In intersections with a large modal share of cyclists, cyclists may be usefully channelized into separated right turn lanes and lanes going straight ahead. Pilot projects in the capital have tested electronic cyclist warning devices, in which I focused my study, in relation to right turning traffic, especially lorries;



Pic 69. Green right-turn arrow for cars at the end of the phase to prevent conflict



Pic 70. This attempt at establishing a waiting space for left-turning cyclists



Pic 71. Waiting space delimited by blue cycle crossing. The blue cycle crossing makes it clear to leftturning cyclists that they can wait between the cycle crossing and the zebra crossing.



Pic 72. Narrow cycle lane leading up to the intersection



Pic 73. Up to two blue cycle crossings are an option in signaled Copenhagen intersections



Pic 74. Traffic island that allows cyclists to ride straight ahead past the island without extra waiting time

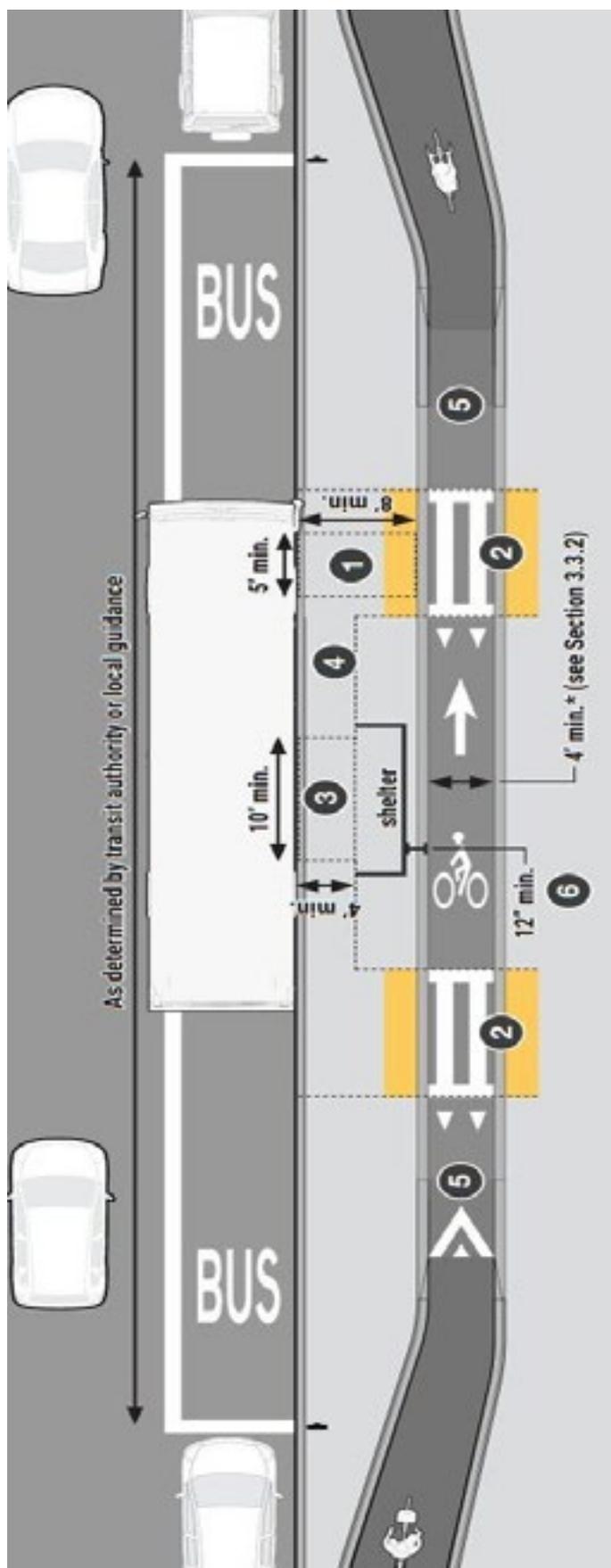


Pic 75. Traffic calmed roundabout with tarmacked cycle lane all the way around

Copenhagen have tested a system by which LEDs along cycle tracks just before the signal warn right turning lorry drivers of cyclists coming from behind. If warning measures are to function properly, it is essential that they are supportive and do not lull road users, cyclists as well as right turning motorists, into becoming irresponsible or less vigilant.” (The safety of Cyclists , Jorgen Brude , 1996).

And now a little focus on Roundabouts; in Denmark are often used to enhance road safety in the countryside and in cities, a roundabout may also be used as a traffic calming measure and often improves traffic flows when it replaces a signalized intersection, no risk of left turn accidents, but not reduce the bicycle accidents. For this case the roundabouts may be designed with one or more lanes in the circulation area and in the approach and exit lanes, the bicycle traffic should be directed to the perimeter, the approach lane width should be no wider than 3.5 m, exit lanes no wider than 4 m. in open country are generally with a central island of 20-40 m in diameter and triangular at the legs of the roundabout. In cities like Copenhagen, there are more road users, the maximum capacity is 25,000 motor vehicles per 24 hour period in a one lane roundabout, and 40,000 in two lane. In trafficked roundabouts with a 30-50 km/h speed limit, cyclists should mix with motor traffic in the one lane circulation area. When there is little space and greater traffic volumes, a small central island or signalization are possible solutions; in mini-roundabout the capacity is up to 15,000 cars per 24 hour period, are used when the signed speed limit is also 30-50 km/h, cyclists should mix with motor traffic in the circulation area.

In Denmark pedestrians, cyclists and motorists are often completely segregated so that each traffic mode has its own area; Normally as a general rule bicycle traffic is not allowed in pedestrianized areas in Copenhagen, when cycling is allowed, cyclists must give way to pedestrians, and must be allowed at certain times of the day, like outside business hours. When there is space a cycle track may be established in a pedestrianized zone, this reduce the number of conflicts with the cyclists. Designing squares and urban spaces without cars and parking spaces permit to put new surfaces and plant.



Pic 76. A section of correct cycle track close to a bus stop

5.4 MATERIALS AND PRICE CALCULATIONS

Road surfaces are often up for discussion when squares and other urban spaces are being renovated; as a general rule asphalt is the most suitable material for cycle track surfaces and is therefore standard on Copenhagen cycle tracks because it offers a smooth, even surface and can be repaired; powdered asphalt normally has a technical service life of 15-20 years, although it may only remain for 10 years. Gravel should not be used on cycle paths although it may be used when the path doesn't need to be bikeable when there is snow. A road surface treatment is the cheapest fixed surface, it bears a certain similarity to gravel and may be a compromise option in natural areas where there is a reluctance to use asphalt. Granite paving slabs and paving stones in general can be used to indicate a pedestrian area. Cycling areas in pedestrianized zones can be segregated by 3 cm high border. A coloured surface application that clearly can highlight a circulation area and help render give-way regulations visible. "The price of cycling infrastructure plan can be roughly estimated on the basis of local, experience-based unit prices. For example, the unit price for a cycle track on one side of the road in a given area in the countryside may be Euro 680.000/km while elsewhere it may amount to Euro 1.080.000. an entire plan can cost as much as Euro 13.453.000 .



Pic 77. A Bicycle traffic light in the city

The price of concrete construction projects can be calculated on the basis of a sketch project, for purposes of estimation 20-80% should be added to the contractor quotation, covering preliminary studies, planning, inspection, administration; a good rule of thumb is to add a total of 50% to contractor expenses, 20% preliminary studies, 30% area acquisitions. Prices depend on the amount or scope of the project and there are regional differences; the price quote is partly dependent on the amount of new construction." (Collection of Cycle Concepts, 2012).

Pic 78. The table shows the quoted contractor prices are at 2016 levels and are used to estimate and calculate cycling infrastructure prices. 20-80% should be added to cover preliminary studies, projecting, inspection, administration, and unforeseeable expenses.

	Metropolis (many intersections)	Towns	Countryside
Two-way cycle track (2.5 – 3.0 m wide)		DKK 2.5 – 6.0 mill. per km	1.0 – 2.5 mill. per km
One-way cycle track (2x2.22 m) incl. drainage	DKK 5.0 -15.0 mill. per km	DKK 3.5-8.0 mill. per km	DKK 2.5-5.0 mill. per km
Cycle lanes (2x1.5 m wide) The low price only covers surface marking	DKK 0.5-10.0 mill. per km	0.25-5.0 mill. per km	DKK 1.5-3.0 mill. per km
Recreational stone dust paths (3.0) m wide		DKK 0.5-2.5 mill. per km	DKK 0.4-1.0 mill. per km
Extensive traffic calming (chicanes, humps, road narrowing, etc.)		DKK 5.0 – 20.0 million per km	

5.5 BRIDGES , TUNNELS, HILLS AND STAIRS

5.5.1 BRIDGES

The City of Copenhagen minds the gaps, over the past decade, they did radical changes in the connectivity of Copenhagen, a city bisected by a harbour. When I did my research I watched like thirteen bridges have popped up (with four more on their way), connecting previously cut off neighbourhoods while facilitating a 13 km recreational path, the Harbour Circle. Mobility and bicycle user experience are both high priorities on the City's agenda, and these bridges are only a part of a greater plan. But most notable of all, each and every one of these new bridges are off-limits to automobiles, saying loud and clear that this is a city for people. To show how serious the city takes connectivity, is interesting show a map with the new and upcoming bicycle bridges of Copenhagen.

Cykelslangen is an elevated, orange bike lane, elegantly connecting Bryggebroen to the neighbouring districts, along a dedicated, bicycle only pathway. Shortly after opening, Cykelslangen became an instant Copenhagen urban icon for its practical, elegant and functional Danish design. At last count, the two bridges accommodated 14,200 and 12,700 daily bicycle riders, respectively, far exceeding traffic flow predictions. These two bridges set a new standard, bicycle bridges are not only widely popular among residents and visitors alike, but an incredible investment, Cykelslangen takes off where Bryggebroen ends on the Eastern side of the harbour and continues in a meandering course to Kalvebod Brygge, a major roadway, some 5,5 m above the quay, the project went from a ramp to an elevated bicycle route. It winds its way and by doing so it makes the bikers inadvertently slow down, a bike route above land and water and it barely touches either resting on slim columns with a distance of 17 – 20 m. It epitomizes the image of Copenhagen as a bicycle City.

Pic 79. The Bicycle Snake of the city



The map is divided into three categories: the built, the temporary and the proposed. The ten already built are currently in use by those looking for a fast A to B. Bridges are the mobility link inside the urban toolbox that effortlessly solves the problem of crossing an obstacle. Done properly, a bridge is A-to-B at it's finest. The significant number of bridges is immediately noticeable on the map, while thirteen new bridges for bicycle users and pedestrians have opened since 2006, nine of of them were built in the last two years alone. Completed in 2006, Bryggebroen was the first new connection built over the Copenhagen harbour in centuries. Bryggebroen served to connect Havneholmen to Islands Brygge and beyond, giving Copenhageners a much needed connection over the harbour. With the change from commercial harbour activities to residences and retail the Inner Harbour of Copenhagen has undergone a pronounced transformation.

As part of this transformation, the first stage was a foot- and bicycle connection across the Inner Harbour, the bridge by Dissing e Weiling studio, that I talked before in the benefit-cost analysis was became a tremendous success not only as a connection between two parts of the city, but also simply as a way to enjoy the views of the harbour, the sensation of being above water.

However heading to or from Bryggebroen on the Eastern side of the Harbour cyclist had to carry their bikes down or up a full flight of stairs at one end of the quayside. However, crossing the bridge into the city, riders were forced to choose between two inconvenient options: to push their bicycle up steep stairs, or take an inconvenient, indirect, detour weaving through pedestrians. This gap was filled with the addition of the Cykelslangen, (The Bicycle Snake), in 2014.

Pic 80. The map of the cycle Bridges in the city





Pic 81. The butterfly Bridge



Pic 82. A pedestrian and cycle bridge in the city



Pic 83. This bridge connect two new part of the city



Pic 84. A cycle bridge in a park



Pic 85. The butterfly Bridge open

The pure joy of cycling, it is orange, so that it may hold its own elevated place amidst the surroundings and to give warmth in daytime and at night lit up from the LED strips in the glimmering stainless steel handrails. Cykelslangen is not an elevated bicycle route, it is not an attempt to establish elevated bicycle routes as such, to separate cyclist from the ground level, bicycles should not be isolated from but rather be an integrated part of city life, street life.

Cykelslangen is a specific answer to a specific problem in Copenhagen in fact the bridge is a painted, airtight welded steel structure, carried by a central steel spine – a 75 cm box girder, from which a series of cantilevered struts, made of folded steel plates, carries the steel plate deck. They aimed for a slim structure, with all parts being structural, hereby reducing the visual impact, the parapet is perceived as a transparent film, no modular hierarchy, in essence underlining the fluidity of movement through space. The parapet consists of inward leaning steel bars with a circular cross section with a stainless steel handrail, it relates essentially to Bryggebroen but differs in detail, reflecting its functionality, alignment and setting. The anti-slip pavement consists of a granulated stone on an acrylic compound, the bridge is lit from LED strip lighting built into the parapet handrail. The thin vertical posts are backlit at night highlighting the winding path.

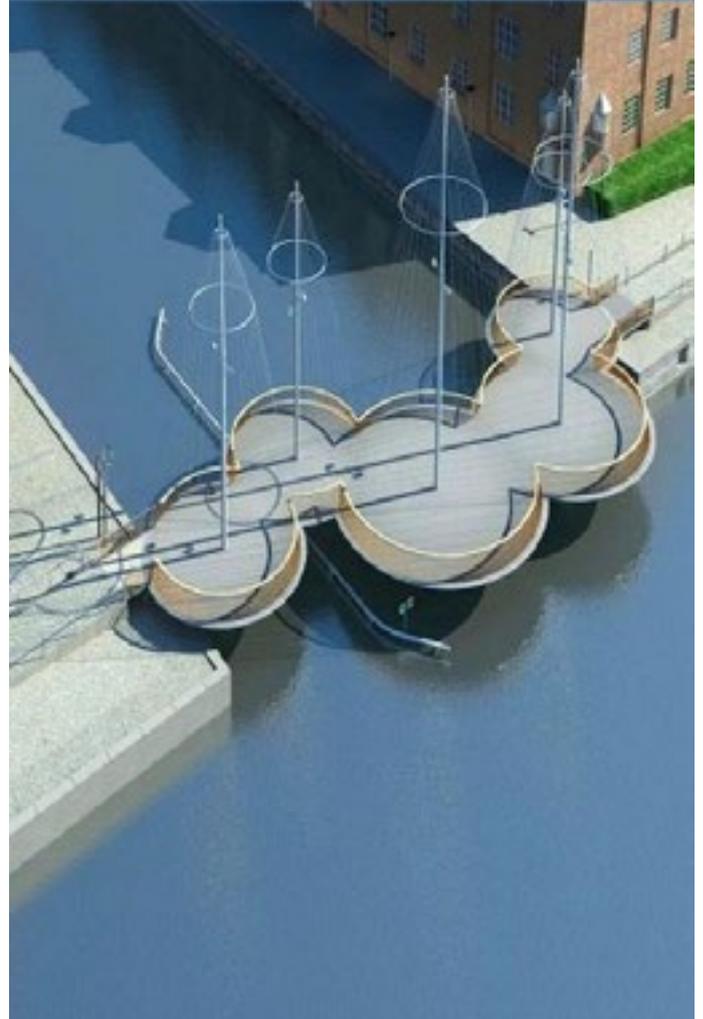
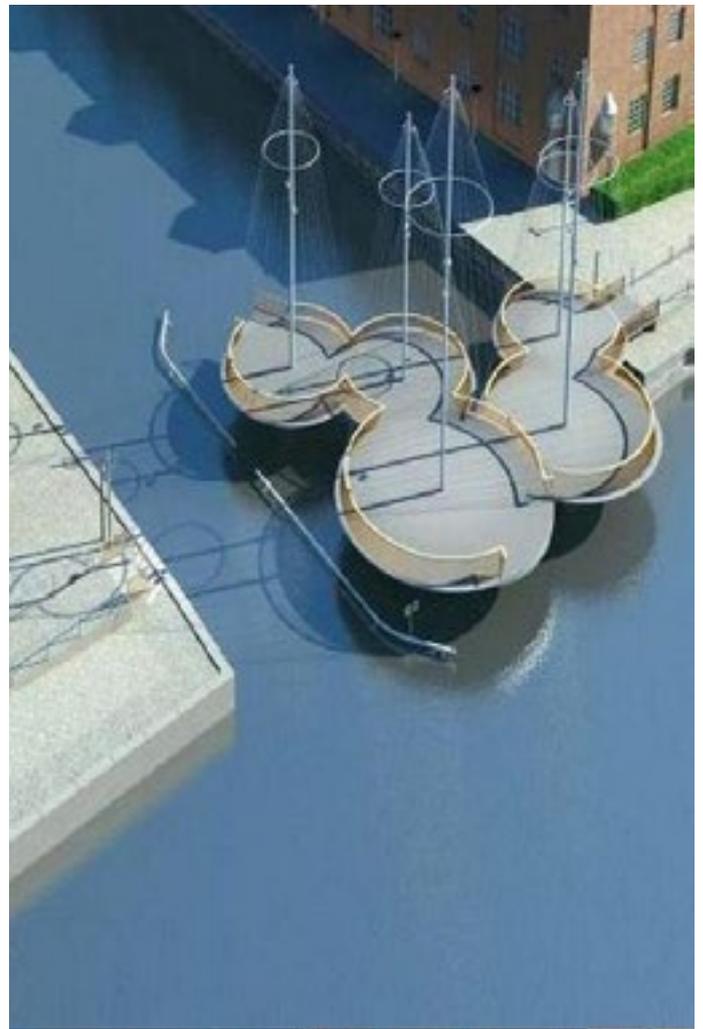
Cycle bridges and tunnels are used when there is a large volume of motor traffic, ramps have to live up to the incline regulations prescribed by the road standards and are thus quite long. High railings and crash barriers in bridges are necessary to protect pedestrians, cyclists and help lorries, the recommended railing height is 1.2 m, so cyclists should not be able to skid under the railing, a windbreak is useful on windy bridges, another option is to place cycle tracks indoors.

In 2009, the municipal mayor of Copenhagen wrote: "What the city needs is access across the harbour further east, closer to the city centre on the Inner Harbour. Our new Opera and the former military area called Holmen, would benefit greatly from increased access. A network of bridges is needed."

The City took note of these gaps and seven years later the results are in, with four new bridges in the area, Holmen, another district of the capital, is now better integrated with the rest of the city in all directions. The Inderhavnsbro is another bridge, connecting Holmen to Nyhavn, Kongens Nytorv and beyond, opened just three weeks ago, with an already noticeable effect on pedestrian and bicycle flow on Holmen. In addition to the Inner Harbour Bridge, Trangravsbroen and Proviantsbroen, have made it easier, faster and safer to move on foot and by bicycle across Holmen and Christianshavn. Shorter bridges over 17th Century canals, such as Cirkelbroen (the Circle Bridge), and the Frederiksholm Canal bridge, help link almost the entire harbour. Designed by the Danish-Icelandic artist, Olafur Eliasson, Cirkelbroen opened in 2015 and fixed a minor, but important gap in the mobility network of Copenhagen, this beautiful, but modest bridge connects Christiansbro with Applebys Plads and accommodates 2,200 bicycle users daily, even smaller bridges, less decorated bridges, like Dyssegravenbroen and Laboriegravenbroen bridge in Christiania and the Lersoparken-Ryparken bridge also have a big, positive impact, the Dyssegraven and Laboriegraven bridges are new connections from eastern Amager into the city.

Pic 86. A view of the Cycle Super Highway of the city





Pic 87 The Cirkelbroen bridge during a day

It's easy to see the need for bridges in a maritime city like Copenhagen, but the City's efforts to connect the urban fabric doesn't end at the harbour's edge, bridges and tunnels also connect bicycle riders to areas previously cut off by busy roads, railways, and construction sites.

The bridge between Lersoparken and Ryparken was completed in 2014, allowing for pedestrians and bicycle users to cross between two parks and neighborhoods while avoiding indirect and busy roads. Åbuen, opened in 2008, eliminated the challenge for bicycle users approaching and exiting the road bordering between Nørrebro and Frederiksberg. Folehaven Bridge will connect and ensure a safe passage between the Vigerslev park and the Folehave area over the rest of Valby. This bridge help bicycle users avoid the major traffic barrier that is and is located at the municipal boundary and with it's design serve as a dramatic welcome to the city of Copenhagen, reminding automobiles that bicycles are above them.

5.5.2 FUTURE DEVELOPMENTS

The city is currently developing two new metro lines, creating inconvenient detours to get around, two temporary bridges symbolize the commitment of the city to cyclist mobility and not strictly on construction efforts. The Sorted Lake bridge is a new way of experiencing the picturesque lake through a floating shortcut, since the Metro expansion has reduced some of the regular gravel paths next to the lake's shore, once the expansion of the Metro is over in 2018, the paths will be back to normal and the floating bridge will be eliminated; another temporary bridge over Frederiksholms canal was put in the last year to give pedestrians and bicycle users the opportunity to bypass the construction of Blox, the future home of Realdania and the Danish Architecture Centre.

The four new bridges will all further develop the accessibility of the central part of the city and the harbour. Langebrogadebro will connect Vester Voldgade and Langebrogade in Amager and is expected to be completed in 2018 as part of Realdania's Blox development. The bridge will become part of the green wave network or 'Grøn Bølge' that will relieve both car and bicycle congestion of Langebro and Knippelsbro. Bænkebro (The Bench Bridge) will connect Teglholmen and Enghave Brygge, in 2018. The residents of these two areas are currently forced to take a very busy and tedious detour along Vasbygade to commute to and from the city centre, which can easily diminish the desire to commute by bicycle.

The new, upcoming Bænkebro will be a nice shortcut through the harbour with less noise and nicer scenery. Once finished, it will be easier to ride all the way down the south harbour connecting the newly developed area at Sluseholmen, and the upcoming commercial and residential area at Enghave Brygge, to the rest of the city. And there's the Nordhavn Tower Bridge incorporated into the Copenhagen Gate tower development, taking the elevation into account, the bridge is hardly an A to B solution. The bridge will lead from one tower to the other, one at Marmormolbyen and the other upon Langelinie, each tower will carry its own cable-stay bridge between the two piers and due to the site geography, these bridges will meet at an angle.

Pic 88-89. The future Nordhavn Tower Bridge



5.5.3 TUNNELS

And lastly a tunnel, The Østerbro tunnel opened last year, addressing a major barrier separating residents and bicycle users from Nordhavn and the waterfront. For businesses and residents on Marmormolen, Amerika Plads, and in Århusgade, this tunnel cuts a significant portion of the transportation time welcoming 2,700 bicycle commuters each day. Lighting is crucial inside and outside tunnels, and a number of tunnels are lit 24 hours a day; it should be possible to see what's going on in the tunnel from the outside, preferably throughout the entire tunnel, window openings should be installed in new tunnels to let essential daylight shine on cyclists. Pedestrians and cyclists should always be segregated in tunnels whenever possible, barriers, sharp and bollards should be avoided inside or outside the underpass.



Pic 90. A tunnel in the city, opening the sides slope outwards and there are roof windows to let in daylight.

5.5.4 STAIRS AND HILLS

Stairs are not intended for cyclists, cycle ramps are a good idea for stairs, particularly near stations, bicycle parking basements, bridges and tunnels; a ramp on each side of the stairs is useful since it makes it easier to go up and down stairs with a bicycle. Cycle ramps should be 0.3 m wide and the railing should be placed so that it doesn't get in the way of a cyclist pushing a bicycle, where there are many cycle tourists a width of 0.5 m-0.6 m is a good idea. The incline of stairs should be no greater than 25 degrees, cyclists generally tend to avoid elevators. Steep hills often have a limiting effect on cycling, but a small hill doesn't affect urban transport habits; cities should not be expanded into hilly areas, but when paths and roads are planned properly even major hills can be avoided. When hills are particularly steep it may be a good idea to signpost alternative cycle routes or resort to more expensive methods such as bike lifts, escalators or elevators. In the next part I will focus on Bicycle Parking, Public Bikes, and ITS Intelligent Transport Systems.



Pic 91. A solution for stairs in the city

6. BICYCLE PARKING, BIKE SHARING AND ITS



6 BICYCLE PARKING, BIKE SHARING AND ITS

6.1 BICYCLE PARKING

Any bicycle journey ends with a parked bicycle and since over 5 million bicycles are in regular use in Denmark this means that many bicycles need to be parked every day, in this section I present good advice and recommendations for establish suitable bicycle parking facilities taking the Danish example for our Italian context. Especially in Italy car parking has been a central issue in area planning for the past 50 years, little attention has been paid to bicycle parking in urban planning and construction projects , bicycle parking should be an integral part of any project from the outset , if people are to be encouraged to cycle , they need space to park their bicycles, and whit this purpose I wanna focus in this part of my thesis on this important part of the bicycle planning.



Pic 92. One-sided butterfly rack by the wall of a residential building



Pic 93. Two-sided butterfly rack

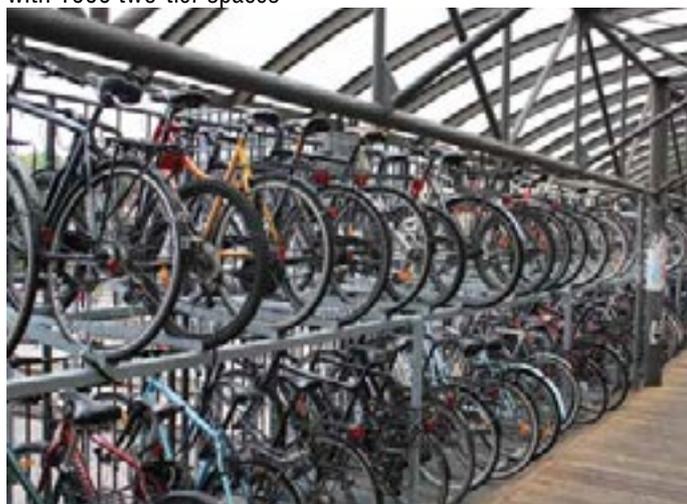


Pic 94. A bicycles parking in a Mall

Bicycles are welcome to park anywhere in Denmark, are allowed to park on cycle tracks, foot paths and pavements, according to the Danish Highway Code bicycles; in the modern city it is a fight to find space, a good bicycle parking facilities reduce bicycle theft and boost cycling since an area in which there is room for parked bicycles signals that cyclists are welcome. Cyclists are perceived as anarchists wherever they like to park; it is not allowed to lock a bicycle to municipal property in Copenhagen or to a building entrance. In 2007 the Danish Cyclist Federation published the Bicycle Parking Manual that contains recommendations, instructions, and examples.

Bicycle facilities cost money is true, for the local authority or the private developer, it is important to write the cost into the construction budget; some are the good arguments to convince the local decision makers to convince like a good bicycle parking facilities mean less obstruction for pedestrians and handicapped, or give to the enterprise a responsible profile or encourage staff to cycle; the location must be always considered before setting up the stands, if it is a wrong location, will be not used. Positioning the bicycle facilities should be in a natural place to park, with an acceptable distance from the destination, should be visible and the access should be in direct continuation of the cyclist traffic flow. The principles most important for the location are a direct access and access lanes should be wide enough to manoeuvre a bicycle. An other crucial part is the capacity; a good parking facilities increase demand, and should have a 25% extra stands for a future expansion. Required capacity should be calculated on the basis of short-term, one hour, all-day, all-night parking to establish the need for each standard. Day time occupancy counts are best taken between 10 a.m. – 12 noon and night time between 9 p.m. – 6 a.m.

Pic 95. A bicycle parking facilities with a front wheel spaces with 1000 two-tier spaces



Sometimes there is a lack of sufficient space at primary travel destination such as stations, shopping centres or centrally located employment nodes, some solutions are to change the area distribution to give preferential treatment to cyclists, for example changing car parking spaces into bicycle parking spaces, or compress the bicycle parking with a two-tier parking, underground bicycle parking and automatic facilities. A perpendicular parking allows with 45 degree angled parking more parking spaces.

The municipal role is very important, should approve norms for establishing bicycle parking with new constructions, squares and urban spaces, workplaces and institutions, public transport terminals, blocks of flats or shops. Bicycle parking thus automatically becomes an integral part of the construction project;

Bicycle parking costs are often lower than car parking costs, the choice of stand is important, the quality of the material, function and design all play a role which determines whether the stand will be used, the parking solution should largely depend on the size of the destination, 5 are the basic standards: no stand, stand, lockable stand, covered stand and monitored covered stand.

“No stand parking is relevant if there is a large variation in demand for the parking and with not enough space, and have to be marked by painting and protected by windbreaks. Stand parking is the most common type in Italy, where bicycles need to be placed for a shorter or longer term; the most common solution in Copenhagen is called the butterfly rack, in which the bicycle's front wheel is placed, normally is vertically and supplemented by locking devices. The hoop stand is another type, one of the benefits is that the bicycle frame can be secured to the stand.

Another option is the so-called two-tiered stand, in which bicycles are parked on two levels, and make possible to compress a large number of bicycles into a small area; a sunken floor level at the bottom tier makes it easier to lift bicycles, most of the stands provide options for auxiliary devices to help place bicycles in the upper tier.

The last two types are the Mobile stands and Shelters and covered stands. Temporary stands are useful for keeping bicycles under control at concerts , town fairs , and create a large number of spaces; when the bicycles need to be parked for most of the day, a covered facility is the best option, especially at stations , educational and cultural institutions, workplaces . covered facilities create a sense of security and ensure that the bicycle parking facility is safe at night or evening.” (Collection of Cycle Concepts 2012).

Every year new types of stands and solutions are constantly being developed , in the city of Copenhagen with the 25% of all families with 2 or more children have a cargo bike, which requires a great deal of space when they parked, so the municipality has installed several brightly coloured bicycle parking facilities for carrier bikes, and demonstrating that where there was only room for one passenger car before , now is room for 4 cargo bikes.

There are 4,000 bike-parking facilities in Copenhagen ,with space for almost 50,000 bikes, the city has favoured an on-street approach to bicycle storage rather than the subterranean or multi-storey solutions used in the Netherlands. This approach has largely been dictated by a desire to take more cars off the roads, transforming the street car-parking spaces into bicycle parking. It's significant that the winning entry in a competition to redevelop the city's Norreport rail station – the busiest in Denmark – has been designed around the bicycle ; designed by local firms Cobe and Gottlieb Paludan Architects, the station has been conceived as a large outdoor plaza punctuated by a series of circular pavilions; these transparent enclosures, which are topped by large shaped overhanging roofs, house the station's various functions ;

the storage facilities places the bike at the centre of the scheme in a series of beds that are recessed 40 cm into the plaza. The bike beds are illuminated at night by thousands of LEDs that create islands of light across the plaza. An other interesting solution for cargo- bike parking that offers temporary secure parking, with a form of a car it's a simple frame of galvanized steel , the CarGo this is his name, comes complete with solar-powered headlights and tail lights that come on automatically at night; in particular all the Frederiksberg council ordered several FRB-branded Custom bike Stands to communicate their green , bike-friendly strategy and vision.

Both Amsterdam and Copenhagen have successfully integrated the bicycle into modern urban life , even in Italian cities with a less enlightened or hostile attitude to cycling , some interesting bicycle sheds are beginning to emerge, but on this, I will speak more in detailed later. And now talking about Price Costs. From the Danish Cyclist Federation one bicycle space costs approx. DKK 1,000 in euro 134,40 per butterfly rack, DKK 2,000 in euro 268,80 per hoop rack , approx. DKK 5,000 in euro 672 per covered space.

The cyclist's security is important in a parking situation since the cyclist is much more vulnerable to attack than on the journeys itself, this means the facility should be well lit and easily to passerby and others in the area, and should be placed where people pass by naturally. Its crucial to factor operation and maintenance into bicycle parking plans from the outset; attention should be paid to the appearance of the design and materials.

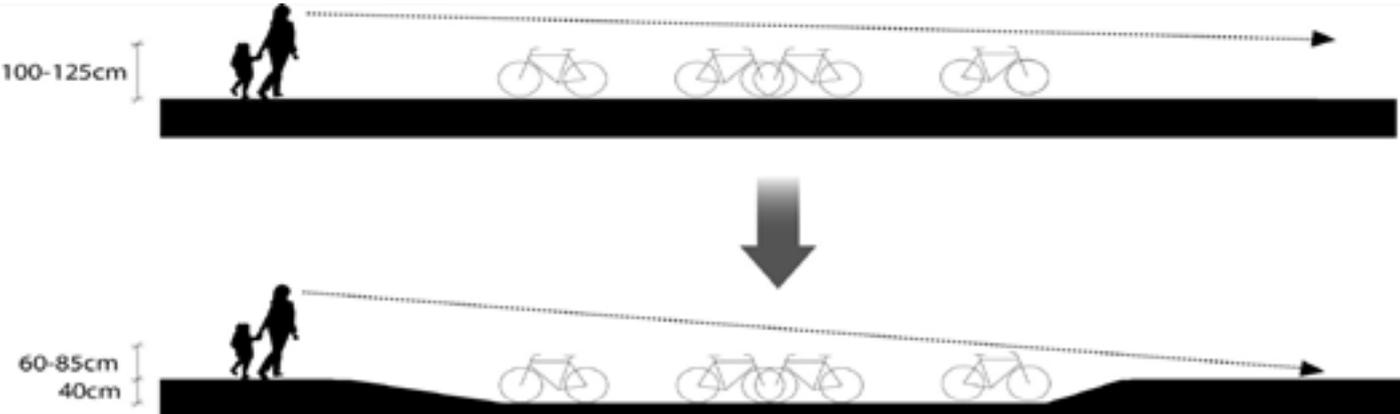
Pic 96. The City of Copenhagen has installed several brightly coloured bicycle parking facilities for carrier bikes, demonstrating that where there was only room for one passenger car before, there is now room for 4 cargo bikes.



Pic 97. A Hoop stand



Pics 98 - 99 - 100 - 101 The Norreport Bicycles Parking Station during day and night with the innovative LED solution



The cyclists can be spoiled with extra service facilities to show them that their choice of cycling is important; the municipality of Copenhagen have installed various types of bicycles pumps , drinking water and minibike workshops, and installing angled rubbish containers and foot rests at intersections.

In Copenhagen all seems perfect, like the parking facilities, but is thanks of the Bicycle parking Plan that make a map of existing bicycle parking and an analysis of future demand within central sections of the municipal area. Guidelines, design formats, are established on the basis of this map, different stakeholders and users is an important factor . according to the cyclist opinions and various Danish studies , the concept easy to find is particularly important , it is crucial for a cyclist to be able to bike directly to the bicycle parking facility .

An other important aspect of my study is the coordination with public transport ; bicycles , buses and trains go hand in hand, from the Danish Transport Authority of 2009 published a collection of ideas to better integrated cycling and public transport based on a number of focus group interviews with railway commuters from major Danish cities. The commuters would like a more stands close to the station, an high quality of the stands, covered space , locking facilities, a wider interval between parking space , and a clear lay out , in 2009 the Danish railways and the Government earmarked DKK 1 Billion for parking facilities at stations .

Pic 102. Lockable bicycle parking facility, Randers. Solar cells on the roof power LED lighting in the facility.



6.2 BIKE SHARING SYSTEMS

And now lets talk on Bike Sharing Systems; In Copenhagen there are four concepts of Public Bikes, Commuter bikes, station bikes and company bikes.

But first What is A bicycle sharing system?

A bicycle-sharing system, public bicycle system, or bike-share scheme, is a service in which bicycles are made available for shared use to individuals on a very short term basis. Bike share schemes allow people to borrow a bike from point “A” and return it at point “B”. Many bike-share systems offer subscriptions that make the first 30–45 minutes of use either free or very inexpensive, encouraging use as transportation. This allows each bike to serve several users per day. In most bike-share cities, casual riding over several hours or days is better served by bicycle rental than by bike-share. For many systems, smartphone mapping apps show nearby stations with available bikes and open docks .

Public bikes in Denmark are normally located throughout the city centre and are either freely available to everyone or only to registered users. More than 100 cities in the world have city bikes; there is a growing trend to install new public bike systems as a supplement to collective transport concentrated around major railway stations; Copenhagen started in 1995 , the authorities are planning to introduce a collaboration with the Danish state Railways ; the Danish public bikes are often with a bike basket or luggage carrier ; the original system was free with a refundable coin deposit; more recent systems cost money based on a hourly rate .

Pic 103. A Bicycles parking station of the Bike Sharing System



Now the city of Copenhagen decided to try again with a technologically very advanced system, which also provides for the use of electric bikes. What you notice immediately looking at the bike is the tablet installed on the handlebars. And here the technological heart of the medium. With these tablets will be able to pay for the bike, to have shown how to reach your destination, consult the timetables of public transport, take advice tourist destinations, and more. Tablets are guaranteed vandal-proof, and in fact during the first three months of the trial do not seem to have been damaged. One of the bike-sharing problems is often the overcrowding of the parking stations in the city center in the morning, during rush hour, when the inhabitants of the suburbs go to work. For this reason almost all the bike-sharing programs involving the use of trucks on which are loaded the bikes parked in the most crowded places, to redistribute them throughout the network. But this is a very expensive procedure and compensate, at least partially, this problem, the tablet offers the possibility to park the bike at a station a bit 'more distant than you expect, in exchange for a discount on the rental price. Even with this reduction of costs, the city of Copenhagen covers about 60% of costs, with the rental rates that cover the rest. The first test of the bikes have taken place in the fall of 2013; in the course of 2014, 135 of car stations for a total of 1,800 bike.

The project is not without critique. It was noted by many voices that bikes are unnecessarily expensive (something like 6000 € for the purchase plus maintenance for the first year), also for the presence of the tablet.

The city bikes are intelligent electric bikes that are available 24/7, 365 days a year. Each bike has a touchscreen tablet which can be used for navigation, payment and guidance to points of interest in Copenhagen and Frederiksberg. To use the bikes, you must create a user account. Create a Bycyklen account online at bycyklen.dk or directly on the bike tablet which is located on the handlebars. It only requires name, email address, telephone number and payment card information. After creating the account, you can sign into any of the Bycyklen bikes by using your user name and password; The bikes can be found in more than 100 Bycyklen stations spread all over the city.

For Copenhagen, the new bike share system has many advantages. It will act as an integrated part of our public transportation system, so that more travellers choose a green form of transportation, and it will also be used to strengthen Copenhagen's green image.



Pic 104. Some of the bikes parked



Pic 105. A tablet is installed in the bikes



Pic 106-107. Some innovative solutions of the new Bike parking facilities



6.3 ITS INTELLIGENT TRANSPORT SYSTEMS

“Our new bike share system says Morten Kabell, Technical and Environmental Mayor, will make it even easier to get around Copenhagen. Commuters can grab a Bycyklen bicycle when they come in by train from the suburbs. Tourists can use it for sightseeing, and the people of Copenhagen can grab a Bycyklen bicycle in a pinch if their private bike gets a flat tire. Bycyklen provides a dynamic and flexibility that you just cannot experience in the car, and means you can move around with a positive green conscience. The system help reduce noise and produce cleaner air in Copenhagen, which are on the list one of the municipality’s goals for 2025, when Copenhagen will become be the world’s first CO2 neutral capital.

Our new bike share project can help enhance the green image that Copenhagen is striving towards, and as a Mayor of Copenhagen I am proud to take a leadership role”.

Commuters bikes are aimed to journeys between home and work place/ educational institution ; they may display a commercial logo and are high quality bicycles; Station bikes are located at railway stations and target the last portion of the journey from train to workplace or educational institution . the area within cycling distance Is 8 times greater than the area within walking distance, it takes more or less the same amount of time to cycle or take the bus;

The last type are the Company Bikes that are aimed at journeys during working hours; this typically involves staff who have not cycled to work; many workplaces have a number of bikes available for the common use of the staff .

ITS is an abbreviation of Intelligent Transport Solutions; the concept covers systems and technical equipment aimed at improving traffic flows and increasing economic efficiency , transport safety and environmental benefits. ITS has been in use for years for motor traffic, like vehicle actuated traffic signals, and has greatly improved motor vehicle passability and factoring this technology into solutions for bicycle traffic could have a similar impact . cyclists are often forced to accept unsuitable solutions such as having to press a pushbutton at a signalized intersection; magnetic loop in the road are the best option, and new technologies for detection such as radar, new light sources such as LED lighting and flexible road marking are new innovative solutions very common in the City of Copenhagen and example for our Italian context.

First the Lane Light were invented for city of Odense , the second city of Denmark; to help cyclists keep up a steady rhythm in relation to traffic signals; and in some solutions advise them to reduce speed so as not to have to come to a full stop on red, Lane lights show the optimal speed, are LEDs placed on bollards; half of the cyclists of the city felt positively about the lane lights and very few were negative ; in Copenhagen are in connection with an existing green wave for cyclists. A number of lights are placed before each intersection; are installed in the cycle track and are directed so as not to disturb other road users.

The green wave was introduced in Copenhagen in 2004, on an experimental basis on Norrebrogade , and included 13 signalized intersections with a speed of 20 km/h , after the completion of the pilot project was concluded that the green cycle wave functioned well;



Pic 108-109 Modular LED running lights help cyclists maintain proper travel speed and and the signal that indicates the start of the green wave

The green wave was established by adjusting the existing signals which were already synchronized for motor traffic ; the result was that after the installation of the green wave cycling speed rose to 20.3 km/h compared to 15.5 km/h before it was installed and other traffic were affected to a limited extent.

Other solutions are the “ Your Speed” indicators along the lane lights , and are a supplement to existing green wave, and Vehicle actuated Signals, in intersections magnetic loops in the road are common in the city, new options for detection like radar, make it easier for bicycle traffic to activate signals ,

An other interesting solution are the LED studs that are a warning system designed to prevent right turn accidents and particularly to warn right turning lorry drivers that there are cyclists on the cycle track , the system tested in Copenhagen were halved in three out of four intersections , cyclists felt positively the system;

Countdown signals for cyclists can be based on the same principles as for pedestrians , red and green countdowns 50 m before the signal, make it possible to time your arrival at the traffic signal, so the cycle tracks can be divided into a fast lane for fast riders, and a comfort lane for slower ones. One of the more innovative idea of Copenhagen are the Super cycle track , putting a new focus on cycling and significant comfort and service levels with ITS solutions. Some of the ideas developed by the super cycle track concept are the INFO STRIPE, envisioned as a road marking indicating that the cyclist is in a super cycle track , the info show lane lights and pictograms indicating cycling times, or the next S-Train station ; Green extensions are utilized for buses and cars , when it is not possible to install a traditional waiting area at a bus stop, a virtual bus waiting area might help cyclists and bus passengers pass each other with fewer conflicts ; the idea is that when the bus's arrival is registered a waiting area becomes visible by changing an asphalt coloured stripe to white; the cycle track becomes visually narrower while the bus is waiting , but still allows cyclists to pass. Dynamic turn prohibitions for motor vehicles can be established by a no turning sign that is activated at peak times ;

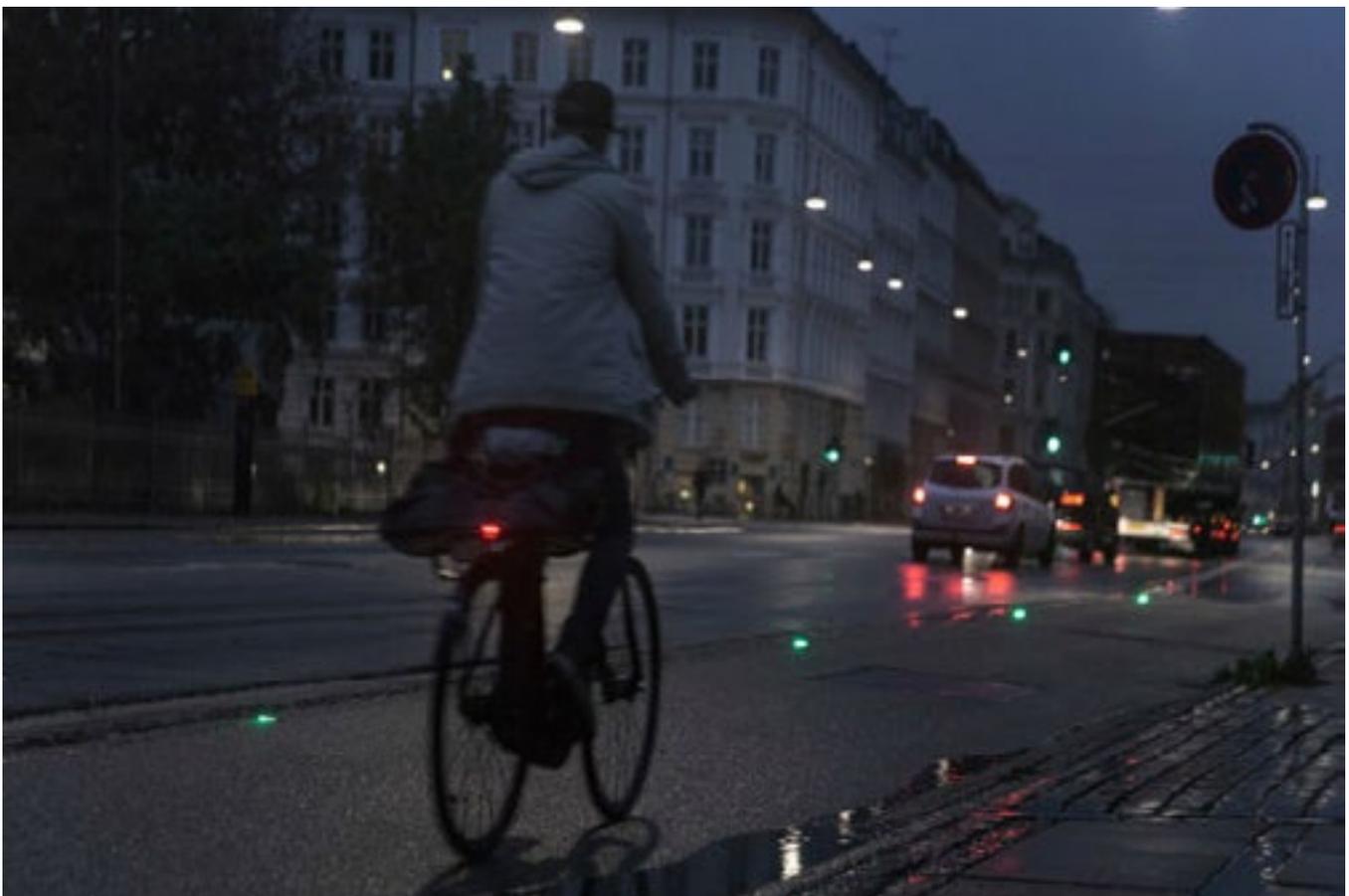
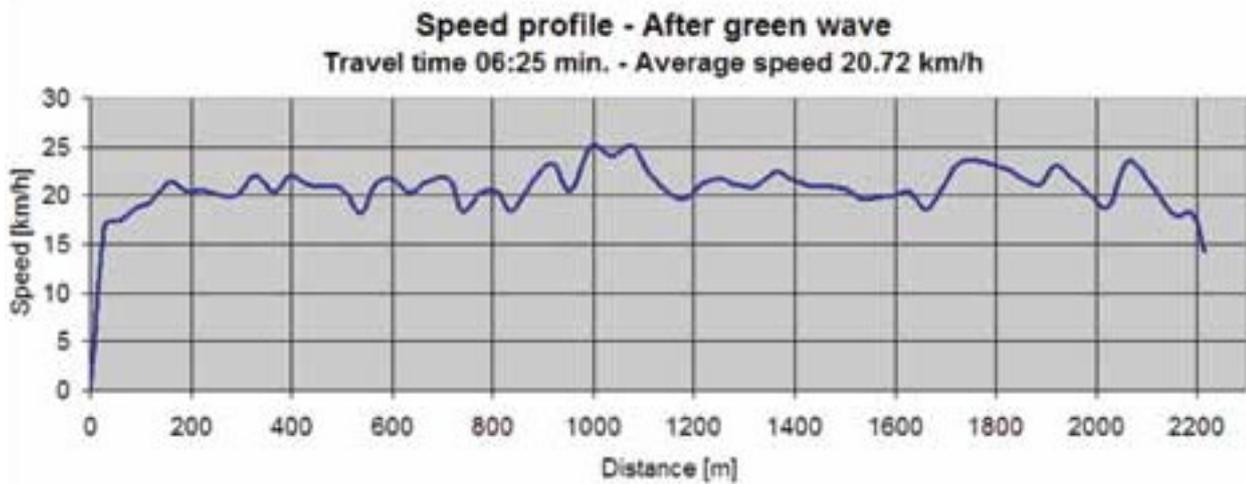
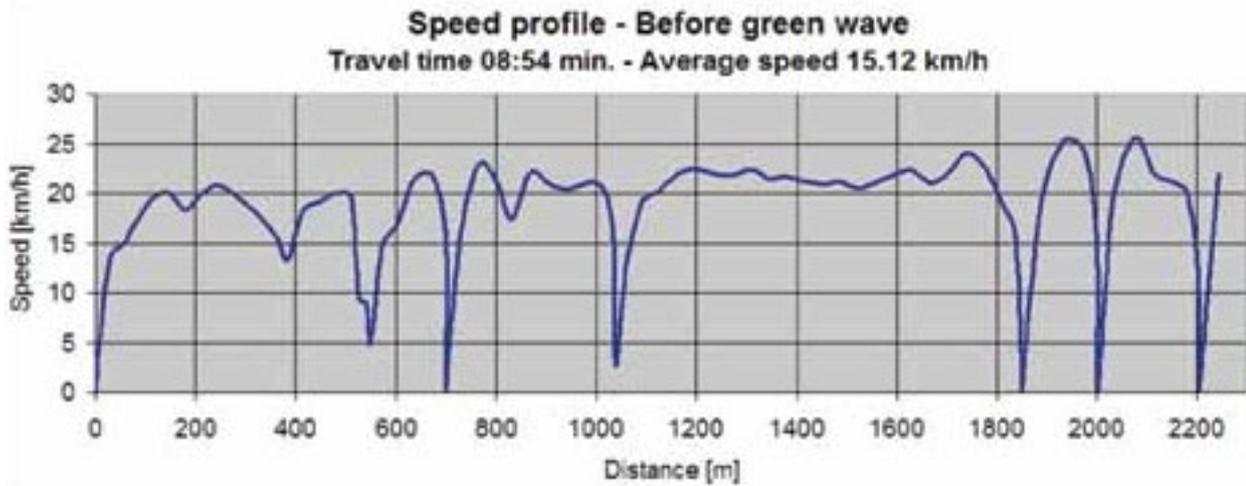
GPS , very common for cell phones, can be used to control the number of kilometres cycled, and uploads it in the national cycling website ; Bicycle counters or bicycle barometers are a way to showing cyclists that they count, provide useful information on bicycle traffic developments . in the future , while difference between rich and poor territories will become less significant , a new distinction will emerge between intelligent territories and those which do not have such aptitudes.

Says Paolo Fusero in his book E-CITY an intelligent territory can apply adequate information and communication technologies within its perimeter in order to maximise efficiency : increase competitiveness while reducing resource consumption. There are four different ways of applying intelligence to territories: planning territories in an intelligent way; obtaining intelligent information from territories , designing intelligent applications for territories and using territories in an intelligent way . an intelligent infrastructure provide a capable of reacting to external inputs and providing services to users; road infrastructures provide drivers with information , thanks to a system of sensors . an interesting study carried out by the Senseable city Lab, within the Massachusetts Institute of Technology of Boston is the Copencycle. The Senseable City Lab is a research group, somewhere between the Media Lab and the Department of Urban Studies and Planning, which set out to understand how new technologies can change the way in which we describe and understand the use and plan the city of future. CopenCycle explores the use of real time technologies to map the flow of people and urban resources in Copenhagen to better understand urban dynamics in real time , the project aims to show how technology can help individuals and the city's planning institutions make more informed decisions about their environment and resources with a special emphasis on people's use of public spaces; the project seeks to integrate mobile and digital technologies to produce more detailed studies of bicycle movement and the services and routes needed to maintain a sustainable urban transportation system.

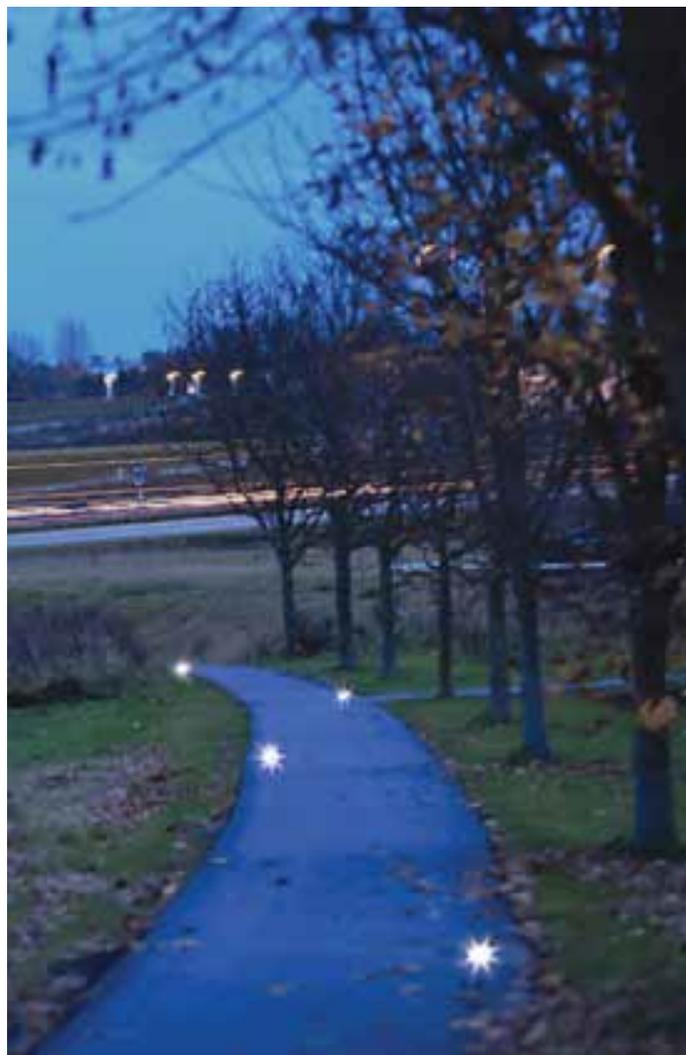


Pic 110. A bicycle LED counter in the city

Pic 111-112. Before the green wave was installed and after and below during the night



In this part I have spoken on how to Design a good infrastructure taking Copenhagen the centre of the study, from different prospective and on different Objectives: Design the cycle infrastructure , the Bicycle Parking Facilities with the system of Bike Sharing and his innovative technologies and on ITS , Intelligent Transport Systems so common in the capital of Denmark; in the next part I will talk on how transfer the best practices of Copenhagen in the Italian context, and in particularly my attention will be in the city of Milan, and how is possible change the behaviours of Italian users and to bring the Milan Context at the level the Danish of the Danish.



Pic 113-114. A LED system help the cyclists during the night



Pic 116. Variable signs warn cyclists of turning lorries



Pic 115. The city of Copenhagen makes it easier for cyclists to hit the rubbish bin by placing it at an angle

7. TRANSFERABILITY IN THE ITALIAN CONTEXT



7. TRANSFERABILITY IN THE ITALIAN CONTEXT

7.1 CAMPAIGNS AND COMMUNICATION

Campaigns and communication are successful if the priorities are clear: what do you wish to affect? And How and When do?

Developing a communications strategy is a must, and also in our Italian context. A communication strategy need to be a lengthy document drawn up by experts . So how we can change the Italian behaviour? A strong Municipal Campaign, an active engagement and involvement , Immediacy and ownership, role models, competitions and New channels.

Research and experiences show that information in itself is not enough to change people's habits; in fact most people know that cycling is healthy and eco-friendly but more is needed before they change their habits; in Denmark and in some Italian cases, the key objective is to get participants actively engaged; is possible present convincing arguments for cycling , experiences shows that it can take up to three years to get people to accept a new message and recognize the need for change. The purpose of active engagement is to break down people's ingrained habits, allowing them to find out for themselves but first they need to be coaxed out of their comfort zones, throw prejudices or anxiety to the winds. People need to feel that they themselves have a say in changing their transport habits or attitudes if they are to get involved; campaigns need to offer something the participants want , and with a choice worth . In Denmark the annual nationwide " we cycle to work" campaigns draws attention to cycling as potential transport mode to and from work, but what actually involves people is the common activity that participants wish to be part of. In addition to getting participants actively engaged and involved campaigns need to be relevant. The target audience's needs, situation and wishes need to be clearly identified in advance. Is crucial that all relevant administrations and sections dealing with planning, urban life, health , prevention, the environment and climate work to promote the use of the bicycle in daily life. Investing in bicycle traffic is relatively cheap in relation to the socioeconomic benefits: healthier citizens, cleaner air and more flexible infrastructure" (Cycle Concepts 2012, Municipality of Copenhagen).

Immediacy is an important parameter in a campaign; people have to feel the campaign addresses their immediate concerns in their daily lives. It is crucial to involve local stakeholders, bringing extra resources as well as familiar spokesmen into the community. Those selected need to be sufficiently informed and motivated about the campaign , it is vital that selected stakeholders are able to anchor the campaign and consolidate behavior changes , the immediacy of personal relationships is an important factor at the workplace and in schools ; local , social activities generate teamwork , the role models effect can be used to advantage , role models can be well know personalities such as professional cyclists or politicians. Role modeling can also take place locally or in the workplace.

Finally competitions are needed to get people join the campaign , prizes are generally a motivating factor , and need to be attractive to the target audience; When we plan a campaign it is vital also to choose the appropriate channel for reaching the audience ; today new technology and new media offer new possibilities and platforms, interactive homepages, smartphones, Youtube, Facebook, GPS technology and much more. The social media are an excellent channel for communicating with younger target audiences. Today many communities have supplemented the municipal website with local cycle citywebsites and Facebook inform citizens of the cycling situation .

So very few people will change their traffic behavior merely on the basis of a campaign this is true, and needed to be coupled with better physical cycling facilities , restrictions o motorized traffic , road safety measures ; so with a Coordinated strategy we have a change of success. ;

If you want to encourage more people to cycle you need to look at local cycling conditions. Is safe? Are there bicycle parking facilities?

Motivation and structural innovation are closely linked , and if the campaign is not connected to the everyday life , will fail. One ways of maintaining a high level of motivation is use the so-called Smart objectives; Specific, Measurable , Attainable, Results Oriented (realistic), Timeline ;

This is the basis of Copenhagen’s campaign and can be used for the Milano area for example. So cycling campaigns are often part of an overall strategy and a long-term plan regardless of whatever their aim is safety , active engagement or behavior maintenance. There are many different evaluation methods including questionnaires or focus groups.

A cycle track plan involves politicians, planners, operations personnel , and must include the general public, especially for our Italian context. The public must be involved along the way , organizations as well as the general public. Focus group of workshops can help identify issues and solutions, so citizens should be involved in the process before the local authority fully commits the plan. In The overall structure many people should be involved , and the local authority should require that all tasks and projects that might be useful in implementing elements of the cycle network should be investigated .

“In Odense the second city of Denmark, the cycle project proved that an integrated and coordinated approach to cycling initiatives produces positive health effects; Odense citizens between the ages of 16-74 were more physically active on average approximately three minutes a day compared to a group. The conclusion was that the project had a significant positive public health impact ; for example a lower mortality rate among Odense citizens was registered during the project period, 1999-2002 , leading to an average increase in life expectancy . it was also noted that anticipated sick leave increments received by Odense residents were reduced in disbursed sickness benefit . for many people exercise is already one of the main reasons for cycling on a daily basis. A number of councils have carried out bicycle account surveys , in Copenhagen exercise and fresh air are cited as the second most important factor , first that biking is fast and convenient. In other words , adding a health benefit focus to behaviour campaigns aimed at adults and children and can be a good reason to bring Italian users to bike. In many areas cycling promotion is an integral part of the community’s health policy and preventive health strategy.

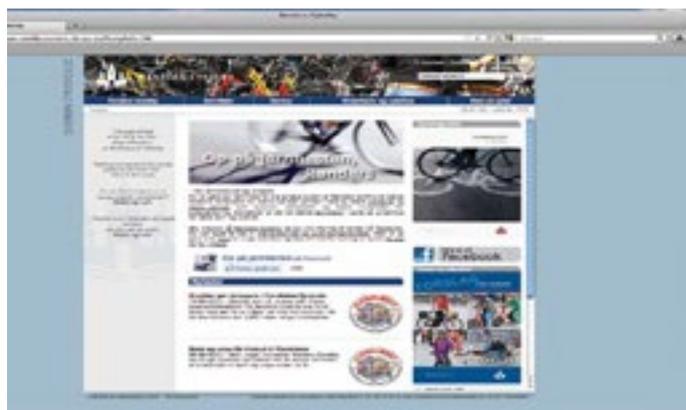
Effective cross-administrative collaboration like in Copenhagen can create also in the Italian context a synergistic effect between cycling itself and the use of cycling as an active preventive element for all age groups.



Pic 117. The police distributed hugs and helmets to cyclists, viewed all over the world on YouTube, as part of the “Use a helmet because we love you” campaign



Pic 118-119 The Facebook page of Aarhus Cykelby page , below the website of the campaign “We bike to work”



A good example of this is the city of Aalborg that in 2007 formulated a health policy for the entire municipality ; the policy involved all municipal administrations , and focus on diet, smoking, alcohol and exercise. So a campaign focused on health can be a good purpose for the city of Milano, generating increased value by cycling with health.” (Cycle Concepts Copenhagen, 2012).

The successful case of Copenhagen , argue that in the best cases studies is not only the characteristics of the projects (their technical suitably, economic efficiency , etc.) but also, or even more so, the features of the decision making process that are crucial in determining the acceptability and feasibility of projects.

The decision to concentrate attention on a success story need an explanation , success says Bruno Dente and Paolo Fareri in Waste and Backyard , “The creation of Waste Facilities : Success Stories in Six European Countries , the term is defined as the passability to build and operate in a reasonable time within a given geographical framework . This definition of success is grounded on two main reasons; the first one has to do with the main objective of the research , focusing on the performance of policy networks, on the identification of the factors facilitating the solution of typical constraints of these decision making processes , and not on the decision of the best solution.

Within the factors that play a role in decision making and in particular in decision making there are the situative variables. Possible variables could include the social and economic conditions of the country and/or the area. In this case I talked on Denmark, one of the richest country in Europe, if we think of context variables that may influence the decision-making process, we think of the degree of environmental consciousness, that is in Denmark is very strong . Possible intervening situative variables could include the social and economic conditions of the country and/or the area. In this respect we could think for example of the unemployment rate that we know that in Italy is very high;



Pic 120. The smart objectives of high level of motivation campaign

If we think of context variables that may influence the decision making process, we could also think of the degree of environmental consciousness. The degree of environmental consciousness at the local level is particularly important. We may expect that in cases where the degree of environmental consciousness is very low the people of that local community value of the bicycle in another way than in cases where the degree of environmental consciousness is high.

The relation between a solution and the problem as defined by the participating actors is always ambiguous, adopting a strategic approach, manipulating the stake (or the perception of what the stake is by some of the actors involved) can be a relevant resource to facilitate success. The second important constraint to success is conflict. We can always identify an actor playing the role of the promoter, with a strong commitment (responding to different objectives), we often have consistent actors against the realisation of the facility.

Pic 121.The behaviour modification process



The opposers are much more homogeneous than the promoters: they are mainly social, local actors, while many processes risk failure because of the lack of interest by the responsible actors, and success depends on the capacity by the promoter to represent the solution as a way to distribute benefits; we can say that a careful stake management is a necessary ingredient of the recipe for success. The area's geopolitical situation is also an objective factor in the project's success : one of the best ways to succeed in such an undertaking is to encourage co-operation between the private sponsors of the project and the public authorities in charge of enforcing the law. The aim of such a collaboration is to establish, beyond the legal framework, specific partnership agreements.

“Decision making is a process of problem solving that reduces possible alternatives to a solution by choosing an option for realisation. Policy making also reduces the number of alternatives, in order to influence the actually stated policy. In this respect public decision making contributes to public policy making. A way to analyse public decision making is to use the elements of public policy analysis. Public policy analysis often starts with an analysis of the problem: what is the discrepancy between the desired situation and the actual situation for the actors involved? Above that: what is the overall problem? The same questions, analysing the problem, we refer to the analysis of a decision making process.”

Which actors have contributed to the process? Besides a listing of all the actors involved, we are interested in the actors' characteristics: what do they apply as their resources, and what are their particular motivations? The role that an actor plays in a decision making process is directly related to its motivation and its resources.

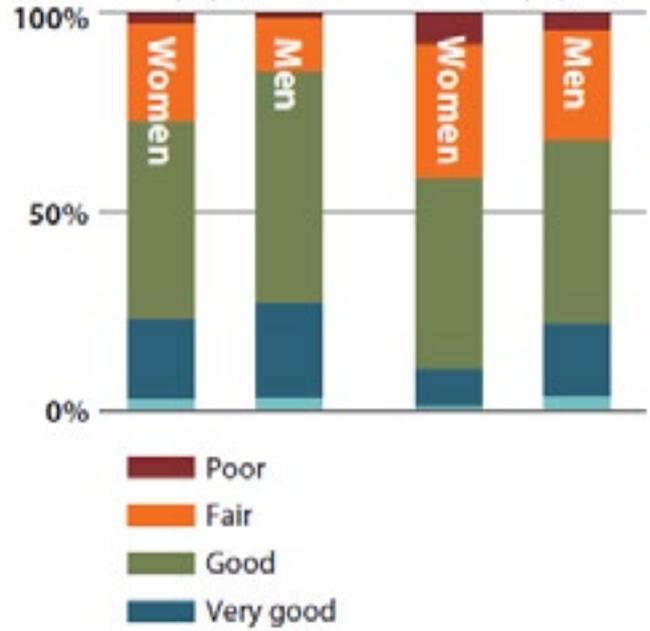
“Besides defining the problem, in order to analyse the decision making process we need to focus our attention to the actors that contributed to the process. That is why in this section we first discuss the criteria for defining an actor in the decision making process. The actor's objectives seem to play a major role in defining an actor as such. Applying the actor definition we can list the actors involved in the decision making process. Besides a listing of the actors involved, in order to analyse the process we need to focus our attention on the characteristics of the actors involved: the actors' resources and their particular objectives.

The role that an actor plays in the decision making process is directly related to the actor's objectives and its resources. The first type is content objectives. In defining content objectives we draw the reader's attention to the aspects of the solution under debate The second type of objective we distinguish is process objectives: in this case attention is put on the actors' roles in the decision making process and not so much on the actual solution to the problem that will emerge. Every type of behaviour requires resources. In participating in a decision making process every actor uses different types of resources to reach its objectives. The first type is economic resources, in terms of the amount of money that can be mobilised during the process. Money can be mobilised in order to be exchanged with other actors and/or to buy other types of resources.

“Concerning the actors playing the role of promoters, the experience shows that campaigns are effective in moving road users away from other transport modes to cycling so campaigns can be used to great advantage by the local planning authorities , associations and businesses to modify the behaviour and attitudes of selected target groups. Motivational campaigns aim at changing transport modes while safety campaigns aim at changing a given behaviour.

Pic 122. The minister for Climate and the environment





Pic 123. The graph show the Percentage of overweight 10 year olds compared to percentage of children that cycle in the same countries

Pic 124. A survey carried out by the city of Odense shows that people who cycle feel they are in better shape than people who don't.



Pic 125-126. Some example of Cargo bicycles initiatives in Milan



Pic 127. Some cyclists to Expo 2015, held in Milan

7.2 ITALIAN CYCLING POLICIES AND LAWS

In Italy at the bicycle theme it is an obvious cultural lag even if something has started to change since the first decree on sustainable mobility in urban areas that included interventions to reduce the use of private means for the benefit of less polluting systems. In our view timidly starts to get the idea that the bicycle can make a contribution, the Danish foreign experience shows that the construction of cycling routes enhances poorly known areas, with positive economic effects. With the law n.366 / 1998 was the first law in favor of cycling, this law even with its limitations is still positive because it represents an incentive to local governments to submit new projects. In the past, in Italy, we were made cycle of poor quality infrastructure and this is due to lack of knowledge on the part of designers and builders. Too often, we have forgotten in our reality of how the cyclist may be of importance even those trivial details to those who design roads, in fact, a cycle path well designed overall, if not attention to detail can not be used because of silly mistakes, to design it is of vital importance to study the technical standards and try it for yourself, pedaling on the bike paths.

The urban transformation of the benefits are many:

- The revaluation of bicycle and pedestrian mobility
- Integration of the different modes of transport with sparing use of land
- Increased safety for motorists
- Aesthetic Revision of the road as an urban space
- Reduction of pollution

How do I promote cycling to reach the Danes levels? By promoting inter-modality is more bicycle parking in large car parks of crown exchange to cities such as Milan or Rome, is more bicycle at the train stations. Taking contact with large companies to implement, in consultation with management, facilitation policies etc workers who travel daily to work by bicycle; realizing, at least for certain hours of the week, a system of roads radial minors reserved for bicycles, By encouraging safe routes for access to schools for children of all ages , sensitizing the motorist attention toward the rider especially if elderly or not so young and promoting cultural campaigns that propose the presence of children in the streets as an urban and social quality indicator.



Pic 128-129. As Italians perceive the car and how it really should be



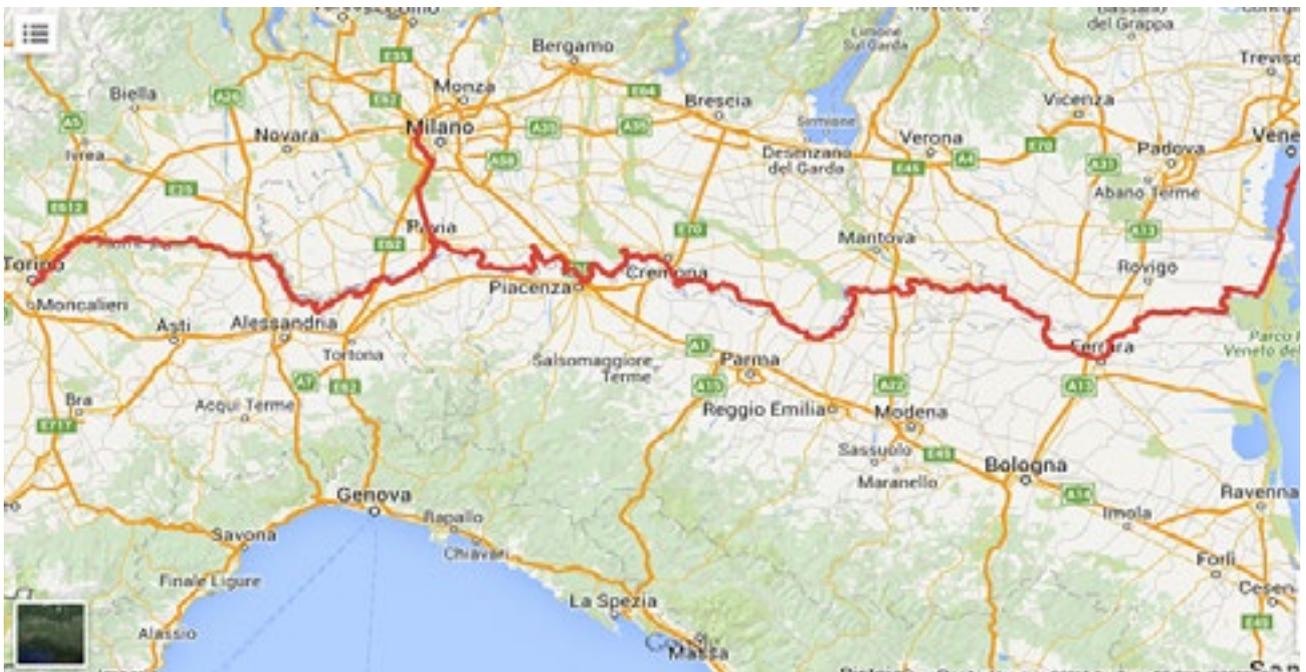
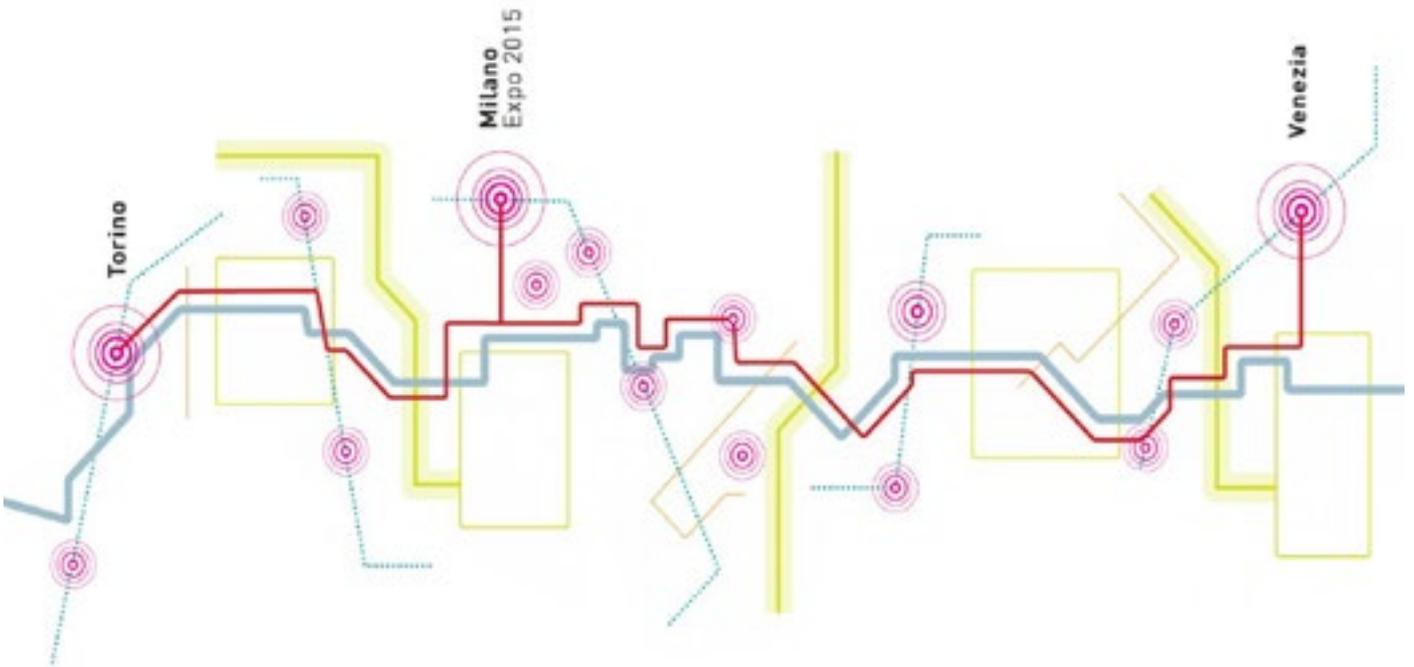
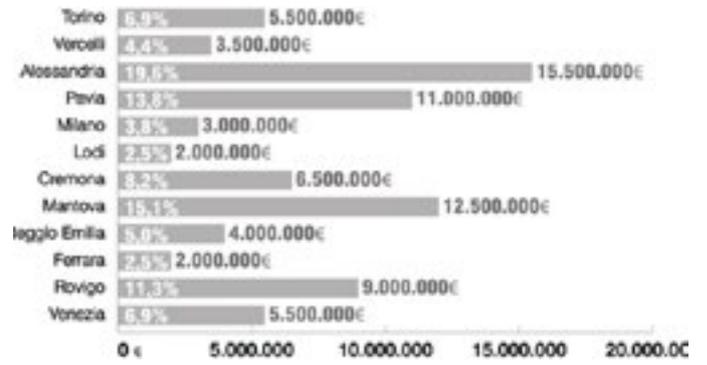
In summary the experiments relating to road safety, implemented in Copenhagen, have established with certainty that the element which influences the behavior of motorists is the shape of the roads and poor results derive from the imposition of speed limits. You must make adequate roads to the behavior that you want to be maintained as described in the Manual of Cycle tracks with the establishment of Environmental Islands, identified in the traffic plan with recovery of urban areas with a 30 km / h limit. Moderation of traffic with interventions that activate motorists in a state of involuntary greater attention to driving.



Pic 130-131 The web site of one of the main promoters sites in Italy. Down a bike path at Lake Garda



132-133-134-135 The VENTO project; one of the main projects of creation of a great cycle in the Po valley with its costs and location



In cycling achievements made in Italy are revealed deficiencies in the horizontal and vertical signs and in the solutions adopted and not, at intersections and in correspondence of the crossings. often there has been a network effect with fragmented routes, discontinuous and made with non-ideal technical solutions, remaining deserted strips. these interventions require major redevelopment, not active cyclability and little interest for the realization of other cycling infrastructure. The law 19 October 1998 n. 366 "rules for the financing of cycling" defines the plane of bicycle networks, the itinerary of bike paths, and regulations lay down the manner, timing and documentation to be submitted. In Italy many associations dealing with cycling; most of them are sports associations related to the world of racing, some of the most important associations are the Italian Federation of Friends of the Bicycle Association and the Italian cycling city. The FIAB brings together 47 associations located throughout the country with the primary purpose of spreading the urban cycling as means of transport daily and as an extra urban middle recreation for local knowledge.

The Italian Association City Cycle brings together 36 cities that have joined together to discuss the creation of ideal conditions for the use of large-scale alternative means of transport. Activators of Political Subjects for cycling are the municipalities that can promote urban quality, a cartography of accidents, construction of adequate maintenance of road safety. The provinces can promote cycle tourism, and updating of the technical, the region may promote specific legislation for cycling, funding, coordination, communications with citizens projects example, the state can promote the adjustment of the Highway Code, experiments and research, the payment of economic incentives and contributions.

The law enforcement agency can promote the prevention and reporting of dangerous situations, and other subjects such as ACI, employers, schools, citizens' groups and associations can play a popular science activities the organizations and citizens.

As part of a mobility planning understood a large part of the territory, the communal area is too limited, create the need for planning Basin, of the District or Provincial. surfed the cycle program provides everyone the opportunity to learn through the use of bicycles and safe, the natural environment and the main cultural elements of the territory.

The benefits we get are of social and economic nature for many tour operators, catering and farm tourism, as in Denmark has developed a thriving tourist-induced economic activity could well take place in Italy a country rich in architectural values, from parks villas , waterways and rural and industrial architecture. Some reference examples are the provinces of Trento and Bolzano, along the major valleys is catered for making a series of bicycle and pedestrian paths for inter-mobility, distinct and separate from the main roadway. As well as along major European rivers along the Adige is a cycle path is made by a high number of tourists. Summarizing the intervention policies to achieve the cycle routes have promoted understanding between municipalities with a network of inter-municipal routes. Promoting bicycle , promote studies on accidents and safety of bike, the bike encouraging leisure activities through initiatives; .

In Italy the network of cycle routes General Program is meant the distinct sequence of steps to achieve the realization of the network, priorities, program agreements with other organizations or programs such as the Urban Traffic Plan, and planning public transport. The program organizes and plans the information systems of how to behave and organize themselves, is a forward plan, financing, construction, operation and monitoring, a dynamic tool and update. The program has as its objectives to enable a policy to protect and promote the use of bicycles as a means of transport, promoting the decongestion of traffic, the activation of policies through environmental redevelopment, accessibility of urban space, land use; reduce social spending on transport costs, promote the use of bicycles in his spare time, be an instrument of communication with citizens.

The map of the network of cycle routes is a sector plan for the management of land and must conform to the main planning instruments. with the urban traffic plan the P.U.T is essentially a land management plan that is developed in the short term and coordinates with the transport plan. A program of construction of bicycle paths should be based on a perfect coordination with the PUT and the transport plan. Even within the General Plan the plan of the network of cycle routes is an element of the Mobility Plan and Transportation.

The Provincial Territorial Plan, the Area Plans and the Regional Territorial Plan of Coordination must be coordinated with the program of cycle paths, cycle zone plans may contribute to fruition goods areas of interest include environmental improvement plans; is possible summarizes a number of benefits for individuals and for the entire community, or increase travel opportunities, economic benefit with relatively low costs, exercise and consequent reduction in cardiovascular disease, hypertension, obesity, diabetes, stress and depression ; higher opportunities for social interaction, fun and reducing congestion, noise pollution and air pollution, reduction in fuel consumption of fossil fuels, lower demand for motorized mobility infrastructure, improving road safety, improving public health. We have seen how health can encourage the use of bicycles for travel every day and not with the presence of more and more generalized varied user must proceed with some ancillary activities such as developing new routes where possible; putting in connection the existing routes.

“As for the realization of regional cycle tracks in Italy, the Law 366/98 indicates two areas of priority: the areas of disused railways, and banks of rivers or streams. The development of the cycling forecast requires consideration of a number of specific factors, which often interact with each other; a study commissioned by the US Federal Highway Administration has identified a logical scheme applicable to the Italian context to represent the interaction of a number of factors in general with the levels of non-motorized travel, it is calculated as a whole and for specific infrastructure embedded in a network of routes. To this is connected a table with the description of the factors that affect the users use of the bicycle. It can be concluded as the choice to move in bicycle is a composite process that involves a series of environmental factors interacting with the individual and social behavior, and depends on the characteristics of the individual connection and the attitude towards the middle.” (Manuale per la Realizzazione della rete ciclabile regionale, Regione Lombardia).



Pic 136 A bike path in a protected park



Pic 137. A stretch of bike path near the canals in Milan



Pic 138. A pedestrian-cycle bridge in the Po valley

7.3 THE CYCLING POLICIES OF LOMBARDY REGIONAL GOVERNMENT

In Lombardy, without thinking about heavy investments and only using the existing network of secondary roads to channel service, canals, rivers, the sediments of former disused railways, you could make a substantial network of connecting cycle routes between the major regions natural protected regional. The canals of Milan's system would, for example, to produce cycle routes from the coastal cities to the river parks of the Ticino and Adda, the distance of 20-25 km, without subjecting cyclists risks of the hinterland traffic. It would benefit both cyclists and motorists. the construction of a cycle path has been understood as the work of 'street furniture' is therefore subject to more or less intense and costly 'make-up': the bottom rolling stock, barriers, borders, green furniture etc. In Italy often. In fact the conditions for the practice of tourism on two wheels, especially in suburban situations, are much less demanding. It takes just a secure location, even at natural background, and good signage. In this study we will try to respect this concept wherever possible. Lombardy, focal region of all communication systems, assumes importance in this proposal with some major backbones axes international crossing on which it will be possible to pivot a regional cycle network model.

“Lombardy is therefore affected by three European pathways, the route 2 (Mediterranean Route) has already had a detailed design, designed by an agency in Turin, and is currently being reviewed by the working group Eurovelo. The route 7 recovers much of the existing bike path Mantova-Peschiera del Garda. 5 The route is still being finalized, in the proposed regional cycle network these three international routes were fully included and more precisely. In particular Route 5 in the integration project for a cycle route Adda.

As well as in other countries, it should also be necessary to make now in Lombardy a cycle network, or if you want a multi-compatible network of 'greenways', as a complement or alternative to the network of vehicular roads.

The requirements for the construction of a Lombard cycle network are as follows:

- give priority to areas of greatest interest or natural landscape
- giving priority to all brownfield existing infrastructure, such as ex-railways, banks, towpaths and cliffs of rivers, canals and waterways, road sections decommissioned etc .;
- provide continuity and connection with cycling networks of the neighboring regions of Lombardy and in particular the Community Initiative project 'EuroVelo';
- invite local authorities to integrate and interconnect partial realizations on a comprehensive framework for regional breathing.” (Manuale per la Realizzazione Ciclabile, Regione Lombardia). “The plan as a whole must define at maximum level, with a cost estimate of the regional project cycle network and establish a list of enforcement priorities based on available financial funds;
- muster the bodies concerned and establish a first phase of consultation on the basis of 'tranches' annual interventions;
- maintaining relations with the Eurovelo European Agency for the implementation of the European network and with neighboring regions for the implementation of the national network;
- promote, through events and multimedia products, the use of the regional cycle network and still stimulate the use of cycling, the financial funds necessary for the realization of regional cycle network can be identified among the following items:
- the national fund provided all 'Article 3 of law 366/98; by LR November 27, 1989, n. 65 - Regional measures to encourage the development of cycle transport (currently being revised);

Pic 139-140. A cycle route in a park, and the bike lane of the Po River



7.4 MILAN CYCLING POLICY

The context of Lombardy certainly many differences but also some similarities from the Danish, as the flat area and the structure of the city of Milan could theoretically become the ideal city of bicycles. In the case of Milan must calculate the town fragmented network of cycle paths, its poor maintenance, abuse and poor education of motorists often clogged with vehicles parked protected paths. In addition, the urban traffic congestion, the high level of pollution and the danger of certain arteries strongly advise against the use of bicycles in the city. Thus, there's a problem of redefinition of the town's road system: it must pass from a network designed only to car service in a multi-functional network where, in one and the same level of dignity, there are also possibilities for other means of transport, from those public, the bicycle, the pedestrian traffic. but in recent years Milan has chosen to be increasingly transformed into a sustainable city and bicycle-friendly. Like other large European cities, it has focused on the promotion and development of cycling not only for leisure but also as a means of self-routing.

Cycling is a great way to ease traffic congestion and return to the Milanese a more beautiful and livable city, cycling in the city is more useful than using other means of transport: it is more pleasant and reduces stress, saves time and money, is good for health and the environment, the land being flat, but not too extensive, balanced climatically could become an example of success as it is Copenhagen in Denmark. Yet Milan suffers from an excess of vehicles that stop and walk through its streets, every 100 inhabitants there are up to 55 vehicles, when in London there are 30 and Paris 26. Opposite usage data bicycle everyday to go to school or at work, in Milan only 4 of 100 citizens while Copenhagen is 50, followed by Amsterdam with 26 and Monaco of Bavaria 14. the Milan City Council has pledged to reverse this trend and to make cycling an everyday tool for all, a trend that it becomes passion but we need a 'best administrative actions and make proper the way for cycles and requires a greater awareness by motorists in the motor vehicle and driving in the parking lot, as well as cyclists in frolic among the vehicles in the queue or on sidewalks. We need to create a culture and a bicycle awareness.



Pic 141-142 The new bike path of Milan Porta Nuova , in the pictured below unfortunately often bike lanes are occupied by cars with serious risks for cyclists



In the graph that I have reported are the number of bicycles entering the center of Milan, the survey was conducted in September of each year from 2002 to 2014 and highlights the increase in the number of cyclists (Source Ciclobby FIAB), with an adjustment for the past two years, other more timely surveys confirm the rising trend, for example Polinomia makes an almost daily census along the same route from west to Venice port, and in May 2015, for example, recorded the absolute cyclists records detected.

The administration intends to act on several fronts to promote change:

- make adequate cycling infrastructure: paths, lanes, overpasses, traffic calming, new rules of the roads;
- create protected facilities for parking of cycles, from cyclostations the racks dotted around the city;
- offer dedicated services for the promotion and protection of the bike;
- facilitate access from the metropolitan area under provincial strategic plan MiBici;
- enhance the cycling tourism

It started a dialogue with all the local reality that closely follow the theme of cycling to continue on this path with the city. The bike sharing data and various surveys, including those conducted by FIAB Ciclobby, which I mentioned before show a growth in the use of the bike, especially in the center and along certain lines. In Corso Buenos Aires, one of the main streets and shopping traffic for example, approximately 14% of journeys made by bicycle (given Ciclobby 2014). A cyclist in ten today uses BikeMi, the Bike Sharing service in the city, some data are far from the Danish context, but which show a change in behavior and habits of the citizens of Milan, in fact in 2016 grew by 18% compared to 'last year the use of Bike Sharing.

The upward trend in the number of people moving in bicycle is confirmed by the annual census of cyclists, in 2014 FIAB Ciclobby showed an increase of 56% compared to the first detection of 2002.

The highest concentration of the steps during peak hours in the morning and late afternoon reveals how the bicycle is increasingly used by citizens of Milan for travel from home to school and work.



Pic 143. A cargo bike in Milan



Pic 144.-145 A part of the bike path in the north part of Milan. Below a cycle bridge



More generally, the trend of the first half of the year shows a growth that seems to have already reached and passed on that route the use of objective bicycle hired by the recent Urban Plan of Sustainable Mobility of Milan in 2020. At the summit the use by cyclists of Milan remains the axis Corso Buenos Aires-Corso Venezia, along this route, the bike has a role in terms of modal split, comparable to that of motorcycles.

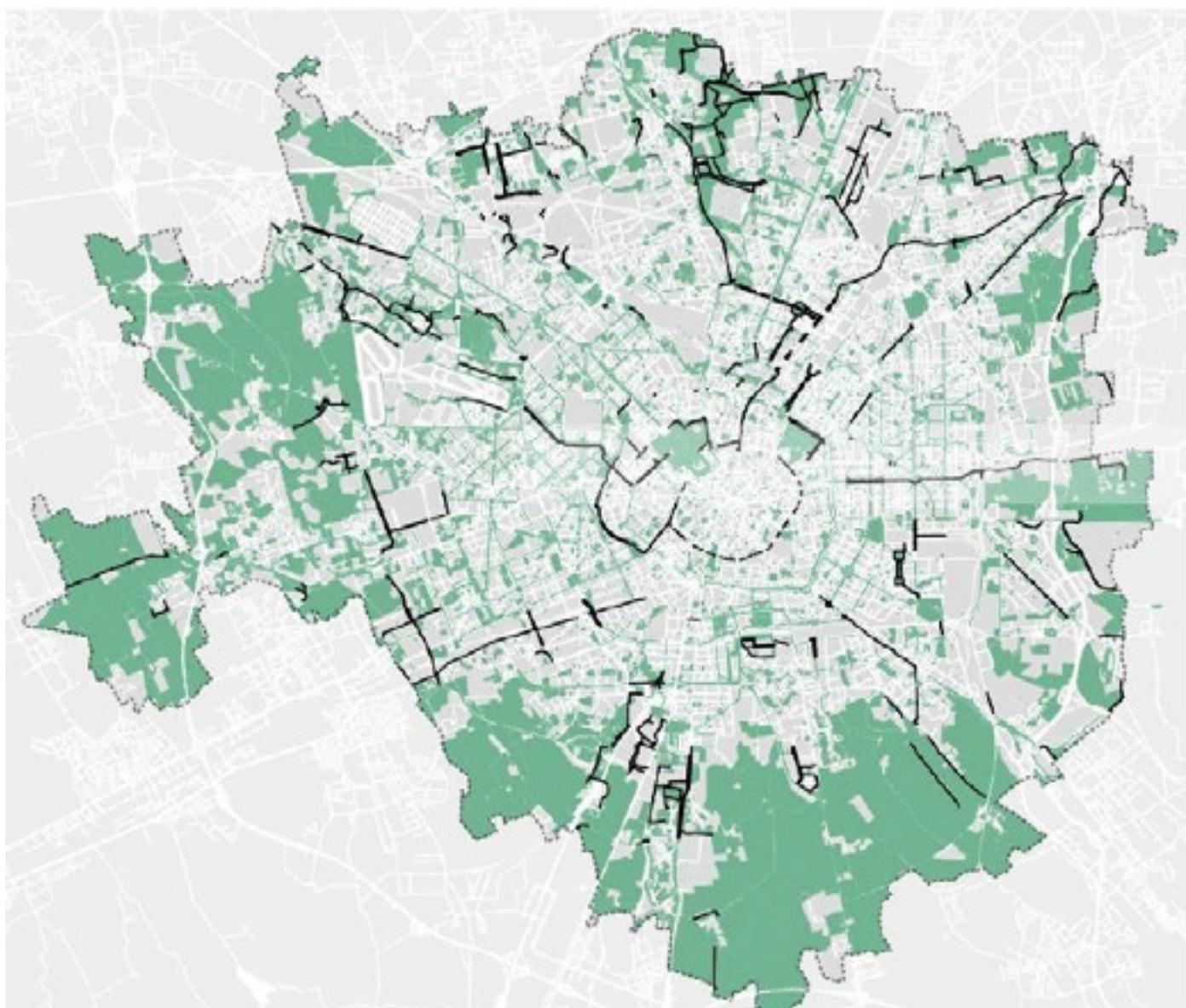


Pic 146. A bike path near the central station

The Milan cycling mobility is spread over a road network in the years affected by various interventions aimed, mainly, at reducing the circulation of private car in favor of a smaller impact on the quality of urban environment alternative mobility. The works of road upgrading performed, the delimitation of the Limited Traffic Zones, Zone to speed Limited and residential areas, the realization of different Pedestrian Zones and a regulatory policy and charging of progressively car extended stop from the center towards the periphery, have an impact on 'orientation of citizens in mobility choices.



Pic 147. Bicycle path near the Duomo



Pic 148. Existing network of cycle routes

The action of the City of Milan, in recent years, has been structured in part in the strategic planning of new works executed directly by the Administration or by private operators in the context of urban transformation, in part in the implementation of enhanced services to users thanks to the cooperation of the public transport company, in finally change some local rules, alongside the work on the public highway with new supplies of racks, have introduced important changes to its range of parking in new private building works. The city offers users a road network potentially suitable for a marked increase in the modal split of cycle transport;

In an effort to counter the positive impression of the streets of insecurity it has proceeded on several fronts, acting both on the grounds of separation between cyclists and other users - with the redevelopment and extension of the network of cycle paths - and on that of promiscuity, you want in the roadway with the various traffic restrictions you want in the new pedestrian areas and parks. There is an ongoing structuring work of the routes to higher demand for bicycle traffic that is using the application of a wide range of technical measures and road network solutions, inspired by the best Italian and foreign experiences, but dropped in the context of existing legislation.

“It is worth remembering that the Administration is particularly active against the Ministry, in collaboration with ANCI, for formulating proposals for amendments to those provisions in favor of a development of the legislation more consistent cycling with the urban fabric of our cities. With regard to the network of cycle paths in the headquarters, the affected cities certainly some of the built quality problems, which arise partly from the low priority between transport modes assigned in the past to cycling: the problems concern both the localization on the territory of some tracks but also their attractiveness, usability, ease of use. The same maintenance conditions, in some cases, are precarious. Other trails were made in the past without a full political and technical sharing: today we have broken than the original perspectives of development and completion or even unregulated use of order for which they were originally intended. In several cases the City has done to their redevelopment and regulation, by raising the general level of quality in others it was decided to postpone actions in the face of other priorities and significant costs.

Overall, the network of cycle routes develops - at the end of 2013 - in 167 kilometers (including traits unregulated) 4: 77% of the road network is in area and 23% in parks and green areas. The change from 2011 to 2013 was 30 km, and the figure continues to grow in 2014, with the creation, among others, part of the Cathedral-Simplon route. It is not an end value in itself, of course, because it corresponds to, a useful indicator to define in a measurable way a municipal action part for cycling mobility. In the field of the reserved road cycling network it is composed largely of slopes in its seat and, in a smaller portion, in lane roadway slopes obtained from: this type, in particular, has expanded significantly .

The implemented interventions They suffer, in many cases, the lack of continuity at the intersections where vehicles and there are no crossings dedicated to bicycles the right turn is permitted; the brevity of some of the new tracks and their location in the area, do not produce the immediate, the effect of continuity that only time will materialize.” (Piano Urbano Mobilità Sostenibile , Milano, 2015) .

It should be emphasized, however, that the technical upgrade process can not be defined on executed and entirely satisfactory to Danish levels and still some stiffness design of the network that must be solved. Finally, there are several kilometers of trails promiscuous with the pedestrian, to be distinguished formally from the Pedestrian Zones. For the latter, a theoretical development of linear tracks (not actually drawn on the ground) which amounts to about 18 km: it is a given growing for years as the private network .. In calculating total network also includes many has been calculated by the interventions carried out to solve the critical points: these are generally bridges, walkways, underpasses necessary to overcome infrastructure barriers such as roads large or railways or natural barriers such as rivers and canals, which present roadway conditions such as to instill strong fear in cyclists in terms of perception of safety or physical problems from fatigue to overcome differences in height.

7.5 MILAN PARKING CYCLING FACILITIES

The bicycle parking in Milan, in recent years, has clearly improved compared to the past but still far from the northern European levels. The Administration has also changed the planning and programming of park approach, by ensuring that it is possibly guaranteed, cyclists, the closest possible to the destinations of trips, or to better satisfy the demand. From 2011 onwards it was released about 3,000 new places for bicycles, in particular, and so widespread in areas with a high demand for parking in the vicinity of attractors such as offices, universities, schools and other public services, metro and train stations, areas shopping, parks and playgrounds, theaters and cinemas, hospitals. With the installation of new bike racks has also taken the opportunity to replace antiquated models and inadequate or vandalized and unusable: the process is still underway and will continue with greater vigor with new orders for manufactured goods. In addition to that, also for the purposes of greater clarity of use of the spaces, the Administration is proceeding with the progressive separation between utilities two-wheeled: mopeds and motorcycles are placed more and more widely spatially separated or combined with those intended for cycles.

“In 2014 it was completed the first large parking lot modal exchange of Milan: it is located at the terminus Comasina M3, and has 390 bicycle spaces, over 100 of whom kept. The City of Milan has introduced the norm for private buildings, to predict - if they are served by the yard - a space for the bike racks for those living or working in civic connected to the courtyard . In 2014 it was approved the new building regulations, providing for new rules on the provision of space for parking in replacements and new construction of the buildings. This standard has meant that the use of private spaces has become a valuable contribution to the reduction of the consumption needs of the public space for parking of vehicles, although, for obvious reasons, the bikes will use a lot less than other categories of vehicles . In order to reduce the consumption of public space, as well as order and cities without slums, progress was also Biciclami initiative, launched in 2013 aimed at the recovery of scrap bicycles or abandoned bicycles tied to racks or other artifacts. With the aim of encouraging the use of bicycles in the longer trips, schedules of the transport service of the bicycle on the entire metro network have been extended.



Pic 149. A bike sharing parking in the center of Milan



Pic 150. A bicycle parking in Assago Metro station



Pic 151. The largest parking for bikes at the Comasina metro station

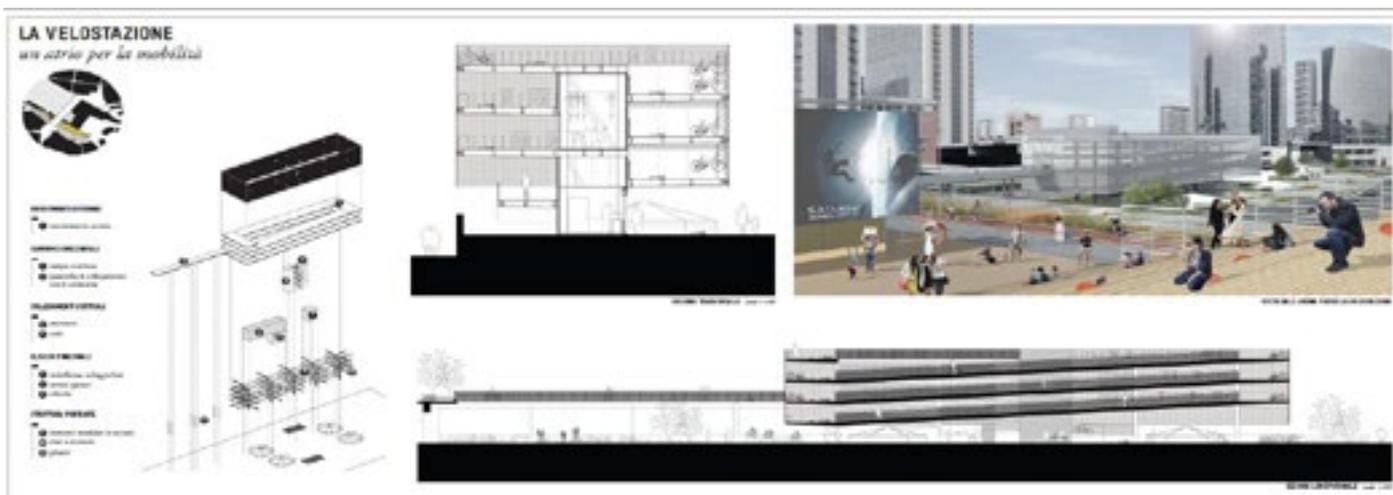
Every day of the week from the beginning of the service to 7, from 10:30 to 16 and from 20 at the end of the service, and all day on Saturdays and holidays. The trial was extended to the surface on tram lines 7 and 31 (the start of the service at 7 and 20 by the end of service and all day Saturday and Sunday). In recent years the service has been extended more widely accepted way even on the regional rail service trains and suburban lines that cross the city. The accessibility on trains is obviously favored by the degree of accessibility of stations: on this point there has been some progress with regard to the design information about new subway lines (such as the M4 and M5). There remain difficulties in overcoming differences in height from floor to platform level road for the majority of existing stations (with the exception of those of the railway, the M3 line, equipped with elevators).” (Piano Urbano Mobilità Sostenibile , Milano, 2015).

A plan for sustainable mobility, in line with the wishes expressed by citizens with advisory referendum to turn Milan into a more livable city, with less traffic and smog: is the project that the administration wants to achieve, and that is in one of cycling its strengths. A program that includes a commitment of resources to promote and increase the use of bicycles for commuting with more secure routes, new routes to moderate traffic, the creation of pedestrian zones and green areas and a continued confrontation with local authorities and associations interested in the topic of cycling; Focusing on the development of cycling is also a commitment to the environment as seen in the case of Danish and a doubling of the people, who use the bicycle as a means of transport in Milan and in European cities, would result in savings of millions of tons of CO2 each year with a huge benefit to the atmosphere and air quality.

In Copenhagen, where one in two people using the bike, you save 80,000 tons of CO2 per year, with a significant contribution to reducing greenhouse gases. Sustainable mobility is made up of a mix of transport modes, the Milan City Council works to promote the use of public transportation also with the creation of park and ride. By way of implementation, after the stalls for bicycles, also the spaces for parking the car at the terminus of the line 3 Comasina, inaugurated in 2011. To facilitate the displacements also long-range with the two wheels, continues the installation of bicycle racks in the vicinity of the railway and subway stations and is in the process of expansion, in accordance with ATM, the time that is allowed transport of the bike in meter.

On the merits of the parking lots to try to get to the Copenhagen model it is to: increase the supply and improve quality, even replacing the bicycle rack antiquated and inadequate to the new standards and changing those vandalized; distribute diffusely parking spaces on densely populated territory and rich in activities and concentrate them where there are functions and services of particular relevance; improve accessibility of parking spaces, providing more visibility and minor inconvenience to other users; build large bicycle parking at major railway stations and other major attractors mobility, encouraging the delimitation of parking also at private facilities.

Pic 152. The bicycle station of Milano Porta Garibaldi: design of preliminary draft in 2014 by the architectural firm T SPOON



With regard to the interchange with the public transport: • further extend the time slots of the transport of the bicycle in tow traveler service on metropolitan lines and on some lines of local public transport for medium-long distance; • provide incentives to their companies / owners entities or actions aimed at overcoming managers of structural differences in height between the plane of the road and the plan for train access (fixed ladders, ramps, lifts), as well as improving access signs; • promote the provision of space to be allocated to services for cyclists, is connected to any parking lots that these isolated and autonomous, and functional to provide information, technical assistance, product sales, bike rental.



Pic 153. Bike sharing for children, an initiative to raise awareness to cycling

In the planning and design of the bicycles stop once performed a thorough analysis of the context of intervention (urban area of intervention; parking demand manifests and potential; the presence, location and characteristics of the attractors, roadway conditions, presence, maintenance and adequacy of parking areas where they exist, of articles; available space for the installation of new artifacts) follow some guiding principles aimed at satisfying certain essential user requirements and at the same time the management : find an adequate location of the parking area, visible and easily accessible from the path of origin of the cyclist; maximum possible proximity of access to attractors reference; placing a number of bike racks and places more than sufficient to meet the demand; determine the type of bicycle carrier suitable to the prevailing function (short break or long term); choose a parking position that is perceived mostly safe and possibly that it is in fact; consider the aspects of ease of cleaning and maintenance of the area and of the articles; to meet any specific requests by cyclists.



Pic 154. A bike sharing parking in front of the cathedral

“The expansion of the system at these levels will require a different economic balance by the current, since the only identification of new advertising spaces would not be enough to cover the costs. It would be necessary to study new forms of financing that guarantee such sponsorships (entrusted to the operator or retrieved by the municipality), or coordinate operations with the public transport system. The total cost of management and maintenance of the system in 2025, with 650 stations, would be around about 1% of the total cost for the local public transport in 2014, which amounted to 720 million euros.” (Piano Mobilità , Regione Lombardia, 2012).

Milan wants to encourage the use of the bicycle and, therefore, the network of routes and areas of wide-spread cycle (eg residential areas) must be integrated from both parkings concentrated at the main traffic attractors that diffused in a capillary way. The presence and quality of the parks are factors so important that many potential cyclists - if there are no such conditions - are absolutely discouraged from becoming continuous users: those who have suffered at least once the theft of a bicycle will probably live the fear this happening again and it must be reassured to boosting customer loyalty again.

7.6 MILAN BIKE SHARING

BikeMi is the service of the City of Milan, which offers the opportunity to use the bike sharing to quickly move into town. A mode of integration of public service much appreciated by the citizens of Milan as evidenced by the steady growth in subscriptions, daily, weekly and annual and the rental during special events. Opened in December 2008, The drawing stations and bicycle storage, in a capillary installed in the area and close to the main attractors, offer a new mode of travel that is integrated with the local public transport by providing users with opportunities for practical and fast movements .

The introduction of bike sharing has a positive effect on cycling as it allowed many users to use a vehicle not owned, you can pick up and drop in any of the active stations, relieving from operating costs, without fear for the theft of the bicycle, without the requirement of a forward displacement and return with the same means of transport. The cost of the system (structure of stations, bicycles, installation, user-card, the Welcome Pack) is borne by the City of Milan, the costs of management and maintenance of the service (at least for the first 213 stations of steps 1 and 2) it was instead covered by the proceeds of advertising facilities that the same service provider has installed simultaneously to the development of the system.

The development of bike sharing has been structured in phases and relative funding:

Phase 1, 103 stations;

Phase 2, 110 stations;

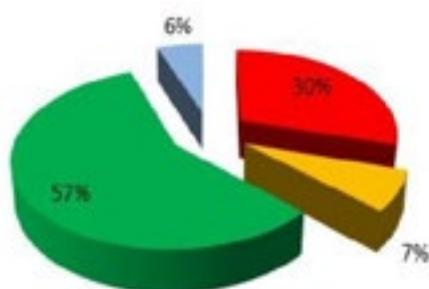
Phase 3, 70 stations (at startup).

It is started from the circle of the ramparts (phase 1) and then widens in a concentric manner towards the periphery (phase 2): the location of the stations has occurred following a few basic principles (eg: the station accessibility, visibility, proximity to attractors and road intersections), in such a way that between these there is an average distance of 300-400 meters (in order to allow users to achieve an acceptable timeframe the nearest railway station - on foot or by bicycle - in the case in which the station is full of bicycles or empty).

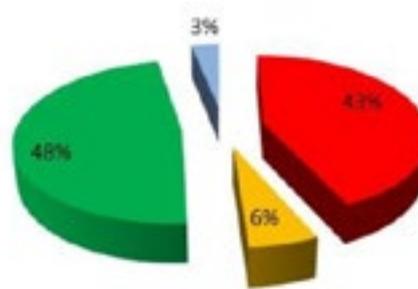
To increase the bike sharing, an integral part of the transport network, the service will extend from the center to the periphery, with the opening of new BikeMi stations, the bicycle rental system of the City of Milan; Thanks to the support of the Ministry of the Environment, today the bike-sharing service offers citizens the opportunity to use both the traditional yellow bicycles that 1,000 new pedal-assisted bicycles and bike-red in the same stations and with the same subscription, subject to a fee slightly higher for hourly usage.

Pic 155-156 Combined effect of modal split in blue bicycle, red car, green public transport, yellow motorcycle

Internal travel in Milan



Total Displacements

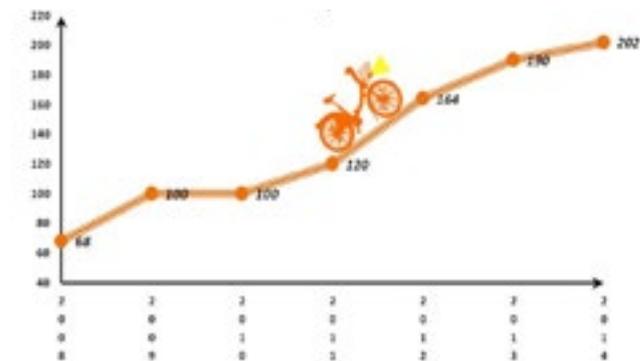


“It is an innovative service certainly far from Bike Sharing Danish but already good; the cyclist acts on the pedal and the electric motor accompanies him without having to make effort, especially uphill and over long distances. The BikeMi stations are expanding to the suburbs, past the Circle of the ramparts continue to raise new points where to get the bikes in particular near the train stations, the local underground, tramway and the main attraction places such as government offices, universities, cinemas and theaters.” (Piano Mobilità Sostenibile, 2015, Milano). According to the document “The Bike Share Planning Guide” prepared dall’ITDP55 of New York, an efficient, reliable and affordable system must maximize two performance parameters: number of trips 56 daily bike between 4 and 8. A number greater than 8 may indicate inefficiency of the system and be a sign of limited availability of bicycles, especially in the peak phases of uses; a less than 4 trips value can highlight on the contrary a low number of uses with respect to the potential offered; A high number of uses by the population can be reached by the service success rate of bike sharing system with respect to the expected results in general the contribution of cycling in the modal split of journeys.

In Milan, they register values, referring to the average values of efficiency expressed in the above study, indicating significant room for improvement and growth. They have in fact 2.4 trips per day per bike and 20.4 day trips per 1000 residents 57. Administration's job to make sure that the planned extension of the stations, the increase in the number of bikes, the choice of areas and attractors to serve, change the time zone of operation of the service, continuous maintenance of bicycle parking, adequate marketing and promotion policy of the service also with reference to the benefits for the individual (eg, costs, health, convenience), are the proper tools to the development of these values. The site selection of bike sharing stations listed here follows some general principles: visibility (especially for casual users); accessibility (both for users and for the reallocation of the operations by the operator bicycles); capillarity (remote stations between them of no more than 300/400 meters); the installation cost of the station; proximity of attractors of mobility; proximity of road intersections; containment of the reduction of stalls for motor vehicles; safety. On the merits of the capillary system, considering the ratio of 1 bicycle per 100 residents - compared with the situation in Copenhagen, where already in 2013 were present 45 bikes every 97 residents is obtained for the development of bike sharing in Milan the following projection:



Pic 157 . Number of subscribers from 2009-2014



Pic 158. Number 2008-2014 stations



Pic 159. Historical levy bicycles 2009-2014 Series

- stations: from 283 to 650 stations (about 3.5 per sq km); Bicycle: from 4,650 to 13,500 bicycles (21 bikes per station). To get to 650 stations from 283 scheduled at the end of phase 3 of the reference scenario a need for further stations 367, for the realization of which it can be assumed the following development: 2020: 500 stations and 10,000 bicycles.

7.7 HOW REACH THE DANISH LEVEL

To reach the Danish levels need to extend the service to more remote and densely populated swathes of territory or attractors isolated but able to generate and justify the presence of the stations, and the upgrading and expansion of the stations where the service is already widespread and is record partial inefficiencies; the facilitation of registration, hourly extension permanently active service throughout the year, part of the work on the network, build roads conditions where cyclists can follow, in their movements and whatever the reason for the trip, pathways that transmit sense of security and where cycling is enjoyable, simple and comfortable, on the merits of the services and other facilities in support of cycling, offering both located car parks that popular, accessible and safe, positioned according to the criteria of maximum proximity to the destination, the presence of such as reducing the cyclists hardship due to a parking spot and concerns about theft, is a frequent factor encouraging the use of the bicycle.

On the subject of the intervention strategies focus on network:

completion and development

- by means of the broad spectrum of possible structural solutions and roadway between the seat and the seat reserved promiscuous, in relation to the singularity of the traits

- a network of privileged cycling itineraries along linear paths, continuous, direct and strong attractiveness, which ensure that users real security and sense of safety, reduced travel times, average speeds competitive with other modes of transport, high levels of comfort and ease of driving;

widespread creation of favorable conditions for frequent use of bicycles as a means of transport for all ages, with the extension of the areas to slow mobility and integration between different types of road network measures (eg restricted traffic areas, areas at low speed residential areas), the rehabilitation of pavements in poor condition (including paved) from the large bicycle traffic routes, the removal of the tracks out of service, improved visibility;

The resolution of the network critical points, with road system and structural interventions measures that serve to facilitate the overcoming of natural barriers (eg rivers) and artificial (eg channels, highways or roads with a high traffic , devoid of signalized intersections, railways and airports rail), facing the broad spectrum of cases present, the maximum critical issues that have inhibitory effects on cycling at minimum those representing exclusively a discomfort along a path . “The integration between the points of the strategy is essential for there to be a real competitive system with other means of transport, for which we expect a significant modal shift in the coming years. The bicycle user profiles are varied and with different needs: in a nutshell, are identified continuous users, fearful and sporadic, for which the plan proposes a set of actions aimed at objectives of efficiency, security and communication, elements that affect in a transversal manner, albeit with different balances, the three categories of cited users.

It must essentially convince those who do not use the bike to do it more often and regularly, as well as retain the loyalty of already regular users. The achievement of these results will certainly affect the quality of the network at different levels of scale, from the floor to the retail, supply and distribution.

For verification of the sustainability of the strategies to be adopted is an evaluation time modeling was necessary to assess, albeit parametrically, the effects of design choices of implementation of cycling routes on the reduction of the road network capacity on which the routes insist and / or reduction offer parking. The realization of the priority routes, if coincident with the main network, it should ensure the maintenance of the levels of efficiency and of the local public transport service, so that the reduction of road capacity is potentially limited to individual motorized transport: in so doing, along the priority routes would be maintained higher levels of competitiveness of public transport and cycling and private transport users would not be induced in the medium to long term to identify alternative routes on the local network. The plan, in fact, intends to parallel transform areas of Environmental Islands with calming measures and traffic restriction measures would not benefit the massive transfer of motor vehicles traveling from the main network to the secondary and local looking for alternative routes” (Piano Mobilità Sostenibile , Milano, 2012).

This result in Milan may be achieved by a careful design of the road platform that takes account of: the removal of supply stop from the main network, consistent with the action priorities indicated by the Guidelines for the preparation, adoption and implementation of the plans urban traffic; the reduction of the width of car lanes without reduction of road capacity, consistently with the characteristics of the categories of vehicles permitted to transit and the rules, or with reduction of road capacity, consistent with the level of network classification assigned to the section concerned; while intervenes on vehicular lanes, it is preferable - if possible - to safeguard the number of vehicular lanes in abutment in correspondence with the critical intersections or the reorganization of the same and of the permitted maneuvers; the recovery of irregularly spaces used today for the parking of motor vehicles, for example under the rows of trees (this operation will still have to maintain and possibly improve the free-draining vital around the existing trees);

The recovery of spaces - understood in their linear development along the path - which generally have a lower marginal utility to others: a peculiar attention must be paid to the preservation of sidewalks under standard congruent with the pedestrian flows; one must take into account that under the sidewalks is moreover placed largely subsystems and that they also generally accommodate poles of traffic signs, poles of public lighting, soil occupations for public premises, newsagents, kiosks.

Spatial planning and design choices - in accordance with the general strategic design - must be taken individually for each track: the safety and competitiveness of cycling mobility are a primary goal to reach which it will give priority to operate in the roadway, including - to the purpose of finding the space needed to improve the conditions of cycling - also have the option of capacity reduction.



Pic 160-161-162 Different possible development in future of the Cycle paths in Milan



The plan does not exclude the definition of the priority routes, for both short and long distances, along roads that do not take on more strategic importance for the mobility of motor vehicles, or inside of parks and green areas. There are in fact cases in which the limitation of traffic or pedestrian choices are entirely consistent and coordinated with the assumption of importance of such courses for mobility on two wheels, which by the possibility of shortening paths otherwise twisty and inappropriate draws great benefits. The analysis leads to the belief that the realization of the entire network of priority cycle routes can result in total: an average reduction of 15% of the capacity of the road network on which insist the routes in question; the use of space used irregularly from car park (for approximately 4,000 vehicles share of demand). The potential size reduction of parking spaces on the street, mainly due to the elimination of illegal parking (to be implemented regardless of the needed space for cycling, respect for the rule of law and road safety), is fully sustainable when you consider the gradual reduction of the internal rate of motorization the city of Milan, which saw, from 2003 to 2013, a decline of about 90,000 vehicles registered, 16,000 of them last year alone. The implementation of interventions that result in removal of street parking supply is therefore consistent with the trend of the last decade to reduce the population of the motorization rate in Milan and with the plan addresses, identifying priorities for action in areas characterized by minors in the critical balance between supply and demand of parking supply on the road.

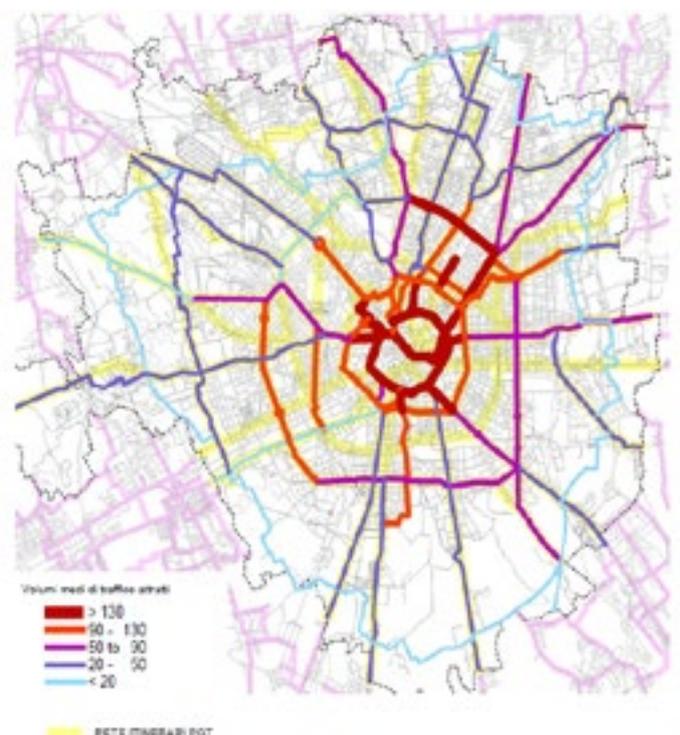
Pic 163. Bike routes of the PGT and interventions planned in the reference scenario



The times plan actions to the development of the cycle network altogether possible to achieve: a modification of the modal balance estimated at a reduction of 2.5% of journeys made by car or motorcycle, resulting in a proportional reduction of negative externalities from traffic; 40% increase of the displacements in Milan carried out with the bicycle; a reduced risk of accidents for cyclists by the current value 6.1 accidents with injuries / Mkm bike paths to a target value of 3 injury accidents / Mkm, in line with that recorded in the most advanced urban reality in the European construction policies and of cycling protection interventions.

The objectives signed by the City of Milan with the signing of the Charter of Brussels in 2009, in terms of modal split (15% of cycling 2020, or higher percentages if the result will be reached in advance) are intended as achievable with reference to 'most central area of the city and in particular to that part of the densely urbanized inner circle trolleybus territory. In the peripheries, however, the area is only partially urbanized and is mainly in these areas that will concentrate the municipal administration efforts to promote both the daily commute that those linked, especially in the Iberian time, to cycling and sport. " The objectives of PUMS, (urban mobility plan of the city of Milan) with reference to cycling, are closely linked with those related to the other of the plan labor issues and the provisions of the Plan of Government of the Territory.

Pic 164 . Priority directions of cycling, PUMS Scenario: average volume of bicycle traffic attracted



They deal with measurable results, which are determined with the aim of starting both the implementation processes that those needed to monitor are reached or exceeded, with the best performance, the goals themselves. Milan aspires to achieve similar results to those of other major European cities with regard to both quality and the safety of the movement. We must build a city in which a cyclist should not travel more than a few hundred meters at most from home to take a path that makes them feel protected (and this applies to all age groups) and where cycling is enjoyable, simple and comfortable.

The setting of the plan's strategies regarding cycling is based on some essential themes and as many fields of action. As for the essentials, we refer to the insertion of cycling among the priorities of transport policy, the continuous process of innovation, improving the livability and quality of urban life, the gradual raising of the levels of comfort and speed of movements, the sense of security that users must be able to sense when choosing and using the bicycle as a means of transport. The fields of action on which we are focusing investments are networks, services, communication and marketing." (*Manuale per la Realizzazione della rete ciclabile regionale*, 2012). The Milan City Council intends to adopt a policy that acts across the board on several fronts, integrating the strategies implemented and actions on different levels and courses of action, both in the general system of mobility that in other areas of action that they can still, even partially, have a bearing on the development and promotion of cycling. The growth of cycling in Milan is scheduled in line with what has been programmed by the PGT (management plan of the Territory) for the development of a multi-center scheme and network. This gradual development must take into account the different distribution of the current traffic congestion and temporary road system and structural measures which have induced an increase in cycling flows in a predominantly radial direction between periphery and center. These streams are then added shifts straddling the periphery along some predominantly of interest guidelines cycling.

The planned network design fully considers the multiplicity of attractors and distributed locations on the territory of the epicenters, and yet still assign a due importance to the city center which attractor / main bicycle traffic generator.

The center is in fact a part of the urban fabric that is already well adapting to the development of cycling mobility (such as on the other hand occurred in all other European metropolitan reality): see in this sense the concentration of displacements, 1 of 5 , which take place in bicycle internally to the circle of the canals and the success of bike sharing since its inception in 2008. the urban transformation in place and the gradual migration of large tertiary from the center to peripheral locations is not necessarily a phenomenon in contrast with the growth of cycling in the most central of the city, as they are still strong demand from home to work and home-study into this area and the strong commercial and tourist attractiveness; planning must still respond appropriately to the natural evolution towards of the functions on the ground, facilitating the accessibility of new centers, and public transport terminals, and distributing investments on a variety of routes.

The PUMS therefore orients itself in the direction of development indicated by the PGT causing the successive levels of the planning, the TMP in a field plane of the bicycle mobility, retain the same overall consistency.

The desired growth of cycling is achieved if the city is gradually adapted to cycling for all journeys, from home to work to those home-school, from shopping to leisure, from racing to cycling. In practical terms, the results will be seen if the number of cyclists increase, if each rider will travel the road every year, will increase if the frequency of use of the bicycle. The cycling the agenda first place means that the general guidelines must always consider, among others, the needs of those who travel on two wheels in order to facilitate those who have already chosen this medium and encourage those who have not already done so.

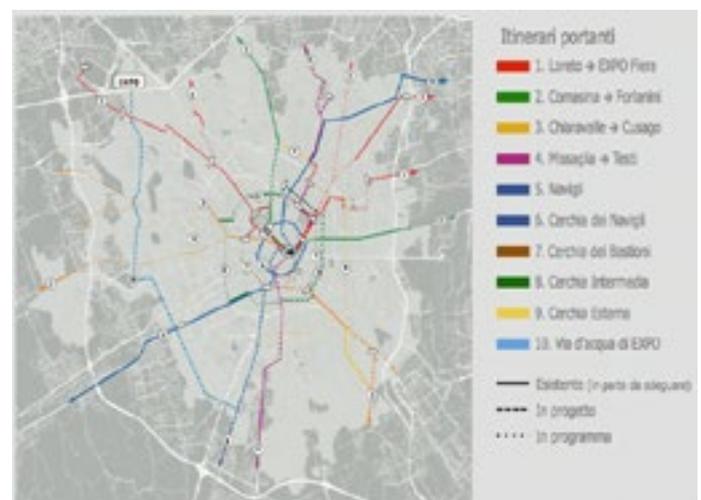
Priority means that actions to facilitate cycling need to be addressed among the first. This is true in the field of planning as in that of the planning: in the first case it is necessary that the space theme recovers administrative agenda so that intervention by the local plan is attention given to the special needs of those who travel by bicycle, which are other than those of pedestrians and those using motor vehicles; in the second case the design must take responsibility, in the real limitations of the context, to adopt technical solutions that respond to the given objectives and basic principles of the legislation.

Innovation means that the planning and design must be interpreted so constantly new instances of the territory, exploring all the opportunities that presents the norm and offering more and more adequate and complete answers to the needs of users, from the network to the parking lot, by the communication services . Innovation also means the hoped-for introduction of new rules: the City of Milan has done and will do its part, to that effect, but it is mainly from changes in the Highway Code and of certain aspects of Ministerial Decree 557/1999 which are expected renovations needed to provide modern solutions and in line with European developments in the field. It is convinced that cycling gives an essential contribution in the field of transport policy, the environmental quality of a city. This is what is perceived observing different urban, European or non-European, where local policies and national government have oriented towards sustainability land development, the organization of transport, the quality of life of citizens. A city densely populated by cyclists certainly benefit in reducing air and noise pollution and traffic congestion, allowing you to save space and public green Increasing the number of cyclists, combined with the decline of the movement of motor vehicles, will have a positive effect on reducing the number of serious accidents, which is positive for the overall health level of the population and the reduction of health costs. In the developments and urban transformations, especially when you increase the settlement density, the cycling will facilitate this goal and thus improve the lives of citizens, impacting on all kinds of movements.

To increase the number and length of trips by bicycle you must also deploy the parking lots and predict the location in any urban renewal, redevelopment or rethinking the intended use of the public space Regarding the road network, reference is made in particular to: • improvement and enhancement of the quality and performance and regulatory requirements of the existing bike paths, which are in bad condition or inadequate; requirements that must obviously in the realization of new paths, allowing in both cases at an average speed higher displacements and in larger spaces; • improvement of the quality in general of the roads for a widespread cycle (removal of the paved or maintenance that guarantees actually between the stones; removal of the rails out of operation; constant cleaning of the network, including bicycle lanes and other sensitive paths, for the whole 'year, no dead periods as in autumn and winter).

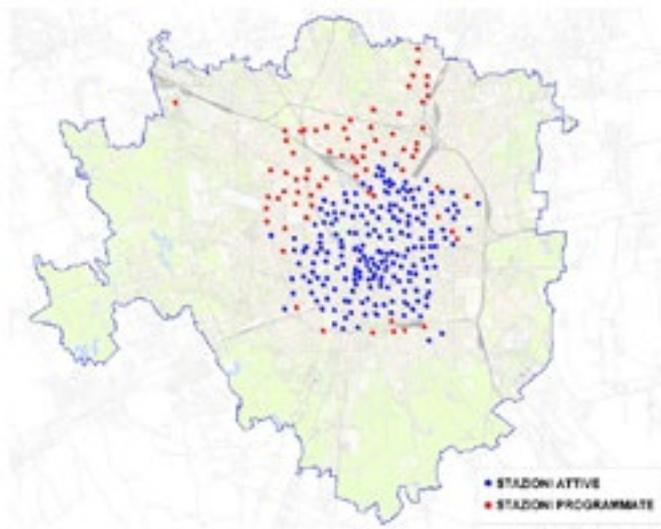
Finally, the issue of services to the cyclist: • spread a network of public pumps; • facilitate the widespread distribution on the territory of repair shops and rental outlets means. The speed of the displacements; The administration will reduce the duration of the displacements is the result, as anticipated, the awareness that competitiveness with other means of transport is among the factors that most convincing citizens to go to the bicycle.

To reduce travel time and raise the average speed must be: along the main routes: or assign precedence priority at intersections and reduce signalized intersections with the streets of the local network, facilitating and limiting crossing times of complex intersections and signalized ; or give priority to the transit of cyclists in signalized intersections, with the adjustment of green waves, the anticipation for cyclists of the phase of green light; or realize paths in its own seat, or lane of suitable section to enable the smooth and safe overtaking between cyclists, limiting the deceleration and stops at signalized intersections; or eliminate situations of promiscuity with pedestrians and vehicles wherever they create precarious security conditions, lower efficiency and comfort of movements; or build new walkways, ramps, bridges and underpasses cycle in correspondence with infrastructural barriers, facilitating - through resolute solutions - the exceeding of the maximum network critical points; or facilitate the crossing of the roads to take the main route in the desired direction; in the rest of the network or allow to follow the shorter distances to reach the major routes, for example by ensuring cyclists the chance to walk the streets in both directions of travel, if necessary through the implementation of sections lane or headquarters own;

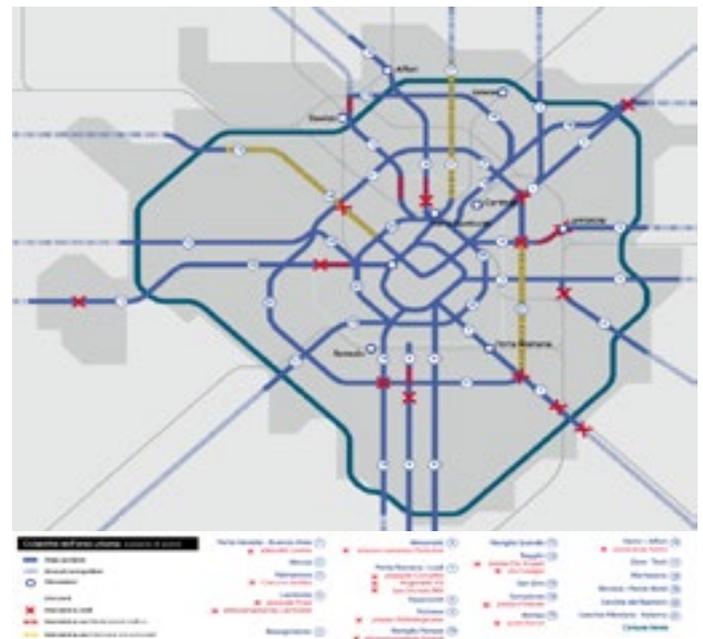


Pic 165. Fundamental routes of bike paths in milan

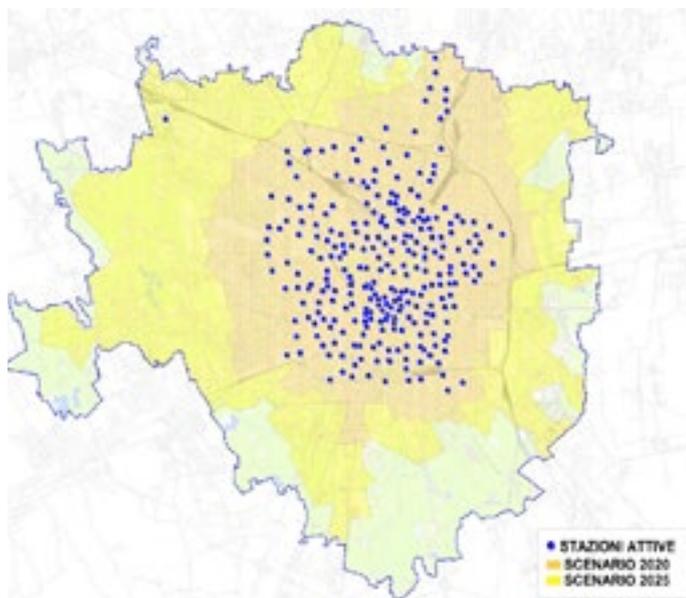
Pic 166. BikeMi, completion of phase 2 and the realization of phase 3 Expansion of bike sharing programmed to the reference scenario(from 205 stations in January 2015 283 active stations)



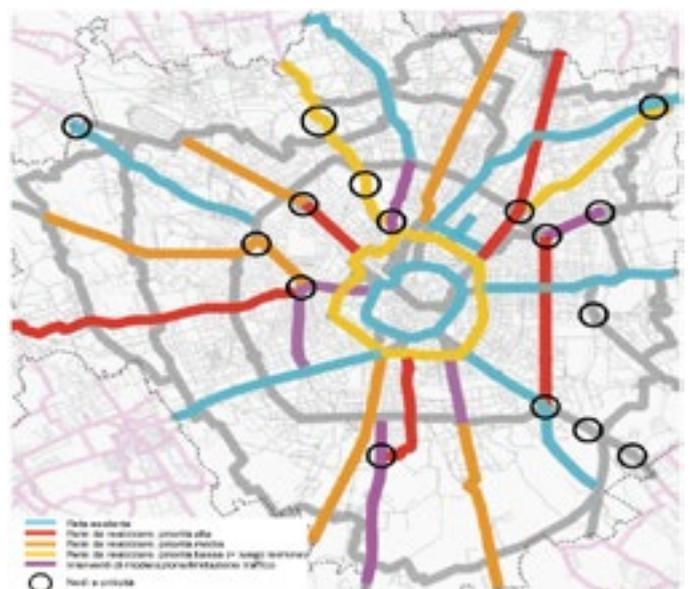
Pic 167. Cyclability in the urban area, scenarios of the Pums Plan



Pic 168. BikeMi, bike sharing service Hypothesis expansion in two phases - 2020 and 2025



Pic 169. Priority directions of cycling: priority interventions



“Spreading culture and education is to focus attention on the benefits that can be had by widespread bicycle use, benefits that apply to both the cyclist and for the city. The communication strategy through an information campaign to citizenship and content, language and its dissemination channels of the messages will be adjusted according to the target audience and the type of movement that you want to promote, such as home-school and home work . The actions related to communication and marketing and a new signage system need to perceive that the cycling has great importance in the planning of urban transport and is considered like other mode of travel: it is necessary to communicate the changes taking place and a new vision of the city that, through a combination of actions (traffic calming, priority routes, pedestrian systems), reinforces security and all users incentives.” (Piano Mobilità Sostenibile, Milano , 2015) .

The issue of communication deserves a benchmarking analysis to identify the best possible strategies to promote the development of actions. The materials of this scenario: develop a strong and coordinated communication, within the broader communication needed for urban mobility; developing marketing policies both within the urban community and commuters both to tourists, especially to entice cyclists sourced from countries that have already developed attention to this form of tourism; work intensively on intermodality with operators of urban and regional TPL so that maximized the ability to transport the bike with adequate space, especially in new trains, and appropriate communication and information signs in the stations; work hard on traffic education of the younger generation and then penetrate further into the school, accompanying the teachers in training programs with dedicated projects; invest in it adequate financial resources drawing directly from the fund resulting from traffic fines and other available resources; the activity is carried on by personnel suitably trained both as educators, and with the help of the local police; develop communicative material on traditional media together with advanced technology supports, fully exploiting the potential that they can provide; enhance the spontaneous and associative initiative organized, able to build consensus and attractiveness to the development of the bike model city: seize the initiatives of the associative groups who know the positives represent: the striking example is that of “mass brats”, the activity at school accompaniment of children with bicycle coordinated by parents and volunteers, which has achieved great success of effective and communicative visibility;

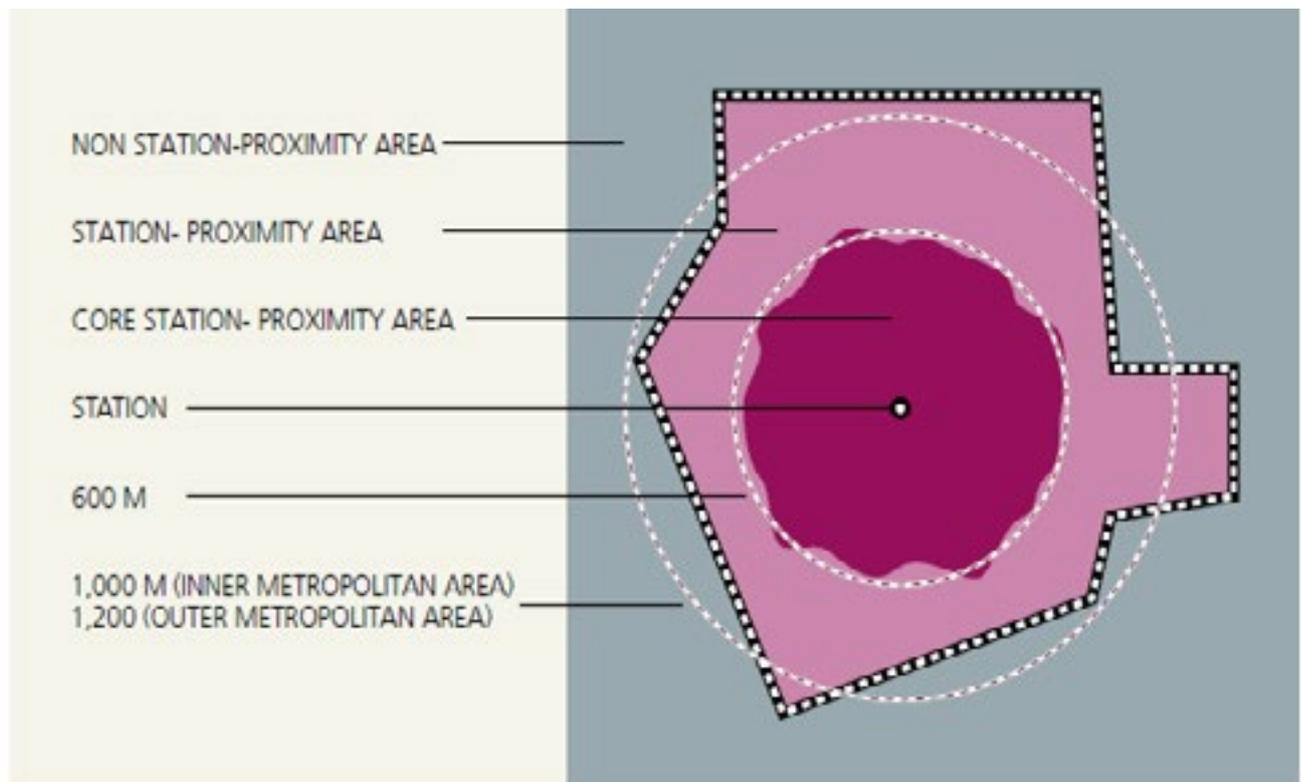
Dedicated events of various kinds, from mass as the Cyclopride58 to cultural events, such as lectures by bicycle to explore the city; maximize the relationship with the mobility manager to put an the center of their actions the promotion of cycling: This subset includes among the ingredients of the BikeMi use facility, suitable protected spaces for bicycle parking company, accident insurance coverage (the 'Inail currently does not cover the injury in a bike), economic incentives if possible; orientation of sponsorships in favor of the city on projects that encourage the bike. For the spread of the cycling culture is important to act in and with schools, with forms of environmental and traffic education, as evidenced by the actions taken by the administration and by the associations with BiciBus walking buses and projects, Cyclopride, the European Stars project and #BICItadini project, which included field trips , courses for children of primary and secondary school.

The Administration has created spaces for information on cycling via the internet and on the major social media; dedicated mapping and, as an experiment, the first marked routes: Porta Romana - Lodi - Chiaravalle, Maciachini - Fermi - Affori, Sempione - Expo. The type of its signal was shared with the Ministry of Infrastructure and Transport, in accordance with the rules. It is necessary to produce a coordinated image of the overall system of cycling, consisting of networks and services, including for example a logo, a system of signs, posters and infographics. This image must then harmonize the signs required by the highway code, so that it can usefully be placed on the public highway.

Pic 170 The principles to modify the behaviour



Pic 171. Principles for environment friendly siting



Criteria for demarcated areas	Characteristic examples of siting options
<p>Core station-proximity area Defined by municipal plan as lying within walking distance of max. 600 m to a station, as well as other urban planning considerations</p> 	<p>Urban – high density</p> <ul style="list-style-type: none"> - Large business and service entities employing many office workers (> 1,500 m floor space) - Major, highly frequented institutions - Dense housing - Shops in accordance with retail regulations
<p>Station-proximity area: Defined by municipal plan as normally based on an area within a 1000 m radius to the station in inner metropolitan areas and an area within a 1,200 m radius in outer metropolitan areas, as well as other urban planning considerations</p> 	<p>Urban – middle density</p> <ul style="list-style-type: none"> - Dense housing - Dense- low-rise housing - Small business and service entities (<1,500 m floor space) - In exceptional cases large business and service entities employing many office workers (> 1,500 m floor space) - Local institutions - Shops in accordance with retail regulations
<p>Non station-proximity area: The other urban areas</p> 	<p>Urban areas with varying degrees of density</p> <ul style="list-style-type: none"> - Dense and dense-low rise housing + single family housing - Local institutions - Extensive building, storage and production enterprises - Small business and service entities (< 1,500 m floor space) - Dense housing (in accordance with supplementary measures) - Shops in accordance with retail regulations

7.8 RECIPE FOR SUCCESS IN COPENHAGEN

TRAVEL TIME

- Bicycle Superhighways (network of routes in the capital region).
- Small short cuts (200-400 in all, including contraflow on one way streets, shunts, etc.).
- Large short cuts (5-8 bridges/underpasses)
- ITS on, for example, routes with Green Waves for cyclists.
- E-bikes – (infrastructure and promotion).
- Information about the best routes (signage, GPS solutions).
- Lower speed limits for cars where necessary, for example around schools.
- Better combination of metro/train/bus and bicycles, including a bike share programme and better parking facilities at stations.
- Increased population density.
- Behavioural campaigns focusing on signalling and overtaking with care.
- Cooperation with the police regarding changing traffic laws, including creating contraflow on one-way streets, as well as solutions that make it possible to turn right at red lights.

SENSE OF SECURITY

- Green bicycle routes.
- Intersection redesign (including cycle tracks running right up to the intersection as standard and pulled back stop lines for cars).
- Wider cycle tracks where there are bottlenecks.
- New cycle tracks and lanes (30-40 km).
- Wider cycle tracks in general (10-30 km).
- Painting lanes on wide and busy cycle tracks.
- Bicycle and bus streets.
- Campaigns related to consideration and behaviour.
- Safer routes to schools.
- Traffic policy at various schools in Copenhagen.

COMFORT

- Smoother asphalt on the cycle tracks
- Improved snow clearance and sweeping.
- Effective bicycle parking (infrastructure, partnerships, and collecting abandoned bicycles).
- Services (air pumps, fountains, 'bicycle buddy' apps, weather reports, etc.).
- Partnerships with workplaces and educational institutions regarding bicycle facilities and information.
- Better conditions for city employees (parking, changing rooms, bike repair, etc.).
- Development of new products (valet parking for cyclists, surface treatment for cobblestones, etc.).

LIFESTYLE AND IMAGE

- Marketing relating to image, lifestyle, the advantages of cycling.
- Campaigns aimed at specific target groups who have the potential to cycle more, including newcomers, the elderly and people who use the car for short trips.
- A sense of ownership, for example campaigns like Your Bicycle City, Your Mother's Bicycle City.
- Online – a one-stop bicycle portal.

EXPERIENCES

- Integrating the experience of wind and weather into cycle track design.
- Communicating positive bicycle experiences (including ideas like Your Favourite Route, Your Favourite Short Cut).

7.9 SWOT ANALYSIS

A SWOT analysis is an effective way to combine internal strength with external strengths, opportunities and threats, and internal weaknesses with external opportunities and threats to develop a strategy. As such, a matrix was developed applicable to the case study of Copenhagen. For its elaboration proceeded as follows:

- Strengths / Opportunities - The strengths of the SWOT analysis have been considered with each opportunity, in order to realize how each internal strong point can help take advantage of each external opportunity;
- Strong Points / Threats - Consider the strengths and threats of the SWOT analysis and try to understand how strengths can help avoid any threat;
- Weaknesses / Opportunities - I consider the weaknesses and opportunities of the SWOT analysis.
- Weaknesses / Threats - The weaknesses and threats of the SWOT analysis are considered and attempts are made to see how they can be avoided.

SWOT COPENHAGEN

STRENGTHS

Historical-artistic Heritage. Copenhagen as we saw with its artistic heritage is one of the ideal city to cycle tourism.

Existence of a strategic plan cycle and cycle vision as pivotal. The existence of a plan and a bike Vision is of fundamental importance for the city.

Geographic location and area suitable for cycling. The geographical area of Copenhagen with its territory is not too big is perfect for bikes.

High-level infrastructural links and well integrated. The city has a very dense infrastructure level and well integrated with the bike paths

High number of combination in favor of the bicycle .The town has a high level as a modality with bicycle parking

High knowledge of the benefits of cycling by citizens. Citizens are aware of the benefits of cycling.

SWOT MILANO

STRENGTHS

Historical artistic Heritage.

Milan with its artistic beauty has a great cultural heritage.

Existence of a cycling plan and its future development the first cycle there are plans and the related developments indicate a change in the near future

Geographic location and suitable area for cycling the area at the center of northern Italy and the surface is not too large it is ideal for bicycles

Infrastructural links; some connections are present

Water Network are used as lineae border cycle paths the ships are in part used as bicycle paths

High number of cyclists' associations for cyclists show an increasing interest in cycling

High and fast response to cycling Initiatives among citizens is crucial.

High and fast response to cycling Initiatives;
citizens respond positively to cycling initiatives

New construction of bike paths, real highways for bicycles. The construction of trails, bike highways is a priority for the municipality of the city.

New ITS systems integrated in the road network. the new ITS systems are highly integrated with great benefits for the community

WEAKNESSES

High costs of Bike Sharing System
The city of Copenhagen is facing some high costs for new bicycles with tablet

High cost of cycling infrastructure. high costs for new cycling infrastructure sometimes slow down the work

Presence of fragmented bike paths in the suburbs in the lower peripheral zones of well-connected bicycle paths

OPPORTUNITY

Opportunity to reorganize the urban fabric as a model example for other urban areas
the opportunity to reorganize the urban fabric is crucial to redevelop many urban areas.

Renovation and development historical areas
The cycling is a reason renewal and development of historic areas

Cycle Plan fully integrated
the bike plan is fully integrated in the strategic plan

Cycle tourism promotion of the city. The cycle tourism is an opportunity to promote tourism

Restoration and construction of new bike lanes in progress. increase and construction of the slopes in the project and in the preliminary phase as described in PUMS

Tourism linked to Cyclability.
Tourism is a key importance for the development of cycling in the city

reducing Pollution
the reduction of pollution is of fundamental importance for the city of Milan

Savings in costs on public health and transport
savings on public health and transport costs from the municipality and citizens

WEAKNESSES

Identity of too tied to cars cities

A few bike paths and fragmented. often fragmented slopes and a few in the center and suburbs

Lack of stable and sustained investment.
few investments represent a serious problem to the growth of the slopes

Lack of communication with citizens
little communication with the citizens, which is a key to success in cycling policies

Deficiency in the roads and in the transport plan
lack of roads and the transport plane, which causes the non-use of the same by cyclists

Coordination of Initiatives Difficulty
poor coordination of initiatives and campaigns to the increase of sustainable mobility

THREATS

High costs and, consequently, loss of use of the Bike Sharing.

Cycling and traffic rules Policy Failure.

Using bicycles for only one type of user such as children or elderly without , exclusion of weak bands.

Dissemination of bike sharing only in some areas and not in a capillary.

New smart systems are not very common except for sporadic cases.

OPPORTUNITY ‘

Opportunity to reorganize the urban fabric of the city based on the Danish Plan . It is an opportunity to reorganize the city of Milan.

Renovation and development historical areas.

Cycle Plan integrated as pivotal to the PGT.

Cycle tourism promotion of the city. increase in profits derived from cycle tourism imperative.

THREATS

High costs of infrastructure of the Danish model and Bike Sharing. high bike sharing costs could lead to political failure.

Cycle Vision sometimes too tied to That not exclusive travel and per diem and use of the bike just as entertainment.

Comparing the two SWOT analysis for some features the backdrop of Milan and Denmark are similar such as the area is not too large and flat, so suitable for cycling. with its artistic beauty also the city of Milan could host a cycling tourism thanks to excellent location in the center of Europe and northern Italy;

The Italian strategic plan is still tied to the old strategic vision, unlike the Danish with key cycling infrastructure, albeit with some improvements and future visions.

Integration with existing infrastructure in Milan with metro and railways is in its infancy but with signs of expansion and future development with respect to the Danish context; if in the Danish context we have a large number of bicycle parking lots, in the Lombard context of the first parks are making their timid appearance. both contexts have a large number of entities in favor of bicycles, and a fast response of citizens to the cycle initiatives. for both cities tourism is crucial, both are increasing the existing infrastructure being pursued at different levels. for both the city thanks to cycling there albeit in a different way a saving in costs and increase the benefits for the city and citizens. some weaknesses of the Danish reality are the high costs of bike sharing and infrastructure in Italy is a serious constraint to development. the fragmented network and few feature of the Italian context, as opposed to the Danish. the lack of investment as opposed to Copenhagen, as well as the presence of bike sharing is not one of widespread princiali differences. The cycling is an opportunity for renewal and development for both contexts. watching too tied to the car as opposed to the Danish journals for travel and failure to comply with traffic rules and poor security characterizes our context.

8. CONCLUSION

The study of Copenhagen for the Italian context has led to results of various types; with the analysis of the planning cycle that takes place in Denmark it has obtained that can lead to key even in the Italian traditional strategic planning cycle the floor in the middle and not as an appendix. with coordination between the planning and the right design infrastructure you can get also have results in excellent Italian. with the promotion of the use to the bicycle, since small educating citizens as occurs in Danimarca you could achieve similar results.

analysis of daily bicycle trips that the city of Milan are 6% and in Copenhagen close to 50% you may notice improvements even in the Italian context, certainly not to the Danish level, but the first signs of change in the daily trips are also in Milan .

Through the study of new technologies systems I tried to compare the two bike sharing systems. The cutting edge Denmark has got weaknesses that are represented by the high costs in Denmark are that if a lesser extent Italian problem in a country with a poor bike culture may portire to failure of the system. Data from the proceeds we see a very strong increase in bike sharing also in a context like ours where the growing number of citizens understand the importance of bicycle mobility albeit with numerous obstacles for car unfortunately.

The first signs of ITS systems also in the context of Milan are by bicycle counter new renting the bike sharing systems, surely there is some way to go in an environment like that of the city of Milan fertile for change. will be important to the campaigns to promote cycling in Denmark it is essential to the use and encouragement of the same; if in Italy we have a policy that in person to engage citizens and use the same policy for daily trips using the bike, maybe there will be a change of behavior of the city's citizens.

Through the analysis of Italian policy in favor of cycling, the Pums the plan of sustainable mobility and the PGT is now denotes increased attention to bicycle mobility than in the past, certainly not to the Danish levels but preliminary designs enhancement Bike sharing, the cycling trails in the region and in Milan are present. the city is committed to the change of mobility in a sustainable manner, but still many steps to get to the Copenhagen model must be made;

A bicycle paths plan should be designed and lived by those who plan, and not a fragmented cycle network as at present or not present in the central areas in terms of economic and commercial residential view it is crucial to the success and use of ' same infrastructure.

Often in the context of Milan they notice the bike paths that come to naught, with a flat area such as Denmark, where a vast historical architectural heritage by bike tourism could have a big gain in terms of economic and social benefits. as we have seen the benefits cycling brings on many aspects, such as reducing air pollution in Milan which represents most of the year a serious problem. the city could save on healthcare medical expenses, and the construction of new cycling infrastructure if the idea collective brings only actually spending as seen in the Danish context a saving and a recovery of costs with a gain for the community and the municipality.

By then analyzes the infrastructure of bicycle parking, we note the lack of the city of Milan, the few parking spaces for bicycles are often or purely tourist areas, or not well connected with the main means of transport; it is true that the early signs are present such as parking Comasina which is the first example of intermodality between public transport and bicycles. but much has to be done, such as connecting and building parking lots at major train stations, of paramount importance. with institutional bodies, universities, hospitals, residential areas, to make sure that citizens use the bicycle serving infrastructure, a good level and at strategic locations. In fact, the goal should be that in a hundred meters you can reach the nearest parking for bicycles, but the road is still long but the first preliminary projects there.

Then increase road safety, diminuzione the vehicular speed, and cycling infrastructure separate and secure for the citizens will lead to success even in the context of the city of Milan. We do that in the collective bicycle is not only a means of enjoyment for leisure but likely to be in the same car should be the goal of the municipality for travel everyday.

“Our position as one of the top cycling cities of the world comes with a responsibility. Even though our cycling culture has become as integral a part of the Copenhagen story as the Little Mermaid we mustn’t merely take it for granted. If we wish to remain in the premier league we must continue to invest. The majority of Copenhageners feel that cycling culture enhances the city’s life and atmosphere; it is an integral part of the Copenhagen we all know and love. This is why we must provide a bicycle-friendly city for all, so that Copenhageners will continue to love cycling far into the future.”

Morten Kabell, Mayor, Technical and
Environmental Administration



9. BIBLIOGRAPHY AND WEBSITES

Andersen L.B, Schnohr P, Schroll M, Hein HO. All-cause mortality associated with physical activity during leisure time, work, sports, and cycling to work. Arch Intern Med (2000):160:11.:1621-1628

Collection of Cycle Concepts 2012, Cycling Embassy of Denmark

Copenhagen City of Cyclists, The Bicycle Account 2014, 2015, City of Copenhagen, Technical and Environmental Administration, Mobility and Urban Space

Copenhagen Climate Adaptation Plan , Municipality of Copenhagen

Cycling and urban travel choice, Yim Ling Proceedings of Velo-city '99

CROW (1998): Recommendations for traffic provisions in built-up areas, Record 15, Holland.

COWI (2008): Samfundsøkonomiske analyser af cykeltiltag - metode og cases.

Cycle Policy 2002-2012 , City of Copenhagen, Building and Construction Administration, Roads and Parks Department

E-city Digital Networks and cities of the future, Paolo Fusero

Focus on cycling , Copenhagen Guidelines for the Design of Road Projects , December 2013, City of Copenhagen , Technical and Environmental Administration Traffic Department. The Bicycle Programme

Good, Better, Best, The City of Copenhagen's Bicycle Strategy 2011-2025, City of Copenhagen

Manuale per la Realizzazione delle piste ciclabili, Regione Veneto

Pianificare le reti ciclabili territoriali , Maurizio Tira Michele Zazzi , Gangemi

Piste ciclabili Manuale di progettazione e moderazione del traffico , Mauro Cozzi , Silvia Ghiacci Piano mobilità sostenibile Milano

Kevin Mayne, CTC The UK Cyclist's Organisation (2010): The process of evaluating English Cycling cities

Mapping bicyclists' experiences in Copenhagen Bernhard Snizek , Thomas Alexander Sick Nielsen

Pgt Milano

Rietveld, Piet, V. Daniel (2004): Determinants of bicycle use: do municipal policies matter? Transportation Research Part A no. 38 p.531–550

Smith, Robert L. og Walsh, Thomas (1988): Safety Impacts of Bicycle Lanes, Transportation Research Record 1168, USA.

Taylor, David C. og Mackie, Archie M. (1996): Review of traffic calming schemes in 20 mph zones, Report 215, Transport Research Laboratory, England.

The Waste and the Backyard, The Creation of Waste Facilities: Success Stories in Six European Countries, Bruno Dente, Paolo Fareri, Josee Ligteringen

Velocity Architecture for bikes, Prestel, Glynth Gavin

www.smart-cities.eu

www.visitcopenhagen.com

www.piste-ciclabili.com/comune-milano

www.comune.milano.it

www.senseable.mit.edu

<http://blog.urbanfile.org>

www.denmark.dk

www.copenhagenize.com

www.cittametropolitana.mi.it

www.bikeitalia.it

www.cyclecopenhagen.dk

www.cyclejourneyplanner.tfl.gov.uk

www.cykelsuperstier.dk

www.ecf.com

www.kk.dk/cyklernesby

www.odense.dk