Research Plan | AE Studio

Healthy urban neighbourhoods within green infrastructures

Strategies for improving the mental health in urban neighbourhoods, with the focus on decreasing depression/anxiety levels and-risks by the implementation of green infrastructures, preventative- and active care

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The choice of the Architectural Engineering chair was made because I liked the set up and freedom of the studio. It gives me a place to explore my fascinations on social and technical aspects. I believe that a technical approach can give societal, sustainable, and innovative solutions, while also benefitting the individual. These are challenges within the Architectural Engineering that can be tackled by experimenting and envisioning.

Graduation Project

Keywords

Mental Health, Urban Environment, Green Infrastructures, Depression, Anxiety, Preventative Care, Active Care, Densification of Cities, Sustainability of Post War Flats

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Introduction

An important part of people their wellbeing is their environment. Because the increase in population and buildings, urban areas suffer from densification and green environments disappear. Research shows that green environments have a positive impact on people their physical and mental health and are therefore important to keep and bring back in our daily environments. Because of the substantial number of existing buildings, but the need of creating healthy environments, it is important to look at the possibilities within the existing urban fabric.

Problem Statement

Unhealthy urban environment

In comparison to rural areas, there is a higher risk of mental illness in urban areas because of social and surrounding features (Buttazzoni et al., 2021), such as the lack of natural environments and public places (Callaghan et al., 2020), noise and air pollution (Baggaley, 2021) and social isolation (How The City Affects Mental Health, n.d.). This is problematic because the world is increasingly urbanising. In 2014 more than half of the world's population was living in urban areas (55%) and the expectancy is that this will be 70% by 2050 (Baggaley, 2021). Therefore, it is important to find ways to make these urban areas healthier.

In the Netherlands, the national programme of liveability and safety is looking into problematic neighbourhoods, often in an urban context, where people have problems such as low income, bad state of dwellings of housing corporations, bad health, and bad living conditions. Next to giving a broader perspective to the inhabitants and improving the safety in these neighbourhoods, the research shows that it is important to improve the physical living environment (Ministerie van Binnenlandse Zaken en Koninkrijksrelaties, 2022).

The need for housing is still going on, which means the densification of urban areas will continue. However, because of the limited space within this urbanisation it is important to find solutions for the densification of housing and the implementation of a healthier environment within the urban fabric that already exists. Furthemore, it is important to especially look into these solutions in problematic neighbourhoods, because the need of improvement is mostly needed here.

Depression/anxiety and needed treatment

As seen in the previous paragraph mental health is an issue within urban areas. However, not only in urban areas is mental health a recurring theme. On a global scale one in eight people suffer from a mental disorder, with depressive and anxiety disorders the most common (World Health Organisation, 2022). According to the World Health Organisation (2022) depression is one of the leading causes of disability worldwide. In 2019 on a global scale around 5 percent of people above 20 years old suffered from a depressive disorder, and 4.8 percent an anxiety disorder, whereas in the Netherlands 5 percent of people above 20 years old suffered from a depressive disorder, and 7.8 percent from an anxiety disorder (figure 01 and 02). Looking at the Netherlands almost one in five people once in their lives encounter a depressive disorder or an anxiety disorder (de Graaf et al., 2007).
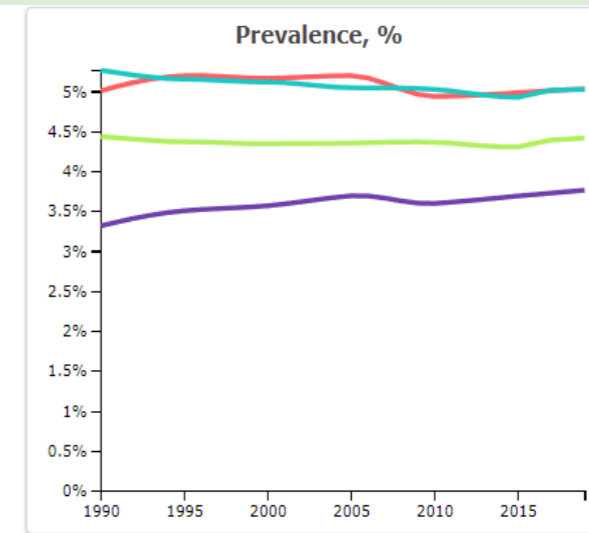
Figure 01: percentage of people suffering from depressive dissorders globally and in the Netherlands, of all ages and older than twenty years old
Source (The Institute for Health Metrics and Evaluation, 2019)
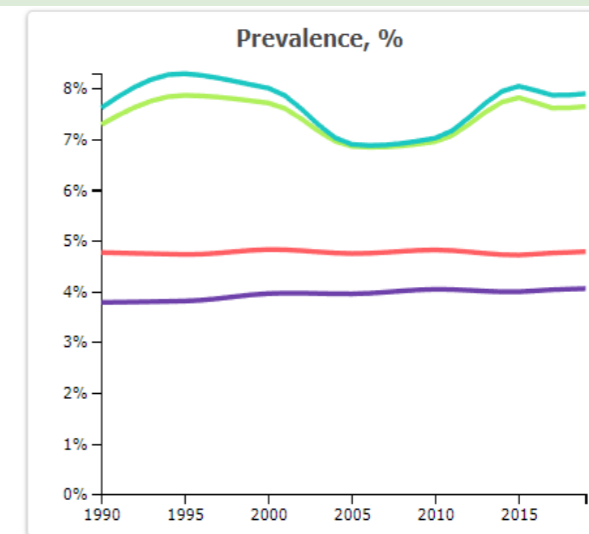
Figure 02: percentage of people suffering from anxiety dissorders globally and in the Netherlands, of all ages and older than twenty years old
Source (The Institute for Health Metrics and Evaluation, 2019)

Research shows that the risk of depression and anxiety is higher in urban areas than in rural areas, which makes it important to look for solutions, especially in these areas. Green environments and the treatment within green environments can have a positive impact on mental health (figure 03), especially for people suffering from depression and anxiety. In the Netherlands this has taken form in for example care farms, where there are already around nine hundreds of (Nederlands Jeugdinstituut, n.d.). However, implementing these care farms in an urban setting has not received much attention (Hassink et al., 2020). This means that for patients in urban areas, where there is often a lack of green environments, this type of treatment could be inaccessible. However, it can be important to stay within the own living environment, because of the needs of the patient or because of the stimulation to deal with mental issues within the triggering environment. Therefore, it is important to investigate how similar types of treatment with the facilitation of green infrastructures can be implemented within the urban context.

Climate change

Adding green infrastructures to urban areas is not only beneficial for mental health, but also regarding adapting and mitigating to climate change. Climate reports show the importance of reducing the flow of heat-trapping greenhouse gasses into the atmosphere and adapting to the current and future climate, to reduce risks to nature and people, such as stated in the 2015 Paris Agreement and in The 2030 Agenda for Sustainable Development (NASA's Jet Propulsion Laboratory, n.d.; Working Group II, 2022).
Green infrastructures are beneficial in adapting to climate change within the city, such as decreasing the Urban Heat Island effect by shading trees and the capturing of rainwater with green roofs (Gill et al., 2007).

Circularity

Not only adapting and mitigating to climate change is important in relation to sustainability. Looking at the densification of urban areas, the potential space to implement new buildings and public spaces is decreasing. Together with the importance of using less building materials to be more circular, it is important to look at the potential of re-using existing buildings and making these more sustainable, for example by decreasing the energy use of the buildings. Furthermore, this again can have benefits on the health of the residents, such as less stress because of a lower energy bill and a healthier apartment because of the improved quality.

Overall problem statement

The subparagraphs above can be summarised in an overall problem statement, which is as follows:

'The world is getting increasingly urbanised and as a result unhealthier because of social and surrounding features, which gives higher risks on mental health problems such as depression and anxiety. Because of the lack of space within these urban areas, important factors such as green structures are lacking which is important to improve the mental health of the users and to be able to adapt to climate change. Furthermore, because of the lack of space within these urban areas and with the look on sustainability, improvements should be facilitated within the existing urban context, such as existing buildings and public spaces.'

Improvement MH and PH   More physical activity   Social cohesion and integration

Structure and productivity   Empowerment and purpose

Livability   Distraction

Figure 03: positive effects on mental health of greenery and treatment within
Used sources: (Harada et al., 2021; Ling & Chiang, 2018 ; Pedersen et al., 2015 ; Hassink, 2008; Bratman et al., 2012 ; Philips, 2013 ; Dewar, 2022 ; Douglas & Douglas, 2022 ; Vinuesa, 2022; Wouters, 2018; Groen Loont Voor Gezondheid, n.d.; Mind, 2017)

Potential location: Boerhaavewijk Haarlem

Haarlem is categorized as one of the most urbanised areas of the Netherlands (figure 04). Boerhaavewijk, a neighbourhood in Haarlem, has a ratio of 4.500 inhabitants per square kilometer, which makes it one of the most densely populated neighbourhoods of the Netherlands (KadastraleKaart, n.d.).

Seen in figure 05 is that there is a need to improve the social aspects and living environment in the neighbourhood and a lot of attention needed to improve the wellbeing in the neighbourhood. For example the existing green within the neighbourhood lacks quality according to the people living there, and more than half of the inhabitants above 19 years old are of risk having depression/anxiety (Gemeente Haarlem, n.d.).

Because of the need for renovating post-war flats (figure 6), the need of adding facilities and improving quality of the existing green within the existing neighbourhood (Gemeente Haarlem, 2012), together with the neighbourhood structure, there is potential space to densify and improve the neighbourhood on mental health and sustainability. Furthermore, looking at the national programme of liveability and safety, which was discussed in the subparagraph *Unhealthy urban environment*, Boerhaavewijk has many similar problems as stated in the research such as as low income, bad state of dwellings of housing corporations, and bad living conditions. Therefore, Boerhaavewijk is a valuable context to conduct research on in this graduation project.

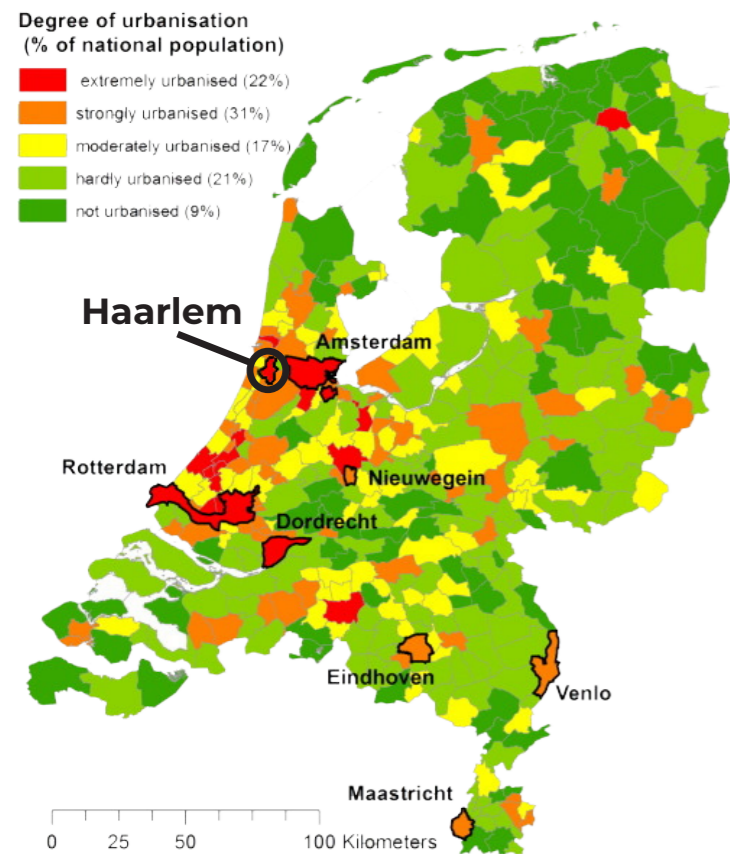*Figure 05: area analysis Boerhaavewijk, own image*
Taken from source: (Gemeente Haarlem, n.d.)

Figure 04: degree of urbanisation in the Netherlands
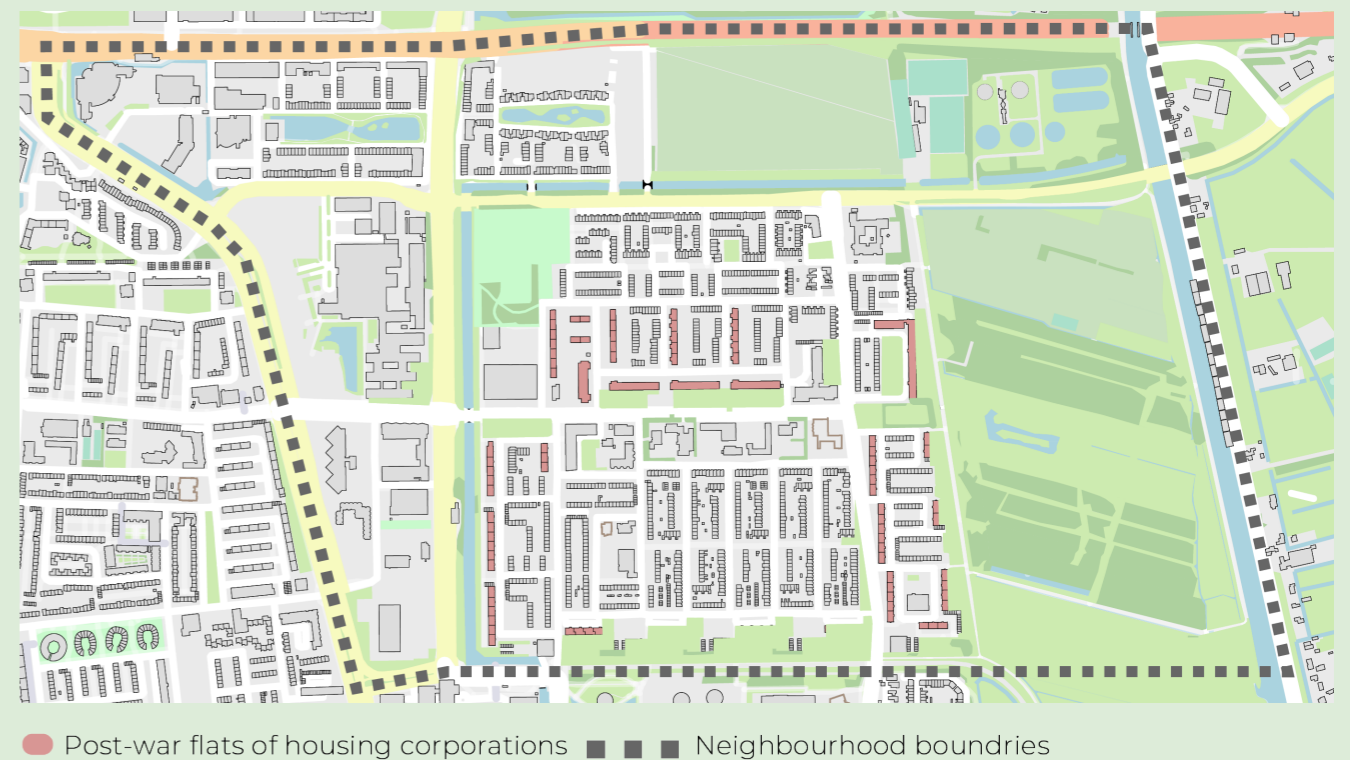*Source (Vanham et al., 2016, p.233)*

Figure 06: post-war flats within Boerhaavewijk, own image

Objective

The overall objective of this graduation project is to find strategies to create a better mental health within urban areas, with the focus on decreasing depression/anxiety levels and -risks by the implementation of green infrastructures, active- and preventative care. This will be done by planning for the neighbourhood Boerhaavewijk and the renovation design of one or more post-war flats within this neighbourhood and its immediate environment.

Within the research paper the goal is to find strategies on decreasing depression/anxiety levels and -risks in an urban context, by testing how these could be implemented within Boerhaavewijk in a neighbourhood plan.

Within the design the goal is to improve the mental health within the urban context, by renovating one or more post-war flats within this neighbourhood and its immediate environment, which would benefit the mental health of the users by implementing the strategies that are found in the research paper. At the same time this design strives to make post-war flats more sustainable and liveable. Because of the repetition and similarities of these buildings, parts of the design might be able to be implemented within other post-war flats as well, depending on the outcome of the research.

Overall design question

The design question is as follows:

'How can post-war buildings in Boerhaavewijk Haarlem be renovated in a way that they will be more sustainable and facilitate for better mental health, by the implementation of green infrastructures and the facilitation of preventative and active care to decrease depression/anxiety levels and -risks?'

The outcome will be a mixed-use programme, which will facilitate dwellings and other functions. However, a more elaborate answer on what the outcome should be, will be answered by the research. The vision of the programme is:

· Low-income dwellings with shared facilities and possible guided living. The focus will be on young adults (18-35) on the scale of risk of depression/anxiety to highly moderate depression/anxiety (figure 07).
· Public green areas combined with meeting places with planned activities for the neighbourhood to stimulate social cohesion and mental health.
· Collective green areas for people that are living together in a guided dwelling, to have more private and quiet benefits of the green on mental health.
· Restaurant or shop where products of the urban gardens will be used. This can give empowerment and purpose to people, and thereby benefit their mental health.
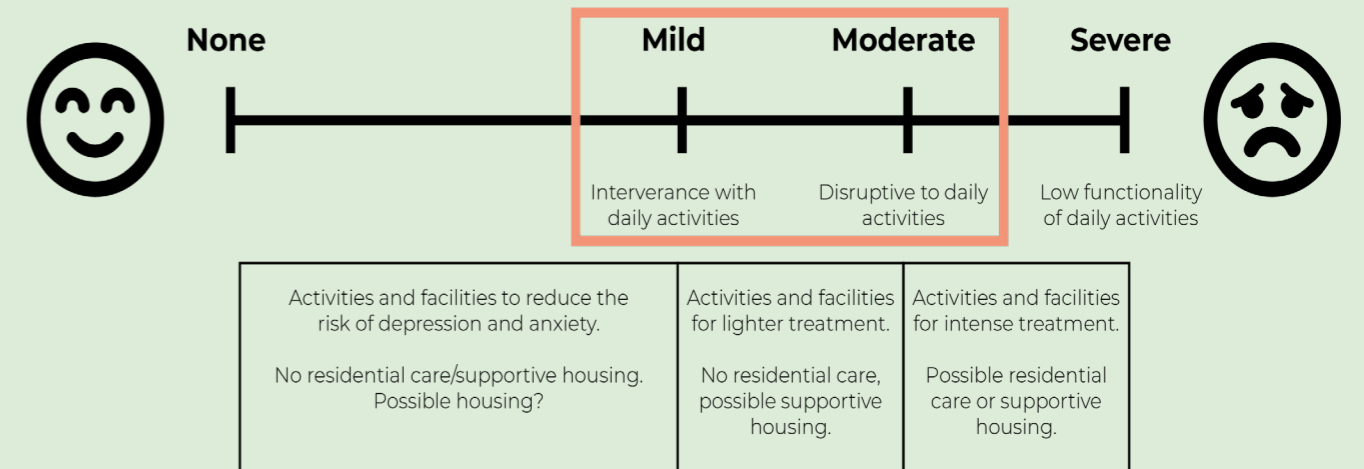· Treatment areas by therapists and by working in the green environments.

Figure 07: scale of depression and anxiety, own image
Used sources: (Ellis, 2020; The Recovery Village & Hull, 2022; PCH Treatment Center, n.d.; Cherney, 2018)

Thematic Research Question

The thematic research question will provide a framework on how to answer the design question and how to implement the envisioned programme. The research question is as follows:

'What strategies are needed for decreasing depression/anxiety levels and -risks in the urban context of Boerhaavewijk, with the focus on green infrastructures and the facilitation of preventative and active care?'

Sub questions:

· What are interventions within the urban context to decrease depression/anxiety levels and -risks?
· What problems and opportunities are there within Boerhaavewijk in relation to health, with the focus on depression/anxiety levels and -risks
· Where and how can the interventions be implemented within the existing urban context of Boerhaavewijk?
· What are the best neighbourhood plans to improve the mental health in Boerhaavewijk, by implementing the found strategies?

Hypothesis

By finding what interventions are needed within the urban context to create a healthy surrounding, together with finding the interventions that are needed to decrease depression/anxiety levels and -risks, strategies will be found to improve the mental health within an urban neighbourhood. By taking the specifics of Boerhaavewijk into account, a conclusion on how to improve the mental health in the urban context of Boerhaavewijk will be found. To be able to determine the success of the found neighbourhood plans, a scoring system and human evaluation will be needed.
Looking at existing literature, an important intervention that is needed in an urban context is the implementation of green infrastructures. By mapping the found results, solutions of what kind of and on how to implement green infrastructures in an existing neighbourhood will be found

Methodologies

To answer the research question and a beginning of the design question, an overview of the different research phases, the research methods, and explanations on what they entail are shown in figure 08. The phases are the following:
· The first phase will be about collecting data on interventions in the urban context and making a scoring system to conclude what the best solutions are on different aspects, which will be determined by available data.
· The second phase will take these solutions into account by making different possibilities for neighbourhood plans with a parametric design tool and with a scoring system ranking which of these neighbourhood plans would work the best on chosen aspects, which will be determined by available data.
· The third phase will be about getting a human reflection on the impact of the concluded best neighbourhood plans.
· The last phase will be about implementing the found strategies of the best neighbourhood plans in the beginning phase of the design.

PHASES		CONTENT	RESEARCH METHODS
R E S E A R C H	I. COLLECTING DATA & RANKING	**Explore information on:** - Interventions that decreases depression/anxiety levels and -risks - The needs of people to be mentally healthy - The needs of people suffering from depression/anxiety	**Literature studies** **Case studies** - Output are interventions within the urban context
		Make an analysis of: - The needs within Boerhaavewijk - Opportunities within Boerhaavewijk - What is already within Boerhaavewijk	**Invesigation** - Output are interventions within the urban context
		Make a scoring system to: - Systemise the interventions on for example impact, cost, complexity, technology, needed space and target group. With this the most suitable interventions for Boerhaavewijk can be found.	**Systematization of data** - Output are rankings, ranges and locations of the found interventions
	II. EXPERIMENT	**Use a parametric design tool to:** - Make prototypes of plans by using the systemized data - Test the effectiveness of the prototypes with a scoring system	**Research by design** - Output are neighbourhood plans and the ranking of these
D E S I G N	III. REVIEW	**Use adobe/render tool to:** - Visualise the most suitable neighbourhood plans **Show target group visuals to:** - Get human based insight and reflection	**Visualisation** - Output are visuals of the found prototypes **Interview** - Output is a review on the found prototypes
	IV. INTEGRATION	**Use the prototypes to choose:** - Urban scale for the design within the neighbourhood **Explore information on:** - The site of the urban scale and needed functions of the design - What is needed in relation to sustainability and adaptability to climate change	**Investigation** - Output are first steps of the design

Figure 08: research methodology, own image

PLANNING

In figure 09 the planning of this graduation project is shown.

First half

	5-9 sep	12-16 sep	19-23 sep	26-30 sep	3-7 okt	10-14 okt	17-21 okt	24-28 okt	31-4 okt/nov	7-11 nov	14-18 nov	21-25 nov	28-2 nov/dec	5-9 dec	12-16 dec	19-23 dec	26-30 dec	2-6 jan	9-13 jan	16-20 jan	23-27 jan	30-3 jan/feb
Weeks	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	1	2	3	4	5
Phase	P1										P2											
Products	Pavillion	Initial ideas		Concept research plan						Final research plan		Register for P2										Final research paper & graduation plan
Presentation	Pavillion pitch	Poster pin-up								P1 presentation											P2 presentation	P2 presentation
Tasks	Write research plan	Write research plan									Write research paper											
			Collecting data							Phase I: Collecting data		& ranking										
													Phase II: Experiment	Phase II: Experiment								
															Phase III: Review	Phase III: Review						
																			Make Presentation	Make Presentation		
										Design: site research		Design: sketch design							Phase IV: Integration			
																						Make Presentation

Second half

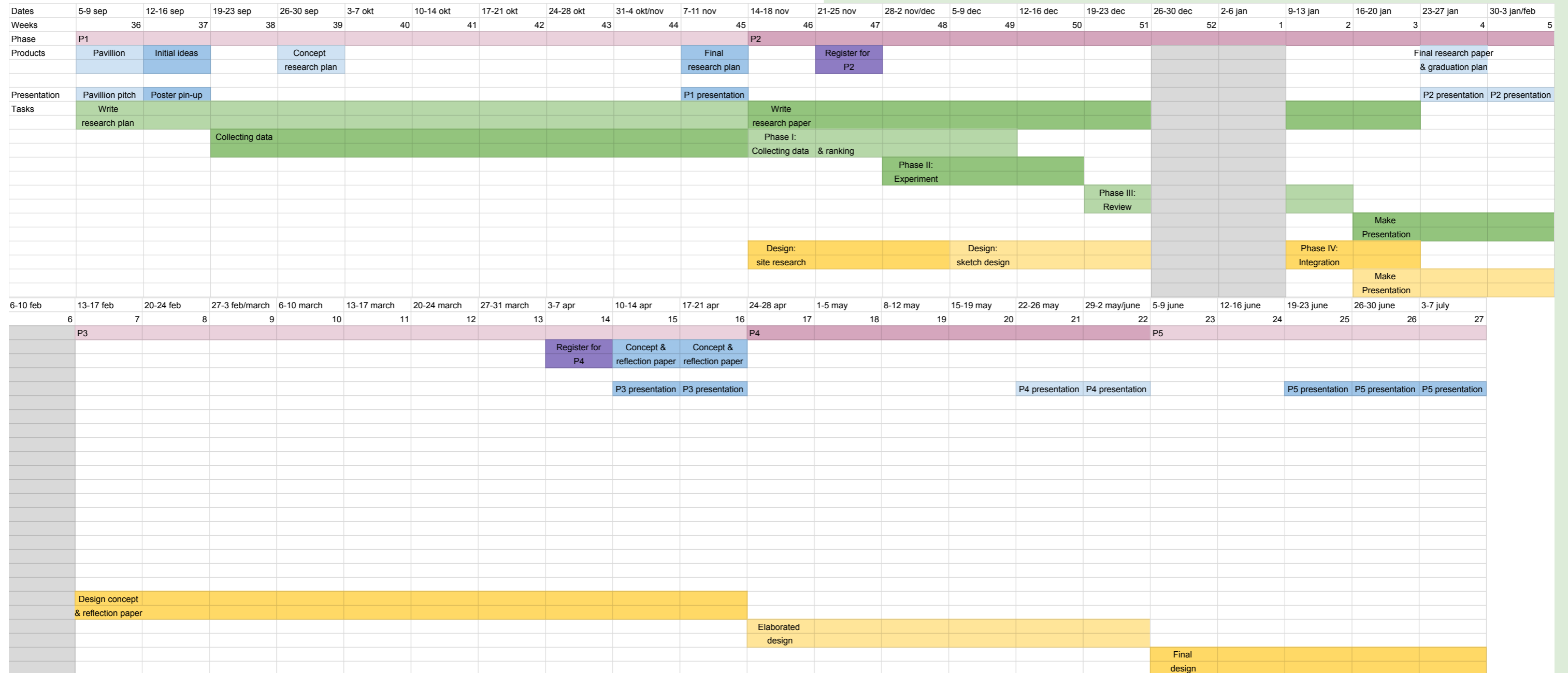|	6-10 feb	13-17 feb	20-24 feb	27-3 feb/march	6-10 march	13-17 march	20-24 march	27-31 march	3-7 apr	10-14 apr	17-21 apr	24-28 apr	1-5 may	8-12 may	15-19 may	22-26 may	29-2 may/june	5-9 june	12-16 june	19-23 june	26-30 june	3-7 july
Weeks	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
Phase		P3										P4						P5				
Products									Register for P4	Concept & reflection paper	Concept & reflection paper											
Presentation										P3 presentation	P3 presentation					P4 presentation	P4 presentation			P5 presentation	P5 presentation	P5 presentation
Tasks		Design concept & reflection paper										Elaborated design								Final design		

Figure 09: graduation planning, own image

Relevance

Regarding green and mental health, a broad range of research has been done. However, within this graduation project an essential element of finding strategies to facilitate better mental health within an existing neighbourhood, Boerhaavewijk, could be a valuable addition. Even though a specific target group and programme are in mind for the design, the outcome can be used for other target groups and functions as well, because green and healthy environments has an important benefit on all people. The specific context of Boerhaavewijk as a testcase does not mean that it is only valuable for this environment. There are many similar post-war flats to be found around Europe and therefor the outputs of this research can be used in a wide context. Furthermore, doing more in depth research on mental health, specifically on depression and anxiety, has a big societal importance.

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