

Graduation Plan

Master of Science Architecture, Urbanism & Building Sciences



Graduation Plan: All tracks

Personal information	
Name	Coby Adam Bianco
Student number	4789717

Studio		
Name / Theme	Architectural Engineering	
Main mentor	Mo Smit	Architecture
Second mentor	Tatiana Armijos Moya	Thematic Research
Second mentor	Paddy Tomesen	Building technology
Argumentation of choice of the studio	I selected Architectural Engineering to actively pursue my interest in sustainability topics such as bio-based building, urban green, and climate adaptivity. I am also motivated by the necessity to transform the built environment towards future proof environments. My goal is to translate my passion for sustainability into practical applications at the building engineering level.	

Graduation project	
Title of the graduation project	Renovating and Greening Haarlem's Post-War Neighborhoods: Achieving a New Balance.

Goal	
Location:	Haarlem - Boerhaavewijk
The posed problem,	Boerhaavewijk was built when construction methods prioritized efficiency and quantity to create affordable housing during a shortage. The residents live in buildings that don't sufficiently provide the expected comfort and their housing demands. Today energy use and summer-time comfort are unsatisfactory and unequipped for future climate challenges. The characterized future weather will increase cooling demand to maintain comfortable indoor conditions. There is low housing diversity and a mismatch between household composition and housing supply. Private outdoor spaces are unpleasant and the public outdoor space potential is underutilized, with areas that do accommodate outdoor activities being of low quality. The space created between the buildings is excessively divided into car infrastructure, paved sidewalks, small green patches, and public buildings, squares and playgrounds.

<p>research questions and</p>	<p>How to renovate the housing and restructure the public space using nature-based design to reduce energy demand and increase social engagement?</p> <ul style="list-style-type: none"> - What necessary changes are required on the building level to facilitate the transition to zero-energy buildings? - What options does the neighborhood have for adding different housing types and densifying the neighborhood? - How can the housing connect better with outdoor spaces and still retain privacy? - Can we replace the necessity for private yards enclosed in fences with a hybrid mix of public space ownership and private yards? - What is a productive public space and how can it be used to encourage outdoor activity and invite social engagement? - How can nature-based design be incorporated into a zero-energy renovation project?
<p>design assignment in which these result.</p>	<p>Boerhaavewijk is comprised of mainly row houses and walk-up apartments that have a repetitive arrangement. We select a stamp in the neighborhood as an example case to retrofit the buildings and upgrade the outdoor environment. We identify interventions that tackle multiple of the problems simultaneously; energy, social, comfort. The neighborhood has a diverse demographic makeup and therefore needs equally diverse housing options. Restructuring the existing buildings to create diversity will increase the housing supply within the neighborhood promoting growth. Deep renovation is chosen because it provides the best results reducing energy demand (Konstantinou & Heesbeen, 2022). The houses are renovated with The design will be leveraging passive strategies whenever possible and low carbon footprint materials.</p> <p>Green features will be seamlessly integrate with the buildings creating coexistence between urban and natural elements. The incorporation of green elements is vital not only for residents' comfort, social environment, and mental well-being but also to make space for nature and bring nature closer to people. Nature-based design will make</p>

use of ecosystem services to enhance resilience to the climate crisis. The public space will be redesigned to reinforce the existing green potential and to create new opportunities for green spaces that not only have an aesthetic or recreational effect but support productive and community-engaging functions (community gardens, neighborhood goods production, activity pockets). The public space should be inviting for residents, encourage social interaction and a stronger connection to nature. Moreover it should accommodate the residents' needs and foster a sense of ownership, even comparable to that of a private yard.

Process

Method description

Literature

- What are important considerations when renovating housing towards zero energy design? What methods have been tested and used?
- What are urban nature-based solutions and the challenges they tackle?
- What are the challenges and limitations of building integrated nature-based solutions?

Site analysis and visits

- Site analysis to understand original intentions, current situation, and future needs.
- site visit to experience the public space.

Research by design

- Using Boerhaavewijk as a case study to combine and test the impact of knowledge gathered from the literature will be used to reinforce concepts and understanding from the research.

Design by research

- The information gathered in the literature study will inform design decisions.

Literature and general practical preference

Hamdy, M., Carlucci, S., Hoes, P. P., & Hensen, J. J. (2017). The impact of climate change on the overheating risk in dwellings—A Dutch case study. *Building and Environment*, 122, 307–323. <https://doi.org/10.1016/j.buildenv.2017.06.031>

Luque, G. P., & Perini, K. (2018). Nature based strategies for urban and building sustainability. In Elsevier eBooks. <https://doi.org/10.1016/c2016-0-03181-9>

Municipality of Haarlem. (2017). Haarlem in 2040.

Municipality of Haarlem & SpaarGas. (2022). Haarlem - Proeftuin Aardgasvrije wijk Deel 1. In Rijksoverheid. ministerie van binnenlandse zaken en koninkrijksrelaties. Retrieved October 15, 2023, from <https://www.rijksoverheid.nl/onderwerpen/aardgasvrije-wijken/documenten/publicaties/2022/03/10/haarlem---proeftuin-aardgasvrije-wijk>

Noord-Hollands Archief: Het historisch informatiecentrum voor Noord-Holland - Noord-Hollands Archief. (n.d.). Noord-Hollands Archief. <https://noord-hollandsarchief.nl/>

Raji, B., Tenpierik, M., & Van Den Dobbelsteen, A. (2015). The impact of greening systems on building energy performance: A literature review. *Renewable & Sustainable Energy Reviews*, 45, 610–623. <https://doi.org/10.1016/j.rser.2015.02.011>

Reijneveld, S. A., Koene, M., Tuinstra, J., Van Der Spek, S., Broekhuis, M., & Wagenaar, C. (2023). Making post-war urban neighbourhoods healthier: involving residents' perspectives in selecting locations for health promoting urban redesign interventions. *Cities & Health*, 1–9. <https://doi.org/10.1080/23748834.2023.2197165>

Reflection

The built environment makes up at least 40% of the emissions nationally and globally. The new building industry only marginally changes the building stock on a yearly basis. Renovation is necessary to become carbon neutral nationally and globally. As urbanism continues to expand globally, densification emerges as a valuable strategy for reducing emissions. Showing the world that existing middle-density cities can become inviting nature-inclusive spaces is a step in the direction to sustainable compact urbanism, increasing densification and moving away from urban sprawl. The topic of nature-based design in buildings is largely in the scope of new buildings while this topic should be explored for renovation while we have the opportunity. A nature-based solutions approach to these neighborhoods is motivated by a few key factors. Firstly, they possess untapped potential for green spaces. secondly, the current state of the buildings leaves much to be desired in terms of aesthetic appeal, and the integration of greenery promises to introduce an additional layer to their façades and overall structure. Thirdly, the wide adoption of green/nature-based technology is still ongoing and there is still information and knowledge gaps to fill. Lastly, including greenery within the buildings in one neighborhood of Haarlem will increase opportunities for simultaneous greenification

and densification elsewhere in the city. The knowledge gap of applying nature-based technology in residential renovations is quite large. The majority of renovations that incorporate a nature-based solution apply a single or very thin applications of the possibilities. In this design we attempt to evaluate a realistic yet complete application of Nature-based design.

Planning

familiarization with topic - green in the city, nature based design,
wk 1.7- literature review on nature based design benefits
1.9 quantification of benefits

Nov 16th

P1

wk 2.2 Collecting information about the housing typology and urban structure.

Site analysis

Collecting information on typical none nature based renovation.

Finding case study

wk 2.3 Testing the availability of space for nature based design; is it enough?

Implementing nature based design in the context

wk 2.4

wk 2.5 Optional additional literature based quantification

wk 2.6 Reflection, how much should be applied on the building level

and how much can be left to the urban scale?

wk 2.7 Can these solutions be applied to the Zero energy renovation?

wk 2.8 Finalizing

wk 2.9

P2
