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The Water Hub

Celebrating diversity through water and providing a water infrastructure for Bispebjerg, Copenhagen

Keywords: Public Condenser, Water, Infrastructure, Accessibility, Cultural Use, Rainwater Harvesting, Common ground, Bispebjerg, Nordvest, Copenhagen

Public Building Graduation Studio
Research Plan

Contents

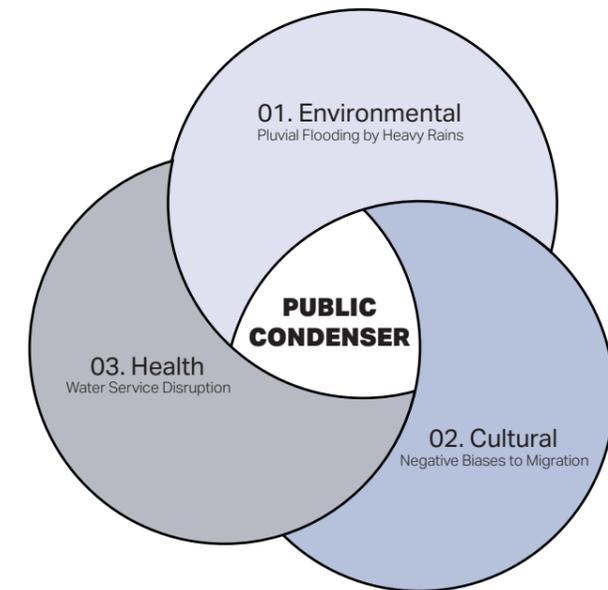
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Introduction

“Water, as a common ground, can tackle these problems on environmental, cultural and health levels”

In the last two decades, Copenhagen and its city authorities have been experiencing problems with pluvial flooding, negative biases to migrants and water service disruption. These problem statements are touching three different levels: environmental, cultural and health. For the Public Building graduation studio, the assignment is to design a Public Condenser. The site is located in Nordvest, a district 5–8 km Northwest from Copenhagen’s city center with approximately 56 000 residents (Copenhagen Municipality, 2018).

It features repurposed and in-use (post-)industrial buildings and social housing, much of it built between the 1930s and the 1960s (Palm Larsen, 2000). Focusing on Nordvest, all three environmental, cultural and health problems are extremely applicable. In the following pages, these problem statements will be in depth discussed. However, these problems all share a unique relation with water. Architecture can tackle these three problems on environmental, cultural and health levels through water as common theme.



Pluvial Flooding

Environmental Problem Statement

Copenhagen

In the summer of 2011, Copenhagen faced the most devastating cloudburst in its history. This cloudburst produced over 200 mm of rainfall within two hours, causing approximately 1,6 billion euros in damage. It was the most expensive natural disaster in Europe that year (State of Green, 2023). The event caused significant damage and overwhelmed Copenhagen in a way that city authorities weren't prepared for, but it also inspired a shift in how the city manages rainwater nowadays.

Copenhagen's Cloudburst Management Plan, introduced in 2012, is a comprehensive strategy aimed at tackling the growing threat of extreme rainfall and urban flooding. Its main objective is to minimize the effects of pluvial flooding, which results from heavy rainfalls that are expected to become more frequent due to climate change (Cloudburst Initiative Copenhagen, n.d.).

This plan consists of traditional measures to lead rainwater away through an expansion of the sewer network, but also prioritizes 300 surface-level projects that are spread over seven different local catchments. All these 300 projects have a minimum implementation timeline of 20 years and are prioritized based on where the risks is highest (State of Green, 2023).

In Figure 1, the water drainage of this Copenhagen's Cloudburst Management Plan is visualized. The overall principles of the strategy are to retain rainwater in the higher elevated areas, to provide robust and flexible drainage of lower-lying areas and to focus on waterflows ending in the Øresund (Sala, n.d.).

Nordvest

As mentioned before, the surface-level solutions are prioritized based on where the risks are highest (State of Green, 2023). Looking at our site, Nordvest is a

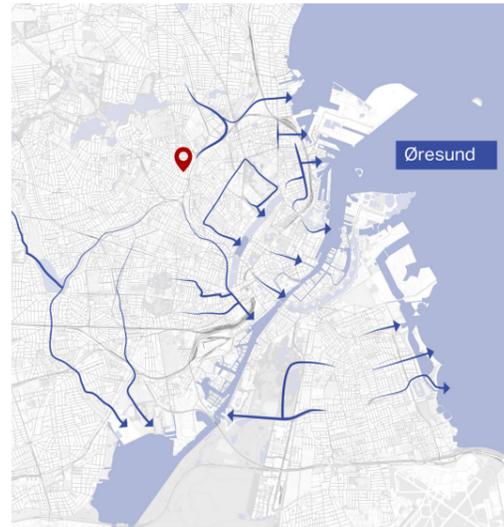


Figure 1: Water Drainage Management in Copenhagen as one of the implementations of the Copenhagen's Cloudburst Management Plan (Sala, n.d.)

district located a little higher in elevation than districts such as Vesterbro and Amagerbro. Thus, the implementations in this district were not necessarily prioritized in timelines as the risks were not the highest for flooding.

However, according to Rikke Lequick Larsen, Urban spatial architect and chief consultant at the Copenhagen City Council, "It is even more important to control the flooding before the water goes down, in elevated areas such as Nordvest" (personal communication with Rikke, 2024).

In Figure 2, the current implementations of the Copenhagen's Cloudburst Management in Nordvest are visualized. Nowadays, two surface projects are realized in Nordvest that deal with reducing the impacts of pluvial flooding caused by heavy rains: the Grønningen Nordvest and the Bispebjerg Krematorium. Also, Lersøparken is currently earmarked for development under the Cloudburst Management Plan. Although this renovation will be finalized in 2026, it is proposed that a small lake will be created in the park, acting as a storage basin (Murphy et al., 2019).

However, these current implementations are not located on the site of the plot (see Figure 2).

Also, according to Rikke Lequick Larsen "It is more dense and also harder to get rid of the rain at the plot", "leading to specific flooding problems specifically at the square where Frederiksborgvej and Rentemestervej cross".

Flooding, Water & Architecture

However, this problem can be tackled by architecture, while focusing on one common theme: water. With regard to pluvial flooding by heavy rains, rainwater can be collected and reused by a public condenser. An example of this is the Google Bay View campus in Mountain View, California, designed by Heatherwick Studio and BIG (Figure 3). The campus canopies are built to capture as much rainwater as possible as part of their "water-positive strategy." Downspouts are hidden within columns around each canopy, channeling rainwater into surface ponds. This water is treated on-site, combined with treated wastewater, and used for different purposes (Pintos, 2024).



Figure 3: The Google Bay View campus in Mountain View, California, designed by Heatherwick Studio and BIG - Bjarke Ingels Group (Pintos, 2024)

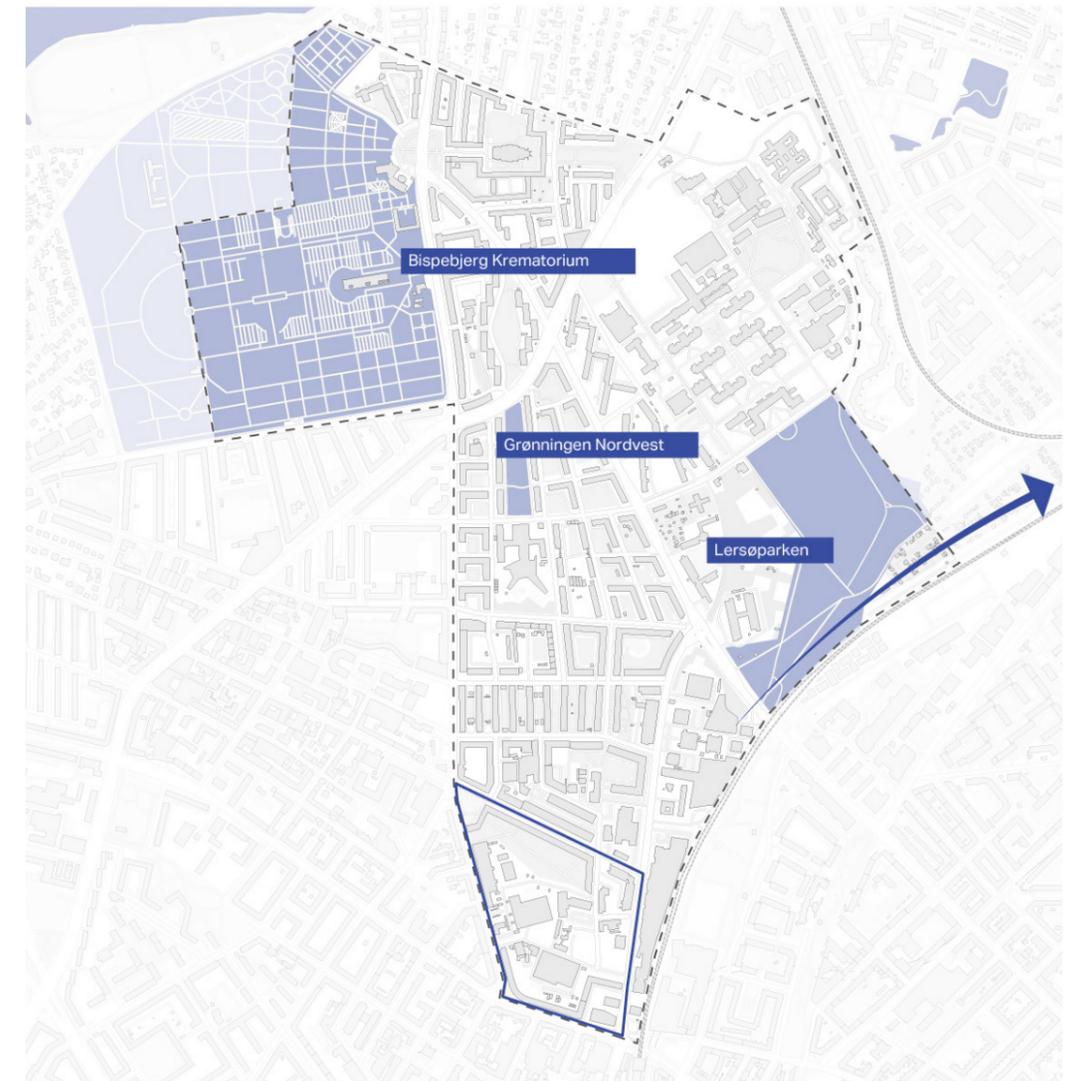


Figure 2: the water drainage management and the surface level projects as current implementations of the Copenhagen's Cloudburst Management in Nordvest (Murphy et al., 2019)

Negative Biases to Migration

Cultural Problem Statement

Copenhagen

Another plan the Danish government introduced was the so-called "Ghetto plan" in 2020, which was renamed the "Parallel Society" policy in 2021. This is a set of laws designed to change neighborhoods that the Danish government calls "ghettos" or "parallel societies" based on the following criteria:

- High percentage of non-Western immigrants;
- High unemployment rates;
- Low income levels;
- Low education levels;
- High crime rates.

If the certain residential area is labeled as a "ghetto" or "parallel society" based on these criteria, the plan for this area includes demolishing and rebuilding certain building and forcing residents to move. However, it is important to mention that this plan has received a lot of criticism, both in Denmark and abroad. Critics argue that it is discriminatory and potentially racist in its targeting of non-Western immigrant communities (Denmark: UN Human Rights Experts Urge Halt in Sale of "ghetto" Buildings, 2020).

Targeting non-Western immigrants as one of these set of laws to define a "ghetto", can be explained by negative biases of the Danes towards migrants. Research shows that three in four Danes believe that integration is far less successful than facts show. There exists a huge gap between people's impressions of reality and the reality itself regardless of age, gender, education level, geography and political stance (Denmark: Majority Strongly Overestimates Integration Problems, 2024).

Moreover, The Danish Institute for Human Rights recently released a report that highlights discrimination and prejudice faced by 29,000 individuals with roots in non-European (or "non-

Western," as defined in Denmark) countries, who were either born in Denmark or arrived as children. These individuals revealed that 84% of ethnic minorities in Denmark have personally experienced illegal discrimination (Denmark: New Report Highlights Discrimination Against Those With an Ethnic Minority Background, 2023).

Nordvest

In the quarter analysis of Bispeparken about the upcoming area renewal by the Copenhagen City Council (2020), it is mentioned that over a quarter of the residents in the Bispeparken have a non-Western background, which is significantly more than in Copenhagen as a whole, where it is approximately 15%. In Bispeparken, 57.9% of the residents have a non-Western background, almost 8 percentage points above the limit of 50%, so an area listed as a so-called 'ghetto' area (Teknik- og Miljøforvaltningen, 2020). Nordvest is not only ethnically diverse but is also experiencing increasing gentrification (Lapina, 2017). Gentrification frequently leads to significant and often unnecessary cultural displacement (NCRC, 2019). Residents of areas like Nordvest, which include working-class, immigrant, and



Figure 4: A housing estate in Mjølnerparken, Copenhagen – the district is on the Danish government's 'ghetto list'. Photograph: Andrew Kelly/Reuters

refugee communities, feel that the "Ghetto" plan is meant to isolate and scatter them. The term "ghetto" has negative meanings associated with crime, unemployment, and problems, causing pain for residents who believe the plan further stigmatizes them

without improving their situation. Many people living in these "ghettos" are feeling angry and betrayed (Versi, 2020).

Culture, Water & Architecture

However, this problem can be tackled by architecture, while focusing on one common theme: water. With regard to negative biases to migration, it is important to celebrate water as the common ground between different cultural groups. The cultural use of water is often celebrated in architecture over the whole world. An example of this is the Mausoleum of Moulay Idris in Morocco, where Islamic women can get water for ablutions (see Figure 6).



Figure 6: Women getting water for ablutions, Mausoleum of Moulay Idris II, Fes, Morocco, Photograph courtesy of Charles O. Cecil / Alamy Stock Photo



Figure 5: Percentages of residents with a non-Western background in Bispeparken and Bispevarteret (Teknik- og Miljøforvaltningen, 2020)

Service Disruption

Health Problem Statement

Copenhagen

This year, a study revealed that more than half of Denmark's drinking water resources are contaminated with pesticides and other toxins. The investigation, conducted by Danske Regioner, also found that one in ten water sources contains levels of dangerous substances exceeding safety standards. "The contamination of Danish drinking water has reached a critical point," the organization stated in a press release. It is also highlighting the threat to the nation's water resources. "Pollution is now so extensive that it is causing a resource problem," said Mads Duedahl, vice chairperson of Danske Regioner (Euronews, 2024).

In Denmark, all drinking water is produced from groundwater. Groundwater that is suitable for production of drinking water can be extracted from almost everywhere in Denmark. This makes groundwater a very important resource in Denmark, but also a very vulnerable resource when sites are polluted (Skræm, n.d.). However, as visualized in Figure 6 in blue, there are several polluted sites in Copenhagen because of its industrial harbour history (Overblik: Her Ligger 61 Farlige Giftgrunde Nær Hovedstaden, n.d.).

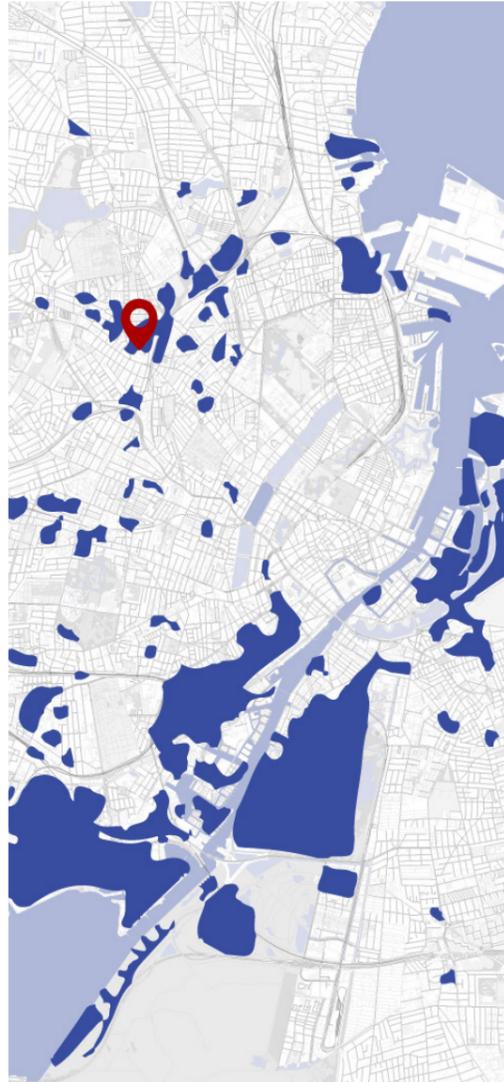


Figure 7: Polluted sites in Copenhagen that serve for groundwater (Overblik: Her Ligger 61 Farlige Giftgrunde Nær Hovedstaden, n.d.)

Nordvest

As visualised in Figure 7, Nordvest also deals with the problem of polluted sites, which are used for drinking water produced from groundwater. Above this, Nordvest is an older urban area with several buildings that do not meet today's standards for energy consumption. An example of this, is that there are some properties in the area without bathrooms. In Figure 8, all residential places are mapped which are currently lacking either a bath or a toilet, or both (Teknik- og Miljøforvaltningen, 2020).

Accessibility, Water & Architecture

However, these problems can be tackled by architecture, while focusing on one common theme: water. With regard to service disruption, providing an accessible water infrastructure can overcome health problems. An example is the Kuwait Water Towers (see Figure 9), designed by the Danish designer named Malene Bjørn. These buildings store water at a certain height from the ground and provide a water infrastructure to the area (Hindelang, 2021).



Figure 8: Residential places in the neighborhood of Nordvest that are currently lacking either a bath or a toilet, or both (Teknik- og Miljøforvaltningen, 2020)



Figure 3: These water tanks, known as the Kuwait Water Towers, store water at a certain height from the ground and provide residences in the area (Hindelang, 2021)

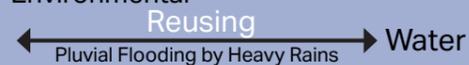
Research Question & Research Aim

Research Question

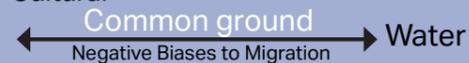
As mentioned before, these problems on environmental, cultural and health levels can be tackled by architecture, while focusing on one common theme: water. With regard to pluvial flooding, rainwater can be collected and reused by a public condenser. Moreover, with regard to negative biases to migration, it is important to celebrate water as the common ground between different cultural groups. Lastly, with regard to service disruption, providing a new water infrastructure can encourage water accessibility. So, my research question will be the following:

“How can a public condenser celebrate cultural variety through water and at the same time provide a water infrastructure for the neighborhood in Nordvest, Copenhagen?”

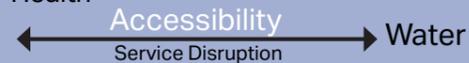
1. Environmental



2. Cultural



3. Health



Sub questions

This research question will be answered by focusing on all the three issues (environmental, cultural and health) and answering the following sub questions:

1. How can rainwater be reused through design in architecture?
2. How do different cultures use water as a common ground in architecture?
3. How can architecture provide water accessibility to address neighborhood issues?

Next to this, it will include on more general sub question on public architecture and climate, integration and health, which will be the following:

4. How can public architecture address climate, integration, and health issues in general?

Research Aim

The overall goal of this project is to design a Public Condenser connected through water. A place where people can identify themselves through water, a place that connects people by water and a place that gives accessibility to water as valuable source of life. It will address a more pragmatic side of water by providing a water infrastructure, but it will also address the more symbolic and cultural side of water by creating a waterscape.

Answering these sub questions and eventually the main research question, will give guidelines how to eventually achieve this design goal.

“A place where people can identify themselves through water, a place that connects people by water and a place that gives accessibility to water as valuable source of life”

Methodology

“The process of designing and creating is both a means of exploring research questions and a way to produce insights”

This proposal is a combination between quantitative (literature review) and qualitative (case study examples) research, leading to a multi-method approach. Above this, the research that I am conducting is also defined by my studio’s approach: “research by design”.

Literature Review

The literature review establishes a theoretical foundation for this research. Sources include peer-reviewed journal articles, seminal books, and recent reports, with a focus on works that address how rainwater can be reused through design, how different cultures use water in architecture, and how architecture can provide water accessibility. Moreover, reviewing literature gives this research a broader academic context by highlighting theoretical frameworks and relevant concepts for these topics. This will also help me selecting case studies and formulating the interview questions.

Literature is found by identifying sources from databases such as JSTOR, Google Scholar, and TU Delft Catalog, using keywords such as “Architecture AND Rainwater” or “Water AND Culture”.

Case Study Examples

Moreover, this research includes an analysis of selected case studies to bridge the theoretical insights gained from the literature with practical applications. Each case was chosen based on its relevance to the three themes. These case study examples will provide contextual and spatial understanding by analysing design in its environmental and cultural context.

Research by Design

Research by Design is a methodology that goes hand-in-hand with my studio’s approach. In this approach, the process of designing and creating is both a means of exploring research questions and a way to produce insights, rather than just a way to create a final product. This approach is commonly used in fields such as architecture. Also, because of this approach I am currently doing research by design through mapping, diagramming, using ArcGis, etc.

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