

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	Barbara de Meijer
Student number	4850734

Studio		
Name / Theme	Metropolitan Ecologies of Places	
Main mentor	Alexander Wandl	Environmental Technology & Design
Second mentor	Birgit Hausleitner	Urban Design
Argumentation of choice of the studio	<p>My graduation trajectory will be a combination of design, planning and technology, which makes sense as it is part of the studio Metropolitan Ecologies of Places (MEP), which is on the 'intersection between the sections <i>Environmental Technology & Design, Landscape Architecture and Spatial Planning and Strategy of the Department of Urbanism</i>' (<i>Year guide for MSC3/4 Urbanism Fall 2023, 2023</i>).</p> <p>In the realm of technology, my project is dealing with building technology, circularity and mitigating environmental issues related to the current agricultural and construction sector. In the realm of planning, the transition towards a fiber-based building sector and creating this whole new value chain requires governance and policies.</p> <p>Design comes into the process to translate the transition and the new value chain to a spatial desirable outcome, as well as a research tool.</p>	

Graduation project	
Title of the graduation project	<p>Weaving Flax Fiber into the Territorial Fabric</p> <p>Sub title: A Spatial Design Exploration on the Potential Role of Flax in a Circular Biobased Building Sector</p>
Goal	
Location:	The Netherlands
The posed problem,	Our society is confronted with numerous multiscale challenges today. Many of these challenges are related to stress that is put on Earth's natural systems, caused by unsustainable human behavior over the past decades. The

construction and agricultural sectors have played and play a notable role in this, as they are both heavily reliant on conventional practices and materials, which are unsustainable. These multiscale challenges encompass reducing CO₂ and nitrogen emissions, achieving a circular economy, higher biodiversity, improving soil and water quality, anticipating waterlogging and drought, the need to build 1 million houses before 2030, potentially an extra 1 million before 2050, combined with the need to refurbish 7 million existing houses, while also creating spatial quality (Ministry of the Interior and Kingdom Relations et al., 2023).

To meet the goals set out in the climate agreement and the Dutch National Circularity Programme, various sectors have to transition to more sustainable and circular practices. Research indicates that biobased building materials could very well replace conventional building materials and could also form an integral solution to the posed societal challenges (Ministry of the Interior and Kingdom Relations et al., 2023). One of the crops that shows great potential is flax, as it has various potential applications due to its technical properties, the climate and soil in the Netherlands are very well suited for growing high-quality fiber flax, and the Netherlands has a long-standing tradition of growing flax for the textile industry (van den Oever et al., 2023). However, the transition to a biobased and flax-based building sector is struggling to take off (Studio Marco Vermeulen, 2020). A possible reason is the complex nature of implementing a full value chain for biobased building materials. It includes matching supply and demand and making it economically viable for stakeholders in the supply chain, as now biobased building materials are often still more expensive than traditional building materials (Ministry of the Interior and Kingdom Relations et al., 2023). In the case of flax, it requires expanding the existing value chain for the textile industry, to create a local circular flax value chain for the building industry, which requires space, expertise, and special machinery (van den Oever et al., 2023).

Recently the ‘National Approach to Biobased Building’ was published (Ministry of the Interior and Kingdom Relations et al., 2023), and €200 million was reserved to build up several biobased building value chains. Research needs to be done

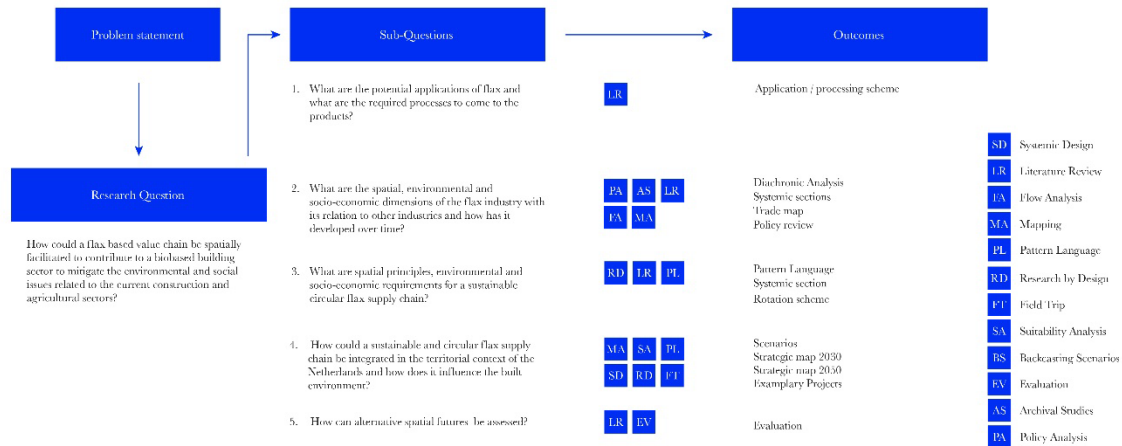
	<p>on how a flax-based value chain could be spatially facilitated to contribute to a biobased building sector to mitigate the environmental and social issues related to the current construction and agricultural sectors.</p>
<p>research questions and</p>	<p>How could a flax based value chain be spatially facilitated to contribute to a biobased building sector to mitigate the environmental and social issues related to the current construction and agricultural sectors?</p> <ol style="list-style-type: none"> 1. What are the potential applications of flax and what are the required processes to come to the products? 2. What are the spatial, environmental and socio-economic dimensions of the flax industry with its relation to other industries and how has it developed over time? 3. What are spatial principles, environmental and socio-economic requirements for a sustainable circular flax supply chain? 4. How could a sustainable and circular flax supply chain be integrated in the territorial context of the Netherlands and how does it influence the built environment? 5. How can alternative spatial futures be assessed?
<p>design assignment in which these result.</p>	<p>A Spatial Design Exploration on the Potential Role of Flax in a Circular Fiber Based Building Sector</p>
<p>To answer the research questions, the design outcomes include:</p> <ul style="list-style-type: none"> - A Pattern language: A complete set of patterns and a pattern field with spatial solutions as well as socio-economic requirements and environmental/ecological requirements for a sustainable circular flax value chain. - Strategy in structure map and systemic section: The patterns and suitability analysis can be translated into a strategy, visualized through a structure map and systemic section, showing exact 	

locations of the different ‘stations’ of a circular flax value chain. In this map and section it should also be visualized how the metabolism of the value chain interacts with its surroundings.

- Key projects: To give an idea of how the stations interact with their surroundings and provide spatial quality, exemplary projects for each station are visualized through axonometric drawings and a collage rendering.

Process

Method description



Chapter 3: Research Design & Methods

Methods

LR Literature Review

Reading and reviewing scientific literature to develop a theoretical and conceptual framework and to create an understanding of the flax industry, and other theories that appear to be relevant during the pattern development and design process.

MA Mapping

Visualizing and connecting research, observations and spatial structures. Mapping through different scales is used to get a spatial understanding of the problem. It is also used during the design phase to analyse how different design interventions interact with their surroundings.

PL Pattern Language

Visualizing and connecting research, observations and spatial structures. Mapping through different scales is used to get a spatial understanding of the problem. It is also used during the design phase to analyse how different design interventions interact with their surroundings.

FT Field Trip

Once strategic locations for interventions have been chosen, visiting the area can help create a better understanding of the social and spatial conditions of the context.

SD Systemic Design

Integrating systems thinking and design thinking. Process is built up by: researching stakeholders, defining the system, mapping the system, choosing leverage point, ideating solutions, prototyping solutions, testing and evaluating results (Ospina, 2018).

PA Policy Analysis

Collecting and analysing policy documents and strategic agendas to determine governmental goals or restrictions regarding implementing a biobased building sector.

SA Suitability Analysis

Analysing land use suitability by formulating decision criteria, overlaying maps and ranking the suitability of land for a certain land use. This method, by McHarg (1969) helps to optimize the benefits of an area.

AS Archival Studies

Analysing and reviewing archival documents and pictures to create an understanding of the flax industry in relation to space and the environment in different periods of time with different context.

FA Flow Analysis

Mapping the flows related to the Dutch flax industry in a systemic section and on map to understand how these flows relate to space and to inform later decision making on where to intervene to create a sustainable circular biobased building sector.

RD Research by Design

Projecting various design interventions on the context to analyse how they interact with each other and the existing context and to explore alternative spatial futures.

BS Backcasting Scenarios

Looking backwards from a generated desired future and create strategy on how this future can be achieved. It involves analysing and experimenting with different ways to achieve this future. The scenarios used are derived from the 'National Approach to Biobased Building' (Ministry of the Interior and Kingdom Relations et al. 2023) which shows a desired future for 2030 and a study by Wageningen University & Research (van den Oever et al. 2023) that shows the potential demand for flax in 2050.

EV Evaluation

Formulating evaluation criteria to assess the designed alternative futures in order to compare the different scenarios and point out potential trade-offs.

Literature and general practical references

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Reflection

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)?

My graduation topic, "Weaving Flax Fiber into the Territorial Fabric: A Spatial Design Exploration on the Potential Role of Flax in a Circular Biobased Building Sector," has a clear link with both the studio topic and the broader framework of my master's program. Within the studio "Metropolitan Ecologies of Places (MEP)," the focus lies at the intersection of Environmental Technology & Design, Landscape Architecture, and Spatial Planning and Strategy, which aligns very well with my exploration of the sustainable integration of flax within the built environment. The relation to the studio is further explained in the argumentation of studio choice.

As the project is a part of the Urbanism track, I approach my research through a combination of urban design, landscape architecture, spatial planning, and engineering. Aligning with the goals of the Urbanism Track, I integrate social, cultural, economic and political perspectives with the natural and man-made conditions of the site, by exploring how a flax based value chain could be spatially facilitated to contribute to a biobased building sector to mitigate the environmental and social issues related to the current construction and agricultural sectors.

The overall master's program, MSc Architecture, Urbanism and Building Sciences, serves as the foundation of my project. My project has a very interdisciplinary nature, addressing contemporary challenges in architecture, building sciences, and urban planning, by integrating flax based materials into the built environment. By situating my research within this master's program, and working in a multi-disciplinary way, I aim to contribute to creating integrated solutions for a more sustainable built environment.

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

My graduation topic, "Weaving Flax Fiber into the Territorial Fabric: A Spatial Design Exploration on the Potential Role of Flax in a Circular Biobased Building Sector," holds significant relevance for the larger social, professional and scientific framework.

The reliance on conventional materials and practices in the construction and agricultural sector has negatively impacted the environment and Dutch society. Because, issues associated with these dependencies include the nitrogen and carbon dioxide crisis, degrading soil & water quality, loss of biodiversity, the need to become less reliant on depleting fossil fuels, the need to build 1 million houses before 2030, potentially an extra 1 million before 2050, combined with the need to refurbish 7 million existing houses (Studio Marco Vermeulen, 2022). We cannot keep building the way we do now. The transition to a circular biobased building sector holds the potential to mitigate these environmental and societal challenges related to the current construction and agricultural practices. Moreover, the research aligns with global initiatives and commitments toward sustainable development, as outlined in agendas like the United Nations Sustainable Development Goals.

Recently the 'National Approach to Biobased Building' was published (Ministry of the Interior and Kingdom Relations et al., 2023), and €200 million was reserved to build up several biobased building value chains before 2030. My work explores spatial strategies for establishing a flax-based value chain. My research integrates socio-ecological metabolism principles and utilizes systemic design and pattern language methods to come to a strategy to spatially facilitate a circular flax based value chain. With this research I contribute to the body of knowledge in the professional and scientific field.

