

Graduation Plan

Master of Science Architecture, Urbanism & Building Sciences



Graduation Plan: All tracks

Submit your Graduation Plan to the Board of Examiners (Examencommissie-BK@tudelft.nl), Mentors and Delegate of the Board of Examiners one week before P2 at the latest.

The graduation plan consists of at least the following data/segments:

Personal information	
Name	Marit Smit
Student number	4858557

Studio		
Name / Theme	AR3AP100 (2024-25) Public Building Graduation Studio "Public Condenser, Copenhagen"	
Main mentor	Paul Kuitenbrouwer	Project Design
Second mentor	Elina Karanastasi	Technical Building Design
Third mentor	Stefano Corbo	Theory & Delineation
Argumentation of choice of the studio	I chose this studio because of my interest in Public Buildings and their potential to transform a neighbourhood. The concept of designing a "condenser" particularly resonates with me—a space where diverse functions and people can come together, creating interaction and connection. Public buildings can have a deep impact on the lives of a city's inhabitants, offering opportunities to enhance and redefine urban life. They serve as spaces for everyone, with the ability to reshape the atmosphere of a neighbourhood and contribute to the city's identity.	

Graduation project	
Title of the graduation project	Trash into Treasure: Designing a Circular Public Condenser
Goal	
Location:	Nordvest / Bispebjerg Bakke, Copenhagen, Denmark
The posed problem	<p>The extraction of natural resources has increased over the past five decades, tripling globally and driven largely by extensive infrastructure development and high levels of material consumption. This resource-intensive model contributes to the global crises of climate change, biodiversity loss, and pollution, posing significant challenges to both the environment and human health (UNEP, 2024). Cities play a central role in this issue, consuming 80% of global resources and generating half of the world's waste (World Bank, 2021). In response, the concept of a Circular Economy has emerged, promoting strategies such as refusing, reducing, reusing, refurbishing, and recycling to minimize resource use and waste generation (Haas et al., 2020).</p> <p>In 2018, Denmark launched a national "Strategy for Circular Economy" to address these challenges. Copenhagen, in particular, aims to position itself as a leader in the circular economy, focusing on waste reduction, reuse initiatives, and public engagement (Circular Copenhagen, 2019). However, Denmark's</p>

	<p>economy remains only 4% circular, significantly below the global average of 7.2%, indicating that only a small fraction of materials re-enter the economy through recycling (Circularity Gap Report, 2024). As part of its efforts, Copenhagen has launched a waste management plan targeting increased household recycling in Bispebjerg by installing 44 new sorting points with a total of 97 waste containers. Construction is planned to begin in early 2025 (Circular Copenhagen, 2019).</p> <p>Despite these existing measures, there remains a significant opportunity to create a broader culture of circularity. The public condenser aims to be a space dedicated to fostering this culture within the community. Its goal is to transform neighbourhood waste into valuable resources for the local area. The building will function as an educational hub, working in collaboration with the local vocational school to offer students, residents, and visitors the chance to learn about circular practices and gain hands-on experience. Additionally, it will provide a space for people to connect through the exchange of waste materials—what might be useless to one person could become highly valuable to another. By encouraging collaboration, learning, and resource sharing, the public condenser seeks to inspire and embed the principles of circularity into daily life.</p>
<p>Research questions</p>	<p>The main research</p> <p>'How can circularity be integrated into a public condenser to inspire and contribute to a more sustainable neighborhood in Bispebjerg, Copenhagen?'</p> <p>Sub questions</p> <ul style="list-style-type: none"> • How is the shift towards a circular economy being implemented in Copenhagen, and how does it compare to other circular communities globally? • What programming and functions should the public condenser support to repurpose waste materials in the Bispebjerg neighborhood? • What circular design strategies can be applied in the construction the public condenser to minimize raw material use?
<p>Design assignment in which these result.</p>	<p>The research focuses on exploring the potential of a circular public condenser and delving deeper into existing strategies for circular design. The objective is to design a building that functions as much as possible on repurposed materials. This space will serve as a hub where people can learn, collaborate, and discover ways to transform one person's waste into valuable resources for others.</p> <p>The research is divided into three parts: The first part focuses on developing a deeper understanding of Denmark's transition toward a circular economy. It examines</p>

	<p>various zero-waste strategies and analyses case studies around the world to assess how communities can play an active role in this shift. The second part identifies the programming and functions of the public condenser. This involves analysing existing waste in the neighbourhoods and exploring how the public condenser can adopt new roles to repurpose these materials into valuable resources. The final part investigates different circular building strategies, exploring how local waste can be utilized in the construction of the public condenser.</p> <p>The findings of the research inform the design of the public condenser, resulting in a building that integrates both a circular program and construction.</p> <p>The Public Condenser will combine educational and recreational functions, centered around three primary objectives: creating, connecting, and discovering. Creating: The public condenser will collect neighbourhood waste and transform it into new resources. A makerspace will support small businesses, organic waste will be composted for urban agriculture, and a repair studio will enable students to fix broken items. Connecting: The building will serve as a social hub with a shared living room and kitchen, where produce from urban agriculture can be used for community activities. Discovering: Workshops, exhibitions, and a reuse shop will encourage learning and creativity, showcasing how old materials can be repurposed.</p> <p>The structure of the public condenser is guided by a framework of five circular design strategies aimed at minimizing raw material use. These strategies are organized around three timeframes: The Past: <i>Designing with Reused Materials</i> prioritizes using existing materials and resources, reducing the need for new raw materials. The Present: <i>Design for Durability</i> ensures the building's longevity, minimizing the need for frequent repairs. <i>Design for Maintenance</i> focuses on making building elements easy to repair, replace, or adapt to evolving needs. The Future: <i>Design for Adaptability</i> allows the building to flexibly respond to changing user requirements over time. <i>Design for Disassembly</i> emphasizes creating components that can be easily dismantled and reused at the end of the building's life cycle.</p>
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Process

Method description

Quantitative Research

To deepen the understanding of the circular economy, the quantitative research focuses on a literature review of key strategies, such as waste transformation into various materials and construction techniques using reused materials. This research identifies practical methods and successful approaches within circular economies. Data analysis is conducted to determine the local businesses in the neighborhood and the waste they produce. Additionally, case studies of circular structures and communities worldwide are examined, providing insights into effective practices and highlighting challenges encountered in different contexts.

Qualitative Research

Several site visits to circular projects and waste facilities in the Netherlands were conducted to gain deeper insights into circular buildings and waste management practices. One notable visit was to BlueCity in Rotterdam, developed by Superuse, which showcases innovative circular practices.

Research By Design

The research and design follow a research-by-design approach, combining analysis with creativity to generate architectural concepts. Instead of relying solely on theory, it incorporates projection and speculation, fostering creative exploration. Tools such as mapping, diagrams, and physical models are used throughout the research process, serving as sources of inspiration for the design. All findings and insights are documented in the Research-by-Design Journal, showing the evolution of ideas and the development of the research.

Literature and general practical references

Circular Economy

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Building design

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Reflection

1. What is the relation between your graduation (project) topic, the studio topic (if applicable), your master track (A,U,BT,LA,MBE), and your master programme (MSc AUBS)?

In the architecture master program, sustainability is a key area of focus. The program emphasizes designing a sustainable built environment, with an 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.

The studio centers on designing a public condenser in Copenhagen, incorporating the five pillars of multiplicity, hybridity, resilience, sustainability, and healthiness. Circularity and reusing materials are closely tied to these themes. **Multiplicity** is seen in the building's diverse functions, which cater to various needs and groups of the community. **Hybridity** comes from the interconnectedness of these functions, where each depends on the others' waste, forming a collaborative and efficient system. **Resilience** is built into the design by making the building adaptable to future needs, ensuring it can evolve while minimizing waste. **Sustainability** is achieved by reducing raw material use, reusing resources, and minimizing environmental impact. Finally, **healthiness** is encouraged by creating a healthier environment through reduced pollution, resource conservation, and promoting sustainable practices.

2. What is the relevance of your graduation work in the larger social, professional and scientific framework.

The graduation project addresses important global issues like sustainability, waste management, and resource use. Cities are responsible for 80% of global resource consumption and half of the world's waste, much of which comes from the construction industry. This project contributes to the shift toward a more circular economy, aligning with global sustainability goals. It focuses on new design ideas that help reduce the environmental impact of buildings. By changing how we think about resources, waste, and sustainability, the project aims to promote a new way of designing buildings and cities.