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	Martine Adriana Schüll
Student number	4429508

Studio		
Name / Theme	Urban ecology & Ecocities	
Main mentor	Nico Tillie	Landscape Architecture
Second mentor	Mo Smit	Architecture (and specialized in local building methods & materials)
Argumentation of choice of the studio	In Q3, our project site was the A12 zone of Utrecht. During this project, my interest in tension and symbiosis between natural and urban environments grew. I would love to learn more about this complex, multi-layered system. During Q3, I did not have enough time to really learn about the different flows and how to start designing based on natural processes. I hope to get the opportunity to do this during graduation. I think it can be of great use for the professional context. Secondly, the interdisciplinary aspect gives the lab a realistic setting. I'm interested in learning techniques and approaches from urbanists as well.	

Graduation project	
Title of the graduation project	A 'shared' brook valley landscape of the (small) Dommel; a study of an alternative approach towards nature development within Van Goghs National Park
Goal	
Location:	The region of Eindhoven, with specific focus on the Staatsbosbeheer properties in the area of the 'Dommeldal uit de verf' initiative and the Green wedge that reaches into the city of Eindhoven. The Dommeldal uit de verf area is an area east of Eindhoven stretching from Geldrop to Son, surrounding the (small) Dommel valley. An area of roughly 10 by 10 km. This area is not yet well discovered by citizens.
The posed problem,	*Nature is threatened* Nature in Brabant is threatened by nitrogen deposition, at risk of drought, and fragmented by urban expansion and monocultural agriculture. The local, intensive livestock industry plays an important role by draining water, polluting water and air, and great use of fresh water. As the report 'condition of nature in Brabant' by Boogaard et al. (2021) shows, quality of nature has been declining steadily since the start of monitoring in 1995, in both nature reserves and agricultural areas. The greatest decline in ecological value is measured in heathlands, which are found in large nature areas surrounding the city of Eindhoven. Nitrogen is causing acidification resulting in invasion of grasses in heathland. Drought is enlarging

	these problems and puts heathland even at risk of releasing large amounts of nitrogen stored in the soil (Bobbink et al, 2019). Nature restoration activities attempt to mitigate the negative effects of high levels of nitrogen deposition and a dis-balanced water system. In addition, national regulations strive to diminish the causes. However, the aim to reduce nitrogen deposition by 25% in the next 10 years, is not enough for to achieve healthy ecosystems (Rotgers & Zijlstra, 2020). Even if all livestock farmers within a buffer zone of 10 km surrounding Natura 2000 areas are remediated, the required nitrogen deposition targets will not be reached (Rotgers & Zijlstra, 2020) Due to continuing climate change, additional disturbances might emerge, such as more severe water deficits and rising water temperature. Vegetation types on the sandy soils of Brabant are especially vulnerable to climate change because they depend entirely on the atmosphere for their supply of water. Quality of specie's habitats may change, especially in nutrient-poor ecosystems like heaths (Vonk et al, 2010). Further invasion of grasses is expected, making maintenance an even more challenging and costly task for nature organizations. Climate change is a long-term phenomenon but anticipate now is most effective. Some promising steps towards more climate adaptive nature in the province of Noord-Brabant are taken. To illustrate, waterboard 'Waterschap de Dommel' has declared to make water levels leading instead of landuse (Waterschap de Dommel, 2021). In addition, the province of Noord-Brabant seems to be the only province to largely maintain the old ecological main structure ambitions and to have taken important steps towards realization of the today called NNB, Nature Network Brabant. Moreover, the currently established national Van Gogh Park, with painter Van Gogh as ambassador, has strengthening of nature as one of the top priorities through investment in robust, connected and resilient nature areas and climate adaptive brook valleys (Stuurgroep Van Gogh Nationaal Park, 2021). *Potentials* While nature is depriving, urban expansion and densification is flourishing. Similar to other large urban areas, Eindhoven has a significant building assignment for the coming years, up to 62.000 houses by 2040. And Brainport companies such as ASML expand rapidly. Another potential is the shift of focus of nature organization Staatsbosbeheer. Whereas their priority has been mainly on nature maintenance and recreation in the last decades, they are opening up towards less traditional activities such as development, in the context of the overall aim to contribute to quality of life with their properties. Staatsbosbeheer is a nature organization in the Netherlands managing 273.000 hectares of land, of which several properties are located in close proximity or on the edge of cities. In the region of Eindhoven, Staatsbosbeheer manages several small patches of land near the brooks and few large forest and heath areas. *Resulting vision* Enlarging nature areas and adding connections also outside of the Nature Network Netherlands is needed to establish a robust, adaptive ecosystem according to Vonk et al (2010). Strategies for connecting heathland and forest zones on national scale seem most

	promising to permit species migration, resulting in improved resilience to extreme weather. To achieve this, Vonk et al (2010) accentuate the importance of synergy. Expanding and connecting habitats can be achieved through multifunctional landscapes around protected areas, in which the wider countryside can play an important role. The document 'Ambition Netherlands Nature positive' by ministerie van LNV (2019) promotes similar approaches of broadening nature policy beyond the Nature Network Netherlands by applying it to developments in rural and urban areas. The housing program can be used as an opportunity to make a significant contribution to the intended robust, connected and resilient nature network and climate adaptive brook valleys in the region of Eindhoven, as existing visions show. Vision 'Natuurrijk Nederland' for instance, acknowledged potential in creating estates in the region of Eindhoven in combination with nature development as well as forestry and cultivating fiber crops, as long as these activities do not compete with food production. The most obvious, short term opportunity would be to expand the city and develop nature in those specific areas. However, the province of Brabant chose the strategy to densify the existing urban fabric instead of expanding into the countryside. Therefore, an alternative approach to this opportunity would be to use the current building assignment as a catalyst for a larger transition that extents into the future. Environmental awareness has not left this sector untouched. A transition has started towards building with biobased materials. To illustrate, 20% of all houses that will be built in 2025 in the Metropolitan region of Amsterdam should be constructed with timber (MRA, 2020), resulting in a healthier living environment and, simultaneously, in a growing need for biobased materials. According to the report Ruimte voor Biobased bouwen (Studio Marco Vermeulen, 2020), the additional, space demanding cultivation of biobased materials should not be seen as a threat for nature or food production, on the contrary, these functions can benefit each other. Building materials can be made from food waste or result from a product of sustainable forestry. The principle of circularity is evident. As states by local building initiative bouwtuin: to build with local materials that, after use, benefit the landscape again (Smit, 2021). For the province of Brabant which has a rich history in of wood industry including poplars, pine forest, and rabatbossen, this can be an interesting strategy. A strategy that can potentially enlarge and improve nature areas, provide the city with building materials in the future and 'feed' the landscape, whilst strengthening the bound between city and surrounding countryside. The economic value of building material can compromise the creation of nature and at the same time be an investment in future clean building materials. The relevance of this vision on the longer run, can be derived form the national vision 'Een natuurlijkere toekomst voor Nederland in 2120' by Baptist et al (2019). This vision describes that further growth of living and working will move slowly from the Randstad to the higher sandy soils, such as in Brabant. A place where living in sync with natural processes can be established in the future. Finally, as nature areas are currently taken care of more and more by large parties such as nature conservation organizations or farming enterprises, it would be of interest to explore what local stewardship can bring in combination with top-down management.

	Moving onwards from existing frameworks The idea of productive nature has been explored from different perspectives for the region during the Landscape Triennial in 2021 which was held in Brabant. Twelve possible levers or drivers for nature development, including building with trees, have been explored and mapped into a spatial vision, using the structuring element of the brooks as basis. This vision is a global idea of the potential. The spatial implications of production of biobased materials in a sustainable way has also been researched by Boom landscape and Studio Marcovermeulen. Both ideas as based on the landscape of South-Holland. What is of interest as a next step, is to explore the potential of developing, reconnecting and improving nature that provides a diversity of building materials that are specific to the brook valley landscape. As well as exploring the exact chain implications and possible local embedment, from sawing to producing. In conclusion, the central problem statement I would like to address is: **There is no explicit framework yet to transform the brook valley landscape to a landscape that combines production of biobased building materials, nature development and local stewardship**
research questions and	what spatial framework for the brook valley landscape of Brabant combines production of biobased building materials, nature development and local stewardship? 1. What biobased building materials suitable for the industry can be grow in the brook valley landscape? 2. What are the essential natural processes by abiotic and biotic components of the brook valley landscape and the resulting strategies for nature development? 3. What factors determine effective local involvement (in nature initiatives and local production)?
design assignment in which these result.	The assignment is to test how biobased materials production can be integrated with nature development, while stimulating local stewardship. These are the drivers/strategy. The final checks are ecosystem services (regulation, provisional and cultural services). This design has to take into account the plans for the Van Gogh masterplan. The resulting objectives of the 'shared' brook valley, a landscape that: • supports biobased building industry production • in which natural processes are accepted and integrated • invited for local involvement / stewardship Additional secondary objectives by State Forestry and Van Gogh National park: • strengthening landscape and heritage (van Gogh National Park) • nature and landscape to the heart of the towns and villages (van Gogh National Park)

	• development of nature experience and sustainable (cultural) tourism (van Gogh National Park) **Expected design solutions** • Macro level / watershed area of the Dommel: Design strategies • Meso level / 'Dommeldal uit de verf' area + green wedge of Eindhoven city: Masterplan for a transformation of the area to productive nature with focus on local building materials and local stewardship • Micro level / City to hinterland: Routing design from the city towards the brook valley in the hinterlands. Optional: proposal for a site specific landart in reference to Van Gogh (and related to local productive nature along the route).

Process

Method description

Research by design approach

The essence of the research is to explore future possibilities of the landscape. Therefore, a research-by-design approach is chosen in which design-based strategies will be used to investigate possible future landscapes. The main body will consist of projective design. Since the region of Eindhoven is selected as specific context a design experiment will be carried out as suggested by Deming & Swaffield (2011). The particular design strategy that will be applied is to transform the landscape into a productive supplier of biobased building materials as well as a landscape with high ecological value. A landscape in which biobased materials can be harvested and be returned to the landscape at the end of their lifespan as building material. This will be the driver of change. It will be investigated how this strategy will transform the selected area and what the outcome is in terms of different ecosystem services.

0. Preliminary phase: inventory, analysis & synthesis with lab

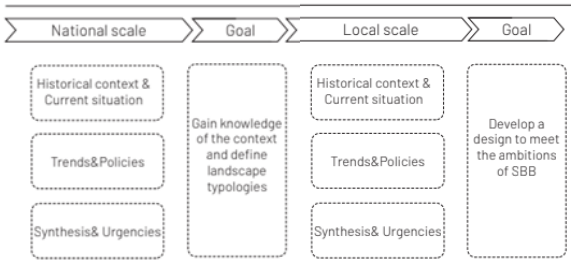


Image by Sanne Francissen

The research by design process will be informed by a preliminary phase that is conducted within a multidisciplinary lab of urbanist and landscape architecture students. The aim of this phase is to find potentials for Staatsbosbeheer properties, in proximity of 16 Dutch cities, of how to contribute to improve quality of life for citizens, flora and fauna.

National scale

Therefore, the phase starts with descriptive modeling of the landscape layers. On national scale, an inventory of the natural, cultural, and urban layers is made by QGIS-mapping resulting in an atlas with the mapped data. Additionally, trends have been mapped, existing future scenarios have been reviewed, and policies on national scale have been reviewed to gain knowledge of the context. In

subsequent synthesis, landscape typologies have been constructed based on the accumulated layers which serve as context for the local scale designs later.

Local scale
Next, 16 cities have been selected, based on principles defined by Staatsbosbeheer, in which the Green Metropolis aims have been leading. Similar analysis activities have been carried out on this local scale. Finally, based on the local inventory, a synthesis has been carried out, resulting in a map and list of potentials for the SBB properties (regarding green/blue structure, densification, livability, ecology, programming, and governance)

Individual part – my research

1. **First phase: answering sub questions**

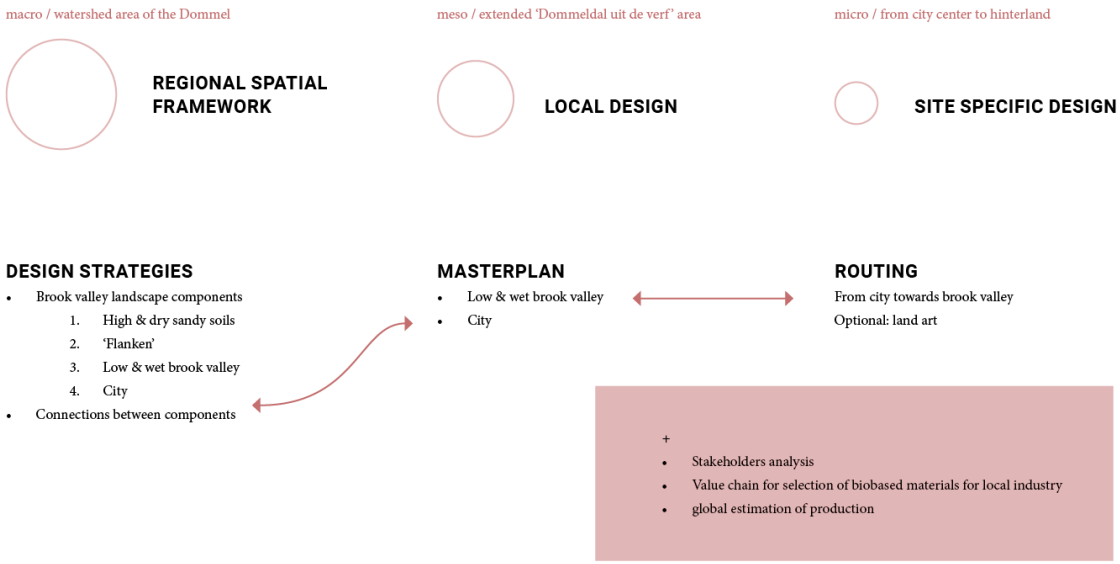
To derive design principles for
- biobased building materials cultivation
- enriching natural processes
- local stewardship / involvement

2. **Second phase: Extended regional & local inventory, analysis & synthesis**

To explore the regional and local dynamics of the chosen area in more depth, the preliminary analysis will be extended. The entire watershed area of the Dommel will be taken into account, as it is working as 1 ecosystem. The regional and local analysis will provide input for the design, especially from a landscape architectural perspective (spatial qualities).

3. **Third phase: Projective design**

In a design-through-scales approach, scales will inform each other. The design will be based on the previously defined principles.



Design scenarios
The previously established principles will be used for the local design. The intention is to use synergistic team-based creativity next to individual creativity to enrich the process, by having creative sessions with other students from the lab.

4. **Final phase: Reflection**

The experiment will explore what values will emerge from the transformation of the region. The design will be evaluated on the outcome of ecosystem services, with special focus on the checks as listed before that are aligned with the Van Gogh priorities. The hypothesis will be tested and the potential role of State Forestry will be explored. The natural boundaries of the ecosystem will be reflected upon.

Literature and general practical preference

Intended

Literature study / document review:

- Report: Het brede beekdal als klimaatbestendige buffer in de veranderende leefomgeving - Verdonschot
- Report: Samen maken we het Aa-dal klimaatrobuust – Waterschap Aa en Maas
- Report: Ruimte voor biobased bouwen – Studio Marco Vermeulen
- Recreation study of State forestry
- Additional literature on nature development & local stewardship

Case study:

- H+N+S - climate proof water system for brook valley / H+N+S, de eeuwige bron.
- BOOM landscape – biobased South Holland
- Studio Marco Vermeulen – building with wood

Expert meeting / workshop:

- GIS
- Ecologist
- Regional account manager of State Forestry
- Representative of province of Brabant
- Building industry representative
- State Forester

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)?

Urban ecology & ecocities lab aims to improve quality of life and environmental performance in cities. In the approach of the lab, the urban ecosystem is applied as base layer for design interventions. In line with the Green Metropolis program, Staatsbosbeheer asks us to explore potentials of their properties nearby cities. As these properties are often only primarily used as recreational areas, my graduation plan starts from the interest to enrich the connection between countryside including nature areas and the city. The city can be seen as a subsystem in a larger network/ecosystem. Nutrients, materials, people etc flow in and out of the city. How can interventions in the countryside influence city life and visa versa? How to connect both physically, but more important, how to enrich local life? If we want to reach a status of a healthy, regenerative living environment, we should not exclude local potentials. Part of the solutions can be found within the city borders, but to a larger extent in the hinterlands. Local resources have the potential to contribute to people's awareness about our dependency on non-human entities. I believe that in our society of overconsumption it can be of great value to see where resources come from, how they are processed, what effort is needed to grow them, and live according to their limitations. Especially the resources that fulfil your physiological and safety needs. The feeling of no limitations has brought us where we are today, out of balance with nature. I hope to explore these local potentials and natural limitations of the environment with my graduation project and to explore the spatial outcome.

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

Social framework:

- The design can be used as a discussion tool in a public debate about approaches of nature conservation in a densely populated country as the Netherlands.
- To design can provide a hint of the possible solution field of productive nature.

- The study can potentially contribute to a better understanding of the scope of local building materials in a Dutch brook valley landscape.
- The study can provide a vision for Staatsbosbeheer of appropriate strategies for their properties in the region of Eindhoven.

Professional framework:

- By using existing frameworks and concepts of professionals as basis, such as the masterplan of the Van Gogh park, the design can potentially enrich the insight on these concepts for professional organizations.

Scientific framework:

- The process and method of this project can be replicated in a new context with a similar problem statement.
- The study might contribute to a better understanding of the relationships between the current situation of the landscape and the potential productive landscape that is projected in the research.

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