CITY > HOME
YOUNG PROFESSIONAL LIVING

P2 REPORT

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Dutch Housing Graduation Studio
"Between Standard and Ideals"

P2 Research Booklet

CITY > HOME
Young Professional Living

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INTRODUCTION

Before you are laying the results of half a year of research that started with an investigation of the city of Amsterdam and in specific the fortification ring as project location. Through researching the location, specific weaknesses and opportunities appeared that could be dealt with architecturally. In this research report, the main topic is 'The Compact City', an urban concept, about finding the right densification that can lead to cities that, because they are more compact have a higher living quality. This higher living quality can come from more walkable cities, where the car is not needed anymore. Places where there are a lot of shops in the street again and much closer proximity to amenities. It is also a city model that is trying to bring people in close proximity to each other, without compromising on personal privacy. It is the trust building encounters that are so important for us. When infrastructure is returning the space it occupies to the city it allows for beautiful green parks that run around the city. So that for everyone there is plenty of green nearby.

The research will later zoom in more to an architectural solution as large city renewal plans are not likely to occur in these parts of the city, but development will go more gradually. The selected location with an odd non-standard shape, that of the fuel station on the Hoge Kadijk became a study on how to achieve a high density in the best possible way. Different projects are projected on the site and scores have been summarised in a scheme called 'SpaceMatrix'. This scheme contains information from various approaches of studies, like urban plans as references as well as own studies on densification for the site.

The location is neither standard or following a clear structure, and that too will be analysed in the research booklet. The project location being an eclectic outcome of different developments, of various functions in different times let to an area that is interesting and allows for much freedom for designing a building on a location that needs to give the urban character back to this location which it is missing.

Eventually, the building will be designed for Young Urban Professionals following a rapid new trend of YPL (Young Professional Living), which are small units with shared amenities. It one of the best solutions to create high-density development for one of the largest demographic groups in Amsterdam.

TABLE OF CONTENTS

1. THE COMPACT CITY

Introduction

The research in this booklet is developed with the aim of understanding the principles of the Compact City, and to translate this knowledge towards a design brief for a building. The research consists of literary studies as well as analysis performed through designing. Throughout the booklet which starts with the problem of sprawl leading to the concept of Compact City, will evolve further to an assignment for the design of a building in Amsterdam's fortification-ring. Throughout the research, the scope will zoom in more and more into detail. This first section of the booklet will discuss the urban concept, which will also lead to a target-group and building principle. The second section contains a manifest for the Compact City. In the third section, there is a plan-analysis that will look at the location and aims of finding the best strategy to densify the site with its non-standard shape. The fourth section of the research looks at the project location which is the Texaco fuel-station at the Hoge Kadijk in Amsterdam and investigates its unique features. The fifth section is explaining the design concept for the building, and in the sixth section, there is the design brief which describes the program of the building based on the performed research in this document. In the end, there is a summary of the research followed by the bibliography.

Problems with sprawl

If you compare a map of around 1900 and compare it to a contemporary map of the Netherlands and of many other countries around the world, you will soon tend to conclude that the population numbers would have exploded during this period, but this is not the case. Let's look at Amsterdam for example. Amsterdam in 1900 had 500.000 inhabitants on 15km², and in 2000 this grew to be about 750.000 however on a footprint of 200km². Would the density have remained the same then the city today would only have a print of about 22,5 km² [1]. It meant that on average in the Netherlands we have started to live in houses three times the size with half as many people that occupy twice the size of terrain. Meaning that per person we increased the use of land with a factor of 12.

Cities have been spilling a lot of space in the last century and started to sprawl this has caused a lot of adverse side effect that we are getting more and more aware of recently and we are beginning to see the qualities of density. The increase of car ownership after the Second World War has played an essential catalyst in this development. This increase in car ownership has led to adverse effects including:

- Car dependency. In a lot of areas mostly in sprawl areas, there is a daily need for a car for the essential functions. Were the car once promised us freedom it now has become a dependency, which is especially negatively impacting those that are unable to drive or do not have the financial means to own a car.

- Congestion. The explosion of car ownership has lead to the first traffic jam in the Netherlands in 1955[2], which was spectacular at the time, but has evolved to become a dreadful commodity. We are wasting a lot of time in commuting from one place to the other, and more and more roads are needed to deal with this congestion.

- Stress and hazard from motorised traffic. The growing volume and speed of car traffic are causing a higher perceived feeling of danger, creating greater vigilance with pedestrians and keeping possible cyclists off the road.

- Roads are barriers to public life. Former functions that were linked to the streets have disappeared as the streets became just mere channels for traffic pushing the public life to other places in the city.

- Dispersal. Car traffic has led to a dispersal of activities that once took place within the neighbourhood to move to other places often outside the confines of local neighbourhoods.

- Air pollution. Motorized vehicles nowadays are majority dependent on the burning of fossil fuels with are being released in the environment and are linked in several researches to adverse health effects.

- Sound pollution. Traffic comes with a lot of sound pollution, however when cars became more quiet the sound produced by the tired of the vehicles are still the major cause of sound pollution, this is combined with the other sounds that cars produce make living near more intensive roads unpleasant, and it is linked in several researches that there are relations between sound pollution of car traffic and detrimental physical and mental well-being of people living near roads with intensive car traffic.

- Disincentive to walking and cycling. A lot of people prefer the car for short distances even. This is mainly because the car is getting the priority on the streets and becomes the most convenient solution. The Vinex neighbourhood Vathorst in Amersfoort has shown an alternative, making short distances quicker proving shortcuts for pedestrians and cyclists and providing barriers for cars to drive

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1   Rudy Uytenhaak, Jeroen Mensink, and Ed Melet, *Steden Vol Ruimte: Kwaliteiten Van Dichtheid* (Rotterdam: Uitgeverij 010, 2009).

2   Yuri Visser, "29 Mei 1955 – De Eerste File in Nederland," Historiek, May 29, 2017, , accessed April 25, 2018, https://historiek.net/29-mei-1955-eerste-file-nederland-pinksterdag/69249/.

● = 50.000 inhabitants

Amsterdam 1900
500.000 inhabitants
15km²

Amsterdam 2000
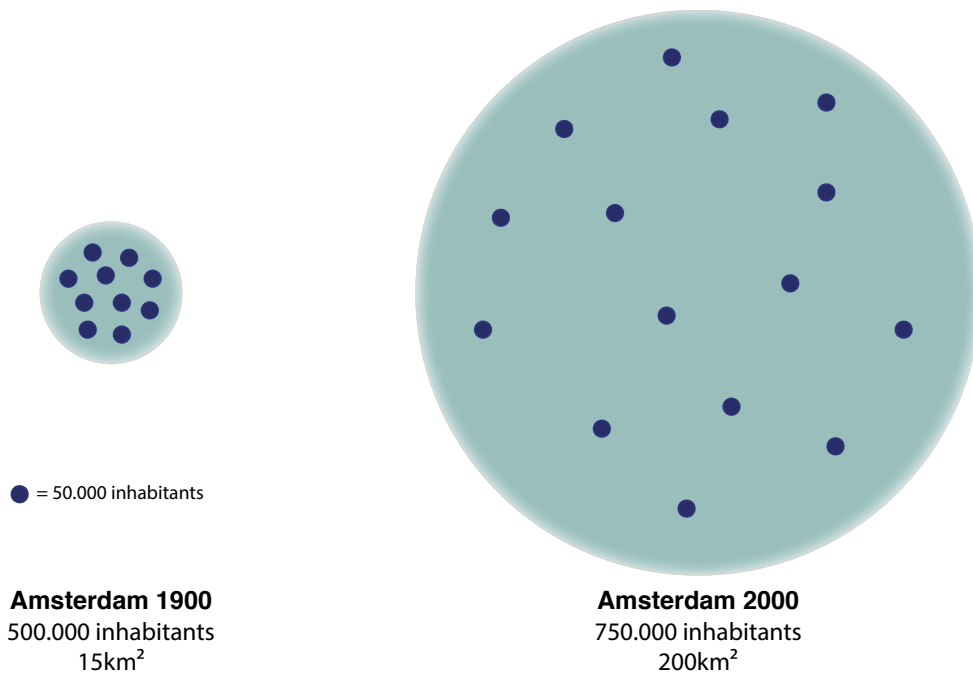750.000 inhabitants
200km²

Figure 1 - Decline of density in Amsterdam between 1900 and 2000 - The outer circle is illustrating the footprint. While the dots are illustrating 50.000 inhabitants. It is clear to see that in 2000 the dots have significantly more space between them, than in 1900 - Source: Own Image

through the neighbourhood. In this way, the right incentives are being offered to the resident to take the bicycle quicker or walk. Exercising more through walking and cycling to different places inside the neighbourhood is one of the most effective ways for a population to stay fit.

Apart from the enhanced car ownership living in lower densities has other social implications as well. People tend to feel , and higher rates of crime are reported in areas that are deserted. Living further apart in suburbs means that the different areas that are appointed to shopping, work or living are almost abandoned in several times of the day, making people feel more unsafe. Also, we tend to become more separated from the community as people spend their times in different places around the city instead of in their neighbourhood where they can meet their neighbours. This is leading to less lively streets and thus people having less interaction with each other. Charles Montgomery explains in his book Happy City[3] the implications of sprawl, and he emphasises the importance of trust-building encounters between people. This can happen with your spouse or even strangers. During these trust-building encounters oxytocin is released which is also called the happiness molecule and will make us feel happier.

"People that are better connected socially are more resilient and get through hard times better, they get over illness more quickly they live longer – on average 15 years then people that are disconnected and are more productive at work (..) Social trust correlates with economic growth" – Charles Montgomery, Happy City (2015)

From an economic perspective sprawl has been negative. A lot of sprawl neighbourhoods have barely any amenities, and the maintenance is expensive compared to those in the city that are being used far more intensively. Sprawl is leading to increased public expenditure and eventually higher taxes. We need more streets, sewage, electricity lines, water pipes, more cell phone antennas, we need more police to surveillance more streets, more bus services with less occupancy, more street lighting, more maintenance for everything, etc. These are costs that are not directly visible but that are hurting our budgets apart from even our direct increase expenditure of travel.

Sprawl is also linked to environmental issues. Denser cities use fewer resources, for infrastructure, etc., but also to heat our houses. The more dense cities show a lower CO_2 footprint per person. Also, sprawl has converted plenty green-spaces to built areas. This has led to negative impacts on natural wildlife and biodiversity. Which is also causing issues with water management as rainwater during high-intensity rainfall that can more difficult infiltrate in the soil.

It is clear that urban sprawl is not a sustainable city form and we need to build compact cities. Especially in a time when city planners are aiming for more liveable/lively, healthy and sustainable cities the compact city model is the best solution.

What is a Compact City?
There hasn't been a general definition of the term 'Compact City'. However, the term is widely adopted in literature for example;

3   Charles Montgomery, *Happy City: Transforming Our Lives through Urban Design* (Londres: Penguin Books, 2015).

7

- *"Intensification of the use of space in the city with higher residential densities and centralisation"* – Elkin (1991)[4]

- *"More intensive land use, Centralized activities and higher densities"* - Newman and Kenworthy (1989)[5]

- *"High density, mixed-use city, where growth is encouraged within the boundaries of existing urban areas, but with no development beyond its periphery''* – Breheny (1996)[6]

- *"... in general it is taken to mean relatively high density, mixed use city based on an efficient public transportation system and dimensions that encourage walking and cycling"* – Burton (2001)[7]

Dantzig & Saaty (1978)[8] were one of the first to try to define the Compact City, and they have listed the characteristics of the features of urban form, space and social functions as follows;

Urban Form:
- High Dense settlements
- Less dependence on the automobile
- Clear boundary from surrounding areas

Spatial Characteristics:
- Mixed land use
- Diversity of life
- Clear identity

Social Functions:
- Social fairness
- Self-sufficiency of daily life
- Interdependence of government

Resulting in a city that generally is having;
- Efficient public transportation.
- A more walkable/cyclable city.
- Lower Energy consumption per capita
- Reduced Pollution (air and sound).
- Feeling more safe, because of more eyes on the street.
- Less infrastructure provision necessary (saving money).

- Better quality amenities and public spaces that are easily accessible.
- More green spaces in the city.
- More inclusive for all income groups.

The Compact City is often revered to as the City of Short Distances/Close Proximity, 'Smart Growth', 'Urban densification' or 'Urban intensification'. Meaning that in the Compact City everything is within close proximity. The close proximity makes that better amenities are coming in the reach of a larger group of people and is not only limited to the people with the highest budgets that can afford to live near the better amenities. The Compact City is therefore also more inclusive. What we can see from Amsterdam, for example, is that the most desired place to live, when we related that to the value of housing, that the city centre where all the mean amenities are centred is most desirable compared to the housing in the more green sprawl areas on the outskirts of the city. It is, therefore, no wonder that the city centre of Amsterdam and Oud-West, Amsterdam's most dense neighbourhoods are also the neighbourhoods with the highest prices per square meter going above 6000 Euros per square meter while housing prices on the edges of the city are around 1500 Euro per square meter. In America, more walk-able cities are having on average 38% more GDP per capita than less walkable neighbourhoods[9]. To further illustrate the demand for this kind of neighbourhoods.

The Compact City is desirable because it is providing the residents more in their needs and is helping them to develop themselves further. Cities are a concentration of people where the main cultural, educational and other amenities are located. You can shop in different shops from all cultures and can find specialised help more readily. The Compact City is covering the needs better as can be illustrated using Maslow's hierarchy of needs[10]. This theory is based that you start on the bottom of the pyramid and to rise to the highest state which is called self-actualisation the lower areas must be achieved entirely or for the major part. Then you can climb up higher. The Basic needs are also called deficiency needs, that can have significant consequences on human well-being if not being met. While the rest are steps that generally enhance the quality of life more. Now step by step is explained why a compact city is better than a more dispersed city.

Physiological needs
Physical needs are better met in the compact city than in sprawl areas. The Compact City is healthier, as it encourages people to walk and cycle. The Compact City offers furthermore higher quality public spaces to find rest and connection to nature, and there is less air and sound pol-

4   Elkin, T., McLaren D., and Hillman M., *Reviving the city: towards sustainable urban development.* (London: Friends of the Earth with Policy Studies Institute, 1991).

5   Newman, P., Kenworthy, J., *Sustainability and Cities: Overcoming Automobile Dependence.* (Washington D.C.: Island Press, 1999).

6   Breheny, M., *'Centrists, Decentrists and Compromisers: Views on the Future of Urban Form'* in Jenks, M., Burton, E. and Williams, K. (eds.) *The Compact City: a sustainable urban form? (London:* E&FN Spon, 1996).

7   Elizabeth Burton, "The Compact City: Just or Just Compact? A Preliminary Analysis," *Urban Studies* 37, no. 11 (2000): , doi:10.1080/00420980050162184.

8   George Bernard Dantzig and Thomas L. Saaty, *Compact City: A Plan for a Liveable Urban Environment* (San Francisco: W.H. Freeman, 1973).

9   Cristopher B. Leinberger and Patrick Lynch, Wake-Up Call: Michigan Metros, PDF, Washington: The George Washington University, 2015.

10   A. H. Maslow, "A Theory of Human Motivation.," Psychological Review 50, no. 4 (1943): , doi:10.1037/h0054346.
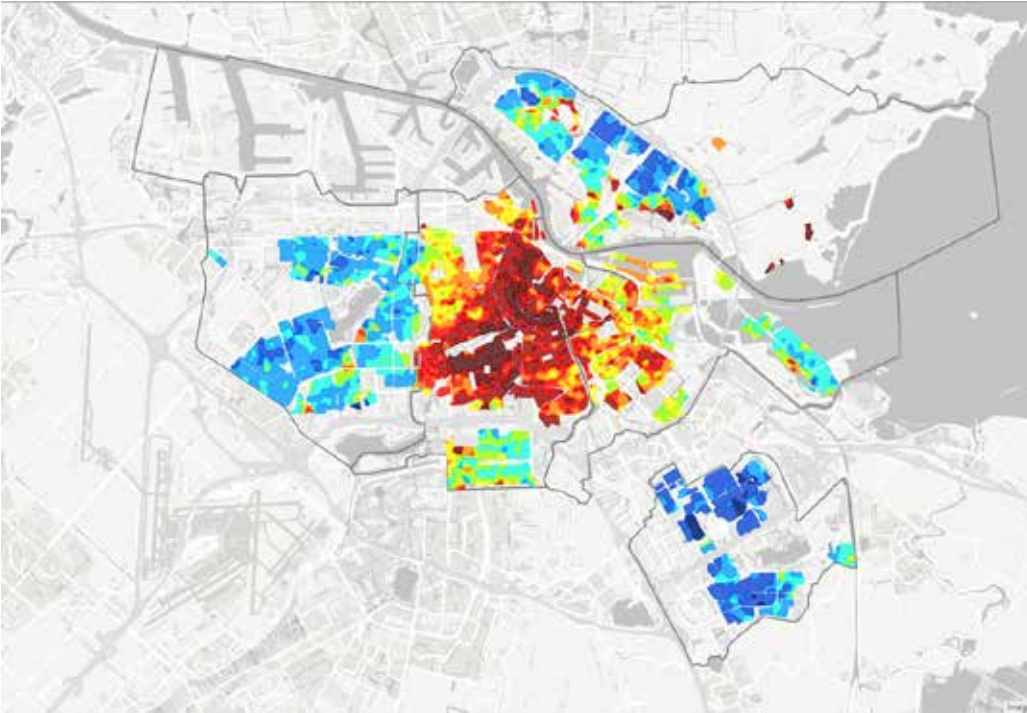
Figure 2 - Average housing prices of Amsterdam per square meter - The dark red spots are the places where the prices go above €6000 per square meter, while the light blue areas are below €1500 per square meter - Source: "Property Value: Sale Price per M2," map, Maps Amsterdam, 2018, accessed May 12, 2018, https://maps.amsterdam.nl/woningwaarde/?LANG=en.
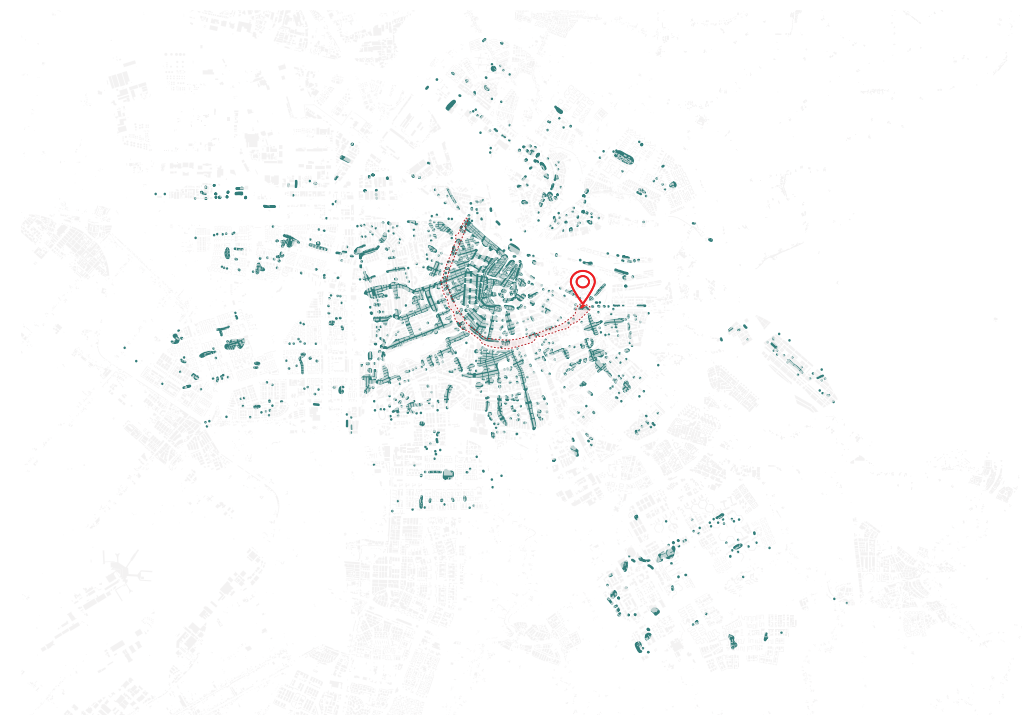

Figure 3 - The spreading of retail functions in Amsterdam - The purple spots are indicating the location of retail functions in Amsterdam. The places with a lot of functions clustered are the same areas that are more expensive (desired) as can been seen in the previous image. Concentration of function indicate generally more walkable areas, while concentrated shopping facilities indicate more car dependence. The red dotted line illustrated the researched area of the former fortification ring and the red marker points out the project's design-site. - Source: Own Image

lution because of reduced car traffic. Also in cities, there are generally more options for food and different cuisines from different cultures.

Safety needs
A good Compact City will be safer. There are more eyes on the street through mixed land use, and research shows that these areas are more safe compared to the more deserted places. Also, compact cities offers more affordable housing, because the land is more efficiently used then in sprawling areas.

Belongingness and love needs
The Compact City creates a place where there can be more social interaction between people. Public spaces will be more lively, so there will always be people around. Chances of meeting other people or the close proximity to friends and families will increase this even further. Trust building encounters release oxytocin that is liked to happiness, as mentioned earlier, and will occur more often in a Compact City. Also, it is easier to maintain connections with friends, family and other people because of close proximity and also community activities are more likely to occur.
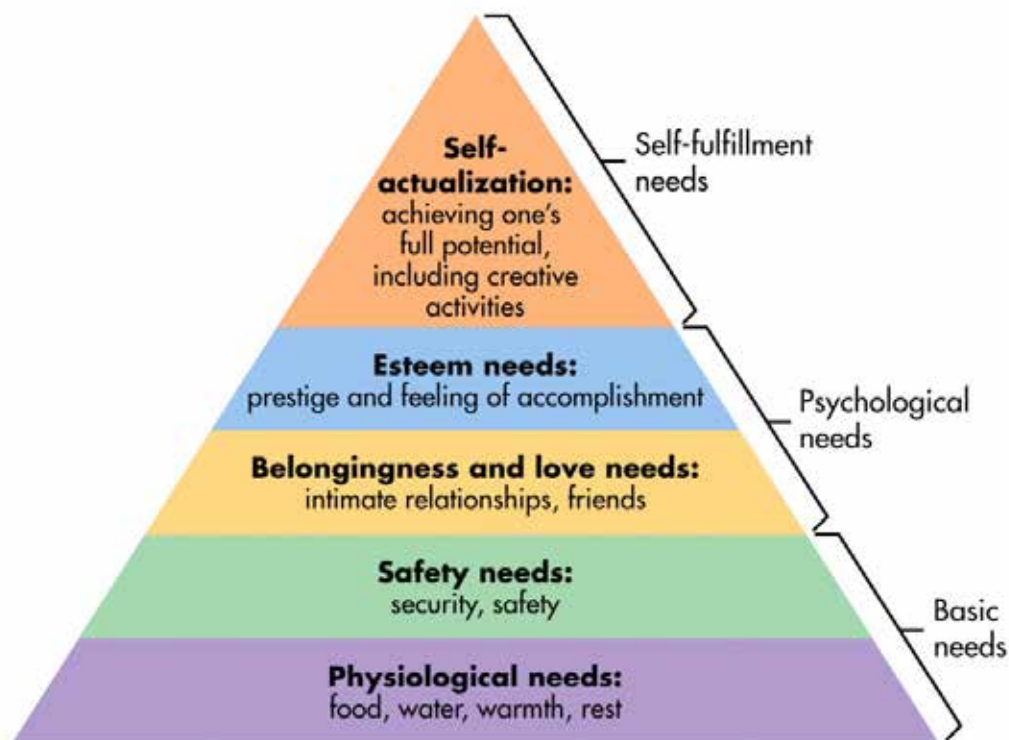
Figure 4 - Maslow's hierarchy of needs - Maslow's hierarchy of needs is a theory that is based on the principle that before a human can develop to the highest state of self actualization the other steps of the hierarchy of needs must be fur-filled. So you start with the basic needs and from there can climb up higher. When your basic needs are not met, for example when you are hungry than all your attention will go on finding food and it will be rare that you are reaching a state of self actualization. - Source: Saul McLeod, Maslow's Hierachy of needs, digital image, Maslow's Hierarchy of Needs, 2017, accessed May 12, 2018, https://www.simplypsychology.org/maslow.html.

Esteem Needs

Esteem links to feeling good about yourself and to be able to accomplish things or self-love. When we love ourselves, we can follow our own interests, and that is easier in compact cities where there will be a more extensive array of amenities available in close proximity. Also different kind of work opportunities is available near to home, and various educational opportunities. There are more stages in a compact city of manifesting your ideas and showing your accomplishments. Self-love also means taking good care of your self, or self-grooming. Health stores, yoga studios, gyms, wellness centres, etc. will be found in greater variety and closer proximity in a Compact City

Self-Actualization

To fulfil the highest category in Maslow's hierarchy a Compact City offers a more fertile ground then more sprawled areas. When we look at Amsterdam, there are already a lot of cultural institutions and creative opportunities to reach a sense of self-actualisation. The closer we live together with the better access we will get to these facilities, and there will be more. It is easier to study in a library just a bit for fun when it is a few streets away then when you need to travel for 30 minutes, then the chances are that you only go to the library with a specific purpose on mind. Also, the sense of community in well designed Compact Cities can be stronger, leading to more community organised (creative) activities and the sharing of knowledge, ideas and visions which can lead to potentially reaching more self-actualisation.

Visions on the Utopian City

When mankind made the transition from 'Hunters and Gathers' to an agricultural society there was a huge change in their way of living. With agriculture it meant that there was effort done in cultivating the land, which would provide with yields. The yields of the land had to feed the population till the next yield could be harvested. This meant storing the food. But supplies of food are vulnerable to be looted especially in times when food is scares. Therefore these storages need to be protected. That is why cities have been walled, to keep the intruders out. Walled cities however came with some other developments too. City walls were expensive, time consuming to build and the more longer the walls the harder to defend them. There was therefore a need to build dense cities. This tradition of city walls has only recently disappeared when new developments in weapons made the city walls an inefficient way of defence.

The city walls of Amsterdam has been demolished from 1878 [11]. The city at the time was reaching the highest density it had ever seen. It was overcrowded, and diseases were spreading. People were living in any room they could find, even if it didn't have windows or was meant previously for storage. In 1901 the 'Woning Wet' [eng. Housing Act] was introduced providing minimal requirements for dwellings. Also at this time social housing corporations were established having to provide affordable housing. After that, the city started to expand outside of its former city walls.

11   Ernest Kurpershoek. "Nummer 9: September 2004: De Laatste Stadswal Van Amsterdam." Ons Amsterdam. September 2014. http://onsamsterdam.nl/tijdschrift/jaargang-2004/759-nummer-9-september-2004?start=1.
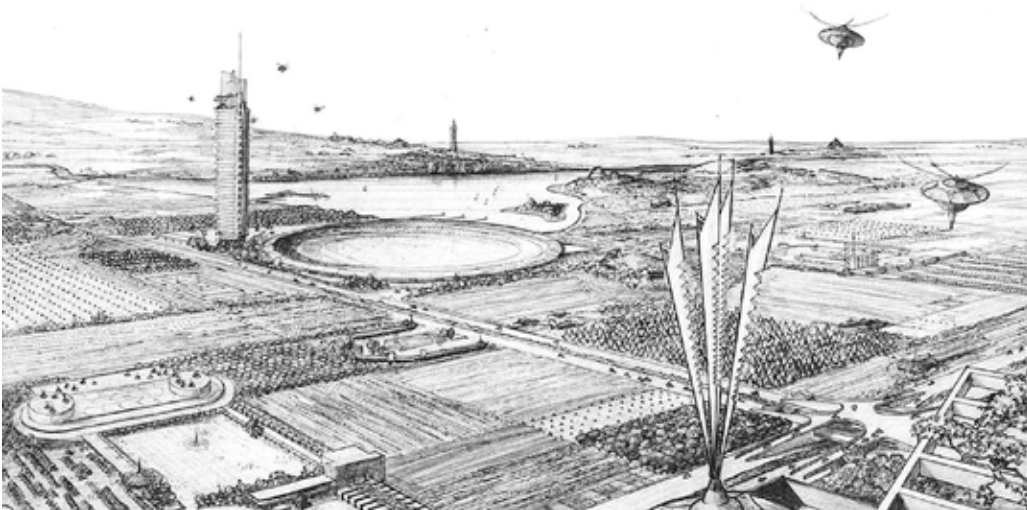
Figure 5 - Frank Lloyd Wright's Broadacre City, The living City, 1958 - Frank Lloyd Wright is according to Breheny the champion de-centralist with his plan for Broadacre City. Wright believed that the city should be everywhere and nowhere. The uprising in modern technology would make this transition possible so he believed. - Source: "Rethinking Frank Lloyd Wright: Thoughts From A Trip Through The Rustbelt", Archinect, 2018

The crowded old city of the 19th century has left a deep aversion towards city life. According to Hall the 20th-century planning history 'represents a reaction to the evils of the nineteenth-century city'[12]. On the start of the 20th century, different standpoints arrived about the city. Michael Breheny categorises the different standpoints in the essay 'Centrists, Decentrists and Compromisers' with Ebenezer Howard as the most important character.

Howard, a stenographer, became later more involved in social issues. The fast urbanisation was seen as a major challenge. Howard, however, was not wholly opposing against the city, as many tend to believe, and acknowledged that there were attractive elements to be found. He looked for the best between the country and the town and developed a Garden City model. These cities would have about 32.000 inhabitants and a density of about 10-12 inhabitants per hectare. The Garden Cities were planned with a clear separation between industrial and residential areas and there would be a central town with facilities. The town would consist of about 400 hectares and a 2000 hectare agricultural belt around it. Letchworth and Welwyn Garden City are realized Garden Cities according to Howard's ideas.

The ideas of Howard would become the influence of many de-centrist to come. However, Howards himself was not nearly as extreme as Frank Lloyd Wright with 'Broadacre City', but more towards the compromiser's side. Wrights described his ideas about the decentralized city as; 'The city should be everywhere and nowhere'[13] . A city that is democratic and gives space for the need of every individual. It was the new technologies and the uprising of the car that to him would loosen the city so that people were

free to live where they would want to live. The drawings that Frank Lloyd Wright made are highly advanced and towards the 50's even included flying pods that almost appear to be UFOs. He saw that technological advances would make sprawl, the goal, a success.

Other de-centralist are as mentioned by Breheny [14]:

- Robert Owen – New Lanark
- Titus Salt – Saltaire
- George Cadbury – Bournville
- William Lever – Port Sunlight
- Mumford, Osborn, TCPA – New towns movement
- Gordon & Richardson – Market solutions
- Evans, Cheshire, Simmie
- Robertson, Green & Holliday – 'Good Life'

Then on the other side are the centrists with Le Corbusier as the champion. He saw the Victorian city blocks as a problem, but his solution to solving the overcrowdedness of the city was to increase the density rather than to lower it. His ideal city model 'Ville Radieuse' was linear based on the abstract shape of a human body. The earlier ideas of high rise housing blocks, free circulation and abundant green-spaces of his previous work also were included in the plan. 'Ville Radieuse' was criticized for missing the human scale, and Lewis Mumford called it "buildings in a parking lot'' and ''The space between the high rises floating in a super-block became instant wastelands, shunned by the public.''[15]

The most quoted centrist in the 20th century has probably been Jane Jacobs. She was not only revolting from the classic de-centralists, but also from centrists like Le Corbusier who were according to her 'egotistical authori-

12   Peter Hall. *Cities of Tomorrow: An Intellectual History of Urban Planning and Design since 1880*. Hoboken, NJ: Wiley-Blackwell, 2014.
13   "Revisiting Frank Lloyd Wright's Vision for "Broadacre City"." Frank Lloyd Wright Foundation. September 08, 2017. Accessed April 29, 2018. http://franklloydwright.org/revisiting-frank-lloyd-wrights-vision-broadacre-city/.

14   Breheny, M., *'Centrists, Decentrists and Compromisers: Views on the Future of Urban Form'* in Jenks, M., Burton, E. and Williams, K. (eds.) *The Compact City: a sustainable urban form? (London:* E&FN Spon, 1996).
15   Donald L. Miller, Lewis Mumford, *a Life* (New York: Grove Press, 2005).
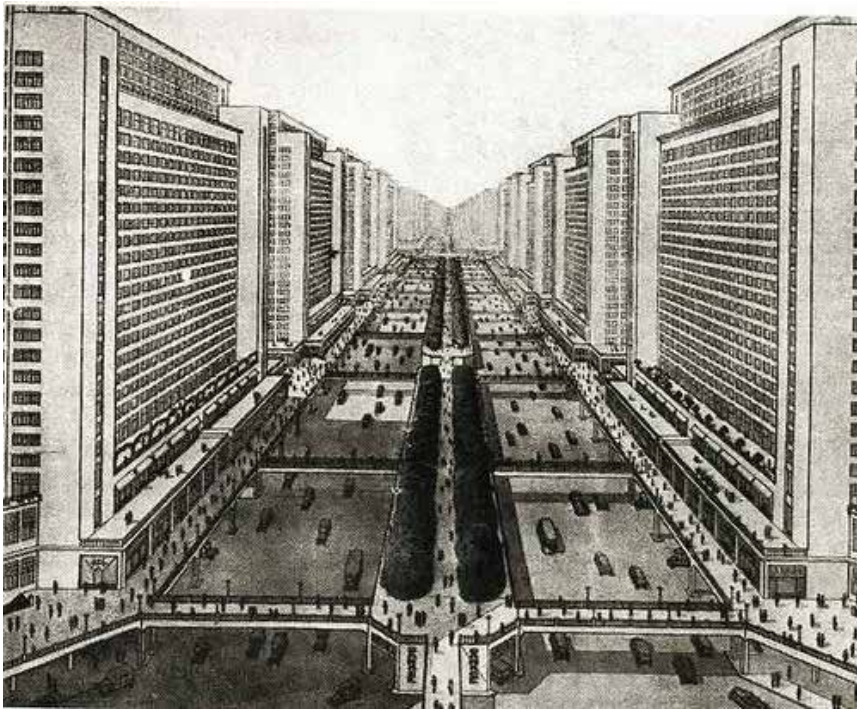
Figure 6 - Le Corbusier's Ville Radieuse, 1924 - Le Corbusier was called by Breheny the champion centralist with his plan Ville Radieuse. He aimed at solving the congestion of the cities by building large apartment-buildings that replaced the courtyard buildings. - Source: "AD Classics: Ville Radieuse / Le Corbusier." ArchDaily. August 11, 2013. Accessed April 30, 2018. https://www.archdaily.com/411878/ad-classics-ville-radieuse-le-corbusier.

tarianism'. Jacobs was more in favor of the density she experienced in her New York neighbourhood. She believed that higher density would lead to more diversity and that this diversity would lead to the richness in urban life that she enjoyed [16].

Other centralists that Breheny[17] mentioned are:

- Nairn – Counter-attack against 'Subtopia'
- Jacobs, Sennett – Urban Diversity
- De Wofle – Civilia
- Dantzig & Saaty – Compact City
- National Governments – Compact City
- Newman & Kenworthy
- ECOTEC, CPRE,FOE

All these strong visionary ideas started to die out towards the 21st century. Where there did not seem to be easy answers to the complex and multifaceted issues of the city. Breheny also brings up the compromisers. The whole idea of the city may not lie in the centralist and de-centralist camp, but can be made out from different elements, however, he says, this is often seen as less fashionable. The TCPA promoted the sustainable social city. An idea that came close to that of Ebenezer Howard who wanted to bring the best of the city and the countryside together, and searching for containment.

The term Compact City was first opted by George Dantzig and Thomas L. Saaty [18], two mathematicians, in 'Compact City: A plan for a Liveable Urban Environment' (1978). They were in this regard on the centralist camp of Breheny and Saaty were seeing the compact city as a sustainable urban form through the more efficient use of resources. Even though there has been a lot of criticism on the model that the arguments used for the Compact City's benefits are often not strong enough and too simplified. The Compact City that Dantzig and Saaty were envisioning was quite controversial. Their compact city was low in density, as a suburb, but would be stacked layer on layer on top of each other with an elevator being able to bring anyone to the rooftop garden in just a few minutes. The term has continued to influence city planners, and urban renewal schemes till today, often with different perspectives to the same concept, because a general definition is still missing.

In the Netherlands town planning emerged after the establishment of the 'Woningwet' [Eng. Housing Act] in 1901. In Amsterdam there were several expansion plans for example Plan Zuid by Berlage. This plan was still having the closed building blocks of about 4 to 5 stories on average and was approved in 1917 by the municipality council. This plan was already having a lower density then the earlier constructed expansion plan of what is now Oud-West. The expansion plan of Van Eesteren that was finished in 1935 had a completely new vision of the future of the

16   Jane Jacobs, The Death and Life of Great American Cities (New York: Modern Library, 2011).

17   Breheny, M., *'Centrists, Decentrists and Compromisers: Views on the Future of Urban Form'* in Jenks, M., Burton, E. and Williams, K. (eds.) *The Compact City: a sustainable urban form? (London:* E&FN Spon, 1996).

18   George Bernard Dantzig and Thomas L. Saaty, Compact City: A Plan for a Liveable Urban Environment (San Francisco: W.H. Freeman, 1973).

city[19]. The influences of the Garden City from England and the influences of 'The Nieuwe Bouwen' [Eng. New Way of Constructing] influenced the plan. The expansion plan was carefully constructed with estimates about population growth and even the decline in the family sizes. The plan consisted mostly out of mid-rise apartment blocks that were placed in vast open green spaces. The Garden Cities had to function as independent neighbourhoods where the functions were separated from each other. Most of these areas were constructed after the second world war, when a lot of affordable housing was needed quickly and the repetitional patterns of the modernistic schemes provided for a good solution. Also farm ground was not very profitable so they were cheap to buy and convert to residential areas. Also at that time the car ownership exploded meaning that people could travel larger distances which work as a catalyst to sprawl. The densities were really low. The Bijlmermeer in Amsterdam constructed in 1973. For those familiar with the Bijlermeer know that this urban scheme failed, people were feeling unsafe and crime rates were high. Today this area has gone through major renewal plans to make the area attractive again. All the way towards the 21th century the density of Amsterdam has been declining, from 600 inhabitants per hectare to 60 per hectare. This trend of sprawl has slowed down in recent years, for the main reason that Amsterdam is reaching to its administrative borders. The expectation is that the density of the city will slowly stop and stagnate, but if it will rise in the future is still unsure.

The need for Compact Cities
We are currently witnessing the greatest mass migration of humankind ever recorded in history. It is the migration to the city. In 2016 already 54% of the world's population was living in cities and with the rise of the world population going from 7,55 billion to an expected growth of 11,18 billion in 2100[20]. This growth of 3.63 billion people will be mostly housed in the cities, providing an enormous challenge of the future on how to accommodate all these extra people.

Rapid rates of urbanization are now mostly taking place in developing counties. Were there only ten mega-cities in 1990 this amount rose to 28 mega-cities in 2014 with sixteen in Asia, four in Latin-America, three each in Africa and Europe, and two in North America. In 2030 the UN expects to have more then 41 mega-cities with 10 million inhabitants or more [21].

"Managing urban areas has become one of the most important development challenges of the 21st century. Our success or failure in building sustainable cities will be a major factor in the success of the post-2015 UN development agenda," - John Wilmoth, Director of UN DESA's Population Division [11].

Most of these rapid growing cities are getting congested, polluted and are unsustainable. These cities will face major challenges in solving these issues and will benefit from implementing right Compact City strategies. For others cities like Amsterdam becoming a Compact City is just as important. Amsterdam's future vision of 2040[22], a unique document that for the first time was created with contributions of every section and stratum of society has a central motto;

"Amsterdam will develop further as a central city of an international competing, sustainable, European Metropole."

And to achieve this the city has put forwards six spatial tasks that it wants to meet by 2040:

- Densify
- Transform
- Public Transport on a regional scale
- High quality of public space
- Invest in recreational use of green-space and water
- Converting to sustainable energy

There are 70.000 new dwellings already proposed within the cities boundaries. However, most of these will be constructed on old harbour areas, rather then densifying existing neighbourhoods. In the document is also mentioned that the city wants to densify within the ring A10 and do that with high-rise buildings. It will indeed enhance the overall density, but will not lead to more walkable cities per se. These high rise buildings will be built at the edges meaning that the concentration is not towards the centre. So yes, Amsterdam is well aware that it needs to be compact, but it needs to put some extra effort if it wants to intensify in the existing urban fabric to become a city that can achieve the highest standards for a liveable city.

How to realize a Compact City?
The time of large-scale city renewal projects is finished in the Netherlands. It seems that we have finally realized that we cannot plan whole cities, but that cities have to grow organically. There are so many variables that are at play in a city that to construct good cities we need to pro-

19   Richter Roegholt, "De Droom Van De Jaren Twintig," De Groene Amsterdammer, January 13, 2001, , accessed June 06, 2018, https://www.groene.nl/artikel/de-droom-van-de-jaren-twintig.
20   *World Population Prospects: The 2017 Revision, Key Findings and Advance Tables*, PDF, New York: United Nations, Department of Economical and Social Affairs, Population Division, 2017.

21   *"World's Population Increasingly Urban with More than Half Living in Urban Areas | UN DESA Department of Economic and Social Affairs."* United Nations, July 2014.
22 S*tructuurvisie Amsterdam 2040: Economisch Sterk En Duurzaam*. PDF. Gemeente Amsterdam, March, 2011.

vide the correct framework and steer it, but no longer try to control the city.

When it comes to transforming the city into a compact city, then it is crucial to set frameworks for new development in the city to make sure the right density will be achieved. It will create islands in the city that will have this increased density and which will start to change the neighbourhood. The more of these high-density projects start to arise, the more the surroundings will adapt to the new situations. The city, however, must actively make sure that the right amount of amenities can settle in these densified clusters so that the city can become walkable/cyclable and that the public spaces are upgraded to the required standards to prevent the city becoming crowded and congested.

When we speak of density then there is always a question about what the desired density is. First of all there are many definitions of density, to start of with the division between[23] ;

- Perceived density
- Physical density

Perceived density is how dense we feel the city is. Some cities are more dense then others but do not feel more dense per se. It is the task for designers to design buildings that are having a low perceived density and a high physical density. That can be measured by the following methods[24] ;

- Population and dwellings density
- Land Use Density

- Coverage
- Building Height
- Spaciousness

Some of these terms will be further discussed in the plan analysis where they will help to quantify the density of different plans and to come up with the most effective strategy to density the project location.

Often in projects and urban plans, there is referred to dwellings density as it is easily quantifiable. However this not telling us anything about the number of people living in the area. The number of inhabitants in the Jordaan in Amsterdam went from 1.200 inhabitants per hectare to just below 300 in 2000. The decline is mostly because of the shrinkage in household size. So when the dwellings density remained relatively similar the population density decreased very quick. For a compact city, the population density is therefore more important than the dwellings density. Supermarkets and other amenities are more looking at population densities because they need a minimum amount of customers/users to be viable.

When it comes to setting a target number, there is another challenge. First of all because different locations in different cities have different potentials. Also in calculating density, there is the influential factor on what to include and what not to include. Measured density therefore always need to be taken with a critical node, but can be perfectly used to compare different kind of densities on a same location.

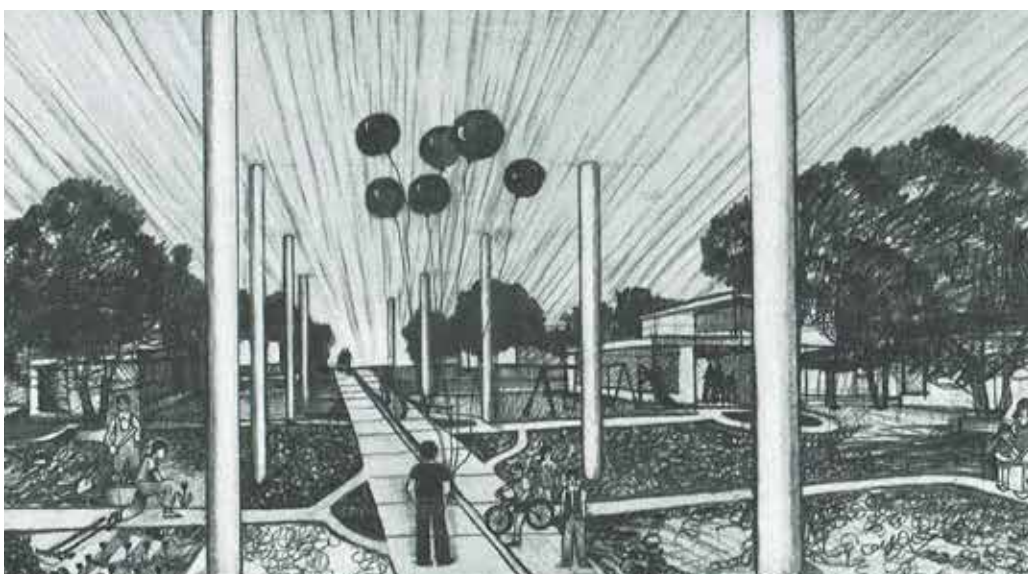Density is often related to congestion and air pollution.

Figure 7 - The walkable bike-paths of the Compact City of Dantzig and Saaty - Their Compact City model would be low density neighbourhoods stacked together in order to create a high density. As you can see on the impression of the city, there is no daylight entering these neighbourhoods. Further development in lighting had to solve this issue. - Source: George Bernard Dantzig and Thomas L. Saaty, Compact City: A Plan for a Liveable Urban Environment (San Francisco: W.H. Freeman, 1973).

23   Amos Rapoport, "Toward a Redefinition of Density," *Environment and Behavior* 7, no. 2 (1975): , doi:10.1177/001391657500700202.
24   Meta Berghauser Pont and Per Haupt, *Spacematrix: Space, Density Und Urban Form* (Rotterdam: NAi Publishers, 2010).
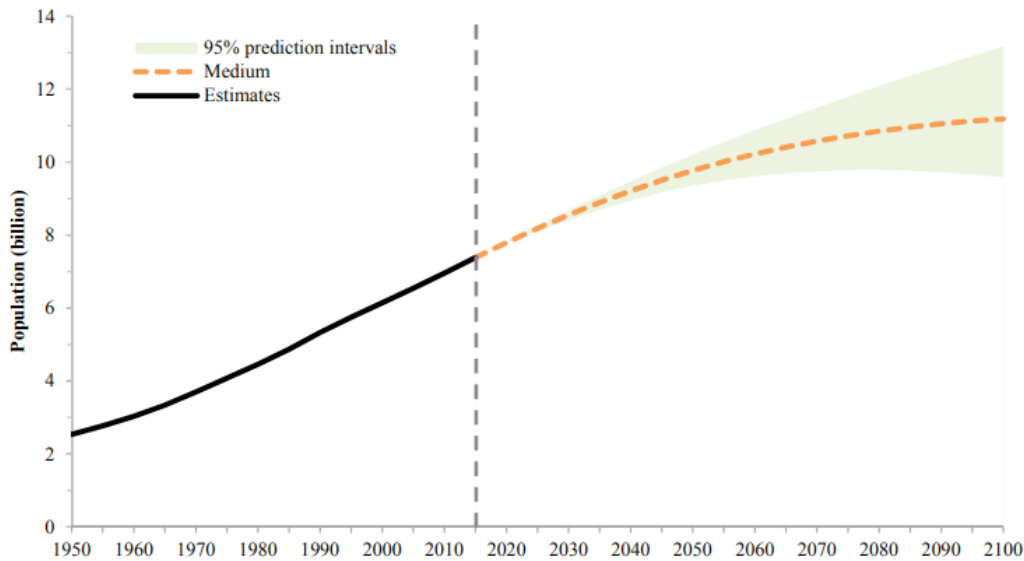
Figure 8 - Population of the world: estimates, 1950-2015, and medium-variant projection with 95 per cent prediction intervals, 2015-2100 - The estimated growth of the world's population according to the predictions of the United Nations. It is estimated that around 2100 there will be more than 11 billion people and most of them have to be housed in cities. - Source: World Population Prospects: The 2017 Revision, Key Findings and Advance Tables, PDF, New York: United Nations, Department of Economical and Social Affairs, Population Division, 2017.

Compact Cities are NOT about reaching a maximum amount of dwelling or population density per se. Because we would end up with cities like Kowloon City in Hong Kong. A Compact City is about achieving a maximum amount of density without compromising on the cities liveability. The term liveability has been found more abstract even then density and is often used in literature without further explanation. Liveability in this report is linked to the daily quality of life that an inhabitant of the city will have. This means that density cannot lead to streets where there is no sunlight, where there is a lack of privacy and overcrowdedness.

It is always about finding the right balance. A Goldilocks density. Goldilocks is a character in a child story. The girl that sneaked into the house of three bears and tasted porridge of all the three bears and came to the conclusion that she like the one that was neither too hot and neither too cold. The same applies when we look at density. A too high density will reverse the positive effects gained by a Compact City. It will be experienced as overcrowded and congested. A too low density will not provide for the right amenities, make us car dependant again. It is all about finding the right density. An exact number after reading countless of articles, books and journals seem not to exists. The right solutions should be found for each individual situation.

The assignment
The research aims is to eventually design a building that can be the starting point for a more compact city. The fortification ring is the best place to do this as it forms the bridge between the old relatively dense historical inner city that was designed to be walkable and the newer developments outside of the ring.

Where the Compact City is asking for a wide array of target groups mixed in the city for this project there is chosen to only include one, because every target group is coming with their specific demands which will take too much time

and takes the focus away from trying to build a building that contributes to the Compact City. The research question is therefore formulated as follows:

How to design a building for Young Urban Professionals that maximizes population density while providing an attractive living environment and to contribute to a more compact city?

In order to answer this research question there are two sub-questions formulated:

1. How to design a building that uses the site to its fullest potential to create a more compact city?

2. How to design compact housing that addresses the needs for Young Urban Professionals.

The first sub-questions will investigate the site and has a goal to find the optimal building mass that can lead to a maximum population density on the location. It is always important to try to make the location as dense as possible, but in this research, it will be taken a step further.

The second research question is relevant because we have started to use more and more space per person and to achieve a higher population density a study needs to be done on how to create dwellings that are more compact without losing on living quality.

Reducing the personal footprint
The research aim is to design a building for the future city. The building that will be designed will have the following aspects;

- High population density, without being perceived as overcrowded.
- High quality of public spaces that are lively and contain greenery.
- Bringing people closer together to promote social inter-

40 8 x4 **1900**

72 16 x4 **1950**

89 39 x3 **1990**
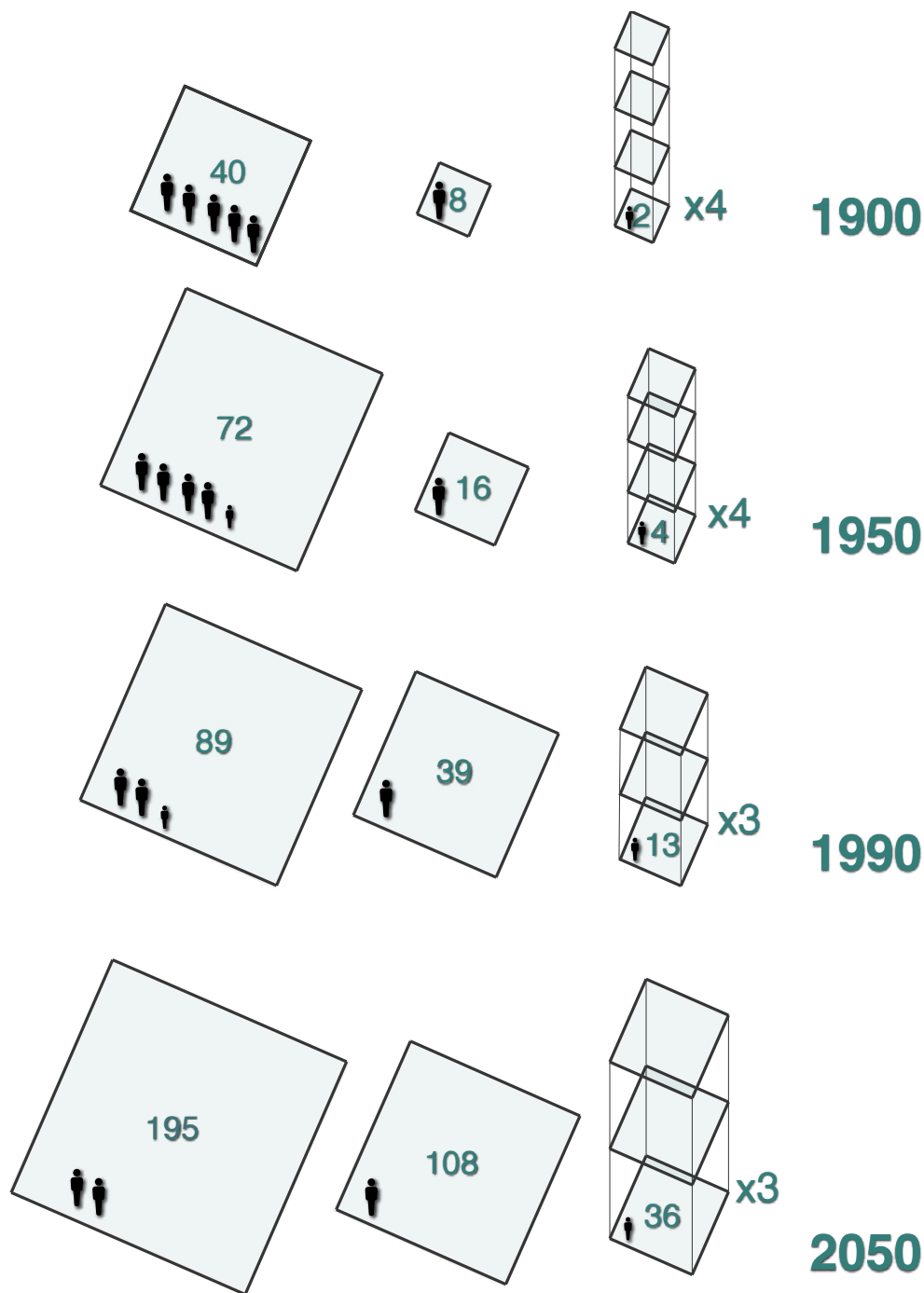
195 108 x3 36 **2050**

Figure 9 - Development of the personal footprint - The personal footprint has grown exponentially over the last 100 years and it is expected to do so even more in the future. This development is bringing people further away from amenities, neighbours and nature. The growth of personal footprint is one of the main factors that has led to sprawl. - Source: Rudy Uytenhaak, Jeroen Mensink, and Ed Melet, Steden Vol Ruimte: Kwaliteiten Van Dichtheid (Rotterdam: Uitgeverij 010, 2009).

action.
- Being inclusive.
- Encourages walking/cycling over car-usage.

First of all, it is important to increase the population density of the city. The project area is located in a neighbourhood that has a relatively low density compared to the rest of the inner city. The low density can be seen in the lack of amenities compared to the east side of the city centre. Uytenhaak shows that the personal footprint has risen tremendously over just 100 years and is expected to grow even further. In 1900 he explains that we would live on average with five persons in a 40m² home, which is small and can be considered cramped. Because we

would build on average four layers height, the personal footprint only became 2m², compared to later footprints like in 1990, where the personal footprint per person already became 13m². Uytenhaak eventually sees a growth towards 36m² per person per dwelling in 2050, and this is very large space. It also means that on average we occupy about 108m² per person which is much more than the 39m² of 1990.

One of the major reasons for the footprint getting so much larger is that the sizes of the households have decreased to 1,97 in 2017 (OIS) . Also, the households in Amsterdam are according to data from the IOS for 53% consisting of people living alone, which is a huge group. The second largest group is the group of people living together without children. That

these small households are so prominent in Amsterdam gives a vast potential to change the personal use of space and to design dwellings that are more compact then they are living in now. From own earlier research, it can be concluded that more compact forms of living more compact for households with children is also possible, but much more complicated.

Young Urban Professionals

Amsterdam has a relatively young population and the group of 20-34 years old is making up almost 30% of the demography of Amsterdam. This makes designing for this group attractive. Most people in this age group are responsible for the high amount of single person households, as people marry later and have children even later than in the past. The most interesting group out of this age group can be identified as 'Young Urban Professionals'. This group has finished their studies and had a job. They are generally highly educated and have jobs with higher salaries. They enjoy living in the city where they see the city more as an extension of the house. It means that activities like meeting friends are often happening

outside of the house, having a cup of coffee or tea in the city, or going out and spend the evening in café instead of inviting them at home. The home becomes more the private realm in the home that is called the city. Even in the way they work the office is not a set place anymore. First of all the set desk is disappearing and flexible working places are taking over the office. Also, there is a trend of working from home. Young Urban Professionals, however, are more ambitious and tend to work more freelance. This has become possible through the emergence of the internet. All that you need as an entrepreneur is a laptop. Business meetings can just as well happen in a trendy café and is no longer bound to a formal office. In short, we are no longer stuck in one place, and the YUP has the freedom to choose where to live and where to work.

This new way of living also has had a significant influence on our cities. Cities always used to be crowded with people moving in the urban spaces for work, and travel. The public realm was a trading place, and always full of activities. This began to change when the workshop and indus-

Households in Amsterdam

- Living alone
- Living together without children
- Living together with children
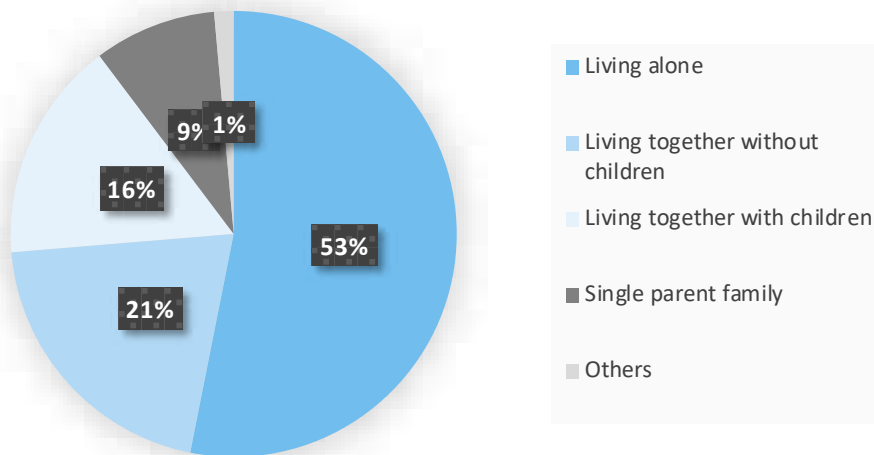- Single parent family
- Others

Figure 10 - Households in Amsterdam - It is clear to see that there are a lot of small households. 53% of the households comprises people living alone, which is a huge number. The second largest group of 21% comprising households of people living together but without any children, and 25% of the households do live with children. This amount is far less than households without children. - Source: Own Image, data from: IOS, "Feiten En Cijfers," Onderzoek, Informatie En Statistiek, , accessed June 06, 2018, https://www.ois.amsterdam.nl/feiten-en-cijfers/#.

Age groups in Amsterdam

- 0-19
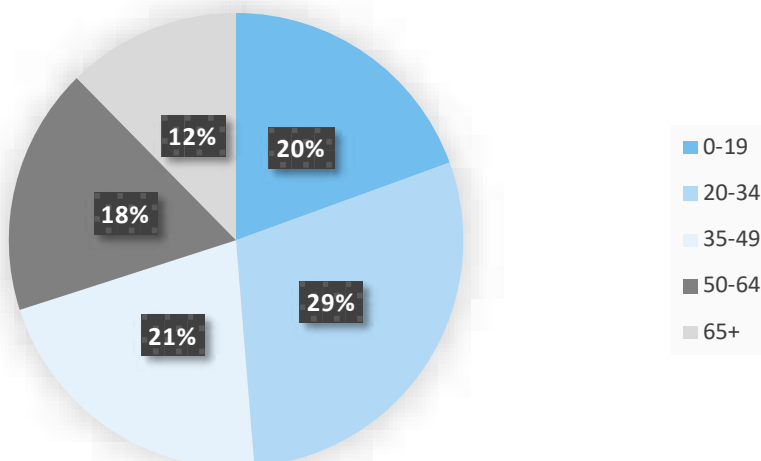- 20-34
- 35-49
- 50-64
- 65+

Figure 11 - Age groups in Amsterdam - 29%, the largest group, is of the age group 20-34. Amsterdam has a young population. This largest group comprises also the category of the Young Urban Professionals and makes it therefore such an interesting target-group. - Source: Own Image, data from: IOS, "Feiten En Cijfers," Onderzoek, Informatie En Statistiek, , accessed June 06, 2018, https://www.ois.amsterdam.nl/feiten-en-cijfers/#.
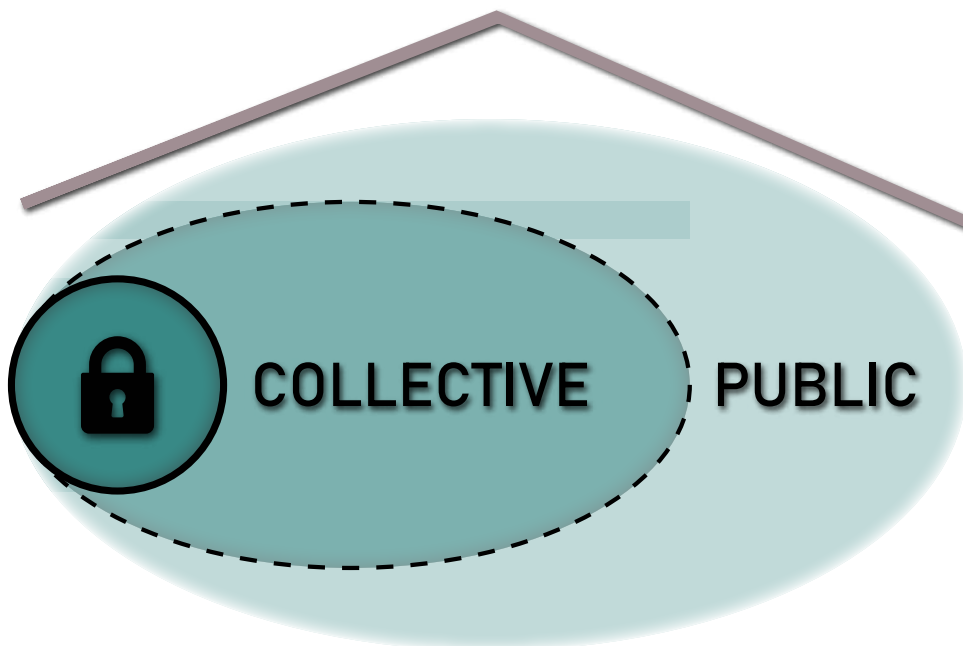
COLLECTIVE   **PUBLIC**

Figure 12 - Home of the Young Urban Professional - The home of a Young Urban Professional isn't limited to the confines of the private realm, but extends into the collective, and public realm. The city becomes an extension of the home. This makes the private realm less important to the Young Urban Professional than for other target groups, but makes it more important to design good collective spaces. - Source: own image

tries were moving to the outside of the city and we started to live in larger houses. The public space became then the place for tourist and shopping and shopping was till recently the main activity why people would go to the city. However, in an age where it is easy to order anything you like from the internet, where we can communicate on the internet, and we can make our cappuccino from home, the city remains to take in an important rule. We want to be in the city and this 'being in the city' has become the primary activity. Jan Gehl revered to it as the 'cappuccino culture'.[25] When someone is standing in the city for hours that is strange and suspicious, so we need to have a cappuccino, and we are okay to stay in the city as long as we

wish so. The amount of terraces has exploded in recent years, making the city a place for leisure.

The YUP enjoys the city also for a different reason. It is the services and amenities that are in close proximity. A service culture is emerging. We pay a fee, and we get all the movies right at are nose via services like Netflix, the same is with music, Spotify offers you plenty of songs to choose from. There is no longer a need for a private CD or Blue-Ray collection. The same is going on with many other aspects of life. HelloFresh is offering you your dinner, which you only need to prepare according to a recipe, supermarkets deliver at home, your car is leased, your bicycle may-

Figure 13 - Traditional Japanese Futon - The traditional Japanese Futon is made out of 100% cotton stacked in different layers for different seasonal climates. They are aired and stowed away in the morning and taken out again in the evening, saving plenty of space. According to some sleeping on a traditional futon is more healthy, but will take time getting used to sleeping on one of those. - Source: Anjali Dixit, "What Happens To Your Body When You Start Using the Floor More - Japanese Futon Bed," 24GreenBuildings, December 21, 2016, , accessed June 09, 2018, http://www.24greenbuildings.com/what-happens-to-your-body-when-you-start-using-the-floor-more-japanese-futon-bed/.

25   Jan Gehl et al., *New City Life* (Copenhagen: Arkitektens Forlag, the Danish Architectural Press, 2006).

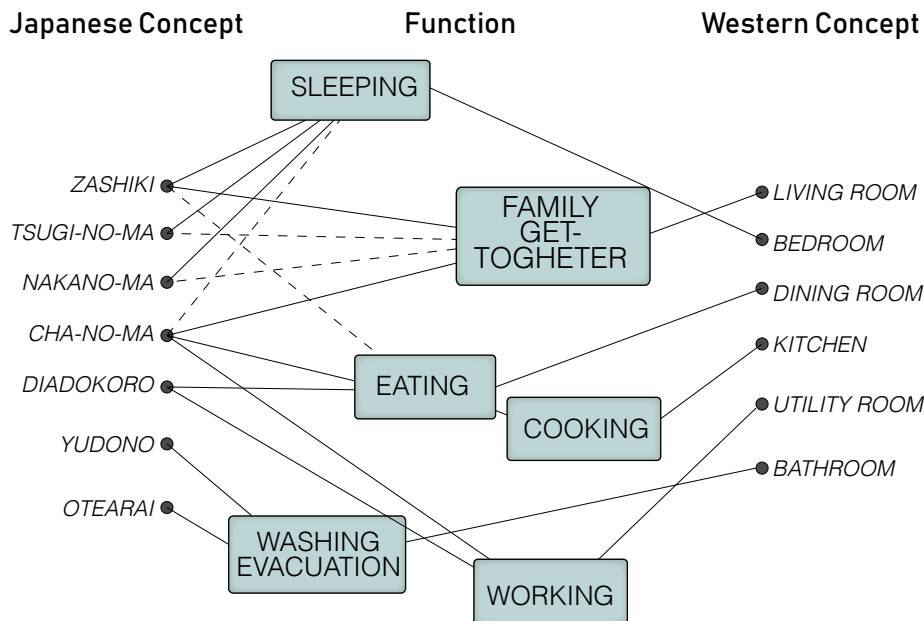**Japanese Concept**   **Function**   **Western Concept**

Figure 14 - Japanese concept versus Western concept of housing - In Japan the rooms are not named with their function like in Western tradition, but are named after the placement in the house. As the Japanese concept is showing in the diagram, there is much more flexibility and different usage per room than in the Western concept. - Source: edited after: Bernard Leupen and Harald Mooij, Het Ontwerpen Van Woningen: Een Handboek (Rotterdam: NAi Uitgevers, 2011).

be comes from Swapfiets, where you have a bicycle for a monthly fee. The list can go on and on and on, but what is important is that this lifestyle is being preferred over having personal ownership. Having services makes it easy to spend time on the things that matter most and creates flexibility. Especially for young people that do not have a lot of saving it is easy to pay a low monthly fee and have a lot of services this way.

The most suitable way of living for Young Urban Professionals would then also be to have a dwelling as service. To have a unit that is half or fully furnished and that is having all the comforts that a Young Urban Professional can image.

Micro-Apartments

This need for serviced living and reducing the footprint has led to micro-apartments. Micro-apartments are apartments which are much smaller then regular apartments. These apartments generally consist out of one single room with a bathroom attached to it, so all the activities, apart from washing/toilet, happen in the same room. Through highly efficient use of space and clever innovation can these rooms be transformed into really comfortable living spaces for singles or couples. The best way to image an micro-apartment is to think of a hotel room, but slightly more spacious and with a kitchen. The sizes can vary from tiny rooms of 25m² towards larger spaces. In the Netherlands with the current building regulations the maximum size of a micro-apartment would be limited to 50m², this is because above 50m² there are additional requirements for dwellings, like storage units and balconies. Below the 50m² there is still a need for outdoor space and storage, but this can be communal and therefore more efficient.

The concept of the micro-apartment is a combination between the typical western apartment and an older vernacular way of life of many cultures of which the Japanese way of life is interesting to use in the comparison. The Japanese and some other cultures are not having the same kind of interior-spaces that people in more western cultures are used to nowadays. Today a typical Dutch or Western house contains rooms with a specific function. These rooms are then filled with heavy furniture and stay there in the rsame place. Throughout the day the different rooms are being used according to their function. It means in the daytime we are in the room that is called the living-room and in the night we are in the bedroom. For the majority of people living alone, this means that there is always a vacant space which isn't used. Why can't we change the function of the room instead of changing the function of the room? The answer is simple, our furniture is too big and heavy.

How different do the Japanese use their houses? Instead of having a box-spring mattress or memory foam, they sleep on eight layers of cotton. Japanese beds are called 'futon,' which they put on the floor just before going to bed and store them away in the evening. This means that what we consider to be a bedroom, can be used for all kind of other activities throughout the day and although While according to some the traditional Japanese futons are more healthy then the mattresses used by the western world it definitely takes time getting used too, and not all will prefer this kind of bedding. The same is with sitting on the ground instead of having a table and chairs. So living very minimalistic might not appeal to everyone. The aim is, therefore, to find a middle ground between having the flexibility between different functions that can take place in one room and on the other side having some of the furniture and 'comfort' of the western concept.

"I could afford a much bigger space, but I've realized that a 'less but better' lifestyle is really compelling," Hill says, nodding to the fact that tiny living isn't just a spatial conceit–it's a way of life that proposes excising all the un-essentials. "The idea of editing is critical. No one wants to see a four-hour movie and there's a reason for that. Editing down parts of your life really helps you focus on the stuff that's important." [26] – Graham Hill, a real-estate developer, founder of the sustainability blog Treehugger, TED speaker, and tiny-living evangelist.

Graham Hills apartment named ' 6 Rooms into 1' (Life Edited 1) is an inspiring example of a micro-apartment that brings together the aspects of flexibility and comfort. He realized that living bigger and bigger isn't leading to any more happiness. It, in fact, makes us work harder to keep it maintained, and clean and we also need to buy more stuff to fill it up. His ideology is that when you cut in your space, stuff, media, and friends, you can become more grateful for what you have and allows for a life with less
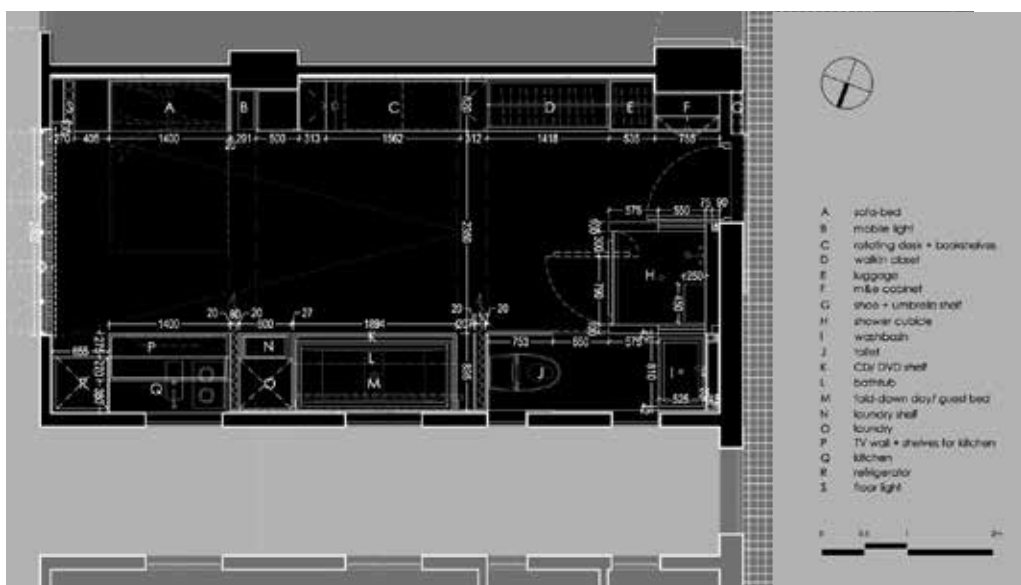

Figure 15 - Domestic Transformer ' 24 rooms into 1' - Sliding walls hide different rooms and exposes different functions. In this way there is maximum room to compose different spaces. The room as a whole can be used for inviting friends and more smaller places can be created to have a more intimate spaces. After you are done cooking, the kitchen disappears and the kitchen table appears, when you want to work the home office appears and when you want to sleep the bed appears. Through this way the apartments limited floorspace is always optimally used. - Source: Gary Chang, "Domestic Transformer," EDGE DESIGN INSTITUTE LTD., 2007, , accessed June 09, 2018, http://www.edgedesign.com.hk/2007domestictransformer/.

Figure 16 - Floor-plan highlighting the different elements of which the 'transformer' is consisting - Different rooms do not use any more floorspace than necessary when not used. In this way maximal use of the available floorspace can be obtained. One advise, make sure you finish your shower before any guests arrive, as the glass shower cabin is standing prominent in the room. - Source: Gary Chang, "Domestic Transformer," EDGE DESIGN INSTITUTE LTD., 2007, , accessed June 09, 2018, http://www.edgedesign.com.hk/2007domestictransformer/.

26   Diana Budds, "Designing Better Microapartments–By Living In Them," Co.Design, September 13, 2017, , accessed June 09, 2018, https://www.fastcodesign.com/3066087/designing-better-microapartments-by-living-in-them.

Figure 17 - ' 6 rooms into 1' - Life Edited - This 39m² apartment can be adjusted to suit different activities, for example, giving a dinner for 12 persons. The table on the photo is a table that can be extended with panels that are otherwise stored away, just like the chairs. The chairs are designed to stack together efficiently. The guest-room is stored and can be revealed by moving the sliding wall. Behind the wall are two beds that can fold out of the wall. The whole apartment is suitable for daily living and is the home of Graham Hill, a real-estate developer, founder of the sustainability blog Treehugger, TED speaker, and tiny-living evangelist. - Source: Matthew Williams, "See Full Set of Official LifeEdited Apartment Photo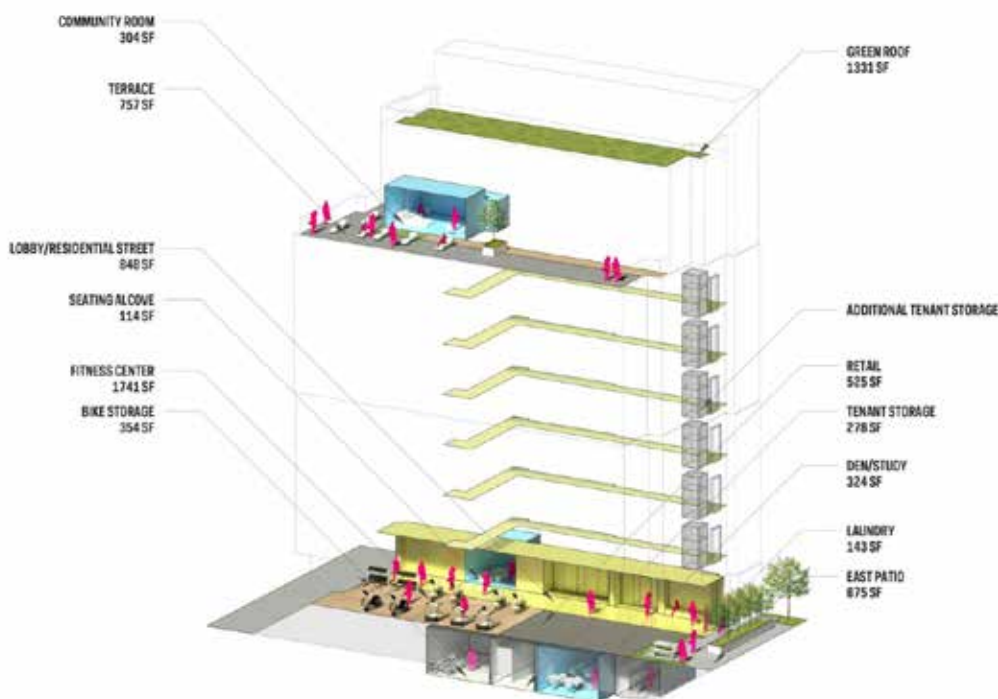s," LifeEdited, February 15, 2015, , accessed June 09, 2018, http://lifeedited.com/see-full-set-of-official-lifeedited-apartment-photos/.

stress and worries and lead in this way to more happiness.

The concept of ' 6 rooms into 1' takes a standard 100m² apartment and try to fit into a 39m² apartment. He explains that the apartment being in New York, with this high rents, is saving you 60m² space that you need to pay for and it saves a lot of money, but most important: It allows you to earn back the investment that is necessary for the furnishing of the apartment, as bring in more technologically advanced furniture leads to higher initial costs for beds that can be stored away and walls that can move. Williams design brief was that the house had to be suitable for two persons, contain a guest-room for two guests staying over. Also, the house had to be suitable to give a party for 12 people, including a home office, home cinema, very clean air and built environmentally friendly[27]. The result

is an exciting apartment with loads of little tricks that can transform the apartments in all kind of settings. I order to see more of the apartments I would recommend to watch this video on Youtube: http://bit.ly/1goI3Rm.

A more extreme version can be found in Hongkong. Gary Chang's ' Domestic Transformer' is a micro-apartment that compresses 24 rooms into 1 room. He works with the same principles as the previous apartment mentioned, sliding walls make all these transformations possible. The cost of this apartments will, therefore, be much higher than the previous apartment, but with the monthly savings in rent, over time it may earn itself back. The apartment can be best compared with a Swiss army knife, and that is why I personally refer to these kind of apartments as ' Swiss Army Knife - apartments'. To fully understand this apartment I would recommend watching the following video on Youtube: https://bit.ly/1poFsfN, because it is

27   Laura Fischer, "About," LifeEdited, March 16, 2018, , accessed June 09, 2018, http://lifeedited.com/about/.

hard to understand the workings of these kinds of apartments from conventional floor-plans and even photos.

In New York in 2016, nARCHITECTS finished the construction of the building Carmel Place (former known as My Micro NY) this building contains 55 micro apartments of 25-35m^2 and was designed after being the winning proposal of adAPT NYC, an initiative of former major Bloomsberg's administrator's New Housing Marketplace Plan to accommodate the cities growing small-household population. The floor-plans of this building are much more standard then the extreme versions we have seen earlier. The most flexible part remains the bed that can lower and fold into the bed (Murphy bed). This also makes the buildings more affordable. In this case, the units have been build in a factory and brought to the location to be stacked on top of each-other and welded together. Prefabrication reduces the cost of the additional furniture that is needed. For larger buildings with more units working with prefabrication can be beneficial if the units can be transported to the site.

What is interesting on a building scale is that there are communal rooms in the building. Living in a small house can feel to some quite claustrophobic and having communal spaces in the building makes this feeling much less. Instead of having a small garden patch or balcony, the dwellers in Carmel place can go to the rooftop terrace and have the best view. Also, it is a meeting place and certain activities can be organized in communal spaces. On the ground floor, there is apart from a small retail space also a gym where you can do your workout. Having additional communal spaces especially with like minded people is a great asset to make living in micro apartments more attractive.

Young Professional Living Concept

There is a recent trend in Amsterdam and other cities around the world. It seems there is a gap in the market and that is being filled in rapidly by developers. This concept of housing for Young Urban Professionals is being marketed in many different ways, but the term 'Young Professional Living' was most simple and striking and can be shortened as YPL concept. The term is coming from the project developer FIZZ. They offer micro-apartments between 30 and 41m^2 in their recently opened building 'Little Manhattan' in Amsterdam. You can apply for an apartment in the building if you are between 23 and 35 years old and have a stable income, as professional or as an entrepreneur. The same kind of selection is taking place for other similar concepts for example of Change= in Amsterdam, or the Collective Old Oak in London. The buildings are designed to be like long stay hotels with communal spaces where like-minded people can meet and share ideas. The people living in the building can enjoy a vast array of services including laundry and cleaning services.

The collective Old Oak is a complex with 550 apartments of which some are shared and others are private. Living in London is very expensive and so renting a room here is making it possible for people to find affordable housing. The downside of the Old Oak is that the units are tiny and the prices quite high. The communal spaces are not making up for this lost quality, by placing them in corners and some leftover areas.

A shared accommodation provides you with a 9m^2 bedroom with a small personal bathroom and a small shared kitchen for about €1200,- per month and €1320,- for a small private room. The bills is a 'all-in bill', meaning that WIFI, access to communal spaces, bi-weekly room cleaning and other facilities are included.

The concept of Change= in Amsterdam is thereby much more appealing. Their first building that opened just last year has almost 500 apartments which are about 30m^2 and cost €732,- per month, which also includes the bill for the community services. The apartments are eligible for a subsidy on the rent if your income is low, making a concept like this provide for a more inclusive city. During this year they will open a second building with 600 apartments, and they have plans to export this concept to Utrecht, Eindhoven and The Hague.

FIZZ, where I started with, has also a lot of plans to expand the concept further. In 2019 there are plans for 212 dwellings in a building called Lofts 020 in Amsterdam and another 385 dwellings in a building in Rotterdam called Cobana. In 2020 there is a plan for Amsterdam with another 429 dwellings in a building that will be named Don Bosco.

The Collective in London is also expanding, in this year they want to finish the building Stratford, a tower in London with 223 Co-Living apartments and 214 private apartments (437 in total) and another big project, called Canary Warf, but there are no details available so far.

Other project developers are also busy in building similar projects. The Student Hotel is a concept that is spreading out over The Netherlands and is going internationally too, which is more aimed at students and short stay guests, but come with really nicely have designed there communal spaces and Zoku in Amsterdam works with the same concept but is for short stays and asks for some deep pockets.

It is no wonder hearing that Change= for their first building had quickly 6000 people wanting to rent a room, with only 500 apartments they could not deal with this much interest. If we add up the other developments of this concept that are planned in Amsterdam, then it still doesn't provide for the demand. As shown earlier this is a large demographic group in Amsterdam and they, just like the rest of Amsterdam, are facing the difficulties on the housing market and providing with an building that not only provides for affordable housing, but also a style of living that for the Young Urban Professional makes these concepts so attractive. The Collective Old Oak put on their website that people living in the building do not need to leave the building because all the services are available in side this building. Change = is offering 32 community services, including workshop, lectures and career help. Ultra fast internet, a restaurant, cinema, etc. All is really service orientated to the dwellers of the building. All is not for free of-course. But apart from a standard fee you are free to make your own choices. These concept even allow you to lease an interior. So when you have a job, there are rooms available and you are also lucky enough to get one appointed then without needing a lot of personal stuff, like a bed, cutlery, a couch, or tv you can move to Amsterdam and lease it all. It is a really flexible set up. Also for people

coming from abroad they do not need to find furniture, or need to deal with different costs and taxes. All is included to be in one bill and to your own needs you can expand it with different services. At a concept called North Orleans which is quite expensive, you can get your room weekly cleaned for an additional €150,- per month for example.

YPL and the Compact City

The Young Professional Living Concept will definitely contribute to a more compact city. Small units are increasing the population density and shared facilities make this way of living attractive. The buildings do not need large parking garages when placed near a city centre. The apartments are reachable for Young Urban Professionals with low and higher incomes, because the prices can be kept under the limit for subsidy for rent. However these concepts are exclusive for a certain group. Demographics show that this group contains approximately 30% of the population of Amsterdam so there is a large group that can be served with these kind of concepts. Different target-groups can have different concepts and it is important to keep the neighbourhoods mixed with different groups. It will even be possible to make a combination between different groups living together in the building and sharing certain amenities. For this project however the scope will be on Young Urban Professionals of 20-35. Meeting a reduction in footprint near that of 1900 is not possible. Micro-apartments are small, but because it only serves a maximum of two people and the majority is expected to live alone, the footprint will remain to be about 20-35m^2 per dwelling and as a building as a whole a little bit more with about 40m^2 is expected. Still this is a large decrease if we look at the future increase of footprint that was expected. Only by starting to live in larger groups together in a single dwelling this footprint can be reduced more. This however requires a shift in culture.

Close proximity can definitely be achieved and for the project location about 400 people can be estimated to life on the site. That is about 650 people per hectare for a location that has challenging dimensions and a non-standard shape. This kind of increase can have a lot of good benefits on its environment. If you are the owner of the supermarket across the street from the project location you will be very happy to see this building being realized. For the rest of the city it also means that 400 dwellings will be available to other people living in the city. There are now Young Urban Professionals living in dwellings that have several rooms and could possibly suit a young family that is now having to leave the city, because there are no suitable dwellings in their price-range. When there is a shift of Young Urban Professionals moving to YPL concepts, then other dwellings potentially come available at a lower price. Of course this is not something that will happen after a few of these buildings have been constructed, but when there is a larger development of this concept in the future then the shift will gradually become apparent. Now because of high demand the prices of these YPL concepts are high, but not excessively, when in the future there are more different developers then there will also be more competition that can possibly lower the prices of living overall. This is still speculation, but the future is promising.

Figure 19 (below) - FIZZ's Little Manhattan which is almost ready to open its doors. - The concepts of YPL is quickly taking up pace with plenty of projects and initiatives that are being planned and executed now. YPL seems to fill a gab in the housing market. Although these concepts are searching for new dwellers there is very little information available about the organization of the buildings and how the collective spaces look like. - Source: FIZZ, "Home," Little Manhattan, , accessed June 10, 2018, http://www.littlemanhattan.nl/.

Figure 20 (below) - Room in FIZZ, Little Manhattan, Amsterdam - The rooms in FIZZ are wider then in the other concepts that have been studied. The size of this apartment is about 40m², which provides for a large living space. There is here no need for flexible furniture. Although being about to save the space which the bed is using would free up even more space that can be utilized. - Source: FIZZ, "Home," Little Manhattan, , accessed June 10, 2018, http://www.littlemanhattan.nl/.

Figure 21 (right) - Library room - Old Oak - The Collective - Old Oak has different communal rooms. The library consists out of some bookshelves, comfy chairs and some larger tables to read and study. The rooms, with different functions are located at different corners in the building, but often a bit hidden from view. - Source: Jessica Mairs, "World's Largest Co-living Complex Promises Residents "everything at Their Fingertips"," Dezeen, February 22, 2017, , accessed June 10, 2018, https://www.dezeen.com/2016/04/28/collective-old-oak-common-co-living-plp-architecture-willesden-junction-london-housing/.
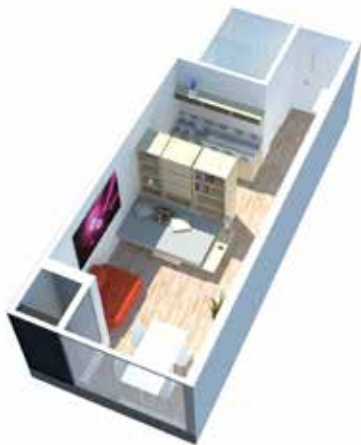

Figure 22 (right) - Change = newest location to be finished in 2018 - The newest location of this fast spreading concept will be constructed in Amsterdam. Another almost 600 units will be added to the portfolio with many more initiatives planned to expand the concept over the Netherlands - Source: "Change= II / Youth Housing | OZ Architect | Amsterdam," OZ, , accessed June 10, 2018, https://www.ozarchitect.nl/projects/change-ii-housing/.

Figure 23 (left) - Room in the Collective - Old Oak - The Collective - Old Oak has the smallest rooms of the YPL concepts studied and comes with one of the highest price tags. This is probably because of the location in London where the housing prices are sky high. Rooms here are smaller than hotel standards. The room on the photo is seperated in three parts. Two bedrooms with their own attached bathroom and a shared small kitchen. The size of the bedroom is about 9m² - Source: "The Collective Old Oak | Co-Working | Co-Living Accomodation," The Collective, , accessed June 10, 2018, https://www.thecollective.com/co-living/old-oak/.

Figure 24 (left) - Room in Change=, Amsterdam Nieuw-West - The rooms in the concept of Change= are larger than of the Old Oak in London. There is a small kitchen and a living space. The rooms provide for placing some of your own furniture to make the space more personal - Source: "Amsterdam Nieuw-West - 498 Woningen | 32 MicroLiving Services | 1 Community," Zo Kan Je Woning Eruit Komen Te Zien, , accessed June 10, 2018, https://www.change-is.com/location/amsterdam-nieuw-west.

2. MANIFEST

The Compact City
Empowering Amsterdam to become a more attractive and competitive city

Throughout the last century the way that we live in cities in The Netherlands and most other parts of the world has drastically changed. Until the 19th century cities were built within the fortifications, to protect the cities from attacks. The streets were laid out by a feudal ruler or municipality and the plots were filled in individually. Density was a natural outcome and was often high, because the city walls were expensive, and time consuming to construct. With the uprising of the industrialisation there came a larger influence of politics and the public sector with led to the concept of density to compare different cities and to lay-out expansion plans to absorb the rapid growth of population which in the 20th century evolved in a state driven planning.

Density was often used to describe clear densities in expansion plans which was often decided based on extensive research. Influences of CIAM and the Garden City found its way into the extensions plans for cities. The were looking for 'light, air and spaciousness' to escape the congested cities. The car was the catalyst, after the second World War there was an explosive growth in car ownership, making even more sprawl possible. Decentralisation policies from the Dutch government even aimed of moving people out of the city and spreading institutions over the country.

Around 1980 because of problems with sprawl, mobility, unsustainability, economic demands, and personal segregation came a need for minimum densities. We started to realize the cities gain there strength from concentration. However the decline in density seemed to have stopped, the city is still slowly sprawling apart. From the 80's we started to revitalize the cities and we saw a re-appreciation for the city emerge.

However we are failing to see the downsides of the sprawled city. There is a great need for a compact city. Amsterdam has entered a new period of economical prosperity to some revered to as the 'Third Golden Age'. It is in this period that the city of Amsterdam can potentially double its amount of inhabitants to about 1,5 million. This opportunity is the best chance to create an economically stronger position for the city. Where it cannot compete with mega-cities having around 10 million inhabitants in size, it needs to compete in quality.

When a city wants to increase in quality then the most effective way is to become a compact city. A compact city is a city that aims to create maximum populations density per hectare in a mix-used neighbourhoods while assuring a high level of well-being for the inhabitants. A compact city is hard to express in numbers. Density in itself is a term that can be used and interpreted in many different ways. It is therefore important that we aim for the highest population density of the city without compromising the well-being of the inhabitants. Compact cities can be built in a way that leads to a lot of congestion and the same situations in cities that we tried to escape in the past. So it is essential we design the compact city in the right way.

First of all we need to redesign our houses to use the space more efficiently. Simply speaking since the last 100 years we have started to life with half the amount of people in three times larger houses, that occupy twice the amount of space. Which means the personal use of space has increased with a factor 12 and with a factor of 36 in total footprint per person, through the increase in infrastructure for example. What this means is that the city of Amsterdam had 500.000 inhabitants in 1900 on a 15km² footprint which expanded to 200km² now with only 750.000 inhabitants. If the density would have remained the same then the footprint of Amsterdam today would only have been 22,5km². This is why it is so crucial to design smaller and more multifunctional dwellings. With the advances in modern technology we can easily design dwellings that are far more flexible in space without compromising on living quality. Especially for the small single and double households that are now in the vast majority. We marry later, have children later, and less. The micro apartment is offering a promising development.

Secondly when we start to live all closer and more compact together we need to redesign our public realm. The city has become car centred after the explosion of car ownership. What has promised us freedom has driven us to be car dependant. We must reverse this. The compact city is a walkable city and pushes the car out to its perimeters as much as possible. The inhabitants of the compact city enjoy the close proximity the city offers. People walk and cycle more, and public transportation is much more efficient and quick. The city will be redesigned for the human 5km/hr scale and the residents will become more healthy and will feel happier. There will be a higher amount of trust building encounters, even those with strangers that will lead to the release of oxytocin. This trust molecule is linked to happiness. As Charles Montgomery explains in his book Happy City:

"People that are better socially connected are more resilient and get through hard times better, they get over illnesses more quickly, they live longer, on average 15 years compared to people that are disconnected, they furthermore are more productive at work. (...) Social trust correlates strong with economic growth."

Thirdly the compact city is the best solution to creating sustainable cities. In dense cities the CO_2 footprint per person is much lower than in sprawl areas. We need less energy to heat our houses and if they become more compact even less, but we also need less energy in traveling. We need less resources to construct and maintain roads, sewage, metro lines, street-lighting, etcetera. However the compact city does create some local environmental issues if not designed well and that is why it is so important to push the car out of the city. This will prevent congestion, but also improves air quality, reduces noise, improves safety and leaves space to plant more greenery.

Green-spaces are very important to counter the intensity of the compact city. Research have shown that people that are in closer proximity to natural environments are not only better resilient against depression and anxiety, but also are more empathetic and generous. Green-spaces further can counteract the urban heat effect and will leave enough space for rainwater to penetrate the soil. Instead of designing wide and deep parks, our former roads will become long narrow parks, letting us enjoy the park wherever we go. Allowing our children to play freely and safely outside again.

The traumatic experiences of the 19th century city has led to expansive sprawl and exponential growth of our footprint. Now is the time to embrace the city again. The city can offer so much when it is compact and designed with a human centred approach, where the car is not a part of anymore. We need strong municipalities to set frameworks to allow for densification. The time of large scale city renewal plans are behind us. We need to start increasing the density where it is possible and this will put the chain of action into motion. When we work from the dense city centre outwards we can slowly expand the walkable city. The increase in population density will trigger an increase in amenities. It will be a process that will take years, but with Amsterdam inside its Third Golden Age it can take a big leap in this development. When Amsterdam can successfully adopt the compact city model it

will not only attract more people, but can greatly boost the economy too. If we stay behind now, the city may never get a change to revitalize again, so lets start today, the demand in houses is sky high. Let's set an example for the rest of the world and lets built the city of our dreams to prosper economically, to become healthier, happier, and sustainable!

SPRAWL

UNDESIRED COMPACT

DESIRED COMPACT

3. PLAN ANALYSIS

Topic

The topic for the plan analysis is to look at effective ways for densification in the Compact City of tomorrow. The Compact City is mentioned earlier is not just about achieving the highest amount of density, but is very much linked to finding the Goldilocks density. The right density for the location. Neither to high and neither to low. Densification is just a number and does not speak about the design implications attached to it. The project site is therefore very important, as different locations will come with different limitations and constrains. In the quest for searching buildings that were having high levels of densification there are often a lot of aspects that need to be taken in account. It is very hard to come up with one approach that will suit every situation. When you are building in an empty field, when there are not any constrains it is easy to design enormous tower blocks that will definitely gain you the highest density levels achievable. However massive tower blocks, for example, are not always desirable. Towers can lead to public spaces that are not designed to have a desired human scale to it. The Compact City is aiming to create lively and active cities. Where the public spaces are full with life. Having just ten people on a square that is 100x100 meters obviously will not evoke a sense of connectiveness and would not encourage any spontaneous meetings. The square will look empty. How different it is when you look at the squares in the old Italian cities. They are very small and designed to a nice human scale. There are only a few people needed to make the space look alive. When a public space looks filled with life it attracts more people, who will stop and look earlier, and are much more feeling invited to sit and stay on the square compared to squares that look empty.

Relevance

The issue of densification is relevant in cities like Amsterdam that want to become more attractive and are suffering from housing prices sky rocketing. Amsterdam has reached the borders of its municipality and cannot sprawl out. Space is limited. The only option now is densification. Currently it is happening in the old harbour areas, and other areas that have become unused. However the density only slowly increasing in Amsterdam. Finding the right balance of density and keeping the city an attractive place to live in remains crucial for a city that wants to strengthen its role in the world economy. There is a gab in knowledge about right approaches to densification and good mentioned attempts are often resulting in dead streets and vertical sprawl of people living more disconnected from each-other. No one dares to speak about right numbers, all the researchers say, not too much and not too less and the term is not further specified.

For developing countries that have cities that are at the moment sprawling very rapidly because of the quick ur-

banization it is even more important to come up with right approaches to control the right amount of density being achieved. Organic growth is good, but always within a good framework. There is a large growth in population expected over the coming years and the majority have to be housed in our cities, while the pressure on getting more sustainable is increasing too. With lands getting more valuable it becomes really important to look for strategies to come to right levels of densification. Density has often been seen as a negative term, but leads to better solutions for more lively, attractive, sustainable and healthy cities.

In the contexts of this research report the project location will be examined. The location is generally to small to do an urban study, and so this study will focus more on a building level. It is important for a non-standard sized plot to search for the right model to densify the site in the best possible way. Being able to asses different studies, really allows to make educated decisions on which kind of typologies to select for the final design.

Research Questions

In order to do a specific plan analysis there are some research questions set that need to be answered in order to get the desired results. The research questions are as follows:

Main research question:

Which building typology will provide for the most effective building approach to the project site to contribute to a more Compact City?

Sub-questions:
1. *How do different typologies perform on the location in form of density?*

2. *How do different typologies impact the city and the inhabitants and what kind of density is desirable to create a good liveable building with qualitative good public spaces?*

3. *Are there combinations and optimizations possible of (new) typologies that together can lead to a better performing building?*

Hypothesis

The project location has a unique multi-angular shape and that will make it a challenge to achieve high level of density, or even being able to test all kinds of typologies on the site. Knowing that the site has a large canal on the northern site makes it likely that high rise buildings will perform quite well on the site. Although just high rise buildings will most likely not contribute to the right public spaces and can cause the vertical sprawl. When you look
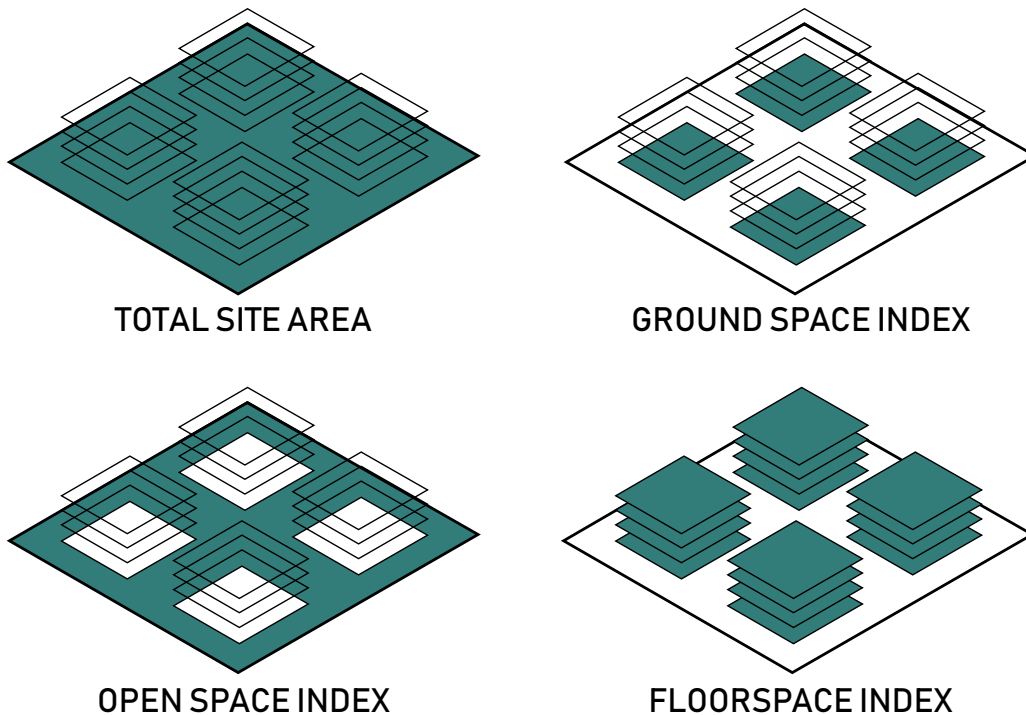
TOTAL SITE AREA

GROUND SPACE INDEX

OPEN SPACE INDEX

FLOORSPACE INDEX

at examples from the historical cities that are very attractive it is easy to see that the GSI score is very high. The GSI is the Ground Space index and will be explained later more, but it means that there will be a large coverage of the site with buildings to achieve density. This means, being able to create high density with limited height, so that it is more likely that there will be more public space that can be shaped on a human scale.

Method

In order to determine the performance of the existing typologies there is a need to quantify the performance of the building and to give it a score. The 'Spacematrix'[1] of Meta Berghauser Pont and Per Haupt will be the tool that will visualize the scores based on the buildings through the FSI (Floor Space Index), the GSI (Ground Space Index), The OSR (Open Space Ratio) and the L (Average Building Height). The Floorspace Index is calculated by dividing the total amount of floorspace of the building by the area of the project location. When the whole project location would be covered by a two story building then that means that the FSI would be two. The higher the floorspace ratio is the more floorspace there is realized and possibly also increases the amount of dwellings that can be realized. This is the main indicator. The second indicator is the GSI, the Ground Space Index. The Ground Space Index is the footprint of the building divided by the total area of the project location. This means what when half of the site is covered for a building then the GSI is 0.5. Generally the lower the number is the more open space there is on the site. More open space is not per-se a goal, because it might not lead to well enclosed public spaces, like the
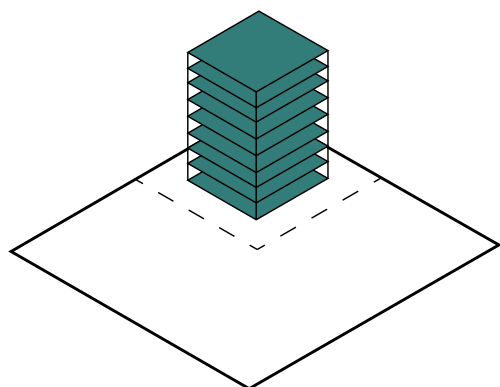
issues a lot of post-war neighbourhoods with modernistic principles faced. The third indicator is the OSR, the Open Space Ratio. The OSR is calculated by dividing 1-GSI by the FSI. This number is the open space in relation to the FSI. When the GSI is remaining the same, but when the FSI increases this means that the OSR will decrease. The Building Height is expressed in L and can be calculated when the FSI is divided by the GSI. This will give an average building height on the location.

There will be a matrix of the performance of the building on the design location. There are different projects selected and tested. The selection criteria was that the building had to fit on the location and that the dwelling typology preferably would match with the typology of project. According to Rudy Uytenhaak[2], and what can be concluded from this research too, is that designing buildings that are deep is a good way to densify a location. In this case the rough dimensions of 4x8 meter were used for a standard dwelling, which is used to find buildings having similar kind of dwellings and also to perform studies on the site. 8 meters is the depth and is limited by the access of daylight. By deeper floor-plans it becomes important to have a two sided orientation or higher ceilings. By having a east-west orientation the width of the building can become about 20 meters, which is more than could be achieved using double sided orientation.

When starting out to calculate the FSI and GSI scores of different building it soon became apparent that there did not seem to be any useful correlation between different buildings. In calculating the FSI and GSI, the dimensions

1   Meta Berghauser Pont and Per Haupt, *Spacematrix: Space, Density and Urban Form* (Rotterdam: NAi Publishers, 2010).

2   Rudy Uytenhaak, Jeroen Mensink, and Ed Melet, *Steden Vol Ruimte: Kwaliteiten Van Dichtheid* (Rotterdam: Uitgeverij 010, 2009).
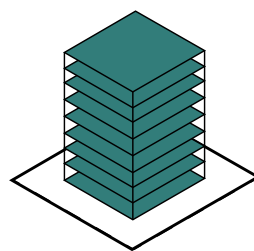
FLOORSPACE INDEX = 1

FLOORSPACE INDEX = 4

Figure 26 - Importance of the plot size - The reason for comparing the building on the same plot size is because otherwise different buildings are not comparable with each other. This illustration shows twice the same building, but on the left the FSI is 1 and on the right the FSI is 4 - Source: own image, inspired on: Meta Berghauser Pont and Per Haupt, Spacematrix: Space, Density and Urban Form (Rotterdam: NAi Publishers, 2010).

of the project location are crucial. So when assessing a building then the implications that the building has on its surroundings can not always be determined. The same is true for urban schemes and that shows the weakness of these numbers. When you construct a large tower then there will be a shadow cast by it. If the tower is standing at a waterfront on the north then the shadow does not have any major implications and the plot can be really small. When the tower would be standing on the south edge of a neighbourhood, then the shadow will have a major impact on the surrounding area. The plot will potentially be larger. One of the buildings that would have had tremendously distorted the project site were some of the more high rise buildings, that would stand on plots equal to the footprint. It would result in a higher GSI score than Raval, in Barcelona, which is an urban scheme that has an extremely high GSI score of 0,91. This comparison would be completely invalid to make. So instead after trying different methods, it was determined that the plot should remain equal and only the building should be allowed to change. This would show a clear relationship between the construction and the location. By using the project location, which does have some constrains due to the urban fabric and non standard shape the study became directly more specific and could be used well to discover what would be the best building shape to obtain the highest level of desired density.

In order to answer the second sub-question, the public spaces will be assessed and the strength and weaknesses of the site will be discussed for the different projects that are being assessed in the matrix. Projects with a low GSI for example will have different kind of influences on the site then those with higher amounts of GSI.

Then the third sub-question will be assessing the case-studies and will look how to further optimize the scores by combining different typologies and how to further enhance the scores. This research question will already step up towards the design of the urban plan for the building to come on the location, so it will also take more factors in consideration about the location and the surroundings as-well as maximum building heights.

Results

On the next page there is the complete Space-matrix filled in with all the projects. Also there will a separate booklet that has all the printed floor-plans as projected on the location. The dots represent the projects and their location in the matrix their scores. The number in the dots are linked to projects in the scheme in this document. The different colours represent the different categories of plans projected on the location;

Red = Project is projected on the site, but there are possibilities to optimize through placing the building more then once on the location.

Light Blue = Project is optimized by being able to place it more then once on the location. The relationship between the blue and red dots are visible, because the projects have the same number but come with an additional letter in the optimized condition.

Purple = This project fitted on the location once and could not be placed multiple times on the location.

Yellow = These yellow dots are having in their numbers also a 'U' because these dots do represent urban schemes. This is the only group of references that is not linked to the location, but are projections of the site as they are.

Orange = Orange dots represents the urban schemes from the yellow dots but translated towards the location. These dots are showing the relationship between the urban plans as they are measured and how these principles will work on the location to give an understanding how these two relate to each-other.

Light Green = Are own studies performed on the plot. Some are based on basic fundamental schemes, like a courtyard typology that was unable to project with an existing floor-plan, so an basic scheme was made to make a good projection. Some of the studies are more detailed than others. By making the schemes more detailed the restrictions that a scheme has become apparent and helped in the comparison of different schemes.

Dark Green = These are the projects from the light green-dots that are changed and altered from the original scheme, mostly in terms of building heights.

All together it is leading to a scheme where there are clear relationships between these groups. In order to make the scheme more detailed and to show which kind of densities where desirable it was important to put extra information in the matrix. This has been done by using different colours in the background that indicate different ranges in density. The different meanings of the colours are;

Red background = This is a part of the matrix that is holding the projects of which the density is too low. The general FSI for densification projects in Amsterdam now is 1,6. Generally found densities are 1,2. Everything above the FSI of 1,6 will lead to more densification then the municipality is aiming for right now. By setting these ranges we need to take in account again the non-standard size of the plot. An FSI that can be easily obtained from a square plot with little limitations can therefore never be compared to the project location in this research. FSI scores are lower on the plot then in other cases. That is what the orange dot illustrates.

Orange background = Is the FSI between 1,6 and 2,5. Everything above an FSI of 2 is generally considered highly urban. 2,5 is already quite a high score. The studies performed on the plot showed that a higher level of 2.5 could be achieved on the location, so that made 2,5 FSI minimum FSI that will be realized. So that ever design in this section will turn the area more dense than general densification standards of Amsterdam, but remember that these also tend to include larger areas with roads, as they measure on an urban scale.

Light Green background = The light green background is the area that would be considered the right FSI and the right L (average height). It is said that high-rises in itself can lead to vertical sprawl and undefined public spaces that are outside of the human scale. Futhermore looking at the surrounding urba fabric, 30 meter is a height that connects to the surroundings without sticking out to far from the rest of the surroundings buildings. Later it also turned out that because the space between the two buildings was about 30 meters and the east-west orientation that the maximum height achievable was 30 meters. Apart from saying that the height on average should be lower then ten it also states a minimum amount of GSI that needs to be reached when you are reaching a higher FSI. The minimum GSI for an FSI of 2,5 is 0,24.

Bright green background = The bright green section is that has a very low building height combined with a high FSI. This would be an interesting aim, but studies have shown that this is with current buildings standards out of reach and would therefore not be a realistic aim. Never the less it was kept in the scheme to illustrate what the difference

is between high density low rise and high density mid rise.

So the result out of this scheme is that it is in first instance clear to see the difficulty to work on this project location as the site itself does not provide for an easy solution. All the projects that were projected on the site only were about to achieve up-to 30% of ground covering, a GSI of 0,30 and one time almost up-to 0,35 with the project 10, Corso Trieste in Rome. Also there seems to be a lot of projects only getting an GSI score that is around 0,22-0,24 that just seems to increase in FSI with more floors, with the project 12, Woodstock tower in the United States with an FSI of just over 7.

It was only when designs that were made for the location itself that the GSI could raise up higher. But it remained hard to reach a GSI score of about 0,50 and in order to get an explanation why this is so urban plans are included and pretty soon it was easy to see that for a GSI score to be higher then 0,50, so a coverage of over 50% seemed only achievable in plans that are much older. When there were different rules about daylight and different street-profile widths were used. In contemporary architecture were are used to have an equal height of the building as is the distance between the opposite building. This rule clearly wasn't applied in the older city centres which therefore could become much more dense. More modern urban plans with a higher FSI like Java Island (U3) and KNSM Island (U5) in Amsterdam are having a much lower GSI of respectively 0,45 and 0,64, so this helped determining what kind of GSI was possible to reach. It also made clear that recreating neighbourhoods like the old historical city centre of Amsterdam is not possible with using these new standards. The only way to get similar kind of FSI is built with more floors than in the references.

In order to see how a principle like the Jordaan (U2) would relate to the site there was a different group created. U90 is the principle of the Jordaan projected on the location and we can tell that the GSI went down from 0,75 to 0,56. This is because the site does not have an optimal shape for these kind of lay-out this indicates what the effect is of projecting on the location versus looking at separate projects. A lot of other schemes researched are containing orthogonal schemes and are hard to project on the location.

The studies that have been designed specifically for this location show also a trend. It seems to be very hard to exceed the GSI level of 0,45, meaning a 45% coverage. The design of study 95 is showing that a coverage up-to 0,64 is possible, but although the scheme came with an high FSI too with study 95 up-to 45 meters, study 95a up-to 60 meters and study 95b to 30 meters (which turned out to be the desired maximal building height later) have FSI scores of respectively 5,60 , 6,74 and 4,47. It was because the scheme in itself was so stuck to the oval shape that did not fit in well in the urban contexts that this scheme was discarded, but it gave way to a variation on the scheme that would eventually become a P2 proposal.
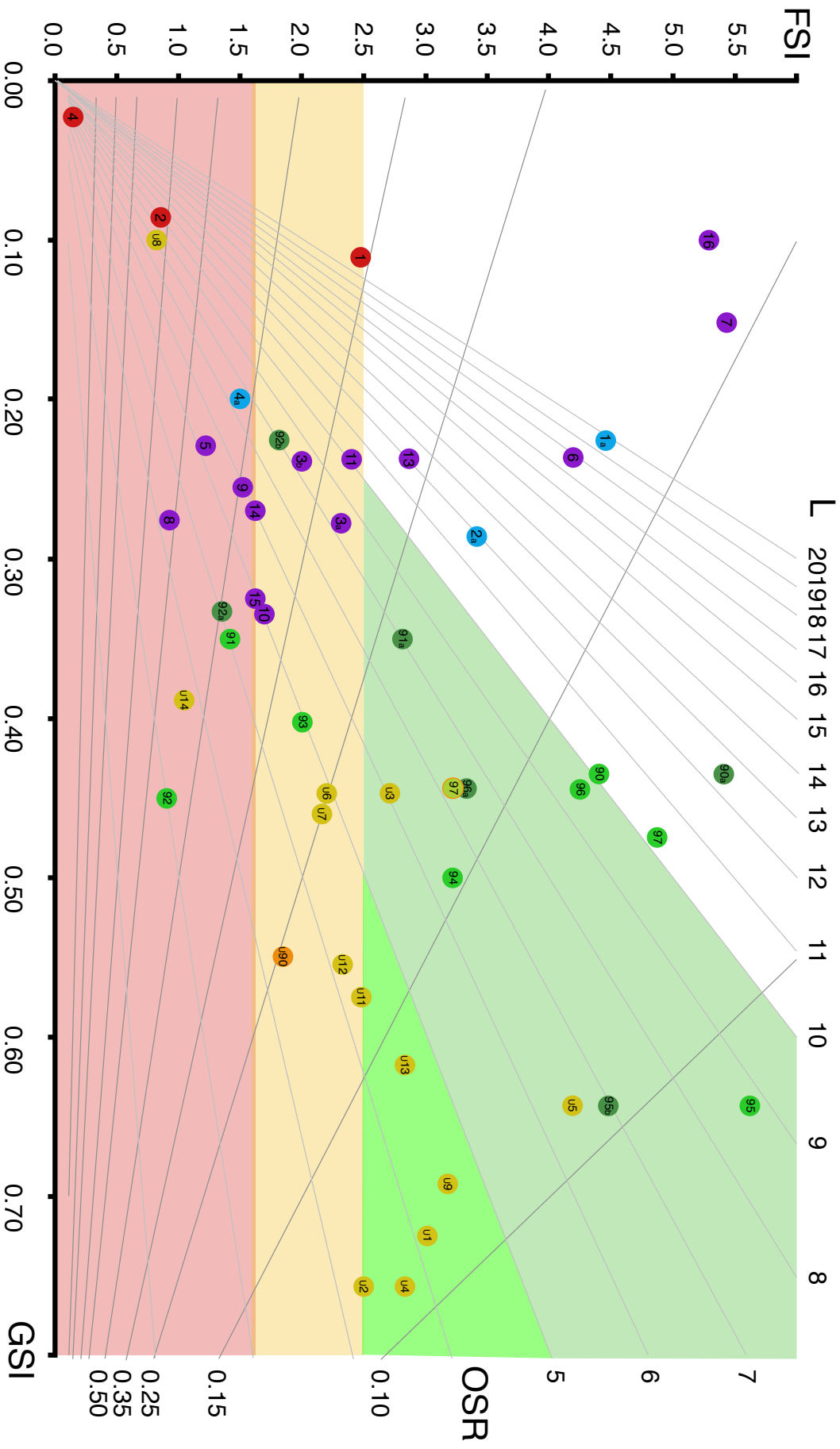
CASE STUDIES

1. Hochhaus - Bremen, DE
Architect: Alvar Aalto
Footprint = 650m²
Floorspace Building = 14.300m²
FSI = 2,48
GSI = 0,11
OSR = 0,36
L = 22 floors on average
H = 65 meters
Amount of Dwellings = 189
Dwellings per hectare = 328

1a. Hochhaus 2x - Bremen, DE
Architect: Alvar Aalto
Footprint = 1300m²
Floorspace Building = 28.600m²
FSI = 4,96
GSI = 0,23
OSR = 0,16
L = 22 floors on average
H = 65 meters
Amount of Dwellings = 378
Dwellings per hectare = 656

2. 4 Fuk Wa Street, Hong Kong
Architect: AH Basto
Footprint = 410m²
Floorspace Building = 4.920m²
FSI = 0.85
GSI = 0,07
OSR = 1,09
L = 12 floors on average
H = 36 meters
Amount of Dwellings = 88
Dwellings per hectare = 153

2a. 4 Fuk Wa Street 4x, Hong Kong
Architect: AH Basto
Footprint = 1.640m²
Floorspace Building = 19.680m²
FSI = 3.41
GSI = 0,28
OSR = 0,21
L = 12 floors on average
H = 36 meters
Amount of Dwellings = 352
Dwellings per hectare = 611

3a. VM Houses (V only) - CopenHagen,DK
Architect: BIG
Footprint = 1.600m²
Floorspace Building = 13.600m²
FSI = 2,36
GSI = 0,28
OSR = 0,31
L = 8,5 floors on average
H = 36-15 meters
Amount of Dwellings = 124
Dwellings per hectare = 215

3b. VM Houses (M only) - CopenHagen,DK
Architect: BIG
Footprint = 1.360m²
Floorspace Building = 11.560m²
FSI = 2,01
GSI = 0,24
OSR = 0,38
L = 8,5 floors on average
H = 30-21 meters
Amount of Dwellings = 106
Dwellings per hectare = 184

4. Song Pang, Seoul, S-Korea
Architect: SsD Architecture
Footprint = 130m²
Floorspace Building = 975m²
FSI = 0.17
GSI = 0,02
OSR = 5,78
L = 7,5 floors on average
H = 24 meters
Amount of Dwellings = 14
Dwellings per hectare = 24

4a. Song Pang 9x, Seoul, S-Korea
Architect: SsD Architecture
Footprint = 1.170m²
Floorspace Building = 8.775m²
FSI = 1,52
GSI = 0,20
OSR = 0,52
L = 7,5 floors on average
H = 24 meters
Amount of Dwellings = 126
Dwellings per hectare = 219

5. Bikuben Student Res., Copenhagen, DK
Architect: SsD Architecture
Footprint = 1.300m²
Floorspace Building = 7.000m²
FSI = 1,21
GSI = 0,23
OSR = 0,64
L = 5,4 floors on average
H = 21 meters
Amount of Dwellings = 107
Dwellings per hectare = 186

6. Man Wan, Hong Kong
Architect: -
Footprint = 1.280m²
Floorspace Building = 24.320m²
FSI = 4,22
GSI = 0,22
OSR = 0,18
L = 19 floors on average
H = 57 meters
Amount of Dwellings = 432
Dwellings per hectare = 749

7. Tin Ma Court, Hong Kong
Architect: -
Footprint = 840m²
Floorspace Building = 31.080m²
FSI = 5,39
GSI = 0,15
OSR = 0,16
L = 37 floors on average
H = 110 meters
Amount of Dwellings = 560
Dwellings per hectare = 971

8. Casa Economica, Rome, IT
Architect: Innocenzo Sabbatini
Footprint = 1575m²
Floorspace Building = 5.512m²
FSI = 0,96
GSI = 0,27
OSR = 0,76
L = 3,5 floors on average
H = 6-21 meters
Amount of Dwellings = 89
Dwellings per hectare = 154

9. Casa Impiegati, Rome, IT
Architect: Mario de Renzi & Luigi Ciarrocchi
Footprint = 1.470m²
Floorspace Building = 8.820m²
FSI = 1,53
GSI = 0,25
OSR = 0,49
L = 6 floors on average
H = 18 meters
Amount of Dwellings = 72
Dwellings per hectare = 125

10. Corso Trieste (2/4 blocks), Rome, IT
Architect: Dario Barbieri
Footprint = 1.965m²
Floorspace Building = 9.825m²
FSI = 1,70
GSI = 0,37
OSR = 0,39
L = 5 floors on average
H = 15 meters
Amount of Dwellings = 48
Dwellings per hectare = 83

* References to all the images used can be found in the bibliography under a separate heading 'Plananlysis'

CASE STUDIES

11. Casa a torre in viale Etiopia (4x), Rome, IT
Architect: M. Ridolfi & V. Frankl
Footprint = 1.371m²
Floorspace Building = 13.710m²
FSI = 2,38
GSI = 0,24
OSR = 0,32
L = 10 floors on average
H = 30 meters
Amount of Dwellings = 108
Dwellings per hectare = 187

12. Woodstock Tower, New York, US
Architect: H. Douglas Ives
Footprint = 1.350m²
Floorspace Building = 45.900m²
FSI = 7,96
GSI = 0,23
OSR = 0,10
L = 34 floors on average
H = 102 meters
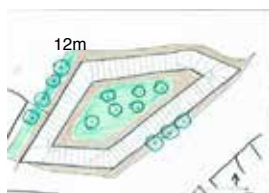Amount of Dwellings = 576
Dwellings per hectare = 999

13. Borchard Apt., New York, US
Architect: Rouse & Goldstone
Footprint = 1.300m²
Floorspace Building = 15.600m²
FSI = 2,71
GSI = 0,23
OSR = 0,29
L = 12 floors on average
H = 36 meters
Amount of Dwellings = 121
Dwellings per hectare = 210

90. Three Ovals
Footprint = 2.480m²
Floorspace Building = 25.550m²
FSI = 4.43
GSI = 0,43
OSR = 0,13
L = 10,3 floors on average
H = 45-15 meters
Amount of Dwellings = 360
Dwellings per hectare = 624

90a. Three Ovals 60m
Footprint = 2.480m²
Floorspace Building = 30.800m²
FSI = 5,34
GSI = 0,43
OSR = 0,11
L = 12,42 floors on average
H = 60-15 meters
Amount of Dwellings = 450
Dwellings per hectare = 781

91. Simple Courtyard (BG 0.5)
Footprint = 2.000m²
Floorspace Building = 8.000m²
FSI = 1,39
GSI = 0,35
OSR = 0,47
L = 4 floors on average
H = 12 meters
Amount of Dwellings = 230
Dwellings per hectare = 399

91a. Simple Courtyard (BG 0.5-8 floors)
Footprint = 2.000m²
Floorspace Building = 16.000m²
FSI = 2,78
GSI = 0,35
OSR = 0,24
L = 8 floors on average
H = 24 meters
Amount of Dwellings = 480
Dwellings per hectare = 833

14. 370 Central Park West, New York, US
Architect: -
Footprint = 1.560m²
Floorspace Building = 9.360m²
FSI = 1.62
GSI = 0,27
OSR = 0,45
L = 6 floors on average
H = 18 meters
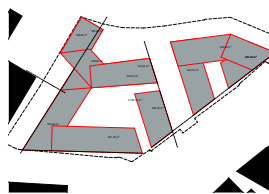Amount of Dwellings = 60
Dwellings per hectare = 104

15. Haarlemmerplein, Amsterdam, NL
Architect: Dick van Gameren
Footprint = 1.900m²
Floorspace Building = 9.195m²
FSI = 1.59
GSI = 0,33
OSR = 0,42
L = 4,85 floors on average
H = 18 meters
Amount of Dwellings = 69
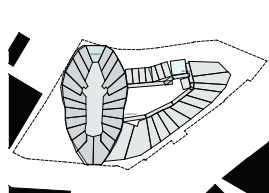Dwellings per hectare = 120

16. Marina City, Chicago, US (1 tower)
Architect: Bertrand Goldberg
Footprint = 550m²
Floorspace Building = 30.800m²
FSI = 5,34
GSI = 0,10
OSR = 0,17
L = 4,85 floors on average
H = 180 meters
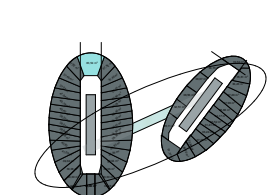Amount of Dwellings = 320
Dwellings per hectare = 555

94. VO Crashcourse
Footprint = 2.242m²
Floorspace Building = 11.037m²
FSI = 1.91
GSI = 0,39
OSR = 0,32
L = 4,92 floors on average
H = 18 meters
Amount of Dwellings = 76
Dwellings per hectare = 132

93. Variation dwelling depth
Footprint = 2.420m²
Floorspace Building = 14.332m²
FSI = 2,49
GSI = 0,42
OSR = 0,23
L = 5,92 floors on average
H = 30 meters
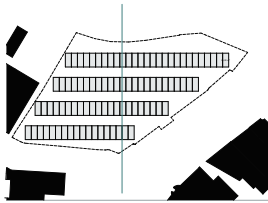Amount of Dwellings = ...
Dwellings per hectare = ...

94. Hybrid
Footprint = 2.897m²
Floorspace Building = 18.254m²
FSI = 3,17
GSI = 0,50
OSR = 0,16
L = 6,30 floors on average
H = 30 meters
Amount of Dwellings = 255
Dwellings per hectare = 442

95. Two ovals and one floating
Footprint = 3.665m²
Floorspace Building = 25.740m²
FSI = 4,47
GSI = 0,64
OSR = 0,08
L = 7 floors on average
H = 30 meters
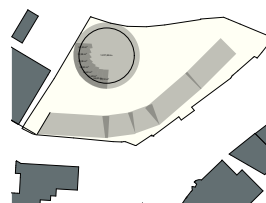Amount of Dwellings = 420
Dwellings per hectare = 728,53

* References to all the images used can be found in the bibliogra-phy under a separate heading 'Plananlysis'
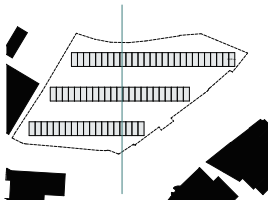
CASE STUDIES

92. Row Housing (2 floors)
Footprint = 2.576m²
Floorspace Building = 5.152m²
FSI = 0,89
GSI = 0,45
OSR = 0,62
L = 2 floors on average
H = 12 meters
Amount of Dwellings = 184
Dwellings per hectare = 319

92a. Row Housing (4 floors)
Footprint = 1.932m²
Floorspace Building = 7.728m²
FSI = 1,34
GSI = 0,34
OSR = 0,50
L = 4 floors on average
H = 24 meters
Amount of Dwellings = 276
Dwellings per hectare = 479

92b. Row Housing (8 floors)
Footprint = 1.344m²
Floorspace Building = 10.752m²
FSI = 1,87
GSI = 0,23
OSR = 0,41
L = 8 floors on average
H = 32 meters
Amount of Dwellings = 384
Dwellings per hectare = 667

U1. Grachtengordel, Amsterdam, NL
Island Area: 7,1ha
FSI = 3,00
GSI = 0,73
OSR = 0,09
L = 4,08

U2. Jordaan, Amsterdam, NL
Island Area: 4,7ha
FSI = 2,54
GSI = 0,75
OSR = 0,10
L = 3,40

U3. Java Island, Amsterdam, NL
Island Area: 4,7ha
FSI = 2,72
GSI = 0,45
OSR = 0,20
L = 6,08

U4. De Pijp, Amsterdam, NL
Island Area: 3,3ha
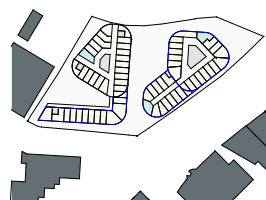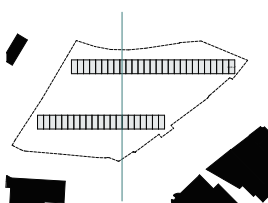FSI = 2,84
GSI = 0,75
OSR = 0,09
L = 3,79

96. Small Funen
Footprint = 2.545m²
Floorspace Building = 19,342m²
FSI = 3,36
GSI = 0,44
OSR = 0,17
L = 7,60 floors on average
H = 30 meters
Amount of Dwellings = 340
Dwellings per hectare = 590

97. "23-5"-30m
Footprint = 2.699m²
Floorspace Building = 28.167m²
FSI = 4,89
GSI = 0,47
OSR = 0,11
L = 10,44 floors on average
H = 30 meters
Amount of Dwellings = 440
Dwellings per hectare = 763

98. P2 Proposal
Footprint = 2.534m²
Floorspace Building = 18.517m²
FSI = 3,21
GSI = 0,44
OSR = 0,17
L = 7,31 floors on average
H = 30 meters
Amount of Dwellings = 302
Dwellings per hectare = 524

U8. Bijlmer Oud, Amsterdam, NL
Island Area: 30,8ha
FSI = 0,83
GSI = 0,10
OSR = 1,08
L = 7,82

U9. Noordereiland, Rotterdam, NL
Island Area: 2,7ha
FSI = 3,16
GSI = 0,69
OSR = 0,10
L = 4,59

U10. Raval, Barcelona, SP
Island Area: 1,4ha
FSI = 4,47
GSI = 0,91
OSR = 0,02
L = 4,89

U11. Stadstuinen, Rotterdam, NL
Island Area: 5,8ha
FSI = 2,46
GSI = 0,57
OSR = 0,18
L = 4,35

* References to all the images used can be found in the bibliography under a separate heading 'Plananlysis'
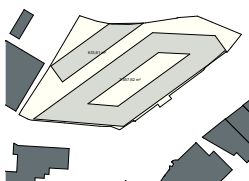
CASE STUDIES

U5. KNSM Island, Amsterdam, NL
Island Area: 3,3ha
FSI = 4,17
GSI = 0,64
OSR = 0,09
L = 6,50

U12. Berlage plan Zuid, A'dam, NL
Island Area: 7,7ha
FSI = 2,41
GSI = 0,56
OSR = 0,18
L = 4,27

U6. De Peperklip, Rotterdam, NL
Island Area: 2,6ha
FSI = 2,20
GSI = 0,45
OSR = 0,25
L = 4,89

U13. Museum Kwartier, Amsterdam, NL
Island Area: 4,5ha
FSI = 2,86
GSI = 0,62
OSR = 0,13
L = 4,61

U7. Klauserplatz, Berlin, DE
Island Area: 4,3ha
FSI = 2,14
GSI = 0,46
OSR = 0,25
L = 4,63

U14. Ypenburg masterplan MVRDV , The Hague, NL
Island Area: 2.0 ha
FSI = 1,07
GSI = 0,39
OSR = 0,56
L = 2,72

U90. Jordaan on site
Footprint = 3.191m²
Floorspace Building = 15.955m²
FSI = 2.77
GSI = 0,55
OSR = 0,16
L = 5 floors on average
H = 15 meters

* References to all the images used can be found in the bibliography under a separate heading 'Plananlysis'

It is that in order to get a high GSI score on the location it was important to get a dense building. Studies in courtyards that would provide for more public spaces, but would not get high enough levels of densification. The same is true for constructing single buildings that would have a high massing. One single building cannot reach enough building depth to produce enough GSI to have a high enough density factor. Multiple buildings perform much better and two perform better than three buildings on the location. The alterations in height need to be taken in account too. Some of the earlier urban schemes do not fit that well to the urban fabric and that is why some of the studies that score higher did not made it to become a proposal.

Applying the rule of 45 degrees between two buildings proven also that 30 meters is a maximum building height as for two buildings to be constructed to be 30 meters the space in-between can maximal be 30 meters too. Then some smaller volumes facing north can create the right connections to the urban fabric and increase the density more.

Conclusion

"Which building typology will provide for the most effective building approach to the project site to contribute to a more Compact City?"

This was the research question that was formulated in the beginning of the research. The answer is that the best suitable typology for the site will be two buildings reaching 30 meter with a central core or corridor. With in-between a square of 30 meters that has at the south side a lower volumes which have also a lower height and will have dwellings facing south. This will also connect better with the existing urban fabric.

The easiest way to achieve high density is to have a low GSI and a lot of floors. One large tower over 60 meters, or even replicating the Woodstock tower (12) on the location, would get very high levels of density, but turned out to be undesirable. Lower urban schemes turned out to have a to low GSI and a lot of difficult corner solutions in order to make an efficient building. Mat and row typol-
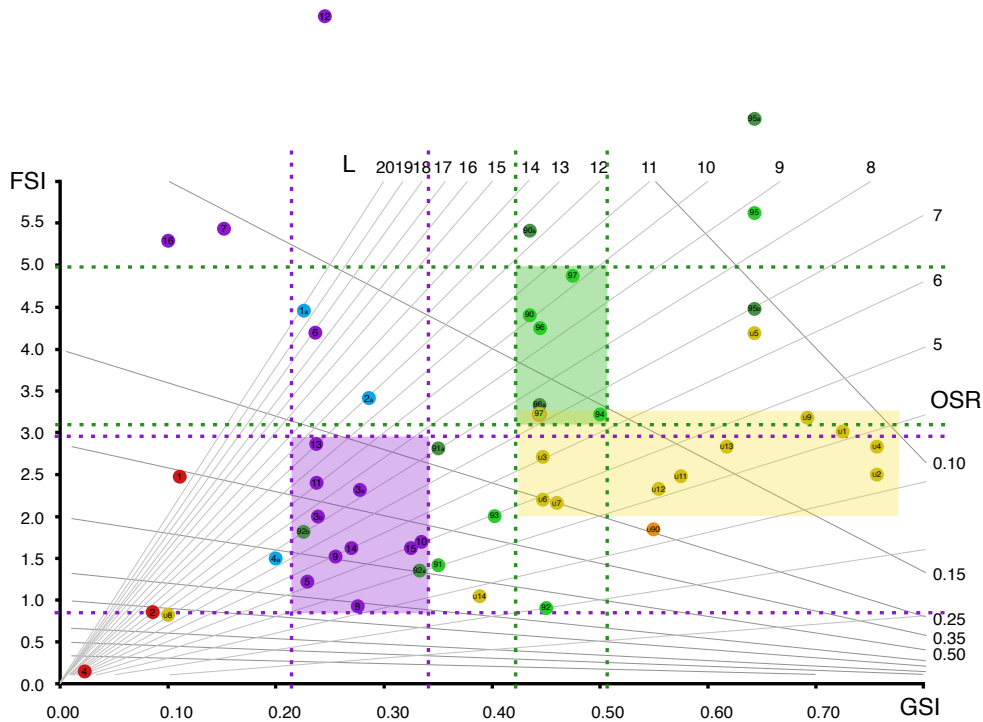
Figure 27 - SpaceMatrix with clusters - The Spacematrix with all the case-studies. It shows where there are some of the clusters are. It is clearly noticeable that there has been an improvement possible with site specific studies and that the GSI was able to reach towards 0.50 which is about the maximum. The P2 proposal is in light green with an orange edge. This project is slightly lower in score because it has been more detailed, and thereby more efficient. The urban schemes (yellow) are not projected on the site and are not directly relate-able. This cluster comes also from a clear selection of projects with a high GSI and FSI, so the cluster is influenced for this scheme - Source: own image

ogies were neither to reach a desired level of density. Only buildings that would have a central mode of access, like towers, or apartment-buildings would fit the location well, but than only if splitted into two separate buildings. This would allow height, with minimal space between façades to keep the GSI as high as possible.

Then also the aspect on relation to the city was very important. As the research showed the height became limited and thereby also the impact on the surroundings. 30 meter is still quite high, but in an urban scheme this can be designed in a way to reduce the effect of the height on street-level. A central square that forms, by the distance the buildings have form automatically a place that is shielded from the surrounding traffic. It is important this space will be designed to be lively. Also there is a lot of interaction with the water on the north side.

Discussion

This research is a research that is very specific. The same methodologies can be used for similar searches to optimal use of plot. Especially when they are having non standard shapes. The factor on which buildings you select is very important to the outcome, and their sizes are important to fit. If you can make more abstract alterations of these existing schemes according to a more strict method than this can become more specific and can lead to better results. The limitations of the site and the design of the urban scheme were factors that became more specific throughout the process and haven't been always a stable factor. However in the conclusion some schemes for this reason have been discarded and variations on the schemes have

been made, often having a lower score than the original. This research started with a lot of questions and started very broad and became more narrow throughout the process. Although providing a lot of information the process was a bit trial and error and used an exclusion method to come to the conclusion which one was best. Making the research reliable, but with more data it can become more specific. Additional studies can still easily be done to expand the research even further and making the study more reliable. Although time constrains did not allow for this.

4. LOCATION ANALYSIS

The assignment of the graduation studio did not provided us with a specific location, but with an area to research. From this area the best location for the project had to be selected. This part of the research will focus mostly on the analysis of the selected project location and it's characteristics.

The project site is located on the intersection between the 'Hoogte Kadijk' and the 'Sarphatistraat' on the location of the Texaco fuel station. After studying the fortification belt this location has the best characteristics to develop a building to enhance the density. Figure 28 shows the location based with the red marker and the area within the red dotted lines show the fortification belt. The ares marked green show the locations of retail functions and as shown earlier there seem to be a strong correlation between density, price and functions, but also with walk-ability. Areas west from the centre are having a high density of functions, while the east side of the city centre contains less.

Within the 17th century the city expanded to what is now called the fortification ring, where the old city walls stood. This development went from west to east and had to provide enough housing for the vastly growing population of the Golden Age of Amsterdam. Amsterdam re-

mained growing, but at 1672 due to the 'rampjaar' [eng. Disaster year] the development of the plots in the new city expansion came to a hold[1]. This is why today the city expansions on the east site are less dense then the earlier development. On the east side there was a lot of green space and also more industrial activity. Today you can see much more recent development than compared to the west side of the city's 17th century expansion. The location of the zoo 'Artis' is called the 'Plantage' that because of the lowered demand was turned into gardens for the citizens of the city to enjoy.

This less dense development can explain why today this area of the city does not have that much retail development and carries a lot of potential to develop here according to the principles of the Compact City. That is why the site on the Hoge Kadijk, where there is now a texaco fuel-station was selected. The location is laying at an interesting crossing between different areas. This is why there are some more clusters found around the location. It is from here that increasing the amount of population can nicely expand further, while the inhabitants of the building still can enjoy the nearby amenities. The crossing is formed because of the Oosterburgergracht and the Zeeburgerstraat, two roads that connect to the Mauritskade (s100) and the Prins Hendrikskade (s116). On the north
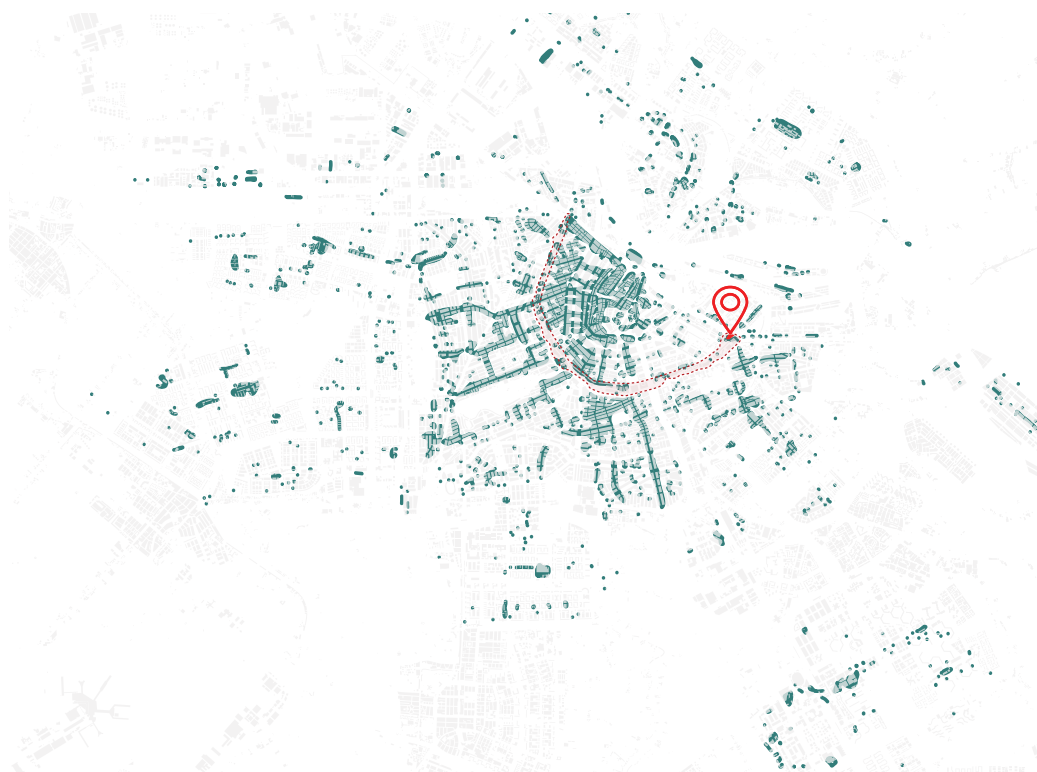
Figure 28 - The spreading of retail functions in Amsterdam - The purple spots are indicating the location of retail functions in Amsterdam. The places that are having a lot of functions clustered are also the same areas that are more expensive (desired) as can been seen in the previous image. Concentration of function indicate generally more walkable areas, while concentrated shopping facilities indicate more car dependence. The red dotted line illustrated the researched area of the former fortification ring and the red marker is location the location that will be further developed. Source: Own Image

1   "Rampjaar 1672," Wikipedia, December 02, 2017, , accessed May 15, 2018, https://nl.wikipedia.org/wiki/Rampjaar_1672#Gevolgen.

Figure 29 - Different Areas in Amsterdam with railway and metro connections - The yellow area indicates the expansion of what will become the new inner city of Amsterdam according to the municipality. The purple area is the centre of the cultural, tourism and some business activities. The brownish area in the left top is the harbour. The red area is Schiphol as a major hub for direct flights in Europe. The blue area is the business district 'Zuid' and the gree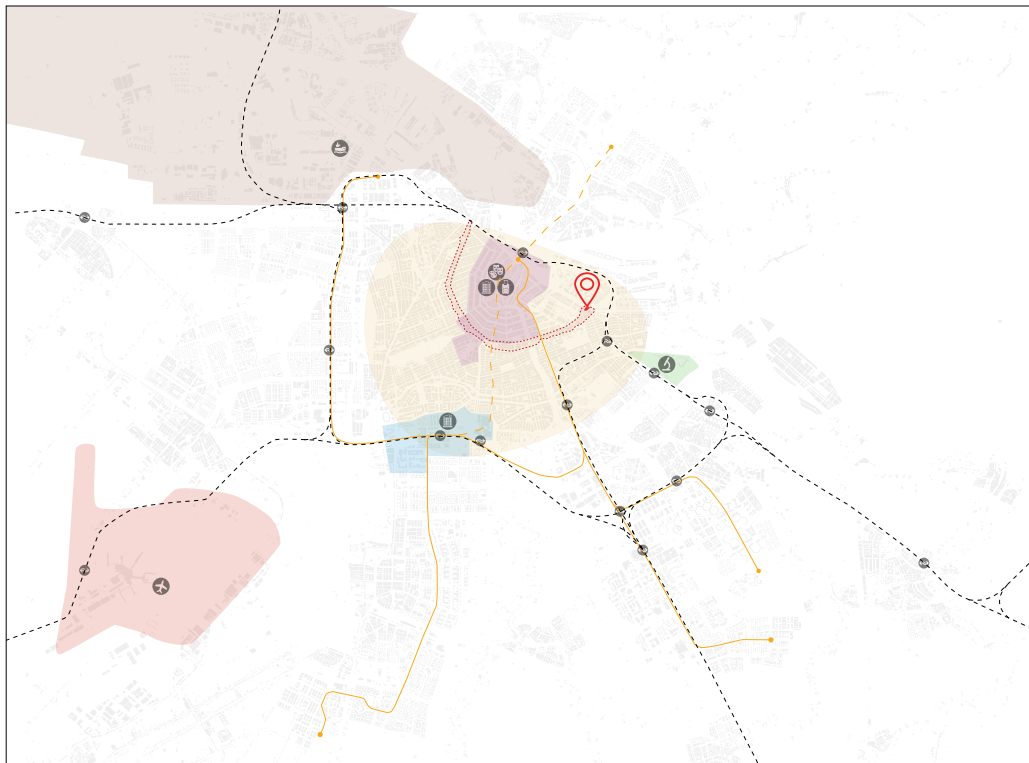n patch near the location is the SciencePark that is now having an important internethub. The black dotted lines are the railways and the yellow lines are the metros of which the dotted yellow line is the North South line that is under construction. Source: Own Image

the tram connects to KNSM Island and Java Island. To the south is the start of the fortification-ring. This road has been downgraded. Providing only one way traffic. This has probably been done to prevent traffic using a short-cut and send the traffic directly on the Mauritskade. The site also has some smaller side roads connecting some dwellings and offices.

Another reason for selecting this location is that the location is having good connections to the public transport network. Which is interesting for the target-group of Young Urban Professionals and in a less car-dependant city it is essential to have a good public transport network to connect to mid-distant travels. The tram 10 (van Hall-straat - Leidseplein -Azartplein) is stopping right in front of the project location is connects really good to the rest of the city. Important locations that can be of increased interest for the target group are also easy to reach like the Amsterdam Business park, the Zuidas and the SciencePark. The first two can be reached by taking the metro from the 'Weesperplein' and the Sciencepark can be reached on bicycle and via the bus. While the inner city is always nearby. Futhermore there are tram 14 (Sloterpark - Dam - Flevopark) and bus 22 (Muiderpoortstation - Centraal Station - Station Sloterdijk) connecting really well to all the places in the city.

The site is now functioning as a Texaco fuel-station together with a car- wash and is one of the most busy Texaco fuel

stations in the Netherlands[2]. However the fuel-station is not in a desirable place, where cars need enter and turn back on the street. It is making a loop into an area that could otherwise be much more car-free. The car really need to be pushed out of the city centre to create a more walkable and cyclable city. The street next to the location can be a really good starting point as one street is already closed off in one direction and could become completely closed of for car traffic. This is the easiest place on the whole fortification ring to start creating a car-free zone.

Traffic is slightly intense on the north east side of the plot, but slows as the traffic comes from the Oostenburgersgracht and takes a turn onto the bridge over the water and then turns again onto the Zeeburgerstraat. The soundmap indicates also were the traffic intensity is the highest. However the plot is affected relatively lightly on a small area. During the visits to the location there was indeed a constant flow of traffic at the location, but the traffic sound was not disturbing. A building, or dense greenery can form a shield against the sounds of car traffic.

On the figure ground drawing it is clearly visible that the location is positioned in an eclectic neighbourhood with many different typologies, with different functions and from different building periods. There are courtyards, but also single buildings and towers. There are some workshops and industrial buildings that have been turned into dwellings. It is very eclectic. This location allows very

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2   Lex Boon, "Op De Sarphatistraat Staat Een Van De Drukstbezochte Texaco's - Amsterdam - PAROOL," Het Parool, August 08, 2016, , accessed May 15, 2018, https://www.parool.nl/amsterdam/op-de-sarphatistraat-staat-een-van-de-drukstbezochte-texaco-s~a4353707/.

Figure 30 - Noise Map 2017 - The map shows the measure sound intensity generated by motorized traffic at daytime. The scale starts at 55-60dB, orange is 60-65dB, red is 65-70dB and purple is more then 70dB. The map clearly indicates the traffic flow when looking at the positions that have the highest intensity. Personal observations can verify this pattern. - Source: Noise Map 2017, map, accessed May 15, 2018, https://maps.amsterdam.nl/geluid/?LANG=cs.

Figure 31 - Figure Ground drawing - This map indicated built and unbuilt areas in the location. The location itself is marked with a brownish colour with black dotted lines. It is clear to see that there is no clear structure in the area and that the buildings all are like single entities. The location therefore allows with a lot of options to design various building masses - Source: Own Image

Werf Kromhout
Former Shipyard
- ca. 1888

Former VOC's Smokehouse and Admiral house
-1660

Former Warehouse Entrepot

Former Power Plant
-1903

De Gooyer
Windmill
-1814

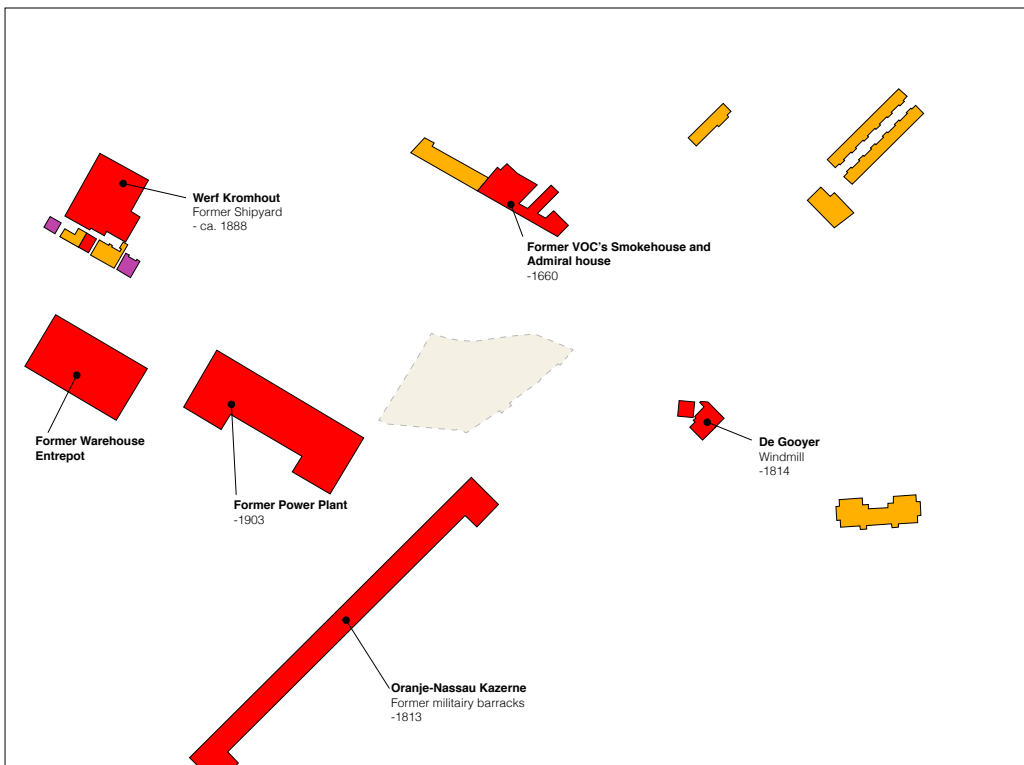**Oranje-Nassau Kazerne**
Former militairy barracks
-1813

Figure 32 - Historical Buildings and landmarks - The Red volumes highlight national heritage while the orange buildings are municipal heritage buildings. The purple buildings are protected as a protected street image. Buildings that are important to the character of a neighbourhood, but not on a building level have enough significance to be listed as a municipal or a national monument. Source: Own Image

much for a wide variety of different volumes and masses to be constructed on this site in a typological way. Because the location doesn't come up with strict boundaries there was a lot of freedom to investigate different kind of typologies and experiment during the plan-analysis.

Despite being less densely developed as a site and having more redevelopment over time there are still some historical buildings that characterize the location, like the landmark 'De Gooier' which has been rebuilt on this location in 1814, however the original windmill is much older going back to the 17th century. There is the former VOC smokehouse and admiral house which date back to the Golden Ages when the areas around the IJ river where harbour areas that were bustling with activities. The Hoge Kadijk, was when looking at historical maps a place used by the military as storage space. Street-names like; 'Kruithuisstraat' [eng. Gunpowerhouse-street] and 'Geschutswerf' [eng. Artillery-dock] remind to this past. A bit further to the North there are still a lot of trances of the former entrepot-dock which was a transshipment port established under French rule. In this port goods could be stored and traded further without having to pay the high import taxes. Most of the remaining warehouses have been redeveloped for housing. In this French time the military barracks have been constructed, which however never really suited it's purpose. After the Netherlands was freed from the French occupation the barracks were called Oranje Nassau Kazerne. The building had some different functions over time, but the most remarkable is that it was house

to animals of the zoo Artis for a while[3]. The yard 'Kromhout' [eng. Bend Wood] is the first covered shipyard in the Netherlands after the yard bought the halls, which were constructed for the World Exhibition in 1887[4]. The newest building that is protected is the former power-plant, which was the first power plant to be constructed by the municipality in Amsterdam to electrify the tram-network[5]. Large steam-engines that were fired by coals produced here the energy. The chimneys and a lot of other buildings have now been demolished. The former coal-storage has been redeveloped in 2001 and is called the Aquartis-building designed by Liesbeth van der Pol.

This mixed development, re-development and being a more industrial area has led to an interesting amount of offices and enterprises, being clustered around the location. The different roads coming together at the junction near the location has given the location some good retail functions like an Albert Heijn supermarket right opposite of the site and a Vomar and Attent supermarket at walking distance. The inner city is generally known to have a lot of functions nearby and this location is not an exception. However, enhancing the density in this location in the correct way can enhance the amount of functions in this location even more. Still there are some sport functions,

3   "Oranje-Nassau Kazerne," Wikipedia, June 03, 2018, , accessed June 04, 2018, https://en.wikipedia.org/wiki/Oranje-Nassau_Kazerne.
4   "Het Werfgebouw," Kromhout | Het Werfgebouw, , accessed June 04, 2018, http://www.kromhoutmuseum.nl/bezoek/het-werfgebouw/.
5   "Van Kolen- Tot Elektriciteitscentrale," Week Van Het Lege Gebouw, May 14, 2016, , accessed June 04, 2018, http://www.weekvanhetlegegebouw.nl/kolen-tot-elektriciteitscentrale/.

Legend:
- Office
- Enterprises
- Care
- Activities and Meeting
- Retail
- Hotel, Restaurants and bars
- Education
- Sports
- Going out and Tourism

Figure 33 - Function Map - Close to the city centre of Amsterdam there can be found a lot of different functions. This location is has clustering because of the crossing of different roads. There are a lot of enterprises and offices that the location is having. Furthermore there is a supermarket right across the street and some more useful functions - Source: Own Image, data from: Gemeente Amsterdam, "Non-residential Functions Map," Maps Amsterdam, accessed June 13, 2018, https://maps.amsterdam.nl/functiekaart/?LANG=en.
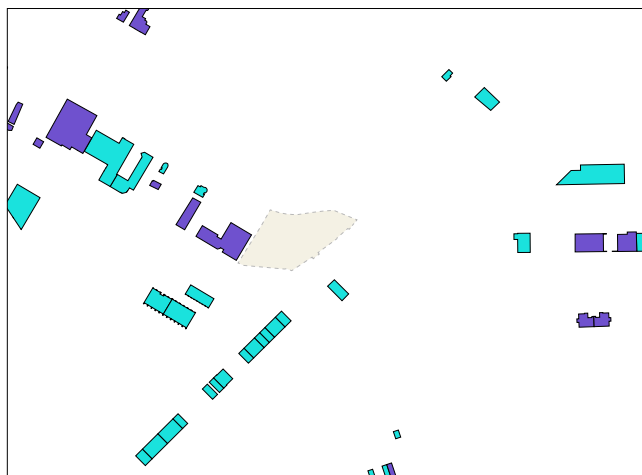
Offices and Enterprises
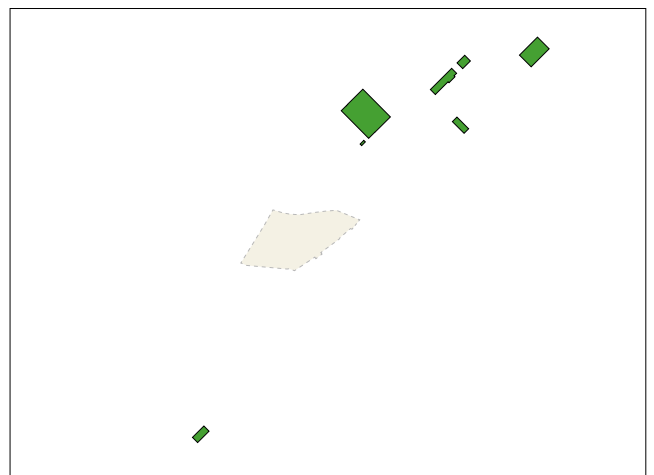
Sports
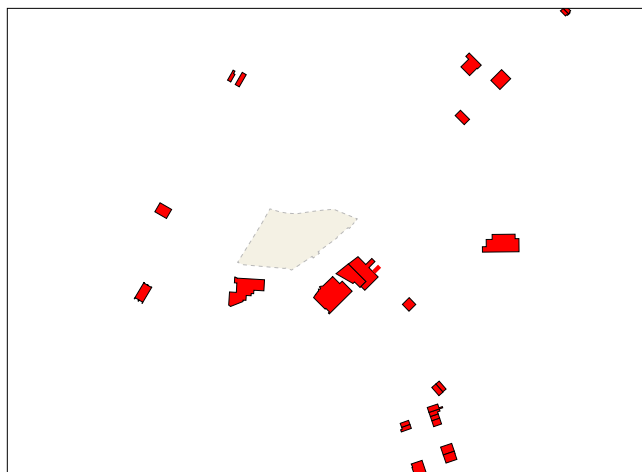
Retail

Hotels, Restaurants and Bars

Legend:
- < 27 meter
- 24 - 27 meter
- 18 - 24 meter
- 12 - 18 meter
- 6 - 12 meter
- > 6 meter

Figure 34 - Height Map - Even looking at the building heights it can be concluded that the composition of different volumes forms an eclectic whole, around more planned neighbourhoods. What is interesting here is that there are some larger buildings around the plot and high elements along the waterline. - Source: Own Image, data from: "AHN Viewer," Actueel Hoogtebestand Nederland, , accessed June 13, 2018, https://ahn.arcgisonline.nl/ahnviewer/.

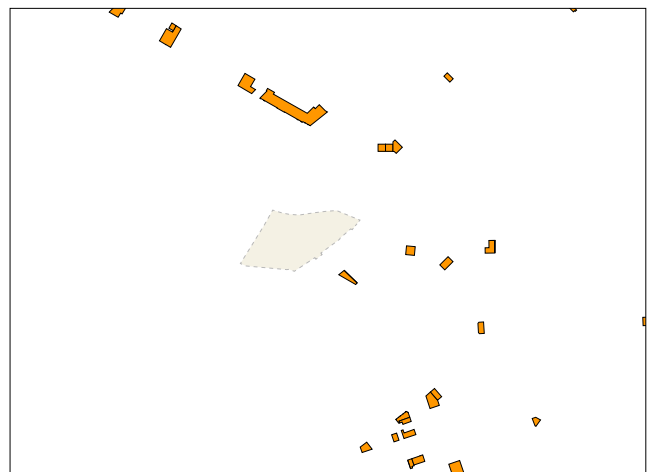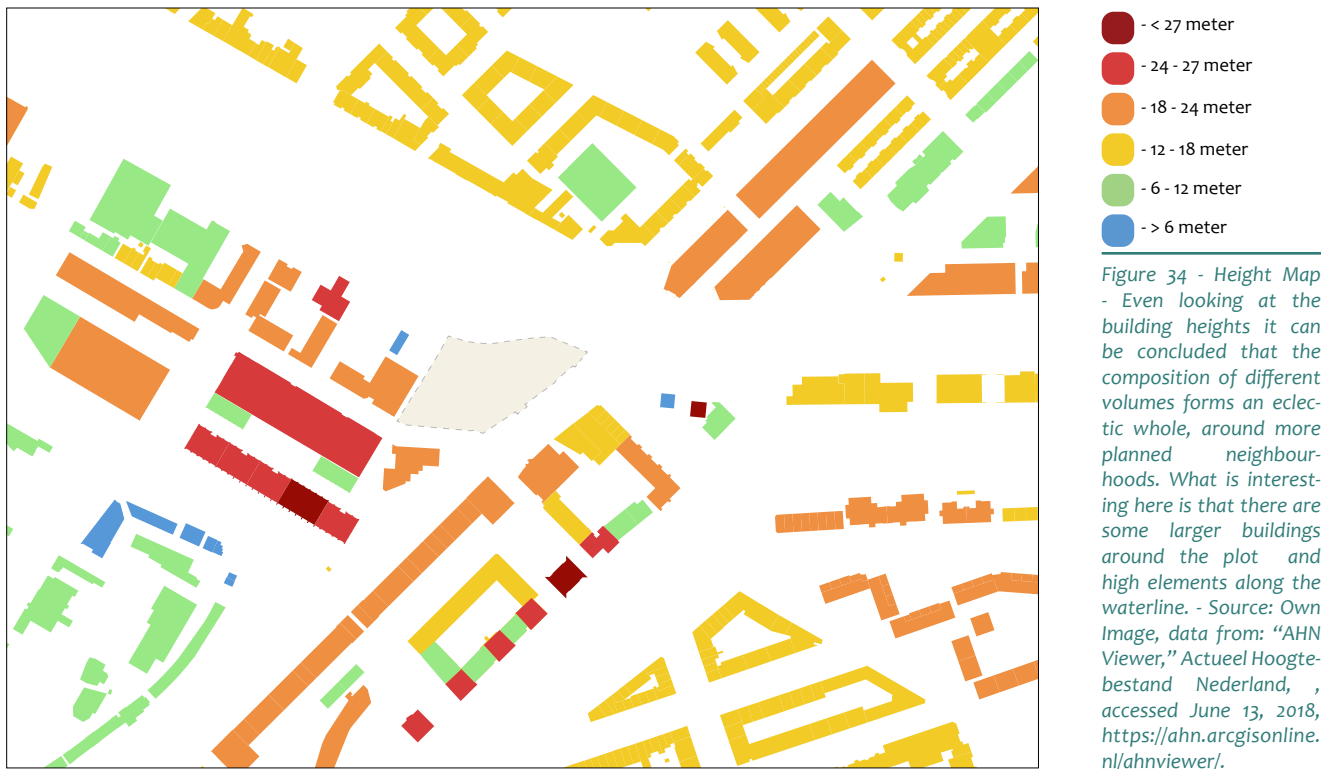and there are plenty options for leisure activities, to get a terrace or go out for a dinner. Even the inner city is at 10 minutes cycling from the location.

As concluded earlier stacking dwellings is a good way to increase density although it is not always desired to have large skyscrapers. By looking at the heights the surrounding buildings a maximum height can be established for the project. The height of some towers are getting towards the 30 meter and some go over it slightly. All these buildings are located along the water side, just as the project location is. The project location furthermore has some higher buildings surrounding it, apart from across the street where some of the buildings are slightly lower. Leading towards the conclusion that 30 meter building height is acceptable in the surroundings without rising far out from the surrounding buildings.

It is important to know how the site is being perceived from eye-level In order to gain an understanding how the plot is experienced there are seven places selected that have a relation to the site. The first place is from the north of the location where there is more car traffic. The green boundaries and the distance from the site keep the plot out of sight. When a building stands here it will be visible better, but does not influence this streets atmosphere that much. The second point is in the north of the site where it looks almost directly at the site. The fuel-station is visible slightly as the sight is blocked here too by some greenery. Further this line of sight looks into the old city centre, but there is no sense of a dense urban fabric from this perspective. The third point looks almost passed the project site. The site can be seen on the left side of the picture where the tree is standing. From this perspective

a higher building which is laying behind the plot is visible when you look straight ahead over the road. The fourth perspective is closer to the site. This street has a higher traffic intensity and looks over the north side of the plot. There is a long view here as-well, seeing the trees on the opposite site of the water clearly.

Perspective five, this one is taken in a narrow road. Not much traffic will go through here generally, but the plot is well visible from this point. The fuel-pomp and the white building next to it, which is hidden by a tree mostly are also visible. There is an open view, because of the low fuel-station. The sixth perspective is located south of the location on a street that has only one-way traffic that goes in the direction towards the location. Interestingly here the trees are blocking off most of the sight towards the location, but because of a bend in the road the location does become visible, however less. The final perspective, number seven is taken in a side road too on the west side of the location. This road has a bend in it breaking the long straight street-line at the end and looking at a building. The location is not very visible from here, but will emerge more when this road is followed till it is all the way visible on the left hand side. All these perspectives show that for a urban scheme the location of the fuel-stop creates a very open space. The fuel-stop itself is very low and it almost looks like from here you are leaving the city, instead of providing with a feeling that you are really inside the city. The spaces are not defined in a way that you are feeling inside a dense city and through redeveloping the project site, the atmosphere of the location can become much more urban than that it is right now. So for the design of the urban plan it is important to really try to get the feeling of a denser neighbourhood to this location.
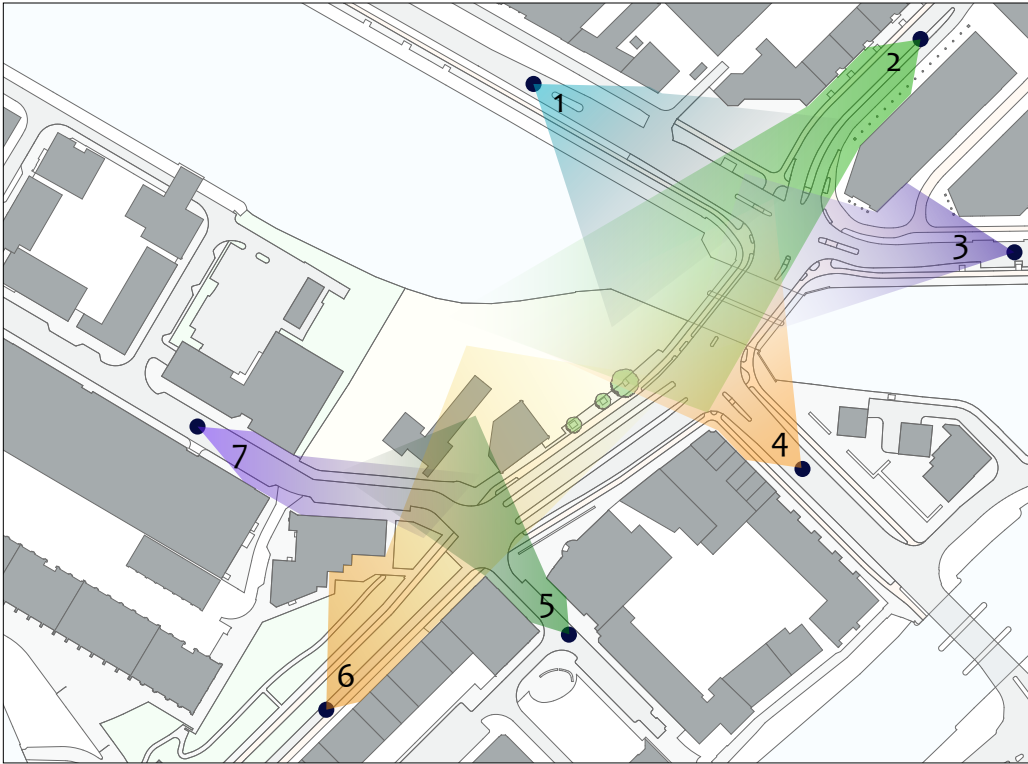
Figure 35 - Eye sight perspective - In order to get a good image on how the site is perceived from all direction there are seven perspectives added. The perspectives show that a large plot adjacent to a wide canal with a little bit of construction, make the area feel empty. It is losing the urban feel in this location, which can be solved by constructing a larger building on this location - Source: Own Image (Images perspectives eye-sight from: "Google Maps". 2018. Google Maps Streetview. https://www.google.nl/maps/@22.3295082,114.164 9423,3a,60y,359.31h,120.5t/data=!3m6!1e1!3m4!1s19vJtylUNF-gl-fPoUN0Sog!2e0!7i13312!8i6656

1.

2.

3.

4.

5.

6.

7.

Because the location has such a weird shape it is challenging to organize all the dwellings in a right way to let them received enough daylight. Especially, when analysing the sun graph, because the west side has an obstructed exposure to the sun, because of a building standing near to the plot. The west and south sides are unobstructed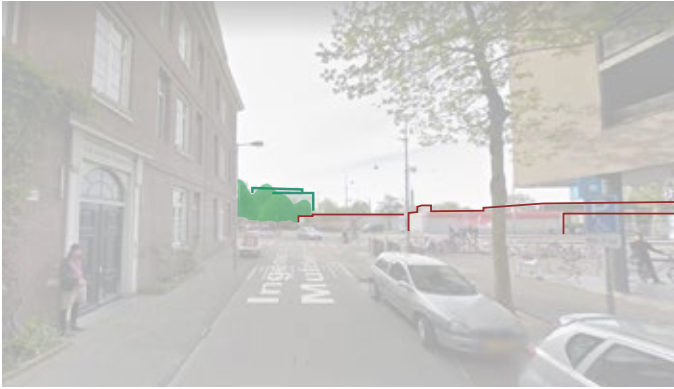, allowing to create enough exposure to sunlight. However studies have shown that only a south orientation is not enough with the typology that has a single orientation. It allows for very small density. The most optimal sun orientation will therefore be an orientation from east to west and using south if possible. This scheme while aiming for a high density has been a large challenge also because it will be hard to utilize the waterfront in a good way and involve the design connected to the water and proving with enough sunlight.

So the location is one with a lot of potential. It has great connections to the city bicycle and public transport. All the possible locations of interest can be reach with ease. The location itself is laying in an area with a good amount of facilities through being on a crossing of different areas. One busy road is passing by the location on the north-east side and only impacts the location slightly. The Sarphati street has blocked traffic from one way to prevent traffic from entering the main road. Over time the other direction can also be closed to form an almost car free area, which would be idea for this location.
Being on the east site of the city centre where there is

less retail development seems to indicated to low levels of density. Providing a boost to this location can help to move the neighbourhood forward in development. The project site is in an eclectic neighbourhood with buildings of all kinds of different backgrounds, materials, functions, and typologies. The location in past has been used by the military and became later the end station of tram 10, next to the first municipal electricity power plant, fired by coal. The area has this industrial character still in some of the buildings, but most of them have been replace by other dwellings.

The fuel-station is positioned at an undesired place. Cars need to drive into the fuel-station and make a U-turn to return to the streets they came from. This is causing a lot of unnecessary traffic in the area. Apart from that the fuel-station is giving the location a gab in the urban lay-out. Like you are leaving the city. Restoring the urban fabric here can bring this urban feel back to a location that can use it very well to receive the initial boost that will hopefully help the re-development of this site to become a more desirable and liveable space in Amsterdam.
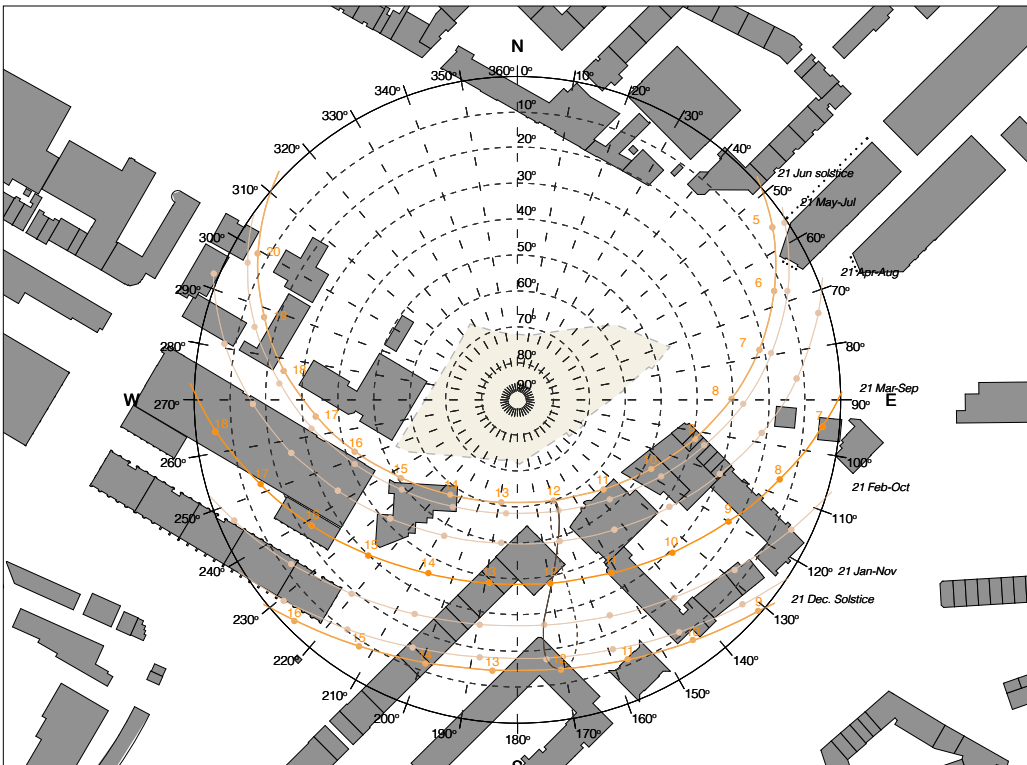
Figure 36 - Sunlight - The path of the sun is going from east to west. The orientation of the sun is one of the major challenges in designing as micro-units have a one sided orientation. Involving the waterline in the design made it even harder. However eventually, the urban design scheme solves this issue well by a east west orientation and a central square that receives sun for a long part of the day - Source: Own Image
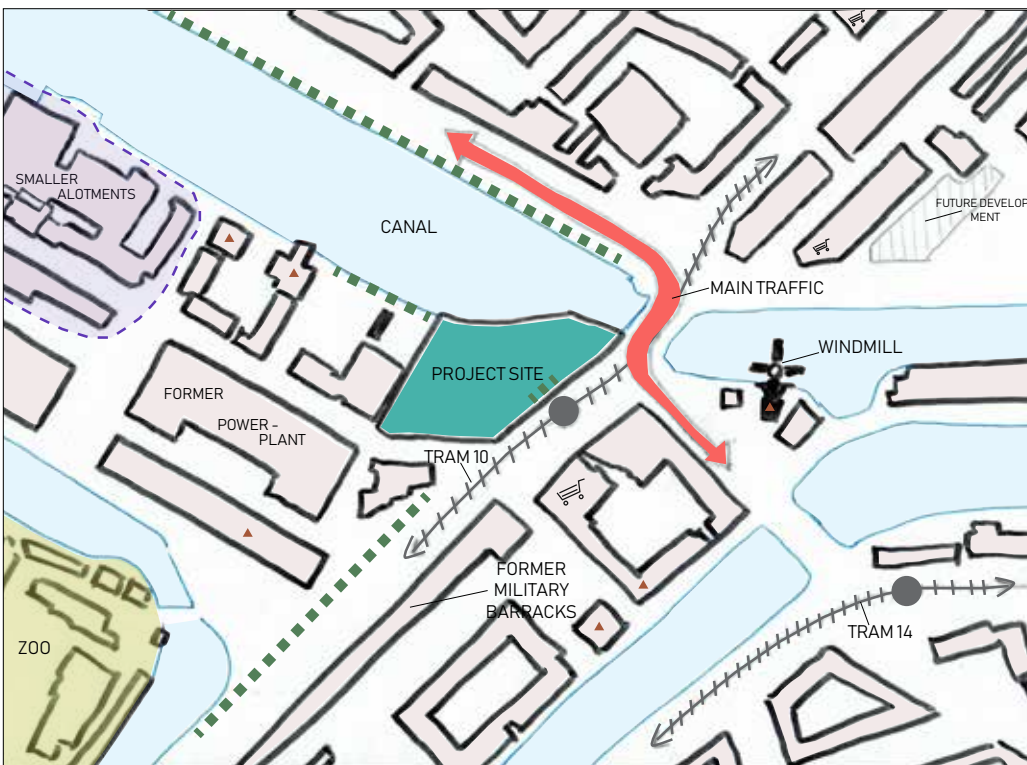
Figure 37 - Overview - This overview shows the main elements of the project site. The red line as indication for how the major traffic stream is and the lines with stripes indicating the trams. The dots represents tram-stops. The green dotted lines are lines that have greenery, and the triangles show which buildings peak out over the rest. There are three supermarkets nearby that are indicated with a shopping cart. Furthermore higher up the Hoge Kadijk there is an area where there are smaller allotments. This area has more historical constructions and therefore a completely different atmosphere than the area around the project site is giving. - Source: Own Image
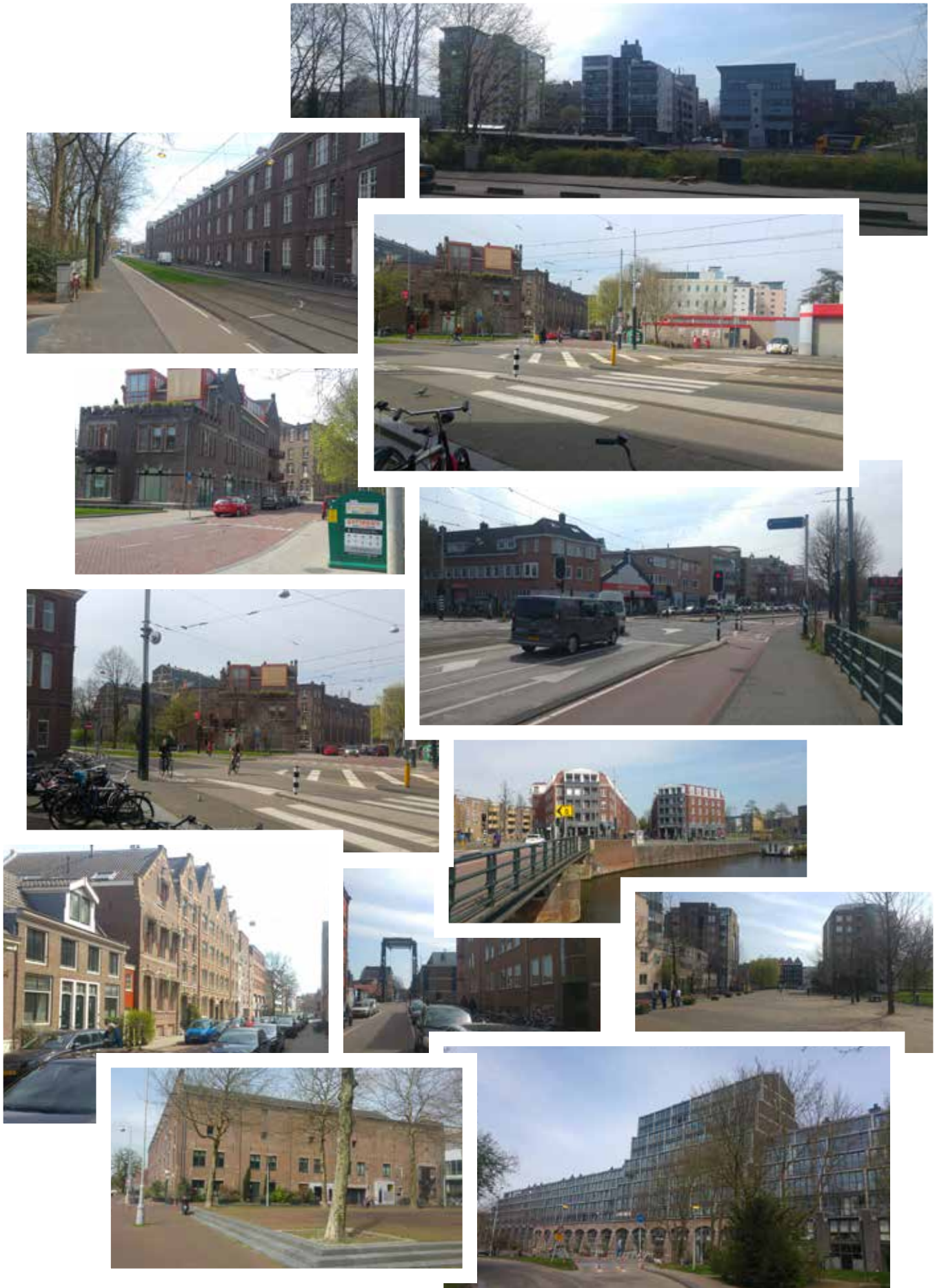
Source Images: Own Images

5. CONCEPT

The urban design scheme has been formed following three main aims;

1. Restoring urban character of the site
2. Achieving a high density
3. Manifesting the ideals of the Compact City

As mentioned in the location analysis, the location with the fuel-station now makes the location feel to much open. It feels like you have reached the end of the city and are now leaving it. This has never been the case in this location. Even in the 17th century the location formed a connection to the harbour-site on the north. It is because one perceives on the location a vast openness. One that is caused by the wide canal, but also, because there is no en-closer by any building on the site of the Texaco fuel-station, while the rest of the urban fabric has this much more. The site is relatively large and the fuel-stop only comprises one single layer of construction.

In order to restore the urban fabric, the building will follow the lines given by the structures of the surrounding buildings. At first is seems that the location with its odd shape and location on the corner would not have any lines to follow, however, there seems to be enough structure to connect the building and form a connection between different areas on the location.

The location stands at a corner and will steer the surrounding structures to link to each-other. First of all, on the Sarphatistraat and the Hoogte Kadijk the lines of opposite buildings are followed. This creates a good enclosure for the street profiles. On the north site on the project site along the Sarphatistraat the building will stop in line with the buildings on the Zeeburgerstraat.

At the Hoogte Kadijk on the east side of the plot the building follows the line of the adjacent building, while taking in account that there is enough daylight and distance between the two buildings. The north side of the building is following roughly the structure of the other building as the Hoge Kadijk that stand in line with the water. The difference at the plot is that the buildings follow the curvature of the site.

Secondly it was important to achieve a high density. The plan-analysis aimed to find out how this can be achieved in the best way, while keeping the constrains of the location in mind. This led to designing two building on the location with an east-west orientation. The maximum height what could be achieved is 30 meters as that is also the distance between the buildings along the central square. The building were set with a 90 degrees angle to the earlier lines set along the streets. Afterwards, the buildings had to be shaped to allow enough daylight to reach every area. This leads to lower massing in the south and the building

reaching maximum building height in on the north side of the location.

Thirdly were the implications of the ideals of the Compact City. Having the two buildings provides, on the crossing of the Sarphatistraat, Hoogte Kadijk and Ingenieurs Jakoba Mulderplein, for another axis. This axis is entering into a car free zone, roughly where there before was the exit of the fuel-station. This extra axis shows how the city can be with car free streets. On the north side the Zeeburgerstraat is extended in a car free area, this was the place were now the entrance is of the fuel-station. The central square that follows becomes lively, through the entrances that will be placed there and the transparency of the façades on the first floors. The shared amenities will be positioned behind the transparent façades, making an inviting gesture, and making it easy to spot interesting activities, and friends. The square has a connection to the waterfront, and receiving for most part of the day sunlight. The square reflects most of the sounds from the cars around it aiming to create, a pleasant place where the advantages of walkable/cyclable cities can be experienced. Having two buildings really makes you feel surrounded by the concept of Young Professional Living, and can be experienced by everyone.

The building further will not contain a large parking garage, but instead a small parking area where there are shared cars. Indoor bicycle storage is easily accessible, promoting cycling. The entrance of the parking garage is concealed and the garage in the future can be easily transformed to other functions.

Living more compact is achieved through micro-units. Units that through flexible interiors can be kept smaller this way. Micro-apartments are very suitable for Young Urban Professionals as they live a lot outside their public realm. In order to make smaller living more attractive than living in larger houses there is a wide array of shared amenities in the building. This really makes that 'less = more', because the shared amenities are only possible because of the compactness of the building.

About every 30 apartments, which is about one per floor will have a shared living-room/kitchen. This is a place to hang out with other residents of the building. It is a perfect place to organize cooking dinner together, so you do not need to cook daily for yourself for example. On the ground-floors there will be more general shared amenities that can be enjoyed flowing specific desires. It can be going to the pub with friends on Friday evening, or watching a movie in a cinema-room. You can really enjoy facilities that you could otherwise not enjoy if you would life on your own. Different kind of activities take place too in the building, really enhancing the community building.

All the roofs apart from the once that reach to the 30 meter will be transformed to be roof-gardens to be enjoyed by the residents. There will be plenty of space to sit, quietly or barbecue. All these roof-gardens are aimed to the south and overlook the surroundings nicely. It also helps to green the city and use all of the available surfaces in the best possible way. The others higher roofs will be used for solar-panels.

Altogether it is forming a building that will make Amsterdam a more attractive city. The direct surroundings will improve under the increase of population on the site and may help to revitalize the rest of this part of the city. The building gives the urban feel back and manifest it's believe in the Compact City. It showcases the workings of the building and will show loads of activities taking place in the buildings transparency that the shared amenities hold.
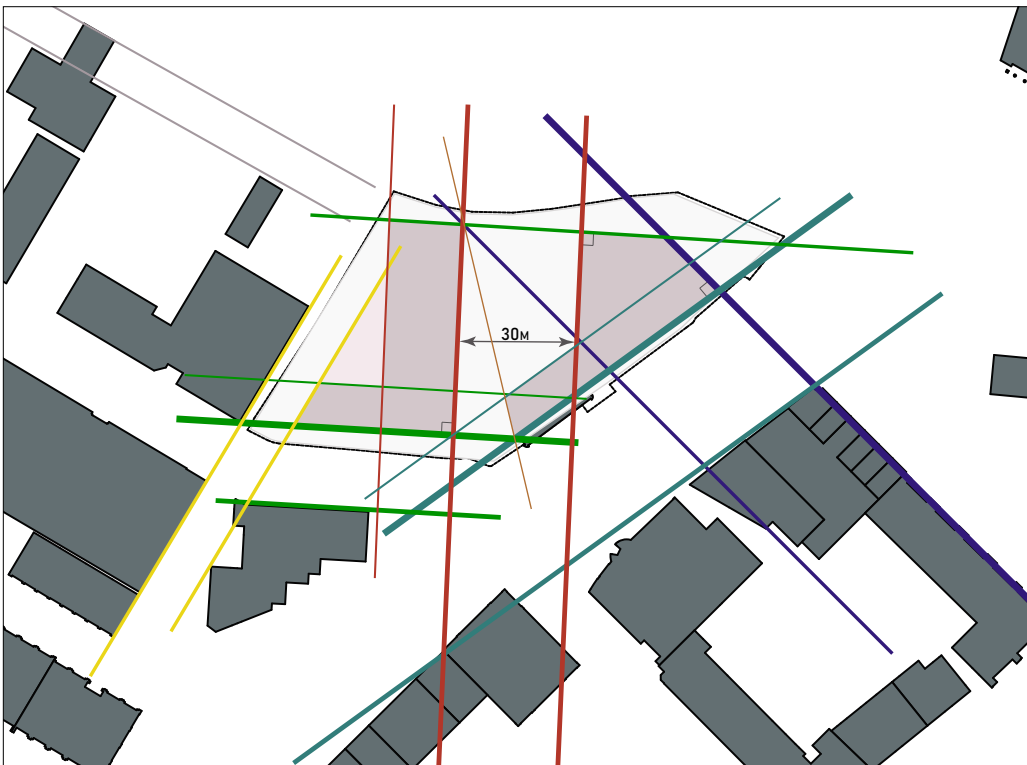
Figure 38 - Connecting to the Urban Fabric - Lines with the same colour are parallel to each other and the thicker the line the more importance. The red lines are rotated 90 degrees from the green lines and in order to have enough distance between the two buildings there was a free space of 30 meters required. The blue green line was aimed to be parallel to the adjacent buildings, but found out that there is no straight line to be found, so an average was chosen for this to on eye level it looks parallel. - Source: Own Image
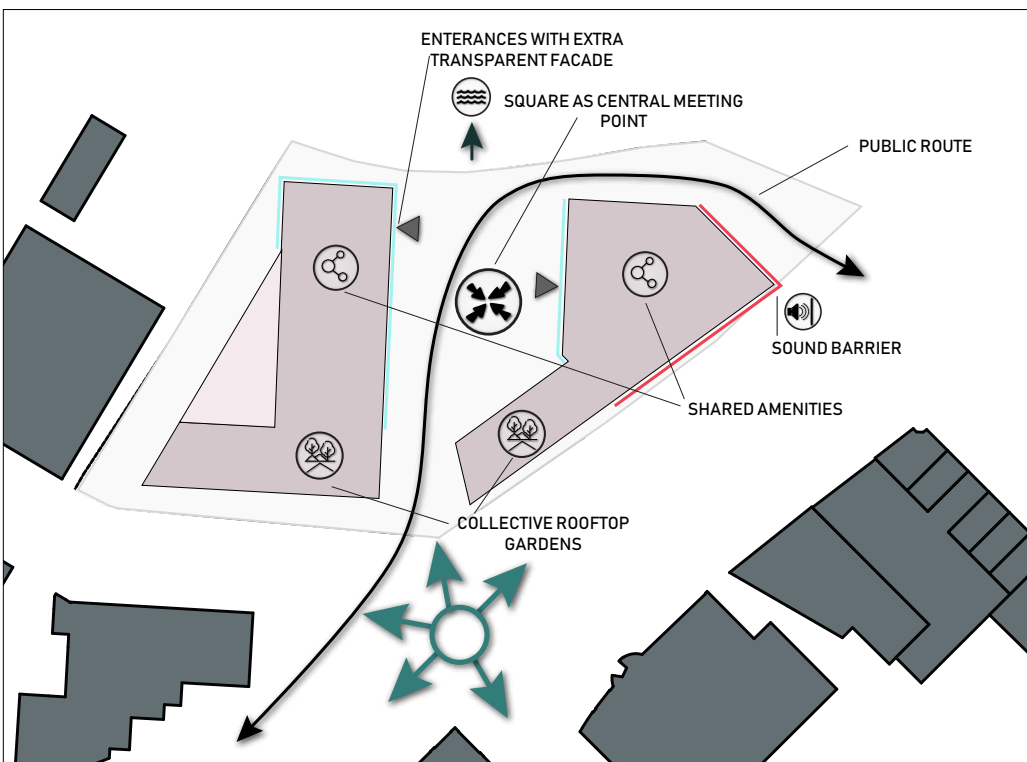
Figure 39 - Urban Plan - The building is forming a new route from the junction. Where there is a route going over the central square where the shared amenities are behind transparent façades. The entrances are also along this square to make them lively. One building is acting as a sound barrier to keep the sound of the car traffic out. On the south there are rooftop gardens as communal spaces. The square is looking over the water, connecting the building with the water. - Source: Own Image

49

6. PROJECT DESIGN BRIEF

The project aimed for Young Urban Professionals creates a high population density on the site, through a concept called 'Compact City'. The building is compact with 822 dwellings per hectare as density. In order to achieve such a high level of density on a challenging plot with a non-standard shape the Young Professional Living concept, combined with the optimal massing retrieved from the Plan-analysis was used to give the highest amount of a desirable density. The buildings will have small micro-units, combined with shared amenities, to best suit the lifestyle of Young Urban Professionals.

The project is consisting out of two buildings which are referred to as building 1 and 2 as shown on the image below. The buildings are similar to each-other in organisation, but there are some differences. Building 1 has more of the shared amenities than building 2, although all the amenities are available for every resident. Building 1 also has the parking garage and provides, because of the terraced shape for all the floors above the 4th floor a roof garden. Building 2 provides for a Co-working concept on the ground floor, and has only one large roof garden. The organisation of this building comes more from a central core, compared to Building 1 that has corridors. The following data and program of the two buildings are as follows:

Plot area:	5.765m²	
Footprint building:	3.200m²	(b1:1.600;b2:1.600)
Floorspace building:	14.258m²	(b1:7.129;b2:7.129)

FSI:	2,47	(Floorspace index)
GSI:	0,56	(Ground Space Index)
OSR:	0,18	(Open Space Ratio)

Dwelling typology:

72x Type A: 29.1m²	- micro-apartment
72x Type B: 19.1m²	- micro-apartment
24x Type C: 34.6m²	- micro-apartment
24x Type D: 23.0m²	- micro-apartment
24x Type E: 26.3m²	- micro-apartment
24x Type F: 28.2m²	- micro-apartment

There are six different types of micro-apartments in the building. The main types are A en B into which A is the main type meant for one or two person households. B is meant for one person only. Type C is on the corners on the sides of the terraces. It has a double sided orientation with a window going around the corner of the building providing with a nice panoramic view. Type D comes together with type C and is a derivitive of type B but with the bathroom extended. It gives the main space a more space and holds the kitchen really nice. On the north side of the building there are types E and F and type F features a very nice corner window. Type E by fitting around the elevator has a really nice seating area and a larger bathroom compared to the B type.

Amount of Dwellings: 240
Building 1: 120   (A:36x; B:36x; C:12x; D:12x; E:12x; F:12x)
Building 2: 120   (A:36x; B:36x; C:12x; D:12x; E:12x; F:12x)

Figure 40 - The Urban Plan is containing two buildings which will be named building 1 and 2 and the numbers correspond with the buildings on this image. Source: Own Image

Dwellings per ha.:　　　　416

Estimated occupancy rate: 1,2 per dwelling
Total amount of inhabitants: ~ 300
Inhabitants per hectare: 520

Footprints

m² total floorspace/inhabitant:　　27,4m²
m² footprint building/Inhabitant:　6.15m²
m² project site/Inhabitant:　　　　11,1m²

Communal Living-rooms

The concept is that the building helps creating social inter-actions and connections. Also the units are limited in size and in order to make that worth it is by proving communal spaces. These spaces are more spacious and are eqquiped with a kitchen and good places to sit and hang-out with other dwellers. These communal living-rooms have to be as much equally divided and in this case they are distribut-ed on most of the floors. The top floors do not have them because the amount of dwellings in low and there wasn't enough space to fit these in. Yet the placements of the stairs makes it easy to go down a floor.

Shared Amenities

This is space reserved from shared amenities that can be used free of cost by the residents. These amenities are there to provide for a more comfortable and luxurious lifestyle and more social interaction between the resi-dents. The spaces will be set-up in a flexible way, so that functions can change over time. Shared amenities can for example be:

- Large communal kitchen/living-room
 (more central compared to those on each floor)
- Restaurant/Café
- Cinema room
- Wellness room
- Library
- Gym
- Rent-able rooms for private group use.
- Workshop spaces
- Micro-Hotel for overnight guests
- Bicycle repair shop
- Game/Sports room
- Etc.

These spaces can be positioned on the ground floors of the buildings. These are made to be flexible and can adapt to different needs. In this design on the north end of both buildings there are some communal spaces planned. One will be themed a library which is meant for studying and reading. The other is a space meant to hang out and relax. There will also be a room meant for multifunctional use. For example when you want to give a party you can use the room to do so as your own apartment will most likely be a bit too small if you want to invite a bit larger group.

General
Building 1:
- Large entrance, with lounge (100m²)
- Parking Garage: 60 places (approx. 300m²)
　　　　　　　　- 15x shared cars
　　　　　　　　- 45x for rent
- Indoor bicycle storage: 160 places (approx. 200m²)
- Communal Spaces
- Communal Storage: 35m²
- Laundry Room: 40m²
- Storage space staff
- Staff room/Office
- Gym (200m²)
- Restaurant (210m²)

Building 2:
- Large entrance, with lounge (100m²)
- Indoor bicycle storage: 160 places (approx.200m²)
- Communal Spaces
- Laundry Room: 40m²
- Storage space staff
- Co-Working Concept: 400m² along street-side.

The Co-Working Concept is a concept of an office space where everyone can rent a working-place. The office comes with the general facilities that an office which can be utilized. This is perfect for small businesses, start-ups and freelancers. The concept comes with presentation/meeting rooms which can be rented. Residents of the building are invited to use this space free of cost for stand-ard flexible workings-spaces for as far as the demand goes, but they can also rent a fixed place at an lowered rate. Ideal for the ambitious Young Urban Professional.

7. SUMMARY

A lot of cities have been enduring sprawling over the past century, and so did Amsterdam. Amsterdam in 1900 had 500.000 inhabitants on a 15km^2 footprint expanded to become 200km^2 but saw only an increase in the population of about 250.000 inhabitants. If the density would have remained the same since 1900 then today the city would have only been 10% the size of what it is now.

This is not a manifest to built cities like we had them in 1900. Those cities were congested, and people were living with large families in minimal units, but it does show that there is space for a middle path. Sprawl has led to becoming car-dependent, and in many of the less dense city edges, there are shopping centres. Clusters of shops with large parking places to park, shop and drive home. Looking at Amsterdam's inner city on the west side there are no clusters of shops found, but shops decentralized along the streets. Having a lot of shops makes the public spaces more alive and exciting, as well as it can lead to more walkable and cyclable cities.

Sprawl also has led to being more car-dependent which changed the social structure of neighbourhoods. The own neighbourhood is often driven through by car, and the activities are taking place in a different location inside the city. This is leading to a loss of social cohesion of neighbourhoods. Social interaction is one of the keys to a happy life. Trust building encounters with people, even if it would be a stranger, releases oxytocin which links to greater feelings of happiness and an overall higher experience of well-being.

Additional benefits of living more compact are that there will be less expenditure on public services. The image that Amsterdam would only be 10% of what it is today, then how much would the municipality save on infrastructure, public lighting, cost of public spaces and maintenance? The savings will be enormous, and it would also allow having great quality public spaces to be enjoyed. Also, because the city is only 10% of its size, nature is always in close proximity. The image that we could shrink Amsterdam to be this 10% of the size and have the other 90% as a natural reserve around the city is fascinating. How clean would the air be by now?

The strength of cities is their concentration of people, knowledge, wealth, goods, etc. This is what sets a city apart from the countryside that is often less wealthy. The compact city is also referred to as 'City of close proximity', personally I believe this name is more specific to the aim of the Compact City, however a general definition has never been established. It is therefore important to frame the term in a right way. Going through different definitions has led to a list of the main characteristics of the Compact City as following:

- Efficient public transportation
- A more walkable/cyclable city
- Lower energy consumption per capita
- Reduced pollution (sound and air)
- Feeling more safe, because of more eyes on the street
- Less infrastructure provision necessary (infrastructure in the widest definition, so also about gas, electricity, water pipes, internet-cables, etc.)
- Better quality amenities and public spaces that are easily accessible
- More green-spaces in the city.
- More inclusive for all income groups

Looking at Maslow's Hierarchy of Needs it can be concluded that the needs of humans can be better fulfilled in a compact city compared to more sprawled cities. From the basic needs of access to supermarkets and more space for agriculture, for food, to more housing that can be established to a higher level of belongingness when you are successfully a part of the neighbourhood in which activities take place, and are not spread out through the city. There are more different stages in a compact city to share your ideas and believes, as well as more places to find the personal things that make you who you are. Eventually, to reach the highest stage in the hierarchy of needs, self-actualisation, the compact city offers a lot of cultural amenities, which are easier to reach. It will be much simpler to go every week to the theatre for example when it is a few blocks away, compared to taking a car and having to spend half an hour trying to park it somewhere and paying more for parking than for the ticket itself. It is about this close proximity that makes it possible. Having a neighbourhood that is alive will lead much quicker to engage in activities that are organised, all attributing to more chances of interchanging ideas, meeting like-minded people, manifesting your thoughts and reaching to self-actualisation.

So throughout history, we always needed compact cities, because cities had to protect themselves from being robbed. After making the transition from hunters and gathers to an agricultural society, we produced yields that had to provide for enough food till the next yield. This meant that society suddenly had to become much more advanced then it was before. Storage spaces needed to be protected and social systems for distribution had to be invented. Which led to the construction of city walls. City walls were expensive and time-consuming to build, so it was important that the city was dense. As it was most efficient and also, the smaller the walls, the easier it is to defend them. When a city grows, it is hard to expand the walls every-time. Cities would grow denser inside, till it reaches a point that no one would fit anymore before the city would develop further.

The ancient city didn't know any cars, and most people had to rely on walking to get around. It was, therefore,

a must to have a city that has this close proximity. The compact city was at that time a natural outcome of circumstances and a necessity. However in the city of the 19th-century life was turning bad. The industrial revolution has taken place and loads of pollution, cramped living spaces, no sewage, all attributing to infectious diseases. Even the rich were suffering and turning negative against the city. They would try to escape the city if they could with large second houses constructed in nature. The city built up a bad reputation.

This bad reputation led to strong visions in the 20th century about how the city had to be. Amsterdam's city walls were demolished around 1878 because advances in warfare made them ineffective and in 1901 the Housing Act was established in the Netherlands. This has led to social housing cooperation, and large expansion plans to house the population. Breheny in his essay 'Centrist, Decentrist and Compromisers' talks about the different standpoints that have been around in three camps. The main figure in the essay was Ebenezer Howard, who is categorised to be compromiser prescribing a lower density in his Garden City plans but still recognising the strengths of the city. The champion decentralist was Frank Lloyd Wright with his plans for Broadacre city. He believed that the advances in technology would make the undemocratic city obsolete and through spreading out the people over the countryside where ever household could possess their piece of land. This is what he saw would be the future. The troublesome sprawl of America of today is not even near the low density as Frank Lloyd Wright envisioned it to be so that his plan would have most likely failed. Champion centralist was Le Corbusier for his plan Ville Radieuse. He saw the benefits of the city and that the congestion could be solved by bringing in high-rise buildings with a low footprint. There would be light, air and space. In The Netherlands modernistic ideas, with influences from the Garden City has led to the rapid vast expansion plans that have largely led to a great reduction in density. It was later after the 70-80's that the city would start to earn back appreciation of the general public.

In our current time, there are plenty issues with suitable housing and liveable cities, especially in developing countries. Cities around the world are exploding in size and with a world's population already over 50% living in cities, and an expected rise in worlds population that will mainly be housed in these cities, it is essential to come up with cities that are compact, and that can healthily accommodate its people. Cities are the economic engines of the economy, and it is vital that they work well. In the case of Amsterdam as a city that wants to establish itself as a European Metropole, it is essential that it becomes desirable. According to Zef Hemel Amsterdam has entered a third Golden age and with an estimated doubling of the population if the city can facilitate the growth in a right way. Becoming more attractive leads to businesses that want to settle and proper housing to an attractive labour market. Size matters, but when you want to compete with

larger cities then quality is more important, and Amsterdam has the potential to do so.

The east side of the historic city centre lacks density. There are not the same amount of facilities, so it is an important location for enhancing the density. Density per se is not the aim, but a Goldilocks density is the best. Not too high and neither to low. Reading countless of articles haven't provided for clear figures to follow as every location has their own specific needs and potentials. For this location, it is essential to bring in a high population density. Density can be explained in many definitions, but population density is the most efficient method of describing the aim for density.

To raise the density, it is essential to look at the personal use of space. The personal use of space has increased enormously over the last century, and the footprint on the city has expanded from $2m^2$ towards and expected $36m^2$ in 2050 according to Rudy Uytenhaak. The expansion has mainly to do with the smaller households that we are having compared to in the past. The smaller households are not something that can be solved architecturally, but these small households do form a perfect group to reduce the footprint. 53% of the households in Amsterdam are people living alone and the largest group in age wise are between 20-34 making up for 29% of Amsterdam's population. It is the group that can be named as Young Urban Professionals that forms a good target group.

Young Urban Professionals are people in the age group 20-35 who are generally higher educated and have a job. They love the city life and see the city as an extension for the house. The house as a private realm becomes less important as less time is spent in them. They are very social and enjoy serviced kind of lifestyle. Owning becomes less important. Spotify, Swapfiets, Netflix, HelloFresh, are all services that we started to enjoy. They have everything at their fingertips, and that makes too that the office has lost importance. They can work everywhere, in a coffee-bar, co-working place, or at home. A large percentage of this group is working already on the more freelance basis or has become an entrepreneur. Office essentials are a laptop and internet. It is a group that is flexible and moves to different places easily. They live alone for longer times, and when they do live together, it will be at a higher age that they will have children.

Living as small as possible can be done by creating spaces that have multiple functions instead of one function per room. In Japanese culture, they use less furniture and the furniture they use is less heavy, so it is easier to change the function of different rooms. A traditional Japanese Futon is a bed of thick layers of cotton that can be taken out and stored again at daytime. For the YUP this solution will be unattractive, so a middle ground needs to be found. Micro-apartments with flexible furniture seems a great solution. The bed also can be stowed away but is still a comfortable bed as we know it with a mattress. Technology has advanced, and smart solutions help to save a lot of space. Different examples show that rooms can be transformed into six different

layouts or in the most extreme case even 24.

The private realm is less important for the Young Urban Professionals, so it can be smaller, however just smaller units may not be appealing to anyone. Being able to come up with a concept that matches their lifestyles better is important. Recent developments show a different new way of living. Project developer FIZZ called this concept YPL, Young Professional Living. YPL is a concept that selects a group of residents, of 18-35 to rent one of their micro-apartments, they need to have a stable income and can use a wide array of communal functions. It are these communal functions that makes that 'Less = More'. By proving a smaller dwelling unit and giving communal spaces there is an extension to the 'home' which is far larger then any private house could offer. Think of having a nice rooftop terrace, and a spa. Or a restaurant where you can eat your dinner when you do not feel like cooking, or even a gym. At the moment in the Netherlands there is a rapid new trend of this quite new developments, but the demand has been so high for this kind of living that these new projects are easily filled up. It really seems to be a gap in the market. One that contributes to a more compact city.

The plan-analysis is focussing on trying to achieve an as high population density on the site as possible conform to Compact City standards. The location is the fuel-station on the Hoge Kadijk which is having a unique non standard shape. Designing a building with a high density therefore would be hard to achieve. Through studying different projects and projecting them at the site. An image could be formed what worked good and what did not. The results were documented in a SpaceMatrix that takes the FSI (Floorspace ratio) and GSI (Groundspace ratio) in account. Apart from taking reference projects and taking their scores, the research also looked at urban plans without projecting them on the site. The FSI/GSI method is highly dependable on the plot size, that is why these building needed to be projected on the project location in order to be comparable. For the Urban Schemes this was easier to research, however in an attempt to translate these schemes to the project location the shape would quickly drop the scores drastically. Design studies were done too because with reference buildings it was hard to achieve a GSI higher than 35%. With the project-specific studies it was possible to get up to only 40-50%. Having to limit the height to 30 meters in order to fit in the surroundings made making two buildings, that were standing 30 meters apart the most efficient scheme. Lower masses would be standing more towards the south and east side and would have a single orientation while the majority of the dwellings would be facing East-West. About 470 dwellings can in this way be realized which would be about 820 dwellings per ha. Around the central square could then be the shared amenities, making the square sheltered from car traffic. The FSI score is 3.46 and the GSI score 0.45. Everything above the FSI of 2.5 is considered highly urban. This location is, especially, because of the complex shape of the plot.

The location of the fuel-station is a location that is very eclectic in many ways. The site has never had significant constructions on it and is used in the past for military purposes. Later there has been an end station for the tram. The surroundings of the site contain some old historical buildings, like the Gooyer, a windmill that attracts tourists and the Oranje Nassue barracks. On the north of the Kadijk was the Entredok with a lot of warehouses that are now transformed to dwellings. Typological and morphological a clear repetitive structure is absent, although some basic lines can be found on the location. There are high and low buildings with different functions. All are making this location diverse and interesting. However, the location of the fuel station makes the location feel less urban then it is. The site misses some encloser to give it the urban feel. That will be on of the architectural standpoints in the design for a building.

Altogether the building will stand on a prime location where it is easy to reach the science park, via the Weesperplein all the business districts in the metro and the city centre at ten minutes cycle. You have access to luxurious shared amenities, beautiful views over the water, and a sunny roof garden to enjoy with friends a barbecue on summer evenings. The building because it brings so many people to the location will have an impact on the neighbourhood where local amenities will benefit from. In the future having more of these islands of high density can transform neighbourhoods to become attractive according to the principles from the Compact City. It is therefore important that the municipality creates good frameworks for this kind of development to take place to efficiently densify the city. Building massive towers at the A10 will densify the city too, but will lead to more cars having to travel to the centre of the city. Starting to develop from the inside to the outside will be much more effective and will help to make Amsterdam become a more competitive European Metropole that can house the people that are attractive to the city to live and work. But above all to create a city that will be healthier, livelier and more sustainable for the inhabitants of Amsterdam to enjoy!

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