

Copenhagen Cloudburst Plan

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City Population	1,378,649
City Area	342.2 km ²
City GDP	7.2 billion USD
Climate Zone	Cfb (temperate oceanic)
ARC3.3 Linkage	Nature-Based Solutions (NbS)

heavy rain/cloudbursts and increased stormwater. The other perspectives that are needed for a successful project are improving the characteristics of the city, developing the uniqueness of the city, creating new green public spaces and improving flora and fauna, while also strengthening the public life. This is the declared goal for The Municipality of Copenhagen: to make the public spaces better, even when it is not raining.

Brief History and Context. The basic philosophy behind the Climate Adaptation Plan is to make adaptation a precondition in the future for urban development in the city. Resilience must be a part of all the work that will be undertaken – and not just from a negative, problem fixated point of view. The idea is to look for synergies and possibilities and develop solutions that will improve the recreational qualities of the city – and the quality of life for Copenhageners.

Introduction. Cities today are facing a number of challenges: Growing population, social inequity, climate change, – and one of the latest being the global COVID-19 pandemic. Copenhagen – the capital of Denmark – is no exception to dealing with the impacts of these challenges. Even though Denmark in general has been able to manage the pandemic it has also led to significant changes in citizens’ behaviour – and therefore an increased focus on how we plan in the city. Two hard lockdowns with closed shops, cafés, restaurants and bars led to an increased use of urban space in the city.

This case study will demonstrate how it is possible, through planning, to alleviate impacts from increased risk of flooding due to climate change, following heavy rain, called cloudbursts. It is possible to also create opportunities that can be of use in other situations, in this case a pandemic. The Cloudburst Management Plan of Copenhagen will be analyzed on how this can be used to create a more equal and liveable city, especially during pandemic times.

The Municipality of Copenhagen is committed to see the need for climate adaptation as an opportunity to make Copenhagen an even greener, more sustainable and robust city for the future everyday lives of the people living in Copenhagen (The Cloudburst Plan). To meet this goal, it is necessary to work with integrated city planning, where climate adaptation is one of many solution s, when solving the challenge of uncontrolled flooding due to

Copenhagen started the implementation of its cloudburst management plan in 2015. The plan aims to protect the city from 100-year rain events by creating a stormwater management system to supplement the existing sewer system. The plan covers the entire city – and the implementation period is estimated to be around 20 years. The planning was initiated in 2011 by the approval of the Climate Adaptation plan for Copenhagen – followed up by the Cloudburst Management Plan in 2012. This was further detailed in the next two years – leading up to a final implementation plan in 2015. The plan is reassessed on a regular basis due to the dynamic nature of both urban development and climate change. The reassessments are handled by smaller scale master plans with strong focuses on urban space improvement potential and hydraulic measures and capacity.

The main approach of the plan is managing stormwater on the surface wherever possible – only using underground solutions where it is more economical – or the only possibility. This approach allows the city to use climate adaptation measures to improve the urban landscape, especially by adding more green to the city and upgrading urban space in the city.

A number of projects are currently being implemented, such as the Soul of Norrebro (see image 1). The selection of the locations has so far been to choose the more socially vulnerable parts of the city using the climate change adaptation projects as an opportunity to upgrade neighbourhoods that have



Figure 1. *The Soul of Norrebro project for climate adaptation and cloudburst management*

previously been lacking attention and public investment.

Governance structure of the implementation of the plan. The implementation of the cloudburst management plan is carried out in close collaboration with the city of Copenhagen and the publicly owned Utility – Greater Copenhagen Utility (shortened in Danish: HOFOR).

Responsibility for the plan lies with the Technical and Environmental Administration in the City Administration. They do the main part of the planning, design, and construction. The utility only carries out work on underground solutions.

To facilitate the work between the different stakeholders, a joint organisation has been created where daily collaboration is conducted between the utility and the city administration. For major decisions, there is a joint steering committee that can decide on changes in the plan that may have larger, general consequences.

The work is financed primarily through the water fees paid by the citizens and businesses in the city (based on their water consumption). Only where projects add features other than hydraulics (i.e., green spaces, playgrounds, etc.) is it funded by the city through taxes.

The project's aim is not only to solve the issue of climate change (e.g. the hydrological or biological cycles of a project such as the Soul of Norrebro; see image 2), but it is also important that it contributes to the positive development of the city.

To do this, it is necessary to involve the surrounding stakeholders (the social cycle of projects' co-creation). When this is done, the local boards and citizens engage themselves in developing the city. The municipality shares its considerations about the project at an early stage. This is an opportunity for both the local boards and citizens, as they are challenged by outsiders' views

on priorities and considerations and the possibility for capacity building for the engaged people through a thorough dialogue. This dialogue often leads to new solutions, adjusted priorities, and even more know-how to the Copenhageners about developing the city with responsibility and to a diverse set of needs and goals. In the end, it is a political decision on how the project will be developed. There are public meetings, and in most cases, a group of citizens and local stakeholders follow the project closely – also getting involved in the tough decisions if budget cuts are needed.

This type of local engagement creates a sense of ownership to the projects that continues after it has been completed. Often, citizens form local groups that look after the areas – or work on local activities – like markets, dancing, and other activities. These activities create more tightly knit communities – something that has also been important during the pandemic, where the access to social activities was limited. If you know people in your neighbourhood, however, and meet them on a walk then it also creates some social cohesion and a feeling of belonging. In Copenhagen, a growing number of households are single person households (more than a fourth of citizens in Copenhagen live in a single person household) – and this group was the most socially challenged during the pandemic.

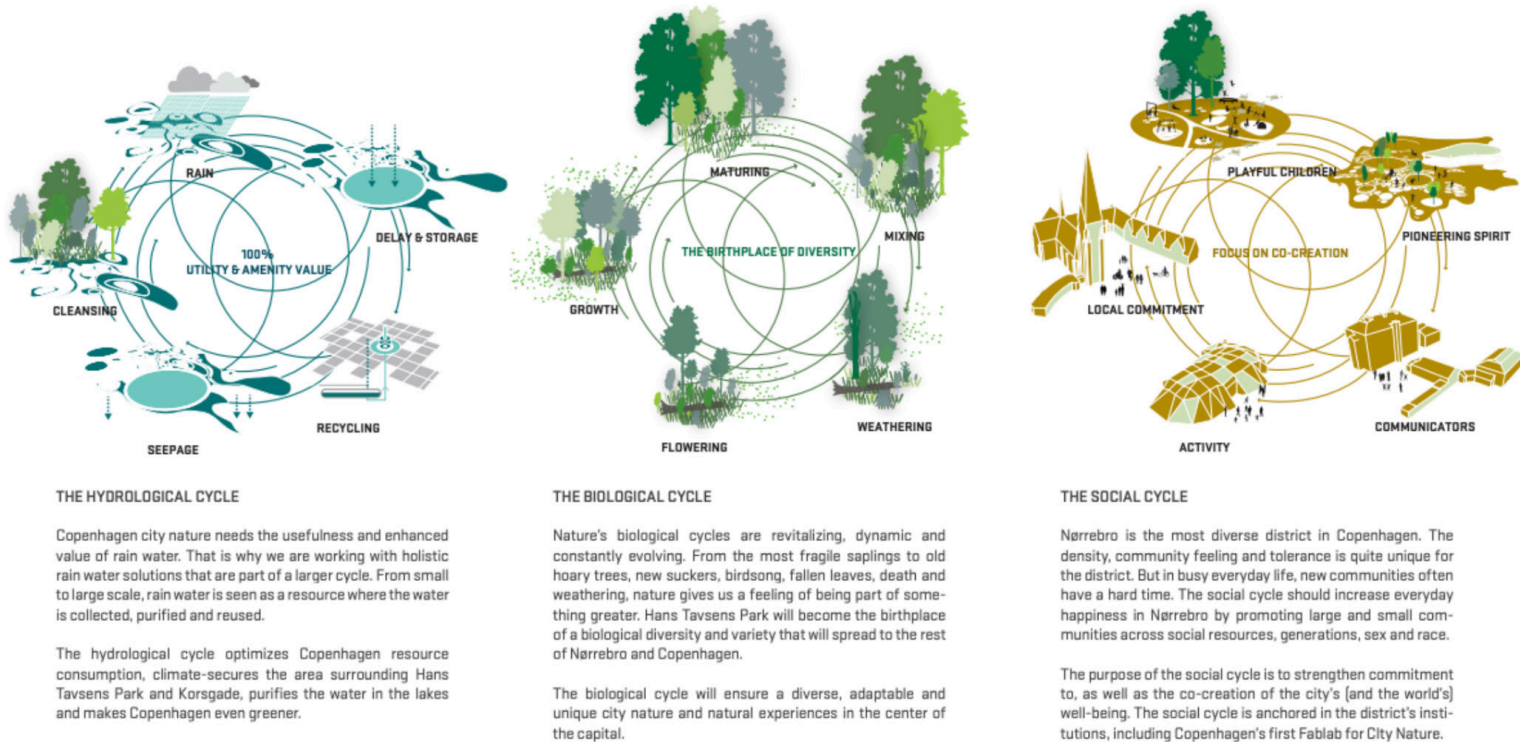


Figure 2. Tactical approach: *The Soul of Nørrebro cycles*

Analysis, Evaluation, and Implementation. From the beginning, the concept of the cloudburst management plan was to focus strongly on the co-benefits of the adaptation process. It was important for the city that this would not be a technical fix – but also have a strong emphasis on short-term benefits for the citizens. The city identified the following co-benefits:

- Increasing and improving recreational spaces in the city
- Meeting places – to also increase social resilience
- Increasing biodiversity in the city
- Health
- Improving micro-climate (UHI)
- Accessibility and safety
- Economic activity

At the time of the approval of the plan nobody had imagined that 5 years later Denmark would be facing an almost total lockdown with people working from home, and being advised not to have guests, etc. With all indoor public places being closed, the citizens turned to the outdoor open spaces. People would have walking groups, they would be biking, and meeting on the harbour front to drink a cup of coffee. Suddenly there was a pressure on public spaces – and especially green spaces in the city. In some places, the city introduced one way walking so that people could avoid close contact face to face or have other measures to avoid them being too crowded.

It became very clear that the city really needed more green space.

The cloudburst management plan delivers exactly that. By creating new green spaces – transforming hard paved surfaces to pocket parks with possibility for recreation, upgrading existing green spaces that makes them more attractive for public use, the cloudburst management plan increases the options for citizens to meet in a green space close to their home.

Future Implementation and Concluding Thoughts. The cloudburst management plan in Copenhagen has a long implementation period. For the next 20 years the projects will slowly but surely change the city by creating new spaces for people to meet and opportunities for physical activities, as well as involving the citizens in the development of their city. At the same time, the city will slowly become more resilient to future climate change – and hopefully also more resilient to future social challenges.

References

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Additional Data

- **Population Density:** 4,031 people/km²
 - **Gross National Income (GNI):** 73,340 USD (High Income)
 - **Gini Coefficient:** 34.9
 - **Human Development Index (HDI):** 0.952 (Very High)
 - **Type of Climate Intervention:** Adaptation
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