

## Graduation Plan: Architectural Engineering Studio

Master of Science Architecture, Urbanism & Building Sciences

### Personal information

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### Studio

Name / Theme: Architectural engineering Studio/ Second Life

Main mentor: Anne Snijders [Academic field involved]

Second mentor: Mo Smit [Academic field involved]

**Argumentation of choice of the studio :** Climate change, material scarcity, circularity and loss of biodiversity are some of the challenges we must face as architects. I chose the aE studio because of the expertise of the tutoring group on the specific challenges and the freedom that is being given for formulating the context, program and technical interest according to one's personal fascination. Specifically, my fascination is to create solutions out of eco-friendly local materials that will serve the local community as well as the local eco-system.

**Graduation project:** NURTURE. RESEARCH. HARVEST. REPEAT: The Hugo R. Kruyt building as a biodiversity lab-farm-hub.

**Location:** Utrecht, Hugo R. Kruyt building

**Problem statement:** The deprivation and loss of biodiversity is one of the most alarming environmental problems of today's, threatening precious ecosystem services, animal and plant existence, as well as human welfare. The architecture of our buildings and the construction industry promote a self-centered civilization, taking into consideration mainly the human needs. Specifically, the façade acts as a wall that interrupts the natural movement of animals and insects and as a result the pollination and growth of plants. In order to establish meaningful connections between nature and human, we must consider that green corridors are read in 3D. Therefore, I am utterly convinced that nature must be given a fully-fledged place in the façade design for the transformation of the urban environment, which is currently out of balance, to a healthy, future-proof and attractive place that humans, animals, plants, micro-organisms and minerals would love to live and co-exist. The shape of the built environment in Europe will be more than 70% determined till 2030, thus we as architects will have to work on the existing stock to transform it to fit the future needs of our cities and nature. Utrecht Science Park is an area under redevelopment with goals of lower CO<sub>2</sub> emissions, minimizing of the campus' waste and promotion of biodiversity. One of the buildings that must be redeveloped, otherwise will be demolished, is the Hugo R. Kruyt building, whose 25% is currently unused. Its location is crucial as it is the first building when entering the campus and is planned to be the meeting point of students and professors. How can a laboratory building be transformed into a social condenser that acts as a biodiversity hub for interaction between nature and human and prolong its lifespan?

**Design question:** How to effectively redesign the Hugo R. Kruyt building in Utrecht, into a nature inclusive education-research hub, that promotes biodiversity, human & nature interaction, and make use of ecofriendly materials?

**Research questions:** How to design nature inclusive façade elements out of mycelium with organic/agricultural waste, to increase the biodiversity in Hugo R. Kruyt building in Utrecht Science Park?

### Sub-research questions:

1. What are the urban habitats of local species, and its spatial and ecological needs?
2. What are some of the existing case-studies of nature-inclusive building elements?

3. How can mycelium with organic/agricultural waste, be used and shaped for the materialization of prefabricated nature inclusive façade elements?

**Design assignment:** The starting point of this research assumes that nature-inclusive prefabricated elements can contribute to the increase of biodiversity in the urban-scape, while at the same time reduce CO<sub>2</sub> emissions in the process. The all-encompassing goal is to find ways to promote biodiversity through nature-inclusive design using local eco-friendly materials. In the context of the current mentality, that the building environment somehow separates itself from nature, conveying a new perception through architecture, which encourages a symbiosis between nature and humans, will assist the transition of cities to a healthier environment for both humans, animals and plants. Designing for ecology comprises a wider context, which carries economic, social aspects as well as the reduction of materials and energy in construction and demolition. Therefore, the nature-inclusive prefabricated elements will be designed as flexible modular structures out of locally harvested eco-friendly materials for the reduction of CO<sub>2</sub> emission and material waste. The goal of UU to have zero waste and the assumption that there could be enough organic and agricultural waste locally provided, the biology faculty in collaboration with the Material Science faculty that will be introduced to the building could help in the production of mycelium components for the construction of habitats. As Urban ecology is a complex process and is determined by both abiotic and biotic factors; the relationships between species, the relation of species and the non-living environment, as well as human activity will be considered in the design. The final design will be the implementation of detailed nature inclusive prefabricated façade elements. For the purpose of this detailed design the research will be conducted on the location and the chosen building itself, as well as mycelium, local species and their habitats.

**Method description:** The research methods that are going to be utilized in my research paper are both quantitative and qualitative. The different sub-questions require different methods due to their distinct character. Literature review, scientific research, data collection, research by design, reports, and case studies. The findings will be used as guidelines, evidence, and inspiration for the redesign of Hugo R. Kruijt in Utrecht University. The research will be realized within the specific geographic location of Utrecht for the mapping of the local biodiversity, as it is essential for my understanding of the local situation and the local needs in terms of biodiversity.

### Reflection

1. Nature inclusive façade design in the existing building stock can provide solutions for the Second life of existing buildings, by engineering architectural solutions for biodiversity, as a MSc AUBS student must design for the users of the city that are not only humans but animals and plants.
2. The graduation project can serve as a reference for the upcoming redevelopment of the Hugo R. Kruijt building, with some of its aspect could act as a starting point for other similar buildings in the campus (Practicumgebouw Diergeneeskunde) or globally. The production of a more detailed table of needs of the studied species can be implemented globally, even though the research is in a specific context. The building can act as a reference for future building that promote nature inclusive design with local materials.

### Literature and general practical preference

1. Natuurinclusief bouwen en ontwerpen in twintig ideeën. (2018, June 6). Issuu.  
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3. Stiphout, M. van., Lehner, M., & Havik, G. (2019). First guide to nature inclusive design. Amsterdam: nextcity.nl.
4. Vink, J., Vollaard, P., & Zwarte, N. de. (2017). Stads natuur maken = Making urban nature. Rotterdam: Nai Uitgevers/Publishers.
5. Vogelbescherming Nederland, Zoogdierverseniging (2019) Bouwnatuurinclusief [online] Available: <https://www.bouwnatuurinclusief.nl/>

