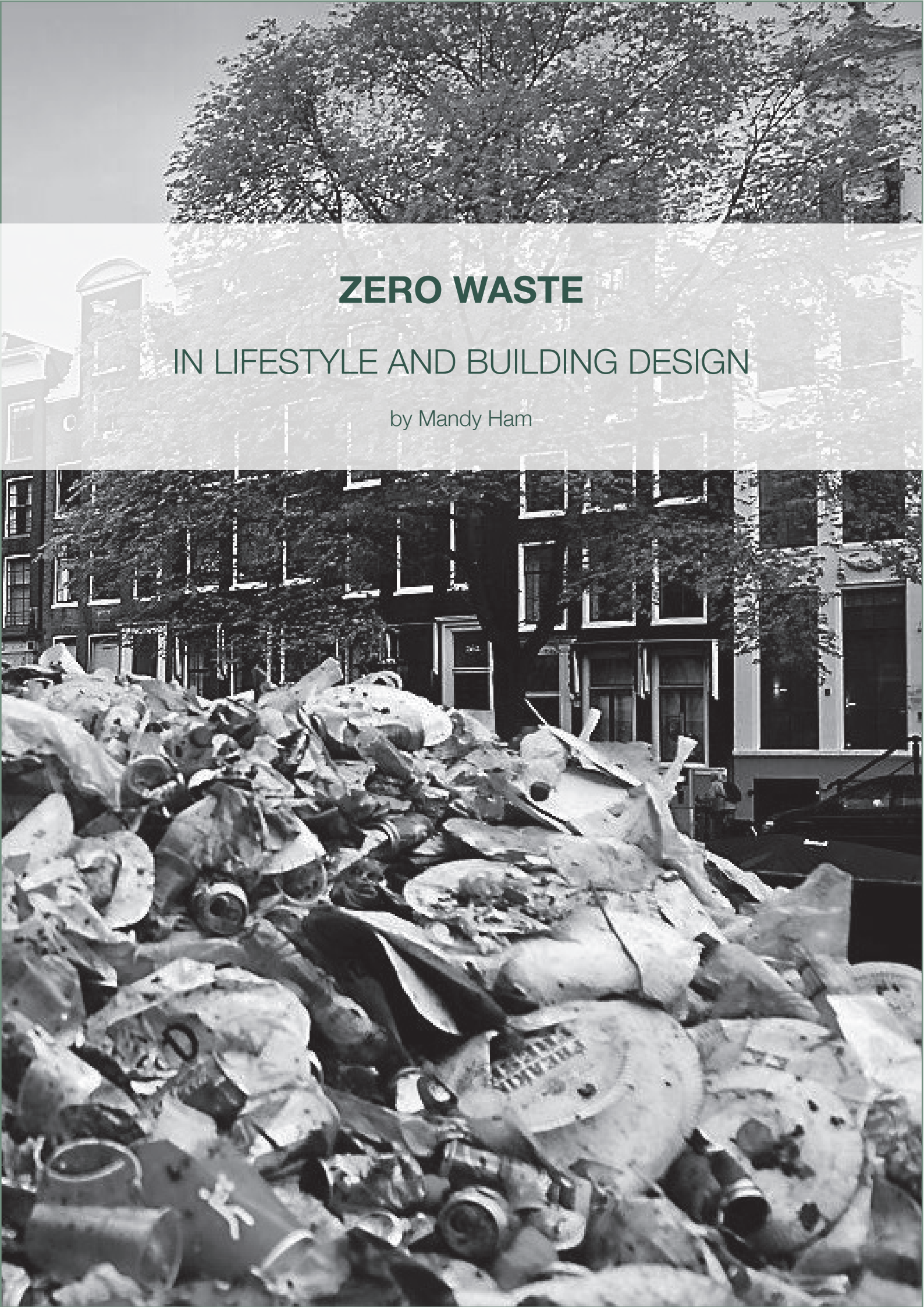
ZERO WASTE

IN LIFESTYLE AND BUILDING DESIGN

by Mandy Ham



ZERO WASTE

in lifestyle and building design

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CONTENT

00 PREFACE

Heaven on earth, breath-taking, picture-perfect and paradise, are just four out of thousands of ways to describe the Maldives. But, and I don't want to ruin this picture-perfect idea of the Maldivian paradise, these islands are far from heaven on earth.

Around two years ago we went on a field excursion to the Maldives with the master one studio Architectural Engineering. Behind this perfect picture of paradise islands, the Maldives is having issues with its solid waste management and the islands are having troubles using its own resources, as there are almost none. We visited different islands and saw the consequences of having no resources to use in your own country. Food doesn't grow there easily, so most of it is imported from India. The same happens with building materials. Most older houses are built of coral stone, but as the corals are dying, the government has decided that people can't use coral stone anymore as a building material. The same applies to the sand on the beaches and the palm trees on the islands, because they protect the islands for flooding's, which is another problem the Maldives will face more and more the coming years due to the climate changes (Wadey, 2017).

While visiting the islands where the inhabitants of the Maldives live, we didn't see the worst thing yet, namely the Thilafushi Island. This island, which is filled with garbage produced by the Maldivians and tourists, is just horrible. There are no other ways to explain this situation. There was waste everywhere. We couldn't see any further than six meters because of the fine particulates, and for that reason we also needed to wear masks, because it was just too dangerous, and thus unhealthy, to breath. We walked around the island. There were small fires everywhere and lots of solid waste just falls into the ocean because the mountain of solid waste is to high. And still ships with waste were arriving at the garbage island day in day out. We were shocked. And I started to wonder if this will be the future of our earth? And I was so happy that I live in a country where everything is managed so good, that we don't face these issues. But do we not face these issues? I started wondering, where does all our waste go? What do we do with it and am I indeed lucky that our 'out of sight, out of mind' mentality doesn't care about all the waste we produce, because we just don't see it anymore after we have thrown it away and it is managed so good? I don't think so. I think we may even have a bigger problem than the Maldivians, as they are at least aware of their solid waste problems and our society isn't.

01 INTRODUTION

"In a world where more and more people are consuming more... In a society where most of us are consiously and unconsiously detached from the reality of our own supporting ecosystems... In an economy where precious resources are produced so cheaply that we can throw so much of them away... In an environment being stripped of its resources, being polluted and made toxic...

We should provide a real change of re-connect and re-think our relationship with the supply and waste streams we take for granted in our unsustainable lifestyles."

- Professor Susan Roaf, Heriot-Watt Univeristy, Edinburgh, UK

(Lehmann, 2012)

01 INTRODUCTION

BACKGROUND

"A study of Dutch residential architecture over the centuries is not only a study into dwelling and building types, but also an investigation of the political and societal views that developed in subsequent epochs."

- Dutch Housing Graduation Studio Manual, 2018

BETWEEN STANDARD AND IDEALS

At this moment, the Netherlands is reconsidering the ideals of its present developments and is critically reflecting on the welfare state project, while adding to this, 'new' concerns, like climate change, overpopulation, ecology, et cetera. The city is a place of constant transformation and so do our ideas on how to use the city, live in the city and built the city. Ideals are constantly changing and exactly this is the goal of the Dutch Housing Graduation Studio, which focusses on finding out what those new ideals might be. 'Between standard and ideals', which is the name of the Dutch Housing Graduation Studio, focusses on the question "how do we want to live and what kind of buildings do we need to allow for that?" (Chair of Architecture and Dwelling, 2018).

The municipality of Amsterdam has presented in 2017 the plan for a new neighbourhood in the Westpoort harbours, which will be the location of this research. Haven-Stad, which is the name of the new neighbourhood, will be developed from 2029 till 2040. The neighbourhood is situated close to the city centre, but just outside the UNESCO World Heritage Designation, as show in figure 1. It will give place for 40.000 and 70.000 dwellings in a mixed work-live environment (Gemeente Amsterdam, 2018).

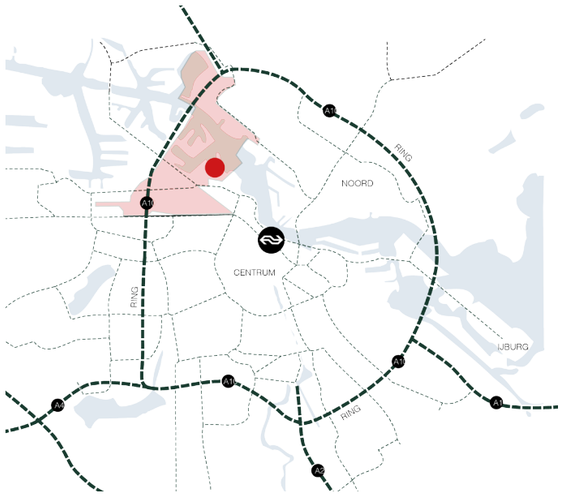


Figure 1. Map of Amsterdam (FRANTZEN et al. - Patch 22)

URBANIZATION

Every minute the global urban population will increase by 145 people. While in 1800 about 7% of the global population lived in cities, nowadays more than 50% of the world's population lives in cities (H. Ritchie and M. Roser, 2018). Cities are growing fast, which is a worldwide trend, and also in the Netherlands cities are facing an immense growth.

In the coming ten years the population growth in the Netherlands will increase from 17 million inhabitants right now till 18 million inhabitants in 2030 (Centraal Bureau voor de Statistiek, 2018). One-third of this one million population growth must be facilitated in the four biggest cities of the Netherlands; Amsterdam, Rotterdam, The Hague and Utrecht (Centraal Bureau voor de Statistiek, 2016).

The city of Amsterdam, which is the context of this research, is the fastest growing city in the Netherlands (Centraal Bureau voor de Statistiek, 2019) as the city grows with approximately 11.000 inhabitants every year (Gemeente Amsterdam, 2016, p. 4). While the municipality announced a building stop in 2010, the city was still growing over time. In order to accommodate the growth, the municipality of Amsterdam has developed a plan 'Structuur Visie Amsterdam 2040' in which they aim for a largescale densification of the existing boundaries (Gemeente Amsterdam, 2016, p. 6), which gives a lot of opportunities as well as challenges for a lot of aspects, such as the quality of life, healthiness of the living environment and affordability. The task of the future architect is to take these opportunities and challenges into account while creating new forms for living in the very dense city.

TOPIC AND RELEVANCE

HISTORY OF WASTE

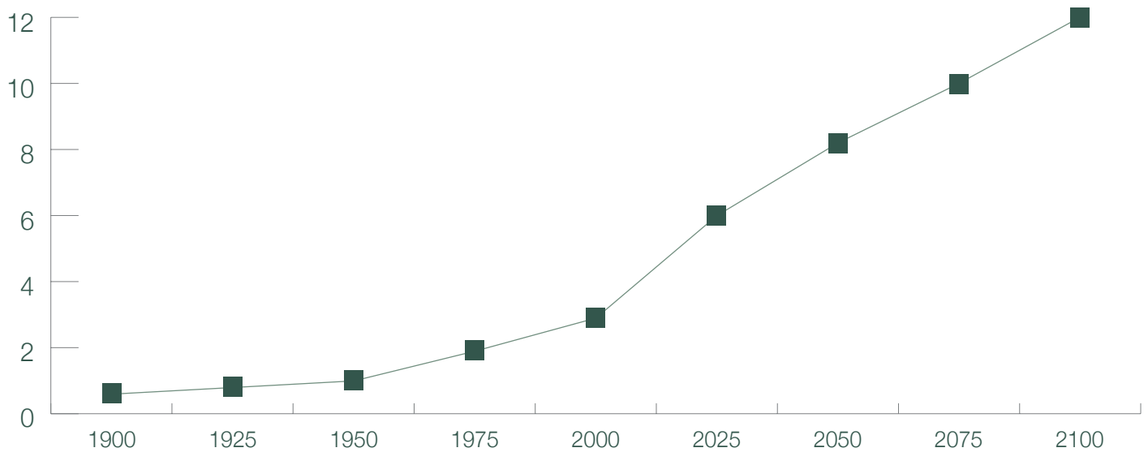
For thousands of years humans have produced garbage. In low pollution areas waste may have been neglectable as humans have always lived in a 'circular economy' (Mauch, 2016). Leftover foods were served to animals or boiled to soup, people made use of resources in their nearby environment, which made that packaging's were not used at all, and broken objects were repaired and durable goods were used for many decades, instead of throwing it away after already a few years (Mauch, 2016). People have always used resources from our planet earth, only in a very different way as we do now; with respect for our own eco system.

It was only since the beginning of the industrialization and the large urban growth of cities, that the production of garbage had become a concern for human beings. In the 18th and early 19th century household waste was dumped directly into the streets and in rivers. In the first place, this wasn't a big issue, as the garbage on the streets was reused or recycled allowing many people to make a living by selling what they could find in other people's rubbish. Over time, people started to collect their waste in central waste mounds, where the waste was burned to ashes which was uses for making bricks and soil conditioner. This could be seen as the first example of a zero-waste management system (Herbert, 2013, p. 7). However, as the cities were growing more rapid, the streets became more and more choked with filth due to the lack of waste management regulations (Herbert, 2013). As a result of this, serious public health problems started to arise in the cities, such as epidemics caused by vermin. In

Figure 2. Wast in Amsterdan canels in the early 20th century. Source: Stadsarchief Amsterdam

the mid-19th century, social reformer, Edwin Chadwick was commissioned by the government of Great Britain to undertake an investigation into sanitation and make recommendations on improving the public health conditions. He published his report 'The Sanitary Condition of the Labouring Population' in 1842 in which he which he argued for the importance of adequate waste removal and management facilities to improve the health and wellbeing of the city's population (Chadwick, 1842).

Over the years, waste management systems have evolved towards a good working system in which households store their garbage in-house and garbage is being collected by waste management companies once or twice a week. The collected garbage was brought to landfill but, as the disposal of waste

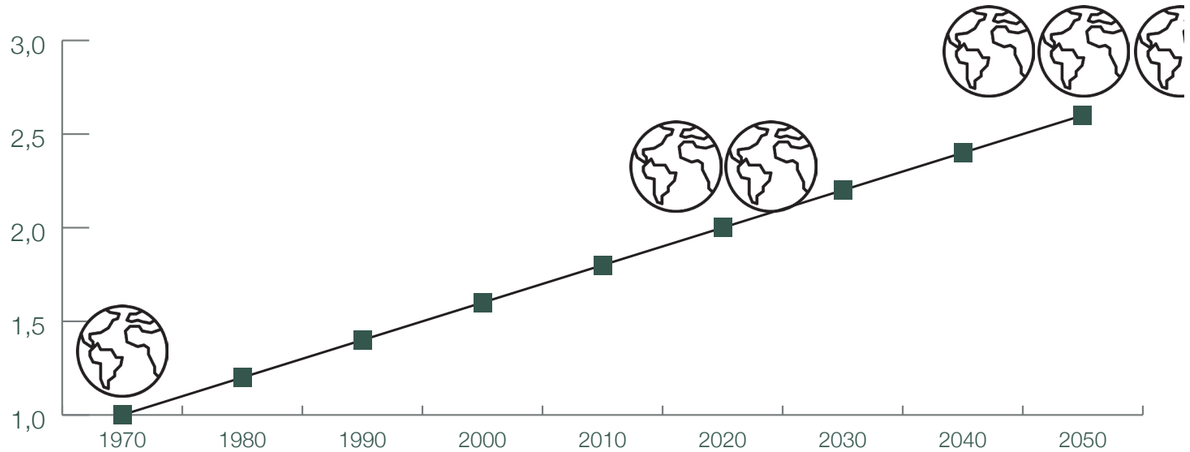


Graph 1. Estimation increase of waste prodction till 2100 (Stromberg, 2013)

increased slightly, there wasn't enough space to landfill all of the garbage human produced. This problem made that the first incineration plants were created in which waste was thermally threated. Incinerators reduce the solid mass of the waste by 80–85% and the volume, which means that while incineration does not completely replace landfilling, it significantly reduces the volume for bringing waste to landfill (RenoSam and Remboll, 2006, p. 12). Although studies have shown that by the burning of waste involves the generation of climate-relevant emissions, mainly emissions of CO2 (carbon dioxide) as well as N2O (nitrous oxide), NOx (oxides of nitrogen) NH3 (ammonia) and organic C (Johnke, 2000), this has never been a problem for our ecological system and human health. At least not until the Western culture changed to a consumerism society and a throw-away culture, with as a result huge increase of the solid waste production, which is shown in graph 1.

CONSUMERISM AND THROW-AWAY SOCIETY

As the industrialization continued, the availability of consumer goods increased enormously. Since 20th century we live in a linear economy which is focussed on continual, exponential economic growth (T. Rau, 2018, p. 11). The assembly-line manufacturing made that mass production became more and more known, especially in the United States of America and Western Europe. The production of easy-to-use, disposal items, has made that stuff we buy, loses its value very fast. Where in the past, goods were reused, repaired or recycled, today new products are being rolled out and bought by millions every day. Products are made to fail, items that once were considered durable are now almost exclusively disposable. It is actually more difficult for consumers to find a durable version of a product, than a disposable one. Our society has made that products are made for a very short lifespan; products are designed to fail, to be outfashioned or to be outdated (T. Rau, 2018, p. 22). Our global extractions are environmentally damaging and depleting some resources to the extent that they are in danger of running out. Many of those resources find their way into the goods, gadgets and machines that we find indispensable in our everyday lives. At some point, we can imagine, we must run out of place to put all the stuff we waste. And indeed, this is what happen in the Netherlands in the late 1980's (Rijkswaterstaat Environment, n.d.) as the country suffered from a lack of landfill capacity and insufficient thermal treatment capacity. This isn't only a local problem, also globally we are approaching limits on how much waste we can put to landfill, dump in the oceans and incinerate (Mauch, 2016, p. 5). Together with this, the humankind uses more of earth's resources than the planet's ability to provide for everyone living on the planet.



Graph 2. Estimation increase of earths needed up to 2,6 earths by 2050 (WWF, 2010)

Ruim een ton vuil per seconde erbij

Mondiaal probleem Met de verstedelijking groeit de mondiale afvalberg. De toename wordt veroorzaakt door de groeiende welvaart in armere landen.

Amerikaans plastic afval massaal naar ontwikkelingslanden gestuurd na Chinese ban

TT | 05 oktober 2018 | 09u25 | Bron: The Guardi

Het Parool HOME AMSTERDAM OPINIE PS STADSGIDS

Mondiale afvalberg in 2050 ongeveer 70 procent gegroeid

Geplaatst op 20 september 2018 door P Geertsma

Tegenvallende resultaten bij scheiding afval

deVolkskrant

Maasoevers vol met plastic afval

Wie deze zomer de strandjes van de Maas of de Waal opzoekt, moet straks eerst een hoop plastic rotzooi aan de kant schuiven. Want de oevers liggen bezaaid me zwerfafval, zo blijkt uit een groot onderzoek van het initiatief Schone Rivieren.

Al het afval moet in 2050 worden hergebruikt

Het kabinet wil dat Nederland in 2050 'circulair' is. Dan moet de economie volledig draaien op hergebruikte grondstoffen en moet al het afval worden verwerkt tot bruikbare materialen. Zo moeten het gebruik van grondstoffen en de uitstoot van CO2 worden verminderd.

Gerard Reijn 14 september 2016, 6:00

Het Parool HOME AMSTERDAM OPINIE PS STAD

'Afvalbeleid gemeente Amsterdam rijp voor de prullenbak'

AD Nieuws Regio Sport Show Video Koken &

Wereldwijde afvalberg dreigt ruim te verdubbelen

De afvalberg is wereldwijd sterk aan het groeien. Wanneer we niet ingrijpen zal de hoeveelheid afval die we produceren in 2050 met zo'n zeventig procent zijn toegenomen. Daarvoor waarschuwt de Wereldbank in haar nieuwe verslag 'What a waste'.

Buitenlandredactie 20-09-18, 21:19

Rommel op straat vindt niemand fijn Gemeente Amsterdam

27 februari 2019

Een opgeruimde buurt is veel aantrekkelijker om in te wonen, spelen en werken dan een rommelige. Dat snappen we allemaal. Daarom steken veel mensen tijdens de Landelijke Opschoondag op zaterdag 23 maart de handen uit de mouwen voor een zwerfafvalvrije buurt. Doet u mee?

Na een dagje samen opruimen is de buurt zo schoon. Nog een reden om mee te doen: u leert uw buurtgenoten beter kennen en dat is wel zo gezellig.

Het Parool HOME AMSTERDAM OPINIE PS STADSGIDS

Gemeente kan stijging afvalklachten met moeite bijbenen

Kabinet: in 2050 geen afval meer

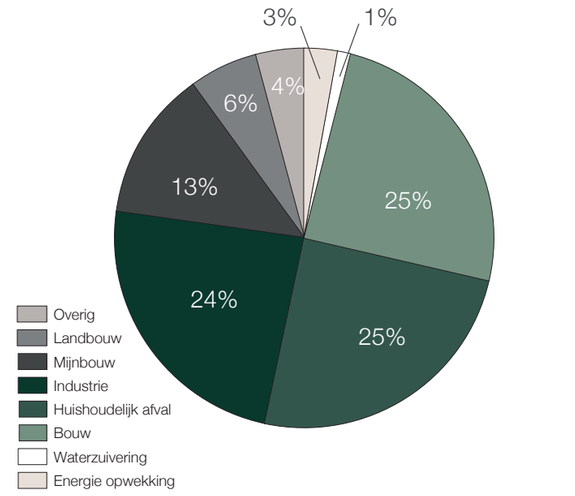
Jos Verlaan 14 september 2016

Afval bestaat niet. Die stelling moet in 2050, als het aan het kabinet ligt, werkelijkheid zijn. De economie moet dan vooral draaien op hergebruikte grondstoffen. Dat schrijven staatssecretaris Sharon Dijksma (Milieu, PvdA) en minister Henk Kamp (Economische Zaken, VVD) in de brief over het Rijksbrede programma Circulaire Economie.

PROBLEM STATEMENT

"Mismanagement of waste is harming human health and local environments while adding to the climate challenge. It doesn't have to be this way. Our resources need to be used and then reused continuously so that they don't end up in landfills"
- Laura Tuck Sustainable Development at World Bank

On the 20th of September 2018 the World Bank posted this press release; *"global waste to grow by 70 percent by 2050 unless urgent action is taken… urgent action is needed to prevent waste from clogging the streets"* (The World Bank, 2018). As the global population progresses towards 8.5 billion by 2030 (United Nations, 2015, p. 5), the amount of urban solid waste is growing even faster than the rate of urbanization, which will be problematic for our living environment as well as our environmental health. As the urban population increases, so does its consumption of good and we are stretching many of our natural resources to their limits. As the ecological impact of waste can no longer be ignored, reducing or even eliminating waste is a great concern for the future of our urbanized world.



Graph 3. Solid waste production per sector in the Netherlands (ING, 2014)

RESEARCH GOAL

If we look at graph 3, in which the estimation of solid waste produced per sector is shown, we can see that there are three large percentages of solid waste being produced. 25% of the solid waste is produced by households. An other 25% is produced by the built environment sector. Focussing on examinatin solid waste in the houshold sector, as well as the built environment sector makes that the solid waste produced will decrease with 50%. The goal of this research is thus to elaminate waste in households and building design. The role of the architect in this matter is very important, as a change of lifestyle needs to be taken into account in the design of the residential complex. Only while focussing on the lifestyle of the individual as well as the community, it is possible to make them live zero-waste in a zero-waste home and building.

RESEARCH QUESTION

The research is split up into two parts, zero-waste lifestyle and zero-waste building design. The research questions, for both parts a differen research question, that will be answered in this report is 'what are the needs, on a dwelling scale and building scale, for people that live zero-waste?' and 'what are zero-waste design principles?'. In order to answer the research questions, sub-questions have been asked:

General
- what is the history of zero-waste?
- what is zero-waste?

Lifestyle
- what is a zero-waste lifestyle?
- who live zero-waste?
- what are the needs of people that live zero-waste?

Building design
- what is zero-waste in building design?
- what are zero-waste design principles?

DESIGN QUESTION

The design question is: 'how can the needs of people that live zero-waste be incorporated into a zero-waste residential building design?'.

02 ZERO-WASTE LIFESTYLE

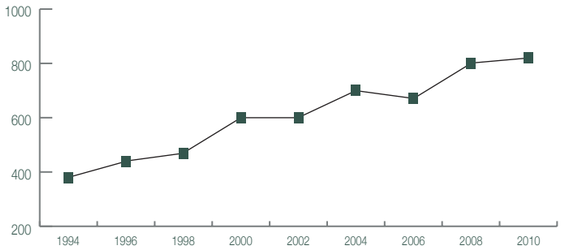
ZERO-WASTE IN GENERAL

"Zero Waste is a goal that is ethical, economical, efficient and visionary, to guide people in changing their lifestyles and practices to emulate sustainable natural cycles, where all discarded materials are designed to become resources for others to use. Zero Waste means designing and managing products and processes to systematically avoid and eliminate the volume and toxicity of waste and materials, conserve and recover all resources, and not burn or bury them."
- Zero Waste International Alliance, 2018

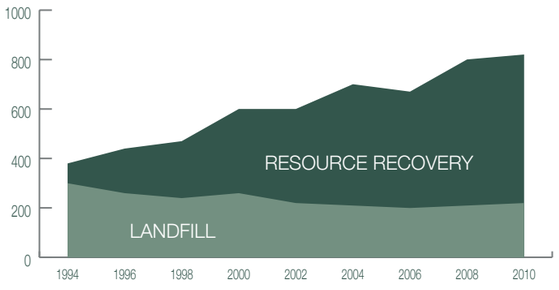
DENINITION OF ZERO-WASTE

Zero-waste is not about producing no waste, but about not sending any waste, if it isn't compostable, to our environment. The term waste, as being used in this research, is different to the term used by most newspapers. Waste, as defined in the Cambridge dictionary, is "an unnecessary or wrong use of money, substances, time, energy, abilities, etc.:". Not using rest heat of green houses for example is also waste, although we can't see it physically. Waste is thus more than only garbage or trash, it is about everything we waste such as, the waste of rain water, waste of rest heat, waste of resources. The Planning Group of the Zero Waste International Alliance adopted the first peer-reviewed internationally accepted definition on November 29, 2004:

"Zero-waste is the conservation of all resources by means of responsible production, consumption, reuse, and recovery of products, packaging, and materials without burning and with no discharges to land, water, or air that threaten the environment or human health."
(Zero Waste International Alliance, 2018)



Graph 4. Canberra waste production (source ACT Government)



Graph 5. Canberra waste production (source ACT Government)

HISTORY OF ZERO-WASTE

Zero-waste was introduced for the first time in the 1970's by Paul Palmer, a chemist who later became the founding director of the Zero Waste Institute. He noticed that scientific businesses were discarding used, but clean, chemicals that could be reused. His vision on zero-waste was scientific and financial, rather than ecological in the first place. On his website The Zero Waste Institute Paul writes: *"With time, it became clear that recyclers did not understand, and did not trust, the reuse of chemicals or engines or buildings, but were wedded to consumer garbage and the retrieval of low-level broken materials…Ultimately it became clear that a new term would be needed and so I settled on using Zero Waste to include all of the methods for reusing all of society's products"* (Palmer, n.d.). Zero-waste is thus not a linear take-make-waste strategy, but it is meant to recover all resources used in the production process, instead of burning or burying them. In Palmer's point of view, as he writes on his website: *"IT IS NOT a lifestyle choice – your personal choices do not effect large, social changes"* (Palmer, n.d.).

Over the time term zero-waste became more widely adopted and zero-waste communities started to evolve all around the world. Today zero-waste organizations, help and advice municipalities across the world to transition towards Zero Waste. The first city to announce a zero-waste goal was Canberra in Australia as in 1996 the local government was promoting 'No Waste by 2010' (Pedersen, 2017, p. 12). The goal was to implement a new waste management strategy in which the ultimate challenge was to empower the community so that they stop treating materials as waste but rather as resources (ACT NoWASTE, 1996). However, in the ABC journal broadcast it became clear that *"the ACT Government's aim of 'No Waste by 2010' will not be met as Canberra's waste level continues to climb… Those in charge of the program are disheartened by Canberran's addiction to shopping and the waste that comes with it"* (ABC News, 2010). The level of waste has even increased, as shown in graph 4 and 5. While Paul Palmer points out that zero waste is not a lifestyle choice, the Canberra 'No Waste Strategy by 2010' has shown that only if people do change their lifestyle, zero-waste can be achieved.

ZERO-WASTE LIFESTYLE

The zero-waste movement is based on the philosophy of a circular economy. Everything should be reused repeatedly to avoid throwing waste to landfills, burning it or burying it. The main idea of zero-waste, which is proposed by Bea Johnson, is that, if a community cannot reduce, reuse, repair, recycle or compost a product, the industry should not be making that product in the first place (Connett, 2006). The zero-waste idea looks at the issue of waste management from the front end, instead of asking how to get rid of waste when it is there. (Connett, 2006) The zero-waste movement is a lifestyle movement where individuals change their lifestyle to become more sustainable by changing habits from their previous lifestyle. Although Palmer argues that zero-waste is not a lifestyle choice, Bea Johnson changed this point of view with her her book 'Zero Waste Home', in which she argues that individual choices can indeed make a different to social changes. Bea Johnson is seen as the 'mother' of the zero-waste living and writes in her book about the 5 R's that will make it possible for everyone to live zero-waste; *"Refuse, Reduce, Reuse, Recycle, Rot (and only in that order) is my family's secret to reducing our annual trash to a jar since 2008"* (Johnson, 2013)

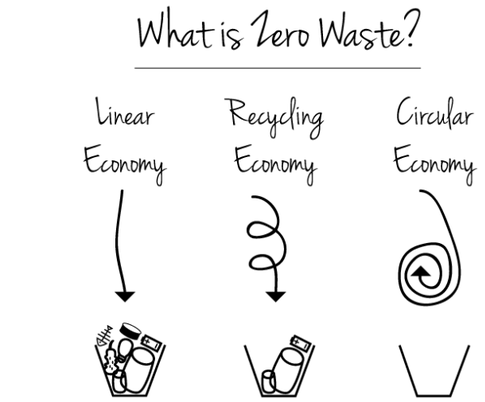


Figure 3. Zero-waste is about a circular economy (A drop in the ocean, n.d.)

5 R'S OF ZERO-WASTE

Refuse

Implementing zero-waste in the home starts with our behaviour outside the home, Bea writes. Although most of the materials that enter our lives are recyclable, zero-waste is not about recycling in the first place. Refusing to let needles products enter in our daily lives is what the first and most important R is about. Every bit one takes, creates the demand for the world to make more. Accepting and taking stuff creates a society of wasteful practices. If you realy don't need it, refuse buying it (Johnson, 2013).

Reduce

There are things in life we really need, and of course it is important to still live comfortably and a qualitative life. However, if we do need stuff, we can still reduce it to a minimum. Reducing allows people to focus on the quality instead of the quantity of life. The second, and also very important R of zero waste, reduce, *"addresses the core issues of our waste problem"*, Bea writes, *"it takes into consideration the imminent environmental consequences of population growth, associated consumption and the finite planetary resources that cannot support the world's needs"* (Johnson, 2013).

Reuse

Reusing is utilizing the problem in its original manufactured form several times to maximize its usage and increase its useful life. By doing so, instead of recycling, resources that otherwise will be lost through the process of recycling will be saved. Shop with reusables, use refillable alternatives for disposals, buy used (second hand), buy smart, so products are reusable. Also repairing stuff or using different elements for something else can be seen as reusing (Johnson, 2013).

Recycle

When it is absolutely necessary recycling is a better option than sending an item to the landfill. It does safe energy, conserve natural resources, divert materials from landfills and create a demand for recovered materials. Materials such as steel, aluminium, glass or paper are more likely to get recycled over and over versus plastics for example, which are mostly downcycled in a very energy consuming process. When buying new, durability is thus very important to take into account. Where do the materials come from, what kind of materials have been used, does it need to travel the world for you, which produces a lot of waste as well (Johnson, 2013).

Rot

The last step in the process of a zero-waste lifestyle is rotting. Rotting is the process of composing in which nature takes back its resources. If buying a product, choose a product that is compostable. If the product is at its end of life, nature can take it back (Johnson, 2013).

TARGET GROUP DATA

Zero-waste communities have started to evolve around the globe, and also in the Netherlands the zero-waste movement is growing. The national Zero Waste Nederland Facebook community has, at this moment and the group is growing rapidly, 10.856 people following the page. Besides the national zero-waste group, already 29 sub-groups have been established in the Netherlands, as shown in figure 4. Also in Amsterdam, which is the biggest sub-group at the moment, a zero-waste community has been established. The group is growing fast, as only in the last two months 125 people have joined the group, which is an increase of 20%. For the target group research, as well as the Zero Waste Nederland Facebook group as the Zero Waste Amsterdam group has be analysed.

RESEARCH METHODOLOGY

Living zero-waste is a very new and unknown topic as almost no research has been done about living zero-waste and building design. Investigating the target group is thus a very important part of this research report. The chooses research methodology is to conduct a survey is the Zero Waste Amsterdam group in which people living in and in the area around Amsterdam live. The questionnaire, which can be found in appendix I, will be used as the basis for the target group research. In total 102 people have responded on the questionnaire held in het Zero Waste Amsterdam group. The results will be shown in this paragraph. The results can also be found in appendix II. The questionnaire is held in dutch and English. 80 people responded to the dutch version and 22 people to the english version.

ZERO WASTE NEDERLAND
10.856 likes on Facebook *(on 27th of May 2019)*

Zero Waste Amsterdam
Jij en 660 others zijn lid

1 Texel 256
2 Amsterdam 661
3 Haarlem 459
4 Zandvoort 80
5 Noordwijkerhout 44
6 Leiden 178
7 Alphen aan den Rijn 79
8 Gouda 32
9 Den Haag 264
10 Rijswijk 28
11 Delft 18
12 Rotterdam 75
13 Barendrecht 46
14 Oosterhout 119
15 Zeeland 184

ZERO WASTE / LESS WASTE NEDERLAND
7052 community members on Facebook *(on 27th of May 2019)*

16 Groningen 343
17 Leeuwarden 90
18 Drenthe 26
19 Zwolle 46
20 Enschede 44
21 Apeldoorn 511
22 Zutphen 179
23 Hilversum 18
24 Baarn 72
25 Utrecht 219
26 Wageningen 52
27 Nijmegen 470
28 Eindhoven 481
29 Maastricht 242

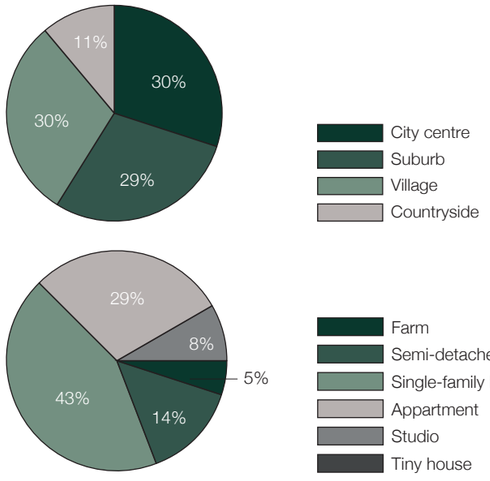
Figure 4. Zero-waste Facebook communities and member numbers in the Netherlands (Zero waste / Less waste Nederland, n.d.).

DEMOGRAPICH DATA
Target group: Zero Waste Amsterdam

Zero Waste Amsterdam
Jij en 660 others zijn lid

Established on 7th of January in 2017
661 members *(on 27th of May 2019)*

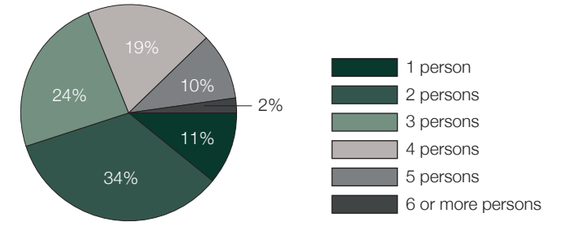
Group description:
"For all of you lovely souls interested in learning more about a Zero Waste lifestyle. Please share all your ideas about this movement, zero waste grocery stores, ideas for recycling your waste, compost tips and the like!"

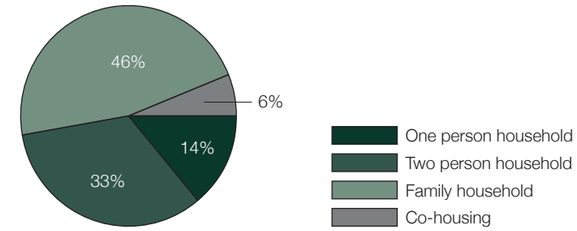


Graph 7. Household composition data (source: questionnaire)

Living environment and housing type
In graph 9 is shown that people form the Zero Waste Amsterdam are form the city of Amsterdam as well as from the nearby environment of Amsterdam. 59% of the people lives in the city centre or in one of the suburbs of Amsterdam, while the other 41% lives in villages nearby.

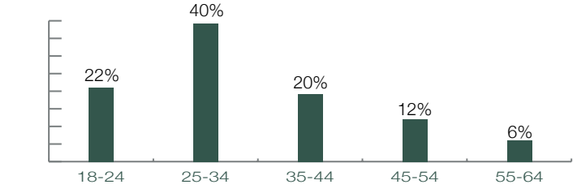
Garbage production and separation
From the people in the Amsterdam Zero Waste Facebook group most people estimate that they produce below average or average amount of solid waste. In the Netherlands the average amount of solid waste production per person is 490 kilo per person per year. However, regarding to the separation of the produced waste, most people estimate themselves separating very much of the waste they produce.



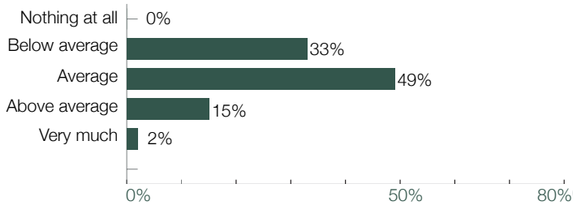


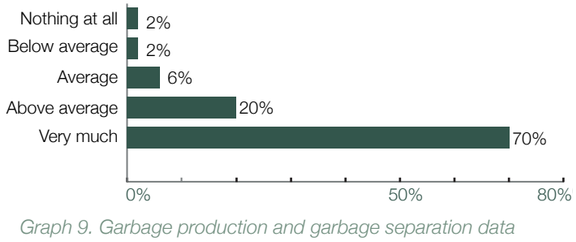
Graph 6. Household composition data (source: questionnaire)

Age and home composition
Graph 6 shows the age numbers of the respondents. The graph shows that most people living zero-waste are 'younger' people between 18 and 34. Most people living zero-waste in the area of Amsterdam are starters and (young-)families, as shown in the graph 7 and 8. whcih corresponts to the graph showing the age of the respondents.. 47% of the people living zero-waste are one or two people households, 46% are family households and 6% are co-housing households.



Graph 8. Age numbers (source: questionnaire)



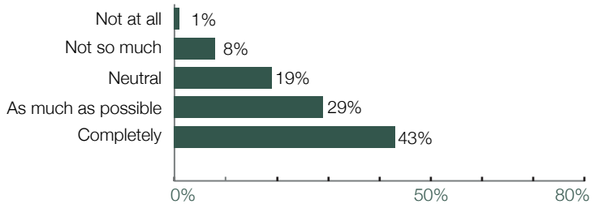


Graph 9. Garbage production and garbage separation data (source: questionnaire)

ZERO-WASTE LIFESTYLE DATA

Willing to live self-sufficient

Graph 10 shows how much people are willing to live as self-sufficient as possible. Looking at the numbers, 43% is willing to live completely self-sufficient and 29% as much as possible, which means that 72% of the respondents is willing live as self-sufficient as possible.



Graph 10. Willing to live as self-sufficient as possible (source: questionnaire)

Measures to promote zero-waste lifestyle

As a large goup of the people is willing to live zero-waste, of course they have taken measures already in their homes in order to support their lifestyle. In graph 11 is shown what measurements most people have already taken. Almost everyone seperates their carbage in their own home. Half of the people grows (most) of their own vegetables and around one third has an outdoor composing system. A big part of the respondents collects rain water and has invested in renewable energy sources.

[redacted]oja, waswater van groente/fruit ook opvangen. Verder zoveel mogelijk meubels, huisraad en kleding tweedehands kopen.bij s zomerse hittegolf houden we ons huis koel met rietmatten voor de ramen (dat scheelt een ventilator) en veeg ik onze houten vloer ipv dat ik de stofzuiger gebruik. En kook ik s avonds in de schuur op ons 4pits kampeergasstel, dat scheelt veel warmte in huis.

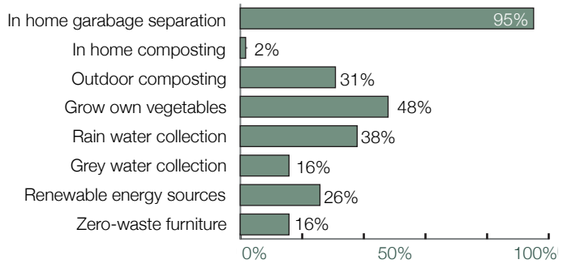
[redacted] Ik heb een minikliko bij de gemeente aangevraagd die ik (als ik in bad ben geweest met rozemarijn en munt) volgooi met water, waarmee ik mijn tuin, stekken, etc mee begiet. Badkamer op begane grond, dus rij de kliko zo naar buiten. Ik geloof dat ik de enige ben die zo knettergek is, maar het staat me tegen drinkwater te gebruiken voor bad en tuin.

[redacted] ons huurhuis kan ik niet verbouwen om de wc met regenwater door te spoelen. Maar dankzij tip uit tijdschrift genoeg vang ik nu douchewater op met een ouderwetse zinken ton (weckketel met deksel). In de badkamer alias bijkeuken heb ik ook een zinken teiltje in de wasbak geplaatst waarmee ik het water opvang van handen wassen na het toiletbezoek. Met het opgevangen water spoelen we nu de wc door. Scheelt 1/3 vh waterverbruik. Maar bv als particuliere

Figure 5. Facebook messages about measures already taken in the home to live zero-waste (Zero-waste Amsterdam Facebook, n.d.)

Willing to live zero-waste

A similar question has been asked in the surveys from Santa Monica and Montgomery. Although the question is inserted in a different way, the information is comparable. In the survey of the City of Santa Monica respondents were asked how much they were willing to live zero-waste by 2030. 88% of the respondents did strongly agree or agree to be formal committed to achieve zero-waste by 2030. Also the survey from the Montgomery Countryside Alliance asked the question at what interest respondents were willing to adapt a zero-waste goal. 92% of the respondents answered that they are very much interested in achieving this goal. In Amsterdam a greater group is neutral in living completely self-sufficient, as this is different of course than living zero-waste.

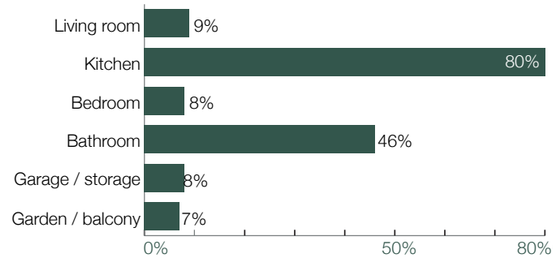


Graph 11. Measurements taken already regarding to zero-waste living. (source: questionnaire)

Figure 6. Reuse of gray water in toilet. (Zero-waste Amsterdam Facebook, n.d.)

Challenges per room regarding living zero-waste

The respondents were also asked in which rooms they are facing the most challenges regarding their zero-waste lifestyle. Most of the respondents are facing challenges in the kitchen and bathroom. A small group is also facing challenges in the living room, bedroom, garage / storage room and garden / balcony. This can be compared to the book Zero Waste Home from Bea Johnson in which she also argues that the journey of zero-waste starts in the kitchen and bathroom are rooms in which implementing living zero waste is most challenging.



Graph 12. Challenges per room regarding to zero-waste living (source: questionnaire)

Challenges regarding living zero-waste

In addition to the question in which room the respondents are facing the most challenges, an open question has been asked about what most of these challenges are about. The challenges most of the respondents are facing are:

- Expensiveness of investment in renewable energy sources / sustainable renovations;
- Living in a social rental complex in which changes regarding to renewable energy sources or sustainable renovations are not allowed;
- No zero-waste (ecological) furniture available on the market;
- No place in nearby environment where separated waste can be collected;
- No place to grow own vegetables;
- Difficult to ‘rent’ applicants or other stuff one doesn’t use daily;
- No zero-waste supermarket nearby;
- Not enough storage space in kitchen and bathroom for storage;
- Not enough awareness in nearby environment, it would be better if a whole neighbourhood would be stimulated to live zero-waste.

I am looking for more eco friendly food storage ideas, like silicon stasher bags instead of zip lock and glass instead of Tupperware. Any good local options?

And does anybody have an indoor composted they like? I saw this one but it doesn't get very good reviews.

Figure 8. Someone looking for help in finding a compost bin for in home. (Zero-waste Amsterdam Facebook, n.d.)

Dat plasticvrij kopen hé. Is dat wel te combineren met een fulltime baan en gezin met pubers? Markt is geen optie, dan werk ik. AH verkoopt wel katoenen broodzakken maar al het brood in de winkel is verpakt in plastic. Enige optie is om een medewerken van Appie het brood uit de plastic te zak te laten halen en opnieuw te verpakken in de katoenen zak... Vleesvervangers kun je niet zonder plastic kopen, ook bij de groenteboer zijn de meeste waren in plastic verpakt.

Na tien dagen is de score: plasticvrij wc-papier, siliconen rietjes (beetje dubbel want normaal gesproken koop ik geen rietjes dus echt een plasticbesparing is het niet) en een duurzaam sponsje. Oh ja, ook smakeloze tomaten en paprika's los gekocht; de smaakvolle zijn namelijk wel in plastic verpakt.

Dat zero/less waste leven is volgens mij alleen te combineren met een parttime (of geen) baan en het dan te beschouwen als een hobby waar je veel tijd aan besteedt. Als onderdeel van een 'normaal' leven is zero/less wel verhipt lastig zo niet onmogelijk. Zijn er hier anderen die het wel lukt om een fulltime baan, huishouden en (puber)gezin te combineren met plasticvrij kopen?

20 189 opmerkingen

Leuk Opmerking

Figure 7. Someone complaining about having difficulties living zero-waste (Zero-waste Amsterdam Facebook, n.d.)

Hey guys! How do I compost? Also in a tiny apartment on a budget?

6 30 opmerkinge

Leuk Opmerking

[redacted] Following!!

Leuk · Beantwoorden · 21u

[redacted] Have you tried worm bins? If done properly they don’t create smell, or attract bugs 3

Leuk · Beantwoorden · 21u

[redacted] I have red wiggles in a plastic tote composting all fruit and veggie scraps! 1

Leuk · Beantwoorden · 21u

[redacted] awesome!

Leuk · Beantwoorden · 20u

Nog 9 antwoorden weergeven

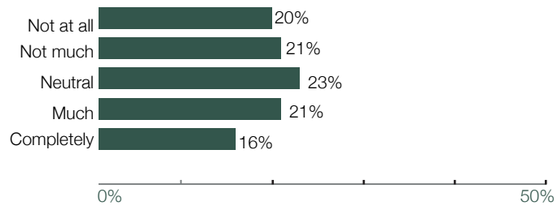
[redacted] Uncle Jim's worm farm. Stackable composting bins 1

Leuk · Beantwoorden · 21u

Figure 9. Someone looking for help in finding a compost bin for in home. (Zero-waste Amsterdam Facebook, n.d.)

TARGET GROUP NEEDS

Regarding to the demographic data, the target group can be defined. As mentioned above, 46% of the respondents are family households, which means that this will be one of the target groups. The other 47% exists out of 14% single person households and 33% two person households, which will be the other two target groups. As part of the research their needs regarding to live a zero-waste lifestyle will be investigated. Several aspects such as their needs regarding to their current home, sharing spaces, sharing facilities, furnishing, outdoor space and shared transport will be researched.



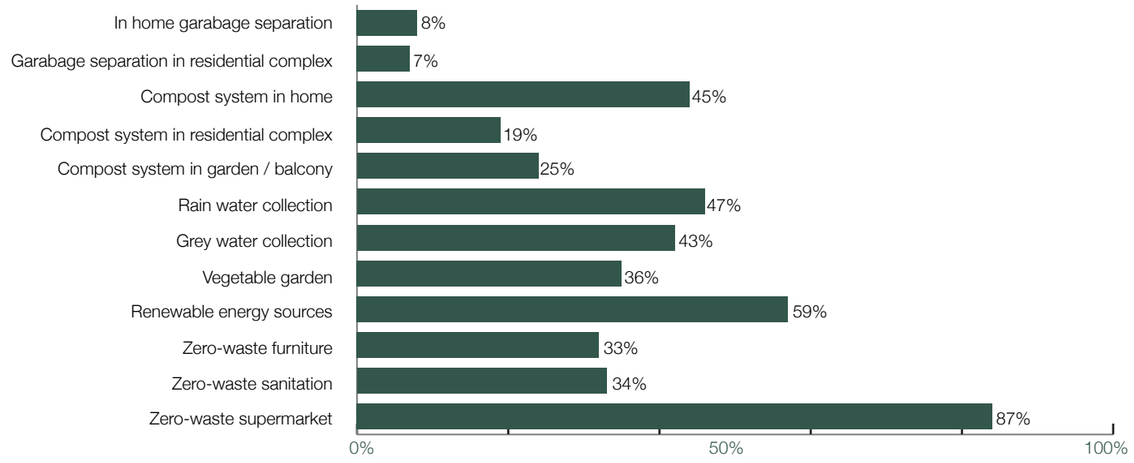
Graph 13. Willing to live smaller than current home (source: questionnaire)

NEEDS AND WISHES IN EXISTING HOME

In the past paragraph, the measures already taken by the respondents have been mentioned. In addition to this, the questionnaire has asked what people miss in their homes at this moment. In graph 14 is shown what the respondents miss in their homes. The reactions are being compared with graph 11 in which is shown what kind of measures the target group already has taken, because they won't miss those aspects in their homes right now, but might need it.

The garbage separation aspect, for example, is an aspect the target group doesn't miss in their homes because 95% of the respondents already have garbage separation in home. The zero-waste supermarket is something almost everyone misses in their nearby environment.

Figure 10. Zero-waste shop in Amsterdam (Zero-waste Amsterdam Facebook, n.d.)



Graph 14. Needs and wishes in current home regarding to zero-waste living. (source: questionnaire)

SHARED FACILLITIES

Shared rooms and facilities are needed in order to promote a zero-waste lifestyle. Not only does it encourage a sense of community, it also makes it possible for people to invest less in 'stuff' they don't use every day. Two advantages of sharing stuff are less waste and less investment in stuff which will leave more space to invest in generally more expensive sustainable lifestyle decisions. Shared rooms and facilities should this be incorporated into the building design. However, it is important to invest what rooms and facilities the target group wants to share with others.

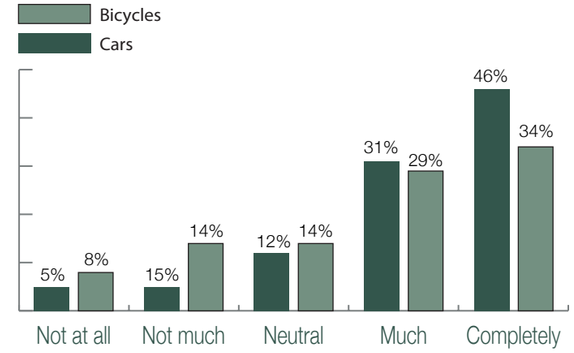
Willing to share rooms

The respondents were asked which rooms they were willing to share in order to minimalize their living space. In graph 16 is shown that most people are not willing to share 'intimate' spaces such as the kitchen, the living room and the bathroom. Looking at the other spaces, people are more willing to share the vegetable garden, storage and laundry room. Other things that were mentioned by people that they are willing to share are workshop spaces in which they can rent or use tools to fix things that are broken.

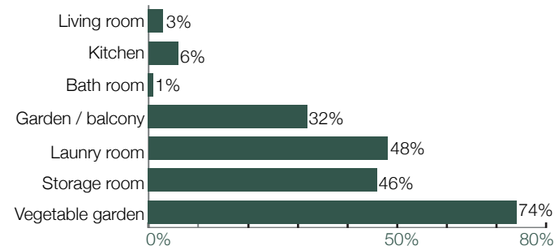
The answers are comparable to the precentages in graph 17. This graph, which is done by an other graduation student, shows the willingness for people to share rooms and facilities in general. The same as in the zero-waste lifestyle questionnaire, people aren't much willing to share intimate spaces such as the kitchen, dinnertable, living room, bathroom, sleepingroom and toilet. However, people are willing to share some spaces and facilities, just like in the reaction on the questionnaire.

Willing to share cars and bycicles

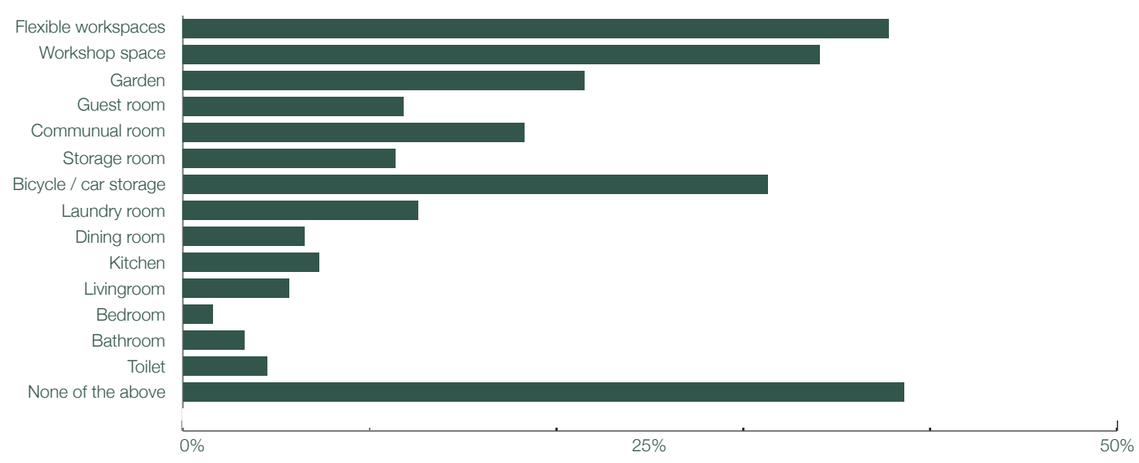
Regarding to shared cars and bycicles, graph 15 shows that moste people are interested in sharing cars and a smaller amount is interested in sharing bicycles.



Graph 15. Willing to share cars and bicycles (source: questionnaire)



Graph 16. Willing to share rooms(source: questionnaire)



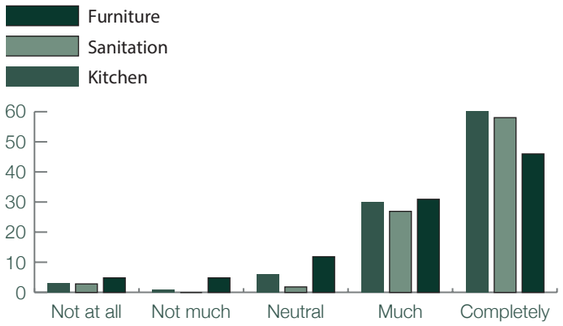
Graph 17. Willing to share rooms (source: questionnaire)

FURNISHING

Another aspect regarding to living zero-waste and reducing waste is home interiors. Much people argued in the Facebook group that finding zero-waste furnishing is very hard to find. However, there are several solutions which make it possible to let interiors last longer, such as built-in furniture, rental furniture and second-hand furniture. Incorporating furniture elements into a building design makes that the elements must be more durable as it is built-in. The respondents have been asked about their needs regarding to home furnishing.

Need for zero-waste built-in kitchen, sanitation and furnishing

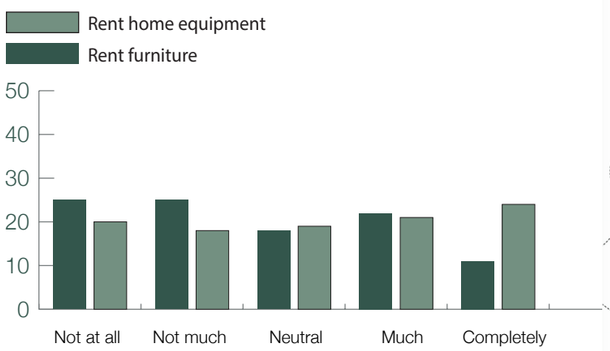
The graph below shows that almost everyone is interested in buit-in zero-waste interior.



Graph 18. Need for zero-waste built-in interior (source: questionnaire)

Willing to rent furniture and home equipment

Besides built-in interiors, the respondents have been asked if they are willing to rent furniture and home equipment. While almost everyone is willing to live in a house in which furniture is built-in, the opinions are devided concerning renting of furniture. The reason could be that people want to 'own' and 'belong' stuff for a better sense of home (Sennett?).



Graph 19. Need for zero-waste rental home furnishing (source: questionnaire)

An other aspect, which wasn't questioned in the questionaire, is the interest in second hand furniture. A lot of people as wel as in the facebook group as in the results of the questionaire have mentioned that they are very much interested in buying 'stuff' second hand.

Figure 11. Zero-waste (bamboo) furniture ideas (Zero-waste Amsterdam Facebook, n.d.)

Heb ooit een bamboevloer in de keuken gehad.
Hard hout en behandeld met botenlak als ik mij niet vergis, beviel erg goed.

Toevallig hebben mijn schoonouders sinds een paar jaar een woonkamervloer van bamboe en deze bevalt hen ook erg goed.
Deze staat in de olie.

Figure 12. Zero-waste bamboo floor ideas (Zero-waste Amsterdam Facebook, n.d.)

Figure 13. Furniture library Maastricht (Zero-waste Amsterdam Facebook, n.d.)

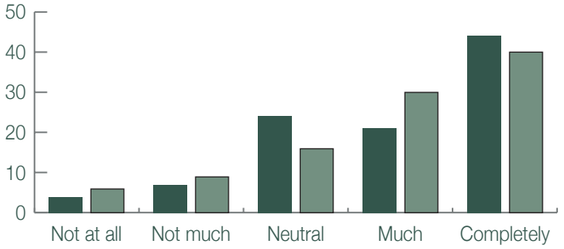
OUTDOOR SPACE

Communal private or communal (vegetable) garden

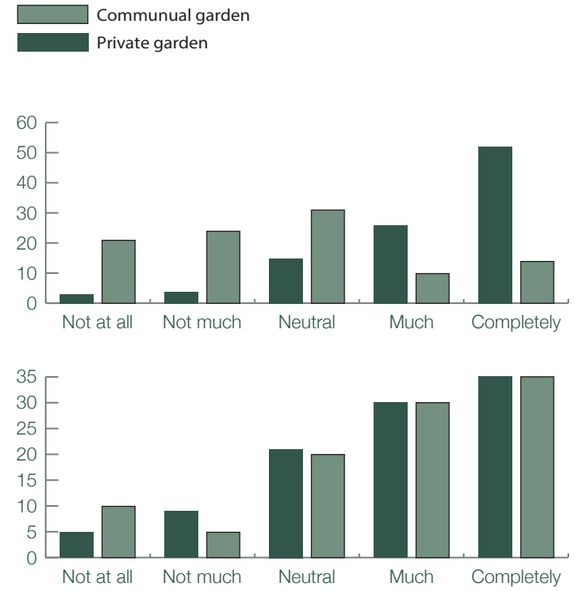
In graph 21 is shown in what numbers the respondents need a private or communucal garden and a private or communual vegetable garden.

Need for waste separation in home and in residential complex

As expected, as 96% of the respondents already separates their waste in home, a large percentage had the need for waste separation in home or in the residential complex.



Graph 20. Need for waste separation (source: questionnaire)



Graph 21. Need for private vs communual (vegetable) garden (source: questionnaire)

Figure 14. In-home waste separation (Zero-waste Amsterdam Facebook, n.d.)

Figure 15. In-home composting (Zero-waste Amsterdam Facebook, n.d.)

CONCLUSION TARGET GROUP AND NEEDS

NEEDS IN GENERAL
Single person household
Inkomen
m2
willing to live smaller

Two person household
Inkomen
m2
willing to live smaller

Family household
Inkomen
m2
willing to live smaller

SINGLE PERSON HOUSEHOLD

TWO PERSON HOUSEHOLD

FAMILY HOUSEHOLD

Living space	growing vegetables
	in-home composting and waste separation
	built-in furniture
	refilable tools in kitchen and bathroom
Outdoor space	private garden / balcony so vegetable can be grown in-home
	communual vegetable garden
Facilities in residential complex	shared cars / bycicles
	shared ‘stuff’, such as gardening applicants, tools, furniture that isn’t used everyday, kitchen applicances, childrens play tools, etc.
	rainwater collection, grey water collection
	garbage collection / separation, composting
Facilities in neighbourhood	zero-waste supermarket
	second hand shop / furniture library
	waste centre

03 ZERO-WASTE DESIGN

ZERO-WASTE IN BUILDING DESIGN

"Zero-waste concepts in design consider the entire life cycle of buildings and express the need for closed-loop systems and construction processes. Better material flow management treads to better material efficiency in the use of raw materials and construction systems... Truly sustainable design can only be achieved if energy efficiency is combined with material efficiency." *- Steffen Lehmann (Lehmann, 2012)*

deVolkskrant

Al het afval moet in 2050 worden hergebruikt

DUTCH CIRCULAR ECONOMY AGENDA 2016

"Globally, the built environment is responsible for an estimated 60% of material use. In the Netherlands, buildings are responsible for 40% of everyday energy use and 25% of CO2 emissions" (Arup, 2016). Construction and demolition activities in the Netherlands additionally account for 24 million tonnes of waste production, which is almost equivalent to industrial and consumer waste combined. And although 94% of this waste is currently recycled, this mostly occurs in downgraded form, which, in the end, will still end up landfilled, burned or buried (Amsterdam, n.d.). As explained in the first paragraph of this chapter, zero-waste is about changing from a linear economy to a circular economy. While in terms of lifestyle the term 'zero-waste' is used more often, in building design the term 'circularity' is known better.

In 2016, the Dutch government initiated the Circular Economy programme, aimed at developing a fully circular economy in the Netherlands by 2050. As part of this programme, five sector specific transition agenda's have been published, including the building sector. The agenda for the transition to a circular built environment in The Netherlands, called the Transition Agenda, uses a broad definition that includes buildings and infrastructure. The definition used for the purpose of this project is a modified version of this definition, with a specific focus on circular buildings (Metabolic, 2018). A circular building can be defined as:

"A building that is developed, used and reused without unnecessary resource depletion, environmental pollution and ecosystem degradation. It is constructed in an economically responsible way and contributes to the wellbeing of people and the biosphere. Here and there, now and later. Technical elements are demountable and reusable, and biological elements can also be brought back into the biological cycle." (Metabolic, 2018)

Figure 16. Waste in the built environment (Arup and Ellen MacArthur Foundation, 2018)

CIRCULAR ECONOMY

The circular economy model has its roots in concepts dating back to the 1970s. Different theories and concepts have evolved around that time, such as the Club of Rome's 'Limits to Growth' theory, Braungart and McDonough's 'cradle to cradle' concept, Stahel's 'performance economy', and Lyle's 'regenerative design' model (Arup, 2016). However, thanks to the Ellen MacArthur Foundation which is a charity dedicated to promoting the global transition to the circular economy, circularity in our economy has gained more practical framework to be used. Drawing on these earlier works, the Foundation developed the system or 'butterfly' diagram (figure 6) based on the notion that material flows can be divided into two interacting loops: the technical and biological resource cycles (Ellen MacArthur Foundation, 2019).

"Within the biological cycle, renewable and plant-based resources are used, regenerated and safely returned to the biosphere — as in composting or anaerobic digestion. The bio-economy is a growing sector with the potential to lower raw materials consumption, reduce waste and generate higher-value products for sustainable biological re-use. Within the technical cycle, man-made products are designed so that at the end of their service life – when they can no longer be repaired and reused for their original purpose their components are extracted and reused, or remanufactured into new products. This avoids sending waste to landfill and creates a closed-loop cycle" (Ellen MacArthur Foundation, 2019).

As an output of the Ellen MacArthur Foundation's research, a framework has been developed which outlines six actions to guide the transition towards

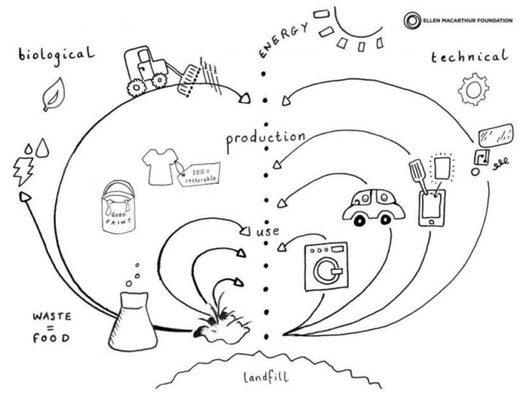


Figure 17. 'Butterfly diagram" (Ellen MacArthur Foundation, 2019)

a circular economy. The ReSOLVE theory (Ellen MacArthur Foundation, 2019) has been widely adapted as one of the key elements to work towards a circular economy. The elements can be applied to products, buildings, neighbourhoods, cities, regions, or even to entire economies. However, in September 2016 Arup published the report 'The Circular Economy in the Built Environment' in which the six ReSOLVE elements have been implemented on the Built Environment in specific. Another theory which has been widely adapted, are the seven pillars of a circular economy (Gladek, 2017). Metabolic has introduced seven pillars which can also be applied on products, buildings, neighbourhoods, cities and entire economies. However, also those pillars have been implemented in a framework by Metabolic, SGS Search and the municipality of Amsterdam specific for circularity in the built environment. Both theories will be explained in the next paragraph and be compared to the 5 R's of Zero-Waste in order to create a zero-waste design framework.

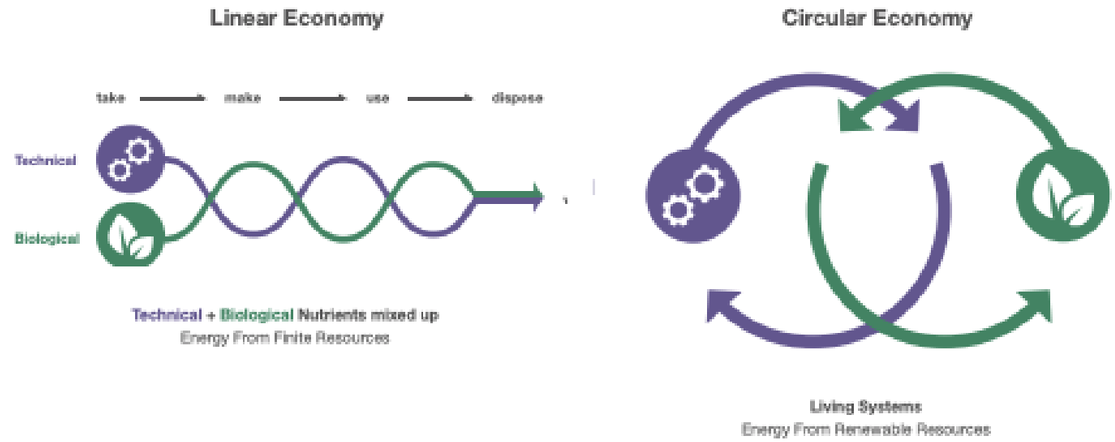


Figure 18. From a linear to a curcular economy (Ellen MacArthur Foundation, 2019)

ReSOLVE PRINCIPLES

The principles are a key output of the Ellen MacArthur Foundation's research. It outlines six actions to guide the transition towards a circular economy.

Regenerate

In the built environment, regeneration allows for circular and efficient building performance by reducing consumption of primary resources and waste. Shifting to renewable energy resources and materials are very important in order to return recovered biological resources to the biosphere. (Arup, 2016).

Share

In the built environment, owners can share under-used spaces, facilities and equipment. By occupying less space fewer resources are needed to deliver the same function or service, and thus less waste is produced. This includes housing more people within a smaller footprint and making greater use of offices and workplaces throughout the 24-hour cycle, and sharing facilities and vehicles. The product loop should be kept low speed and utilisation of products should be maximized, by sharing them among different users (peer-to-peer sharing of privately owned products e.g. cars, rooms, appliances or public sharing of a pool of products), by reusing them through their entire technical lifetime (second hand), and by prolonging their lifetime through maintenance, repair, and design for durability and upgradability. (Arup, 2016).

Optimise

In the built environment the key is maintaining materials and components at their highest value while changing design and construction processes to maximise efficiency. The elimination of waste and the promotion of reuse and repurposing are very important aspects in this matter. Flexible design methodologies help to optimise the performance of assets, whilst off-site construction and modular components reduce waste produced on-site. To eliminate primary material use, components and materials may also be reused to construct new buildings or repurposed for other use.
Increasing the performance and efficiency of a product are thus very important. Waste in production and supply chain from sourcing and logistics, to production, use phase, end-of-use collection etc should always be taken into consideration in a design. (Arup, 2016).

Loop

For finite materials, it means remanufacturing products or components and recycling materials. Looping of materials and components creates new uses for materials through remanufacturing and recycling. By focusing on disassembly during the design phase the chance of effective second use and reuse pathways for components and materials increases. It also enables greater integration of recycled materials and components from other industries. Monitoring and tracking the performance of assets is also critical to enable looping opportunities further down the line. Keep components and materials in closed loops and prioritise inner loops are very important in the design. (Arup, 2016).

Virtualise

Dematerialise resource use by delivering utility virtually: directly, e.g. books or music; or indirectly, e.g. online shopping, autonomous vehicles, virtual offices. An ever-expanding number of apps and services have taken advantage of digital technologies to replace physical marketplaces. They match supply to demand virtually, making it easier to share and exchange goods and services, thereby saving time and money for users. Digital services can also facilitate real-time maintenance tasks that formerly required physical interventions, and their associated costs (Arup, 2016).

Exchange

Old materials and technologies should be replaced with advanced renewable materials and new technologies (e.g. 3D printing or electric engines). Sustainable energy and materials and advanced technologies that enable optimised, flexible, and user-focused design are slowly replacing static products and services and top-down design and operation approaches. Selecting these resources and mechanisms enables efficiency gains and minimises waste and other negative externalities. New business models such as leasing, performance-based models, and flexible use design also increase efficiencies (Arup, 2016).

SEVEN PILLARS FRAMEWORK

Metabolic has developed a framework for circular building projects for the municipality of Amsterdam. Amsterdam is much aware of the fact that the future of the built environment has to be circular. Especially in the harbour area of Amsterdam circularity is an important matter, as their goal is to become the foremost circular economy hotspot in Europe (Port of Amsterdam, n.d.). The framework developed by Metabolic exists out of seven pillars (characteristics) and four basic principles (Gladek, 2017). In figure 19 the seven characteristics are shown. However, as this research focusses on principles to design zero-waste, the characteristics won't be explained.

Figure 19. Seven pillars of the circular economy (Metabolic, 2018)

FOUR PRINCIPLES BY METABOLIC

REDUCE

The easiest way to mitigate impact is to avoid producing it in the first place, rather than trying to figure out how to supply an enormous energy demand in a sustainable way. Reduce the impact of extracting raw materials and subsequent production is to reduce the initial demand for such materials. For example, it is important to devise a system based on low demand for energy and materials, as recent studies have shown that up to 75% of energy used in the built environment could be eliminated through smarter design. It is important to note that we never aim to "reduce" resource demand beyond a level where it may begin impacting comfort. (Metabolic, 2018)

SYNERGIZE

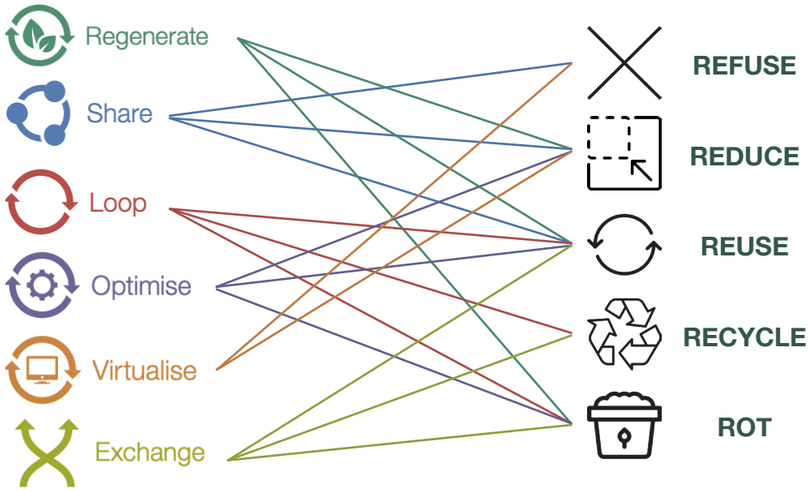
Once resource demands and their related impacts have been maximally reduced, the next step is to identify local synergies that can satisfy these demands. It is particularly important to take locally available resources (such as rainwater or heat from local water sources) and raw materials which one knows will be released during the demolition of nearby building into account in this design phase. For example: if waste heat is being produced in a building, it should ideally be cascaded and re-used. Design options that satisfy multiple resource demands (such as a greenhouse that can be used to generate heat, electricity, collect water, provide recreational space, and be used to produce food) are preferable to single-solution choices. Local waste flows (energy, materials) should ideally be used. Contextually available resources (such as rainwater or heat from local bodies of water) should be tapped into to a maximum extent. (Metabolic, 2018)

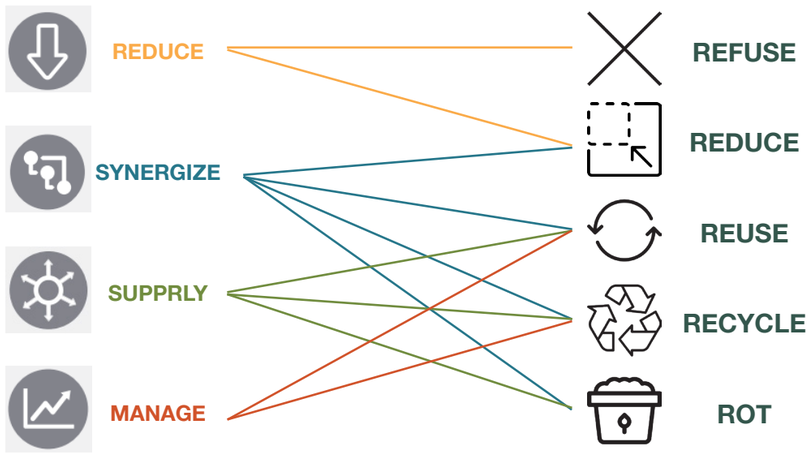
SUPPLY

Once synergistic supply options have been reasonably exhausted, the remaining functional demand can be supplied by using clean, renewable or otherwise ecologically beneficial sources. Locally produced resources are preferred, because their impact will generally be smaller and their efficiency higher because they do not have to be transported over long distances and major investments in infrastructure are not required. However, the impact and efficiency should be decisive in choosing for local sourcing. (Metabolic, 2018)

MANAGE

Creating information and data transparency about how and when resources are being used is essential to operating an efficient and well-functioning system. It is important to maintain feedback about how a system is working once it is operational; even basic informational feedback has been shown to reduce resource demands (e.g., for energy and water) in households by up to 15%. This kind of feedback allows for behavioural and technological adjustment over time. For each impact area that is traditionally associated with the built environment and urban living, we have followed this hierarchy as a guiding principle in eliminating or reducing impact. (Metabolic, 2018)





CONCLUSION

In the past paragraphs the two main adapted principles have been researched. Both have overlapping ideas with the 5 R's of zero-waste; refuse, reduce, reuse, recycle and rot. The ideas behind the principles will be taken into account while developing the zero-waste design framework.

Although the 5 R's of zero-waste are very clear and more or less the same as the other circular principles, they have to be applied on different building scales, or layers, in order to create a circular building. Refuse, reduce, reuse, recycle and rot thus have to be made more practical to use. The municipality of Amsterdam has created a framework by picking out five of the seven pillars created by Metabolic. These 'theme's' do indeed apply to the built environment, but not yet on the different building elements itself. A building is not a unary thing with a single lifecycle, but a composition of several layers. The concept of building in 'layers' was in the 1970's first proposed by architect Frank Duffy. Later it was further developed by Stuart Brand in the 1990s. Buildings, they said, are made of separate and interlinking layers, each with a different lifespan. Brand's widely-known model includes six layers: Site, Structure, Skin, Services, Space, and Stuff and their lifespan added to it. In the next paragraph this theory of Brand will be explained and researchd.

SHEARING LEAYERS (STEWARD BRAND)

"All buildings are predictions, and all predictions are wrong" (Brand, 1994) is the slogan of Steward Brand that gave insight into the problem of buildings. In Brand's point of view buildings were not designed for change as components with a longer technical or social lifespan are being integrated with components with a much shorter lifespan as they write; *"Our basic argument is that there isn't any such thing as a building. A building properly conceived is several layers of longevity of built components"* (Brand, 1994). Building in 'layers' makes it thus possible that each element may easily be separated and removed. This makes reuse, remanufacture and recycling better feasible. Adding to this, building in separate layers, allows each element to be repaired, replaced, moved or adapted at different times without affecting the entire building (Brand, 1994).

- Site is the fixed location of the building (Brand, 1994).

- Structure is the building's skeleton including the foundation and load-bearing elements (Brand, 1994).

- Skin is the façade and exterior (Brand, 1994).

- Services are the pipes, wires, energy and heating systems and moving parts like elevators and escalators (Brand, 1994).

- Space is the solid internal fit-out including walls and floors (Brand, 1994).

- Stuff are chairs, desks, kitchen appliances, lamps, all the things that twitch around daily to monthly (Brand, 1994).

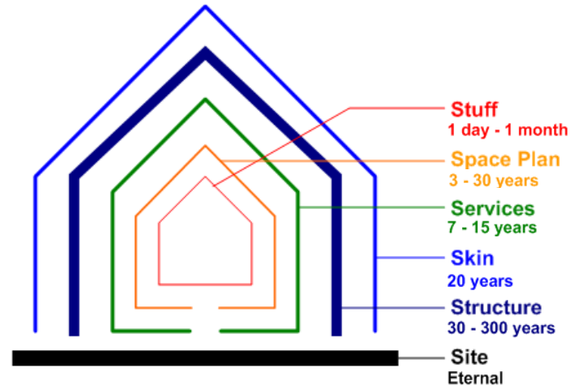


Figure 20. Shearing layers by Steward Brand (Brand, 1994)

ZERO-WASTE MATRIX

Adding the shearing layers to the zero-waste design matrix is a logical step which makes it possible to create a practical framework applicable to all the layers of a building. It takes the different layers of time in consideration as well as the different possibilities of refusing, reducing, reusing, recycling and rotting principles.

The zero-waste framework, which is based on the five R's of zero-waste and the shearing layers of Stuward Brand is shown below. On the next pages the matrix is filled in with methods and examples on how the matrix can be used an what examples do relate to the taken measures in order to design a zero-waste building.

	REFUSE	REDUCE	REUSE	RECYLE	ROT
STUFF					
SPACE PLAN					
SERVICES					
SKIN					
STRUCTURE					
SITE					

Figure 10. Zero-waste design matrix (own illustration)

ZERO-WASTE DESIGN MATRIX	REFUSE	REDUCE	REUSE	RECYLE	ROT
STUFF	100% built-in furniture	shared ‘stuff’ in residential building rental ‘stuff’ built-in kitchen, sanitary, storage	second hand ‘stuff’	durable products made from durable resources that can be recycled or upcycled (NEVER downcycled)	resourches that can be taken back by natrure.
SPACE PLAN	‘ruwbouw = afbouw principle’	micro-housing / tiny housing below average square meters smart grid system for less ‘rest’ materials	double use space (‘smart design’) shared facilities in building (non daily-used spaces)	recyclable materials	resourches that can be taken back by natrure.
SERVICES	low-tech design passive house design	low-tech design passive house design shared electric devices short installation distances	rest heat grey and rain water collection solar energy wind energy	ownership services (lights, kitchen appliances, installations) durable services	resourches that can be taken back by natrure.
SKIN	-	green facade modular facade	design for reuasability durable materials modular facade	facade leasing durable design demountable facade	resourches that can be taken back by natrure.
STRUCTURE	-	collumn structure less materials smart grid system for less ‘rest’ materials	structure materials from around site adaptability for future functions design for reusability	structure materials from around site design for recyclability	resourches that can be taken back by natrure.
SITE	renovate existing stock instead of building new	high-rise (less floor area used)	resources taken from the area in order to built new replant trees etc.	-	-

04 URBAN MASTERPLAN

04 URBAN MASTERPLAN

INTRODUCTION

The pressure on the Amsterdam housing market is increasing. If one would look at the map of Amsterdam, you will see that the transformation of ‘Haven-Stad’ is a logical first step to take in the development of Amsterdam as Haven-Stad is one of the last major areas within the Ring A10 where a highly urban work- and living area can be developed. The pressure on the urban development is high and the demand for it homes large. Haven-Stad is, by its location within the ring and its size, a promising one development location. That is why the municipality of Amsterdam has high ambitions for Haven-Stad; to provide a highly accessible and a high-density living and working environment in a sustainable, attractive and healthy living environment.

As mentioned before, the pressure on the Amsterdam housing market is increasing as the city is growing with 12.000 persons per year. That is why in the recent period new urban plans for Haven-Stad have to be investigated whether higher densities for living and working can be achieved. The sheer size of the project, 75.000 dwellings in a mixed work-live environment, invites to be bold and idealistic. It offers a sense of freedom: very close to the city centre, but not burdened with the Unesco World Heritage designation The municipality of Amsterdam has set a goal of an average building density of floorspace index (FSI) 2 and an average dwelling size of 80 m2 gross floor area and an average of 30 m2 gross floor area per workplace, which can be used for investigating new urban plans. An important precondition for this compaction is that from the outset we make sufficient space available for social facilities such as schools, sports and recreational facilities.

The context of this research will be Minervahave, situated in Haven-Stad. The Minervahaven is a harbor basin in the port of Amsterdam. It was dug around 1880 on the southern bank of the recently dug North Sea Canal. The Minervahaven is one of the few ports in Amsterdam-West within the A10 ring road. The port was used for a long time for timber transfer and there was a timber processing industry.

“Haven-Stad will be the sustainable city of tomorrow. The scale of Haven-Stad helps to design all possibilities and innovations in the field of ***sustainable energy, circular construction, waste separation and recycling into practice.***”

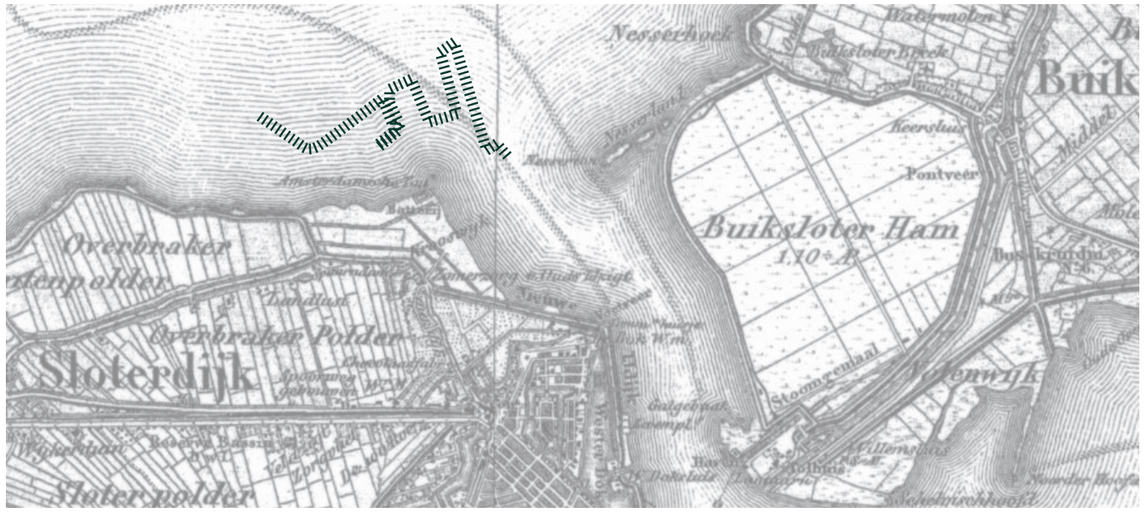
- Gemeente Amsterdam

(Gemeente Amsterdam, 2017, p. 11)

HISTORY MINERVAHAVEN

The context of this research will be Minervahave, situated in Haven-Stad. The Minervahaven is a harbor basin in the port of Amsterdam. It was dug around 1880 on the southern bank of the recently dug North Sea Canal. The Minervahaven is one of the few ports in Amsterdam-West within the A10 ring road. The port was used for a long time for timber transfer and there was a timber processing industry.

Figure 10. Minervahaven around 1975 (beeldbank Amsterdam)



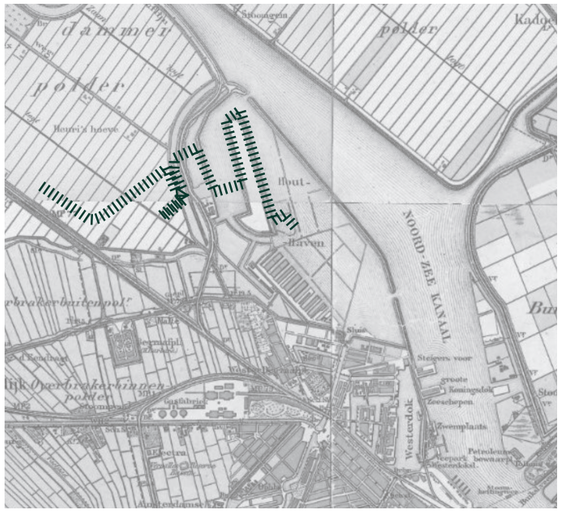
1878 START EASTERN PORT EXPANSION

- The city of Amsterdam couln't deal with the growing port idenity. Due to lack of storage harber activities threatened to leave the city and establisch elsewhere
- Started on the southern side of the North Sea Canal 1865 - 1876.
  Would lead towards a shorter international connection in the west of the city.

Figure 11. Nieuwe Houthaven around 1930 (beeldbank Amsterdam)

1880 AANLEG MINERVAHAVEN

- Eastern port area was not sufficient enough for the increasing volume of transhipment activities

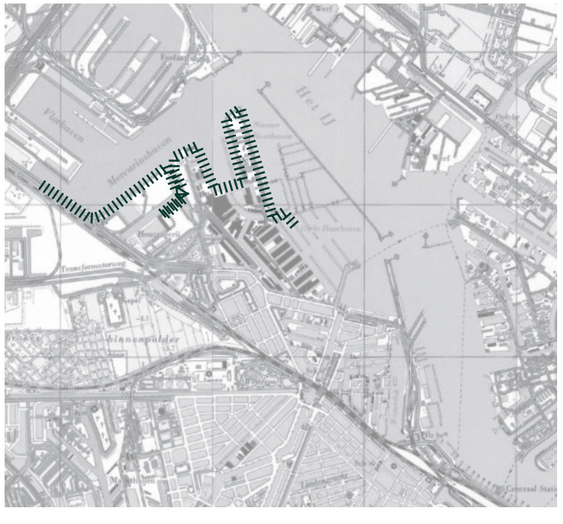


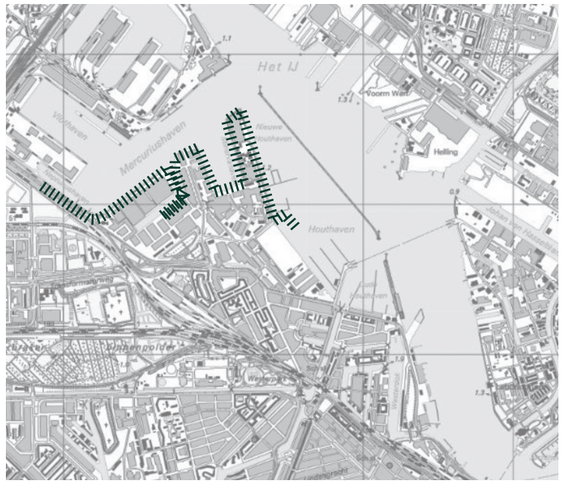
1913 AANLEG OP EN OVERSLAG HAVENS

- 1913 chosen for the option for port Construction and transshipment because other options were not practical (longer sailing distance) and expensive
- Shape was determined by the Danzigerkade which was extracted from the Oude Houthavens as a port of entry towards het IJ

1975 EXPANSION MOERMANKADE

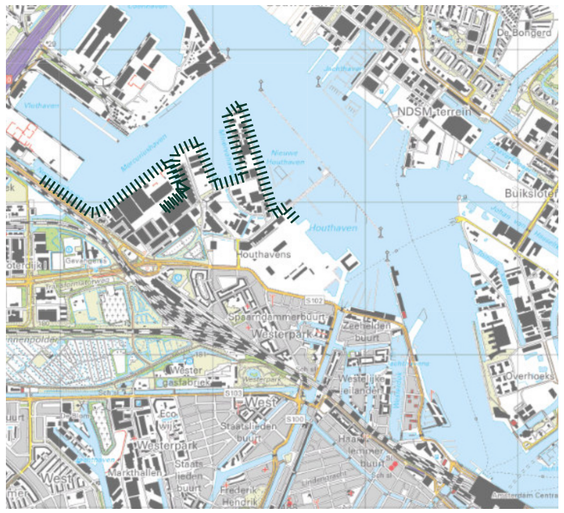
- Addition on the west quay for the Moermankade
- Opened up more towards het IJ with the several quays of the Nieuwe Houthavens
- Minervahaven is being build up with non - harbour related buildings like offices





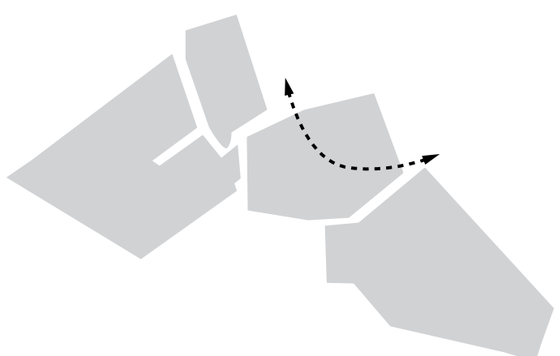
2000 CONNECTION HOUTHAVENS

- o The old Houthaven and the Nieuwe outhaven are connected by demoloshing the border in between
- o The area along the Mercuriushaven has been build up with industrial buildings
- o The Danzigerkade has been build up along with the Moermanskade with big buildingplots



PRESENT

- o Many big Industrial buildings have been demolished
- o New office buildings have been placed on the site
- o Introduction of new hightech creative buildings along the Danzigerkade

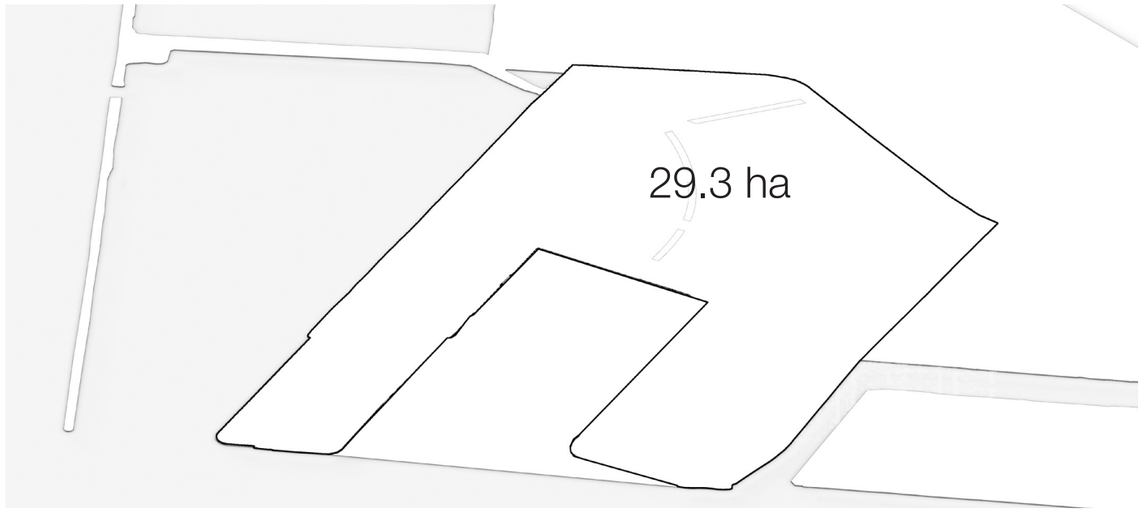


CONCLUSION

- o Keeping the legibility/ stratification of the harbourdevelopment
- o Water as main character
- o Defined shape of the Danzigerkade

MINERVAHAVEN REDEVELOPMENT GOALS

Total Area	29,3 Ha
Recreation	2,9 Ha
Dwellings	min. 5.810
FSI	min. 2.0
GSI	-



Legend

- Theatre/Hotel
- Retail
- Leisure
- Office
- Industrial Use
- Food and Beverage
- Education

IMPRESSIONS MINERVAHAVEN

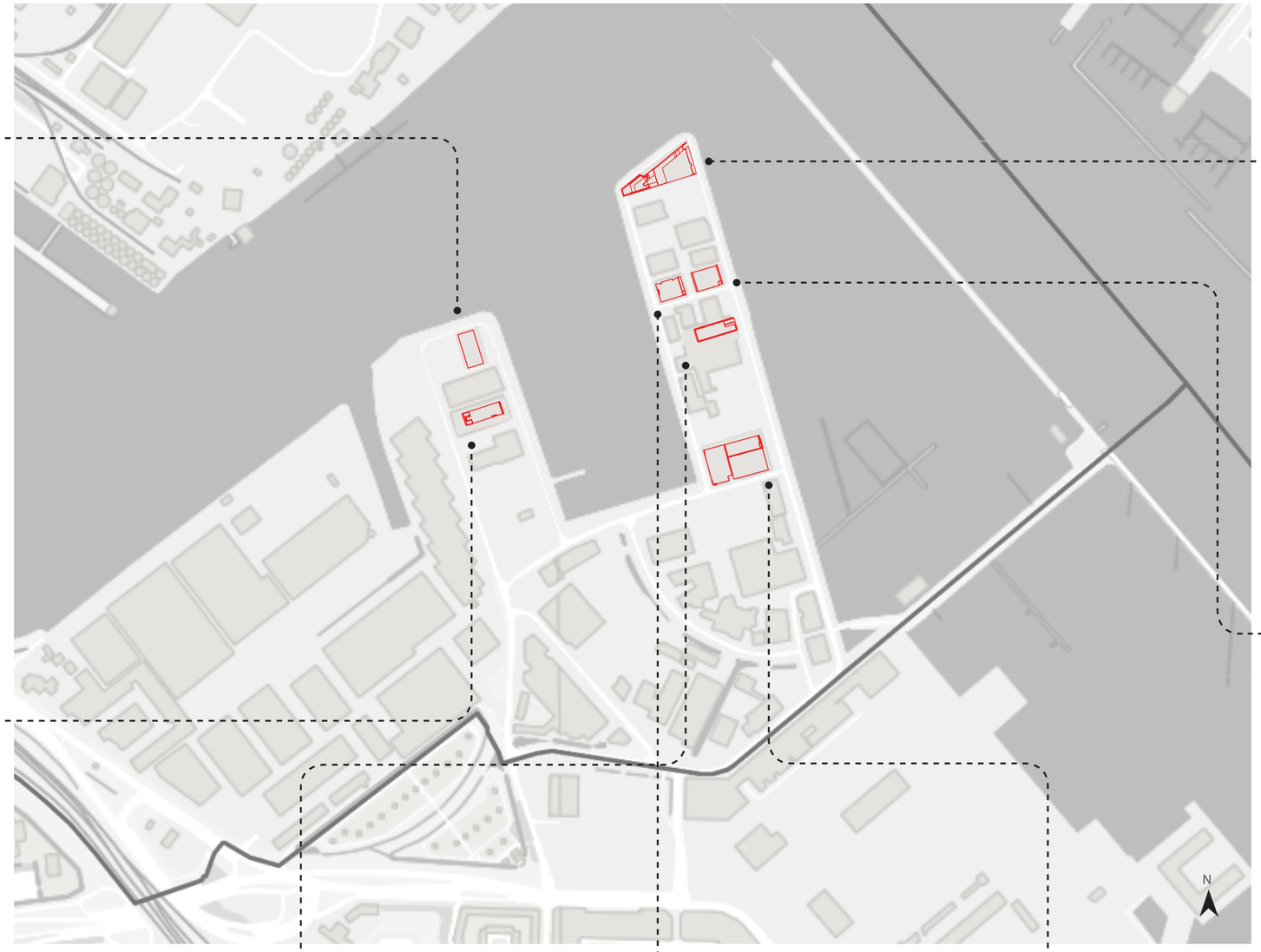
IMPRESSIONS MINERVAHAVEN

MOERMANSKADE 313

Current function | Office
State of building| Under construction, therefore brand new

MOERMANSKADE 85

Current function | Office
State of building| Good



DANZIGERKADE 181

Current function | Office
State of building| Excellent

DANZIGERKADE 55

Current function | Office
State of building| Excellent

MASTERPLAN MANHATTAN AAN ‘T IJ

Accents on the block ends up to 150+m

Accents on the block ends up to 100m

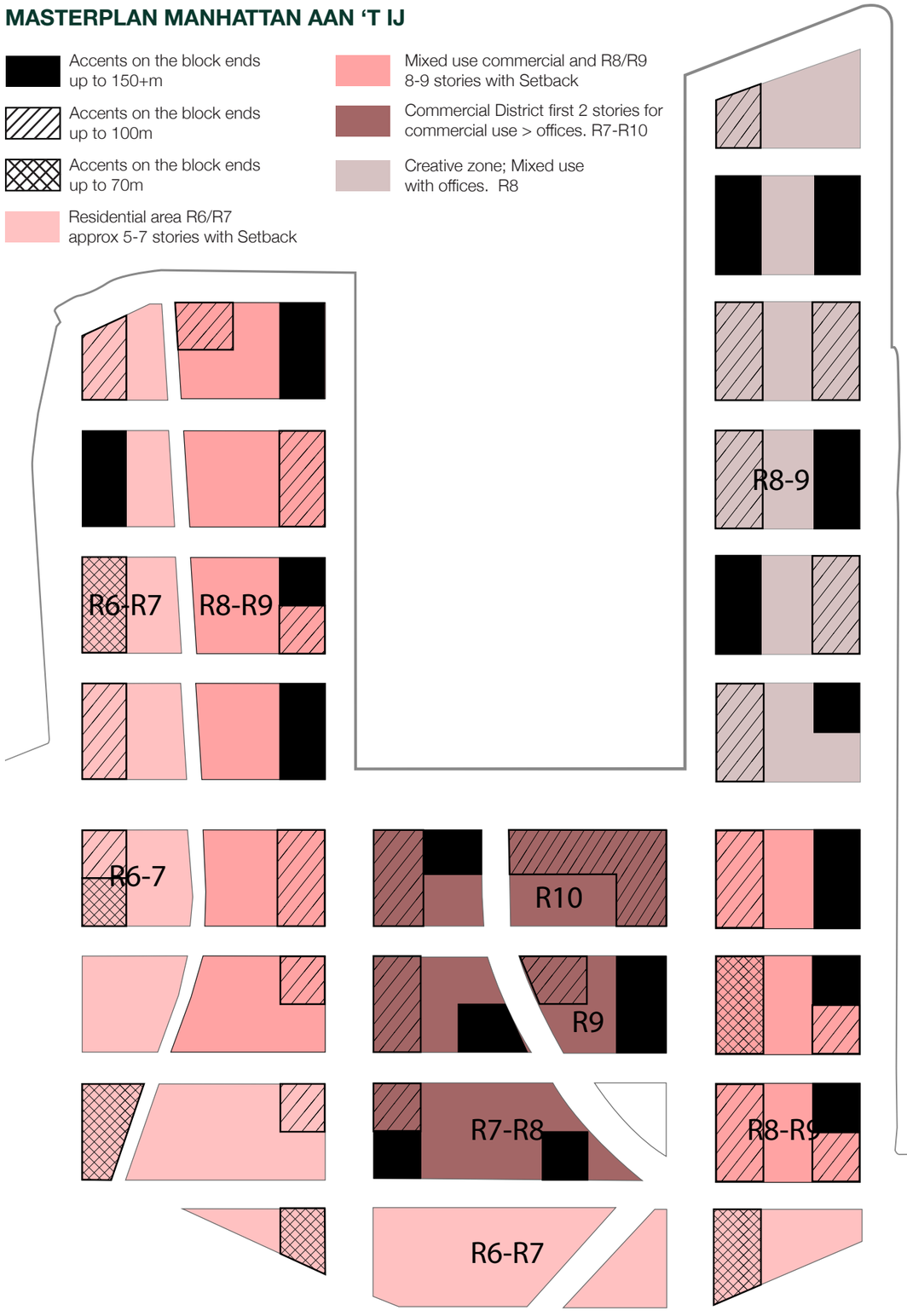
Accents on the block ends up to 70m

Residential area R6/R7 approx 5-7 stories with Setback

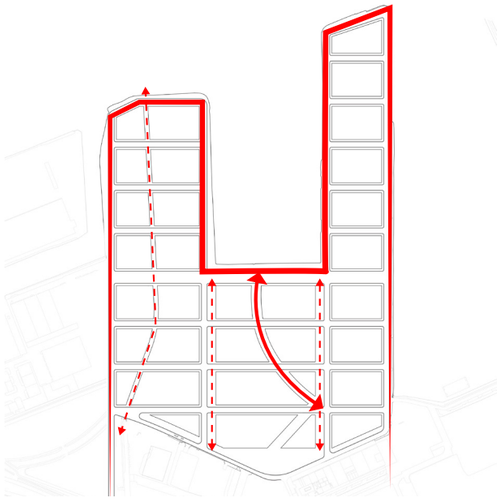
Mixed use commercial and R8/R9 8-9 stories with Setback

Commercial District first 2 stories for commercial use > offices. R7-R10

Creative zone; Mixed use with offices. R8

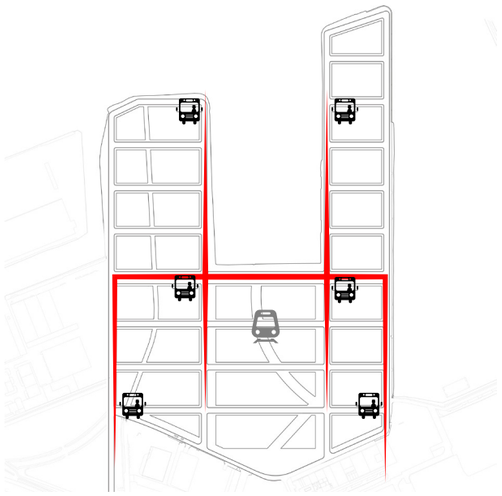


04 URBAN MASTERPLAN



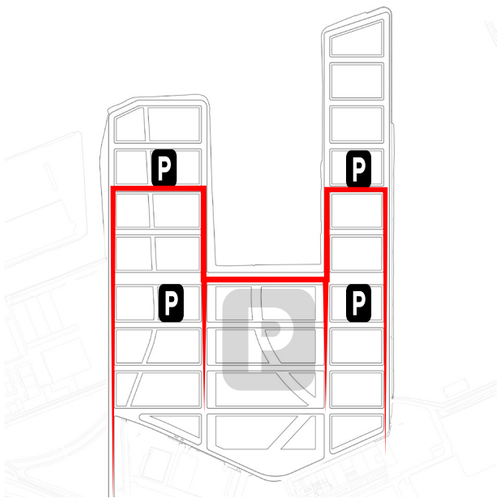
Pedestrian circulation

- Borders designed as boulevards
- Narrow street profiles within the gridlines
- Danzigerbocht highlighted as the Broadway of Manhattan aan het IJ



Public Transport

- Good connection within the grid by several busstops
- Avenues as the circulation nerves
- Possible future subway station in center of area



Cars

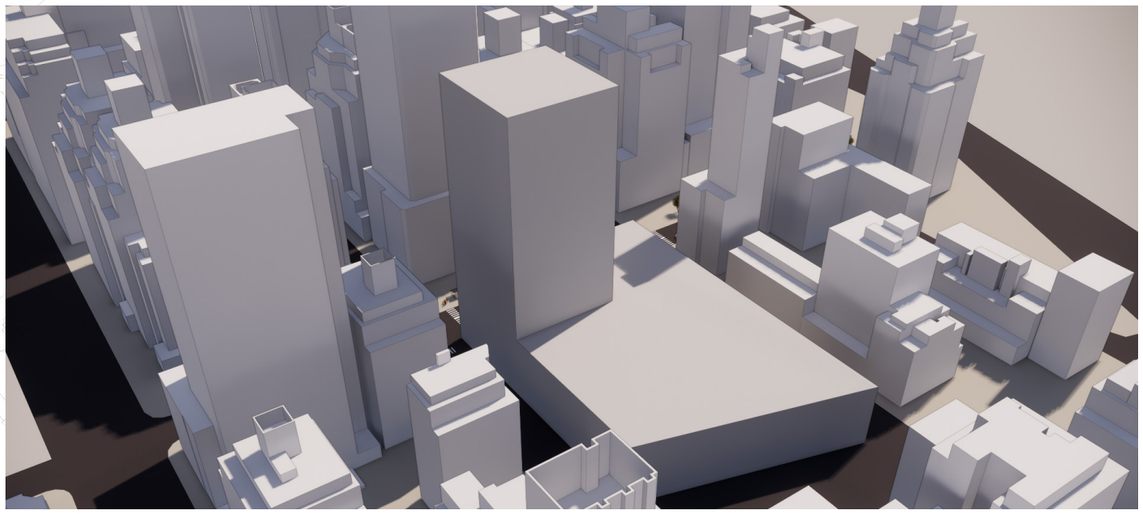
- Integrated parking garages within the grid
- Commercial district combined with an underground parking area
- Circulation border towards the parking areas to preserve the harbour borders as the leisure area

04 URBAN MASTERPLAN

CHOOSEN BUILDING WITHIN MASTERPLAN

CHARACTERISTICS BUILDING

Mixed use commercial and R8/R9
8-9 stories with Setback



05 PLAN ANALYSIS

Treet, Bergen, Norway
by ARTEC

62 appartments
14 storys high
1 story basment

Net floor area: 540 m2 (one floor)
Net floor area: 5830 m2

50 appartments type A
12 appartments type B

05 PLAN ANALYSIS

TREET Bergen, Norway
LIFESTYLE DWELLINGS

23% private balcony

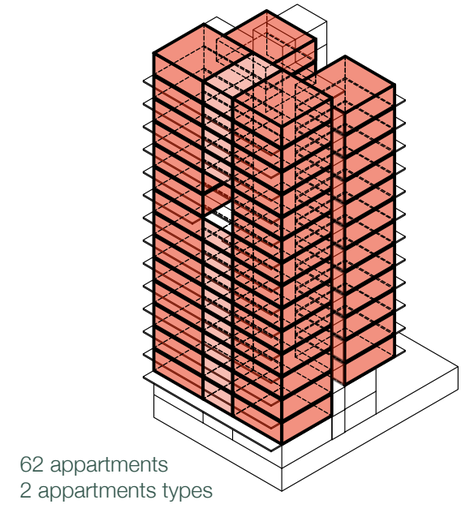
kitchen connected to balcony

built- in furniture closets

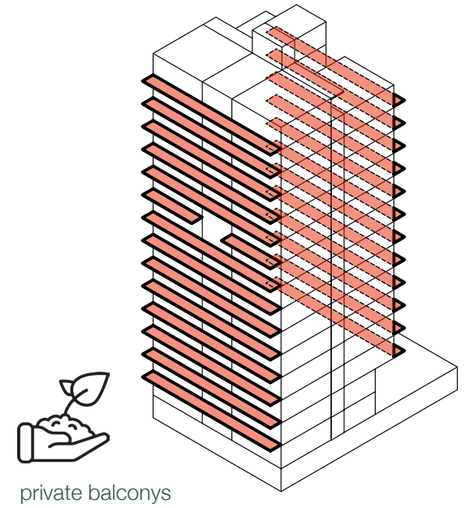
built-in storage rooms
(for waste collection)

built-in electric devices with
maintenance contract

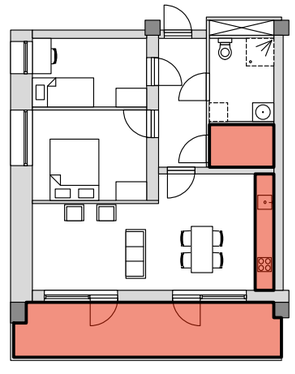
Several aspects can be found in the design regarding to the zero-waste lifestyle aspect:
- private balcony
- storage room (for waste collection)
- waste stream: balcony - kitchen - storage (type A)
- built in kitchen, bathroom, closets, floor
- lease contract built-in electronic devices



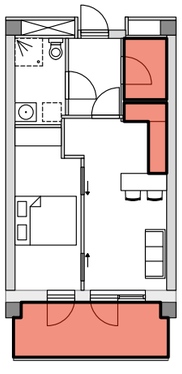
62 appartments
2 appartments types



private balconys



floorplan scale 1:200
TYPE A - 65 m2



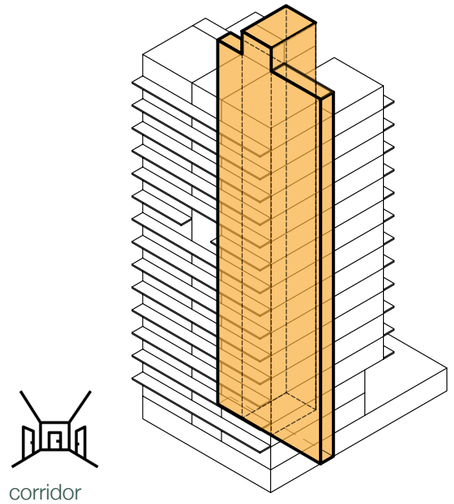
floorplan scale 1:200
TYPE B - 40 m2

VERTICAL TRANSPORT

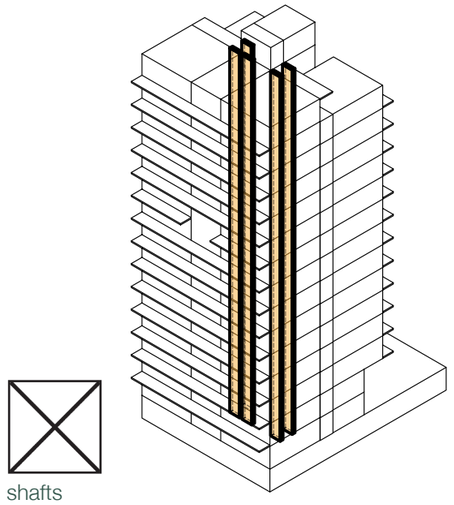
10%

1,3%

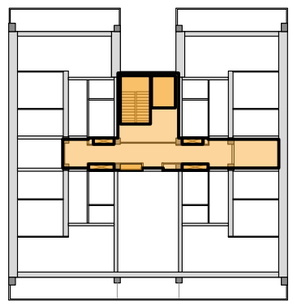
5,6%



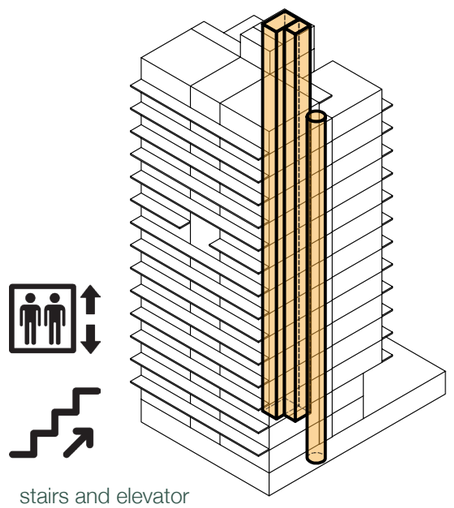
corridor



shafts



floorplan scale 1:500



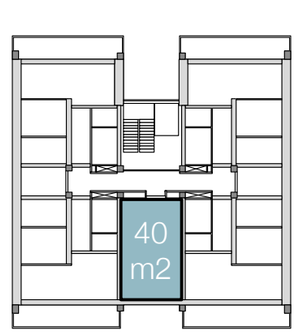
stairs and elevator

SHARED FACILITIES AND OUTDOOR SPACE

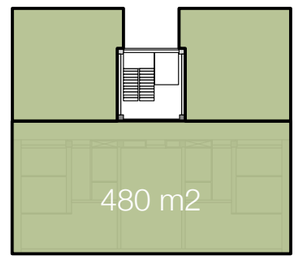
14,6%

0%

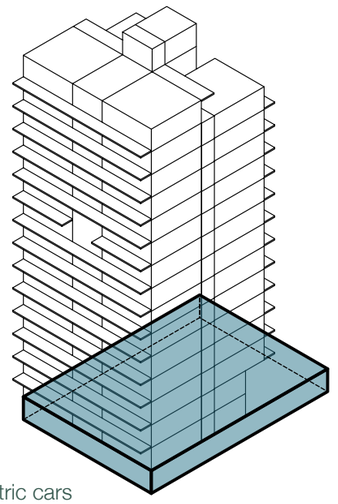
8%



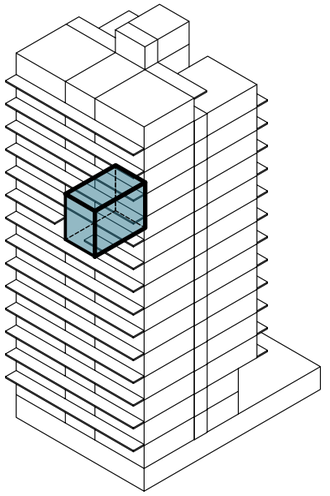
fitness room



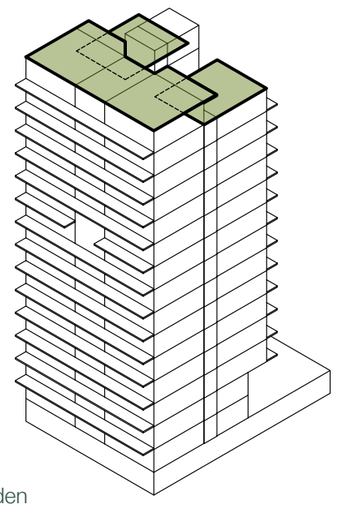
shared rooftop garden
floorplan scale 1:500



car parking
shared electric cars



fitness room



rooftop garden

PATCH 22, Amsterdam, The Netherlands
by Frazanten et al.

26 appartments
8 storys high

Net floor area: 650 m2 (one floor)
Net floor area: 5200 m2

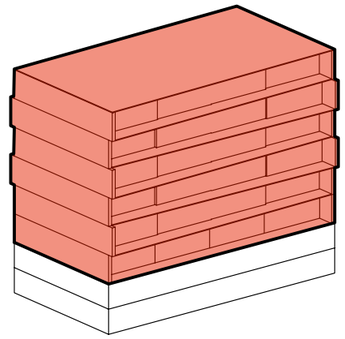
26 different typologies
one and two floor appartments

05 PLAN ANALYSIS

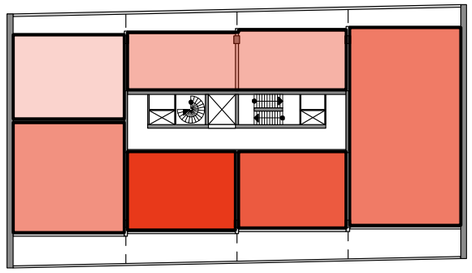
PATCH 22 Amsterdam, The Netherlands
LIFESTYLE DWELLINGS

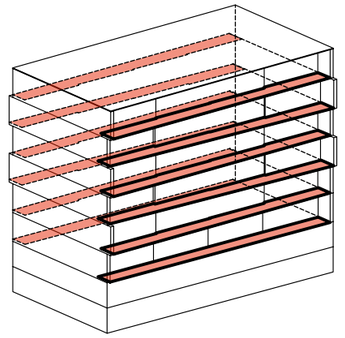
21-30% private balcony

kitchen connected to balcony

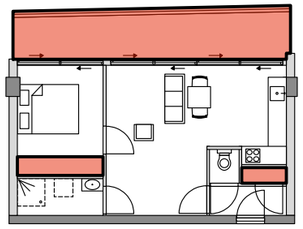


62 appartments
2 appartments types

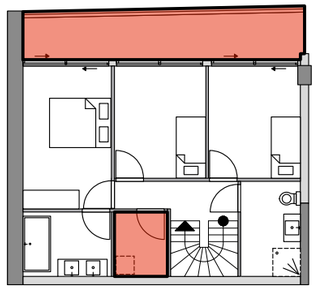


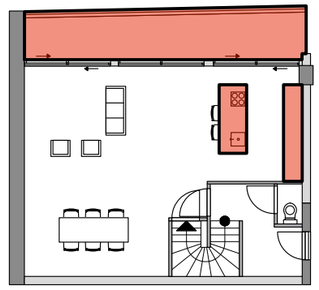


private balconys



floorplan scale 1:200
TYPE X - X m2





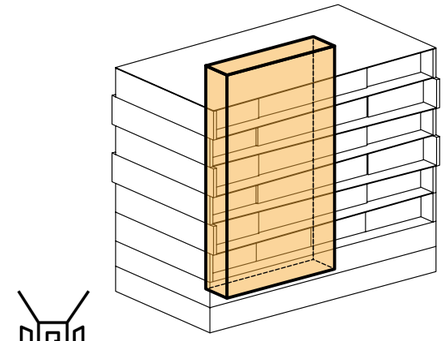
floorplan scale 1:200
TYPE Y - X m2

VERTICAL TRANSPORT

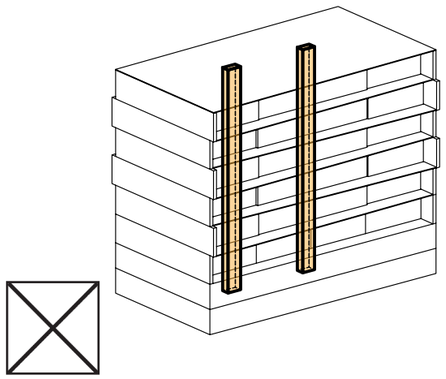
6,9%

0,7%

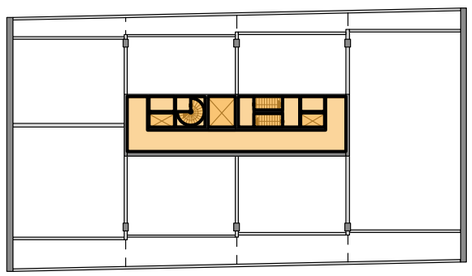
3,7%



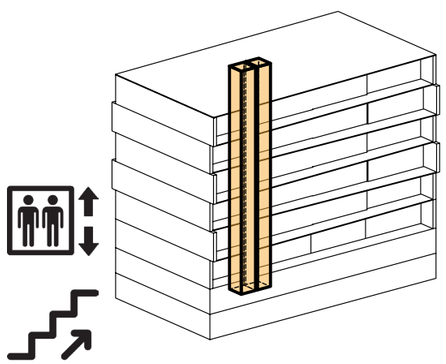
corridor



shafts



floorplan scale 1:500



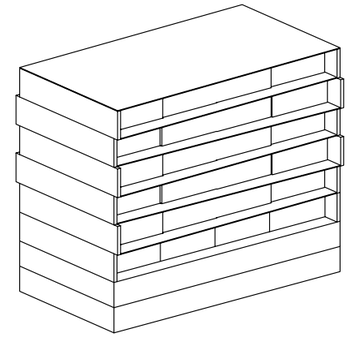
stairs and elevator

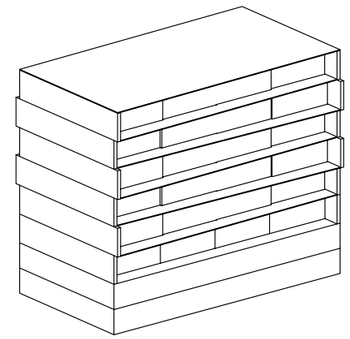
SHARED FACILITIES AND OUTDOOR SPACE

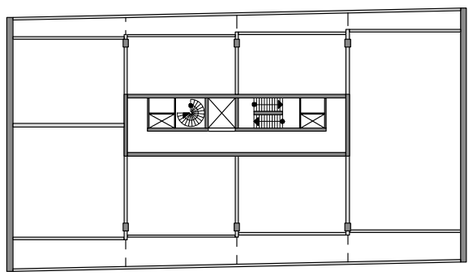
0%

0%

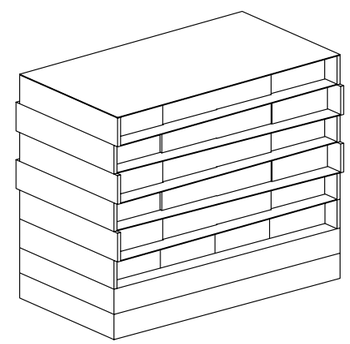
0%







floorplan scale 1:500



Mjøstårnet, Brumunddal, Norway
Voll Arkitekter

27 appartments
17 storys high (including offices and hotel)
6 storys appartments

Net floor area: 665 m2 (one floor)
Net floor area: 11300 m2

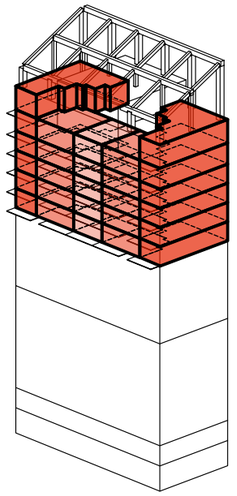
3 different typologies:
Type A - 12 family appartments
Type B - 10 familiy / two person appartments
Type C - 5 two person appartments

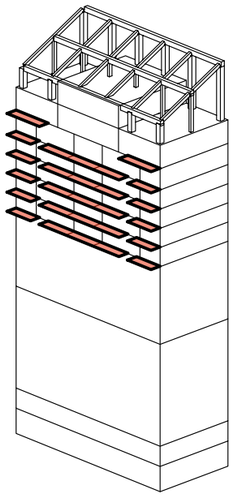
MJØSTÅRNET Brumunddal, Norway
LIFESTYLE DWELLINGS

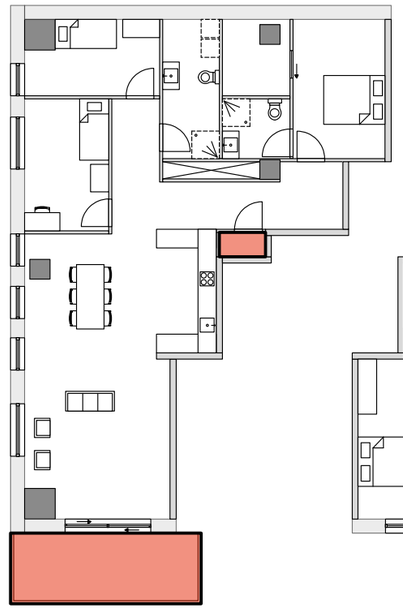
10-17% private balcony

built-in storage rooms
(for waste collection)

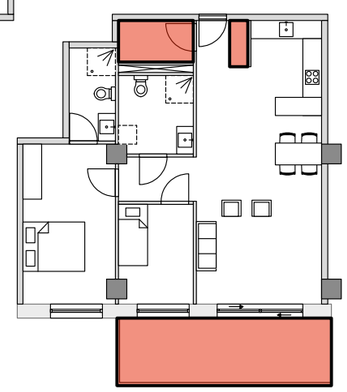
05 PLAN ANALYSIS



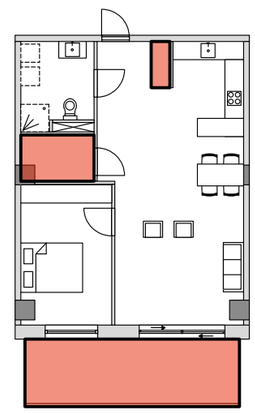




floorplan scale 1:200
type A - 130 m2



floorplan scale 1:200
type B - 82 m2



floorplan scale 1:200
type C - 67 m2

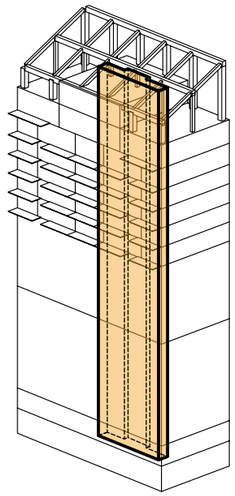
VERTICAL TRANSPORT

6,1%

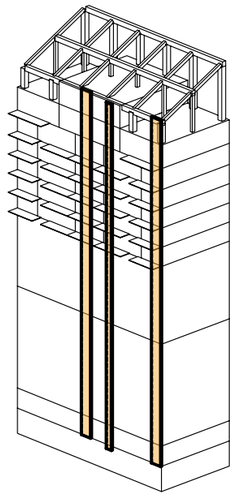
0,3%

6,9%

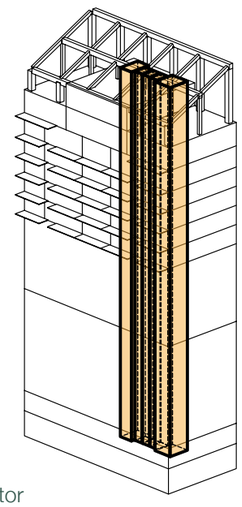
corridor

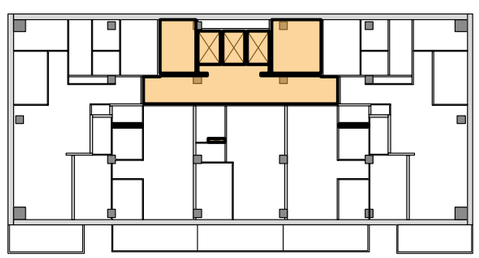


shafts



stairs and elevator





floorplan scale 1:500

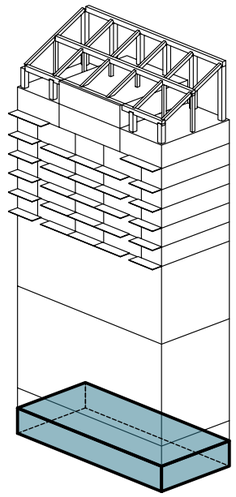
SHARED FACILITIES AND OUTDOOR SPACE

11,8%

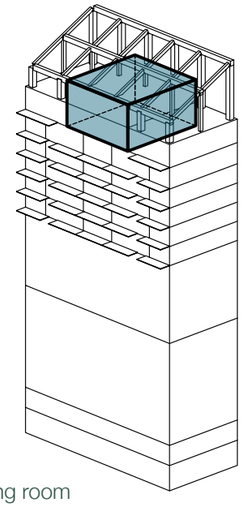
0%

2,3%

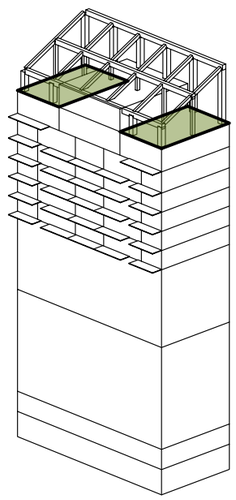
shared lobby

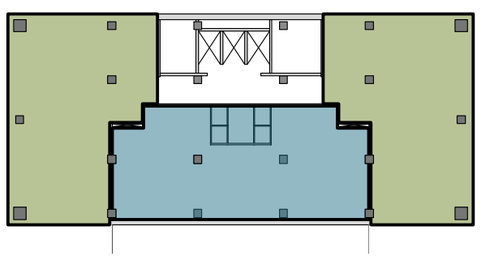


communal living room



rooftop garden





floorplan scale 1:500

360° residential building
by Kraaijvanger

26 appartments (per neighboorhoud)
208 appartments total
5 storys per neighborhood

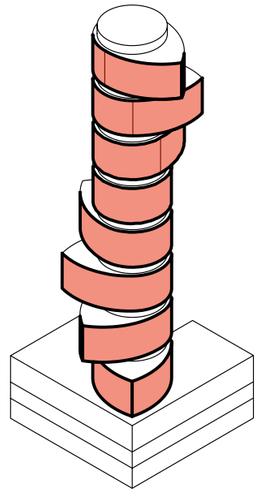
Net floor area: 680 m2 (one floor)
Net floor area: 30100 m2

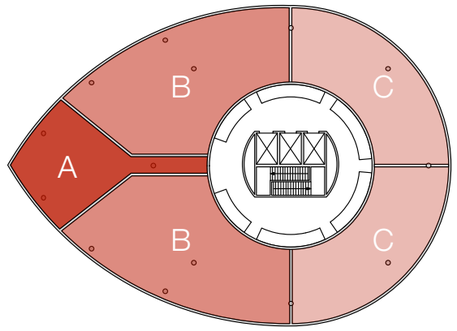
6 different typologies:
Type A - 65 m2 (4 appartments)
Type B - 137 m2 (4 appartments)
Type C - 92 m2 (4 appartments)
Type D - 71 m2 (4 appartments)
Type E - 64 m2 (4 appartments)
Type F - 61 m2 (6 appartments)

05 PLAN ANALYSIS

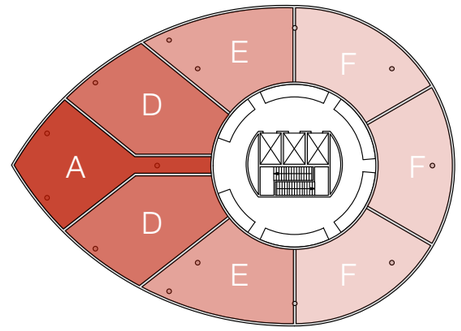
360° RESIDENTIAL BUILDING
LIFESTYLE DWELLINGS

furniture library (rent furniture)

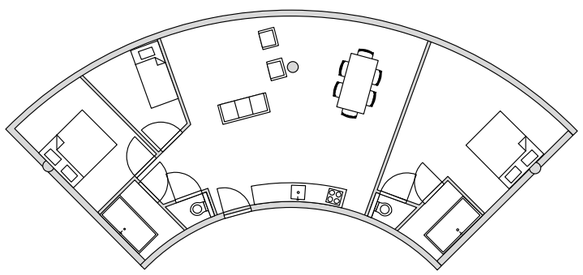




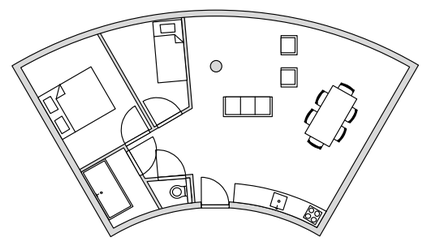
floorplan scale 1:500



floorplan scale 1:500



floorplan scale 1:200
type C - 92 m2



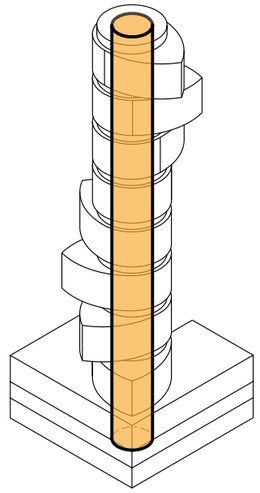
floorplan scale 1:200
Type F - 61 m2

VERTICAL TRANSPORT

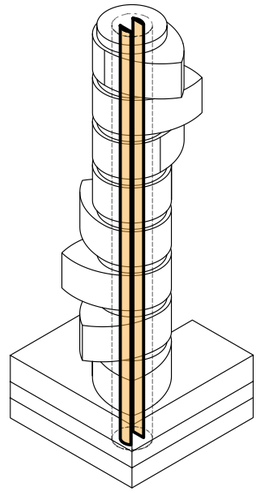
12,6%

0,9%

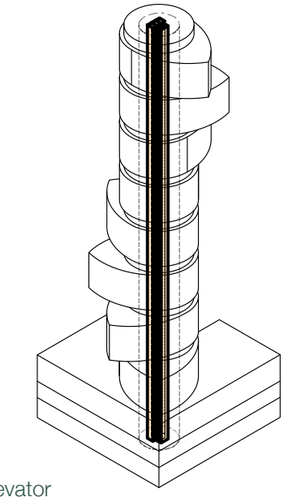
3,6%



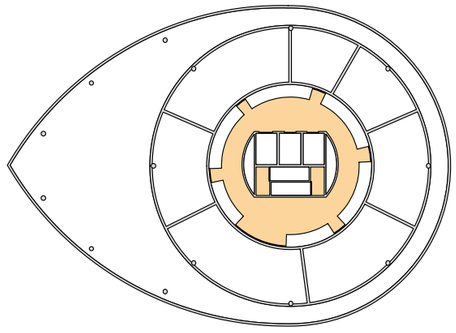
corridor



shafts



stairs and elevator



floorplan scale 1:500

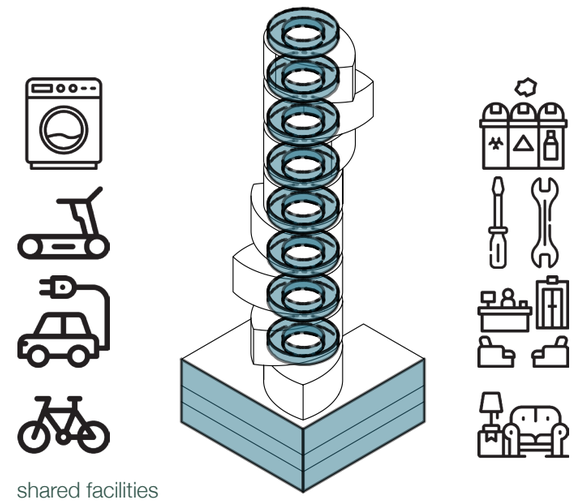
SHARED FACILITIES AND OUTDOOR SPACE

9,2%

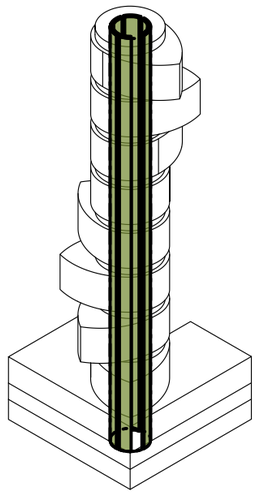
5,5%

9,9%

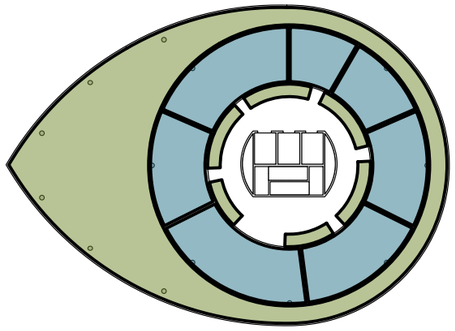
Shared facilities:
- lobby
- electric cars and bikes
- fitness / yoga
- washing machines
- waste collection / waste centre
- workshop space
- hotel / guestrooms
- supermarket
- furniture library



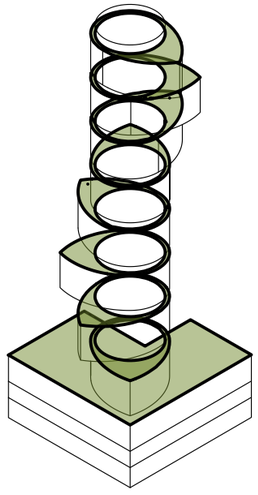
shared facilities



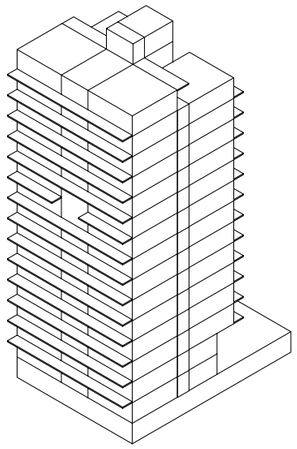
fitness room

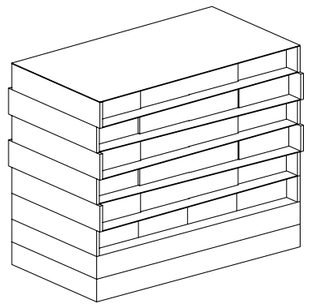


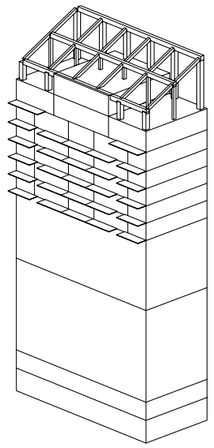
floorplan scale 1:500

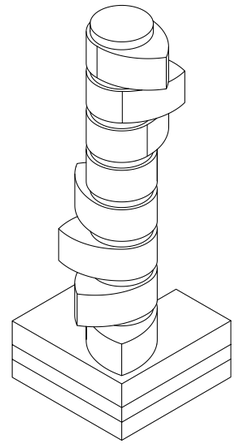


rooftop garden









BUILDING SCALE

10%
15,6%
1,3%
facilities in building
- fitness
- shared electric cars
5,6%
0%
8%

BUILDING SCALE

6,9%
0%
0,7%
3,7%
0%
0%

BUILDING SCALE

6,1%
11,8%
0,3%
facilities in building
- 2 shared communual living rooms
- shared lobby
6,9%
0%
2,3%

BUILDING SCALE

12,6%
9,2%
0,9%
facilities in building
- lobby
- electric cars and bikes
- fitness / yoga
- washing machines
- waste centre
- workshop space
- hotel / guestrooms
- supermarket
- furniture library
3,6%
5,5%
9,9%

DWELLING SCALE

private balcony
kitchen connected to balcony
built- in furniture closets
built-in storage rooms (for waste collection)
built-in electric devices with maintenance contract

DWELLING SCALE

private balcony
kitchen connected to balcony

DWELLING SCALE

private balcony
built-in storage rooms (for waste collection)

DWELLING SCALE

furniture library (rent furniture)

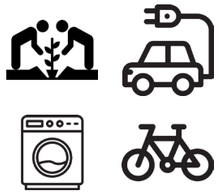
06 PROJECT BRIEF

GENERAL
- X dwellings
- X types
- 3 neighbourhoods (X dwellings per neighbourhood)
-

DWELLINGS

- Storage room
- Kitchen and bathroom connected to storage room
- In-home vegetable ‘garden’
- In-home composting
- In-home waste separation
- Built-in furniture regarding to bathroom, kitchen, closets
- Intermediate (outdoor)space (4-season dwelling)

SHARED FACILITIES

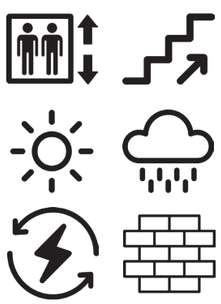


- Workshop / pantry / shared appliances room for each neighbourhood
- Laundry facilities for each neighbourhood
- Shared electric cars (0,2 per household)
- Shared bicycles (1 per household)
- Shared vegetable garden per neighbourhood

BUILDING COMPLEX

- Creating small ‘neighbourhoods’ in high rise
- Zero-waste supermarket on ground floor (two storeys height 4,0 meters)
- Waste centre on ground floor (two storeys height 4,0 meters)
- Parking on half depth ground floor
- Installation rooms half depth ground floor

BUILDING DESIGN

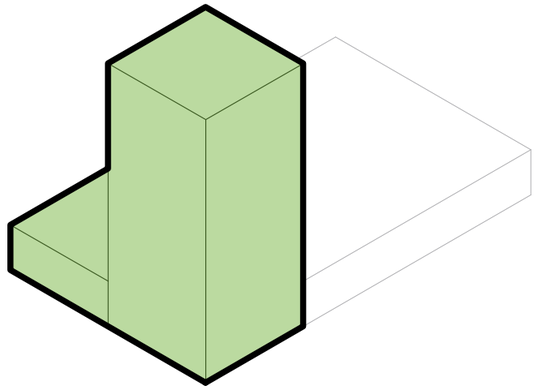


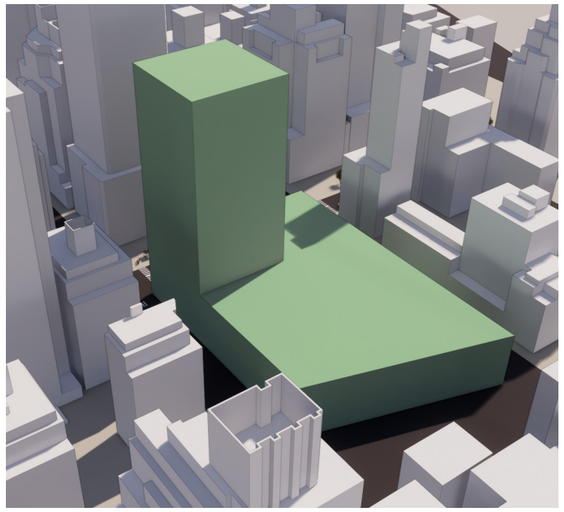
- Wooden lead bearing structure
- Ruwbouw = afbouw principle
- Central core (measurements)
- Min. 2 elevators
- Min. 2 fire escapes
- Central shaft for installations
- Zero-energy design (to be measured by using EPA-W)
- Zero-waste design by use of zero-waste design matrix

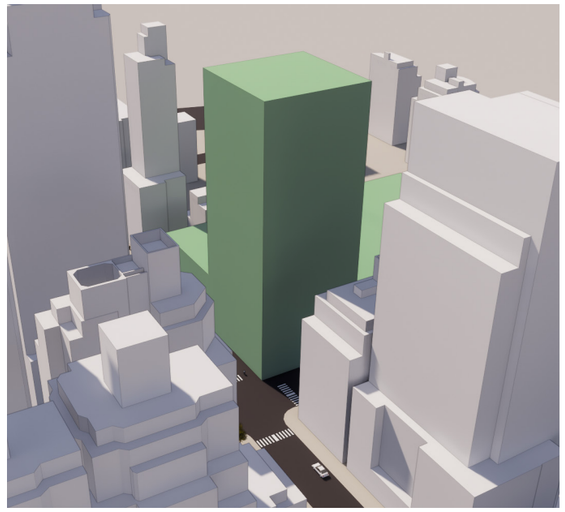
07 MASSING STUDIES

07 MASSING STUDIES

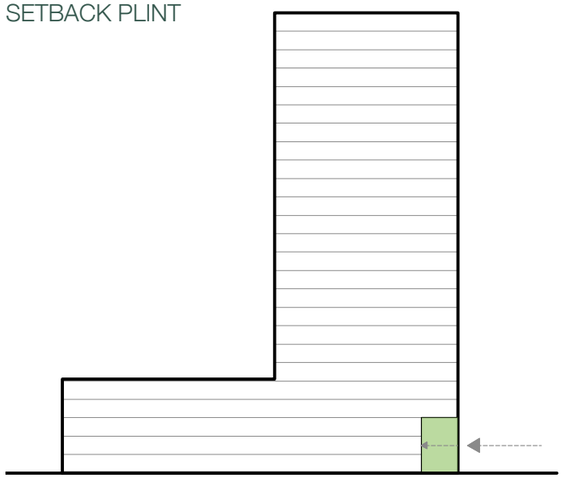
BUILDING MASS

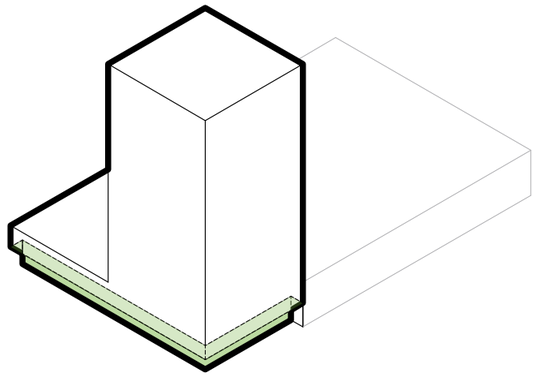


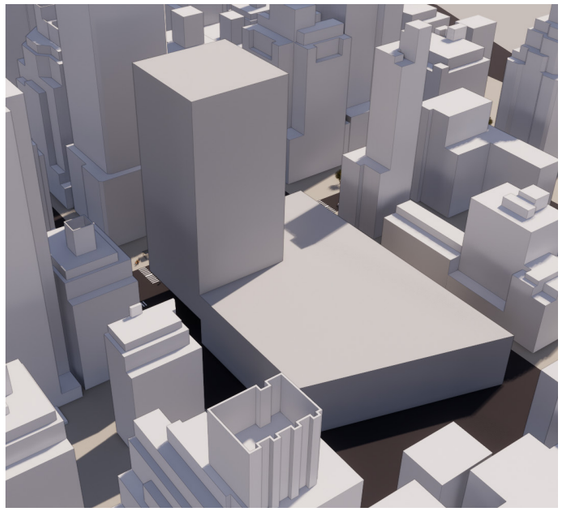


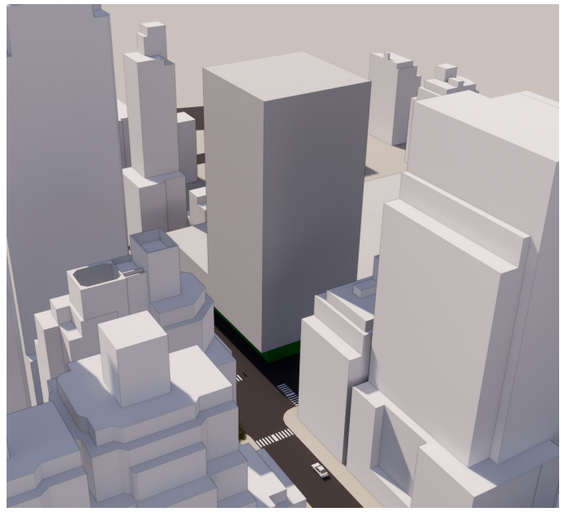


SETBACK PLINT



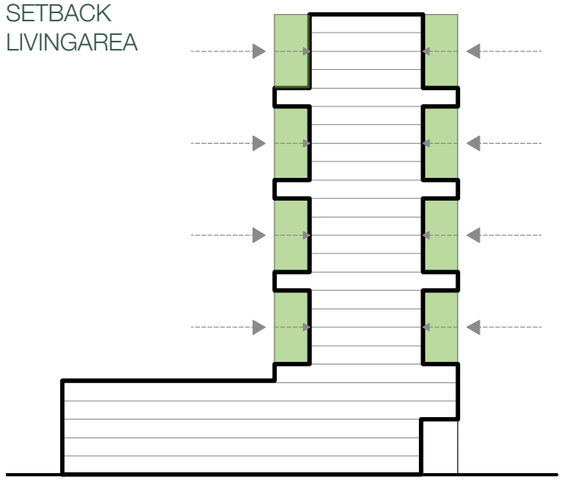


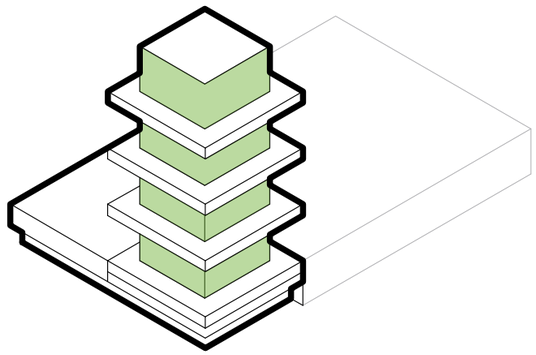


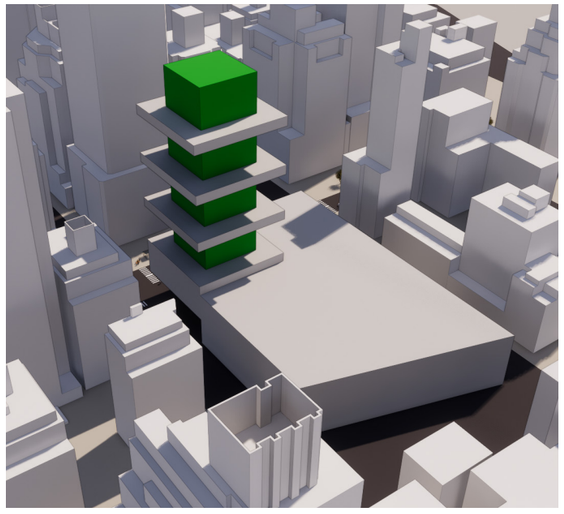


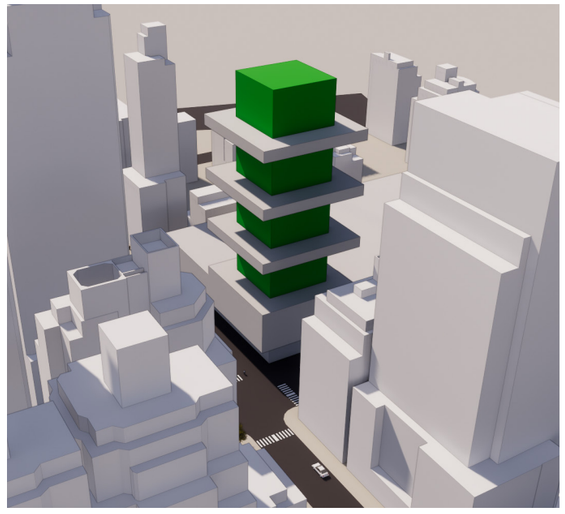
07 MASSING STUDIES

SETBACK
LIVINGAREA

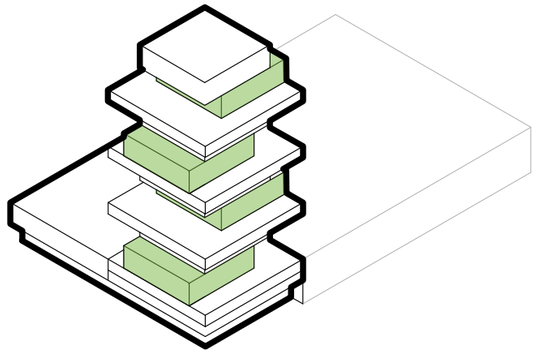


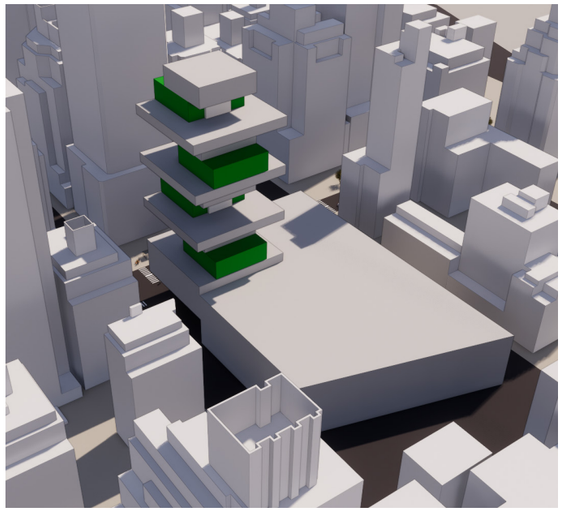


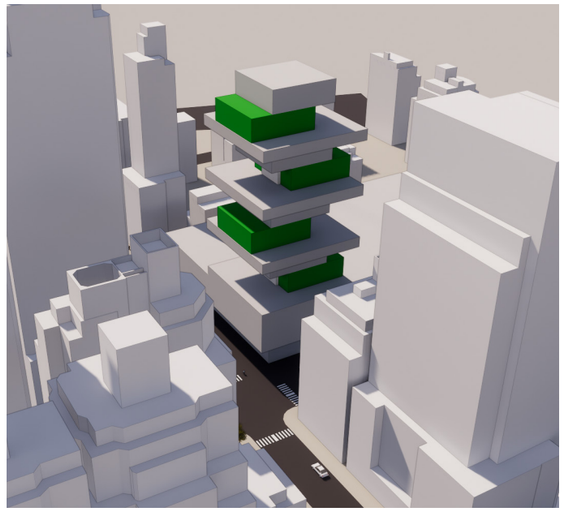




SHIFTING LAYERS







07 MASSING STUDIES

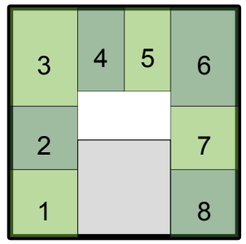


diagram floorplan one person households

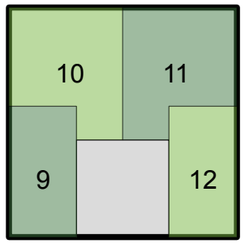


diagram floorplan two person households

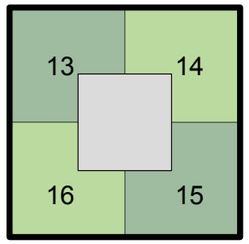


diagram floorplan family households (two floors)

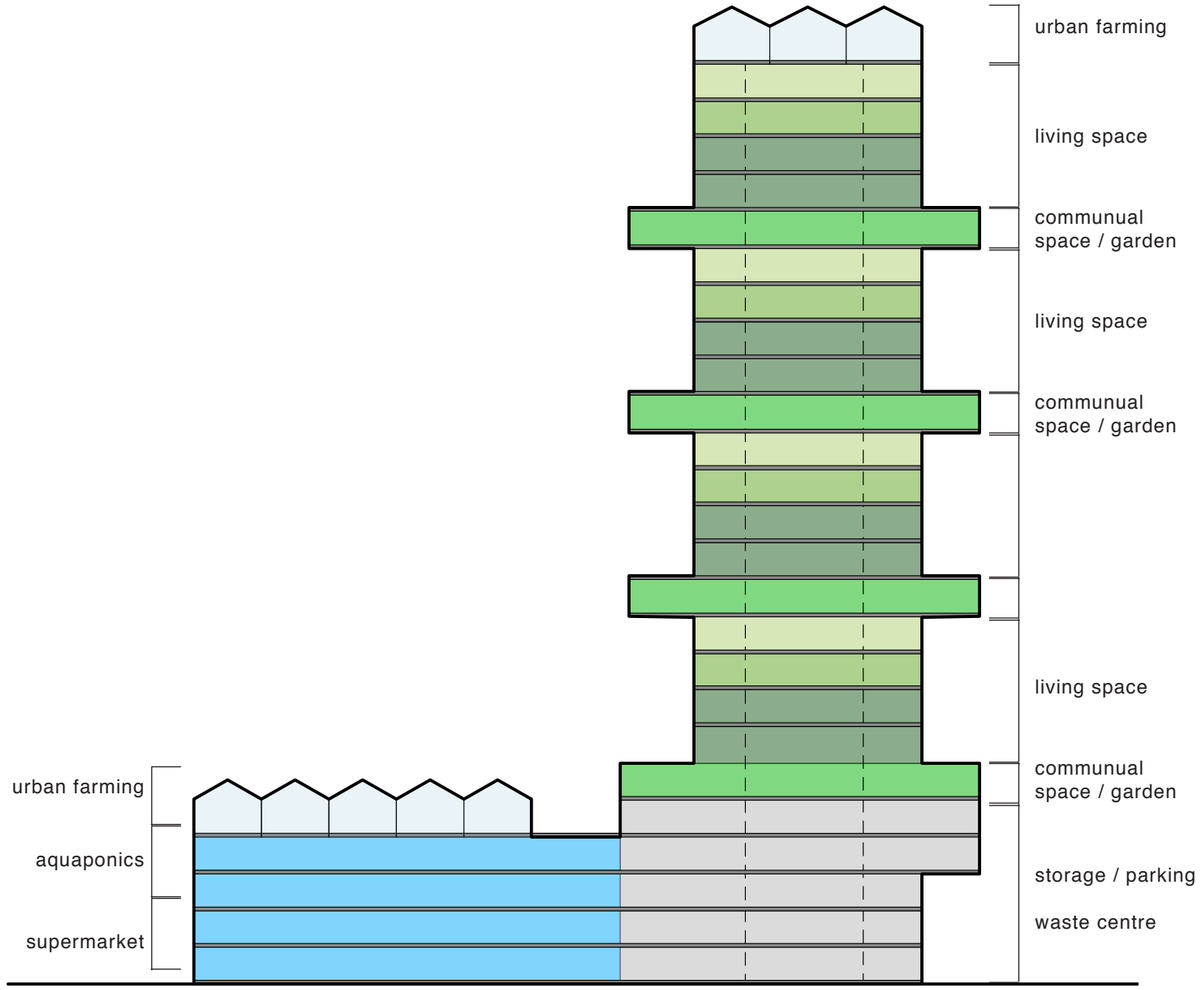


diagram section east facade

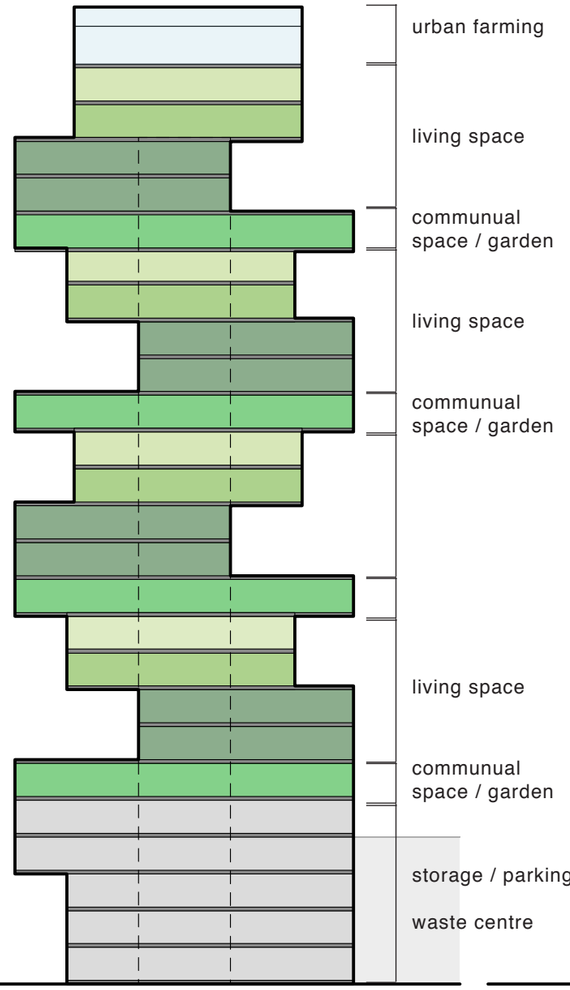
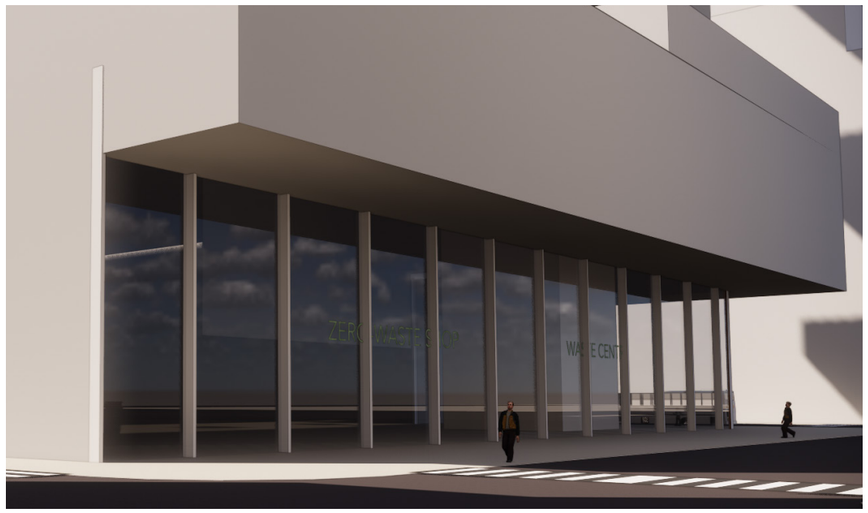
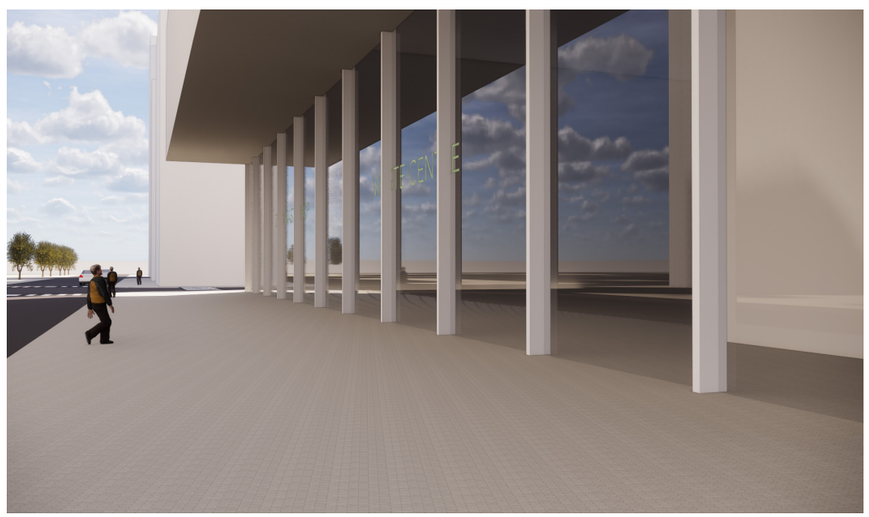


diagram section north facade

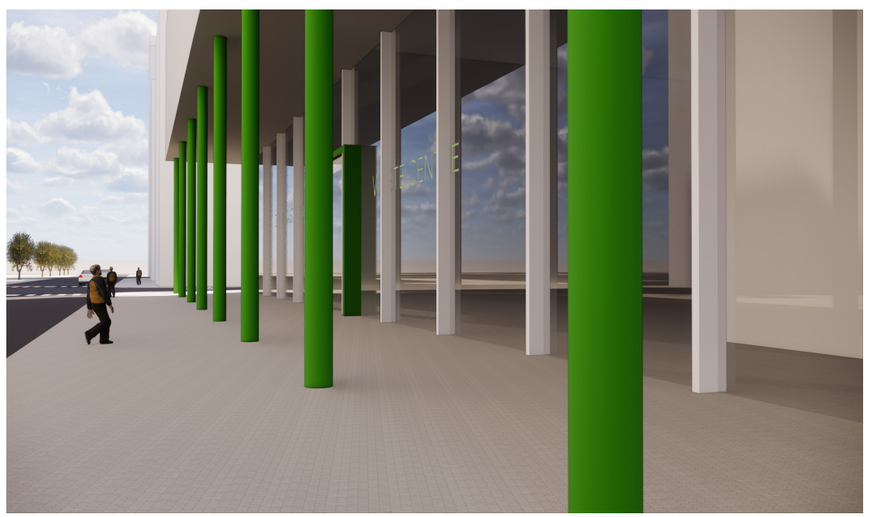
diagram north facade

CITY ON EYE LEVEL
plint research

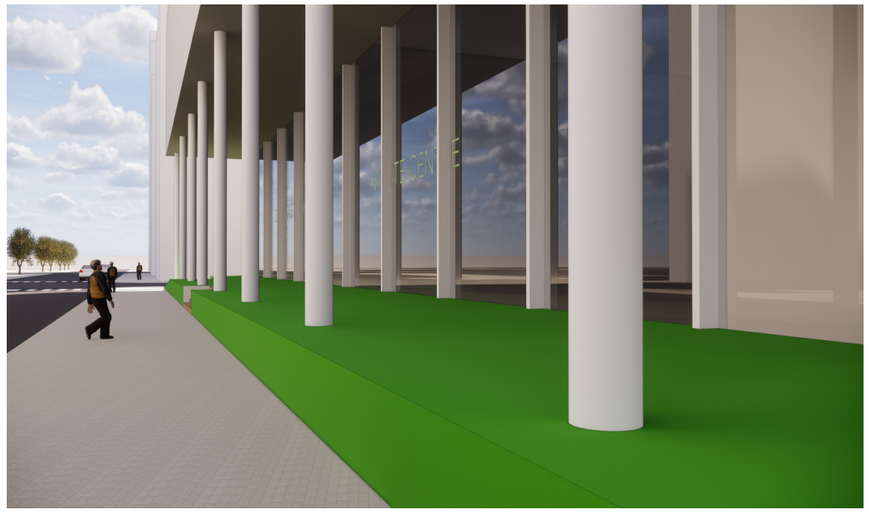




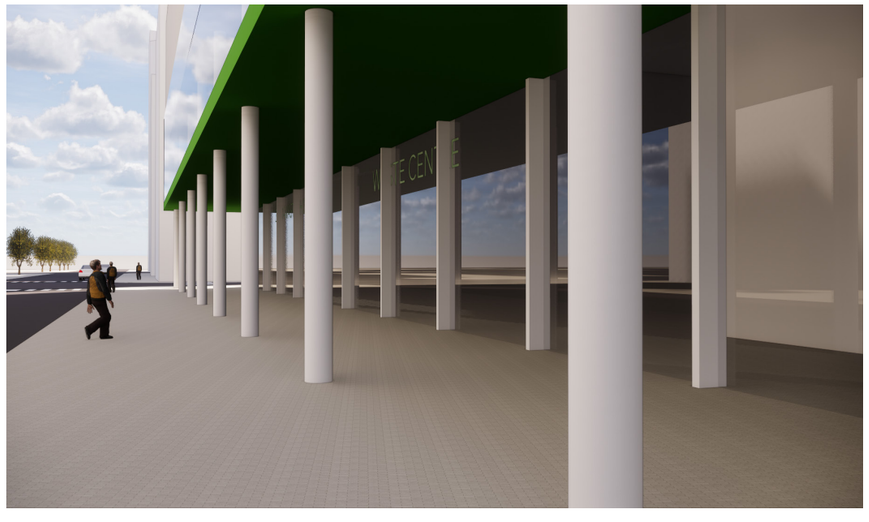
STRUCTURAL
COLUMNS



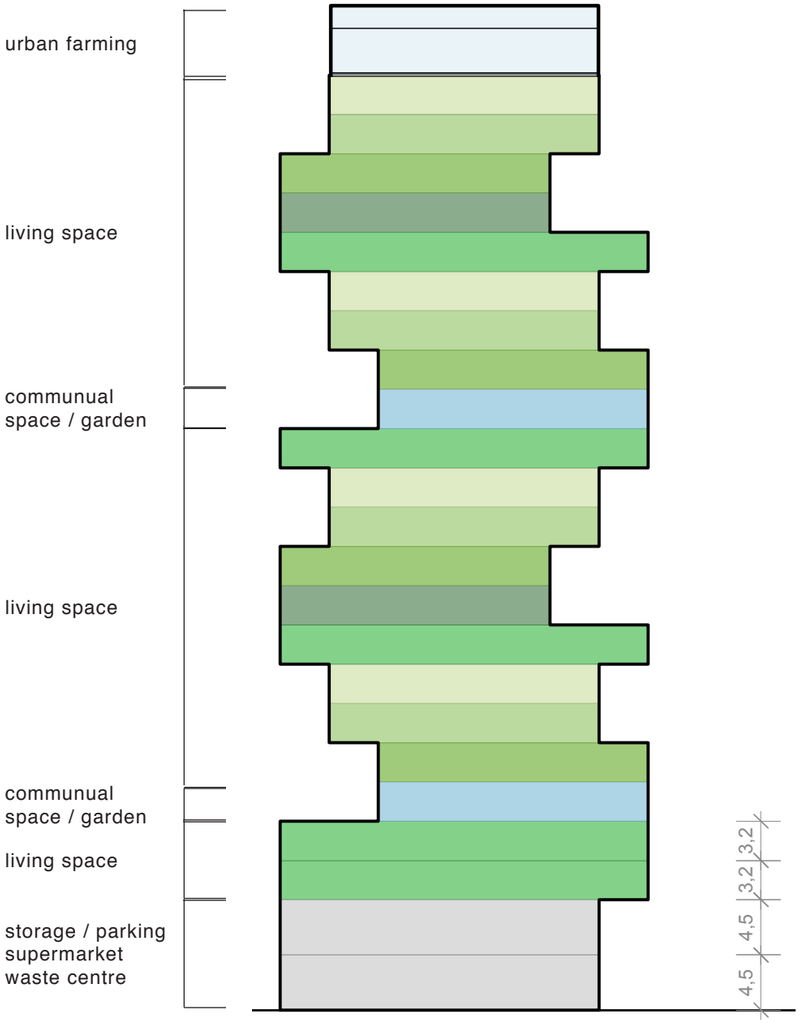
VERANDA



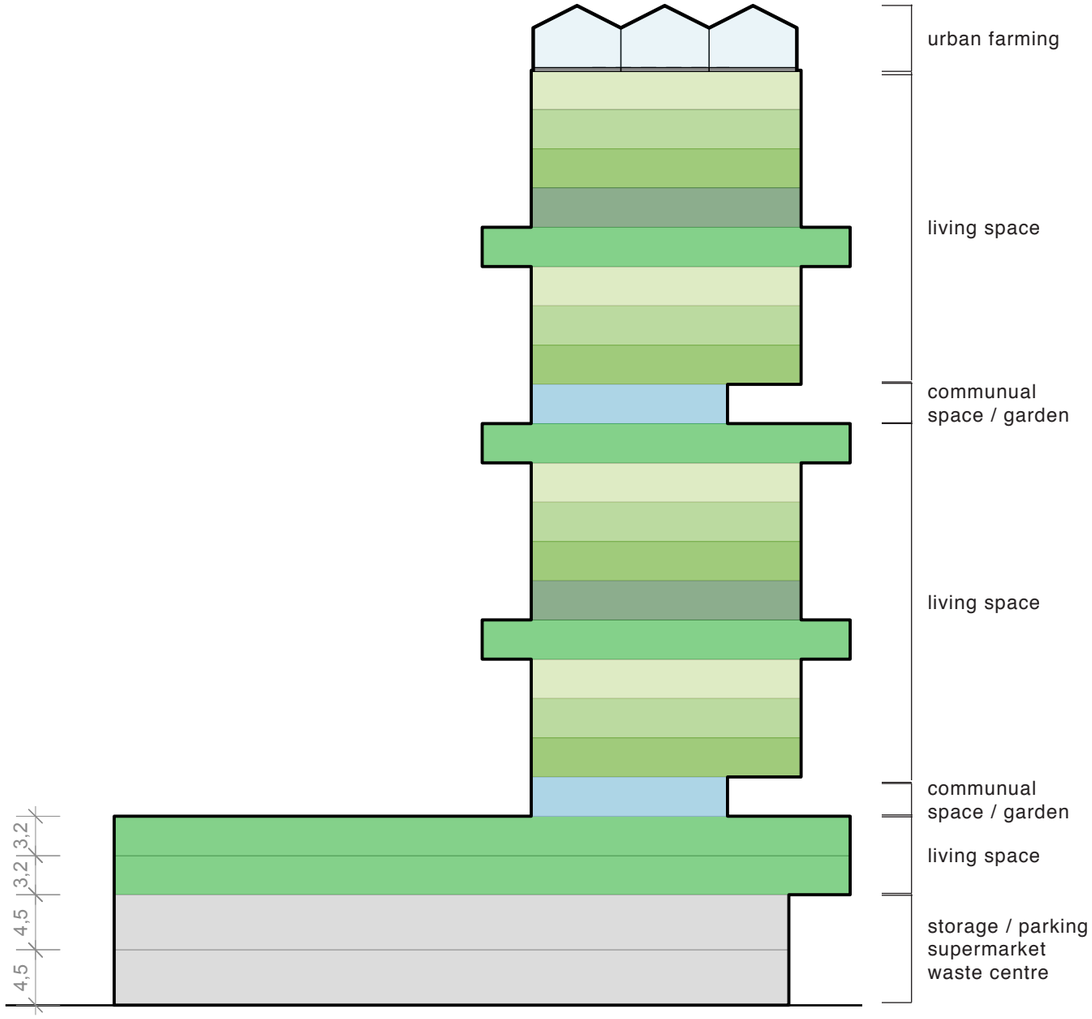
LOWERING PLINT



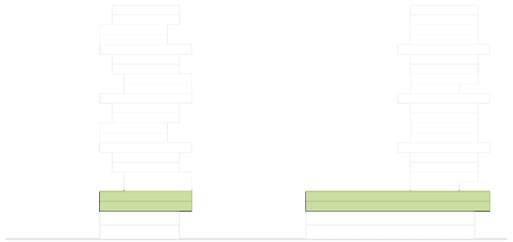
08 CONCEPTUAL DESIGN

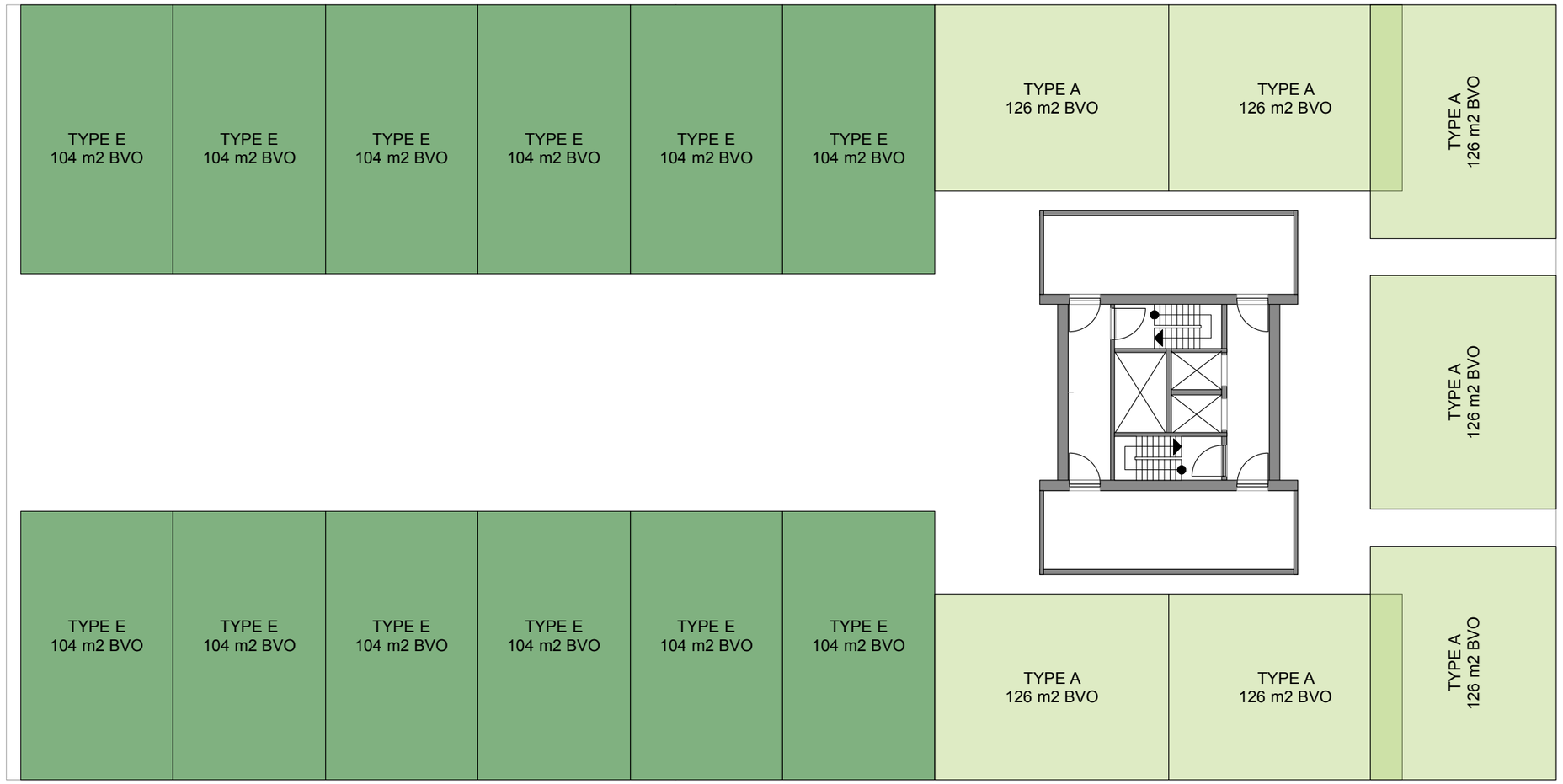


SOUTH FACADE
1:500

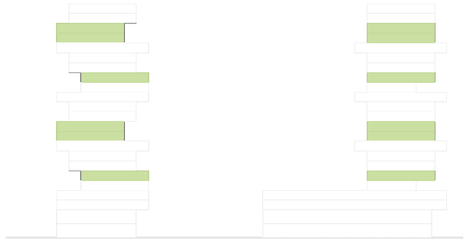


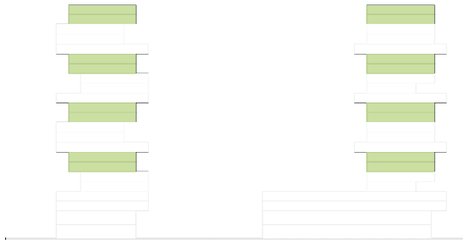
EAST FACADE
1:500

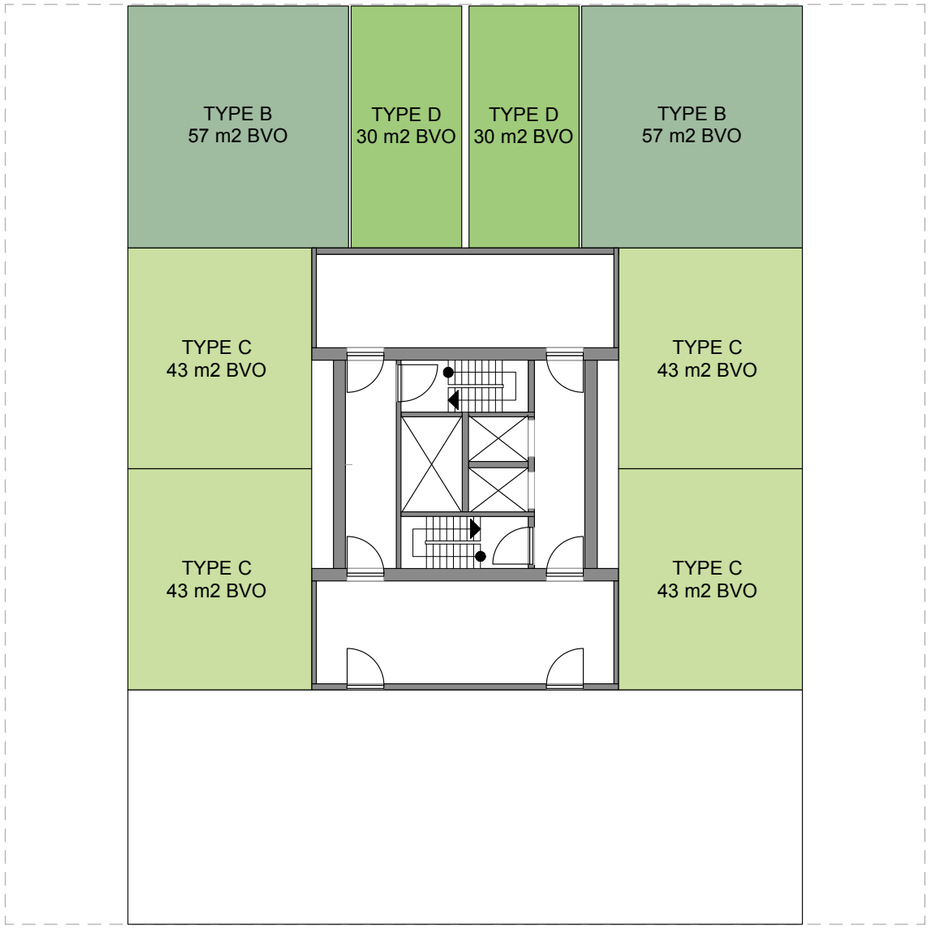




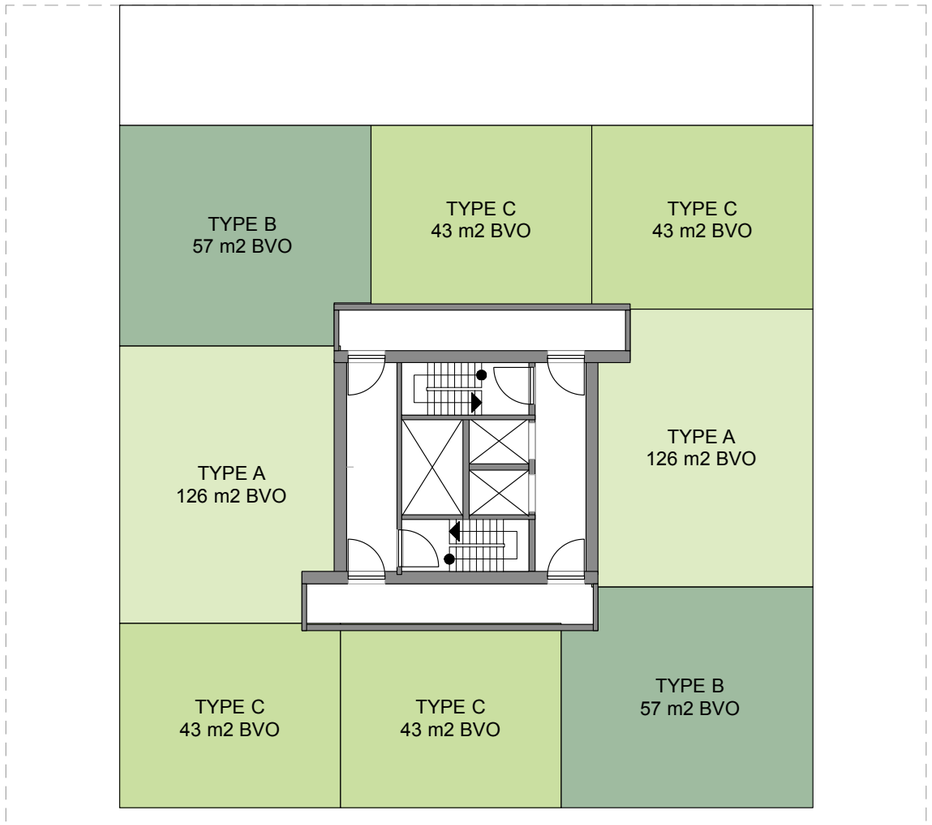
AVERAGE FLOORPLAN
1:200







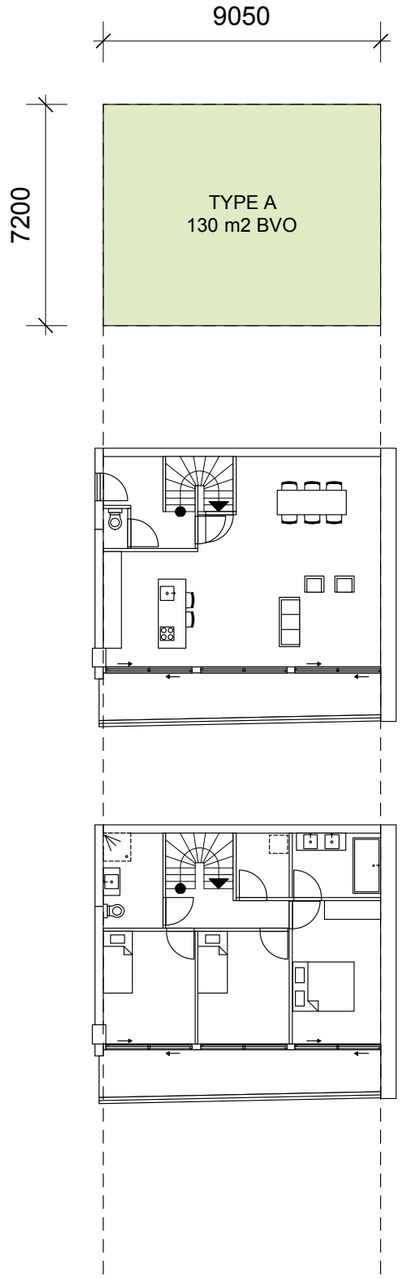
AVERAGE FLOORPLAN
1:200



AVERAGE FLOORPLAN
1:200

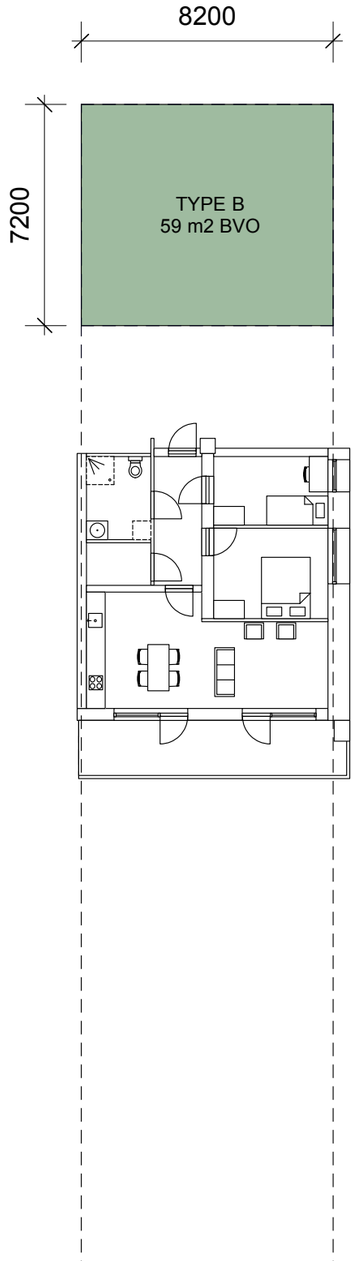
floorplans from
PATCH 22

FAMILY DWELLING
maisonnette



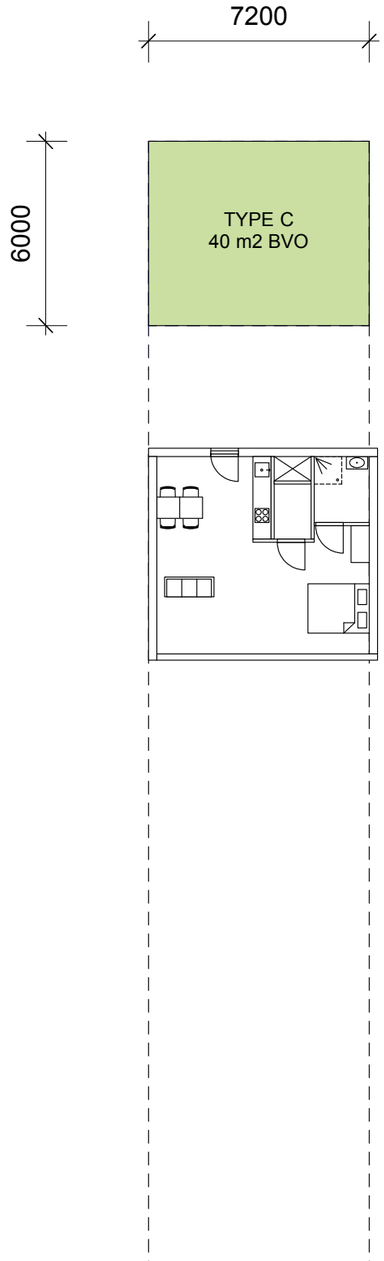
floorplans from
TREET

FAMILY DWELLING
one floor



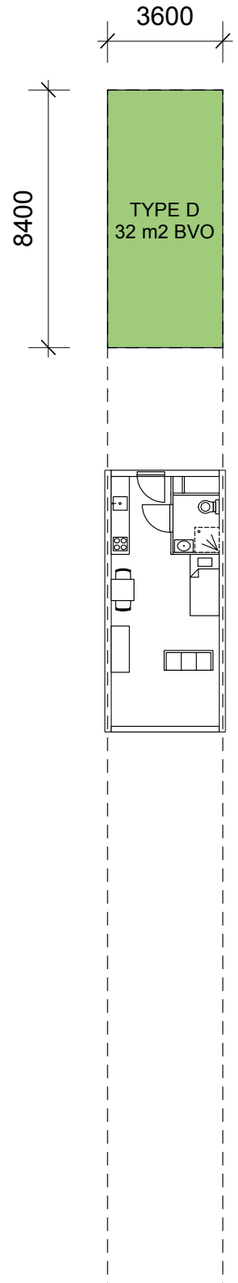
floorplans from
PATCH 22

TWO PERSON DWELLING
one floor



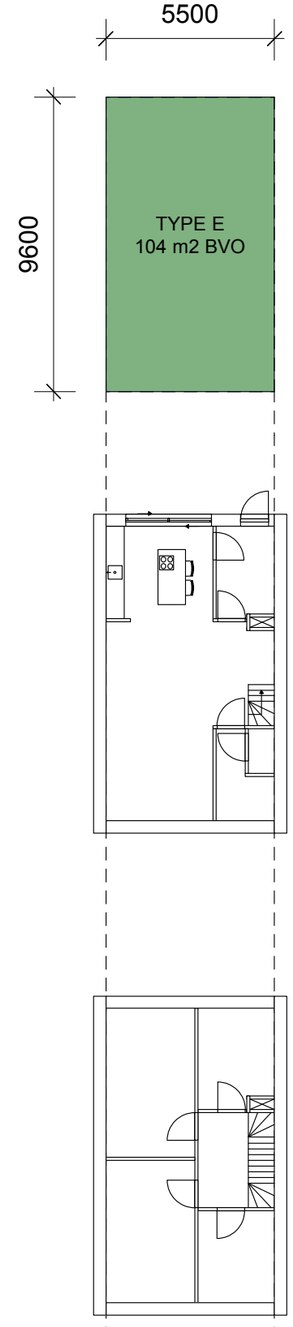
floorplans from
STUDENT HOUSING
ROTTERDAMSEWEG

ONE PERSON DWELLING
one floor



floorplans from
PATCH 22

FAMILY DWELLING
maisonnette



09 GRADUATION PLAN

Graduation Plan: All tracks

Submit your Graduation Plan to the Board of Examiners (Examencommissie-BK@tudelft.nl), Mentors and Delegate of the Board of Examiners one week before P2 at the latest.

The graduation plan consists of at least the following data/segments:

Personal information	
Name	Mandy Ham
Student number	4634225
Telephone number	+31 6 16 17 11 18
Private e-mail address	mandy.ham@live.nl

Studio	
Name / Theme	Dwelling – Dutch Housing
Teachers / tutors	Pierijn van der Putt and Theo Kupers
Argumentation of choice of the studio	After following different master studio's and different courses I reflected back on which I like and which makes me happy. Designing residential buildings has been my interest already since I did my bachelors. I mostly did renovation projects or re-development projects in which living spaces needed to be created. However, I've never designed a residential building myself. For that reason, I choose to do the Dutch Housing Graduation studio. On the one hand it is something which I know I love to do and on the other hand I think I can learn a lot as I've never entered a dwelling studio before.

Graduation project	
Title of the graduation project	Zero-waste: in lifestyle and building design
Goal	
Location:	Minvervahaven, Amsterdam
The posed problem,	On the 20th of September 2018 the World Bank posted this press release; *"global waste to grow by 70 percent by 2050 unless urgent action is taken… urgent action is needed to prevent waste from clogging the streets"* (The World Bank, 2018). As the global population progresses towards 8.5 billion by 2030 (United Nations, 2015, p. 5), the amount of urban solid waste is growing even faster than the rate of urbanization, which will be problematic for our living environment as well as our environmental health. As the urban population increases, so does its consumption of good and we are stretching many of our natural resources to their limits. As the ecological impact of waste can no longer be ignored, reducing or even eliminating waste is a great concern for the future of our urbanized world.
research questions and	The research is split up into two parts, zero-waste lifestyle and zero-waste building design. The research questions, for both parts a different research question, that will be answered in this report is 'what are the needs, on a dwelling scale and building scale, for people that live zero-waste?' and 'what are zero-waste design principles?'.
design assignment in which these result.	Design of a zero-waste building, which means that the building itself should be built circular, as well as implementing the needs for people that live the zero-waste lifestyle in the building and design. Design question: 'how can the needs of people that live zero-waste be incorporated into a zero-waste residential building design?'

Process
Method description
Research zero-waste lifestyle: - Online ethnographic research (analysis of the Zero-waste Amsterdam Facebook community group) - Questionnaire posted in the zero-waste Amsterdam Facebook community group (102 responses) - Literature study - Plan analysis - Own experience (I have tried to live zero-waste myself) Research zero-waste building design: - Literature study - Plan analysis - Own experience (I have tried to live zero-waste myself) Design: - Virtual reality - Sketching - Model making - Plan analysis - Digital drawing - Own experience (I have tried to live zero-waste myself)

Literature and general practical preference

Literature:

Arup. (2016). *The Circular Economy in the Built Environment.* London.

Arup, E. M. (2018). *From principles to practices: First steps towards a circular built environment.*

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Pedersen, M. K. (2017). *The Zero Waste Movement: A case study of mundane climate change activism in Denmark.* Malmö University.

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Zero Waste International Alliance. (2018). *Zero waste definition*. Opgehaald van Zero Waste International Alliance: http://zwia.org/zero-waste-definition/

Questionnaire:

- 102 responses from Zero-waste Amsterdam Facebook Group
- Questions based on own experience, analysis Zero-waste Amsterdam Facebook Group and Zero Waste Home from Bea Johnson.

Case-study's:

- Treet, Bergen, Norway by ARTEC
- PATCH 22, Amsterdam, The Netherlands by Frazanten et al.
- Mjøstårnet, Brumunddal, Norway by Voll Arkitekter
- 360° residential building (conceptual design Rotterdam) by Kraaijvanger

Own experience:

- Lived zero-waste myself as well

Reflection

Relevance

The increase of waste is a world-wide problem just like stretching many of our natural resources to their limits. The first city to announce a zero-waste goal was Canberra in Australia as in 1996 the local government was promoting 'No Waste by 2010' (Pedersen, 2017, p. 12). However, in 2010 it became clear that not only was the goal of zero-waste not achieved, the inhabitants of Canberra were producing more waste than ever before (ABC News, 2010) because they didn't change their lifestyle. So, although a lot of governments and municipalities are trying to work towards a circular economy, changing the lifestyle of people is at this moment the biggest concern as the consumerism society is the real problem. Architecture should contribute to create awareness about the waste problem and should provide solutions for individuals and communities to live zero-waste. However, not much research has been done yet in the field of zero-waste lifestyle regarding to a zero-waste residential building design, which makes it even more important to analyse the Zero-Waste Amsterdam Facebook group very well and implement my own experiences regarding to living zero-waste in the research.

Time planning

Research report

- Deadline research report 13 June 2019

13 June – 20 June
P2 presentation (20 June)

- 13 – 17 June Finalizing conceptual design (apartment types, circulation, 1:500 model)
- 18 – 19 June Preparation presentation (2 days)

24 – 28 June

- Revision feedback

29 June – 1 September summer holiday

1 September - P3

- Design elaboration to 1:100
- Dwelling types
- Shared facilities
- Design supermarket and waste centre
- Façade
- Materialization
- Construction
- Climate design
- Details

P3 presentation

P3 – P4

- Revision feedback
- Continuing working on presented by P3 and finalizing drawings
- Model making
- Reflection

P4 – P5

- Revision feedback
- Final model
- Final presentation

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APPENDIX

Questionnaire zero-waste living

*Vereist

1. **To participate in the survey you must agree to the informed consent. This is necessary for scientific research and means that you are sufficiently informed in advance about your rights as a participant. All data is treated confidentially and all information is made anonymous. You can cancel your participation at any time.** *
   Markeer slechts één ovaal.
   - ◯ Agree

Demographic data

2. **Gender**
   Markeer slechts één ovaal.
   - ◯ Male
   - ◯ Female

3. **Age**

   _____

4. **Living environment**
   Markeer slechts één ovaal.
   - ◯ City centre
   - ◯ Suburb
   - ◯ Village
   - ◯ Countryside
   - ◯ Anders: _____

5. **Current house**
   Markeer slechts één ovaal.
   - ◯ Dutch row house
   - ◯ Appartment
   - ◯ Farm
   - ◯ Semi-detached house
   - ◯ Dutch canal house
   - ◯ Studio
   - ◯ Tiny house
   - ◯ Anders: _____

APPENDIX I

6. **Family composition**
   Markeer slechts één ovaal.
   - ◯ One person household
   - ◯ Two person household
   - ◯ Family household
   - ◯ Co-housing
   - ◯ Anders: _____

7. **Current composition of the house**
   Markeer slechts één ovaal.
   - ◯ 1 person
   - ◯ 2 persons
   - ◯ 3 persons
   - ◯ 4 persons
   - ◯ 5 persons
   - ◯ 6 or more persons
   - ◯ Anders: _____

8. **How many trash do you produce?**
   Markeer slechts één ovaal.

	1	2	3	4	5	
not at all	◯	◯	◯	◯	◯	totally

9. **I separate my own trash**
   Markeer slechts één ovaal.

	1	2	3	4	5	
not at all	◯	◯	◯	◯	◯	totally

10. **I have taken the following measures in my home to promote my zero-waste lifestyle:**
    Vink alle toepasselijke opties aan.
    - ☐ Wast separation in house
    - ☐ Composting system in house
    - ☐ Composting system in garden / on balcony
    - ☐ Place to grow own vegetables
    - ☐ Rainwater collection
    - ☐ Shower / bathwater collection
    - ☐ Zero-waste furniture (100% recyclable or compostable)
    - ☐ Zero-waste kitchen (100% recyclable or compostable)
    - ☐ Zero-waste sanitation (100% recyclable or compostable)
    - ☐ Renewable energie (such as solar panels, heat pump, etc.)
    - ☐ Anders: _____

11. **Furthermore, I have taken the following measures in my home to promote my zero-waste lifestyle (not compulsory)**

Challeges

12. **In the next room or rooms I encounter the most challenges with regard to a zero-waste lifestyle**
Vink alle toepasselijke opties aan.

- [ ] Kitchen
- [ ] Bathroom
- [ ] Livingroom
- [ ] Bedroom
- [ ] Garage / storageroom
- [ ] Garden / balcony
- [ ] Anders: _____

13. **I miss the following elements in my current home or environment to live the zero-waste lifestyle**
Vink alle toepasselijke opties aan.

- [ ] Place to grow own vegetables
- [ ] Zero-waste supermarket
- [ ] Waste separation in house
- [ ] Waste separation in residential complex
- [ ] Compost system in house
- [ ] Compost system in garden / on balcony
- [ ] Compost system in residential complex
- [ ] Rainwater collection
- [ ] Shower-/bathwater collection
- [ ] Zero-waste furniture
- [ ] Zero-waste kitchenfurniture
- [ ] Zero-waste sanitation
- [ ] Renewable energy sources
- [ ] Anders: _____

14. **I also run into the following things (not required)**

APPENDIX I

Home

15. **To what extent are you willing to live smaller than your current home if you thereby promote a zero-waste lifestyle?**
Markeer slechts één ovaal.

	1	2	3	4	5	
not at all	◯	◯	◯	◯	◯	totally

16. **Would you be willing to share the following spaces with local residents in order to promote a zero-waste lifestyle?**
Vink alle toepasselijke opties aan.

- [ ] Kitchen
- [ ] Bathroom
- [ ] Living room
- [ ] Garden / balcony
- [ ] Laundry room
- [ ] Storage room
- [ ] Vegetables garden
- [ ] Anders: _____

17. **I would rather have my own kitchen with all mod cons in my home, than my own small pantry and a shared larger kitchen in the residential building**
Markeer slechts één ovaal.

	1	2	3	4	5	
not at all	◯	◯	◯	◯	◯	totally

18. **I prefer a private garden / balcony than a communal garden / roof terrace**
Markeer slechts één ovaal.

	1	2	3	4	5	
not at all	◯	◯	◯	◯	◯	totally

19. **I am willing to live as self-sufficient as possible**
Markeer slechts één ovaal.

	1	2	3	4	5	
not at all	◯	◯	◯	◯	◯	totally

20. **To what extent does the concept of a tiny house appeal to you?**
Markeer slechts één ovaal.

	1	2	3	4	5	
not at all	◯	◯	◯	◯	◯	totally

21. **To what extent does the concept of a tiny house in high-rise buildings appeal to you?**
Markeer slechts één ovaal.

	1	2	3	4	5	
not at all	◯	◯	◯	◯	◯	totally

Home furnishings

22. **To what extent are you willing to move into a home where a zero-waste interior with regard to the sanitary facilities is built in?**
Markeer slechts één ovaal.

	1	2	3	4	5	
not at all	◯	◯	◯	◯	◯	totally

23. **To what extent are you willing to move into a home where a zero-waste interior with regard to the kitchen is built in?**
Markeer slechts één ovaal.

	1	2	3	4	5	
not at all	◯	◯	◯	◯	◯	totally

24. **To what extent are you willing to move into a home where a zero-waste interior with regard to furniture is built in?**
Markeer slechts één ovaal.

	1	2	3	4	5	
not at all	◯	◯	◯	◯	◯	totally

25. **To what extent would you be willing to rent furniture?**
Markeer slechts één ovaal.

	1	2	3	4	5	
not at all	◯	◯	◯	◯	◯	totally

26. **To what extent would you be willing to rent equipment? (such as TV, white goods, kitchen appliances, etc)**
Markeer slechts één ovaal.

	1	2	3	4	5	
not at all	◯	◯	◯	◯	◯	totally

27. **I am willing to share the following kitchen appliances with local residents (in a communal kitchen, for example)**
Vink alle toepasselijke opties aan.

- [ ] Coffee machine
- [ ] Kettle
- [ ] Microwave
- [ ] Oven
- [ ] Dishwasher
- [ ] Refrigerator
- [ ] Freezer
- [ ] Anders: _____

Environmental needs

28. **I prefer to travel by public transport**
Markeer slechts één ovaal.

	1	2	3	4	5	
not at all	◯	◯	◯	◯	◯	totally

29. **I am in favor of the concept of sharing bicycles**
Markeer slechts één ovaal.

	1	2	3	4	5	
not at all	◯	◯	◯	◯	◯	totally

30. **I am in favor of the concept of sharing cars**
Markeer slechts één ovaal.

	1	2	3	4	5	
not at all	◯	◯	◯	◯	◯	totally

31. **To what extent do you need a private garden / balcony**
Markeer slechts één ovaal.

	1	2	3	4	5	
not at all	◯	◯	◯	◯	◯	totally

32. **To what extent do you need a communal garden / balcony**
Markeer slechts één ovaal.

	1	2	3	4	5	
not at all	◯	◯	◯	◯	◯	totally

33. **To what extent do you need your own vegetable garden?**
Markeer slechts één ovaal.

	1	2	3	4	5	
not at all	◯	◯	◯	◯	◯	totally

34. **To what extent do you need a communal vegetable garden?**
Markeer slechts één ovaal.

	1	2	3	4	5	
not at all	◯	◯	◯	◯	◯	totally

35. **To what extent do you need a zero-waste supermarket within walking distance?**
Markeer slechts één ovaal.

	1	2	3	4	5	
not at all	◯	◯	◯	◯	◯	totally

36. **To what extent do you need a built-in system to separate waste in your home?**
Markeer slechts één ovaal.

	1	2	3	4	5	
not at all	◯	◯	◯	◯	◯	totally

37. **To what extent do you need a built-in system to separate waste in your residential building**
Markeer slechts één ovaal.

	1	2	3	4	5	
not at all	◯	◯	◯	◯	◯	totally

Additions

38. **I would like to share the following information in the interest of new concepts for zero-waste living and building**

_____

_____

_____

_____

_____

APPENDIX I

Enquête zero-waste living

*Vereist

1. **Voor deelname aan de enquête dient u akkoord te gaan met de informed consent. Dit is nodig voor wetenschappelijk onderzoek en houdt in dat u vooraf voldoende bent geïnformeerd over uw rechten als participant. Alle gegevens worden vertrouwelijk behandeld en alle informatie wordt geanonimiseerd. U kunt te allen tijde uw deelname beëindigen.** *
Markeer slechts één ovaal.

◯ Akkoord

Demografische gegevens

2. **Geslacht**
Markeer slechts één ovaal.

◯ Man
◯ Vrouw

3. **Leeftijd**

_____

4. **Woonomgeving**
Markeer slechts één ovaal.

◯ Stadscentrum
◯ Buitenwijk stad
◯ Dorp
◯ Platteland
◯ Anders: _____

5. **Huidige woning**
Markeer slechts één ovaal.

◯ Eengezinswoning
◯ Appartement
◯ Boerderij
◯ Twee-onder-eenkap
◯ Grachtenpand
◯ Studio
◯ Tiny house
◯ Anders: _____

6. **Gezinssamenstelling**
Markeer slechts één ovaal.

- ◯ Alleenstaand
- ◯ Samenwonend
- ◯ Gezin
- ◯ Cohabitatie
- ◯ Anders: _____

7. **Huidige samenstelling woning**
Markeer slechts één ovaal.

- ◯ 1 persoon
- ◯ 2 personen
- ◯ 3 personen
- ◯ 4 personen
- ◯ 5 personen
- ◯ 6 personen of meer

8. **Hoeveel afval produceert u?**
Markeer slechts één ovaal.

	1	2	3	4	5	
Helemaal niet	◯	◯	◯	◯	◯	Helemaal wel

9. **Ik scheid mijn eigen afval**
Markeer slechts één ovaal.

	1	2	3	4	5	
Helemaal niet	◯	◯	◯	◯	◯	Helemaal wel

10. **De volgende maatregelen heb ik getroffen in mijn woning om mijn zero-waste lifestyle te bevorderen:**
Vink alle toepasselijke opties aan.

- ☐ Afvalscheiding in woning
- ☐ Composteersysteem in woning
- ☐ Composteersysteem in tuin / op balkon
- ☐ Plek om groente en fruit te verbouwen
- ☐ Opvangen regenwater
- ☐ Opvangen bad / douchewater
- ☐ Zero-waste meubilair (100% recyclebaar of composteerbaar)
- ☐ Zero-waste keuken (100% recyclebaar of composteerbaar)
- ☐ Zero-waste sanitaire voorzieningen (100% recyclebaar of composteerbaar)
- ☐ Hernieuwbare energie (zoals zonnepanelen, warmtepomp, etc.)
- ☐ Anders: _____

11. **Verder heb ik nog de volgende maatregelen genomen in mijn woning om mijn zero-waste lifestyle te bevorderen (niet verplicht)**

_____

_____

_____

_____

_____

Uitdagingen

12. **In de volgende ruimte loop ik het meest tegen uitdagingen m.b.t. een zero-waste leefstijl aan**
Vink alle toepasselijke opties aan.

- ☐ Keuken
- ☐ Badkamer
- ☐ Woonkamer
- ☐ Slaapkamer
- ☐ Garage of berging
- ☐ Tuin / balkon
- ☐ Anders: _____

13. **De volgende elementen mis ik in mijn huidige woning of omgeving**
Vink alle toepasselijke opties aan.

- ☐ Plek om fruit en/of groenten te verbouwen
- ☐ Zero-waste supermarkt
- ☐ Mogelijkheden tot afvalscheiding in woning
- ☐ Mogelijkheden tot afvalscheiding in woongebouw
- ☐ Composteersysteem in de woning
- ☐ Composteersysteem in woongebouw
- ☐ Composteersysteem in tuin / balkon
- ☐ Opvangen regenwater
- ☐ Opvangen bad-/douchewater
- ☐ Zero-waste meubulair
- ☐ Zero-waste keukeninrichting
- ☐ Zero-waste sanitaire voorzieningen
- ☐ Hernieuwbare energie (zoals zonnepanelen, warmtepomp, etc.)
- ☐ Anders: _____

14. **Ik loop verder nog aan tegen de volgende dingen aan (niet verplicht)**

Woonvorm

15. **In hoeverre bent u bereid om kleiner te wonen dan uw huidige woning indien u hiermee een zero-waste leefstijl bevordert?**
Markeer slechts één ovaal.

	1	2	3	4	5	
Helemaal niet	◯	◯	◯	◯	◯	Helemaal wel

16. **Zou u bereid zijn de volgende ruimtes te delen met omwonenden om zo een zero-waste leefstijl te bevorderen?**
Vink alle toepasselijke opties aan.

- [ ] Keuken
- [ ] Badkamer
- [ ] Woonkamer
- [ ] Tuin / balkon
- [ ] Wasruimte (gedeelde wasmachines)
- [ ] Garage of berging
- [ ] Moestuin
- [ ] Anders: _____

17. **Ik heb liever een eigen keuken met alle gemakken voorzien in mijn woning, dan een eigen kleine pantry en een gedeelde grotere keuken in het woongebouw**
Markeer slechts één ovaal.

	1	2	3	4	5	
Helemaal niet	◯	◯	◯	◯	◯	Helemaal wel

18. **Ik heb liever een eigen tuin/balkon, dan een gemeenschappelijke tuin/dakterras**
Markeer slechts één ovaal.

	1	2	3	4	5	
Helemaal niet	◯	◯	◯	◯	◯	Helemaal wel

APPENDIX I

19. **Ik ben bereid om zo veel mogelijk zelfvoorzienend te leven**
Markeer slechts één ovaal.

	1	2	3	4	5	
Helemaal niet	◯	◯	◯	◯	◯	Helemaal wel

20. **In hoeverre spreekt het concept van een tiny house u aan?**
Markeer slechts één ovaal.

	1	2	3	4	5	
Helemaal niet	◯	◯	◯	◯	◯	Helemaal wel

21. **In hoeverre spreekt het concept van een tiny house in hoogbouw u aan?**
Markeer slechts één ovaal.

	1	2	3	4	5	
Helemaal niet	◯	◯	◯	◯	◯	Helemaal wel

Wooninrichting

22. **In hoeverre bent u bereid om een woning te betrekken waarbij een zero-waste interieur m.b.t. de sanitaire voorzieningen is ingebouwd?**
Markeer slechts één ovaal.

	1	2	3	4	5	
Helemaal niet	◯	◯	◯	◯	◯	Helemaal wel

23. **In hoeverre bent u bereid om een woning te betrekken waarbij een zero-waste interieur m.b.t. de keuken is ingebouwd?**
Markeer slechts één ovaal.

	1	2	3	4	5	
Helemaal niet	◯	◯	◯	◯	◯	Helemaal wel

24. **In hoeverre bent u bereid om een woning te betrekken waarbij een zero-waste interieur m.b.t. het meubilair is ingebouwd?**
Markeer slechts één ovaal.

	1	2	3	4	5	
Helemaal niet	◯	◯	◯	◯	◯	Helemaal wel

25. **In hoeverre zou u bereid zijn om meubilair te huren?**
Markeer slechts één ovaal.

	1	2	3	4	5	
Helemaal niet	◯	◯	◯	◯	◯	Helemaal wel

26. **In hoeverre zou u bereid zijn om apparatuur te huren? (zoals tv, witgoed, keukenapparatuur, etc)**
Markeer slechts één ovaal.

	1	2	3	4	5	
Helemaal niet	◯	◯	◯	◯	◯	Helemaal wel

27. **Ik ben bereid de volgende keukenapparatuur te delen met omwonenden (in bijvoorbeeld een gemeenschappelijke keuken)**
Vink alle toepasselijke opties aan.

- [ ] Koffiezetapparaat
- [ ] Waterkoker
- [ ] Magnetron
- [ ] Oven
- [ ] Vaatwasser
- [ ] Koelkast
- [ ] Vriezer
- [ ] Anders: _____

Omgevingsbehoeften

28. **Bij voorkeur reis ik met het openbaar vervoer**
Markeer slechts één ovaal.

	1	2	3	4	5	
Helemaal niet	◯	◯	◯	◯	◯	Helemaal wel

29. **Ik ben voor het concept van deelfietsen**
Markeer slechts één ovaal.

	1	2	3	4	5	
Helemaal niet	◯	◯	◯	◯	◯	Helemaal wel

30. **Ik ben voor het concept van deelauto's**
Markeer slechts één ovaal.

	1	2	3	4	5	
Helemaal niet	◯	◯	◯	◯	◯	Helemaal wel

31. **In hoeverre heeft u behoefte aan een eigen tuin / balkon**
Markeer slechts één ovaal.

	1	2	3	4	5	
Helemaal niet	◯	◯	◯	◯	◯	Helemaal wel

APPENDIX I

32. **In hoeverre heeft u behoefte aan een gemeenschappelijke tuin / balkon**
Markeer slechts één ovaal.

	1	2	3	4	5	
Helemaal niet	◯	◯	◯	◯	◯	Helemaal wel

33. **In hoeverre heeft u behoefte aan een eigen moestuin?**
Markeer slechts één ovaal.

	1	2	3	4	5	
Helemaal niet	◯	◯	◯	◯	◯	Helemaal wel

34. **In hoeverre heeft u behoefte aan een gemeenschappelijke moestuin?**
Markeer slechts één ovaal.

	1	2	3	4	5	
Helemaal niet	◯	◯	◯	◯	◯	Helemaal wel

35. **In hoeverre heeft u behoefte aan een zero-waste supermarkt op loopafstand?**
Markeer slechts één ovaal.

	1	2	3	4	5	
Helemaal niet	◯	◯	◯	◯	◯	Helemaal wel

36. **In hoeverre heeft u behoefte aan een ingebouwd systeem om afval te scheiden in uw woning?**
Markeer slechts één ovaal.

	1	2	3	4	5	
Helemaal niet	◯	◯	◯	◯	◯	Helemaal wel

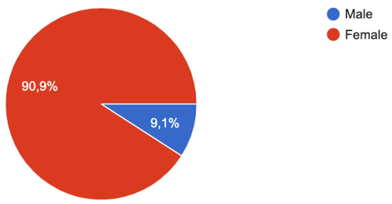
37. **In hoeverre heeft u behoefte aan een ingebouwd systeem om afval te scheiden in uw woongebouw (indien van toepassing)**
Markeer slechts één ovaal.

	1	2	3	4	5	
Helemaal niet	◯	◯	◯	◯	◯	Helemaal wel

Aanvullingen

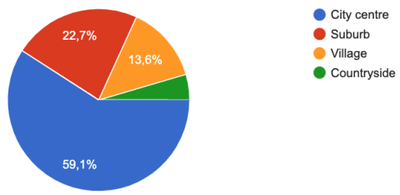
Gender

22 antwoorden



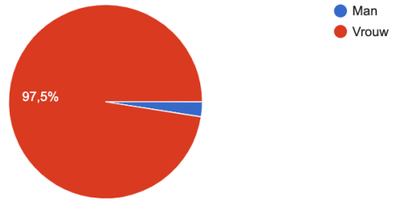
Living environment

22 antwoorden



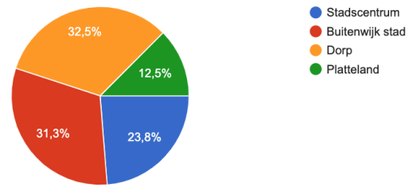
Geslacht

80 antwoorden



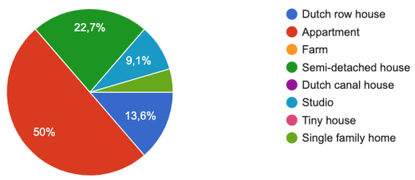
Woonomgeving

80 antwoorden



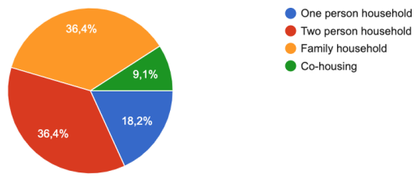
Current house

22 antwoorden



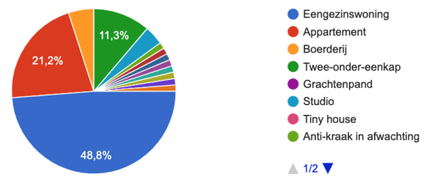
Family composition

22 antwoorden



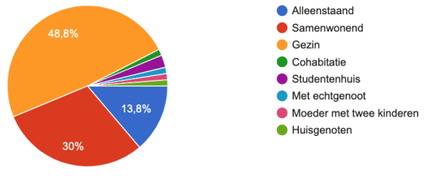
Huidige woning

80 antwoorden



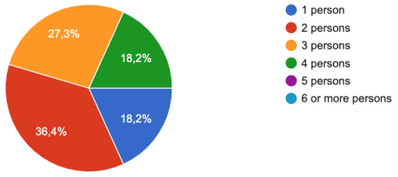
Gezinssamenstelling

80 antwoorden



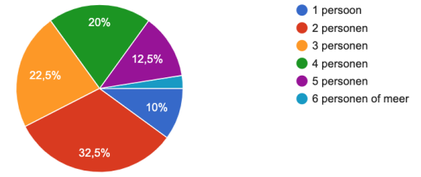
Current composition of the house

22 antwoorden



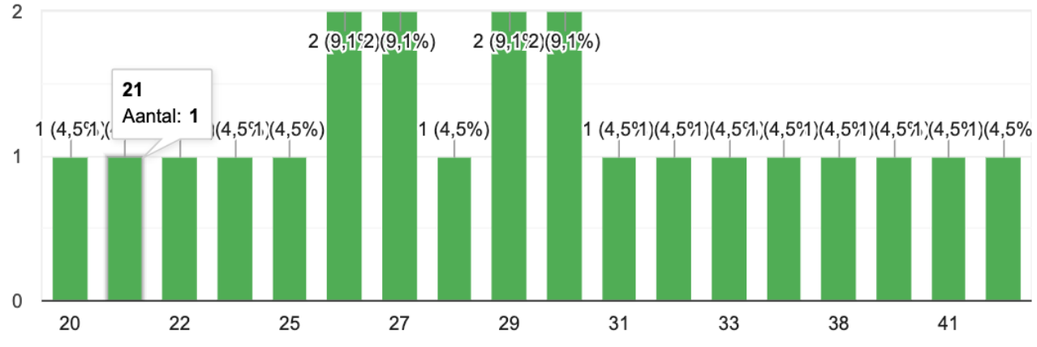
Huidige samenstelling woning

80 antwoorden



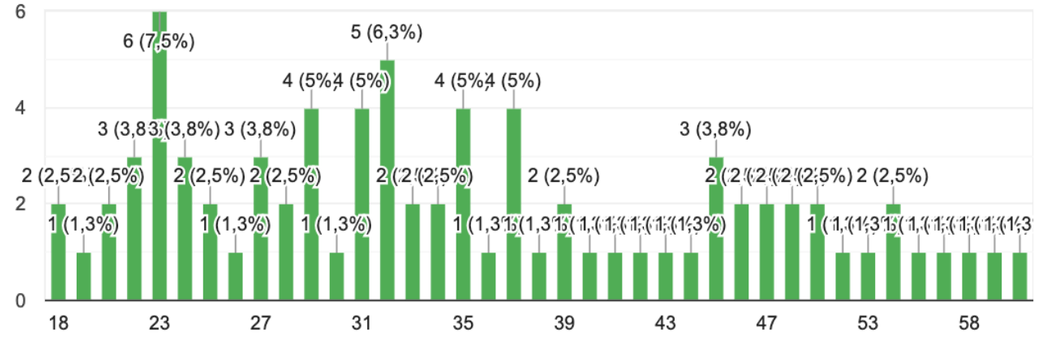
Age

22 antwoorden



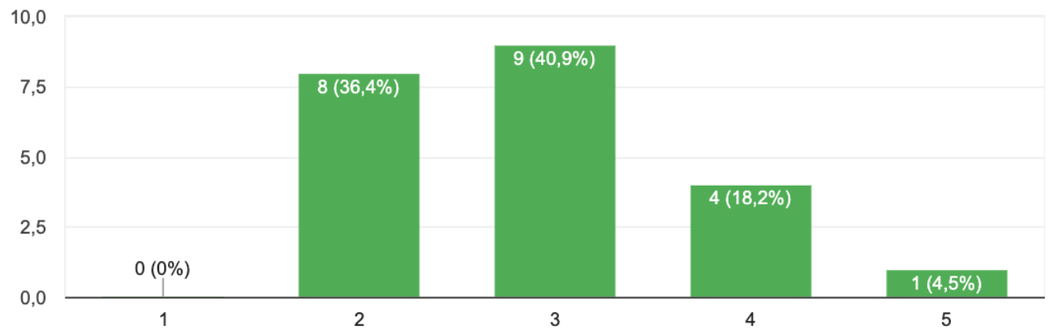
Leeftijd

80 antwoorden



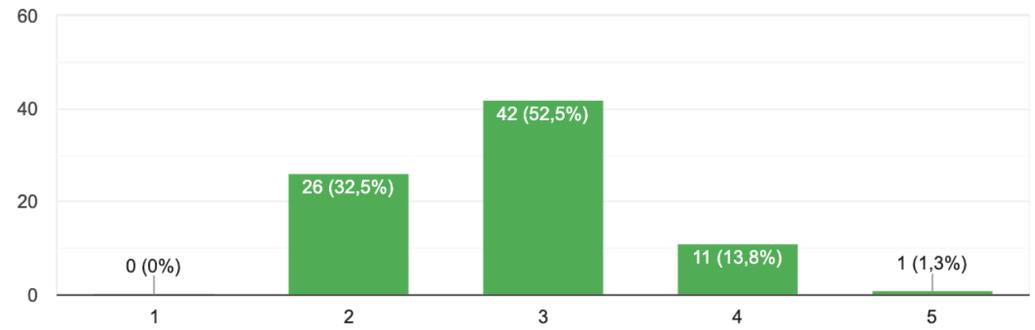
How many trash do you produce?

22 antwoorden



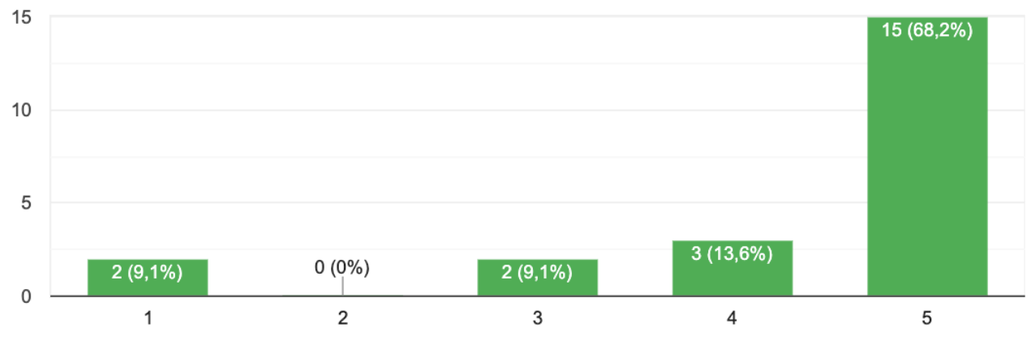
Hoeveel afval produceert u?

80 antwoorden



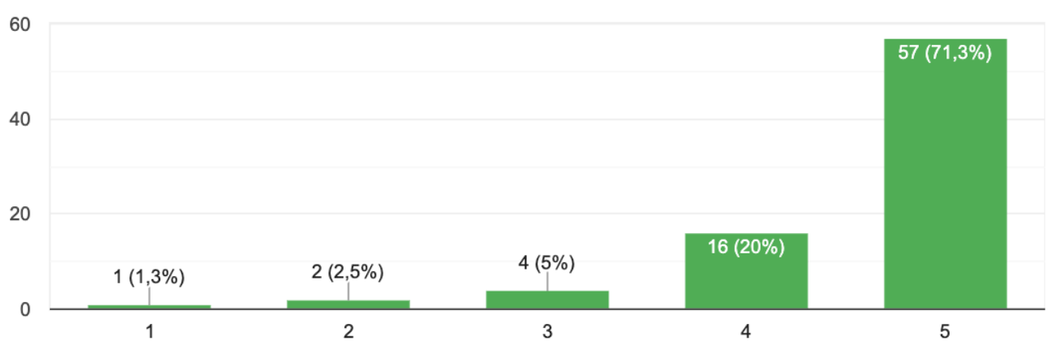
I separate my own trash

22 antwoorden



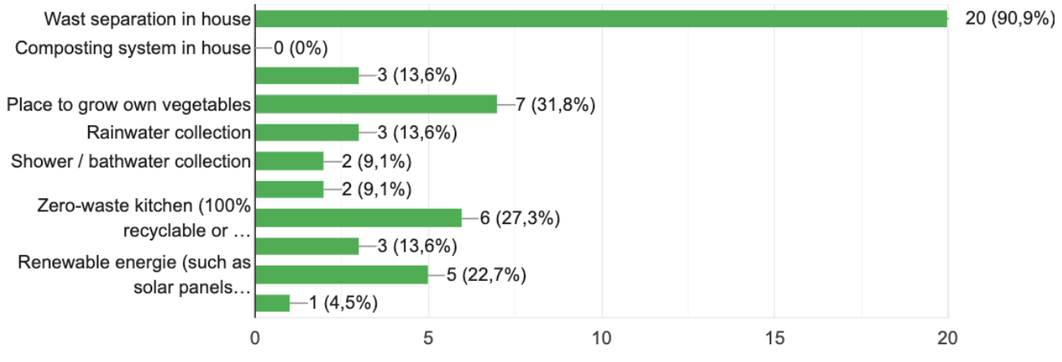
Ik scheid mijn eigen afval

80 antwoorden



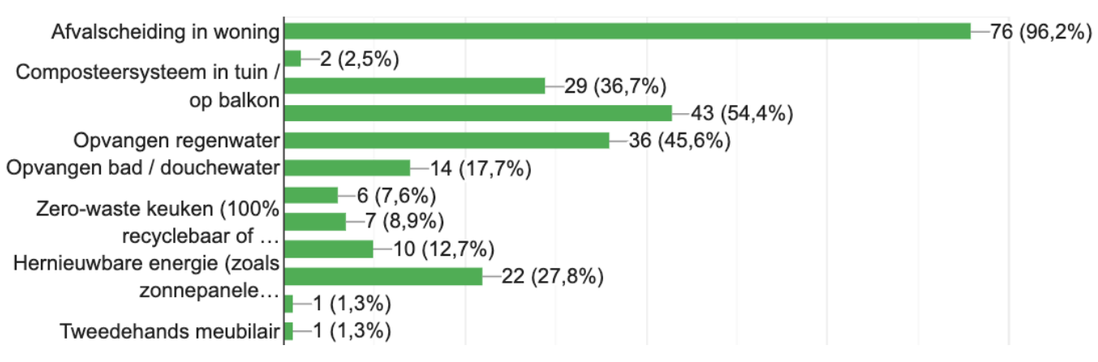
I have taken the following measures in my home to promote my zero-waste lifestyle:

22 antwoorden



De volgende maatregelen heb ik getroffen in mijn woning om mijn zero-waste lifestyle te bevorderen:

79 antwoorden



Furthermore, I have taken the following measures in my home to promote my zero-waste lifestyle (not compulsory)

9 antwoorden

Reducing food waste and creating zero waste alternatives (cloth paper towels)
Plastic free
changed doors to increase light into the house and reduce turning on lights
Using reusable bags to shop. Bring my own containers to the stores when I can. Drastically reduce my consumption of goods that comes in plastic.
Cloth diapers, napkins, norwex cleaning rags (no chemicals), reusable bags, Family cloth, hang dry clothes
Washable nappys, shampoo/soap bars, shopping package free when I can. Second hand furniture
Less waste shopping- I try to buy products without packages or in glass/paper,I use reusable boxes for lunch, coffe mug, I use menstruation cup instead of pads and special towel to remove make up instead of cotton pads, try to but cosmetics without packages - soap instead shower gel, in general I but less cosmetics, I made my own from the kitchen products like peeling from coffee and olive oil etc, also for cleaning I trtu to use only vinegar, baking soda, essential oils
Jar shopping, home made stuff
Buying less stuff

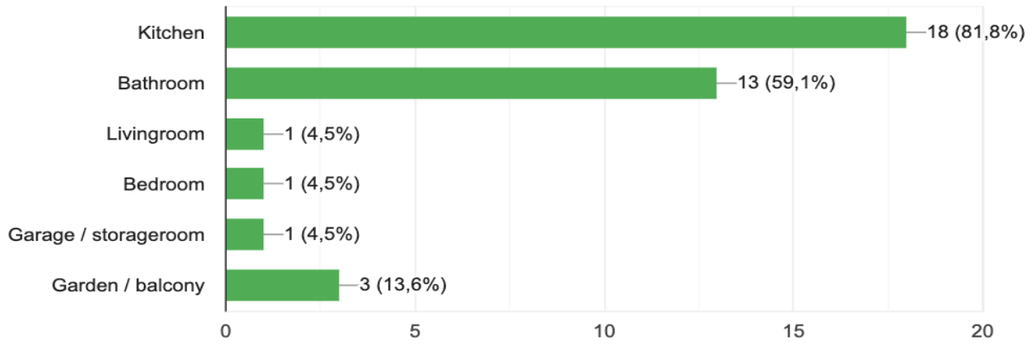
Verder heb ik nog de volgende maatregelen genomen in mijn woning om mijn zero-waste lifestyle te bevorderen (niet verplicht)

25 antwoorden

Extra isolatie
Verpakkingsvrije producten (groenten, maar ook shampoo oid). Verder maak ik zelf mijn eigen sausen voor bij eten ipv uit pot (scheelt productie).
Ik let veel op voeding en kleding
Ontspullen/minimaliseren
Herbruikbare boodschappentassen, eigen bakje meenemen naar slager, eigen herbruikbare drinkfles (rvs)
Isolatie, 2e hands bouwmaterialen gebruikt
extra opbergruimte voor alle herbruikbare bakjes/potjes/flessen in de keuken
Geen
Veel ‘ouderwetse’ wasbare en herbruikbare zaken
Wij hebben bijna alle meubels tweedehands. Overbodige artikelen verkopen wij of geven wij weg aan iemand die dit goed kan gebruiken. Door handicap is niet alles zero-waste toe te passen, maar ook hier proberen wij zo zuinig mogelijk te zijn.
Wc doorspoelen met douchewater
Net begonnen met deze levensstijl dus willen nog wel maatregelen gaan nemen
Bewust boodschappen doen, wasbaar maandverband/luiers
Boodschappen zo zero-waste mogelijk doen, vegetarisch en vaak veganistisch eten
Zoveel mogelijk op de markt halen met eigen doosjes en zakjes en dingen zelf maken
hervulbare koffiecups, wasbaar maandverband, groente/broodzakjes
Geen alu of plastiek folies meer, herbruikbare zakjes, Too good to go,...
Tweedehands meubilair
Niet verbouwen, overnemen keuken, badkamer, vloer ed vorige bewoner
Hergebruik van zoveel mogelijk, bv kleding
We kopen bijna alles tweedehands
Besparende douchekop
Hoge isolatie van wanden en dak en plaatsen van tripleglas. Oude ramen worden herbruikt in de wagenberging en voor een koude kas. Plaatsen van zonneboiler, wtwunit en douchewtw (warm afvalwater verwarmt koud water zodat er minder water verwarmt hoeft te worden).
Producten in bulk kopen, zelf in glas verpakken. Led lampen. Duurzame materialen (zoveel mogelijk) zoals hout, bamboe.

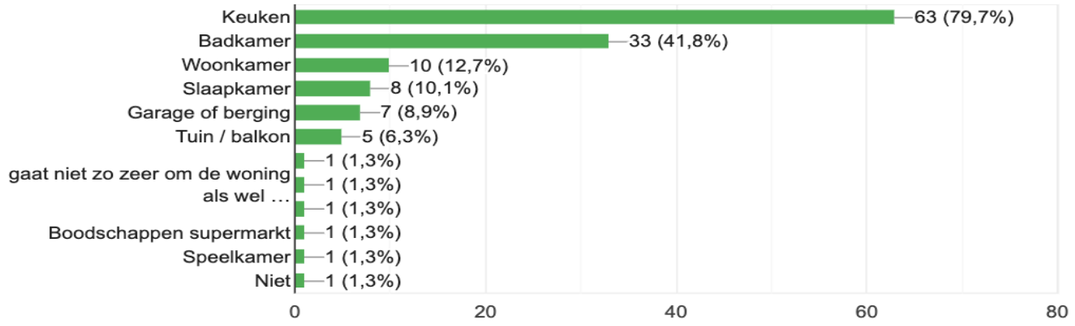
In the next room or rooms I encounter the most challenges with regard to a zero-waste lifestyle

22 antwoorden



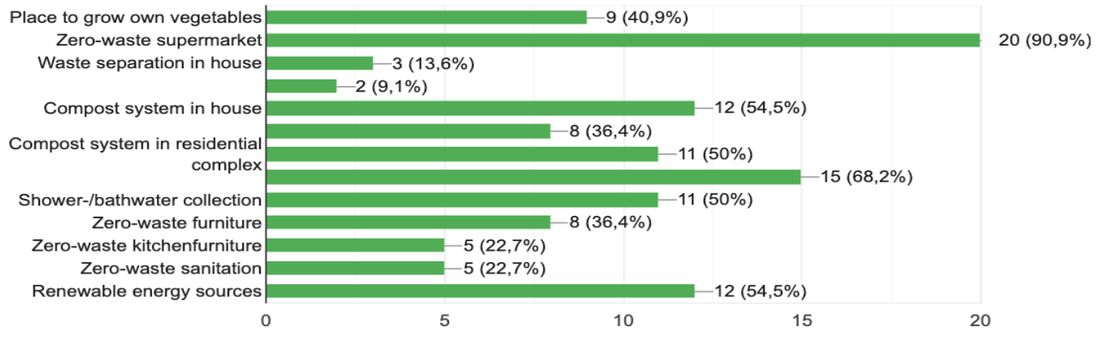
In de volgende ruimte loop ik het meest tegen uitdagingen m.b.t. een zero-waste leefstijl aan

79 antwoorden



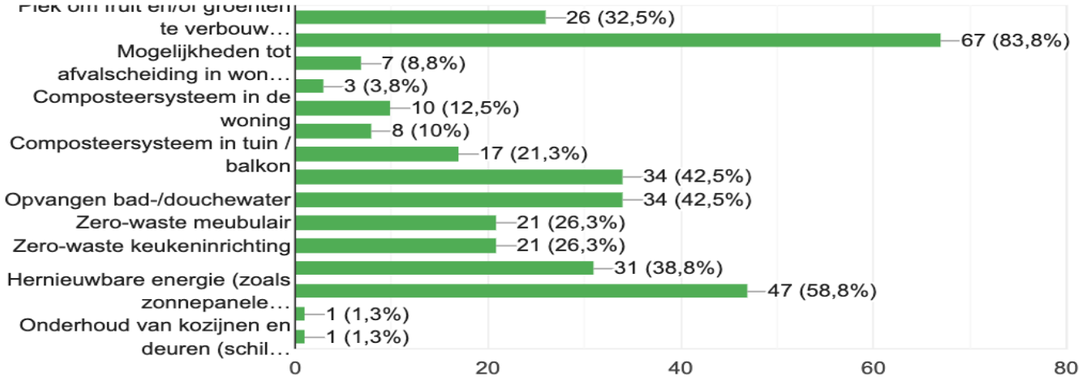
I miss the following elements in my current home or environment to live the zero-waste lifestyle

22 antwoorden



De volgende elementen mis ik in mijn huidige woning of omgeving

80 antwoorden



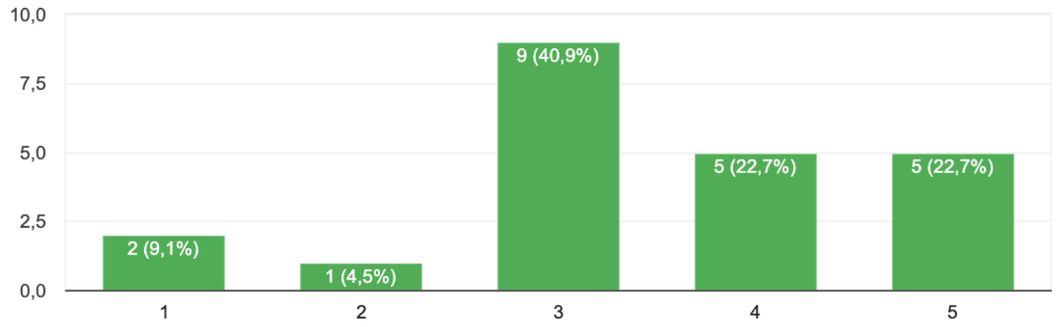
Ik loop verder nog aan tegen de volgende dingen aan (niet verplicht)

17 antwoorden

Mijn huisgenoten verspillen meer dan ik.
We zijn een keuken aan het zoeken, het enige zero waste is dan tweedehands.
alle spullen die via de kinderen stiekem toch het huis in komen
Online bestellingen die vaak met onnodig veel verpakking (papier en plastic) geleverd worden (niet echt huisgerelateerd)
We wonen erg afgelegen, dus grote afstanden en bijna geen ov helaas
We weten niet of we hier willen blijven wonen waardoor er niet geïnvesteerd wordt voor milieu bewuste dinge zoals sedum dak etc
Veeel plastic verpakkingen
Kinderen (traktaties, cadeautjes, etc)
Dit huis is niet geschikt voor zonne energie. Wel zouden wij wind energie kunnen omzetten, het ontbreken van goede faciliteiten voor particulieren maakt dit helaas nog niet mogelijk.
Ik wil zoveel mogelijk zero waste maar mijn zonen (19 en 21) zijn nog niet overtuigd om geheel over te stappen. Te grote verleidingen voor snoep, snack en vlees voor hen.
Gewoon die zero waste winkel!!!!!!😍
Mensen van hogere leeftijd motiveren
Kosten die het met zich meebrengt om zo milieu bewust mogelijk te leven
Ik probeer met de middelen die ik tot mijn beschikken heb een bijdrage te leveren.
Het is allemaal zo duur. Voor mensen met minder te besteden, maar wel de wil hebben, Is het soms erg lastig.
Ik kan niks veranderen want het is een huurwoning
Huis is van wbv, staan niet open voor zero waste inrichting mbt sanitair, keuken en zonnepanelen

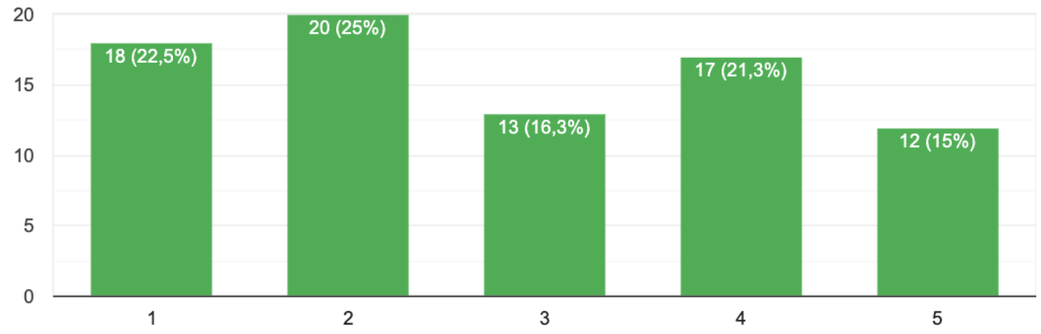
To what extent are you willing to live smaller than your current home if you thereby promote a zero-waste lifestyle?

22 antwoorden



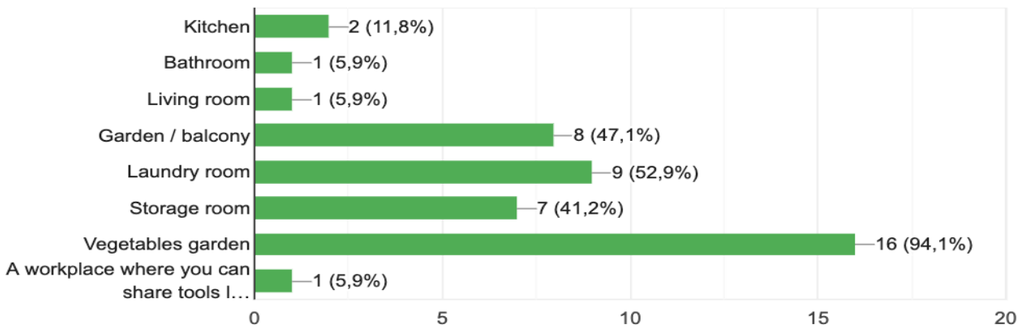
In hoeverre bent u bereid om kleiner te wonen dan uw huidige woning indien u hiermee een zero-waste leefstijl bevordert?

80 antwoorden



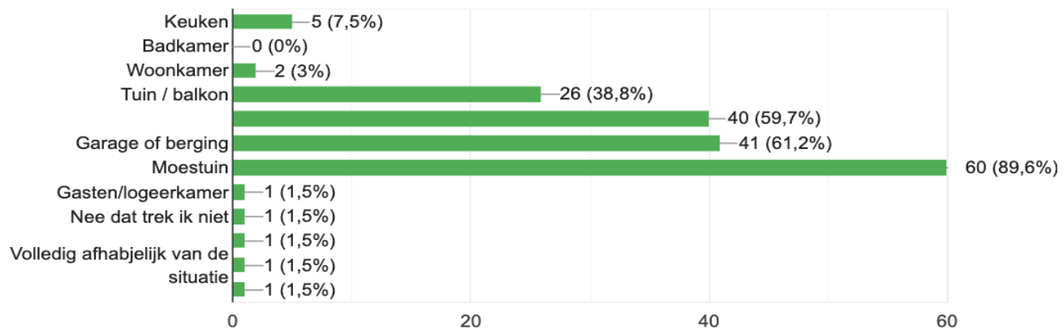
Would you be willing to share the following spaces with local residents in order to promote a zero-waste lifestyle?

17 antwoorden



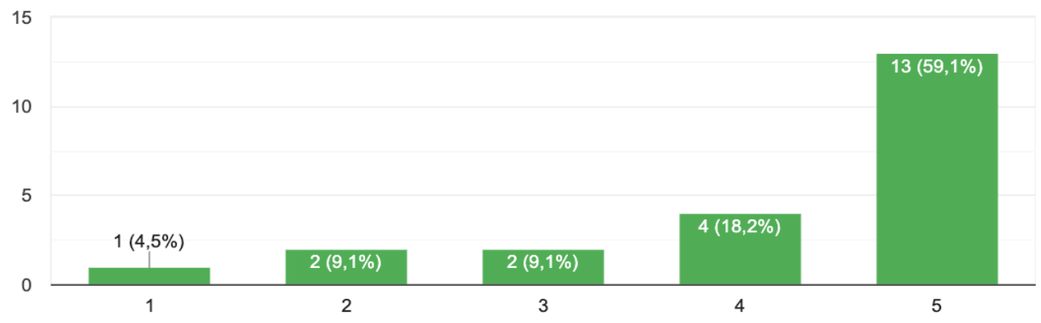
Zou u bereid zijn de volgende ruimtes te delen met omwonenden om zo een zero-waste leefstijl te bevorderen?

67 antwoorden



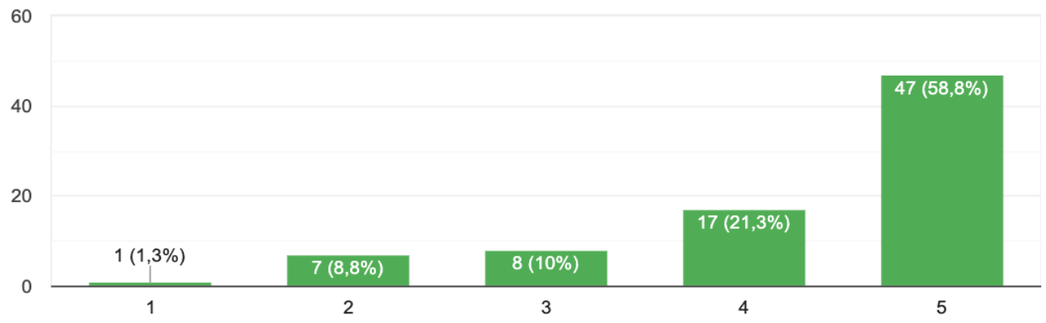
I would rather have my own kitchen with all mod cons in my home, than my own small pantry and a shared larger kitchen in the residential building

22 antwoorden



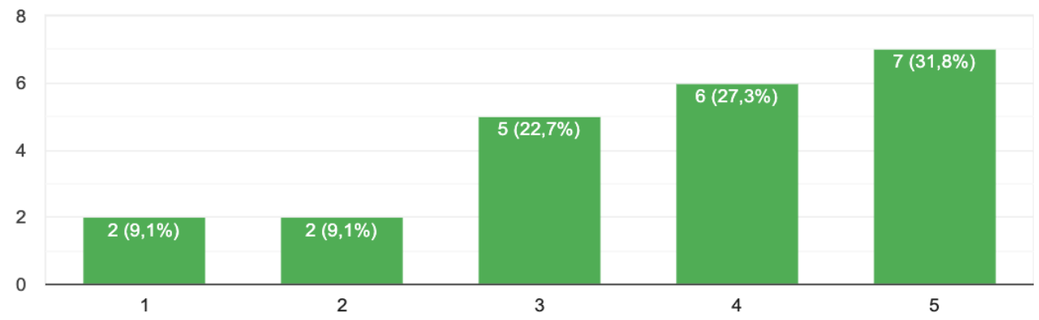
Ik heb liever een eigen keuken met alle gemakken voorzien in mijn woning, dan een eigen kleine pantry en een gedeelde grotere keuken in het woongebouw

80 antwoorden



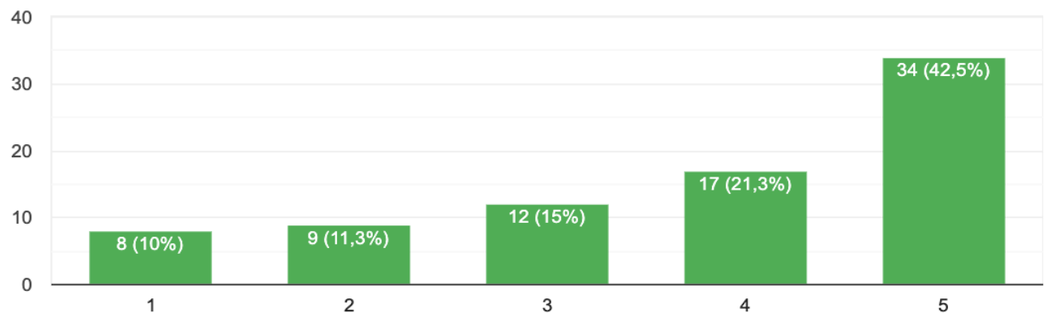
I prefer a private garden / balcony than a communal garden / roof terrace

22 antwoorden



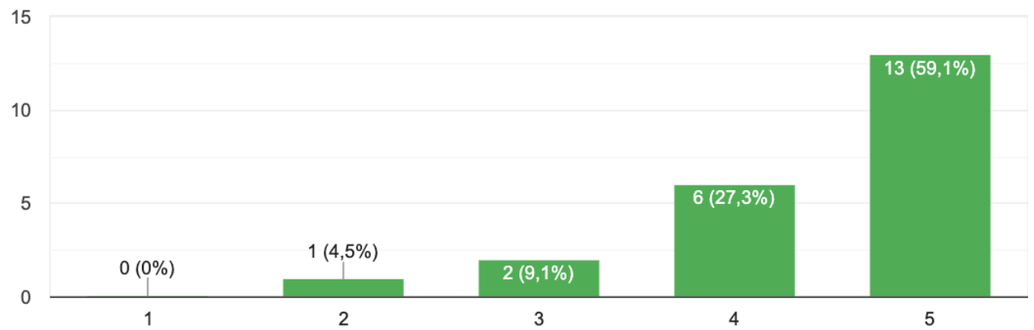
Ik heb liever een eigen tuin/balkon, dan een gemeenschappelijke tuin/dakterras

80 antwoorden



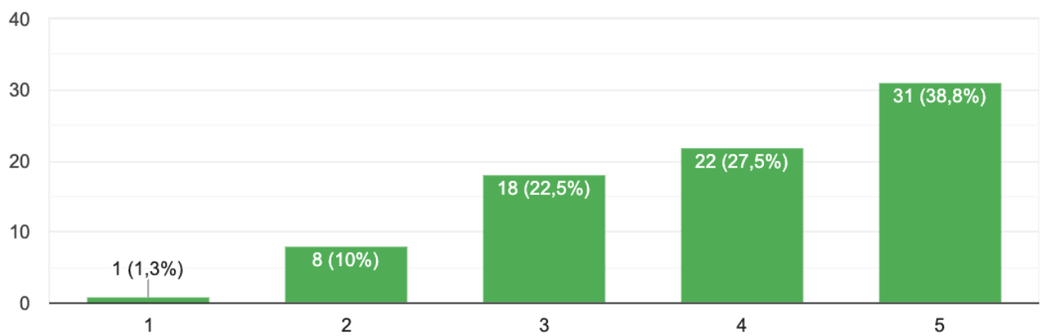
I am willing to live as self-sufficient as possible

22 antwoorden



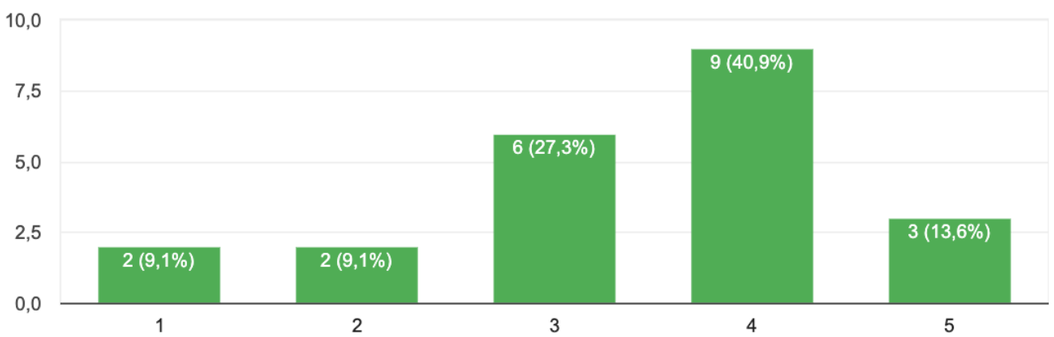
Ik ben bereid om zo veel mogelijk zelfvoorzienend te leven

80 antwoorden



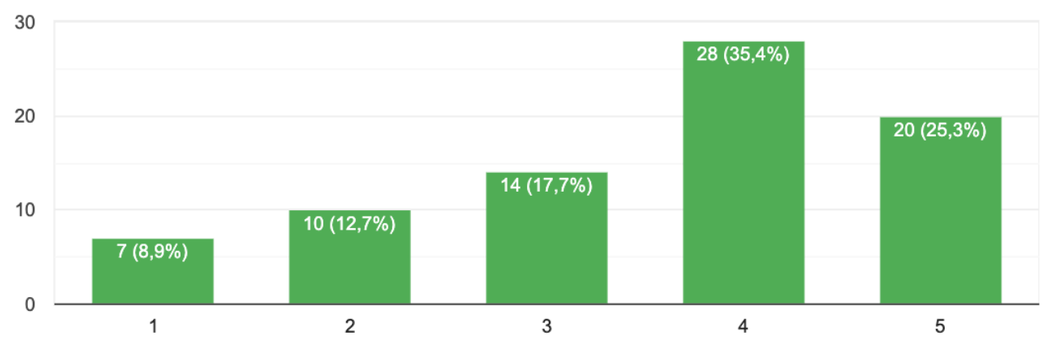
To what extent does the concept of a tiny house appeal to you?

22 antwoorden



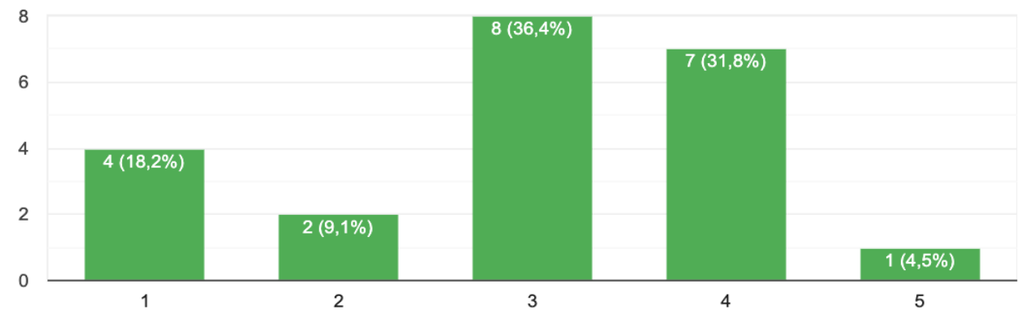
In hoeverre spreekt het concept van een tiny house u aan?

79 antwoorden



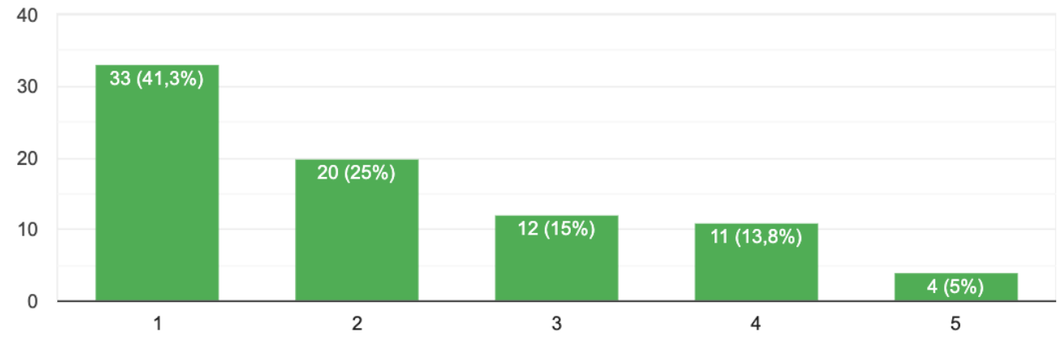
To what extent does the concept of a tiny house in high-rise buildings appeal to you?

22 antwoorden



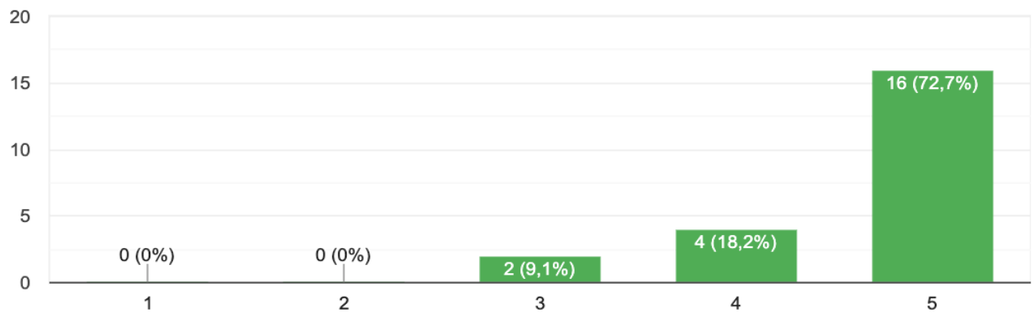
In hoeverre spreekt het concept van een tiny house in hoogbouw u aan?

80 antwoorden



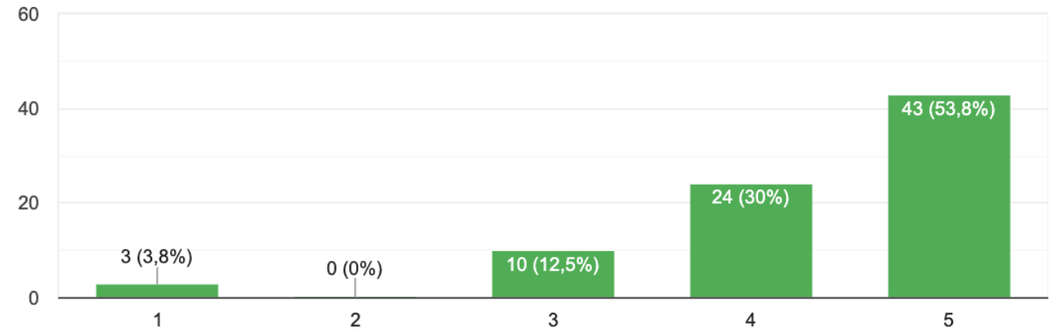
To what extent are you willing to move into a home where a zero-waste interior with regard to the sanitary facilities is built in?

22 antwoorden



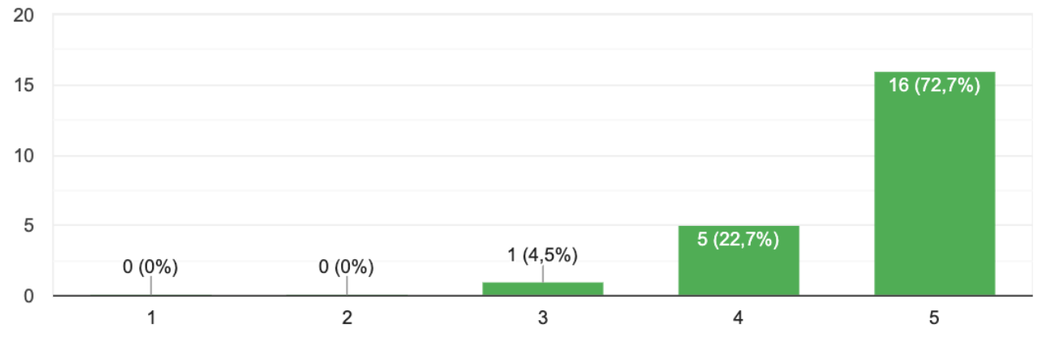
In hoeverre bent u bereid om een woning te betrekken waarbij een zero-waste interieur m.b.t. de sanitaire voorzieningen is ingebouwd?

80 antwoorden



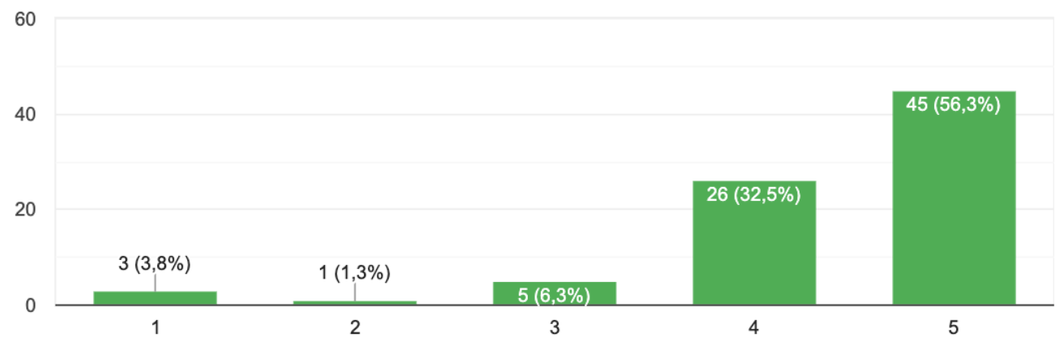
To what extent are you willing to move into a home where a zero-waste interior with regard to the kitchen is built in?

22 antwoorden



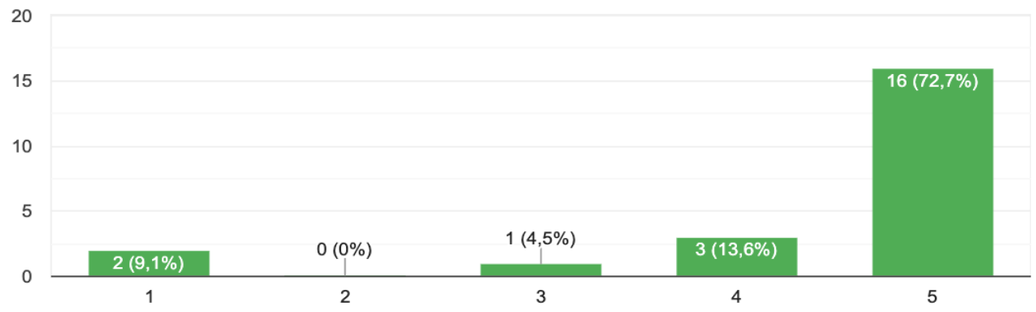
In hoeverre bent u bereid om een woning te betrekken waarbij een zero-waste interieur m.b.t. de keuken is ingebouwd?

80 antwoorden



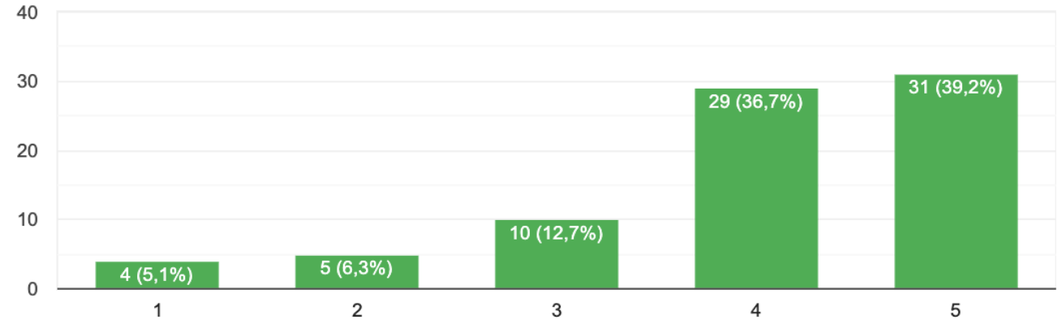
To what extent are you willing to move into a home where a zero-waste interior with regard to furniture is built in?

22 antwoorden



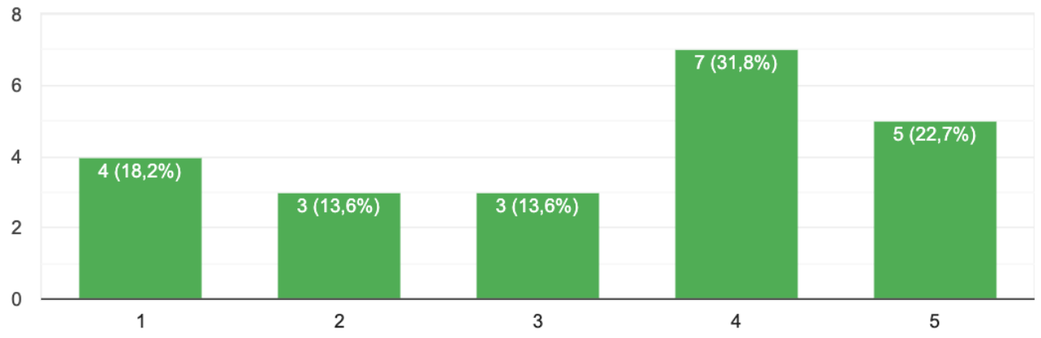
In hoeverre bent u bereid om een woning te betrekken waarbij een zero-waste interieur m.b.t. het meubilair is ingebouwd?

79 antwoorden



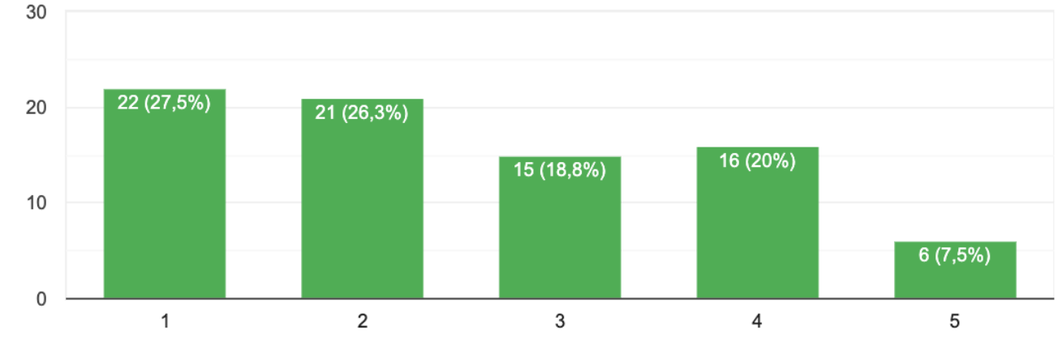
To what extent would you be willing to rent furniture?

22 antwoorden



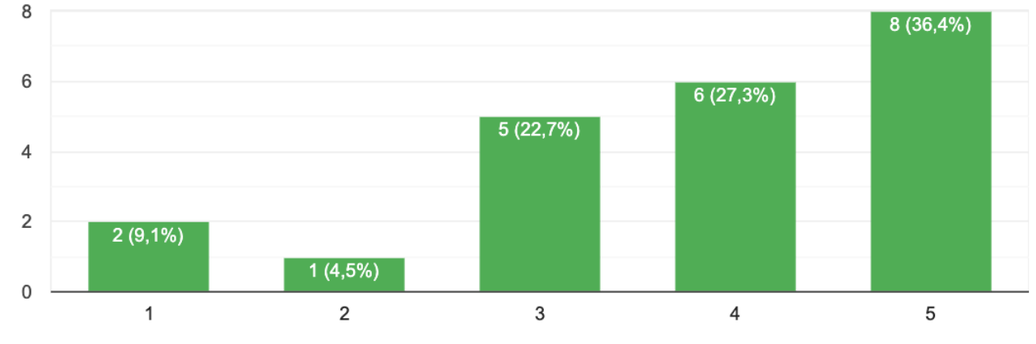
In hoeverre zou u bereid zijn om meubilair te huren?

80 antwoorden



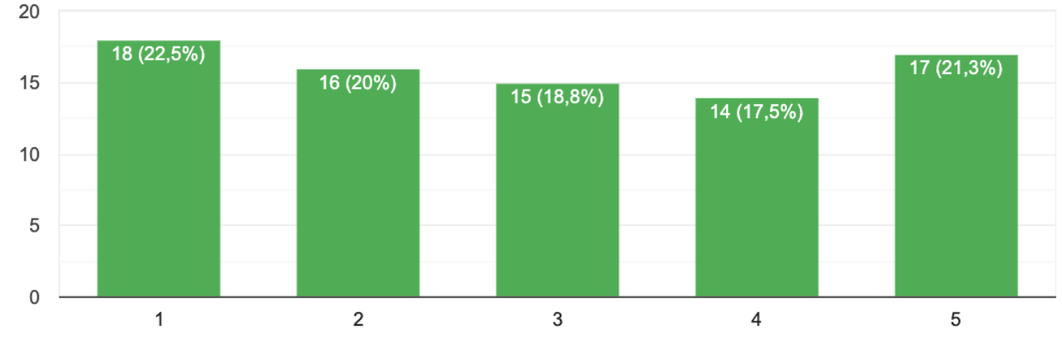
To what extent would you be willing to rent equipment? (such as TV, white goods, kitchen appliances, etc)

22 antwoorden



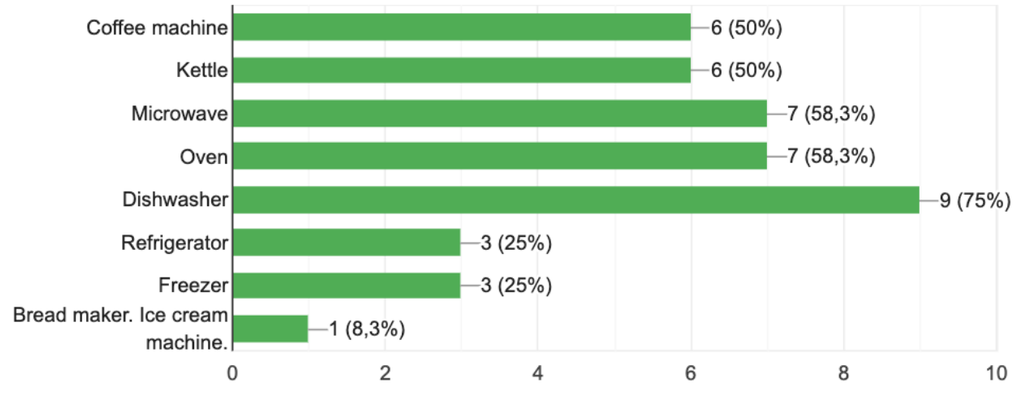
In hoeverre zou u bereid zijn om apparatuur te huren? (zoals tv, witgoed, keukenapparatuur, etc)

80 antwoorden



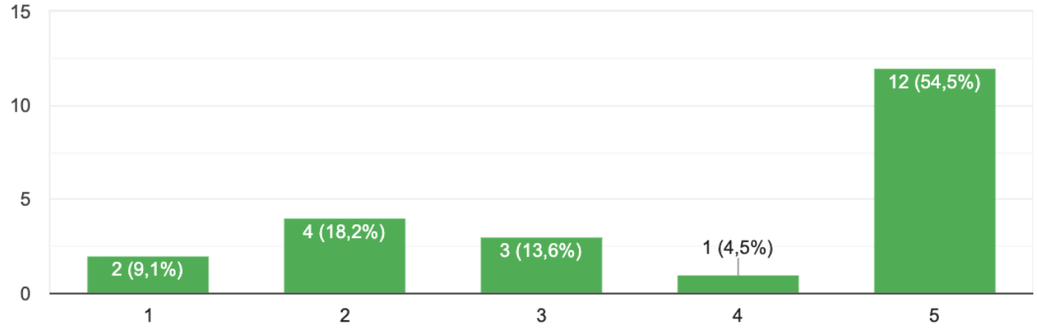
I am willing to share the following kitchen appliances with local residents (in a communal kitchen, for example)

12 antwoorden



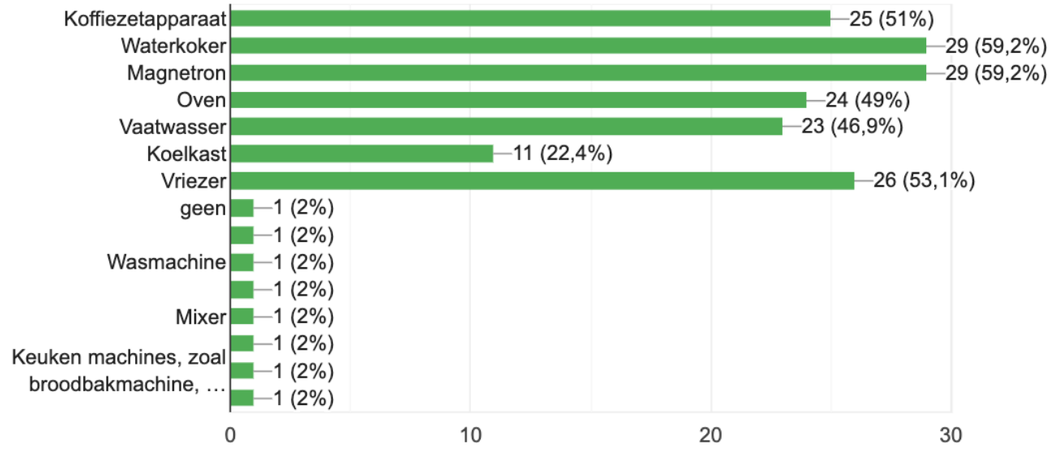
I prefer to travel by public transport

22 antwoorden



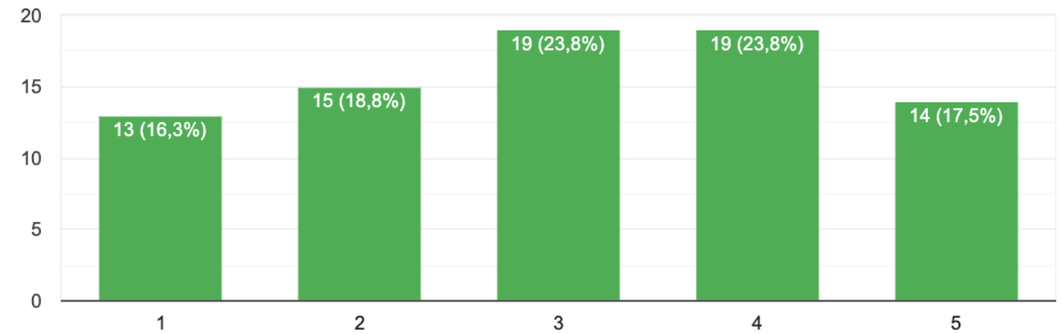
Ik ben bereid de volgende keukenapparatuur te delen met omwonenden (in bijvoorbeeld een gemeenschappelijke keuken)

49 antwoorden



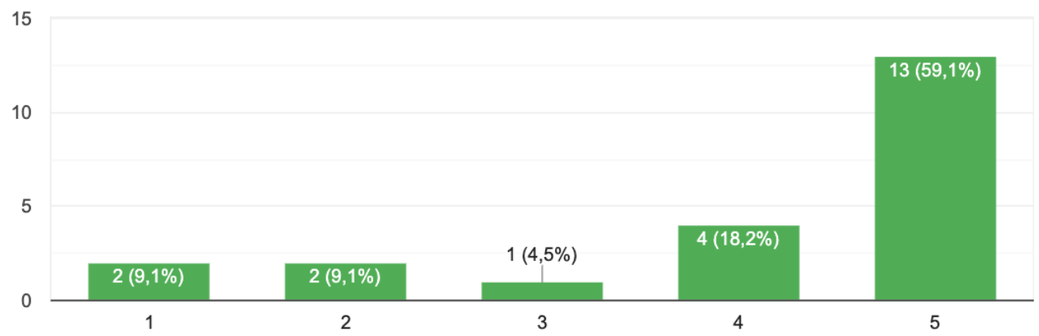
Bij voorkeur reis ik met het openbaar vervoer

80 antwoorden



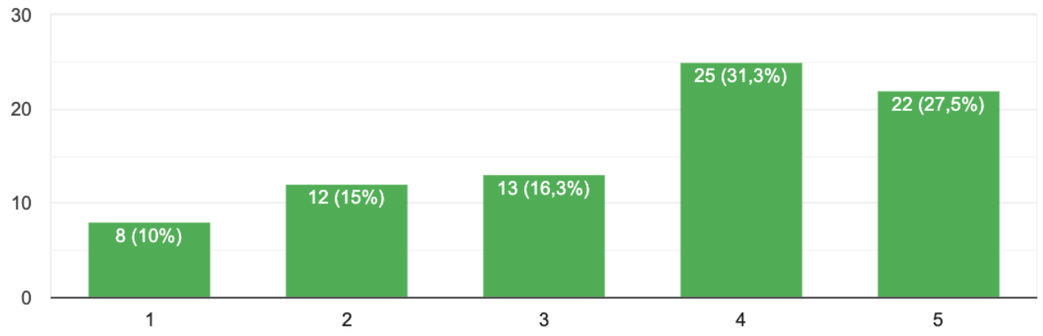
I am in favor of the concept of sharing bicycles

22 antwoorden



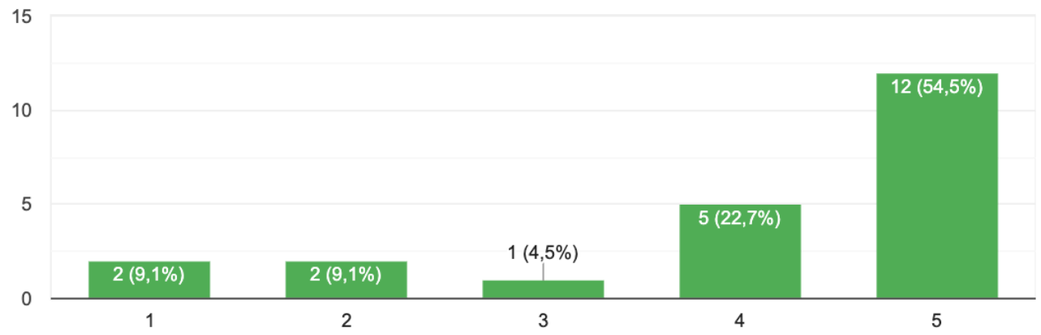
Ik ben voor het concept van deelfietsen

80 antwoorden



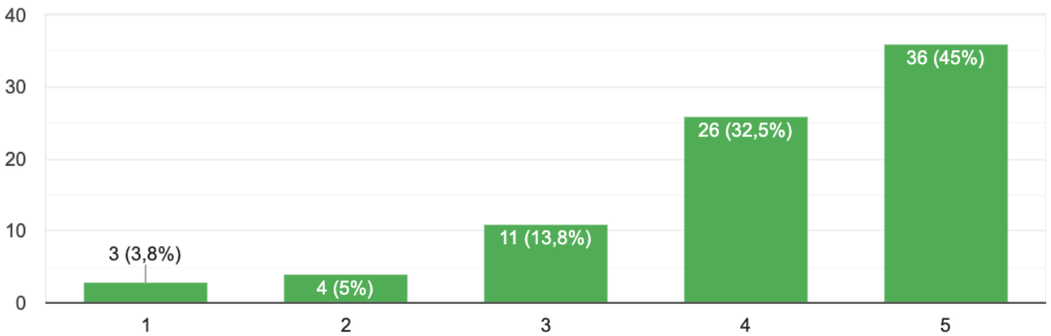
I am in favor of the concept of sharing cars

22 antwoorden



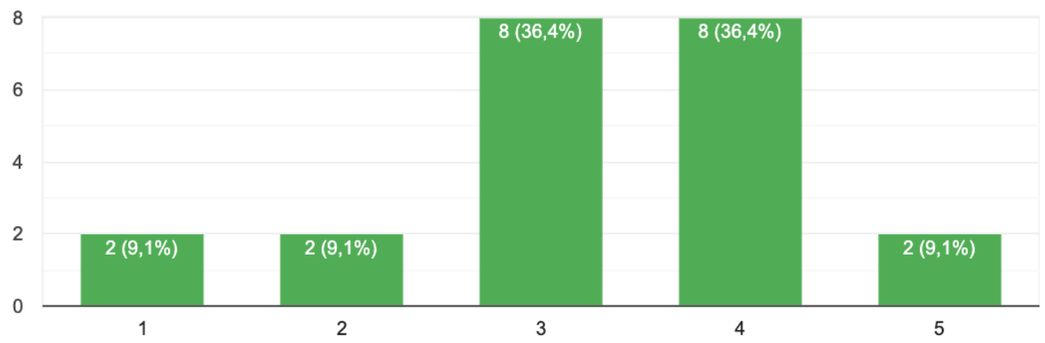
Ik ben voor het concept van deelauto's

80 antwoorden



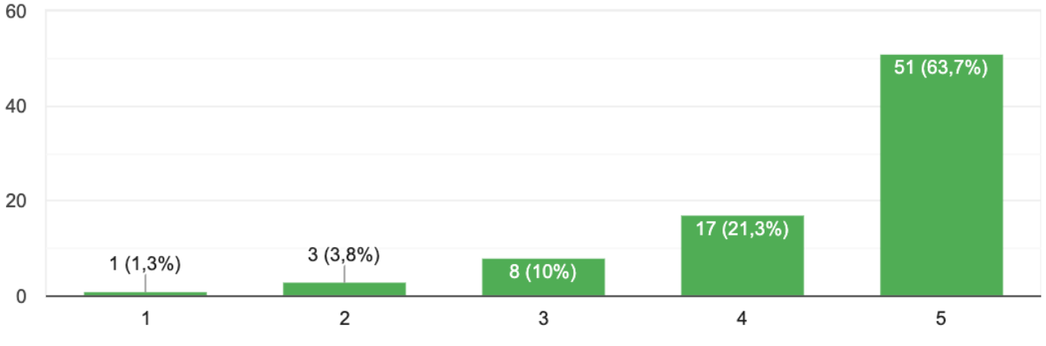
To what extent do you need a private garden / balcony

22 antwoorden



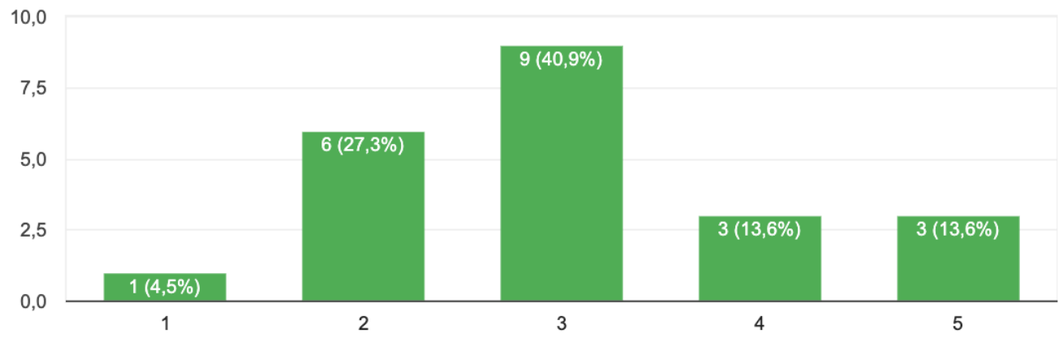
In hoeverre heeft u behoefte aan een eigen tuin / balkon

80 antwoorden



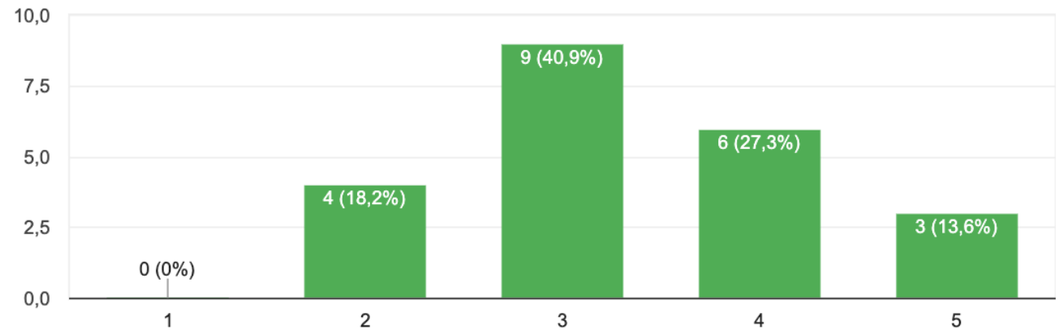
To what extent do you need a communal garden / balcony

22 antwoorden



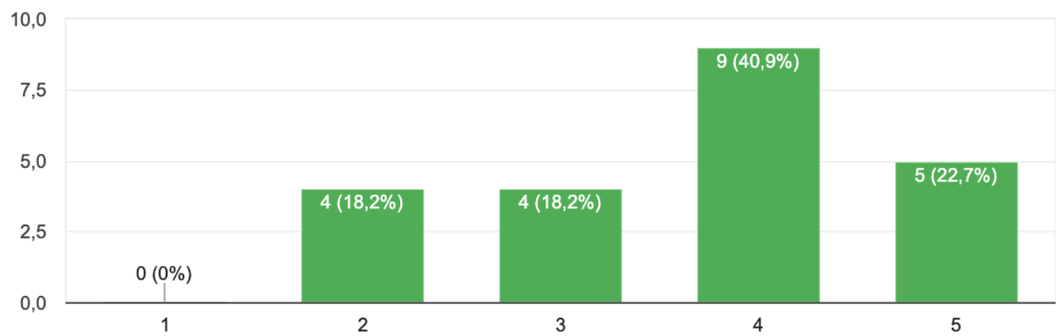
To what extent do you need your own vegetable garden?

22 antwoorden



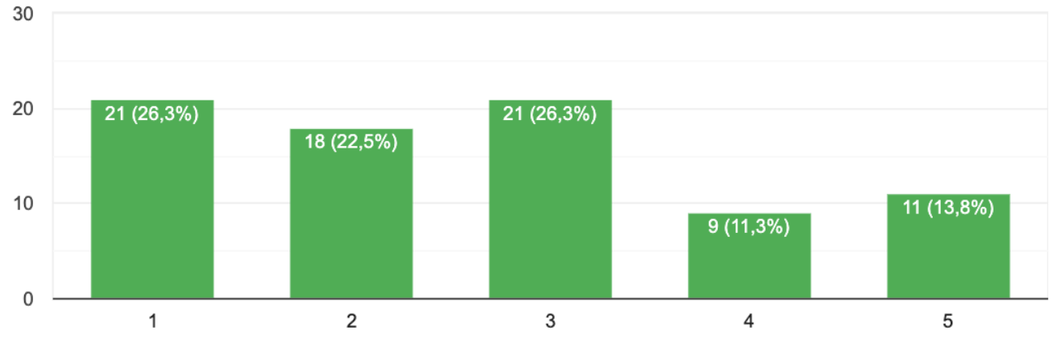
To what extent do you need a communal vegetable garden?

22 antwoorden



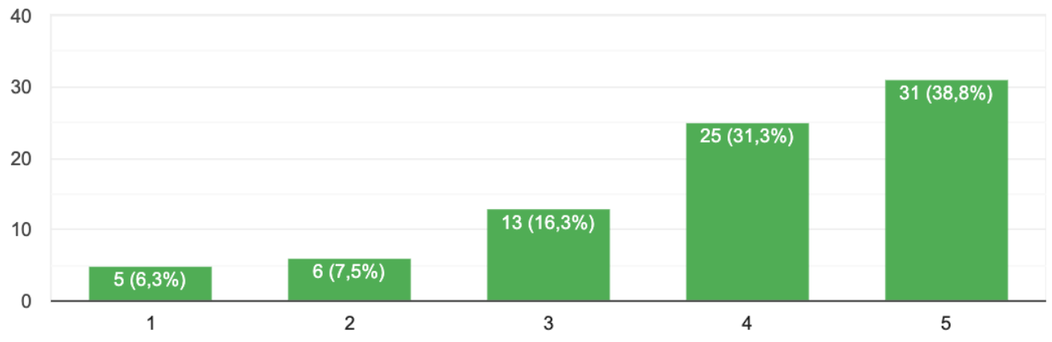
In hoeverre heeft u behoefte aan een gemeenschappelijke tuin / balkon

80 antwoorden



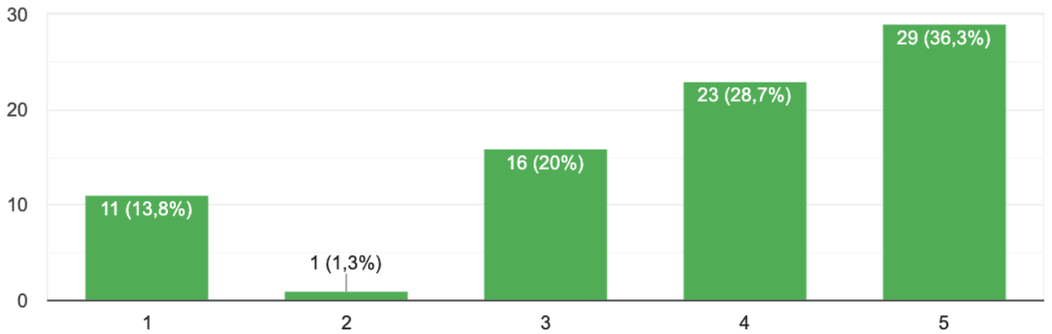
In hoeverre heeft u behoefte aan een eigen moestuin?

80 antwoorden



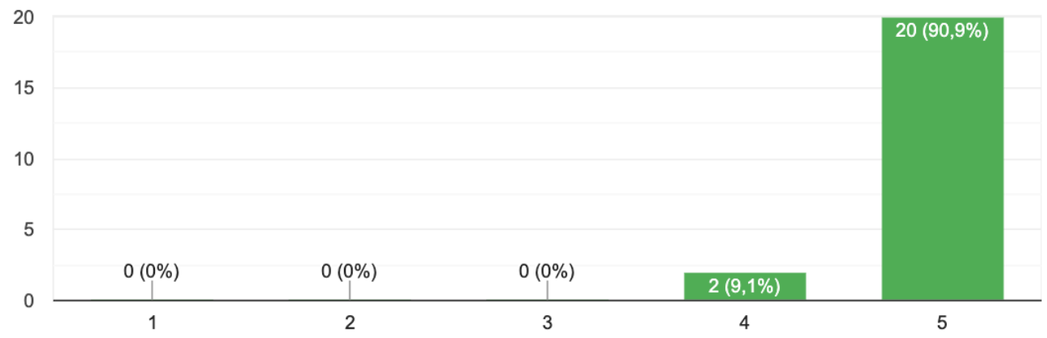
In hoeverre heeft u behoefte aan een gemeenschappelijke moestuin?

80 antwoorden



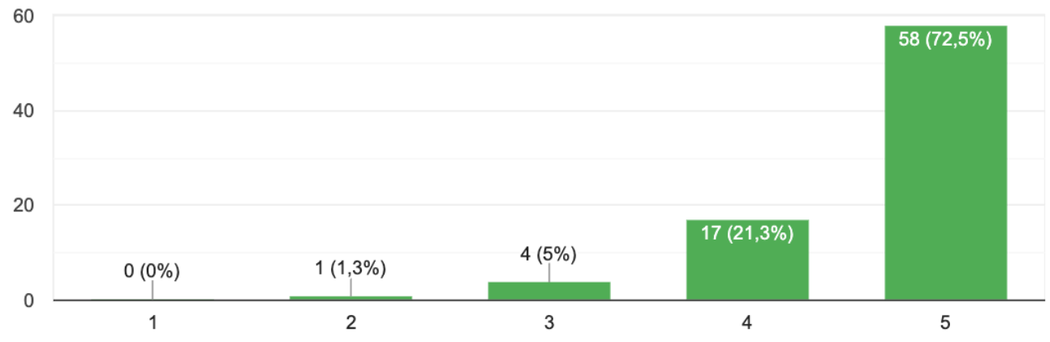
To what extent do you need a zero-waste supermarket within walking distance?

22 antwoorden



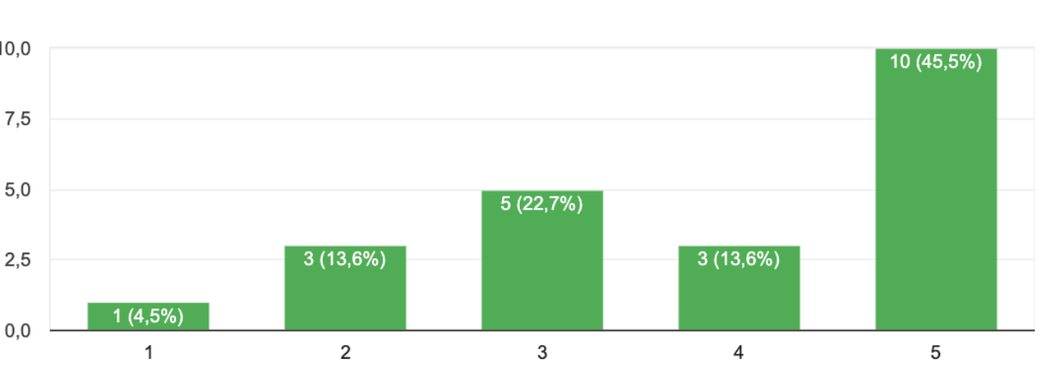
In hoeverre heeft u behoefte aan een zero-waste supermarkt op loopafstand?

80 antwoorden



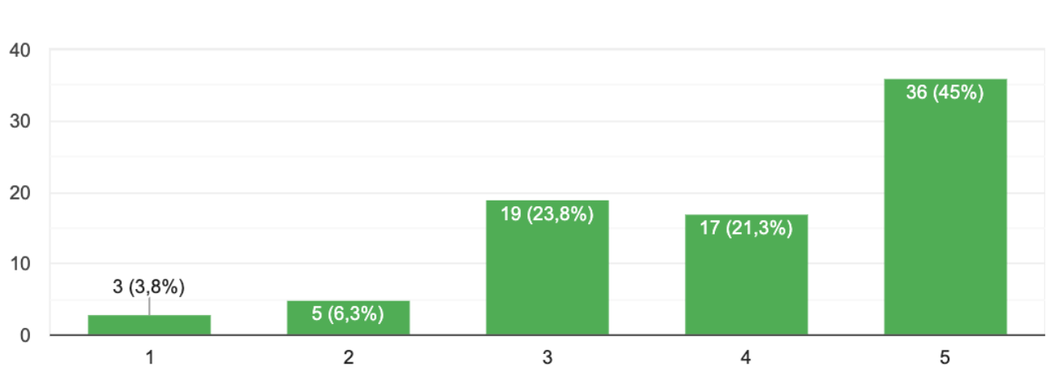
To what extent do you need a built-in system to separate waste in your home?

22 antwoorden



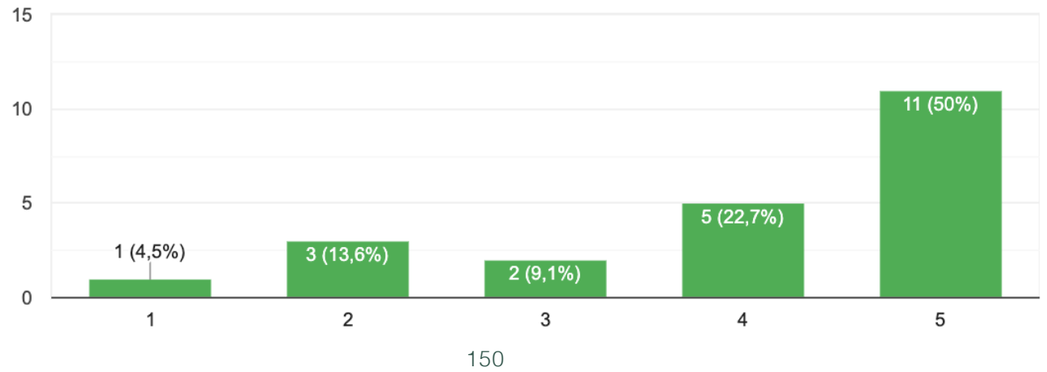
In hoeverre heeft u behoefte aan een ingebouwd systeem om afval te scheiden in uw woning?

80 antwoorden



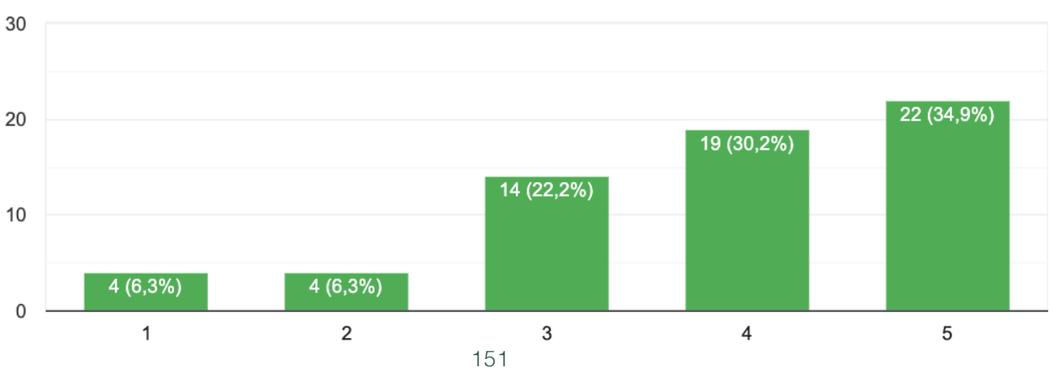
To what extent do you need a built-in system to separate waste in your residential building

22 antwoorden



In hoeverre heeft u behoefte aan een ingebouwd systeem om afval te scheiden in uw woongebouw (indien van toepassing)

63 antwoorden



I would like to share the following information in the interest of new concepts for zero-waste living and building

5 antwoorden

- Yes
- I think that a zero waste delivery service for groceries would be a good idea. Is makes it more accessible to people who think living a less/zero waste lifestyle is very time consuming and difficult
- I'm moving to the city next week, and if I could have had the option to move into an apartment that was small and extremely eco friendly, I would have definitely taken it. There is a huge issue right now for students especially in Amsterdam having no where to live; having tiny home that are eco friendly would really help reduce the current demand for homes. I really hope we see more eco friendly and zero waste living options, where these options are integrated beautifully into the building
- I would want second hand furniture

De volgende informatie wil ik nog graag kwijt in het belang van nieuwe concepten voor zero-waste wonen en bouwen

22 antwoorden

- Als op het wonen al een gewoonte is zero waste te leven is de rest al een stap makkelijker
- Als het makkelijker wordt om zero-waste te leven zou ik het zo doen. Maar nu moet ik er heel veel moeite en tijd insteken en dat is lastig.
- Ik zou graag zien dat dit concept ook in huurwoningen wordt geïmplementeerd, niet alleen koopwoningen.
- Meer informatie, meer recycling, duurzame materialen, lang meegaande spullen.
- hard nodig, succes!
- Wat versta je eigenlijk onder een zero waste interieur, keuken, meubelen etc? Dat is hier niet duidelijk
- Mijn persoonlijke utopie zou een eigen (kleine) woning met tuin zijn, die geschakeld is aan een gemeenschappelijke tuin met een klein gebouw voor algemeen gebruik. Waar vrienden/familie kunnen logeren, opslagmogelijkheden voor spullen die gedeeld kunnen worden (grasmaaier, heggenschaar, BBQ, tostiapparaat) en een grote gemeenschappelijke moestuin
- Ik haal liever spullen tweedehands dan dat ik deel met buren. Ik woon nu in een studentenhuis, de enige reden dat ik daar nog niet weg ben is geld. Delen van oven/vriezer/koffiezetapparaat vind ik vervelend en vies. Ik ben zelf erg schoon en de mensen om me heel niet (zo).
- Wij zijn een gezin van 6. Daarom sommige opties niet realistisch zoals gedeelde badkamer, koelkast, ...
  We wonen afgelegen in Zeeuws Vlaanderen met amper ov en geen trein. Koelkast en vriezer delen is dus niet zero waste, want minder ruimte= vaker boodschappen halen met auto.
- Ik zou het zo fijn vinden dat er meer locaties zouden zijn waar ik milieu bewuste dagelijkse spullen kan kopen.
- Ook fijn als de gemeente meewerkt: stimuleren van zo veel mogelijk recycling ect (hier in Ede betaal je per keer dat je restafval containter wordt geleegd, dit zou ook een goed idee zijn voor bijvoorbeeld de plastic container.
- Er zou meer over geïnformeerd moeten worden. Net als dat er veel word geïnformeerd over isoleren van je huis.
- Graag rekening houden met gehandicapten
- Ik zou voor mijn toekomst graag zien dat ik, als ik het niet meer alleen red in mijn huis vanwege leeftijd/gezondheid/eenzaamheid, ik op een zero waste plek kan wonen met gelijkgestemde ouderen waarbij we elkaar aanvullen in wat we nog wel kunnen. En zorg inkopen waar nodig.
- Deel van de dingen in de enquête zijn niet voor toepassing voor ons omdat we al een eigen woning hebben met apparatuur en meubels . Dus is op dit moment niet duurzaam om te veranderen/ vervangen. Als we weer voor de keuzes staan gaan we wel bewustere keuzes maken. En blijven kijken hoe we onze huidige woning kunnen verduurzamen
- Succes
- Waar mogelijk alle middelen gebruiken om minder afval en meer kwaliteit en duurzamer te leven.
- Graag dat het betaalbaar blijft, en dat het niet, omdat het hip en populair is, buiten proporties duur wordt.
- Het moet betaalbaar zijn of worden gemaakt. Die nieuwe tiny houses bijvoorbeeld zijn abnormaal duur...