

Reflection | April 2025

TRASH INTO TREASURE

Designing a **Circular Public Condenser** in Bispebjerg, Copenhagen

ONE MAN'S TRASH
ANOTHER MAN'S
TREASURE

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Graduation studio 'Public Condenser in Copenhagen'

Architecture and Public Building | TU Delft

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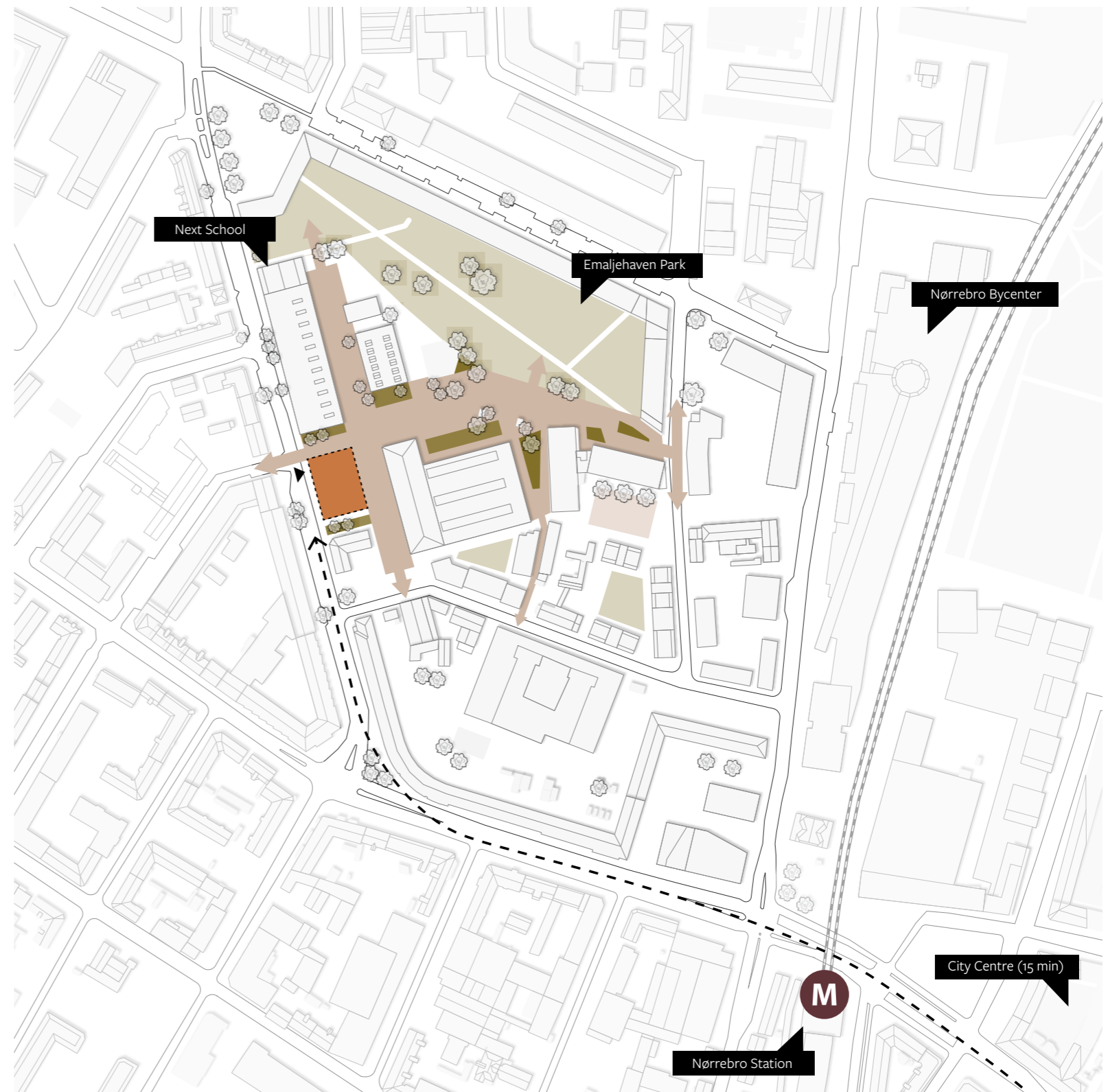
1. Introduction

This graduation project focuses on designing a Circular Public Condenser in Bispebjerg, Copenhagen. Central to the project is the transformation of neighbourhood waste into valuable resources, embodying the principles of circularity. The building aims to promote a more circular neighbourhood by raising awareness about the challenges of waste and by educating people on how to reuse and recycle materials more effectively. Beyond its educational role, the public condenser will function as a meeting place, where entrepreneurs, neighbourhood residents, and students from the Next School can gather.

The project started with a group site analysis and a visit to Bispebjerg. The neighborhood includes a diverse mix of housing and has a slightly younger demographic than other areas of Copenhagen, with more single residents and a relatively high proportion of people from non-Western backgrounds. One element that stood out during the site visit was the presence of the NEXT vocational school, which occupies a significant portion of the design area. The school currently feels quite closed off from the surrounding neighborhood, but has expressed an interest in becoming more open to the public in the future. This potential informed my approach to the design.

Copenhagen is positioning itself as a leader in the circular economy, with policies focused on reducing waste and increasing reuse. However, there is still room to strengthen public understanding and engagement with these ideas. Educational partnerships—such as one with the NEXT school—could help make a circular lifestyle more accessible and practical for a wider audience. This idea became the start of the design brief: a public condenser that serves both as a learning hub and a lively meeting space.

I decided to position the building at the current entrance of the NEXT school, along the busy Frederiksborgvej. This location allows the building to serve both as a new entrance for the school and as a visible marker of the city's circular ambitions. Because the site is relatively small, I had to design a compact building with a limited footprint. To ensure it still makes a statement, I gave it a slightly taller profile than the surrounding structures—making it noticeable without being dominant.



1.1 The design site and location of the Circular Public Condenser

2. Research and Design

How can circularity be integrated into a public condenser to inspire and contribute to a more sustainable neighborhood in Bispebjerg, Copenhagen?

The research for my graduation project investigates existing strategies for circular design. The key challenge and focus of this project was not just designing a building constructed with circular principles, but also creating a public space that encourages sustainable living among its users. To reach this conclusion, I examined initiatives already implemented in Copenhagen aimed at promoting circular lifestyles and identified potential activities and strategies that could further enhance this shift toward sustainability.

How is the shift towards a circular economy being implemented in Copenhagen, and how does it compare to other circular communities globally?

This part of the research focuses on existing strategies within Copenhagen and explores how the public condenser could contribute to these ongoing initiatives. In 2019, Copenhagen launched the Circular Copenhagen platform, focusing on reducing waste and promoting reuse. The city set up 5 large 'Genbrugsstationer' and 12 smaller 'Nærgenbrugsstationer' in neighborhoods for waste sorting. Through the research, I discovered that the Bispebjerg neighborhood lacks a Nærgenbrugsstation, which made me realize the opportunity to design a facility that could better serve the community's recycling needs.

By looking at other communities, such as the village of Kamikatsu in Japan, I saw a the potential to focus on urban symbiosis within Bispebjerg. At the moment, collected waste in Copenhagen is transported to recycling facilities outside the city, and anything that can't be recycled is incinerated for energy. If Copenhagen truly wants to become a circular city, this system needs to change—waste should be reused as a resource locally, within the community itself. Based on this insight, I designed the waste collection hub as the core of the public condenser, connecting it directly to functions that can repurpose the waste into valuable new resources.

To improve accessibility, I designed a new bike route that runs directly through the building, making it easy for residents to drop off their waste by bike. At the center of the Nærgenbrugsstation, I placed a registration point where users can log the materials they bring. From there, the waste is sorted into 12 categories, ready to be reused or recycled.

What programming and functions should the public condenser support to repurpose waste materials in the Bispebjerg neighborhood?

By studying different case studies and stakeholders within Bispebjerg, I started to envision the public condenser as a space where entrepreneurs, residents, and students could come together to collaborate and create. A partnership with local schools, such as the NEXT vocational school, could create a collaborative place focused on circular education. From this idea, the program evolved around three main goals, blending educational and recreational functions: creating (turning neighborhood waste into new resources), connecting (providing shared spaces for social interaction), and discovering (offering spaces for learning and creativity).

To encourage public engagement, I placed key functions like the reuse shop, repair café, and workshop on the ground floor, with large display windows showcasing the building's activities to the neighborhood. The workshop connects directly to the waste hub, making it easy to work with heavy materials and putting the creative reuse of waste on display.

A central atrium with a staircase links the public spaces: the exhibition hall on the first and second floors, the circular living room on the third, and the collective kitchen connected to the rooftop urban farm on the fourth. Offices and research labs are tucked into quieter areas but remain visually connected through reused glass walls.

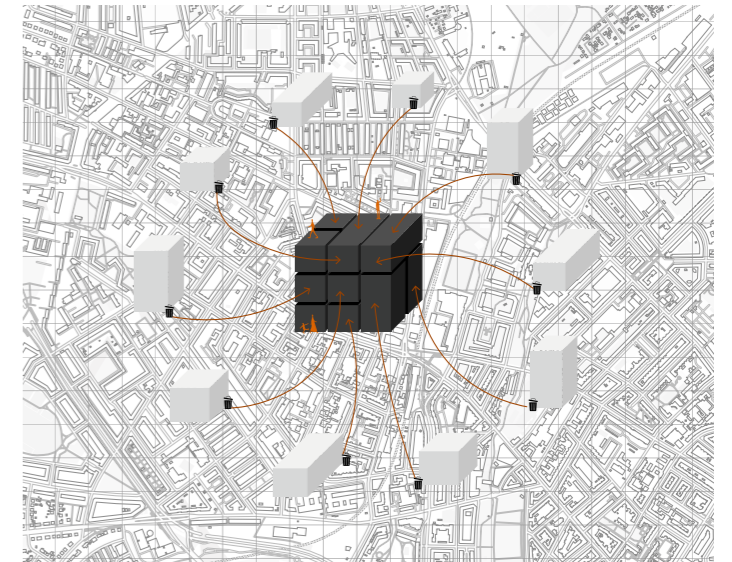
My ultimate goal is for all the programs within the building to be interconnected, forming a circular system where resources and waste flow between activities. This would create an urban symbiosis that reduces waste, promotes local production and consumption, and fosters sustainable jobs. While I believe this is achievable on a smaller scale, I also recognize that some waste will inevitably not be reusable or recyclable within a facility like the public condenser. For this, larger facilities outside the city will likely be needed to handle waste that can't be processed on-site.

What circular design strategies can be applied in the construction of the public condenser to minimize raw material use?

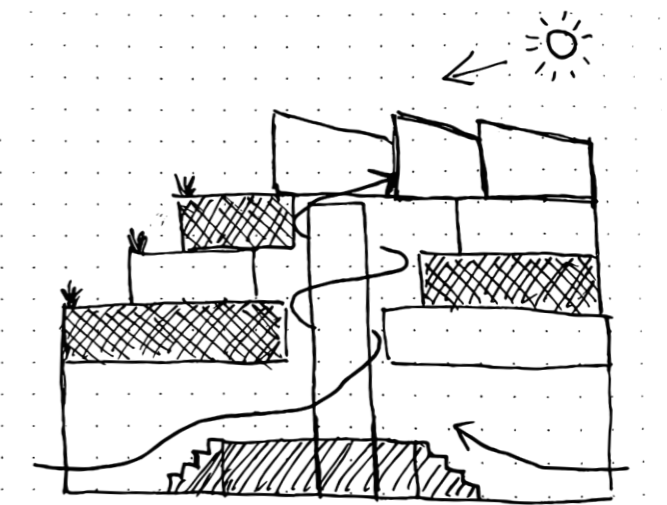
The last part of the research focuses on the construction of the public condenser, exploring circular building strategies. The structure of the public condenser followed five key circular design strategies:

Designing with reused materials to minimise raw material use.

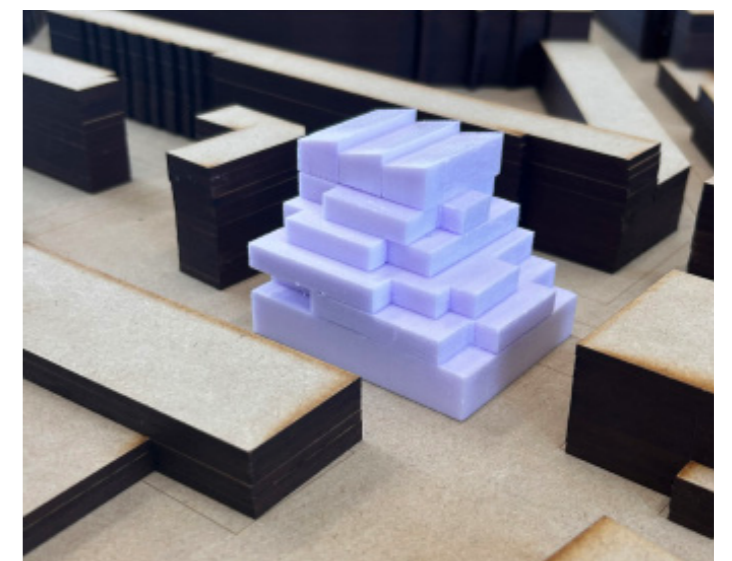
When I began the design process, I initially explored the possibility of repurposing existing buildings or finding structures in Copenhagen set



2.1 Diagram of the initial design concepts for the Public Condenser.



2.2 Sketch illustrating the building's form and internal circulation



2.3 Physical model exploring the building's form developed during the P2 phase

for demolition to serve as donor buildings for the public condenser. Unfortunately, I couldn't find a suitable option. Instead, I focused on mapping the available building materials by researching demolition companies and other facilities in Copenhagen and Denmark that collect and resell construction waste. This led to a list of facade and interior materials, which I incorporated into both the facade design and the interior layout of the building.

For the facade, I designed a rhythmic system based on the materials I sourced. Inside the building, I wanted to follow the principles of "Refuse and Reduce," using only what was necessary and avoiding excess materials, especially when it came to concealing pipes and ventilation. I also focused on reusing materials like old windows as partition walls and reclaimed metal pipes for railings.

Designing for durability to extend the building's life.

I found it challenging to balance durability with the circular principles I wanted to uphold. Reused materials often aren't of the best quality and can have damage, making them less durable than new ones. In the end, I decided to prioritize high-quality reclaimed materials, like triple-glazed windows, to make sure the building would be resistant and sustainable over time.

Designing for maintenance to make repairs simple.

For maintenance, I chose to design the facade as a modular system, allowing it to be easily swapped out or repaired when necessary. I also made sure that elements like ventilation, electrical, and water pipes were accessible, which makes repairs simpler. Designing for maintenance also required careful attention to the details of the building. Making sure materials were mechanically attached with screws rather than glued, allowing them to be easily replaced or reused when needed.

Designing for Adaptability so the building can adapt and change.

The building's column-and-beam structure allows for future changes in function, while the modular facade system enables the building to adapt to new needs. This flexibility is key for the building to evolve over time.

Designing for disassembly so its components can be reused.

Finally, I opted for a timber-based, bio-based construction approach, ensuring that the building could be fully disassembled and reused at the

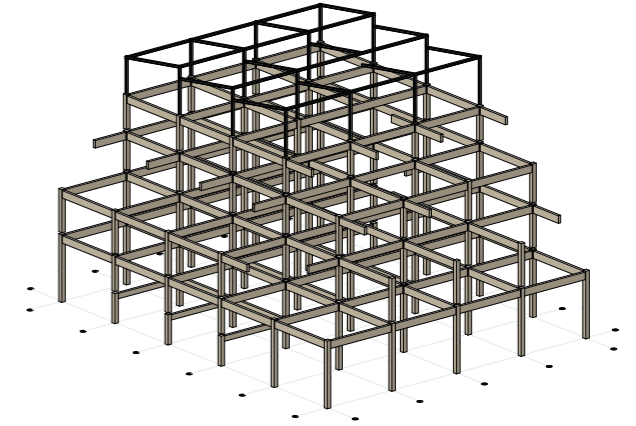
end of its lifecycle. The facade system is also designed to be easily taken apart, with dry connections and screw-based fastenings, making the entire structure adaptable and sustainable.

Design Process

Reflecting on the design process within the Public Building studio, I recognize that the research-by-design approach played an important role in shaping my project. In the early stages, working with models and diagrams helped to clarify initial ideas and explore different spatial concepts. Researching case studies and visiting relevant sites also provided valuable insights into how recycling facilities operate and how various public condensers function in practice, which helped ground the project in realistic examples.

Before the P2, I envisioned the building as an elevated square with waste collection located underneath and separate public functions positioned on top. However, over time it became clear that this concept did not align with the idea of a Public Condenser, where different functions are closely connected and interdependent. This realization led to a shift in the design, resulting in the first more integrated proposal that I presented at the P2.

After the P2, I found it challenging to transition from a conceptual design toward a more realistic and buildable plan. One of the main difficulties throughout the process was working with reused materials. Unlike conventional design approaches, where materials are selected after the design is developed, I constantly had to adapt my design to what materials were actually available. I often shifted between two strategies: designing an element first and then searching for matching materials, or researching available materials first and adapting the design accordingly. This made the process time-consuming and required many iterations, as I repeatedly had to weigh whether to modify the design to fit the available materials or to compromise by using new ones instead.



2.4 Column and beam structural design during the P3 phase.



2.5 Interior view of the atrium developed during the P3 phase



2.6 Facade studies and sketches exploring materiality and patterns.

3. Academic & Societal value

Relation between graduation project and the master track and program.

In the architecture master program, sustainability is a key area of focus. The program emphasizes designing a sustainable built environment, with a focus on creating future buildings, cities, and infrastructures. For me, the reuse of materials can go beyond just architecture; it can influence urban design and even the way we plan cities. This approach is something I feel passionate about, as it can reshape not just individual buildings but entire urban landscapes, making them more sustainable and adaptable for the future.

Relation between graduation project and the studio topic.

The graduation studio centers on designing a public condenser in Copenhagen, incorporating the five pillars of *multiplicity*, *hybridity*, *resilience*, *sustainability*, and *a healthy environment*. Circularity and reusing materials are closely tied to these themes.

The concept of *Multiplicity* is central to the design, as the building serves a variety of functions for the community, including waste collection, repair cafes, workshops, and urban farming. This approach accommodates to different community groups—residents, entrepreneurs, and students—creating a space for interaction and engagement.

Hybridity is reflected in the interconnectedness of the building's functions. Each area supports and relies on the other's waste or resources to form an efficient, cohesive system. For instance, neighborhood waste is repurposed into resources for the makerspace or urban farming. The building's flexibility also enables spaces to change functions throughout the day, making them accessible to different people.

The design incorporates *resilience* by ensuring adaptability. The modular facade and flexible spaces allow the building to evolve with the community's changing needs. Furthermore, the building is designed with disassembly in mind, so its materials can be reused for future projects.

Sustainability is a key consideration, with a focus on reducing environmental impact. The design prioritizes the reuse of materials, such as repurposed windows and locally sourced construction waste, which minimizes the need for new raw materials and reduces waste.

Finally, a healthy environment is promoted through spaces that encourage social interaction and well-being. Urban farming areas, waste management, and resource conservation all play a part in creating a cleaner, healthier environment.

Relevance of design and research project.

The academic value of my graduation project lies in its contribution to the ongoing discussion around circular design in architecture. By focusing on reuse and adaptability, the project explores how circular principles can be applied to public buildings. It combines existing building strategies and relies mostly on established methods. What makes this project stand out, I believe, is that it doesn't just focus on circularity in construction, but also in the building's program, with the aim of supporting the development of a more circular community.

From a societal perspective, the project tackles broader issues such as resource scarcity and waste management. The design works to make circular practices more visible and achievable at the neighborhood scale, encouraging behavioral change through architecture. Still, shifting societal habits around waste and reuse requires more than just design—it also depends on political, economic, and cultural developments across the city.

