FUTURE-PROOF PORCH FLATS

Design guidelines for the transformation of 20th century porch flats in the Western Garden Cities of Amsterdam

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Future-proof porch flats:
Design guidelines for the transformation of 20th century porch flats in the Western Garden Cities

A research on the principles of the Western Garden Cities in Amsterdam and the revitalisation of this area through building with adaptability in the transformation of 20th century porch flats in Amsterdam Nieuw-West

Figure 0.1: Porch flats in Amsterdam Nieuw-West
(Stadsarchief Amsterdam, 1960)

CONTENT

ABSTRACT

This research paper dives into Amsterdam Nieuw-West, exploring the principles of Western Garden Cities and the use of adaptability in the construction process. The Western Garden Cities are an elaboration of Cornelis van Eesteren's 1935 Algemeen Uitbreidingsplan (General Expansion Plan). This city district is part of the Western Garden Cities and has recently been listed by the National Cultural Heritage Agency of the Netherlands to have national importance. This area is listed because of the meaningful urban plan and the execution of it after World War II. However, in the 1980s, the Western Garden Cities even became synonymous with squalor crime and social problems. The current housing stock is considered obsolete, both architecturally and physically. The area faces many problems and threats, making it an ideal location for transformation and renewal. Recognizing the pressing housing crisis and the urgent need to transform existing buildings in a circular way, this research looks into innovative approaches of building with adaptability, to efficiently revitalize this city district. The research proposes design guidelines for the transformation of porch flats, the most common building typology, in Amsterdam Nieuw-West. It is the repetition and the recognisability of these residential buildings that allows for improvements. The guidelines are a list of intervention strategies that can be implemented in the transformation of the post-war porch flats in Nieuw-West, they respect the heritage status of the neighbourhood and are complemented by a set of adaptability strategies. These guidelines are a helpfull tool for transforming porch flats in the area with a diverse range of small interventions. However, the guidelines don't form definitive answers, but are rather a flexible framework which is useful as a starting point in the design process.

Keywords: Western Garden City, building with adaptability, Amsterdam Nieuw-West, post-war porch flats, Algemeen Uitbreidingsplan, heritage, circularity, housing crisis, revitilisation, design guidelines

01 INTRODUCTION

1.1 INTRODUCTION

One of the biggest social problems facing the Netherlands today is the lack of sufficient housing (Weijer, 2022a). A big change to tackle this issue is to rethink the existing building stock. In 2050, 90 percent of the current dwellings still exist, and these buildings are a great change for renovation (Weijer, 2022b).

'We now have 7.9 million homes of which about 7.3 million must be renovated in some way by 2050. In short: 270,000 renovations per year, and thus 1,000 homes per day to be addressed'

- Weijer, 2022b

This can only be achieved by scaling up the renovation concepts and execute this in many projects, a comprehensive approach. Building in an adaptable way is necessary states van Nunen, lecturer in Sustainable Renovation at the Hogeschool Rotterdam, advisor at BouwhulpGroep and columnist of RenovatieTotaal, in an article from Weijer (2022b). Building with adaptable building systems means thinking about using prefabricated materials, flexibility and demountability in order to accelerate the process, make it cost efficient and minimizing errors in the construction phase. And next to the fact that it is a key quality in enabling building alterations, the large advantage is that this is a circular way of building. Building adaptability has been understood as key concept that fit with the principles of the circular economy and circular built environment (Ness and Xing, 2017). The lifespan of the buildings will be extended and the building materials can be reused in the future. Also, the user or owner can accommodate changes in an affordable manner, while reducing the amount of waste generated from building changes (Hamida et al., 2022). It plays a vital role for reversibility of building products.

Post-war porch flats are considered outdated in terms of both housing level and market relevance. The residential obsolescence relates to small floor areas, climbing stairs, outdated kitchens and bathrooms, and low insulation value (Vlaenderen, 2011). Market-wise, many porch flats suffer from the way how people look at it, due to their function as an affordable safety net for immigrants and young starters. Porch flats are often located in neighbourhoods with liveability problems and social deprivation. Porch flats could use an upgrade and can form a chance to tackle the housing shortage and contribute to a circular economy by using the existing housing stock.

The Ministry of Economic Affairs and at that time VROM set up the Industrial, Flexible and Demountable (IFD) program. But, the IFD program has not been adequately translated to the demand, so it never came to scale up in renovation projects. Meanwhile, the principles have also changed, but IFD is still relevant. IFD 2.0 is the follow-up program, where it is more about creating scale by producing building elements in an industrial and flexible way. Moreover, we have too few people on the construction site. So producing building elements in an efficient way is good for the whole construction chain.

Adding an extra layer on top of 20th century residential buildings forms a big change to tackle the renovation issue. This is mentioned in the SEV studies (social-economic research) on redevelopment of existing housing as one of the most promising possibilities (Weijer, 2022a). Next to this, many other interventions in the current housing stock can be done in order to achieve more circularity, energy efficiency and differentiation in housings to create a liveable environment.

In this research, Amsterdam Nieuw-West is being investigated. This post-war city district offers numerous opportunities for revitalization, making it a potential solution to the housing shortage in the

1.1 INTRODUCTION

Netherlands. The most common building typology is the porch flat. This city district is part of the Western Garden Cities and has recently been listed by the National Cultural Heritage Agency of the Netherlands to have national importance (Havinga et al., 2019). This area is listed because of the meaningful urban plan and the execution of it after World War II. However, this area deals with many issues and offers therefore a great opportunity for improvements. The heritage value of the neighbourhood still needs to be considered and forms an important part of the research.

Figure 1.1: Porch flats in Osdorp
(Stadsarchief Amsterdam, n.d.)

1.2 AMSTERDAM NIEUW-WEST

Amsterdam Nieuw-West is a relatively new city district. It was created after the Second World War. The historical roots of the area lie in Sloten, which was initially characterized by peat soil (Vashti, 2021). Various efforts were made to transform it into a fertile agricultural land, supplying Amsterdam's daily needs. However, as urbanization gradually encroached on this rural landscape, the 'Algemeen Uitbreidingsplan' (AUP (General Expansion Plan)) emerged between 1934 and 1958, figure 1.2 (van Eesteren Museum, 2017). The Western Garden Cities are considered a textbook example of modern urbanism as propagated in the 1930s by the architects of Nieuwe Bouwen, who had united in the Congres Internationaux d'Architecture Moderne (CIAM) (Mens, 2020). This is not remarkable, given that the AUP was designed by the chairman of CIAM, Cornelis van Eesteren. The AUP revolutionized Amsterdam's neighbourhood concept, leading to the creation of Amsterdam Nieuw-West.

The AUP was influenced by Ebenezer Howard's garden city concept, emphasizing greenbelts around the city and open building blocks that prioritized green spaces and improved living conditions (figure 1.3). The result was an urban plan that featured segregated functions within neighbourhoods, a well-connected green structure, open building blocks, recreational opportunities for all residents, and optimal natural light and air flow.

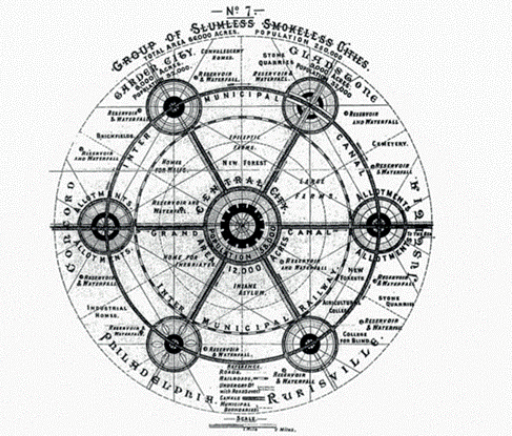


Figure 1.3: Ebenezer Howard's Garden City concept (ResearchGate, 1998)

Figure 1.2: Algemeen Uitbreidingsplan (Stadsarchief Amsterdam, 1935)

1.3 ALGEMEEN UITBREIDINGSPLAN

These thoughts are also implemented in the Western Garden City of Nieuw-West, where the motto 'light, air and space' became important in the development of Dutch post-war expansions. The ideal image of the Western Garden City was about the design of a green structure that had to form a coherent whole, with a hierarchical structure from the level of the neighbourhood to the level of the city. This created a balanced composition between the built and unbuilt space (Feddes, 2012). Besides this, the 'neighbourhood concept' also became important. This concept was developed from a sociological point of view (Havinga et al., 2019). Where every neighbourhood had its own facilities.

The execution of the plan started with Slotermeer in 1951, this is followed by the construction of the Garden Cities Geuzenveld, Slotervaart, Overtoomse Veld and Osdorp (figure 1.4). The entire area was completed in 1965. The focal point of Nieuw-West is the Sloterplas, surrounded by the named Western Garden Cities. With a later expansion in the 1990s with the neighbourhoods Oostoever Sloterplas, Nieuw Sloten and De Aker. The main dwelling typologies in Nieuw-West consist of tower blocks, slab blocks with gallery access, slab blocks with point access, row houses and duplexhouses (Havinga et al., 2019).

However, the euphoria about these neighbourhoods did not last for a long time. In the 1980s, the Western Garden Cities even became synonymous with squalor crime and social problems (Mens, 2020). The current housing stock is considered as obsolete, both architecturally and physically (van Eesteren Museum, 2022). This area faces many problems and threats, making it an ideal location for transformation and renewal.

City planners in the past already created plans for urban renewal of this city district. The urban renewal led by

Figure 1.4: Amsterdam Nieuw-West
(illustrated by author)

1.3 ALGEMEEN UITBREIDINGSPLAN

Bureau Parkstad ran from 1999 to 2007 was characterized by large-scale demolition and new construction plans. The ambitions were concretized in the development vision 'Richting Parkstad 2015', that was published in 2001. The report contains the spatial, programmatic, social, financial and procedural aspects of the proposed renewal projects (Mens, 2020). However, the outbreak of the financial and economic crisis in 2008 made the market fell silent, leading to the return of smaller-scale interventions. This had a positive effect on the initial principles of the AUP, they stay remained. Corporations began to focus more on their existing building stock, the heritage values and the relationship between architecture and public spaces.

This indicates that although the principles of Western Garden Cities are not readily apparent now, it is an important aspect for this neighbourhood. The task of transformation is a contemporary one, but can be linked to principles of the past in order not to lose the qualities conceived then.

Figure 1.5: Porch flats in Slotermeer
(Stadsarchief Amsterdam, n.d.)

02 PROBLEM STATEMENT

2.1 PROBLEM ANALYSIS

2.1.1 Housing crisis

The Netherlands currently faces a significant housing crisis (Weijer, 2022a). With a growing population and limited available land for new construction, finding a solution has become an urgent matter. The housing crisis is characterized by factors such as a shortage of affordable housing, rising property prices and an increasing demand for housing. According to the ABF Research, the Netherlands is short approximately 390.000 homes. An increase of 75.000 homes compared to last year (Séveno, 2023).

The housing crisis needs to be tackled. This can be done in two ways, building new houses or rethinking the existing housing stock. Where the last strategy is the most sustainable, as we have a large existing building stock. Thus, the housing crisis should be tackled with the transformation of buildings we currently have. They form a perfect opportunity for an innovative approach, also aligning with sustainability goals, making it a promising solution for the Netherlands. As mentioned in the introduction, this can only be achieved by scaling up the renovation concepts and create a comprehensive approach. It offers the opportunity to optimize available space and provide new spaces for dwellings.

Figure 2.1: Housing protest
(HLN, 2021)

2.1 PROBLEM ANALYSIS

2.1.2 Need for circular solutions

The earth is under great pressure, there are growing needs for raw materials and energy. The construction sector plays a big role in this, this is why change is necessary. Namely, the construction industry consumes 40% of the materials in the world economy, of which only an estimated 20-30% are recycled or reused at the end of their life (Leising et al, 2018). Until now, non-renewable materials are widely used in construction. The extraction, processing and transportation of these products causes a great environmental effect on the earth (Geldermans en Jacobsen, 2015). This means that currently, mainly the linear economy is going on, where products are scrapped after use and are landfilled or incinerated. A solution for this is going from linear processes to circular processes. The definition of building circular can be found in the Circular Economy (CE). This is an economic system that focuses on structural changes in the existing economy. The CE applies strategies to avoid waste generation and negative environmental impacts. A conceptual framework that depicts the CE is the 'Butterfly Diagram' in figure 2.2. It shows that resources should flow in a closed reversible system, in a closed loop (Hamida et al., 2022). With an increasing population, and thus increasing demand for housing, measures will need to be taken. The CE is all about the infinite reuse of products.

For the building industry, we must consider building with adaptability with a focus on renewable materials, demountability and flexibility. Prefabrication and off-site manufacturing leads to a reduced overall construction schedule, improved quality, and reduced resource wastage (Lacey et al., 2018). Besides this, transformation or renovation of existing buildings is more sustainable since the carbon emissions, development costs and construction materials are lower than if demolished and rebuilt.

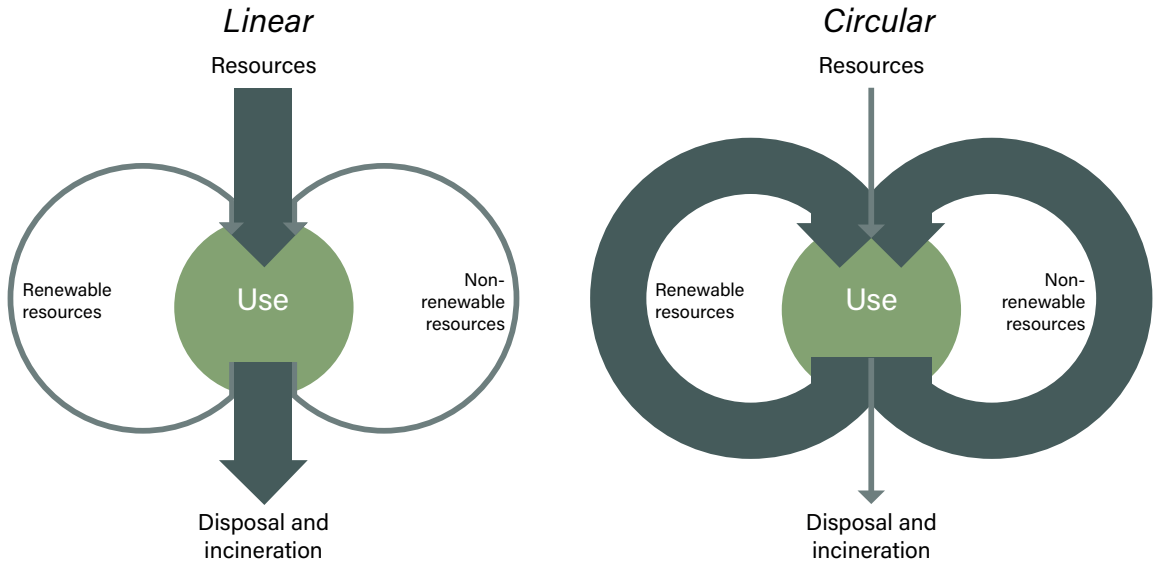


Figure 2.2: Linear to circular economy
(Illustrated by author, based on Kenniskaarten, 2021)

2.1 PROBLEM ANALYSIS

2.1.3 Quality Western Garden City

As stated in the introduction, Amsterdam Nieuw-West , while recognized as a post-war heritage site, is facing significant issues. Nieuw-West is struggling with economic and social deterioration of neighbourhoods, lack of sufficient housing diversity, monotony, fragmentation and anonymity of open spaces and rapid decline in amenities, services and retail (Sabaté & Galindo, 2000)

When the city district Amsterdam Nieuw-West developed, the vision of the Western Garden Cities was implemented, this brought a new face to the city. This post-war neighbourhood with at that time an innovative approach. It was created with open building blocks in order to create more light, air and space. There is lots of space for greenery that promotes outdoor activity and stimulates social activities (figure 2.5). At the moment, this vision is long gone, green spaces around housing blocks are barely used and houses are outdated. There is a need for renewal and identifying the initial principles in order to create a liveable environment.

Despite the challenges and changing urban dynamics over time, the Western Garden Cities remain significant in Amsterdam's urban development. The cultural-historical significance of the design and layout of Amsterdam Nieuw-West is expressed primarily in the way that housing plans, building subdivisions and the long lines of public spaces in the form of watercourses, roads and green spaces have been dimensioned and arranged in relation to each other (Mens, 2020). But some of these principles may not meet the current needs of the users.

The neighbourhood shows low satisfactory scores from its residents (figure 2.3). This is a worrying fact, and due to the lack of renewal and transformation in the neighbourhood the score will not improve soon. In the AUP, the Western Garden Cities should promote the urban quality and the living qualities with several facilities and lots of green, it seems that this failed.

Therefore an investigation is necessary into these principles in order to revive the district, preserve the values and meet the current needs of residents. Transformation is urgent in order to upgrade the buildings, add new dwellings and functions and create a comfortable environment for all its users.

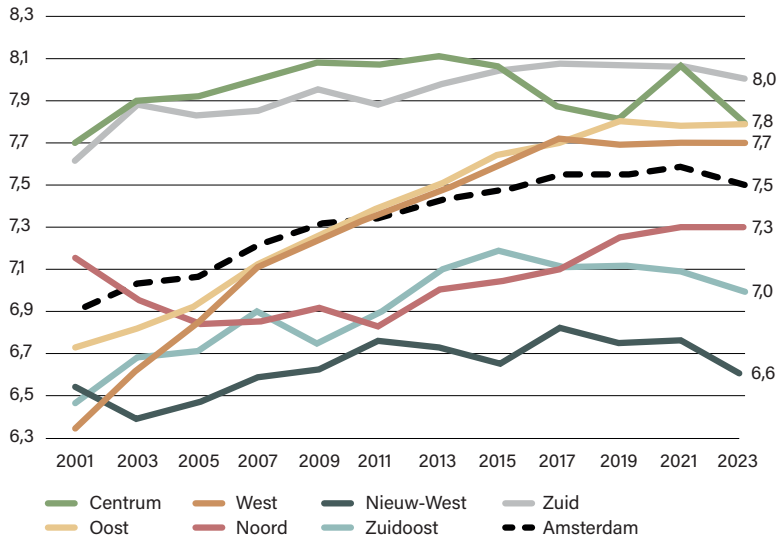


Figure 2.3: Satisfaction of inhabitanst with city district (scale 1-10)
(Gemeente Amsterdam, 2023)

2.1 PROBLEM ANALYSIS

Figure 2.4: Vibrant plinth Amsterdam Nieuw-West
(Stadsarchief Amsterdam, 1971)

Figure 2.5: Children playing in Osdorp
(Stadsarchief Amsterdam, n.d.)

2.2 PROBLEM STATEMENT

The problem analysis provides the basis for starting this research, figure 2.6 gives an overview. The problem statement covers several scales. The housing crisis is a problem on a national scale, due to the growing demand for housing, there is a shortage in the housing market. For this, the existing housing stock can be used by transforming, adding and upgrading the living environment. This is also a very sustainable solution, less construction materials need to be produced and this contributes to the other problem: the need for circular solutions. This problem is also of great importance in the Netherlands and, because the construction sector plays a major role in this, very necessary to take into account. These two problems from the problem analysis can easily be applied to Amsterdam Nieuw-West. This area, the Western Garden Cities, offers porch flats that are suitable for circular transformation. The Western Garden Cities suffers from many problems. But because of the history of this urban extension, it is also recognised as a post-war heritage. So the buildings and the urban plan, although outdated no longer meets with current needs, have a heritage status and this should be respected in transformation. Many buildings have already been demolished over time, but we recognise that using them is more circular and that this does not erase the time period of the past.

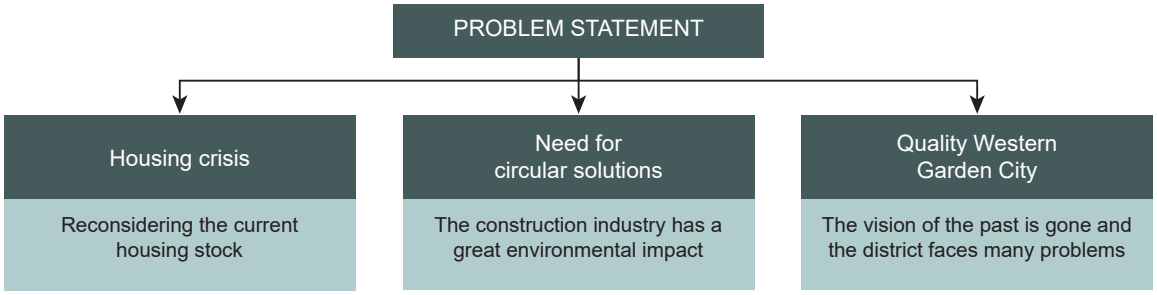


Figure 2.6: Problem statement
(Illustrated by author)

03 RESEARCH QUESTION

3.1 RESEARCH QUESTION

3.1.1 Research question

The research question that will be tackled is a fundamental question that stems from the problem statement. It is a response to a pressing need for circular solutions in the building industry where there is a housing shortage, the growing dissatisfaction with the current living environments and the recognition that the quality of Western Garden Cities is no longer present in Amsterdam Nieuw-West. The research question is formulated below.

> What design guidelines can be employed for the transformation of post-war porch flats in the Western Garden Cities of Amsterdam while utilizing adaptability?

The sub questions that will help to answer the main research question are divided into two categories. With each their own research question in order to come to a conclusion. The questions are formulated as follows:

- What are the principles of Western Garden Cities?
  - What are the Western Garden City principles of the urban plan?
  - What are the Western Garden City principles of the building typologies?
  - What are the Western Garden City principles of the urban life?
- What intervention strategies that use adaptability are suitable for transforming porch flats in the Western Garden Cities?
  - What is the need for adaptability?
  - What is the history behind adaptability?
  - What is the transformation potential of Nieuw-West porch flats?
  - How is adaptability used in reference projects?

Figure 3.1: Sloterplas
(own image)

3.1 RESEARCH QUESTION

3.1.2 Diagram of research design

The research came out of a personal interest about the technical side of buildings and the interest of diving into the history of existing urban plans in order to transform in the best possible way and not let past visions be lost. Besides this, transformation of existing buildings is a very circular solution to the housing crisis and smart building systems can help to do this quickly and efficiently.

Figure 3.2 shows the diagram of the relation between the research and the design case. The aspects of the studio, heritage, housing crisis and circular solutions are combined in this research and the design in the next phase.

In order to formulate the research question, the problems were defined. This problem statement results in a research question and a design question. The research question can be answered through a thematic research where literature, reference projects and other related aspects will be studied. This results in an analysis of the findings that can give grip and provide design guidelines for future transformations in Nieuw-West and my own design case to have a clear list of intervention strategies. The design question overlaps with the research question, the findings of the research will be implemented in the design. But, the design case also needs an elaborate study. Where the site and building itself need to be analysed, with aspects like context, scale, technology or typology. After this, a value assessment will be done that provides a framework of what to preserve and what to change.

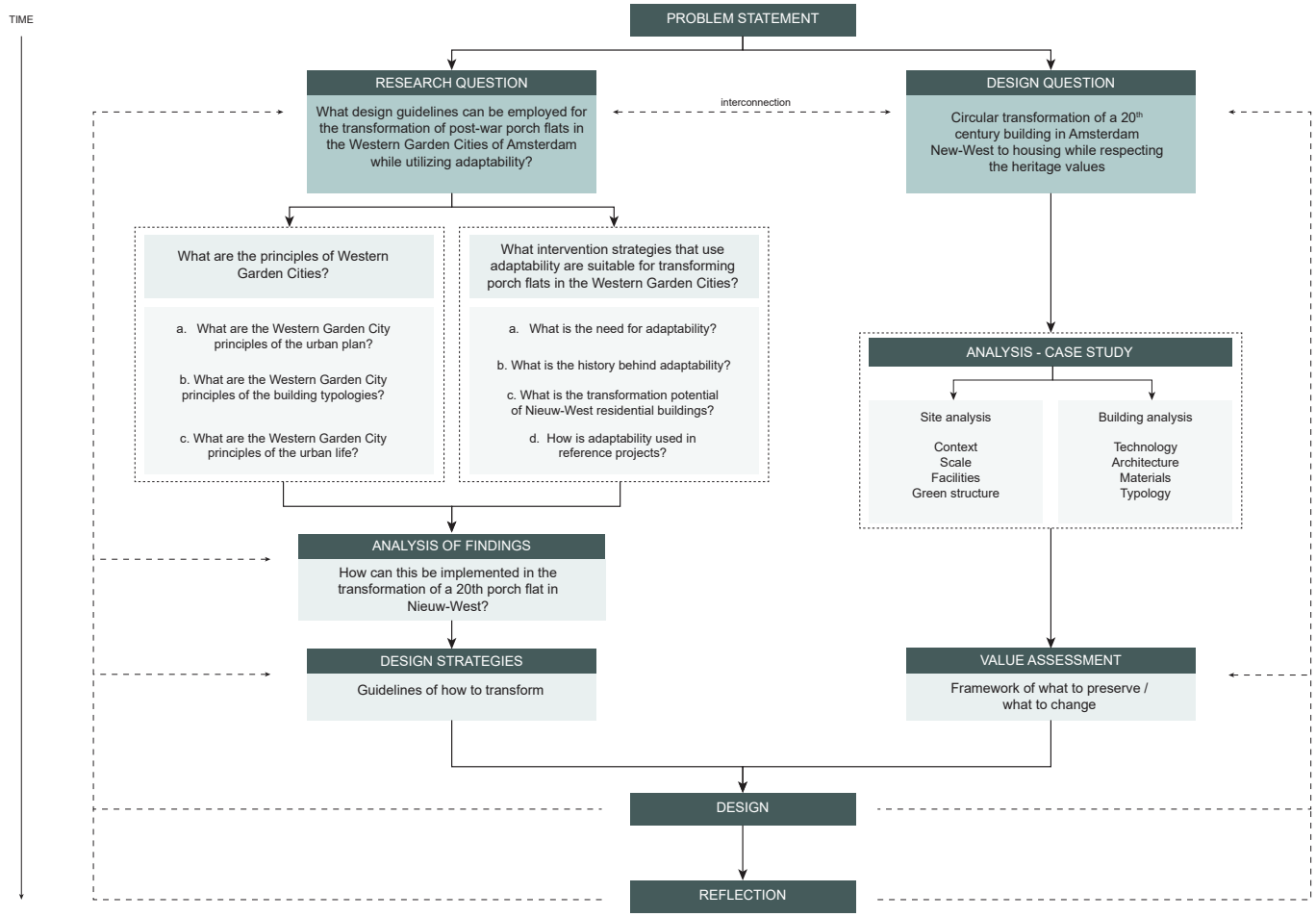


Figure 3.2: Diagram of research design
(illustrated by author)

3.1 RESEARCH QUESTION

3.1.3 Hypothesis

There are many residential buildings in Amsterdam Nieuw-West with the same typology, the porch flat, this research will give design guidelines to transform efficiently while utilizing adaptability that contributes to a circular future. Because this area is recognized as national heritage, it is important to dive into the principles of the area and revive it in modern times. Of course, urban dynamics and residents' desires have also changed from the past, so some values will not matter and need to be modernized. It is expected that this research will provide a solid basis as a starting point for transforming porch flats in Nieuw-West, providing a matrix with guidelines. In the design case, this will be tested on one of the two research cases. The design case will form an example on how to transform a porch flat in Nieuw-West and revive the city district while not losing the vision of the past.

Figure 3.3: Small harbour at Sloterplas
(own image)

3.2 RESEARCH AIM

3.2.1 Research aim

This research aims at investigating the Western Garden City principles while embracing adaptability in order to create a sustainable, resilient, and vibrant living environment (figure 3.4). Transformation is very important nowadays and helps to improve the building and living qualities while creating space for new dwellings and variations in floorplans. This research investigates the heritage value of the Western Garden City in Amsterdam Nieuw-West and looks at reference projects with innovative adaptive building systems that help to transform in a circular, cost-efficient and fast way. The importance of the past needs to be brought back to the modern times and relate to the current needs.

Two buildings in Nieuw-West will be evaluated in order to create design guidelines that will revive the district. These buildings are typical porch flats in Nieuw-West and will therefore represent this building typology in the neighbourhood. The research cases differ in their typology, construction system, parcel form, materials and other aspects.

The research will provide design guidelines for Amsterdam Nieuw-West to transform existing post-war residential buildings to a modern, innovative and community based design while reviving the vision of the past.

3.2.2 Link to the project

The graduation studio contains the topics: housing crisis and circularity, where heritage makes the connection. This research links to the graduation studio in multiple ways. The investigation and goal of reviving the Western Garden Cities relates to the spirit of the city district Amsterdam Nieuw-West. The neighbourhood needs a boost and revaluation about the Western Garden Cities. The history of the plan will be evaluated and relates to the heritage and preservation aspect of the studio. Next to this, there is an urgent need to transform in a circular way in order to stop the world from running out of its supplies sooner and sooner. Adaptability can be applied when transforming in order to make the buildings future-proof. This makes it possible to keep up with changing needs, as small interventions can be done. The housing crisis will be partly tackled as this research dives into this adaptability, where diversity and densification can be provided. These parts of the research link to the question of the studio: How can circularity and heritage approaches join forces? Thus, the past meets modern times.

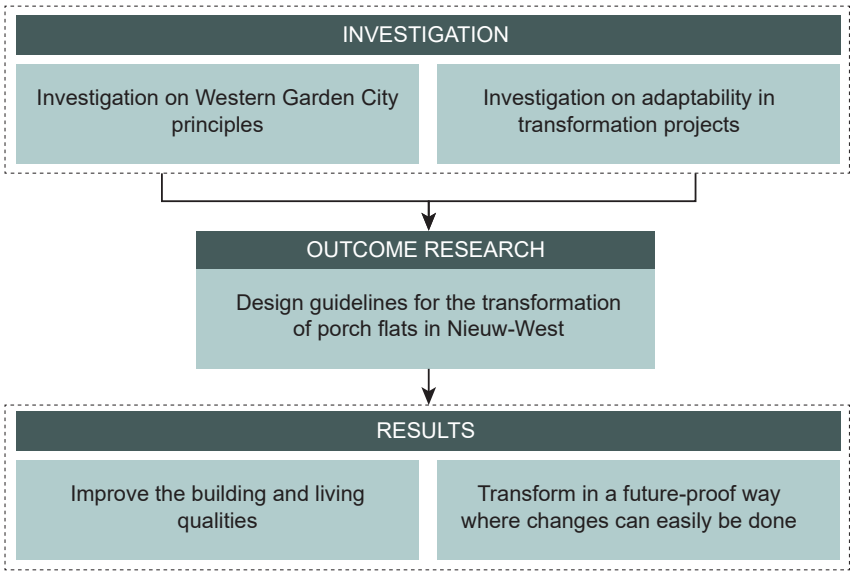


Figure 3.4: Research aim
(Illustrated by author)

3.3 POSITION IN THE FIELD

3.3.1 Relevance

There is little knowledge of building with adaptability in the transformation of existing residential buildings. In the future, this can be very relevant in order to transform these buildings in an efficient way. Also, local residents will be less inconvenienced by the construction work. Additionally, Amsterdam Nieuw-West recognizes the importance of the principles of the past, yet there's currently no overarching strategy for addressing the present condition comprehensively. Because this city district contains many somewhat similar porch flats, there is an opportunity to establish guidelines for the neighbourhood to transform. This could help the city district transform to a liveable environment with the use of efficient interventions while respecting the heritage. Besides this, there are numerous of studies about the urban plan and spatial qualities of the neighbourhood, but there is little attention about the individual buildings and the way they should be transformed in a circular and future-proof way (Nio et al., 2017).

3.3.2 State-of-the-art

Many research has been done about the Western Garden Cities, different books and articles form a very good overview of the principles on the neighbourhood and building scale (Sabaté & Galindo (2000), Nio et al., (2004), Hellinga (2005), Yegenoglu et al. (2008), Nio et al. (2008) and Agricola et al. (2013). These sources are complemented by research papers from Mens (2020), Havinga et al. (2019) and Feddes (2012). This forms a good basis for the research on the Western Garden City principles. They all address the need for the neighbourhood to transform and elaborate on the characteristics. There is a discussion on how to transform and there is no clear answer, this research will try to fill this gap and create a comprehensive approach.

Building with adaptability is a common approach in the construction of new buildings, there are many theories and examples of these structures. But, in transformation projects, this falls behind. As stated in the introduction, there is the IFD program (Weijer, 2022b). This is a contemporary approach in existing projects but still needs more attention and needs to scale-up. This research tries to fill the gap in using adaptability in renovation projects, in order to transform faster and more circular in the future. The theoretical framework will further elaborate on theories that will be used in order to form a conclusion on the research question.

Figure 3.5: Impression Amsterdam Nieuw-West
(own image)

04 METHODOLOGY

4.1 THEORETICAL FRAMEWORK

The research question is answered by using the methods described on the previous pages. Some subjects in the research need extra theory in order to collect data. Therefore, a theoretical framework has been established (figure 4.1).

The transformation potential of porch flats in Nieuw-West will be assessed according to Bernard Leupen his approach from Yegenoglu at al., (2008). Leupen questions changeability of the permanent. Where a building is designed to last while society continues to grow. He identifies four functions in his framework to examine the layers of the building: the load-bearing structure, the skin, the interior and the serving elements. Yegenoglu et al. extend these functions by also looking at the surroundings, the framework is expanded to include the functions of parcel form, outdoor space and infrastructure. By applying Leupen's model at these two levels, it is possible to describe the transformation possibilities of the Western Garden Cities.

The use of adaptability in existing transformation projects also need to be reviewed, therefore different aspects of these project will be assessed in order see how this can be implemented and combined with the intervention strategies that cope with the heritage values of the Western Garden Cities. To find these key aspects to form a matrix, the determinants of Brinksma (2017) will be used. He defines in his paper aspects such as: prefabrication, lifespan, reversibility, resident participation and responding to household dynamics.

Also, material needs to be collected about these projects. Weijer is specialised in renovations with adaptability and writes a lot of articles about it. These articles from RenovatieTotaal will be used to collect several projects and information about it.

RESEARCH SUBJECT	THEORY	VALUE
Transformation potential of Nieuw-West residential buildings	Bernard Leupen from Yegenoglu et al., (2008). Westelijke tuinsteden: Breukvlakken	Leupens' approach provides a strategy on assessing existing buildings and their transformation potential on different aspects
Determinants of adaptable building systems	Brinksma, H. (2017). Toekomstbestendig renoveren.	This research will provide key aspects in order to assess the adaptable building systems
Adaptability in transformation projects	Weijer, H. (2019-2023) RenovatieTotaal.	Weijer writes articles about transformations projects with adaptable building systems, this provides real life cases

Figure 4.1: Theoretical framework (illustrated by author)

4.2 METHODS

The research question consists of two parts, where the principles of the Western Garden Cities are investigated on the one hand and building with adaptability on the other hand. These two parts are subdivided by several questions in order to define a conclusion. Every sub question has their own methods, where some will overlap. Literature review for example is very important for background information.

The used methods are outlined below:

1. Literature review

A literature review is used in order to collect information about the historical development of Western Garden Cities and the history and background information of adaptability in buildings. The information will be collected from books, municipal documents and other public documents. This will gain insight in the different topics and gives a comprehensive overview.

2. Site observation

This research looks at the existing situation of the built environment and collects information about the current state. Also, how the spaces are being used will be observed. This will provide pictures and an understanding about the neighbourhood and the current state.

3. Documentary analysis

This documentary analysis will look at historical photos from the 20th century derived from Stadsarchief. This will give insight in how the previous condition was and how this has changed over time.

4. Comparative study

A lot of buildings nowadays are built with modular systems, adaptable structures or are designed to be disassembled in the future. This provides an efficient and circular way of building. Through the comparison of multiple references, a matrix will be set up with some key aspects. This provides

Figure 4.2: Impression Amsterdam Nieuw-West
(own image)

4.2 METHODS

an overview of the use of adaptability in the building industry. The projects are renovation projects. Unfortunately, there is little knowledge about building with adaptability in renovations with residential buildings, thus we can also learn from other references like an office building that changed to a residential building. This expands the research.

The research will also conduct a comparative study on two different buildings in the area. These porch flats represent the neighbourhood, as they have different construction systems, different parcel forms, and different roof shapes. They will be assessed on their ability to transform. There will be looked at the architectural aspects and surroundings of the buildings.

The methodological framework (figure 4.3) forms an overview of the used methods for the research. The different research methods are here connected to the sub questions of this research.

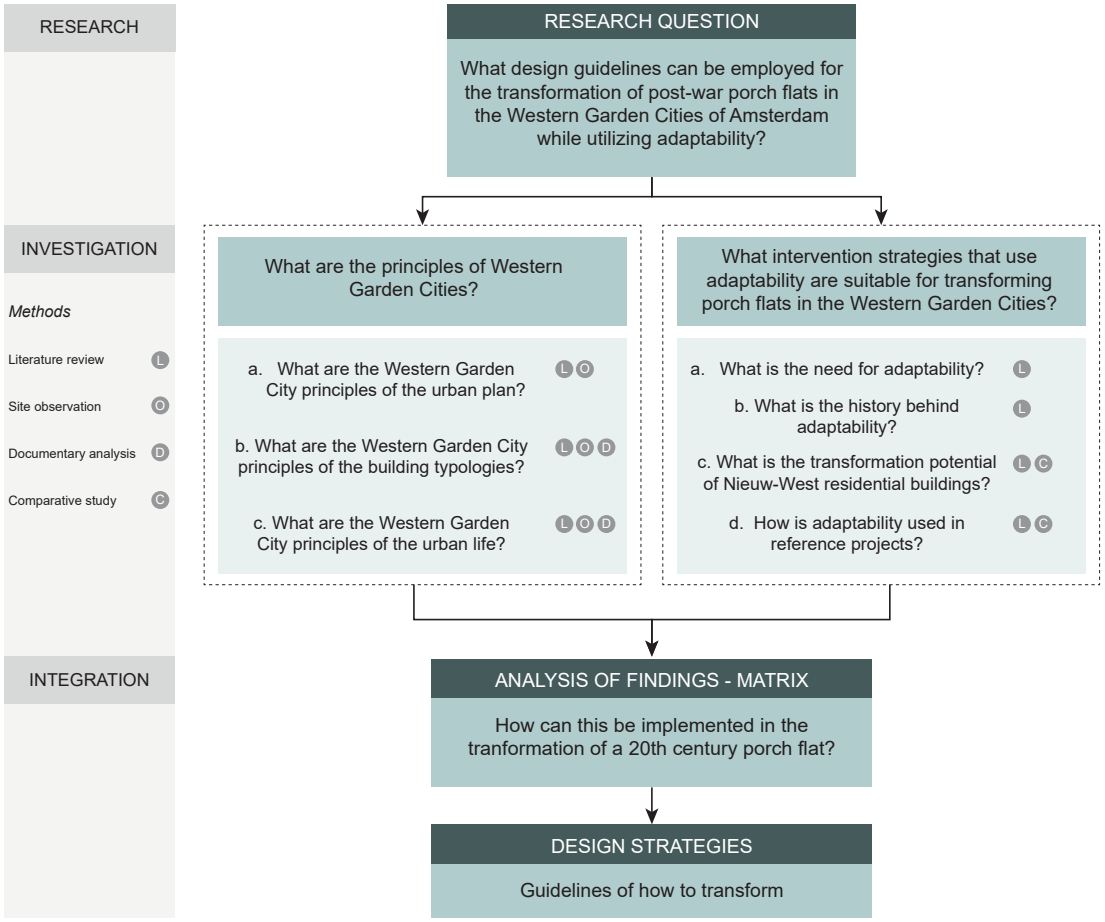


Figure 4.3: Methodological framework
(illustrated by author)

05 PRINCIPLES WESTERN GARDEN CITIES

This chapter investigates the principles of the Western Garden Cities, the urban expansion of Amsterdam which was conceived before World War II and implemented hereafter. This chapter delves into the vision of this plan at different scales to get a grip on the urban plan and its built environment. It starts with a general introduction and then analyses the urban plan, the buildings and the inhabitants. Several books and papers have been used for this purpose to give a comprehensive overview of the positive and negative values of the area. This chapter forms a conclusion where it becomes clear on which aspects should be transformed and which aspects should be preserved with possible improvements. This conclusion can be used to later employ adaptability strategies to make this transformation achievable while remaining and improving the vision of the past and making the porch flats in the area future-proof.

5.1 INTRODUCTION

In the 1920s, urban planner Cornelis van Eesteren envisioned the AUP for Amsterdam, shaping the foundation for the Western Garden City (figure 5.1). This plan arranged living, working, traffic, and recreation, setting the stage for post-World War II expansion districts (van Eesteren Museum, 2017). Van Eesteren drew inspiration from Ebenezer Howard's idea of 'garden cities', imagining small urban communities in rural settings. In this concept, each city, accommodating around 32,000 people, would have its own facilities. The Western Garden Cities of Amsterdam are marked by their green spaces, experimental subdivisions, and a mix of building types, including single-family homes, mostly porch flats, and occasional high-rise structures.

As stated in the introduction, these areas were influenced by an organization called the Congrès Internationaux d'Architecture Moderne (CIAM), founded in 1928, where the architects supported modern architecture and functional design principles. They used a functionalist approach, focusing on logical design, a lot in the Western Garden Cities. However, this functionalist rigidity has led quickly to a mismatch with contemporary needs (Yegenoglu et al., 2008).

Numerous studies have been conducted on the Western Garden Cities, exploring both their positive attributes and aspects that need improvement. Discussions around the preservation versus renewal of the Western Garden Cities prompt questions about the value of the heritage concerning renewal. Interpretations and valuations of the AUP vary, partly due to differences between the plan and its realization. The 1950s and 1960s implementation can be described as experimental and pragmatic, with some failures such as incomplete networks, unsuccessful architectural support for the basic structure, and construction at higher densities than intended (Nio et al., 2004).

The renewal of the Western Garden Cities began in 2001 with the adoption of the development vision 'Richting Parkstad 2015'. This urban renewal witnessed a transition to a policy introducing principles from the Vinex operation, emphasizing building for the market and maximum housing differentiation (Mens, 2020). The renewal plan outlined the spatial, programmatic, social and financial aspects of proposed renewal projects. It aimed at transforming and densifying the area, involving the demolition of 13,000 homes (a quarter of the housing stock) and the construction of 22,000 new homes. The motivation for this massive operation included social and economic disadvantages, a one-sided, low-quality housing stock, and a changed regional position (Nio et al., 2004). This program went hand in hand with densification ambitions, but this led to many concerns. Critics highlight the speed and scale of innovation, cautioning against potential mistakes during major interventions. The challenge in early post-war neighbourhoods lies in simultaneous participation of all scale levels in the renewal process (Nio et al., 2004).

Despite the ambitions, the financial and economic crisis in 2008 slowed down the market, leading to smaller-scale interventions. This crisis, however, increased appreciation for heritage, encouraging smaller renovations of various ensembles in the Western Garden Cities while retaining their heritage values that indicates the importance of the principles of the past (Mens, 2020).

There is nowadays still a need for renewal, as there is still an outdated and one-sided housing stock and a changed position in the broader context of the Amsterdam region.

Renewing public space in post-war neighbourhoods is spatially and sociologically complex due to strong interrelationships between buildings, the urban plan, public spaces and the residents (Nio et al., 2004). The ongoing transformation requires coordinated efforts from both government and market parties to avoid disjointed plans that may disregard existing networks and fail to contribute meaningfully at larger urban scales (Nio et al., 2004). Yet the question remains; Does their value lie in the low building density, in the long sight lines and their quantity or in the large size of open spaces (Sabaté & Galindo, 2000)? And how is it possible that the Western Garden Cities, once the example of modern stone construction with an international reputation and an expression of progressiveness and future optimism at its best, has degenerated into a part of the city that is being demolished in so many places (Hellinga, 2005)?

5.1 INTRODUCTION

Since the principles of the AUP are of great importance when rethinking the city district, outlining this will provide valuable inspiration for renovating. This chapter will investigate the principles of the Western Garden Cities on the scale of the urban plan, the building and the residents including the current needs. These values will be made visible in a matrix as a conclusion for each subchapter. The overall conclusion of this chapter will provide an overview of the principles to consider during the transformation process, ensuring that the visions of the past will be retained.

Figure 5.1: Aerial photo urban plan
(Stadsarchief Amsterdam, 1962)

5.2 PRINCIPLES OF THE URBAN PLAN

5.2.1 Background information

The urban plan is the most important scale of the Western Garden City, the AUP is a city plan with no specific information about the buildings and little information about the residents. It is hard to get an idea on how the urban expansion should function as a living environment and what the neighbourhoods would ultimately look like (Hellinga, 2005). The AUP had a core structure where only global destinations and the size of those destinations have been designated. Different layers surrounding these areas were connected to each other. The infrastructure, the Sloterplas, the shopping centers and green belts are interrelated and form long lines in the plan (Mens, 2020). This indicates that most of the attention of the designers went to the urban structure. When reviving the district, it is of great importance to indicate the qualities and not losing them.

The Western Garden Cities, like Howard's Garden City, were full of idealism where living and industry had to remain separate, the distances to work, shopping and school were short and there was no alcohol for sale. The Garden City unites the best of both worlds; the amenities of the big city and the rhythm and tranquillity of a rural community (van Eesteren Museum, 2017).

The AUP was made in a way where the plan was propagated as urban development 'for architecture', a strong spatial support that invites specific architectural interpretations. The bird's-eye views of Nieuw-West makes these intentions clear with fields of buildings inside of the designed structure of the area, see figure 5.2 (Nio et al., 2004). This is the core of the AUP's legacy, but the most widespread misunderstanding is that the building fields are autonomous, as if they can be erased and refilled at will, without taking into account the nature of the urban plan. This is the criticism on how the AUP has been executed, in a hasty manner which missed the opportunity to actually shape the functionalism that was intended. For example, the backyards of low-rise homes along a continuous parkway are just as strange a combination as the Geuzentuin along a cycle path. (Anna Vos in Nio et al., 2004).

Figure 5.2: Aerial photo Slotermeer Noordoost
(Stadsarchief Amsterdam, 1980)

5.2 PRINCIPLES OF THE URBAN PLAN

5.2.2 The two concepts

The Western Garden City brings together two important concepts rooted in urban planning and shaped by the CIAM and the garden city movement by Ebenezer Howard. These modernist ideas shaped the design of the AUP.

The first concept, the 'wijkgedachte' (the neighbourhood unit), grew from a social perspective that saw the family as the basic unit of society (figure 5.3). This was because of a lack of social cohesion and the fact that the city was densely populated (Havinga et al., 2019). This idea was founded by the director of the Rotterdam Housing Department, A.W. Bos, who spread this concept shortly after the war, especially in Rotterdam (Hellinga, 2005). Bos's idea encompasses the most extreme community ideology of that time. A heterogeneous population would be formed into a whole, through the hierarchical structure of functions. The 'wijkgedachte' suggested organizing urban functions like living, working, traffic, and recreation in a segregated way (Havinga et al., 2019). The Western Garden City is built upon the foundation of this idea of neighbourhoods, each with its own essential services like shops, schools and churches nearby. However, this concept is not visible anymore, as the population has changed and individuality has taken its way.

The second concept where the Western Garden City is based upon, is 'light, air, and space'. This became a crucial theme during post-war periods, with an emphasize on the importance of greenery for optimal access to light, air, and space (Cultureel Erfgoed, 2016).

In essence, the Western Garden City embodies these two influential ideas, this reflects the modernist ideas of that time that shaped the AUP. It has a long lasting impact on modern architecture and is still visible nowadays.

Figure 5.3: Wijkgedachte, 'Het gezin is de oorsprong van de stedelijke gemeenschap' (berg.hotglue, n.d.)

5.2 PRINCIPLES OF THE URBAN PLAN

5.2.3 Urban structure

As stated before, the urban structure forms a very important aspect of the city district. The post-war neighbourhoods, known for their remarkable openness and abundant green spaces, redefined the urban landscape (Rijksdienst voor Cultureel Erfgoed, 2016).

The National Cultural Heritage Agency specifies the significance of the Western Garden Cities with some core qualities of which 'the hierarchical structuring of both the infrastructure and the greenery' (Havinga et al., 2019). As visible in figure 5.4, the infrastructure starts with so-called city avenues, these roads serve as a route connecting the existing city to the expansion. The city avenues are branching in the area to district roads, neighbourhood streets, residential streets and sidewalks. The green system included a structure from the landscape, the park, park strip, green belt, and courtyards. These systems are related to each other and host some public functions. The Heritage Agency also specifies another quality, namely 'the balanced relationship between the buildings and the public space'. These qualities were the basis of appointing the Western Garden Cities as national heritage (Havinga et al., 2019). Parks and park strips reinforce the autonomy of the individual neighbourhoods. Good examples are the Eendrachtspark between Geuzenveld and Slotermeer and the greenery around Plantijnpad between Slotervaart and Osdorp (Agricola et al., 2013). Within larger neighbourhoods, these parks sometimes also provide internal differentiation. The greenery have a separating as well as a connecting function, they are linked to the complete system.

Expert meetings also tried to highlight different key aspects of the Western Garden Cities (Nio et al., 2004), where one is about the relation between parcel forms and the relationship between architecture and urbanism: the transparency of the parcel forms, the cohesion between the scale levels, the rhythm and repetition of the open buildings, the relationship between building fields and networks. Another key aspect is the vision behind the urban plan, that in

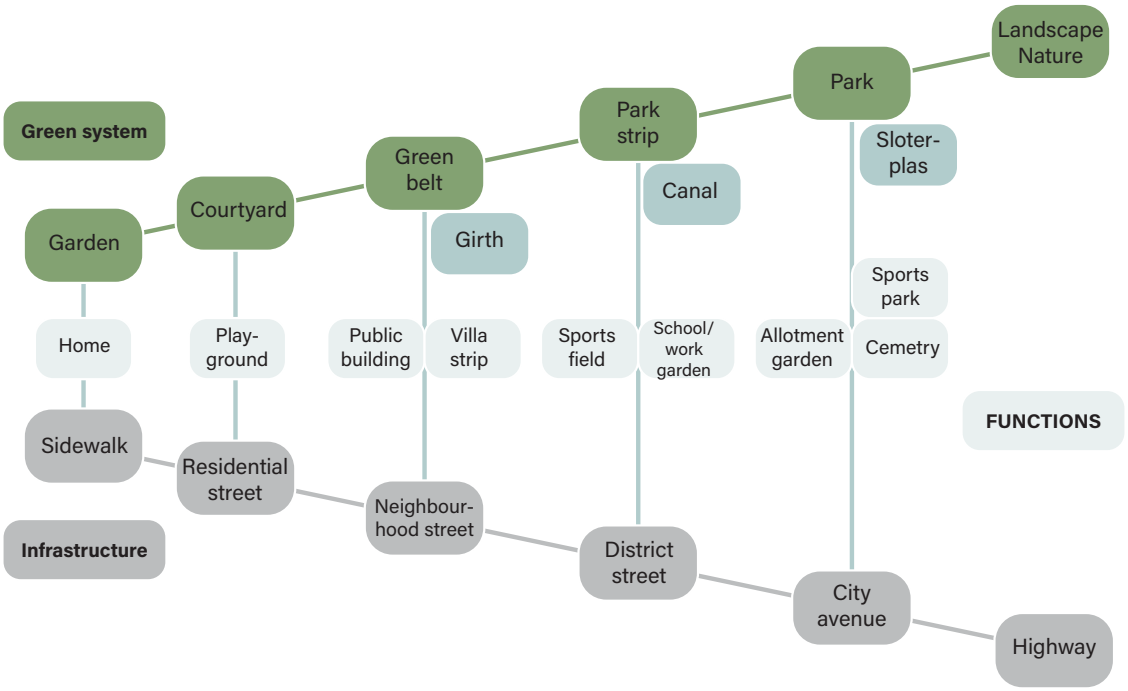


Figure 5.4: Hierarchical structure
(Illustrated by author, based on Nio et al., 2008)

5.2 PRINCIPLES OF THE URBAN PLAN

principle is very good. The areas can be seen as laboratories of collective parcelling, therefore these experts state that it is about reshaping collective spaces, but with the current needs. In the Western Garden Cities, the key aspects are site specific.

The hierarchical structure ensured that residents were able to choose whether their route to school and work ran along traffic lanes or through greenery, figure 5.4. This view led to the realization of the ideal image of the Garden City, with a coherent whole. This created a composition between the built and unbuilt space, which was designed radically and consistently for the first time in the AUP (Feddes, 2012).

The design language of the urban structure was geometric and avoided symmetry to support building pattern composition, figure 5.5 (Feddes, 2012). The landscape architects (Jan Bijhouwer, Mien Ruijs and Wim Boer) who were involved as supervisors in the layout of the urban plan also sought to create sheltered spaces in addition to the objective continuity of transparency of the unbuilt space (Agricola et al., 2013) They tried to make gradual transitions between public spaces and roads to more private areas for families with young children. However, the envisioned pleasant and sheltered spaces have remained unappropriated, as residents did not embrace these areas as the designers had hoped (Feddes, 2012).

From this, we can state that the essence of the spatial composition lies in the interconnection at different scale levels. Public spaces are generously dimensioned,

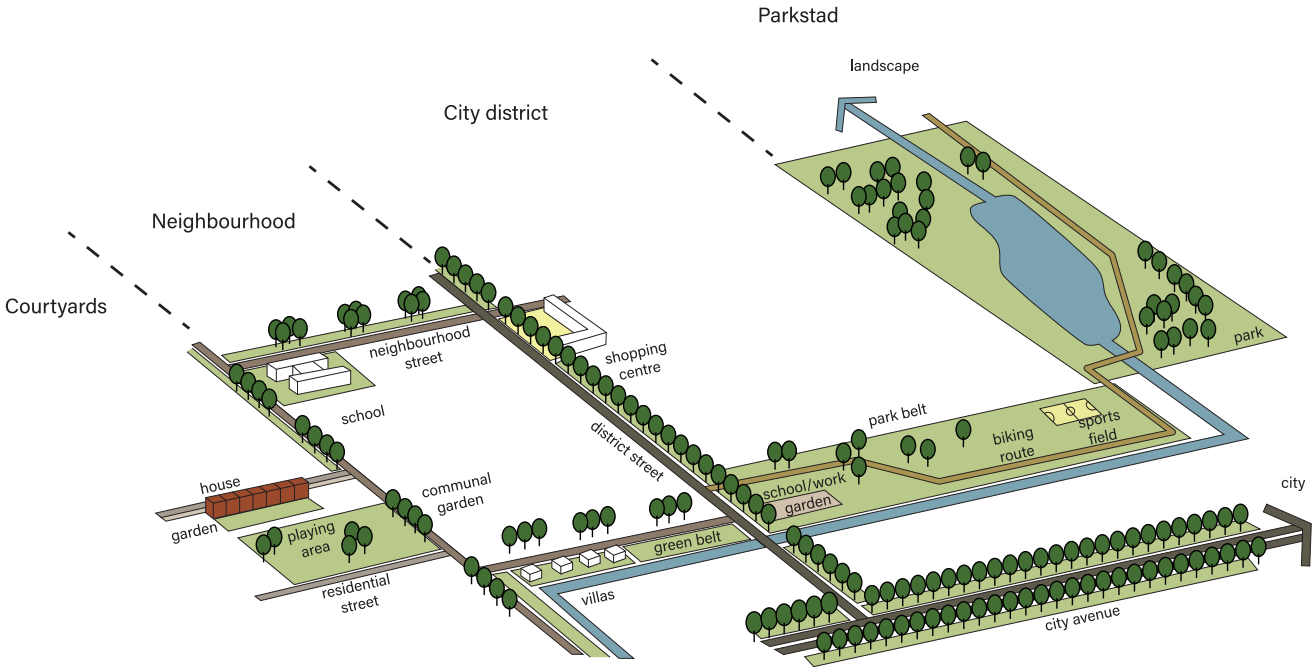


Figure 5.5: Structure of Nieuw-West
(Illustrated by author, based on Feddes, 2012)

5.2 PRINCIPLES OF THE URBAN PLAN

offering large green areas, courtyards, and wide sidewalks. There is a continuity between courtyards, green spaces and park strips. On the one hand, this flowing connection of public spaces forms an important quality. On the other hand, the problems it poses have been widely reported (Nio et al., 2004). The green space is becoming uniform in many places, the boundaries between public and collective spaces are unclear and the use of green is minimal in many places. This led to a spatial layout that lacked identity in the urban plan.

A solution for this is divided into different opinions. Designers in the past tried to explore new relationships between public, collective and private spaces in response to contemporary needs (Nio et al., 2004). Some propose a sharp separation between private and public through physical elements like fences or closed building blocks, emphasizing the potential safety benefits of closing off courtyards. However, this approach is against the heritage principles of the neighbourhood. A middle path is also proposed, with more nuanced solutions in the formalization of collective spaces. The concept of a semi-open building block is suggested as a meaningful strategy for renewing the collective spaces. This approach acknowledges desire for differentiation while respecting the initial thoughts of the AUP.

Figure 5.6: Green structure
(Illustrated by author, based on Feddes, 2012)

5.2 PRINCIPLES OF THE URBAN PLAN

5.2.4 Public functions

A large part of the plan is also centred around the public functions and the division of functions (figure 5.7). Each Garden City neighbourhood features a central shopping square, such as Plein '40-'45 in Slotermeer, Allebéplein in Overtoomse Veld, and Sierplein in Slotervaart (Agricola et al., 2013). Each neighbourhood stands as a self-sufficient entity, promoting independence for its residents. Rooted in the idea of the AUP, each neighbourhood also have their own shops, schools, churches, green spaces, and playgrounds, in order to encourage interaction and relaxation (van Eesteren Museum, 2017). The urban plan divides the neighbourhoods with water and greenery as structural elements.

However, the separation of functions, while contributing to order and harmony, poses challenges. Safety concerns arise from the lack of mixed functions, hindering social control. The argument is made that introducing functions within the neighbourhood that facilitate relaxation and recreation could enhance the overall safety and vitality of the area (Yegenoglu et al., 2008).

René Boomkens also criticizes the strict spatial separation of primary functions in the Western Garden Cities, claiming that it results in a lack of urbanity. In his exploration of urbanity in the book 'Drempelwereld,' Boomkens associates urbanity with the blending and overlapping of different functions, activities, and lifestyles (Yegenoglu et al., 2008). He emphasizes the importance of transitional or mediated spaces, which he calls 'de drempelruimte.' Boomkens argues that these intermediate spaces are lacking in the Garden Cities, and achieving urbanity would be possible by incorporating more mixed functions and reducing the focus on residential areas alone.

The complicated balance between separation and integration of functions remains a crucial aspect in shaping the character and functionality of the Western Garden Cities.

Figure 5.7: Public functions
(Stadsarchief Amsterdam, 1964)

5.2 PRINCIPLES OF THE URBAN PLAN

5.2.5 Findings

The urban plan has the most important value within the AUP. The plan was designed with the idea of creating an urban structure of networks and within which there is space for building. This is therefore of great importance in this part of the city. The matrix below (figure 5.8) shows what is of positive, neutral and negative value within this examined scale. These values are important when interventions are made in the western garden cities. Positive values such as the use of water and greenery as structuring elements and the hierarchical arrangement of systems should not be lost. There are also negative values such as the lack of urbanity due to little mix of functions and the sparse use of public spaces around buildings.

Positive value These values are of importance in the area and need to be considered while renovating	Use of green and water as structuring elements	Consideration of collectivity in initial urban planning, 'wijkgedachte'	Structure was geometric and avoided symmetry to support building pattern composition	Connection between the small scale of the outdoor area to the larger scale, hierarchical structure	Optimal access to 'light, air and space'
Neutral value These values are present in the area but have no positive or negative value	Seperation of functions; work, living, traffic, recreation	Introduction of open building blocks	Remarkable openess of the city district	Each neighbourhood has its own central shopping square	
Negative value These principles have a negative value and need to be changed in order to revive the area	Lack of intermediate spaces	Safety concerns arise from the lack of mixed functions, lack of urbanity	AUP executed in a hasty manner, for example: backyards along a continuous parkway	The envisioned sheltered spaces have remained unappropriated	Uniform green spaces

Positive value
Neutral value
Negative value

Figure 5.8: Values on the scale of the urban plan
(Illustrated by author)

5.3 PRINCIPLES OF THE BUILDING

5.3.1 Background information

The buildings in the urban expansion were rapidly built from the ground up in the 1950s and 1960s (figure 5.9), there was no gradual development of the neighbourhoods after World War II (Hellinga, 2005). One of the most remarkable transformations in the cityscape during the developments of the Western Garden Cities was the introduction of open building blocks, initially referred to as strip allotments. This departure from the closed building block concept, considered outdated, aimed to address issues related to optimal sunlight exposures within homes (Agricola et al., 2013).

As we dive into the building typology of the Western Garden Cities, we explore the tension between historical preservation and the pragmatic shifts in architectural designs and current needs. The architecture in the Western Garden Cities has remained generally restrained and sober (Yegenoglu et al., 2008). However, the preservation of cultural-historical values faced a critical juncture in the 1990s, as these neighbourhoods became subject to redevelopment initiatives that sometimes disregarded their inherent urban and social housing heritage (Mens, 2020).

This subchapter will look into the principles of the residential buildings in the Western Garden Cities and provide positive and negative values of the housing stock. The most dominant typology is, as stated before, the porch flats. Also called 'slab blocks with point access' (Havinga et al., 2019). After presenting general information about the housing stock, this typology will be examined and assessed to outline its characteristics and values.

Figure 5.9: Construction site Nieuw-West
(Swaager, 1955)

5.3 PRINCIPLES OF THE BUILDING

5.3.2 Building stock

Regarding the nature of the housing stock, the 'Nota van Toelichting' (explanation behind a legislative proposal) indicated a goal to construct a significant proportion of single-family homes (50-60%), making these housing options accessible to workers (Hellinga, 2005). This preference aligns with the Amsterdam tradition and a decision by the mayors and councillors from six years earlier in which the entire western expansion was earmarked for single-family homes.

The housing stock in Amsterdam Nieuw-West consists of a mix of typologies: medium high-rise buildings (up to 4 storeys), single-family houses and special housing types such as homes for the elderly and some high-rise buildings that provide 'prominent points' between the low-rise buildings (van Eesteren Museum, 2017).

The National Cultural Heritage Agency specifies the significance of the housing stock of the Western Garden Cities with, emphasizing the quality of 'the characteristic repetition of building blocks and the interspersion of high and low-rise according to the principles of the CIAM' (Havinga et al., 2019). Next to this, expert meetings also have specified an important key aspect of the housing stock. It concerns the materialisation and form of the architecture, a restrained design, the colour scheme of bricks and roof tiles and the specific building height.

However, due to the high pace of construction, combined with a scarcity of financial resources and lack of building materials, affected the quality of the buildings and hereby also the quality of the neighbourhoods (Hellinga, 2005). As time has progressed, the current housing stock is perceived as architecturally and physically outdated (van Eesteren Museum, 2022). The buildings are seen as obstacles to positive development. Thus, the current housing stock, next to its qualities, has many architectural shortcomings. The aesthetic value of the beautiful trees often compensate for these poor buildings (Feddes, 2012).

The buildings offer numerous of opportunities together with the (green) surroundings. Many of these buildings are being faced with demolition, reuse, renovation or restoration (figure 5.10). This post-war heritage can serve as inspiration and can be turned into a neighbourhood with positive qualities where sustainability is the key and where the quality is considered (van Eesteren Museum, 2022).

Figure 5.10: Renovation of a porch flat in Osdorp
(Stadsarchief Amsterdam, 2004)

5.3 PRINCIPLES OF THE BUILDING

5.3.3 Building characteristics

As mentioned before, the porch apartment flats with a 4-storey building height is the most prominent building typology in the Western Garden Cities (5.11). This makes that this is the promising typology for further investigation into their characteristics and their potential for future-proof renovations and transformation.

The building systems that are used in the post-war porch flats are a combination of concrete and timber construction or the ground-breaking method – the system homes. The threat of a long-term housing shortage and a lack of skilled constructions workers and traditional building materials, forced the government to promote industrial construction methods (Agricola et al., 2013). Nemavo, representing the Dutch Housing Company, played a pivotal role in popularizing the successful approach, the Airey system. Among the 2 million post-war houses, approximately 400 to 500 thousand were constructed using this system building method. This non-traditional approach aimed to minimize on-site labour, encouraging innovation in construction techniques and production methods, leading to the advent of prefab building systems (Rijksdienst voor Cultureel Erfgoed, 2016).

The fact that most of the porch flats in Amsterdam Nieuw-West have overlapping construction techniques, presents opportunities for standardized and scalable solutions in addressing the current renovation challenge (Rijksdienst voor Cultureel Erfgoed, 2016). It is the repetition and the recognisability of these residential buildings that allows for standard improvements such as enlarging homes and enhancing the energy efficiency.

There are a few characteristics of this building typology and the surrounding space that are important to take into account when renovating. This will be further investigated in detail in the second chapter; the transformation potential of the research cases.

Firstly, most of the ground floors are made up of storage spaces. The CIAM did not envision this, but the notion of raising dwellings above the ground floor resulted in this development. Current days, this closed character on the ground floor is perceived as unpleasant with little connection between the building and the public green areas surrounding the buildings (figure 5.12 & 5.13).

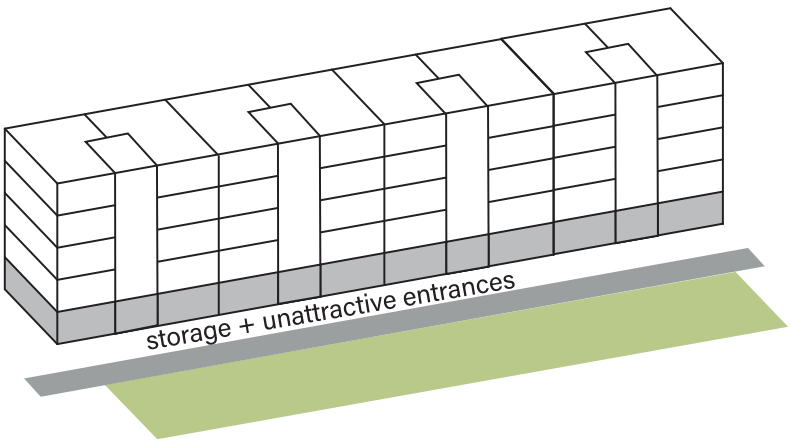


Figure 5.11: Typogoly of the porch flat
(Illustrated by author)

5.3 PRINCIPLES OF THE BUILDING

Secondly, many collective spaces like courtyards, though present, often lack direct accessibility from the building block (Feddes, 2012). This is related to the first point, where the ground floor is not connecting with these spaces. This is also related to the fact that the there is a decrease in population density, there is a reduced spatial pressure and it results in a lack of vibrancy and social control.

Thirdly, there lies a quality in the way how the buildings are oriented. All of the residential building are optimally oriented to the sun. The envisioned north-south oriented strips featuring east-west oriented houses became the architectural ideal, ensuring that the living rooms faced the sun on the west side, while kitchens and bedrooms occupied the east side (Agricola et al., 2013).

There are already theories about renovations and interventions on the building scale. According to Nio et al., (2004), there are many opportunities in organising the open spaces in between the buildings. This is an important key for renewal. The division between public and private, makes that there is little presence of semi-public spaces.

Also, according to the current wishes on the housing market, the buildings are seen as inappropriate with houses that are too small offering little comfort (Sabaté & Galindo, 2020). The diversity of the buildings including the dwellings need to be expanded. The prevailing preference is for more single-family homes and fewer 4- and 5- room dwellings without elevators.

Sabaté and Galindo (2020) offer some possibilities. One of them is connecting two residential units horizontally or vertically, resulting in the creation of duplex houses. Besides that, the ground floor could make space for public functions or dwellings. Also, dwellings can be enlarged by breaking down walls are adding extra layers on top of the existing porch flat. There are also more specific interventions, changing the façade, alter in sizes and layout, and adding small buildings with a different character. This provides a diverse image of the cityscape and creates many visual effects.

Figure 5.12: Closed character, Rinckerstraat
(Stadsarchief Amsterdam, n.d.)

Figure 5.13: Closed character, Johan Jongkindstraat
(Own, image)

5.3 PRINCIPLES OF THE BUILDING

5.3.4 Housing characteristics

Besides the characteristics of the buildings, the housings inside of these building also form an important aspect of this post-war innovative expansion plan. In this era, the Dutch government did research into standardization in housing construction as mentioned before. But this had also its effects on the houses. A study by W. van Tijen in Yegenoglu et al. (2008) proposed a forward-thinking idea, making the stairwell of a porch flat interchangeable with a bedroom (figure 5.14). This innovative approach aimed at maximizing living space, emphasizing additional living areas beyond the minimum room dimensions to enhance lasting living value. On space utilisation, this study said that the living room-kitchen connection has great advantages for the housewife, both at mealtimes and for monitoring small children and family contact. If a second living area is present, spacious connection of this with the kitchen is an ideal solution. The space could be used as a children's room during the day and dining room or study room in the evening. The relationships between spaces thus influence the potential for multiple space use and transformation during the day.

Due to these early explorations on spatial usage, criteria were formulated regarding standardization of building elements. These criteria were not formulated to make the houses more transformable, but rather to establish a more efficient construction process (Yegenoglu et al., 2008). This was criticized in the late 1950s by the new Forum editors Van Eyk, Herzberger and Bakema. They think this development led to solutions with little diversity.

An evaluation of the functional floor plans suggests limited versatility at the construction scale. For instance, while a living room could be transformed into a bedroom, the reverse is less feasible without substantial adjustments (Yegenoglu et al., 2008). The porch flats offer greater adaptability at the levels of renovation and expansion than flexibility inside of one dwelling. Studies on the flexibility of porch flats in the Western Garden Cities reveal that combining houses allows the creation of new homes that align with the contemporary demands.

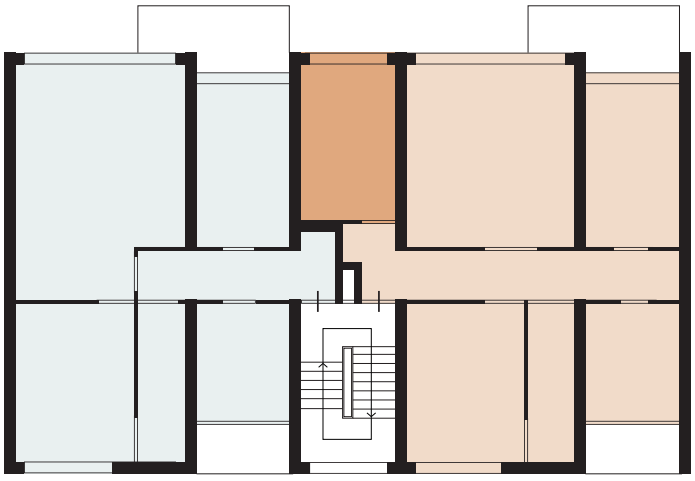


Figure 5.14: 'Wisselkamer' principle
(Illustrated by author)

5.3 PRINCIPLES OF THE BUILDING

It is clear that the values of the Western Garden Cities are mostly in the larger scale, the quality on the scale of the homes is quite low. The average homes in porch flats were around 50 m^2. Some were designed as duplexes, with compact features such as tiny kitchens and a small bathtub that could be transformed in a few minutes to a washing machine. The involvement of the Urban Development department led to the addition of balconies, compensating somewhat for the limited internal space (Hellinga, 2005).

Since the late 1970s, housing associations have embarked on enhancing the housing stock in the Western Garden Cities. Improvements involve central heating, double glazing and sometimes updated kitchens and showers. By 1989, more than half of the housing stock had undergone some form of enhancement (Hellinga, 2005).

5.3 PRINCIPLES OF THE BUILDING

5.3.5 Findings

The buildings were built in a rapid manner as many houses were needed after World War II. As a result, standardised solutions were sought and many similar buildings were built. Porch flats have the largest proportion. The matrix below (figure 5.15) shows the values of the buildings. Many buildings have already been demolished over time because they no longer meet current needs and the buildings are architecturally and physically outdated. The post-war buildings that remain represent an excellent opportunity for renovation and reviving the principles of the western garden cities. Rethinking the current housing stock will contribute to a circular and flexible future. However, there are values that are important to take into account, such as there is optimal exposure of light and the buildings are well situated. Yet most of the values of the buildings are negative, there is little diversity, the ground floors are often of closed character and little connection is made with the public green space.

Positive value These values are of importance in the area and need to be considered while renovating	Opportunities presented for standard solutions	The presence of mediated spaces, 'wisselkamer'	Optimal sunlight exposures within homes	Buildings offer inspiration for redevelopment	
Neutral value These values are present in the area but have no positive or negative value	Adoption of different construction methods	Restrained building design, in colour, materialisation and form	Clear division between public and private	Appearance of the facade	
Negative value These principles have a negative value and need to be changed in order to revive the area	Architecturally and physically outdated housing stock	Little diversity in buildings and houses	Closed character on the ground floor	Collective spaces lack accessibilty from building block	Limited versatility at the construction scale

Positive value
Neutral value
Negative value

Figure 5.15: Values on the scale of the building
(Illustrated by author)

5.4 RESIDENTS

5.4.1 Background information

After the completion of the Western Garden Cities, residents from the city centre of Amsterdam were attracted to this area. They were seeking a new, modern way of living. In the post-war years, these neighbourhoods became the home of original residents, predominantly (young) family households. This initial population was relatively homogeneous, sharing a similar way of life and utilizing facilities and public spaces in the Western Garden Cities with a common orientation (Nio et al., 2008). There were differences in age and living situation, but the residents had the same way of living. The early days of the Western Garden Cities represented a pioneering period characterized by a sense of togetherness and optimism for the future (Hellinga, 2005)

The carefully planned neighbourhoods were envisioned to embody social equality, with maximum walking distances to playgrounds, recreational areas, and shopping zones, creating a strong community bond among the residents (Yegenoglu et al., 2008). In the 1950s and 1960s, the image of these garden cities reflected an idealized social scenario. Families, embracing the responsibilities for their environment, enjoyed the benefits of gradually improving living standards. Despite the scarcity of resources, the residents found contentment in their homes, which were gradually mechanized with household appliances like vacuum cleaners, refrigerators, and washing machines (Yegenoglu et al., 2008).

These pioneering days, looking to the future with optimism, is captured in images very beautifully. Helling (2005) captures the feeling: 'The people in their airy homes, peering out from the balcony on Lelylaan at people cycling, always in the sun with beautiful cloudy skies'. The homes were created by the standards of 'Goed Wonen' (Good living), the ideal interior as visible in figure 5.16 and 5.17. 'People in front of the window, gazing longingly inside'. At that time, everyone would have been happy with the home (Hellinga, 2005).

There are people who confirm this idyllic image of the Western Garden Cities. However, this image is also nuanced by some older residents who experienced the challenges of the early years in the Western Garden Cities. Some describe a barren sandy plain where sand seeped through windows, and heating homes against the cold was a significant struggle, often relying on coal stoves. Lack of amenities, especially schools in the beginning, added to the hardships faced by the early inhabitants (Hellinga, 2005).

Figure 5.16: Interior living room Slotermeer
(Stadsarchief Amsterdam, n.d.)

Figure 5.17: Interior living room Slotermeer
(Stadsarchief Amsterdam, 1954)

5.4 RESIDENTS

5.4.2 Social segregation

In the 1970s and 1980s, the post-war neighbourhoods did not fulfil the needs of the original residents. In this period, the original inhabitants, having outgrown their houses, looked for other emerging cities like Purmerend and Almere. This departure opened the door for a wave of migration that reshaped the social fabric of Amsterdam Nieuw-West (Mens, 2020). Antilleans, Surinamese, Moroccans, Turks, and other new city dwellers arrived and turned the neighbourhoods into outposts of multicultural society (figure 5.18). The post-war neighbourhoods, built on collective values, encountered difficulties in adapting to the rising individualism, diversity, and anonymity of the area (Agricola et al., 2013).

This arrival of diverse populations, presented both opportunities and challenges. The once homogeneous demographic landscape underwent substantial changes over the next two decades. The AUP, with its foundational values of collectivity, social equality, and neutrality, faced a growing tension with the evolving importance placed on privacy and identity (Nio et al., 2004). The heterogenization of the population created a complex dynamic within the Western Garden Cities. Social and cultural diversity increased, impacting the original vision of a cohesive urban community.

Public residential courtyards were in the 1960s and 1970s vibrant spaces, but after began to lose their original social significance. The changing social profile of residents led to altered patterns of usage for these common spaces (Yegenoglu et al., 2008). The green communal spaces around the building blocks now seemed to retain primarily visual green quality rather than serving as binding and mediating spaces.

Simultaneously, also the high rents meant that the population had become more heterogeneous than envisaged (Hellinga, 2005). On top of that, the way housing was allocated also contributed to a more heterogeneous society. The municipal housing service mostly financed the construction of social housing. Later, they were then sold on to the Amsterdam

Figure 5.18: Residents in Osdorp
(Stadsarchief Amsterdam, 2007)

5.4 RESIDENTS

federation of housing corporations, who distributed the houses via a fixed allocation key. This was done per individual project, so no homogeneous compartmentalised neighbourhoods, but all mixed together. In addition, half of the housing corporation houses were allocated directly through the Amsterdam Central Housing Office, where compartmentalisation played no role whatsoever, so anyone could live there, including people from 'outside' (Hellinga, 2005).

The decades following the establishment of the Western Garden Cities witnessed also a transformation in residents' relationships with facilities and the built environment. Increased mobility and prosperity allowed residents to explore facilities and recreational places beyond Amsterdam Nieuw-West (Nio et al., 2008). Small shops in the neighbourhood disappeared and other facilities gained specific significance for the new residents, especially Moroccans and Turks. This evolution marked the shrinking influence of the original residents from the 1980s onwards and the emergence of new worlds shaped by the growing number of newcomers and their own interpretations of public spaces (Nio et al., 2008).

Critics have suggested changing the neighbourhoods to match current values, but the difficulty lies in finding lasting solutions without tearing down and building new buildings, which might repeat the cycle of societal changes every few decades. The everyday life in the Western Garden Cities tells a story that connects the past, present challenges, and future hopes, showing how these neighbourhoods are continually evolving within the larger context of urban living.

5.4 RESIDENTS

5.4.3 Findings

The matrix below shows the values of the residents and community in Nieuw-West (figure 5.19). Residents in the Western Garden Cities have changed over time. As current Amsterdam residents outgrew their homes and looked for other suburban spots, space became available for people of Turkish, Surinamese or Moroccan descent. This changed the demographic profile of this district and caused the sense of community to decline. There is also a decline in the use of common public spaces and this has also led to less social safety on the streets. The area suffers from problems such as inequality, poverty and crime. There is plenty of reason to revitalise urban life and increase satisfactory scores. Only this would bring back the community feeling of how it used to be designed.

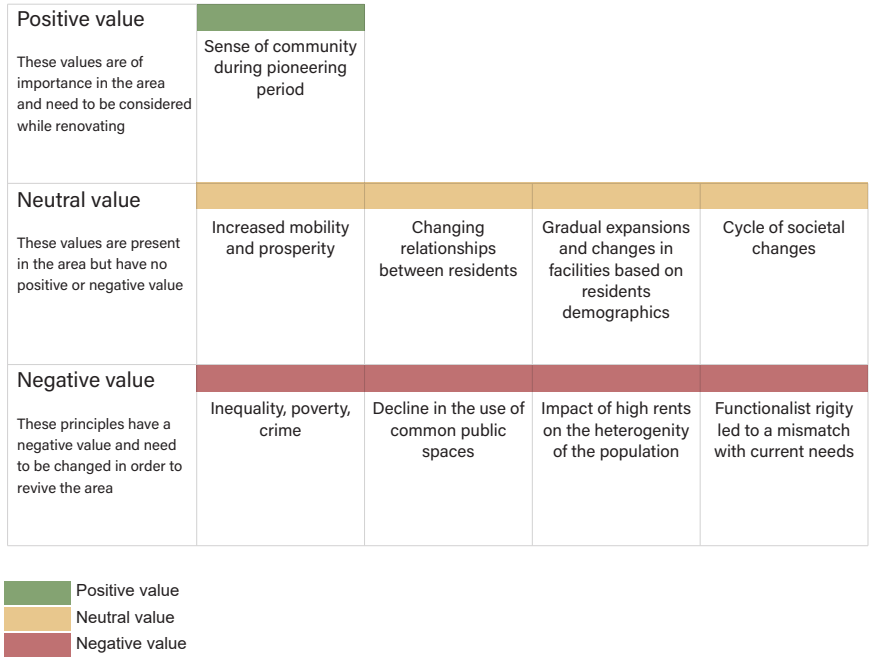


Figure 5.19: Values on the scale of the residents
(Illustrated by author)

5.5 CONCLUSION

In conclusion, the Western Garden Cities embody a set of values that are integral to their identity. As we dive into the aspects of this city district, it becomes evident that the principles are rooted in different scales, where the urban plan is the most elaborated one. When the AUP was made, there was not yet a clear picture about the buildings and the people who were going to live there, this only came later.

The urban plan of the Western Garden Cities, outlined in the AUP, is rooted in modernist ideals and the garden city movement. The AUP shapes the area's identity with a core structure of green, infrastructure and water. Influenced by concepts like the 'wijkgedachte' and 'light, air, and space,' the Western Garden City reflects ideas that continue to community and optimal access to light, air and space. The hierarchical structure creates a relationship between buildings and public spaces, emphasizing the significance of infrastructure and greenery. However, the strict spatial separation of functions poses challenges to safety and urbanity. Critics advocate for a more mixed-use approach, introducing functions that facilitate relaxation and recreation, emphasizing the importance of transitional spaces in achieving urbanity.

The buildings inside of this urban plan were rapidly constructed after the war, with the introduction of open building blocks. The porch flats dominate the housing stock and offer many opportunities. Challenges include architectural and physical shortcomings. The current housing stock is perceived as outdated, opportunities lie in leveraging the recognizable building systems and the valuable principles for standardized solutions. Renovation considerations include addressing closed ground floors, enhancing accessibility to collective spaces, optimizing houses and adding dwellings to optimise space utilization.

The demographics in the Western Garden Cities underwent a transformation in residents. Initially, attracting homogeneous, predominantly young family households, the neighbourhoods represented a period marked by a sense of community and optimism. The departure of original inhabitants in the 1970s and 1980s made place for new residents. The more heterogeneous population impacted the vision of cohesive urban community and common spaces lost their original significance.

The story of the urban life in the Western Garden Cities reflects a continual evolution within the broader context of the urban plan. The changing needs are the most important part of adjusting the current state of the area and its buildings. While considering and preserving the positive principles, visible in figure 5.20, it is possible to come with subtle solutions. The potential interventions that support the principles are outlined in the diagram on the next page. They are divided into preservation methods and intervention strategies. They emerged from an extensive literature review using various sources and opinions of critics. From this flowed this matrix that builds on the revival of Western Garden Cities and provides options for renewal in the current timeframe. The heritage and hereby the vision of the area contributed to a list of small interventions that can be added to porch flats in the Western Garden Cities. The matrix indicates first the current situation as it is now, followed by the original idea behind it or, if it has a positive value, how it can be preserved. This is followed by the intervention strategies and improvements. This diagram will later be linked to adaptability in renovations so that these interventions contribute to future-proof porch flats and neighbourhood by applying these improvements to multiple flats and their surroundings.

5.5 CONCLUSION

	CURRENT SITUATION	INITIAL VISION	POSSIBLE INTERVENTION
URBAN PLAN	'Wijkgedachte' has disappeared.	Heterogeneous population into a whole through the hierarchical structure of functions.	Create more space for communal areas in the buildings.
	Sheltered green spaces have remained unappropriated, the greenery is uniform. People don't feel attached.	Landscape architects tried to make gradual transitions between public spaces to more pricte areas for families.	The sheltered spaces are still not sheltered enough and a connection needs to be made from the building to the green.
	Public functions are centered and a lot of the initial functions disappeared. Lack of social control.	Centered functions creates seperation in the area.	Introducing functions within the residential areas that facilitate relaxation and recreation to enhance safety and vitality.
	The urban plan has a sober character with little diversity.	Built as fast as possible and seperate residential buildings from shopping areas.	Apply a strategy with a diverse range of interventions. For example different facades or different function of green space.
BUILDINGS	Poor quality of the buildings, architecturally and physically outdated.	Create buildings according to the 'Goed Wonen' principle with seperation of rooms and a balanced size.	Upgrade the building appearance and the floorplans by creating holes in the construction and enlargening dwellings.
	Ground floors are made out of storage spaces, closed character is perceived as unpleasant en uninviting.	The CIAM did not envision this, but the notion of raising dwellings above the ground floor resulted in this.	Make ground bounded dwellings and reserve space on this floor for communal functions.
	Little diversity in dwellings. Mostly 4-5 room dwellings.	Creating almost only single family homes for a homogeneous neighbourhood.	Create diversity by adding building mass and merge or split dwellings.
	The buildings have a sober appearance.	Built in a very fast and efficient way, all the buildings are somewhat the same.	Create visual effects by changing the facades and adding small buildings with a different character.
	Little versatility at the construction scale of the buildings.	The functionalist buildings were made to only accommodate families, there was no intent of changes.	Holes can be made in the concrete construction in order to connect functional spaces.
RESIDENTS	Change in social profile of residents led to altered patterns of usage for common spaces.	Homogeneous community of people that came from the city centre to the outskirts of Amsterdam after te war.	Make more space for communal areas and densify in order to optimize space utilization.
	Sense of community during the pioneering period is not present anymore. Individuality has given way to this.	Community was a key principle when the Western Garden City was based on.	Improvements in the building block, create larger transportation zones and more community based functions.
	Mismach with the current needs. Houses are not capable of changes.	Houses were created with a functionalist rigity.	Create floorplans that can adjust to varying future needs.

	CURRENT SITUATION	PRESERVATION METHOD	IMPROVEMENT
URBAN PLAN	Light, air and space is an important aspect. There is optimal access to this and greenery.	Preserve the openess of the combination of green and buildings.	This openess is not necessary for the green spaces around the buildings.
	Hierarchical system. Relation between green, infrastructure and functions.	Not interfere with the geometric design, ensure that people can still choose their way to work or school.	Improve urbanity by mixing functions. More intermediate spaces and not focus only on residential buildings.
	Urban plan has open building blocks and open spaces.	The open appearance needs to be preserved.	Addition of volume to also create semi-open blocks, this will renew collective spaces and create differentiation.
BUILDINGS	Perfect orientation of the building.	Preserving the north-south orientation, bedrooms and kitchens on the east side. Living room on the west side.	Create more space for the living room, give this living area the hole width of the building.
	The courtyards around the building form an important aspect in the transition of spaces.	The courtyards needs to be preserved to make the living place more attractive, as there is outdoor space for the residents.	Create differentiation in the design and use of these courtyards and give them their own character.
	Porch flats are created with standard construction methods.	These buildings need to be preserved, as they present opportunities for standard solutions.	Buildings can be upgraded with innovative interventions.
	Some porch flats contain the 'wisselkamer', where this room can be appointed to a dwelling.	This room makes the house capable of minimal changes in size.	This principle can be applied to other porch flats and can create a form of adaptability.

Figure 5.20: Interventions and improvements for porch flats in Amsterdam Nieuw-West
(Illustrated by author)

06 BUILDING ADAPTABLE

This chapter explores the use of building with adaptability. The previous chapter discussed the principles of the Western Garden Cities, the conclusion that followed was that there are qualities in the neighbourhood, but also lost visions of the past and potentials to improve. The qualities should be preserved and the negative aspects of the neighbourhood improved. This can be done through transformation in the built environment. Transformation is an important topic nowadays, as the existing environment is used, thus reducing pollution. As discussed, adaptive building is very important, addressing changes in the future and allowing residents to make their own adjustments as they wish. This chapter first gives an overview on the need for adaptability, its history and how it was used in post-war mass housing. After this, it explores the transformation possibilities of porch flats in Nieuw-West. Since the conclusion of the previous chapter cited points for improvement, it should also look at whether this is possible. Following this, reference projects are analysed. These reference projects each have some form of adaptability in the renovation process and provide a good overview to see what aspects can be used in the porch flats of the Western Garden Cities.

6.1 LITERATURE REVIEW

6.1.1 The need for adaptability

The Western Garden Cities have a uniform character. By not tackling and planning neighbourhood renewal on a large scale, diversity arises naturally (Yegenoglu et al., 2008). A solution must be found in which efficient and circular transformations can be achieved, creating urbanity and regaining liveliness. An overarching approach for the neighbourhood is a good strategy to solve the housing shortage and quickly find solutions for the poor quality of the Western Garden Cities. This approach will then have to involve different aspects to create a diverse image, such as adding different public or communal functions. The approach can be implemented in different phases. Since the human image changes with time, the neighbourhood will also have to constantly change.

Building adaptable is a perfect intervention for the changing human image (Yegenoglu et al., 2008). It is a sustainable solution to adapt with the needs per time period and thus future-proof the housing stock and further functions. Adaptable buildings will address future changes in the built environment in a sustainable matter (Menawa et al., 2016). It suggests the ability to adapt to evolving contextual demands or dynamics while ensuring the continued functionality of buildings (Hamida et al., 2022). Durability and design for disassembly are closely related to adaptability, contributing to enhance long-term performance. It embodies spatial, structural, and service strategies which allow the level of malleability in response to changing parameters (Schmidt et al., 2010).

Renovations to a building only last for a certain period of time. Every 25-30 years, houses may necessitate either full or partial renovations to align with contemporary requirements (Brinksma, 2017). The way buildings are designed in the past, can sometimes thwart future-proof renovations. Brinksma (2017) states that a renovation should not only contribute to improving the market position and sustainability for the next generation of users, but also not hinder and preferably increase opportunities for future adjustments.

At the moment, the post-war porch flats are seen as obsolete, both from a market and living perspective. It is not conceivable that all porch flats will eventually be demolished, but neither will they all be transformed. The trick will be to select good and promising ones for transformation (Vlaenderen, 2011). These can then be transformed according to a future-proof concept where the heritage principles of the area and adaptability is taken into account.

6.1.2 History of building adaptable

Adaptability in buildings knows a long history. Whereas now it is considered with technical and material innovations, the origin of adaptable buildings involve neither factory nor mass-produced materials (Marquit, 2013).

The origin can be traced back over 400,000 years when nomadic peoples were mostly on the move searching for new habitants, this involved short stays in one place. They made shelters or huts out of tree trunks, branches, twigs, leaves, animal furs and skins (Staib et al., 2008). These collected materials could quickly and easily be assembled, dismantled and taken with them. The requirements were that the materials are lightweight, easy to handle and not consist of too many individual pieces. This early pursuit of portability and adaptability laid the groundwork for unitized nomadic dwellings, representing an early form system building.

Later, around 3500 B.C., bricks were introduced. Mesopotamians and Egyptians used wooden forms to mould flat, rectangular blocks, and marked the beginning of mass production, where builders efficiently created entire cities and monuments with

6.1 LITERATURE REVIEW

these bricks (Staib et al., 2008). The Greeks and Romans later achieved precision in stone construction by using clamps, pins, and carefully planned designs. At the same time, timber construction advanced from simple post structures to more complex frames. In the 1860s, this type of construction addressed the need for easily transportable housing in the North American prairies. After this, during the industrial revolution, there was a significant shift to using iron as a construction material. Cast iron, wrought iron, and steel became crucial for architectural innovation. James Bogardus's 1848 building in New York was a breakthrough, entirely constructed from prefabricated cast iron elements, demonstrating the transformative potential of system building during this industrial time period. In parallel, the construction of glasshouses, like Joseph Paxton's Crystal Palace at the 1851 World Exhibition, showcased collaboration between architects and engineers. This glass marvel not only demonstrated the potential of industrialized building but also initiated discussions on structural clarity, spacious designs, and collaborative possibilities in the construction industry.

Looking at this historical journey of adaptability in buildings, it is clear that it is closely tied to societal changing societal needs, technological progress and the creativity of architects and builders throughout history. The transition from simple nomadic dwellings to impressive structures in the 19th century reflects an enduring pursuit of efficient, adaptable and scalable solutions in architecture.

6.1.3 Post-war mass housing

The developments described above continued with mass housing. Mass housing began in 1854 with the development of high-grade steel and its application in construction. This was followed by the development of reinforced concrete and by 1900, concrete structures were already being used in Europe (Brinksma, 2017). After World War II, there was a shortage of building materials and a severe housing shortage. This resulted in experimentations with new construction methods where they used material and labour-saving measures in housing construction (Staib et al., 2008). This led to prefabrication and standardisation. This made it easier to quickly produce houses in high numbers in the reconstruction period. Non-traditional housing construction experienced tremendous growth during this period.

This way of building saved a lot of labour, but also received critical acclaim. For instance, Habraken (1961, p7) says in Brinksma (2017) that mass housing makes the house an object of use and the occupant merely a user. The resident has little influence on how to live there, unlike other housing that can be modified in many ways by residents. Changes include new ceiling construction, extensions to the house or relocations of doors or windows. In this, some homes are more suitable than mass housing.

The majority of porch flats consist of two bays, one with the entrance door, the central hall – with the children's bedrooms on one side and the bathroom and kitchen on the other, and one bay with the living room and master bedroom. This strict composition makes changes by the residents difficult. Future residents and changing patterns have not been taken into account. Habraken's critique can be summarised as a criticism of the progressive building techniques of the time that ignored the wishes of residents.

Habraken states that mass housing must satisfy the following three conditions:

(1) Free composition; which means that as little as possible is determined in advance what kind of families will move into the housing and in what order of arrangement they will do so

(2) The resident's environment can

6.1 LITERATURE REVIEW

continue to renew itself; meaning that residents can adapt their living environment to their own wishes

(3) Time; which is about fuelling a community. This can be done, but not rushed. It takes time, perhaps more than a generation, for society to form into a unity with its environment and in turn bring that environment in line with the people.

6.2 TRANSFORMATION POSSIBILITIES

6.2.1 Assessment framework

To further elaborate this research, there will be looked into two research cases. These buildings are located in Amsterdam Nieuw-West, have a different construction typology and differ in their parcel form. This investigation forms an important part of assessing the adaptable building systems in the next subchapter, as we first need to see how transformable the porch flats in the Western Garden Cities really are.

The outcome of the previous chapter already provided positive values of the urban plan and the buildings that need to be considered while renovating this area and are useful when assessing which strategies with adaptability are suitable. From this part of the research, the list of assessment criteria for different aspects will be expanded, and, thus, linked to real cases.

The assessment framework for assessing the transformation possibilities of the two research cases in Nieuw-West is based on the book of Yegenoglu et al. (2008). This book offers a clear method where they also assess similar building types. They use the theory of Ir. B.A.J. Leupen from his doctoral thesis 'Framework and Generic Space.' In his research, he questions the changeability of the permanent. He looks at the challenge of creating buildings that are meant to endure for a century while acknowledging that people's habits change dramatically during this period. This challenge led him to explore how permanent elements of a building can transform in order to keep up with changing needs.

Leupen uses this contradiction as the starting point of his research. 'The permanent, that part of the house that lasts for a long time, forms the framework within which change can take place. The framework defines the space for change. The framework is specific and therefore includes that which defines the architecture for a long time. The space within the framework is general, indeterminate in use, this space I have called generic space. The term framework was inspired by the book 'Earth Moves' by French architect and philosopher Cache' (Leupen, 2006). Thus, the framework defines the permanent, but also the transformable. The architectural elements that should be sought out are the building's structural layers: the load-bearing structure, the interior, the shafts and the access. In order to assess these four aspects, Leupen links it to polyvalence, renovation and expansion. According to Leupen, polyvalence means that a change of function can take place without changing any of the layers. This indicates the flexibility of the building.

Leupen limits himself, according to Yegenoglu et al. (2008), to the level of the building. This framework can also be applied to a higher level. It is necessary to include the surroundings of the building to have more guidance for grounded statements. Yegenoglu et al. (2008) add the following aspects to the framework: the parcel form, the infrastructure and the outdoor space.

The assumed rigidity of the Western Garden Cities regarding transformation can be assessed by using Leupen's approach and the extension of his approach from Yegenoglu et al. (2008).

6.2 TRANSFORMATION POSSIBILITIES

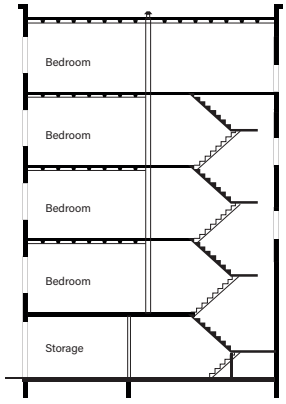
6.2.2 Johan Jongkindstraat

The first research case is on the porch flats situated in Johan Jongkindstraat within the Overtoomse Veld neighbourhood (figure 6.1). This building was built in 1959 and designed by architects Johannes Fake Berghoef and Hein Klarenbeek, the founders of architecture firm Berghoef & Klarenbeek, where they collaborated on architectural projects as part of the reconstruction of the Netherlands between 1949 and 1962 (Amsterdam Cultuur-Historische Vereniging, n.d.). The building has five floors, with the ground floor consisting of storage and the porch entrance. This flat consists of 28 dwellings of 60 square metres and 8 dwellings of 30 square metres. The entire project consists of six identical residential buildings, with 5 smaller buildings with public functions and a number of small dwellings. For this study, only the residential building, the porch flat, will be considered. This flat was built according to the airey building system. This involves the use of prefabricated concrete blocks and a concrete floor that is easy to install. The building could thus be assembled quickly.

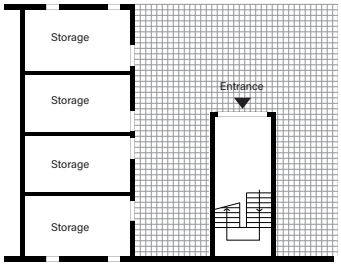
Johan Jongkindstraat

Area:	Overtoomse veld
Typology:	Porch flat
Levels:	5
Construction:	Airey
Parcel form:	Strips
Building year:	1959
Architect:	Berghoef & Klarenbeek

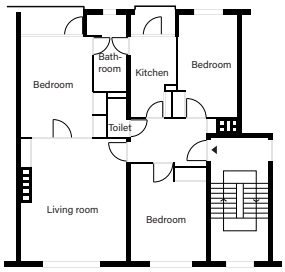
Section



Ground Floor



Dwelling type A



Dwelling type B

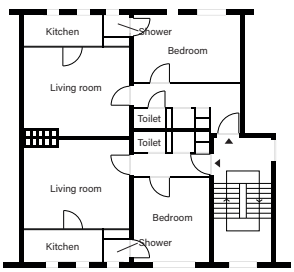


Figure 6.1: Background data Johan Jongkindstraat

6.2 TRANSFORMATION POSSIBILITIES

Load-bearing structure
The main supporting structure consists of long slabs, each 4.37m apart. Due to the stairwell, the distribution there is slightly different, namely 4.37 - 3.11 - 2.35m. This division has consequences for the polyvalence of the building, a space of 3.11 or 2.35m width is not suitable for every function. However, additional passages can be created in the construction when the house is transformed, the weight must then be absorbed by means of a lintel. The building system used is called airey, with much use of precast concrete. The roof is flat and offers an opportunity for expansion.

Skin
The skin poses little hindrance when the houses are transformed as the front and rear façades are non-bearing. In case of renovation, the adaptation of the skin should be carefully considered, as this is a property with a building system of value for post-war construction. The façade with typical features probably cannot be lost.

Interior
The interior walls in this building are again made of drift stone. How they are arranged now, it forms a hindrance in the polyvalence of the space. However, this light stone type can be removed relatively easily, allowing functions to be rearranged.

Shafts
Generally, serving elements are a barrier to transformation. This is also the case here because the pipes are only present in a limited number of places. This building layer is limiting the polyvalence of the space. Renovation and expansion is quite possible, but the location of the shafts must be carefully considered. It is most optimal to keep the shafts in the same place.

Access
Access to these buildings is tied to the position of the porch. For the polyvalence of the space, the stairwell forms an obstacle as it gives only access to dwellings. For renovation or expansion, it is possible to adapt this in transformation. One option could be to turn them into galleries and close the stairwells to create more space.

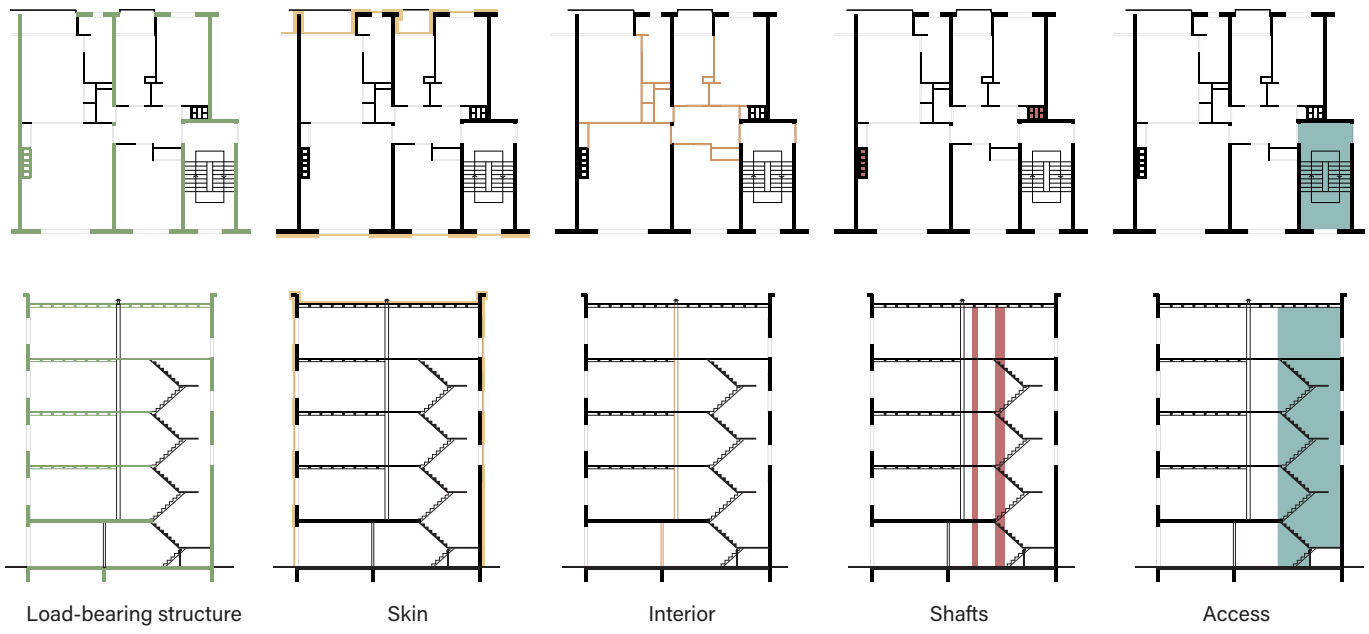


Figure 6.2: Building elements Johan Jongkindstraat
(Illustrated by author)

6.2 TRANSFORMATION POSSIBILITIES

Parcel form
The residential building blocks are in a strip allotment, the smaller buildings on the north side with office, storage and dwelling function create a sort of hooked shape. The functions in between the buildings could change easily without changing the parcel form. The parcel form offers no big issue in renovating. Also, the area south from the buildings has a lot of leftover space when expanding the parcel form.

Infrastructure
The buildings are surrounded by roads on the north and south side. The road on the north side offers an easy access to the buildings. This road has dead-end streets with parking spaces in front of the entrances of the buildings, these are determined by the building shape. The busy road, Lelylaan, doesn't offer easy access to the buildings. The train station is nearby and on walking distance. Besides that, there are bike lanes that surround the buildings, that makes it easily accessible by bike. It is possible to change the dead-end roads when changing the building form, but the other roads aren't changeable.

Outdoor space
The courtyards are surrounded by the buildings. In front of the entrances, there is the street with parking spots. This fact makes that the greenery is only used when people go their own purpose. The green is poorly used and can be seen more as 'kijkgroen', which means green where people only look at. The outdoor space can really use an upgrade when transforming the parcel form or functions of the ground floor.

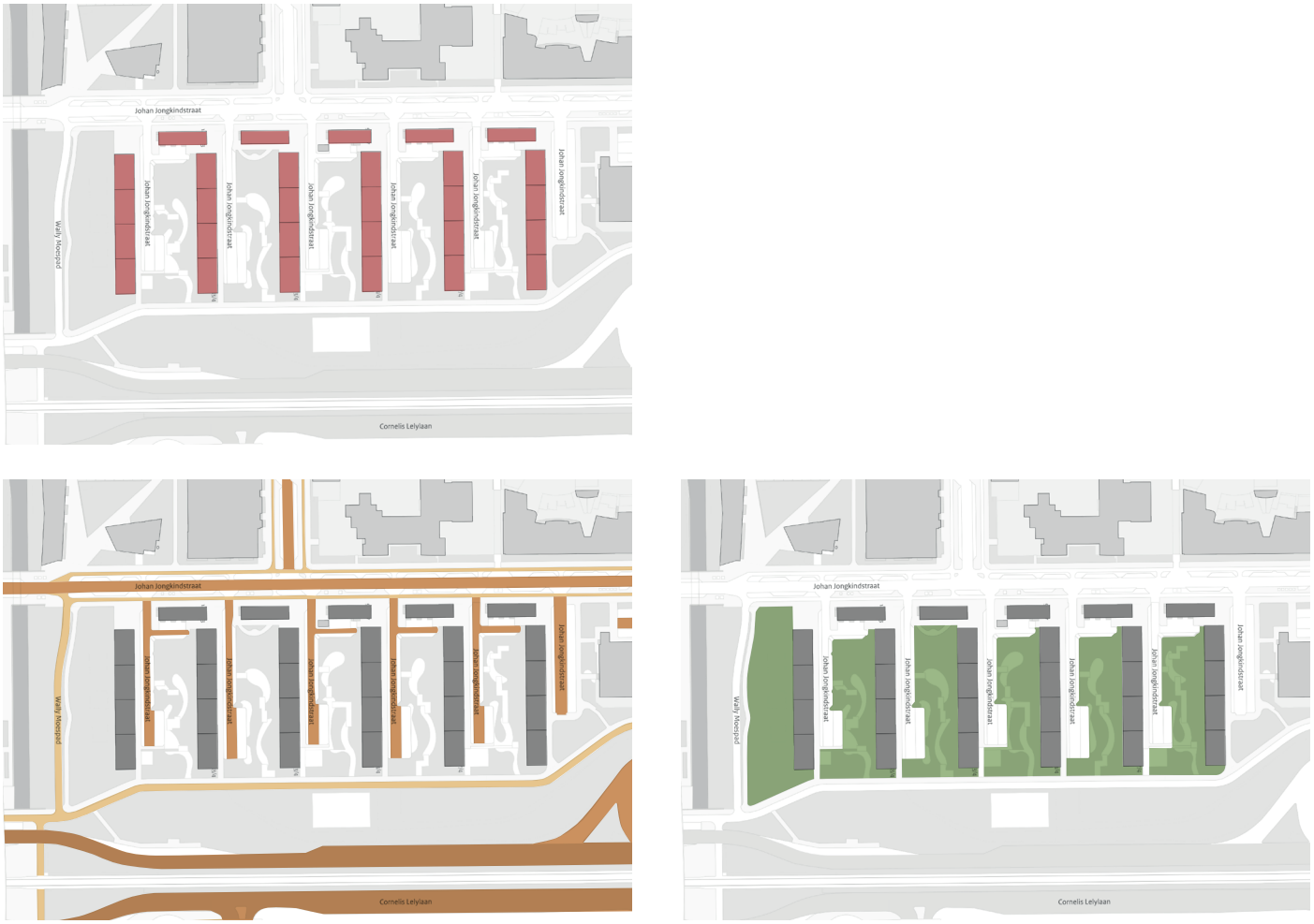


Figure 6.3: Surrounding elements Johan Jongkindstraat
(Illustrated by author)

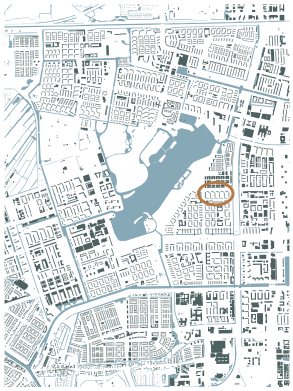
6.2 TRANSFORMATION POSSIBILITIES

6.2.3 Isaak Gosseshof

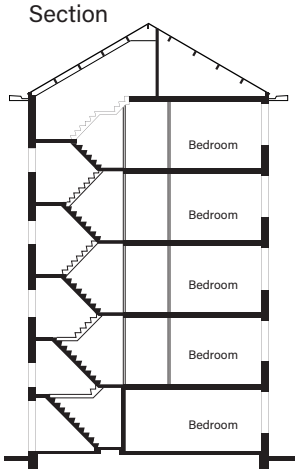
The second research case is on the porch flats situated in Isaak Gosseshof within the Slotervaart neighbourhood (figure 6.5). Built in 1957, this building was designed by architect B. Bijvoet. These porch flats consist of 5 storeys, with the ground floor used partly for living, and partly for storage rooms and the porch entrance. The plot shape is hooked, and the overall project consists of 5 identical buildings. The flats vary slightly in area, for example, those with two more bedrooms on the ground floor are 78 square metres. The homes on the other floors vary between 50 and 60 square metres, with one having an extra bedroom due to the principle of the 'wisselkamer'.

Isaak Gosseshof

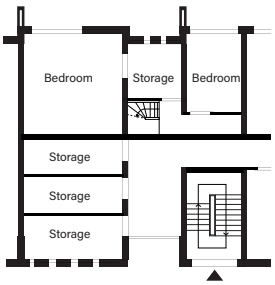
Area:	Slotervaart
Typology:	Porch flat
Levels:	5
Construction:	Concrete + timber
Parcel form:	Hooked
Building year:	
Architect:	



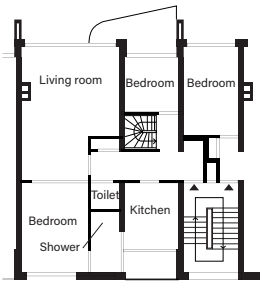
Section



Ground Floor



First floor



Second, third, fourth floor

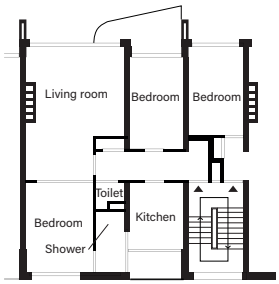


Figure 6.4: Background data Isaak Gosseshof

6.2 TRANSFORMATION POSSIBILITIES

Load-bearing structure
As on Johan Jongkindstraat, the main load-bearing structure consists of long disks, hereby spaced 3.95 - 2.32 - 2.30 meters apart. Whereby the large bay is intended for living and sleeping, and the smaller bays for a small bedroom, a kitchen and the stairwell. The supporting structure of the non-residential separating wall may hamper the flexibility of the houses as the dimensions remain fixed. However, it is possible to create holes in the existing structure by means of a lintel and join dwellings together.

Skin
The skin poses little obstacle when the houses are transformed. There are plenty of windows so plenty of daylight can enter the house. The front and rear façades are non-bearing and can therefore be modified without much effort. It offers no limits for the polyvalence, renovation or expansion of the building.

Interior
As in the previous porch flat, the inner walls consist of a light brick, but this building does not define what kind of brick it is. The polyvalence is limited as it is now, but the internal walls can be easily removed to rearrange functions. This layer does not hinder expansion or renovation.

Shafts
The shafts are located in two places in the house. As with Johan Jongkindstraat, it is beneficial to take into account their current placement. This layer limits the polyvalence of the spaces, but there are opportunities to rearrange the shafts while renovating of expanding the building.

Access
Access is tied to the position of the porch. In renovation or expansion, like on Johan Jongkindstraat, a gallery can be made and the stairwell closed. This creates more communal space for residents and more space for housing.

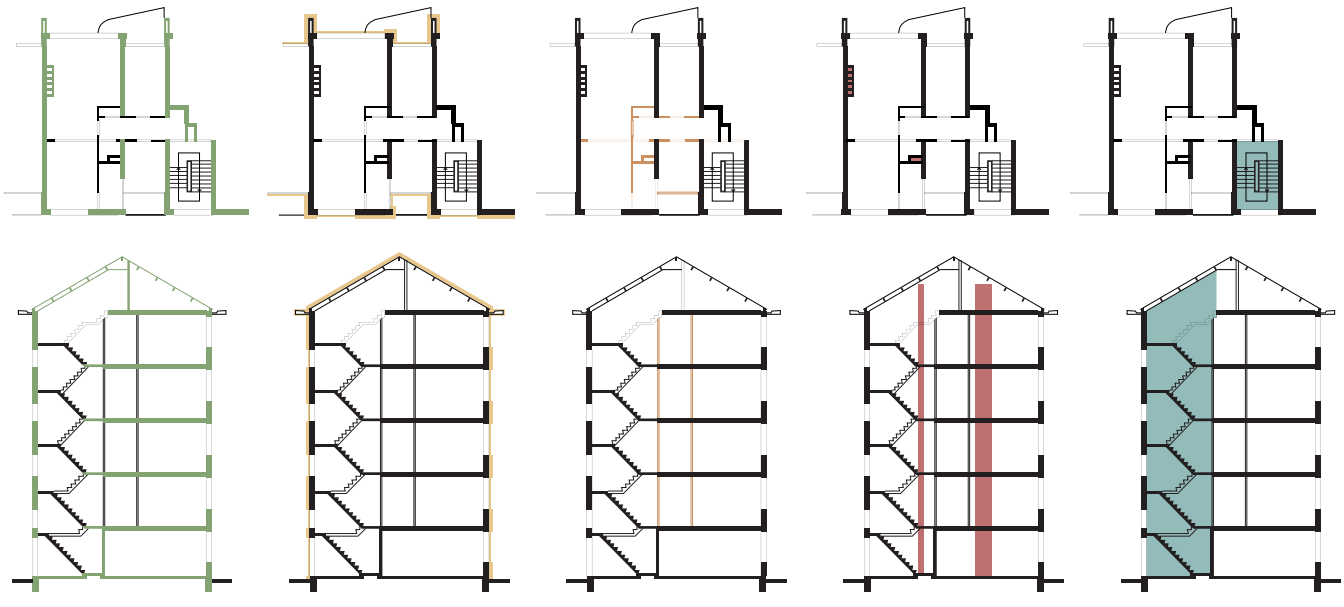


Figure 6.5: Building elements Isaak Gosseshof
(Illustrated by author)

6.2 TRANSFORMATION POSSIBILITIES

Parcel form
The building blocks are placed in a hooked allotment. The entrances are facing towards the street with parking spots. When looking at polyvalence, there are not many limits. The building can be transformed from the inside without changing the parcel form. For expansion and renovation, changing the parcel form is not very difficult, since there is enough space surrounding the buildings for expansion.

Infrastructure
The building blocks are accessed by roads; the roads with parking spaces next to the building entrances are determined by the building shape. These roads will be an obstacle in case of building expansion, new solutions for parking would be required.

Outdoor space
The green space is surrounded by the building blocks; the volumes create a hook, defining the courtyards. On the inside of this hook are private gardens with large hedges and fences. This means there is little connection to the building from the public green space and the green space is little used. The gardens, as they are now, will hamper polyvalence and expansion of the building.

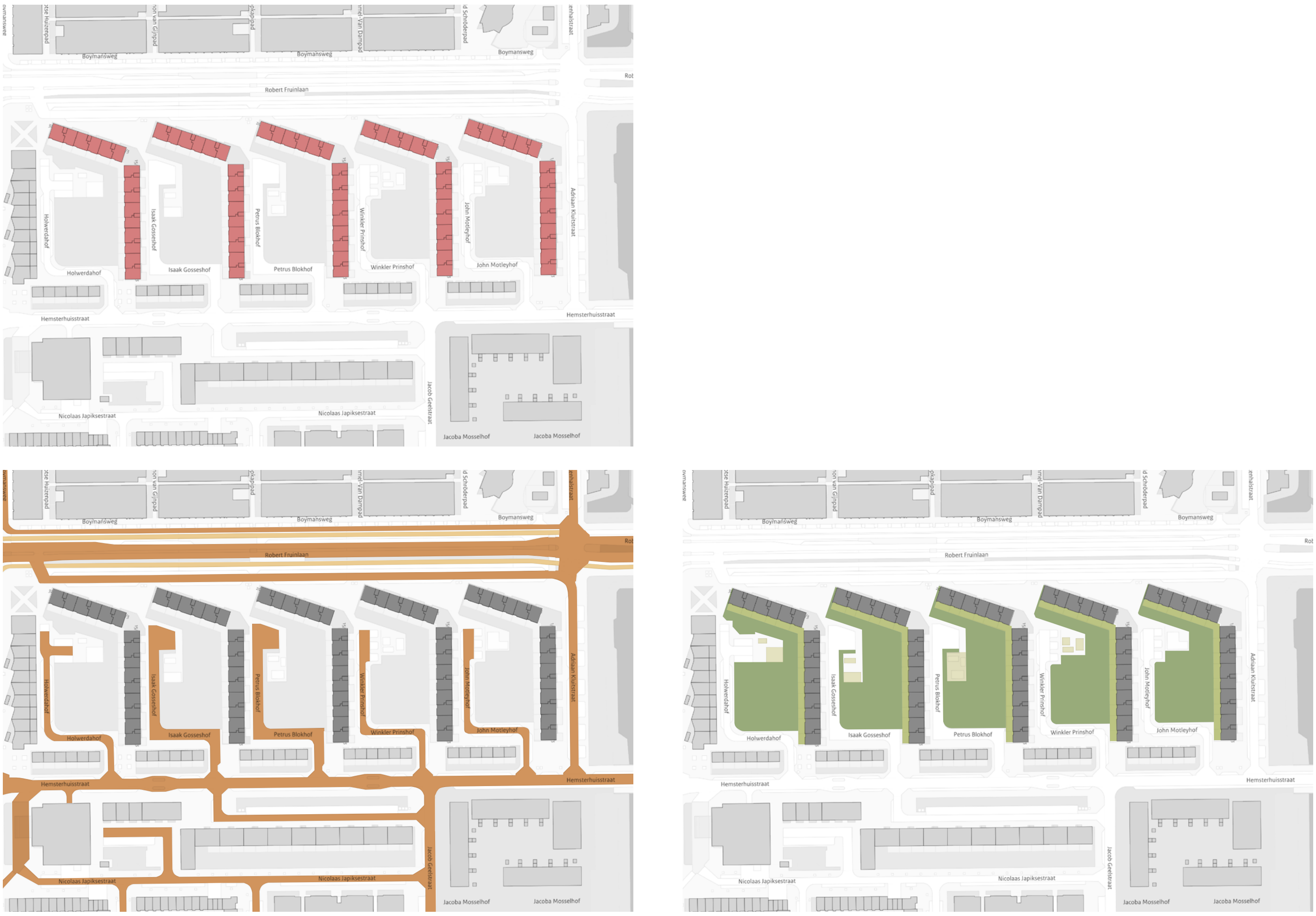


Figure 6.6: Surrounding elements Isaak Gosseshof
(Illustrated by author)

6.2 TRANSFORMATION POSSIBILITIES

6.2.4 Findings

To show the results the study into the transformation possibilities of these two post-war porch flats in new-west, diagrams have been made. These diagrams form the conclusion of the degree of transformability of the buildings. This was determined using Leupen's theory and the additional aspects about the environment by Yegenoglu et al, (2008). The aspects of the framework are plotted in a matrix and the colour code indicates the degree of obstacles in transformation. The book contains six analyses of buildings, including porch flats, which were used to compare with these two research cases. From this, and the research above, the conclusions are based. As can be seen in figure 6.7, the two research cases are similar in quite many aspects. Although they differ in construction type, ground floor function, subdivision shape and size of dwellings, it can be concluded that the porch flats have many similarities. Both are capable of transformation at the level of renovation and expansion.

However, there are a number of obstacles that stand in the way of transformation. For instance, the infrastructure, with parking spaces, is an obstacle to expansion. Other solutions should be found for this, such as adding an extra residential floor on top of the existing buildings or expanding in the green areas around the buildings. In addition, the current interior of both porch flats is also an obstacle when housing other functions. When renovating or expanding, these walls can easily be removed as it is not part of the main load-bearing structure.

For the porch flats from each time period, it is stated that the main load-bearing structure is the determining layer (Yegenoglu et al., 2008). Transformation possibilities mainly involve merging dwellings and expanding the building. Each functional dwelling in the flat consists of two bays. This allows for the merging of a residence with half a residence or multiples thereof. This provides more differentiation in the flat, and the size and dimensions of the residence can be tailored to current demand. Additionally, it is important to introduce more diversity on the ground floor. When more small offices or other public services are present in the building, a more urban layout will be necessary. Differentiation contributes to making this post-war urban expansion more urban.

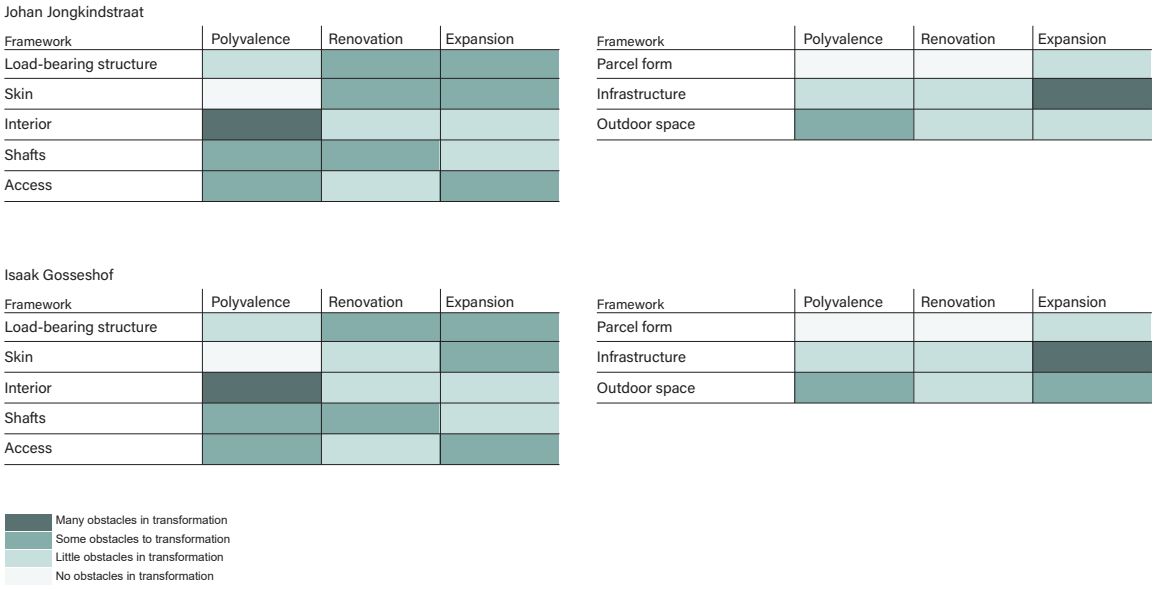


Figure 6.7: Transformation potential of Nieuw-West porch flats
(Illustrated by author)

6.3 REFERENCE PROJECTS

6.3.1 Assessment framework

To test which transformations are suitable for transforming post-war porch flats, the assessment framework from Henk Brinksma's thesis (2017) was used. The thesis, entitled 'future-proof renovation', deals with the renovation task of housing. Houses are renovated several times during their lifetime, each time this is a new task. Often, transformations are labour-intensive and a lot has to be done on site, resulting in solutions that require the house to be adapted again at short notice to meet changing requirements. The thesis argues that transformations should take place that do not hinder changes in the future. This means adaptable building and thus using materials that can be easily removed and reused, making it easy for the occupant to arrange the home in different ways and being able to return to the previous state of the building.

The assessment aspects are shown in figure 6.8, these aspects contain a brief explanation and can be used to test reference projects for their building system and suitability for transformation into porch flats.

Brinksma does the analysis on renovation concepts from different companies, such as Dura Vermeer's 'Zero on the Meter', a prefabricated bathroom or toilet from Faay or a façade renovation from the Nederlandse Bouw Unie. This uses different colours for each assessment section, resulting in a diagram showing the score positive, neutral or negative.

For this study, nine reference projects are looked at where transformations have been done in an adaptable way. These are tested against the 13 criteria and the available information is added to a matrix.

ASSESSMENT ELEMENT	DESCRIPTION
Series of one	With the series of one, any home can be improved at any time This could be in a renovation cycle, in the event of a mutation, changing regulations or at the resident's own request. These are demand-driven adjustments.
Prefabrication	The adaptation is feasible such that indoor activities take place for a maximum of one working day.
Execution technique	The connections and joints are capable of undergoing permanent physical changes in the service of usage flexibility. The mounting space required for this must always be accessible.
Lifespan	The technical lifespan of the various newly added components is coordinated with each other.
Reversibility	Components to be replaced can be removed and reused.
Resident participation	Residents can participate in the renovation of their homes.
Production	Production of exceptional or specific parts can take place near of the renovation site.
Demolition	No one-off demolition work on the current home is required to connect new element clusters or elements to the existing structure.
Responding to market dynamics	The renovation has helped ensure that house splitting is possible and can be undone again. Amalgamations should be made and again can be undone.
Responding to household dynamics	The renovation contributes to the fact that floor plan changes within homes can be made and undone. Think of built-in concepts with flexible walls and other layouts of the house itself. Lifetime-proof is building homes in such a way that people can live in them for several years of their lives.
Suitable for installation changes	The renovation concept allows installation changes and adaptations during and after the renovation.
Prepared for climatic changes	The renovation concept can accommodate the expected large quantities of rainwater, new plants and animals and an increase in the outside temperature.
Maintenance	The structure of the renovation concept should make it possible to easy maintenance and cleaning.

Figure 6.8: Assessment framework reference projects
(Illustrated by author, based on Brinksma, 2017)

6.3 REFERENCE PROJECTS

6.3.2 Analysis

The reference projects tested against the assessment framework are described below. For each aspect, for which there is information, a description is given in the assessment framework of what is interesting for the transformation of post-war porch flats in Amsterdam Nieuw-West where adaptivity plays an important role. The nine reference projects all have some form of adaptability and transformation. The adaptability can be found in the building materials, using prefabricated parts for example, but it can also be in how the floor plans are laid out, where residents can make their own layout according to their own wishes. As there are few projects and knowledge to date where renovation and adaptivity go together, the projects include different aspects. These innovative interventions can be brought together into a system that can be applied in the transformation of porch flats.

De Swollenaer, Zwolle

This former office building is under construction and will be completed in 2024. It will house 88 sustainable flats for social rent. It is part of an area development in Zwolle. It uses Plegt-Vos' Smart House Factory, which makes prefabricated components for new buildings and renovations (Plegt-Vos, 2023). This enables fast, sustainable and affordable construction. The flats will attract a mixed resident group.

Wiltonflats, Schiedam

This project consists of 3 flats with 39 flats each (Zijdekwartier, 2023). It was built in 1959 with an additional residential floor in 1996. The buildings were made senior-friendly in the renovation, alongside which functionality and sustainability were addressed. A lot of attention is paid to adjusting the liveability. Everything in between the flats is of great importance, pleasant routes have been created, space has been made for encounters, the main entrances have been moved to the quiet side of the buildings and the buildings are more involved with the greenery. The entrance halls have been made more spacious to allow for a 'drempelzone'. The galleries have also been widened for social contact and the façade has a more friendly appearance.

6.3 REFERENCE PROJECTS

Wallisblok, Rotterdam

This residential building was pre-war and in poor condition (Hulshof Architecten, 2012). The municipality was looking for a solution to refurbish and boost it. It is a perfect location for collective commissioning. This approach gave many opportunities financially. The building was completely tackled and stripped down to the structure. The living area was expanded and individual façade layouts could be made. Residents could choose what to do with their homes.

Porch flat, Alphen aan den Rijn

This flat has 11 porches and 66 apartments. The current apartments are small and there is limited outdoor space with small balconies and loggias (Vlaenderen, 2011). This project suggests improvement by making more differentiation by merging homes. The target group consists of a diverse group. Balconies and the living rooms are enlarged, the kitchen is connected to the living room, voids are added for connection and additional shafts are attached to allow changes in the floor plan.

Smartlofts, Amsterdam

This former municipal district office was transformed into an open-plan residential building with 36 dwellings and various shared spaces (Space&Matter, 2016). The future residents were an important part of this transformation. They helped determine the size, layout and location of their apartment. The flats have an efficient layout with minimal space for circulation and no division of functions. The residents can decide for themselves how to arrange their flat.

Inside-out, Utrecht

This project concerns a high-rise apartment building. It is Europe's first energy-producing high-rise apartment building (Inside-Out, 2021). The innovative Inside-Out renovation system integrates installation components such as heating, ventilation and energy generation into a multifunctional panel. This is places on the outside of the apartments. It is a modular system that enables sustainability, easy installation and reuse (Weijer, 2021). Renovation inconvenience is reduced and people do not have to leave their homes during renovation.

6.3 REFERENCE PROJECTS

Heiligharn, Den Helder

This apartment building has undergone a façade renovation and a rooftop addition of five penthouses (Triple Solar, 2023). The building contains 237 rental flats and despite its poor condition, renovations were carried out. The residential additions are made of lightweight construction with aerated concrete and a steel structure. The choice of aerated concrete came not only because of its light weight, but also because of its building physics properties where it has heat-accumulating, sound-insulating and fire-resistant (Weijer, 2022c). This structure is adaptive and can later be taken apart and reused.

Solar Decathlon

This design considers an integrated approach to transforming porch flats into gallery flats (BNA, 2022). They want to create more social cohesion, increase the living space by using the space released from the porches and thus create additional housing. They also added an elevator to make it more accessible. The two extra floors provide more housing and is made of timber-frame construction. This is also economically interesting as more dwellings can be built on the same square metres. Recycled materials are used. Nuisance is avoided as the team works with prefabricated materials.

Flierbosdreef, Amsterdam

This former office will be transformed into a residential building with 397 flats (De Loods, 2023). It is part of a larger development plan in Amsterdam on Bijlmerdreef. New volume will be added, contrasting in architecture with the base of the building. This strengthens the building's identity. The design incorporates a ground floor to accommodate various public functions (Yilmaz, 2022). At the rear, the lounge with terrace provides liveliness and social control. The façade is made entirely of prefabricated panels.

6.3 REFERENCE PROJECTS

PROJECT / ASSESSMENT ELEMENT	 De Swollenaer	 Wiltonflats	 Wallisblok
Series of one			The houses are empty and offer the oppotunity for renovations or other changes per household. The facades are designed individually and can also be changed in layout.
Prefabrication	All the elements are constructed somewhere else, this ensures sustainable and affordable construction.		
Execution technique	The joints are simple, ensuring fast and efficient construction.		
Lifespan	The lifespan of the building is extended. The existing construction is used and a new facade is added. This facade can be changed and reused in the future.		The building was outdated, new facades and new structures gave the building an upgrade.
Reversibility	Because of the use of prefabricated materials, the elements can be removed. The building has been stripped, but the casco can be used when reversing.		The inside of the homes is easy to change, but the facade has completely been removed and this is not reversible.
Resident participation		Taken account of residents by making it senior-friendly and moving the entrance to the quiet side of the building. Created space for meeting other people. 'Drempelzone' by enlargening the gallery.	The collective approach gave a lot of opportunities. The future residents could decide on their facade, an empty floorplan or with interior walls, placement of balconies and a rooftop.
Production	Production of elements takes place in the Slimme Huizenfabriek of Plegt-Vos in Zwolle where they built prefabricated elements.		
Demolition	Demolition of the sub structure was necessary to go to the casco of the building. After, the new elements were easy to apply.	The building has been stripped, it is a casco renovation. The facade has a more open and contemporary look.	The hole facade has been removed and holes have been made in the existing concrete structure.
Responding to market dynamics	Due to the open structure of the floorplans, it is possible to merge or split dwellings when the market changes. The building now offers a mixed program of dwelling types.	They responded to the market dynamics by creating more senior-friendly apartments and creating space for communal areas.	The houses are divided per wishes of the residents, in the future it is easy to adapt the houses and merge or split them.
Responding to household dynamics	The dwellings have an open floorspace and changes can be done by residents themselves.		This project is a very good example of responding to the household dynamics. The infill of the houses is up to the residents and can be easily adjusted.
Suitable for installation changes			
Prepared for climatic changes		The design focussed on sustainability, and the outdoor spaces. The building has more relation to the green spaces and this green courtyard can collect rainwater.	
Maintenance	Maintenance is easy, the facade panels can also be removed and replaced.	The galleries on the back side of the building make it easy to clean and maintain.	

Figure 6.9: Matrix of the reference projects
(Illustrated by author)

6.3 REFERENCE PROJECTS

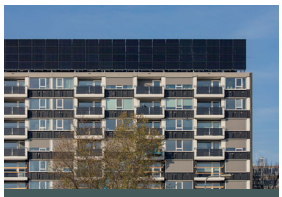
PROJECT / ASSESSMENT ELEMENT	 Portiek Alphen aan den Rijn	 Smartlofts	 Inside-out
Series of one	Due to innovative adjustments in the load-bearing structure and addition of balconies, the resident can change the infill of their homes.		
Prefabrication			The panels are built off site. They are easy to use.
Execution technique			Due to the prefabricated panels that include installations, it is easy to apply this to the existing facade.
Lifespan		The lifespan of the building is extended. The existing construction is used and a new facade and atrium is added.	
Reversibility	This building has undergone minor interventions, it is possible to return to the previous state.	Inside of the homes, it is easy to change the infill.	The existing structure and dwellings are preserved. The facade can be removed and replaced on another flat in the future.
Resident participation	Residents outgrow their houses and complain about people who move very fast and are not attached to the place. This project listens to this and creates larger houses and more variation.	The residents were involved in the design process from the very beginning. They helped determine the size, layout, location of their dwelling and communal spaces.	
Production			This integrated facade system 'Inside Out' is produced in the Netherlands and can construction work is limited on site.
Demolition	There is little demolition needed for the interventions of this design.	The building has been stripped and the existing structure was the inspiration for the new dwellings.	Demolition is kept to a minimum, only the facade is applied to the existing one.
Responding to market dynamics	The new floorplans offer multiple variations of dwellings. Houses can be merged or splitted in the future.		
Responding to household dynamics	The new floorplans offer opportunities for the residents to change the layout and position of the kitchen and seating area. This makes the houses more future-proof for the residents.	The Smartloft apartments have an efficient layout with minimal circulation space and no seperation of functions, residents are free to define and adapt the infill of their homes.	
Suitable for installation changes			The paneling and installations components (heating, ventilation, energy) are integrated. The panels need to be replaced by the same sytem.
Prepared for climatic changes			
Maintenance			

Figure 6.9: Matrix of the reference projects
(Illustrated by author)

6.3 REFERENCE PROJECTS

PROJECT / ASSESSMENT ELEMENT	 Heiligharn	 Flierbosdreef	 Solar Decathlon
Series of one			
Prefabrication	Because of the innovative prefab system Ytong Cascos, the panels only need to be mounted during construction work.	The use of prefabricated elements ensures fast and efficient construction.	The addition of a new floor on top of the building only cost half a week, due to the use of prefabricated materials. They use a timber frame construction, where the facade parts can be hung in it.
Execution technique	A steel structure on top is made on steel legs, which rests on the existing load-bearing walls. This forms the foundation for Ytong Cascos system, that uses aerated concrete prefab elements.	The execution of the new addition, the facade, the two new storeys and sub structure, is easy due to prefabricated materials with simple joints.	
Lifespan		The lifespan of the building has been extended. The addition of the two storeys with a new construction and the addition of a clear facade that is suitable for dwellings creates a new building.	The load-bearing structure of the old building is used, the new facade and extra storeys create a building with a long lifespan. The facade can easily be changed when it is outdated.
Reversibility	The extra layer on top has a seperate construction system and is made out of steel and prefabricated elements. This makes it easy to remove this building layer in the future and reuse the materials.	The prefabricated facade elements and flexible interior walls offer the opportunity for future changes and going back to the casco of the building.	The two new storeys have a seperate construction and can be removed in the future. The circulation core is already made out of recycled steel and can also be removed and recycled in the future.
Resident participation	The residents liked the large apartments and therefore the layout of this didn't change.		
Production	The prefabricated elements are built in the Netherlands and can be easily applied on the construction site.	The production of the prefabricated elements takes place in the Netherlands.	
Demolition	No huge demolitions took place. The existing facade also got an upgrade, the panels are attached to the outside.	The building has been stripped, this costs a lot of time and waste. The prefabricated facade was easy to apply after the demolition work.	The renovation takes place per porch access, a vertical approach. Other dwellings can still be used and demolition is kept to a minimum.
Responding to market dynamics		Smart and flexible options, like removable interior walls, makes sure that changes in dwelling sizes can be done when the market changes.	
Responding to household dynamics		The open structure of the floorplans creates space for residents to change it to their own needs.	
Suitable for installation changes			
Prepared for climatic changes			They suggest that cars will disappear from the immediate streetscape, replaced by car parks on the outskirts of the neighbourhood. This results in more green to collect rainwater.
Maintenance			The access has been changed to galleries, this makes maintenance more easy.

Figure 6.9: Matrix of the reference projects
(Illustrated by author)

6.3 REFERENCE PROJECTS

6.3.3 Findings

The matrix above (figure 6.9) gives an overview on available information of the nine chosen reference projects. Several things can be said about each assessment criteria, so this provides several options that can be implemented for the transformation of post-war porch flats (figure 6.10). The available information about the reference projects can be linked to the conclusion of the Western Garden Cities principles. The conclusion of this chapter will elaborate more on this. The next chapter will give an overview of the guidelines and thus answer the main research question.

- Prefabrication
- Execution technique
- Lifespan
- Reversibility
- Production
- Demolition
- Responding to market dynamics
- Responding to household dynamics
- Maintenance

- Resident participation
- Demolition
- Responding to market dynamics
- Prepared for climatic changes
- Maintenance

- Series of one
- Lifespan
- Reversibility
- Resident participation
- Demolition
- Responding to market dynamics
- Responding to household dynamics

- Series of one
- Reversibility
- Resident participation
- Demolition
- Responding to market dynamics
- Responding to household dynamics

- Lifespan
- Revesibility
- Resident participation
- Demolition
- Suitable for installation changes

- Prefabrication
- Execution technique
- Reversibility
- Production
- Demolition
- Suitable for installation changes

- Prefabrication
- Execution technique
- Reversibility
- Resident participation
- Production
- Demolition

- Prefabrication
- Execution technique
- Lifespan
- Reversibility
- Production
- Demolition
- Responding to market dynamics
- Responding to household dynamics

- Prefabrication
- Lifespan
- Reversibility
- Demolition
- Prepared for climatic changes
- Maintenance

Figure 6.10: Available information per reference project (Illustrated by author)

6.4 CONCLUSION

The results of the previous chapter gave a clear overview of what transformations are needed to upgrade porch flats in the Western Garden Cities. This chapter has looked further into this and the need for adaptability in transforming existing residential buildings. Adaptability is an efficient and circular way of renovating, since the human image changes with time, the housing and environment must also be able to change with it. So, it is a perfect intervention for the changing human image.

Alongside this, an analysis was made of the possibilities in the porch flats and their immediate surroundings. Thus, it was concluded that the two projects, as representative of all other porch flats in the neighbourhood, are capable of transformation at the level of renovation and expansion. Some adjustments need to be made to make changes, but in most respects they are quite capable. Interior walls can be easily removed and the construction allows for other functions and expansion of dwellings.

After analysing the transformation potential of the porch flats in Nieuw-West, it was important to look at the different options of adaptive interventions. Here, nine renovation projects were selected, each of which had some form of adaptability after renovation. These were assessed against assessment criteria that provide an overview of the characteristics per reference project. Collected information was compiled into a matrix. This matrix is used in the next chapter to link this to the necessary improvements and interventions to make the Western Garden Cities vibrant and future-proof again where heritage plays an important role.

07 DESIGN GUIDELINES

This chapter anwers the main question: What design guidelines can be employed for the transformation of post-war porch flats in the Western Garden Cities of Amsterdam while utilizing adaptability? From the previous chapters, there are several results that can be merged into this chapter. The design guidelines mainly revolve around how to tackle Western Garden Cities in a comprehensive approach. When these design guidelines are applied, it is important to think about future-proofing the porch flats to avoid having to make major interventions within a short period of time. Here, strategies are given for adaptability that can be applied. In addition, Western Garden Cities also have positive values that should be preserved; the interventions are adapted to this. A short list of preservation strategies is added to indicate this.

7.1 DESIGN GUIDELINES

The design guidelines emerged from the first part of the study. This examined the values of Western Garden Cities. The values of the area lie mainly in the design of the urban plan and less in how the buildings are executed. The character of the Western Garden Cities lies in the area's hierarchical structure with long lines and a lot of openness. Although Amsterdam Nieuw-West used to be a city district with a homogeneous community and a sense of community, this has quickly disappeared. The area suffers from several problems and revaluation is needed. As there is no comprehensive approach yet that reflects a clear list of interventions for the porch flats in the area, this study was set up. From literature review, different opinions fo critics and a study on reference projects, there are several guidelines that form the conclusion of the study.

The matrix below first shows the preservation strategies, which is also an important component so that the heritage of the area will not be lost. Previous plans made to tackle the Western Garden Cities were extreme and left little of how the AUP was conceived. A lot of new construction had to make way and densification was done wherever possible. Fortunately, these plans did not come to pass and an appreciation of this post-war urban expansion has emerged. The list shows the positive values along with the preservation strategy that contributes to preserving the character or Nieuw-West.

	PRESERVATION STRATEGY
1	Preserve the openess of the combination of green and buildings.
	Light, air and space are important aspects. There is optimal access to this and greenery.
2	Not interfere with the geometric design, ensure that people can still choose their way to work or school.
	Hierarchical system. Relation between green, infrastructure and functions.
3	Preserving the north-south orientation, bedrooms and kitchens on the east side. Living room on the west side.
	Perfect orientation of the building.
4	The courtyards needs to be preserved to make the living place more attractive, as there is outdoor space for the residents.
	The courtyards around the building form an important aspect in the transition of spaces.
5	Porch flats need to be preserved, as they present opportunities for standard solutions.
	Porch flats are created with standard construction methods and thus offer solutions that can be applied to many of them.
6	Preserving the ‘wisselkamer’, as this makes the house capable of minimal changes in size.
	Some porch flats contain the ‘wisselkamer’, where this room can be appointed to a dwelling.

Figure 7.1: List with preservation strategies
(Illustrated by author)

7.1 DESIGN GUIDELINES

The matrix below shows the actual design guidelines as a part of the answer of the research question. It forms a list of 13 guidelines that will ensure that porch flats in Nieuw-West can be transformed to meet current needs and revive this district. Below the design guidelines, the current problems are visible, making it clear what the problem is and needs to be improved.

For using the design guidelines in practice, it is important to apply a diverse range of interventions. Diversity in façade appearance, green spaces and functions. The study followed that urbanity is lacking in the area. In addition, it lacks identity, so many buildings have already been demolished, due to an sober appearance, outdated physical state and little relationship between building and surroundings.

	DESIGN GUIDELINES
1	Create more space for communal areas in the buildings to enhance safety and vitality. 'Wijkgedachte' has disapearred and lack of social safety and a vibrant streetscape.
2	The sheltered spaces are still not sheltered enough, adding building mass could help create more sheltered spaces. Sheltered green spaces have remained unappropriated, the greenery is uniform. People don't feel attached.
3	The buildings need to be connected to the surroundings by adding ground-bounded dwellings, public functions on the ground floor and attractive entances. The ground floors are made out of storage spaces, closed character is perceived as unpleasant and uninviting.
4	Improve urbanity by mixing functions. Residential areas are sober and not extensively used.
5	Addition of volume to create semi-open blocks, this will renew collective spaces and create differentiation. The character of the Western Garden Cities is uniform and due to the openess, people don't feel assigned to spaces.
6	Upgrade the floorplans by creating holes in the construction and create a floorplan that can adjust and offer different options. Little diversity in dwellings and little versality at the construction scale of the buildings.
7	Create visual effects by changing the facades and adding small buildings with a different character. As the buildings are built in a very fast way, alle the buildings have a similar and sober appearance.
8	Create more space for the living room, give this living area the full width of the building. The living room is mostly oriented on the west side, but they are too small for larger families.
9	Create differentiation in the design and use of the courtyards and give them their own character. The courtyards are all similar to each other and not used extensively.
10	The principle of the 'wisselkamer' can be applied to other porch flats and can create a form of adaptability. Some porch flats already contain a 'wisselkamer', this can manage small changes in dwellings.
11	Densify to optimize space utilization. The low number of residents per area creates unused spaces.
12	Create larger transportation zones to make it easier for people to meet and connect. For example with galleries, also to create more space for dwellings as porches can be removed. Sense of community during the pioneering period is not present anymore. Individuality has given way to this.
13	The addition of more intermediate spaces will improve urbanity. There is a strict division of public and private in the residential areas.

Figure 7.2: List with design guidelines
(Illustrated by author)

7.1 DESIGN GUIDELINES

When the design guidelines will be put into practice, it is important to think further about building with adaptability. The research went into different forms of this, a list of assessment criteria was obtained from Brinksma's (2017) thesis. Nine reference projects were assessed against these criteria and provided insight into applying different strategies to apply adaptability in renovation projects. The matrix below depicts this, with the projects that may provide inspiration below. This list, together with the design guidelines, can be used to renovate porch flats and make them future-proof while respecting the heritage status.

	ADAPTABILITY STRATEGIES
1	Individually designed facades offer the opportunity for renovations per household.
	Series of one - Wallisblok
2	Use of prefabricated elements to ensure sustainable and efficient construction.
	Prefabrication - De Swollenaer, Inside-Out, Heiligharn, Flierbosdreef, Solar Decathlon
3	Use of simple joints to ensure easy adaptability.
	Execution technique - De Swollenaer, Inside-Out, Heiligharn, Flierbosdreef
4	Extend the lifespan by physically upgrading the building.
	Lifespan - De Swollenaer, Wallisblok, Smartlofts, Flierbosdreef, Solar Decathlon
5	Ensure reversibility by adding prefabricated elements and additions with a seperate construction system.
	Reversibility - De Swollenaer, Wallisblok, Portiek Alphen aan den Rijn, Smartlofts, Heilighar, Flierbosdreef, Solar Decathlon
6	Listen to the wishes of the residents and create variation in dwellings and functions.
	Resident participation - Wiltonflats, Wallisblok, Portiek Alphen aan den Rijn, Heiligharn,
7	Production of elements closeby to minimize transportation waste and costs.
	Production - De Swollenaer, Inside-Out, Heiligharn, Flierbosdreef
8	Keep demolition to a minimum, achieve adaptability with small interventions.
	Demolition - Portiek Alphen aan den Rijn, Inside-Out, Heiligharn, Solar Decathlon
9	Create floorplans that offer multiple variations for other functions and alterations in dwelling sizes.
	Responding to market dynamics - De Swollenaer, Wiltonflats, Wallisblok, Portiek Alphen aan den Rijn, Flierbosdreef
10	Create open floorspaces within one dwelling to offer residents the opportunity to change the infill.
	Responding to household dynamics - De Swollenaer, Wallisblok, Portiek Alphen aan den Rijn, Smartlofts, Flierbosdreef
11	Make installation changes possible by using elements that are easy to remove.
	Suitable for installation changes - Inside-Out
12	Prepare for climatic changes by collecting rainwater and preserving green spaces.
	Prepared for climatic changes - Wiltonflats, Solar Decathlon
13	Galleries offer easy cleaning and prefabricated panels can be removed in case of damage.
	Maintenance - De Swollenaer, Wiltonflats, Solar Decathlon

Figure 7.3: List with adaptability strategies when applying design guidelines
(Illustrated by author)

7.1 DESIGN GUIDELINES

To visualize the results of the study, a bird's eye view of a large part of Amsterdam Nieuw-West is shown below (figure 7.4). It shows some of the many porch flats. By applying different interventions and creating a diverse range of interventions, there will be a more intensive use of the city and the vision is that the problems will gradually disappear. The infographic shows the different guidelines that can be implemented, together with the adaptability strategies (in the yellow boxes) that are important when using the design guidelines. This forms a comprehensive approach for the revival of the Western Garden Cities.

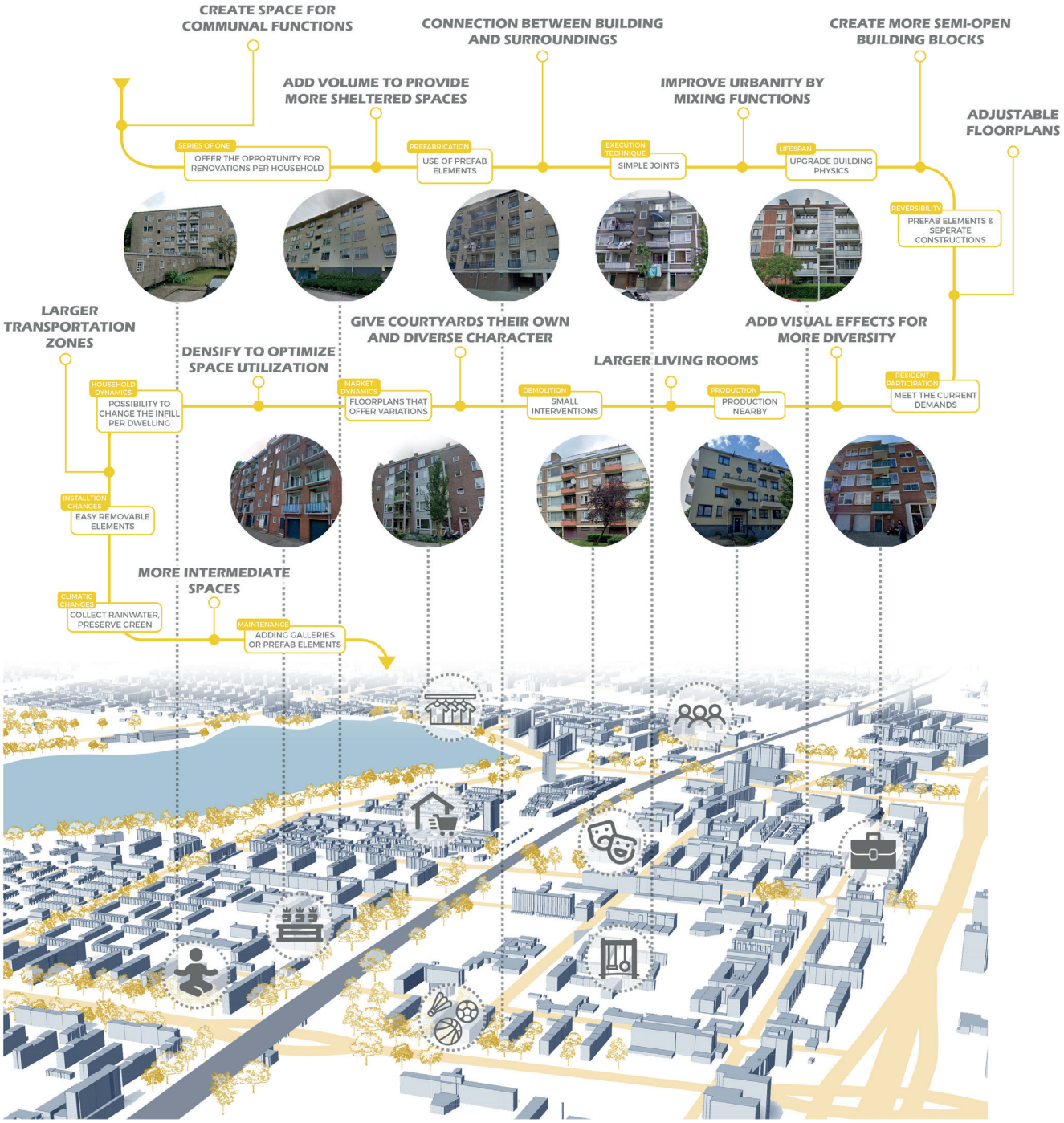


Figure 7.4: Design guidelines
(Illustrated by author)

08 CONCLUSION & DISCUSSION

8.1 CONCLUSION

8.1 Problem

This research originated from an analysis of problems at hand. Due to a growing demand for housing, there is a housing crisis in the Netherlands, which is a problem on a national scale. More housing is needed and the housing stock is currently monotonous and offers few opportunities. The existing housing stock can offer a solution by transforming, adding and upgrading the living environment. In addition, there is a demand for circular solutions. Using existing buildings to partly solve the housing shortage contributes well to this. Less construction material is used and it is a sustainable solution. The problem of housing shortage and the demand for circular solutions is applicable to the housing stock of Amsterdam Nieuw-West. Amsterdam Nieuw-West or the Western Garden Cities is an elaboration of the AUP, a plan developed by Cornelis van Eesteren. This urban plan was implemented after World War II and residential buildings were built at a rapid pace. These buildings are currently outdated, one-sided and contribute to a bleak streetscape. This housing stock primarily consists of porch flats, many of which have already been demolished, but those that remain offer a good opportunity for transformation. The Western Garden Cities face multiple problems, such as crime, neighbourhood degradation and lack of social safety. Despite this, the area belongs to post-war heritage because of its history. This heritage status should be respected during the transformation.

8.2 Research aim

The aim of this research is to investigate the principles of Western Garden Cities, in order to get to the heart of the history and visions of the plan. This was done while embracing building with adaptability. This contributes to a sustainable and resilient future of the built environment. The heritage value and improvements of the area were explored with subsequent research into adding adaptability in porch flats. The research thus provided design guidelines that will contribute to an overall vision for the development of this part of the city at the level of the porch flats and the close surroundings.

8.3 Research

The research question of this study is as follows: What design guidelines can be employed for the transforamtion of post-war porch flats in the Western Garden Cities of Amsterdam while utilizing adaptability?
The answer to this main question emerged from a study of Western Garden Cities, looking at the scale of the urban plan, buildings and residents. As a result, a set of improvements and interventions followed. To apply this to transformation where adaptability is paramount, the second sub-question looked at this. Through literature review, the need for adaptability in buildings was explained, its history and how it has already been applied in post-war buildings. Adaptability contributes to the changing human wishes and thus ensures that buildings can adapt with changing social dynamics. This sub-question also explores the transformation potential of porch flats in Nieuw-West. Two representative porch flats were tested against an assessment framework, the building itself and the surrounding area were examined. It followed that the porch flats pose few limitations in the context of transformation or expansion and adding interventions is possible. To explore the interventions and possibilities for the buildings and surroundings, nine projects were further analysed. These projects are all transformation projects where some form of adaptability is present. This gave a wide overview about the possibilities for porch flats in the Western Garden Cities.

To bring together the two sub-questions, the principles of Western Garden Cities and building adaptable, the matrices of the conclusions were combined. This forms the design guidelines and preservation

8.1 CONCLUSION

strategies for the general approach for the transformation of the area. These guidelines differ in improvements from urban planning level to building level.

Much research has been done on the Western Garden Cities, various interventions have been given, but there was never a clear picture on the best method of preserving heritage and the transformation of this. This research concluded that a diverse variety of interventions are needed to revitalise the area and the porch flats. This can be done in the form of small interventions, such as adding public functions, enlarging transportation spaces for more social contact, promoting a floorplan that allows changes in dwelling size and functions, and adding volume to densify for space optimisation. These small interventions help future-proof the porch flats and their surroundings. It creates more vibrancy and changeability without losing the positive values of Western Garden Cities. This conclusion can form a good start for future changes in the neighbourhood and their porch flats.

8.2 DISCUSSION

Reviving the area of the Western Garden Cities and dealing with changing standards led to this research on the Western Garden Cities and implementing adaptability. This research found useful insights by combining sources about the vision of the AUP and sources about adding adaptability in renovation projects. Yet, it is crucial to acknowledge limitations and uncertainties within the study.

One of the primary limitations during this research was the constraint of limited information regarding the integration of adaptability in renovating existing buildings. The existing literature and available case studies provided a foundation, but there exists a gap in comprehensive guidelines for incorporating adaptability into the post-war porch flats in Nieuw-West. This limitation emphasizes the need for further exploration and in-depth investigation during the design phase in the next semester. This will give useful insights and the provided design guidelines in this research will become more practical.

Furthermore, the scope of the research could benefit from an expansion of reference projects. A broader pool of cases enrich the understanding of design strategies and offer diverse perspectives on the implementation of adaptability. This could potentially unveil additional possibilities and refine the proposed guidelines.

While the results offer a comprehensive overview of design guidelines for the transformation of post-war porch flats in Amsterdam Nieuw-West, it is essential to be careful when looking at these results. The research provides guidelines rather than definitive answers. The proposed strategies stand as potential pathways towards the revival of these principles and adding modern techniques, but they are not complete or conclusive. The trustworthiness of the results depends on understanding that these guidelines are more a flexible framework for exploring ideas rather than strict rules. The performance of the guidelines rely on putting them into practice.

In conclusion, this research has succeeded in establishing a comprehensive understanding of the Western Garden City principles and their integration with adaptability in porch flats. The faced challenges form opportunities for future research, asking for more investigation on reference projects. The ongoing research in the design phase sets the stage for next steps in making these guidelines work for porch flats in Amsterdam Nieuw-West.

09 REFLECTION

9.1 REFLECTION ON RESEARCH

9.1 Intention of the project

This graduation research focuses on finding a set of design guidelines that can be applied to all porch flats in Amsterdam Nieuw-West. Here, it is important to explore the heritage value of the Western Garden Cities in order not to lose it and to make suitable improvements. These improvements must be future-proof to meet changing needs, and will therefore have a form of adaptability. The intent of the study is to use the outcome, the design guidelines, to form an overview of the many different studies that have been done. Adding adaptability in transformation has hardly been done yet but points to a positive improvement and can contribute to future-proofing the built environment. The guidelines provide a general approach. Next to this the intention of the research is to apply this outcome to a design case and realize an actual design. This can be a good addition to the research by putting it into practice.

9.2 Relation with the graduation studio

The heritage studio, adapting 20th century heritage: resourceful housing, has two challenges. The studio deals with the housing crisis and the circular economy. In doing so, heritage makes the connection between these two aspects. This research connects to these two challenges by partly tackling the housing crisis by giving a strategy of adding volume and increasing diversity. In addition, circularity is included by using the existing housing stock, thereby reducing the amount of construction material produced. Next to this, circularity is also about future-proofing buildings. Here, it is important to examine the heritage value, but also that interventions will not cause problems. These design strategies given in the study cope with the vision of the neighbourhood. But alongside this, they also have a form of adaptability in them which means that changes made will contribute to the vision of the future. Adaptability ensures that much can be done in the future with small changes, thus promoting the circularity of the project.

9.3 Transferability of the research

The research was conceived because there is no clear strategy to revive Amsterdam Nieuw-West, as the area suffers from multiple problems and many buildings are being demolished. However, the current housing stock is important to preserve in order not to lose its heritage status, and is suitable for small interventions to try to solve the problems in Nieuw-West and make the area more attractive and add more urbanity. The design guidelines given are a combination of intervention strategies that have emerged from the positive and negative values of the area. They are then linked to adaptability to make it more practical and future-proof. These guidelines can be a good basis for renovations of porch flats. It is important to keep in mind that these guidelines are a flexible framework and not definitive answers. The discussion explains this further.

9.4 Personal takeaway

From this research, I learnt that little research has been done on future-proofing existing buildings, and this includes porch flats. A lot of research has been done on adaptability in buildings, but little on its application in renovations. In addition, a lot of research has been done on Western Garden Cities, but again there is no clear conclusion on how to transform. I learnt how to deal with post-war heritage and its transformation. By reading various sources, I quickly found out that renovations consist of minor interventions like adding insulation or replacing window frames, but this doesn't look at future generations and changing dynamics in the social and economical patterns. When transforming porch flats that are more forward-looking, their adaptability should be taken into account. I will take the guidelines of this research into the design phase, this will be the starting point for adapting and redesigning porch flats in Amsterdam Nieuw-West.

9.2 REFLECTION ON RESEARCH & DESIGN

The design case is located at the Johan Jongkindstraat, close to Lelylaan station. The plot has 6 porch flats with a residential function and 5 smaller buildings with both a residential and public function. The design project forms the location in order to implement the design guidelines provided by the research and can thus form an example of how to transform post-war porch flats in Amsterdam Nieuw-West. The urban diagrams (figure 9.1) show the interventions of the design.

The research & design diagram on page 23 gave me a clear image from the beginning on how the research and the design are related to each other. After the research and the analysis of the design case were finished, I was able to combine these by implementing the design guidelines in the design case. But this wasn't as simple as it seems, figure 9.2 shows a first concept design by just implementing the strategies derived from the research like adding volume, adding a gallery and connect the plinth to the surroundings. This shows that the research offered quite static results and a generic approach, which was still helpful. This first concept included many guidelines from the research but wasn't site specified for the location yet. This immediately revealed that the guidelines are indeed no definite answers and need to be adjusted to the specific case. This was also one of the main comments after the presentation, that I need to dive further into the surroundings and look into different scenarios for the transformation and maybe even partly demolition of these porch flats. The design project will make the design guidelines from the research more practical and give insights into the implementation of the results. This feedback helped me to develop more design ideas related to the site and exploring a variety in scenarios.

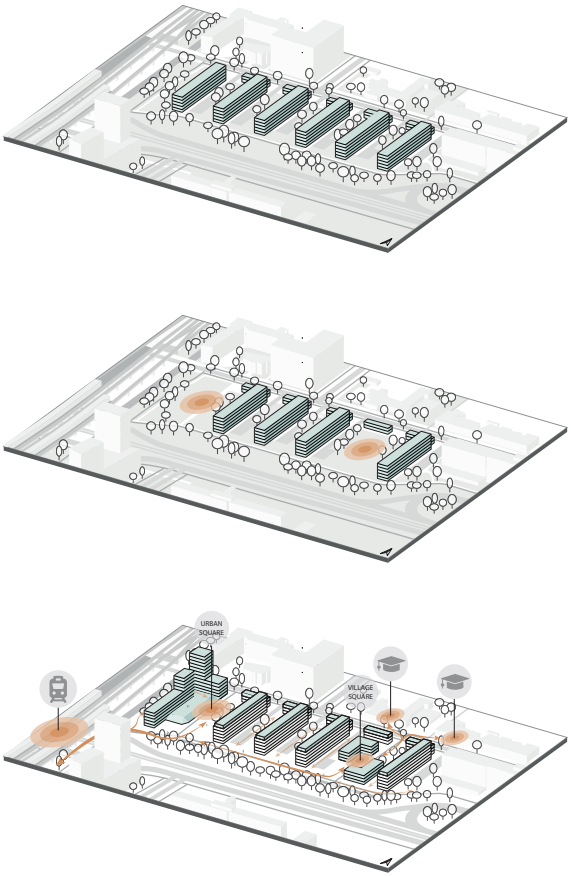


Figure 9.1: Urban diagram with interventions
(Illustrated by author)

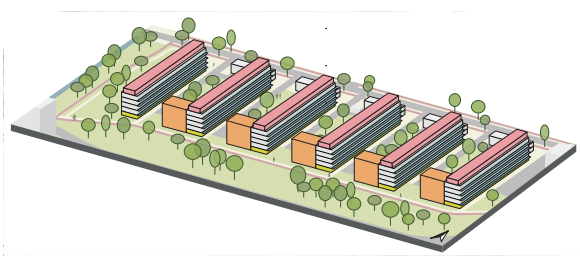


Figure 9.2: First concept only based on guidelines
(Illustrated by author)

9.2 REFLECTION ON RESEARCH & DESIGN

After a second site visit with more focus on surroundings, sightlines and public spaces, my vision became clear. Alongside this, it worked to make visualisations of the problems, values and opportunities of the porch flats and its surroundings. From this came a first draft of a master plan in which the two schools on the north side and the train station on the south-west side could be connected. Also diversity could be created by demolishing two buildings and placing new ones. The side of the station thus becomes more urban and the side of the two schools becomes more village-like. I made many different sketches for the volumes of the new buildings, the sections of the existing flats and the experience of the space. The decisions I made are based on the research and how it fits within the context of this case. The volumes for example are chosen because of sunlight. Next to that, I also wanted to create a landmark by giving the new building on the urban square 12 floors, so that people can see it from the train station for example and this invites people to use the public spaces and shops on the ground floor. The values of Western Garden Cities, such as having different routes, community-based living environments and intensive use of space were added to the design. Because of this, I found that the research was very helpful, by exploring the principles of the Western Garden Cities, I could come with appropriate solutions for the transformation of these porch flats.

However, during the design phase there were also many challenges and dilemmas that I faced. The biggest one was in the first part of the design where I made a decision on demolishing two porch flats. This has of course a large impact and is not very circular, but the reason I wanted to do this was to make this project more challenging, seeing what is possible and also show the possibilities and the added value that it can give by doing it. This also relates to my idea behind this project, because I want this project to be an example of how to implement the design guidelines on different scales. The design guidelines from the research differ from small scale interventions like adding a mix of functions or diversify floorplans to larger scale interventions like breaking the repetition by building new and adding a roof extension. Adding a gallery also came from the research, this has to do with adaptability because it can be easy demounted and the façade is easy to clean and tiles can be easily replaced. Next to that it has more advantages, like making it wheelchair friendly as the porch access will be removed, creating more space inside the building, having more contact with people and having more eyes on the street in order to make a connection between the building and the surroundings. However, a gallery also has negative aspects, there will be for example less privacy and a gallery can be a very long walking route to your home. The positive values outweigh the negative values in this case. The length of the flats is not very long and I made accesses on both ends of the flat to minimize walking distances and minimise the number of people that will walk past your window. Also, I made small holes in the gallery in front of bedroom windows so that people can't stand directly in front of the window.

Next to this, there was also the dilemma of parking. The parking places are in front of the existing flats and the walking distance to the front door is very minimal. However, this of course can hinder the sight and the appearance of the courtyards. It was difficult to make a decision on what to do with these parking places as there is very limited space in the surroundings to make parking places. For the urban square, I could make parking on the ground floor with a floor deck on top. The cars are not visible in this square. Also in the village square, the cars won't be very visible as the buildings are L-shaped and facing each other which makes smaller intimate

9.2 REFLECTION ON RESEARCH & DESIGN

courtyard in between. I decided to keep the parking places as they are for the remaining ones. This was a difficult decision but it won't be realistic to make underground parking, the soil is too wet and it is hard to explain for adaptability and circularity reasons. Here is my research also related to decisions I make, where adaptability and future-proofing the plan are important.

Another dilemma that I faced were the brick facades on the upper floors of the new building. For heritage reasons I wanted this in brick, to refer to the old buildings by using the material from the ground floor on the upper floors and the concrete tiles on the ground floors of the new buildings (figure 9.3). However, brick has a quite high carbon footprint and is not demountable. Therefore I choose to demountable bricks and I came with two options. The first option had thicker bricks and less aluminium profiles and the other option had very thin bricks but a lot of aluminium profiles. I decided to use the first option, because aluminium also has a very large carbon footprint and the thicker brick stones are more suitable for higher buildings and have more thermal mass.

These are a few dilemmas that I faced during the design, but with the help of the guidelines I was able to make choiches related to the heritage or adaptability.

Figure 9.4 on the next page shows the key aspects that explain the design. The sub aspects can be linked to the design guidelines from the research. Where the first three aspects are related to the heritage and the fourth aspect to the adaptability part. This image shows the relation between the research and design and how the guidelines are categorised and implemented. Because the project is very big and contains many interventions, it was needed to make an image like this to explain the design decisions. Connecting to the train station and schools are location related interventions. Also, preserving the characterstic façade is a preservation strategy that is applicable for these kind of tiles, as it is a material that indicates the time period of the building. Thus, the design guidelines of the research are implemented, but some are added to this specific location in order to give extra quality to the project.

Figure 9.3: (from left to right) Existing facade, transformed facade, new building urban square, new building village square
(Illustrated by author)

9.2 REFLECTION ON RESEARCH & DESIGN

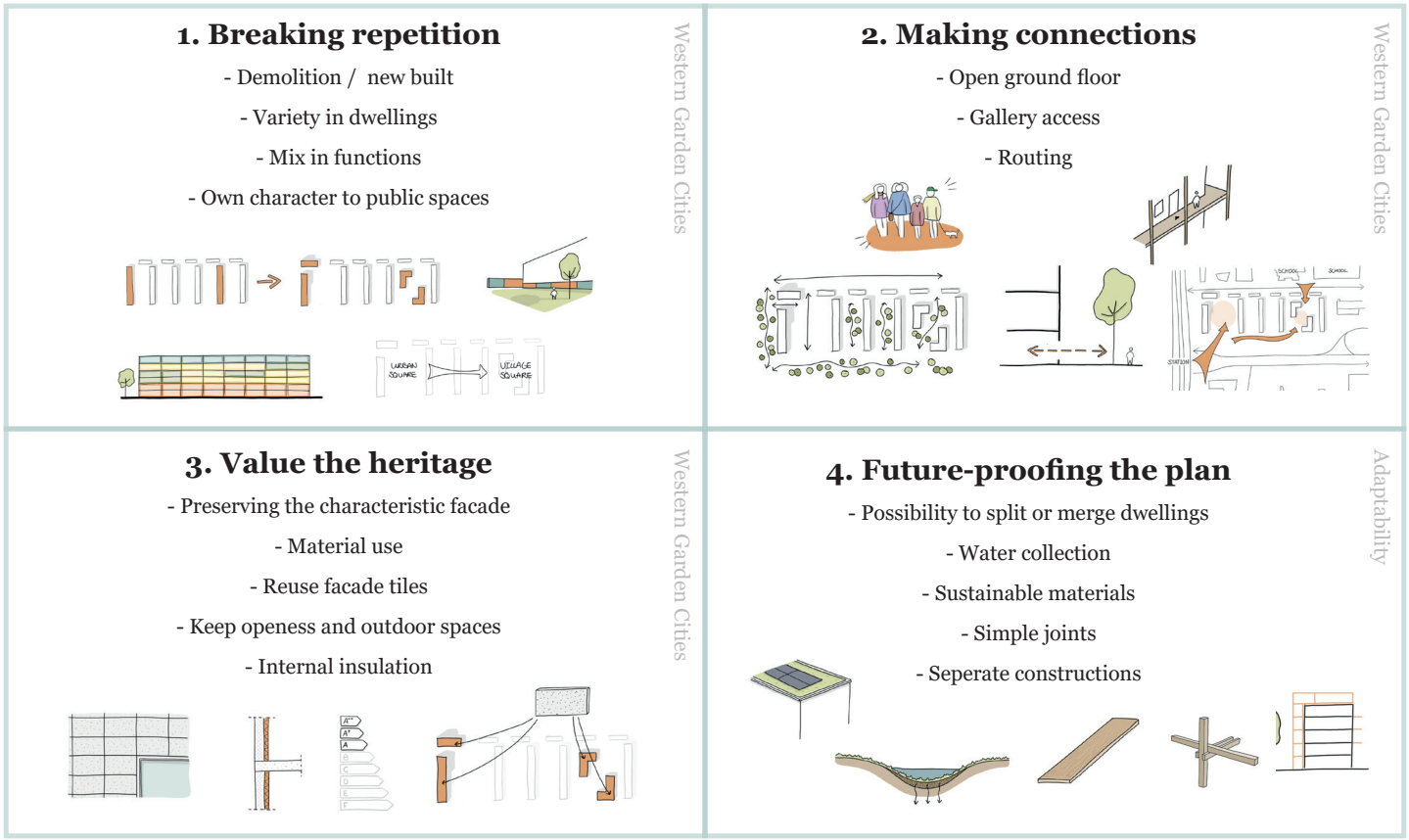


Figure 9.4: Key aspects of the design
(Illustrated by author)

10 REFERENCES

10.1 LITERATURE LIST

Agricola, E., Feddes, Y., Hartman, H., De Hoog, M., Roosebeek, M., Van Rossem, V., Schilt, J., Sorgedrager, B., & Van Der Werf, J. (2013). Atlas AUP Gebieden Amsterdam. Valiz, Amsterdam. Bureau Monumenten & Archeologie.

Amsterdam Cultuur-Historische Vereniging. (n.d.). Architecten werkzaam in Amsterdam (geweest) en genoemd op onze site in Wik-I-A'dam | www.amsterdamhv.nl. https://www.amsterdamhv.nl/wiki/architecten.html#jfber

BNA. (2022, January 12). Nederlandse inzending Solar Decathlon biedt oplossing voor circulaire transformatie van naoorlogse portiekwoningen. https://www.bna.nl/nieuws/nederlandse-inzending-solar-decathlon-biedt-oplossing-voor-circulaire-transformatie-van-naoorlogse-portiekwoningen

Brinksma, H. (2017). Toekomstbestendig renoveren. A+BE: Architecture and the Built Environment. https://doi.org/10.59490/abe.2017.13.1856

De Loods. (2023, October 19). Transformatie Flierbosdreef | Projecten | De Loods Architecten en Adviseurs. De Loods Architecten En Adviseurs. https://deloods.nl/projecten/transformatie-flierbosdreef/

Feddes, Y., (2012). Het groene kapitaal van tuinsteden. AGORA Magazine 28(2), 14-16. https://doi.org/10.21825/agora.v28i2.2212

Geldermans, R. J., & Jacobsen , L. R. (2015). Materialen & Circulair Bouwen: Vervolgonderzoek Pieken in de Delta project REAP+. TU Delft Open.

Gemeente Amsterdam. (2021) Wonen in Amsterdam 2021 Leefbaarheid. Amsterdamse Federatie van Woningcorporaties.

Gosling, J., Naim, M., Sassi, P., Iosif, L., Lark, R. (2008). Flexible buildings for an adaptable and sustainable future. Cardiff University.

Hamida, M. B., Jylhä, T., Remøy, H., & Gruis, V. (2022). Circular building adaptability and its determinants – A literature review. International Journal of Building Pathology and Adaptation, 41(6), 47–69. https://doi.org/10.1108/ijbpa-11-2021-0150

Havinga, L., Colenbrander, B., & Schellen, H. (2019). Heritage attributes of post-war housing in Amsterdam. Frontiers of Architectural Research, 9(1), 1–19. https://doi.org/10.1016/j.foar.2019.04.002

Hellinga, H. (2005). Onrust in park en stad: Stedelijke vernieuwing in de Amsterdamse Westelijke Tuinsteden. Het Spinhuis.

Hulshof Architecten. (2012, February 17). Wallisblok. https://www.hulshof-architecten.nl/portfolio/wallisblok

Inside-Out. (2021). Op Weg Naar Energieleverende Hoogbouwflats. https://tki-inside-out.nl/inside-out/

Lacey, A. W., Chen, W., Hao, H., & Bi, K. (2018). Structural response of modular buildings – An overview. Journal of Building Engineering, 16, 45–56. https://doi.org/10.1016/j.jobe.2017.12.008

Leising, E., Quist, J., & Bocken, N. (2018). Circular Economy in the building sector: Three cases and a collaboration tool. Journal of Cleaner Production, 176, 976–989. https://doi.org/10.1016/j.jclepro.2017.12.010

Manewa, A., Siriwardena, M., Ross, A., & Madanayake, U. (2016). Adaptable buildings for sustainable built environment. Built Environment Project and Asset Management, 6(2). https://doi.org/10.1108/bepam-10-2014-0053

10.1 LITERATURE LIST

Marquit, A. (2013, December). From Sears & Roebuck to Skyscrapers: A history of prefabricated and modular housing. NYC Buildings.

Mens, N. (2020). Waardering en stedelijke vernieuwing van de Westelijke Tuinsteden in Amsterdam. Bulletin KNOB, 19–37. https://doi.org/10.7480/knob.119.2020.3.689

Nio, I., Bekkering, H., Berkelbach, C., Michel, H., & Vrolijk, D. (2004). De tweede impuls: vernieuwing van de Westelijke tuinsteden. Tijdschrift voor de volkshuisvesting: 2004/5 supplement. Bijlage van Stedebouw & Ruimtelijke ordening: 2004/4.

Nio, I., Reijndorp, A., & Veldhuis, W. N. (2008). Atlas westelijke tuinsteden Amsterdam: de geplande en de geleefde stad. Trancity / EFL Stichting.

Plegt-Vos. (2023, June 8). Transformatie kantoor levert Zwolle 88 woningen op. https://www.plegt-vos.nl/verhalen/transformatie-kantoor-levert-zwolle-88-woningen-op/

Renovatietotaal (2022, December). Prefab oplossingen voor uw technische vraagstuk. RenovatieTotaal. Nr 7.

RenovatieTotaal. (2023, June). Opgehoogde galerijen Wiltonflats worden echte ontmoetingsplaats. Renovatiekrant. Nr 4.

Rijksdienst voor Cultureel Erfgoed. (2016). Wederopbouw, een kansrijke erfenis. Ministerie van Onderwijs, Cultuur en Wetenschap. Rijksdienst voor Cultureel erfgoed, 2016.

Sabaté, J., & Galindo, J. (2000). De kwaliteiten van de Westelijke Tuinsteden. Amsterdamse Raad voor de Stadsontwikkeling.

Séveno, V. (2023, July 12). The Netherlands short 390.000 homes in 2023. IamExpat. https://www.iamexpat.nl/housing/real-estate-news/netherlands-short-390000-homes-2023

Schmidt, R., Eguchi, T., Austin, S., Gibb, A. (2010). What is the meaning of adaptability in the building industry? Loughborough University. United Kingdom.

Space&Matter. (n.d.). JFK Smartlofts. https://www.spaceandmatter.nl/work/jfk-smartlofts

Staib, G., Dörrhöfer, A., & Rosenthal, M. (2008). Components and systems. Modular construction design – structure new technologies. In De Gruyter eBooks. https://doi.org/10.11129/detail.9783034615662 Van Eesteren Museum. (2017, March 19). Westelijke Tuinsteden. Van Eesteren Museum. https://vaneesterenmuseum.nl/nl/de-tuinsteden/westelijke-tuinsteden-2/

Triple Solar. (2023, September 7). 5 optopwoningen bovenop bestaand flatgebouw Heiligharn. Triple Solar BV. https://triplesolar.eu/project/5-optopwoningen-bovenop-bestaand-flatgebouw-heiligharn/

Van Eesteren Museum. (2022, May 23). Vernieuwing Westelijke Tuinsteden - sociale huisvesting en erfgoed. Van Eesteren Museum. https://vaneesterenmuseum.nl/nl/vernieuwing-westelijke-tuinsteden-sociale-huisvesting-en-erfgoed/

Vashti, M., (2021). Finding Common Grounds – Adapting Heritage Meaning in the Renewal of Socially Diverse Couperusbuurt. Delft University of Technology.

Vlaenderen, B. (2011, January) Transformatie portiekflats. SEV onderzoek. BAVAVLA Architecten.

Weijer, H. (2019, September). Duurzame renovatie van woningen kan sneller en goedkoper met prefab. RenovatieTotaal. Nr 5.

Weijer, H. (2021, December). Energieleverende hoogbouwflat in Utrecht dankzij prefab gevel. RenovatieTotaal. Nr 7.

10.1 LITERATURE LIST

Weijer, H. (2022a, June). Optoppen als redding voor de woningnood. RenovatieTotaal. Nr 3.

Weijer, H. (2022b, December). 'IFD 2.0 hard nodig voor renovatie van 1000 woningen per dat tot 2050'. Renovatiekrant. Nr 7.

Weijer, H. (2022c, December).'Prefab moet altijd ten dienste zijn van ontzorging in een project'. Renovatiekrant. Nr 7.

Woutersen, B. (2022, September). Circulaire renovatie op Schiphol Trade Park geeft gebouw iets extra's. RenovatieTotaal. Nr 5.

Yegenoglu, H., Droog, M., Bolier, D., Vullings, N., Supèr, M., Goossens, L., Rohaan, G., Van Der Ham, M., Gielleit, T., & Avdic, M. (2008). Westelijke Tuinsteden: Breukvlakken - Urbane woontypologiën in de Westelijke Tuinsteden, Amsterdam. TU Delft.

Yilmaz, T. (2022, May 6). Een nieuw verhaal voor de Flierbosdreef. Stedenbouw. https://www.stedenbouw.nl/artikel/een-nieuw-verhaal-voor-de-flierbosdreef/

Zijdekwartier. (2023, November 21). Zijdekwartier Architecten. 1912 Wiltonflats Schiedam / Renovatie 117 Woningen. https://zijdekwartier.nl/1912-renovatie-wiltonflats/

10.2 FIGURE LIST

0.1 Porch flats in Amsterdam Nieuw-West (1960). Stadsarchief Amsterdam.

0.2 Aerial picture Osdorp (1973, April). Luchtfoto Osdorp-Midden. Flats Saaftingestraat. Stadsarchief Amsterdam.

1.1 Porch flats in Osdorp (n.d.). Viveportenstraat Osdorp. Stadsarchief Amsterdam.

1.2 Algemeen Uitbreidingsplan (1935). Algemeen Uitbreidingsplan van Amsterdam. Stadsarchief Amsterdam.

1.3 Ebenezer Howard, Garden City model, 1898. ResearchGate. https://www.researchgate.net/figure/Ebenezer-Howard-Garden-City-model-1898_fig1_307138728

1.4 Amsterdam Nieuw-West (2023). Illustrated by author.

1.5 Porch flats in Slotermeer (n.d.). Burgemeester Fockstraat slotermeer Stadsarchief Amsterdam.

2.1 Housing protest. (2021, September 12). HLN. https://www.hln.be/buitenland/steeds- moeilijker-om-woning-te-vinden-protest-in-nederland-tegen-ernstige-wooncrisis_a380d0d1/

2.2 Linear to circular economy (2023). Illustrated by author, based on Kenniskaarten. A circular economy differs from a linear economy, but how? (2021, March 16) Kenniskaarten - Het Groene Brein. https://kenniskaarten.hetgroenebrein.nl/en/knowledge-map-circular-economy/how-is-a-circular-economy-different-from-a-linear-economy/

2.3 Satisfaction of inhabitanst with city district (scale 1-10) (2021). Gemeente Amsterdam. Wonen in Amsterdam 2021 Leefbaarheid. Gemeente Amsterdam. Amsterdamse Federatie van Woningcorporaties.

2.4 Vibrant plinth Amsterdam Nieuw-West (1971). Behang Centrum West 'De Houtban.' Stadsarchief Amsterdam.

2.5 Children playing in Osdorp (n.d.). Het winkelcentrum Osdorp met een beeldengroep en fontein naar het ontwerp van Bolhuis Stadsarchief Amsterdam.

2.6 Problem statement (2023). Illustrated by author.

3.1 Sloterplas (2023). Own image.

3.2 Diagram of research design (2023). Illustrated by author.

3.3 Small harbour at Sloterplas (2023). Own image.

3.4 Research aim (2023). Illustrated by author.

3.5 Impression Amsterdam Nieuw-West (2023). Own image.

4.1 Theoretical framework (2023). Illustrated by author.

4.2 Impression Amsterdam Nieuw-West (2023). Own image.

4.3 Methodological framework (2023). Illustrated by author.

5.1 Aerial photo urban plan (1962). Luchtfoto van de Sloterplas en omgeving gezien in noordoostelijke richting. Stadsarchief Amsterdam.

5.2 Aerial photo Slotermeer Noordoost (1980). Stadsarchief Amsterdam.

5.3 Wijkgedachte. (n.d.). https://berg.hotglue.me/

5.4 Hierarchical structure (2023). Illustrated by author, based on Nio, I., Reijndorp, A., & Veldhuis, W. N. (2008). Atlas westelijke tuinsteden Amsterdam: de geplande en de geleefde stad. Trancity / EFL Stichting.

5.5 Structure of Nieuw-West (2023). Illustrated by author, based on Feddes, Y., (2012). Het groene kapitaal van tuinsteden. AGORA Magazine 28(2), 14-16. https://doi.org/10.21825/agora.v28i2.2212

5.6 Green structure (2023). Illustrated by author, based on Feddes, Y., (2012). Het groene

10.2 FIGURE LIST

kapitaal van tuinsteden. AGORA Magazine 28(2), 14-16. https://doi.org/10.21825/agora.v28i2.2212

5.7 Public functions (1964). Tussen Meer 57 t/m 63. Stadsarchief Amsterdam.

5.8 Values on the scale of the urban plan (2023). Illustrated by author.

5.9 Construction site Nieuw-West (1955). Geuzenveld deel L, N. Swaager. Stadsarchief Amsterdam.

5.10 Renovation of a porch flat in Osdorp (2004). Gestripte portiekflat in het Zuidwestkwadrant van Osdorp. Stadsarchief Amsterdam.

5.11 Typology of the porch flat (2023). Illustrated by author.

5.12 Closed character, Rinkerstraat (n.d.). Top Rinckerstraat. Stadsarchief Amsterdam.

5.13 Closed character, Johan Jongkindstraat (2023). Own image.

5.14 'Wisselkamer' principle (2023. Illustrated by author.

5.15 Values on the scale of the building (2023). Illustrated by author.

5.16 Interior living room Slotermeer (n.d.). Stadsarchief Amsterdam.

5.17 Interior living room Slotermeer (1954). Stadsarchief Amsterdam.

5.18 Residents in Osdorp (2007). Vrouwen bekijken elkaars inkopen op de "Tussenmeer" weekmarkt in Osdorp. Stadsarchief Amsterdam.

5.19 Values on the scale of the residents (2023). Illustrated by author.

5.20 Interventions and improvements for porch flats in Amsterdam Nieuw-West (2023). Illustrated by author.

6.1 Background data Johan Jongkindstraat. (2023). Illustrated by author. Picture derived from Google Maps.

6.2 Building elements Johan Jongkindstraat (2023). Illustrated by author.

6.3 Surrounding elements Johan Jongkindstraat (2023). Illustrated by author.

6.4 Background data Isaak Gosseshof (2023). Illustrated by author. Picture derived from Google Maps.

6.5 Building elements Isaak Gosseshof (2023). Illustrated by author.

6.6 Surrounding elements Isaak Gosseshof (2023). Illustrated by author.

6.7 Transformation potential of Nieuw-West porch flats (2023). Illustrated by author.

6.8 Assessment framework reference projects (2023). Illustrated by author, based on Brinksma, H. (2017). Toekomstbestendig renoveren. A+BE: Architecture and the Built Environment. https://doi.org/10.59490/abe.2017.13.1856

6.9 Matrix of the reference projects (2023). Illustrated by author.

6.10 Available information per reference projects (2023). Illustrated by author.

7.1 List with preservation strategies (2024). Illustrated by author.

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7.3 List with adaptability strategies when applying design guidelines (2024). Illustrated by author.

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9.1 Urban diagram with interventions (2024). Illustrated by author.

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9.3 Facades of the design (2024). Illustrated by author.

9.4 Key aspects of the design (2024). Illustrated by author.