

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	Lotte van Oevelen
Student number	4677889

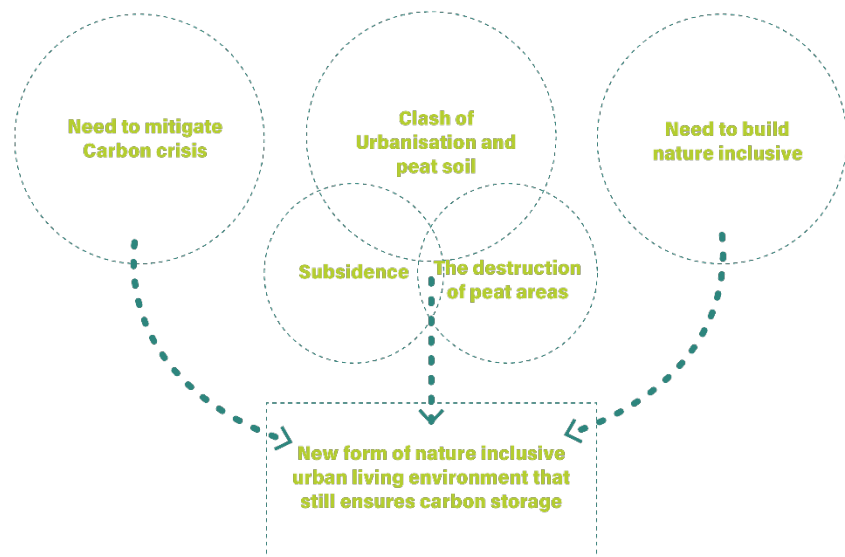
Studio		
Name / Theme	Urban ecology and ecocities	
Main mentor	Remon Rooij	Urbanism, planning
Second mentor	Nico Tillie	Urban Ecology, landscape
Argumentation of choice of the studio	<ul style="list-style-type: none"> - I am interested in the role of urban ecology in climate adaptation of cities. This is why I like the assignment of this studio, where the lab is focused on the merge of nature and city. This separation in thinking should vanish more and more in the future in order to create resilient cities where nature is part of our daily city life. - Secondly I like the studio's connection to landscape architecture. - Also the locations of in the studio (green areas in and around the city) and interaction with Staatsbosbeheer spoke to me very much. - I like the way of designing/ methods of the studio type of learning environment. My project is a design oriented project. 	

Graduation project	
Title of the graduation project	(re)carbon city
Goal	
Location:	Gouda
The posed problem,	<p>In order to mitigate and adapt to climate change, it is important to restore and preserve peatlands. The Woningdeals now struck are planning to build housing mainly in the west of the Netherlands, on top of our own carbon sinks.</p> <p>One of the biggest layers of peat in the Netherlands is situated in Gouda. This creates opportunities to prevent the emission of CO2 and store carbon in the peat soil in Gouda. However, the Woningbouw agenda states that new housing should be built in Gouda too (see map on the right) A big expansion area, Westergouwe, is situated in the west of the city bordering a Staatsbosbeheer property.</p>

Building on peat soil brings a lot of problems with it. As a result of dewatering in the polder of gouda in many other locations, many peat areas have dried up, causing the dead plant material in peat to come into contact with oxygen, causing 'oxidation'. This causes CO2 to be released and the soil sinks. Rewetting stops soil subsidence and increases biodiversity in the peatlands. (Staatsbosbeheer, 2021). The traditional way of building worsens the subsidence and in turn, causes the houses to sink. This is an unsustainable way of building.

With the destruction of peat areas, biodiversity is lost. It is important to preserve this beautiful ecosystem. This project gives the opportunity to explore building in a nature inclusive way.

This project will try to find a synergy between the three problems, the need to store carbon, the need to build housing, and the need to build nature inclusive in the form of a science-based design for a new form of living environment.



research questions and

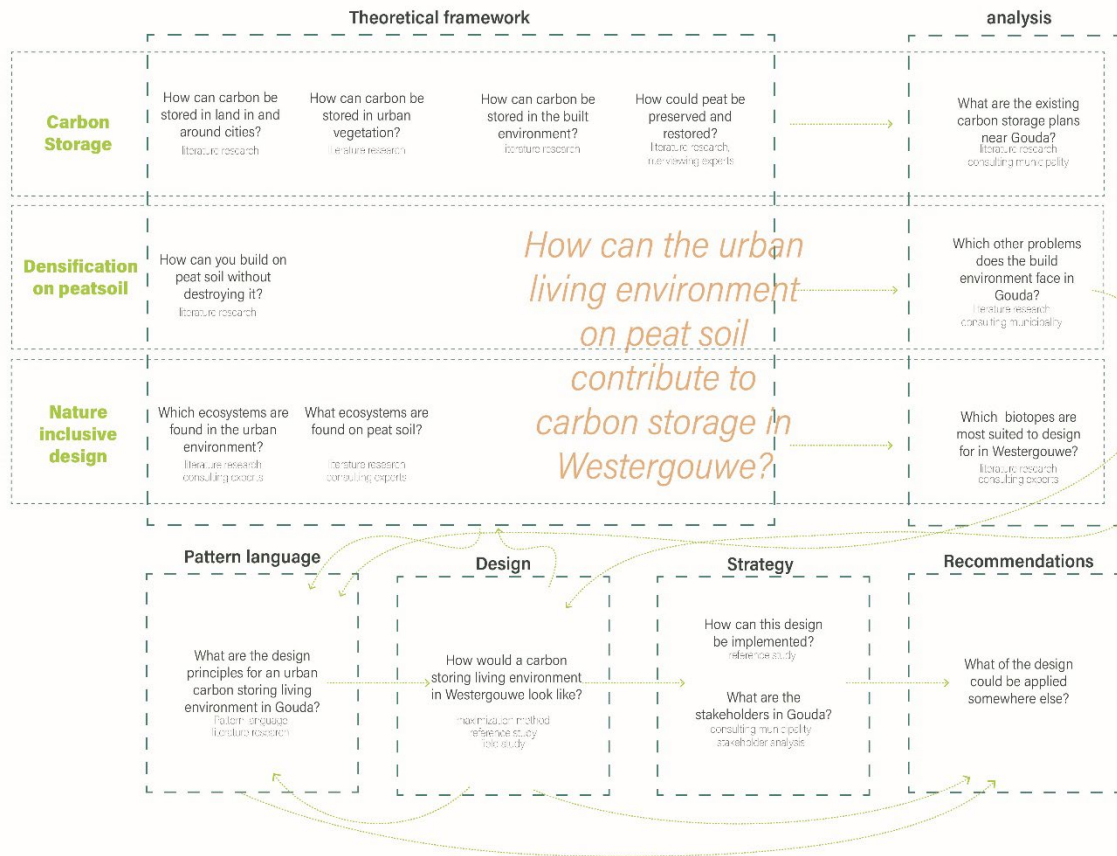
Main research question:

How can the urban living environment on peat soil contribute to carbon storage in Westergouwe?

Sub questions:

- How could carbon be stored?
 - How can carbon be stored in land in and around cities?
 - How can carbon be stored in urban vegetation?
 - How can carbon be stored in the built environment?
- How could peat be preserved and restored?
- How can you build on peat soil without destroying it?
- Which ecosystems are found in the urban environment?

	<ul style="list-style-type: none"> • Which ecosystems are found on peat soil? • What are the existing carbon storage plans near Gouda? • Which other problems does the build environment face in Gouda? • Which biotopes are most suited to design for in Westergouwe? • What are the design principles for an urban carbon storing living environment in Westergouwe? • How would a carbon storing living environment in Westergouwe look like? • How can this design be implemented? <li style="padding-left: 40px;">What are the stakeholders in Westergouwe? • What of the design could be applied somewhere else?
<p>design assignment in which these result.</p>	<p>The aim of this project is to create a research-based design for a residential area in Westergouwe. This design explores a way to build a living environment on top of peat soil in an ecologically responsible way, trying to preserve the carbon in the soil and store carbon in itself. This neighbourhood should be nature inclusive.</p> <p>After the design is a small strategy done and will be looked at the possibility to implement the design at other locations.</p>
<p>[This should be formulated in such a way that the graduation project can answer these questions. The definition of the problem has to be significant to a clearly defined area of research and design.]</p>	
<p>Process</p>	
<p>Method description</p>	



Literature Research

Literature research is used throughout the project. Literature is the base for the theoretical framework. Data is gathered through books, google scholar & research gate.

Reference study is used in the analysis to get a grip on the assignment and gather knowledge about the subjects, It is used in the design to see how the reference has shaped the design. In the strategy it is used to see how the design is implemented.

Pattern language

A pattern language could be made because of different reasons. For example, it could be a communication tool or a design tool, a way to structure and understand a complex system to create a coherent design. The pattern language could be represented in a graph, a pattern field. The connections between patterns are essential to creating a coherent field.

The reason this method is used in this project is because the author wants to translate a technical/environmental research into design principles which lead to the design.

The pattern fields stay dynamic while the project progresses and after finishing this project can be something to use and to be adjusted for other designers in the recommendations.

Fieldwork

Site Visit is a personal visit where the author makes personal observations and documents this with photos and sketches. These visits lead to understanding and inspiration for the design

Interviews are held with the local inhabitants and the municipality. This information is used to get a grip on the main problems and qualities of the place and to gather more in-depth information about the already planned urban development in and around the site.

Internet Searches are used to gather data in a more quick way. Google maps is used to quickly understand the site. Various other sites are used to get an understanding of the context of the place.

Mapping

Mapping is used in different stages of the project. First, it is used to form the context in the problem statement, then it is used in the analysis to understand the sites better and identify the problems and opportunities, in the design it is used to discover, design, and communicate this design, in the strategy it is also used and a communication tool and lastly in the recommendations it is used to communicate ideas for designers and other planners. The data for mapping is collected from different sources, examples are: Google Maps, QGIS, National Georegister, PDOK, Klimaat Effect Atlas.

Maximisation Method

This method consists of three phases; maximisation, optimization and integration. In the maximisation phase a design is made focussing solely on one subject. It is important to not think about other subjects or the feasibility of the design in order to be as bold as possible for this one particular subject.

For the optimization phase, the designer combines different maximizations into one design that optimises all subjects.

The integration phase brings together the optimization with another subject and makes the design more feasible/realistic. This additional subject can be a conflicting subject, a subject that aligns with additional goals or a subject that you as a designer want to characterise the place.

The maximisation method is a quick way to make a basis for a design. It is also important to set a time constraint for this phase. This way you make decisions quickly and do not give yourself time to let the realistic designer take control.

The author could use this method to take the subject of a carbon city to the extreme. This method forces the author to be bold in the design.

Stakeholder analysis

This method is used to get a better understanding of the assignment to create a carbon city. Most climate goals are big assignments that can be overwhelming for urban planners to contribute to. By translating the design into understandable Strategic Interventions and dividing these among the stakeholders, this assignment can be less intimidating for future planners and other parties. The data for this analysis is found through fieldwork and reference reviews.

[A description of the methods and techniques of research and design, which are going to be utilized.]

Literature and general practical preference

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[The literature (theories or research data) and general practical experience/precedent you intend to consult.]

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)?

My graduation project is related because I am making a design for a living area which is part of Urbanism. I am also basing my design on scientific research which is also one of the learning objectives of the master. My topic is related to the lab Urban ecology and ecocities because I am aiming to make a design that adapts to and mitigates the climate, ecocities. And one of my goals for this design is to make this design nature inclusive where knowledge about urban ecology will be needed.

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

Societal relevance

The earth is heating up (NOAA (a), 2021). Scientists have found that global warming is dominantly caused by the greenhouse effect (Dunn et al., 2021). This is caused by greenhouse gases (GHGs) which block the heat from escaping the atmosphere. In particular carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O) and water vapour (H₂O) have a big role in the greenhouse effect. Of which CO₂ has the biggest contribution to global emissions (65%) (Bhattacharyya et al., 2021).

The Netherlands is expected to have 18.8 million inhabitants by 2035. Because of this, among other reasons, the demand for housing will naturally increase. To meet the growing demand, a total of 845,000 homes will have to be built between 2020 and 2030. In 2020 there was a shortage of 331,000 homes (4.2 percent of the housing stock). The Government is stimulating provinces, municipalities and developers to annually build 75.000 new homes. (woondeals, nationale Woonagenda).

Scientific gab

Carbon storage is a relatively new subject. The importance of carbon storage has just recently been underscored in the climate agreements of November 2021 but has not been studied yet in the context of urban design. Urban design is essential in the realisation of climate goals. There are numerous scientific studies done about climate adaptation and

mitigation. Nevertheless, there is a gap in knowledge on how to realise the goals determined in literature.

Most recent studies about carbon storage are focused on agriculture. In an urbanised country like the Netherlands, the border between the countryside and the city is less and less visible. Because of this, it is important to study this in the context of the built environment too.

Staatsbosbeheer and Carbon storage

The client of the lab is Staatsbosbeheer. Staatsbosbeheer wants to reduce the excess CO₂ in the air in order to contribute to the Climate Agreement. This means a reduction of at least 49 percent by 2030. Peat areas must emit 1 megaton less CO₂ until 2030 (Staatsbosbeheer, 2021). They want to create 5000 hectares of extra forest and raise the water level in 5000 hectares of peatlands to contribute to the sequestration of CO₂. Staatsbosbeheer manages more than 30,000 hectares of peatland itself.