REFLECTION

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The graduation project focuses on the implementation of ecosystem services into the post-war neighborhood. This topic is related to multiple themes of the studio: renovation for second life, nature inclusiveness and healthy environments. The projects' overall purpose is the creation of a healthy and pleasant living environment for residents while also considering other species and the impact on other ecosystems. This is achieved through the implementation of various natural and technical measures and will be further explained in the next chapters.

Research

Before starting the research, the initial purpose of my graduation project was to create a healthy living environment for both humans and other species through design, while increasing the housing stock. My initial thoughts were to achieve this through more sustainable housing, for example by using biobased materials, creating public spaces that are climate adaptive and designing pleasant living spaces (figure 1). This goal arose mainly from the current need for housing and the pollution deriving from the built environment as the building and construction sector is currently responsible for 40 percent of the CO^2 emissions and almost half of world's global waste that ends up in landfills. Moreover, the building industry is one of the world's major users of non-renewable resources. All in all, this makes this sector one of the most polluting industries. A concept that clearly shows the use of earth's natural resources and consequences for humans is the concept of ecosystem services. This concept refers to the benefits that humans derive from natural ecosystems and the impact of the population on these ecosystems.

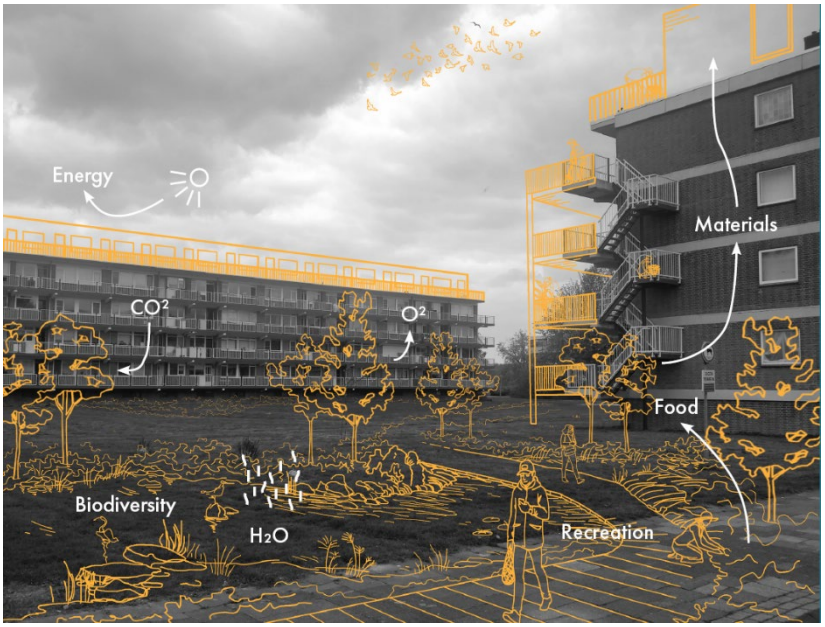

Figure 1: Initial vision graduation project

This concept mainly focusses on demand and supply of ecosystems from and for humans. Humans rely on the resources provided by ecosystems. These resources ensure the maintenance of human well-being and health. These resources or services are categorized into four types: provisioning (such as food and water), regulating (like climate regulation and carbon sequestration), cultural (including recreational and spiritual benefits), and supporting services (which maintain the conditions for life, such as provision of habitats and maintenance of biodiversity). As the relation between supply and demand is particularly unbalanced in the city, mainly due to their high population density, the research was focused on the city. During the research, the most relevant ecosystem services in an urban environment were explained and strategies were introduced to enhance these services, while simultaneously relieving pressure on existing natural ecosystems. These strategies mainly consisted of various forms of blue and green infrastructure, but measures like the creation of nest-boxes in the facade were also included. The implementation of these strategies into the post-war neighborhood can be seen in figure 2.

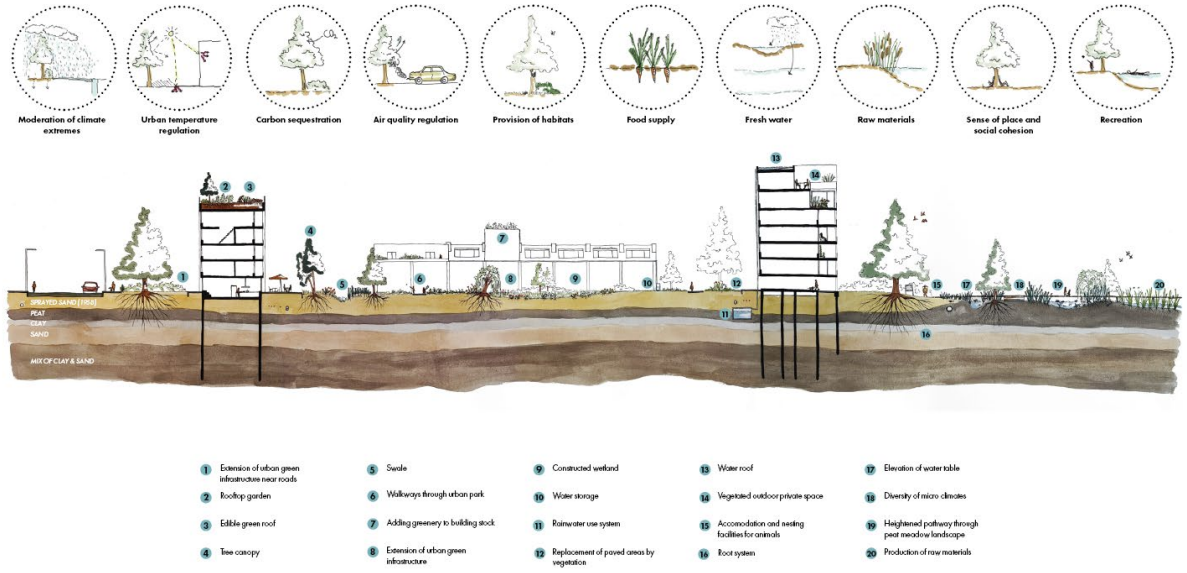

Figure 2: The implementation of strategies to enhance the supply of ecosystem services in the post-war neighborhood

While researching these various ecosystem services, the post-war neighborhood was chosen as the site for the project. These neighborhoods are often characterized by the unsustainability of the housing stock, the unused and low quality urban green spaces, and their repetitiveness in design. Moreover, these neighborhoods offer space for densification and since these neighborhoods currently encompass almost 30 percent of the current housing stock in the Netherlands, improvements within these neighborhoods can have major impact on the total Dutch housing stock.

During the research, I looked into the supply and demand of ecosystem services within a post-war neighborhood, while using a stamp in Boerhaavewijk in Haarlem as a test-case to determine the influence of the proposed strategies on the supply of ecosystem services. While looking into this, I noticed the demand for ecosystem services is often unclear. Although the need for ecosystem services, for example for food and water, is measurable, the need for other

ecosystem services, like biodiversity, is often difficult to determine. I also experienced this during my research and the chosen methodology, as determining demand in relation to the supply of the stamp in Boerhaavewijk was difficult or sometimes impossible. This led to the quantitative side of the research being partially incomplete. The research confirmed that the proposed strategies to strengthen urban ecosystem services were useful in absolute terms, but the extent to which this had an impact in relative terms to total demand often remained unclear. However, this didn't mean the research was 'irrelevant'. The report endorsed the importance of existing ecosystems and argued for the recognition and appreciation of these services, making the management and conservation of these ecosystems crucial. Moreover, the contribution of enhanced urban ecosystem services through the proposed measures is not only beneficial in a quantitative way. The research also underlined the benefits of these strategies for the living quality of these neighborhoods as strategies like introducing for example parks and allotment gardens within the neighborhood can lead to a more pleasant environment, where people can meet, play and recreate.
Overall, the research report demonstrated the positive impact of the enhancement of ecosystem services within an urban environment on the health and well-being of its inhabitants and the sustainability and climate adaptivity of the built environment. However, the magnitude of this positive impact is unclear, partly because the impact on health of certain types of services, such as biodiversity, is difficult to express in numbers. Nonetheless, the concept of urban ecosystem services offers designers a guideline of ecosystem services which can be implemented in the urban environment through the proposed strategies.

In hindsight, it might have been better to narrow my research topic, for example by looking more into only one of the ecosystem services categories. In this case, I could have done more research into the exact benefits of utilizing the concept of ecosystem services into the design process for health. Additionally, I could have looked more into how the proposed strategies could be implemented into the urban environment, while also considering the neighboring ecosystem, the soil type and the existing species. This could have provided a more extensive and substantiated foundation for certain design choices.
On the other hand, the report now shows an overview of the most important ecosystem services in an urban environment, including the design principles to promote this in the city. This makes the report relevant to all design projects in an urban environment, especially in post-war neighborhoods. Moreover, as I was not familiar with the concept of urban ecosystem services beforehand, I learned a lot from this broader approach. Therefore, I would definitely consider the concept of urban ecosystem services and the benefits of its implementation in an urban environment in future projects.

Design – the neighborhood

After the research, I looked into how the urban ecosystem services could be enhanced in te project location, Schalkwijk in Haarlem. During the research process, the importance of green and blue networks came to light as a way to improve the provision of ecosystem services. These networks support biodiversity and ecological resilience by creating corridors for wildlife by linking parks, wetlands, waterways, etc., allowing species to migrate. This connectivity supports diverse ecosystems, which are better equipped to adapt to environmental changes and stresses. Moreover, green and blue infrastructure improves water quality and flood regulation through measures like rain gardens and permeable surfaces. This improves water quality by filtering pollutants and absorbing excess rainwater. This natural management reduces flooding risks and helps maintain groundwater levels, benefiting both ecosystems and human communities. Furthermore, urban green and blue networks improve (mental) well-being and create opportunities for recreation. These networks provide accessible green and blue spaces for outdoor activities, promoting physical health and encouraging community engagement. Natural environments have been shown to reduce stress and improve mental well-being, enhancing the quality of life for residents.

For these reasons and after extensive research into the history of the neighborhood and the former landscape, an urban ecological corridor was introduced into the neighborhood. This corridor, which can be seen in figure 3, connects the peat meadow landscape on the east side of the neighborhood to the river Spaarne on the west side of the neighborhood. Additionally, the corridor connects various existing facilities, such as supermarkets, sports fields, and schools. The design of this corridor will include different areas that offer benefits for residents as well as for other species. For instance, helophyte filters will be installed to recycle rainwater for household use, and retention areas (wadi's) will be created to temporarily hold rainwater, with spaces in between for social interaction and play. These areas will feature native species like willows, bulrushes, and reeds, which enhance various ecosystem services, such as water purification and nesting opportunities. Furthermore, this route will serve as an extension of the existing peat meadow landscape adjacent to the neighborhood, while bringing back the former landscape into the neighborhood. The implementation of urban ecosystem services can be seen in figure 4.

Figure 3: The urban ecological corridor

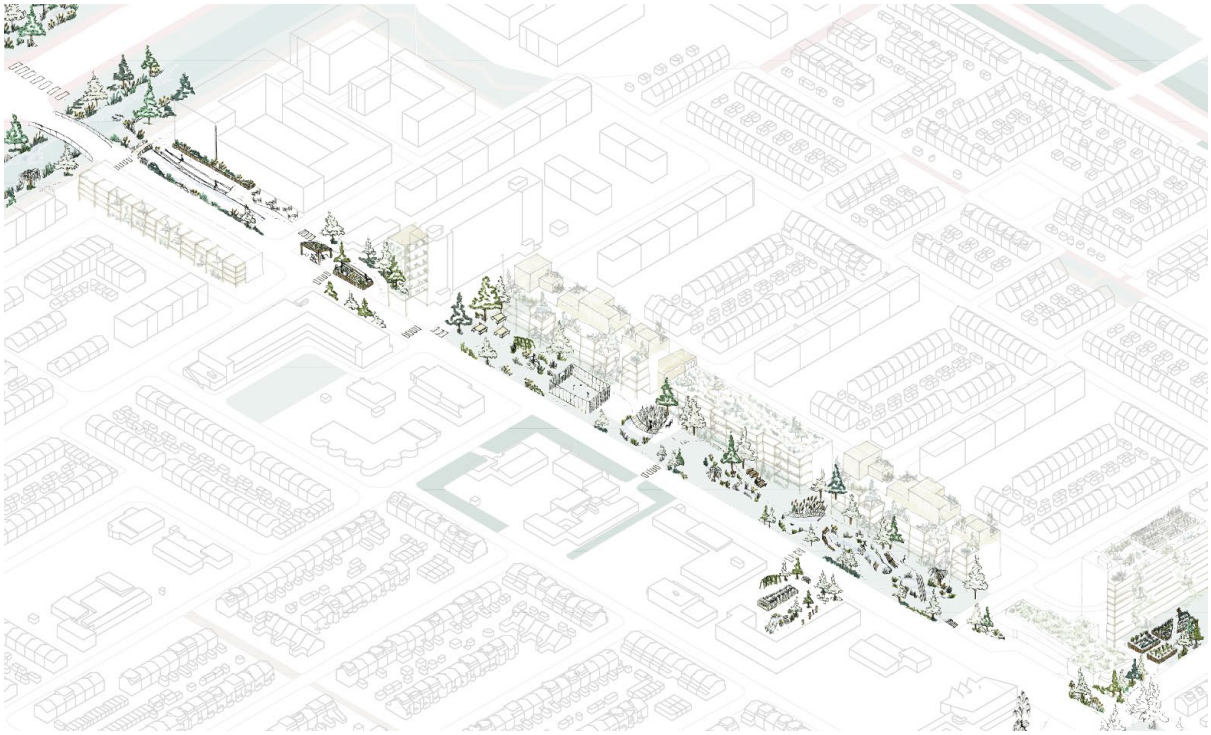

Figure 4: The implementation of ecosystem services into the urban ecological corridor

Design – Residential portico flat

During the research into post-war neighborhoods, in particular Schalkwijk, the existing problems were recognized. Currently, the post-war neighborhoods are dominated by cars, hard surfaces and repetitive building blocks which often do not show a clear connection with the local landscape. The existing green spaces are often of low quality, are unused and mainly serve the purpose of 'visual green'. Moreover, the housing stock is often still meant for large families, although the average household size has decreased immensely. Moreover, the current housing shortage asks for the densification of these neighborhoods.

The purpose of the renovation of the portico flat was to tackle these problems, while also considering the implementation of urban ecosystem services on the building scale. The main interventions included the redistribution of existing apartments to create more smaller units. Additionally, two floors were added on top of the building to further increase the housing stock. New exterior insulation and cladding were also applied to enhance the building's sustainability, using materials that can be produced in the peat meadow landscape (cattail as insulation material and ash wood for the cladding). In order to also implement ecosystem services on the building scale, the focus was primarily on the verticality of buildings and its opportunities. Buildings create the opportunity to have greenery on multiple vertical levels, such as green roofs and living walls. This supports urban biodiversity by creating habitats for birds, insects, and other wildlife, which can thrive in these diverse environments. This vertical greenery also improves air quality by absorbing pollutants and increasing oxygen levels, which directly benefits residents' health and well-being. Furthermore, these green spaces help regulate temperature by providing shade and absorbing heat, reducing the urban heat island effect, while also managing stormwater by absorbing rainwater, thus mitigating flooding risks in cities. To make greenery on multiple levels possible, larger balconies were added to the building, which are accessible from each apartment. The interventions can be seen in figure 5 and 6.

Towards P5, I will mainly work on a more coherent storyline and visualization of the implementation of urban ecosystem services on different scales. In particular, I will focus on the climate design of the portico flat in order to clearly show the positive impact of the strategies to enhance these ecosystem services on the residents and other species.

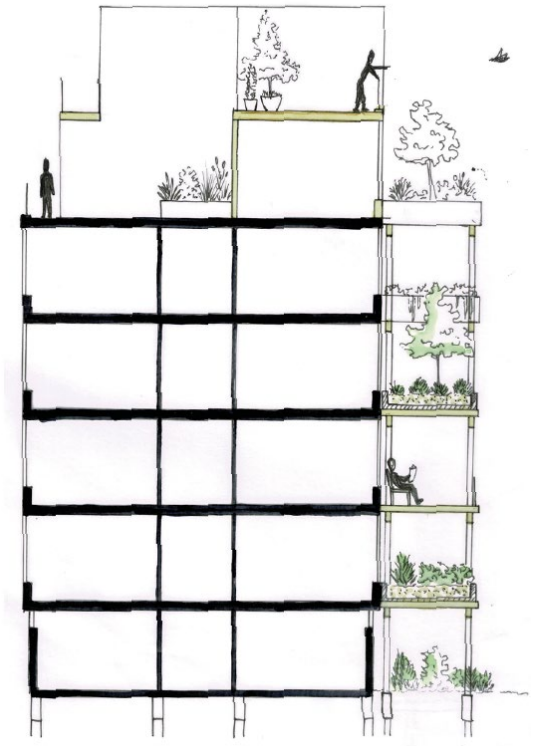

Figure 5: The interventions on the building scale

Figure 6: The interventions on the building scale; greenery on multiple levels