

NATURE-BASED SOLUTIONS TO ESTABLISH A NET-POSITIVE URBAN WATER CYCLE IN AN OPEN BUILDING NEIGHBOURHOOD HYBRID

Reflection Paper

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Summary of the project

The Westelijk Havengebied in Amsterdam is a part of the municipality of Amsterdam, on the west-north-west side of Amsterdam. The area, with a surface of 35,47 km², lies south of the Noordzeekanaal. Westpoort is a business and industrial area, and includes the western harbours of the city. Westpoort has only 370 inhabitants. In the coming ten years, one million homes are to be built in the Netherlands. A coalition of 34 organisations in the areas of housing, construction and care and wellbeing has drawn up an action plan to this end, in cooperation with municipalities and provinces. The city thus faces an enormous challenge. It may take another 15 or 25 years, but there will come a time when Amsterdam has more than 1,000,000 inhabitants and they will need affordable housing. It will be necessary to build or redevelop. One of the places that is suitable for this is the Westelijk Havengebied. This project supports the plans for more- and affordable housing. A micro city in the area that not only facilitates living and working, but also focuses on leisure, sports and wellbeing. This project is a complete mini city with everything nearby: schools, sports, shops, care and greenery. It is largely car-free, with few on-street parking spaces. However, there are many bicycle and pedestrian paths to encourage residents and visitors to keep active.

Relation between research and design

The increasing exposure of cities to the effects of climate change are a major part of today's architectural discourse. An increase in heavy precipitation, flood risk and land subsidence within the context of Amsterdam is measured. Simultaneously, increasing temperatures result in the dehydration of soil and the urban heat island effect. (Van den Born et al., 2016) Together with these environmental challenges, the Netherlands is also dealing with a housing shortage and an urgent need for affordable housing solutions in order to build 1 million homes before 2035. (Rijksoverheid, 2020) Evidently, the need for housing also applies to the city of Amsterdam, given that it is the biggest city in the Netherlands and currently very popular among a variety of people. In order to achieve a sustainable addition to the housing stock, buildings and neighbourhoods need to be resilient and designed for change and diversity to be able to withstand the societal, environmental and economic challenges of today. In addition, water shortages threaten to arise due to increased periods of drought and simply by more people having to consume it. (Rijkswaterstaat, no date) Various studies have been carried out and published on the water cycle. For example, the publication by (Sugano and Lu, 2019) about applying hybridity as a concept for a possible decentralized water circulation model. Or the publication about open building by Frans van der Werf (van der Werf, 1993). To my knowledge however, none have been studying the possibility of combining these topics. This research will contribute to future developments related to the integration of water circularity within the open building concept. However, after researching these different topics and trying to combine these disciplines, it turned out to be more complex and challenging than initially expected. In retrospect, I should have made my research more tangible and smaller in nature. The time given for the graduation project is limited to one year, my research in which I wanted to combine three major themes is actually not feasible in such a short period of time. It takes a lot of knowledge, expertise and time to be able to conduct such a research. This has resulted in that, in fact I have not been able to achieve the desired end result that I initially had in mind. This also affected my design. Because the research covered three major themes, I didn't find the time to research all of them thorough enough to fully understand its possibilities and limitations. I was able to collect general information from all disciplines that I tried to combine as best as possible. In retrospect I would have liked to have a more specific and single research topic that was more appropriate for the given time. It would have then been more likely to have drawn tangible conclusions that could have formed a good basis for my design.

Relation between master programme, graduation topic and studio topic

The master's programme Architecture, Urbanism and Building Sciences is broadly structured. In this programme, technology, theory and design are deeply intertwined. Your own creativity and spatial insight however, play a major role. The master's programme focuses on technical-scientific education. It teaches students to analyse complex problems clearly and step-by-step. Individually or in groups, various design projects are executed to learn about the interaction between technology, culture and the living environment. The master ensures the relationship with the national tasks of the coalition agreement, such as climate and energy transition, circular economy, housing and socio-economic themes. This project focuses on a variety of goals. Sustainability plays a major role, whereas housing construction goals or investing in green space for social purposes are also of great importance within the design. In addition, this project focuses on new ways of cooperating within regions by transforming an industrial area into live-working areas. Within the Architectural Engineering studio, the close relationship between the design and its translation to engineering is primary. It is interdisciplinary and close to the social task of connecting, deepening and broadening. Finding the right balance between these 3 in engineering sustainably, and manufacturable design solutions is challenging. It however plays a major role in the creation of this project by constructing in wood, implementing many greenspaces and its associated water systems for added value in relation to social purposes. Developing a large amount of housing and making the building as public as possible will contribute to this thought. To benefit social tasks, an integral approach of including sustainability, climatic principles, energy efficiency, and wellbeing strategies is required in the design. Designing a building as a micro city in which various facets of nature, people and infrastructure come together is complex and requires fundamental and applied research and design in close relation with each other: engineering.

Research method and approach chosen by the student in relation to the graduation studio

The scientific field of the Architectural Engineering studio is the study of the integral structural design of a building or structure with the realisation of architecture as the ultimate goal. Both new construction and technical transformation of existing buildings belong to the domain of the studio, including aspects of sustainability and life cycle. On the one hand, the function of the studio lies in coordinating and integrating the input from the three core design chairs, structural design, building structures and climate design; on the other hand, the studio contributes to the interaction between building technology and architecture through the technical composition, arrangement and composition of building materials, building products and building components. Within the studio, this is comprised by research as well as by design. My own project has also been established by means of this approach. My process is based both on problems as on creating and testing solutions. Regarding my design project, I would rather apply 'research thinking' to be more appropriate than research-by-design. The process leading up to my final design made me think and contemplate numerous times, which has been good to be able to make informed choices and make the design into what it is now. It however has also been my stumbling block. Due to this continuous process of thinking and reflecting I often couldn't make choices, which resulted in a lack of time. During the design process, I framed, experimented and reflected. It was an iterative process, in which framing, analysis, idea development, realisation and reflection initially went through very quickly. This quick turnaround provided me with multiple options in a short amount of time, allowing me to weigh different options against each other and ultimately choose the right one and work it out in more detail. I found it a challenging process and was not always sure of my choices, precisely because of the many options research thinking gave me and the uncertainty that comes with every option. For future projects it would be better to schematically draw up the options available to a certain extent which will provide me with enough conclusions to base decisions on. Once levelling out these conclusions and comparing them with each other it would be easier for me to make a decision to follow through.

Relation between the graduation project and the wider social, professional and scientific relevance

Design research is linked to the practice of design. Within architecture and urban design, professionals also explore new fields and domains by working in a design-oriented manner, exploring options and alternatives and trying out models for the future. Architecture and urban design have their own intellectual culture. Design research has a place in it, as a specific form of knowledge acquisition and development, appropriate to the discipline. The design disciplines within architecture and urban design can, by their own nature, play a key role in tackling the major social challenges. This consists of connecting knowledge, technology and creativity to market opportunities and social needs. They work at the interface between knowledge and application. From there, concepts are developed for new products, services and systems that are realised, applied, introduced and exploited by others. Architecture and urban design are an important mediator and at the same time determining institution in the design of the built-up environment. Through the use of materials and the specific design of systems for the use of energy and water, for example, architecture can contribute to the sustainable use of raw materials and resources. Architecture also has the ability to promote an inclusive and safe society in the functional context of everyday life. And so it is in my design, where water and nature play a primary role, but also the housing shortage is tackled, ensures a high societal relevance of the project.

On a personal-social level, with regard to (communication with) fellow students, the relationship with the project is much less guaranteed. Due to the current circumstances regarding COVID-19, working from home was a requirement and the university was closed during pretty much my entire graduation period. This was challenging, sometimes demotivating and above all, less inspiring than I had imagined the graduation process to be. The social interaction with students and lecturers was completely absent and that was harder than I had initially expected. Architecture is a creative process in which consultation and discussion with fellow designers is of crucial importance. Working together on design ideas through sketches gives many new and important insights, an element that has now been completely dropped. This has certainly had a negative impact on my thinking and ability, and therefore on the final design.

Turning green areas into opportunities that can be developed into tangible possibilities that greatly enhance the value of green areas for users requires scientific research. Much has already been written and designed about nature-based solutions, in order to contribute at national and international level to solving local and global challenges on topics such as climate change, biodiversity, environmental quality, circular economy, urbanisation, migration and food security. The complexity of these issues continues to demand integrated and robust solutions. My research and design can help make these solutions more concrete and comprehensive. Much has also been written about open building and high-density. However, the combination of these terms is scarce. In order to fill the gaps in scientific knowledge about nature-based solutions in combination with open construction and high-density, my research and design serves as a tool and a basis for further research.

Ethical issues and dilemmas you may have encountered during graduation

Honestly, I did not experience any real ethical issues and dilemmas during my graduation process. Something that could possibly be close to an ethical dilemma within my graduation process is the fact that my building is of large scale. The financial consequences associated with this, and the spatial impact it will have are of great consideration. At the same time, there is a great housing shortage and the construction of new (large) residential buildings is essential. Does the large housing shortage outweigh the high financial investment? That could be a question of an ethical nature.

The current situation regarding COVID-19 could also be seen as an ethical dilemma. The world is struggling with a major corona crisis, implemented measures that have a major impact on the wellbeing of people are an important and big part of this. One of the measures taken by the Netherlands was to close universities and libraries and avoid social contact. On the one hand, this was necessary to get the corona crisis under control again, but on the other hand, it has had a huge influence on the performance and wellbeing of students and possibly lead to study delay of some, which in the end costs a lot of money. Besides, it points out the lack of open and public space available for when such situations occur.

