Circular Citizens

The road towards the circular economy

I.D. Bertens
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Author:
Imke Bertens

Student number:
4543874

Master's Programme Environment and Society Studies
Global Environment and Sustainability
Radboud University Nijmegen

Supervisors:

Thesis supervisor:
Ingrid Visseren-Hamakers

Internship:
Dar NV

Supervisor Dar NV:
Melissa Kars

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Preface

I would like to present to you: Circular Citizens, the road towards the circular economy. This thesis represents the final stage in completing the Environment and Society Studies Master's Programme. The subject of this thesis interests me, so I am happy that this topic marks the final stage of my education at Radboud University.
During my studies, I was introduced to waste management and the circular economy. The encounter with these subjects evoked a new passion that has evolved during my studies. It came to a point that I wanted to have waste as the topic for every project that I needed to do.
I paused my Master's and began to work at Dar, which was great, as I was so interested in waste and waste management. After a year of working at Dar, I got the opportunity to write my Master's thesis there. The topic that my supervisor Melissa Kars was interested in, was related to citizens and the circular economy. After a literature review, this topic appeared to be rather absent in studies involving the circular economy, which was perfect for my research. The fact that I was able to write about a subject that is both relevant for the university and Dar is something I am very content with.

This research will be interesting for various audiences. First and foremost, this research specifically focused on citizens of Nijmegen, which means that the recommendations are the most operable in this area. Therefore, the gained knowledge can be useful to colleagues at Dar and colleagues at Nijmegen Municipality. Second, this research can be used by other researchers that are interested in citizens and the circular economy. And furthermore, other graduate students in upcoming years can use this research to learn more about the structure of a Master's thesis. I did the same with previous theses of alumni.
The process of writing this thesis was not easy, but overall it went well. My thesis supervisor Ingrid Visseren-Hamakers made sure that I stayed on track, and proposed negotiable deadlines in between meetings. This structural process contributed to finishing my thesis on time. Lots of changes, feedback moments, and staring at screens are included in the process, but I am proud of this end result.
I would like to thank my thesis supervisor Ingrid Visseren-Hamakers for her feedback, ideas, the moments of just chatting, and overall support. I also would like to thank my internship supervisor Melissa Kars for her contributions to the execution of this research, and for the time she took to discuss certain problems I ran into.
Next to my supervisors, I am grateful for the respondents that participated in this research. Without their help, this whole research would not have taken place. Especially in the COVID-19 period, which complicated the recruitment of respondents.
Furthermore, I want to thank my friends and family members, my thesis group members, and my colleagues at Dar for feedback, reviews and other contributions to this research.

To the readers of my thesis, enjoy!

Summary

Increasing attention is given to the Circular Economy, which is a concept that could create economic welfare as well as sustainability. Yet, citizen involvement is often neglected in circular economy literature. Governments and organizations are much more involved in the circular economy, even though citizens are a substantial group of actors in such a societal change. One specific dimension in which citizens are essential is waste, as citizens use products and generate waste. Such practices are interesting to observe, especially because waste related practices are not often studied.
Therefore, the main question of this research is: *How do citizens contribute to the circular economy, with a focus on waste?*
This was studied by looking into waste practices of citizens of Nijmegen. Practice theory proposes that practices are made up of meaning, competences and material, and if these aspects are all included in a situation, a certain practice is shaped. Practice theory was used in this research to both inform the research methods, as the interviews and survey were based on this framework, and to analyze the results. Next to practice theory, the R9 model was used to define how circular citizens' practices would be. This model consists of the following terms: R0 Refuse, R1 Rethink, R2 Reduce, R3 Reuse, R4 Repair, R5 Refurbish, R6 Remanufacture, R7 Repurpose, R8 Recycle and R9 Recover. These terms hold certain values: a high number indicates less circular practices, and a low number signifies more circular practices. For example, R0 is the most circular and R9 is the least circular. The interviews and survey answers were analyzed using this model.
The main question is answered via three different sub questions, that are explained below. Sub question one was analyzed with practice theory, sub question two was analyzed with the R9 model, and sub question three was answered with both frameworks.

The first sub question to be answered was: *How are waste separation practices performed by citizens?*
Waste separation appears to occur most if it is seen as convenient and commonsensical (*Meaning*), if there is enough knowledge and little confusion on how the process works (*Competences*), and if there is enough space and material to perform the practice (*Material*). Within the different waste sections, differences in meaning, competences and material can be seen. One of the more successful waste separation practices is glass separation, because of common sense, knowledge on what belongs to glass, and the efficient design of glass containers.

Next, *How circular are waste practices of citizens?*
It seems to be the case that citizens of Nijmegen are quite invested in recycling, which is the second to lowest circular behavior. However, one could argue that citizens of Nijmegen are slowly moving up in the ladder of circular economy. Next to recycling, citizens often tend to reuse products, either by buying or selling second hand, or giving away items. Furthermore, some citizens also mentioned that they would refuse to use certain products, which is seen as the most circular practice.

What can be done in order to increase circularity in practices?
For waste separation to be increased, the aspects 'convenience, common sense, knowledge, space and material' should be sufficiently present in a system. In all likelihood, the presence of these matters would create a successful system.
Furthermore, in order to increase circular practices, more insights in practices such as reuse and refusal are required. If the motivations of people to choose reuse or refusal of products could be explained, then the insights can be used to create stimuli that enhance such circular practices.

To conclude, citizens are contributing to the circular economy with waste separation practices, but such practices are not the most circular. It is possible that citizens are increasingly practicing reuse, but more research would be necessary to confirm that. Nevertheless, reuse and refusal of products should be stimulated more in order to increase circular practices.

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1. Introduction

1.1. Research problem

Linear economy

Since the Industrial Revolution, the economic standard in society is one that follows the concept of a linear economy (Esposito et al., 2015). This form of economy involves the ‘’take, make, waste’’ principle, in which resources are taken, then made into products, and at the end of their lifecycle these products are wasted (Sariatli, 2017; Esposito et al., 2015). The linear economy has been criticized for decades, as there is a limit to this way of living (Ward, 1968). Non-renewable natural resources are lost, and the large amounts of waste that are produced by humans are damaging natural ecosystems around the world (Patnaik, 2018).

‘’It is not difficult to find evidence that human activities are beginning to overrun the resources of the planet. The exhaustion of the oil that has fueled the industrial revolution appears to be less than a century away, waste disposal sites are in increasingly short supply, the atmosphere over Antarctica is being radically changed as a consequence of industrially synthesized halogenated gases, and so forth. In many of these cases, the industrial processes that have benefited society are also among the sources of the problems. It is clear that "business as usual" is not an option that industry can maintain for long. ‘’ (Jelinski et al. 1992, p. 1).

Various academics, among Jelinski et al. (1992), warned about the finity of the linear economy. However, a report by the Club of Rome is regarded as a study with a significant impact on society and environmental science (Bonciu, 2014; Turner, 2008). The Club of Rome is a group of scientists that can be seen as pioneers when it comes to criticism of the linear economy. In their work Limits to Growth (Meadows et al., 1972) it was stated that continuous population- and production growth is impossible when resources are limited. An increasing number of publications about the limits of the linear economy followed, including literature about waste management. Publications as such depict the large extent of waste generation itself, along with the challenges that it causes.
It is indicated that, on a yearly basis, 11.2 billion tons of waste is collected world-wide (Luttenberger, 2020; Ferdous et al., 2021). The division of waste generation is not homogeneous, as Hoornweg & Bhada-Tata (2012) affirm that waste generation is connected to the affluence of an area. High-income countries seem to produce the most waste per capita, whereas low-income countries produce the lowest amount of waste per capita. Figure 1 illustrates this statement: most countries in North America, Europe and Central Asia have been classified as high-income countries, and the majority of countries in Sub-Saharan Africa have been identified as low-income countries (Hoornweg & Bhada-Tata, 2012).

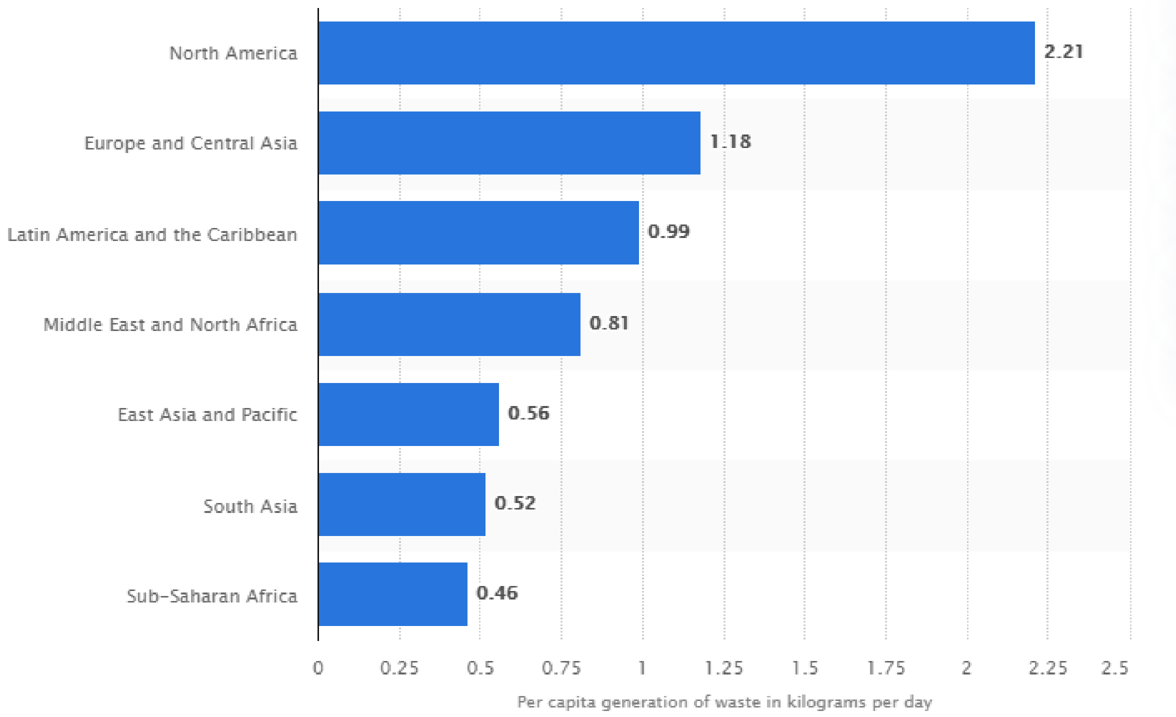

Figure 1: Average waste generation per capita in kilograms per day, by region (Tiseo, 2018)

The extensive amount of waste generation is problematic for various reasons: waste causes air-, water- and soil pollution, and accelerates climate change, which results in further biodiversity loss and increasing weather extremes (Ferdous et al, 2021; Skogen et al., 2018).
Waste that is not recycled, is either incinerated or landfilled. Both of these practices cause air pollution: carbon dioxide along with other varying substances, depending on the composition of waste, are emitted. Air pollution is a threat to public health, as several toxins can increase chances of illness, or even shorten citizen's life-spans (Khan & Ghouri, 2011). Next to that, these emissions are of influence on the acceleration of the greenhouse effect, which causes global warming and climate change (Hoornweg & Bhada-Tata, 2012).
Climate change is one of the largest global challenges of this era, as it significantly impacts livability of animals, humans and vegetation. For example, changing temperatures and -precipitation transform landscapes, and therefore transform the natural habitat of numerous creatures. Such transformations result in biodiversity loss (Skogen et al., 2018). Other effects of climate change include extreme weather, such as heavy precipitation, storms, heat waves and cold waves (Weilnhammer et al., 2021). Frequent extreme weather complicates the survival of creatures and vegetation, which could result in more biodiversity loss as well.

Furthermore, water- and soil pollution are other consequences of waste generation. A contemporary waste issue that is related to water pollution is the plastic issue. Globally, massive quantities of plastic waste enter the ocean because of immoderate plastic generation and poor management (Kershaw et al., 2011). The amount of plastic pollution in oceans was estimated at 150 million tons in 2015, and could escalate to 600 million tons in 2040 if structural change remains to fail (Parker, 2020).
A study by Lamb et al. (2018) covers the notion that plastic waste pollution can be associated with diseases in coral reefs, which are some of the most biodiverse ecosystems in the world. Coral reefs are already damaged by the increased CO2 levels in oceans, for which waste is partially responsible

(Munday et al., 2012). Plastic pollution thus increases the tempo of deterioration of coral reefs, which will accelerate biodiversity loss even more.

The problems that waste causes are vastly undesirable, which is why solutions are sought for. For instance, various academics attempted to introduce different approaches for changes in the economic system (Stahel, 1997a; Trannoy et al., 1992; Jackson, 1993). Among those approaches the circular economy is a favored one. This will be discussed in the next section.

Circular economy

The circular economy is an economic framework in which unusable by-products such as waste do not exist (Geissdoerfer et al., 2016). The idea of the circular economy is based on the natural system of earth, in which every part of nature has its own purpose (Velenturf et al., 2019). Since each plant and animal has a specific part in the system, in general redundant factors are inexistent: all matters can be used by other parts of the system.
As previously discussed, waste generation causes a significant proportion of environmental problems. Thus, if a system is created in which waste will eventually not exist anymore, the impact of these problems will decrease as well (Jonker et al., 2018).

A multitude of different studies have been done on the circular economy and its ability to combine both economic- and environmental stability (Stahel, 1993; Alamerew & Brissaud, 2017; Pauli, 2010; Braungart & McDonough, 2009; Ellen MacArthur Foundation, 2012). These different studies hold a variety of meanings to the circular economy. For instance, Stahel (1993) mainly focuses on closed loops, and highlights the importance of slowing down processes within those loops via, for instance, more reuse of products. Braungart & McDonough (2009) have worked on the "*Cradle to Cradle*" vision, in which products will not lose any value if reused. Moreover, one of the goals of the cradle to cradle principle is to *upcycle*, which means that products could become more valuable if recycled. Another idea that is linked to the circular economy is the idea of *the blue economy*. The main focus of the blue economy is creating healthy and sustainable oceans and waters, while simultaneously providing jobs for livelihoods (Pauli, 2010). Furthermore, industrial ecology is an example of a circular economy, in which industrial systems are not isolated from the environment, but co-existing with the environment (Jelinski et al., 1992).

Yet, one viewpoint that is particularly interesting for this research is the R9 list, which is a guide list created by the PBL Netherlands Environmental Assessment Agency that defines different circular steps (Potting et al., 2017). In their view of the circular economy, the ultimate goal is to close production chains. This can be done with use of the 9 R's:

- Refusing
- Rethinking
- Reducing
- Reusing
- Repairing
- Refurbishing
- Remanufacturing
- Repurposing
- Recycling
- Recovering

These strategies are listed from high circularity to low circularity (Potting et al. 2017, p. 15). The R9 model is a continuation of the Ladder of Lansink (Potting et al.. 2018), which is a model that was created by the Dutch scientist and politician Ad Lansink. In Section 2.2.2. this will be elaborated on.

The circular economy could be the most realistic way to create a more sustainable society that could help to counteract climate change, pollution and biodiversity loss. Therefore, more and more attention is given to this form of economy: in theoretical fields, but also in politics and business. For example, the European Union aims to be fully circular in 2050, and is taking various measures in order to accomplish this aim. To illustrate, the European Commission created the first circular economy action plan in 2015 to integrate circular practices in different sectors, such as plastic production, water management and waste management (European Commission, 2015). The second action plan was introduced in 2020, in which reuse and waste prevention are the main focuses (European Commission, 2020). The objective is to normalize sustainable production, and to empower consumers with policies such as right-to-repair, in which producers will be responsible for reparations and upgrades.
Various sectors are already engaged in achieving circular standards. For instance, in glass production an increasing amount of production material is derived from glass waste. Glass can be recycled infinitely, and reusing this material for production is less expensive than using raw material (Ferdous et al., 2021). Thus raw materials are conserved and expenses are reduced. Furthermore, the construction industry is increasingly committed to circular practices as well, as multiple construction materials can be reused without devaluation (Benachio et al., 2020). This can be exemplified with steel: the metal is completely recyclable, and 90 percent of this type of metal is continuously reused in European production (European Recycling Industries Confederation, 2020).

Because of the growing attention to the circular economy, these and other sectors are strengthened in capabilities and possibilities, as knowledge and experience are increased. Yet, multiple improvements can still be done in different areas of circular economy developments, such as the inclusion of an important group of actors. This will be explained in the following.

Citizen involvement

While reading circular economy literature, a notable matter was touched upon, as there tended to be a lack of literature that involved citizens (Repo et al., 2018; Sijtsema et al., 2019). In general, citizens are accustomed to living life in the linear economy. When one finishes a chocolate candy bar, one throws the wrapper in the garbage can and that is that. Not all citizens are aware of, or interested in the entire process after disposal (Sijtsema et al., 2019). Another finding in circular economy literature is that when citizens are included, they are often represented passively. When reading different studies, authors often choose to discuss governments and organizations and their role in the circular economy. Motivating or obligating citizens to participate in these practices is quite common, while giving citizens an active voice is not (Muranko et al., 2019; Wastling et al., 2018; Daae et al., 2017).

The United Nations created a Sustainable Development Goal for sustainable consumption and production patterns, which indicates that awareness of the role of citizens does exist (UNEP, 2017). However, it seems that the role of citizens is not proportionally addressed yet in European policy, as only recently sustainable consumption and production has been introduced in policy-making (European Commission, 2020). A study by Repo et al. (2018) supports the statement about a lack of attention to citizens. In this paper consumer inclusion by policy-makers was studied, and to cite one of the conclusions: ''*A potential lack of congruence may contribute to low public acceptance and thereby hinder or at least slow down the accomplishment of policy targets for circular economy.*'' (Repo et al., 2018, p. 4). Another study in which the same problem was found, is a study by Sijtsema et al. (2019). This research focused on the viewpoint of the citizen in the circular economy, for the reason that: ''*Research on consumer involvement in a CE is in its infancy and requires general insights into the diversity of perceptions of a CE*'' (Sijtsema et al., 2019, p. 3). The fact that these papers are relatively new, and one states that this topic is not thoroughly studied by others, citizen involvement in the circular economy is quite an interesting subject to study.
A report by the United Nations Framework Convention on Climate Change affirmed that the implementation of circular economy measures is barely happening: only 9% of the world's economy is circular (UNFCCC, 2019). This low implementation rate could possibly be explained by the lack of attention to citizen involvement, and the passive role of citizens. If the majority of actors in the circular economy are governmental- and organizational parties, and citizens are somewhat neglected, the low implementation rate is not surprising.

The Netherlands, Nijmegen municipality and Dar

As previously mentioned, high-income countries are responsible for the largest part of waste generation. The Netherlands is an example of such a high-income country. In 2019, 553 kilograms of municipal waste per capita was collected (CBS, 2021), which indicates that a long way remains for a zero waste society to come about. However, a share of 392 kilograms per capita of this quantity is recycled or reused. The remaining 161 kilograms of municipal waste per capita can be identified as residual waste, and are incinerated with energy recovery, or landfilled (Benchmark Huishoudelijk Afval, 2021).

The large share of reused and recycled material in the Netherlands illustrates the implementation of the European Union's action plans that were previously mentioned. In the Netherlands, the aim to achieve a circular economy in 2050 is present as well (Rijksoverheid, 2016), and to achieve this, further waste reduction is necessary. The 2025 target of the Netherlands is to reduce residual waste to 30 kilograms per person per year, which could be seen as ambitious as the current quantity is 161 kilograms per person. However, multiple areas within the Netherlands differ from this mean, such as Nijmegen Municipality with 113 kilograms of residual waste per person. This city has a lower amount of residual waste per person than cities of comparable size (Benchmark Huishoudelijk Afval, 2021). A reason for this could be that the attention for the circular economy is already quite present in this city. In 2018, Nijmegen won the title of European Green Capital, as the city could prove to be active with numerous circular economy- and sustainability initiatives (Green Capital Nijmegen, 2020). Furthermore, the biggest current political parties in Nijmegen are Groenlinks and D66 (Gemeente Nijmegen, 2021), which are parties that acknowledge environmental problems as issues with urgency (Groenlinks, 2021; D66, 2021).

The partnership with Dar NV could be another reason for a lower residual waste quantity. Dar NV is the waste collection company of Nijmegen and other municipalities in the region. Nijmegen, along with Berg en Dal, Beuningen, Druten, Heumen, Mook and Middelaar, and Wijchen are shareholders of Dar NV. This means that decision-making is executed in conjunction with these municipalities. Thus, Nijmegen municipality can be seen as a decent actor in circular economy developments, which generates curiosity in looking into waste separation practices of citizens of this municipality. If citizens are involved in the circular economy, Nijmegen could be an example for other cities in how to involve citizens. If citizens are not involved in the circular economy, recommendations can be made in how to improve such involvement.

1.1.1. Aim of this research

As explained in the previous section, the focus of this research is to identify the role of citizens in the circular economy. To explore this, practices of citizens of Nijmegen will be studied. In Section 3.1 a more elaborate explanation of this choice is given. But for now, the aim of this research is:

To better understand the role of citizens in the circular economy.

1.1.2. Research questions

Following the aim, the main question is:

How do citizens contribute to the circular economy, with a focus on waste?

To operationalize this question, and make it suitable with the methods of study, the following sub questions have been formed:

1. *How are waste separation practices performed by citizens?*
2. *How circular are waste practices of citizens?*
3. *What can be done in order to increase circularity in practices?*

1.2. Research relevance

1.2.1. Societal relevance

The reduction of waste generation can be described as crucial, for the fact that waste generation contributes to climate change, pollution and biodiversity loss. Since high income countries, such as the Netherlands, are responsible for a large share of waste generation, a logical course of action is to commence with circular practices and waste reduction. The Netherlands and other European countries are proceeding in that direction, by aiming to be completely circular in 2050.
However, an important note when transforming from a linear economy to a circular economy is that all actors should be included in the process. Therefore, not incorporating viewpoints of a large group of actors such as citizens in decision-making and execution of circular policies is problematic.

The lack of citizen involvement could be an explanation of the low rate in which the circular economy is implemented in society. In literature, citizens are often mentioned in a passive manner, which results in the notion that decision-makers are responsible for activating citizens in circular behaviors. Such a task is rather challenging, as behavioral change can be seen as a time-consuming and difficult process (UNEP, 2017).
In the Netherlands, waste separation rules and regulations are predominantly used for motivating citizens in circular behaviors. Of course, these rules and regulations are beneficial to circular developments. Yet, if the middle-term objective of 30 kilograms residual waste per person in 2025 is aimed to be achieved, other approaches should be considered. Moreover, the existing rules and regulations are not even constantly complied with. Therefore, it is quite interesting to study how citizens handle waste, and if they are practicing other circular behaviors, without influence of the municipality. Moreover, the importance of citizens' behaviors is depicted. These behaviors can suggest which policies or systems are functioning and which are not. In other words, this study will examine the circular economy on the level of citizens, which is societally relevant because such an understanding is not present yet.
The examination of practices can be applied in future decision-making processes, by using the discovered practices as a template. For instance, if citizens of Nijmegen tend to refuse take-away packaging, policies can be created in which this is taken into account. Understanding of citizens' practices can then contribute to more suitable policy-making, which can accelerate circular economy developments.

1.2.2. Scientific relevance

As mentioned by Sijtsema et al. (2019) in Section 1.1.3., citizen involvement in the circular economy is not proportionally included in scientific literature. Hobson (2020) discussed the role of citizens in the circular economy as well. She focused on the framing and treatment of citizens, in which it was concluded that citizens are indeed often depicted as passive actors.
Since there is a lacuna between the citizen and circular economy in scientific literature, this research is scientifically relevant for its contribution to bridging the gap between these notions.
The lack of citizen involvement and the passive framing of citizens in circular economy literature are quite remarkable. That is because both the circular economy and citizen involvement can be described as popular research topics, with millions of hits on Google Scholar (Google Scholar, 2020).
Yet, research on the combination of these topics was only recently initiated. Therefore, this study is a contribution to enlarge the understanding of citizen involvement in the circular economy.

2. Theoretical and Conceptual framework

2.1 Research philosophy

Before the beginning of my internship, I worked at Dar NV. This could have created bias that I am unaware of, which is why it is important to highlight. Respondents should not be influenced by my own interest in waste separation, because that would affect the validity of this study. Therefore, special attention was paid to interviewing with a neutral scientific perspective. Yet, the thoughts and viewpoints of citizens could still have been influenced unintentionally. Fortunately, the chosen research philosophy takes these matters into account.

Ontology of this research

In this research, an interpretative approach is used to gain insights (van Thiel, 2014). Interpretivist research focuses on creating meaning via interaction. These meanings are dependent on the researcher's interpretations as well as the participants interpretations, which are influenced by historical- and cultural contexts of the individuals that are involved in the study (Moon & Blackman, 2014, p. 1173). The researcher, as well as citizens, can interpret concepts in a certain way. Since the citizens' viewpoints form a crucial part of this research, it is sensible to use an approach that embraces the difference in meanings and contexts of participants. The interpretative approach asserts that there are multiple realities which should be viewed holistically, as these different realities influence others and can be seen as interrelated (Lincoln & Guba, 2007, p. 17). This exact notion can be applied to this research, as the different respondents have their own practices and motivations, and by analyzing these different realities new insights are obtained. These insights are not based on one reality of one citizen, but are based on the compilation of all different viewpoints.

Epistemology of this research

The generated knowledge in interpretative approaches can be described as subjectivist and transactional: the 'researcher' and the 'researched' collectively create the research findings (Guba & Lincoln, 1994). In interpretative research the distinction between ontology and epistemology is quite vague, as both reality and knowledge are shaped via subjective interpretations (van Thiel, 2014).
In practice theory knowledge can also be seen as subjective. The differences in social contexts and differences in individuals depict that objective truths are difficult or even impossible to find. However, with use of a subjectivist approach, different individuals and contexts can be analyzed to gain insights. For example, it can be studied to what extent certain practices are executed in similar ways, and which factors could be involved in the development of such a practice (Moon & Blackman, 2014).

2.2. Theoretical framework

2.2.1. Practice theory

Practice theory is a sociological theory used by many researchers and in multiple academic fields (Bourdieu, 1977; Shove, 2012; Giddens, 1979; Schatzki, 1996). Practice theory analyses and endeavors to understand human practices within the social world. Widely known concepts that focus on this dichotomy are *structure* and *agency* (Giddens, 1979). Structures can be seen as the social world, and agency as individual human behavior. The behavior of individuals constructs the social world, and the social world shapes the behavior of individuals again. For instance, if more people start a vegan diet, eating vegan is normalized, which can motivate people to eat vegan. This is a simplified example to explain practice theory, as it cannot be as deterministic as this (Hilgers, 2009). Human practices are constantly changing, and are a matter of probability, meaning that practices can take unexpected turns. This can create changes in social structures over time, which can influence human practices again et cetera.

A large number of academics have written about practice theory. Bourdieu was one of these academics, and his way of thinking about practices is useful in researching citizen involvement in the circular economy. Two key concepts in Bourdieu's writing are *habitus* and *fields* (Bourdieu, 1984). Habitus can be described as thoughts, opinions and practices of an individual in a certain context. Every individual has a specific context and makes decisions in its actions that are appropriate for that context. The context that is mentioned here, can be a description of the term field.

In habitus, a distinction can be made between primary habitus and secondary habitus, as described by Hilgers (2009). Primary habiti are the first fundamental binaries that have gotten meaning in society, such as gender, time, length, place et cetera (Hilgers, 2009, p. 735). Changing these binaries can be established, but it would take a vast amount of effort, as they are the foundation of a certain society. Primary habitus is predominantly created in early childhood, by interacting with practices in a child's surroundings (Sapiro, 2015).
Next to that, there is secondary habitus. Secondary habitus is shaped later in life, for example in education, or in different social environments that an individual interacts with (Atkinson, 2011; Cornelissen, 2016; Wacquant, 2004; Wade, 2011). Secondary habitus can thus be formed, as soon as there are new impulses that influence the individual due to changed surroundings (Wade, 2011).
An example can be the study of Cornelissen (2016), who did research on dumpster divers in New York City. Dumpster divers can be described as people that collect food from retail trash as a lifestyle choice. She explains that dumpster divers are often high-educated white people that made a rational choice in living as a dumpster diver, with the most important reason being that they think of dumpster diving as ''*commonsensical*'' (Cornelissen, 2016, p. 503). This change in habitus can be established by entering new surroundings (Wade, 2011) and getting new impulses, as mentioned. For example, dumpster divers' friends were influenced in their habitus by learning about it via the dumpster divers (Cornelissen, 2016, p. 519). This shows that the view of waste can be altered, which is promising in developing a circular economy.

The possibility of changing one's habitus is interesting, as there is an assumption that citizens have a different habitus about the circular economy than organizations. In the introductory chapter, it was mentioned that the circular economy is mainly known in organizations, but not at the citizen level. Individuals working at organizations and institutions learn about the circular economy and its potential, which makes it more likely that the habitus of these individuals will adjust (Cornelissen, 2016). At the citizen level, these opportunities of learning about the circular economy are not very present yet. If an individual has opportunities to encounter impulses and surroundings that stimulate involvement in the circular economy, a change in habitus is more likely to happen (Bourdieu, 1977). These opportunities are examined at the citizen level in Nijmegen, with use of the practice theory of Shove (2012).

Practice theory: Meaning, Competences and Material

Elizabeth Shove (2012) has a similar yet different approach to practice theory as Bourdieu. She explains practices as the bridge that overarches structure to agency, just like Bourdieu does with *habitus*. Yet, Shove focuses specifically on how practices come to exist.
Practices are viewed as 'normal ways of doing' or 'routines' (Shove, 2005, p. 44; Verhulst, 2020; Shove & Warde, 2002). The underlying decision making process that makes a practice a normal routine, embodies the theory of practice.
Shove uses the terms *meanings, competences and material* to define practices. Her approach also has similarities with Giddens (1986), who used *rules* and *resources* to shape structures and the practices that can take place in them. The difference is that Shove specifically focuses on the practice, and Giddens states that these *rules* and *resources* are shaped in structures, in which practices happen. The focus on practice is particularly useful in this research, as shaping the context around citizens' practices makes the citizen an active actor. If this research would put the focus on structure, citizens would become a passive actor, which is the exact problem.

To get back to Shove's approach on defining a practice, she uses meaning, competences and material as compartments that are needed for every practice to exist. Below is an explanation of the different compartments of Shove's practice theory. And after that, in the conceptual model of practices, usage of this theory will be elaborated on.

Meaning

Meaning can be described as ways of thinking about a certain aspect, for instance ideas, norms and values, opinions and beliefs (Verhulst, 2020). Meaning can be predicted among people to a certain extent, for example via political preferences, level of education, family income, age and other demographic information (Xu et al., 2017). It needs to be taken into account that depicting meanings is influenced by location. For example, in one country a higher family income can have a positive influence on waste separation, whereas in another country higher family income can negatively influence waste separation (Bandara et al., 2007). In various countries, organic and locally produced food is cheaper than imported, plastic wrapped foods. A higher income can give people access to imported foods, which can increase waste generation and complicate waste separation (Matemilola & Elegbede, 2017). In other countries, imported plastic wrapped foods can be cheaper than locally

produced foods, so a higher income would mean that people would have access to local foods, which can decrease waste generation and improve waste separation.
Meaning is quite connected to habitus, in the way that subjects acquire meaning via education, or lack of education (Bourdieu, 1984; Sapiro, 2015). If an individual attaches a certain meaning to a subject, it influences the practice with that subject (Shove & Watson, 2005). For instance, a person living in Nijmegen has the idea that all different types of waste are landfilled in one location. This person is then unlikely to execute the practice of waste separation, as it is believed that separation would not be useful. If that person would have the idea that waste is actually recycled and the practice of waste separation would be sensible, it would be more likely for that practice to occur.

Competences

The second aspect that is necessary for practices to happen is competence. Competence can be seen as a certain skill or know-how on how to execute a practice. For instance, a person is eager to separate waste, but the person does not have any know-how on how to do that properly.
If this know-how is lacking, the practice of waste separation cannot be performed by this individual. Furthermore, if a person lacks physical ability to separate waste, for example because of a disease, the practice can also not be performed.

Material

Material can be described as the things or matters that are needed for a practice. To be able to separate waste, materials are required, such as different waste containers, signs that indicate the type of waste that belongs in a container, vehicles that can empty the containers, and so on.
Material can be necessary as well for meaning to develop or for competences to improve. To refer back to the example of waste separation, objects such as information sheets or documents can be beneficial for this practice. Another example of the essentiality of material can be the circumstance that a person is not capable of walking to a container. In this case, material such as a wheelchair or other accessibility techniques are needed.

Conceptual model of Practices

In Figure 2, the conceptual model of practices is depicted. This model is used in both developing the interview- and survey questions, and answering the first sub question '*How are waste separation practices performed by citizens?'*.

As explained, practices consist of three components, which are meaning, competences and material. These are interconnected and need one another for a practice to be created. The reason for choosing this model as a basis of the interview- and survey questions is that it is a functional model, as one can incorporate the three components in clearly formulated questions.

Waste separation can be taken as an example again to illustrate this statement. It was touched upon in the previous, but a complete explanation of practices was not yet discussed. In the following, waste separation practices of a progressive oriented female citizen are chosen to exemplify the construct of a practice.

To understand Meaning, the interviewer could ask for her opinion on waste separation. Competences can be defined by asking how to separate waste, and if she is able to do that. And lastly, for Material, questions could be formulated about supplies that are needed to separate waste.

Potential responses could be that this female would look upon waste separation as the desired behavior that every citizen should perform (*Meaning*). Next to that, she understands how waste separation works in her municipality, and she has the physical ability to separate waste (*Competences*). However, materials of two waste sections are lacking: she cannot separate plastic- and organic waste, because there are no facilities (*Material*). Thus, because of the fact that some material is missing, the practice cannot be continued. In other scenarios a similar practice ceasement would occur. If the woman has the motivation and material to separate waste, but she does not understand how it works, it would still not happen for the fact that knowledge is lacking. Lastly, if she would know how to separate and all the necessary equipment is present, but she would not want to separate, it would not happen either.

The described scenarios give an insight in how this study was conducted and how the data was analyzed. The conceptual model is applied to explore shared practices among citizens, and will be depicted again in Section 4.1.

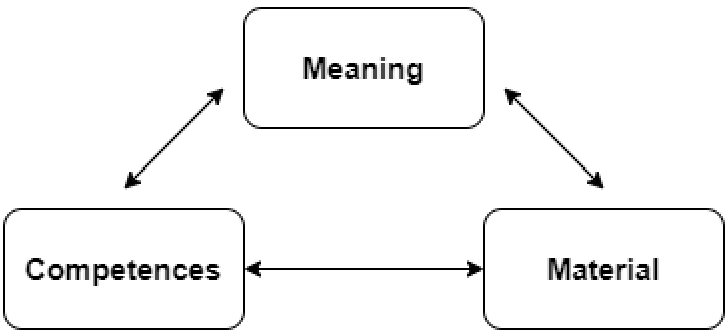

Figure 2: Conceptual model of Practices

2.2.2. Circular economy

As discussed in the introduction, there are many different concepts that produce ideas similar to the circular economy. Closed loops is one of these concepts (Geissdoerfer et al., 2020; Murray et al., 2017; Stevens, 2010). A common definition of the circular economy is a '*closed-loop economy in which waste becomes a resource and excessive waste is not generated*' (Geisendorf & Pietrulla, 2018, p. 772). The concept of closed loops means that production cycles are developed in which there are no residues, as all the objects in production are used as a resource (Geissdoerfer et al., 2020).
Stahel (1993, 1997b) wrote about closed loops in combination with the functional- and service economy. The idea of a functional- and service economy is that goods and services are used in the most optimized way, so they can be used for a long time while saving resources and energy (Stahel, 1997b). In closed loops and the service economy, mutual responsibility is needed from businesses as well as customers. This could be a challenge, as customer's behavior is more difficult to regulate than industrial production (Camilleri, 2018).

Braungart and McDonough (2009) would define a circular economy with the 'Cradle to Cradle' vision. Stahel (1997b) supports product- and service optimization, while the Cradle to Cradle vision aims to change product development in general, with the positive growth discourse as the main driver for a sustainable economy (Toxopeus et al., 2014). *Positive growth* signifies economic growth that has positive impacts on the earth. For instance, a fruit farm with different kinds of fruit can feed humans, animals and insects. Next to that, the trees and plants store carbon dioxide, produce oxygen and prevent mudslides (Braungart & McDonough, 2009). In the Cradle to Cradle philosophy, the objective is to change production, services and systems in a way that the environment is not spared but improved (Kopnina, 2016). This means that all materials should be used as fuel or nutrients for other products or materials (Toxopeus et al., 2014). Furthermore, recycling is not seen as a desirable practice, as material often loses value. Instead, upcycling is introduced, meaning that used material will be used in production to make products with an equal or higher quality (Braungart & McDonough, 2002).
However, such changes in production systems can be seen as ambitious and unfeasible in the short term. For example, material needs to be developed in a way that it could be used infinitely, which is a challenge. Next to that, cradle to cradle aims for positive growth, but it is unknown what this growth could do to existing ecosystems (Bjørn & Hauschild, 2012).

Industrial ecology is another viewpoint of the circular economy (Jelinski et al. 1992; Preston, 2012). It is explained that industrial ecology aims to create industries that are holistic and in connection with their surroundings: "*It is a concept in which an industrial system is viewed not in isolation from its surrounding systems but in concert with them. Industrial ecology seeks to optimize the total materials cycle from virgin material to finished material, to component, to product, to waste product, and to ultimate disposal*. " (Jelinksi et al., 1992, p. 793).
Ayres & Ayres (2002) describe the concept by dividing *industry* and *ecology*. Industry involves design and production of materials, and ecology is described as non-human natural ecosystems. The natural ecosystems serve as an example of how industrial processes should work, and second, industrial processes should exist in concert with natural systems. Industrial ecologists aim to improve evaluation tools that estimate how nature and society co-exist. The purpose of improving evaluation tools is to increase environmental decision making (Tilley, 2003). Making estimations is seen as a challenge, as there are multiple factors that need to be taken into account, such as costs of air-, water-

and soil pollution, waste disposal, transportation costs et cetera (Etsy & Porter, 1998). Therefore, creating evaluation tools that are comprehensive and complete would be unfeasible.

Another concept that is related to the circular economy is the blue economy (Pauli, 2010; Katila et al. 2019). The blue economy can be described as: ''*A framework for a long-term vision of sustainability in which economic growth, social cohesion, and environmental protection go hand in hand and are mutually supportive*'' (Katila et al., 2019, p. 216). The blue economy has similarities with other discussed concepts, yet the blue economy is specifically aiming at processes around oceans, seas, and coasts, and is therefore not as relevant for this research.

The discussed concepts give an insight into different meanings that the circular economy can have. Geissdoerfer et al. (2016) wrote a broader literature review on different definitions of circular economy concepts, of which some were discussed in this chapter. Based on their literature review, the following definition was used to describe the circular economy:

''*A regenerative system in which resource input and waste, emission, and energy leakage are minimized by slowing, closing, and narrowing material and energy loops. This can be achieved through long-lasting design, maintenance, repair, reuse, remanufacturing, refurbishing, and recycling*'' (Geissdoerfer et al., 2016).

Even though this definition is based on various contributions, there is a missing component. Declining production of unnecessary goods is not taken into account, which is a highly efficient step into sustainable production (van Ewijk & Stegemann, 2014). The other discussed concepts also did not take into account that declining of goods could be seen as one of the most important steps in a circular model. The R9 model, which will be discussed in the following, does take this development into account.

The R9 model

In Section 1.1.2. the R9 model was introduced briefly. As mentioned before, the R9 model was created by the PBL Netherlands Environmental Assessment Agency, and is based on a Dutch context (Potting et al., 2017). This model is a continuation of the Ladder van Lansink, which is a waste hierarchy model, created by the Dutch scientist and politician Ad Lansink in 1997 (Potting et al., 2017).

In the Ladder van Lansink, six different steps are presented. As seen in Figure 3, landfilling and incineration are incorporated in the model. Yet, such steps can be seen as more linear than circular (Icibaci, 2019; van Ewijk & Stegemann, 2014). After all, these two steps within the Ladder van Lansink are present merely for waste disposal. By including incineration and landfilling in the model, it could suggest that these are somewhat acceptable steps in sustainable waste disposal. Therefore, these steps do not inspire radical change that is needed for the circular economy to develop (van Ewijk & Stegemann, 2014, p. 126).

Figure 3: Ladder van Lansink (Recycling.com, 2021)

In the R9 model, incineration without energy recovery and landfilling are not included, as the focus is laid upon the avoidance of resource- and material use, as well as waste production (Potting et al., 2017). The steps that are included can be found in Figure 4. The model is based on the amount of environmental pressure that certain steps would evoke: The lower the number behind an R, the more decrease in environmental pressure (Potting et al., 2018). For example, if products are refused, extraction of raw material such as fossil fuels will not be executed, neither will there be any production or transportation, which will minimize environmental pressure.

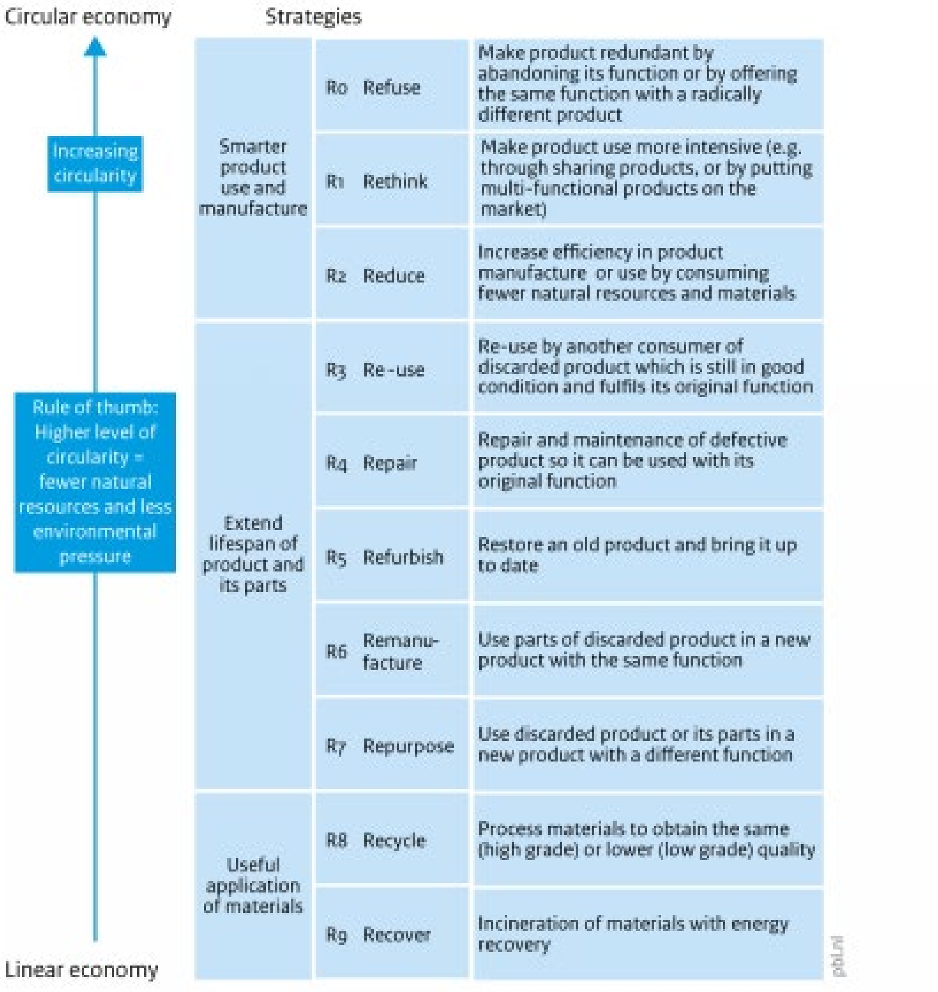

Figure 4: R9 Model (Potting et al., 2017)

To be able to understand the R9 model, it will be clarified with examples in the following part:

- Refuse (R0) is seen as the most circular strategy, and means refusal of buying- or making use of products that are unnecessary For instance, a person refuses to buy a plastic bottle of shampoo. As explained, this step will decrease environmental pressure the most, as there is a lack of extraction, production, transportation and other additional processes.

- Rethinking products (R1), thus creating products that are multi-purposed, such as a pocket knife, or creating a shared function on products. The *OV-fiets* is an example of a product with a shared function (Villwock-Witte & Grol, 2019). In short, the *OV-fiets* concept is a bicycle sharing system in which people can rent bicycles for a small amount of money.

- Reduce (R2) involves to lessen the amount of material needed to create products, by increasing efficiency. For example, creating a shampoo bar without packaging is more circular than creating a plastic bottle of shampoo. This step focuses mainly on production processes.

- Reusing products (R3) involves using a product recurrently. If one person would discard a product, the product can be reused by another person, while the product holds its original purpose. If someone needs a new table and their friend wants to discard her table, she could give the table to reuse.

- Repair (R4) means to restore products so that the usage of a product is prolonged. For example, repairing clothing or repairing electronic devices.

- Refurbishing products (R5) is a strategy that repairs discarded products and resells them to new customers. The reason that this strategy is less circular than repairing is that the product is not returned to the same owner.

- Remanufacturing products (R6) implies to take parts from a discarded product and use these parts in a new product. For example, manufacturing a new table with old table parts.

- Repurposing a product (R7) is to create a new function for an item, or to use a discarded product to make a new item. Creating a dress or shirt out of an old curtain could be an example of repurposing.

- Recycling (R8) can be described as processing discarded material into a new clean material of the same, or lower quality. Paper, metal, plastic and glass recycling are examples of creating new clean material.

- Recovering (R9) involves material or products that are incinerated with energy recovery. For example, residual waste bags could be incinerated, after which electricity is gained out of the combustion heat.

These strategies are used to define how circular citizens' waste practices would be. To be able to do that, a conceptual version of this model is created. This is a similar, yet simplified version of Figure 4 and is described in the section below.

Conceptual framework: R9 Model

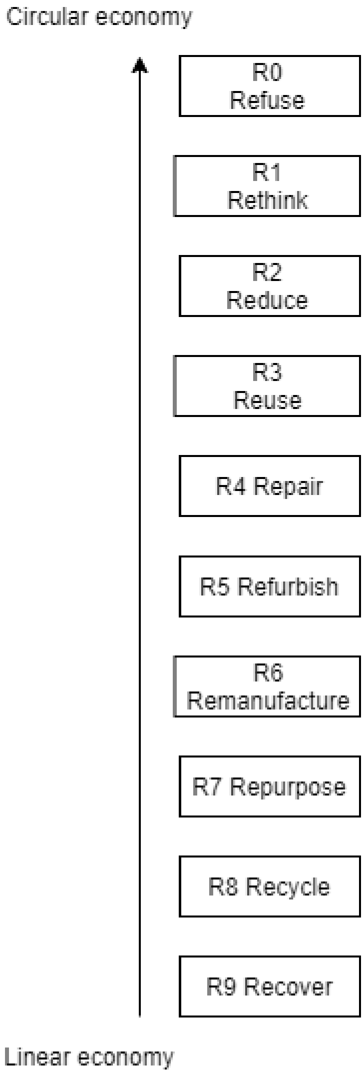

Figure 5: Conceptual R9 model

Next to Shove's practice theory model, the R9 model is used in order to define citizen involvement in the circular economy. A simplified version of the R9 model is created to be able to apply the model in the analysis. With the use of this conceptual model, the second sub question '*How circular are waste practices of citizens?*' is answered.

With use of these ten R's, it is made possible to classify citizens' practices in less circular- or more circular behaviors. In this manner, the second sub question is operationalized.
The meanings of the ten different R's are essentially similar to the theoretical framework, yet R9 Recover will be operationalized by focusing on residual waste. Residual waste is incinerated with energy recovery and therefore residual waste provides a connection between citizens and energy recovery.

Rethink, Reduce and Refurbish do not necessarily apply to citizens, as these strategies are focused on design, production processes and selling products. Nevertheless, it was decided to include all of these strategies in this research, because of the fact that it is possible that citizens would show behaviors that can be related to these R's. However, the possibility that there will be little to no connections with these strategies should be taken into account. The other strategies can be used on citizens, as these are practices that can take place on a daily basis, and therefore are likely to be found in the results.

To reiterate, the first sub question is answered using the conceptual model of practices, and the second sub question is answered by means of the R9 model. The third and last sub question '*What can be done in order to increase circularity in practices?*' is answered by using the findings of both sub question one and two. In Section 4.3. this third sub question can be found.

3. Methodology

3.1. Research strategy

The research strategy that is used in this study is a case study (Yin, 2009; van Thiel, 2014; Myers, 2019). This strategy was chosen for multiple reasons. First of all, in the research problem it was stated that citizens are either forgotten in scientific studies on circular economy, or they are given a passive role. By doing a case study, opportunities are created to actively impart citizens, as citizens are personally interviewed. Secondly, this strategy is chosen because in-depth information is useful to increase the body of knowledge on citizen involvement in the circular economy. After all, this is a little-studied subject, so in-depth information would be valuable. A third reason that the case study strategy is chosen, is because there is a need for a solution for this specific case. The exploration of suitable solutions could become more successful if the case can be thoroughly studied, because more specific information can be gathered (van Thiel, 2014).
Case study is useful for answering the research questions, because via interviews, citizens' actual waste practices are studied. This would be a useful addition to literature about circular economy, because actual practices and thought processes are studied, instead of estimations of governments and businesses. An important note for choosing these specific methods is that this research happened during COVID-19. Since March 2020, there are strict measures in the Netherlands to minimize the spreading of COVID-19. For social practices, a more suitable method of study would be observation (Maxwell, 2008), but to take the COVID-19 measures into account, it was chosen to use an online survey and interviews that could be held at a distance of 1,5 meters. To observe multiple citizens for a few hours would not have been feasible or sensible in this time, as it would have been difficult to keep distance.

The topic of this study is citizen involvement in waste related practices. This topic is chosen to study, because in the Netherlands, the citizen is quite a significant actor in various practices that involve waste. For instance, one of such practices is waste separation. ''*Separation at the source*'' or ''*Bronscheiding*'' is a policy that is often executed in the Netherlands, and for that policy it's important for the citizen to participate (Van Raak et al., 2014). Citizens are supposed to separate waste at home, and the different types of waste are collected at separate times, so that waste collection companies can collect different waste streams. Next to waste separation, other practices of citizens, with regards to used products, influence the amount of produced waste as well. Therefore, these practices will also be examined.

The demarcation of this research is Nijmegen. Nijmegen is a municipality that has one of the best waste logistics and separation rates within the category of same sized municipalities (Dar, 2017; Verhulst, 2020; Druten Nieuws, 2019). Since this is a high-scoring area, the study can be interesting for other municipalities: if this research will show that citizens are not particularly involved in the circular economy, improvements can be made in this area, which could indicate that other municipalities could also improve citizen involvement.
If this research will show that citizens are involved in the circular economy, it could be a reason why this municipality is one of the better functioning areas in the Netherlands. In that case, the findings could still be useful for other areas, as Nijmegen could be an example for other municipalities.

3.2. Sampling

Interviews and a survey were used, in which data was collected about waste practices of citizens. To be able to represent the citizens of Nijmegen, respondents were recruited based on age, area of residence, and daily occupation.
These specific characteristics are chosen and other characteristics are left out, because of feasibility. There is a broad spectrum of distinctions among citizens, which is impossible to represent completely in one study. Next to this, adding more characteristics will increase difficulty in encountering the required respondents. In Appendix E, more information can be found regarding age, area of residence and daily occupation of citizens.

Citizens were recruited via both snowball sampling, and a mix of cluster sampling with self-selection (van Thiel, 2014). The network of colleagues of Dar was consulted to get in contact with a multitude of residents. This can be seen as a snowball-sample. Since colleagues of Dar NV are often citizens of Nijmegen themselves, it is likely that their social networks exist around Nijmegen as well. An advantage of this way of sampling is that recruiting people would be made easier. A disadvantage is that people can have similar backgrounds. This was countered by the second sampling method: a mix of cluster sampling and self-selection (van Thiel, 2014). A survey was created and disseminated via Dar, which citizens of Nijmegen were able to fill in. Respondents were recruited via voluntary participation, but the respondents were accessed via Dar, which made this a clustered group.
13 citizens were interviewed and 31 citizens responded to the survey, which means that a total of 44 respondents participated in this study. In Appendix B, an overview of the interviewees and survey respondents are presented.

3.3. Research design

In a research design there are eight elements that need to be reported correctly (van Thiel, 2014). These elements include: the research problem, the theoretical framework, the sampling framework, strategy and methods, reliability and validity, data analysis, a schedule, and reporting the results. Below in table 1 these elements are lined up.

Research problem	*How do citizens contribute to the circular economy, with a focus on waste?*
Theoretical framework	Practices: meaning, competences and material The R9 model
Sampling framework	Interviews with citizens: snowball sample, quota sample Survey with citizens: cluster sample, self-selection
Strategy and methods	Strategy: Case study Methods: structured interviews, a survey with open questions and content analysis
Reliability and validity	Triangulation: apply multiple methods to enhance the results. Sub-units: multiple units are studied within the same case (citizens of Nijmegen of different areas and different ages). Database: all steps taken and all gathered data will be documented. Peer-review: fellow researchers will review what has been written.
Data analysis	Record interviews, analyze using ATLAS.ti Survey analysis using ATLAS.ti
Schedule	See Appendix A
Reporting the results	Discuss the data results and compare with the used theories. Recommendations.

Table 1: Research design

3.4. Research methods and data collection

The research methods include interviews, a survey and content analysis. In the interviews and survey a similar format was used, meaning that the same questions were asked. This was done to increase validity, as asking the same questions while using different methods enlarges data collection (Myers, 2019). For instance, interviews provide in-depth data with a smaller number of respondents, while a survey allows to acquire more respondents that provide facile data.

The interview- and survey questions were created by using Shove's approach on practice theory (2012). In Appendix C and D the interview- and survey format are to be found. The data of both of these methods were recorded, transcribed, and analyzed
For answering the first sub question of this research: '' *How are waste separation practices performed by citizens?''* practice theory was employed again, and gathered data was analyzed with use of *meaning, competences* and *material*. Furthermore, content analysis was used to answer the first sub question. The used document is the Afvalmonitor (2019), which provides insights into waste separation rates of Nijmegen. This document supports the research findings, as the waste separation rates are comparable to outcomes of findings of this research.
The second sub question, which is ''*How circular are these practices?*'', was analyzed with use of the R9 model. Different scenarios were presented to respondents, after which it was examined how common the different R's were in the proposed situations. The results of these analyses can be found in Chapter 4.
The last sub question ''*What can be done in order to increase circularity in practices?*'' is to be found in the analysis of the other sub questions, because explanations were given on what citizens would need to improve waste related practices.

After answering the sub questions, the main question is answered and recommendations are made. These recommendations are useful to Nijmegen Municipality, as this research is a case study on citizens of Nijmegen. And the recommendations can potentially be useful for other municipalities, as explained in Section 3.1.

In both the interview and survey it was highlighted that people will be anonymous and that there are no correct or incorrect answers. Moreover, it was communicated multiple times that respondents should answer the question by how they act, and not how they should act or how other people act. These aspects are stressed to increase validity, as it is important for respondents to feel comfortable in answering honestly. If respondents provide socially desired answers, or do not speak about their own practices, the data is incorrect.
For the interviews, attention was given to a regular dress-code, meaning jeans and a t-shirt, as it was important that respondents would not be influenced by appearances. The appearance that was aimed for was ''neutral student'' instead of ''intern at Dar''.

3.5. Data analysis

The interviews and surveys are analyzed using ATLAS.ti, a computer programme for qualitative analysis. The analysis is divided in two parts: one part is focused on the complete data set, and the second part is focused solely on the proportion with the six scenarios. To answer sub question one, the interviews and survey are partially focused on waste separation and recycling. Yet, sub question two is focused on waste practices in general, which means that the results would be disturbed if the analysis would not be divided. Therefore, a separate analysis was needed.
However, even though the data is analyzed twice, the analysis process is similar. This process is described below.

In ATLAS.ti transcripts of the interviews were uploaded, and the analysis was started with open coding. Open coding involves highlighting certain words or sentences in texts and identifying them with a concept, or code (van Thiel, 2014). Once similar words or sentences are found, these will be given the same code. In this manner, connections and resemblances in data can be explored.
After that, the answers of the survey were uploaded in ATLAS.ti, and the same codes were used to analyze this content. This was possible as most questions in the survey were open questions that people answered concisely. And because of the fact that the survey and interview format are alike, the same analysis was used (van Thiel, 2014, Myers, 2019).

At the end of the first session of open coding, there were 197 codes created. This amount of codes made the analysis quite difficult and chaotic, which is why the codes were further classified into overarching codes. This was done by merging codes together and, if necessary, renaming codes. After merging codes, 64 open codes remained.

Axial coding was the next step to be taken in the analysis. Axial coding is used to group open codes even further, by selecting codes that share a characteristic that the researcher is looking for. In this research, the axial codes of the first analysis were *Meaning, Competences, and Material.* And the axial codes for the second analysis were *R0 Refusing, R1 Rethinking, R2 Reducing, R3 Reusing, R4 Repairing, R5 Refurbishing, R6 Remanufacturing, R7 Repurposing, R8 Recycling and R9 Recovering*. The open codes were grouped into these axial codes to be able to write down the results with a clear and structured presentation of data.

3.6. Reliability and validity

Reliability

To guarantee reliability in this research, multiple methods were used to collect data. First of all, the reliability of the citizen data collection is increased by using triangulation. Multiple citizens were interviewed using a short and structured interview guide, which was created using the theoretical framework. Next to that, the same questions were used in the online survey. The survey was added in order to increase the number of respondents, because more respondents equals more data gathering, which is beneficial for reliability. In citizen recruitment, attention was given to certify the presence of sub-units, which contained the characteristic of age and neighborhood of residence. Furthermore, content analysis was done to support research findings. The document that was chosen for analysis is the Afvalmonitor 2019, in which waste separation percentages of Nijmegen were presented. Waste separation practices could be justified with these percentages.

Validity

Internal validity
The internal validity is secured by the following measures: triangulation, documentation of data and peer reviews. Triangulation was done via interviews, in which multiple people with different backgrounds were spoken. Next to that, the added survey increased internal validity, because the same data was gathered with a different method. Lastly, the outcomes of the interviews and survey responses were analyzed with the use of documents on waste separation in Nijmegen. Furthermore, all data was gathered, documented and added to this study . This means that used documents as well as transcripts of interviews and answers of the survey were added in a file, which was sent to Radboud University. Such a step is quite necessary in every research, as gained knowledge should always be documented to avoid deception (Yin, 2009).
In this way, a full body of knowledge is created which benefits the internal validity (van Thiel, 2014). Lastly, this study was peer-reviewed by fellow students and the research supervisor. Because of contributions of other reviewers, more insights were given to the researcher and bias was attempted to be combated, which is beneficial to validity.

External validity
This research is not likely to be generalizable, as the subject of study involves one case, which is citizens' waste practices in Nijmegen. Yet, since the research strategy is a case study, it is generally known that external validity is lower than in other strategies (Yin, 2009; van Thiel, 2014). Moreover, the actual concept of study is of larger importance than generalizability: more inquiries on citizens and the circular economy are required. Despite the fact that this is a case study, this research focuses on citizens and the circular economy, which is why it can be seen as a contribution to a developing body of knowledge on this topic.

4. Results

In the following chapter the results of this research are presented. In the introduction, three sub questions were described, which will be answered in the three upcoming sections. Section one contains the answer to sub question one, section two poses the answer to sub question two, and the third section provides insights in the third sub question.
The results are based on the answers of 44 different respondents with different characteristics. In Appendix E, a large amount of quantitative data with respect to these characteristics is displayed. These characteristics are not included in the results, as they are irrelevant to the sub questions. It was chosen to include this data in the Appendix for those interested.

4.1. Practices

The first sub question: *How are waste separation practices performed by citizens?* is answered in this section. The answer was created by means of the conceptual model of practices, as described in Section 2.3.1., and illustrated with use of the different waste sections that citizens are supposed to separate. In Section 4.1.1. descriptions of these waste practices can be found. In the sections after that, the more important factors that are depicted in the descriptions are further explained, after which the answer to sub question one is formed.

Nota bene, the Dar Afvalmonitor 2019 was used to consolidate the illustrated waste separation practices. The Dar Afvalmonitor is an annually published document with data on waste separation in Nijmegen and surrounding villages. The Afvalmonitor supports the constructed practices, as the waste separation percentages seem to correspond with opinions and experiences of citizens.

4.1.1. Waste separation practices

To reiterate, in this section the waste separation practices are solely described. In the following sections the important factors for waste separation to occur are elaborated on.

Glass separation

In the interviews and survey all citizens stated that they would separate glass, which exemplifies the tendency that this practice is well established in Nijmegen. A notable finding in the survey is that a citizen who claimed to not separate waste at all, would still separate glass waste. Furthermore, in the interviews some respondents would forget to mention glass waste. When asked for which reason they forgot, they stated to not think of glass as waste. The fact that some citizens do not associate glass with waste could signify that the meaning of this section is changing. However, this is an assumption and more research would be necessary to submit proof to this idea. In chapter 5, this will be elaborated on.
The well-functioning glass separation practice is also visible in the Afvalmonitor, as 88% of glass waste is separately collected in Nijmegen (Afvalmonitor, 2019). The reasons for this practice to occur can be found in Figure 6.

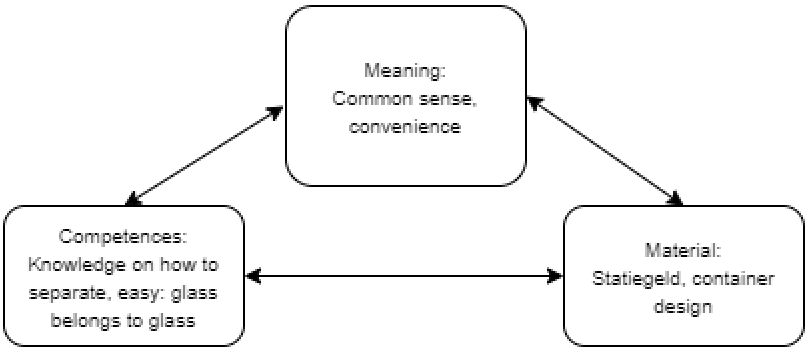

Figure 6: Glass separation

The meaning of glass separation involves common sense and convenience. People explained that glass separation is something they '*just do*', and '*have been doing for years*'. Also, respondents would state that this is how one *'is supposed to act'*. Glass separation appears to be quite embedded within common sense. Next to that, it is seen as an easy system that takes little effort. The reason why citizens would see glass separation as an easy system can be explained by competences and material. In competences it was found that knowledge on glass separation is easy and accessible, as one interviewee explained: ''*This is glass, this belongs to glass*'' (Interviewee 10). This quote summarizes that knowledge on glass separation seemed to be obvious for respondents.
In terms of material, *statiegeld* is a large factor for citizens to separate glass waste. Statiegeld is a measure that includes a small amount of money in the selling price of bottles, which is refunded if people return the bottles to the supermarket (Regeling Beheer Verpakkingen, 2021).
The mentioned connection between statiegeld and glass separation is that respondents would think it makes sense to separate statiegeld-bottles, as they would get a refund for that act.
Furthermore, another material factor that supports glass separation is design of containers. As mentioned, respondents tend to think that glass separation does not take a lot of effort: ''*It is the same amount of effort to throw something in the white glass compartment as to throw it in another one, so I might as well do the right thing'* (Interviewee 13). The container design therefore facilitates glass separation as well.

Battery separation

Battery separation is a second practice that can be described as well-functioning, as 39 respondents would bring empty batteries to designated bins in the supermarket.
In the Afvalmonitor it is described that 97% of small chemical waste is separated in Nijmegen. Batteries are one example of small chemical waste, yet the Afvalmonitor evidences that practices of this particular product resemble other small chemical waste products. In Figure 7 factors that influence this practice are presented.

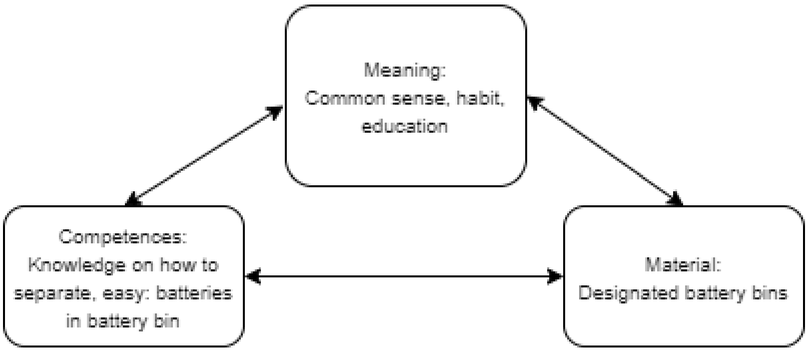

Figure 7: Battery separation

Battery separation tends to be seen as commonsensical and habitual. Different citizens would explain that batteries pollute the environment, and thus seem to have knowledge about that. Some respondents mentioned being educated about battery separation in their childhood, as they remembered special bins for batteries in schools. These bins are also to be found in supermarkets and other public spaces, which is known by most respondents. Furthermore, the fact that there are designated bins for batteries makes battery separation easy to understand: *batteries belong to the battery bin.*

Paper separation

The next practice is *paper separation*, and can be found in Figure 8. In the Afvalmonitor 2019, 91% of paper waste is collected separately, which is a high percentage as well. An important explanation for this is that paper waste separation is seen as commonsensical. A result worth mentioning is that paper waste, similar to glass waste, was forgotten by a handful of citizens, as they would not associate paper with waste per se. Again, perhaps the meaning of paper is changing, which will be discussed in Chapter 5.
Furthermore, together with the other waste sections so far, knowledge on what belongs to paper waste seems obvious, because ‘’*In paper waste, you throw paper*’’ (Interviewee 10). Yet, there does exist unclarity on certain products. All 44 respondents could name correct products that belong to paper waste, but 10 respondents either mentioned pizza boxes or receipts when asked what they would discard in paper waste.
Concerning material, most respondents have access to a paper waste container. This is either a private container for one house, or a shared container for multiple houses. Yet, it was mentioned several times that citizens experience a lack of space in paper waste bins. There would be too little space for the generated amount of paper waste.

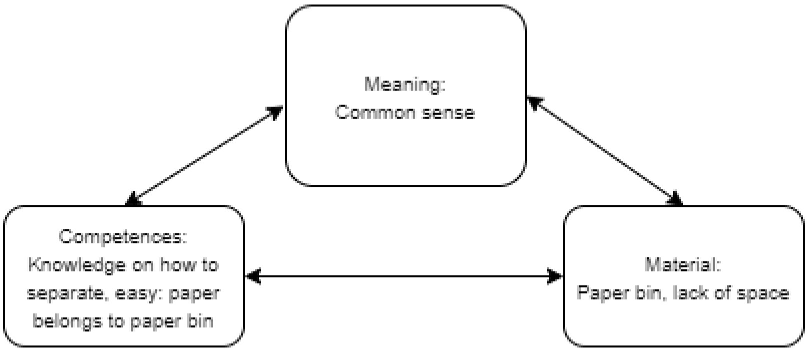

Figure 8: Paper separation

Organic waste separation

In Figure 9, the practice of *organic waste separation* is displayed. The Afvalmonitor (2019) reported that 73% of organic waste is separated correctly. This percentage is fairly lower than the other mentioned waste sections. The tendency of respondents to not separate organic waste can be explained by the following.

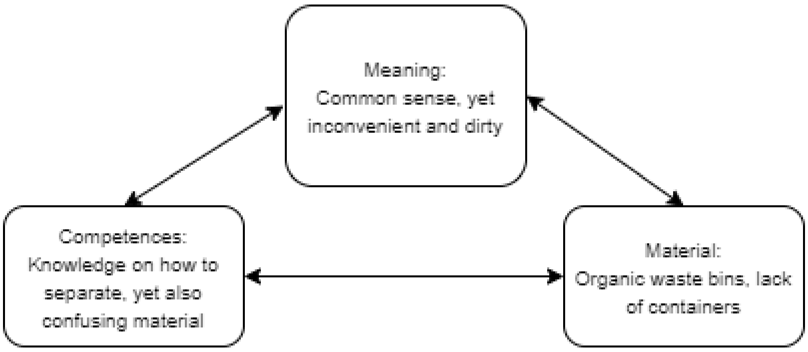

Figure 9: Organic waste separation

A scenario was presented in which it was asked how respondents would dispose of moldy bread in a plastic bag, with a paper sticker attached. Most citizens stated that they would separate the bread and plastic bag, but a sizable number of 15 people would not separate, because of inconvenience and dirtiness. For example, Interviewee 12 stated: '*If I see a bag and I think it's disgusting, I throw it all in residual waste at once*'. An interesting finding is that *dirty* is subjective: one respondent would be repulsed by a used tea bag, whereas another would not care about eating moldy bread. In Section 4.2. the subjective meaning of dirtiness will be further explained.

Regarding competences, *knowledge* seems sufficient, as all respondents could name correct items that belong to organic waste. Yet, an apparent factor that hinders organic waste separation is *confusing material*. For example, six people used the organic waste bin for tea bags, which is a debatable product. Various brands of tea bags are produced with plastic components, which impedes composting. Therefore it was decided to advise people to use residual waste for this item (Milieucentraal, 2021).

Furthermore, a handful of respondents mentioned that they do not have access to an organic waste container, and some do not have space for a container. This can be explained by the perceived dirtiness, as an interviewee explained that he would not place a container in his house because of the smell and bugs it can attract.

Plastic waste separation

In 2019, 84% of plastic waste was separated correctly in Nijmegen (Afvalmonitor, 2019). This percentage indicates that plastic+ separation practices are executed sufficiently. Multiple factors contribute to this practice, which are depicted in Figure 10.

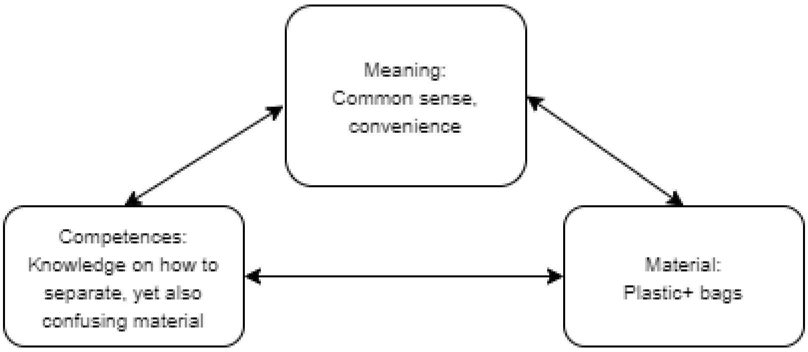

Figure 10: Plastic waste separation

Plastic waste separation is seen as commonsensical. Respondents would dispose of plastic in the orange plastic+ bags, and when asked why they would do this, many answered that *it is supposed to be like that*. Others would say that it takes little effort to do it, and it feels better.
Another factor that stimulates plastic separation is that citizens seem to have sufficient knowledge, because the majority of answers on what belongs to plastic waste were correct. However, there is confusion about items such as styrofoam and aluminum. Multiple respondents would dispose of these items in plastic waste, because they would assume this is how it should be done. Therefore, confusing material forms an obstruction in plastic waste separation.
In terms of material, citizens make use of the orange plastic+ bag, which seems to be acceptable to separate plastic waste. These bags are accessible, as they were described as affordable and can be bought at supermarkets.

Residual waste

Annually, an average of 87 kilograms of small residual waste is produced by one inhabitant of Nijmegen. Nijmegen Municipality aims to minimize this amount to 30 kilograms per inhabitant by 2025 (Afvalmonitor, 2019). In order to achieve this, it is useful to analyze how residual waste disposal is practiced. A description for this practice is presented in Figure 11.

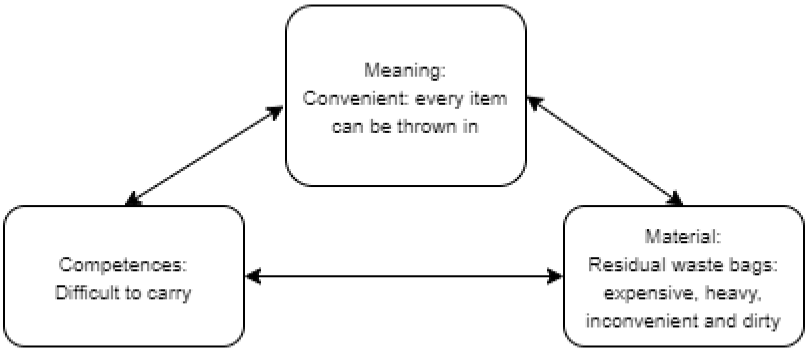

Figure 11: Residual waste

Regarding meaning, it appears that people mainly dispose of items in residual waste because it is easy or convenient: every item can be thrown in residual waste. However, the other dimensions of this practice were more negative. For instance, residual waste bags were described as expensive, heavy, difficult to carry, inconvenient and dirty. The one positive side of residual waste is the convenience that every item can be discarded in the residual waste bags. This is an interesting tendency, because it appears so that the inconvenience of the bags is of less importance than the convenience of residual waste itself. People would throw items in residual waste bags, because of the ease. And then people would think of their waste bags as inconvenient and dirty. Yet, the practice continues. The explanation that can be given is that quick convenience is of such a large importance, that all other negative factors are suppressed.

No separation

The last practice that will be elaborated on is *No separation*, and is depicted in Figure 12. The practice of not separating consists of various factors that were described in the previous. In meaning, the most evident factor is convenience. Respondents often indicated that a task could be too much work for too little output, for example the task of separating a paper sticker from a plastic bag. Dirtiness could be related to these factors, because if a task is seen as dirty, it would be inconvenient for a person to carry out.

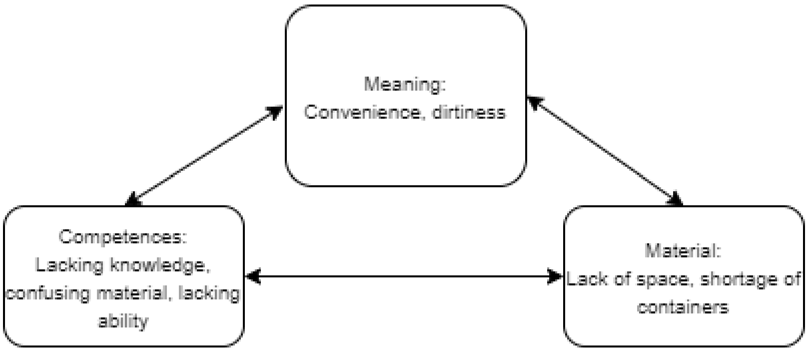

Figure 12: The practice of no separation

For competence, lacking knowledge and confusing material are important factors for waste separation to be hindered. Furthermore, ability can also be of influence on waste separation, which has not been discussed yet. This is because most respondents did not have any disabilities. Two hindrances that were found in the interviews were the lacking ability to walk, and handicaps. Insufficient walking abilities was related to elderly people, as respondents would mention that some seniors would not be able to walk to the street with heavy waste bags. But of course, next to elderly people, there are other citizens with walking disabilities, such as people with certain diseases, people who miss one or two legs, or people in a wheelchair. This was not so much discussed in the interviews or the survey. One interviewee did mention his handicap, which appeared to be related to arm movements. This obstructed him to fully separate certain types of waste, as it would be too much effort.

One last handicap or disability was color blindness, which complicated glass separation for some, as it could be difficult to see the difference between some types of glass.

For material, lacking space and lacking Dar material were often mentioned factors that obstruct waste separation, as a practice could not be performed without these. For example, Interviewee 13 would have the motivation and skill to separate waste, but in her accommodation there was only material for paper- and residual waste. This resulted in no organic-, and plastic waste separation practices. Glass waste could be separated regardless, as she herself needed to bring glass waste to glass containers.

4.1.2. Meaning

In this section, the meanings that were substantially present in described practices are further explained. These meanings represent a share of the answer to the first sub question. In combination with the upcoming sections on Competences and Material, the answer is formed. But first, Meaning is elaborated on.

As stated in Section 2.2.1., the description of meaning that is used in this study includes ways of thinking about a certain aspect, for example ideas, norms and values, opinions and beliefs (Verhulst, 2020). In the discussed waste section practices it came forward that both *convenience* and *common sense* are influential factors for waste separation to occur.
Convenience was mentioned multiple times by all respondents and was shown to be important for both separation of waste and no separation of waste. For example, a survey respondent would dispose of all types of waste in the orange plastic+ bags. When asked why this respondent would do that, they answered: ‘’*Easy*’’.
Furthermore, convenience can be seen as an important meaning in these practices, because multiple other discovered factors are related to convenience. The subject *dirty* is an example. Several respondents would not separate waste because they would call it ‘’too dirty’’. This experienced *dirtiness* hinders the ease of waste separation because when dirty products need to be divided, there is increased contact with the products. The task becomes more difficult and more negative, since there is more contact with *dirty* items. The following quotation of the interview with Interviewee 5 illustrates this statement:

> *How would you dispose of a plastic bag, containing molded bread, with a paper sticker attached?*
>
> - *Residual waste. I know I am not supposed to do that, but I am not going to open a bag that is molded, after which I will get musty air in my face, and then removing the bread with my hand, and then throw it in organic waste, and then removing the sticker, and then throwing the other bag away.*
>
> *You don’t feel like doing that?*
>
> - *No, because it is molded and it needs to disappear as fast as possible.*

Another example is the torn idea of convenience in practices regarding residual waste. As discussed in 4.1.1. several respondents had negative feedback on the residual waste bags that are used in Nijmegen municipality. These residual waste bags are expensive (10,50 euros per roll), as a way to promote waste separation: Citizens would possibly perceive the bags as valuable, and use them more economically. Negative feedback included that the bags are overpriced, but also they are heavy, they smell, and they are difficult to store. Yet, citizens still make use of residual waste bags. To illustrate, respondents from Dukenburg and Nijmegen Noord explained that they often dispose of waste in the residual waste section, but simultaneously they complained about the inconvenience of the residual waste system. The multifactorial inconvenience that is experienced does not outweigh the convenience of quick disposal it seems. One could argue that this is related to short term gratification versus long term solutions, in which the quickest earned reward defeats the rewards that take time to be earned (Roberts, 2014).

Furthermore, convenience is present when other persons would dispose of waste for a respondent. For instance, Interviewee 8 was asked what he would do with a box filled with old books, Lego and broken devices. He responded: ''*I would definitely place the entire box in the garden and wait until the landlord brings it to bulk waste …. Otherwise I would not know what to do with it. And it is easy.*'' (Interviewee 8).

Parental support in waste separation is a related notion to this, which was only discussed by citizens below the age of 30, and majorly mentioned by students. There are both advantages and disadvantages of parental support. An advantage is that potential lacking knowledge on how to separate waste can be countered by involving parental help. For instance, an interviewee would hand empty batteries over to her father and let him take care of it. A disadvantage is that this support could generate a situation in which a person is dependent on the parents. To illustrate: Two respondents recently moved out of their parents' house, and explained that they lacked knowledge on waste separation, because they relied on their parents' ways of doing.

Parental support could be a way to educate young people. Parents could teach their children how waste separation works, instead of doing it for them.

These varying examples illustrate how convenience can hinder waste separation practices. However, convenience can also be used to evoke waste separation practices, by making a separation task as easy as possible. This can be done by designing products out of one material, increasing knowledge on how to separate, or designing waste facilities that simplify separation. These notions will be further explained in 4.1.3. and 4.1.4.

Next to convenience, citizens of Nijmegen tend to think of common sense when it comes to waste separation, as the second most mentioned aspect is ''*that is just how you do it*''. Lots of citizens state that this practice is part of their normal routine. A notable finding was that *common sense* was often detected in waste sections that have existed for multiple decades, such as glass- and paper separation. This exemplifies that the idea of common sense develops over time.

It could be argued that common sense is present in nearly all waste sections, because of *environmental awareness*. Citizens explained that they contribute to a better environment by separating waste, which could be supported by the fact that common sense was not included in residual waste practices, as seen in 4.1.1. Respondents seemed to be aware that residual waste is not recycled, which is an unsustainable process. An example of this awareness is a citizen who would lower her voice when she explained that she discards batteries in residual waste. This voice lowering indicated a sense of discomfort. Perhaps she feels that waste separation is commonsensical, but for her convenience is of greater value.

Furthermore, lots of people below the age of 30 seemed to think of waste separation as commonsensical. This can partially be explained by the scenario on battery separation. Many respondents with an age below 30 argued that batteries belong in the battery box in supermarkets, because *that is just how you do it*. Some of these respondents mentioned how this idea was taught in schools, which indicates that education is related to development of *common sense*. In the theoretical framework a similar notion was described, as it was stated by various academics that education does influence practices (Bourdieu, 1984; Sapiro, 2015; Shove & Watson, 2005) Therefore, battery separation in Nijmegen illustrates and supports the connection between education and practices.

4.1.3. Competences

In this following part, the competences that were often mentioned in Section 4.1.1. are deepened out. These competences will be the second component of answering sub question one.

Competences were described as certain skills or know-how on how to act out a practice. The subject that was found to be discussed the most, is *knowledge*. The interview and survey contained knowledge questions such as ‘’*Name three things you throw in paper waste*’’. Respondents that answered these questions correctly, received the code ‘’knowledge’’. This code was used 164 times, which indicates that respondents have adequate knowledge on how to separate types of waste.
It was found that many people specifically had knowledge on the practices of glass- and paper waste. Interviewee 10 gave a possible explanation for a high amount of knowledge on these types of waste: ‘’*Those waste bins should contain just one material, the paper bin is for paper, that’s it. The glass bin is for glass, that’s it’’*(Interviewee 10).
The explanation can be linked to convenience as well, since the clarity of these sections facilitate waste separation practices. If a citizen can quickly understand how a product should be separated, the process becomes more convenient.
Yet, an often occurring factor is *confusing material*, which illustrates how a practice can be obstructed because of the unclarity on how a practice works. *Confusing material* is related to both competences and material: Citizens sometimes do not know what product belongs in which bin (*knowledge*), or the product consists of lots of different materials, which makes separation difficult (*material*).
One student living in Nijmegen Oost described this as a very obstructive matter in waste separation. To refer back to *convenience*, the use of confusing material in a product enlarges the inconvenience of disposing of the product. And since convenience is one of the more important aspects within waste separation, *confusing material* is an unfortunate matter that should be avoided. This could be done by changing production, for instance by developing products that are made out of one material, or by clear communication on how to correctly dispose of the product. Changing production would be the option of preference, as this would facilitate the practice most. To explain this: even if it would be communicated how a product should be separated, the separation would still take lots of effort. By developing a product out of one material, this extra communication is not required and the practice is made easy.

4.1.4. Material

This last section contains an elaboration on the notable material factors that were seen in Section 4.1.1. After explaining this final dimension, the answer to sub question one is formed.

The most mentioned subject is *Space*, which is an intangible sort of material. It is valued highly, because waste separation requires *space*: If all waste needs to be disposed of in different bins, more space is needed. However, a fascinating result in this research is that the amount of space that people need seems to be subjective. To illustrate, Interviewee 5 was a student that lived in student housing, and he would separate waste without complaints, even though his room's capacity was limited. Interviewee 11, who lives in a house with a garden and a driveway, mentioned that he barely had enough space for waste bins. This interviewee valued the aesthetics of his housing, which made him feel like there is not enough space for waste bins.
It seems that students and citizens below the age of 30 are fairly interested in the subject of space, as it was mentioned fairly often by these groups. One could argue that this subject is emphasized because of a lack of space, as student housing is not known for being spacious. For instance, Interviewee 6, who lives in student housing, explained that he does not have enough space for organic waste. He lives in an apartment without a balcony or garden, which would mean that he would have to keep a small organic waste bin inside of the apartment:

''*In one week I would have counted more fruit flies than I ever wanted to see, plus it smells. If I would have had a garage, it would have been a different story*'' (Interviewee 6).

This is an accurate example of the essentiality of Material in practices. The Competence and Meaning of this interviewee seems to be adequate to separate organic waste, but because of a lack of space this is not quite possible.

Another mentioned subject was the *lack of Dar material*, which is a large factor for not separating. Similar to space, Dar material is essential for waste separation to be practiced. Interviewee 13 illustrates the importance of this factor, as she stated to only have access to a residual waste bin and a paper waste bin, which disabled her in separating most waste types. Another example was given by Interviewee 4, who did not have access to an organic waste container, as it was removed from her neighborhood. Therefore, she is unable to fully separate organic waste.

The next subject that was often mentioned is *sustainable design for products*. What is focused on in this subject, is that certain products are, or should be, designed in a way that facilitates waste separation. For example, the glass separation system was often mentioned in a positive way. Citizens are expected to bring glass waste to containers near supermarkets, except for glass waste with *Statiegeld*. As explained, statiegeld is a measure to enhance reuse of packaging. This measure includes a small amount of money in the selling price, which will be refunded if people return the packaging. Respondents expressed contentment about *statiegeld*, as they appear to view this as a rewarding system. A matter to be noted is that *Statiegeld* was solely mentioned in relation to glass waste, even though various plastic bottles can be returned for statiegeld as well.
Glass waste without statiegeld needs to be tossed in glass waste bins. These bins have three compartments: one for green glass, one for brown glass and one for white glass. Almost all respondents stated that they would toss the glass in the designated compartment, as they are designed in a way that it would take as much effort to throw glass jars or bottles in the designated area as in an

incorrect area (Interviewee 13). Some respondents were motivated to separate glass, because they would look at it as a game: ''*I would separate the different colors, because it's playful, it is like a game right?*'' (Interviewee 8).

Other remarks were that products need to be designed in a way that stimulates waste separation. *Confusing material* and *unsustainable design* relate to this. One of the presented scenarios concerned ordering take away, and how citizens would dispose of this material. Interviewee 5 explained: ''*I think I would be too confused because of all those different materials, so I would probably throw it all in residual waste*''. Suggestions about the minimization of confusion in waste separation have been made in Section 4.1.3., but to reiterate: an optimal manner to facilitate waste separation would be improvements in design of products.

4.1.5. Resume

In this section it was endeavored to define waste separation practices of citizens in Nijmegen. The most frequent aspects that influence waste separation seem to be convenience and common sense for Meaning, knowledge for Competences, and sufficient equipment and space for Material. These aspects can be used to enhance existing waste separation systems. In this study, glass separation was seen as one of the better waste mechanisms, along with battery- and paper separation. This can be explained by the previously mentioned aspects, because these were found in the practice of glass separation. Citizens would see glass separation as convenient and commonsensical, they would have enough knowledge on how it works, and the material to separate is designed in a manner that increases convenience for that practice to occur. Therefore, one way to increase the other waste separation practices would be to follow the example of the glass mechanism. The separation system should be easy to use, and confusion on what material belongs where should be avoided. Then the largest obstacles in waste separation practices are removed and waste separation could be enhanced.

In the following chapter, waste separation- and other waste practices will be analyzed in combination with the R9 model, in order to define circular practices around waste.

4.2. R9 Model

In the following section the second sub question will be answered, which is *How circular are waste practices of citizens?*. To reiterate, the answer is derived by means of the R9 model, as described in Section 2.3.2.
Since the interviews and survey are partially focused on waste separation and recycling, a separate analysis is done to avoid recycling becoming a dominant practice in this part. Six scenarios were presented in which it was asked what citizens would do with varying used products. The answers of these scenarios were analyzed in a separate document, by means of calculating how many times certain practices were used, and the outcomes are depicted in Figure 13 combined with explanations below.

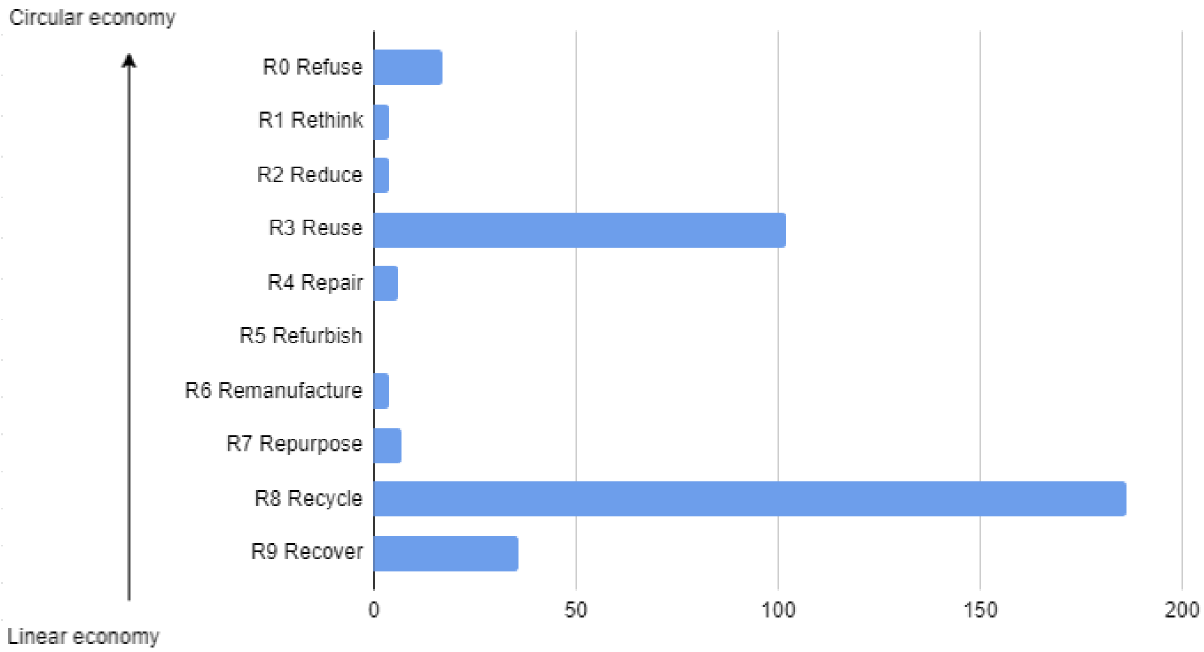

Figure 13: Circular practices of citizens of Nijmegen

R8 Recycle

Recycling (R8) was described as processing discarded material into a new clean material of the same, or lower quality.

In particular, R8 Recycling emerged as the most commonly used practice in these scenarios.
The 44 respondents that participated in this study stated that they would recycle, at least, sometimes. Glass waste, paper waste and batteries were found to be recycled most of the time. Reasons for that include convenience, common sense, knowledge, space and sufficient material as seen in Section 4.1. These types of waste are easy to distinguish, and they are so embedded in people's habits that respondents do not even consider why they would separate, they *just do it*. This practice was thoroughly explained in Section 4.1., which is why it will not be discussed further in this part. More attention will be given to the other R's.

R3 Reuse

Reusing products (R3) involves using a product recurrently.

Reuse was mentioned most often after R8 Recycling. It was found that reuse is majorly practiced by buying second hand and giving away products.
In the scenario ''*You need furniture for your house, how will you get it?*'' various respondents would purchase furniture second hand, or ask if their social surroundings would give away furniture. The reasons for people to obtain second hand furniture are:

- Money, it is more affordable than new furniture.
- Sustainability, it is seen as squandering to get new furniture if one can obtain a similar second hand product.
- Fun, shopping in thrift shops is seen as pleasant.

Money in particular tends to be stimulating citizens to obtain items second hand, as an analysis of *reuse* in relation to *money* revealed an interesting potential connection between the two. Interviewees who answered that they earned enough money, would buy new furniture, whereas interviewees who did not have a lot of money were more likely to reuse. This tendency seems to be comparable with the notion of Hoornweg & Bhada-Tata (2012) in which it was stated that waste generation is higher in high-income countries, and lower in low-income countries. This is at macro-level, but it is notable that such a statement can be observed at micro-level as well. The fact that a connection between money and sustainable behavior such as reuse can be seen at levels of both citizens and countries, supports the possibility of this connection to be existent.

Furthermore, respondents would prefer certain types of furniture to be new, because of hygiene. However, the sense of dirtiness versus cleanliness can be described as subjective once again, similar to what was found in Section 4.1.1. To exemplify, Interviewee 3 would not buy a second hand couch, because: ''*I don't know.. I want it to be clean''.* Interviewee 9, on the other hand, did buy a second hand couch: ''*Actually almost everything I buy is new, but right now I do have a second hand couch which I found on Marktplaats*''. An explanation for differences in subjective meanings between dirty and clean can be related to primary habitus, which was described in Section 2.1.1. Dirty and clean could be seen as fundamental binaries that are formed in early childhood (Hilgers, 2009). Therefore what is taught to be dirty and what is taught to be clean can differ between individuals, as every individual has a different formation of those meanings. However, these primary habiti can be altered via education, by, for example, communicating how second hand items are cleansed.

Give away is an often-mentioned subject in R3 Reuse. The scenario in which it was asked what respondents would do with Lego, books and broken electronic devices, lots of respondents would give away both the books and Lego if these items would be in proper condition. Some respondents would bring these items to a special give away area, either in the hallway of their apartment building, or to a community center. Reasons for giving away products are quite similar to motivations for people to obtain second hand furniture. To illustrate, interviewee 6 gave an explanation on why he would give away items: ''*You can just throw them out, but A: it takes more effort, B: You can make someone else happy, and C: it's good for the environment. It is more like, why wouldn't you do it?*''. The fact that this respondent thinks of disposal as more effortful than giving away products is favorable in circular economy developments. This is because it was established that convenience is important in practices, which makes it likely that this practice will continue. Moreover, if others develop the same idea that giving away products is convenient, the practice of reuse will increase, which is beneficial for the circular economy.

R9 Recover

Recovering (R9) involves material or products that are incinerated with energy recovery.

As established in the conceptual framework, R9 Recover was operationalized with use of residual waste, because in Nijmegen residual waste is incinerated with energy recovery. Respondents mentioned use of residual waste the most often after Recycling and Reuse, which indicates that this least circular practice is still rather common.
In Section 4.1.1. it was stated that residual waste is used because of convenience, as one can always dispose of items in residual waste. What was interesting is that some respondents had trouble coming up with residual waste items, or got insights into how many items do not belong to this waste section: ''*Very little remains.. if you throw the food and stuff in organic waste, very little items are residual waste*'' (Interviewee 8).
Use of residual waste is the least circular behavior of citizens of Nijmegen, yet one could argue that this practice is declining, because of the increase of common sense and convenience in various waste separation sections. However, more research would be necessary to acknowledge such a statement. This will be further explained in Chapter 5.

R0 Refuse

R0 Refuse means refusal of buying- or making use of products that are unnecessary.

In the scenarios, R0 Refuse is another practice that has been mentioned several times. Citizens were not asked if they would refuse products, but they would express it themselves. An interesting observation during the interviews is the difference between three interviewees when discussing product refusal: Interviewee 2 and 3 seemed to be proud of refusing products, and Interviewee 4 seemed to think of product refusal as commonsensical. Interviewee 4 explained that she is from a farmer family, in which she was raised with the idea that all products can be reused and that economical behavior is positive. It could be argued that such a nurture is related to the development of common sense. A similar notion can be found in battery separation, in which citizens below the age of 30 view battery separation as commonsensical, because they were educated in school about this practice. Nurture and education could therefore both be related to common sense, which could be an opportunity for the practice of refusal to increase. In the recommendations, this notion will be elaborated on.

Examples of refusing products are avoidance of disposable plastics, not ordering take away meals and the Nee Nee sticker. Avoidance of disposable plastics is accomplished by, for instance, bringing reusable bags to the supermarket for fruit and vegetables, or reusable bags for bread. Furthermore some respondents explained that, when they would order food, they would ask for as little plastic as possible to come with it. Two other respondents stated that they would not order take away meals at all. The last mentioned subject of R0 is the Nee Nee sticker. This is a product that citizens can obtain via the municipality to communicate that they are not interested in local newspapers, advertisement folders and other papers. This sticker can be placed on the front door, so that they will not receive these papers and so that less paper will be wasted (Rijksoverheid, 2020).

Overall, a few examples of refusal were found in the results, which is why it can be stated that there is room for improvement within this practice.

R7 Repurpose

Repurposing (R7) means to create a new function for an item, or to use a discarded product to make a new item.

This practice was detected a few times. For example, some respondents repurposed small plastic containers and glass jars for storage. Or citizens would repurpose the paper takeaway bag for paper waste storage, or use the styrofoam boxes as lunch boxes.
Another example was found via Interviewee 4, who explained that she would collect organic waste and bring it to a community garden, after which the organic waste is repurposed as compost. A motivation for this is that she does not have access to an organic waste bin, and she preferred to not dispose of organic waste in residual waste.
The last example is Interviewee 10, who would take old bread to her parents' house to feed chickens, which can be seen as another form of repurposing.

These examples illustrate that items should be viewed differently, for instance by reckoning that used products are not necessarily waste, in order to extend the life-cycle of a product. Education could be a measure that benefits change of viewpoints on item usage. This will be discussed in the recommendations.

R4 repair

Repair (R4) means to restore products so that the usage of a product is prolonged.

In the scenario on broken electronic devices, six respondents explained that they would repair them either themselves, or have it repaired by someone else. Interviewee 6 stated to repair it himself: ''*The kettle, if it is broken then… wait how does a kettle break? I can fix that. I will fix it!*''. Yet, most citizens would bring the broken devices to Dar to recycle. Therefore, an increase in the practice of repairing is favorable.

R6 Remanufacture

Remanufacturing products (R6) implies to take parts from a discarded product and use these parts in a new product.

A handful of mentions were found to relate to R6. For instance Interviewee 6, who hobbied with deconstructing electronic devices that are used up, and rebuilding other devices with useful parts. Furthermore, Interviewee 10 stated: ''*I also have a bulletin board, which I made out of an old painting frame*''. These kinds of practices can be seen as remanufacturing, which could possibly be executed by other citizens as well. Yet in this research it was discussed only a few times. More on this can be found in Chapter 5.

R1 Rethink

Rethinking products (R1), thus creating products that are multi-purposed, such as a pocket knife, or creating a shared function on products.

A few examples were given of R1 Rethinking: sharing the newspaper with neighbors, sharing a paper waste container with neighbors, and sharing books via public bookshelves.
The newspaper and a paper waste container were not specifically designed to be shared, but citizens themselves created this shared function. Public bookshelves are an initiative to encourage people to

share books, so that old books, that are no longer used by the owner, can be used by others (Baay, 2017). It is possible that creating a shared function is more common and popular than what this study shows. This will be clarified further in Chapter 5.

R2 Reduce

Reduce (R2) involves to lessen the amount of material needed to create products, by increasing efficiency.

R2 was not mentioned very often. This is not surprising, as this specific concept is more common in product design, which is less related to citizens. As seen in Section 4.1. there were multiple cases in which respondents mentioned product design, but those cases were related to stimulating recycling, not to using less products. Nonetheless, this practice would be quite favorable in circular economy developments, as reducing material in product design would result in less waste generation.

R5 Refurbish

Refurbishing products (R5) is a strategy that repairs discarded products and resells them to new customers.

Lastly, no subjects were found that related to R5 Refurbishing. This makes sense, as this specific practice is more focused on business. However, it is possible that other citizens of Nijmegen do create refurbished products. More research would be necessary to explore this practice.

Resume

To summarize, it can be stated that citizens of Nijmegen tend to lean towards the less circular practices, based on the analysis of the interviews and the survey. Using residual waste for disposal is still a relevant tendency, yet recycling is by far the most common activity with regards to managing waste. Next to recycling, reuse appears to be quite a common practice for citizens of Nijmegen, as it was mentioned the second most often. Furthermore, refuse was found in different behaviors of respondents as well. Reuse and refuse are the two most circular behaviors that citizens could practice, because rethink and reduce are more related to production of items. Reuse tends to be far more present in people's behavior than refuse, as only a small group of respondents would answer questions with rejection of products. Still, the finding that reuse is commonly seen in waste practices reveals an opportunity for this practice to expand. In the next section, these opportunities are elaborated on.

4.3. Increasing circular practices

In this section, the third sub question *What can be done in order to increase circularity in practices?* is answered. The answer is created by means of the findings of sub question one and two, and gives insights into how circular economy developments could be accelerated.

In sub question one an attempt was made to frame citizen's waste separation practices. Overall, citizens seemed to have enough motivation, knowledge and material to make recycling a common practice. However, various waste sections differ in how much of a common practice they are, as some sections were shown to be successful mechanisms, whereas others could still improve.
The most successful separation practice tends to be glass separation, as all respondents stated that they would separate glass. Even a respondent that said to not practice waste separation mentioned that they would use the glass waste system.
The reason for glass separation to be a successful practice is related to five different factors:

- Convenience
- Common sense
- Knowledge
- Sufficient equipment
- Space

These factors are required for every waste separation practice in Nijmegen. If these are included, it is likely for a practice to be executed as desired. Therefore, in order to increase waste separation practices in Nijmegen, a focus should be laid upon these factors.

In sub question two it was endeavored to depict how circular waste practices of citizens would be. It was stated that current waste practices tend to be leaning towards the less circular side, as recycling and use of residual waste are quite common practices. However, a large proportion of respondents would also regularly reuse items, which indicates that reuse is commonly practiced as well. Moreover, refusal of products is included in the more frequently mentioned circular practices, as it was mentioned several times. In order to develop practices such as reuse and refusal, it would be required to further discover what motivates people to reuse or refuse. Therefore, more research should be done on these specific practices.
Once these practices are studied more, the findings can depict what kind of stimulation would be useful for circular practices to occur. This could improve the circularity of waste practices of citizens of Nijmegen. In Section 5.1.2. this will be elaborated on with the viewpoint of transformations within societies.

5. Discussion

To be able to position this research in the larger scientific debate, different viewpoints have been chosen to include in the discussion. The chosen viewpoints are environmental justice, transformations and governance. In the following chapter, these three perspectives will be explained and will be related to this research. After positioning this study, the validity and limitations will be discussed.

5.1. Contribution to academic debates

5.1.1. Environmental justice

Environmental justice could not be missed in a study on waste management in the Netherlands. The United States Environmental Protection Agency defines environmental justice as: ‘‘*The fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation and enforcement of environmental laws, regulations and policies*.’’ (EPA, 2021; Banzhaf et al., 2019, p. 186). Fair treatment is described in a way that no group of people would have to endure an unequal share of negative environmental consequences that are induced by governments, industries or policies. A notable matter in this description is that there is a focus on negative impacts, and positive developments are not mentioned.
Menton et al. (2020) described that mainstream environmental justice is focused on fair distribution of environmental costs and benefits, along with fair assignment of resources, wealth and income. The term mainstream is added here, because it is stated that environmental justice is a broad subject with intersectional meanings, which complicates the search for an inclusive definition.

To connect environmental justice to this research, the electronic waste issue will be used as an example. A multitude of European countries, including the Netherlands, export electronic waste to low-income countries. For instance, in the Agbogbloshie area of Ghana, 215.000 tons of electronic waste is imported on a yearly basis (Heacock et al., 2016, p. 551), of which a major share originates from Western Europe. This electronic waste is often processed in informal manners, which means that it is managed inappropriately- and unsafely, causing health hazards in local communities (Grant et al., 2013). Such an electronic waste system can be seen as environmentally unjust: High-income countries, that have access to safe and proper waste management, export their electronic waste to low-income countries, which do not have access to safe waste management facilities. Furthermore, exportation and shipping of waste seems unnecessary if it could be processed locally.
This research could contribute to developments of environmental justice, because this study aims to stimulate more circular practices among citizens in the Netherlands. If citizens in a high-income country like the Netherlands reduce, reuse, or recycle electronic waste, low-income countries would experience a reduction in electronic waste imports, which decreases the amount of health hazards and pollution. Of course, a reduction in imports could also lead to reduced economic activities, which would be problematic for low-income countries. However, the current amounts of waste imports are excessive, and the quantities are predicted to increase, because of consumer demand and products’ short life spans (Perkins et al., 2014). Therefore, circular practices around electronic waste in the Netherlands could positively influence environmental justice in this manner.

5.1.2. Transformations within societies

The next viewpoint is related to transitions or transformations within societies. Environmental issues are global- and wicked problems, which are not caused by one factor but are deeply embedded in systems (Geels, 2011). Therefore, systemic transformations are needed to resolve these wicked problems. Transformations do not occur abruptly, but evolve over time. The reason for that is that established societal systems are difficult to change, because of dissent between stakeholders, distributed control, path dependency et cetera (Kemp et al., 2009).
Implementation of the circular economy can be seen as such a societal transformation, as the linear economy is entrenched within society (Hobson & Lynch, 2016). Kemp et al. (2009, p. 82) state that socio-technical systems would take one or more generations to transition. In order to create a circular economy, when referring to the used model in this research, societies would have to ascend in the R9 model. The outcomes of this research actually depict this idea. Currently it seems that R8 Recycle is the most common practice in Nijmegen, as this topic was discussed the most. Thus, citizens of Nijmegen could be placed in this rank. R9 Recover is discussed far less, which could indicate that this practice is decreasingly executed, and therefore less common. Furthermore, it can be seen that R3 Reuse is mentioned as the second-highest, and R0 Refuse is mentioned as well. One could argue that this model depicts a transition in which R3 is becoming the common practice, which could mean that Nijmegen is slowly ascending the R9 model. However, further research would be necessary to confirm such a statement, as transitions take time.

5.1.3. Governance

Governance could be described as the manner in which societies are managed. This management can be represented by governments, markets, networks, families, tribes and organizations, with use of language, norms or laws (Bevir, 2012, p. 1). Governance refers to all constructs of social organization. A well-studied subject of governance is the interaction between the state, market and civil society, in which interesting changes have taken place over the last decades (Rhodes, 1997; Banerjee, 2014; Newell et al., 2012). Before the 1990's, the most influential actors in Dutch decision-making were the state and market. However, this began to change because of globalization and environmental awareness, in which public organizations such as NGOs acquired influence (Weber et al., 2011). Today, this influence is still present within the dynamic between the three governance pillars (Bolleyer, 2021).
The fact that civil society is increasingly included within decision-making, supports the motivation of this research. In the introduction it was mentioned that much emphasis is laid upon businesses (market) as well as governments (state) within circular economy literature. Focus on civil society is gradually more present, but the proportion of citizens, which form a part of civil society, is not included enough. However, a reason for the lacking attention to citizens in circular economy literature could be explained by following the viewpoint of Jhagroe (2019). He studied food citizenship within the governmentality framework, in which citizens search for food options that are ''*democratic, socially and economically just, and environmentally sustainable*'' (Jhagroe, 2019, p. 190). Yet, it is questionable to what extent citizens control such developments, as businesses as well as governments decide what is produced and what is offered to citizens. The same thought can be given to circular economy developments: to what extent can citizens be of influence in working towards the circular economy?

It could be argued that citizens were actually given too many responsibilities in the past decades. If governments would be strict with law implementations and regulations, citizens would not have a choice anymore to make ‘sustainable decisions’. People would have little choice than to refuse, reuse etc.

However, the three pillars of governance do need one another to exist within society. If this is taken into consideration, the role of citizens becomes clear: Governments need citizens to be able to govern, because in the Netherlands governments are elected by citizens, and businesses need consumers to be able to grow, as consumers purchase from businesses.
If citizens’ waste practices transform into more circular ones, this would also mean that the viewpoint of waste would transform within governments and businesses. For example, in the future, citizens could value reuse and refuse more. This could influence business, as citizens could choose to purchase items that will be reused, or citizens would not purchase various items at all. Furthermore, if citizens would highly value reducing waste generation, the public agenda of political parties could begin to view waste as an important subject that must be minimized.

Concerning the notion that the Netherlands can be seen as a consensus democracy, in which decision-making is highly influenced by general agreement between stakeholders (van der Meer et al., 2019), it is unlikely that strict and fast law implementations regarding the circular economy are executed. Therefore, this research can contribute to actual developments of the circular economy, as this study depicts current practices, and recommends how to improve these practices for the benefit of the circular economy.

5.2. Validity and Limitations

As discussed in Section 3.5.1., triangulation, documentation of data and peer reviews were used to increase internal validity of this research. There is a sufficient amount of triangulation, as 13 citizens of different ages, locations of residence and day-to-day occupations were interviewed, and 31 citizens with equivalent characteristics responded to the survey. Next to that, the analyzed documents on waste separation rates in Nijmegen corresponded to the outcomes of interviews and the survey. Furthermore, the documentation of data includes recordings of interviews, transcripts, analysis outcomes of ATLAS.ti, responses of the survey and other used documents. These were successfully and safely submitted at Radboud University. Lastly, this research has been peer reviewed numerous times in order to counter bias and unnoticed mistakes.

Some limitations were discovered while analyzing the results of the interviews and survey, which were unable to be resolved. These will be explained in the following.
A limitation that was known beforehand relates to the choice of the sampling population. For the interviews, the selection focused on age, location of residence and daily occupation. Because this specific selection was made, numerous characteristics were left out that could have been important for the research findings. Disabilities are an example of missing characteristics. Some disability-related results were found, but these results were coincidentally included. People with disabilities can encounter different hindrances than people without disabilities, and can therefore perform different waste practices. If research on waste practices is continued, inclusion of such characteristics would be beneficial.

Another omission of this research is the practice of textile separation. The explanation for this limitation is that this section was accidentally not added in the interviews. In the survey this practice was added, but the survey served as a supporting data source. Therefore, there was too little data about textile separation for analysis. In future studies, this section should not be forgotten in the methods.

Also, this research was conducted from February 2021 until July 2021. During this study, COVID-19 restrictions were present in the Netherlands, which resulted in choosing different methods of study. Observations are commonly used for the analysis of practices, but as mentioned in chapter 3.1. this method was replaced by interviews and a survey, along with document analysis. Next to this, malfunctions of recording equipment caused loss of interview audio in some cases. The interviewees would repeat their answers in other recordings, but these repeated answers would be a summarized version of the actual answer, causing data to be lost.

6. Conclusion and Recommendations

6.1. Circular citizens

The linear economy has been the economic standard within society, in which production systems extract natural resources, make products that are used by consumers, and at the end of usage these products are disposed of. The environmental consequences of such a system, including air-, water- and soil pollution, climate change and biodiversity loss, are extensive and should be minimized.
A transformation towards a circular form of economy appears to be promising, as it could help to lessen and mitigate the impacts of climate change, while sustaining or increasing economic welfare.

The academic attention to circular economy is quite large, yet one notable finding in circular economy literature was the lack of attention to citizens, even though citizens form a substantial group within society. Furthermore it was stated that, if citizens would be mentioned, they would be given a rather passive role, in which organizations and governments are in charge of motivating and obligating citizens to participate. This was also found in literature on waste-related practices, which is notable because of the large influence of citizens on this process.
Therefore, this research focused on citizens in relation to waste practices. The following main question was posed: *How do citizens contribute to the circular economy, with a focus on waste?*

The main question was divided into three sub questions. By answering these questions, the overall main question would be answered as well. Via interviews with 13 interviewees and a survey with 31 respondents, data on waste separation and other waste related practices was gathered and analyzed. In the following part, the sub questions are answered.

How are waste separation practices performed by citizens?

Nijmegen has specific waste separation systems for different waste sections. Some of these systems are more successful among citizens than others. For example, glass- battery- and paper separation seem to be practiced often. This is most likely due to convenience and common sense, as most people would state that they just do it like this, and they would mention that it takes little effort to act how one is supposed to act. Furthermore, ease of knowledge was found to be important in practicing waste separation. In all three sections, people would easily understand that a certain product belongs to a certain waste section. Lastly, the presence of material and enough space were proven to be important in performing a practice.
The separation systems that did not comply with these aspects, were depicted as less successful. In organic waste- and plastic separation, citizens seemed to lack knowledge, as they tended to be confused about which product would belong in which waste section. The organic waste separation system would have the most flaws, as some people would think of the practice as inconvenient and dirty. Next to that, multiple respondents would mention that they do not have the material or space to separate organic waste.
Overall, it seems that the biggest obstacles in waste separation are lacking knowledge, confusing products, lack of material and inconvenience. If these obstacles are absent, the practice is likely to occur.

How circular are waste practices of citizens?

It was explained that citizens of Nijmegen are most invested in recycling practices, and after that, reuse is the most mentioned practice. In terms of the R9 model, this would mean that citizens of Nijmegen can be ranked in Recycling, and have moved beyond Recover. Furthermore, the model could possibly show that the practice of Reuse is becoming more common, but further research would be necessary to evidence this assumption. Thus, the answer to this question would be that the practices of recycling and reuse are the most common circular behaviors among citizens of Nijmegen.

What can be done in order to increase circularity in practices?

This research focused on both waste separation practices, and other practices regarding waste. So in this part, an answer will be given for both of these focus points.
Meaning, competences and material were studied in different waste separation practices. The most mentioned aspects were convenience, common sense, knowledge, space and the presence of material. If all of these are to be found in a practice, then waste separation systems are likely to be successful. Therefore, in order to increase waste separation, attention must be given to these five aspects. Existing successful systems can be used as a practical example for changes in other separation systems.
As for the second focus point, it was found that recycling is the most common practice. However, reuse is also commonly practiced, and refusal of products tends to be practiced among several citizens as well. In order to increase circular practices, it would be required to gain more insights in mentioned practices such as reuse and refusal. If the motivations of people to choose reuse or refusal of products could be explained, then the insights can be used to create stimuli that enhance such circular practices.

How do citizens contribute to the circular economy, with a focus on their waste separation practices?

Citizens of Nijmegen seem to be rather invested in waste separation and recycling, since the recycling system is properly functioning. However, if it is aimed to increase circularity within waste practices in general, the focus must be changed towards higher R's of the R9 model. The main focus of citizens of Nijmegen seems to be on waste separation and recycling, whereas refusing products or reusing would be a much more circular focus. However, as stated in the second sub question, such a process would take time. To conclude, citizens are contributing to the circular economy with their waste separation practices, but these practices are not the most circular ones. It could be that citizens are advancing in circular behaviors, as there appears to be attention to reuse and refusal as well, but more research would be necessary to confirm this statement. Nevertheless, as far as this research goes, citizens of Nijmegen seem to be contributing to the circular economy mostly with waste separation and reuse.

6.2. Recommendations

6.2.1. Recommendations Dar NV

The last section of this study contains recommendations that are based on the conclusions. Of course it is recommended that the connection between citizens and the circular economy will be further studied, as this was one of the motives for this research. However, this section focuses solely on recommendations with regards to Dar NV. Section 6.2.2. focuses on recommendations for further research.

The first recommendation is to gain insights into the motivations of people to reuse and refuse. In this research, the practice of recycling has been the main focus. However, reuse and refuse were described as more circular behaviors. Therefore more attention to reuse- and refusal of products would be recommended. Some examples can be to create a campaign that stimulates refuse of single-use products, to create campaigns that motivate citizens to reuse products, to advise citizens to bring used furniture to thrift shops instead of the recycling center.

Furthermore, Dar should take into consideration to change their business model, as it is likely that waste generation will be decreased if society is developing towards a circular economy. Opportunities for Dar are to focus on other segments of public space management such as the maintenance of vegetation in Nijmegen and surrounding municipalities. Or Dar could transform the recycling centers into reuse-centers, in which citizens could bring used products that Dar would resell to other citizens. Next to that, Dar-owned thrift shops could be a business opportunity for the circular future of Nijmegen. Dar could, for instance, collect used clothing, which will be sorted and resold to others. However, it is important that products would be of sufficient quality for these ideas to be operable, as products would be reused infinitely. Therefore it is essential that product design and manufacturing are involved, which illustrates the interconnectedness of different actors in circular developments.

The third recommendation is related to the enhancement of waste separation. Waste separation could be improved if the aspects that were found in this research will be incorporated in waste separation systems. To reiterate, these aspects include convenience, common sense, knowledge, space and material. In both organic waste- and plastic waste it would be recommended to act on the findings. For example, knowledge on these two sections must be facilitated, as there seems to be confusion on types of waste and their designated waste sections. In organic waste, convenience must be enhanced, as the task is often referred to as dirty. Furthermore, material should be present for every citizen to be able to separate organic waste, as multiple citizens mentioned that they do not have access to organic waste bins, which obstructs the possibility of waste separation. Thus, if Dar is focused on further optimization of waste separation, the aspects of convenience, common sense, knowledge, space and material should be included in all waste sections.

Another recommendation is related to knowledge enhancement, as it was stated that education could be an approach to change waste practices of citizens. This was particularly found in the example of battery separation, as various citizens would view battery separation as commonsensical, because of early education regarding this practice. Also, this finding supports the statement on the connection between education and practices, that was described in the theoretical framework. Therefore, increasing knowledge via education seems to be an effective measure to influence practices. A few functional contributions to knowledge enhancement are illustrated below:

- An English version for waste separation information would be quite useful to non-Dutch speaking citizens of Nijmegen. This information could be shared as a PDF file on the Dar website.
- Next to this, a citizen proposed the idea to send the Dar waste collection calendar, in combination with an information card of which waste belongs to which waste section. This could also increase knowledge among citizens.
- Furthermore, some people mentioned their routines of purchase in relation to waste generation. They would often buy the same products, thus they would know where to dispose of these products. This could be used to enlarge knowledge among citizens as well. Dar could cooperate with local supermarkets to educate customers where they could dispose of the products they bought.

The mentioned ideas are possible prosecutions of the research findings. If the essence of these recommendations would be implemented, circular practices could be increased in Nijmegen. Perhaps then, inhabitants of Nijmegen can be referred to as Circular Citizens.

6.2.2. Recommendations for further research

This last section contains recommendations for further research. Firstly, this research can serve as an example for studying other waste systems. However, waste systems are context-specific, which means that a context-specific analysis is quite necessary, as there can be local differences between systems. So it is recommended that these specific outcomes will not be used for other areas. Instead, more research can be done with the use of a similar template. It is a labor intensive research template, but in order to improve existing systems in different areas, such research is likely to have useful and practical outcomes.
Moreover, using a similar research template to study other areas would be interesting for further research, as it would enlarge the body of knowledge on citizens' waste practices and the citizen’s perspective on transitioning to a circular economy.
Another recommendation would be to repeat this research in several years, in order to support the possibility that citizens of Nijmegen are transitioning to more circular practices. It would be quite interesting to see if societal change can actually be measured via practices of citizens.

Next to these ideas for further research, some interesting thoughts arose in the results that could also be an outset for new research. For example, some respondents would not think of glass or paper while they were asked about waste practices. This could indicate changes in the discourse of waste, which would be interesting to learn more about.
Furthermore, *rethinking and creating a shared function on products* could be more common than what was found in this study. It could be that this practice was mentioned scarcely because of the lack of related questions. Therefore, future research can be conducted on citizens’ sharing practices, for example.

Also, more specific research could be done on citizens that were not at all- or not proportionally included in this study. For instance, populations with an age above 65 years old could have a different viewpoint on waste practices. Or people with certain disabilities. Some data was collected on disabilities in relation to waste practices, but more in-depth research would be interesting.

The same would go for children, as they were not included at all in this study. If waste practices of children would be researched, the outcomes could be compared to this study and new conclusions could be drawn. For example, perhaps children's waste-related practices would be concentrated higher up in the R9 model, which could support the notion of the circular transition. However, these are just assumptions, but further research could assist these ideas.

In terms of research methods, it would be recommended to use observations in future studies on waste practices. Unfortunately, observations were not used in this research, because of the COVID-19 restrictions. This method would have been relevant because the actual practices could have been studied, instead of people's explanations on practices. Given the circumstances, the research methods were adequate to depict citizens' waste practices, but observations would be recommended.

Finally, the most important matter in future research would be a further increase of attention to citizens' practices. As established in Section 2.2.1., familiarization with the circular economy at citizen level is not a common activity yet. However, if citizens' practices are studied more, an increasing amount of attention will be given to the citizen perspective, and therefore citizens can be understood better. If citizens can be understood better, customized measures can be taken to involve citizens in the circular economy.

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Appendices

Appendix A: Thesis schedule

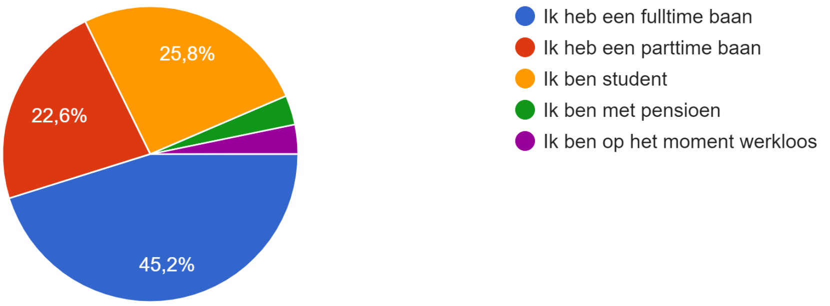
February 1st	Start Internship
February 1st - February 21th	Theoretical framework
February 21th- March 12th	Finish research proposal
March 12th - March 20th	Desk research to answer sub question 1 Feedback research proposal
March 20th, April 1st	Answer sub question 1 Create interview guide for citizens Create survey
April 1st - April 15th	Recruit citizens Interview citizens and transcribe Survey live on Dar website
April 15th - May 15th	Interview citizens and transcribe
May 15th - June 10th	Analyse results of survey Analysis interviews Write down results
June 10th - June 25th	Discussion and conclusions
End of June	Finalize and present recommendations
July	Finish Internship

Appendix B: Overview interviewees and survey respondents

Interviewee 1	Dutch, 48 years old, lives in Nijmegen Oud-west
Interviewee 2	Dutch, 50 years old, lives in Nijmegen Oud-west

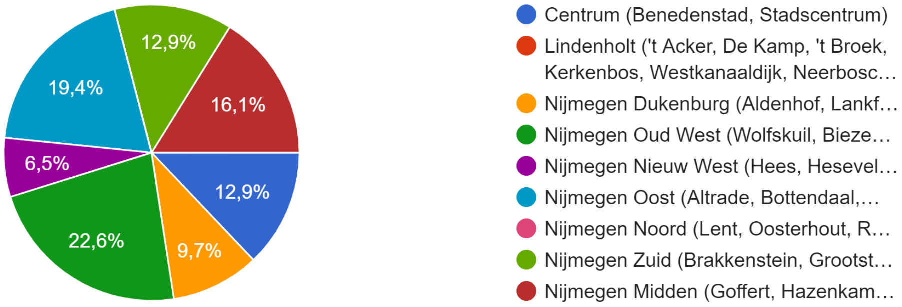
Interviewee 3	Greek, 32 years old, lives in Nijmegen Oud-west
Interviewee 4	Dutch, 69 years old, lives in Nijmegen Centrum
Interviewee 5	Dutch, 23 years old, lives in Nijmegen Oost
Interviewee 6	Dutch, 26 years old, lives in Nijmegen Midden
Interviewee 7	Dutch, 21 years old, lives in Nijmegen Zuid
Interviewee 8	Dutch, 22 years old, lives in Nijmegen Zuid
Interviewee 9	Dutch, 30 years old, lives in Nijmegen Dukenburg
Interviewee 10	Dutch, 22 years old, lives in Nijmegen Oost
Interviewee 11	Dutch, 56 years old, lives in Nijmegen Noord
Interviewee 12	Dutch, 56 years old, lives in Nijmegen Noord
Interviewee 13	Dutch, 23 years old, lives in Nijmegen Nieuw-west

1 Wat is uw huidige situatie?
31 antwoorden



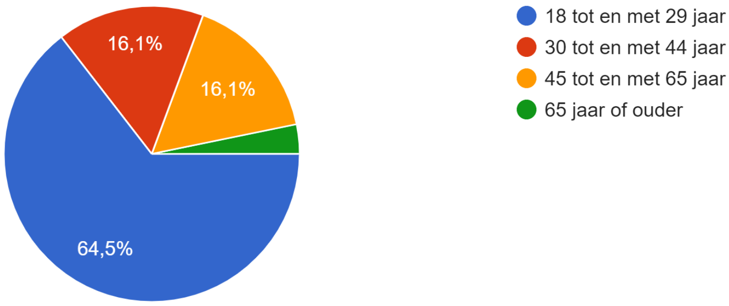
25 In welk deel van Nijmegen woont u?

31 antwoorden



26 In welke leeftijdscategorie valt u?

31 antwoorden



Appendix C: Interview questions

Q: Hallo, mijn naam is Imke Bertens en ik ben student aan de master Global Environment and Sustainability op de Radboud Universiteit. Bedankt dat je wilt deelnemen aan mijn onderzoek! Ik doe onderzoek naar hoe bewoners van Nijmegen hun afval scheiden. Je identiteit blijft anoniem en de resultaten zullen enkel gedeeld worden met de Radboud Universiteit en afvalinzamelaar Dar. Heb je nog vragen voordat we beginnen?

Q: Er zijn geen goede of foute antwoorden, hoe eerlijker je antwoord, hoe meer je mij helpt.

Q: Wat doe je in uw dagelijks leven?
Q: Geboortejaar?
Q: In welk deel van Nijmegen woon je?

Q: Wat is uw mening over afval scheiden?

Q: Hoe moet je afval scheiden in Nijmegen?

Q: Heeft u de mogelijkheid om het goed te scheiden? En de ruimte?

Q: Wat voor spullen gebruik je om je afval in te gooien?

Q: Wat doet u waarbij? Er zijn geen goede of foute antwoorden, hoe eerlijker je antwoord, hoe meer je mij helpt.

Q: Drie concrete dingen: Wat doe jij bij papier en karton?

Q: Drie concrete dingen: Wat doe jij bij gft?

Q: Drie concrete dingen: Wat doe jij bij plastic?

Q: Drie concrete dingen: Wat doe jij in het restafval?

Q: Drie concrete dingen: Wat doe jij bij glas?

Q: Ik noem hier een aantal scenario's, waarna ik vraag hoe u zou handelen. Het is belangrijk dat u goed nadenkt over wat u daadwerkelijk doet, niet wat u denkt dat anderen doen of hoe het hoort. En dit is ook belangrijk: Het gaat om wat je doet als je het weggooit, maar ook als je het niet weggooit.

Q Je hebt een plastic broodzak met beschimmeld brood, en er zit een papieren sticker op. Hoe gooi je het weg?
Q: Hoeveel keer van de gevallen doe je het zo? (Waarom?)

Q: Je hebt een doos vol met lege wijn- en bierflessen. Sommige bierflessen hebben statiegeld. Alle verschillende soorten glas zitten in de doos (wit, groen, bruin). Wat doe je?
Q: Hoeveel keer van de gevallen doe je het zo? (Waarom?)

Q: Je bent je huis aan het opruimen en verzamelt een grote doos vol met spullen die je niet meer wilt. Er zit van alles in: boeken, Lego, een kapotte waterkoker en een kapotte fotocamera. Wat doe je ermee?
Q: Hoeveel keer van de gevallen doe je het zo? Waarom?

Q: Je hebt eten besteld en het komt binnen. Je burrito zit in een aluminiumfolie, in een piepschuim doos, in een papieren tas. Wat doe je ermee als je het moet weggooien?
Q: Hoeveel keer van de gevallen doe je het zo? Waarom?

Q: Je wilt een meubelstuk (tafel/kast/bank etc.) voor in je woning. Hoe kom je aan een meubelstuk?
Q: Hoeveel keer van de gevallen kom je op deze manier aan meubels?

Q: Je televisie afstandsbediening doet het niet meer, want de batterijen zijn leeg. Wat doe je met die batterijen?
Q: Hoeveel keer van de gevallen doe je het zo? Waarom?

Appendix D: Survey questions

Afval scheiden in Nijmegen

Bedankt dat u wilt deelnemen aan mijn onderzoek! Ik doe onderzoek naar hoe bewoners van Nijmegen hun afval scheiden. Het zou mij erg helpen als u deze enquête naar waarheid kunt invullen. De enquête duurt zo'n 10 minuten.
Uw antwoorden zijn anoniem en de resultaten zullen enkel gedeeld worden met de Radboud Universiteit en afvalinzamelaar Dar. Nogmaals bedankt.

*Vereist

1 Wat is uw huidige situatie? *

Markeer slechts één ovaal.

Ik heb een fulltime baan

Ik heb een parttime baan

Ik ben student

Ik ben met pensioen

Ik ben op het moment werkloos

Anders:

2 Wat is uw mening over afval scheiden? *

Markeer slechts één ovaal.

Ik vind afval scheiden niet belangrijk

Het maakt me niet uit

Ik vind afval scheiden belangrijk

Anders:

3 Optioneel: waarom denkt u zo over afval scheiden?

4 Heeft u de mogelijkheid/ruimte om afval te scheiden? *

5 Hoeveel afval schat u dat u per maand heeft? (Hoeveel plastic, papier, gft, glas, textiel en restafval) *

Wat gooit u waar?

Welk afval gooit u waarbij? Een belangrijke opmerking: deze vragen gaan over hoe u handelt. Denk dus met name aan wat u daadwerkelijk doet en niet wat u denkt dat mensen doen, of wat hoort. Er zijn geen goede of foute antwoorden. Hoe eerlijker u bent, hoe meer u mij helpt!

6 Welk afval gooit u bij oud papier? Noem 3 dingen *

7 Welk afval gooit u bij gft? Noem 3 dingen *

8 Welk afval gooit u bij plastic+? Noem 3 dingen *

9 Welk afval gooit u bij glas? Noem 3 dingen *

10 Welk afval gooit u bij restafval? Noem 3 dingen

11 Welk afval gooit u bij textiel? Noem 3 dingen *

Spelletje: wat doe je?

Er komen een aantal situaties waarin u moet aangeven hoe u handelt. Deze vragen gaan over hoe dingen weg zou gooien, maar ook over wat u doet als u het niet weggooit. Herinnering: deze vragenlijst is anoniem. Hoe eerlijker u bent, hoe beter.

12 Je hebt een plastic broodzak met beschimmeld brood, en er zit een papieren sticker op. Wat doe je hiermee? *
13 Hoeveel keer van de gevallen doe je het zo? Waarom? *

14 Je hebt een doos vol met lege wijn- en bierflessen. Sommige bierflessen hebben statiegeld. Alle verschillende soorten glas zitten in de doos (wit, groen, bruin). Wat doe je? *
15 Hoeveel keer van de gevallen doe je het zo? Waarom? *

16 Je bent je huis aan het opruimen en verzamelt een grote doos vol met spullen die je niet meer wilt. Er zit van alles in: boeken, Lego, een kapotte waterkoker en een kapotte fotocamera. Wat doe je ermee? *
17 Hoeveel keer van de gevallen doe je het zo? Waarom? *

18 Je hebt eten besteld en het komt binnen. Je eten zit in aluminiumfolie, in een piepschuim doos, in een papieren tas. Wat doe je ermee als je het moet weggooien? *
19 Hoeveel keer van de gevallen doe je het zo? Waarom? *

20 Je wilt een meubelstuk (tafel/kast/bank etc.) voor in je woning. Hoe kom je aan een meubelstuk? *
21 Hoeveel keer van de gevallen kom je op deze manier aan meubels? *

22 Je televisie afstandsbediening doet het niet meer, want de batterijen zijn leeg. Wat doe je met die batterijen? *

23 Hoeveel keer van de gevallen doe je het zo? Waarom? *

24 Waar maak jij gebruik van om afval te scheiden? *

Vink alle toepasselijke opties aan.

Plastic+ zakken

Plastic+ ondergrondse container

Groene of rode restafvalzakken

Restafval ondergrondse container

Papier container

Papier container ondergronds

Gft container voor eigen woning (kan je rollen)

Gft container die je deelt met de buurt (staat vast in de grond)

Gft klein containertje (50 cm hoog)

Gft keukenbakje

Gft biozakjes

Ik doe niet aan afval scheiden

Anders:

25 In welk deel van Nijmegen woont u? *

Markeer slechts één ovaal.

Centrum (Benedenstad, Stadscentrum)

Lindenholt ('t Acker, De Kamp, 't Broek, Kerkenbos, Westkanaaldijk, Neerbosch West, Bijsterhuizen)

Nijmegen Dukenburg (Aldenhof, Lankforst, Malvert, Meijhorst, Staddijk, Tolhuis, Vogelzang, Weezenhof, Zwanenveld)

Nijmegen Oud West (Wolfskuil, Biezen, Waterkwartier)

Nijmegen Nieuw West (Hees, Heseveld, Neerbosch-Oost, Haven- Industrieterrein)

Nijmegen Oost (Altrade, Bottendaal, Galgenveld, Groenewoud, Hengstdal, Hunnerberg, Kwakkenberg, Ooyse Schependom)

Nijmegen Noord (Lent, Oosterhout, Ressen)

Nijmegen Zuid (Brakkenstein, Grootstal, Hatert, Hatertse Hei)

Nijmegen Midden (Goffert, Hazenkamp, Heijendaal, Nijeveld, Sint Anna)

Anders:

26 In welke leeftijdscategorie valt u? *

Markeer slechts één ovaal.

18 tot en met 29 jaar

30 tot en met 44 jaar

45 tot en met 65 jaar

65 jaar of ouder

Appendix E: Interview results overview

Below, subjects that relate to meaning, competences and material are presented, combined with the number of times that subjects were mentioned by different groups. Furthermore, the average of mentions per person is presented, as it was endeavoured to describe practices of different groups. Using the average per person creates a standardized measurement, which can be applied to depict differences between groups (van Thiel, 2014). This overview is presented in the Appendix, because of the fact that it was not particularly useful for answering the research question. Nevertheless, the overview is interesting and could perhaps evoke new research ideas, or be used in other studies.

Meaning

Convenience	*Times mentioned*	*Total number of respondents*	*Average mentions per person*
Mentioned 135 times by 44 respondents.			
Mentioned by citizens:			
- Below the age of 30:		25	3
- Between the age of 30-65:	76	17	3,2
- Above the age of 65:	54	2	1,5
Mentioned by citizens in:	3		
- Nijmegen Centrum:		5	2,6
- Nijmegen Dukenburg:	11	4	4,5
- Nijmegen Oud West:	18	10	2
- Nijmegen Nieuw West:	20	4	2,8
- Nijmegen Oost:	11	7	4,1
- Nijmegen Noord:	29	2	7
- Nijmegen Zuid:	14	6	3,2
- Nijmegen Midden:	19	6	2,2
Mentioned by:	13		
- Full time employed:		18	2,7
- Part time employed:	48	8	3,1
- Student:	25	14	3,9
- Retired:	55	2	1,5
- Unemployed:	3	2	2
	4		
That is just how you do it (common sense)	*Times mentioned*	*Total number of respondents*	*Average mentions per person*
Mentioned 82 times by 37 respondents			
Mentioned by citizens:			
- Below the age of 30:		25	2,3
- Between the age of 30-65:	57	17	1,2
- Above the age of 65:	21	2	2,5
Mentioned by citizens in:	5		
- Nijmegen Centrum:		5	1,8

- Nijmegen Dukenburg:	9	4	1,5
- Nijmegen Oud West:	6	10	0,8
- Nijmegen Nieuw West:	8	4	2,3
- Nijmegen Oost:	9	7	2,4
- Nijmegen Noord:	17	2	3
- Nijmegen Zuid:	6	6	1,7
- Nijmegen Midden:	10	6	3
Mentioned by:	18		
- Full time employed:		18	1,4
- Part time employed:	25	8	1,5
- Student:	12	14	2,8
- Retired:	39	2	2,5
- Unemployed:	5	2	0,5
	1		
Positive attitude towards waste separation	*Times mentioned*	*Total number of respondents*	*Average mentions per person*
Mentioned 75 times by 41 respondents			
Mentioned by citizens:			
- Below the age of 30:		25	1,9
- Between the age of 30-65:	48	17	1,5
- Above the age of 65:	25	2	1
Mentioned by citizens in:	2		
- Nijmegen Centrum:		5	0,6
- Nijmegen Dukenburg:	3	4	1
- Nijmegen Oud West:	4	10	1,7
- Nijmegen Nieuw West:	17	4	2
- Nijmegen Oost:	8	7	2,4
- Nijmegen Noord:	17	2	2,5
- Nijmegen Zuid:	5	6	1,8
- Nijmegen Midden:	11	6	1,7
Mentioned by:	10		
- Full time employed:		18	1,2
- Part time employed:	22	8	0,4
- Student:	3	14	2,7
- Retired:	38	2	1
- Unemployed:	2	2	5
	10		
Environmental awareness	*Times mentioned*	*Total number of respondents*	*Average mentions per person*
Mentioned 23 times by 18 respondents			
Mentioned by citizens:			
- Below the age of 30:		25	0,3
- Between the age of 30-65:	8	17	0,8
- Above the age of 65:	13	2	1
Mentioned by citizens in:	2		
- Nijmegen Centrum:		5	0,8
- Nijmegen Dukenburg:	4	4	0,3
- Nijmegen Oud West:	1	10	0,8
- Nijmegen Nieuw West:	8	4	0,3
- Nijmegen Oost:	1	7	0,3
- Nijmegen Noord:	2	2	1
- Nijmegen Zuid:	2	6	0,3
- Nijmegen Midden:	2	6	0,5
Mentioned by:	3		

- Full time employed:		18	0,5
- Part time employed:	9	8	0,1
- Student:	1	14	0,4
- Retired:	6	2	1
- Unemployed:	2	2	2,5
	5		
Nurture and education	*Times mentioned*	*Total number of respondents*	*Average mentions per person*
Mentioned 8 times by 6 respondents			
Mentioned by citizens:			
- Below the age of 30:		25	0,2
- Between the age of 30-65:	5	17	0,1
- Above the age of 65:	1	2	1
Mentioned by citizens in:	2		
- Nijmegen Centrum:		5	0,4
- Nijmegen Dukenburg:	2	4	0
- Nijmegen Oud West:	0	10	0,1
- Nijmegen Nieuw West:	1	4	0,25
- Nijmegen Oost:	1	7	0,14
- Nijmegen Noord:	1	2	0
- Nijmegen Zuid:	0	6	0,5
- Nijmegen Midden:	3	6	0
Mentioned by:	0		
- Full time employed:		18	0,1
- Part time employed:	1	8	0
- Student:	0	14	0,4
- Retired:	5	2	1
- Unemployed:	2	2	0
	0		
Social cohesion	*Times mentioned*	*Total number of respondents*	*Average mentions per person*
Mentioned 30 times by 9 respondents			
Mentioned by citizens:			
- Below the age of 30:		25	0,7
- Between the age of 30-65:	18	17	0,5
- Above the age of 65:	8	2	2
Mentioned by citizens in:	4		
- Nijmegen Centrum:		5	0,8
- Nijmegen Dukenburg:	4	4	0
- Nijmegen Oud West:	0	10	0,4
- Nijmegen Nieuw West:	4	4	0
- Nijmegen Oost:	0	7	1,4
- Nijmegen Noord:	10	2	1,5
- Nijmegen Zuid:	3	6	1,3
- Nijmegen Midden:	8	6	0,2
Mentioned by:	1		
- Full time employed:		18	0,2
- Part time employed:	4	8	0
- Student:	0	14	1,3
- Retired:	18	2	2
- Unemployed:	4	2	2
	4		
Zonde (it's a waste to throw away)	*Times mentioned*	*Total number of respondents*	*Average mentions per person*
Mentioned 15 times by 11 respondents			

Mentioned by citizens:			
- Below the age of 30:		25	0,4
- Between the age of 30-65:	9	17	0,3
- Above the age of 65:	5	2	0,5
Mentioned by citizens in:	1		
- Nijmegen Centrum:		5	0
- Nijmegen Dukenburg:	0	4	0,3
- Nijmegen Oud West:	1	10	0,2
- Nijmegen Nieuw West:	2	4	0
- Nijmegen Oost:	0	7	0,4
- Nijmegen Noord:	3	2	1,5
- Nijmegen Zuid:	3	6	0,2
- Nijmegen Midden:	1	6	0,8
Mentioned by:	5		
- Full time employed:		18	0,4
- Part time employed:	8	8	0,1
- Student:	1	14	0,4
- Retired:	5	2	0,5
- Unemployed:	1	2	0
	0		
Parental support	*Times mentioned*	*Total number of respondents*	*Average mentions per person*
Mentioned 13 times by 5 respondents			
Mentioned by citizens:			
- Below the age of 30:		25	0,5
- Between the age of 30-65:	13	17	0
- Above the age of 65:	0	2	0
Mentioned by citizens in:	0		
- Nijmegen Centrum:		5	0
- Nijmegen Dukenburg:	0	4	0
- Nijmegen Oud West:	0	10	0
- Nijmegen Nieuw West:	0	4	0,5
- Nijmegen Oost:	2	7	1,4
- Nijmegen Noord:	10	2	0
- Nijmegen Zuid:	0	6	0,2
- Nijmegen Midden:	1	6	0
Mentioned by:	0		
- Full time employed:		18	0
- Part time employed:	0	8	0,3
- Student:	2	14	0,8
- Retired:	11	2	0
- Unemployed:	0	2	0
	0		
Dirty	*Times mentioned*	*Total number of respondents*	*Average mentions per person*
Mentioned 15 times by 9 respondents			
Mentioned by citizens:			
- Below the age of 30:		25	0,3
- Between the age of 30-65:	7	17	0,5
- Above the age of 65:	8	2	0
Mentioned by citizens in:	0		
- Nijmegen Centrum:		5	0
- Nijmegen Dukenburg:	0	4	0,3
- Nijmegen Oud West:	1	10	0,4
- Nijmegen Nieuw West:	4	4	0
- Nijmegen Oost:	0	7	0,9

- Nijmegen Noord: - Nijmegen Zuid: - Nijmegen Midden: Mentioned by: - Full time employed: - Part time employed: - Student: - Retired: - Unemployed:	6 3 0 1 7 1 7 0 0	2 6 6 18 8 14 2 2	1,5 0 0,2 0,4 0,1 0,5 0 0
Complaints on Dar waste bags Mentioned 8 times by 5 respondents Mentioned by citizens: - Below the age of 30: - Between the age of 30-65: - Above the age of 65: Mentioned by citizens in: - Nijmegen Centrum: - Nijmegen Dukenburg: - Nijmegen Oud West: - Nijmegen Nieuw West: - Nijmegen Oost: - Nijmegen Noord: - Nijmegen Zuid: - Nijmegen Midden: Mentioned by: - Full time employed: - Part time employed: - Student: - Retired: - Unemployed:	*Times mentioned* 3 5 0 0 2 0 0 2 3 1 0 3 2 3 0 0	*Total number of respondents* 25 17 2 5 4 10 4 7 2 6 6 18 8 14 2 2	*Average mentions per person* 0,1 0,3 0 0 0,5 0 0 0,3 1,5 0,2 0 0,2 0,3 0,2 0 0
Aware of misbehaviour Mentioned 5 times by 3 respondents Mentioned by citizens: - Below the age of 30: - Between the age of 30-65: - Above the age of 65: Mentioned by citizens in: - Nijmegen Centrum: - Nijmegen Dukenburg: - Nijmegen Oud West: - Nijmegen Nieuw West: - Nijmegen Oost: - Nijmegen Noord: - Nijmegen Zuid: - Nijmegen Midden: Mentioned by: - Full time employed: - Part time employed: - Student: - Retired: - Unemployed:	*Times mentioned* 2 3 0 0 3 1 0 0 0 1 0 1 3 1 0 0	*Total number of respondents* 25 17 2 5 4 10 4 7 2 6 6 18 8 14 2 2	*Average mentions per person* 0,1 0,2 0 0 0,8 0,1 0 0 0 0,2 0 0,1 0,4 0,1 0 0

Lack of interest	*Times mentioned*	*Total number of respondents*	*Average mentions per person*
Mentioned 3 times by 2 respondents			
Mentioned by citizens:			
- Below the age of 30:		25	0,1
- Between the age of 30-65:	3	17	0
- Above the age of 65:	0	2	0
Mentioned by citizens in:	0		
- Nijmegen Centrum:		5	0
- Nijmegen Dukenburg:	0	4	0
- Nijmegen Oud West:	0	10	0
- Nijmegen Nieuw West:	0	4	0
- Nijmegen Oost:	0	7	0
- Nijmegen Noord:	0	2	0
- Nijmegen Zuid:	0	6	0,3
- Nijmegen Midden:	2	6	0,2
Mentioned by:	1		
- Full time employed:		18	0
- Part time employed:	0	8	0
- Student:	0	14	0,2
- Retired:	3	2	0
- Unemployed:	0	2	0
	0		

Competences

Knowledge	*Times mentioned*	*Total number of respondents*	*Average mentions per person*
Mentioned 164 times by 44 respondents.			
Mentioned by citizens:			
- Below the age of 30:	87	25	3,5
- Between the age of 30-65:	77	17	4,5
- Above the age of 65:	10	2	5
Mentioned by citizens in:			
- Nijmegen Centrum:	20	5	4
- Nijmegen Dukenburg:	12	4	3
- Nijmegen Oud West:	40	10	4
- Nijmegen Nieuw West:	8	4	2
- Nijmegen Oost:	28	7	4
- Nijmegen Noord:	9	2	4,5
- Nijmegen Zuid:	19	6	3,2
- Nijmegen Midden:	28	6	4,6
Mentioned by:			
- Full time employed:	73	18	4,1
- Part time employed:	23	8	2,9
- Student:	44	14	3,1
- Retired:	10	2	5
- Unemployed:	14	2	7
Lack of knowledge	*Times mentioned*	*Total number of respondents*	*Average mentions per person*
Mentioned 62 times by 32 respondents.			
Mentioned by citizens:			
- Below the age of 30:	30	25	1,2

- Between the age of 30-65: - Above the age of 65: Mentioned by citizens in: - Nijmegen Centrum: - Nijmegen Dukenburg: - Nijmegen Oud West: - Nijmegen Nieuw West: - Nijmegen Oost: - Nijmegen Noord: - Nijmegen Zuid: - Nijmegen Midden: Mentioned by: - Full time employed: - Part time employed: - Student: - Retired: - Unemployed:	28 4 3 2 24 4 17 2 6 4 20 4 23 4 11	17 2 5 4 10 4 7 2 6 6 18 8 14 2 2	1,6 2 0,6 0,5 2,4 1 2,4 1 1 0,7 1,1 0,5 1,6 2 5,5
Confusing material Mentioned 13 times by 11 respondents Mentioned by citizens: - Below the age of 30: - Between the age of 30-65: - Above the age of 65: Mentioned by citizens in: - Nijmegen Centrum: - Nijmegen Dukenburg: - Nijmegen Oud West: - Nijmegen Nieuw West: - Nijmegen Oost: - Nijmegen Noord: - Nijmegen Zuid: - Nijmegen Midden: Mentioned by: - Full time employed: - Part time employed: - Student: - Retired: - Unemployed:	*Times mentioned* 9 4 0 0 0 4 0 5 2 1 1 6 0 7 0 0	*Total number of respondents* 25 17 2 5 4 10 4 7 2 6 6 18 8 14 2 2	*Average mentions per person* 0,4 0,2 0 0 0 0,4 0 0,7 1 0,2 0,2 0,3 0 0,5 0 0
Handicap Mentioned 4 times by 3 respondents. Mentioned by citizens: - Below the age of 30: - Between the age of 30-65: - Above the age of 65: Mentioned by citizens in: - Nijmegen Centrum: - Nijmegen Dukenburg: - Nijmegen Oud West: - Nijmegen Nieuw West: - Nijmegen Oost: - Nijmegen Noord: - Nijmegen Zuid: - Nijmegen Midden: Mentioned by: - Full time employed:	*Times mentioned* 1 3 0 0 0 3 0 1 0 0 0 3	*Total number of respondents* 25 17 2 5 4 10 4 7 2 6 6 18	*Average mentions per person* <0,1 0,2 0 0 0 0,3 0 0,1 0 0 0 0,2

- Part time employed: - Student: - Retired: - Unemployed:	0 1 0 0	8 14 2 2	0 0,1 0 0
Lacking ability to walk Mentioned 4 times by 3 respondents. Mentioned by citizens: - Below the age of 30: - Between the age of 30-65: - Above the age of 65: Mentioned by citizens in: - Nijmegen Centrum: - Nijmegen Dukenburg: - Nijmegen Oud West: - Nijmegen Nieuw West: - Nijmegen Oost: - Nijmegen Noord: - Nijmegen Zuid: - Nijmegen Midden: Mentioned by: - Full time employed: - Part time employed: - Student: - Retired: - Unemployed:	*Times mentioned* 0 2 2 2 0 1 0 0 1 0 0 2 0 0 2 0	*Total number of respondents* 25 17 2 5 4 10 4 7 2 6 6 18 8 14 2 2	*Average mentions per person* 0 0,1 1 0,4 0 0,1 0 0 0,5 0 0 0,1 0 0 1 0

Material

Space Mentioned 31 times by 31 respondents Mentioned by citizens: - Below the age of 30: - Between the age of 30-65: - Above the age of 65: Mentioned by citizens in: - Nijmegen Centrum: - Nijmegen Dukenburg: - Nijmegen Oud West: - Nijmegen Nieuw West: - Nijmegen Oost: - Nijmegen Noord: - Nijmegen Zuid: - Nijmegen Midden: Mentioned by: - Full time employed: - Part time employed: - Student: - Retired: - Unemployed:	*Times mentioned* 19 9 3 4 3 5 2 7 1 2 7 7 5 13 3 3	*Total number of respondents* 25 17 2 5 4 10 4 7 2 6 6 18 8 14 2 2	*Average mentions per person* 0,8 0,5 1,5 0,8 0,8 0,5 0,5 1 0,5 0,3 1,2 0,4 0,6 0,9 1,5 1,5
Sustainable design of products Mentioned 26 times by 13 respondents Mentioned by citizens:	*Times mentioned*	*Total number of respondents*	*Average mentions per person*

- Below the age of 30:	11	25	0,4
- Between the age of 30-65:	13	17	0,8
- Above the age of 65:	2	2	1
Mentioned by citizens in:			
- Nijmegen Centrum:	2	5	0,4
- Nijmegen Dukenburg:	3	4	0,8
- Nijmegen Oud West:	6	10	0,6
- Nijmegen Nieuw West:	3	4	0,8
- Nijmegen Oost:	5	7	0,7
- Nijmegen Noord:	4	2	2
- Nijmegen Zuid:	1	6	0,2
- Nijmegen Midden:	2	6	0,3
Mentioned by:			
- Full time employed:	9	18	0,5
- Part time employed:	3	8	0,4
- Student:	10	14	0,7
- Retired:	2	2	1
- Unemployed:	2	2	1
Unsustainable design for products Mentioned 14 times by 10 respondents Mentioned by citizens:	*Times mentioned*	*Total number of respondents*	*Average mentions per person*
- Below the age of 30:	6	25	0,2
- Between the age of 30-65:	4	17	0,2
- Above the age of 65:	4	2	2
Mentioned by citizens in:			
- Nijmegen Centrum:	4	5	0,8
- Nijmegen Dukenburg:	2	4	0,5
- Nijmegen Oud West:	1	10	0,1
- Nijmegen Nieuw West:	0	4	0
- Nijmegen Oost:	4	7	0,6
- Nijmegen Noord:	1	2	0,5
- Nijmegen Zuid:	1	6	0,2
- Nijmegen Midden:	1	6	0,2
Mentioned by:			
- Full time employed:	3	18	0,2
- Part time employed:	2	8	0,3
- Student:	5	14	0,4
- Retired:	4	2	2
- Unemployed:	0	2	0
Confusing material Mentioned 13 times by 11 respondents Mentioned by citizens:	*Times mentioned*	*Total number of respondents*	*Average mentions per person*
- Below the age of 30:	9	25	0,4
- Between the age of 30-65:	4	17	0,2
- Above the age of 65:	0	2	0
Mentioned by citizens in:			
- Nijmegen Centrum:	0	5	0
- Nijmegen Dukenburg:	0	4	0
- Nijmegen Oud West:	4	10	0,4
- Nijmegen Nieuw West:	0	4	0
- Nijmegen Oost:	5	7	0,7
- Nijmegen Noord:	2	2	1
- Nijmegen Zuid:	1	6	0,2
- Nijmegen Midden:	1	6	0,2
Mentioned by:			
- Full time employed:	6	18	0,3

- Part time employed: - Student: - Retired: - Unemployed:	0 7 0 0	8 14 2 2	0 0,5 0 0
No Dar material	*Times mentioned*	*Total number of respondents*	*Average mentions per person*
Mentioned 16 times by 9 respondents			
Mentioned by citizens:			
- Below the age of 30:	16	25	0,6
- Between the age of 30-65:	1	17	0,1
- Above the age of 65:	3	2	1,5
Mentioned by citizens in:			
- Nijmegen Centrum:	3	5	0,6
- Nijmegen Dukenburg:	1	4	0,3
- Nijmegen Oud West:	1	10	0,1
- Nijmegen Nieuw West:	9	4	2,3
- Nijmegen Oost:	0	7	0
- Nijmegen Noord:	0	2	0
- Nijmegen Zuid:	0	6	0
- Nijmegen Midden:	6	6	1
Mentioned by:			
- Full time employed:	1	18	0,1
- Part time employed:	1	8	0,1
- Student:	14	14	1
- Retired:	3	2	1,5
- Unemployed:	1	2	0,5
No car	*Times mentioned*	*Total number of respondents*	*Average mentions per person*
Mentioned 5 times by 5 respondents			
Mentioned by citizens:			
- Below the age of 30:	4	25	0,2
- Between the age of 30-65:	0	17	0
- Above the age of 65:	1	2	0,5
Mentioned by citizens in:			
- Nijmegen Centrum:	1	5	0,2
- Nijmegen Dukenburg:	1	4	0,3
- Nijmegen Oud West:	0	10	0
- Nijmegen Nieuw West:	0	4	0
- Nijmegen Oost:	1	7	0,1
- Nijmegen Noord:	0	2	0
- Nijmegen Zuid:	0	6	0
- Nijmegen Midden:	2	6	0,3
Mentioned by:			
- Full time employed:	0	18	0
- Part time employed:	1	8	0,1
- Student:	3	14	0,2
- Retired:	1	2	0,5
- Unemployed:	0	2	0