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	**Yuxin Yang**
Student number	5550459

Studio		
Name / Theme	Architectural Engineering	
Main mentor	Mo Smit	Architecture
Second mentor	Nico Tillie	Urban Ecology
Argumentation of choice of the studio	I really like Architectural Engineering's rigorous approach to architectural technology and its perfect blend of technology and design.	

Graduation project	
Title of the graduation project	Species-friendly complex student housing in Delft Campus
Goal	
Location:	Delft Campus
The posed problem,	Cities are growing as a result of population increase and the quick advancement of technology, which has also resulted in several issues like habitat loss for animals and environmental pollution, which has sparked a global catastrophe of species extinction. According to the United Nations Environment Programme (2010), human activity is 1,000 times more likely to cause a species to become extinct globally than it would be in the wild. Cities must have biodiversity to survive, and it is crucial for preserving natural balance and promoting sustainable development. Therefore, it is essential to incorporate biodiversity into urban and architectural planning. Urban planners and designers have developed techniques in recent years to incorporate biodiversity into urban development. For instance, nested bricks and bat boxes atop buildings are mentioned in Gemeente Amsterdam's "Twenty ideas for integrating biodiversity into urban planning and development," as well as installations in parks and forests such as rainwater pools and insect hotels. Their building of artificial habitats for

	urban animals including insects, hedgehogs, squirrels, bats, and birds, as well as their consideration of plant species as food sources, is what they all have in common. The technology for vertical greening systems, such as green roofs, rooftop pools, and green walls, has been continuously evolving. These systems use a variety of modular architectural strategies and are more adaptable and durable than the original technology. Based on the hierarchy of biological chains and the "convergence of nesting, feeding and resting space ecological requirements" of animals, the vertical greening system of buildings and the habitat of invertebrates and secondary consumers are taken into account as a whole. the development of a modular vertical greening system that can be installed on any building surface, and is demountable, versatile, and responsive to the
research questions and	How to use flexible modular vertical greening to enhance the biodiversity of the city and build an ecological system on the building scale?
design assignment in which these result.	How to convert an existing building into a complex student housing and incorporate modular vertical greening in Delft campus?

Sub questions:
1.What is local biodiversity?
2.What is modular vertical greening?
3.How to combine the needs of urban animals with modular vertical greening system?

Process

Method description

For research (P1 and P2)，beginning with an animal ecology viewpoint, the study examines the spatial requirements of nesting sites for building-dependent species in urban contexts, including size, orientation, entry, height, and temperature. This is done through literature reviews and case studies. The impact of various vertical greening techniques on the diversity and abundance of insect species is then researched in the literature, with the modular living wall system serving as the primary system chosen for analysis. To define the various modular living wall systems in terms of substrate, materials, and irrigation systems as well as to determine the effects of each feature on the diversity of insect species and strategies to improve them, literature reviews and case studies were used.

For the design in P2, the first step entails surveying the area and examining how the structure interacts with its surroundings, with a focus on the biodiversity of the area's green areas, ponds, plants, and animals. The exterior of the structure is then scrutinized, including its windows and any hallways that connect its various rooms. The examination of case studies that concentrate on the architectural strategy of the building and how the plants affect the spatial environment of the building, such as IBN - institute for forest and nature research and Vertical Park in Amsterdam, is then shown. Case studies of various vertical greening techniques and green roofs are presented after this.

Literature and general practical preference

1.Gemeente Amsterdam - Ruimte en DuurzaamheidFollowthis publisher. (2019, January 29). Twenty ideas for integrating biodiversity in urban planning and development. Issuu. Retrieved March 24, 2023, from https://issuu.com/gemeenteamsterdam/docs/twenty_ideas_for_integrating_biodiv

2.Kromoser, B., Ritt, M., Spitzer, A., Stangl, R., & Idam, F. (2020). Design concept for a greened timber truss bridge in city area. Sustainability, 12(8), 3218. https://doi.org/10.3390/su12083218

3.Gunnell, K., Williams, C., & Murphy, B. (2013). Design for biodiversity a technical guide for new and existing buildings. RIBA.

4.Zuñiga-Palacios, J. et al. (2021) "What do we know (and need to know) about the role of urban habitats as ecological traps? systematic review and meta-analysis," Science of The Total Environment, 780, p. 146559. Available at: https://doi.org/10.1016/j.scitotenv.2021.146559.

5.Francis, R. A., & Lorimer, J. (2011). Urban reconciliation ecology: the potential of living roofsand walls. Journal of environmental management, 92(6), 1429-1437.https://doi.org/10.1016/j.jenvman.2011.01.0

6.Surya, S. (2016) 'Biodiversity and Bird Friendly Design in urban areas for Sustainable Living', Indian Journal of Science and Technology, 9(5). doi:10.17485/ijst/2016/v9i5/87224.

7.Mayrand, F. and Clergeau, P. (2018) 'Green roofs and green walls for biodiversity conservation: A contribution to urban connectivity?', Sustainability, 10(4), p. 985. doi:10.3390/su10040985.

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

At the scale of individual buildings or streets, one option for urban biodiversity planning is to retrofit existing structures with vegetation cover. This technique may include the installation of green walls, green roofs, and indoor gardens. I want to design a system that takes into account the greening of the building facade as well as the habitat of secondary consumers and invertebrates as a whole. To develop a vertical greening system that is modular, demountable, flexible, and responsive to the needs of urban plants and animals, and that can be installed on any building surface. The goal of this project is to produce a vertical greening system that is modular, demountable, flexible, and responsive to these demands.

The link between people and animals, the relationship between the building and its context, and the relationship between new sections and existing buildings all need to be adequately studied. Additionally, the architectural approach needs to take into account the ecological, artistic, and building technology aspects. It also illustrates the collaborative and diverse design approach that is used in architectural practice.