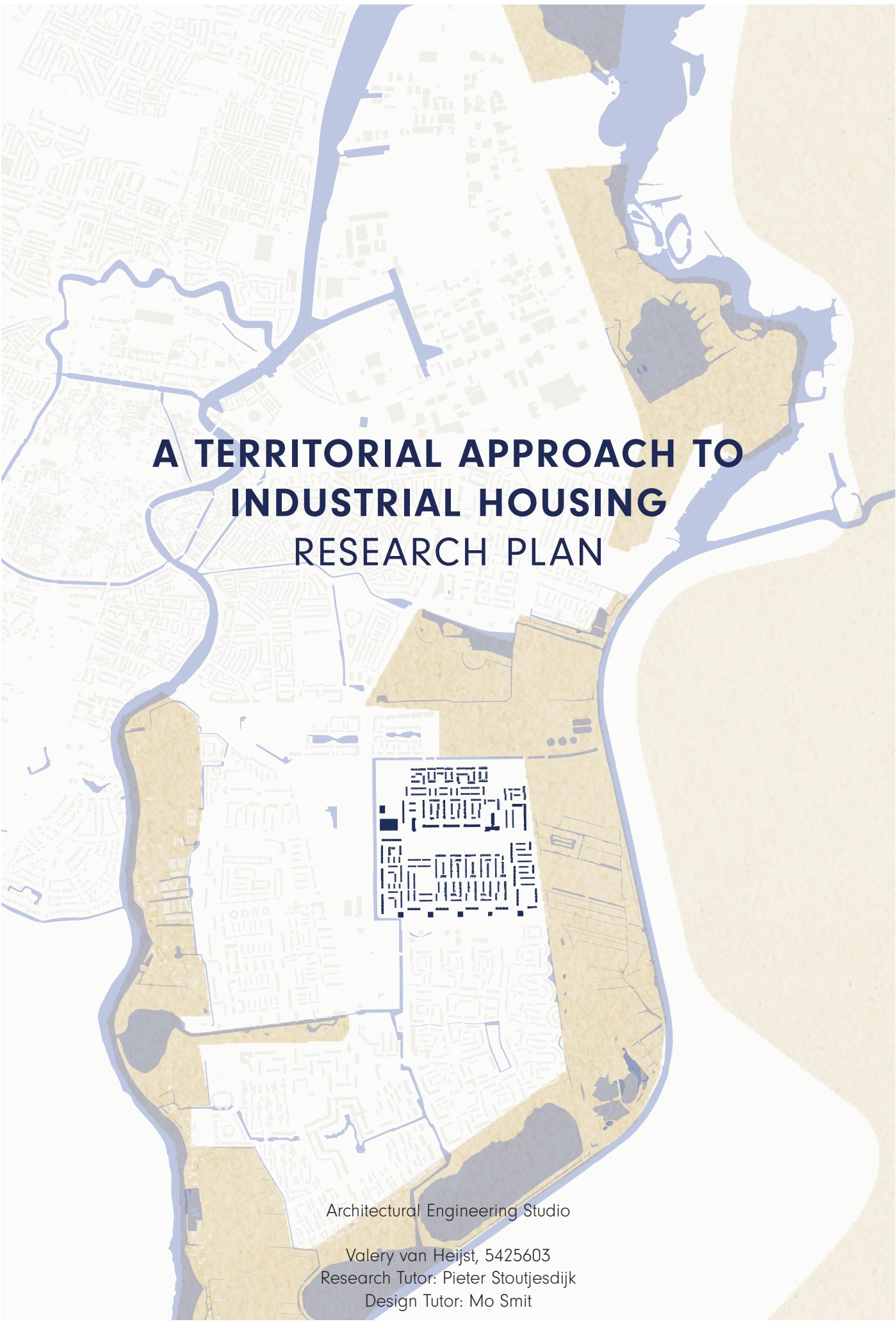


The background of the cover is a stylized map of an urban area. A river, depicted in a light blue color, winds through the landscape. The land is represented in a light beige or tan color. A specific area, likely the industrial housing site, is highlighted in a darker tan color. This highlighted area contains a detailed black and white site plan showing building footprints and internal structures. The title text is centered over the map.

A TERRITORIAL APPROACH TO INDUSTRIAL HOUSING RESEARCH PLAN

Architectural Engineering Studio

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KEYWORDS

Territorial: an area of land, that is considered as belonging to or connected with something.

Industrial housing: a residential structure that is designed for the occupancy of one or more families; constructed in one or more modules or constructed using one or more modular components built at a location other than the permanent site; and designed to be used as a permanent residential structure when the module or the modular component is transported to the permanent site.

Post-war neighbourhood: Neighbourhoods constructed as part of the reconstruction after the second world war, between the period op 1945-1965. These neighbourhoods are constructed with the modern ideologies of an open building block, repetition of urban patterns and a strict separation of functions.

Context specific: Architecture referencing and relating to its natural, historical, political and social frame that can help explain it.

Adaptable: Adaptable homes, homes that are able to adapt over time when housing demand or housing wishes change.

Diverse: Including many different types

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1. GENERAL PROBLEM STATEMENT

The current outcomes of industrial housing construction are not suitable for quickly solving the housing shortage within the layered problems of post-war neighbourhoods.

Housing shortages

The housing shortage in the Netherlands is growing, with a housing shortage of 390,000 in 2023.¹ Looking towards the future, the number of inhabitants and households will only grow in the coming years. The expected peak of housing shortages is not anticipated until 2027, and in subsequent years the shortages will only decrease due to an increase in the housing stock. In order to achieve this reduction in shortages in 2027, or even better to achieve it sooner, it is important that smart and high-quality solutions are now imagined to increase the housing stock.

Current outcomes of industrial housing

Industrially produced homes will be able to increase the building stock and thus reduce the housing shortage more quickly by shortening the construction process by 50%.² In addition, it will reduce CO2 emissions from the construction process by 40% and waste production by 50%. The current production process consists of fully assembling modular units in a factory hall. These units are then placed at any desired location, regardless of the connection with the built environment, the landscape or the urban context. This creates a repetitive and serial urban quality. By using the exact same modules, disregarding the landscape its put in, the characteristics of the urban environments become generic.

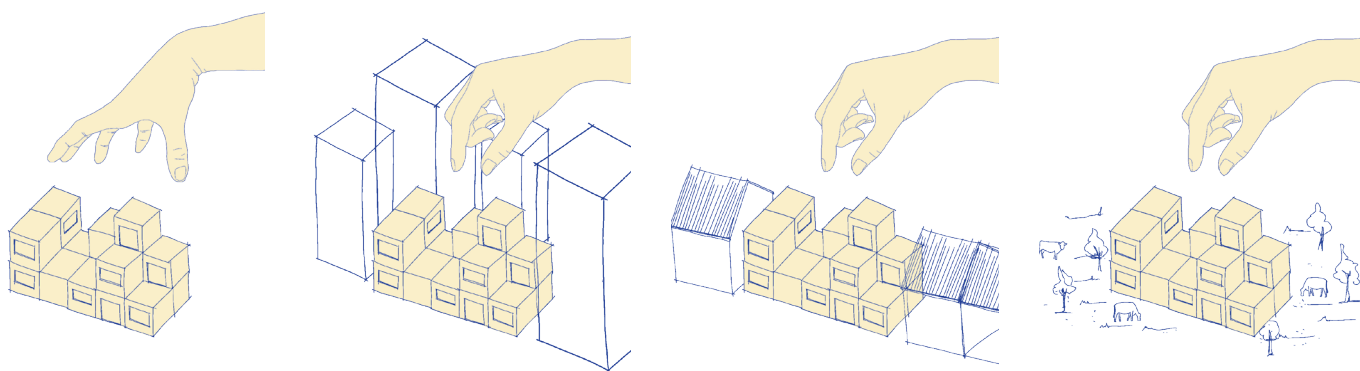


Figure 1, Generification of the built environment

2. CONTEXT

Throughout history, the Netherlands has had to deal with housing shortages before. The most notable one being after the second world war. Large neighbourhoods were built to deal with these shortages, we now know them as post-war neighbourhoods. Within The Netherlands there are about 1800 of these post-war neighbourhoods.³ At that time of development, they were built for rapid urban expansion to solve housing shortages. Many of these neighbourhoods are now outdated and lack urban quality. In reality the large green areas often lack a functional and ecological value, the living environments are neglected and the separation in functions deteriorates the social safety and the liveliness of the urban environment.⁴

1 Koninkrijksrelaties, Ministerie van Binnenlandse Zaken en. 'Het statistisch woningtekort nader uitgelegd - Home | Volkshuisvesting Nederland'. Onderwerp. Ministerie van Binnenlandse Zaken en Koninkrijksrelaties, 14 June 2021. <https://www.volkshuisvestingnederland.nl/onderwerpen/berekening-woningbouwopgave>.

2 Bertram, Nick, Steffen Fuchs, Jan Mischke, Robert Palter, Gernot Strube, and Jonathan Woetzel. 'Modular Construction: From Projects to Products'. Capital Projects, n.d.

3 KAW. 'Onderzoek Ruimte Zat | Bezit van corporatievastgoed'. Accessed 9 October 2023. <https://www.kaw.nl/projecten/onderzoek-ruimte-zat-corporatievastgoed/>.

4 Lörzing, Han, and Arjan Harbers. 'Krachtwijken met karakter', n.d.

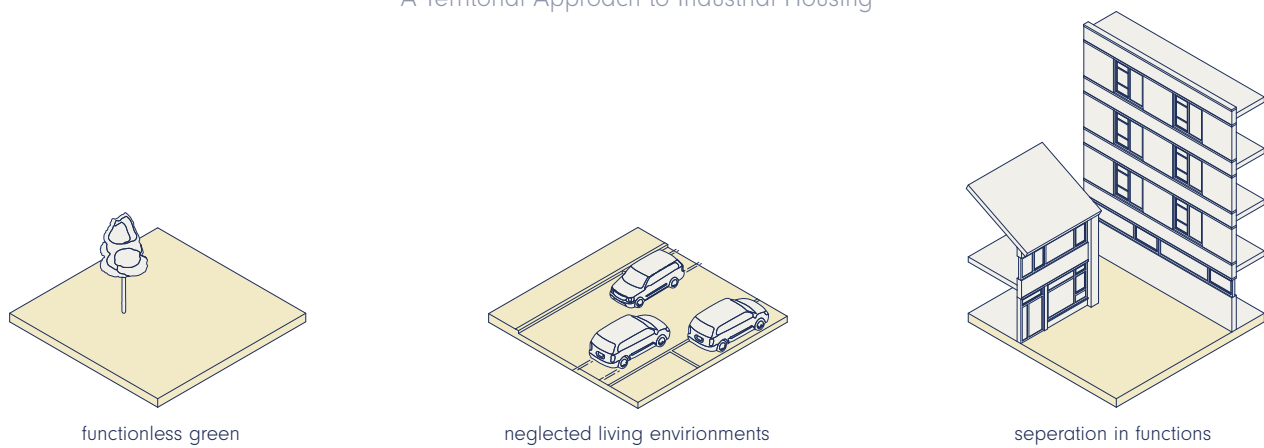


Figure 2, Characteristics of a post-war neighbourhood

The Boerhaave neighbourhood in Haarlem is one of these post-war neighbourhoods. A stamp of high-rise buildings alternating with row housing form the urban development principle within the neighbourhood. The residential area is split in half by an axis that hold the supporting public functions of the neighbourhood. The green areas are missing a qualitative and ecological function and the car has been given a lot of priority in the public space.

This lack of spatial quality is reflected in the satisfaction of the residents. When you look at the social numbers of Haarlem, the Boerhaave district has the smallest percentage of residents who think they live in a pleasant neighbourhood and the lowest percentage of Haarlem residents who are happy with the neighbourhood they live in.⁵

The Boerhaavewijk can form a suitable urban landscape for the design of diverse industrially produced homes that fit into the urban environment and add to the spatial quality of the area so that the housing stock is expanded in a rapid and qualitative manner.

3. OVERALL DESIGN OBJECTIVE

A start to reducing housing shortages in the Netherlands can be done by increasing the housing stock within the Boerhaavewijk in Haarlem. The housing stock can be increased by surgical intervention within existing residential areas. The spacious and open urban plan of the post-war neighbourhoods makes the neighbourhood a good location for an internal expansion of the residential area. The functionless greenery, the blind façades, the many parking spaces and the spacious traffic routes can be used as new construction sites.

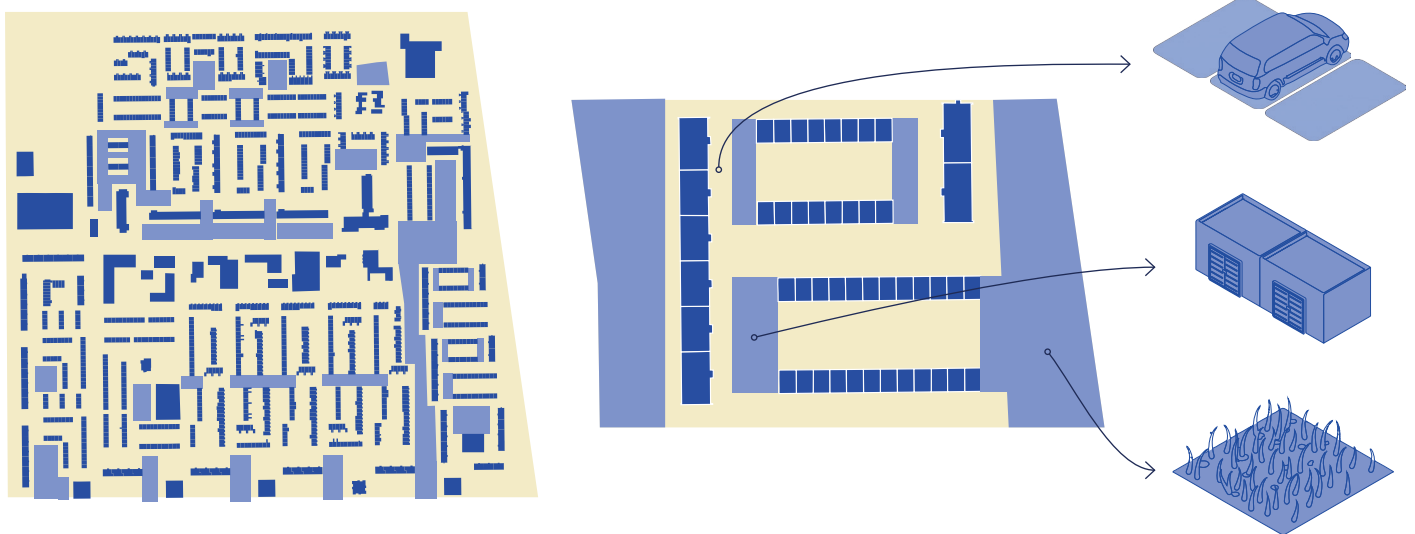


Figure 3, +76.000 m2 ground-level square meters Figure 4, inward growth of the housing stamp

5 'Haarlem in Cijfers'. Accessed 20 October 2023. https://haarlem.incijfers.nl/databank/?cat_open_code=cgdhajcSivicifjd.

When the housing stock is increased, it is important that this is done for the right target group. One of the reasons for the current housing shortage is a shortage of suitable housing, the elderly cannot move on to smaller homes and larger homes are not available to families.⁶

The current housing demand is mainly (74%) for smaller homes.⁷ This includes homes from 50 m² to 75 m². Looking at the current housing supply in the neighbourhood, 48% of the homes are single-family homes and 52% are multi-family homes. This shows an instability between housing demand and housing supply.

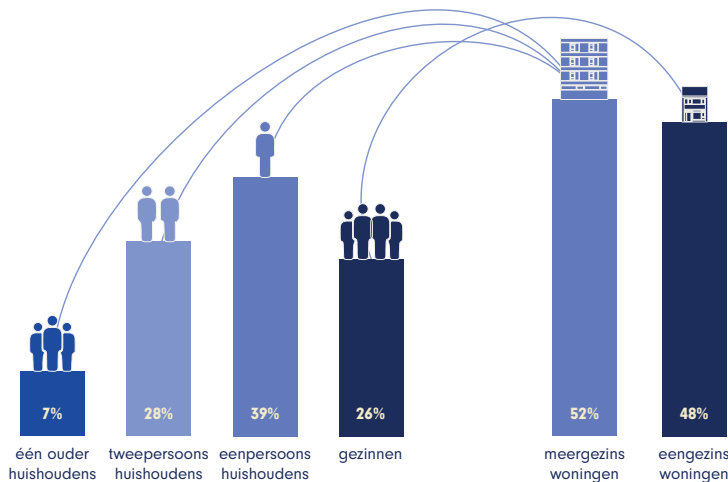


Figure 5, Housing demand and housing stock in Boerhaavewijk

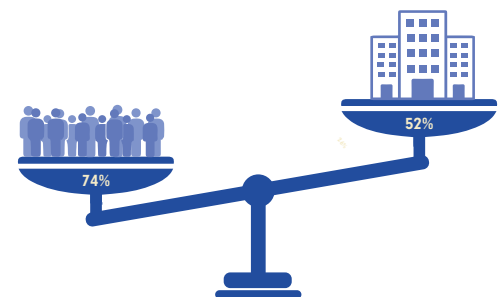


Figure 6, imbalance in demand and stock

Given the demand for multi-family homes and the limited space that becomes available for new housing construction due to surgical intervention within the existing urban development stamp, high-rise buildings are a logical solution for infilling the neighbourhood. By adding more high-rise buildings within the existing urban environment, it is important to investigate how the spatial and social quality within the neighbourhood can be increased.

The spatial quality of the district must be improved. The district was built at the time from an ideology of rationality and centrality. The new methods of new large-scale industrial production methods led to an increase in housing production. This increase in scale and the applications of industrial prefab and systematic construction methods resulted in a standardization of the buildings. The residential areas were given a simple, regular and repetitive pattern. The housing stamp became recognizable from this, in which a combination of different housing types are combined so that the stamp can then be repeated endlessly. If similar industrial methods are to be used within the post-war neighbourhoods, it is important to resist this uniformity.

The uniformity can be resisted by creating context specific architecture. By designing buildings that are deeply rooted in its topographical, social and cultural context. Where architecture can find its balance between the optimization of advanced technology and the ever-present tendency to egress into nostalgic historicism or the glibly decorative, as Kenneth Frampton argued in his essay *Towards a Critical Regionalism*.⁸

Improvement can also be found within the social quality of the neighbourhood. When you look at the social figures of Boerhaavewijk, it is not only clear that the residents are dissatisfied with the neighbourhood. It also becomes clear that there is a lack of social cohesion within the neighbourhood. The Boerhaave has the highest percentage that does not know their neighbours, the least percentage that feels at home with local residents and the lowest percentage that is satisfied with the neighbourhood composition.⁹ In addition, 55% of the residents of the neighbourhood feel lonely, which is one of the highest percentages in Haarlem.

These types of figures are also characteristic of the modern state of post-war neighbourhoods, these areas often have a weak socio-economic profile.¹⁰

⁶ Koninkrijksrelaties, Ministerie van Binnenlandse Zaken en. 'Het statistisch woningtekort nader uitgelegd'

⁷ KAW. 'Onderzoek Ruimte Zat'.

⁸ Frampton, K. (2019). *Towards a Critical Regionalism. Six Points for an Architecture of Resistance*. Critical Regionalism . Revisited, OASE, (103), 11–22. Retrieved from <https://www.oasejournal.nl/en/Issues/103/TowardsaCriticalRegionalism>

⁹ 'Haarlem in Cijfers'.

¹⁰ Statistiek, Centraal Bureau voor de. 'Veel naoorlogse stadswijken sociaaleconomisch zwak'. Webpagina. Centraal Bureau voor de Statistiek, 17 November 2017. <https://www.cbs.nl/nl-nl/nieuws/2017/46/veel-naoorlogse-stadswijken-sociaaleconomisch-zwak>.

4. DESIGN QUESTION

How can a densification of the post-war neighbourhood stamp be created by adding multi-family apartments for a target group consisting of 1 to 2 person households, where the architectural design is formed by its surrounding (urban) landscape to create a neighbourhood with a strong identity that promotes sociability and reactivates the urban environment?

5. THEMATIC RESEARCH OBJECTIVE

Industrial building process

Industrial production techniques can be used to create a rapid increase in housing demand. Not only will this accelerate the construction process, it also reduces CO2 emissions, reduces waste production, saves costs and requires less physical labour.¹¹

With industrial production methods, the manual labour on the construction site is largely replaced by machine manufacturing in a factory.¹² This production can be done in the form of modules. These modules have standardized measurements and can be interchangeable. The modules can be produced as 1D, 2D and 3D modules.¹³ The produced modules can be transported to the building site modules are assembled to form the building.

Looking at the advantages of the industrial production process, the logical material chose is wood. Wood is able to strengthen the advantage of the production process such as reducing emission and waste reduction. Its biobased properties ensure an efficient use of raw materials.¹⁴ In addition, because wood is lightweight, it is suitable for a variety of industrial production methods and it can be efficiently transported. These two qualities make it wood an excellent material for densification purposes. Lastly, wood can serve as a long term carbon storage, adding to the ambition to reduce CO2 emissions.

Industrial production methods and the modular approach also open up the opportunity to design architectural connections that ensure flexibility and adaptability of the building on a long term. Knowing the problems the industrial production techniques of the 1960s have caused in the Boerhaavewijk, it is important that if the housing demands and wishes change in another 40 years the buildings in its architecture and layout can easily be adapted.

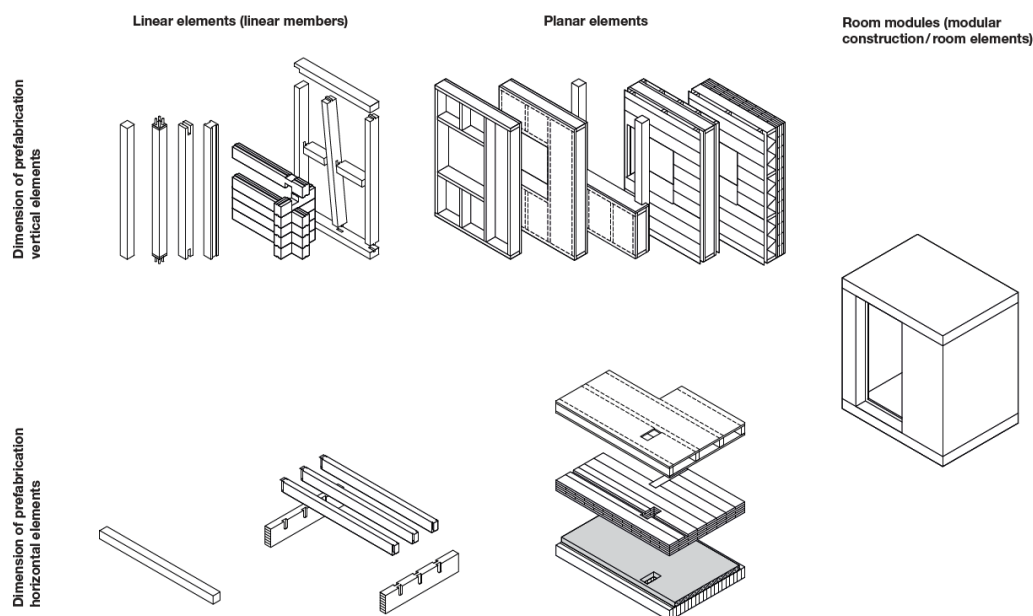


Figure 7, 1D- 2D and 3D elements. Kaufmann, Manual of Multistorey Timber Construction.

11 Cobouw. Tekort aan personeel maakt woningbouwambities onhaalbaar, 23 March 2022. <https://www.cobouw.nl/303839/tekort-aan-personeel-maakt-woningbouwambities-onhaalbaar>.

12 Koninkrijksrelaties, Ministerie van Binnenlandse Zaken en. De woningbouw betaalbaar en duurzaam versnellen: Programma conceptuele bouw en industriële productie - Rapport - Rijksoverheid.nl. Rapport. Ministerie van Algemene Zaken, 30 April 2021. <https://www.rijksoverheid.nl/documenten/rapporten/2021/04/30/programma-conceptuele-bouw-en-industriële-productie>.

13 'Manual of Multistorey Timber Construction. Principles - Constructions - Examples | Hermann Kaufmann, Stefan Krötsch, Stefan Winter | | DETAIL'. Accessed 26 September 2023. <https://www.naibooksellers.nl/manual-of-multistorey-timber-construction-principles-constructions-examples.html>.

14 Kaufmann, Manual of Multistorey Timber Construction.

Another issue of industrial architecture that can be seen not only in the Boerhaavewijk but also in current examples of modular architecture is the lack of context specificity. This can be seen by the uniformity of all post-war neighbourhoods scattered throughout the Netherlands, but you can also see it in the modular houses currently appearing all over the country. Using the exact same module everywhere the built environment becomes uniform.

Context specific architecture

The meaning of the word context refers to the situation in which something exists or happens and that can help explain this. When we look at the context of architecture, this relates to the architecture's natural, historical, political and social context.

In the essay 'Towards a Critical Regionalism' Kenneth Frampton defines critical regionalism as to modify the influence of universal civilization with elements arising indirectly from the peculiarities of a particular place.¹⁵

Analysis method of the context

To create this context specific architecture, a thorough landscape analysis needs to be constructed, This analysis will zoom in on the Boerhaavewijk, but also to its surrounding context to the rest of Haarlem, its surrounding green belt and the surrounding natural areas reaching from the Nationaal Park Zuid-Kennemerland on the east to the Haarlemmermeer on the east.

The method of location analysis is based on the PhD research conducted by Bárbara Maçães Costa investigating architecture as an agent of environmental history.¹⁶ With her research she identifies 5 layers also named thresholds to map environmental relations in architecture. The 5 layers are:

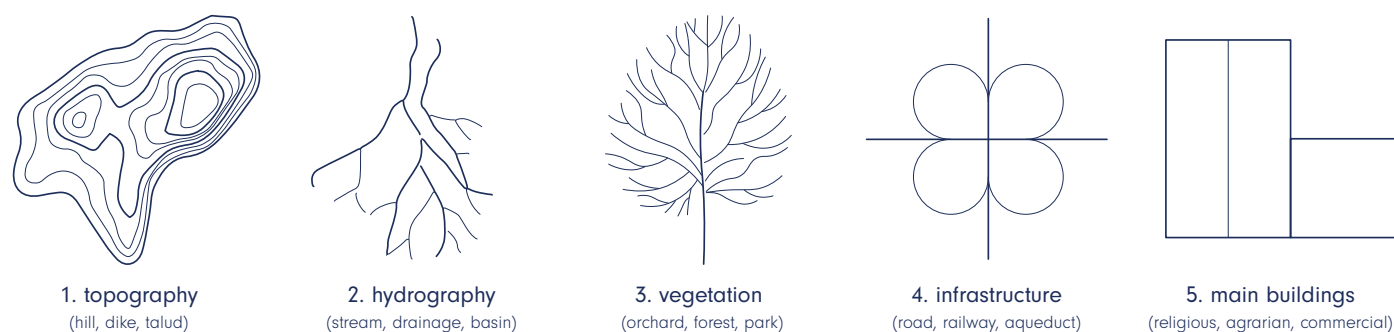


Figure 8, The layers of landscapes

By combining these layers environmental totalities can be identified, the elements of physical, cultural and political context that can be carried over into the architecture.

The architecture of context specificity

These contextual thresholds can then be translated into the architecture for the building to refer to its natural, historical, political and social context. According to critical regionalism this needs to be done in a way that the high tech approach, in this case the industrial production techniques, is not covered up by a decorative facade as a compensation. From the essay of Kenneth Frampton, we can identify a few points of how to design context specific architecture.

1. Identity providing architecture

The architecture of critical regionalism has the capacity to develop a resistant, identity-providing culture, while at the same time having discreet access to universal technology. It can do this through finding inspiration through elements such as variation and quality of local light, or from a tectonics derived from a particular structural mode, or from the topography of a particular location.

2. The place-form

Frampton describes the placelessness of buildings that we see in the modern built environment, in his opinion caused by an architectural approach that focusses only on logistical land-use and existing city systems.

Heidegger argues that the opposite of the placelessness can be found in the German word *Raum*. Meaning an infinite continuum of equally subdivided spatial components and wholes.

¹⁵ Frampton, Towards a Critical Regionalism.

¹⁶ Maçães Costa, Bárbara. 'Conduit, Patio, Waste: Mapping Environmental Relations in Bairro Da Malagueira'. EPFL, 2021. <https://doi.org/10.5075/epfl-thesis-8185>.

Heidegger argues that concreteness, by the clearly defined character of its boundaries forms the phenomenological essence of such a space/place. In which the boundaries are meant as the place from which something begins to appear.

3. A dialectical relationship with nature

Frampton wished for a more direct dialectical relationship with nature than is possible within the more abstract, formal traditions of modern avant-garde architecture. With his use of the word *natures* he refers to the tangible elements of topography, context, climate, light and tectonic form. With the tectonic form he means to indicate a structural poetry instead of the re-presentation of a facade.

4. Sensory perceptions

The last point he makes is the importance of the the body's ability to interpret its environment in other ways besides sight. A names a few other ways in which the body can sense perceptions. The smell of the materials, the impulse to quicken our pace and the intensity of light, darkness, heat and cold.

6. THEMATIC RESEARCH QUESTION

How can industrial production techniques for wooden building components produce context-specific, long-term adaptable and diverse multi-storey homes?

7. THEMATIC RESEARCH METHODOLOGIES

	sub-question	methodology	approach	result
1	Which reference projects can be selected?	Case study and literature study	Investigate projects that are built with industrial production techniques, and which have to do with context specificity, adaptability or / and has a diverse modular approach.	A selection of case studies to be analysed.
2	Which principles from the reference projects can help to from design principles on the subjects of context specificity, adaptability and diversity?	Case study	Formulating conclusions that can be used as design principles.	A list of design principles to design context specificity, adaptability and diversity within industrial housing.
3	What thresholds from the context can be used to translate into the architecture?	Site analysis	Analysing the 5 layers of the context of Boerhaavewijk and Haarlem to formulate the identity providing characteristics of the context.	Contextual elements of the Boerhaavewijk that can be integrated into the design to create context specific architecture.
4	How can the contextual thresholds be translated into architecture?	Case study and literature study	Using the design principles of sub-question 2, the thresholds of question 3 and the essay of Critical Regionalism to formulate a design strategy for the densification of the Boerhaavewijk.	A design strategy of the densification of the Boerhaavewijk that consist out of contextual threshold and references of how to include these into the architecture to design context specific industrial housing

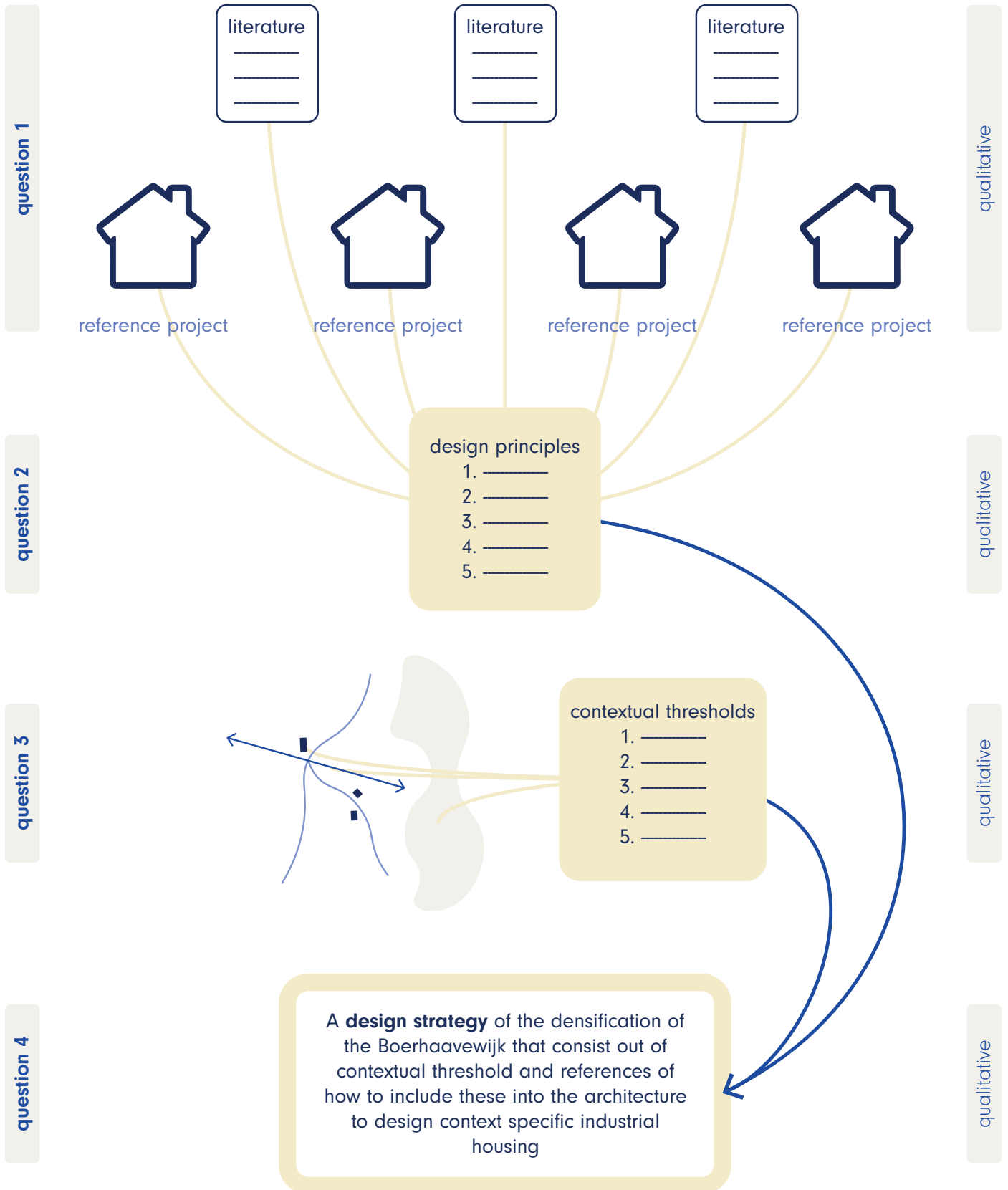


Figure 9, Visual diagram of the research plan

8. RELEVANCE

As mentioned in the problem statement, there is a shortage of 390,00 homes in the Netherlands this year, so this is also the number of households that cannot currently find a (suitable) home. On this large scale, the project will provide some relief in these numbers.

Furthermore, there are 1800 similar post-war residential areas in the Netherlands, these areas often face the same problems when it comes to spatial quality. The project can be an example for improving urban quality.

Currently there is a lot of demand for rapidly produced industrial housing, if we do not start to question the ways in which these modules are now produced and if we do not adhere to the same architectural standards and requirements of regular housing for these modules, the build environment will have to suffer the consequences.

9. PLANNING

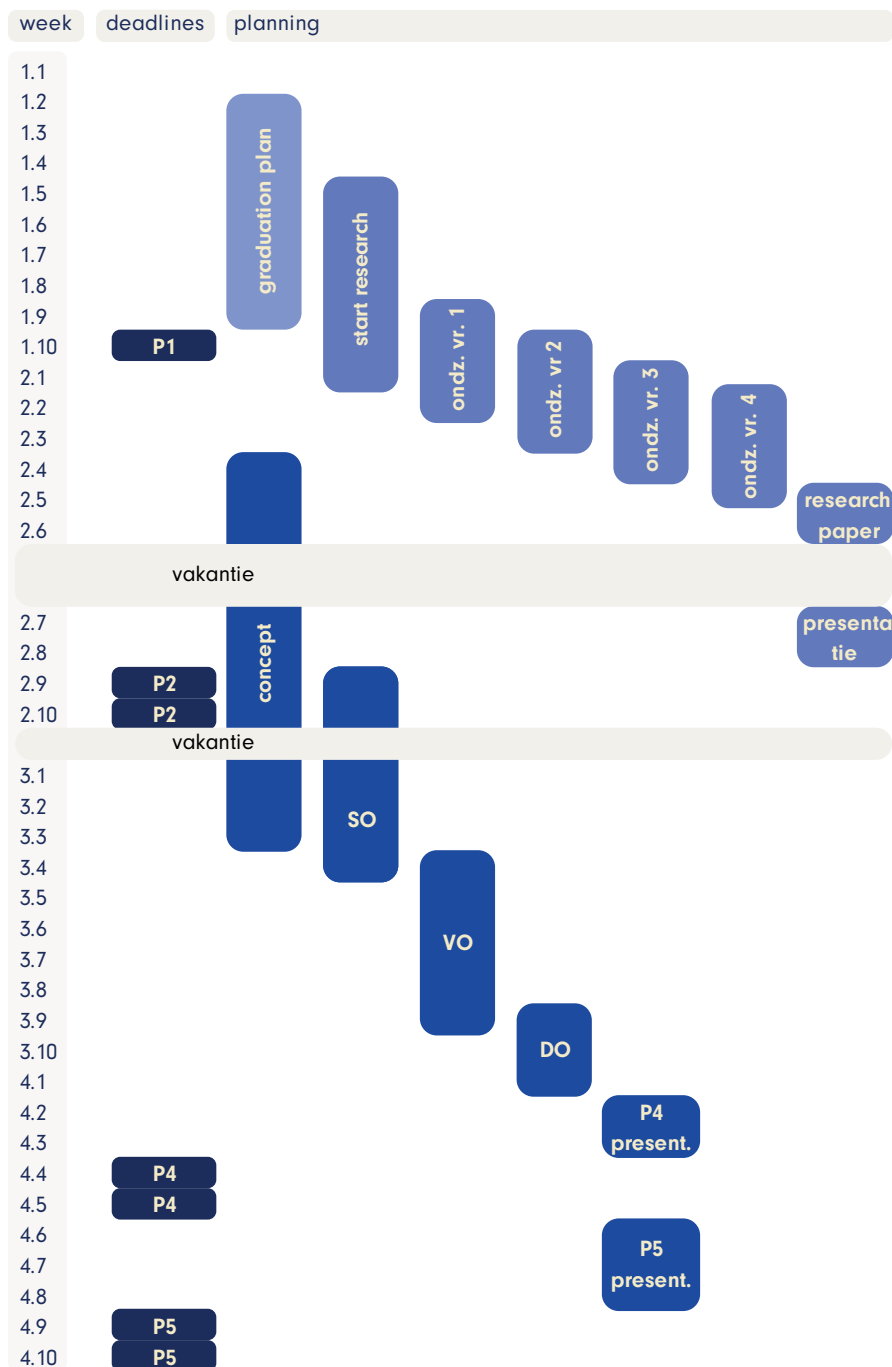


Figure 10, Planning graduation studio

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