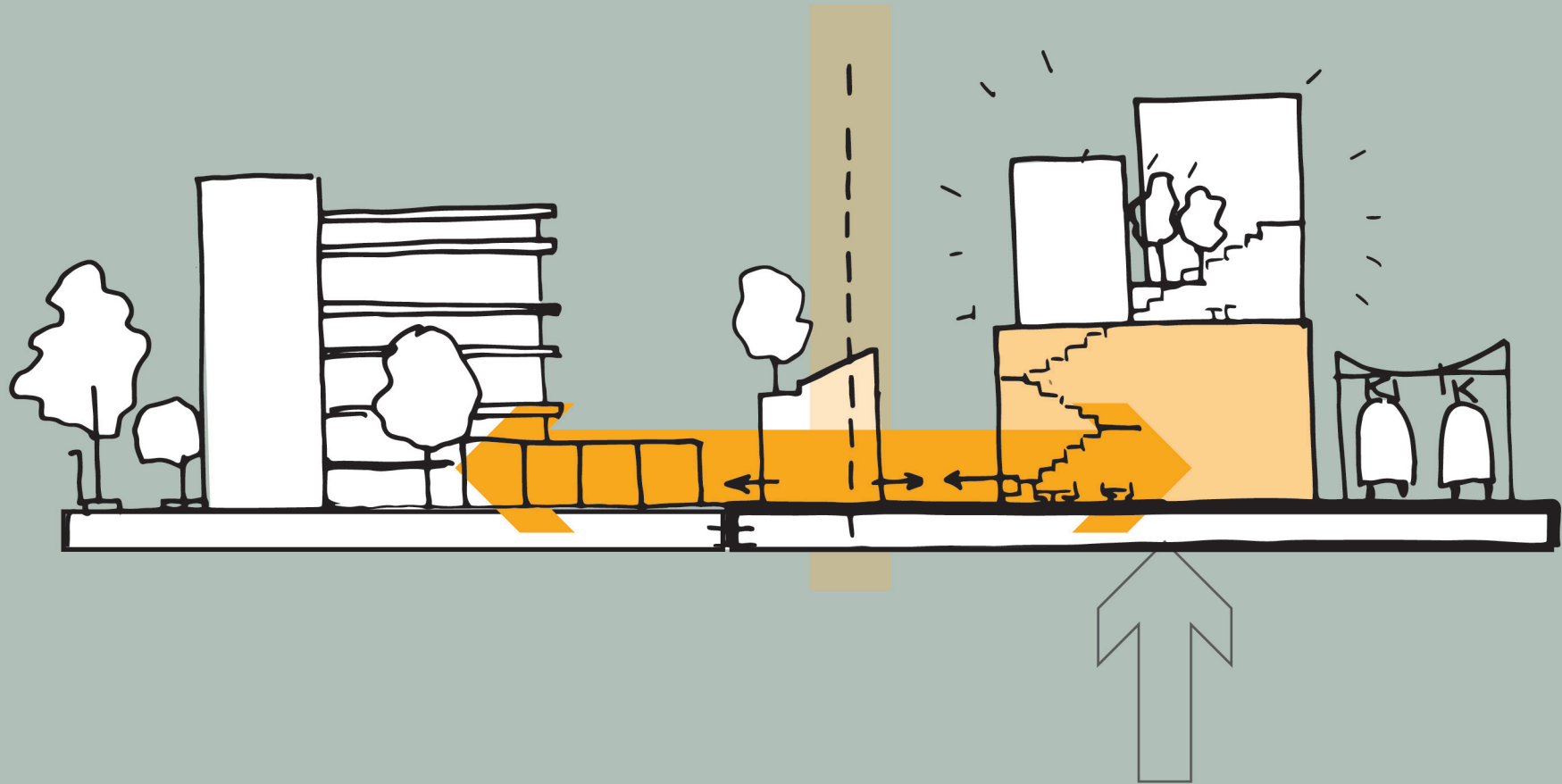


INCLUSIVE STATION DEVELOPMENT

Achieving post-war neighbourhood renewal by creating station areas of the future



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Table of Content

Introduction	p. 5
Research question/methodology/reading guide	p. 18
Transit-Oriented development	p. 19
Inequality and segregation	p. 27
Historic analysis of Delft	p. 36
Quality of Voorhof	p. 47
Theoretical framework & spatial analysis	p. 53
Residents interviews	p. 79
Design strategy	p. 87
Bibliography	p. 99

Introduction

Introducing the case, the problems statement and research questions

Introduction

In recent years the redevelopment of railway station areas has had an important role in urban planning and governmental politics. Transit-Oriented Development (TOD) is a spatial planning strategy that has the aim to increase agglomerative qualities and facilitate sustainable development by improving the attractiveness and accessibility of stations. In Europe TOD uses the public transport system as the backbone and driver of urban development. It can be summarised as a regional network of living environments centred around high-quality public transport hubs (Carlton, 2007).

Research and governmental reports have stressed the importance and relevance of TOD planning as it corresponds with the poly centric structure of the Randstad and other economic centres of the Netherlands. Figure 1.1 and Figure 1.2 are examples of governmental and policy document on TOD in the Netherlands. It is, therefore, no coincidence that the BNA (the Royal Institute of Dutch Architects) has selected four station areas in their research project 'Stad van de Toekomst'. They see station areas as the places in which we can combine intensification of the existing urban fabric while linking it to energy transition, changing mobility systems and a transition towards a circular economy ("BNA Onderzoek - Stad van de toekomst," 2018). For these goals, station areas are well suited because they offer existing and sustainable transport options that often fit the needs and desires of starters and higher educated residents, the target groups of municipalities and developers (Dijkstra & Emmerik, 2015).

Recently the focus of the Dutch national government, province and municipalities has shifted towards the suburban stations because the area around them has become one of the vital locations for the expected densification of existing cities (Stedenbaan, 2016). This focus may appear strange, as these stations are often regarded as less complex compared to larger stations, it may seem these areas don't need extensive integrated planning to develop them. In reality, however, while some aspects are less complicated, other areas such as

socio-economic aspects are a greater issue. Smaller suburban stations are often located in disadvantaged neighbourhoods with lower quality of life and residents with less socio-economic prospects ("Leefbaarometer Kaart," 2016). Another aspects that can create complex situations around suburban stations is the different types of work that are located in the area. Densifying in an area with manufacturing industries or other industrial companies creates a tension between the stakeholders.

Figure 1.1 Cover of research report 'Knooppunt ontwikkeling in Nederland' by Platform 31 (Tan, Koster, & Hoogerbrugge, 2013).

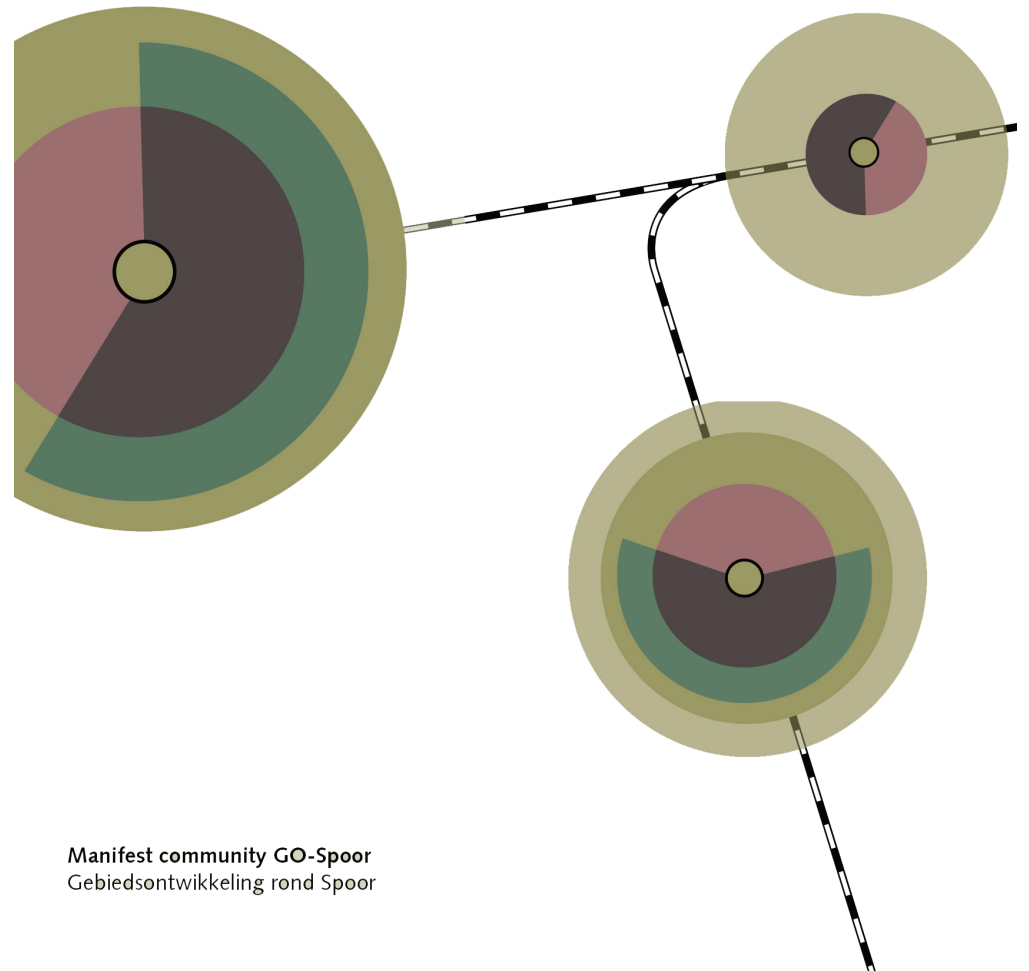
Figure 1.2 Cover of 'Manifest voor Spoor en Stad' by De Community of Research and Practice GO-Spoor (Modder & van Uum, 2015).

Knooppunt-ontwikkeling in Nederland

PLATFORM31

(Hoe) moeten we Transit-Oriented Development implementeren?

Manifest voor spoor en stad



Manifest community GO-Spoor
Gebiedsontwikkeling rond Spoor

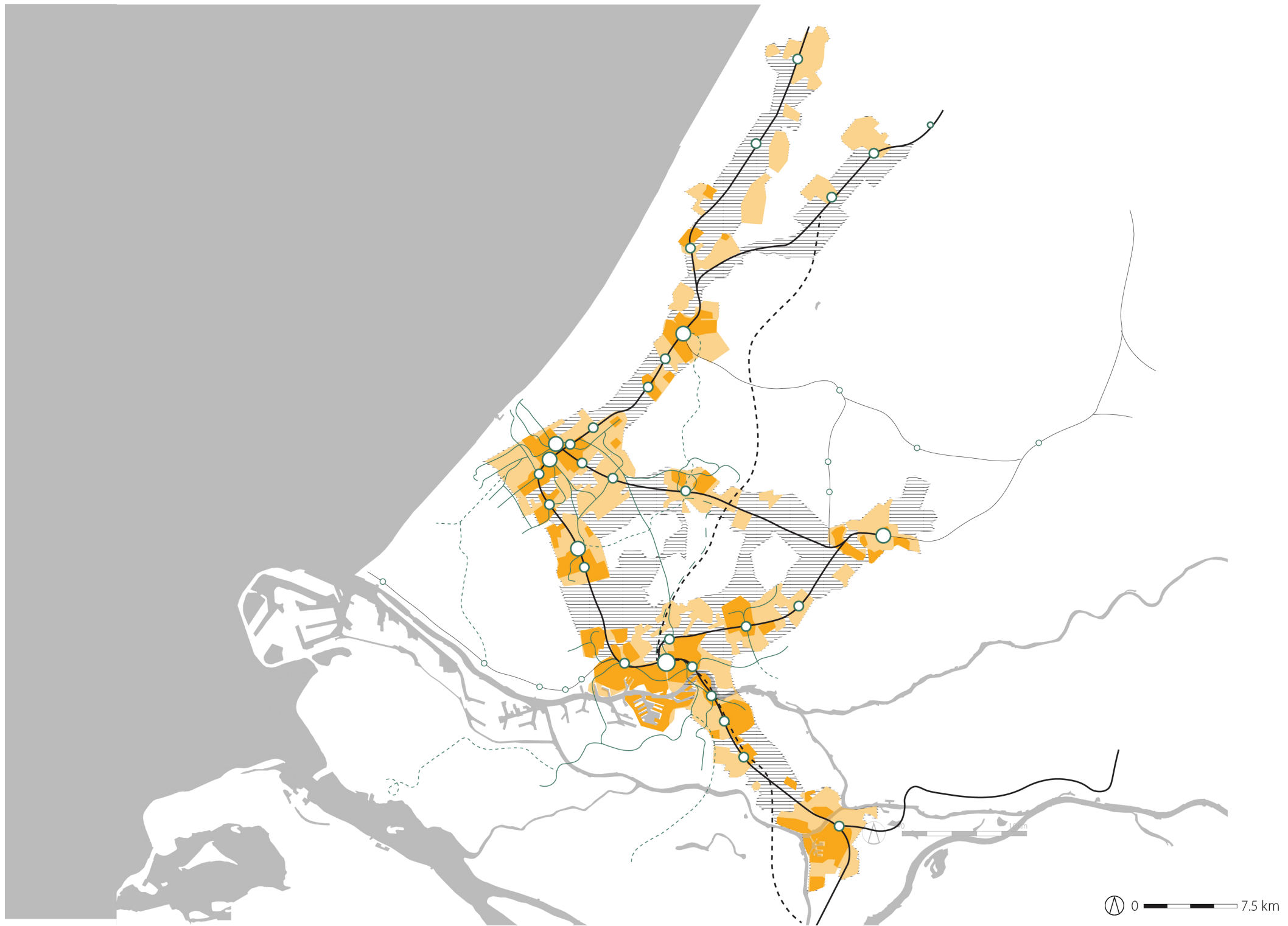
Stedenbaan

In Netherlands there are multiple projects underway that try to implement TOD strategy, in the southern part of the Randstad the project is called Stedenbaan. The program connects living, working and recreation with the aim to create an economically strong and accessible southern peripheral city. The project stimulates and develops a coherent and recognizable high-quality network of NS sprinters, buses, trams, light rail and subways for public transport. The NS sprinters that will ride 6 times per hour in the future serve as the backbone of the development. The project is a collaboration between Province Zuid-Holland, Municipality Rotterdam, Municipality Den Haag, Metropolitan region Rotterdam-Den Haag, region Holland-Rijnland, region Midden-Holland, region Drechtsteden, NS and ProRail. The nine partners have agreed on the on the programming of housing and office space near the stations and stops of the public transport network.

Figure 1.3 depicts the Stedenbaan project, clearly showing the focus areas of the project. The project connects the cities, from Leiden to Dordrecht, by improving the attractiveness and accessibility of the stations and increasing the frequencies of buses, trams, light-rail and trains.

Figure 1.3 The Stedenbaan project; a project to increase the agglomerative qualities and sustainable development by increasing the accessibility and attractiveness of station areas. The projects is based on a connection between Dordrecht and Leiden. (Monitor Stedenbaan 2016. Retrieved from http://www.zuidelijkerandstad.nl/sites/www.zuidvleugel.nl/files/documenten/monitor_2014_web_hr.pdf) (Self illustration)

- City areas with potential to develop
- Cities within Stedenbaan
- Green areas to preserve
- Stations
- Railway included in Stedenbaan
- Railway
- HST Railway
- Light rail, tram and metro
- HOV bus connection



Projects such as Stedenbaan depend on the performance of the big stations but also relay on the performance and development of the small stations. Focus has shifted to these station because they have more open space which have become vital locations for the densification of existing cities (Stedenbaan, 2016). This focus may appear strange, as these stations are often regarded as less complex compared to larger stations, but as mentioned in the previous paragraph some elements are more complex.

The Stedenbaan projects is based on improving the attractiveness, accessibility and increasing the amount of housing and office spaces in the areas around the stations. But along the backbone of this project a lot the stations are located in disadvantaged neighbourhoods with lower quality of life and residents with less socio-economic prospects (“Leefbaarometer Kaart,” 2016), see Figure 1.4.

While in last few years attention for station redevelopment has increased, see figure Figure 1.1 and Figure 1.2 for an example of policy documents, the attention for neighbourhood renewal has came to a standstill. As of 2012 most of the governmental funding for neighbourhood renewal has been stopped. As a result, many neighbourhood facilities were closed, while unemployment, poverty and debt problems increased (Dorigo, Leidelmeijer, & Zeelenberg, 2017). Figure 1.5 shows the development of the liveability (quality of life) of focus neighbourhoods in the Netherlands.

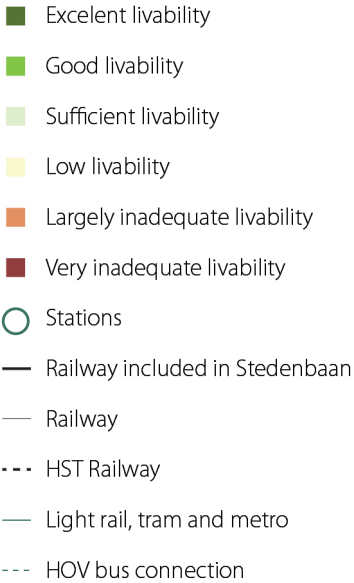
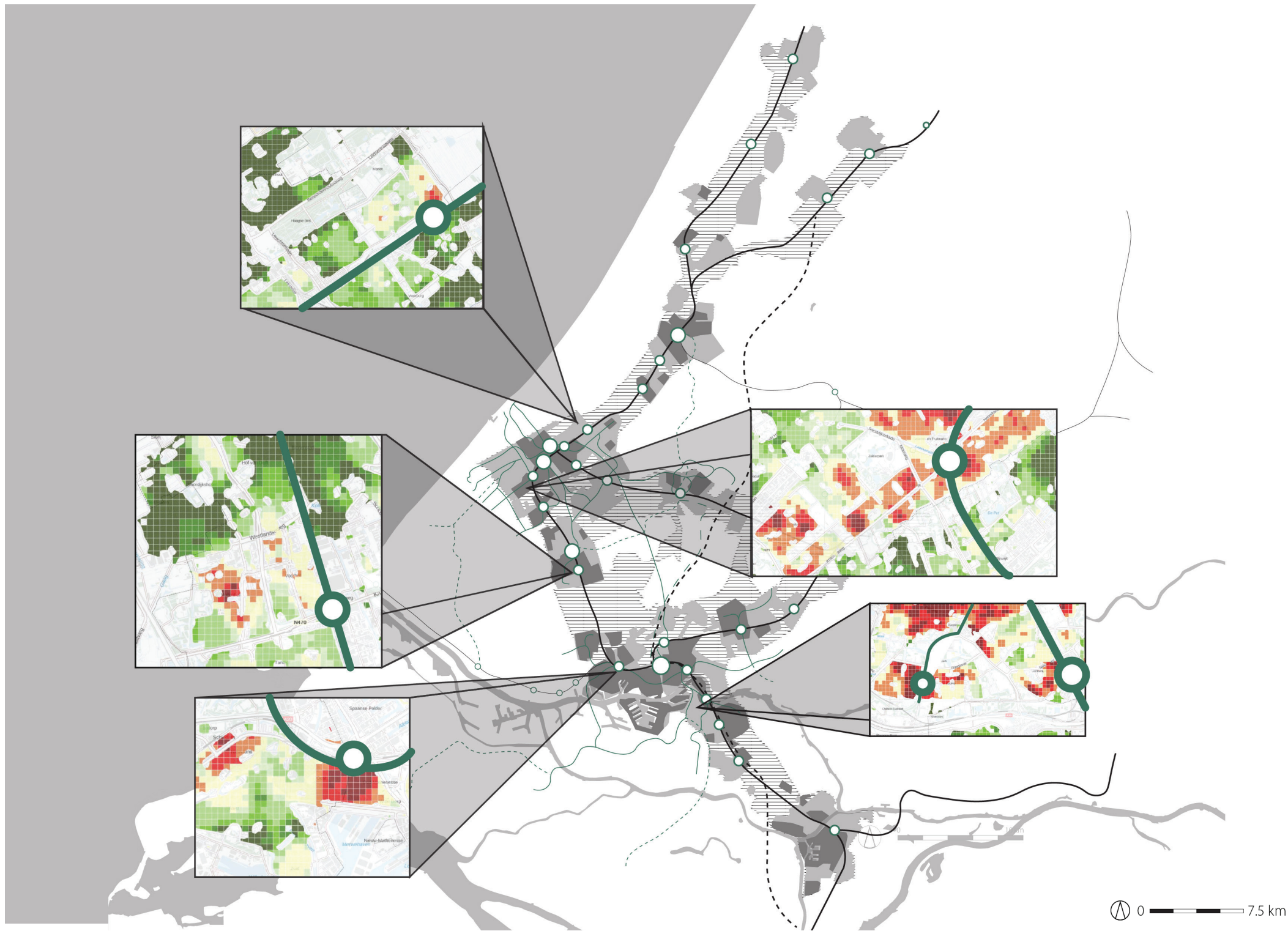


Figure 1.4 Disadvantaged neighbourhoods along the Stedenbaan project. (Self illustration)

Leefbaarometer Kaart. (2016). Retrieved January 3, 2019, from <https://www.leefbaarometer.nl/kaart/#kaart>



Research by M. Dorigo et al. (2017) shows that the progress of neighbourhood renewal projects such as the project “De 40 wijken van Vogelaar”, a project that provided investment into the “forty most deprived” neighbourhoods of the country to counter the accumulation of social, physical and economic problems, was nullified by the end of funding in 2012. After 2012 the quality of the physical environment and the liveability of the deprived neighbourhoods deteriorated while the Dutch average neighbourhood still improved.

The development of the station areas clashes with the deterioration of the neighbouring deprived neighbourhoods. The station areas developments are favoured with stakeholders with investment opportunities and/or major interests, such as the NS, Prorail and private developers while deprived neighbourhoods are most often not. The new developments are targeting high educated residents with many socio-economic opportunities while deprived neighbourhoods have a higher concentration of poverty, and residents with little socio-economic opportunities. The new developments will be completely circular and sustainable while the old buildings are deteriorating and are the opposite of energy neutral. This clash between the existing neighbourhood and the new developments create an emphasis on the inequality between the residents of the disadvantaged neighbourhood and the residents of the new station area development, see Figure 1.6.

The goal of this research booklet is to formulate a strategy that uses the momentum of the station development to improve the liveability, and with that reduce the inequality, in the deprived neighbourhoods.

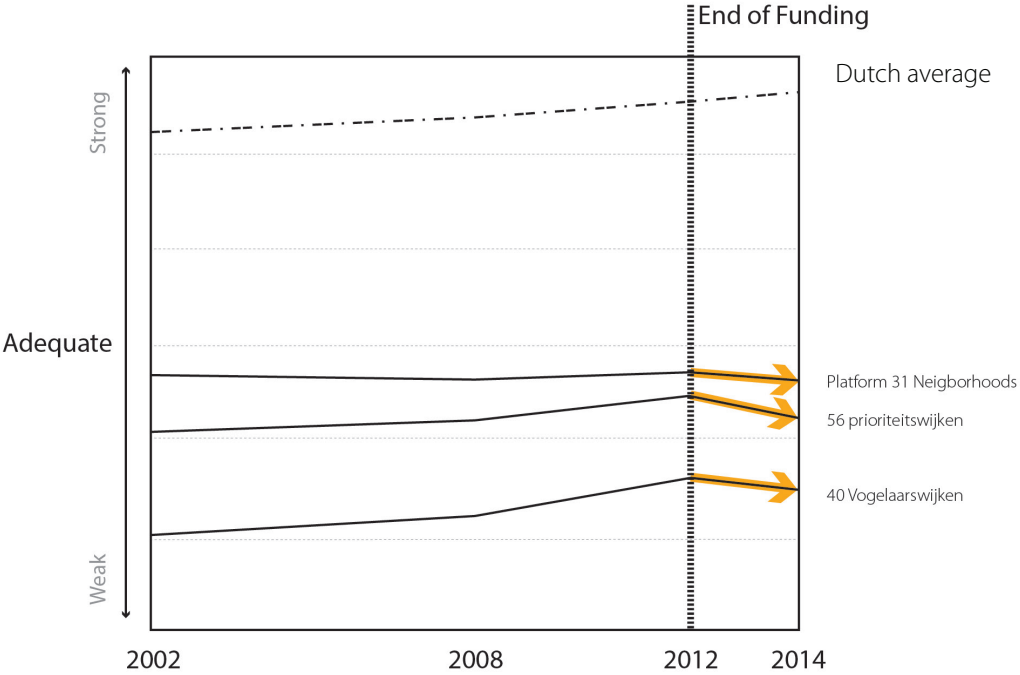


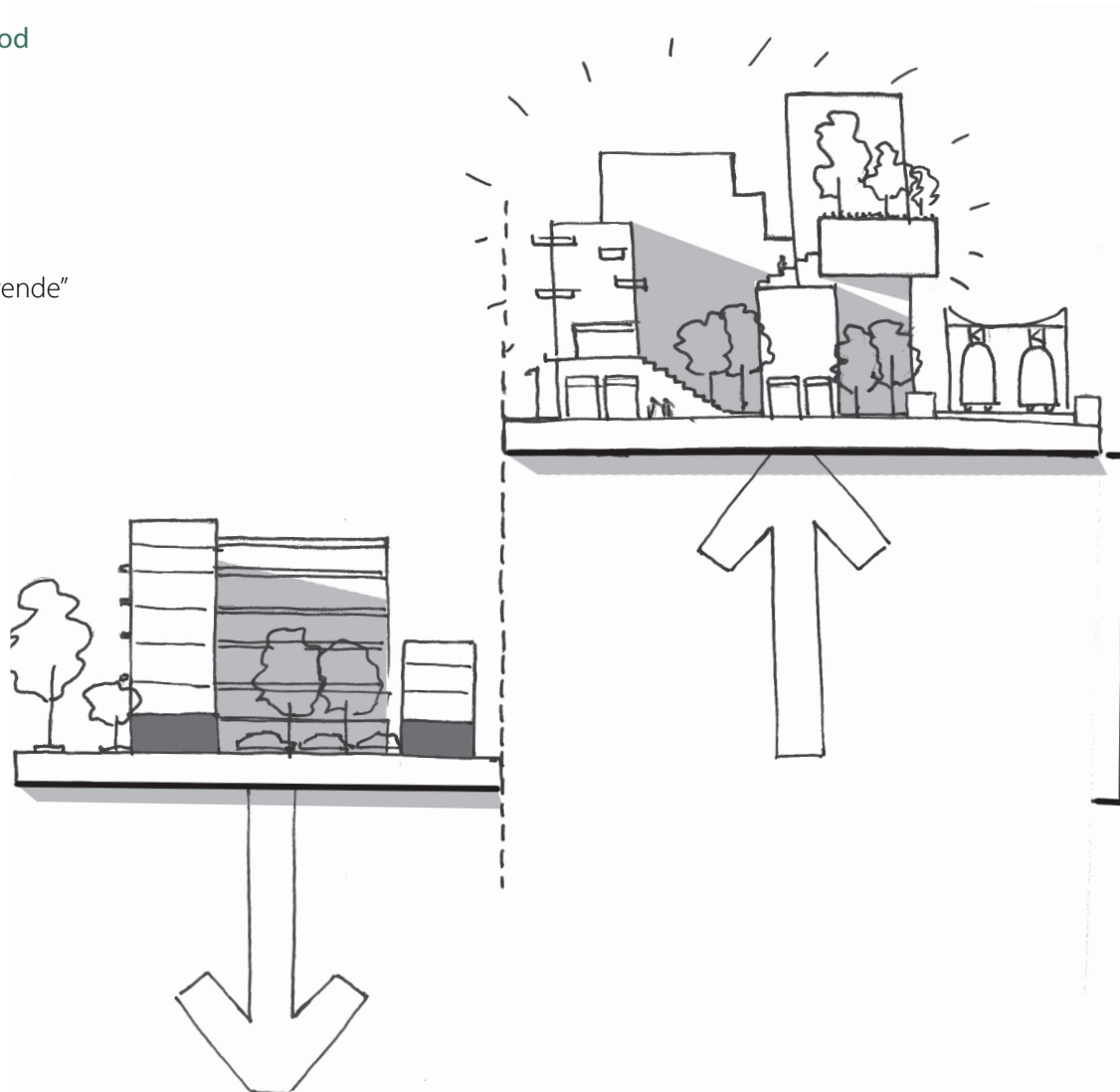
Figure 1.5 Dorigo, M., Leidelmeijer, K., & Zeelenberg, S. (2017). Ontwikkeling van de leefbaarheid in de (voormalige) aandachtswijken. Den Haag.

Figure 1.6 Illustration of the problem statement. (own illustration)

Problem statement

Decline of post war neighbourhood

Concentration of Poverty
Singular typologies
Little investment opportunities
Higher concentration "hulpbehoevende"



Transit-oriented development goals

Circular building method
Sustainable energy
Diverse typologies
Economic activity

Development of stations areas creates an emphasis on the inequality between the residents of the disadvantaged neighbourhood and the residents of the new station area development.

Case: Delft Zuid

The station Delft Zuid is chosen as case study because this area is in development. The municipality of Delft has chosen the area around the station as one of the four areas of the Delft that is going to be developed and has high ambitions for this area. The municipality of Delft has expressed the ambition to realize the station (area) of the future. With the proximity of TU Delft and The Green Village, this is the basis for further development from Delft Zuid station to Delft Campus, as the centre of a lively urban environment. Here they want to address the maximum potential of innovations from science and business.

Delft Zuid, as of December 2019 Delft Campus, is located in Southern part of the city. Together with the regional road it divides in the area into four parts. In this research the focus on one of these parts: the neighbourhood Voorhof. Compared to other neighbourhoods Voorhof is not an extremely deprived neighbourhood, see Figure 1.4. But as this thesis a architectural and urban research project, it is a very nice case study because Voorhof is a post war neighbourhood. Post war neighbourhoods have a very characteristic urban and architectural structure which has often been criticized. Which makes it very interesting to research and challenging to design for.

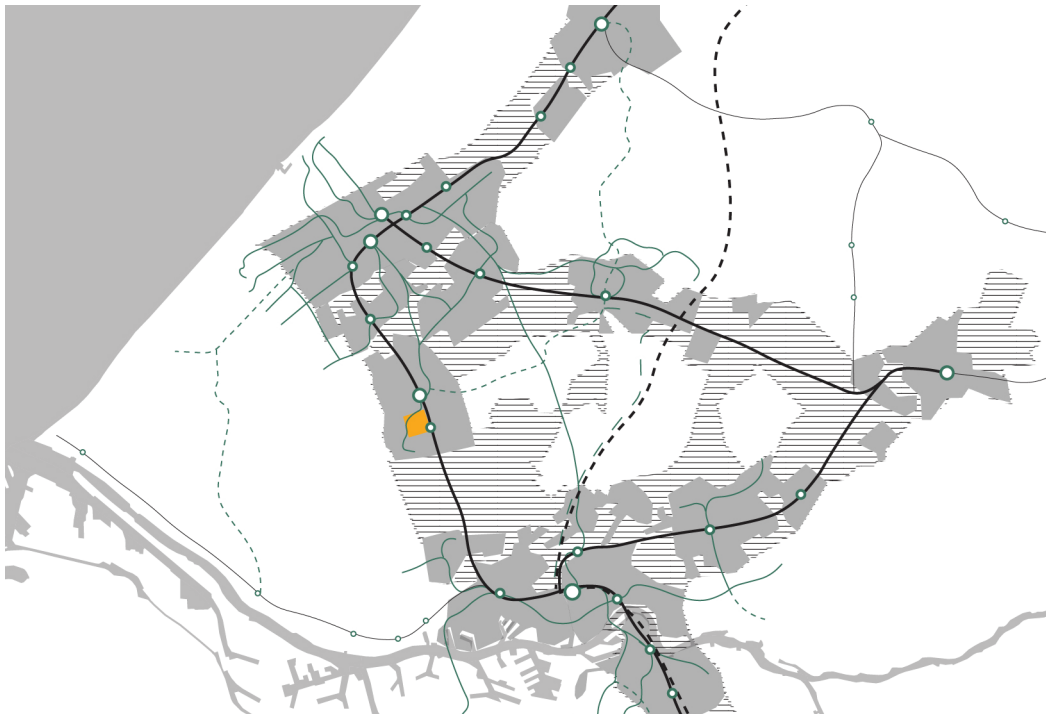
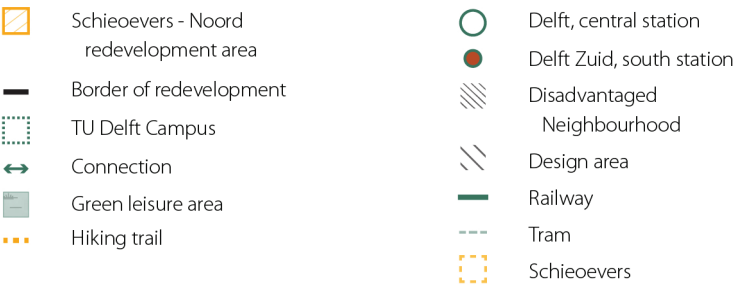
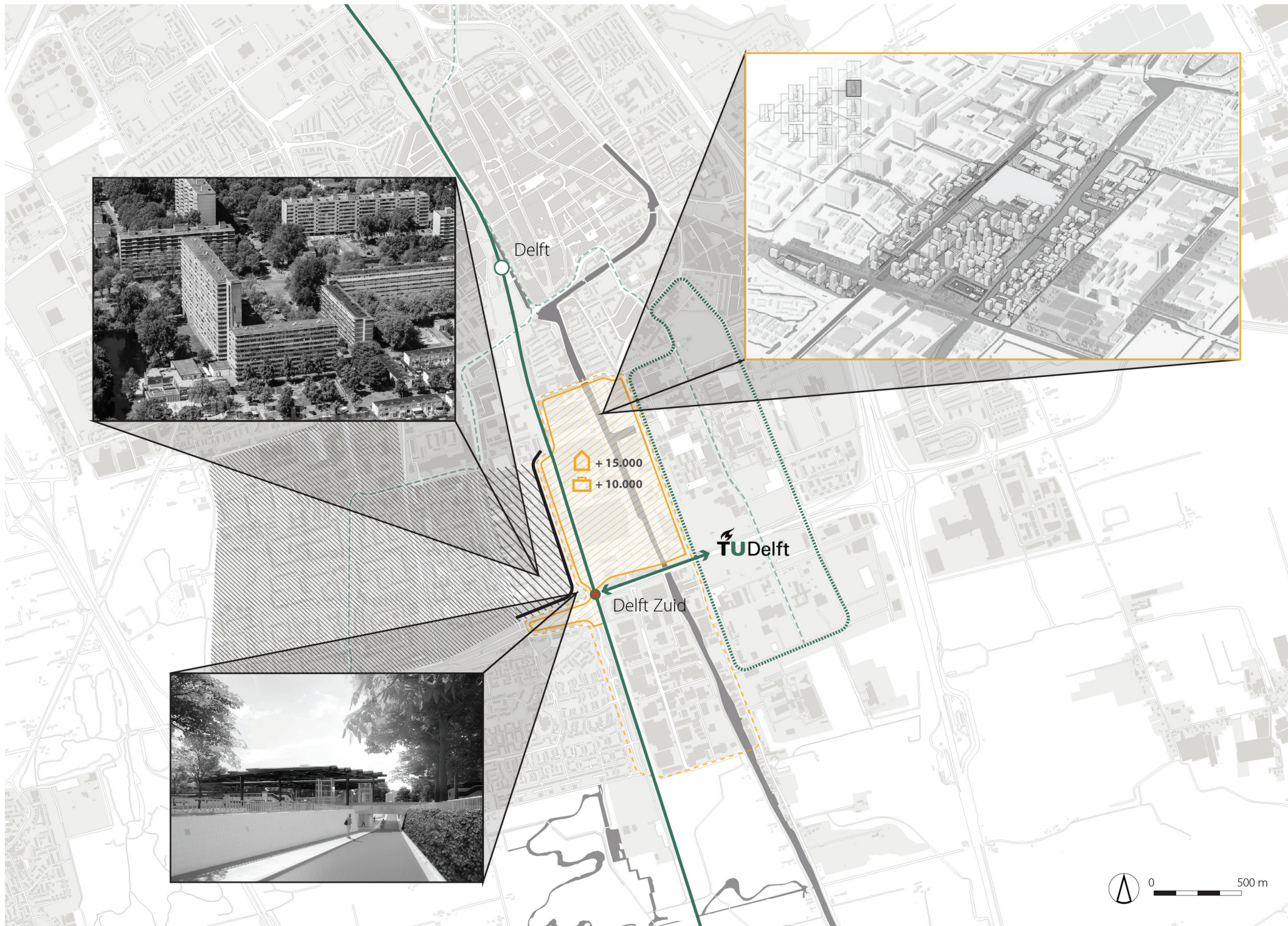


Figure 1.7 Location of Delft within the Stedenbaan project. (Own illustration). Delft in the middle of the connection between the Rotterdam and Den Haag, which is a strategically a very important location. (own illustration)

Figure 1.8 Map of the case study Delft Campus. The station is visible with the relation to the TU Delft, the Schieoever development and the Post war neighbourhood Voorhof. (own illustration)





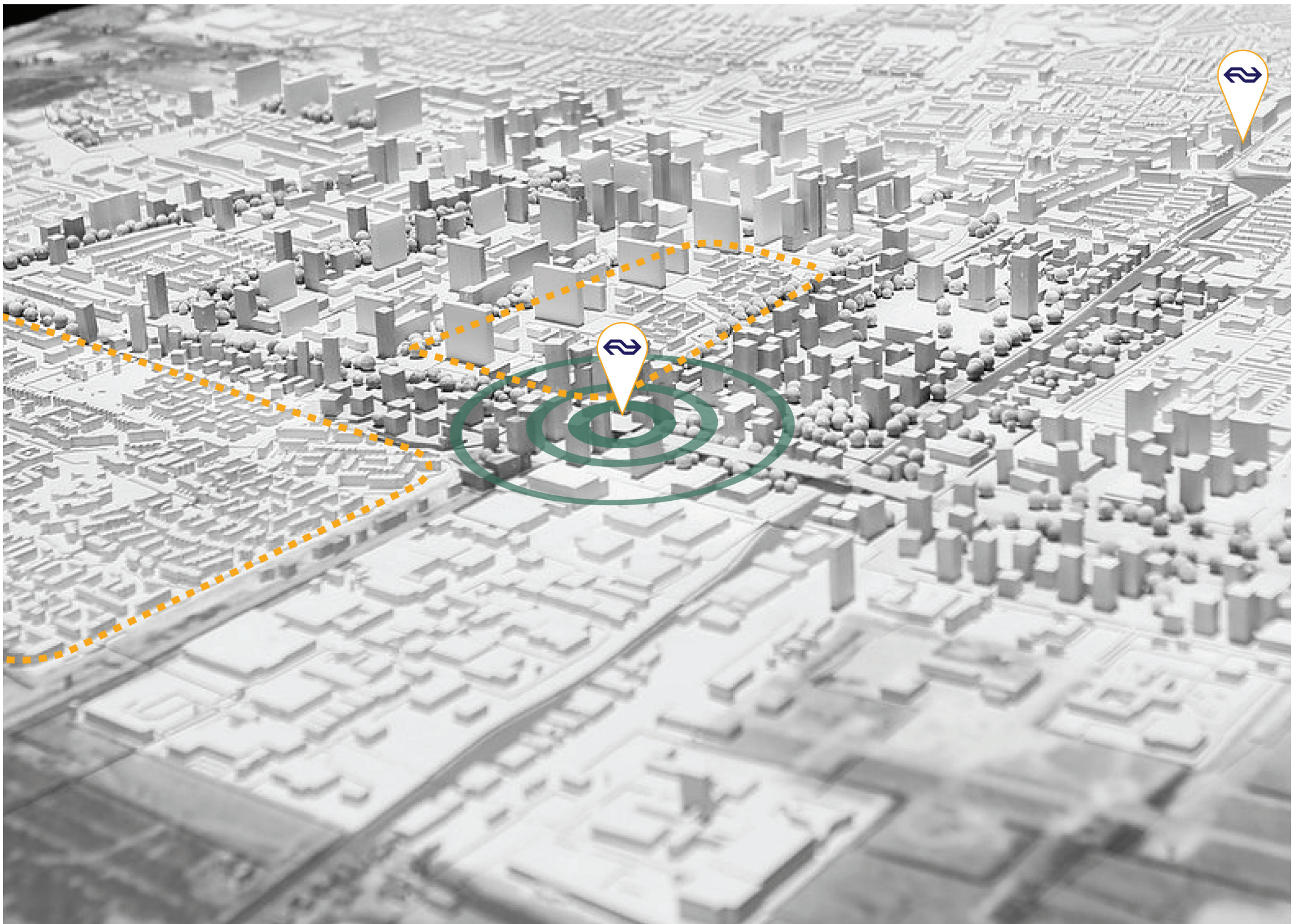
The development around Delft Zuid is in the starting phase, the first plans have been published. Besides the design of the new station, the first energy neutral station of the Netherlands, plans have been published of the new high-rise buildings around the station. Policies of the Dutch national government aim to densify the existing cities within their current border. In the case of Delft the post-war neighbourhoods offer, as one of the only neighbourhoods, sufficient unbuilt areas to facilitate densification. The expected densification surrounds the existing neighbourhoods, see Figure 1.9.

In the policies and strategies of the municipality little is said about the development of the existing neighbourhoods. These neighbourhoods are far from perfect, they have their own problems, such as the deteriorating housing stock and public space. Fifty years after their construction these post-war neighbourhoods are in need of (urban) redevelopment. The station development offers opportunities for the post-war neighbourhood to be improved. At the moment the strategy of the municipalities is lacking and missing a big opportunities.



Figure 1.9 The new high rise next to Delft Zuid/Campus station, developed by Certitudo.

Figure 1.10 Model of southern part of Delft produced by Buro Ruig (2018). Model illustrates a possible strategy for the expected densification of Delft. The municipalities expects to densify around and in the existing post-war neighbourhoods.



Research question

The main research question of this thesis defined by the of development peri-urban stations. These station were developed on the outskirts of cities, they are shaped the rapid urbanization of the past century. Over time cities have grown and the stations are no longer located at the border but are part of the inner cities. Delft Zuid is located in a post war neighbourhood, a typical station which was on the border of the city, but has now a important position in the local, region and national policies. At the same time the neighbourhood has difficulties, which are hard to improve. The research question has been formulated as follows:

‘How can spatial redevelopment of peri-urban station areas improve the quality of the adjacent post-war neighbourhoods?’

The research question leads to three sub questions:

“What is a good quality neighbourhood?”

What are the architectural and urban aspects that contribute to a lower quality of life in Voorhof?

What are the design elements that can be used to improve the neighbourhood and create a station of the future?

Methodology

The research for this thesis report is done by a combination of three methods. A literature review has been under taken to understand the history of post-war neighbourhoods, research inequality and to formulate an theoretical framework on which the answer to the questions “what is a good neighbourhood?” and “how can we improve post-war neighbourhoods” can be based. The theoretical framework is used a base for a spatial analysis, which will include multiple field trips. The conclusions of the spatial analysis will be validated by short street interviews with the current residents of the neighbourhood.

Reading guide

This strategy booklet consist of extensive background informations. It will start with an overview of Transit Oriented development, as this is the main governmental policy steering the development of small stations. This will be followed by an overview of economic inequality and the relationship between inequality and the build environment. After this the history of post-war neighbourhood Voorhof will be discussed as the history of the neighbourhood is a big influence on how it functions today. Next the current status of the neighbourhood will be discussed. After this the theoretical framework and spatial analysis will be described. Which will result in the strategy for the design intervention.

Transit Oriented Development

First of all, improving the mobility options in vulnerable neighbourhoods is always an improvement in the socio-economic prospects of people. Many necessities of life cannot function without an adequate transportation system, be it public or private, be it goods or people that travel. Mobility has become a basic condition for participation in our society and can be regarded as a form of social capital (Jones & Lucas, 2012). This paper focuses on Transit Oriented Development (TOD) not only because of the Dutch national government's interest as their strategy to optimize land use, increase human capital and facilitate sustainable urbanization of the Randstad (Dijkstra & Emmerik, 2015), the reason is also because TOD offers possibilities to improve the quality of life in disadvantaged post-war neighbourhoods.

Since the railway, with its infrastructure, viaducts and buildings, appeared in the city in the nineteenth century, it has consistently influenced the spatial development of its surroundings (Carlton, 2007; Cavallo, 2008). The momentous growth in the mobility of persons and goods, which started in the Industrial Revolution, went hand in hand with a radical transformation of the size and form of cities (Bertolini, 2017). Luca Bertolini, Professor of Urban and Regional Planning at the University of Amsterdam, describes the influence of radical change as follows: In the pre-industrial period the social dimension of the city (the city as an intense and diverse concentration of social and economic interactions, the *civitas*) and the physical dimension of the city (the city as density created by build structures, the *urbs*) are related to each other and most of the time coincided. The modern forms of transportation and communication created the possibility of dissociating the two dimensions of the city, a high concentration of social and economic interaction is no longer related to a high-density city. The social and economic interactions can increasingly happen without physical proximity. (Bertolini, 2017). Post-war neighbourhoods are an example of high dense neighbourhoods with relatively little and/or weak social and economic interaction. In post-war planning, neighbourhoods are divided into zones with different functions, the social and economic interaction is not located in the densely populated area but is reachable by modes of

modern transportation (Hereijgers & Velzen, 2001). The changing infrastructure had major influence on the social interactions in the neighbourhoods and, as discussed in the chapter on inequality, had major influence on the quality of live in these neighbourhoods.

Transit Oriented Development

It could be said that Transit Oriented Development (TOD) is merely the 1990's branding of an old concept. Looking back on urban development, the influence of (transit) infrastructure is clearly visible on the development of cities. Although it is originally an American planning tool to counter the effects of sprawl, which rarely occurs in Europe, it has been adapted to European thinking and planning. In Europe, TOD development is a strategy that is used to capitalise on the public transport system as the backbone and driver of urban development. It can be summarised as a regional network of living environments centred around high-quality public transport hubs, characterised by higher building densities, mixed functions and a walkable, human, scale (Calthorpe, 1993; Dittmar & Ohland, 2004).

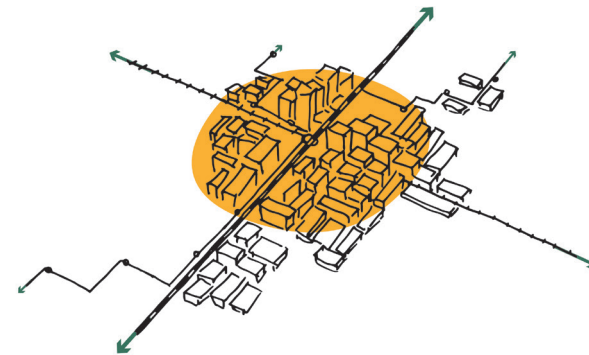
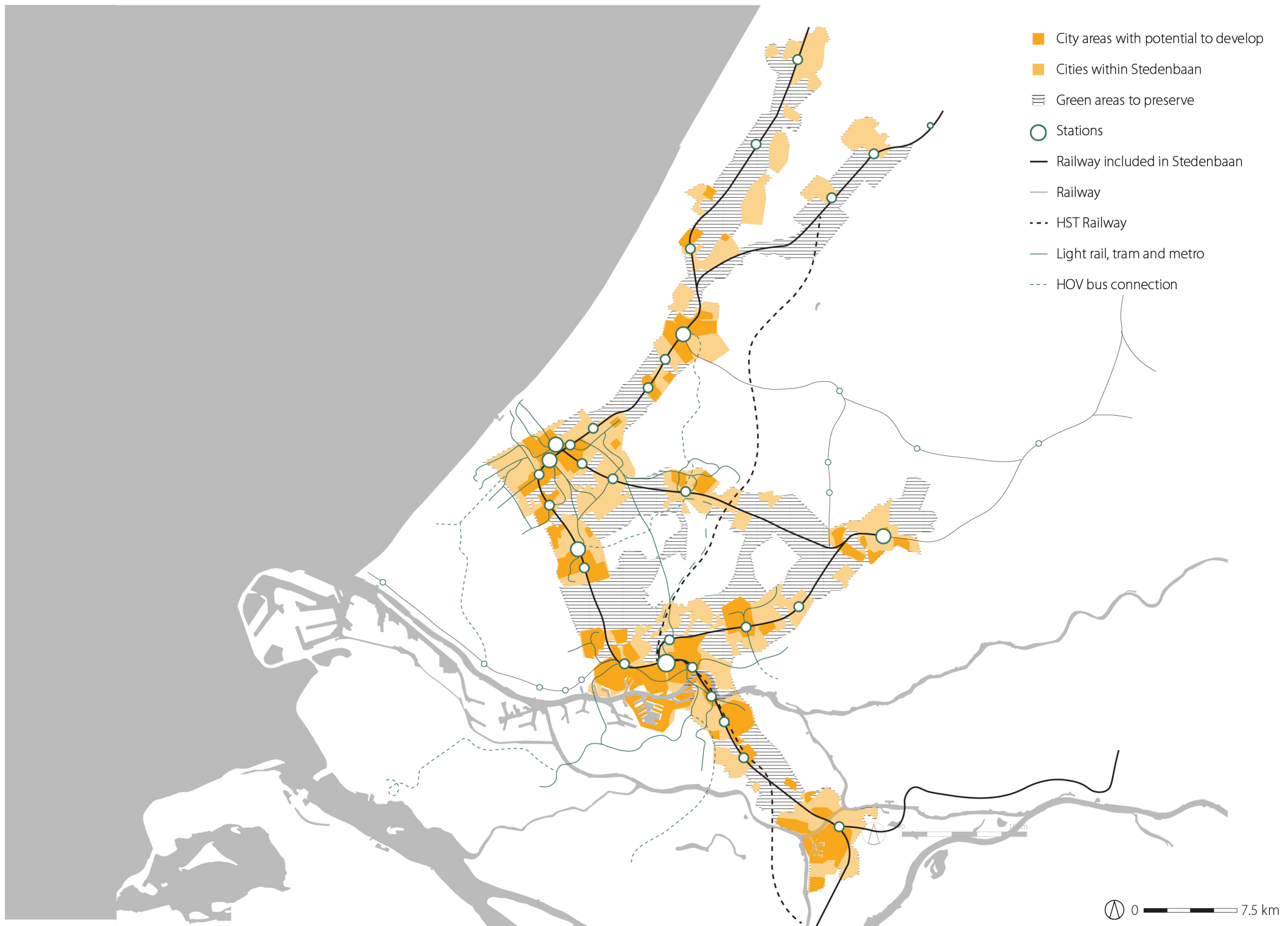


Figure 7.46 Aim of transit oriented development: high density, high quality, living and working places concentrated around infrastructure nodes. (own illustration)

Figure 7.47 Map of the Stedenbaan project, an example of transit oriented planning. (own illustration)



Undoubtedly there is an unbreakable relation between the changes in human mobility and the appearance of our cities. A town for pedestrians and horses has different physical characteristics than our contemporary city. Over centuries, European cities have developed into what they are now, strongly influenced by military, political, cultural and economic logic. For example, the traces of the water city are still apparent today in many Dutch cities, where canals once served as the main transport system. The way we move goods and people has a defining impact on the way we inscribe the territory and thus how we organize our cities and how they take their physical shape.

Railway stations have developed into key points in city development. They are the main point in which the railway and the city intersect. At this intersection different scale levels intertwine. The train station provides access to the international transport network, which is considered highly important for urban areas functioning in international economic networks. Nonetheless, the local and regional transport networks are at least as important. Most large urban or metropolitan areas nowadays are increasingly dispersed or polynuclear urban regions, characterized by intensive, rather criss-cross transport patterns that require efficient and high-capacity regional public transport networks rather. (Trip, 2007)

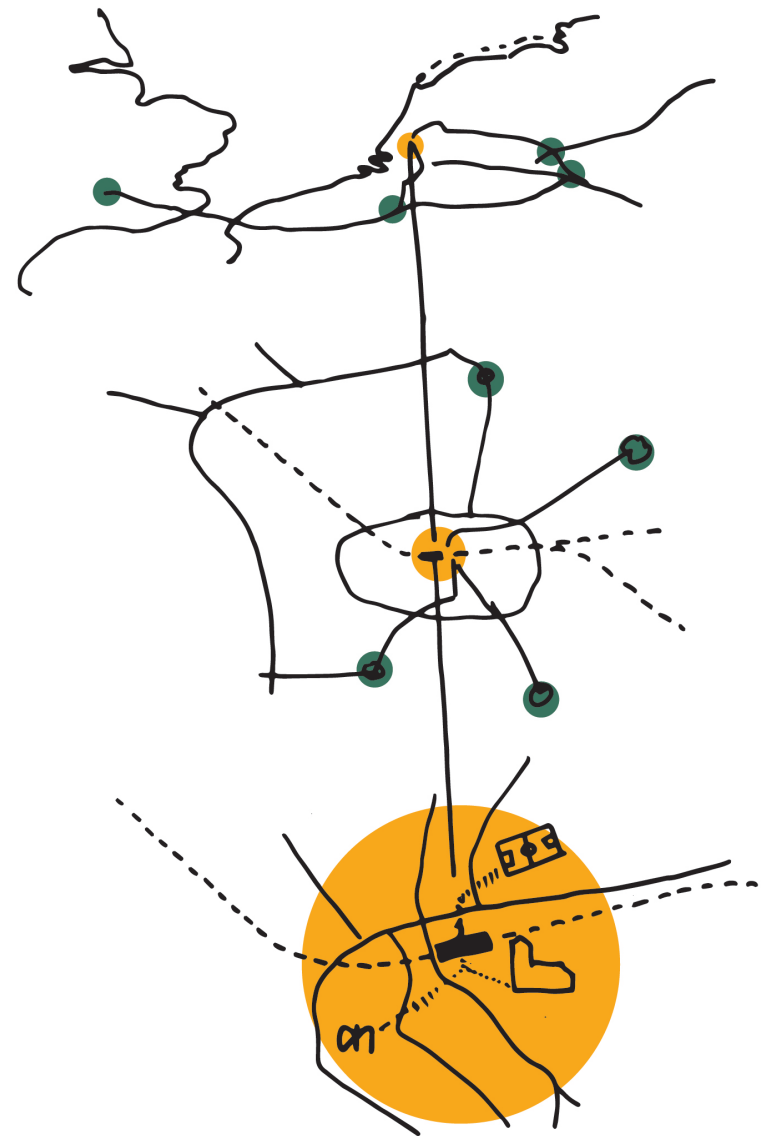


Figure 7.48 Station is intersection of networks at different scales. (own illustration)

Figure 7.49 Examples of different infrastructure and functional networks at different scales. (own illustration)

Node & Place

As the importance of mobility networks in urban areas increases the development “good” station areas becomes important. The balance between the station as a ‘Node’, a junction between different types of mobility and directions, and as a ‘Place’, the quality of the environment around the node such as liveability and attractiveness, is first described by Bertolini in ‘Nodes and places: complexities of railway station’(Bertolini, 1996). Stations have become important nodes in transport networks as well as in non-transport systems. They are the connections between ever denser, faster and further reaching mobility systems that offer transportation options to reach office complexes, shopping centres and educational institutions on a global scale. At the same time station areas functions as a ‘place’, Bertolini describes them as a place that is “both a permanently and temporarily inhabited area of the city, a dense and diverse conglomeration of uses and forms accumulated through time, that may or may not share in the life of the node. The mixture of housing, small business premises and informal public spaces of the station’s neighbourhood are an expression of this local dimension.” (Bertolini, 1996)

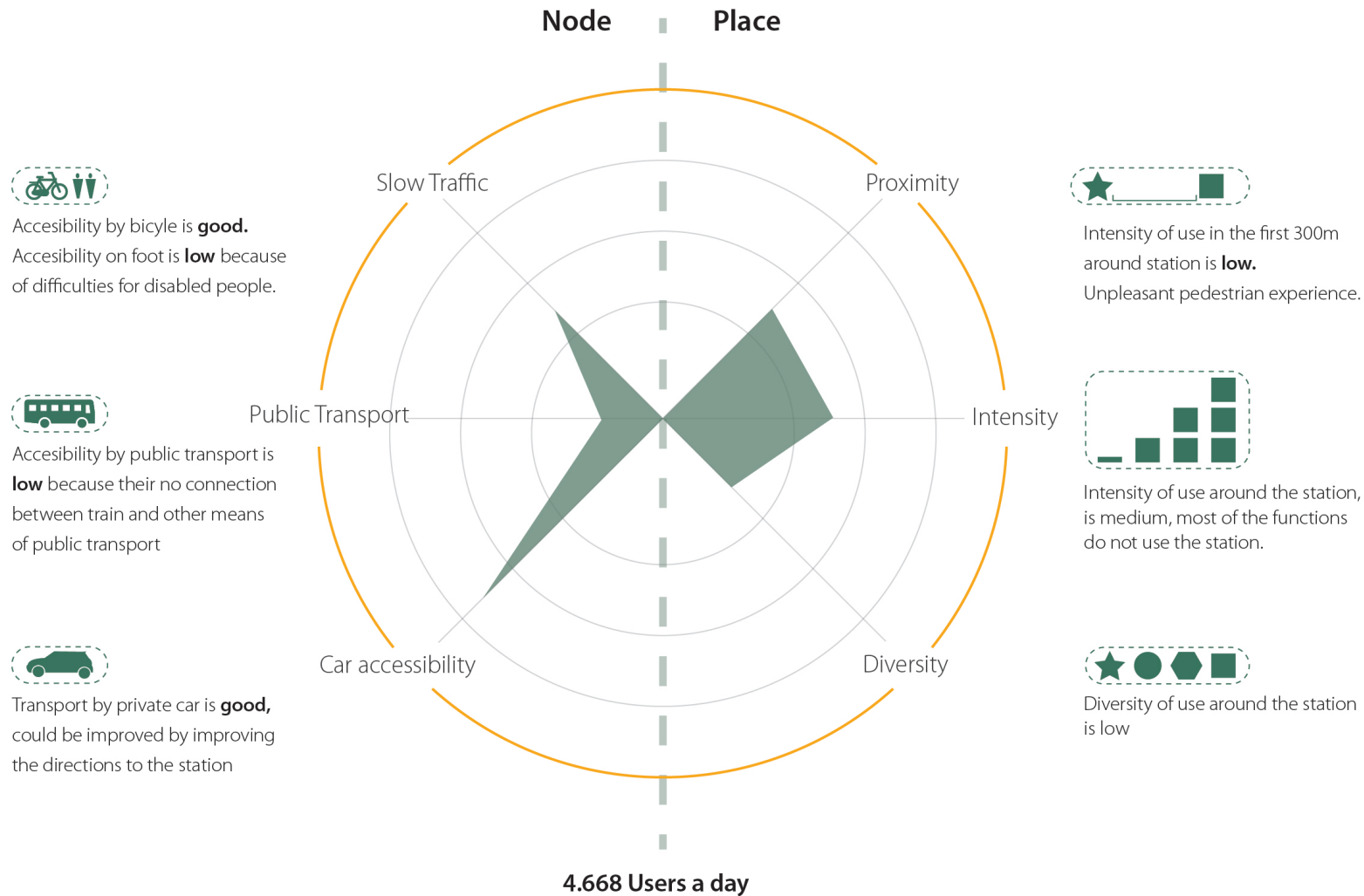
In dense areas stations acquire a new roll, they facilitate neighbourhood functions besides their mobility program. With shops, agencies, rental firms, supermarkets or day-care centres. These facilities provide travellers with a cup of coffee and at the same time provide a father on his way home with the last opportunity to do some quick grocery shopping. The mixed users require a sophisticated routing in order to connect different programs. Stations become junctions, ideal places for mixing and integration. In these areas public space will take on all sorts of forms in order to facilitate everyone, in the exterior space as well as in inside buildings. (Harteveld, 2019)

Over the years Bertolini developed the Node and Place theory into a model with criteria to

measure the Place and Node qualities of a station. Association Deltametropool, an initiator of independent design research in the area of metropolis development in the Netherlands and the Euro-Delta metropolis, has developed the Place -Node model into a butterfly model. It illustrates the coherence between the ‘Node’ and the ‘Place’ value of the station, giving insight into the current situation and the potential of the station. The butterfly model places six characteristics, as identified by Bertolini (1996) in relation to each other: the left wing describes the ‘Node’ value, the right wing describes the ‘Place’ value. The butterfly can

only function properly when both wings are in balance. The position in the public transport network and the intensity of residents, employees and visitors, both in the middle of a wing, should always be in balance with each other. The better the position in the public transport network, the greater the intensity of the area around a node. The same applies the other way around: the greater the intensity, the better the position in the public transport network. (Vereniging Deltametropool, 2013)

Figure 7.50 Butterfly model assesment of Delft Zuid made by Delta metropool regio. ("Knooppunt- en in de Stadsregio Rotterdam (januari 2014) by Vereniging Deltametropool - issuu," n.d.)



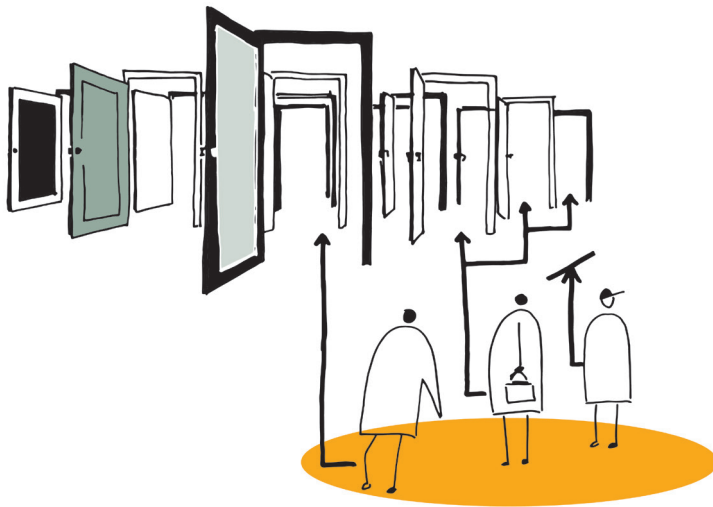
Accessibility

Besides the intensity and diversity of functions, increased by the station development, the notion of accessibility is critical for the improvement of the disadvantaged neighbourhood. Accessibility must be interpreted in a broader view; how many and how diverse are the activities, who can participate and who is allowed to organize. (Bertolini, 2017)

The station developments has to balance between diverse activities and public spaces that provide a place for everyone and at the same time it has the responsibility to hold everyone together. Socio-economic differences can generate conflicts or lead to advantages. The accessibility of infrastructure and transport systems as well off public places and amenities play a central role in inclusivity and democracy of cities. (Harteveld, 2019)

Figure 7.51 Illustration of accessibility (own illustration)

Figure 7.52 Collage of the current state of the Station Delft Zuid. (Own illustration)



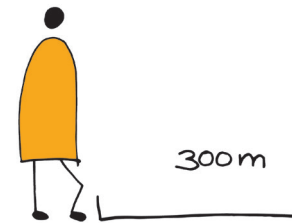
Delft Zuid

Important mobility hubs balance their importance as a node with their quality as a place. In order to increase the importance of the “Node” the quality of the place has to increase as well. Often important nodes, with high quality place, become “places to be” for mobility and non-mobility related facilities and activities, and not only places to pass through. They attract investments and play an essential role in urban development strategies of their surroundings.

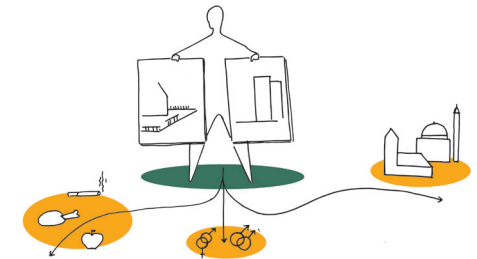
The aim of the municipality is to develop Delft Zuid into “The Delft Campus station”, the area will be a safe and dynamic public transport hub that will connect TU Delft, Voorhof, Tanthof, Schieoevers and even Midden-Delfland. In the coming years the area will develop into a nice place where more people can live and work. An environment where there are facilities and many sustainable innovations are applied, including smart mobility solutions. In order to become the a dynamic public transport hub a lot has to be done. At the moment the station is only reachable by train, car and active travel, see Figure 7.50. The node aspects of the station are relatively easy to improve. The station can be connected to the bus network, new smart mobility options and mobility as a service (MaaS) create opportunities to improve the connectivity of the station.

The development of the “Place” aspects of Delft Zuid requires a lot of work and investments. Figure 7.52 show the current state of the station area. In order to become a lively and nice place the quality of the environment will have to be improved. The similarity with the improvements needed in the adjacent post-war neighbourhood are evident.

Based on the Node and Place theory the station area needs to improve its proximity, diversity and intensity of functions in the area round the station.



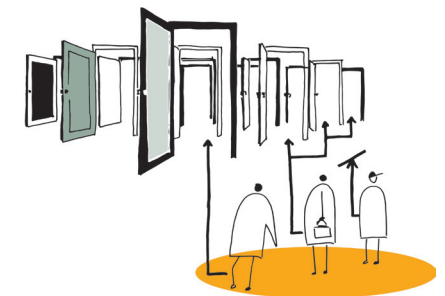
Proximity



Diversity



Intensity



Accesibility

Economic inequality and segregation

Economic inequality

The trend of increased socio-economic inequality is often ignored in the Netherlands. The Dutch citizens regard themselves as a very equal society, but recent research shows that this notion is no longer valid, and definitely not a certainty of the future (Bregman, 2013 and Kremer, Bovens, & Schrijvers, 2014). In the Netherlands, income inequality is relatively small, while wealth inequality is big and predicted to increase in the coming decades. Figure 2.11 shows the increase in inequality measured by the Gini-coefficient and the top 10% share. The inequality in net assets has risen sharply in recent years, the most striking feature is that the debt level of the bottom 90% of households has risen while the value of home equity has fallen sharply, in contrast to the top 10% that stabilized its debts and in addition to equity home now has more assets than ever. At the moment, the bottom 60% has only 1% of all capital, the richest 10% per cent owns 60% of the total amount of wealth. This means that wealth inequality is almost the same size as in the United States (Bregman, 2013 and Kremer, Bovens, & Schrijvers, 2014).

In 2009 Kate Pickett and Richard Wilkinson published their influential book called “The Spirit Level: Why More Equal Societies Almost Always Do Better”. The book argues that there are “pernicious effects that inequality has on societies: eroding trust, increasing anxiety and illness, (and) encouraging excessive consumption”. Figure 2.12 shows that the amount of social problems in a society is not related to gross national product but to the amount of inequality. It claims that for eleven different health and social problems: physical health, mental health, drug abuse, education, imprisonment, obesity, social mobility, trust and community life, violence, teenage pregnancies, and child well-being, outcomes are significantly worse in more unequal countries, whether rich or poor. Perhaps the most fascinating is that the rich suffer from inequality. “They also suffer from more depression, drug abuse, teenage pregnancy and crime”. So, it was stated that inequality negatively affects all classes of society. (Booth, 2010)

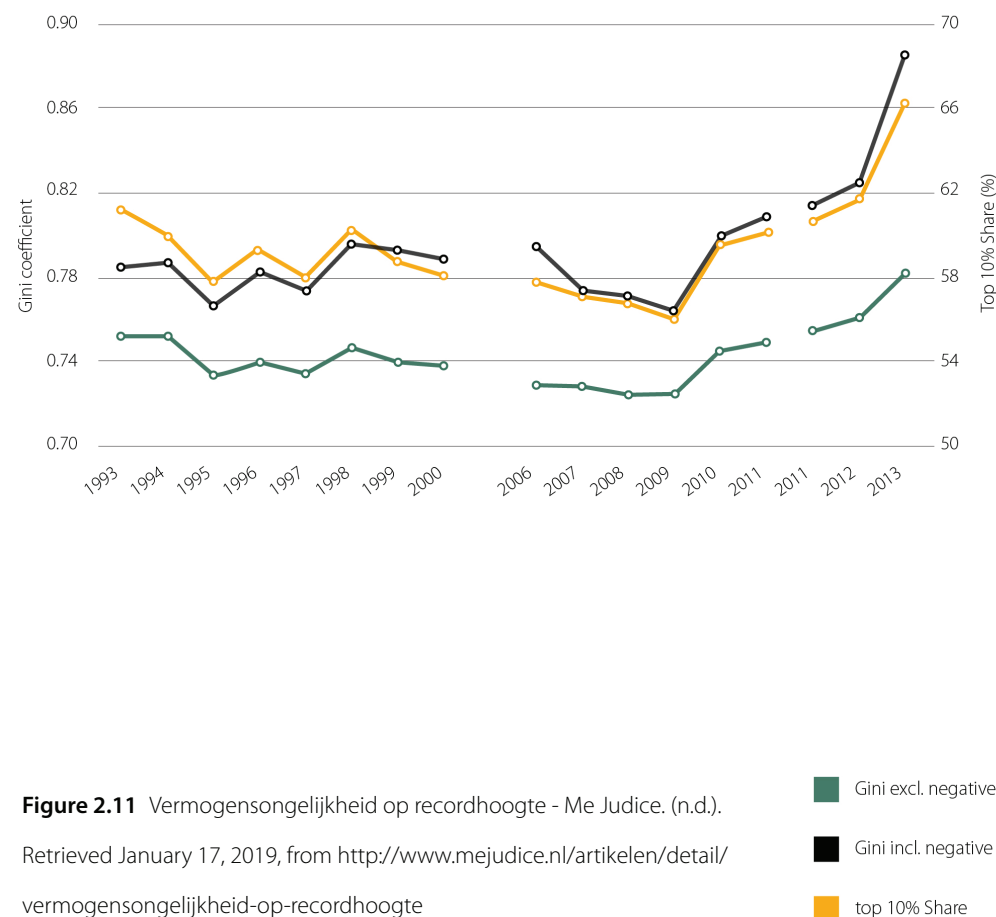




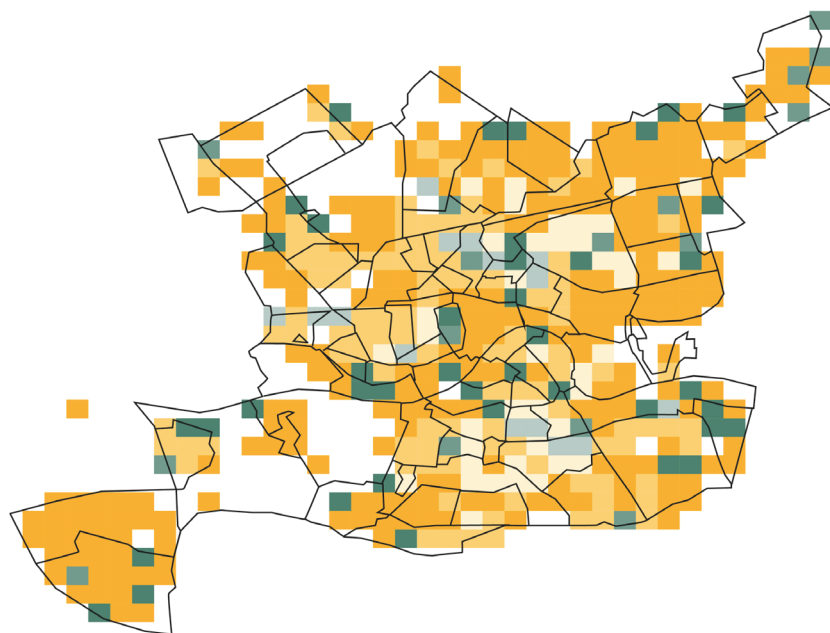
Figure 2.12 Relation between inequality and social problems within a society such as depression, drug abuse, teenage pregnancy, and crime. It was stated that inequality negatively affects all classes of society (Booth, 2010).

Inequality in the built environment

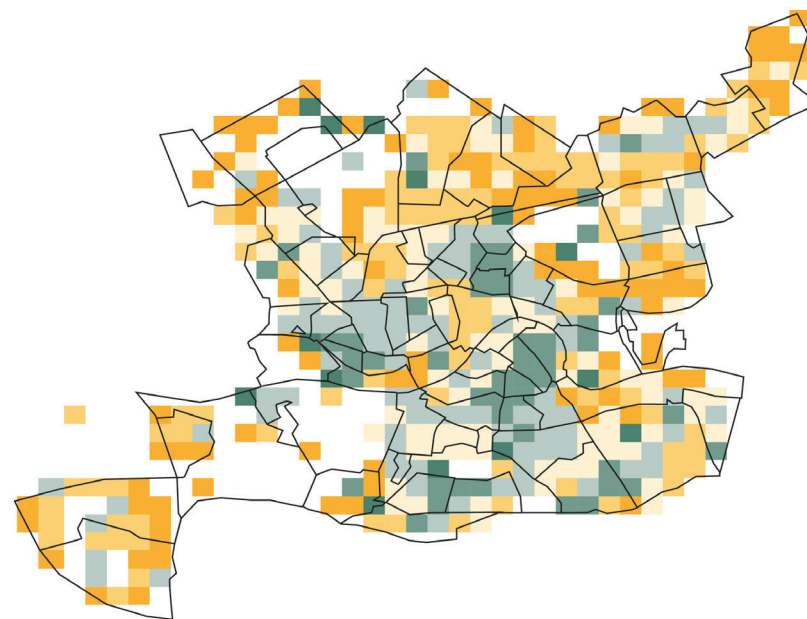
Economic inequality acquires a spatial dimension when different groups (high-low educated, high-low income etc.) live in the different areas of the city. Low-income households are restricted by their low income to the cheapest, considered by the majority of the population as the least attractive houses and neighbourhoods. Or are restricted to public housing. Where state intervention in Europe has long countered segregation, (neo) liberal transformations in welfare states have caused an increase in segregation. (Marciniczak, Musterd, van Ham, & Tammaru, 2015) Figure 2.13 shows the increased segregation in Rotterdam between 1971 to 2013. It clearly shows the increased concentration of low-income households. Growing inequalities in Europe, even in the most egalitarian countries, can lead to socioeconomic segregation which results in an unequal distribution of services and erodes a sense of shared identity (Katz & Nowak, 2018).

Based on last year's statistical analyses, the CBS concluded that post-war neighbourhoods are dealing with a higher concentration of low-income households. The people who live in post-WWII neighbourhoods are more dependent on social welfare than the residents of other neighbourhoods and the amount of people that have a minimum income is higher (CBS, 2017). The concentration of these groups is created by the high concentration of affordable housing and the singular dwelling types that are available in these neighbourhoods. The way post-war neighbourhoods have been constructed has a huge influence on the current concentration of low-income households in these neighbourhoods. In Delft the difference between the origin of the city centre and the post-war neighbourhood is example of all post war neighbourhoods.

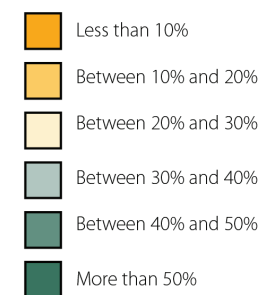
Figure 2.13 Zwiers, M., Kleinhans, R., & Van Ham, M. (2017). The Path-Dependency of Low-Income Neighbourhood Trajectories: An Approach for Analysing Neighbourhood Change. *Applied Spatial Analysis and Policy*, 10(3), 363–380.



1971



2013



Urban renewal

The Netherlands has a long history of urban renewal. Ever since the introduction of the Housing Act of 1901, there have been instruments for renewing (inner) cities and neighbourhoods. National policy really started after the Second World War and since then it has regularly changed course. Briefly summarized, a development can be observed from clearing and reconstruction (wederopbouw en stadssanering) to urban renewal (stadsvernieuwing) at the end of the sixties, to the restructuring of post-war neighbourhoods (Grotestedenbeleid) from the mid-1990s to the early 2010s. An important turning point was the phasing out of this policy by the Rutte I and II cabinets. The neighbourhood policy were being decentralized, based on municipal policy and bottom-up initiatives. (Gastkemper, Uytterlinde, & Van der Velden, 2019)

Since the end of the Grotestedenbeleid (GSB) (Major Cities Policy) and the “Investeringsbudget stedelijke vernieuwing (ISV) (Urban Renewal Investment Budget) in 2015, the renewal of neighbourhoods has taken shape without a policy framework and without governmental funding. The shift from central to local was gradually started with reducing the budget of ISV, by now the cities have to do without financial support from the central government. The transition from centrally to locally-driven neighborhood renewal heralded a period in which cities are searching for new forms of urban development. Much government policy has changed in a relatively short period of time, which has an impact on the living environment in vulnerable neighborhoods. In many municipalities, the neighborhood approach ended up at an impasse. (Gastkemper et al., 2019)

Period	Problem	Time	Governmental policy	Lead
Naoorlogs wijkenbeleid (Post-war neighbourhood pol	War damage Housing shortage	1945 - 1970	Wederopbouw en Sanering (reconstruction)	National government
	Quality of housing Improving 19e century neighbourhoods	1970 - 1995	Stadsvernieuwing (Neighbourhood renewal)	National government --> Municipalities
Grotestedenbeleid (Major cities policies)	Improving liveability and post-war neighbourhoods Attractive (inner) cities	1995 - 2014	CSB, ISV, neighbourhood strategies	Municipalities, housing associations
Lokaal gestuurde wijkvernieuwing (local redevelopment)	Liveability, attractive cities Threatening segregation Climate change	2015 - Today	None	Municipalities, private companies, residents and housing associations

Figure 2.14 Development of neighbourhood renewal. (Gastkemper et al, 2019, p.4)

Research by Dorigo et al. (2017) shows that the progress of neighbourhood renewal projects was nullified by the stop of national funding. The progress made by projects such as the “De 40 wijken van Vogelaar”, a project that provided investment into the “forty most deprived” neighbourhoods of the country to counter the accumulation of social, physical and economic problems, came apart. The quality of the physical environment and the liveability of the deprived neighbourhoods deteriorated while the Dutch average neighbourhood still improved.

In many municipalities, the neighborhood approach ended up at an impasse, they are in need of new strategies and policies. Research project “Renewal of City renewal” calls for a different approach at the strategic level: assessing initiatives and projects in terms of their benefits to the city, and connecting them to a broad-based, long-term strategic awareness. It is important here to shift back and forth between different scales and disciplines and seek connections between goals in different sectors. Investment flows in one area can be used to produce effects in others, and so contribute to the spatial/programmatic development of the city as a whole. The relationship between public and private players will have to become looser, and smarter. (Engel, Velzen, Wal, Linders, & Franke, 2013)

The development of the station areas clashes with the deterioration of the neighbouring deprived neighbourhoods. The station areas developments are favoured with stakeholders with investment opportunities and/or major interests, such as the NS, Prorail and private developers while deprived neighbourhoods are most often not. Investment flows in the station area can be used to improve the spatial quality of the adjacent neighbourhood.

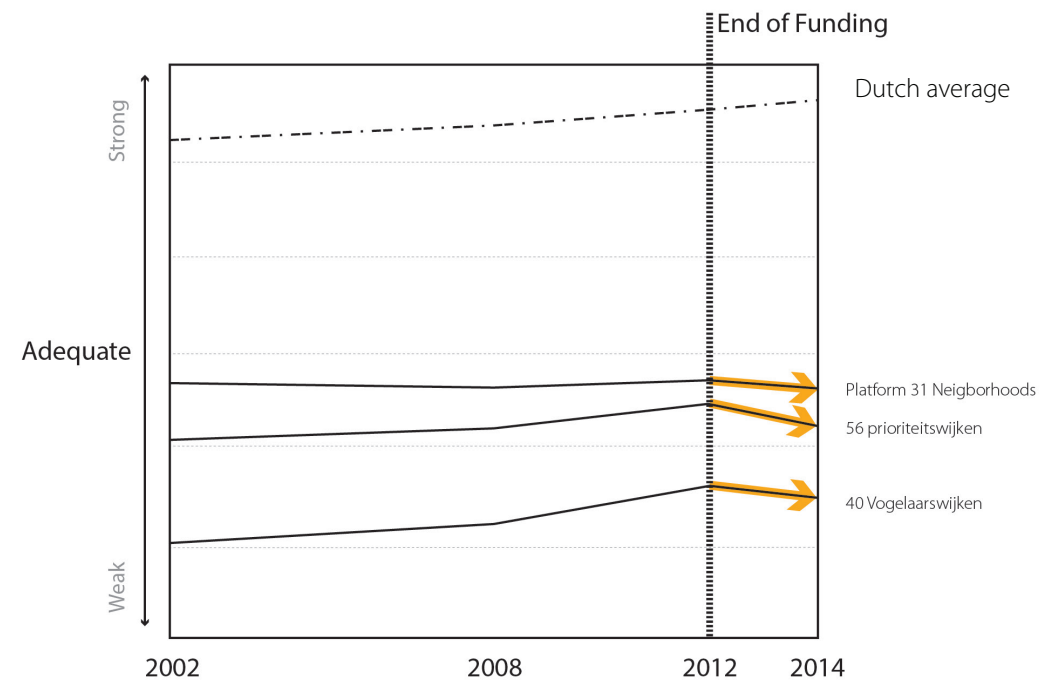


Figure 2.15 Dorigo, M., Leidelmeijer, K., & Zeelenberg, S. (2017). Ontwikkeling van de leefbaarheid in de (voormalige) aandachtswijken. Den Haag.

History of Voorhof

The growth and development of neighbourhoods has major influence in how the function today. The industrial revolution, the development of automotive mobility and innovation in the building industries have had a unique influence on the design of post-war neighbourhoods.

When post-war neighbourhoods are compared to city centres, their different structure is clear. Old cities centres have grown organically and reflect hundreds of years of interaction among people and activities. As cities grew, the activities they provided changed, adjusting to the changing lifestyles of its inhabitants (Scott, 1998). Voorhof in Delft is a post-war neighbourhood build in 1967 housing circa 13.000 people. In order to understand the current problems the history of Delft and Voorhof is discussed in this chapter.

Historic development of Delft

The city of Delft originated in a strange location: not at a junction of trade routes and in the middle of peat land. That peat was mined in the 11th and 12th by digging parallel locks at fixed distances from each other, which resulted in narrow elongated plots. For the drainage of these ditches, around 1050, the river Schie had been canalized in north-western direction. The peat reclamation ditches were perpendicular to the drainage canal, the Schie and the oude Delft, which gave it a regular structure that determined the shape of the city, see Figure 3.16.

Around AD 1300 the century developed into a regional market center. In the same period the oude Delft was extended and connected to the Vliet, Delft consequently became part of an important trade route. The old reclamation and drainage canal became a shipping route. As soon as the city became part of the trading network of Holland, the city developed rapidly, see Figure 3.18.

In the second half of the 13th century, and in the course of the 14th century, Delft flourished because of its cattle and dairy trade, breweries and cloth industries. The city expanded in to the north and to the south, along to the main canals. In less than 200 year the city has grown from an insignificant agricultural settlement to one of the largest and most powerful towns in the Holland region. In its situation on peat subsoil – necessitating constant drainage – and the comb shaped structure of its reclamation landscape it epitomizes the typical Dutch canal town with its regular, orthogonal plan, see Figure 3.17.

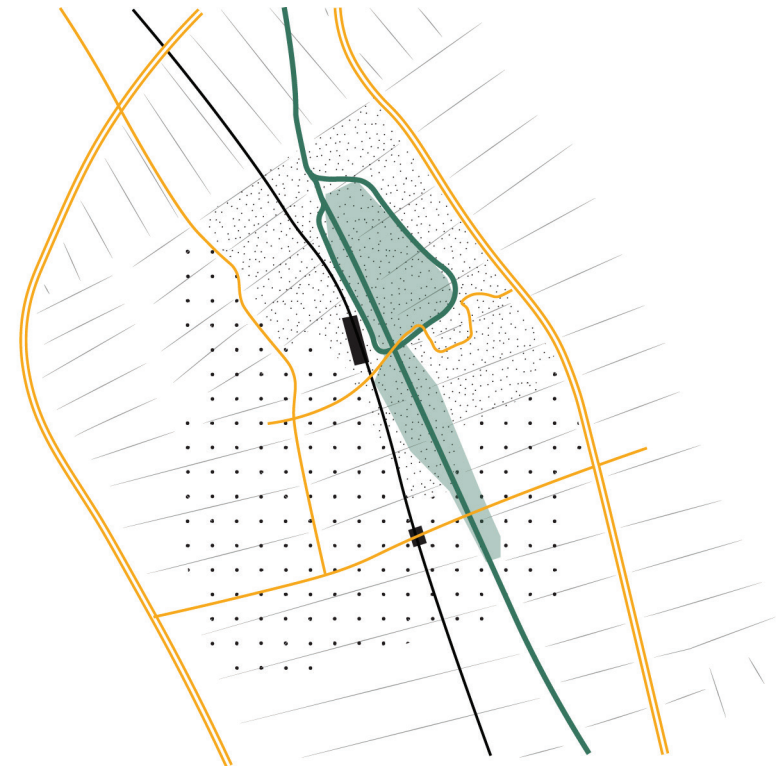
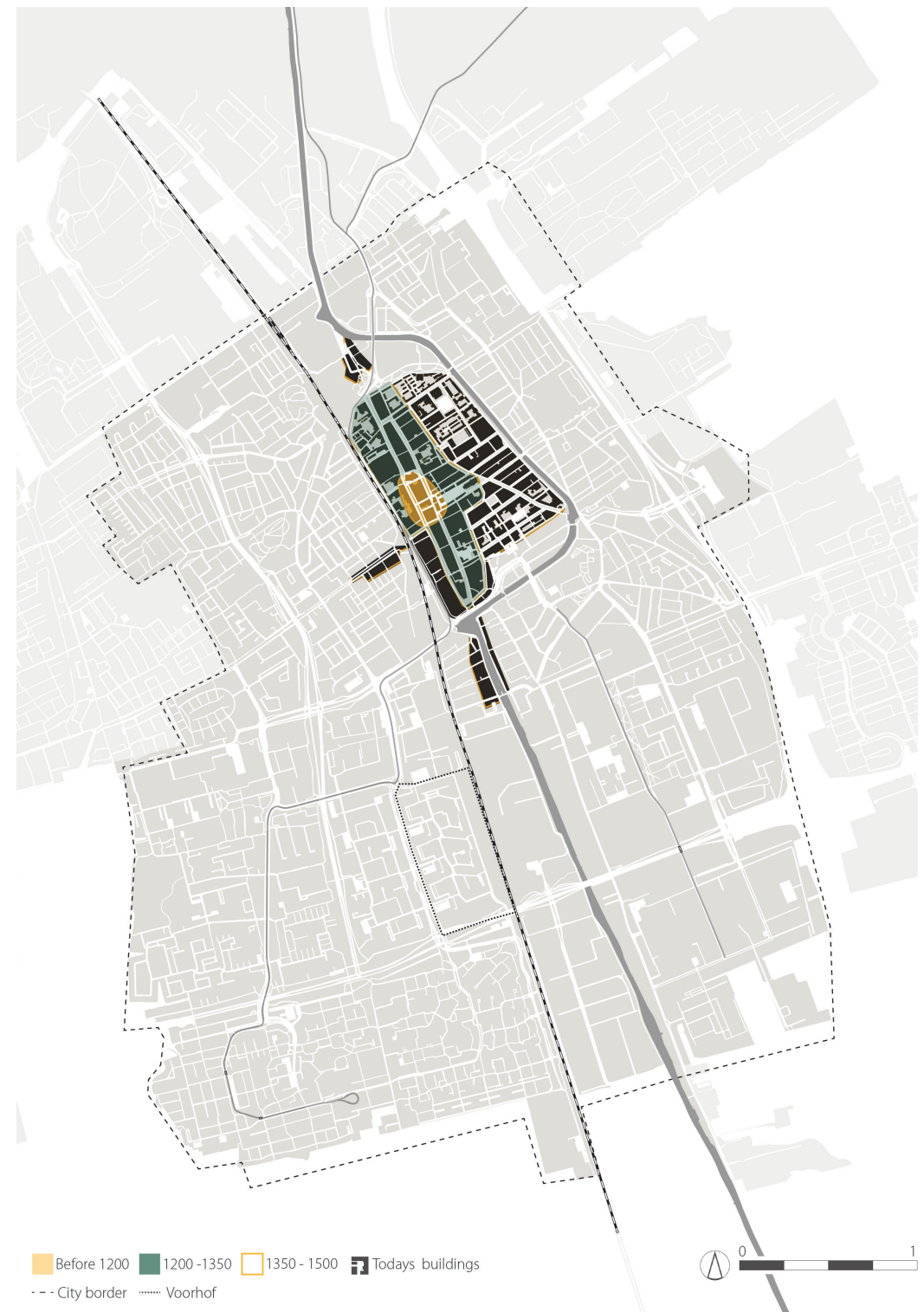


Figure 3.16 Characteristics of development of Delft (Rutte & Abrahamse, 2016, p. 45) The map clearly shows the two factors that profoundly influenced Delft's spatial development: the infrastructural axes of the canals, and at right angles to them, the field patterns of the peat reclamation landscape (green lines). Later the developments (dark dots) mainly cluster in the south and are linked to newly constructed motorways. Interestingly, the three successive main infrastructural elements of water, railway and motorways all run parallel to each other. (Self illustration)

Figure 3.17 Delft from the east by Paul Paris (Rutte & Abrahamse, 2016, p. 46), the old structure of the middle ages is still visible in today's streets pattern.

Figure 3.18 Historic development of Delft: 1200 - 1500. (Self illustration) The figure shows the first phase of the historic development of Delft. Today's buildings are projected over the historic development to show the correspondence between the historic development and today's buildings.



Before 1200 1200-1350 1350-1500 Today's buildings
 - - - City border Voorhof

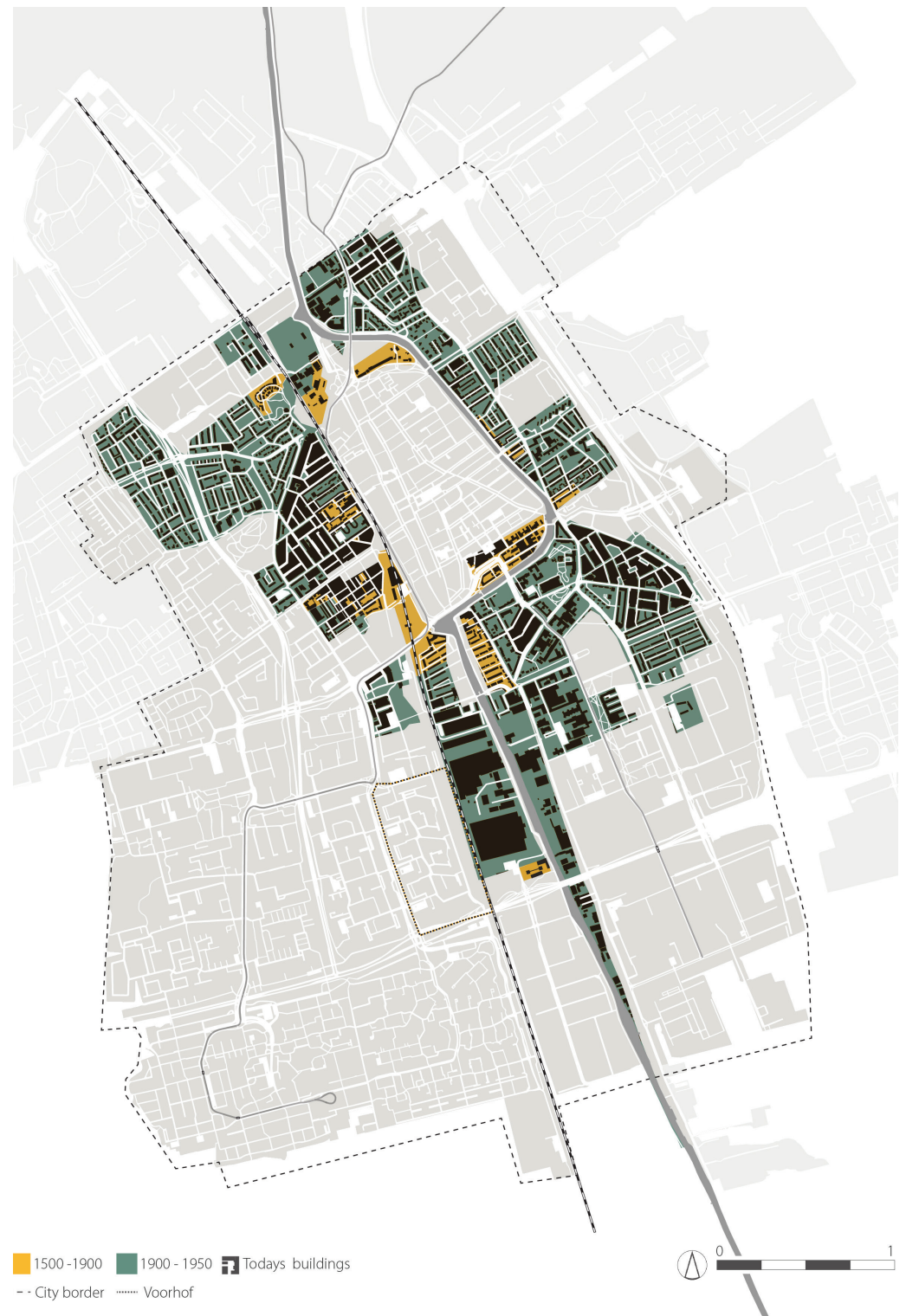
During the Dutch Golden Age, Delft experienced another era of prosperity. In the 18th and 19th century, however, the town went through a recession. Shortly before 1850 the railway line from the Hague to Rotterdam was constructed: although it touched upon Delft in the west, the construction of Delft station did not immediately contribute to the town's recovery. After a while, however, a group of progressive industrialists discovered the sleepy old town as an excellent business location because of its good infrastructure and cheap labour forces. Delft's growth accelerated shortly after 1900 and between WWI and WWII. The industry extended along the canal and the Polytechnic (today's University of Technology) stimulated the growth of the economy. The Polytechnic experienced such growth it needed a new location, it moved to south along the Schie canal.

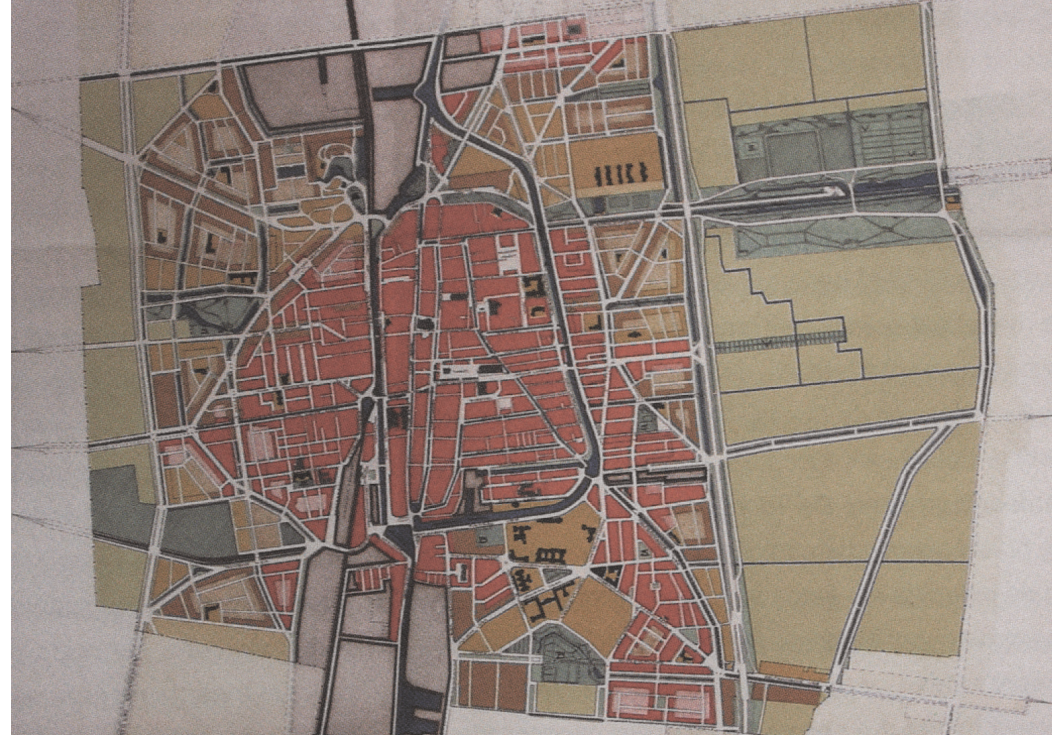
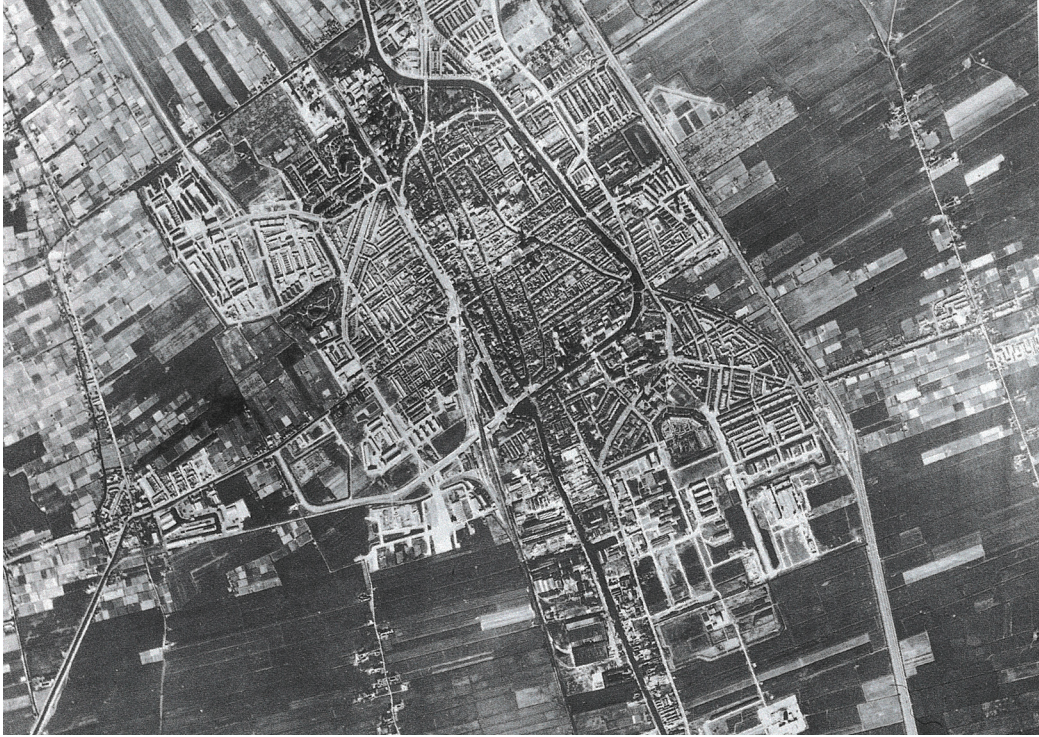
After WWII Delft's growth proceeded with vigour, again involving industries and the Polytechnic. From 1950 onwards an extensive university campus was built on grounds adjoining the existing Polytechnic area, while west of the railway huge housing estates appeared that were commissioned by the municipality. The high-rise estates, Poptahof, Voorhof and Buitenhof, are textbook examples of modernist urban planning.

Figure 3.19 Historic development of Delft: 1500 - 1950. (Self illustration) The figure shows the first phase of the historic development of Delft. Today's buildings are projected over the historic development to show the correspondence between the historic development and today's buildings.

Figure 3.20 Aerial photo of Delft 1958 (Boekraad et. al., 2006, p. 38)

Figure 3.21 Expansion plan of Delft 1931 by J. de Booij (Boekraad et. al., 2006, p. 20)





Voorhof

In the 1940 Delft was steadily growing. The population increased through the inflow of people into the Randstad. The city was known as a vital industrial city, just like The Hague and Rotterdam, and therefore attracted many workers. The strategic location between these cities and along the Delftse Schie made it an attractive location for industries. Delft distinguished itself by facilitating industries in combinations with related educational facilities. However, the housing conditions did not keep pace with the growing number of employees and students, and was in many cases of low quality.

The outbreak of the Second World War in May 1940 brought an abrupt end to the execution of housing programs in Delft. After the war, the housing program was slowly starting. Initially the municipality based the urban expansions on existing plans (See figure XX). However, due to developments at the end of the 1940s, among other things housing shortage, infrastructure, education and industry, the realization arose that there was a need for a new overall expansion plan. Especially the expectation of large numbers of students and new buildings of the Technische Hogeschool, required the preparation of a new general expansion plan. To give direction to urban development, in 1949 the city council appointed Van Embden and Froger as external advisors to the municipality of Delft.

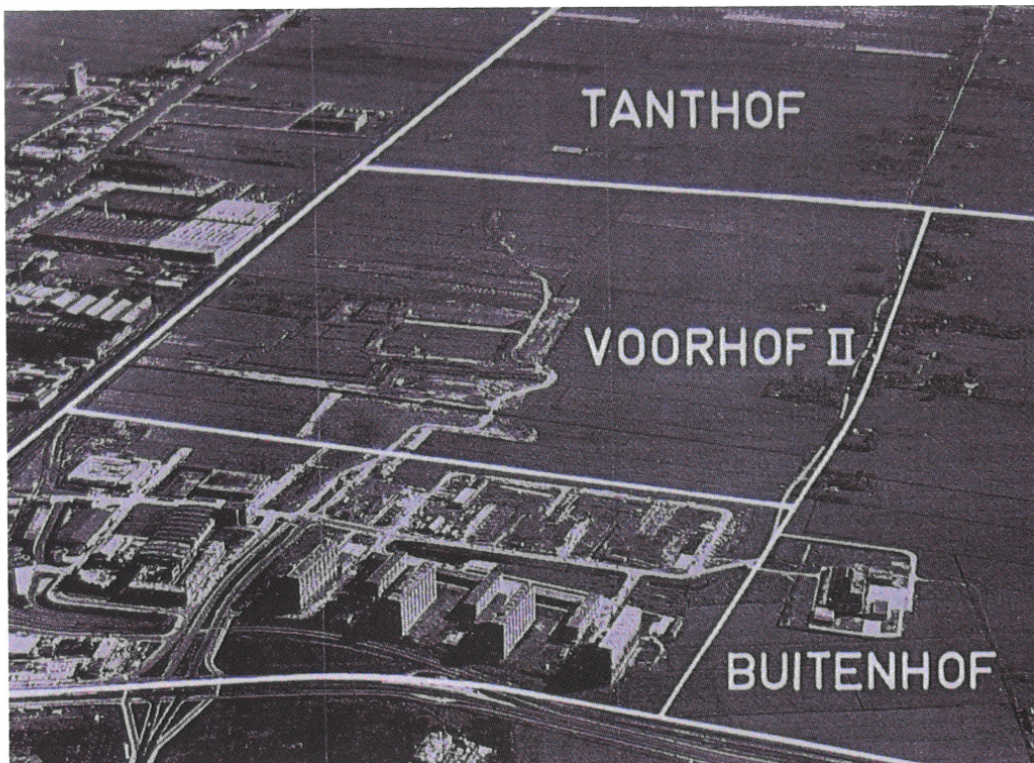
The many expansion neighbourhoods of Delft are based on various urban development principles. Until 1950 the design of the neighbourhoods was based on what is called a monumental or “Berlagiaanse” form of urban development. Subsequently, districts were built according to the concept of organic urban development. Annexation of territory of the municipality of Schipluiden in 1960 made an increase in the scale of the urban expansions possible. With this, a new phase in city planning became possible: the functional city. Van Embden and Froger, advisers from the municipality of Delft, developed the southern expansion area of Delft on serial construction, division between functions and the “wijkgedachten”. Serial construction meant that as many building components as possible were produced



in the factory and mounted on the construction site. Building became a production line. To make this system successful, high quantity of units had to be built. Everything was aimed to build quickly and cheaply. The districts Poptahof (Voorhof I), Voorhof II and Buitenhof are the first districts that have been built according to the new method.

Voorhof II Oost was built in the southwest of Delft in the sixties. The neighborhood is part of the southwestern urban expansion that was realized after the annexation of Schipluiden. Voorhof II is the southern part of the Voorhof district, and together with the Poptahof (Voorhof I) and the Mythologie neighborhood forms the Voorhof district. The Voorhof Oost neighborhood lies along the Voorhofdreef, which functions as the central access road. In

Figure 3.22 Detail of the urban development plan of Rotterdam - Delft - Den Haag 1931 by J. de Booy. (Boekraad et. al., 2006, p. 20) .



the east, the neighborhood lies against the Delft-Rotterdam railroad. In the north and south the neighborhood is bounded by the Minervaweg and the kruithuisweg. The historic roads have been preserved in the design but have changed dramatically. The original farms have been replaced by four lane roads and high-rise buildings.

Figure 3.23 Aerial photo of Poptahof North with indications of the expansion districts in 1964 (Boekraad et. al., 2006, p.32)

Figure 3.24 Sketch of the urban development of Delft, 1957 (Boekraad et. al., 2006, p. 32).

Urban designer W. Wissing designed Voorhof II Oost as one coherent urban design. Because of efficiency requirements and cost savings, Wissing opted for a high quantity of the same housing types, the variations were reduced as much as possible. Although rationalization of the construction was paramount, Wissing tried to create a spatially varied neighborhood. He placed the highest buildings in a regular rhythm along the Voorhofdreef where he formed courts with eighteen and nine level buildings. These flats mark the neighborhood and also guide the three main branches of traffic into the neighborhood. Between these high-rise buildings and along the northern ring road (Minervaweg) are gallery galleries of six levels that work as walls and create sightlines over water. In the middle zone of the neighborhood, in a varied and staggered way, two level single-family homes are situated.

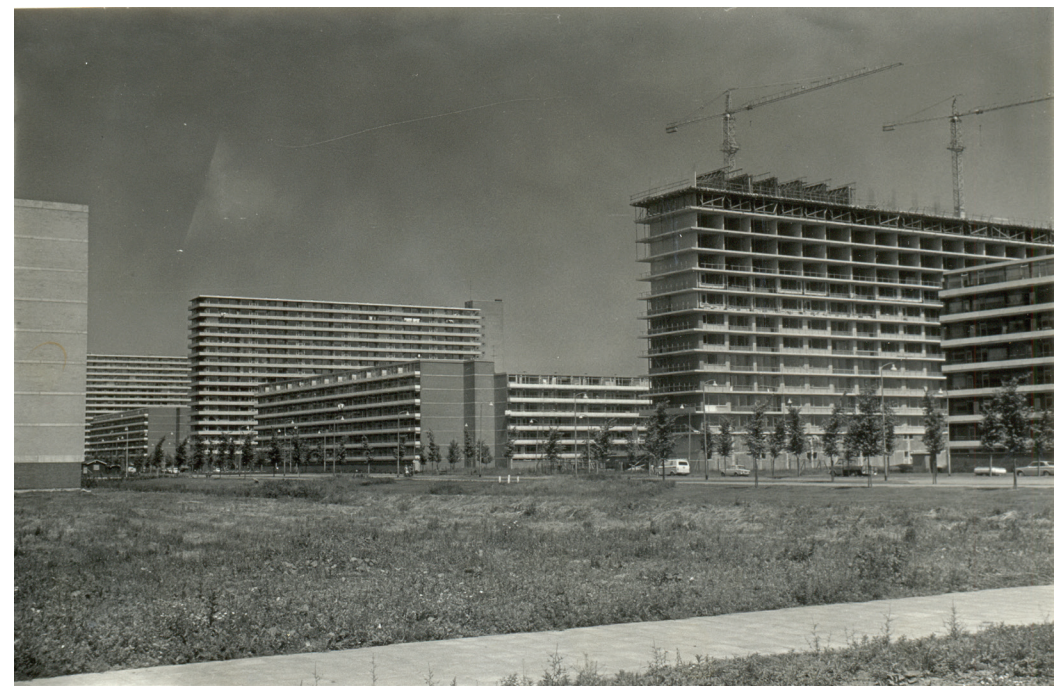
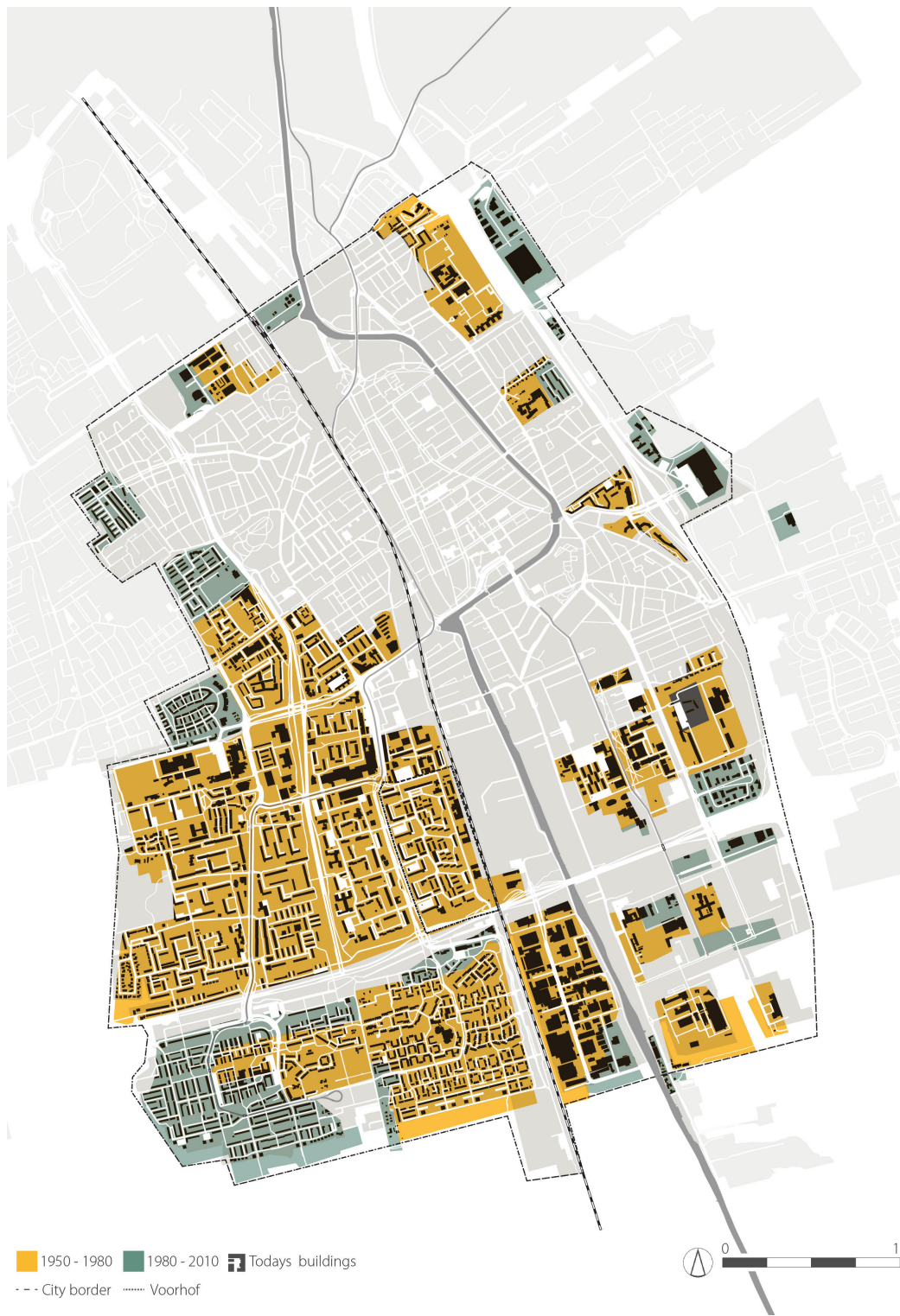
The more than 2000 homes in Voorhof II Oost have been build in three and a half year, and started in October 1963. To achieve the high speed of construction, the housing types were limited to three main groups, which were built in as many 'production flows'. With every production flow only one or two architectural firms were involved. With the first production flow, the largest number of homes could immediately be realized. The 984 houses along the Voorhofdreef were built in high-rise buildings of sixteen and nine stories, designed by architectural firm Tol, Noordhoek and De Ruyter from Rotterdam. The walls and floors of these flats were constructed as a cast construction where efficiency could be achieved by using a concrete plant, construction cranes and steel framework that did not require scaffolding. Architects A. Verschoor and Teun Bier supplied the design of the second production flow with 672 gallery houses in seven and six levels along the neighboring edges. These houses were built as assembly in accordance with the EBO assembly method using prefabricated concrete elements. The single-family homes, on the other hand, are built in short strips with a front and back garden and are arranged along streets in a staggered manner. The Utrecht architect CJ Gillis and the Delft-based architect JHJ van Rossum each designed a type of one-family house for Voorhof. These two types of houses were build by traditional building techniques, whereby the labor savings could be achieved from the restriction to a few types in combination with large series.



The collective amenities are spatially integrated in the the neighbourhood and hardly disturb the regular rhythm. The shopping facilities are mainly situated on the northern edge of the neighbourhood, and one small supermarket is in the middle of the neighbourhood. The pavilion at the Hendrik Tollenstraat (to the south of the Delflandplein) has shops and on the ground floor facilities such as a cafe. In the middle of the neighborhood halfway the Multatuliweg is a one supermarket that reinforces the small scale of this part. The schools have a more autonomous character and are spread over the neighborhood: low pavilions in the green between the other buildings.

Voorhof II Oost has relatively few deviations of the housing program. A clear division is visible

Figure 3.25 Verkavelingsplan Voorhof II by W. Wissing 1962`



ble between Voorhof II Oost and West. In the West the neighbourhood has facilities such as an elderly house, community centers, student housing, a church and some sports facilities. Voorhof II Oost has a small industrial area along the eastern edge of the neighbourhood. The strip acts as a buffer between the railway and the neighbourhood.

Figure 3.26 Voorhofdreef seen from the J. Slauerhofflaan by J. Hoekstra (1969)

Figure 3.27 Historic development of Delft: 1950 - 2010. (Self illustration) The figure shows the first phase of the historic development of Delft. Today's buildings are projected over the historic development to show the correspondence between the historic development and today's buildings.

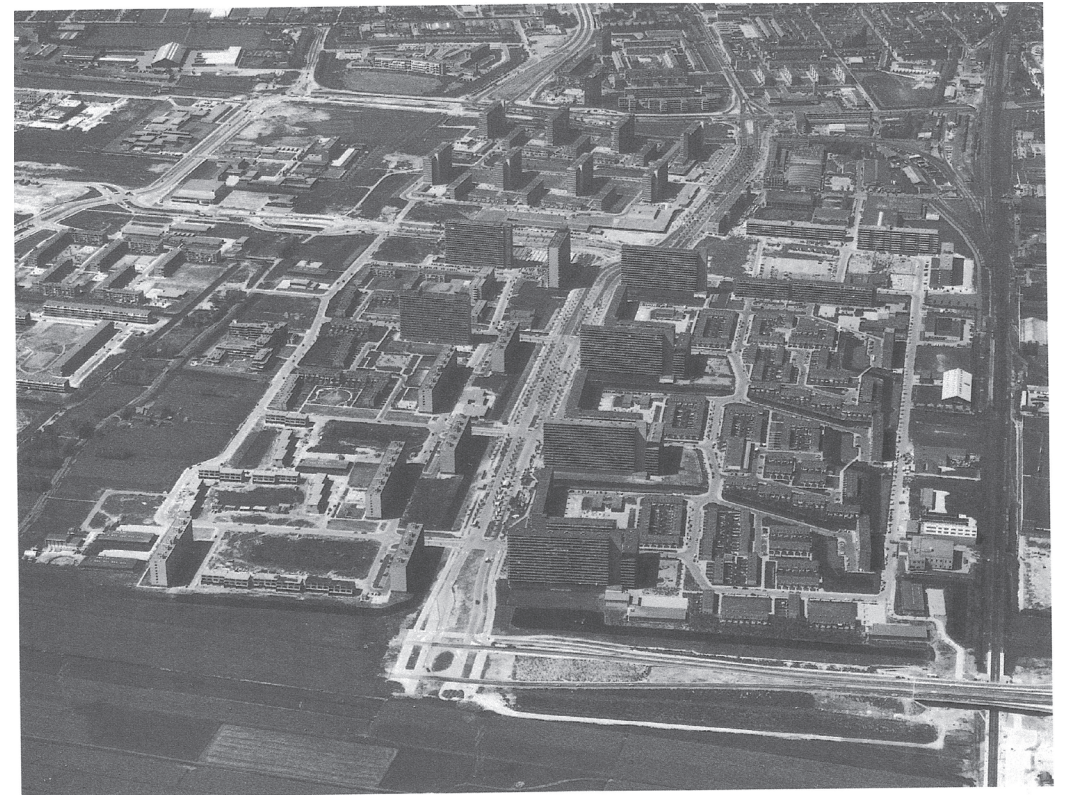
Besides limited facilities, it is striking that the neighbourhood has hardly any big public spaces. There are only a few small squares, most of them function as parking or a playground. The public space that is available is the green area of the Voorhofdreef. In the case of single-family homes, a range of small public gardens, green areas and private gardens are being created. The watercourse strengthens the spatial alternation and the creation of neighbourhoods and leads the neighbourhood into three parts. The water functions as a barrier along the edges.



Figure 3.28 Crossroad between Voorhofdreef and the Kruithuisweg; aan linkerkant flat Roland Holstlaan 924 - 1146, by J. Hoekstra (1971)

Figure 3.29 Aerial photo of the Voorhof (Boekraad et. al., 2006, p. 22)

Figure 3.30 Crossroad between Voorhofdreef and the J.J. Slauerhofflaan; in the background the high-rise of the Dirk Costerplein, by J. Hoekstra (1969)





Decline of post war neighborhoods

While post-war neighbourhoods were envisioned as modernist urban and social utopias that would solve numerous urban problems, they have never been able to live up to their vision. They were carefully planned at the apartment, building and neighbourhood levels with the aim to provide middle-class families with good quality living environments in a cost-efficient manner. While many of the projects were built with big ambitions, the image of the neighbourhoods quickly changed (Tellinga, 2004). There was a rapid decline in post-WWII housing estates. Already in 1986, twenty years after their completion, reports were given on the problems regarding the structure, design and population of the neighbourhoods (Kempen, 1986; Priemus, 1986).

Today the problems are related to the physical decay of the housing estates and social problems due to a high concentration of ethnic minorities and residents with lower socio-economic prospects. The increasing concentration of these groups is created by the high concentration of affordable housing and the dominance of a singular dwelling type. A recent pan-European study by Baldwin, Hess, Tammaru & van Ham (2018) summarizes the problems of post-war neighbourhoods as follows: “housing estates in many European countries have become, over the decades, the sites of intractable problems including social dysfunction, poverty, ethnic concentration, isolation, and segregation, amid deteriorating building and public spaces.” (Baldwin et al., 2018).

While many post-war neighbourhoods are in bad shape, it is important to recognise the still vital part they play in today's cities, they house thousands of residents, of which many live happily and are as much part of the city of the future as any other neighbourhood. Based on the findings in this chapter, two aspects of inequality in postwar neighbourhoods have to be countered. First of all, the high concentration of residents with lower socio-economic prospects has to be reduced by diversifying the housing stock. Secondly, the quality of life has to be improved by creating more possible and intentional activities.

The neighbourhood *voorstad* has declined but has not developed into an extremely deprived neighbourhood. The next chapter will go into detail on the current situation of the neighbourhood. Research will be done to understand which aspects of the neighbourhood result in a lower liveability.

Current value of Voorhof

While many of the projects were build with big ambitions, the image of the neighbourhoods quickly changed (Tellinga, 2004). There was a rapid decline in the quality of post-war housing estates and the reputation of the neighbourhoods. The neighbourhood Voorhof is a typical post-war neighbourhood, as described in the previous neighbourhood. In next paragraphs the current value of the neighbourhood is compared to the average value of neighbourhoods in Delft.

The property value (WOZ-waarde) and the Leefbaarometer are used to compare the quality of the neighbourhood to the quality of the rest of the city.

Property value

The property value (woz-waarde) of a property is based on the free sale value of the property, or the amount that the house will deliver when it is sold. Municipalities define the property value by comparison models based on sales figures and characteristics of the properties. This value depends, among other things, on the size and location of the house and the type of home. The value of the home can rise and fall, for example due to adjustments to the house, but also due to rising or falling prices on the housing market.

Besides the physical characteristics of a property, such as size, location and state of maintenance, the social characteristics play an important part in determining the property value. Factors such as the average income, the safety situation and the perception and the popularity of the neighbourhood are of influence on the sales figures, and in turn on the property value (Spierings & Meeuwisse, 2012).

The average property value of all the properties in a neighbourhood is therefore an indicator for the quality of the neighbourhood as perceived by people. If the average value is high people like to live in the neighbourhood, if the average value is low people prefer to live in other neighbourhoods.

Figure 4.31 shows the property value per m² of Delft, the neighbourhood Voorhof and the other post war neighbourhoods have lower values than other neighbourhoods of Delft. This is validated by the Figure 4.32 which shows the development of the property value over time. The value of high rise in Voorhof has increased, but less than the average of Delft and the country, while the property value of the row houses has declined.

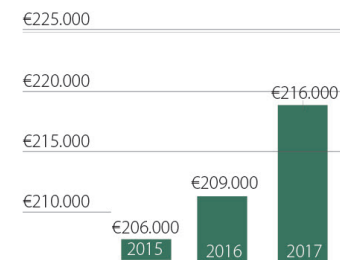
Figure 4.31 The property value of Delft per m². The property value is displayed on a map with the urban fabric of the city, which makes it possible to compare the urban qualities of the neighbourhood with the property value. (based statistics of the cbs, own illustration)

Figure 4.32 the diagrams of this figure show the property value development of two of the neighbourhoods of Voorhof compared with the average of Delft and the Netherlands. The diagrams show that while the average of Delft and the Netherlands has increased, in Voorhof the increase was far less or there was a decrease. (allecijfers.nl,n.d.)

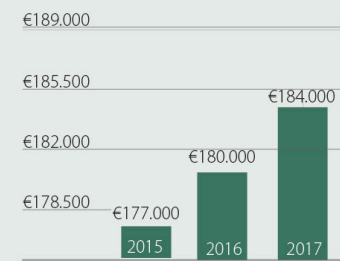


WOZ - Value

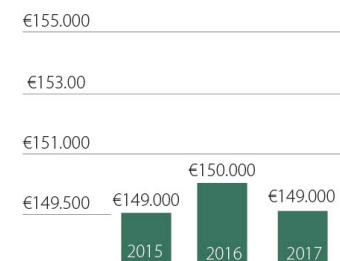
The Netherlands



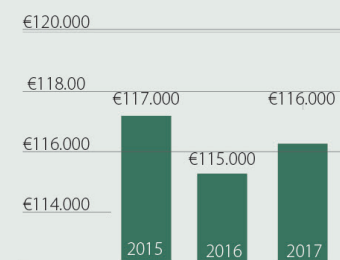
Delft



Multatuli neighbourhood



Voorhof hoogbouw



Leefbaarometer

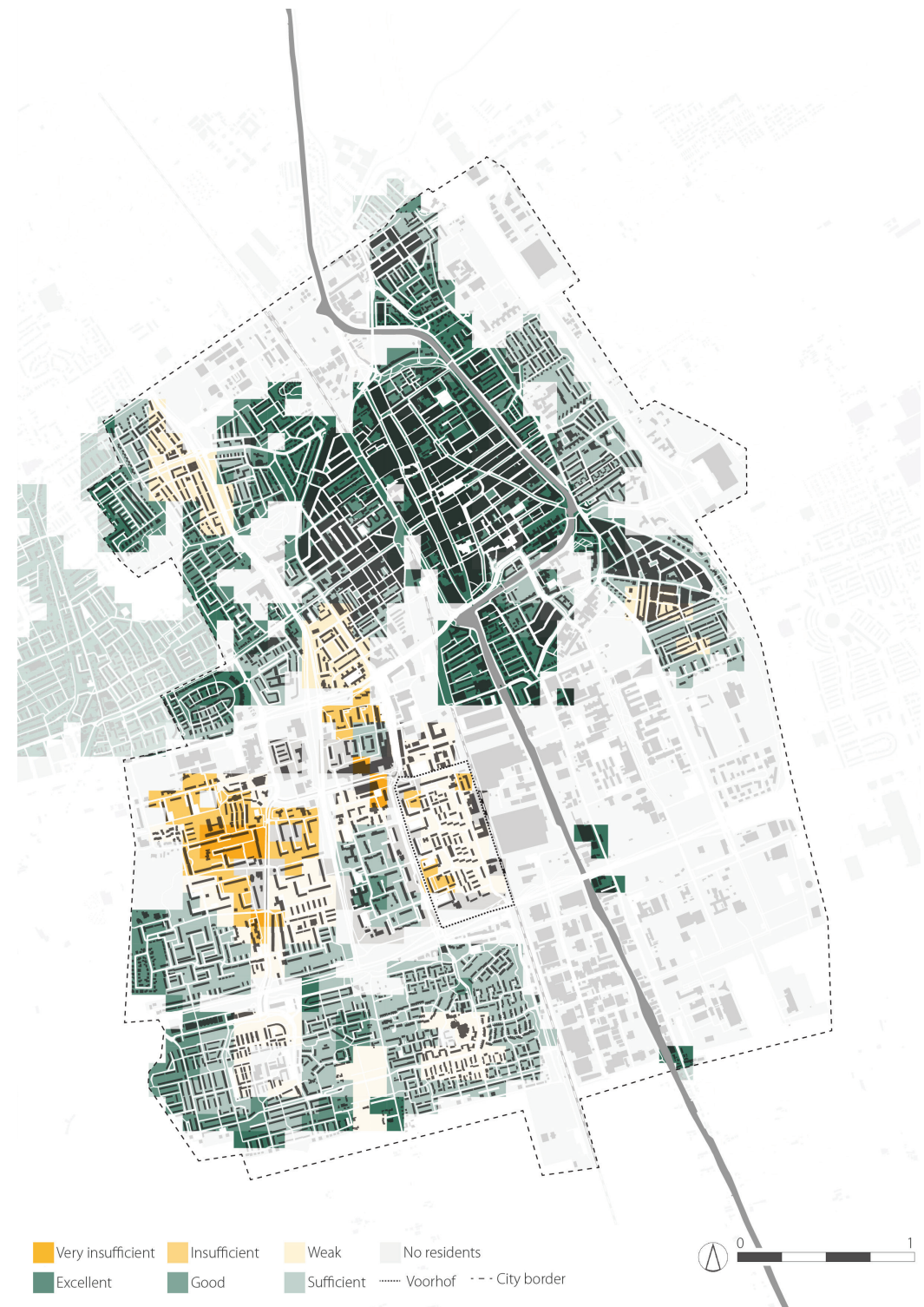
The Leefbaarometer (Liveability Meter) provides information about the quality of life in all districts and neighbourhoods, where quality of life is defined as “the extent to which the living environment meets the conditions and needs that are desired by the residents”. It shows the situation in the neighbourhood, but also developments and backgrounds of the neighbourhood. To visualize liveability, 100 indicators are used, subdivided into 5 dimensions: Dwellings, residents, amenities, safety and physical environment. .

Figure 4.34 shows the liveability in Delft. In the illustration it is visible that the average liveability in Delft is high, but there are neighbourhoods in which liveability is lower. When you compare the information of the previous chapter, historical development Figure 3.27, you can see that the lower liveability in Delft is concentrated in the post war neighbourhoods. The lowest liveability is concentrated in the neighbourhood Buitenhof, this neighbourhood struggles with unemployment, poverty and radicalization. The neighbourhood Voorhof does not struggle with these problems but as you can see in Figure 4.33 the neighbourhood has a lower liveability.

As the liveability of Voorhof is lower than the average it is important to know which aspect creates this lower liveability. The leefbaarometer shows us that the lower liveability in Voorhof is created by lower quality of three of the five elements; the dwellings, safety and physical environment, see Figure 4.34. What is important to realize is that the leefbaarometer is not objective. For example the quality of the dwellings is lower if they are build in the post war period, the quality of the specific dwellings is not taken into account.

Figure 4.33 Livability in Delft 2016. (Self illustration based on information of the leefbaarometer.nl)

The illustrations shows the livability in Delft in 2016 in combination with the current urban structure.



That is why it is also important to look at the development over time. Has the neighborhood improved or is it actually declining? Figure 4.35 illustrates the changes of liveability over time, from 2008 - 2016. It shows that in Voorhof in last eight years the liveability has declined.

Deviation of Voorhof relative to the national average, subdivided by category.

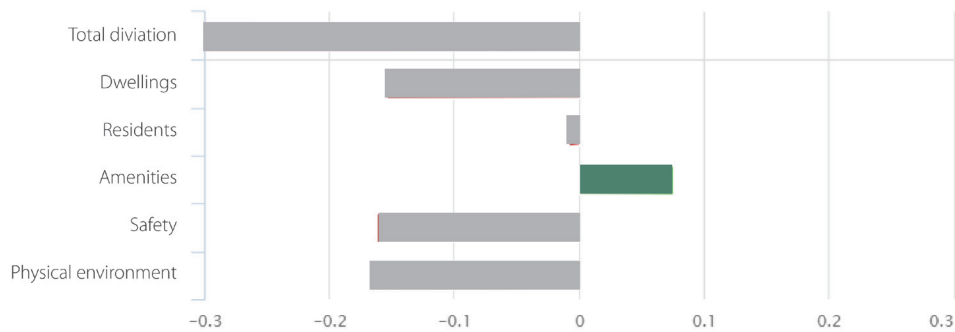
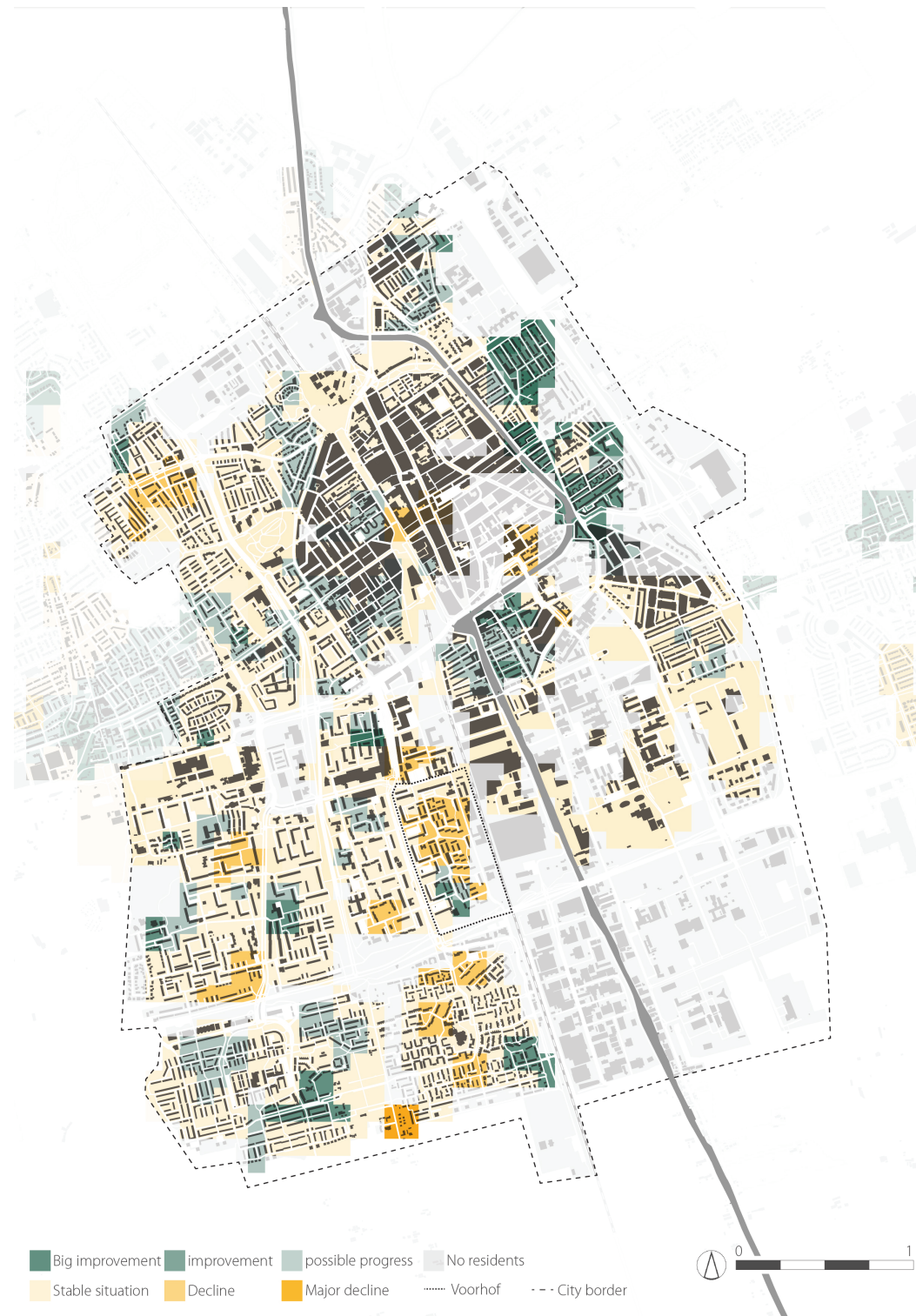


Figure 4.34 The liveability in Delft, deviation in relation to national average. ("Leefbaarometer | Kaart," n.d.)

Figure 4.35 Development of livability in Delft 2008 - 2016 (Self illustration based on information of the leefbarometer.nl) The illustrations shows the development of the livability in Delft in combination with the urban structure.



Theoretical framework & spatial analysis

Quality of Life

In the beginning of this thesis report inequality is based on economic differences. It was stated that the amount of economic inequality has increased and the relationship between social problems in society was discussed. Income inequality led to concentrations of low-income households in post war neighbourhoods due to large amount of public housing. Based on the cadastral value and the Leefbarometer it was concluded that the post war neighbourhood is of lower quality than the average neighbourhood. Negative influence of the environment, created by the low quality, reinforces inequality between low- and high-income households. In the next paragraphs the influence of the environment on the quality of life will be discussed by discussing the relationship between the quality of the build environment and the quality of life. Next the scope of the research will be reduced by picking one topic, based on the problems of post-war neighbourhoods and the influence of the station area development.

Quality of life is the subjective interpretation of the standard of living; it is the general happiness and the emotional well-being of individuals and societies, that cultivates negative or positive attitudes towards life. This can be observed through life satisfaction, family relationships, physical health, education, employment and leisure balance, wealth, lifestyles, safety, security to freedom, religious beliefs, and the environment (Johnston & Gregory, 1981). Research has found that while standard of living increases, happiness does not always follow (Kahneman & Deaton, 2010). It shows that as a certain standard of living is reached happiness is no longer related to the standard of living but related to the quality of life.

There is a close relationship between quality of life and the environment because people's lives are strongly affected by the health of their physical environment. The impact of pollutants, hazardous substances and natural environments on people's health is sizeable. Environmental quality also matters intrinsically because most people value the beauty and health of the place where they live (Streimikiene, 2015). A third relation between the quality

of the environment and the quality of life is addressed by Jan Gehl in his famous book 'Life between buildings'. The build environment can create or retain social interaction and activities. Social interaction is one of the crucial elements of human society and has an important role in determining the quality of life. (Datta, Datta, & Majumdar, 2015; Gehl, 2011) The following paragraphs compare the relationship between the built environment, the quality of life and the problems in post-war neighbourhoods with the influence of station development in order to reduce the scope of the research and to formulate a well-defined design assignment.

The problems of post war neighbourhoods can roughly be divided into three categories: poverty and ethnic concentration, deteriorating buildings and public spaces and social dysfunction (such as isolation and segregation). The higher concentration of poverty and ethnic groups is created by the high concentration of affordable housing and the singular dwelling types. Diversifying the housing stock falls under the responsibility of the housing corporations (Hess, Tammaru, & Ham, 2018). Research by Kleinhans has shown that the influence of housing diversification has ambivalent results on area reputation, residential attitudes and cross-tenure social interaction, and therefore has little effect on improving the quality of life of the current residents. The influence of mixing is often superseded by other, more significant factors in residential satisfaction, such as lifestyle (Kleinhans, 2014). The densification of the station area can be achieved by creating dwelling typologies that are currently not located in the neighbourhood, and thus diversifying the housing stock but this will not have a significant influence on the quality of life of the current residents.

The improvement of the deteriorated buildings is the responsibility of the home owners and housing corporations. Only in case of demolishing would new development be able to improve the quality of the housing stock. But this is not desired because post-war neighbourhoods suffer of very little historical layers. When they were created, architects and urban designers started with a 'tabula rasa', all existing urban fabric were destroyed in order to

create the new modern neighbourhoods. The lack of historic references results in a one dimensional area with very little shared identity. (Hereijgers & Velzen, 2001) .

The physical quality of the public space can be improved in the zone between the new development and the existing neighbourhood. Part of the investments in the station area can be used to improve the public space in the border zone. In this way the station development can have a positive effect on the living environment of the current residents. This border zone between the new development and the existing neighborhood is also the area that can improve social interactions and activities, as stated by Jan Gehl (2011). The social dysfunction in the neighbourhood can be improved by designing the public space of the border zone. The position of this thesis is that these social problems have a vast influence in the quality of life and can be improved by adjusting the public space and the program of public functions in the border area between the station development and the exciting neighbourhood. In this way a relationship is established between the station development, problems of the post war neighbourhoods and the improvement of the quality of life of the current residents.

In the next paragraph the relationship between the environment, individual experience and social interaction will be discussed.

Theory of Affordance

Three decades ago psychologist James J. Gibson wrote 'Architecture and design do not have a satisfactory theoretical basis'. An ecological approach to the psychology of perception and behaviour could provide a theoretical basis to architecture (Gibson, 1976). His research resulted in 'The theory of affordance' a conceptual framework to understand the relationship between environments and its occupants, it describes the relationship between what the environment offers to the individual, what activities it provides or furnishes regardless of whether they are for good or for bad (Giesecking, Mangold, Katz, Low, & Saegert, 2014).

In relation to design-based practice, Donald Norman, professor at the university of California, and author of the famous book *The Design of Everyday Things*, extends the theory of affordance to include the existence of actual and potential affordance of objects. This highlights that design has the capacity to embed planned and improvised functional applications, at times with some unexpected uses where normal objects are repurposed in extraordinary ways. Within a neighbourhood the residents can use areas in very different ways, through community diversity different people interpret and occupy the same objects depending on the intended but most of al the unexpected uses of normal objects. (Jonescu & Ghanim, 2018) For instance, a set of steps which rises sixty centimetres high does not afford climbing to the crawling infant, yet might provide rest to a tired adult or provide shelter for children playing hide and seek. This notion of intention/needs is critical to an understanding of affordance, as it explains how the same aspect of the environment can offer diverse affordances to different people, and even to the same individual at another point in time.

The physical design of a neighbourhood influences the amount of affordances in an area. Which results in different types of activities that are possible in the area. As not all neighbourhoods provide the same activities some neighbourhoods fit certain lifestyles better. A neighbourhood can stimulate or prevent lifestyles from being practiced.



Figure 5.36 Theory of affordance is a framework for understanding the relationship between the environment and human behavior.

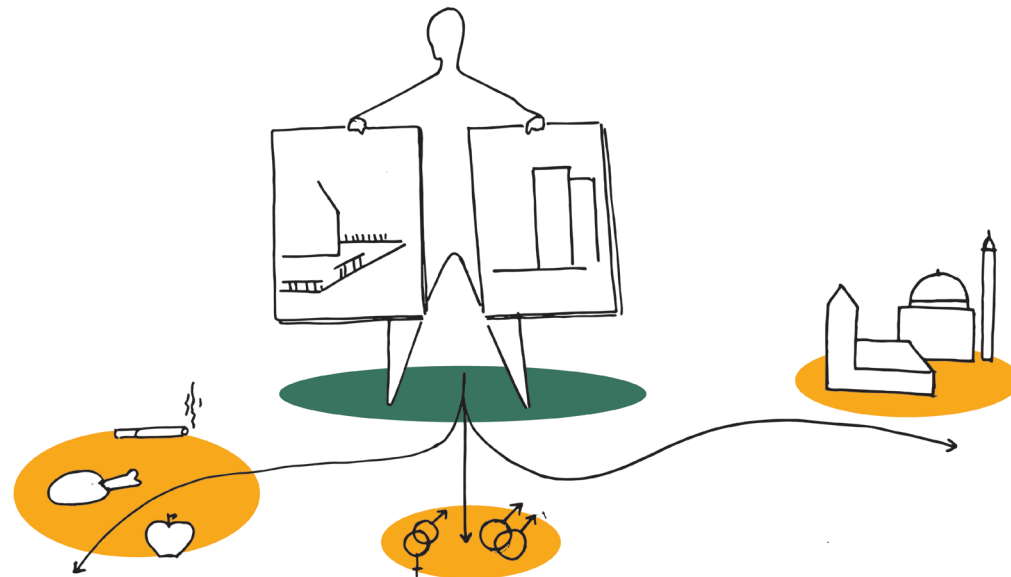


Figure 5.37 illustration in the ability to live your life according to your chosen lifestyle. (own illustration)

Quality network of places

Marketta Kyttä, professor of Urban Planning and Land Use at Aalto University, describes the quality of an environment as the quality of a network that includes multiple places. Individuals have their own “quality network of places” according to their preferences, mobility possibilities, and restrictions. The network consists of areas that offer intended and unintended uses, together they facilitate the daily activities and the special occasions (Kyttä, 2004). It is important to realize that all residents of a neighbourhood have different networks. Research has shown that individuals with different networks differ significantly in their socio-demographic characteristics, such as age, gender, employment, household characteristics, and residential neighbourhood. It validates that groups of people with different lifestyles often have different networks that intersect little (Hasanzadeh et al., 2019). Students have networks that reach far beyond the city border, while young children and elderly are bound to the neighbourhood.



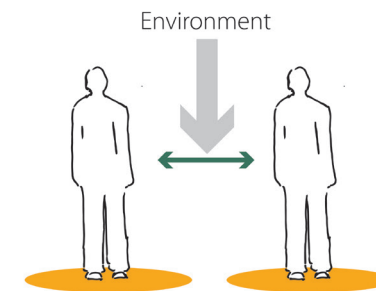
Figure 5.39 Illustration of different networks created by different lifestyles. (own illustration)

Transit and affordance

J. Gibson's notion of affordance has been complemented by Heft, arguing for a more 'action-based approach' (2010), the physical environment may offer possibilities to humans but never in a uniform process, but rather as a dynamic interaction with spaces, objects and time. As Kytä (2004) stated individuals have their own "quality network of places" they move from and to the different areas of interest. How people move from one place to another has a tremendous impact on the people interact with their environment. This makes the theory of affordance particularly interesting to areas related to infrastructure and mobility. In mobile situation the perception of an environment's potential has to be figured out on the fly. Travellers have to be part of a complex sequence of spaces and objects that offer different affordances. In station areas, which is the focus area of this research, many of the subjects are on the move, subjects are travelling, they are often in a hurry or on a tight time schedule. Stations are transfer hubs facilitating easy and efficient transfers from one type of mobility to another. In order to engage subjects with the possible affordances of the station they need to have something alluring, something that will slow down the fast pace of the traveller (Jensen & Bendix Lanng, 2016). This notion allows us to move beyond Gibson's notion of affordance in which subjects gaze neutrally at the objects. Instead we can use the concept of affordances to address "meaningful, value-rich features of experiences that in the course of action and in the contexts of an individual's history are often alluring", and will slow down the pace of traveling. (Heft, 2010)

Social interaction

The previous part provided a conceptual framework to understand the relationship between environments and its occupants, the next paragraphs will go into detail on the influence of the environment on social interactions between occupants. Jan Gehl is perhaps the most well known architect and urban consultant in this field of research, he is known for his work on improving the quality of urban life by re-orienting city design towards the pedestrian and cyclist. Greatly simplified, outdoor activities in public space can be divided into three categories, each of which places very different demands on the physical environment: necessary activities, optional activities and social activities.



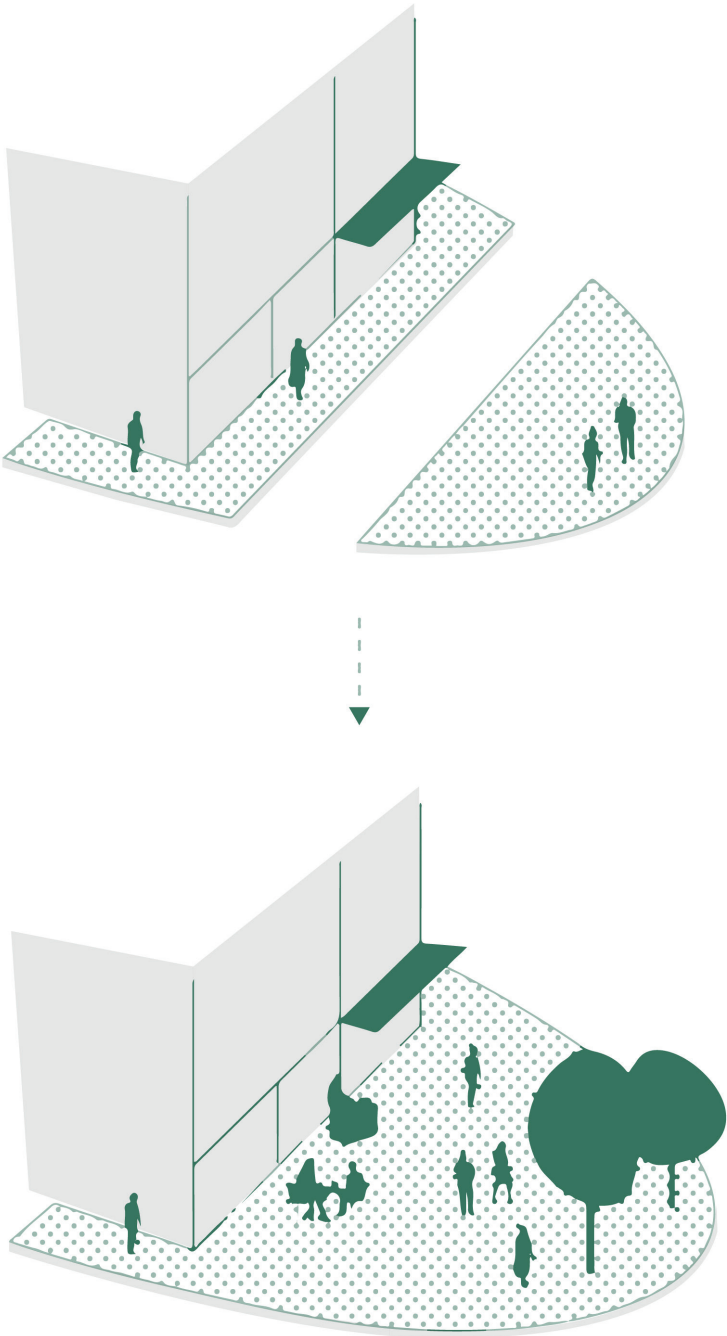
Necessary activities contain those that are more or less compulsory, they are general everyday activities. These activities take place through the year and are more or less independent of the quality of the environment. Regardless of the quality of the environment, people will make sure the necessary activities are carried out. Optional activities are activities that will happen if the individual has the wish to do so and the environment is able to make it happen. This category includes activities such as sitting on a bench to catch some sunshine and simply watching the people walking by. These activities only happen when the physical environment and the weather are favourable. When the environment is of poor quality, only necessary activities happen. When public space is of high quality, necessary activities happen with the same frequency. But a wide range of optional activities will occur because the public place invites individuals to stop, sit, eat, play and so on. (Gehl, 2011)

When optional activities occur, the opportunity arises for social activities. Social activities are all activities that depend on multiple people being in the same environment. Social activities are those activities that include interactions between different people. This can be children that are playing, neighbours that are discussing their day, a simple greeting and the most common social activity 'passive contact'. When necessary and optional activities are afforded, social activities will arise.

Relationship between people have varying degrees of intensity. These social activities that will arise may seem small, maybe even insignificant. But these small activities, such as simple hearing other people, can form the basis for other types of activities. These small social activities create opportunities for a possible starting point for contact at a higher intensity. Are a change to maintain an already established intense relationship and can be a source of inspiration.

If activity in the physical environment is missing the lower end of the contact scale disappears. The varied transition zone from being alone to being together has disappeared. The boundaries between isolation has become more clear. In his book Jan gehl addresses elements of urban design that diminish social activities.

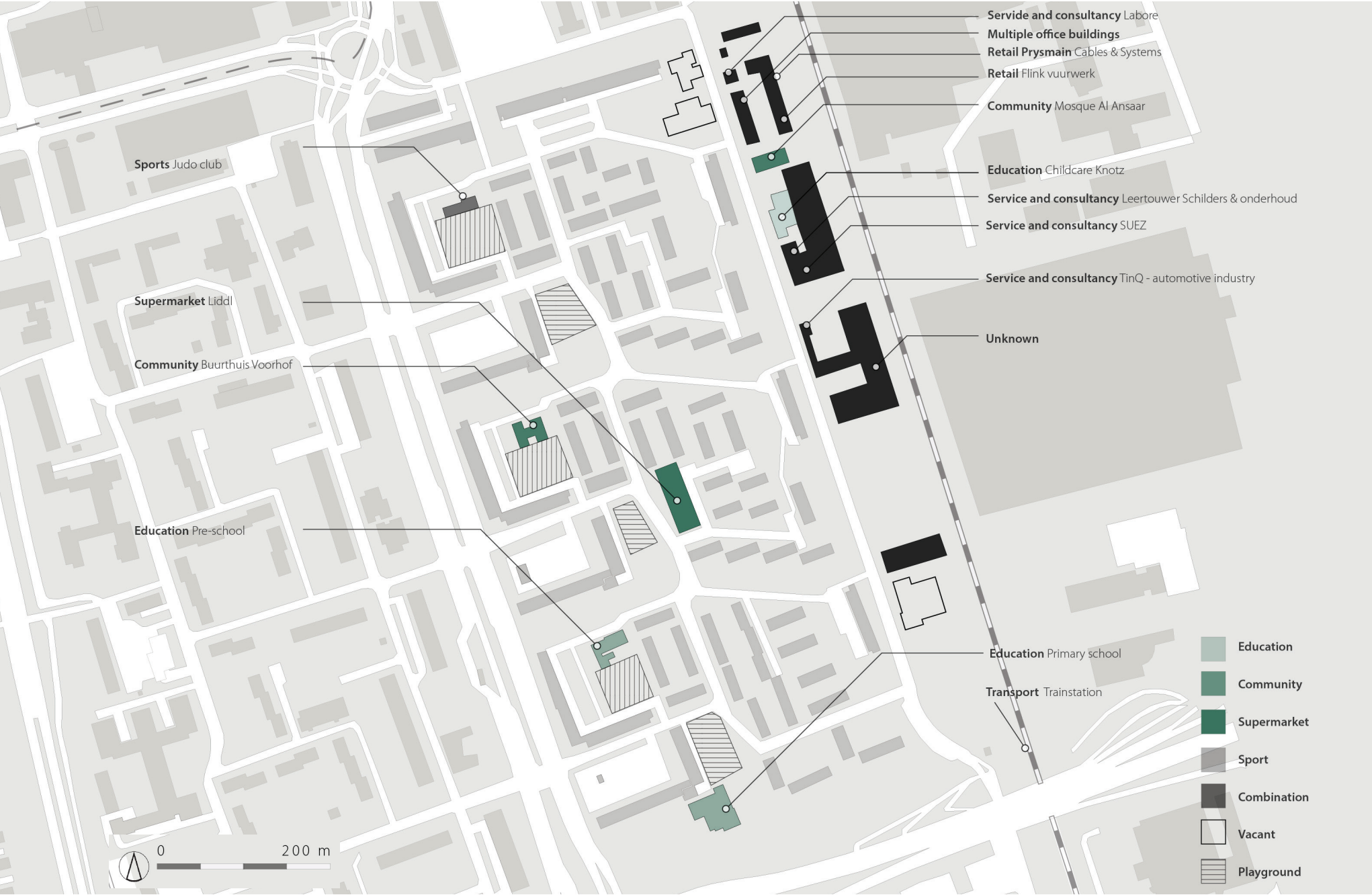
	Quality of the physical environment	
	Poor	Good
Necessary activities	<div></div>	<div></div>
Optional activities	<div></div>	<div></div>
Resultant activities (social activities)	<div></div>	<div></div>



Thirds spaces

The optional and social interactions created by high quality public space are part of what Eric Klinenberg (2018) calls social infrastructure. Social infrastructure is a set of physical places and organizations that shape our interactions. The social life we experience in our daily life does not exist in a vacuum, but is created by our environment, as Gehl (2011) stated. It is supported by the places where we spend time. When social infrastructure is well designed it can foster all kinds of social interactions. It turns a community from a fuzzy concept into a lived experience. When social infrastructure is neglected or bad designed, it stimulates isolation and segregation. Klinenberg has a wider scope than Gehl, the location and design of libraries, schools, the local café and the groceries stores are all vital parts of public life. He combines the theory of third spaces with the theory of Gehl. The third place is the social surroundings that sits in between the two usual social environments of home ("first place") and the workplace ("second place"). Examples of third places are settings such as churches, cafes, clubs, public libraries, or parks. When community life is deteriorated, as is often the case in post war neighbourhoods, the third places may be a solution in reframing the way interpersonal interactions are addressed on a local level. (Oldenburg, 1999)

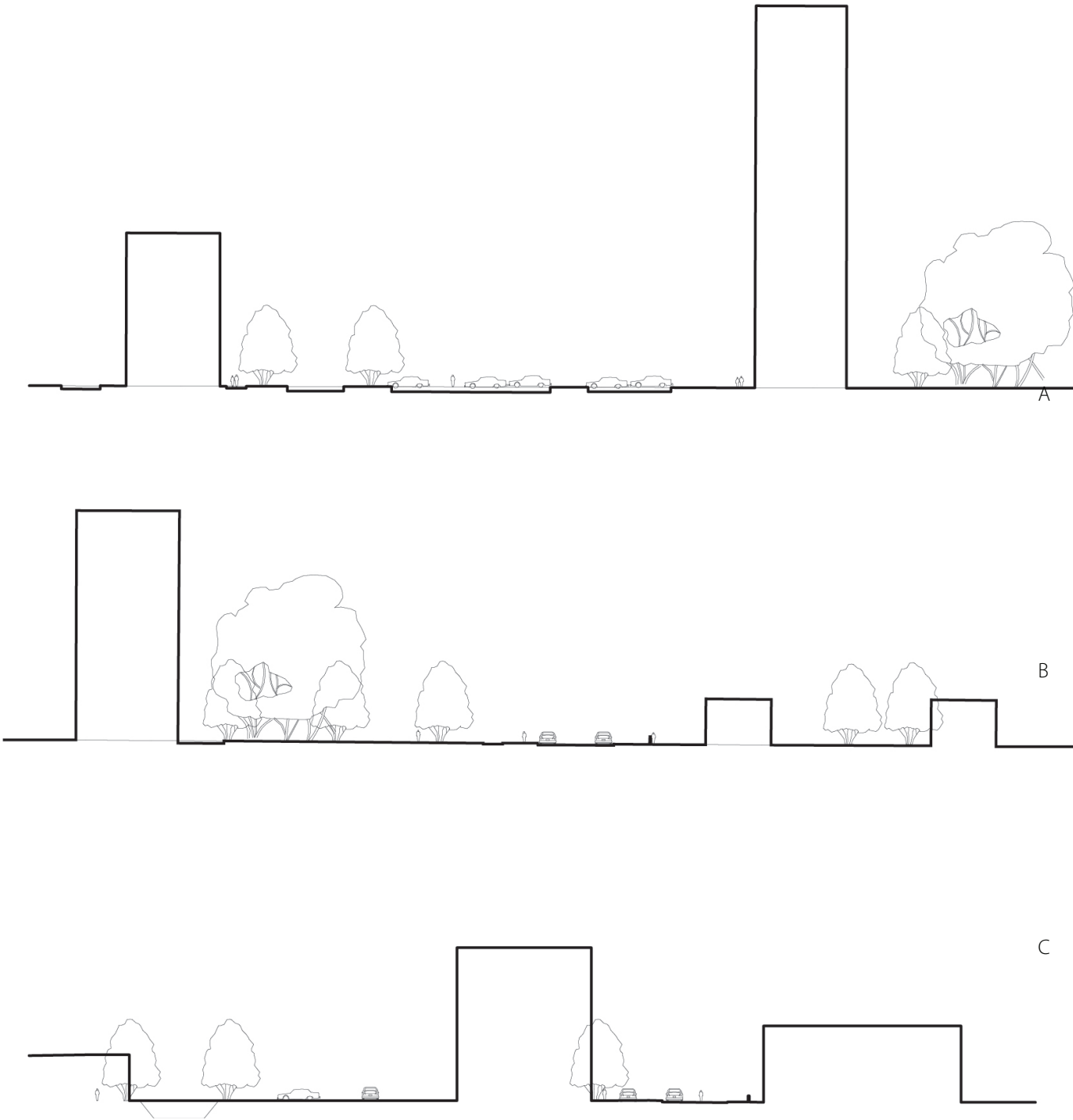
Program in Multatuli and Voorhof High-rise

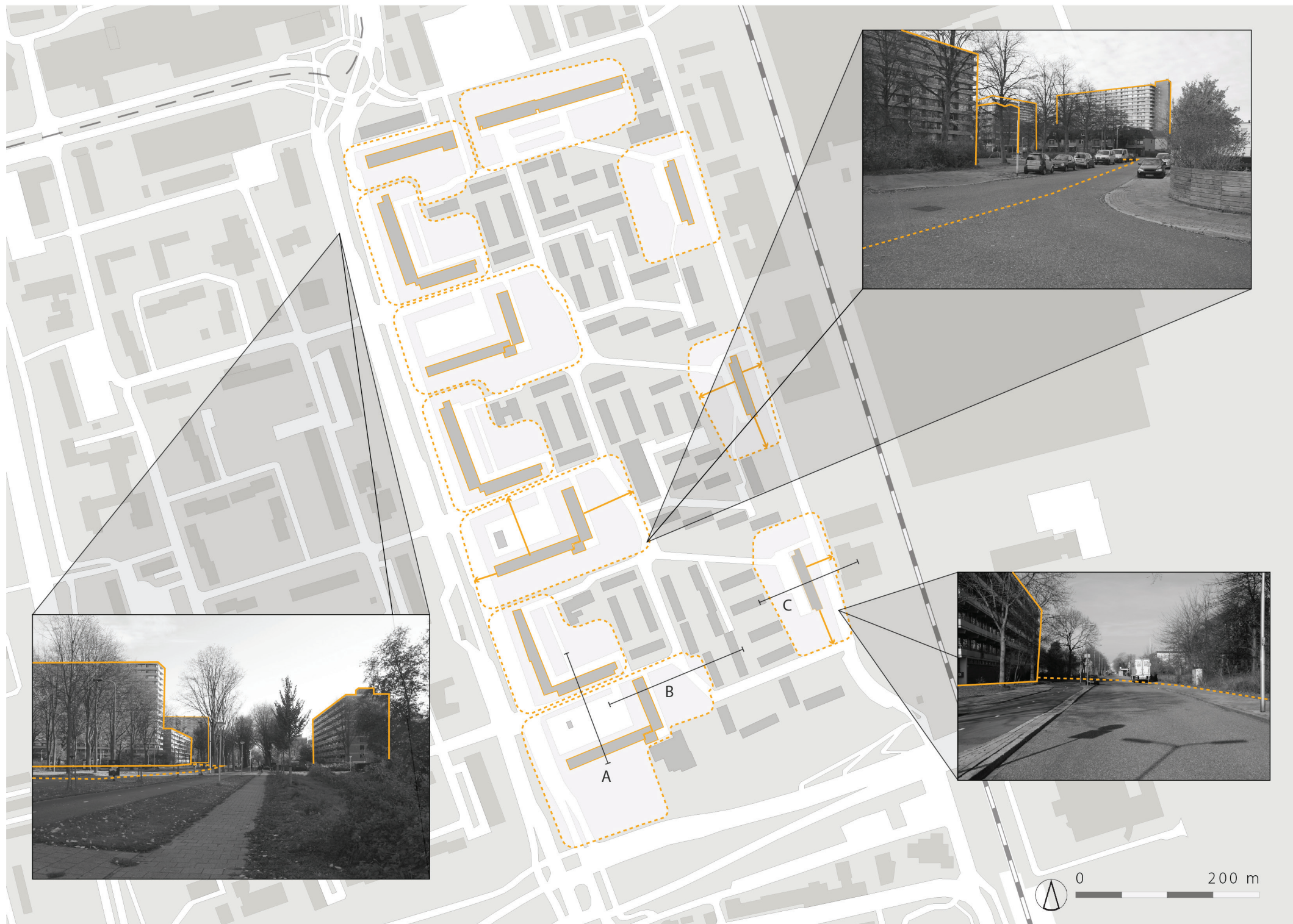




In-human scale of the neighbourhood

Conclusion: In the border of the neighbourhood the scale of the public s the size of the buildings and the roads, prevents people from having socia leads to lower liveability and quality of life. The new development will hav street profiles: by carefully adding building mass the human scale can be r the neighbourhood.





Different types of public space

Based on a typological analysis of Voorhof four main types of public space can be identified; public space defined by car parking, long stretches of useless green, redundant amount of playgrounds and sidewalks.

The areas around daily amenities have the potential to facilitate optional and social activities. In the images of Figure 5.40 the public space around these amenities is shown. The dominance of infrastructure, car parking and non human scale result in places that do not facilitate optimal and social activities

Figure 5.40 Collage of photo's illustrating the low quality of public space (own photo's). On the left; the supermarketed Lidl, in the middle the Mosque and on the left the community house.



Redundant playgrounds, dominated by inhuman scale

Voorhof has many playgrounds, next to all the highrise buildings big playgrounds have been created. These playgrounds have designed in the sixties when the neighbourhood was created. Over the years these playgrounds have not been upgraded. Which results in outdated and very stony playgrounds. The amount of children in the neighbourhood has decreased which results in little use.



Figure 5.41 Collage of public playgrounds (own illustration)



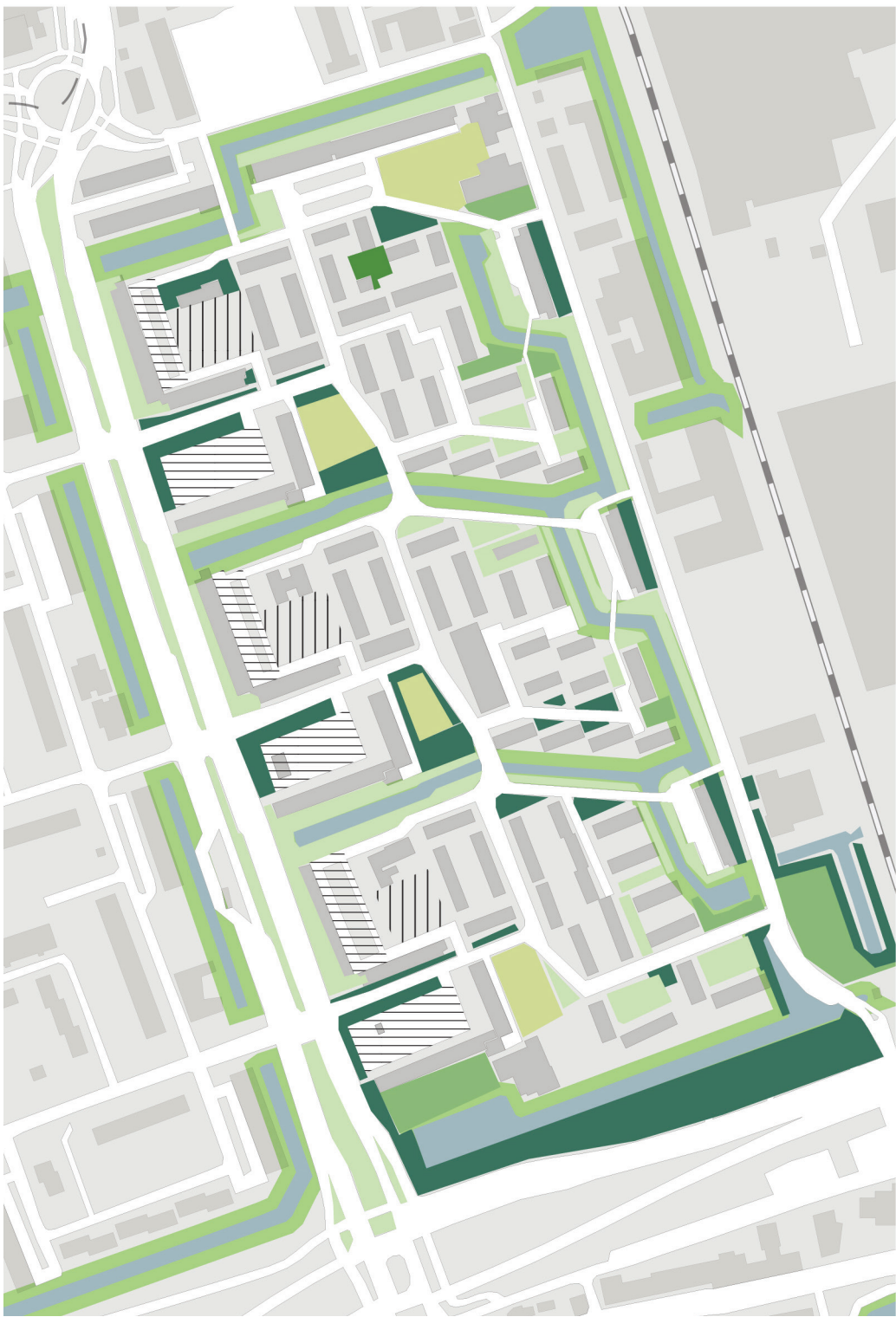
Public space dominated by car

In post war neighbourhoods the infrastructure for the car is dominant over all other infrastructures. As a result a lot of the public space is dominated by the car parking, see Figure 5.42. It is interesting to see that the community functions that are located next to the public space is closed off. The community centre has a very closed facade and does not look very inviting.



Figure 5.42 Collage of public space dominated by car parking (own illustration)





Stoney parking lot



(semi) Hard water front



Generic hard playground



Grassland



Generic soft playground



Shrubs/Bushes



Generic green structure

Figure 5.43 The green areas in Voorhof categorized by research of De Urbanisten (2016) . Categorized according to a combination of the type of vegetation, amount of paved surface and the type of function.

Green public space

Green public spaces in Voorhof can be divided into two groups; the shattered patches of green in between houses and the long stretches of green next to the high-rise buildings , streets and water. The green public spaces have very little functions for residents. They are not connected and do not offer pleasant walking routes. But green public space can have

other functions, such as counteracting urban heat islands and improving biodiversity.

Positive assets of green areas

In cities, green areas have more functions than facilitating human activity. Besides providing residents an opportunity to sport, sit in the sun or a stroll it also provides fresh air, counters urban heat islands and is able to capture CO₂ gas from the air. One of the elements residents experience as quality of the neighbourhood is the green character it has. While the green character of Voorhof is very visible, it does not provide many positive benefits for the environment.

Urban design and research company 'De urbanisten' did extensive research into the benefits of green areas in cities. It resulted in the report "Good green is golden: Exploring the value of green-blue networks for the city: case Zwolle" (2016). The benefit of green areas are resources or processes that originate from natural ecological systems, these are called ecosystem services. Ecosystem services can become an integral part of our urban public spaces, while at the same time serving relevant urban agenda's like climate adaptation , water safety , healthy and learning environments , and urban growth . A high quality green areas provide



Figure 5.44 Mapping of some of the birds and animals in Delft, based on the report *Natuur in Delft* by Eijsackers, D., Albers, K., & Faasen, T. (2017). The illustrations give a short overview some of the animals that live in Delft. Based on this information an assumption can be made on the amount of biodiversity in a neighborhood. The large amount of green areas in Voorhof, visible in Figure 5.43, does not correspond with a high amount of biodiversity. (own illustration)

ecosystem services that create benefit for the city, humans and other animals.

This condensed urban public space shows added values like: education, recreation, food provision, water storage, cooling, cleaning capacity, soil fertility, pollination, carbon storage, reduction of hindrance, symbolic value and biodiversity. The benefits of the aforementioned include the establishment of a stimulating environment for a healthier and more productive urban population, damage control during climatic extremes, the increase of social cohesion and the rise of real estate values.

Even though the neighbourhood is regarded as a very green area, the ecosystem service analysis shows that the green areas provides very little services, see Figure 5.45. This finding is supported by research into the biodiversity in different neighbourhoods in Delft. Figure 5.44 shows the amount of birds and some insects in different neighbourhoods. Even though Voorhof is a very green neighbourhood the amount of biodiversity is not higher than in other neighbourhoods.

The conclusion of this analysis is that by improving the green public areas the quality of the neighbourhood can be increased, not only for activities of people, as mentioned in the previous paragraph, but also to create a sustainable neighbourhood with a rich biodiversity.

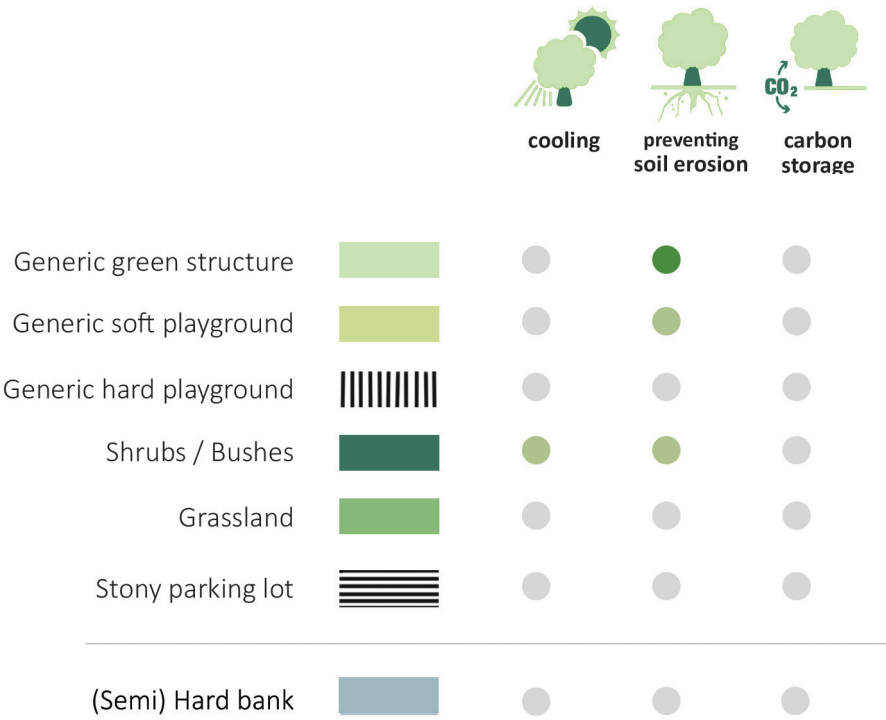
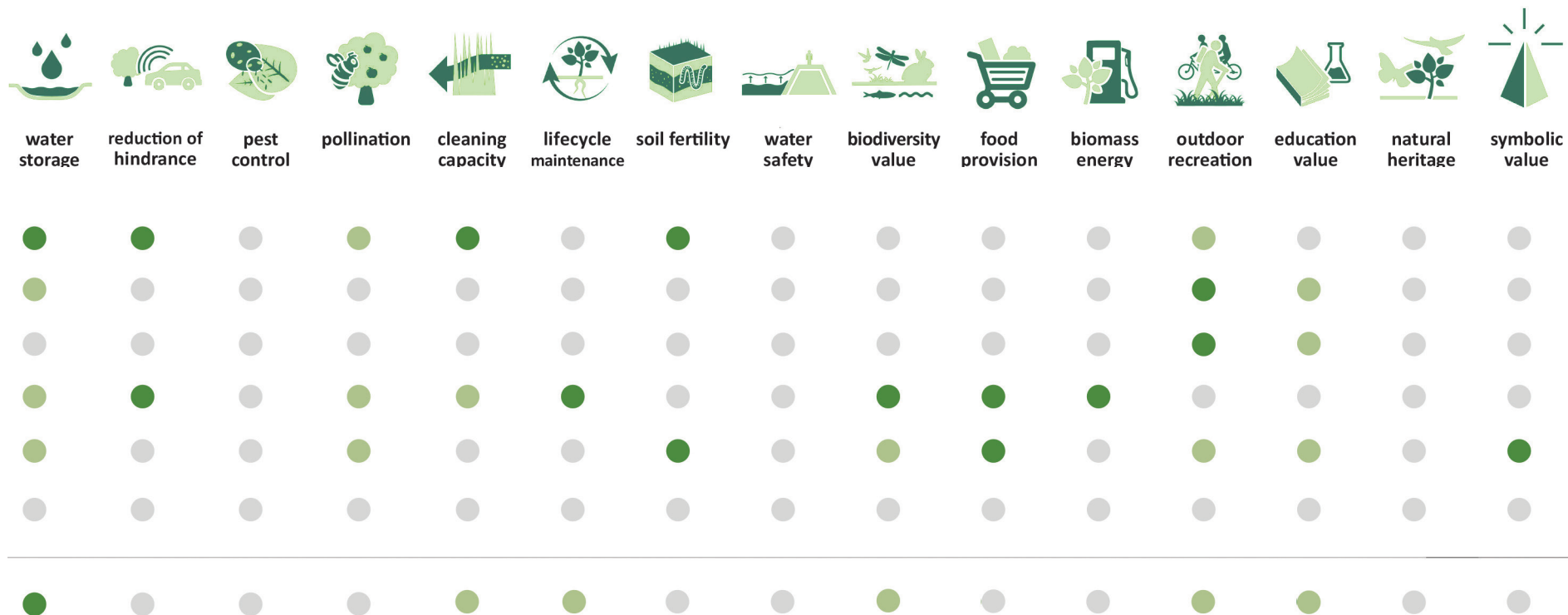
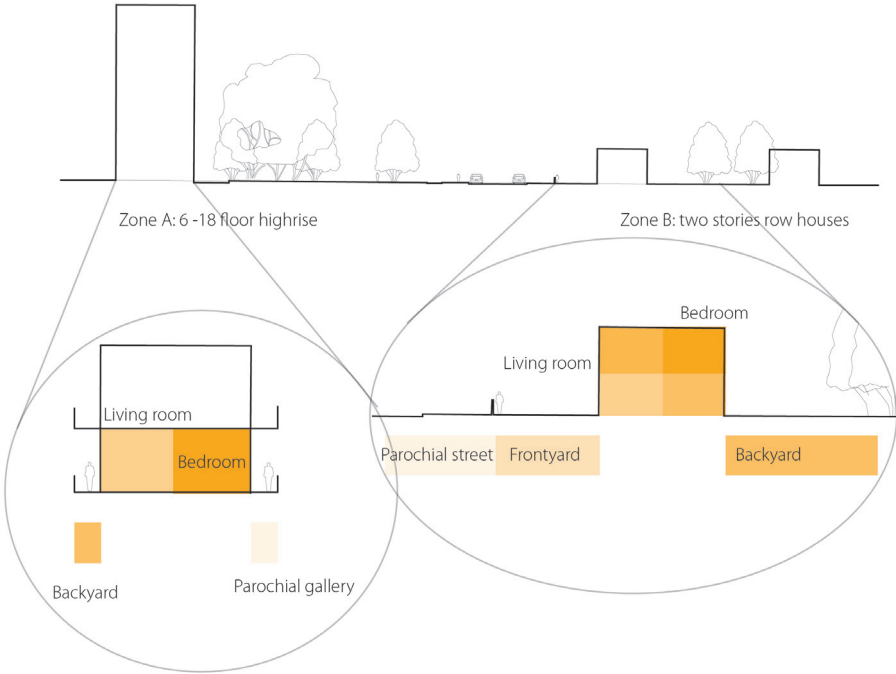


Figure 5.45 Functional public space: scored according to 18 ecosystem services by De Urbanisten (2016). The illustration shows the scores of the different types of green public space in Voorhof. The category '(Semi) hard bank' is added because the original categorisation lacked a suitable category.







In zone B there is little appropriation of public space, but people use their front garden a lot. Most people who have their front garden on east or west side of the house have sitting areas. In some places people use the small green areas in front of their house for children to play or to have a picnic.



In zone A the transition from private to public is very explicit. The balconies are very narrow preventing residents from appropriating the space. Due to the narrow balconies people walk close to the windows of the bedroom and kitchen. Residents close their curtains to improve their privacy. The community functions follow the strict border between public and private. They are very closed to their surrounding.

Conclusies

Monofunctional design of post war-neighbourhoods creates a low affordance neighbourhood

Design of public space and buildings does not promote social activities

Resident opinion

Semi-structured interviews

In projects regarding the quality of environment a personal perspective is very important. Quality of life is a subjective interpretation of the quality of life. It is the general happiness and the emotional well-being of individuals and societies, that cultivates negative or positive attitudes towards life. This means that even though we can measure it, it is a very person experience. Not everyone finds the same things attractive, beautiful or pleasant.

Semi structured interviews have been conducted to discover the opinion of the residents on the quality of the neighbourhood. Based on the research two problem statements have been formulated to review whether the current residents have a similar opinion on the neighbourhood. The respondents are divided into two groups, the residents of voorhof high-rise neighbourhood and of the Multatuli neighbourhood. Residents were asked to respond to two statements and answer one open question.

Voorhof hoogbouw

Inwoners 2.580

dichtheid 24,106 personen/m²

sociale huur 32 %



Multatuli

Inwoners 1.720

dichtheid 8,304 personen/m²

sociale huur 80 %



Statement: The neighborhood is turned inwards, but has no function on the inside

De wijk stelt mij in staat actief bezig te zijn? De wijk stelt mij in staat plezier te beleven of vermaakt te worden?



Selection of Comments:

Het is niet gezellig in de buurt. Er is veel groen maar weinig kwaliteit parken.

Ik mis niks in de wijk.

Ik mis een plek om een kop koffie te drinken.

Er is geen plek om mensen uit de wijk te ontmoeten.



Selection of comments Comments:

Het is een fijne en rustige wijk.

Eigenlijk doe ik alles buiten de wijk, in delft is alles binnen tien minuten fietsen te bereiken.

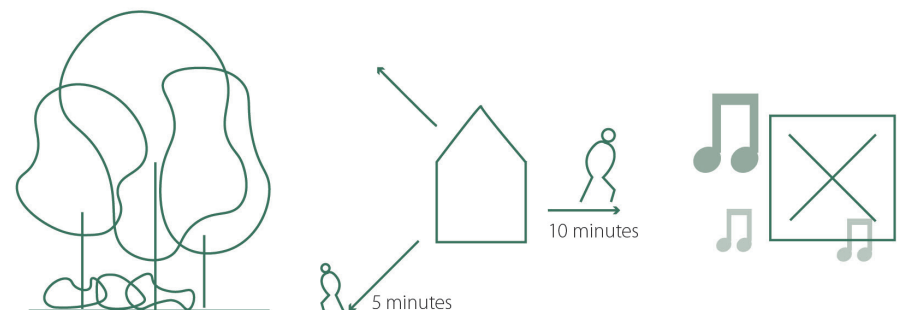
Er zijn weinig goede speeltuinen voor kinderen.

Het zou leuk zijn als er meer avond activiteiten zijn voor buurt bewoners.



Mensen zijn redelijk positief over de wijk. Het meest genoemd is: Ik mis niks in de wijk, want alles is in delft dichtbij. De conclusie die ik hier uit trek, in combinatie met het verschil in antwoord op stelling een en twee, is dat de wijk voldoet aan de eerste levens behoeftes van de bewoners. Maar dat ze al voor al het geen plezier geeft, hun levens kwaliteit niet verhoogt (?). Daarvoor gaan ze naar gebieden buiten de wijk.

Waar mensen positief over zijn:



Validation of problem statement

The second problem statement investigates the experience of safety in the neighbourhood, the focus is on the trying to find out if people feel safe enough to be themselves.

Problem statement

The high flats create beautiful homes, but in combination with the car-oriented public space create a unanimous open space on the street level.

Ik voel me thuis in de wijk Voorhof

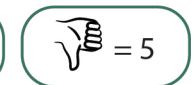
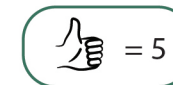
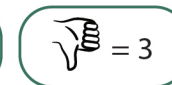
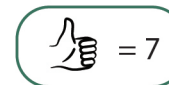
Ik voel me geborgen/beschermt in Voorhof

Voorhof hoogbouw

Inwoners 2.580

dichtheid 24,106 personen/m²

sociale huur 32 %



Selection of Comments:

Het is hier door de hoge dichtheid erg veilig, er wordt altijd een oogje in het zeil gehouden.

Sommige flats verpauperen de laatste jaren, hier voel ik mij niet thuis.

Ik voel me niet thuis in de wijk omdat ik niemand ken. Er is geen manier om mensen te leren kennen.

Ik voel me thuis door mijn leuke burens.

Overdag voel ik me veilig, in de avond blijf ik liever thuis.

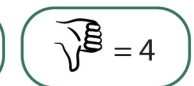
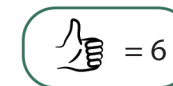
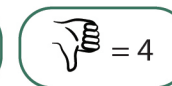
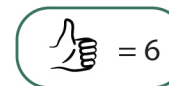
Het is gewoon een erg leuke wijk.

Multatuli

Inwoners 1.720

dichtheid 8,304 personen/m²

sociale huur 80 %



Selection of comments Comments:

Ik zit goed in mijn vel, dus ik voel me overal thuis.

Ik voel met thuis bij de mensen in ons blok.

Ik voel me thuis in mijn huis, buiten mijn huis voel ik me niet thuis.

Ik voel me veilig, maar mijn vrouw voelt zich niet veilig.

Overdag is het veilig, in de avond voel ik me niet veilig.

Ik ben sterk, ik kan mezelf beschermen.

Door de dichte begroeiing is er weinig zicht op de straat.

Mensen voelen zich veilig in de wijk. Maar dit komt niet doordat de wijk hun veilig laat voelen, maar doordat de mensen zich sterk genoeg voelen om zich zelf te verdedigen. De meeste mensen voelde zich naast veilig ook thuis in de wijk. Veel van de bewoners wonen er al lang en kennen er veel mensen. In de avond vinden vooral vrouwen de wijk niet veilig.

Green area is blocking sight on the road



Buildings are deteriorating



Desires of the residents

Residents were asked to answer multiple questions regarding the development of Delft Zuid. Based on these questions eight desires were formulated.



Increase the accessibility for elderly and People who have difficulty walking. At the moment the station is barely accessible for people with difficulties.



Increasing coffee shops and restaurants. The neighbourhood doesn't have any places where you can have dinner, or meet friends



Post-war neighbourhoods do not provide elderly and bigger family housing. Residents acknowledged the need for a more diverse housing stock.



The residents acknowledged the fact their are only low income houses in the neighbourhood. Diverse housing would improve the neighbourhood.



Residents mentioned the lacking of high quality pedestrian walking routes,



The playgrounds need to be improved. At the moment they are deteriorating



The route to the station needs to be improved. In the evening the route is dark and feels unsafe.



Residents would like more places in the neighbourhood where they can meet each other. Exterior and interior places are needed.

Qualitative program of requirements

In general people were quite positive about the development of Delft Zuid. They recognized the possibilities of the development for their own neighbourhood. The main fear was losing the current qualities of the neighbourhood; the quite and green character of the neighbourhood even though the neighbourhood is very dense.

When developing the station area the transition between the new development and the existing neighbourhood has to be well designed to protect the current qualities of the neighbourhood.



Preserving the good qualities of the neighbourhood; dense but quiet and the green character



Diversifying the housing stock, adding restaurants coffee-houses and meeting places.

Strategy

Program of requirements

The program of requirement can be read as a summary of the findings of the previous chapters. It consists of three groups of requirements. First are the aims of the municipality; they consist of the wish to increase the amount of dwellings and increase the amounts of jobs in the area. Their main aim is to try to combine the densification of dwelling with the the existing manufacturing industries. This combination is difficult as the manufacturing industries create noise and pollution. The municipality has not set a clear deffinition on what kind of combination they want to achieve.

Program of requirements based on the aims of the municaplity



Figure 8.54 The program of requirement based on the municipality documents (own illustration)



The wishes of the municipality are supported by the needs of succesfull TOD development. In the case of Delft Zuid the development of the place related qualities is most important. To improve the place related qualities of the station the 300m radius zone around the station has to be renewed. Within this radius the centrality of the station itself, how much the station area itself is of importance for the surrounding area, has to be improved by increasing the diversity and intensity of functions and activities. Additional the strategy and development has to be able to facilitate change. This is very important for stations areas of the future because the changing mobility systems may change the way we use our infrastructure. Mobility as a Service (Maas) might make the central location of trainstations redundant, it is important that in those cases the new development can still be of vaule for the city.

Finally, based on the TOD theories, the accessibility of the station areas has to be guaranteed. This does not only include the physical accessibility of the station but also how many and how diverse are the activities, who can participate and who is allowed to organize

Figure 8.55 Program of requirement based on the TOD theories. (own illustration)

Lastly, based on the research on the theory of affordances and the resident interviews, the paradox between the development of new program and the protection of the current qualities of the neighbourhood is part of the program of requirements. Based on the theory and the interviews the importance of diversifying and intensifying the activities in the post-war neighbourhood is recognized. But at the same time the residents clearly stated that they love the neighbourhood the way it is today, they love its quiet and green character. The transition from the new development and the existing neighbourhood becomes critical for the success of the new station development.



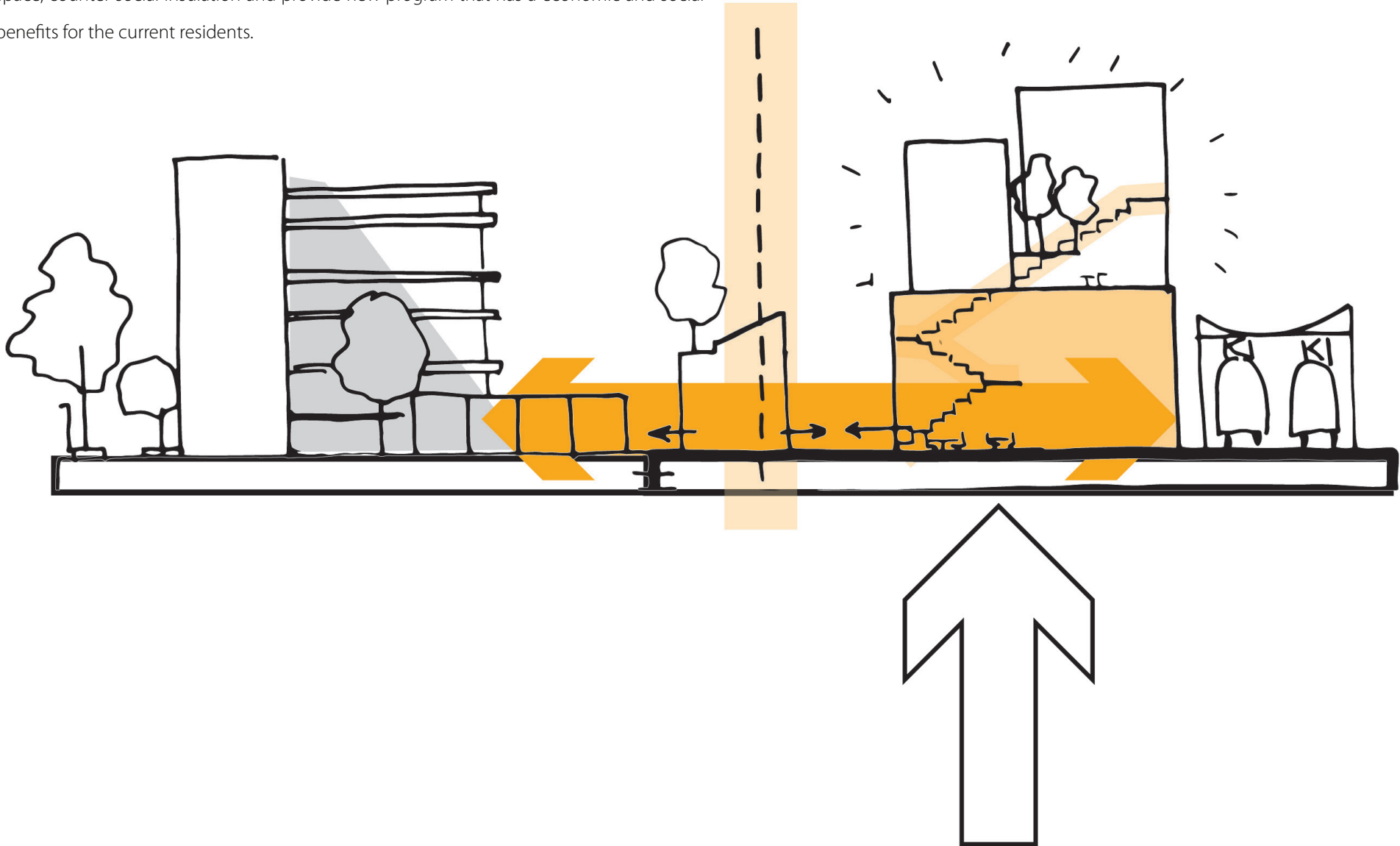
Preserving the good qualities of the neighbourhood; dense but quiet and the green character

Diversifying the housing stock, adding restaurants coffeehouses and meeting places.

Figure 8.56 Program of requirement based on the Theory of Affordances and the resident interviews. (own illustration)

Strategy

Based on the literature study, the plan analysis and the interviews a strategy is made to increase the quality of life in the post-war neighbourhood Voorhof. The momentum of the redevelopment of the peri urban station Delft Zuid is used to improve the quality of public space, counter social insulation and provide new program that has a economic and social benefits for the current residents.



Raise new development to higher levels, to make place for program that creates mutual benefit.

1. Raise the new high quality neighbourhood to create space on ground floor.



3. Create program that enlarges the affordances of the current residents.

2. Connect the new program to economic and activities in the region, on local and regional scale, to secure a stable economic position. By connecting to local and regional economy the new program does not depend on municipal or governmental funding. Creating opportunities for residents to work also means creating opportunities for them to become part of society.

Create a transition from highly urbanised to local community scale to protect the current qualities of the neighbourhood.

1. Preserve the existing street and structure; By respecting the current boundaries of the neighbourhood the current neighbourhood is shown respect, which is something post-war neighbourhoods don't receive often.



2. Green and Blue elements create barriers; The green and blue barriers create additional benefits; maintain the current character of the neighbourhoods, improve biodiversity, prevent flooding and counter urban heat islands.

3. Create a transition in volumes; The gradual increase in volumes facilitates the transition from the old neighbourhood to the new development.. In the existing neighbourhood your view on the new high rise buildings is blocked by small buildings that are in between the new and the old. This way the influence of the new building on the existing streets is less.

Connect the new neighbourhood to the surrounding area to prevent segregation



1. Create routes and sightlines. To connect the new development to the existing neighbourhood the possibility for the current residents to adopt the new development into their daily lifestyles has to be created. This can be done by creating sightlines and routes.

2. Use local materialisation. The production of post-war neighbourhood has been one characterised by technical innovation. Technical innovation in prefabricated construction and in concrete casting created an unprecedented production speed. This resulted in neighbourhoods with very characteristic neighbourhoods, to blend the new development into the existing neighbourhood the materialisation of the existing buildings is used.

3. Create public space at higher levels. To create public spaces on higher levels the transition from public streets to private areas is taken into account. Multiple routes lead to a public square on which front doors are located. Public functions can be located along these routes and on the square.

Design location

The area of development is in between the station area development and the existing neighbourhood. Figure 8.57 shows the areas of interest, the yellow areas are public spaces that can be improved by the station development. The green boxes area plots of land that will be developed into buildings, this development starts near the station and will spread over time. The two components of the strategy are supported by multiple design interventions. In the next paragraphs the design interventions will be discussed.

Design location; includes the municipality plot and the streets around it. It is on the border of the existing neighbourhood and is connected to the new station development.

Figure 8.57 Shows the intervention zones in the design area. On the border of the station development, displayed in green, and the existing neighbourhood there are a couple of potential areas that can be used to improve the neighbourhood and are in close proximity of the station. (own illustration)

Program

The first element of the strategy, raising the new development to a higher level and finding suitable new program, is the most fundamental part of the strategy. Therefore it will be discussed within this strategy booklet.

The program is used to connect different residents, users and industry around the station. The aim is to add functions that are a benefit to the new residents, the existing manufacturing industries, the TU Delft and the existing residents. It is best to add a function that not only has socio-economic benefits but also improves social life in the neighborhood. Part of the new program will therefore be 'third places', see chapter on inequality, such as cafes, clubs, public libraries, or a park. These places are important for civil society, democracy, civic engagement, and establishing feelings of a sense of place. They are places where different residents and users can meet, these social activities that will arise may seem small, maybe even insignificant. But these small activities, such as simple hearing other people, can form the basis for other types of activities.

The station, has a strategic location. It is next to the manufacturing industries, it will be developed into "Delft Campus station" the main mobility hub of the university and is located next to the high way connection to the greenport. At the same time it is located next to neighbourhoods with a higher concentration of low income households.

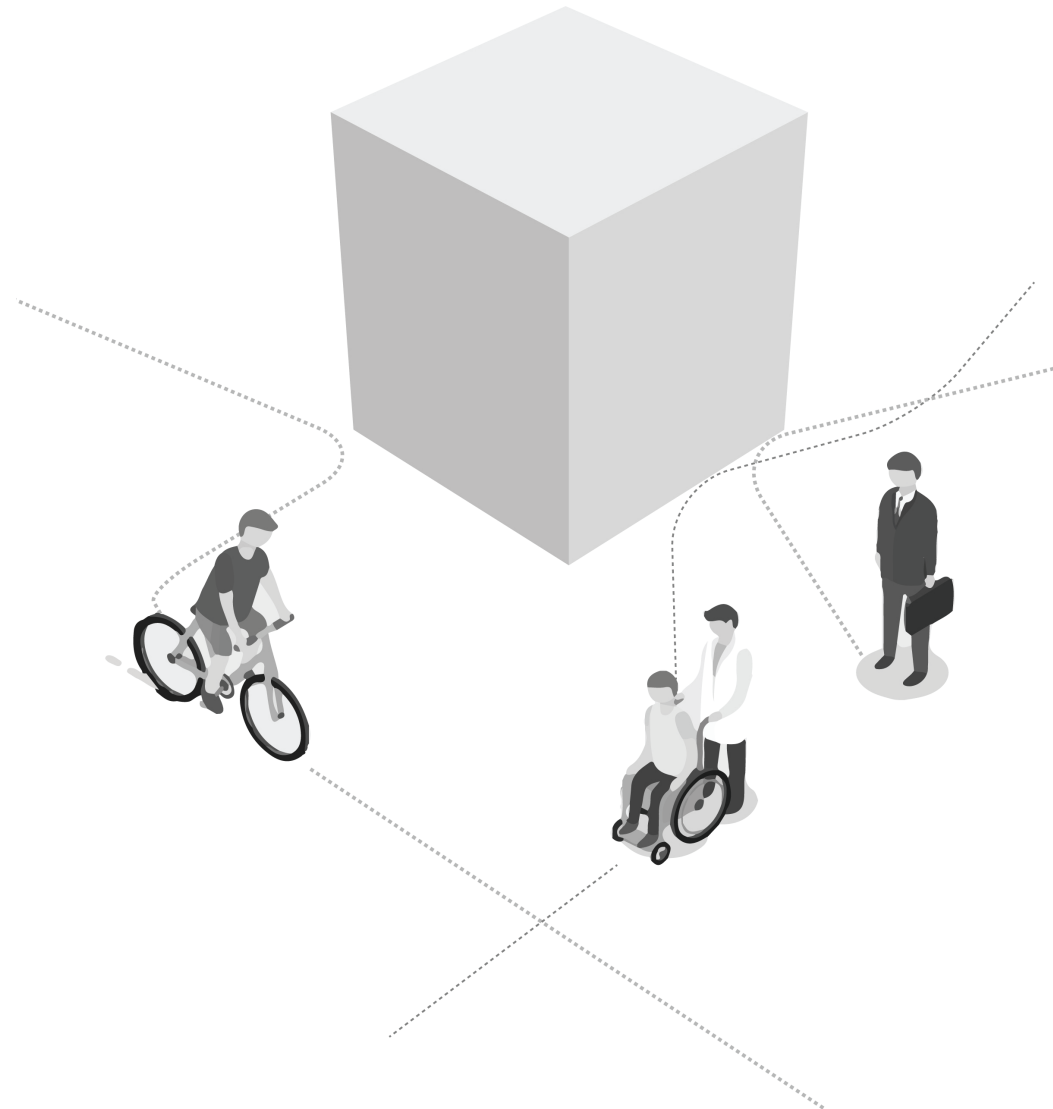


Figure 8.58 Function of social program in a neighbourhood. (own illustration)

Vocational education

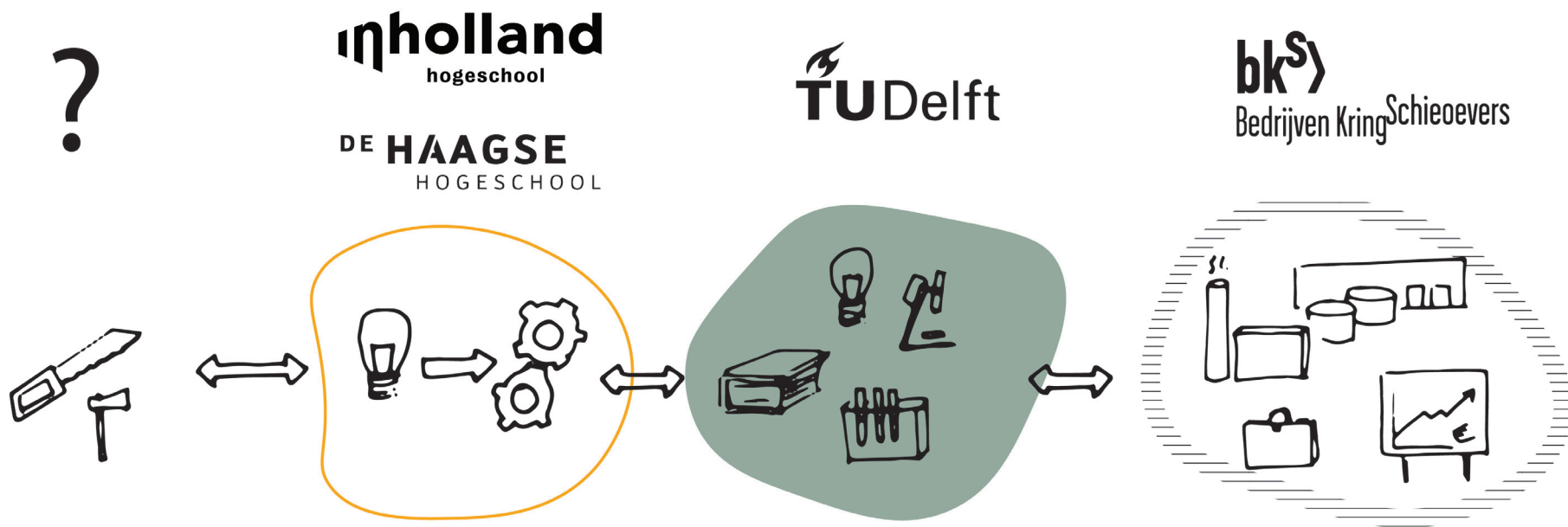
The number of technical vacancies is increasing. More and more young people are graduating in technical fields, but it seems that it will not be enough to meet the needs of the market. 79% of technical organizations expect a shortage of technicians in the coming years, both quantitatively and qualitatively. The vacancies appear at all levels of education, but while the number of students at the TU Delft has increased the number of students at vocational school has been stable. At the moment, as multiple newspapers have reported, the amount of vacancies for practical positions is very high, Figure 8.60 and Figure 8.61. The needed densification is delayed by the shortage of suitable workmen.

The area around the Delft Zuid is a good location for the vocational education because it is in between the TU Delft, manufacturing industries and lower educated households.

Figure 8.59 Technical and technological education in Delft. The municipalities has a University of Technology, two faculties of applied sciences but lacks vocational education.. (own illustration)

Figure 8.60 Newspaper article from the Volkskrant (2018). "Wanted ten thousand technical professionals who can install solar panels and windmills".

Figure 8.61 Newspaper article from the NRC (2018). "Help, there are no longer technicians!".



Gezocht: tienduizenden vakmensen die raad weten met zonnepanelen en windmolens

Investeer in scholing, adviseert de SER

De Sociaal-Economische Raad waarschuwt voor een groot tekort aan geschoold personeel om Nederland door de energietransitie te loodsen.

Joost de Vries 19 april 2018, 12:20



Op een woonhuis worden zonnepanelen geplaatst. Beeld ANP

‘Kabinet, denk bij de transitie naar duurzame energie ook aan de

N.B. Het kan zijn dat elementen ontbreken aan deze printversie.

Help, er zijn geen technici meer!

Techniekonderwijs Amsterdam kampt met een schreeuwend tekort aan technici, en dat wordt nog veel erger. Gemeente en bedrijven sloegen de handen ineen. „Nu begint alles op zijn plaats te vallen.”

✂ Len Maessen 🕒 18 mei 2018 ⌚ Leestijd 6 minuten



Oefenlokaal voor technisch praktijkonderwijs op het Montessori College Oost in Amsterdam.

Foto's Daniel Niessen 📷

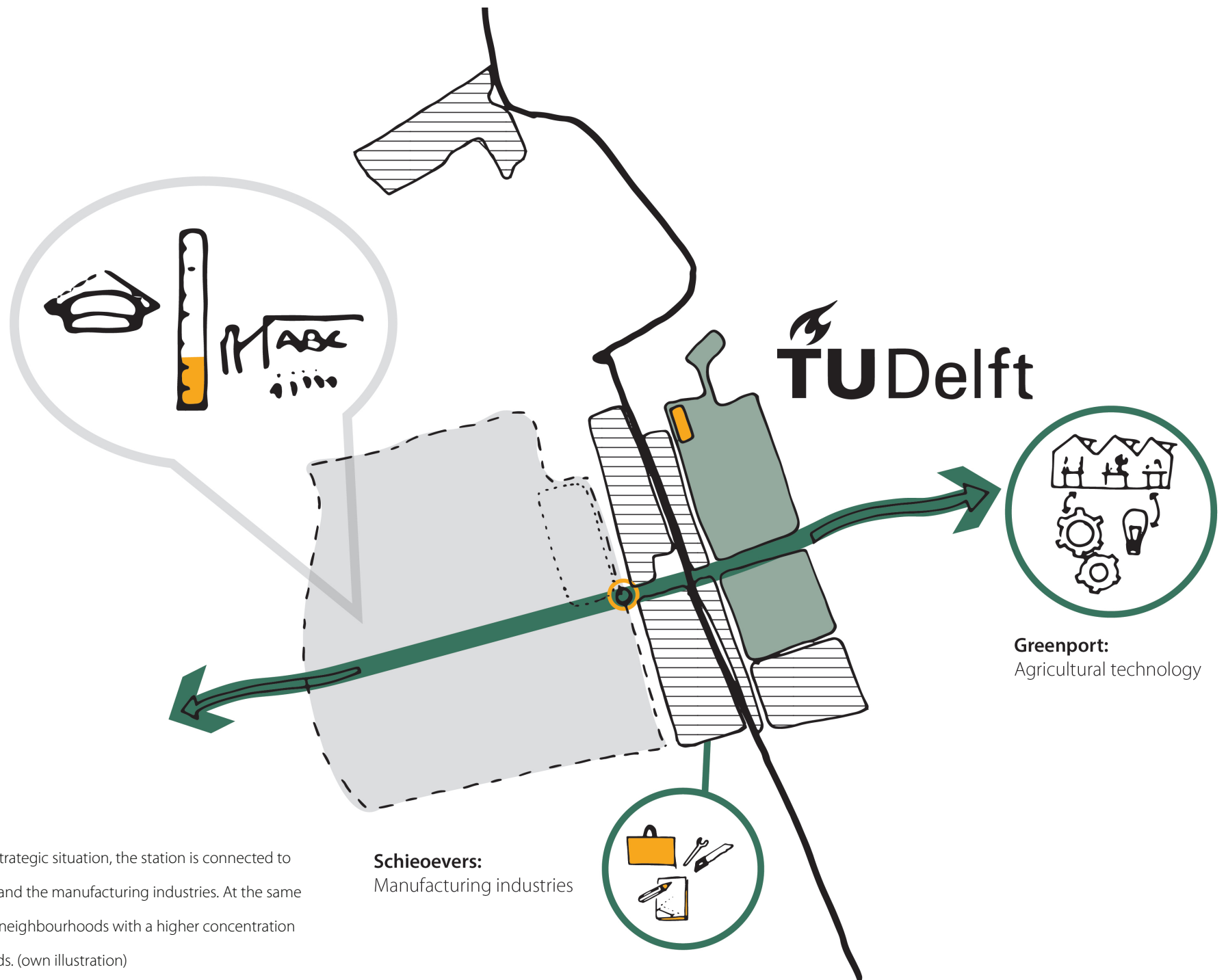


Figure 8.62 Delft Zuid strategic situation, the station is connected to the TU Delft, greenports and the manufacturing industries. At the same time it is located next to neighbourhoods with a higher concentration of low income households. (own illustration)

Benefits of vocational education

A circular economy seeks to rebuild capital, whether this is financial, manufactured, human, social or natural. The goal is to optimize resource yields by circulating products and materials in use at the highest material utility at all times in both the technical and biological cycles. This means that during a life cycle you invest in maintaining the quality of a product. When a product is no longer used, you try to find a new use or you redistribute. When a product is broken you try to refurbish. Only when a product is beyond repair do you recycle the materials.

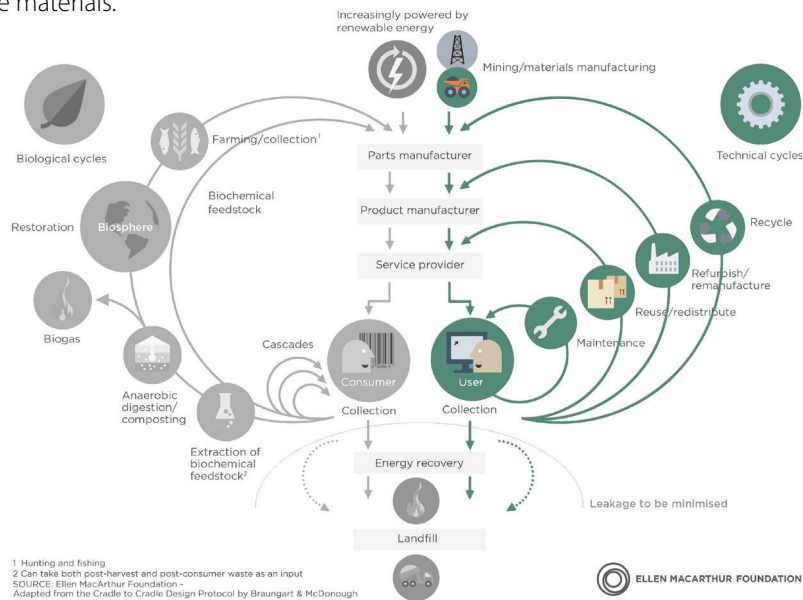
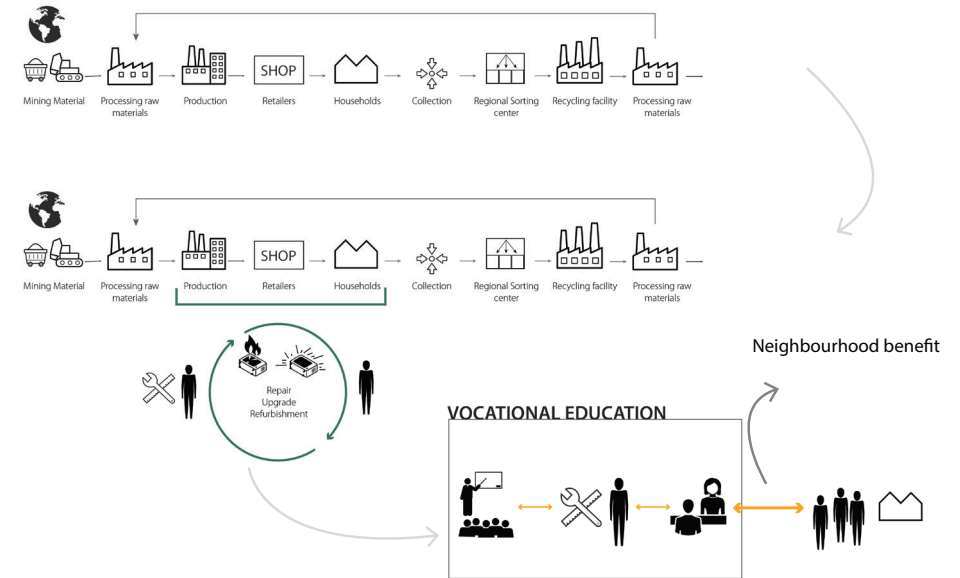


Figure 8.63 Circular economy system diagram by the Ellen MacArthur Foundation. A circular economy seeks to rebuild capital, whether this is financial, manufactured, human, social or natural. The goal is to optimize resource yields by circulating products and materials in use at the highest material utility at all times in both the technical and biological cycles. This means that during a life cycle you invest in maintaining the quality of a product. When a product is no longer used, you try to find a new use or you redistribute. When a product is broken you try to refurbish. Only when a product is beyond repair do you recycle the materials. (Ellen MacArthur Foundation 2012, p.24)

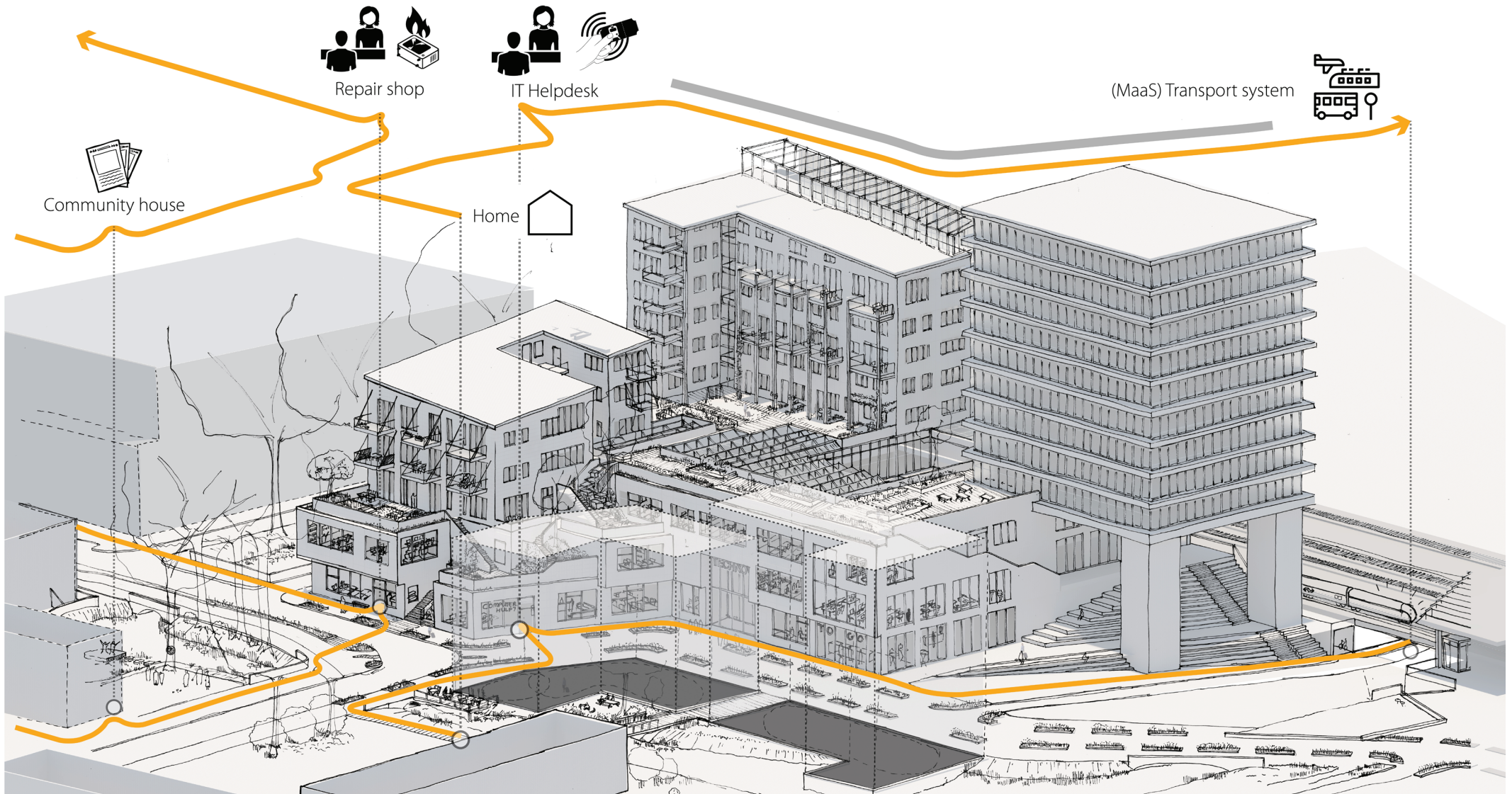


Vocational education will have to include education in maintenance, refurbishment and recycling of materials. As students need to practice maintaining and repairing products the residents can benefit from the school by having their products repaired for free or at a low price. At the moment repairing a product is almost always more expensive as buying a new product. The vocational school will provide residents the opportunity of making their life more circular.

Besides repairing products the vocational education will house a informatics and robotics department. These departments can provide the neighbourhood with an IT help desk. This will diminish the divide of unequal excess to information and communication technologies between elderly and other disadvantaged groups.

Figure 8.64 The alteration of the economic system has a large influence on the manufacturing industry, and in turn on vocational education. Vocational education must include education that prepares for maintenance, repair and refurbishment. (own illustration)

Figure 8.65 Illustration of the design with benefits for the residents illustrated by their daily activity routes in which the vocational education can have a positive impact. The figure shows to different routes of people who use the Repair shop and IT helpdesk. The IT helpdesk can remove the digital barrier of MaaS systems for people who cannot participate in the digital world. The repair shop is able to provide residents with the opportunity to help them repair objects they are unable to repair themselves. En therefore enables them to be part of a circular world.



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Introducing the case, the problems statement and research questions

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