

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	Miriam Kreysel
Student number	5382041

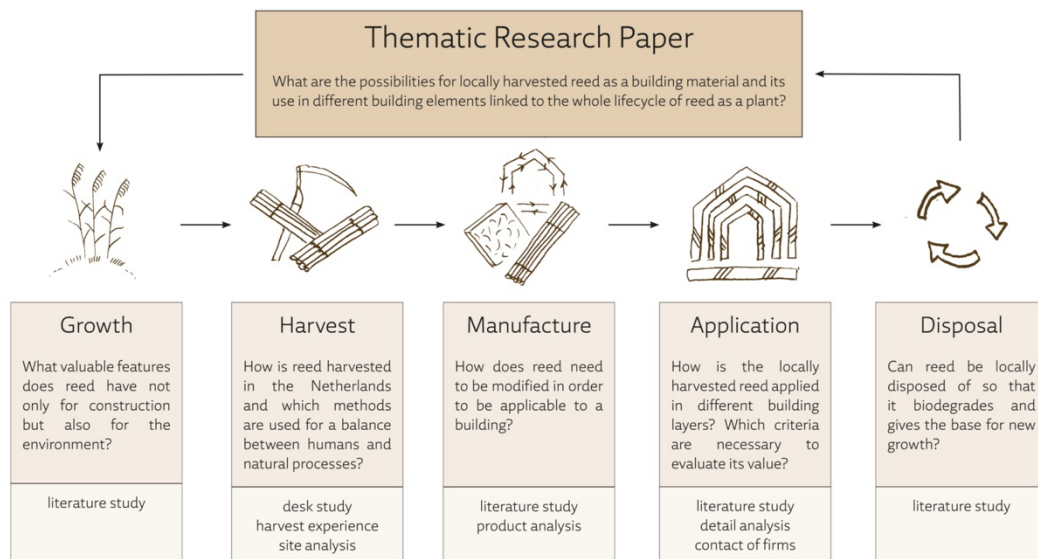
Studio		
Name / Theme	Architectural Engineering	
Main mentor	Thomas Offermans	Architecture Tutor
Second mentor	Nico Tillie	Research Tutor
BT mentor	Paddy Tomerson	BT Tutor
Argumentation of choice of the studio	The studio was chosen to follow the fascination of biobased materials in construction to rethink the connection between humans and nature. At the Floriade Expo 2022, the Dutch and the Almere-Amsterdam pavilion both showed the possibilities of local biobased materials in buildings and the value of integrating nature into the built environment. I got inspired by the boldness and simplicity of the application of such materials but also saw challenges and opportunities to develop the circularity of buildings even further. In the sub-studio Harvest of Architectural Engineering I can thrive with a graduation project that inspires to use biobased construction materials that grow locally, are applied to buildings and can be disposed of in a circular way on the same site.	

Graduation project	
Title of the graduation project	Re-Reed Architecture – A circular activities centre for nature and neighbourhood
Goal	
Location:	Poelpolder, Haarlem, NL
The posed problem,	Embodied energy from the production of building materials contributes to the greenhouse gas emissions of the building sector. Circular building with biobased materials is desirable to make active use

	of the interdependencies between all species. There is still a lack of expertise in this field to successfully apply biobased materials in building elements. This approach aims to store carbon not only in the peat of the rewetted polder but also in the building layers on top of it thanks to the innovative use of reed. As reed grows plentiful in the Netherlands due to its wet area as a river delta, the application of it in construction can become more versatile than only for the existing Dutch roof thatching. With the rewetting of polders, more wetland crops such as reed can grow and make the import of reed from abroad redundant in the future.
research questions and	What are the possibilities for locally harvested reed as a building material and its use in different building elements linked to the whole lifecycle of reed as a plant? Growth: What valuable features does reed have not only for construction but also for the environment? Harvest: How is reed harvested and which methods are used for a balanced harvest for human usage and natural processes? Manufacture: How can reed be modified to be applicable to a building? Application: How is the locally harvested reed applied in different building layers? Which criteria are necessary to evaluate its benefits? Disposal: Can reed be locally disposed of so that it biodegrades and gives the base for new growth?
design assignment in which these result.	An activity centre in the green fringe of Haarlem that enhances the interaction

	between the residents and nature using reed as a local biobased building material
This graduation project aims to develop a circular community hub that receives its construction material from the restored wetland surrounding it. It reconnects nature and people through a nature-inclusive architecture built with locally harvested materials with the focus on reed. To grow this multifunctional crop on the Poelpolder on the outskirts of the city of Haarlem the rewetting of the polder is necessary. Thus, with the aid of the activity centre, the polder is transformed into a productive green fringe and adds a multipurpose to the recreational zone. It can be integrated into the residents' daily life by providing communal functions such as a participatory kitchen, workshop areas and a market. The centre in the Poelpolder serves as an extension of the existing wijkcentrum which cannot host as many activities for the neighbourhood and especially for the children as they would like to. Not only reed will grow on the rewetted peat, but there is also a possibility for growing food with a paludiculture approach. These locally grown crops can be sold on-site and provide the neighbourhood with local food and a meeting point. Thus, the community centre connects wetlands and the city, people in the neighbourhood, and adds a vibrant function to the Poelpolder to promote its restoration and locally grown crops. It results in a circular architecture to allow the city to extend into the landscape as an equal player in our ecosystem.	
Process	
Method description	
The research methods follow the chronological process of reed from its growth to its application in construction. It starts as an elaborate literature study on the plant reed with literature diving into the biology of the grass-like plant. Not only were the characteristics of reed of interest but also the impact on the environment. One step further and I found myself in the harvesting season of reed. For that a thorough desk study with exciting articles from other reed harvesting countries, for example, Finland and Estonia, was useful. To experience the harvesting process myself, I organised an excursion to a Dutch "rietsnijder" to assist a reed cutter and receive first-hand knowledge about this material. The next step after the reed dries is the manufacture of reed. The goal was to learn how to modify reed for its future use. This part of the research included an analysis of products on the market next to the literature study. The most important part of the design is naturally the application of reed to the building. For that, the literature study helped to get inspired by projects from around the world. An intense analysis of detailing with reed assisted to understand the material inside and out. To establish in which building element reed is the most beneficial a few criteria showed its value. The criteria are based on the function the building element must fulfil and if reed manages to meet these requirements or even exceeds them. The	

rating of the application possibilities is based on a careful review of resources, expert opinions, and products.



Parallel to the research of reed, the site of the Poelpolder next to the neighbourhood Boerhaave in Haarlem was analysed. Several excursions to the site offered insight in the social structures, the use of the green spaces, and the challenges the neighbourhood faces. The programme development of the design offers insight into how much space is needed for an addition to the existing wijkcentrum. The positioning of the activities hub in the Polder is experimented with. Reference projects in wetlands, volume studies and landscape architectural strategies are helpful tools.

Literature and general practical preference

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Reflection

The relevant connection between my graduation topic, the studio topic Architectural Engineering, the Architecture master track and the general MSc programme of Architecture, Urbanism, and Building Sciences at the TU Delft is evident in several layers of the project.

With the focus on Architectural Engineering, the primary environmental issue addressed in this project is that of unsustainable building materials. The solution suggested for the problem is the use of the biobased material reed. Biobased materials become more and more an important topic. Not only for architecture but also for building technology. The architecture changes with the materials used and, thus, the importance of detailing cannot be underestimated. All scales serve the same goal of the mitigation of the human impact on the environment.

This is where the graduation project acts. Demonstrating the opportunities of one biobased material, the project is a positive outlook into a biobased future that needs to come rather sooner than later. Without regulations and policies, the project is free to explore all possibilities of biobased constructions and can in the end lead to inspiration for further research, alternative design strategies and adds to the ongoing discussion of the reduction of emissions in the building sector which is not only lead at our faculty but also in the professional circles.