Reflection | Architectural Engineering Studio

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Motivation

As I approached the final years of my education, I contemplated various graduation topics, ultimately focusing on the reintroduction of nature in cities, climate adaptation, biobased materials, and carbon-neutral (zero energy) cities. Research indicates that a gray urban landscape is harmful to both people and nature. Recognizing the benefits of reconnecting with nature, it became clear that its absence is frustrating. Additionally, the necessity to build and to renovate towards zero-energy buildings is very present. Many neighborhoods are undergoing or have undergone renovations to decrease their energy burden. In other places neighborhoods have been transformed into more green, climate adaptive and nature inclusive environments. Every renovation that is undertaken has to choose what interventions it should have and what ambitions it should reach. Energy efficiency often overshadows greenery and nature inclusivity due to stronger regulations and certifications. We need to elevate our ambitions, transforming residential areas into carbon-neutral and nature-enhancing environments that will supply benefits across many themes. My interest lies in prioritizing nature reintroduction and exploring its interaction with energy efficiency principles. What benefits and challenges does greening the landscape present for energy use? Architecturally, this involves making living environments greener, encouraging social opportunities, and balancing green spaces with building density.

Research Results

The research began by questioning the impact of integrating nature into urban areas on building energy usage. Considering Indirect energy use from healthcare, water treatment, and behavioural changes were added to the motivation to persist with the research as was that higher exposure to nature and the increased environmental awareness it provides. Six nature-based solutions, or functions, were highlighted: noise mitigation, pollution capture, building energy use, microclimate, water reuse, and stormwater mitigation. These functions of nature-based solutions are looked at at the neighborhood level, considering local opportunities and weaknesses. Building-integrated greenery, is a subset of interventions available and can be very effective under certain circumstances but may complicate project feasibility. Parameters were identified to help apply these solutions based on neighborhood context and conditions, avoiding conflicts and stacking compatible elements.

Project Results

The project integrates zero-energy ambitions with nature based solutions in a typical row of houses. The landscape is reevaluated, focusing on nature-based ground activation informed by neighborhood scale analysis. Public spaces, often dominated by mobility infrastructure, and underutilized private ground are redesignated. The project is also informed by municipality ambitions and initiatives that support residents in greening efforts and adopting responsibility for high-quality green spaces. The design rethinks the public and private outdoor spaces belonging to housing corporations. The design features an urban stamp, with on row of houses facing a more open landscape context and the other row of houses facing a street context. The design create a green outer shell for the collection of houses to use nature based solutions as a protective jacket, mitigating undesirable urban effects offering new nature exposure and support opportunities. The open space between the buildings fosters social opportunities and integrates nature-based solutions. Social aspects are crucial for the design’s success, ensuring benefits for residents and overcoming objections to changes. The public space treated as a landscape can offer more resident adoption and initiative opportunities. The success of the design relies on the initial commitment to manage the green infrastructure until it becomes increasingly self-sustaining. The majority of people with gardens don’t find keeping up the garden a desirable activity but they do find the presence of a garden desirable. The portion of the population that does find gardening a desirable activity (40%) have the opportunity to engage in these activities as part of the community and encourage others to partake.

What is the relation between my graduation topic, Architecture, and Architectural Engineering?
Transforming an urban grey area into a green, usable space addresses many environmental and societal issues. This graduation project tackles these problems while renovating a common housing typology to create a more carbon-neutral environment. Existing urban and architectural structures are reused and adapted to meet environmental, social, and climate-related goals. As the project evolved, it became clear that even more opportunities are possible, addressing Haarlem's challenge of balancing green spaces with additional housing.

How did the research and the design influence each other?
The design process was closely integrated with the research. Understanding the context was essential to evaluate the applicability and necessity of nature-based solutions (NBS). This question arose repeatedly throughout the design phase. Quantifying the effects of NBS remains challenging due to local context variations and short-term weather patterns that influence the greenery's efficacy. The design also had to focus on the carbon footprint. Ideally, building-integrated greenery could reduce the need for additional insulation, but this cannot be guaranteed, so a thicker layer of insulation is included. Approaching the design and the influence of NBS from a larger-scale perspective proved to be more impactful.

How do I assess the value of my way of working (my approach, my used methods, my used methodology)?
I struggled a lot in the past year to establish a working approach and workflow. During the design process, I often got lost in the details of a particular part of the design, too quickly excluding or discarding options and losing sight of the larger picture. I frequently had to step back, re-evaluate my work, and refocus on my goals. In terms of research, I gravitated towards scientific papers, while that might not be completely necessary. I used scientific literature and both small and large case studies to expand my knowledge and familiarity with potential solutions and the result incorporates many ambitions.

How do I assess the value of the academic and societal value, scope and implication of my graduation project, including ethical aspects?
Academically, the project is a step towards diversifying and advancing sustainable urban transformations. It builds upon existing strategies on both architectural and urban scales, with each scale receiving different levels of detail in their development. The urban scale was primarily addressed during the first half of the research phase, focusing on enhancing public spaces to better meet human needs, fostering a sense of belonging, and increasing neighborhood resilience. On the architectural scale, the project received more detailed development. The aim here is to improve residents' living conditions, replacing underutilized spaces with greener, more active, and healthier environments. Additionally, the project introduces new housing opportunities, allowing the neighborhood to grow organically. However, this requires redefining the boundaries between private and public spaces, which can be challenging but ultimately provides greater value.

Another important aspect is the balance between social housing, investment costs, and time. While smaller, impactful interventions may be cheaper and less disruptive, they are often less effective. Larger projects, though more impactful, are less feasible in lower-income areas and typically require temporary relocation of residents. My project is a larger intervention and must be approached with caution. Increasing housing opportunities can help ease the investment burden and improve feasibility.

How do I assess the value of the transferability of my project results?

Because the project is based on a common housing strategy, it can be applied elsewhere. The research aims to help a workflow for deciding which nature-based solutions are valuable for specific areas and contexts. In public spaces, there is more freedom for variation. In collective spaces, the project can adapt to different scenarios by introducing multiple interchangeable collective functions. The housing intervention is also flexible, offering three variations that can be configured to fit different needs. Elements of the project and the research can be transferred to projects with less space.