SYMBIOSIS UNEARTHED

symbiotic regeneration of Dutch postwar garden city neighbourhoods

Architectural Engineering
Design tutor: Stephan Verkuijlen
Research tutor: Mo Smit
Argumentations of choice of the studio: The hands-on approach of Architectural Engineering convinced me to choose the studio. I hope this way of research and design will help me find a practical, feasible solution for my problem statement.

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Keywords
Anthropocene, Symbiocene, inclusive design, nature, biobased materials, regenerative systems, holistic, health

"Moderniteit is collectieve zelfbeperking tot planetaire plundering."[1]

"*Modernity is collective self-limitation to planetary plunder.*"

1 Willem Schinkel, *Theorie van de Kraal. Kapitaal - Ras - Fascisme*, 2019.

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GENERAL PROBLEM STATEMENT

We are living in the Anthropocene Epoch, a time characterized by the serious impact of human activity on the Earth's ecosystems and climate. In this era, nonhuman and human beings are physically suffering because of the unhealthy environments we have created.
Urban areas expose its inhabitants to several health hazards like air pollution[1], heat stress[2] and the absence of plants[3]. At the same time, a lot of nonhuman species are losing their habitats due to deforestation in the name of, urbanisation and agricultural purposes[4] which lead to a decrease in biodiversity of species[5] and of soil[6].

Anthropogenic consequences like these reveal the huge social injustice between the Global North and the Global South[7]. Even though countries from the Global North consume a disproportionate amount of the Earth's resources, people in the Global South have a higher chance of being affected by the climate change effects caused by named consumption[8]. Furthermore, social injustice is also present within Northern countries through discrimination in healthcare and in our overall society, which results in poorer health[9].

Urban societies tend to rely on a dichotomy between nature and human beings. Sadly, some human beings tend to think that they can dominate others, which results in exploitation of other people and the Earth. Humans are in fact natural beings and, as indigenous peoples show, it is possible to live in symbiosis with nature instead of dominating and exploiting it. A shift of mindset is urgent, a shift from human benefit to mutual benefit of all species and ecosystems; we need to move from the Anthropocene to the Symbiocene[10].

Many characteristics of Dutch postwar garden city neighbourhoods relate to the aforementioned issues of our modern society. Firstly, these neighbourhoods were built in bulk and mainly consist of a few specific flat typologies[11], which means that not everybody's needs are met by the limited

1 European Environment Agency, *Air Quality in Europe: 2017 Report*, vol. 13, 2017, https://www.eea.europa.eu/publications/air-quality-in-europe-2017, 28.

2 Piracha, Awais, and Muhammad Tariq Chaudhary. 2022. "Urban Air Pollution, Urban Heat Island and Human Health: A Review of the Literature" *Sustainability* 14, no. 15: 9234. https://doi.org/10.3390/su14159234.

3 Evelise Pereira Barboza et al., "Green Space and Mortality in European Cities: A Health Impact Assessment Study," *The Lancet Planetary Health* 5, no. 10 (October 1, 2021): e718–30, https://doi.org/10.1016/s2542-5196(21)00229-1.

4 Tombari Bodo, Batombari Gbidum Gimah, and Kemetonye Joy Seomoni, "Deforestation and Habitat Loss: Human Causes, Consequences and Possible Solutions," *Journal of Geographical Research* 4, no. 2 (May 11, 2021): 22–30, https://doi.org/10.30564/jgr.v4i2.3059.

5 R.P.H. Snep and Philippe Clergeau, "Biodiversity in Cities Biodiversity in Cities , Reconnecting Humans with Nature," in *Springer EBooks*, 2012, 938–61, https://doi.org/10.1007/978-1-4419-0851-3_296.

6 Maria A. Tsiafouli et al., "Intensive Agriculture Reduces Soil Biodiversity across Europe," *Global Change Biology* 21, no. 2 (November 17, 2014): 973–85, https://doi.org/10.1111/gcb.12752.

7 "North–South Divide in the World," *Encyclopedia.Pub*, December 1, 2022, https://encyclopedia.pub/entry/37558.

8 Carmen G. González, "Food Justice: An Environmental Justice Critique of the Global Food System," in *Cambridge University Press EBooks*, 2015, 8–15, https://doi.org/10.1017/cbo9781107295414.020.

9 Iris Andriessen et al., *Ervaren Discriminatie in Nederland II* (Sociaal en Cultureel Planbureau, 2020), https://www.scp.nl/binaries/scp/documenten/publicaties/2020/04/02/ervaren-discriminatie-in-nederland-ii/Ervaren+discriminatie+in+Nederland+II.pdf.

10 "Exiting the Anthropocene and Entering the Symbiocene," *Minding Nature* 9, no. 2 (May 2016): 12–16.

11 Anita Blom, Bregit Jansen, and Marieke Van Der Heiden, "De Typologie van de Vroeg-Naoorlogse Woonwijken" (Rijksdienst voor het Cultureel Erfgoed, April 2004), 25, accessed October 21, 2023.

variation in apartments. Secondly, the buildings often have technical problems and lack certain facilities, that are required in new buildings. Lastly, there is a lot of space reserved for green, but these patches of land are usually monotonous and are not intended for people to interact with[12]. So, for the sake of living quality, Dutch postwar garden city neighbourhoods definitely require change. Instead of demolishing the flats, which is sometimes done, the value of the buildings and the surroundings should be acknowledged.

If the objective is to turn the impact of architecture into a positive, regenerative one, the resource flows and the effects on the environment should be considered as well. Then, the question emerges: how can a postwar garden city neighbourhood be renovated and at the same time provide the building materials in a circular way and contribute to the health of human and nonhuman beings and the soil?

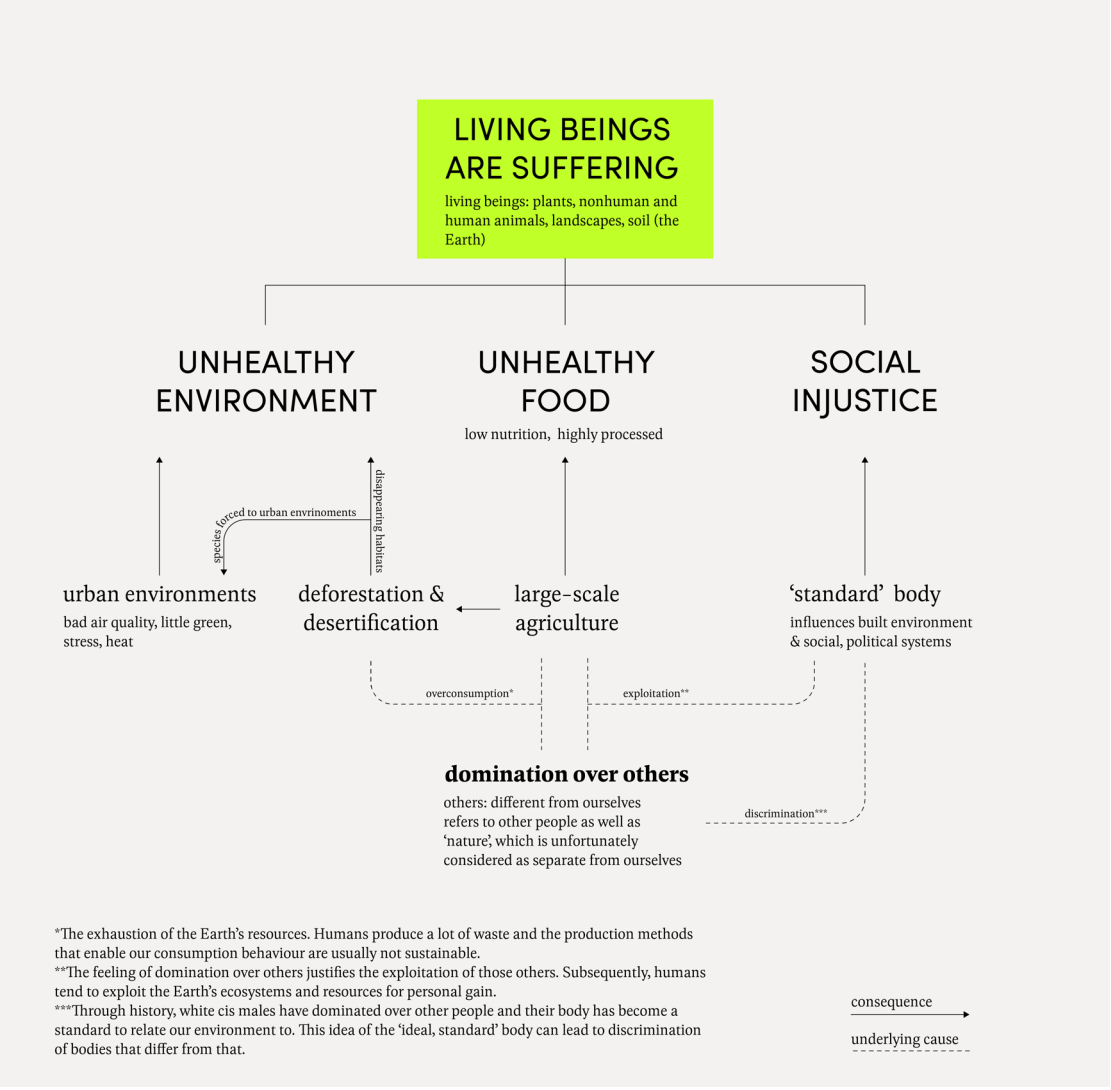


Figure 1. N. Dalman, *General problem statement*, 2023.

12 Raffael Argiolu e.a., "Bloei En Verval van Vroeg-Naoorlogse Wijken", *https://www.officielebekendmakingen.nl/* (Nicis Institute, 23 juni 2008), 16, geraadpleegd 31 oktober 2023, https://zoek.officielebekendmakingen.nl/kst-30995-51-b1.pdf.

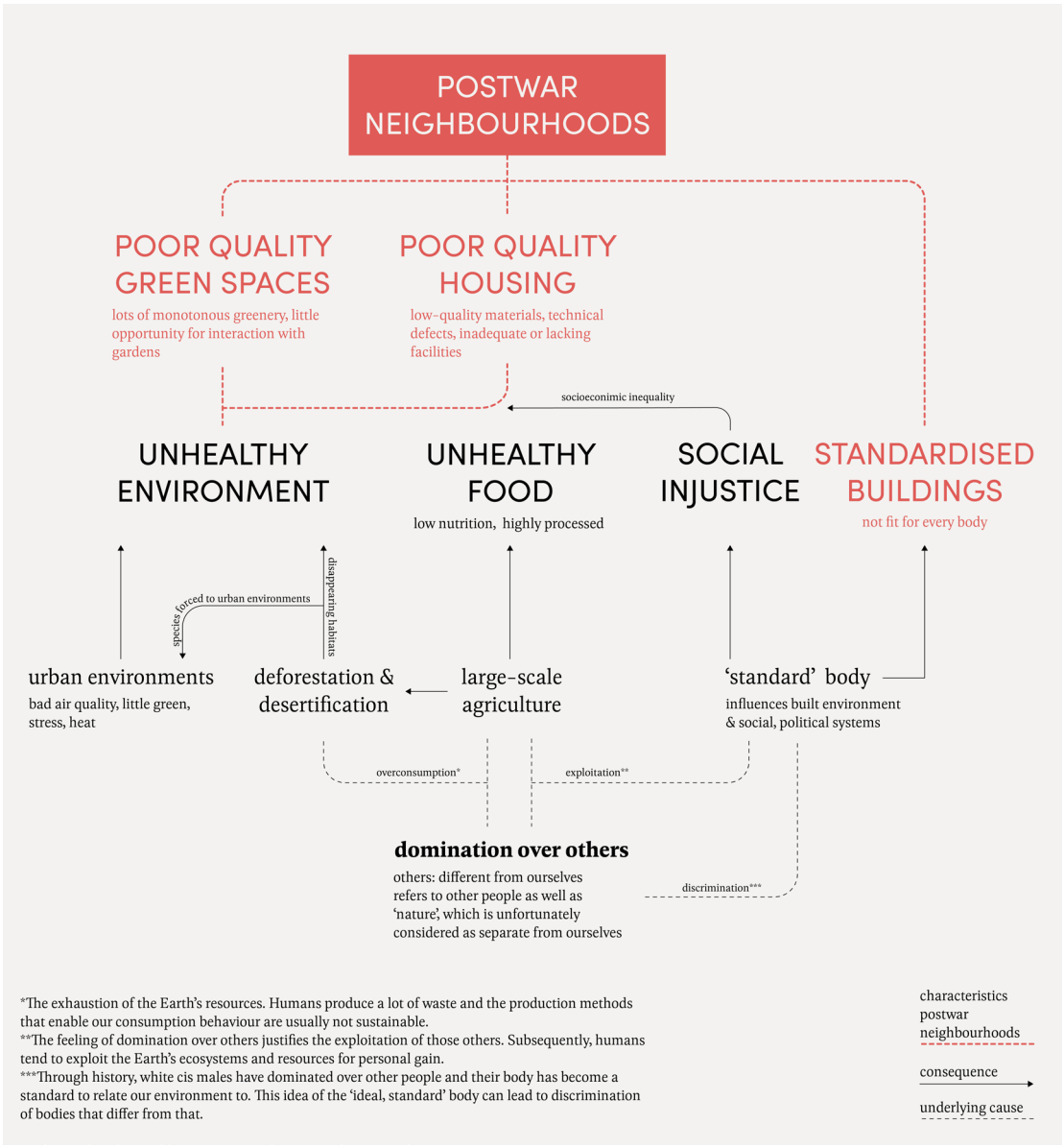


Figure 2. N. Dalman, *Problem statement with specific context*, 2023.

OVERALL DESIGN OBJECTIVE

After the second World War, between 1945 and 1965, a lot of urban expansion districts were built to meet the housing shortage of that time. Nowadays, demolition and new construction is often chosen as a development plan for those neighbourhoods, instead of renovation[13] (see Figure 3.) Loads of energy and materials have been invested in existing buildings and they store a lot of CO_2. Therefore, the housing stock should be appreciated and maintained, and my graduation project will accordingly focus on renovation. The postwar garden city neighbourhoods, usually located at the edge of cities (see Figure 4), contain a lot of similar typologies, which means research about the renovation could offer solutions for many contexts in the Netherlands.

The intention of my graduation project is to transform a postwar garden city neighbourhood into a healthy, flourishing residential forest, that provides the needed biobased building materials through agroforestry. Tackling a location that is currently ecologically exhausted and unhealthy for its inhabitants could uncover a huge contrast and answer urgent needs. The transformation is meant to bring great improvements for the health of human and nonhuman beings and have a regenerative effect on the ecosystem. Instead of simply taking plants from the soil for material use, the goal is to create a circular system that grows plants for renovation, while building nutrients and life in the soil.

The regenerative forest will be a biodiverse ecosystem, that provides healthy food and encourages interaction with the environment. Besides physical health, the transformation should contribute to the mental health of the inhabitants. This aim will be implemented in the design through topics like safety, social health, accessibility, and inclusivity. Ultimately, the ambition is to create a comfortable neighbourhood for all inhabitants, by trying to get a sense of everyone's needs.

Figure 3. T. Stolk, *Demolition flats Dordrecht*, 2018, photo, 1120x747, DordtCentraal, https://dordtcentraal.nl/actueel/video-gejuich-om-sloop-portiekflats/.

13 Anita Blom, Bregit Jansen, and Marieke Van Der Heiden, "De Typologie van de Vroeg-Naoorlogse Woonwijken" (Rijksdienst voor het Cultureel Erfgoed, April 2004), 2, accessed October 21, 2023.

Figure 4. Dienst der Publieke Werken, *Algemeen Uitbreidingsplan of Amsterdam*, 1935, drawing, World Garden Cities, https://www.worldgardencities.com/nl/tuinsteden/westelijke-tuinsteden-amsterdam-netherlands.

OVERALL DESIGN QUESTION / HYPOTHESIS

How can Dutch postwar garden city neighbourhoods be transformed into residential (agro) forests, which are healthy for all living beings and enable them to sustain themselves in a regenerative way?

REFLECTION ON THE RELEVANCE

The transformation of the postwar garden city neighbourhoods into regenerative forests will have positive societal and environmental impacts. The renovation of the flats will include an addition of new apartments, which can reduce the current housing shortage in the Netherlands[14]. The creation of a regenerative agroforest could increase the biodiversity of the neighbourhood, which is valuable in the context of the problems that come with biodiversity loss[15]. Additionally, an increase in soil biodiversity improves the water absorption and can therefore help prevent flooding[16].

The system of the local agroforest and the biobased building materials is intended to be entirely circular. Using a circular strategy rules out the unsustainable activities of transporting materials and extracting scarce materials. The inhabitants of the neighbourhood will be encouraged to interact with their natural environment and hopefully develop gratitude for the things they receive, like clean air, healthy food, and comfortable housing.

14 Ministerie van Algemene Zaken, "900.000 nieuwe woningen om aan groeiende vraag te voldoen", Volkshuisvesting | Rijksoverheid.nl, 24 juli 2023, geraadpleegd 30 oktober 2023, https://www.rijksoverheid.nl/onderwerpen/volkshuisvesting/nieuwe-woningen#:~:text=In%202021%20steeg%20het%20woningtekort,die%20een%20woning%20nodig%20hebben.

15 Ingrid Visseren-Hamakers en Marcel Kok, *Transforming Biodiversity Governance*, eBook, *Cambridge University Press eBooks* (Cambridge University Press, 2022), 6–7, https://doi.org/10.1017/9781108856348.

16 P.N.M. Schipper e.a., *Goede Grond Voor Een Duurzaam Watersysteem: Verdere Verkenningen in de Relatie Tussen Agrarisch Bodembeheer, Bodemkwaliteit En Waterhuishouding* (Kruyt Grafisch Adviesbureau, 2015), https://edepot.wur.nl/348633.

THEMATIC RESEARCH OBJECTIVE

The main objective of my thematic research is to develop a model for a biodiverse, regenerative forest that is connected to the renovation of a postwar garden city neighbourhood and can provide the needed building materials in a circular way. It relates to the current, Anthropogenic mindset which completely distinguishes humans from nature, by researching how humans' actions can be beneficial to the Earth instead of how the Earth's resources can benefit humans. The thematic research will concern a plot in Zeeheldenkwartier in Hilversum (see Figure 5.) There is an existing case of plans to build with local trees from the nature reserve Goois Natuurreservaat[17]. This is an area with sandy soil, in which forests can grow well. Therefore, the thematic research will focus on building with wood and fibres from the local trees and possibly other plants[18].

The plot that will be studied will be studied consists of flats of the typical portiek- en galerijflats typologies and is located adjacent to a forest, which is part of Goois Natuurreservaat[19] (see Figure 6 and 7.) The thematic research will contain an analysis of the requirements for future renovation of the specific typologies as well as possibilities for adding new apartments. By combining data about the quantities of needed building material for the renovation of the plot, the growth cycle of the trees and plants and the lifespan of the biobased building elements, the research will aim to determine the size of the regenerative forest, how the forest can be established over time and the circular system of harvest and growth. In the end, the outcomes of the thematic research will define a way to renovate a postwar garden city neighbourhood in a circular manner, that, at the same time, refrains from problems like the exhaustion of the Earth's resources, exploitation of people, biodiversity loss and unhealthy lifestyles.

Figure 5. N. Dalman, *Zeeheldenkwartier in Hilversum*, 2023, edited photo, 2085x1376, (edited from) Google Maps, https://www.google.com/maps.

17 Bart Van Manen, Marc Maassen, and Inge Huiskers, "Pilot Woonakkoord Gooi En Vechtstreek: Een Stapeling van Duurzame En Sociale Opgaven" (Regio Gooi en Vechtstreek, January 19, 2023), accessed October 19, 2023.

18 Smit, M.J. Groenendijk, R. Köbben, R. Vélu, D, Stichting Bouwtuin, *Naar een Nieuwe Streekarchitectuur*, 2022.

19 "Onze gebieden - Goois natuurreservaat", Goois Natuurreservaat, 29 augustus 2023, Accessed November 2, 2023, https://gnr.nl/over-ons/onze-gebieden/#pix_section_kaart.

Figure 6. N. Dalman, *plot with portiek- and galerijflats in Zeeheldenkwartier in Hilversum, with two flats selected for thematic research*, 2023, edited photo, 2087x1517, (edited from) Google Maps, https://www.google.com/maps.

Figure 7. *Google maps streetview image of the two flats selected for thematic research on the Sweerslaan in Hilversum*, 2023, photo, 1100x800, Google Maps, https://www.google.com/maps.

THEMATIC RESEARCH QUESTION(S) / HYPOTHESIS

How can a regenerative agroforest be established in and around a Dutch postwar garden city neighbourhood with sandy soil that can provide the needed biobased building materials for the renovation of that neighbourhood in a circular way?

Subquestions:

1 What are architectural and urbanistic principles of the Dutch postwar garden city neighbourhoods?

2 What are the requirements for the renovation of the typical portiek- and galerijflat typologies?

3 How could new apartments be added to the existing flats?

4 Which building elements would be needed for the renovation and topping up of the width of one apartment of the two flat typologies?

5 What does the ecosystem of an ideal regenerative forest on sandy soil in the Netherlands look like?

6 Which trees and plants can be used for which building elements?

7 What is the growth and harvest cycle of the different trees and plants?

8 What are the quantities of natural resources that would be required to renovate the entire neighbourhood and how much surface of regenerative forest would be needed to grow that amount?

9 What is the lifespan of the building elements, and how could they be reused or repurposed?

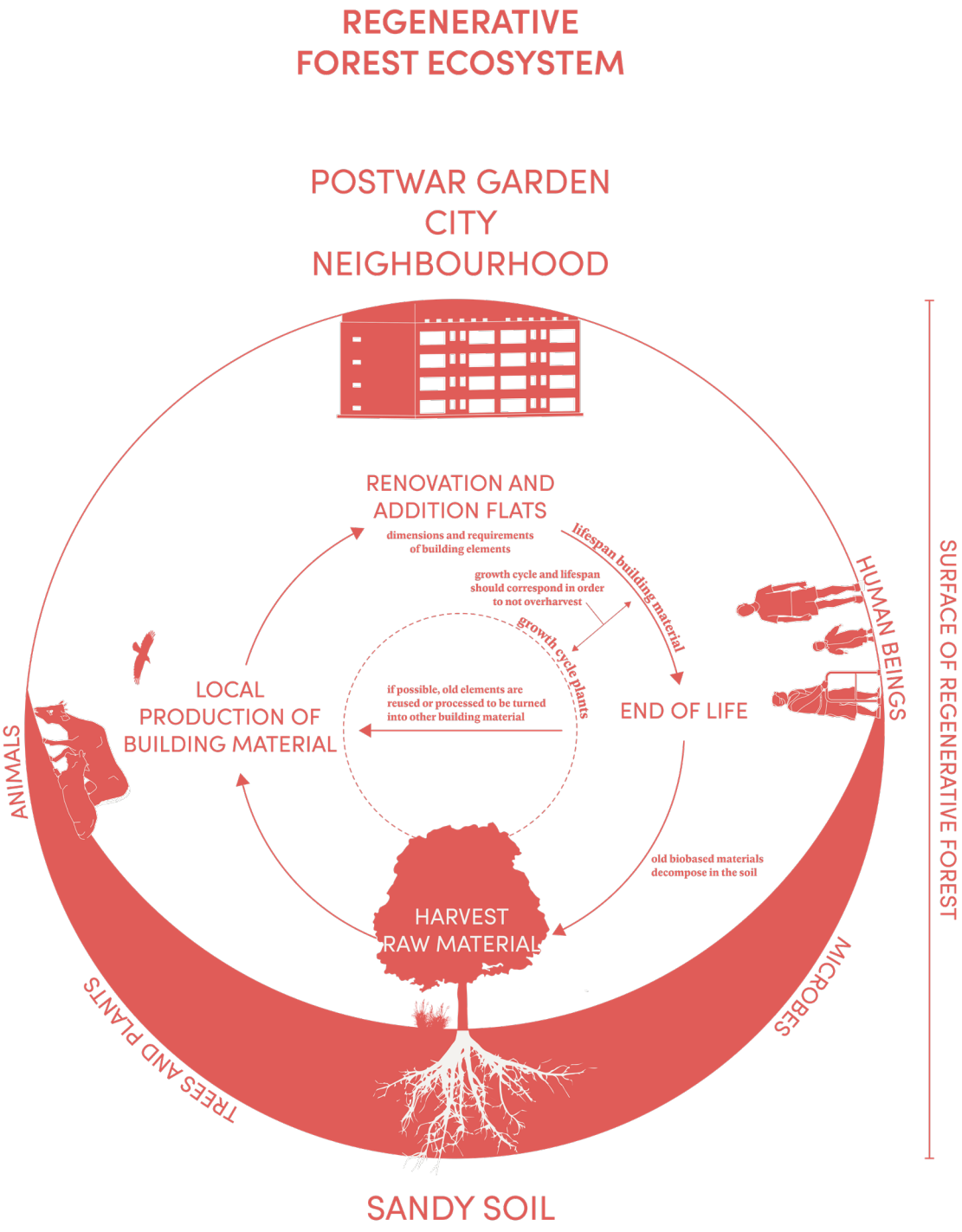


Figure 8. N. Dalman, *Visual research plan*, 2023.

REFLECTION ON THE RELEVANCE

The thematic research will provide specific information, regarding biobased materials and the circular process, about the renovation of portiek- and galerijflats, a typology that is specific to the Dutch garden city neighbourhoods. The portiekflats were mainly built in the 1950's and 1960's and many are currently in need of renovation[20]. In addition, the amount of portiekflats in the Netherlands equals 11% of the total housing stock[21]. Because of this, the thematic research is valuable in a more general sense, as it will be applicable to many postwar garden city neighbourhoods in the Netherlands. The intention is to contribute to the health of the neighbourhood in a holistic way, so that all living beings in the ecosystem can benefit from the findings. The research solely focuses on sandy soil, therefore, more research will be needed to provide a similar solution for other soil types in the Netherlands, like clay and peat soil.

THEMATIC RESEARCH METHODOLOGY

Historical, literature study will be used to find the architectural and urbanistic principles of Dutch postwar garden city neighbourhoods. The results of this study will be of a qualitative nature.

For the requirements for renovation of dwellings, quantitative data will be sought through literature review. An important source will be the Dutch Bouwbesluit[22], which contains official building regulations.

To answer the third and fourth subquestions, a case-study analysis of the two flats from the chosen site (see Figure 6) will be done. The results will apply to the specific flats (see Figure 9) but are intended to be applicable to the portiek- and galerijflat typologies. Literature study about renovation and building methods will also be required to be able to determine appropriate building elements and materials.

The research method for subquestion 5 will be qualitative and will include many different sources about regenerative forests in general and about ecosystems specific to sandy soil. The results will include a collection of different types of organisms, including animals and micro-organisms. The ecosystem-specific trees and plants, that will be described in the results of the fifth subquestion, will be linked to the required building elements of subquestion 4. Qualitative and quantitative literature review can provide information about the suitability of biobased materials for specific purposes.

As subquestion 7 is strongly connected to the fifth one, the same sources can probably be used. The outcomes for this subquestion will be quantitative instead of qualitative though, describing the growth cycle of the trees and plants through time and the best way to go about harvesting them.

20 Garritzmann Architecten. "Kansen Voor de Naoorlogse Portiekflat." https://www.hparchitecten.nl/, 2015. https://www.hparchitecten.nl/wp-content/uploads/2019/10/Kansen-voor-de-naoorlogse-portiekflat.pdf.

21 "SUM - TU Delft - Solar Decathlon Europe Competition," n.d. https://www.delftsolardecathlon.com/.

22 "Bouwbesluit 2012," Bouwbesluit Online, September 7, 2023, https://rijksoverheid.bouwbesluit.com/Inhoud/docs/wet/bb2012.

The lifespan of the building elements will be determined by reviewing literature and will be translated into quantitative data. Information about the reuse or repurpose of the building elements can be found in literature and real-life examples.

The results for subquestion 9 will be found through a calculation about the selected neighbourhood (see Figure 6) supplemented by information from literature about required sizes of agroforests.

The results of all the subquestions can be combined and applied to the research location to find the answer to the main thematic research question.

Interviews with owners of (regenerative) agroforests could provide useful information about the composition of the forest, types of trees and plants and the process of harvesting. This information would be relevant for multiple subquestions.

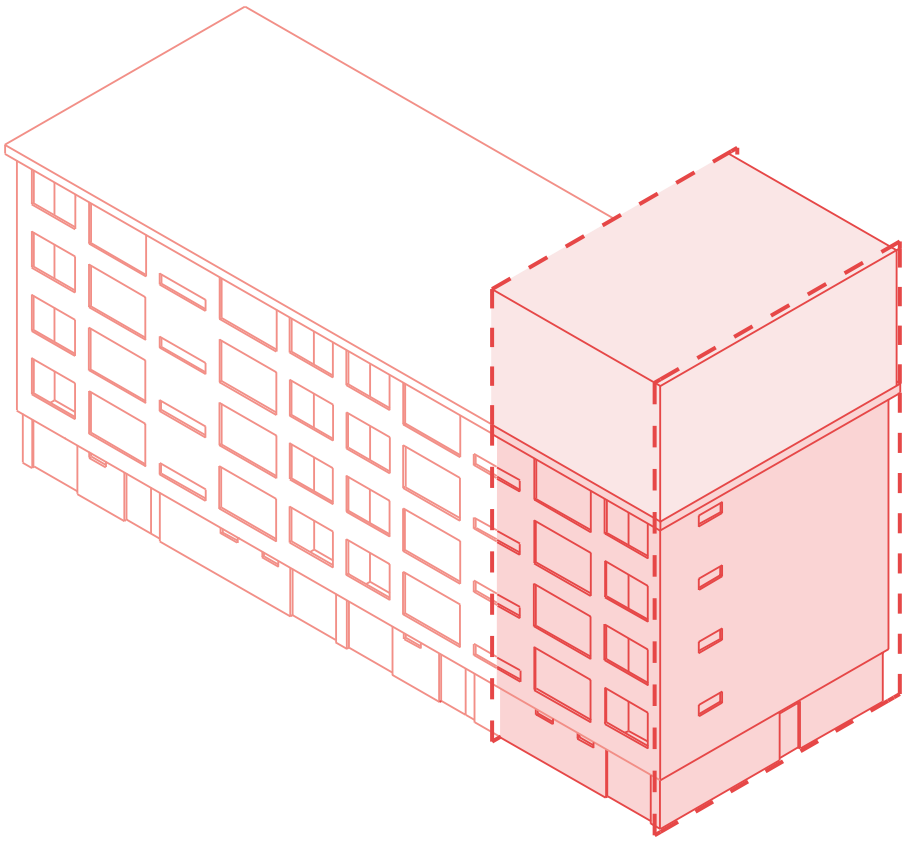


Figure 9. N. Dalman, *width of one apartment of portiekflat which will be used to determine required building elements*, 2023.

EXPECTED RESULTS & DESIGN IMPLEMENTATION

The aim of the thematic research is to find specific, quantitative data that can be used for the renovation of the portiek- en galerijflat typologies. The research will provide a list of all the building elements that are needed and from which trees or plants from the regenerative agroforest in sandy soil they will be made. The amount of required materials will be defined in the research and this will be directly linked to the amount trees and plants in the agroforest. The information could be translated into a timeline, that shows the growth and harvesting cycle of the different plants. Important in the main design objective is the health of the forest and its soil, so the thematic research will define characteristics of a healthy, biodiverse forest and ways to attain and maintain those characteristics. Ideally, the holistic vision of creating a self-sufficient and healthy ecosystem in the form of a regenerative forest in a postwar garden city neighbourhood can be proven to be feasible through the thematic research.

The thematic research will give specifications for the size and composition of the regenerative forest. In the phase after P2, these specifications can be translated into a holistic design of the neighbourhood combined with a design for the renovation and new apartments. Other topics like (nature) inclusivity, social health and physical health can be researched and included in the regenerative forest as well. The aspect of time will be an essential element of my graduation project and the results from the thematic research will provide useful information for establishing a timeline. Different phases, related to the growth and harvesting cycle of the trees and plants, and the lifespan of the building materials, will eventually be defined in a circular design plan.

Figure 10. N. Dalman, *Collage impression of Dutch postwar garden city neighbourhood as regenerative forest*, 2023.

PLANNING MSC3

46 13.11-19.11

Results subquestion 1
(historical) literature
description and visuals of typologies on different scales

47 20.11-26.11

Results subquestion 2
literature (regulations)
list of quantitative requirements for renovation and new construction, linked to flat typologies

Results subquestion 3
examples, literature (circularity)
description and visuals of building system

50 11.12-17.12

Results subquestion 6
literature and results subquestion 4 and 5
list of elements and respective material

Results subquestion 7
literature and interviews
list of required trees and plants with respective growth cycles and harvest instructions, presented in timeline

51 18.12-24.12

Results subquestion 8
literature and examples
list of building elements and respective lifespan, additional options for reuse and repurpose presented in timeline

Results subquestion 9
calculation (with results from other subquestions) and literature
list of required amounts of trees and plants and required size of forest

2 08.01-14.01

Organise all results and work on conclusions

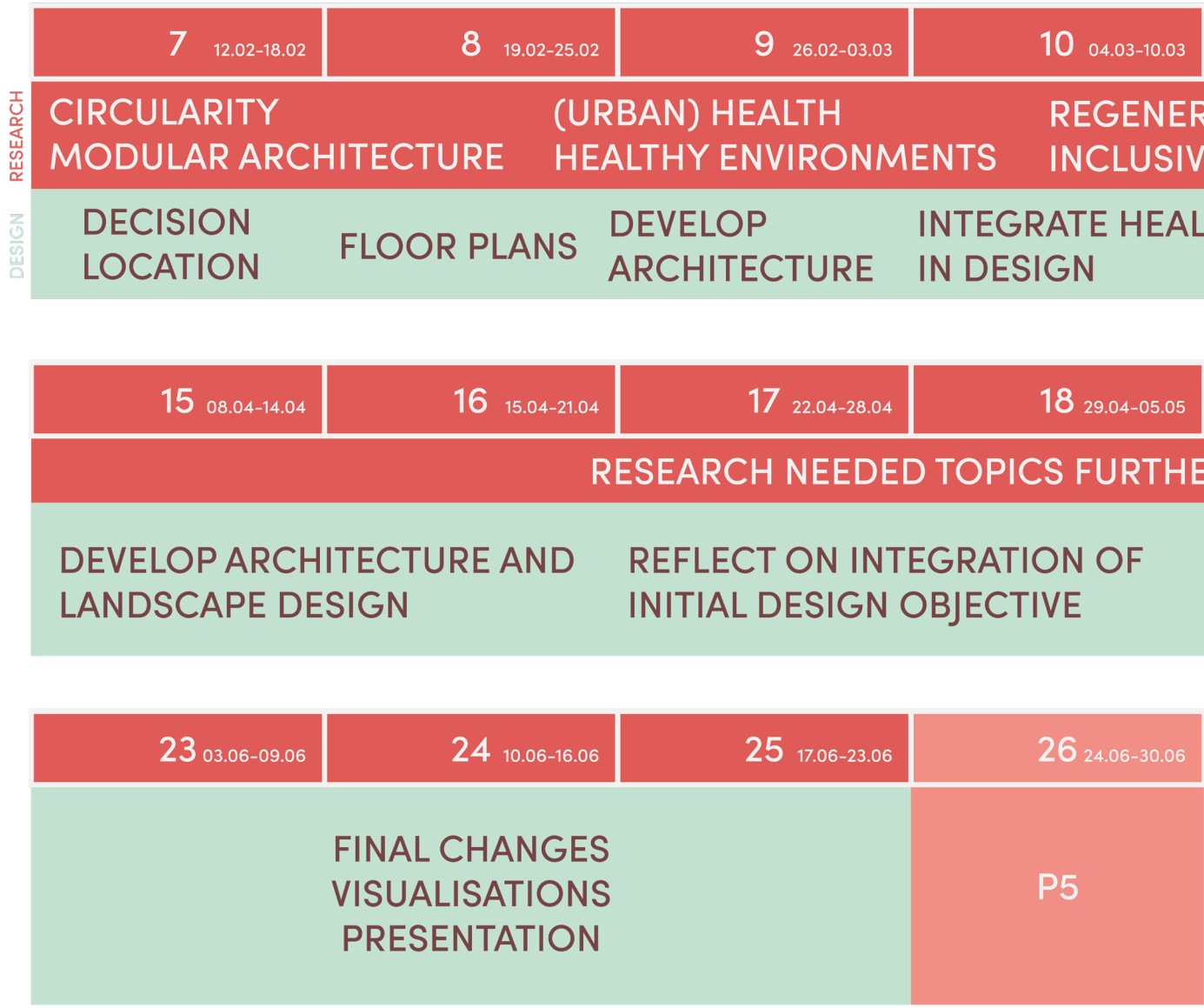
3 15.01-21.01

Results main question
combination results of subquestions
complete circular timeline of renovation and biobased building elements, visuals of composition forest in context

MAKE PRESENTATION

48 27.11-03.12	49 04.12-10.12
Results subquestion 4 examples and literature (circularity) list of building elements with size and requirements, implemented on specific flats INTERVIEW	**Results subquestion 5** real-life examples, interviews and literature description, visuals, list of organisms INTERVIEW
52 25.12-31.12	1 01.01-07.01
HOLIDAYS	HOLIDAYS
4 22.01-28.01	5 29.01-04.02
P2	P2

PLANNING MSC4



11 11.03–17.03	12 18.03–24.03	13 25.03–31.03	14 01.04–07.04
RATIVE SYSTEMS ITY	BIOBASED BUILDING BUILDING TECHNOLOGY		P3
TH LANDSCAPE DESIGN	DETAILING	WHOLE DESIGN	

19 06.05–12.05	20 13.05–19.05	21 20.05–26.05	22 27.05–02.06
ER		P4	REFLECTION P4
DETAILING AND FINALISATION VISUALISATIONS			

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SOURCES FOR THEMATIC RESEARCH

Subquestion 1

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