

Designing the

GREEN BRIDGE of Copenhagen

EXECUTIVE SUMMARY

Nicolle Shandrow, Laura Antul, Samee Swartz, *Worcester Polytechnic Institute*

INTRODUCTION

Copenhagen has been struggling with problems related to traffic congestion since the city's expansion following its industrialization. As cars became more popular, subsequent air and noise pollution increased and grew problematic for the health and well-being of the city's inhabitants. Pollution is still a problem today, and current traffic congestion is contributing to global climate change via the amount of greenhouse gases entering the atmosphere. Climate change is a global phenomenon associated with changes in the frequency and severity of weather conditions such as drought and flooding. In 2009, the Copenhagen government launched the Carbon Neutral Initiative- a comprehensive plan to reduce greenhouse emissions and make Copenhagen the first carbon neutral capital in the world. The importance of this initiative was emphasized when, in 2011, Copenhagen experienced a historic cloudburst which flooded the city causing an estimated 6 Billion DKK (about 1 Billion USD) in damages. To reach carbon neutrality and adapt to the recent changes in weather severity, the city is actively focusing on decreasing car usage, finding greener ways to handle stormwater, and increasing their quantity of green spaces, all while maintaining or improving the city's livability.

"[This] project is a very good vision of what we could do in Copenhagen if we were free to make the city more livable in every way."

— Morten Kabell, Mayor of
Technical and Environmental Affairs



sponsored by

MILJØPUNKT  AMAGER

blue_quartz (2009). Image was altered for this project. Retrieved April 27, 2015, from commons.wikimedia.org/wiki/File:Langebro_from_above.jpg

MILJØPUNKT AMAGER

Our sponsor, Miljøpunkt Amager, is an environmental non-profit organization dedicated to increasing awareness for environmental concerns and promoting greener living. One of their initiatives is to encourage traffic reduction in favor of alternative forms of transportation, such as biking or public transit. Currently in the city there are many proposals for traffic reduction including creating tunnels underneath the city, congestion pricing, and ways to increase public transit usage. These options are being discussed by city officials, however there is a great deal of controversy about the costs and benefits of each option. Our sponsor is working, in cooperation with other local Miljøpunkt organizations, to create a large green strip proposal, as shown in Figure 1, which runs from the northern area of Nørrebro, down the busy H.C. Andersens Boulevard, across Langebro (Long Bridge), and down Amager Boulevard. Once complete, this large scale conceptualization will be used to incentivize politicians and locals to reduce both the amount of traffic and the space designated to it.

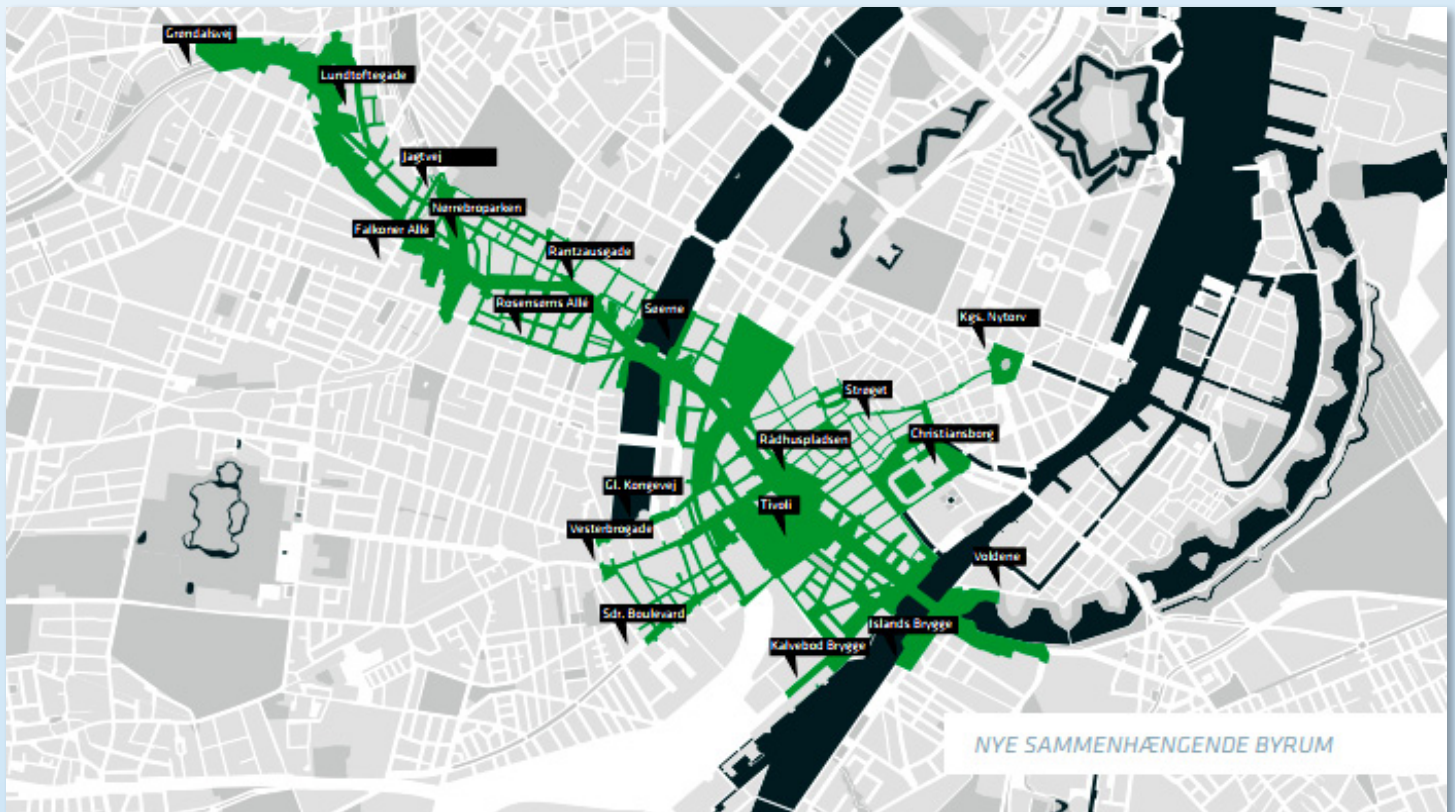


Figure 1: Conceptualization of a greater green strip through Copenhagen. Jensen, A. & Tredje Natur (2014). *Indre by Revitalisering. Københavns Hjerte Fra Bispeengen Til Amager.*

GREENING LANGEBRO

This project focused on assisting Miljøpunkt Amager by analyzing the public opinion and preferences of green spaces in order to create a design proposal for the greening of Langebro. To accomplish this goal we completed the following objectives:

1. Understand the impacts and challenges of implementing green spaces in Copenhagen
2. Assess public opinion and preferences of green spaces on Langebro
3. Create green space surface designs for Langebro based on local and municipality preferences while integrating with the design for Amager Boulevard
4. Assist Miljøpunkt Amager in promoting a green strip through Copenhagen by creating a webpage with design renderings and information about the project

The first two objectives, were completed through interviews and surveys with political figures, experts in relevant fields, and locals around the site location. The purpose of speaking with city officials and employees of the municipality was to understand the political opinions and current plans for reducing traffic and greening Copenhagen. Experts in architecture, civil engineering, botany, and green space design were interviewed to better understand logistical and technical intricacies of designing for a bridge. Finally, it was vital to talk with members of the community to better understand what aspects and features of green spaces would be preferred for a green space on Langebro. After analyzing this information, design proposals were created for consultation with Simone Hochreiter, an architect working with Miljøpunkt Nørrebro. From here surface designs were finalized and created using the computer program Revit.

LANGEBRO FINAL DESIGN PROPOSAL

The final design utilized a winding road, as shown in Figure 2, which allows for the creation of three distinct pocket parks and two side parks. The street will consist of two car lanes (one in each direction), two bike lanes, and two pedestrian lanes.

This design integrates a barrier of bushes and trees between the car lanes and the green areas (including the bikers) in order to help reduce air and noise pollution from traffic and promote the overall green aesthetics of the location. Below, we will detail the designs for each of the three parks, labeled A, B, and C in Figure 2.

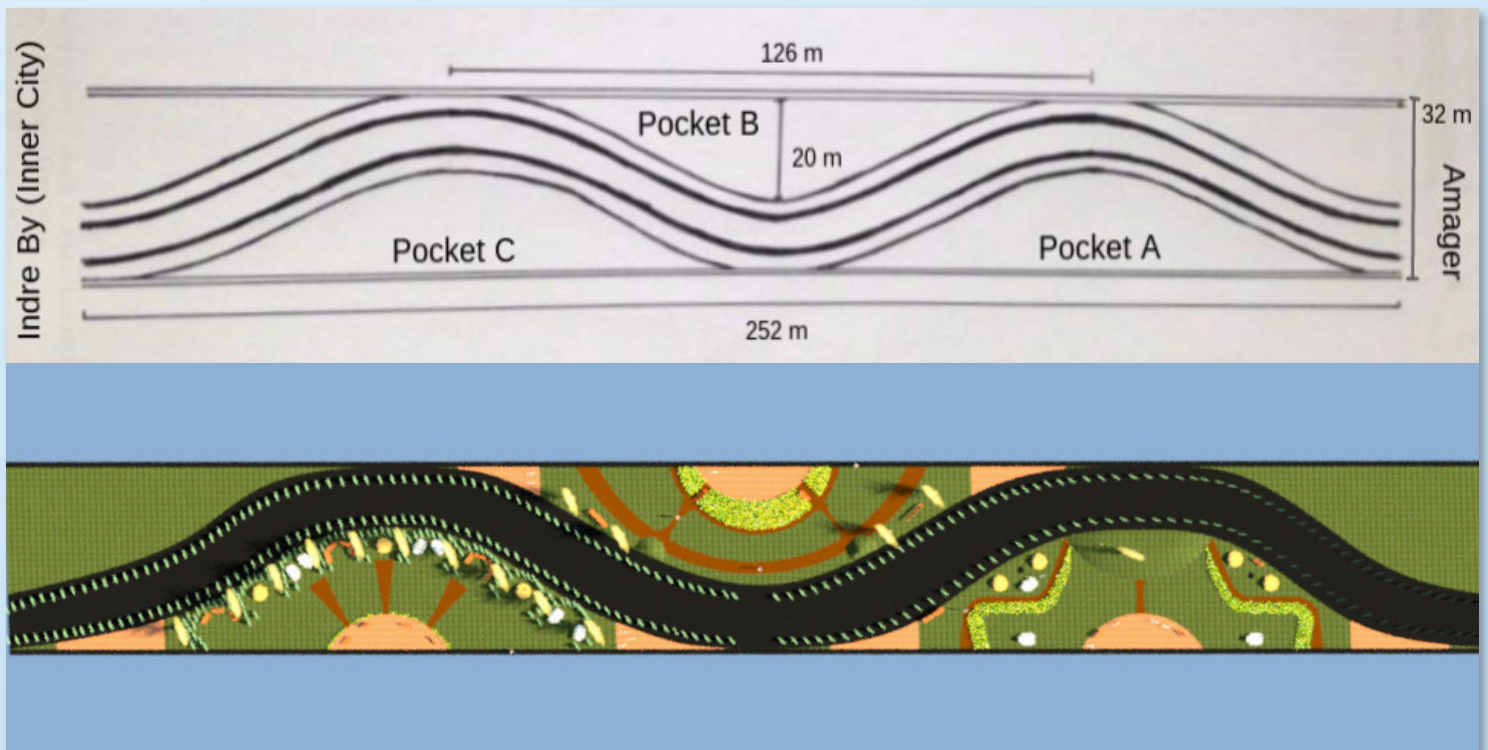


Figure 2: The design and dimensions of the road and walkways on Langebro from an aerial view.

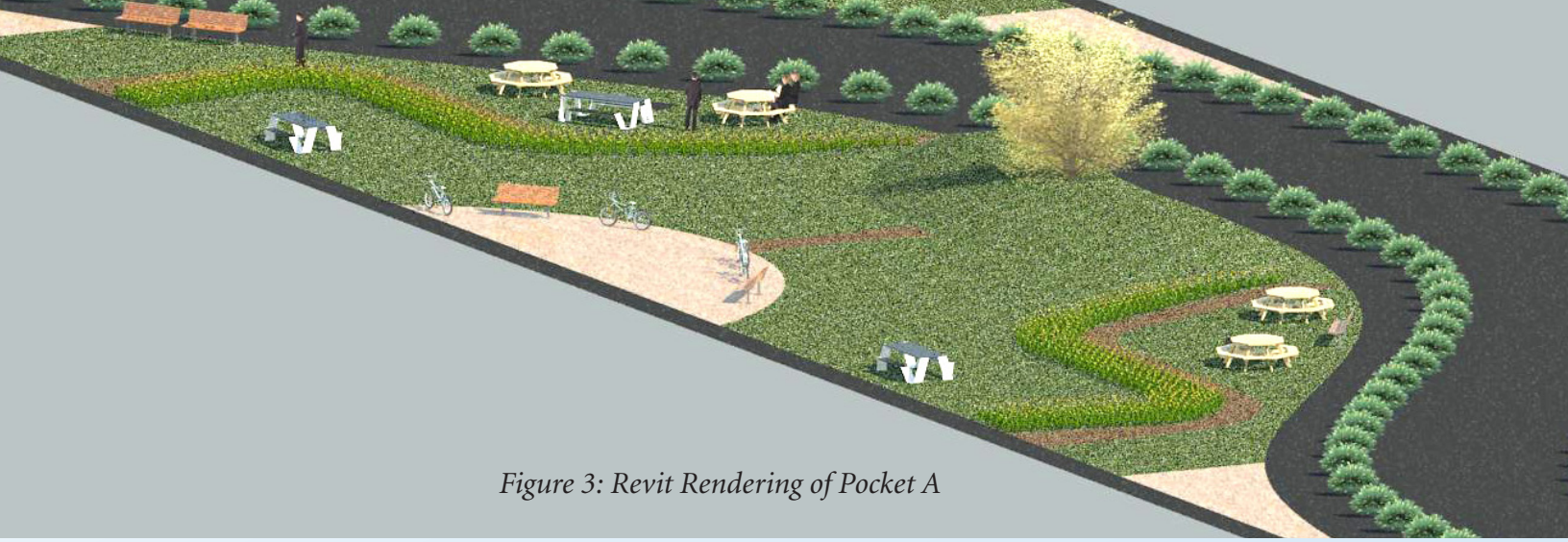


Figure 3: Revit Rendering of Pocket A

POCKET A

The first pocket is designed to be the social hub of the Langebro green strip. Survey results indicated a high desire for a communal area for socialization, therefore, Pocket A is designed with a lot of sitting areas, like picnic tables, long benches, and open expanses of grass (Figure 3). To encourage people to barbeque without damaging the grass, we also integrated specific square meter areas on the ground, made of pavement or stone, for people to place their grills. For this area, minimal florals were incorporated in favor of mixtures of green shrubs, bushes, and grasses. This will still give the area a good aesthetic, however large areas of florals could detract from the overall spacious design and likely be less appropriate in an area expecting high volumes of people.

This pocket is positioned closest to Amager and the Islands Brygge green strip, adjacent to the popular waterfront socialization area, the 'Harbor Bath'. By placing this pocket close to these areas, we hope to encourage people to use the space. We also positioned this area, as previously mentioned, so that it will receive the most sun in the afternoon hours, a time when Danes are frequently out sunbathing.



Figure 4: Revit Rendering of Pocket B

POCKET B

The surveys conducted on green space preferences also showed an overwhelming interest in biodiversity, so the second pocket is designed as a botanical garden. It is dedicated to highlighting a variety of vegetation and aesthetics including Danish flowers, bushes, grasses, and trees. We designed the entire space to be lined in green elements, with three prominent flowerbeds in the center of pocket. The dirt or gravel paths run through and around the pocket in an organic way. To facilitate relaxation, much of the area will be covered in grass and will also contain two raised mounds, about a meter high, with a tree on top. The space will also have benches facing different directions to allow for a variety of views.

This pocket was chosen for the center facing east, because it was created as an environment for appreciating biodiversity so afternoon sun was less important.



Figure 5: Revit Rendering of Pocket C

POCKET C

The third pocket was designed to accommodate the people from our survey who favored using a green space as an area to quietly relax. We designed it in a way that would use greenery to promote a feeling of privacy and security. The small semi-circled areas with benches and tables, seen on the rendering, are lined with small shrubbery and trees. This was designed to provide a feeling of being surrounded by nature and a pseudo-privacy without impeding the view into or out of the spaces.

This pocket, like Pocket A, is positioned to receive the afternoon sun but will be closer to the inner city; the location of commercial buildings and the Royal Library. The hope for this design is that it will encourage people in the nearby area to use it for small meetings and lunch outings.

LIMITATIONS AND FUTURE WORK

Significant limitations to the design included the inaccessible building restrictions on Langebro. Even after research and interviews with various locals and city officials, we were unable to get a definite understanding of which parts of the bridge were protected and how strictly. As a result, the design was limited to the bridge's surface, presumably the area with the least likelihood of protections. If more concrete answers could be found as to the extent and permanence of the protections, more radical designs could be made to the green space proposal for Langebro.

We also suggest that further research be done to get the public's opinion on the final design renderings. Although we conducted interviews with a variety of locals, and incorporated many interests and suggestions, we did not have the resources to run a focus group to gather public feedback after Langebro's green design was finished. As a result, we recommend doing further analysis to better understand how well the design will be received by the public and city officials.

A second, separate, analysis could be done to determine the overall technical feasibility of the design. We created a proposal that we believe to be realistic and achievable, however this should be confirmed by those with more expertise in environmental and civil engineering. A feasibility analysis of the Langebro design could also be completed and could include how difficult, both physically and politically, it would be to gather funding for the project, create a curved road through the area, and add soil and vegetation.

CONCLUSION

This Langebro design was created as a piece of a larger green strip from Nørrebro to Amager. Once all the pieces have been designed and combined, there will be a clear, obtainable, incentive to reduce traffic and car ownership across the city. This design could help promote healthier living and aid in moving forward with the green culture of Copenhagen. It is our hope that, upon construction, the winding road and pocket parks across the iconic Langebro will become a popular and prominent landmark of Copenhagen that draws locals and visitors to appreciate the potential of green spaces in the city.