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Behavioural and situational factors which influence household waste separation: A quantitative case study in Gouda

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Summary

To support the goal of the European Union to go fully circular in 2050, the Netherlands set a household waste separation target of 75% (Government of the Netherlands, 2016). Various organisations are supporting the government's goal. One is Cylus.

Cyclus functions cooperatively with 12 municipalities in collecting, cleaning and processing waste sustainably with a vision in mind; to work together with the municipalities and contribute towards the Netherlands' transition into circular economy.

However, household waste separation percentages revealed that the municipality of Gouda is far from reaching its target of 75%, only achieving between 43% and 53% in the course of 5 years. This research aimed explain which behavioural and situational factors could have possibly influenced this result.

By utilising a quantitative case study as the research strategy, the research proceeded by obtaining primary and secondary data through questionnaires, interviews, observations and accessing websites and databases.

The literature review enabled the researcher to discover factors which have possibly influenced household waste separation in Gouda. The behavioural factors were supported by the Theory of Planned of Behaviour. This theory suggested that intention is a main driver of one's behaviour (Ajzen, 1985). In this case, recycling behaviour. Meanwhile, the situational factors were supported by the Infrastructure-Service-Behaviour (ISB) Model (Timlett et al, 2011) wherein it is believed that not only behaviour influences recycling behaviour but infrastructure and services as well.

Inferential tests such as correlation, regression and t-test were performed to analyse the data obtained. Moreover, a Cronbach's alpha test was used to measure the consistency of the items. This was done to find out if the answers obtained from different items can be used to explain one indicator. The research findings found perceived behavioural control and age as the strongest predictors of household waste separation. Older people (aged 60 and above) were found to recycle more than younger people (aged below 60). It is believed that older people have more free time compared to younger people because they lack obligations such as going to work or looking after children. It was determined that the low household waste separation percentage in Gouda was due to the population dominance of those aged below 60. Moreover, perceived behavioural control was found to influence household waste separation. Although difficulty belief was perceived positively by residents, this was not the case for control belief. The perception of the residents regarding their control over recycling was affected by the fact they were not well-informed of what is being done to the items they deliberately or intended to separate. Thus, affecting their intention to recycle.

Lastly, this paper ended with some suggestions regarding the possible course of actions the municipality and Cyclus can take such as more frequent collection and improved public awareness campaign. These actions are in hope to contribute towards the improvement of household waste separation in Gouda to meet the 75% target.

Keywords

Household waste separation, community participation, behavioural factors, situational factors, recycling, circular economy

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Abbreviations

MSW	Municipal solid waste
VANG	*Van Afval Naar Grondstof* / From Waste To Resource
VNG	*Vereniging Nederlandse Gemeenten*
NVRD	*Nederlandse Vereniging van Reinigingsdirecteuren*
TRA	Theory of Reasoned Action
TPB	Theory of Planned Behaviour
SN	Subjective norm
PBC	Perceived behavioural control
EMF	Ellen MacArthur Foundation
ISB	Infrastructure-Service-Behaviour model
GFT	*Groen, fruit, tuinafval* (Dutch) / green, fruit, garden waste (English)
EU	European Union
EC	European Commission
CO_2	Carbon Dioxide
ISWM	Integrated Solid Waste Management
GDPR	General Data Protection Regulation

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Chapter 1: Introduction

This chapter introduces the topic of waste and how it has negatively impacted the world. To use waste as a resource, the concept of circular economy has been put forward by the European Union to address the presently occurring issues of waste. It is also highlighted in this chapter how the Netherlands is one of the EU states in support of the circularity. Supporting the Dutch Government are companies like Cyclus, which aims to work together with municipalities in contributing towards circular economy through improved household waste separation. Following is the introduction of the problem statement, research objective and its provisional research questions. Lastly, the chapter ends with the presentation of the significance of the study and the scope and limitations.

1.1 Background

Waste is defined as *"any substance or object which the holder discards or intends or is required to discard"* (European Commission, 2008). It is everywhere and too much of it is not particularly good for the human health, the animals and the environment. In fact, it is proven harmful. Take for instance, when solid waste decomposes in landfills, it releases harmful substances like lead and zinc (Pasko and Mochalova, 2014) which if untreated, can pollute the natural system. Groundwater sources can become contaminated with these harmful substances and this contamination can be dangerous to human health. Other forms of threat to human health due to waste are respiratory and neurological diseases resulting from toxins and particulate matter in the air (Thompson, 2014).

Another problem is when waste like plastic packaging end up in bodies of water such as rivers and oceans. This can be the case when waste is not disposed of properly. In fact, solid waste is one of the largest sources of pollution in oceans (Kaza et al, 2018). Due to the improper disposal of waste, animals such as birds and whales face great danger through ingesting plastic waste (Gabbatiss, N.D.; Daly, 2018).

The growing waste is an ongoing issue around the world today. They come in different forms such as hazardous waste, chemical waste, medical waste, bio-waste and solid waste. Solid waste is also usually called municipal solid waste (MSW) due to the fact that it is usually the local municipal governments who are responsible for managing solid waste in their respective municipalities.

It is estimated that 2.01 billion tonnes of waste were generated in the world's cities in 2016 and this is expected to increase to 3.40 billion tonnes in 2050 – a 70% increase from the 2016 figure (World Bank, 2018). This growth of waste is not expected to slow down anytime soon especially with the urban population growing alongside economic growth as well as industrialisation and urbanisation (Dhokhikah and Trihadiningrum, 2012 from Dhokhikah et al, 2015). In large, highly-populated cities, in particular, waste has become a serious problem (Dhokhikah et al, 2015). Back in 1960, world population was 3 billion and this has increased to 7.5 billion in 2018 (World Bank, 2018). This is an estimated increase of 1 billion every 12 years (World Bank, 2018). Not only population growth, but the growing economy is also a threat to the fast-growing waste. Economic growth means an increase on spending capacity. Thus, more waste.
It is undeniable that growing waste is a problem. Its excessive amount is visibly dangerous to the entire planet Earth. It is precisely because of these consequences that there are now strict

rules and regulations in regards to managing waste. Take for example, the Waste Framework Directive in the European Union (European Commission, 2008). The Member States are obliged to adopt waste management plans laid out by the Parliament. This is to ensure that waste is being managed "*without endangering human health and harming the environment, and in particular without risk to water, air, soil, plants or animals, without causing a nuisance through noise or odours, and without adversely affecting the countryside or places of special interest*" (European Commission, 2008).

There are several ways to manage waste; when planning for a city there should be consideration on what method to prioritise. For that reason, waste hierarchies have been created by different organisations. Although they show very similar order. Figure 1 is an example wherein the top is the most preferred option and the bottom being the least preferred. The waste hierarchy shows that prevention is the most preferred, followed by reuse, recycle, recovery and disposal being at the bottom.

Source: European Commission (2008)

Figure 1: Waste hierarchy from European Commission

There are various stakeholders that must be involved in implementing these methods. Although the government can enforce waste policies, and the private sector can set up companies to manage waste, the involvement of the community cannot be ignored in order to succeed. Take for example, recycling. To realise recycling, active involvement of the community (residents) is needed. Although private companies can arrange collection of household waste, the residents are crucial in separating waste at source. The service users or households are considered as one of the main stakeholders of waste management which includes recycling (Guerrero et al, 2013). Therefore, understanding different factors which can possibly influence household recycling is important.

Europe, in particular, is a potential global frontrunner when it comes to waste management and recycling (European Commission, 2018). The Parliament believes that landfilling can pollute the environment (European Commission, 2018). Thus, targets have been set for both landfilling and recycling which will both discourage the former and encourage the latter; only 10% or less of total amount of municipal waste are to be landfilled and 65% recycling rate target by 2035. In order to achieve these ambitions, reusing of materials is crucial. In 2015, the European Commission stated their ambition to transition into a circular economy which will, according to them, "*extract the maximum value and use from all raw materials, products and waste, fostering energy savings and reducing Green House Gas emissions*". The Parliament has stated their goal of "closing the loop" (European Commission, 2015).

As a member state of the European Union, the Netherlands abides by the rule to transition into circular economy. The Dutch government has set its own targets of 50% circularity in 2030 and full circularity in 2050 (Government of the Netherlands, 2016).

1.2 Problem statement

In 2018, the world's population was around 7.5 billion and this is expected to increase up to 9.7 billion in 2050 (World Bank, 2018; Khokhar & Kashiwase, 2015). Along with economic growth and population growth, waste generation is expected to increase (World Bank, 2018).

In 2016, 0.74 kilograms of solid waste per capita per day were generated (World Bank, 2019). High-income countries in particular contribute to this growth in waste by generating about 34% of waste despite only accounting for 16% of the world's population (Kaza et al, 2018). In order to address the problem of excessive waste, there are now aims to use waste as a resource through recovery, reuse and recycling (Kaza et al, 2018). Hence, the circular economy.

The circular economy is the opposing concept of today's current model of linear economy. The current model has a take-make-waste approach. The approach refers to taking resources, making products out of these resources and eventually making waste from disposing these products when it has reached its lifecycle. Circular economy, on the other hand, aims to close the loop of the resource-product-waste cycle through the main concept of "waste as a resource". There are three main principles of circular economy (Ellen MacArthur Foundation, N.D.); one is the regeneration of natural systems through preservation and enhancement of the natural resources. These can be done by controlling the use of these natural resources and balancing its flows allowing them to regenerate. Second is to keep products and materials in use. By circulating the products, there is optimisation of the yield of the resources. Lastly, foster system effectiveness by revealing and designing out negative externalities. These externalities can include discarded waste which ends up in landfills.

In the Netherlands, the national government has declared their support for the circular economy by setting a target of 50% circularity in 2030 and full circularity in 2050 (Government of the Netherlands, 2016). The government has recognised three reasons for the need to transition into a circular economy (Government of the Netherlands, N.D). First, the increasing demand for raw materials. Second, the dependence on other countries. Third, the impact on earth's climate emission wherein the extraction and usage of raw materials result to more energy consumption and more CO_2 emissions.

It is because of this goal that the government created the program "Van Afval Naar Grondstof" or VANG which translates to "From Waste To Resource" in English. This is a program which aims to "*using raw materials in a more sustainable manner*" (Government of the Netherlands, 2016). Supporting VANG, the Ministry of Infrastructure and the Environment[1], the Vereniging Nederlandse Gemeenten (VNG)[2], the Nederlandse Vereniging van Reinigingsdirecteuren (NVRD)[3] and the Rijkswaterstaat[4] set a reduction target of 100 kilos residual waste per inhabitant per year and another target of 75% for household waste separation in 2020 (VANG-HHA, N.D.). There are companies and organisations in support of this ambition.

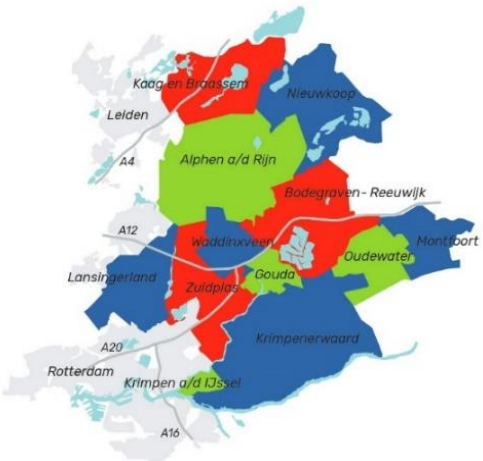

Figure 2: Map of Cyclus municipalities

[1] The organisation which is committed to improving quality of life, access and mobility in a clean, safe and sustainable environment.

[2] Association of Dutch Municipalities (in English) facilitates municipalities with the exchange of knowledge and experience regarding the implementation of national and local policies.

[3] Dutch Association of Cleaning Directors (in English) unites the Dutch municipalities and their public companies that are responsible for waste management and the management of public spaces.

[4] Rijkswaterstaat is the executive organization of the Ministry of Infrastructure and Water Management and works daily on a safe, liveable and accessible Netherlands

One is Cyclus. The municipalities in the regions of Central-Holland and Rijnstreek manage their waste through Cyclus which is a public limited company responsible for collecting, cleaning and processing of waste sustainably. The municipalities of Alphen aan den Rijn, Bodegraven-Reeuwijk, Gouda, Kaag en Braassem, Krimpen aan den IJssel, Krimpenerwaard, Lansingerland, Montfoort, Nieuwkoop, Oudewater, Waddinxveen and Zuidplas are under the management of Cyclus (as shown in Figure 2). Although responsible for waste management, Cyclus still needs to consult the municipalities regarding their plans and strategies.

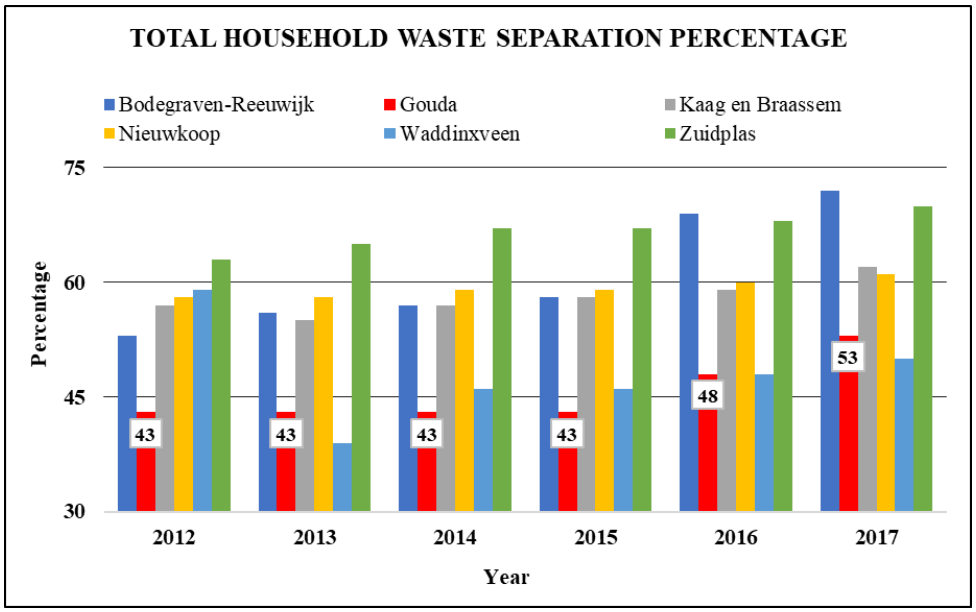

Figure 3: Total household waste separation percentage

Note: The author did not include Alphen aan den Rijn and Krimpenwaard in the graph due to some data missing. Lansingerland, Moontfort, Krimpen aan den Ijssel and Oudewater were also not included in the graph by the author because these municipalities only started working with Cyclus in 2018. According to Cyclus, their Annual Report of 2018 has not been released yet.

From reports and datasets, the municipalities from Cyclus showed differing results when it comes to their household waste separation percentages (see Figure 3). It can be seen that Gouda in particular has an obvious slow progress when it comes to its household waste separation percentages throughout 2012 – 2017 (in red bars).

From the observations made regarding the household waste separation percentages in the Cyclus municipalities, it can be assumed that there are factors influencing the differences in the results. One way to accomplish recycling is through separating waste from the source (Budak & Oguz, 2007) and this act of waste separation involves the participation and commitment of consumers, users and residents (Meen-Chee & Narayanan, 2006 from Budak & Oguz, 2007). Therefore, making it important to look at factors which could possibly influence the participation of the residents in household waste separation.

Studies have found several factors which can possibly influence community participation in household waste separation. These factors found include demographic components such as age, income and education level (Saphores et al, 2012; Akil et al, 2015). There are also situational factors which include the convenience of recycling facilities and services, recycling habits, recycling skills, recycling awareness and past experience of recycling (Largo-Wight et al,

2013; Wang et al, 2011; Bolaane, 2006; Saphores et al, 2012; Ittiravivongs, 2011; Sidique et al, 2010; Strydom, 2018). Recycling convenience and lack of knowledge/awareness are other possible influences (Largo-Wight et al, 2013; Wang et al, 2011; Bolaane 2006; Saphores et al, 2012 and Ittiravivongs, 2011; SUEZ, 2019).

Some studies have also accounted recycling behaviour to behavioural factors (Strydom, 2018; Mahmud & Osman, 2010; Ittiravivongs, 2011). These behavioural factors are usually supported by behavioural theories such as the Theory of Reasoned Action by Ajzen and Fishbein in 1975 and the Theory of Planned Behaviour by Ajzen in 1985. The theories suggest that intention is the main driver of a person's behaviour and that this intention is influenced by different factors; attitude towards behaviour, subjective norm and perceived behavioural control.

Given all the information, it was, therefore, important to understand why Gouda has low household waste separation percentage of only between 43% and 53% throughout the years 2012 to 2017. These results are far behind (at least 22% behind) compared to the 75% target by Cyclus in support of the VANG program. It was important to find out what factors could have possibly influenced these low percentage results.

1.3 Research objectives

The objective of this research is to understand why Gouda has a lower household waste separation percentage compared to the 75% target of Cyclus. In order to do this, behavioural and situational factors, which are believed to influence household waste separation, are looked at. Upon understanding the relationship between the factors and household waste separation, the research can possibly provide Cyclus helpful information towards improving the recycling implementation in Gouda which, in return, can assist their vision of actively contributing to the transition to a circular economy through improved household waste separation percentages.

1.4 Provisional research questions

Main question
How do behavioural and situational factors influence household waste separation in Gouda?

Sub-questions

1. How is recycling being implemented in Gouda?
2. What behavioural factors influence household waste separation in Gouda?
3. What situational factors influence household waste separation in Gouda?

1.5 Significance of the study

In the Netherlands, the government has set a target of 75% household waste separation percentage in 2020. The results of this research can provide Cyclus with possibly useful insight in regards to the lower household waste separation in Gouda compared to the target. Upon understanding the reasons behind the household waste separation performance, it is possible that they can be provided with information which can contributes towards improving the recycling implementation in Gouda and maybe achieve their target goal.

It is also important to note that even though the Netherlands is considered as a frontrunner when it comes to waste management and recycling (European Commission, 2018), Gouda, a Dutch municipality, has a waste separation of 53% which is 22% lower from its target of 75%. In doing this research, factors which are possible influences of such an unexpected occurrence can be attempted to explain.

Finally, the results of this research can add to the existing knowledge that is known of the link between behavioural and situational factors and household waste separation.

1.6 Scope and limitations

In this research, waste separation only refers to household waste separation. Thus, results are limited to a household setting. Moreover, only 1 district was chosen as the research location out of the 9 districts in the municipality of Gouda due to time constraints. Therefore, limiting the raw data obtained into a district level.

More importantly, not all municipalities under Cyclus were included in the preliminary observations due to missing data. Therefore, limiting the pre-observations to only 6 municipalities (as seen on Figure 3) instead of all 12 municipalities.

On a similar circumstance, when obtaining data from all 9 districts in Gouda to aid in choosing the sample size, it was found that not all districts have available data. Thus, forcing the researcher to exclude the said districts in choosing the sample size.

Additionally, due to time constraints, self-reported household waste separation participation was used as the measurement of participation. According to Chan (2009, p. 309), "*the use of self-report data is widespread across diverse fields of empirical research*".

Another important point to note is that, some of the questionnaires were distributed in English during the earlier stages of data collection and some in Dutch during the later stages. Thus, some questionnaires obtained might have been understood more by others and therefore, filled in more accurately or correctly. This is discussed further in Chapter 4.

Lastly, the questionnaire distribution was limited to detached houses, semi-detached houses and townhouses. This was due to the fact that the researcher had no access to enter blocks of apartments where security measures are available for non-residents such as keys for the front door entrance of the building.

Chapter 2: Literature Review

2.1 Introduction

This chapter focuses on elaborating the problem statement which lead to the main research question: *"How do behavioural and situational factors influence household waste separation in Gouda?".* In-depth information taken from existing literature regarding the relationship between behavioural and situational factors and household participation in household waste separation are presented.

Several theories were mentioned in the literature reviewed when talking about behavioural factors influencing household waste separation behaviour. However, two theories have been repeatedly mentioned; the Theory of Reasoned Action (TRA) and the Theory of Planned Behaviour (TPB). TRA suggests that intention is a main driver of one's behaviour. In this case, household waste separation behaviour. TPB is an extension of TRA making this theory a preferable choice due to its additional components which allows deeper understanding of the reasons behind household waste separation participation. This being the case, it was chosen as the underlying theory in this research for the behavioural factors.

Meanwhile, the Infrastructure-Service-Behaviour model was used to support the situational factors. This model suggests that behavioural aspects are not all that affect household waste separation behaviour; but with the inclusion of situational factors such as infrastructure and service. By using this model, the view at which household waste separation participation is being looked at and studied has been widened.

At the end of this chapter, a conceptual framework was created after careful consideration of the factors. This conceptual framework served as a guide for this study and it included the sub-variables of the behavioural and situational factors along with their respective indicators. These indicators were then used to measure the variables chosen.

2.2 Waste

Waste, as defined by the European Commission, is "*any substance or object which the holder discards or intends or is required to discard"* (European Commission, 2008). It takes on different forms; food waste, solid waste, medical waste, hazardous waste and others.

Evolutionary occurrences such as rapid urbanisation, economic growth and industrialisation lead to changes in lifestyle (Manaf et al, 2009). This new lifestyle, in return, lead to the change in composition of waste, as well as its accumulation (Ekere et al, 2009). Waste is a by-product of consumption and the consumption habits of humans resulted in the accumulation of waste (Ekere et al, 2009). It is for these reasons that waste management should be upgraded to deliver appropriate methods to the waste's evolutionary quality, quantity and composition (Manaf et al, 2009). This means that due to the circumstances, traditional methods are no longer sufficient in managing waste.

2.2.1 Waste management and its evolution

Early on, waste management was very basic and mainly focused on waste collection. This can be linked back to the industrial period in the 1800s wherein hygiene was very poor. Diseases

such as cholera and tuberculosis were easily obtained and spread due to the lack of knowledge about sanitation. During this period, sewage waste contaminated drinking water (Trueman, 2015) which led to the death of many. It can be said that waste management then, which was focused on collection, was mainly for public health concerns (Antonioli & Massarutto, 2012).

It was not until the 1970s that waste management started to address environmental issues. During this time, there were already growing concerns about pollution problems caused by open dumping of waste (Antonioli & Massarutto, 2012), which up to this day, remains a popular disposal method, especially in many developing countries (Zurbrügg, 2003). Unfortunately, combined with landfilling, open dumping still accounts for 69.6% of the total global waste method (Kaza et al, 2018).

Developing countries in particular have technical, financial, institutional, economic and social constraints in waste management (Zurbrügg, 2003; Ogawa, 2000 from Manaf et al, 2009). Additionally, the implementation of the said methods is cheap which is why despite being harmful to the environment, they are still preferred by many countries and municipalities. This preference can be associated with the increasing waste being a burden on the local budget. In developing countries, between 20-50% of the local budget is allocated for solid waste management (Guerrero et al, 2013). Developed countries, on the other hand, only uses 10% (Memon, 2010). They also have more advanced waste management techniques (Srivastava, 2013).

Later on, the integrated solid waste management (ISWM) approach was recognised. ISWM is a sustainable approach of managing waste which covers all aspects of generation, segregation, transfer, sorting, treatment, recovery and disposal (United Nations, N.D.). The concept of ISWM also introduced recycling and sustainability.

Sustainability can be measured through the cost-effectiveness of an approach, which usually depends on the economic status of a country (Shekdar, 2009). Therefore, making it that high-income countries are usually the ones who can afford to step up their waste management.

The goal to transition into a circular economy has been put forward by the European Union in 2015 (European Commission, 2015). This is a higher form of waste management (as seen in Figure 4). Both linear economy and re-use economy still produces non-recyclable waste, while the aim of the European Union and its ambition of going circular is to completely eliminate waste by using waste as a resource. Thus, closing the loop (as seen in Figure 4).

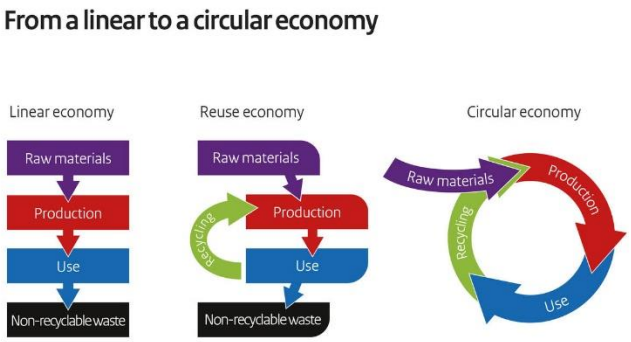

Figure 4: Evolution of waste management concepts

2.2.2 Closing the loop through circular economy

The concept of circular economy started as early as in the 1970s (Ellen MacArthur Foundation[5] (EMF), 2017). In 1976, Walter Stahel, an architect and industrial analyst, introduced the idea of "economy in loops" which was believed to influence resource savings and waste prevention. Similarly, the concept was introduced in Germany in the early 1990's for sustainable economic growth with focus on environmental policies which then helps address issues regarding raw material use and natural resource use (Winans & Deng, 2017). In China, the Circular Economy Promotion Law was established in 2008, where the main concern is about waste management and the cycle of materials (Sakai et al, 2011).

Circular economy is a different concept to that of take-make-waste of the linear economy wherein natural resources are taken, transformed into products and then disposed into landfills or incinerated after reaching the end of its life cycle. This approach not only increases waste generation but also depletes natural resources. It is due to these concerns that the concept of circular economy has been created to gain not only environmental but economic and social benefits as well (EMF, N.D.). The circular economy is based on three principles (EMF, 2017).

The first principle is regenerating natural systems which refers to the preservation and enhancing of the natural resources (EMF, 2017). Replacing non-renewable resources with renewable ones, increasing the use of recycled materials over raw virgin materials and sustainably sourcing of raw materials are some ways that allow the regeneration of the natural system (Manninen et al, 2018).

The second principle is to design out waste and pollution in which the focus is to completely eliminate waste within the waste stream. The relationship between the product designers and the waste industry within the production system is crucial in this principle (Bezama, 2016). By further fostering the relationship between the two industries, it is possible to come up with other feasible end-of-life management of used products. When this happens, the incineration of waste for energy recovery and landfilling of waste can be avoided, which are currently the most adequate end-of-life management options (Hildebrandt et al, 2015 from Bezama, 2016) and are contradictory to the concept of using waste as a resource.

The third and last principle is to keep products and materials in use. In this principle, techniques such as cascading, maintaining, re-using, remanufacturing and recycling are introduced to extend the useful life of products which will eventually be used as secondary raw materials.

Cascading usually refers to the biological cycle. This is the efficient utilisation of biomass (Mair & Stern, 2017) wherein renewable biological resources such as non-edible feedstock, residues, recycled materials and biogenic waste are used as raw materials to produce "new" products such as food, biomaterials, biochemicals, biofuel and energy (European Commission, N.D.; Clark & Deswarte, 2015 and Venkata Mohan, 2014 from Venkata Mohan et al, 2016; Vis et al, 2016). Cascade use of wood, in particular, is a good example of the process. Wood residues and by-products can be formed into wood-based products (Georg-August-Universität Göttingen, N.D.).

[5] A foundation launched in 2010 to help accelerate the transition to Circular Economy. They work in five areas; Education & Training, Business & Government, Insight & Analysis, Systematic Initiatives and Communications.

Depending on the possibilities and appropriateness, maintenance, re-use, remanufacturing and recycling can be performed. Repairing a product for further use extend its lifecycle. But when a repaired product has reached the end of its lifecycle, re-using can be done (Gaustad et al, 2018). Take for example, a pair of jeans. When a pair of jeans gets damaged, one can repair or mend it by sewing. Thus, extending its lifecycle. However, when the pair of jeans becomes too worn out to be maintained or repaired, re-using can be done. This can be achieved through cutting up the pair of jeans into pieces and sew it together to make a new rug or something of the like.

However, reusing is not applicable to all materials which is why remanufacturing can be done. This process rebuilds a new product through combinations of old, new and repaired parts (Gaustad et al, 2018). Unfortunately, there are some instances when neither re-use nor remanufacture is possible or no longer possible. This is when recycling can be performed and this usually requires expertise. Thus, recycling tasks are usually given to professional waste companies.

Finally, within the wider concept of waste management and circular economy is the collection and separation of waste. These are important branches of waste management and are discussed further below.

2.2.3 Waste collection

One element of solid waste management is collection (Shamshiry et al, 2011) and there are different approaches in its realisation. Today, it is common that the waste collection and waste disposal responsibilities are passed on to private companies (Kaseva & Mbuligwe, 2005). In 1990, over 80% of waste collection are done by private companies in the United States and United Kingdom (Lin & Kao, 2008 from Kirama & Mayo, 2016). According to Kaseva & Mbuligwe (2005, p.355), private companies are "*free from bureaucratic hurdles and the upkeep of their equipment is excellent*". Thus, making them a favourable choice. However, this favourable condition is not the sole deciding factor why privatisation of waste collection is preferred at times.

Waste collection methods differ between and within countries (Singh & Livina, 2015). Door-to-door, curbside (kerbside) and drop off are some of the waste collection methods (Singh & Livina, 2015; Lee & Paik, 2011; Sidique et al, 2010).

Curbside collection is when households separate their waste through special bins provided; these bins are then placed on the curbside or nearest collection points until the collection schedule (Lee &Paik, 2011; Moray Council, N.D.). Drop-off is another method of collection wherein residents voluntarily take their recyclable waste to drop-off points or sites and dispose them in appropriate containers (Sidique et al, 2010).

Waste collection is closely associated with waste separation. The most efficient way of collecting recyclable waste is by separating them into fractions at source (Gallardo et al, 2010). In this case, households. By separating waste at households, there is an increase of assurance that the waste generated will be recovered (Ekere et al, 2009).

2.2.4 Household waste separation

Waste separation is also a form of waste management just like waste collection. In fact, it is considered a crucial part when implementing an integrated waste management (McDougall et al, 2001 from Zhuang et al, 2008). By separating waste, the quality of the recyclable materials increases and it results in reducing labour and energy inputs which also improves the financing of waste management (Murray, 1999 from Zhuang et al, 2008).

The separation of waste can be performed either at source or at material recovery facilities during post-collection; wherein the former is the cheaper alternative (Budak & Oguz, 2007). Thus, making it the preferable choice by municipalities. It is important to note that, waste separation at source is the focus of this research. At source separation usually refers to residents/households. Thus, the household waste separation.

To proceed with waste separation, bins or containers usually have to be provided at the place where the waste has been generated (Gallardo et al, 2010). In this case, the waste is generated at households. The number of bins can differ between 2 and 5, depending on which country (Singh & Livina, 2015). For example, in Belgium and Norway they have two bins; one for dry waste and another for wet waste. In Finland, they have 5 bins for paper, plastic, glass, organic and e-waste.

Placing containers is a general idea which can be implemented anywhere. However, there are different specific practices in household waste separation in different regions. In China, for example, residents are required to separate their waste based on disposal facility near their area (Zhuang et al, 2008). In areas close to incineration facilities, residents are required to separate their waste into combustible materials, glass and harmful waste (Huang, 2004 from Zhuang et al, 2008). If located in a service area close to a landfill, the separation is by organic waste, inorganic waste and harmful waste (Huang, 2004 from Zhuang et al, 2008).

However, a waste separation of food waste, dry waste and harmful waste, which were separated in different coloured bins, was found to be more convenient than the ones previously mentioned; in a way that was it was easier to follow (Zhuang et al, 2008).

To improve at-source waste separation results, one way that can be done is to administer public campaigns (Ekere et al, 2009). These public campaigns aim to provide information to the residents about how to separate waste correctly. Moreover, waste separation is influenced by one's attitude towards the environment (Ekere et al, 2009). Therefore, promoting public campaigns, which also spreads environmental awareness, is important. In fact, this method has seen positive results in forms of high participation rate and increased average correct rate of source separation (Zhuang et al, 2008).

For the separation and collection (as well post-collection activities) to run smoothly, there should be a mutual "give-and-take" relationship between the residents and waste managers (Gallardo et al, 2010). There should be as little inconvenience as possible for residents to separate their waste and waste managers should receive recyclable waste based on the compatibility of the post-collection processes they intend to undertake (Gallardo et al, 2010).
There are several ways to find out whether household waste separation is successful or not. These include the waste separation frequency of households, quantity of separated waste by

households and contamination of separated waste by households (Oskamp et al, 1998; Akil et al, 2015). The higher the number of times a household separates its waste in a period of time, the higher the waste separation success. Additionally, the amount of recyclable waste separated also adds into the success input. The more recyclable waste is separated, the higher the chances of success of waste separation. More importantly, success is not only about the quantity but the quality as well. Waste separation is likely to be more successful if there is less contamination. Contamination refers to when unwanted or inappropriate material are mixed in specific recyclable bins.

Whether waste separation succeeds or not, greatly lies on the participation of the community (Gallardo et al, 2010). After all, the quality and quantity of the recyclable waste received by waste managers rely on the type and amount of recyclable waste the community separates. It is for this reason, that we talk a bit further about community participation in the next section.

2.2.5 Community participation

In waste management, stakeholder's involvement and participation are needed to achieve sustainability (Zhuang et al, 2008). On that note, the community is one of the main stakeholders of waste management (Guerrero et al, 2013) making their participation important in waste separation and a key factor for an effective solid waste management (Chung & Poon, 2001 and Sukhor et al, 2011 from Dhokhikah et al, 2015). In fact, it can even be said that waste separation would be impossible to do so without community participation (McDonald & Ball, 1998). Community can refer to consumers, service users, residents or households. In this research, community refers to households in specific.

The involvement of the households is necessary in order for the production sector to have access into the recyclable materials, which are also valued as secondary raw materials. If household waste separation is properly administered, a huge amount of secondary raw materials can be collected (He et al, 2003 from Zhuang et al, 2008) and eventually recycled.
To successfully transition into a circular economy, it is important to have further understanding about household waste separation, which is the first step towards recycling (Singh & Livina, 2015). As mentioned, recycling is a process in support of one of the principles of circular economy which is to keep materials in use.

In the next sections, behavioural and situational factors which are believed to influence household waste separation will be discussed. The behavioural factors area based on the Theory of Planned Behaviour while the situational factors are underpinned by the Infrastructure-Service-Behaviour (ISB) model.

2.3 Behavioural factors

Possible influences towards household waste separation include behavioural factors. Upon reviewing literature, a number of theories have been mentioned about environmental behaviour in household waste separation but two of the most dominant ones are the Theory of Reasoned Action (TRA) by Ajzen and Fishbein in 1975 and the Theory of Planned Behaviour (TPB) by Ajzen in 1985. TPB is an extended version of TRA.

Both theories suggest that intention is a main driver of a person's behaviour. Intention is one's commitment to act (Largo-Wight et al 2013). It is likely that one will perform the behaviour when one has high intention (Fishbein & Ajzen, 1975). In the case of this research, when one has a higher intention of recycling, the more likely one is going to perform the act of recycling. TRA laid out two factors which influence intention; attitude towards behaviour and subjective norm.

The attitude towards behaviour refers to "*the individual's favourable or unfavourable evaluation of performing the behaviour*" (Mahmud & Osman, 2010, p. 120). Some researchers believe that attitude towards recycling behaviour is a predictor of recycling participation (McCarty and Shrum, 2001 from Akil et al, 2015).

Subjective norm is the overall perceived social pressure which came from combined normative beliefs from different social referents. These social referents refer to an important person or a group of people such as family, friends, partner, acquaintances and neighbours. Also, these normative beliefs can form from what is expected of us by these social referents by telling us directly or what we conclude as what they want us to do (Ajzen, 1985 from Lange et al, 2012; Ham et al, 2015). Norms can be either injunctive or descriptive.

Injunctive norms are linked to moral values. In a societal setting, these norms are what one's social referents wants them to do. One can be verbally told of what is expected of them or one can simply assume what they think is being expected of them. In the context of household waste separation in this research, injunctive norm refers to the social pressure one experiences from the people they live with. For example, if you are an environmentalist there is an apparent social pressure in your household wherein your parents, for example, want you to do the recycling.
Meanwhile, descriptive norms are what we see as normal occurrences in our society. An example would be that recycling is a regular practice in the neighbourhood. Thus, one is influenced by this norm and end up recycling themselves. The opposite can also happen wherein recycling is not a common practice in the neighbourhood. Thus, in order not to feel indifferent, one can decide to not recycle.

The TRA has been criticised for being non-realistic with its two intention influences namely the attitude towards behaviour and subjective norm. Critics have stated the TRA assumes that a person has all the conditions needed to perform the behaviour and that the behaviour is exclusively based on one's volitional control or willingness (Valle et al, 2005). Due to this criticism, the Theory of Planned behaviour has been created with the addition of the third influence of intention; the perceived behavioural control (PBC).

Perceived behavioural control is *"the extent to which people believe that they can perform a given behaviour if they are inclined to do so"* (Ajzen, 1985 from Lange et al, 2012, p.446). With the addition of the third influence, the TPB was believed to be a more realistic representation of behaviour fuelled by intention (Valle et al, 2005). In fact, some researchers have found PBC as the strongest predictor of one's intention among the three factors influencing intention (Mahmud & Osman, 2010).

In addition, perceived behavioural control is influenced by both control beliefs and difficulty beliefs. Simply put in the context of this research, control beliefs are beliefs where one perceives waste separation as either under their control or not under their control. Difficulty beliefs, on the other hand, are one's perceptions on whether waste separation is easy or difficult

to do. Statements such as "*waste separation is under my control*" and "*waste separation is easy for me to perform*" are associated with control beliefs and difficulty beliefs, respectively (Trafimow, 2009). Some of the perceptions which affect control beliefs and difficulty beliefs include perceived space needed for recycling, perceived facility condition, perceived recycling skill and perceived time needed for recycling and perceived adequacy of recycling information (Ittiravivongs, 2011).Study results show that difficulty belief is a stronger predictor of intention than the control belief (Trafimow, 2009). This means that an individual's perception of whether recycling is easy to perform or difficult to perform is a strong predictor of whether they will recycle or not.

After literature review, it was found out that perceived behavioural control is an important determinant of recycling behaviour. Thus, it cannot be ignored. As mentioned previously, TRA has failed to incorporate perception into the theory. For this reason, it has been decided to use the Theory of Planned Behaviour instead as the underlying theory for behavioural factors. TPB, as highlighted in previous statements, is a more realistic representation of behaviour. Moreover, TPB has already been used in a number of researches which looked at recycling behaviour (Mahmud & Osman, 2010; Largo-Wight et al, 2013; Ittiravivongs, 2011; Akil et al, 2015; Strydom, 2018). By incorporating the three influences mentioned into the research instruments (i.e. questionnaire), it is possible to obtain opinion from residents regarding their attitude towards recycling behaviour, subjective norm and perception of behavioural control.

2.4 Situational factors

The choices made by individuals in regards to a certain behaviour, in this case recycling behaviour, is not based on behaviour influences alone; in fact, there are constraints within the environment which affects how they act (Giddens, 1984 from Timlett & Williams, 2011). These constraints can also be referred to as situational factors (Timlett & Williams, 2011). Considering both behavioural and situational factors is necessary to further understand community participation in household waste separation.

The Infrastructure-Services-Behaviour model supports the notion that situational factors are just as important as behavioural factors (Timlett et al, 2011). The model refers to infrastructure as the built system such as the bins, collection vehicles and recycling facilities. Services, on the other hand, refer to the systems, providers and enablers which allow people to participate in the act such as the collection methods and communication materials used.

During literature review, other situational factors such as recycling awareness and residential conditions have also been found to influence recycling behaviour.

2.4.1 Recycling convenience

Depending on how convenient the act of recycling is, households may choose to participate in waste separation or not (Largo-Wight et al, 2013; Wang et al, 2011; Bolaane, 2006; Saphores et al, 2012; Hage et al, 2009).

Studies have shown results that people are more likely to recycle when the activity itself is convenient. In contrast, low recycling convenience and services are likely to result in poor participation from the community (Wang et al, 2011). This means that when recycling facilities

are “insufficient and inferior”, residents are likely demotivated of their willingness to recycle (Ittiravivongs, 2011).

Additionally, some people may think it is troublesome and time-wasting to involve themselves in recycling. Therefore, recycling facilities and services should be comfortable to get access to (Ittiravivongs, 2011). To encourage recycling, clearly separated recyclable containers along with steady information of how to recycle should be readily available. For example, in some cases, the combination of both curbside recycling and drop-off recycling was found effective in regards to increasing recycling rate compared to when the two differing services are implemented separately (Sidique et al, 2010).

Similarly, in a university setting, it was found out that recycling rate is higher in buildings with both indoor and outdoor recycling compared to the buildings with only outdoor recycling (Largo-Wight et al, 2013). By giving people choices, recycling convenience is increased.
Others factors also believed to influence recycling are personal recycling skill, prior recycling (e-waste recycling) experience, recycling habit, ineffective policy implementation and enactment of policy ordinances (Ittiravivongs 2011; Saphores et al 2012; Wang et al 2011; Akil et al, 2015; Sidique et al, 2010).

2.4.2 Residential conditions

Residential conditions such as home ownership and resident period are found to influence recycling participation (Wang et al, 2011; Ittiravivongs, 2011). Due to the nature of this research, which is focused on household waste separation, it is important to look into these influences.

Residents who rent the houses they reside in are more likely to recycle than those who own the houses (Wang et al, 2011). Take the case of e-waste recycling in China, for example; wherein residents who rent the house recycle more than the residents who own the house. While the renters stay in the residence temporarily, the home owners are expected to live in the particular residence for a longer period of time. Thus, they can afford to set aside their e-waste and store it in their houses for a longer period of time (Wang et al, 2011). Meanwhile, renters are likely to move out of the house, depending on circumstances, and thus, have to keep the property clean and keep as less things as possible to be brought when moving out.

Literature also shows that residents who have lived longer in the residential area are more likely to recycle compared to residents who have lived there for a shorter period of time (Ittiravivongs, 2011). This is due to the fact that residents who have lived in the area for a longer period of time are in advantage when it comes to expertise about recycling facilities such as where the facilities are located, how the facilities work, when the collection takes place and such.

Recyclers were also “slightly more likely” to have larger families (Saphores et al, 2012). However, this claim does not coincide with the statement from Budak & Oguz (2007) which says household size is insignificant in terms of influencing recycling behaviour along with other factors such as number of adults in household and mean age of adults in household.

2.4.3 Economic benefits

Economic benefits are believed to influence recycling participation. These benefits refer to incentives or rewards in possible forms of money, coupons or lottery tickets. Economic benefits like these are believed to influence one's participation towards recycling (Bolaane, 2006, Schultz et al, 1995 and Wang et al, 2011). When people receive some form of benefit from recycling, they are more likely to participate in the activity. If they see that waste or the act of recycling waste has value (monetary value), they are likely to recycle (Mahmud & Osman, 2010). In some occurrences, for example in the case of e-waste recycling in China, residents prefer to sell their e-waste to the peddlers rather than handing them over to legal dealers (Wang et al, 2011). The reason for this is that they gain some benefit, in forms of cash, when they sell their e-waste to peddlers compared to bringing them to drop-off centres. This is particularly the case for poorer families. In Thailand, projects such as "garbage for egg" encourage poorer families to recycle their waste in exchange for eggs (Singhirunnusorn et al, 2012). There are also other projects wherein instead of eggs, cash is given in exchange for the recyclable waste.

On the contrary, Ittiravivongs (2011) stated that economic benefits are neither direct nor indirect predictors of recycling behaviour.

2.4.4 Demographic components

Although age has been found as a non-predictor for recycling behaviour in some studies (Schultz et al, 1995; Budak & Oguz, 2007), this is not entirely the case for others who have proven otherwise (Buttel & Flinn, 1976; Mohai & Twight, 1987 from Schultz, 1995; Martin et al, 2006 and Bruvoll et al, 2002 from Akil et al, 2015; Akil et al, 2015). It was found that age influences recycling behaviour. There is a common expectation that younger people are more involved in recycling due to the assumption that this group has the highest level of environmental concern (Buttel & Flinn, 1976; Mohai & Twight, 1987 from Schultz, 1995). However, this does not seem to be the case. In fact, it is the exact opposite wherein older people are more inclined to recycling than younger people (Akil et al, 2015; Martin et al, 2006 and Bruvoll et al, 2002 from Akil et al, 2015). Older people tend to have more free time than younger people. This can be attributed to circumstances such as retirement and their lack of tasks and responsibilities of looking after a child. Thus, their participation in recycling is more than those of younger age.

Other demographic factors such as income, age, ethnicity, gender, marital status and education level were also found to influence recycling behaviour (Akil et al, 2015; Saphores et al, 2012). Ittiravivongs (2011) stated that people should be well-educated to be able to practice recycling. Gender and income were also found as non-predictors for recycling behaviour (Hage et al, 2009). However, Saphores et al (2012) found the opposite results wherein women and married people are said to show more motivation in recycling than men and those who are not married.

2.4.5 Recycling awareness

Awareness is one other possible influence for recycling activity (Bolaane, 2006; Sidique et al, 2010; Saphors et al, 2012; Budak and Oguz, 2007; Strydom, 2018; Ittiravivongs, 2011; Hage et al, 2009). From the literature, awareness can refer to both awareness of the recycling scheme (Strydom, 2018; Ittiravivongs, 2011) and the awareness of the consequences of recycling

(Ittiravivongs, 2011; Hage et al, 2009). When people are aware of the importance of recycling and have adequate information about recycling schemes, they are more likely to participate in it (Budak & Orguz, 2007; Guagnano et al, 1995 from Wang, 2011).

Hage et al (2009) found that people are likely to recycle when they are aware of the negative environmental impacts of waste with the addition of their beliefs that they can help in mitigating these negative environmental impacts if they choose to recycle. Similarly, people are also likely to recycle when they believe that their non-participation in recycling can contribute to the negative environmental impacts of waste (Hage et al, 2009).

However, it was found that awareness of recycling does not necessarily equate to recycling participation (Bolaane, 2006). For instance, even if one is aware of the importance of recycling, it will be useless if there is a negative perception of one's ability to recycle (Strydom, 2018). This means that although one is aware of the negative impacts which plastic have towards the environment, for example, if they perceive that recycling is too much effort or difficult to perform then one will still end up not recycling.

Incorporating these factors into the research instruments such as the questionnaire can help obtain information regarding the residents' points of view about the recycling convenience in Gouda, their awareness and their particular residential conditions which can contribute towards the research objective. On that note, the researcher intends to keep an open mind regarding the possible linkages of both behavioural and situational factors. The researcher does not intend to see both factors as separate entities but rather possibly interconnected determinants of recycling behaviour. As the ISB model suggests, behavioural factors have limited scope in explaining recycling behaviour. Thus, the addition of the infrastructure and service, which are also considered situational factors. Discovering the relationship amongst these factors is important in understanding recycling behaviour, which, in return, contributes towards the transition of circular economy which is believed to be a solution with today's growing problem of waste.

2.5 Conceptual Framework

To visualise all the factors discussed previously; the author came up with a conceptual framework (Figure 5). The conceptual framework consists of two independent variables and one dependent variable – behavioural and situational factors being the independent variables and household waste separation being the dependent variable. These variables were taken from the main research question "*How do behavioural and situational factors influence household waste separation in Gouda?*".

Under the behavioural factors, attitude towards behaviour, subjective norm and perceived behavioural control are chosen as sub-variables; all these factors are based on the behavioural Theory of Planned Behaviour (TPB) by Ajzen in 1985. TPB assumes that intention precedes household waste separation behaviour and this is highlighted in the conceptual framework.

Underpinned by the Infrastructure-Service-Behaviour (ISB) Model, recycling convenience, recycling awareness, residential conditions and demographic components were the sub-variables under situational factors. Economic benefits from the literature review was excluded from the conceptual framework because pre-research into the household waste separation in Gouda led to the findings that there exists no incentives or rewards in the form of money, coupons or lottery tickets; which are common forms of incentives or rewards as previously

mentioned in the literature review. Under demographic components, age, gender, marital status, education level, nationality, ethnicity and household income were chosen as control variables. This is for the reason that these factors were previously found as predictors of household waste separation.

Moreover, it is highlighted in the conceptual framework the possible relationship that exists between the two independent variables. This is based on previous literature discussed.

Finally, for the dependent variable of household waste separation, the chosen indicators are presented in the framework; frequency of household waste separation, frequency of separating each recyclable item category, quantity of separated recyclable materials and quantity of non-separated recyclable materials. The quantity of non-separated materials was added in order to avoid bias that only separated materials are being addressed.

Additionally, the contamination of separated recyclable materials, which was mentioned during the literature review, was excluded due to the limited time available as well as the lack of human resources for measuring contamination. These circumstances made it difficult for the researcher to measure such indicator.

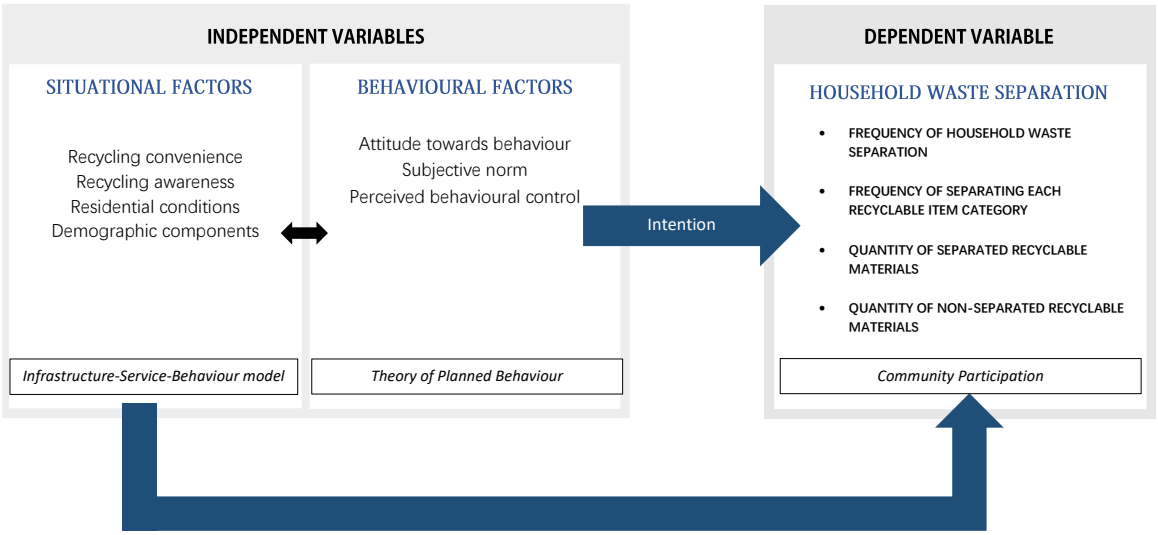

Figure 5: Conceptual framework

Chapter 3: Research Methodology

3.1 Introduction

This chapter presents the research methodology that was used to answer the sub-questions and eventually the main research question. The first section presents operationalisation wherein variables of the research were defined. Additionally, an operationalisation table was created to present different theories and concepts from the literature review with the variables and sub-variables used along with their respective indicators which then allowed the researcher to measure the said sub-variables. The section that follows explained why the research strategy chosen is case study, specifically a quantitative case study. Afterwards, the data collection methods together with the sample size and collection are presented. Countermeasures to overcome challenges in regards to the reliability and validity of the research are also presented in the next section. Lastly, the intended data analysis methods and techniques are laid out.

3.2 Revised research questions

Main research question

How do behavioural and situational factors influence household waste separation in Gouda?

Sub-questions

1. How is recycling being implemented in Gouda?
2. What behavioural factors influence household waste separation in Gouda?
3. What situational factors influence household waste separation in Gouda?

3.3 Operationalisation

In this section, the variables from the literature review were first defined for further understanding. This is then followed by a table representation of the indicators together with their respective data collection methods.

3.3.1 Definition of variables

In this research, the dependent variable is household waste separation while the independent variables are behavioural and situational factors. Each of these variables are explained below.

Household waste separation

In this research, household waste separation referred to the participation of the households in Gouda in separating their waste at source. Data regarding this variable was obtained through the respondents' self-reported waste separation behaviour. Self-reporting is not an uncommon method to use and has been used in previous studies (Oskamp, Zelezny, Schultz, Hurin, & Burkhardt, 1996 from Oskamp et al, 1998).

There were four indicators set for this variable. All of which were measured through questionnaire items designed as a mix of multiple-choice and 5-point Likert scales. The first indicator was frequency of household waste separation. This measured how often a household separates their recyclable waste. The second indicator was frequency of separating each

recyclable item category. This referred to the number of times a household would separate a specific recyclable item category. The recyclable item categories were chosen based on the recyclable material categories currently being collected in Gouda. These are paper & carton, PMD (plastic, metal cans & drink cartons) and glass. It is important to note that GFT (*groen, fruit, tuinafval – green, fruit, garden waste*) is also a collectible waste in Gouda. However, this was missed by the researcher. Therefore, was not included as an item category in the questionnaire and can be considered a limitation. The third indicator was quantity of separated materials. From a previous study (Oskamp et al, 1998), this was measured by the fullness of the separated recyclable bins. However, this method was difficult to implement in this research due to time and human resources constraints. Therefore, an alternative was used instead which is to find out through self-reporting how many recyclable item categories (paper & carton, PMD and glass) does a household separate. To avoid bias of measuring only what items are being separated, the quantity of materials that are not separated (for whatever reason) were also be measured as the fourth indicator.

Behavioural factors

The behavioural factors in this research were underpinned by the Theory of Planned Behaviour. The theory claims that intention is the main driver of recycling behaviour and that this intention has three influences; attitude towards recycling behaviour, subjective norm and perceived behavioural control.

The attitude towards recycling behaviour referred to one's willingness to recycle. This was measured through a series of questions asking about one's willingness to recycle such as their favourable or unfavourable opinion of recycling. The subjective norm referred to the recycling behaviour of an individual's social referents. The social referents in this research was categorised into two: family and friends, and neighbours. This sub-variable was measured through items asking how one's social referents think about recycling. The perceived behavioural control referred to the difficulty beliefs and control beliefs of an individual. This sub-variable was measured through items asking one's perceived control over recycling and also through their perception of how easy or difficult it is for them to separate their waste.

Situational factors

In this research, the situational factors referred to the non-behavioural factors such as infrastructure and service. This concept was underpinned by the Infrastructure-Service-Behaviour (ISB) model wherein it suggests that situational influences are just as important as behavioural influences and that behaviour is not the sole determinant of waste separation participation. But rather, other factors such as recycling facilities and awareness are determinants as well. In this research, situational factors consisted of recycling convenience, recycling awareness and residential conditions.

Recycling convenience referred to the information available on what to recycle, clearly separated recyclable containers and ways of recycling.
Recycling awareness referred to both the awareness of the recycling scheme and awareness of the impacts of recycling. The former was measured through knowledge of the collection schedule and the location of the recyclable bins. The latter was measured through one's knowledge about whether recycling impacts the environment positively or negatively.

Lastly, residential conditions referred to home ownership, number of years in residence and number of people in household. These were measured through whether the house is owned or rented, the number of years a resident has lived in the residence and the number of people living in the same household.

Demographic components

In this research, the demographic components referred to the demographic composition of the sample size which included age, gender, marital status, education level, nationality, country of origin[6] and household income. These components also acted as control variables and were used in two different ways. First, it was used during the pre-research to determine the research location. Data was secondary and obtained through the Gouda municipality database (Gouda in cijfers). Second, primary data was obtained through self-reporting of the respondents. This data was then used to control the results during inferential tests performed such as regression analysis.

[6] Ethnicity was found as a predictor during literature review. However, during data collection some complications were met and thus, the author decided to use country of origin instead. This is further discussed in Chapter 4.

3.3.2 Operationalisation table

Table 1: Operationalisation table

Theories/ concepts	Variables	Sub-variables	Indicators	Definition of indicators	Scale of measurement	Data collection methods
Theory of Planned Behaviour	Behavioural factors	Attitude towards behaviour	Willingness to recycle	One's favourable or unfavourable opinion of recycling	Ordinal, Likert scale	Questionnaires Interviews
		Subjective norm	Recycling behaviour of family and friends	What the people one lives with think of recycling	Ordinal, Likert scale	Questionnaires Interviews
			Recycling behaviour of neighbours	What one's neighbours think of recycling	Ordinal, Likert scale	
		Perceived behavioural control	Perceived easiness/difficulty and control of recycling	How easy or how difficult is it to perform recycling and how much control you have over recycling	Ordinal, Likert scale	Questionnaires Interviews
Infrastructure-Service-Behaviour Model	Situational factors	Recycling convenience	Information available on what to recycle	Information regarding what materials go in respective bins	Ordinal, Likert scale	Questionnaires Interviews
			Clearly separated recyclable containers	Presence of enough separate recycling bins i.e. one for plastics, one for bottles etc.	Ordinal, Likert scale	Observations
			Ways of recycling i.e. curbside, drop-off	Different kinds of recycling collection methods available	Ordinal, Likert scale	
		Recycling awareness	Awareness of recycling scheme	The knowledge about the collection schedule and the location of the bins	Ordinal, Likert scale	Questionnaires Interviews
			Awareness of the impacts of recycling	One's knowledge about whether recycling impacts the environment positively or negatively	Ordinal, Likert scale	
-		Residential conditions	Home ownership	Is it owned or rented?	Nominal	Questionnaires
			Number of years in residence	-	Nominal	
			Number of people in household	-	Nominal	
-	Control variables	-	Age	-	Nominal	Questionnaires Online database
			Gender	-	Nominal	
			Marital status	-	Nominal	
			Education level	-	Ordinal	
			Nationality/ethnicity	-	Nominal	
			Household income	-	Nominal	
Community participation	Household waste separation	-	Frequency of household waste separation	How many times does a household separate their waste	Ordinal, Likert scale	Questionnaires
			Frequency of separating each recyclable item	How many times does a household separate i.e. plastics, bottles, etc.	Ordinal, Likert scale	
			Quantity of separated materials	How many types of recyclable materials does a household separate i.e. plastics only, bottles only, plastic & bottles, etc.	Nominal	
		-	Quantity of non-separated waste	How many types of recyclable materials does a household not separate (for whatever reason i.e. lack of bins etc.)	Nominal	Questionnaires

3.4 Research strategy and methodology

This research used the strategy of a quantitative case study. This was deemed appropriate since this research looked at a large number of variables (situational and behavioural factors) and a small number of units (one district in the municipality of Gouda) which are the main characteristics of a case study strategy. Moreover, this research looked at one case in particular which is Gouda and its low household waste separation percentage. More importantly, there was a strong focus on quantitative data and analysis in this research. Hence, the emphasis on a quantitative case study. The author also particularly aimed to triangulate to look at possible linkages of both independent variables as mentioned in Chapter 2. It is for this reason that survey was not chosen as the research strategy. A survey mainly utilises a questionnaire as its main instrument. Meanwhile, the author also aimed at conducting interviews along with the use of questionnaires in order to find out the said linkages. Although questionnaires can be used in the way of a structured interview (van Thiel, 2014), this research aimed at conducting semi-structured interviews wherein interviewees are free to give out their own answers instead of being asked to pick from pre-chosen answers from the researcher, which is the case for structured interviews. For the purpose of this research, a semi-structured interview with open-ended questions was deemed more appropriate than a structured interview.

Additionally, another main characteristic of a case study is by conducting the research in a real-life setting (van Thiel, 2014) which was also the case for this research.

3.5 Sample size and selection

The municipality of Gouda has a total population of around 73,176 (Gemeente Gouda, 2019). It has 9 districts (as shown in Figure 6) and within these districts are 51 neighbourhoods.

The goal in choosing the sample size and research location was to pick one district which is as diverse as possible in terms of the composition of its residents. This was done in order to avoid bias.

Figure 6: Districts in Gouda

To acquire this goal, the researcher first gathered demographical data for all districts in Gouda and carefully analysed them. Based on the control variables, data collected were age, gender, nationality and marital status. Due to its unavailability, data for education level and country of origin were not obtained. All data mentioned were obtained from the municipality database (*Gouda in cijfers*) and included the number of people per indicator. For example, number of males and number of females under gender. Any district that had missing data for even one indicator was excluded from the selection. In doing so, one district was eliminated; leaving 8 into consideration.

The percentages of indicators were calculated against the total population of Gouda to find out how much of the groups compose the indicator. For example, how many males and females (groups) are under gender (indicator) in the whole of Gouda. Afterwards, the same process was done per district. For example, against the total population of Gouda, how many males and

females are there in the district of Plaswijk (see map from Figure 6). Next, the calculated percentages of the indicators of both the whole of Gouda and per district were compared (see Annex 24). This was done by manually looking at the differences in percentages. All districts which had the same percentages for each group per indicator as the one in overall of Gouda were considered to have passed the first stage of the elimination process. For example, from the demographic data obtained from the municipality database, 49% are males and 51% are females in the whole of Gouda. Any district which also has 49% males and 51% females passed this elimination stage. However, the presence of the exact same percentages was not always available. When this happened, there was a consideration of ±1 difference. If even this alternative was unavailable, a further consideration of ±2 difference was applied. Every time a district passes the group, a point is scored. This was done to confirm that the sample size contained as many categories per indicator as possible. Thus, ensuring a diverse group. After tallying the scores, the result was obvious. Earning 8 points, the district of Noord was chosen as the research location. Finally, to find out the population sample required, Slovin's formula was used.

$$n = \frac{N}{1 + Ne^2}$$

Wherein, n = number of samples; N = total population; e = error. Confidence levels of 90%, 95% and 99% are the most commonly used ones (Lawsky et al, 2014). Due to the limited time available for the research, the confidence level selected was 90%. Otherwise, a large sample size would have been needed (i.e. 385 samples if confidence level was at 95%) which was found difficult to do due to time and human resources constraints. A 90% confidence level means there is a margin of error of 10%.

Based on the demographic data obtained previously, the district of Noord-Gouda has a total population of 10,384. After applying Slovin's formula, it was determined that the needed sample size was 99. However, the actual number of questionnaires obtained was 125 which was around 27% more than the needed amount.

3.6 Data collection methods

This research utilised both primary and secondary data to answer the research questions as well as using both quantitative and qualitative data. However, it is important to note, that the research had a strong focus on quantitative data. To obtain research data, questionnaires, interviews, observations and online databases were the data collection methods.

3.6.1 Primary data collection

For primary collection, questionnaires, interviews and observations were used to obtain desired data.

Questionnaires

The 19-item questionnaire was designed in guidance with previous literature (Ittiravivongs, 2011; Strydom, 2018). It composed of three parts; questions about demographic information, questions about behavioural and situational factors, and questions about the technical and

operational information of the recycling implementation in Gouda to aid the researcher in answering sub-question 1. The three parts used a mix of multiple-choice and 5-point Likert-scales as previous literature (Strydom, 2018); wherein respondents can tick the appropriate or desired answers to the questions and rate their opinions, respectively. The researcher intentionally placed demographic-related questions in the beginning of the questionnaire to make the respondents feel close and personal.

The research location, district of Noord, was already carefully chosen by ensuring its residents' composition was as diverse as possible. Therefore, in distributing the questionnaires, random sampling was applied wherein the author randomly distributed the hard copy questionnaires in the district of Noord by chance. This was done by knocking on households and asking residents to complete the questionnaire, and by slipping through questionnaires in people's mailboxes.

Semi-structured interviews

Due to time constraints and to ensure that the interview results followed the same direction without limiting the possibility of new ideas, concepts and variables, a semi-structured interview was used for this research.

The selection of interviewees was taken from the questionnaire respondents and on random by chance. It was a mixed self-selection sampling and random sampling. This means that questionnaire respondents should have volunteered and be willing to participate in a follow-up interview. They have done so by stating their permission at the end of the questionnaire. Respondents who gave permissions were contacted for a follow-up interview. Additionally, the researcher conducted random interviews on streets by chance. The locations included playgrounds, outside local supermarkets and footpaths where people can do leisurely activities such as walking, jogging or walking their dogs. In addition, between 12 and 60 samples were advised as "enough" for a graduate thesis (Adler and Adler, 2011 from Baker et al, 2012). Due to time constraints, the researcher chose the minimum of 12 interviews.

Semi-structured interviews were also planned to be conducted on key persons from the municipality and Cyclus to know some of the needed technical information to answer sub-question 1, which is about the recycling implementation in Gouda. This was acknowledged as purposive sampling. For the purpose of answering the sub-question, the researcher chose the appropriate interviewees who can possibly provide useful information. Desired and obtained information included the different collection and disposal methods in Gouda and the efforts made by both Cyclus and the municipality in disseminating recycling information such as the recycling schedule and what items can be recycled.

Observations

The researcher also did some observations in the chosen district. From information found online, the municipality of Gouda has different waste separation methods such as the use of mini-containers (with wheels), plastic bags, overground containers and underground containers. To cross-check the data obtained online, as well as the interviews and questionnaires, observations were made in regards to the types of containers that are available within the district chosen. Observation results are presented in the next chapter, section 4.3. Additionally, available recycling information placed on the containers were observed. It was checked whether information available was about what items can be recycled and cannot be recycled.

Moreover, the overall situation of the accessibility to the containers were also observed. This referred to where the mini-containers (with wheels) were placed during collection, where the collection point is for the plastic bags, where the underground and overground containers were located, in which types of houses they were situated in, and what other public containers were available in the district. The results are presented in section 4.3.

Lastly, photographs were taken along with taking notes to document the observations. Photographs taken included the different containers which are all presented in Annex 6.

3.6.2 Secondary data collection

Secondary data in this research composed of technical and operational information in regards to recycling implementation in Gouda. From the municipality website, information such as types of bins, types of wastes and waste taxes were obtained. From the Cyclus website, information such as collection schedule and types of wastes were obtained. The secondary data obtained was used to double-check the information that were obtained from the questionnaires and interviews.

Additionally, data used to select the sample size was taken from the municipality database (Gouda in cijfers). This data included statistical information on age, gender, ethnicity, marital status and population. Educational level and country of origin, however, were not obtained.

3.7 Validity and reliability

There were a number of challenges this research faced which could have threatened its validity and reliability. Reliability refers to the accuracy and consistency of the variables used in a research (van Thiel, 2014). Validity, on the other hand, has two types: internal and external (van Thiel, 2014). Internal validity refers to "the cogency of the study itself" (van Thiel, 2014, p.49) while external validity refers to the ability of the research results to generalise (van Thiel, 2014).

To increase the reliability of the research, Cronbach's alpha test was performed to check consistency of the items assigned to each indicator. Test results which were 0.7 or higher were considered reliable and thus, accepted which means that items tested can be combined into one variable for further analysis. Moreover, triangulation was applied in this research. Both primary and secondary data sources were used and different collection methods such as hard copy questionnaires, semi-structured interviews and observations were performed. Not only did triangulation increased the reliability of the research but the validity as well. The diversified approach of data collection enabled the researcher to gather as much information as possible from different sources and methods. Therefore, improving the reliability and validity of the research.

For the internal validity of this research, control questions were used. These control questions are usually used to overcome the challenge of tendencies of answers of the respondents. These tendencies refer to when people are dishonest about their answers (van Thiel, 2014); they tend to fill in answers which they think can positively influence the research. The control questions were similarly constructed but mean more or less the same. This way, multiple answers for the same indicator were gathered. Moreover, the use of operationalisation increased the internal validity wherein theoretical variables were assigned with specific indicators. These indicators

were then defined and made sure that they only measure their respective theoretical sub-variable.

As for the external validity, non-response was one of the challenges and according to van Thiel (2014), this was especially the case when using online questionnaires. In order to overcome this challenge, a hardcopy questionnaire was used in this research which has a lower non-response rate compared to online questionnaires. Additionally, the probability sampling used in this research allowed generalisation (van Thiel, 2014). Thus, increasing external validity. The researcher was also very careful in choosing the sample size. By making sure that the sample size was diverse enough, it allowed generalisation in the Netherlands.

Furthermore, semi-structured interviews were conducted using an interview manual which contained a list of questions that were used in the interview. According to van Thiel (2014), a manual "*ensures that the conversation follows a fixed pattern*". Thus, increasing the replicability or external validity of the research. Also, during the interviews, some of the items in the questionnaires were asked again to increase reliability.

3.8 Data analysis and techniques

This research used both quantitative and qualitative analysis to answer the research questions. However, the main focus was that of quantitative analysis. Qualitative data obtained from interviews and questionnaires were analysed through manually looking at both the questionnaires and transcripts to create a matrix which listed the main concepts discussed by the respondents and interviewees (see Annex 11). The qualitative data were then used in the forms of quotations to support quantitative results.

To analyse sub-question 1, a descriptive analysis was performed and data obtained were presented in forms of photographs and descriptions. Also, Microsoft Excel provided some visual analysis such as charts, tables and graphs for some data obtained such as residential conditions.

SPSS 26 was used as the quantitative data analysis tool. This is a software package used mainly for doing statistical analyses. Before proceeding with the analysis, data was first checked for missing values and then fixed. This was done by making sure that values were properly defined and coded. For example, making sure that missing values were defined as "999" which then the software reads as missing or invalid.

After preparing the data, the first step was to test internal consistency of the indicators assigned to their specific sub-variables. This was done by performing a Cronbach's alpha test, as used previously (Malik et al, 2015). By conducting this reliability test, it was measured how closely related the indicators were as a group and how reliable they were to measure their particular sub-variable. A general rule is that a reliability test result of 0.7 is an acceptable level and 0.8 or higher is a greater reliability (Ursachi et al, 2015). Once the reliability test result fulfils the expected values, this was taken as a signal that items can be combined into one variable and can therefore, be used for inferential tests.

Descriptive statistics were also used in the analysis. This enabled the researcher to look at the mean values, standard deviation and frequencies of the indicators which then allowed visual comparison and contrast. Additionally, the descriptive statistics also allowed the researcher to

observe the profile of the sample size. The mean values and standard deviation made it possible to look at the average data scores and at how spread out the data scores were, respectively.

Finally, inferential tests were performed. A Spearman's rank correlation test was performed to measure the strength of association between the dependent and independent variables. However, a correlation test does not inform causality. It only shows whether there is a relationship between variables. For this reason, a linear regression analysis was performed. This analysis enabled the researcher to look at which variables explains or predicts recycling behaviour. Through creating regression models, changes were observed in the significant differences between the independent variables (behavioural and situational factors) and the dependent variable (household waste separation). Moreover, control variables were included in the regression analysis to see if there are any changes that occurs in the models. Lastly, a number of t-tests were performed for the residential conditions to find evidence if the means obtained for two categories of the sub-variable were statistically significant.

Chapter 4: Research Findings

4.1 Introduction

This chapter presents the results obtained from data collection. The chapter starts with the presentation of the challenges experienced during the fieldwork. This is followed by a descriptive analysis to provide answers for the first sub-question "How is recycling being implemented in Gouda?" wherein the different separation and collection methods in Gouda are highlighted. Afterwards, the profile of the sample size is shown. This is followed by the presentation of the answers of respondents through tables. These tables allow visual comparison of respondents' opinions. The quantitative data were analysed with support from qualitative data obtained in forms of quotations and also in reference to the qualitative matrix created (see Annex 11). Moreover, Cronbach's alpha test results are presented for each sub-variable. This allowed the author to test the internal consistency of the items before combining them into one variable. The chapter ends by presenting the number of statistical analyses that were performed and discussing the variables that were found significant in predicting household waste separation.

4.2 Data collection and sampling

Some challenges were experienced during the fieldwork. Thus, some adjustments had to be made. Different from the initial plans, the researcher was required to adapt accordingly. The adjustments made are presented in the following sections.

4.2.1 Questionnaires

The first attempt of obtaining questionnaires was done by knocking on random houses within the neighbourhood and asking residents if they can fill in the questionnaire. This was found challenging as most people at home, as observed, were those who have small children to look after. Thus, they do not have time to complete the questionnaire. It is important to note that the researcher conducted the fieldwork during work hours.

Moreover, language was also discovered as a barrier. The first set of questionnaires was distributed in English. This proved to be a disadvantage and the author experienced many rejections due to the nature of the questionnaire. After this experience, it was decided that the following set of questionnaires will be distributed in Dutch.

The first method of obtaining the questionnaires was found very time consuming. Therefore, it was decided to change the method. Instead of knocking on people's doors and ask them to fill in the questionnaire, it was decided to slip the questionnaires in through people's mailboxes instead. Adding a little note, the researcher asked the residents to leave their completed questionnaires outside their door for picking up the next day. This way, not only did the author not have to spend a lot of time waiting for each respondent to complete the questionnaire but the respondents were given more time to fill in the questionnaires as well.

The data collection started poorly with only a handful questionnaires obtained. In order to meet the deadline and to increase the chances of obtaining questionnaires, the author also slipped in little notes into people's mailboxes which contained links to an online version of the questionnaire. However, this was not very successful with only a few responses.

Lastly, the initial intention of obtaining data in regards to ethnicity was not met. During the fieldwork, it was discovered that ethnicity is a protected information under the General Data Protection Regulation (GDPR), which is a law in the European Union to protect privacy of the citizens. To avoid complications, ethnicity was changed into "country of origin" and was made optional.

4.2.2 Interviews

The initial plan was to invite respondents who both have given permission for the follow-up interview and have interesting answers. However, there were fewer volunteers than expected. Thus, everyone who expressed interest have been invited to an interview, regardless of whether their answers were found interesting or not. Thus, the intended 6 recycler interviewees and 6 non-recycler interviewees were not met. Moreover, there were not many respondents who filled in the "additional comments" section.

Despite the volunteers, the target number of interviewees was still not met. Thus, the researcher decided to conduct random interviews; by chance on the streets within the neighbourhood. These areas include outside the local supermarket, close to public recycling containers, footpaths (where people can take their dogs out for a walk) and playgrounds.
The interviews were very short and informal. There was also some language barrier. Some interviewees struggled to fully express their opinions in English and gave really short answers. Thus, this might have limited the results.

It is important to note that an interview from the Cyclus officer was planned and agreed but for unclear reasons, the officer decided to change the decision by answering the interviews through email. Additionally, the interview from the municipality officer was successful.

4.3 Household waste separation in Gouda

This section presents the descriptive analysis to address sub-question 1: "How is recycling being implemented in Gouda?" as mentioned previously in Chapter 3.

4.3.1 Separation

There are a number of methods into which waste is being separated in Gouda. One is through waste containers called "*rolcontainers*" as seen in figures below. These *rolcontainers* refer to bins which have wheels on them that make them easier to drag around. Their capacities can be either 140 litres or 240 litres. According to the residents, these *rolcontainers* are usually available to those who own the houses they reside in and those who have gardens. However, questionnaire results did not support the former statement. There are some respondents who claimed they are renting the house they reside in but also chose *rolcontainers* as a disposal method when asked in the questionnaires. Additionally, through observations, those who use *rolcontainers* are those who live in detached houses, semi-detached houses and townhouses as well as those who have gardens. These observations were obtained when the researcher had a look around the streets of the neighbourhood. It was based on these observations that it can be said; the house ownership was irrelevant. Rather it is the house type that determines which household gets the *rolcontainers* and which do not.

Moreover, there were three observed colours of the *rolcontainers* (Figure 7); grey for residual waste, black with blue lid for paper waste and green for GFT[7] waste (left to right). From observations, residents within a street put out their *rolcontainers* on a specific "pick-up spot" for collection rather than outside their houses. This spot can be a particular corner, for example, as seen from the pictures.

Figure 7: Rolcontainers for different kinds of waste

Another method of separating waste is through underground and overground containers (Figure 8). According to the respondents, these containers are usually available to residents who live in blocks of apartments. Based on the observations done, this seems to be the case as these types of containers were indeed found nearby blocks of apartments. These underground and overground containers are available for residual waste and GFT and food waste. Unlike the GFT and food waste container which you can use for free, the residual waste containers require a pass for access (as shown in Figure 8). This pass is received by each household which then enables the municipality/Cyclus to keep track of a household's disposal movement. This is a new system implemented in Gouda 2 years ago wherein you pay a fixed of amount of €209 plus the variable part (Gemeente Gouda, N.D). This variable part depends on your type of residual waste bin and how much residual waste you dispose. For those who have *rolcontainers*, it is: fixed amount (€209) + emptying times in a year x price (140-litre *rolcontainer* is €3.50 each time and 240-litre *rolcontainer* is €6.00 each time). To those who use the underground containers, it is: fixed amount (€209) + number of throws x price (30-litre containers are €0.75 per throw and 60-litre containers are €1.50 per throw).

Figure 8: Underground (with pass) and overground containers

[7] GFT means "*groen, fruit en tuinafval*" in Dutch which translates to green, fruit and garden waste in English.

For example, if you throw 12 garbage bags in a year in a 60-litre underground container, you would need to pay €227. That is; €209 fixed amount + (12 throws x €1.50 per bag).

Irrelevant of whether a household owns a garden or not, the residents separate their plastic waste (PMD – plastic, metal, drink carton) into plastic bags. These plastic bags are then hung on poles around the neighbourhood ready for collection (as seen in Figure 9).

In some areas, there are public containers (as seen in Figure 9) where you can throw your plastic waste for free, without waiting for the collection date.Similarly, you can also dispose your glass bottles in these public containers for free. As observed and based on data obtained, glass bottles are not collected from individual household. Instead, everyone has to dispose of them in these public containers. These containers divide the bottles into three types – red, brown and green bottles.

Figure 9: Plastic bags and public containers

Left to right: plastic bags for plastic waste, public container for plastic waste, public container for glass bottles and public containers for textiles

Apart from glass bottles, you can also throw textiles into similar public containers. Acceptable items include used shoes, clothing, bags and others. Moreover, there are secondhand shops (*kringloopwinkel*) where you can bring your used items and then they are sold to other people. Some of the respondents have used, or at least acknowledged, this type of system.

4.3.2 Collection

There are different collection days for different kinds of wastes in Gouda. Plastic is collected every week. Both the GFT waste and paper waste for *rolcontainers* are collected on the same week on a bi-weekly basis. The residual waste is also collected on a bi-weekly basis but on a different week than the GFT and paper waste. There is a waste calendar (*afvalkalender*) *provided* by Cyclus, which can be found on their website and is also available as a mobile application called "Afvalkalender Cyclus". This feature allows residents to check the collection schedule for their specific waste containers. It also gives information on the location of the public containers and what materials they can recycle in the specific categories such as what items can be thrown into the paper container. Moreover, it shows additional options to dispose of waste that are not collected by Cyclus. For example, bulky household waste such as tables and chairs are currently not collected by Cyclus. If you check the waste calendar, you will be given advise to bring it to their "waste delivery station" or have them pick it up for a fee.

4.4 Profile of sample size

Table 2 presents data obtained through questionnaires. It shows that only 2% of the respondents were aged between 0 – 19, 20% were between 20 – 39, 34.4% were between 40 – 59 and 40.7% were aged 60 years and above. Majority of the respondents are females at 66% while males only consist of 34%. Respondents are also mainly Dutch at 98% with three other nationalities at less than 1% each – Moroccan, German and British. The country of origin is more diverse. Most respondents originated in the Netherlands at 90% while some originated in the countries of Morocco, Germany, Suriname, Indonesia, Portugal, Netherlands New Guinea, UK and Curaçao. Due to the weak representation of nationalities other than Dutch and countries of origin other than the Netherlands, it was decided to combine the groups into two categories only; "Dutch" and "Non-Dutch" for nationality and "Netherlands" and "Outside the Netherlands" in the country of origin. For the marital status, the data obtained also suggests that 85% of the respondents are married/in a partnership, 7% are unmarried/no partnership, 5% divorced and 3% widowed.

Table 2: Profile of sample size

AGE		GENDER		NATIONALITY		COUNTRY OF ORIGIN	
0 – 19 years old	2	*Male*	34	***Dutch***	**98**	***Netherlands***	**90**
20 – 39 years old	20	***Female***	**66**	*Moroccan*	.8	*Morocco*	2
40 – 59 years old	37			*German*	.8	*Germany*	1
60 years and above	**41**			*British*	.8	*Suriname*	2
						Indonesia	1
						Portugal	1
						Netherlands New Guinea	1
						UK	1
						Curacao	1

HIGHEST EDUCATIONAL ATTAINMENT		HOUSEHOLD INCOME		MARITAL STATUS	
Primary Education	.9	*€1,000 per month or less*	2	*Unmarried/No partnership*	7
Preparatory Secondary Vocational Education (VMBO)	8	*Between €1,001 and €3,500 per month*	28	***Married/In a partnership***	**85**
Senior General Secondary Vocational Education (HAVO)	8	*Between €3,501 and €6,000 per month*	19	*Divorced*	5
University Preparatory Education (VWO)	2	*More than €6,000 per month*	3	*Widowed*	3
Secondary Vocational Education (MBO)	21	*"I do not know"*	7		
Specialist Training	3	***"Prefer not to say"***	**41**		
Higher Professional Education (HBO)	**31**				
Scientific Education (WO)	21				
Others	5				

As can also be seen in Table 2, it can be said that the majority of the respondents are highly-educated wherein 31% achieved Higher Professional Education (HBO) and 21% achieved Scientific Education (WO). Moreover, in the "Others" category, one respondent has claimed that they have obtained a postgraduate doctoral degree (PhD).

For household income, 2% of the respondents claimed that they earn €1,000 per month or less. Those who earned between €1,001 and €3,500 per month consisted 28% of the respondents. Moreover, 19% earned between €3,501 and €6,000 per month and 3% claimed they earn more than €6,000 per month. Lastly, when it came to disclosing household income, 41% of the respondents preferred not to say the amount and 7% claimed they do not know.

4.5 Behavioural factors

The behavioural factors, one of the independent variables in this research, is discussed in this section. Various tables present the results for the three sub-variables based on the Theory of Planned Behaviour; attitude towards behaviour, subjective norm and perceived behavioural control (also see Annexes 12 to 15 for graphical representation of results). Before proceeding with the inferential tests, a Cronbach's alpha test was done first of all to test internal consistency of the assigned questions per indicator. This allowed the author to demonstrate and ensure that the questions asked can be combined into one variable for further analyses. A reliability test result of 0.7 or higher is considered reliable (Field, 2009) and is, therefore, accepted.

4.5.1 Attitude towards behaviour

To measure the indicator "willingness to recycle", three items were asked in the questionnaire. Willingness to recycle refer to one's favourable or unfavourable opinion of recycling which then indicate one's willingness towards the act of recycling. The three items were asked in a form of Likert-scale and the answers obtained[8] can be seen in Table 3. It can be seen that the answers are shifted more towards the right (the positive direction) which suggests that respondents have favourable opinion about recycling.

Table 3: Responses for "willingness to recycle" items (in percentage %)

Statements	*Strongly disagree*	*Disagree*	*Neither disagree nor agree*	*Agree*	*Strongly agree*
A	-	2	1	33	63
B	2	1	3	37	58
C	2	3	24	38	34

A – Recycling is good; B – Recycling is useful; C – Recycling is rewarding

There are 33% who agrees and 63% who strongly agrees that recycling is good (1A). When asked if recycling is useful, 37% agreed and 58% strongly agreed. These results are in line with the interviews wherein most respondents have stated their favourable opinion of recycling when asked what they think about the act of recycling in general. They have said:

"It is very good because the Earth is… too many plastic. So I find it good that they recycle it (waste/plastic). (Interviewee 5)

[8] It should be noted that choices which did not obtain any answers are not included in the graph. This was an automatic feature in the SPSS software. For example, in Chart 1A, the "disagree" option is not showed because none of the respondents have chosen this answer.

"I think it is good". (Interviewee 6)

Moreover, some have stated that recycling is good but everybody should do it and not just one person. Moreover, some thinks it is a must to do recycling and that it is very important for the environment.

"I think it's very important to recycle. It's good for the environment". (Interviewee 2)

"It is good, definitely. But everyone should do it and not like our city and then other city doesn't". (Interviewee 3)

"I think it's a must". (Interviewee 11)

Compared to the more obvious favourable opinion of respondents towards statements A and B, statement C has received more "neither disagree nor agree" at 24% compared to the 1% and 3%, respectively. Despite "agree" and "strongly agree" being the prevalent choices for statement C, when combined they still only account for 71% of the positive answers compared to the 97% and 94% of statements A and B, respectively, which are over 20% higher. It is believed that this statement was vague and unclear to some respondents. One respondent has raised the question "for who?" when asked about the statement "Recycling is rewarding". This means that the respondent was unsure if they were being asked if recycling is rewarding for themselves or for someone else or for something else. Therefore, this might be a reason why the neutral opinion is higher for statement C compared to the two other statements. The item might have gathered a higher non-neutral response if the question was phrased more clearly along the lines of "Recycling feels rewarding to me" or "Recycling is rewarding for the environment". Additionally, Cronbach's alpha test was 0.847 for the three items which means they are reliable ($\alpha > .0.7$) and can be combined into one variable.

4.5.2 Subjective norm

Subjective norm refers to what one's social referent thinks about recycling. In this research, social referents refer to two groups; the family members or friends that you live with and the neighbours. Two sets of statements were asked for this sub-variable, one set for the family members and friends and another set for the neighbours.

Table 4: Responses for "recycling behaviour of family and friends" items (in percentage %)

Statements	*Strongly disagree*	*Disagree*	*Neither disagree nor agree*	*Agree*	*Strongly agree*
A	2	1	5	45	48
B	2	2	33	35	29
C	4	4	40	30	21

A – Recycling is a common practice in my household; B – The people I live with expect me to recycle; C – The people I live with encourage me to recycle

Table 4 presents the results from the first set of statements. It shows that recycling is a common practice in the respondents' households with 45% in agreement and 48% in strong agreement

totalling to 93%. However, for the two statements (B and C), the neutral opinion of "neither disagree nor agree" are much higher at 33% and 40%, respectively. Additionally, Cronbach's alpha test result was 0.835 which was higher than 0.7 and was, therefore, accepted.

Table 5: Table 5: Responses for "recycling behaviour of neighbours" items (in percentage %)

Statements	*Strongly disagree*	*Disagree*	*Neither disagree nor agree*	*Agree*	*Strongly agree*
A	2	1	29	52	16
B	3	12	64	14	8
C	15	17	60	4	4

A – Recycling is a common practice in my neighbourhood; B – My neighbours expect me to recycle; C – My neighbours encourage me to recycle

Table 5 presents the results for the second set of statements. It can be seen that neutral opinion is more prevalent than other answers. Also, some answers leaned towards disagree and strongly disagree more than Table 5.

For statement A, there is an obvious agreement when asked if recycling is a common practice in their neighbourhood; 52% agreed and 16% strongly agreed. This might be because the respondents are aware that their neighbours recycle. Whether this was through observation or interaction with neighbours, it was unknown. Some statements from the interview include.

"Everybody in my neighbourhood separates (recyclable waste) so it's very usual." (Interviewee 12)

"My neighbours recycle too." (Interviewee 1)

Statements B and C have high neutral opinion at 64% and 60%, respectively. These results are similar to the results for statements A and B in Table 5 wherein respondents were asked if their family members and friends expect and encourage them to recycle and most of them have given a neutral response of "neither disagree nor agree". This might be due to the fact that the Netherlands is a highly individualistic country (Schreier et al, 2010). This means that "*self-interests are prioritised over the concerns of the group*" (McCoy et al, 2005, p.213).

It did not matter that respondents are being encouraged by their social referents or not; as well as whether their social referents expect them to recycle or not. For them, they all have their own activities going on. Statements from interviews support this claim.

"I think I have my own encouragement so I don't need their (family, friends & neighbours) help. But of course, it's also very good if they do it (recycling) as well". (Interviewee 2)

"I'm not depending on that. I do what I think is good. They do what they think is good." (Interviewee 10)

"No, that's not important to me". (Interviewee 11)

"Yeah, it's helpful but not a lot". (Interviewee 3)

In addition, when tested for Cronbach's alpha, the result was 0.680. This is a lower value than 0.7 which is considered unreliable. Therefore, it was decided to exclude this indicator in the analyses.

4.5.3 Perceived behavioural control

Perceived behaviour control is influenced by one's control beliefs and difficulty beliefs which refer to one's perception of their control over recycling and how easy or difficult is it to perform recycling. To measure this sub-variable, four items were asked in the questionnaire (Table 6). As can be seen, most of the answers leaned towards the right (agree and strongly agree) with the exception of statement D, which leaned more towards the left (disagree and strongly disagree).

Table 6: Responses for "perceived easiness/difficulty and control of recycling" items (in percentage %)

Statements	*Strongly disagree*	*Disagree*	*Neither disagree nor agree*	*Agree*	*Strongly agree*
A	2	8	13	48	31
B	2	5	11	52	30
C	2	4	7	59	28
D	36	47	10	6	2

A – I have access to the recyclable bins in my neighbourhood; B – The recyclable bins in my neighbourhood are easy to get to; C – I find recycling easy; D – I find recycling difficult

The majority of the respondents agreed they have access to the recyclable bins in their neighbourhood (statement A); wherein 48% agreed and 31% strongly agreed and that these recyclable bins are easy to get to (statement B); 52% agreed and 30% strongly agreed. As known from the questionnaires and from observations, the respondents have their own *rolcontainers* which means each household owns their own *rolcontainers.* Therefore, having access to the recyclable bins and it being easy, makes sense in statements A and B. This is also reflected in statement C when asked if recycling is easy wherein 59% agreed and 28% strongly agreed.

Additionally, as mentioned in section 4.3, apart from *rolcontainers,* there are also other recyclable public containers for items such as glass, textiles, paper and plastic. These public containers are located within the neighbourhood and through observations, getting to them was only a few minutes' walk from the houses and even faster by bike. During data collection, it was observed that most people go to these public containers by bike. Moreover, these containers are located outside the local supermarket where people can just drop off their recyclable items on their way to the local supermarket. For statement D, 36% strongly disagreed and 47% disagreed. This was not a surprising result considering that the statement was "Recycling is difficult". The respondents' disagreement means that they find recycling easy which is the case for the answers in statement C.This is also supported by interview results wherein, despite having collections for plastic waste by Cyclus, residents can choose to throw this type of waste in their own time to these public containers.

"If I have plastic then I can bring it also by the Co-op (local supermarket)". (Interviewee 1)

Moreover, when asked what things or situations can make recycling difficult, some respondents explained that when there is not much facilities where you can throw your recyclable waste, then that would make recycling difficult.

"Maybe if you live in a neighbourhood where there is not so much where you can bring it or take it (recyclable waste), it is difficult. Here, there is enough where you can out your trash." (Interviewee 1)

Based on the statement, it can be said that there are enough facilities in the neighbourhood which is why the perception of recycling is easy to perform. Finally, when tested for reliability, Cronbach's alpha result was 0.255 which was considered unreliable ($\alpha<0.7$). This was found to be caused by two opposing statements of "I find recycling easy" and "I find recycling difficult". Most respondents had positive answers (agree and strongly agree) when asked if recycling is easy and most had negative answers (disagree and strongly disagree) when asked if recycling is difficult. Even though they are opposing answers, the interpretation is the same wherein respondents found it easy to recycle. Therefore, they do not find it difficult to recycle. Thus, the disagree for statement D. After recoding the values in a reversed order, the new reliability test result was 0.745 which is higher than 0.7 and is therefore, considered reliable.

From all the behavioural factors presented, it can be said that respondents generally have favourable opinion towards recycling and that they also have a positive perception of how easy it is to perform recycling. This means that they believe recycling is beneficial for the environment, the animals, as well as people. Moreover, they believe they have control over their actions in regards to performing the activity and that almost next to nothing is stopping them from doing so. This is linked to an important discovery that the opinion of the respondents' social referents has no influence over their recycling participation. For them, they recycle whether encouraged or not, whether expected or not and that what matters is their own decision and not others'.

4.6 Situational factors

Situational factors is the other independent variable in this research. These refer to the factors that were not covered within the behavioural aspect. In this research, these factors refer to recycling convenience, residential conditions and recycling awareness. In this section, results obtained for these factors from the data collection are presented in tables (also see Annexes 16 to 20 for graphical representation of results).

4.6.1 Recycling convenience

This is the first sub-variable with three indicators; information available on what to recycle, clearly separated recyclable containers and ways of recycling.

Information available on what to recycle

To measure information available on what to recycle, three items were included in the questionnaire (as seen in Table 7). Majority of the respondents have showed positive answers for all three of the statements. Combing those who agree and strongly agree, around 84% knows what materials can be recycled (statement A) and around 93% knows which bins are appropriate for the recyclable materials (statement B). Based on the interviews, most interviewees were able to answer when asked how recycling is being implemented in their neighbourhood. They have provided answers regarding the types of wastes being separated, the collection schedules as well as the location of the public containers. From this, it can be said that they are well-informed. Thus, the agreement in statements A and B. Moreover, some respondents have claimed that they received some form of information about recycling.

"Sometimes we get a leaflet where you can see when you can put the trash out or sometimes in the newspaper, if it (collection schedule) has changed. You can read on the newspaper, on the website or you get a leaflet." (Interviewee 1)

"I think there have been some articles on the local newspaper to explain the recycling. I think we might have had one folder about recycling last year." (Interviewee 2)

"We get folders in the mailbox." (Interviewee 8)

In addition, around 74% have agreed and strongly agreed that the municipality provides them with enough information about what to recycle (statement C). According to data obtained from questionnaires, the municipality provides recycling information in various ways (see Annex 23) such as email, post, by the public containers, through public campaigns, by the plastic bags, through newspapers, journals, the website and mobile application. It also seems the respondents are satisfied with the efforts made by the municipality.

"I think the local government is doing their best to inform people." (Interviewee 9)

Table 7: Responses for "information available on what to recycle" items (in percentage %)

Statements	*Strongly disagree*	*Disagree*	*Neither disagree nor agree*	*Agree*	*Strongly agree*
A	2	3	11	68	16
B	1	1	6	63	30
C	4	11	11	61	13

A – I know what materials can be recycled; B – I know which bins area appropriate for the recyclable materials; C – The municipality provides me with enough information about what to recycle

For the reliability test, Cronbach's alpha showed a result of 0.477 which is lower than the reliable value of 0.7. When checking the Item-Total Statistics, the results suggested a Cronbach's alpha of 0.626 if statement C was deleted. However, this is still a low result compared to 0.7. Because of this, it was decided to exclude this indicator from further analyses.

It is believed that the low reliability result was due to the inconsistency of the items. While respondents agreed that they know what items can be recycled and which bins are appropriate, it did not mean that they obtained useful information from the municipality. The researcher

assumed that the residents obtain information from the municipality only. In reality, Cyclus also takes part in promoting recycling in Gouda by providing technical information. In regards to who exerts more effort was unknown. In fact, some interviewees have said that the municipality does not promote recycling at all and some are unsure or unaware.

"Nobody is promoting it. Only the newspaper from Gouda and that's the only thing". (Interviewee 3)

"I don't think they really active… Not that I'm aware of". (Interviewee 10)

Meanwhile, some interviewees think they do not need the promotion of the municipality.

"I have not paid much attention to it because I don't need the promotion of the community to recycle my waste." (Interviewee 11)

Moreover, residents can also obtain information through other sources such as the television, radio and friends (Nixon & Saphores, 2009). Overall, the statements for this indictor are unfortunately vague and thus, cannot be used further.

Clearly separated recyclable containers

Table 8 presents the four items asked to measure the indicator "clearly separated recyclable containers". Among the respondents, 56% agrees and 16% strongly agrees that there are enough recyclable bins in their neighbourhood (statement A). Also, 48% agreed and 11% strongly agreed that they are satisfied with the number of bins in their neighbourhood (statement C) and that these bins support their need for separating their waste (statement D) wherein 60% agreed and 14% strongly agreed. This satisfaction could be due to the fact that respondents have their own recyclable bins (*rolcontainers*) as mentioned in 4.3. Therefore, they did not need to share the particular containers with neighbours. This might also be why 34% are in a neutral opinion when asked if they would like to have more bins in their neighbourhood (statement B) while 28% disagreed and even 8% strongly disagreed. It seemed the respondents are overall satisfied and found no need for additional bins. This satisfaction is supported interview statements when asked about their opinion of the recycling facilities in their neighbourhood.

"I'm very happy because you can everywhere something put it". (Interviewee 5)

"I think it is good. I see things. The people throw the plastic, the groenafval (green waste), everything". (Interviewee 6)

"It's good". (Interviewee 8)

"There's always room for improvement but we're doing fine". (Interviewee 9)

Table 8: Responses for "clearly separated recyclable containers" items (in percentage %)

Statements	*Strongly disagree*	*Disagree*	*Neither disagree nor agree*	*Agree*	*Strongly agree*
A	1	9	18	56	16
B	8	28	34	20	9
C	4	16	22	48	11
D	1	4	21	60	14

A – There are enough separated recyclable bins in my neighbourhood; B – I would like to have more bins in my neighbourhood; C – I am satisfied with the number of bins in my neighbourhood; D – The bins available in my neighbourhood support my need for separating my waste

The initial result for the reliability test showed a Cronbach' alpha of -.329. Upon inspection, it was decided to recode the values for statement B "I would like to have more bins in my neighbourhood" in a reversed order. It was realised that this statement goes in the opposite direction compared to the other three statements. For statements A, C and D, an "agree" or "strongly agree" equals a positive opinion. This means that there is satisfaction from the respondents. Meanwhile, for statement B, an "agree" or "strongly agree" would have meant a negative opinion. This would have been the case if they were not satisfied with current number of bins and thus, would like to have more. After recoding, the new Cronbach's alpha result was 0.777 which is higher than 0.7 and is, therefore, found reliable.

Ways of recycling

Three questions were asked to measure the indicator "ways of recycling" (Table 9). For statement A, 44% agreed and 18% strongly agreed that there is more than one recycling method in their neighbourhood. This is supported by questionnaire results wherein various recycling methods were mentioned by respondents, as also explained in 4.3. Moreover, some interviewees have expressed their satisfaction regarding the different ways in which they can recycle.

"It is good here. If I have plastic then I can bring it also by the Co-op (local supermarket)." (Interviewee 1)

"Really good. People can choose if they are going to recycle by themselves or just go here (by the public containers)". (Interviewee 4)

In a similarly positive result, statement B has the majority in agreement that curbside collection is available in their neighbourhood wherein 44% agreed and 33% strongly agreed. However, it is believed that statement B would have gotten a higher agreement if "curbside collection" was a more familiar term to the respondents. During the data collection, some respondents have asked the researcher what this method means. Moreover, it also seemed like an unfamiliar phrase to them even when translated into Dutch.

Table 9: Responses for "ways of recycling" items (in percentage %)

Statements	*Strongly disagree*	*Disagree*	*Neither disagree nor agree*	*Agree*	*Strongly agree*
A	1	12	25	44	18
B	3	7	14	44	33
C	21	14	18	29	17

A – There is more than one recycling method in my neighbourhood; B – Curbside collection is available in my neighbourhood; C – Underground containers are available in my neighbourhood

For statement C, a variety of answers is more evident. Only 29% agreed and 17% strongly agreed that underground containers are available in their neighbourhood. Additionally, 14% disagreed and 21% disagreed while 18% had a neutral when asked about statement C. out of the three statements, statement C was the one with the most disagreement. Based on

observations, there are definitely underground containers in the neighbourhood (as explained in section 4.3).

This disagreement could be because the respondents have interpreted the statement as something about themselves specifically rather than about the general setting of their neighbourhood. This means that when they own a *rolcontainer* and not use the underground containers themselves, they would either disagree, strongly disagree or have neutral opinion statement C because they think that even though there are underground containers in the neighbourhood, they do not use such containers. This unfortunate interpretation is, however, not what the researcher wanted to obtain.

Additionally, when performing a Cronbach's alpha test, result was 0.454 which was lower than 0.7. In an attempt to improve the reliability result, the Item-Total Statistics was checked. It showed that if statement C was removed, the new result would be 0.606. However, this was still lower compared to the reliable value of 0.7. Therefore, it was decided that this indicator would be excluded in further analyses. In addition, statement C seemed too vague to some respondents, which already threatened the accuracy of the results.

4.6.2 Recycling awareness

This is the second sub-variable under situational factors with two indicators; awareness of recycling scheme and awareness of the impacts of recycling. The following sections presents the results obtained from data collection.

Awareness of recycling scheme

To measure the respondents' awareness of the recycling scheme, 5 statements were laid out on Likert-scale type items. Table 10 suggests that most respondents have positive opinion about their awareness of the recycling scheme in Gouda.

Combining those who agree and those who strongly agree, 87% knew where the appropriate recycling bins are located, another 87% knows when all the recycling materials are collected and 89% says they are always on time with putting the recyclable bins/plastic bags out for collection. In fact, one interviewee indicated that despite how early the collection time is, they are still on time in putting their bins out.

"They (Cyclus) are coming tomorrow…7:30 they are already coming. I always have to run. I understand in summer it's warm and they want to collect early but I'm a little bit older so… Tomorrow is my free day. Tomorrow I have to go 7:00 to put it (bins) away, that's very early". (Interviewee 5)

The results where most respondents are in agreement about knowing the collection schedule were also evident in the questionnaire. When asked about the collection schedule, none have said "I do not know" which means all respondents have the information in regards to when the collections are taking place.

Table 10: Responses for "awareness of recycling scheme" items (in percentage %)

Statements	*Strongly disagree*	*Disagree*	*Neither disagree nor agree*	*Agree*	*Strongly agree*
A	2	3	9	56	31
B	3	4	7	58	29
C	1	5	6	49	40

D	2	3	10	55	30
E	2	9	27	45	17

A – I know where the appropriate recyclable bins are located; B – I know when all recyclable materials are collected; C – I am always on time in putting my recyclable bins/plastic bags out for collection (*if applicable*); D – The municipality provides me with enough information about the collection schedule; E – The municipality provides me with enough information about where the recyclable bins are

Also, statement E has received the highest neutral opinion of 27% among all other statements. This might have been because the location of the recyclable bins can be found from the waste calendar which is provided by Cyclus and not the municipality. Therefore, the respondents could be correct in thinking that the municipality does not provide them with this information. This might also have been the case for statement D wherein, similarly, Cyclus is the one who provides the residents with the collection schedule through, again, the waste calendar. Finally, Cronbach's alpha test result was 0.767 which was higher than 0.7 and thus, reliable.

Awareness of the impacts of recycling

Four statements in forms of Likert-scale were used to measure the indicator "awareness of the impacts of recycling". Table 11 suggests that most respondents have positive answers in all statements. Combining those who agree and strongly agree, 93% are aware that recycling benefits the environment, 92% believes that they are helping the environment when they recycle, another 93% are aware that animals are in danger due to waste such as plastic and 83% believes they will harm the environment if they do not recycle. From the results, it can be said that the respondents have high environmental awareness. Moreover, these results are supported by statements from interviews.

"It (recycling) helps for the ocean and that's part of everything. I want to have the ocean clean and the beach". (Interviewee 3)

"There are (TV) shows about recycling. You can see how it's important to recycle for the ocean". (Interviewee 4).

"I assume it's good for the environment and that recycling helps, so that they can re-use the materials so you don't have to get new (raw) materials". (Interviewee 2)

Table 11: Responses for "awareness of the impacts of recycling" items (in percentage %)

Statements	*Strongly disagree*	*Disagree*	*Neither disagree nor agree*	*Agree*	*Strongly agree*
A	2	1	5	43	50
B	2	2	5	41	51
C	2	-	5	29	64
D	2	3	11	34	49

A – I am aware that recycling benefits the environment; B – I believe that I am helping the environment when I recycle; C – I am aware that animals are in danger due to waste such as plastic; D – I believe that I will harm the environment if I do not recycle

Lastly, Cronbach's alpha test was 0.825 which was higher than the reliable value of 0.7. Therefore, it was decided that the items were reliable and can be combined into one variable for further analyses.

4.6.3 Residential conditions

The third sub-variable of situational factors is residential conditions and it has three indicators; home ownership, number of years in residence and number of people in household. Unlike the other sub-variables, the indicators for residential conditions were not presented as Likert-scales in the questionnaire. Instead, data was obtained through multiple-choice questions. It was, therefore, decided to analyse the data obtained through t-tests. On this note, the results are presented in the following sections.

Home ownership

Among the respondents, 89% claimed they own the house they reside in and 10% claimed they rent it. Moreover, 1% have chosen "others" as their answer. The reasons include younger people filling in the survey stating their parents own the house they reside in. It might have gathered better results if the choices were limited to two and omitting the option of "others". This could have avoided misunderstandings that ownership refers to the household resided in and not the one filling in the questionnaire.

Owned households had a mean of M=4.837 and rented households had a mean of M=4.750. It can be said that owned households have a slightly higher frequency in separating their waste compared to the rented households. This is opposite to the findings where those rent the houses they reside are more likely to separate their waste than those who own their houses (Wang et al, 2011).

To find out whether there is a significant difference between these means, a t-test was performed. Results showed a p-value of 0.441 which was found not significant ($p>0.05$). This means home ownership had no influence over household waste separation. It did not matter whether the house being resided in is owned or rented.

Number of years in residence

When asked how long the respondents have lived in their residences, 2% said less than a year, 10% said between 1 and 2 years, 7% said between 3 and 5 years and 82% said longer than 5 years. Some residents have lived in their respective residences as long as 16 years, 32 years and 33 years.

A t-test is performed when a certain variable has two categories. Although this variable has 4 categories, it was decided to combine them together into two categories. The reason for this is the strong representation of "longer than 5 years" at 82%. Therefore, it was decided to put together "less than a year", "between 1 and 2 years" and "between 3 and 5 years" into the first category. The second category was "longer than 5 years".

The first category had a mean of M=4.897 and the second had M=4.801. It can be said that those who lived less than 5 years in a residence are slightly more likely to separate their waste compared to those who have lived longer than 5 years in their respective residences. This is opposite to the findings that people who have lived longer in a residence are more likely to recycle compared to those who have lived for a shorter period of time (Ittiravivongs, 2011).

However, it is worth noting that the second category was strongly represented a 79%. Furthermore, to test if there is a significant difference between the means, a t-test was performed which showed a p-value of 0.289 which was found not significant ($p>0.05$). This

means that the number of years one has spent residing in a household does not influence one's participation in household waste separation.

Number of people in household

When collecting data on the number of people in households, results showed that 9% lives alone, 44% lives in a 2-people household, 14% lives in a 3-people household, 22% lives in a 4-people household and 11% lives in a 5-people-or-more household. Previous data also showed that 85% of the respondents are married. When plotting marital status against number of people in household, results showed that majority of those who live in 2-people households are married (see Annex 21). From this, it can be assumed that the 2-people household are composed mainly of married couples.

Previous studies showed that those who recycle are slightly more likely to have bigger families (Saphores et al, 2012). This is, however, not the case in this research. As mentioned previously, majority of the respondents live in a 2-people household. When plotting the number of people in household against the dependent variable frequency of separation (see Annex 22) it showed that those who answered "always" when asked how often they separate their waste belong in the 2-people household, not the bigger households. In this research, households with 3 or more people are considered bigger households. This is supported by the fact that the average household size in the Netherlands is 2.2 (ArcGIS, 2018).

This information was incorporated into creating the two categories needed to conduct a t-test. Again, a t-test needs to have two categories for the independent variable. The first category is the combination of the 1-person household and 2-people household. Meanwhile, the second category is composed of the 3-people household, 4-people household and the 5-or-more-people household.

The mean value of the first category was M=4.900 while for the second category was 4.729. From these values, it can be initially said that smaller households tend to separate their waste more than those in bigger households. To test whether there is a significant difference between these means, t-test was performed. Results showed a p-value of 0.014 which was found significant ($p<0.05$). This result means smaller households tend to separate their waste more than bigger households.

From all the situational factors presented, it can be said that respondents are contented with how recycling is being implemented in Gouda. Additionally, from findings it can be said that they are also well-informed in regards to what to recycle, where to recycle and when collections are taking place. Moreover, the respondents also have high awareness of both the recycling scheme in Gouda and the impacts of recycling and not recycling. Most are aware of the benefits recycling provides the environment and the harm waste brings to the environment as well as the people and animals.

4.7 Statistical analyses and findings

Various inferential tests were performed to analyse the relationship between the variables. Appropriate tests were all chosen depending on the types of data. It is important to note that the indicator "quantity of separated materials" has been discarded in the analyses. The reason being it showed very similar results with the "frequency of separating each recyclable item". For example, when asked "Which among the items (paper, PMD and glass) do you recycle?"

and a respondent has ticked all three items, it is very likely that the same respondent will choose "Often" or "Always" when asked how often do they separate each item. Moreover, most respondents have ticked all three items.

Another thing to note is that the "quantity of non-separated materials" was also excluded in all the analyses because it did not obtain results from the questionnaires which would be fit for analyses. There was barely anyone who have chosen items they do not separate which means most of them separate the three wastes presented. Hence, majority of the questionnaires have this item not filled in.

Furthermore, the indicators "frequency of household waste separation" and "frequency of separating each recyclable item" for the dependent variable were combined for the analyses. The new indicator is "frequency of separation". The purpose for this was to make the analyses easier to visually analyse and link to the theoretical variables. Rather than looking at two sets of analyses (one per indicator), it was decided to look at just one. Moreover, the author decided it was appropriate to combine both indicators because they measured very similar items and obtained very similar results. Both were presented as 5-point Likert scales in the questionnaire wherein; 1=strongly disagree up to 5=strongly agree. When tested for Cronbach's alpha, initial result was 0.682, which is lower than the accepted value of 0.7. After carefully looking at the questionnaire answers, it was found that some of the answers did not make any sense. For example, one would expect that someone who answered either "Often" or "Always" when asked "*How often do you separate your waste*?" would have the same or similar answers when asked "How often do you separate paper?" and other recyclable items. However, some had answers of "Never" or "Rarely" when asked. This inconsistency did not make sense. Due to that, such answers were considered invalid and were, therefore, labelled as missing values. After making some adjustments, the new Cronbach's alpha test gave an acceptable result of 0.780 which is higher than 0.7 and thus, reliable.

4.7.1 Correlation

For the correlation analysis, the Spearman's rank correlation was used instead of the proposed Pearson correlation. This is the non-parametric equivalent of the Pearson correlation (McCrum-Gardner, 2008). This means that this type of analysis does not have any assumptions which was found appropriate to use after observing the normality curves of the variables. The assumption of normality for Pearson correlation was not met.

Table 12: Correlation coefficients

		1	2	3	4	5	6	7
1	*Willingness to recycle*	1						
2	*Recycling behaviour of family and friends*	.517**	1					
3	*Perceived easiness/difficulty and control of recycling*	.413**	.359**	1				
4	*Clearly separated recyclable containers*	0.131	.193*	.420**	1			
5	*Awareness of recycling scheme*	.304**	.245**	.378**	.332**	1		
6	*Awareness of the impacts of recycling*	.705**	.512**	.443**	0.128	.385**	1	
7	*Frequency of separation (DV)*	0.120	.206*	.244**	.200*	.297**	.187*	1

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

The correlation results table (Table 12) showed positive correlation amongst the variables. Most variables showed significant values except for the ones highlighted in red; which is amongst the variables; frequency of separation, willingness to recycle, clearly separated recyclable containers and awareness of the impacts of recycling.

A correlation coefficient ranges from -1 to +1 wherein -1 is a perfect negative correlation while +1 is a perfect positive correlation. Additionally, a zero, means no correlation. Table 12 suggests that there is no correlation between the variables mentioned due to the coefficients being closer to 0 compared to the other variables. From the table results, it can be said that the variables are associated amongst each other.

4.7.2 Regression

For linear regression analysis, four models were run (see Table 14). Model 1 included the behavioural factors and control variables. Model 2 included the situational factors and control variables. Model 3 included both behavioural and situational factors with the addition of the control variables. Model 4 included the behavioural and situational factors. SPSS has difficulties running regression analysis with nominal data which has more than two categories. Therefore, the control variables were converted into binary (as shown in Table 13) wherein categories were given codes of either 0 or 1. If the category was deemed important, from literature review, it was coded as 1 while others were coded as 0. For example, previous literature findings stated that married people are more likely to recycle than those who are not married (Mutang & Haron, 2012). Therefore, the "married" category was coded 1 and the others (unmarried, divorced, widowed) were coded 0.

Table 13: Binary codes used in regression for control variables

CONTROL VARIABLE	BINARY CODE
Age	1 = 60 years old and above, 0 = Others
Gender	1 = Female, 0 = Others
Education level	1 = HBO, WO & PhD (University level), 0 = Others
Household income	1 = €3.501 and more
Nationality	1 = Dutch, 0 = Others
Country of origin	1 = Netherlands, 0 = Others
Marital status	1 = Married, 0 = Others

Table 14: Regression analysis for "frequency of separation"

Items	**Model 1 (Behavioural factors and control variables)**		**Model 2 (Situational factors and control variables)**		**Model 3 (Behavioural and situational factors + control variables)**		**Model 4 (Behavioural and situational factors)**	
N	123		119		118		119	
R^2	0.298		0.282		0.345		0.205	
	B	***Sig.***	***B***	***Sig.***	***B***	***Sig.***	***B.***	***Sig.***
Willingness to recycle	-0.087	0.164	-	-	-0.14	0.098	-0.137	0.110
Recycling behaviour of family and friends	0.105	0.061	-	-	0.097	0.102	0.081	0.156
Perceived easiness/difficulty and control of recycling	*0.227*	***0.001***	-	-	*0.181*	***0.005***	*0.175*	***0.008***

Clearly separated recyclable containers	-	-	0.110	**0.027**	0.044	0.410	0.024	0.652
Awareness of recycling scheme	-	-	0.046	0.484	0.030	0.643	0.047	0.466
Awareness of the impacts of recycling	-	-	0.109	0.052	0.088	0.286	0.102	0.223
If 60 years old and above	0.164	**0.014**	0.118	0.094	0.141	**0.046**	-	-
If female	0.045	0.505	0.010	0.883	0.038	0.595	-	-
If university level and above	-0.006	0.925	0.036	0.597	-0.001	0.992	-	-
If household income is €3.501 and more	-0.22	**0.007**	-0.253	**0.003**	-0.245	**0.004**	-	-
If Dutch	0.131	0.537	0.227	0.304	0.085	0.695	-	-
If country of origin is Netherlands	0.006	0.935	-0.030	0.692	-0.005	0.942	-	-
If married	0.07	0.392	0.057	0.519	0.071	0.408	-	-

Model 1 showed some significant results when testing behavioural factors and control variables against household waste separation. Perceived easiness/difficulty and control of recycling was found significant p=0.001 (p<0.05). In fact, it was also found significant in both Model 3 (p=0.005) and Model 4 (p=0.008). This means that the variable has been found significant in all of the models it was included in. This is considered a strong finding.

On the other hand, "clearly separated recyclable containers" was found significant in Model 2 (p=0.027) but was found not significant in Model 3 (p=0.410) and in Model 4 (p=0.652). This means that the significant finding was not very robust as it only appeared in one model.

A similar but slightly better result was age. It was found significant in Model 1 (p=0.014) and Model 3 (p=0.046) but not in Model 2 (0.094). This means that the variable appeared significant in two out of three models. For this reason, it was decided to analyse the variable further through a t-test (showed in the section).

Comparable to "perceived easiness/difficulty and control of recycling", household income was also found significant in all three of the models; Model 1 (p=0.007), Model 2 (p=0.003) and Model 3 (p=0.004). Moreover, the negative relationship showed in all three models suggest that a decrease in education level means less participation household waste separation.

From the regression analysis, four variables were found significant; perceived easiness/difficulty and control of recycling, clearly separated recyclable containers, age and household income.

4.7.3 T-test

A number of t-tests were performed to analyse the sub-variable "residential conditions" (see Annexes 8 to 10). This was done to find evidence for statistically significant difference between the means of the indicators. Although the variables have more than 2 categories, it was decided to combine them into two categories in relevance to the literature. For example, household size had 5 categories: 1-person household, 2-people household, 3-people household, 4-people household and 5-or-more-people household. According to (Saphores et al, 2012), recyclers tend to be in larger families. Therefore, it was decided to combine the categories into two:

smaller households and larger households. In the Netherlands, the average household size is 2.2 (ArgGIS, 2018). Therefore, it was decided that households with 3 or more people are considered as large. Table 15 presents the binary codes used for the t-test.

Table 15: Binary codes used in t-test for residential conditions

VARIABLE	BINARY CODE
Home ownership	0 = Rented; 1 = Owned
Number of years in residence	0 = Less than 5 years; 1 = 5 years or more
Number of people in household	0 = 2 and below; 1 = 3 and above

For the number of people in households, smaller households show a mean value of M=4.900 and larger households M=4.729. The means suggest that smaller households separate their waste more than the larger households. This was confirmed when t-test result showed a p-value of 0.014 which was found significant ($p<0.05$).

When testing the number of years in residence, those who lived in the residence for 5 years showed a mean value of M=4.897 while those who lived longer than 5 years had a mean value of M=4.801. The means suggest that there is not much difference between the two groups when it comes to how often they separate their waste. This was also supported by the significance value obtained p=0.289 which was found not significant ($p>0.05$).

For home ownership, mean values obtained were only slightly different between owned houses (M=4.837) and rented houses (M=4.750). This was a similar result to the number of years in residence. Moreover, home ownership had a p-value of 0.441 which was found not significant ($p>0.05$).

From the t-tests performed, only the number of people in household was found significant which means that there is a significant difference in means between the smaller households and larger households wherein smaller households tend to separate their waste more than the larger households.

4.8 Discussion

Regression results showed that perceived behavioural control, clearly separated recyclable containers, age and income were found significant in predicting household waste separation. Additionally, the number of people in household was also found significant when t-test was performed.

On that note, neither attitude towards behaviour nor subjective norm of the behavioural factors were significant in predicting household waste separation. This is in line with results from previous study wherein attitude towards behaviour was also found as a non-predictor of recycling behaviour (Xu et al, 2017; Zhong & Huang, 2016). One would expect that in order to get involved with recycling, one should have a favourable opinion about the activity (Chen & Tung, 2010). On the other hand, when there is an unfavourable opinion about recycling, one is also unlikely to recycle. However, interview results in this research found a different scenario wherein one had an unfavourable opinion towards recycling yet continues to perform the activity for other reasons. In this case, financial reasons in particular. Moreover, even the municipality has acknowledged such scenario.

"Last week I read something in the newspaper about the recycling of plastics. I understood that a lot of recycled plastics is burned. So, then I think why do I separate my plastic waste. My argument is if I throw it in the grey bin (residuals), I would have to pay for it. If I put it in the collection for separate waste, it cost me nothing". (Interviewee 11)

"I do it (separate waste) because I have to pay less in the cost when I split my dirt. But I think I do it for nothing." (Interviewee 7)

"In Gouda, there are also now a lot of people who do it (separate waste) because they know it can save money." (Municipality interviewee)

From the given statements, the interviewees saw no point in separating their plastic if the waste is going to be burned anyway. Regardless, they decided to continue disposing their recyclable waste into the recyclable containers so they do not have to pay more for residual waste. As explained in section 4.3, residual waste taxes in Gouda are based on a fixed amount plus a variable amount which depends on how much residual waste you throw. In fact, Lee & Paik (2011) also found a similar result where recycling behaviour was not motivated by pro-environmental attitude but the avoidance of waste disposal cost instead.

Subjective norm was also found as a non-predictor of household waste separation. Based on the findings, this was not a surprise as it was found that residents did not need the expectation or encouragement of their social referents to separate waste. In this particular case, the family and friends. As mentioned previously, the "recycling behaviour of neighbours" has been excluded due to its poor consistency as suggested by the Cronbach's alpha test result. The scenario where the residents' recycling behaviour is independent of other people's opinions might be because the Netherlands is an individualistic country (Schreier et al, 2010) and therefore, residents will separate their waste irrelevant of what others think. It can be said that social pressure was ineffective. This is opposite to the result where social norm was considered as the strongest predictor of recycling (Ramayah et al, 2012; Andersson & von Borgstede, 2010). However, this result made sense considering that the particular research was conducted in Malaysia, which is one of the many Southeast Asian countries that are considered collectivistic which means group opinion is valued more than personal opinion, the opposite of individualism, where social pressure is effective.

Perceived behavioural control was the only significant predictor of household waste separation under behavioural factors. This was not a newly-found result as Mahmud & Osman (2010) also discovered it in their study that PBC is the strongest predictor of recycling behaviour among the three influences. In this research, PBC referred to one's difficulty and control beliefs. As explained in Chapter 2, difficulty beliefs refer to one's thinking of how easy or how difficult it is to perform recycling while control belief is one's thinking of how much control they have over recycling. Trafimow (2009) found that difficulty beliefs are stronger predictors of recycling behaviour compared to control beliefs.

When asked about the perception of residents regarding the ease of recycling, high scores were obtained which means residents perceive recycling as easy to perform in Gouda. Around 87% of the respondents said they find recycling easy. Similarly, around 83% said it was not difficult. These results suggest that difficulty belief is very positively perceived by the respondents. However, interesting results were found which suggested that control beliefs were not as positively perceived as the difficulty beliefs. Around 33% of the interviewees stated their concern that they do not know what happens to their separated items.

"I don't know what they do with the separated goods." (Interviewee 7)

"I'm not quite sure what happens with plastics. I know they recycle plastic… I have seen on the TV but it's not very clear." (Interviewee 10)

According to Ramayah et al (2012), attitude towards behaviour is influenced by recycling awareness. As mentioned previously, some respondents did not have a favourable opinion about recycling due to their lack of information about what happens to the separated items and this might have influenced their perception, more specifically their control belief. Upon not knowing what is being done to the items they deliberately separated or intended to separate, they might have felt that they did not have full control over their actions, in this case recycling. Therefore, they might have ended up not separating their waste because they saw no value in performing the action. A similar idea was also confirmed by the municipality itself wherein some residents did not see the point of recycling. The reason being that they find news in the TV that collected waste in the Netherlands such as plastic are being exported to countries like China. However, the municipality has confirmed in the interview that this is not the case. Collected waste such as plastic are exported and manufactured in Europe to make "new" raw materials. On this note, it can be said that perceived behavioural control is linked with recycling awareness.

However, it is also important to note that, sufficient information does not necessarily influence recycling behaviour directly but instead, it can indirectly influence intention which in return contributes to one's favourable opinion of recycling (Wang et al, 2018).

As mentioned previously in Chapter 2, this research is open to possible linkages between both behavioural and situational factors. Moreover, this was precisely the idea of the Infrastructure-Service-Behaviour (ISB) model which underpinned the situational factors. The ISB model suggested that behavioural factors are not the only influences of recycling behaviour but rather a combination of both behavioural and situational factors. In the cases mentioned previously, perception of easiness was linked to recycling convenience and the perception of control was linked to the recycling awareness. This is to say that the high scores obtained for perception of how easy it was to separate waste were possibly influenced by the easy and convenient recycling facilities in Gouda while perception of how much control one has over recycling could have possibly been influenced by the lack of awareness/knowledge about post-collection procedures, according to results.

Regression results also showed that among the situational factors analysed, only clearly separated recyclable containers was found significant. This was an indicator used to measure recycling convenience. The other two indicators (information available on what to recycle and ways of recycling) were excluded due to their low Cronbach's alpha test results. On the other hand, awareness of the recycling scheme and awareness of the impacts of recycling were found not significant when predicting household waste separation. Although clearly separated recyclable containers was found significant, it was only in one out of the three models run. Therefore, making the result not robust enough. The researcher was not convinced that such a limited result can predict household waste separation. Therefore, based on the findings, this indicator, although significance was found, cannot be considered as a predictor.

When performing t-tests to analyse residential conditions, the number of people in household showed a significant result while home ownership and number of years in residence were found not significant. The mean values obtained for number of people in household suggested that

smaller households (M=4.900) are more likely to separate their waste compared to larger households (M=4.729). According to Saphores et al (2012), household size and recycling behaviour relationship have appeared to not have been covered in many studies. This was evident when the author also did not find sufficient literature covering the relationship between the variables mentioned. Moreover, literature found have stated that household size was either not significant in predicting recycling behaviour (Banga, 2013; Fiorillo, 2013) or that larger households tend to recycle more than smaller households (Nixon & Saphores, 2009; Saphores et al, 2012). None of them supported the findings of this research where mean values suggested smaller households (1-2 people) tend to recycle more than the larger households (3 or more people). Due to the lack of academic support for the findings, it was decided that the number of people in households cannot be considered robust enough as a predictor of household waste separation.

Regression analysis for demographic components showed that age and household income were significant in predicting household waste separation. A study from Nnorom et al (2009) claimed that higher income households are more likely to participate in recycling schemes than lower income households. However, findings in this research found the opposite wherein results suggested that higher-income households have lower participation in waste separation. This is consistent with results from previous studies (Garcés et al, 2002; Hadler & Haller, 2011 from Echegaray & Hansstein, 2017). It is believed that higher-income households have higher consumption and therefore, higher waste generation which results to a lower recycling rate (Sidique et al, 2010 from Abbott et al, 2013). Another reason explained by previous studies was that higher-income households may have a higher opportunity cost of time than lower-income households which can result to lower participation in waste separation (Sidique et al, 2010 from Abbott et al, 2013). This means that households with higher income can engage in activities such as watching movies in the cinema, eating out in restaurants, shopping and the like compared to households with lower income. This is for obvious reasons that higher-income households can afford to do so more than the lower-income households. It is for this reason that higher-income households can have less time to separate their waste. A similar claim was done by the municipality during the interview where they stated that people do not recycle because they are either not interested or are "*busy with other things*" (Gemeente Gouda, 2019).

According to CBS, the average household net income in the Netherlands is around €39,000 (€3,250 per month). In Gouda, the average household net income is €38,900 (around €3,242 per month). From the questionnaire data, it was difficult to determine if the respondents are earning the average or not due to how income was categorised. The average monthly income of €3,242 in Gouda falls on category B (between €1,001 and €3,500 per month). It is unidentifiable how many in category B earns the average and how many earns below the average i.e. €3,240. However, it might be helpful to highlight that from available data, 4 out of the 8 districts in Gouda earn more than the average income (Bloemendaal at €39,600, Plaswijk at €40,900, Goverwelle at €44,200 and Stolwijkersluis at €50,700). Disregarding the population of each district, it can be said that half the districts in Gouda (based on available information) earn more than the average household net income.

Moreover, although household income was found significant, it was realised that this variable was strongly represented by some categories. Around 6% claimed they did not know their household income and 40% preferred not to disclose their household income. In total, around 46% of the household income data was invalid, leaving 64 cases valid which is less than the needed sample size of 99. Based on this limitation, household income cannot be considered as a predictor of household waste separation because it does not represent the valid sample size

for this research. More importantly, as mentioned previously, whether respondents earn the average or not, was unidentifiable. Therefore, conclusions cannot be made of whether respondents belong in higher-income households or lower-income households.

Age is not a newly-found predictor of recycling behaviour. Research findings suggest that older people recycle more than younger people. In the case of this research, older people refer to those who are aged 60 and above while younger people refer to those who are aged below 60. Previous studies have shown similar results (Nixon & Saphores, 2009; Akil et al, 2015). Reasons associated with this result include retirement of older people and their lack of obligations such as going to work and looking after kids. Thus, following the statement that older people have more time in their hands which can be dedicated to separating waste at home.

Lastly, gender, marital status, nationality, country of origin and education level were found not significant when predicting household waste separation. This is consistent with previous studies (Wang et al, 2018) where gender and education were also found insignificant in predicting recycling behaviour.

Chapter 5: Conclusions and Recommendations

5.1 Introduction

This chapter summarises the results presented in Chapter 4 and answers the main research question introduced in Chapter 1 which was "What behavioural and situational factors influence household waste separation in Gouda?". The following section then discusses possible ideas for future research and the limitations of this research. Moreover, although the author is not an expert, suggestions are presented in the last section in hope that this can contribute to Cyclus in planning towards improving the household waste separation in Gouda in order to achieve the household waste separation percentage target of 75% in 2020.

5.2 Conclusions

In Europe, the Parliament is pushing through the concept of circular economy where waste is used as a resource, instead of discarding it along with its value (European Commission, 2015). Member states of the European Union are working towards this goal. This includes the Netherlands.

In the Netherlands, the national government along with various organisations, set a household waste separation percentage target of 75% by 2020 (Government of the Netherlands, 2016). In order to meet this target, various waste companies are working through making this successful. One is Cyclus. In support with the goal of the national government to be fully circular in 2050, Cyclus envisions to work together with the consumers and users to contribute towards circularity (Cyclus, N.D.).

Cyclus works together with the municipality of Gouda in waste management. However, despite the efforts, Gouda has a low household waste separation percentage between 43% and 53% in the span of 5 years. Some behavioural and situational factors were believed to have contributed towards this occurrence. This was the objective of this research; to understand why Gouda has a low household waste separation compared to the target of 75% and which factors have influenced this result.

Addressing sub-question 1 which asked "How is recycling being implemented in Gouda?", there are various methods of waste separation and collection in operation in the municipality. This sub-question was needed to supplement and understand further the answers obtained from sub-questions regarding behavioural and situational factors. For example, to understand perceived behavioural control, it was important to know the types of bins provided as well as the types of wastes being separated and whether these facilities and services contribute towards the perception that recycling is easy to perform. By simply asking the respondents Likert-scale type items, only opinions (in forms of scores 1 – 5) about recycling convenience can be measured. Without the technical and operational information in sub-question 1, it would have been impossible for the researcher to comprehend why perception of easiness obtained high scores.

Primary and secondary data regarding sub-question 1 were obtained through questionnaires, interviews, observations. Data obtained included technical and operational aspects of the implementation such as the collection schedule, the collection methods, separation methods, and the types of waste that are being separated. It was found that ownership of the house was irrelevant in regards to finding out what type of separation method you practice. Instead, it was the type of residence. Those who lived in detached houses, semi-detached houses and townhouse had their own *rolcontainers* for the plastic waste, GFT waste, paper waste and

residual waste. Those who lived in blocks of flats or apartments made use of underground and/or overground containers for their residual waste and GFT and food waste. Additionally, irrelevant of where you live, there were public containers available for everyone to use when separating waste that had no particular collection schedules such as plastic waste, glass bottles and textiles. Moreover, second-hand shops are also available for use.

Addressing sub-question 2 which asked "*What behavioural factors influence household waste separation in Gouda?*", it was found that only perceived behavioural control (PBC) influenced household waste separation. This is to say that attitude towards behaviour and subjective norm were found as non-predictors of household waste separation. The non-inclusion of these factors means that one's favourable or unfavourable opinion of recycling does not matter when it comes to household waste separation. Moreover, what one's social referents think about recycling also did not contribute towards the decision of separating waste.

Perceived behavioural control was found as a predictor of household waste separation. In a previous study by Mahmud & Osman (2010), this was found as the strongest predictor that can influence recycling behaviour compared to the other two influences based on the Theory of Planned Behaviour. When one perceives recycling as easy to perform, people are more likely inclined to do so. This was also reflected in the results of this research in section 4.5.3 wherein 87% found recycling easy to do. Moreover, around 80% perceived access to recyclable bins as easy. Based on these findings, residents have good perception about the ease of recycling in Gouda. In this context, scoring high on perception means that recycling is generally perceived as not a difficult or inconvenient task to do (Pakpour et al, 2014). According to TPB, one's perception of their ability to recycle affects their intention to recycle but does not affect the recycling behaviour itself (Strydom, 2018). This means that although one perceives they have the ability to recycle or they perceive recycling to be an easy task, it can remain just that, a perception. It is possible that although there is high perception, the recycling behaviour itself can remain unperformed. PBC is about two kinds of perception: difficulty beliefs and control beliefs. Based on the findings, when it comes to difficulty beliefs, Gouda perceives recycling as easy to do. However, one would question if their control belief is affected by the fact that there seems to be not enough information provided in regards to what happens with the recyclable waste after they are collected. Not knowing what is being made of the item you separated might lead to the perception that you have no full control of your actions or the consequences of your actions which could possibly affect recycling behaviour. Around 30% of the interviewees have made their concerns known about their unawareness of what is being done to the separated items, as discussed previously in Chapter 4.

Addressing sub-question 3 which asked "What situational factors influence household waste separation in Gouda?", none of the factors were considered as predictors. Although initial discussion in Chapter 4 claimed clearly separated recyclable containers and number of people in household were found significant in some analysis, it was decided that the results were not robust enough to be considered as strong evidences of predicting participation in household waste separation. Clearly separated recyclable containers was found significant in only one of the three models while household size had no sufficient literature to back it up.

Demographic components such as age, gender, marital status, nationality, country of origin, education level and household income were used as control variables in this research. Gender, country of origin, education level and marital status were found as non-predictors of household waste separation. This shared the same results as previous study (Saphores et al, 2012; Hage et al, 2009). This means that being male or female does not influence one's participation in household waste separation. On a similar note, it does not matter where one originated from as

well as what education level one has attained. Moreover, whether one is single, married, divorced or widowed does not dictate one's participation in household waste separation.

Meanwhile, it was found that only household income and age were significant in predicting household waste separation. However, as stated previously in Chapter 4, the average household income of residents was unidentifiable because of how the items were categorised which made it impossible for the researcher to find out whether the residents earn the average or less than the average. Therefore, conclusions could not be made. Moreover, household income was strongly represented by some categories and did not offer enough valid answers. The number of cases analysed were less than the needed sample size and therefore, cannot be used as a representation of the Gouda population.

As for age, findings suggested that participation in household waste separation increases with age which means that older people tend to recycle more than younger people. Akil et al (2015) also found the same results. It is believed that older people have more time in their hands because they no longer have to go to work or look after kids, in which younger people might have the obligations to do so. Therefore, older people tend to have and spend more time in separating their waste than younger people.

To sum it up and to answer the main research question which asked "*How do behavioural and situational factors influence household waste separation in Gouda?*", it was determined that perceived behavioural control and age were the influences that could have possibly caused the low household waste separation percentage in Gouda, based on research findings. It was found that older people, aged 60 and above, were the ones who participated more in household waste separation compared to the younger people, aged below 60. In the case of Gouda, only 25% of the population are within this age group while the remaining 75% are younger people. Therefore, the low household waste separation in Gouda can be attributed to the fact that younger people, the "ones who recycle less", dominate the population in the municipality. Leaving the "ones who recycle more" in the minority.

Moreover, perceived behavioural control was found to influence household waste separation. Findings suggested that there is very high positive perception of recycling in Gouda among respondents. However, the perception results do not explain why the household waste separation percentage is lower compared to the 75% target. One would expect that the high positive perception would have resulted in higher separation percentage. This occurrence can be attributed to the finding that residents seem to have the perception that they have little control over the act of recycling because they do not know the end process of their separated items. It is believed that the lack of control belief has hindered people in continuing to perform recycling or to pursue recycling, if intended.

5.3 Suggestions

Even though the researcher is not an expert, several suggestions are presented in this section in hope to improve the household waste separation in Gouda. These suggestions are all based on findings after conducting the research.

First is more frequent collection for the public containers, especially the plastic containers and glass containers. Based on the findings, it was discovered that the said containers were sometimes too full (especially during the weekends) to accommodate any more recyclable waste. This unfortunately impedes the residents who would like to throw in their recyclable wastes and because residents can no longer throw their recyclable waste, these plastic bags and bottles are then just left outside the containers which look unpleasant. See Annex 6.

Some respondents have also expressed their opinion that a more frequent collection for GFT waste would be more convenient for them because they did not want to keep their kitchen waste in their kitchen or containers for two weeks due to the flies it attracts. Due to this, some residents are forced to throw some of their waste in the residual waste container. This is especially the case for those who are living in blocks of apartments where they do not have plenty of space to keep their waste. Moreover, the collection time of 7:30 in the morning might be too early for some people.

The author would also like put some emphasis on collection schedules that might possibly improve recycling convenience for younger people. Assuming the younger group have to work the whole day (say, 9 in the morning until 5 in the afternoon), it might not be the most convenient time to put out the bins at 7:30 in the morning. Maybe it will help to consider collection in the weekends when the younger group have "free time". The author believes it is important to address convenience for younger people because research findings suggested that they are the age group which recycle less. Therefore, encouraging them to separate their waste more, by increasing convenience for them, might lead to improved household waste separation percentage in Gouda.

Also, some residents have claimed that the municipality (in this case, also Cyclus) are not doing enough or not doing anything at all to promote recycling in Gouda. It is important to conduct public campaigns to promote recycling in the municipality. By doing this, there is a way to spread awareness about the current issues the world is facing regarding waste and how to contribute.

Lastly, it is a suggestion to inform the residents of what is being done with the waste they separate. From findings, some residents have expressed their opinion that they are not aware what becomes of their waste after they recycle it and are, therefore, in doubt whether they should keep doing it as they see little to no value of doing the activity. Some also have the misconception that the waste collected are thrown in Asia or Africa and are in disagreement about the idea. The author believes that it is important to make them aware that this is not the case in the Netherlands, as confirmed by the officer from the municipality of Gouda. Spreading the correct information might encourage the residents to separate their waste more or to continue.

5.4 Further research

For further research, it might be more insightful to conduct focus groups to gather in-depth information and further understanding of the possible influences on one's participation in household waste separation. The open interaction might allow the researcher to gather more data in terms of the linkages between and amongst the variables.

In this research, an overlap can be seen between the recycling convenience and perceived behavioural control wherein one's perception of the control and easiness of recycling could have been influenced by how convenient the act of recycling was. Looking at the relationship between these two variables might be helpful in understanding to what extent recycling convenience influences perception.

Moreover, it might help to look at different types of houses especially flats and apartments. This research only looked at detached houses, semi-detached houses and townhouses which have their own bins (*rolcontainers*) and this was believed to be the reason why recycling convenience scored high; because residents who live in these types of houses have their own *rolcontainers* and do not have to share these with neighbours. Moreover, these *rolcontainers*

are located within the properties of the residents. On the other hand, residents who live in blocks of apartments share a public container with neighbours.

It might also help to compare the municipality of Gouda to another municipality under Cyclus which has or almost met the target set by the national government of 75%. For example, Bodegraven-Reeuwijk. By doing a comparison, new factors might be found and it might help discover what efforts are made in Bodegraven-Reeuwijk that are not practiced in Gouda. This might determine whether the lack of similar efforts is a deciding factor which explains the low household waste separation result as mentioned in Chapter 1.

5.5 Limitations

It is a limitation of this research that age is a predictor which Cyclus have no control of. To put it simply, Cyclus cannot change the age of the residents to make them separate their waste more often. Similarly, perception is not a matter that Cyclus can directly intervene in, but indirectly instead through targeting the improvement of recycling convenience in Gouda and to increase recycling awareness.

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Annex 1: English questionnaire for households

Hello! My name is Jinky and I am conducting a research about household waste separation in Gouda for my Master's thesis at the Erasmus University Rotterdam. I would greatly appreciate it if you can complete this questionnaire for me. It will immensely help me in my research. All information collected will be confidential and will only be used for academic purposes. Thank you very much for your help!

1. **What is the disposal method for recyclables in your area?** *You can tick more than one.*
   - ◯ Mini-containers (*bins with wheels*)
   - ◯ Underground/over ground containers
   - ◯ Plastics bags
   - ◯ I do not know
   - ◯ Others: _____
2. **How often does the municipality collect the recyclables?**
   - ◯ Once a week
   - ◯ Every two weeks
   - ◯ Twice a week
   - ◯ I do not know
   - ◯ Others: _____
3. **Does the municipality provide information on what to recycle?**
   - ◯ Yes (*please tick **all** applicable answers*)
     - ◯ By email
     - ◯ By post
     - ◯ By public campaigns
     - ◯ By the containers/bins
     - ◯ Others
   - ◯ No
4. **Who recycles in your household?**
   - ◯ Me
   - ◯ Me and someone else
   - ◯ Not me/Someone else
   - ◯ No one
5. **The house I live in is**
   - ◯ I own the house
   - ◯ I rent the house
   - ◯ Others: _____
6. **How many people live in the house** (*including yourself*)?
   - ◯ 1
   - ◯ 2
   - ◯ 3
   - ◯ 4
   - ◯ Others: _____
7. **How long have you lived in this address?**
   - ◯ Less than a year
   - ◯ Between 1 and 2 years
   - ◯ Between 3 and 5 years
   - ◯ Longer than 5 years
8. **What is your age?**
   - ◯ 0 – 19 years old
   - ◯ 20 – 39 years old
   - ◯ 40 – 59 years old
   - ◯ 60 years old and above
9. **What is your gender?**
   - ◯ Male
   - ◯ Female
   - ◯ Others: _____
10. **What is your nationality?** _____
11. **What is your country of origin?** (*optional*) _____
12. **What is your marital status?**
    - ◯ Unmarried/no partnership
    - ◯ Married/In a partnership
    - ◯ Divorced
    - ◯ Widowed
13. **What is your household's net monthly income?**
    - ◯ €1.000 per month or less
    - ◯ Between €1.001 and €3.500 per month
    - ◯ Between €3.501 and €6.000 per month
    - ◯ More than €6.000 per month
    - ◯ I do not know
    - ◯ Prefer not to say

14. What is your highest educational attainment?

- ◯ Early childhood education and care
- ◯ Primary education
- ◯ VMBO
- ◯ HAVO
- ◯ VWO
- ◯ Secondary vocational education (MBO)
- ◯ Post-secondary non-tertiary education
- ◯ Higher professional education (HBO bachelor, HBO master, HBO associate degree)
- ◯ Scientific education (WO bachelor, WO master)
- ◯ Others: _____

15. Do you agree with the following statements?

	Strongly disagree	Disagree	Neither disagree nor agree	Agree	Strongly agree
Recycling is good					
Recycling is useful					
Recycling is rewarding					
Recycling is a common practice in my household					
The people I live with expect me to recycle					
The people I live with encourage me to recycle					
Recycling is a common practice in my neighbourhood					
My neighbours expect me to recycle					
My neighbours encourage me to recycle					
I have access to the recyclable bins in my neighbourhood					
The recyclable bins in my neighbourhood are easy to get to					
I find recycling easy					
I find recycling difficult					
I know what materials can be recycled					
I know which bins are appropriate for the recyclable materials					
The municipality provides me with enough information about what to recycle					
There are enough separate recyclable bins in my neighbourhood					
I would like to have more bins in my neighbourhood					
I am satisfied with the number of bins in my neighbourhood					
The bins available in my neighbourhood support my need for separating my waste					

2

There is more than one recycling method in my neighbourhood					
Curb side collection is available in my neighbourhood					
Underground containers are available in my neighbourhood					
I know where the appropriate recyclable bins are located					
I know when all recyclable materials are collected					
I am always on time with putting my recyclable bins/plastic bags out for collection (*if applicable*)					
The municipality provides me with enough information about the collection schedule					
The municipality provides me with enough information about where the recyclable bins are					
I am aware that recycling benefits the environment					
I believe that I am helping the environment when I recycle					
I am aware that animals are in danger due to waste such as plastic					
I believe that I will harm the environment if I do not recycle					

16. How often do you separate your waste?

◯ Never ◯ Often
◯ Rarely ◯ Always
◯ Sometimes

17. Which among the following items do you separate? *Please tick all that applies.*

◯ Paper & carton ◯ Glass
◯ Plastic, cans & drink cartons

18. Which among the following items do you <u>NOT</u> separate? *Please tick all that applies. If nothing, please leave it blank.*

◯ Paper & carton ◯ Glass
◯ Plastic, cans & drink cartons

19. How often do you separate the following items? *Please tick one that applies.*

	Never	Rarely	Sometimes	Often	Always
Paper & carton					
Plastic, cans & drink cartons					
Glass					

Additional comments:

_____

_____

_____

If you are interested and willing to participate in a follow-up interview regarding the questionnaire, please fill in your details below so that I can contact you

Name (*optional*): _____

Contact details (phone number or email address): _____

THANK YOU VERY MUCH FOR YOUR TIME!

3

Annex 2: Dutch questionnaire for households

Hallo! Mijn naam is Jinky en ik doe onderzoek naar het scheiden van huishoudelijk afval in Gouda voor mijn masterscriptie aan de Erasmus Universiteit Rotterdam. Ik zou het zeer op prijs stellen als u deze enquete voor mij kan invullen. Dit zou mij immens veel helpen bij mijn onderzoek. Alle verzamelde information is vertrouwelijk en zal alleen worden gebruikt voor academische doeleinden. Heel erg bedankt voor uw hulp!

1. Wat is de verwijderingsmethode van recyclebaar afval in uw gebied? *Meer dan één keuze mogelijk.*

- ◯ Mini-containers (*afvalcontainer op wielen*)
- ◯ Ondergrondse/bovengrondse containers
- ◯ Zakken voor plasticafval
- ◯ Weet ik niet
- ◯ Anders: _____

2. Hoe vaak haalt de gemeente bij u recyclebaar afval op?

- ◯ Één keer per week
- ◯ Elke twee weken
- ◯ Twee keer per week
- ◯ Weet ik niet
- ◯ Anders: _____

3. Geeft de gemeente u informatie over wat u kunt recyclen?

- ◯ Ja (*selecteer a.u.b. alle toepasselijke antwoorden*)
  - ◯ Via e-mail
  - ◯ Via post
  - ◯ Via publieke campagnes
  - ◯ Bij/op de containers/afvalbakken
  - ◯ Anders: _____
- ◯ Nee

4. Wie recyclet in uw huishouden?

- ◯ Ik
- ◯ Ik en iemand anders
- ◯ Niet ik/Iemand anders
- ◯ Niemand

5. Het huis waar ik in woon is..

- ◯ Ik bezit het huis
- ◯ Ik huur het huis
- ◯ Anders: _____

6. Hoeveel mensen wonen in het huis (*inclusief uzelf*)?

- ◯ 1
- ◯ 2
- ◯ 3
- ◯ 4
- ◯ Anders: _____

7. Hoe lang woont u al op dit adres?

- ◯ Minder dan een jaar
- ◯ Tussen 1 en 2 jaar
- ◯ Tussen 3 en 5 jaar
- ◯ Langer dan 5 jaar

8. Wat is uw leeftijd?

- ◯ 0 – 19 jaar oud
- ◯ 20 – 39 jaar oud
- ◯ 40 – 59 jaar oud
- ◯ 60 jaar oud en daarboven

9. Wat is uw geslacht?

- ◯ Man
- ◯ Vrouw
- ◯ Anders: _____

10. Wat is uw nationaliteit? _____

11. Wat is uw geboorteland? (*optioneel*) _____

12. Wat is uw burgerlijke staat?

- ◯ Ongetrouwd /geen partnerschap
- ◯ Getrouwd/In een partnerschap
- ◯ Gescheiden
- ◯ Weduwnaar

13. Wat is het netto maandelijks inkomen van uw huishouden?

- ◯ €1.000 of minder per maand
- ◯ Tussen €1.001 en €3.500 per maand
- ◯ Tussen €3.501 en €6.000 per maand
- ◯ Meer dan €6.000 per maand
- ◯ Weet ik niet
- ◯ Zeg ik liever niet

1

14. Wat is uw hoogst behaalde opleidingsniveau?

- ◯ Voorschools onderwijs en opvang
- ◯ Basisonderwijs
- ◯ Voorbereidend middelbaar onderwijs (VMBO)
- ◯ Hoger algemeen voortgezet onderwijs (HAVO)
- ◯ Voorbereidend wetenschappelijk onderwijs (VWO)
- ◯ Middelbaar beroepsonderwijs (MBO)
- ◯ Specialisten opleiding
- ◯ Hoger beroepsonderwijs (HBO bachelor, HBO master, HBO associate degree)
- ◯ Wetenschappelijk onderwijs (WO bachelor, WO master)
- ◯ Anders: _____

15. Bent u het eens met de volgende uitspraken?

	Sterk mee oneens	Oneens	Neutraal	Eens	Sterk mee eens
Recyclen is goed					
Recyclen is nuttig					
Recyclen is lonend					
Recyclen is een algemene praktijk in mijn huishouden					
De mensen waar ik mee leef verwachten dat ik recycle					
De mensen waar ik mee leef sporen mij aan om te recyclen					
Recyclen is een algemene praktijk in mijn buurt					
Mijn buren verwachten dat ik recycle					
Mijn buren sporen mij aan om te recyclen					
Ik heb toegang tot de recycle (afval)bakken in mijn buurt					
De recycle (afval)bakken in mijn buurt zijn gemakkelijk bereikbaar					
Ik vind recyclen makkelijk					
Ik vind recyclen moeilijk					
Ik weet welke materialen recyclebaar zijn					
Ik weet welke (afval)bakken geschikt zijn voor de recyclebare materialen					
De gemeente geeft mij genoeg informatie over wat ik moet recyclen					
Er zijn genoeg afzonderlijke recycle (afval)bakken in mijn buurt					
Ik zou graag meer (afval)bakken in mijn buurt hebben					
Ik ben tevreden met het aantal (afval)bakken in mijn buurt					
De beschikbare (afval)bakken ondersteunen mijn behoefte om mijn afval te scheiden					

2

Er is meer dan één manier van recyclen in mijn buurt					
Aan de weg verzameling van afval is beschikbaar in mijn buurt					
Ondergrondse/bovengrondse containers zijn beschikbaar in mijn buurt					
Ik weet waar de toepasselijke recycle (afval)bakken staan					
Ik weet wanneer alle recyclebare materialen worden opgehaald					
Ik ben altijd op tijd met het aanbieden van mijn recycle (afval)bakken/zakken voor plasticafval (*indien van toepassing*)					
De gemeente verstrekt mij genoeg informatie over het ophaal schema van afval					
De gemeente verstrekt mij genoeg informatie over waar de recycle (afval)bakken zijn					
Ik ben ervan bewust dat recyclen het mileu ten goede komt					
Ik geloof dat ik het mileu help wanneer ik recycle					
Ik ben ervan bewust dat dieren in gevaar komen door afval zoals plastic					
Ik geloof dat ik het mileu schaad als ik niet recycle					

16. Hoe vaak scheidt u uw afval?

◯ Nooit
◯ Zelden
◯ Soms
◯ Vaak
◯ Altijd

17. Welke van de volgende items scheidt u? *Selecteer a.u.b. alle toepasselijke antwoorden.*

◯ Papier & karton
◯ Plastic, blikken & pakken
◯ Glas

18. Welke van de volgende items scheidt u niet? *Selecteer a.u.b. alle toepasselijke antwoorden. Indien geen van alle, a.u.b. leeg laten.*

◯ Papier & karton
◯ Plastic, blikken & pakken
◯ Glas

19. Hoe vaak scheidt u de volgende items? *Selecteer a.u.b. alle toepasselijke antwoorden.*

	Nooit	Zelden	Soms	Vaak	Altijd
Papier & karton					
Plastic, blikken & pakken					
Glas					

Aanvullende opmerkingen:

_____

_____

_____

Indien u interesse heeft en bereid bent deel te nemen aan een vervolg interview met betrekking tot de enquete, vul dan alstublieft uw gegevens hieronder in, zodat ik contact met u kan opnemen.

Naam (*optioneel*): _____

Contact gegevens (telefoonnummer of emailadres): _____

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3

Annex 3: Interview guide for municipality

1. What are the collection and disposal methods in the whole of Gouda and in the district of Noord in particular? This refers to both residual waste and recyclable waste.
2. Does the municipality provide any incentive and/or rewards to those who separate their waste? If yes, what are these?
3. What motivates the municipality to implement waste separation in Gouda?
4. What is the waste separation target of the municipality in Gouda?
5. What are the efforts made by the municipality to inform people about household waste separation in Gouda?
    a. About the collection schedules
    b. About what waste can be recycled
    c. About the location of the recyclable bins
6. Do you see that there is progress in household waste separation in Gouda? Please explain.
7. Do you receive complaints about waste separation from the residents in Gouda? If so, what are these complaints?
8. What are the biggest challenges you are facing in implementing household waste separation in Gouda?
9. What are your planned improvements in regards to implementation of household waste separation in Gouda?
10. What do you think are the reasons which make households separate their waste?
11. What do you think are the reasons which make households not separate their waste?
12. Are there any consequences for households who do not recycle?

Annex 4: Interview guide for Cyclus

1. What are the collection and disposal methods in Gouda? This refers to both residual and recyclable waste.
2. After the recyclable waste and residual waste are collected, what do you do with them? Please explain.
3. What are the efforts made by Cyclus to inform residents about household waste separation in Gouda?
    a. About the collection schedules
    b. About what waste can be recycle
    c. About the location of the recyclable bins
4. Do you see that there is progress in household waste separation in Gouda? Please explain.
5. Do you receive complaints about household waste separation from the residents in Gouda? If so, what are these complaints?
6. What are the biggest challenges Cyclus is facing in implementing household waste separation in Gouda?
7. What is Cyclus' planned improvements in regards to implementation of household waste separation in Gouda?
8. What do you think are the reasons why residents in Gouda separate their waste?
9. What do you think are the reasons why residents in Gouda do **not** separate their waste?
10. How often do you encounter contamination of recyclable waste in Gouda and how do you deal with this? This contamination refers to waste that are thrown in the wrong bins. For example, glass materials that should not be thrown in the glass bin/container.

Annex 5: Interview guide for households

1. Do you consider yourself to be a recycler?
2. Can you please explain to me how recycling is being done in your neighbourhood?
    a. Collection schedule
    b. Types of bins
    c. Types of waste separated
3. What is your opinion about the recycling facilities and services in your neighbourhood?
4. What is your opinion about the act of recycling in general?
5. What are the things or situations that can stop you from recycling? Or that can make recycling difficult/less easy for you?
6. Does it encourage you to recycle if you see that your family members or your neighbours also recycle? Please elaborate.
7. What do you know about the positive or negative impacts of recycling?
8. What are the efforts made by the municipality to promote recycling in Gouda?
9. Do you feel that the municipality is doing enough effort to promote recycling? Please explain.
10. What do you think can be improved by the municipality about recycling here in Gouda?

Annex 6: Photographs of full public containers

For glass bottles

For textiles

For textiles

For plastic

Annex 7: Some information placed on the containers

Instructions on the residual waste underground container (in Dutch)

Instructions on what can be thrown in by the plastic container (in Dutch)

Annex 8: T-test for “Home ownership”

Home ownership	N	Mean	Std. Deviation	Std. Error Mean
Owned	109	4.837	0.343	0.032
Rented	12	4.750	0.593	0.171

	Levene's Test for Equality of Variances		t-test for Equality of Means						
	F	**Sig.**	**t**	**df**	**Sig. (2-tailed)**	**Mean Difference**	**Std. Error Difference**	**95% Confidence Interval of the Difference**	
								Lower	*Upper*
Equal variances assumed	2.834	0.095	0.774	119	0.441	0.08792	0.11363	-0.13707	0.31291
Equal variances not assumed			0.504	11.824	0.624	0.08792	0.17446	-0.29283	0.46867

Annex 9: T-test for "Number of years in residence"

Number of years in residence	N	Mean	Std. Deviation	Std. Error Mean
Lower than 5 years	22	4.8977	0.26344	0.05617
5 years or more	99	4.8013	0.40489	0.04069

	Levene's Test for Equality of Variances		t-test for Equality of Means						
	F	**Sig.**	**t**	**df**	**Sig. (2-tailed)**	**Mean Difference**	**Std. Error Difference**	**95% Confidence Interval of the Difference**	
								Lower	*Upper*
Equal variances assumed	2.503	0.116	1.066	119	0.289	0.096	0.090	-0.082	0.275
Equal variances not assumed			1.39	46.111	0.171	0.096	0.069	-0.043	0.235

Annex 10: T-test for "Number of people in household"

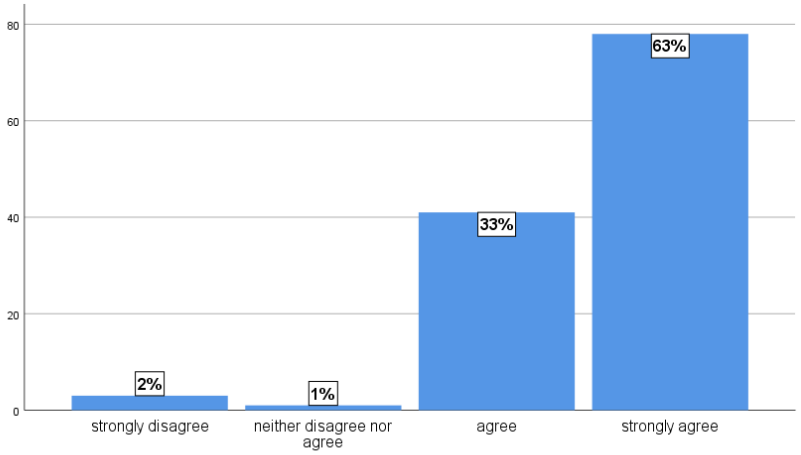
Number of people in household	N	Mean	Std. Deviation	Std. Error Mean
Smaller households	65	4.900	0.341	0.042
Bigger households	58	4.729	0.408	0.053

	Levene's Test for Equality of Variances		t-test for Equality of Means						
	F	**Sig.**	**t**	**df**	**Sig. (2-tailed)**	**Mean Difference**	**Std. Error Difference**	**95% Confidence Interval of the Difference**	
								Lower	*Upper*
Equal variances assumed	5.5	**0.021**	2.515	121	0.013	0.170	0.067	0.036	0.304
Equal variances not assumed			2.49	111.709	**0.014**	0.170	0.068	0.034	0.305

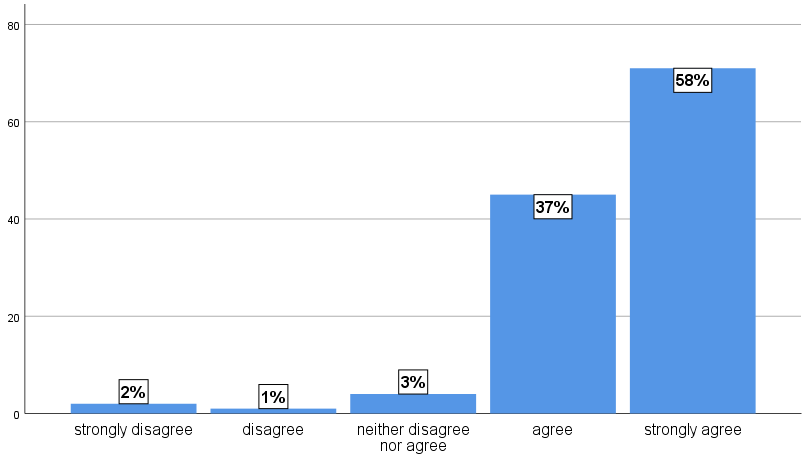
Annex 11: Matrix for qualitative data

Indicators	Residents interview	Residents questionnaires	Cyclus interview	Municipality interview
Willingness to recycle	All respondent seems willing to recycle as they all considered themselves as recyclers	Over 70% have favourable opinion about recycling	-	Some people are busy with other things (other than recycling), some don't believe recycling can save the environment
Recycling behaviour of family and friends	Encouragement is good but not needed	Over 50% considered recycling a norm and are being encouraged or expected to recycle by family and friends	-	-
Recycling behaviour of neighbours	Encouragement is good but not needed	68% agrees it's a norm but less than 25% are being expected or encourage to recycle by neighbours	-	-
Perceived easiness/difficulty and control of recycling	- Good perception of difficulty - Bad perception of control	Perception obtained high scores	-	-
Information available on what to recycle	Most seem well-informed, a few said they are unsure	Over 70% are well-informed	-	Letters, website, stickers on containers,
Clearly separated recyclable containers	Most seem satisfied with the separate recyclable bins	Over 50% are satisfied with the recyclable bins	-	-
Ways of recycling	*Rolcontainers*, public containers, plastic bags	Majority thinks there are various recycling methods	Traditional collection, differentiated collection	*Rolcontainers*, underground containers, above ground containers
Awareness of recycling scheme	Leaflet, newspaper, website, brochure, flyers, journal,	Majority are well-informed of the recycling scheme	-	Some people don't know which waste belongs where
Awareness of the impacts of recycling	Good for the environment, animals, much trash, much plastic, ocean, use less resources	Over 80% are aware that recycling is good for the environment and that waste is not good for the environment	--	Sustainability, circular economy

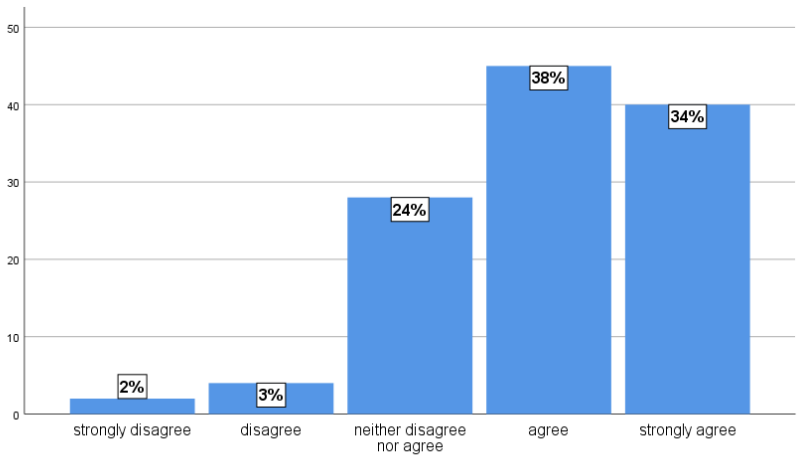
Annex 12: Responses for “willingness to recycle” items



A) Recycling is good

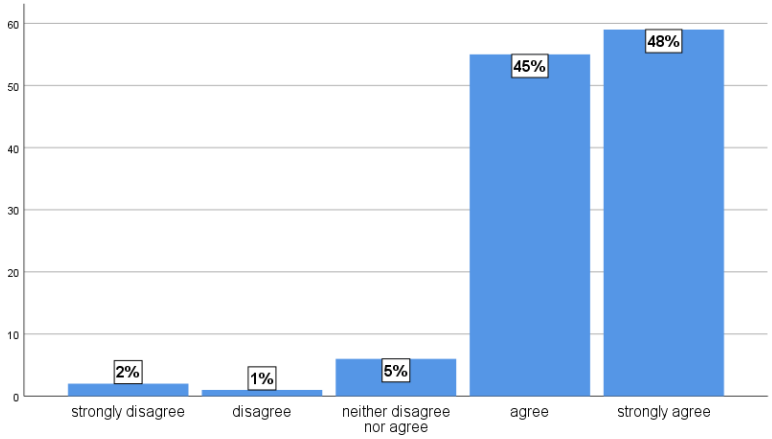


B) Recycling is useful

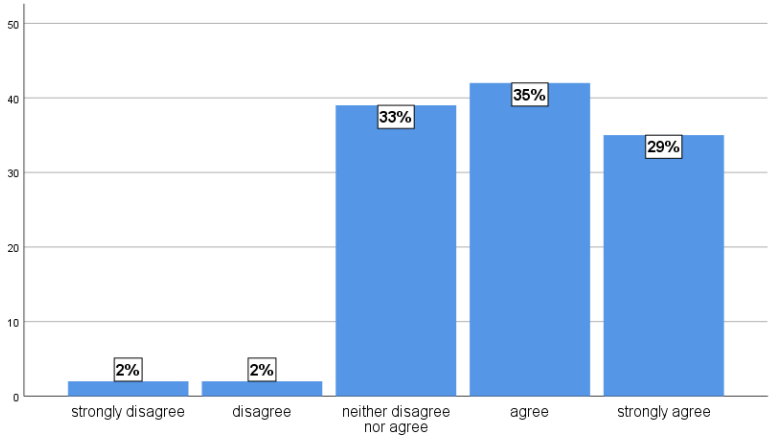


C) Recycling is rewarding

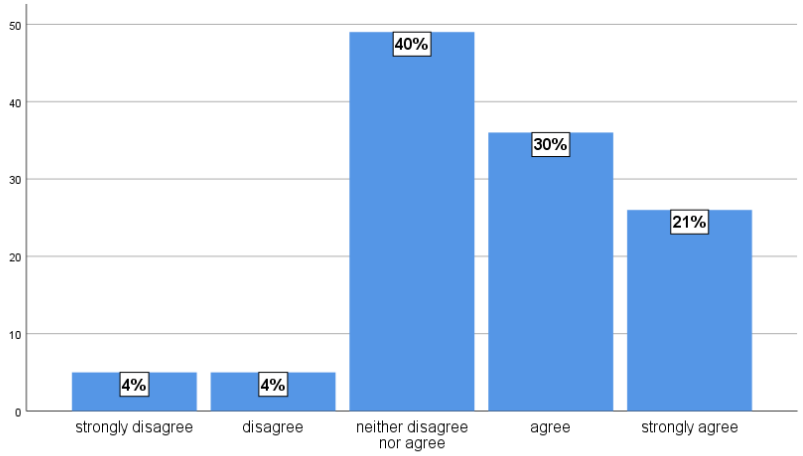
Annex 13: Responses for “recycling behaviour of family and friends” items



A) Recycling is a common practice in my household

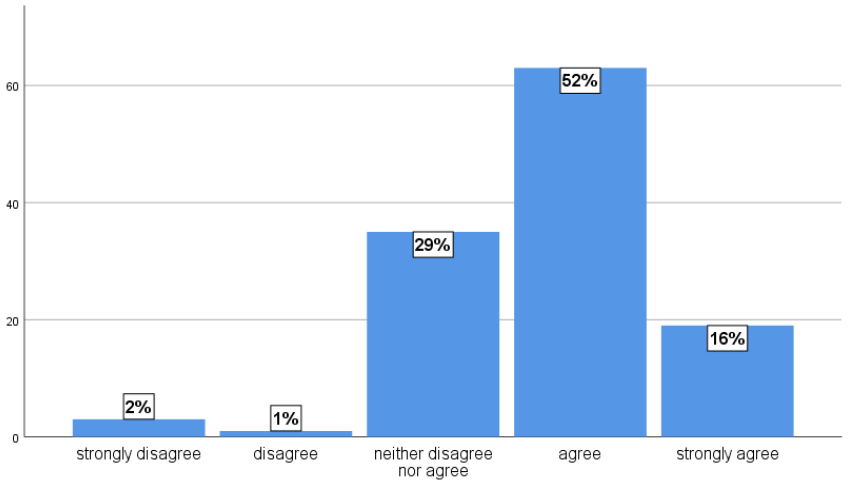


B) The people I live with expect me to recycle

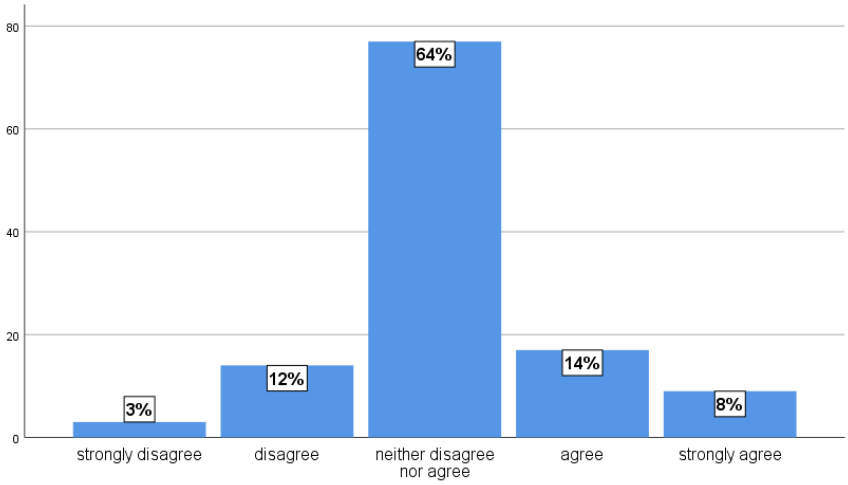


C) The people I live with encourage me to recycle

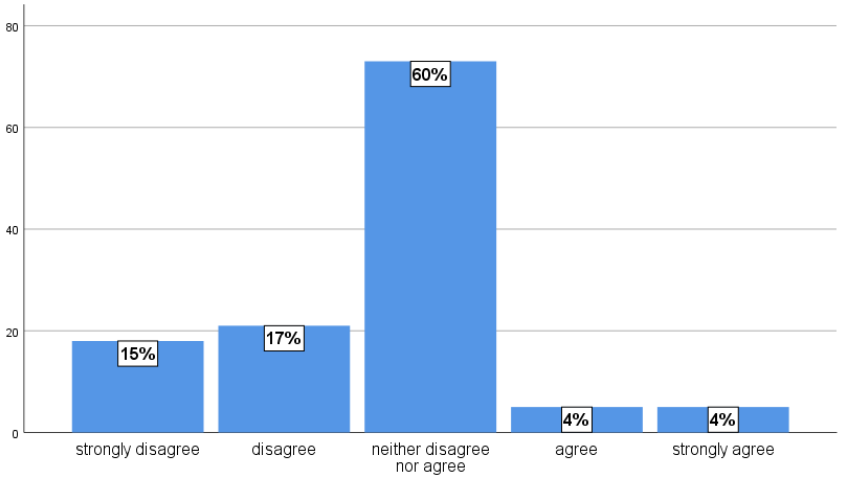
Annex 14: Responses for “recycling behaviour of neighbours” items



A) Recycling is a common practice in my neighbourhood

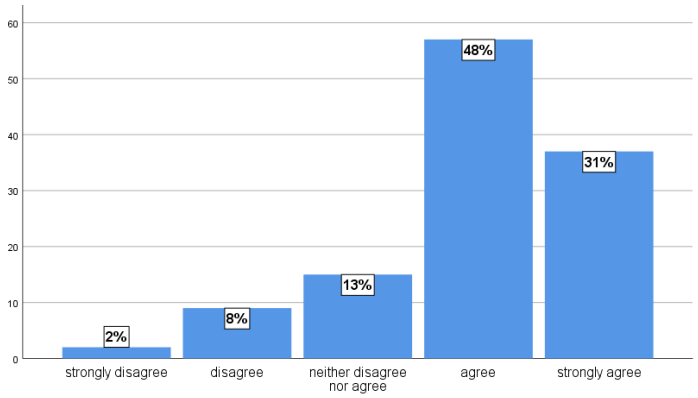


B) My neighbours expect me to recycle

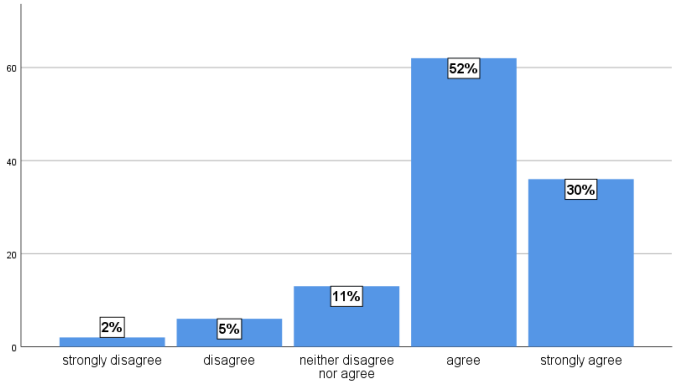


C) My neighbours encourage me to recycle

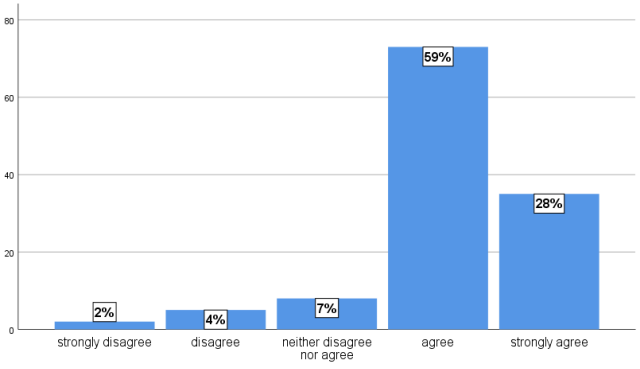
Annex 15: Responses for “perceived easiness/difficulty and control of recycling” items



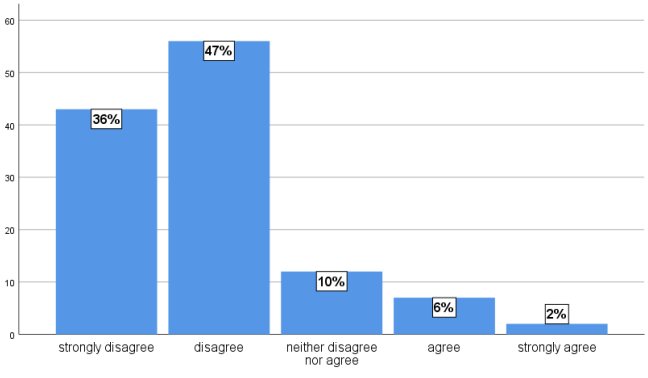
A) I have access to the recyclable bins in my neighbourhood



B) The recyclable bins in my neighbourhood are easy to get to

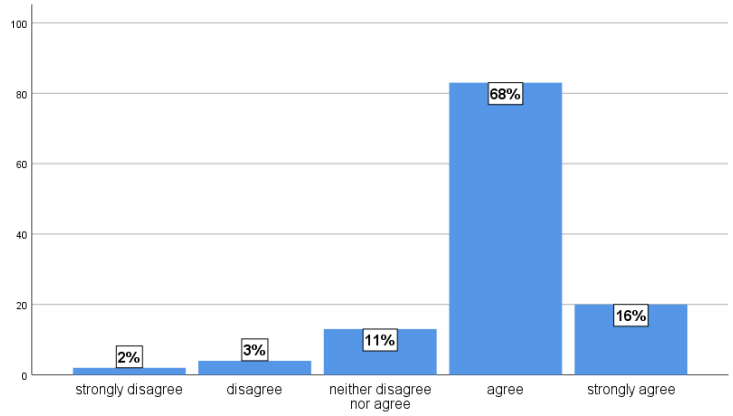


C) I find recycling easy

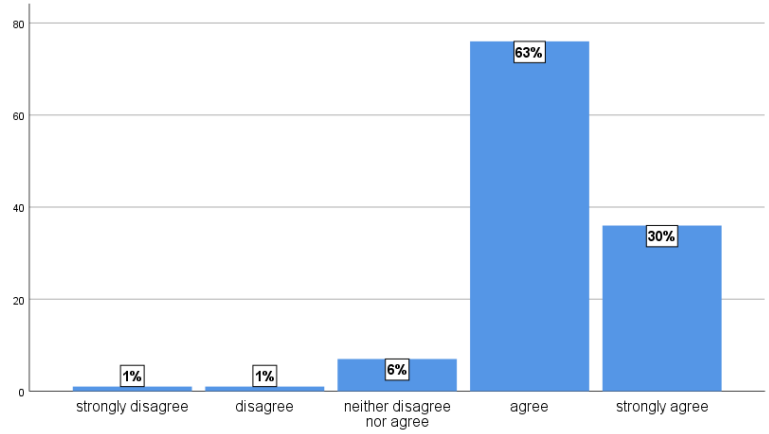


D) I find recycling difficult

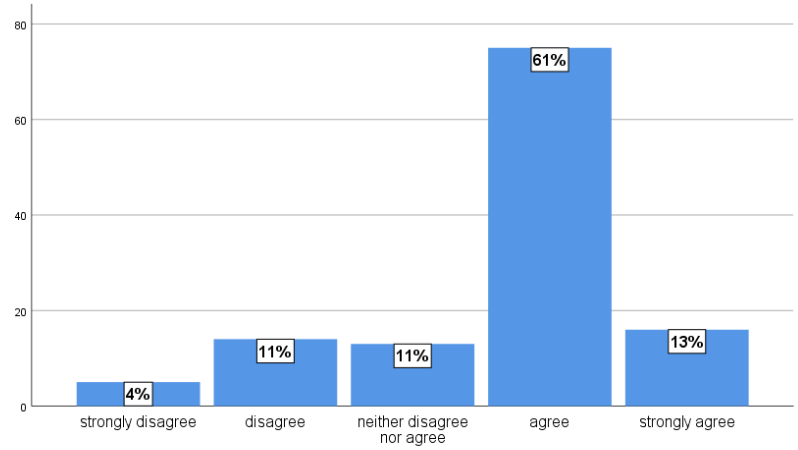
Annex 16: Responses for “information available on what to recycle” items



A) I know what materials can be recycled

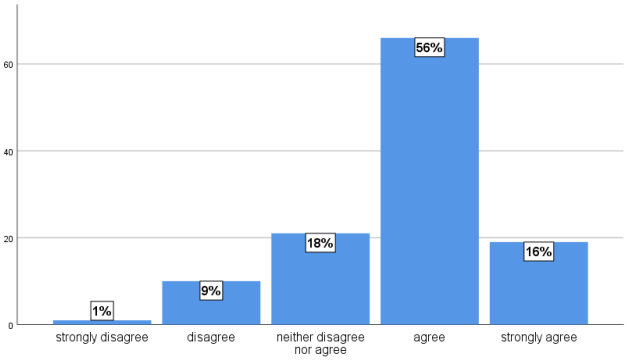


B) I know which bins are appropriate for the recyclable materials

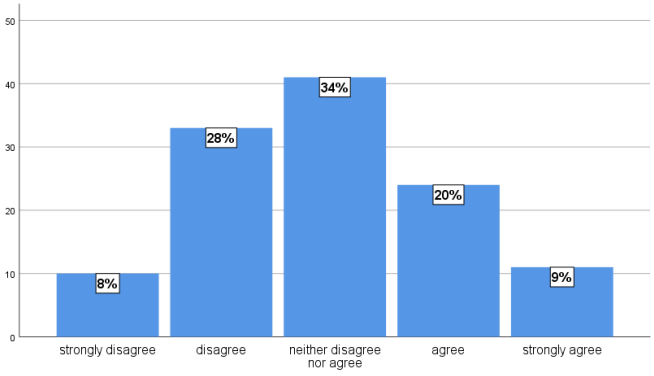


C) The municipality provides me with enough information about what to recycle

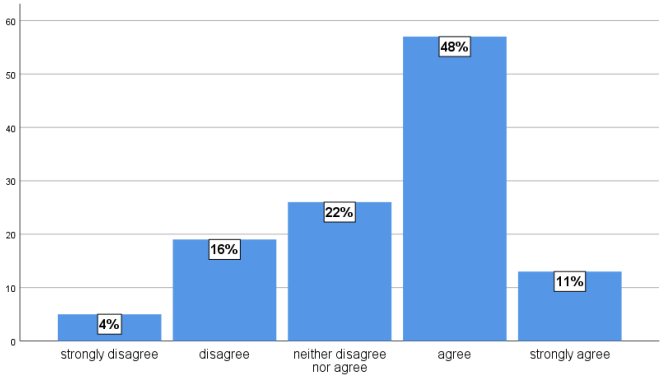
Annex 17: Responses for “clearly separated recyclable containers” items



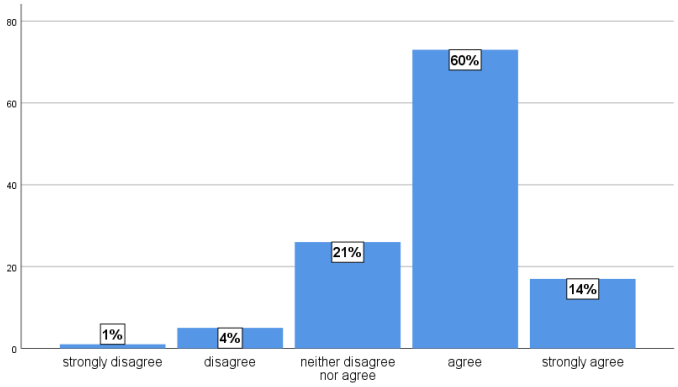
A) There are enough separate recyclable bins in my neighbourhood



B) I would like to have more bins in my neighbourhood

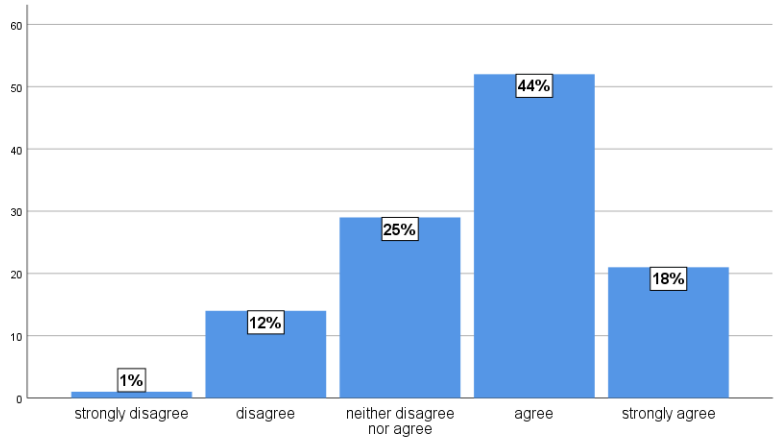


C) I am satisfied with the number of bins in my neighbourhood

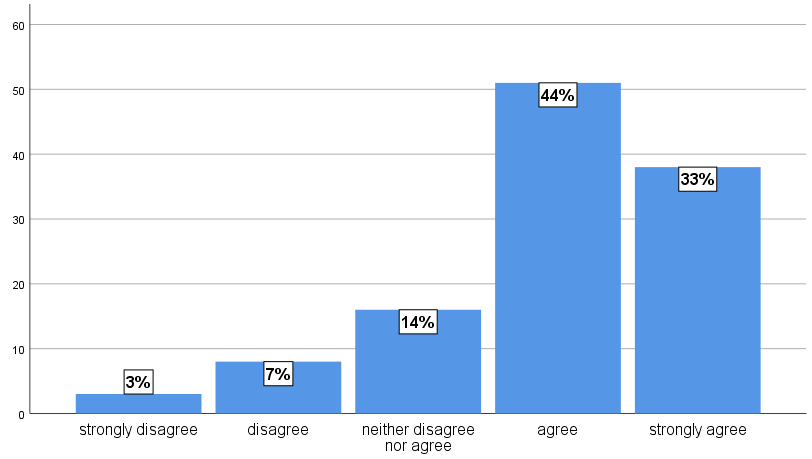


D) The bins available in my neighbourhood support my need for separating my waste

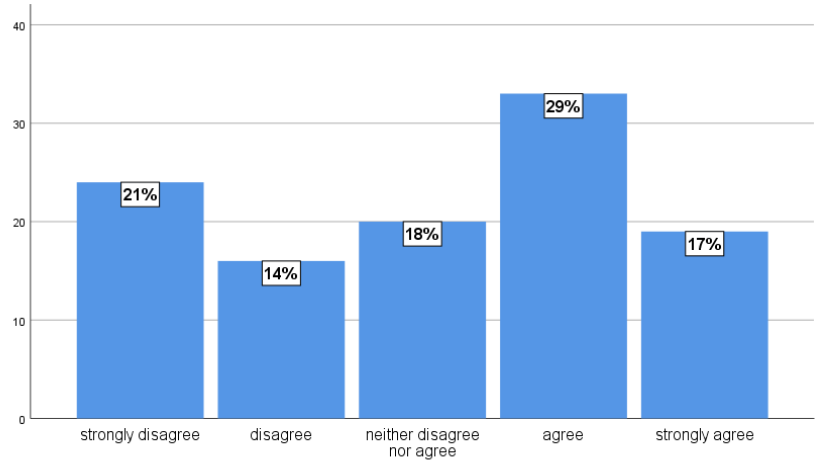
Annex 18: Responses for “ways of recycling” items



A) There is more than one recycling method in my neighbourhood

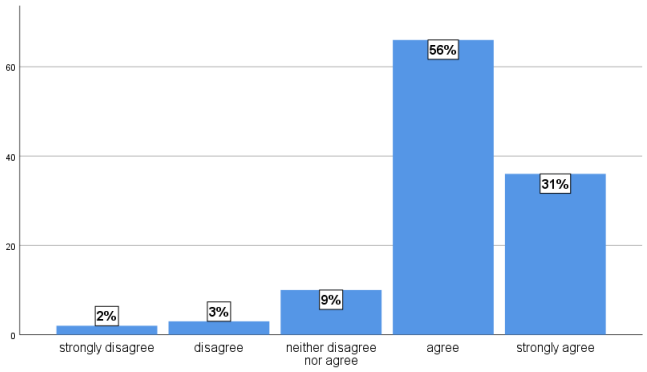


B) Curb side collection is available in my neighbourhood

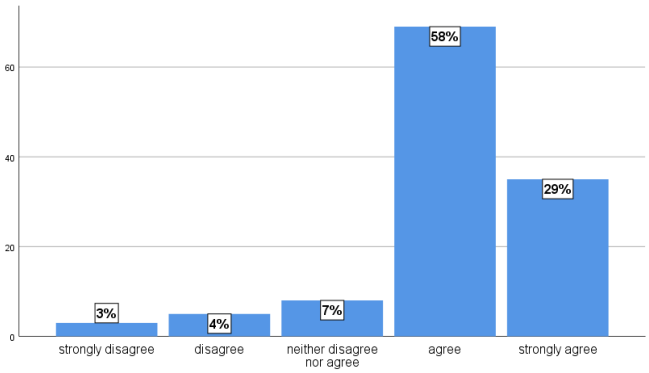


C) Underground containers are available in my neighbourhood

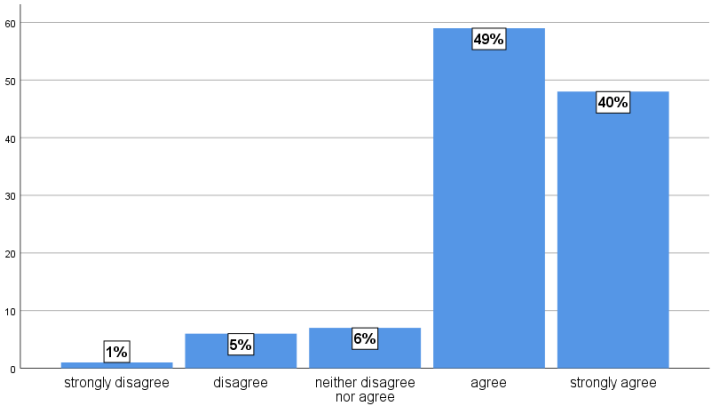
Annex 19: Responses for “awareness of recycling scheme” items



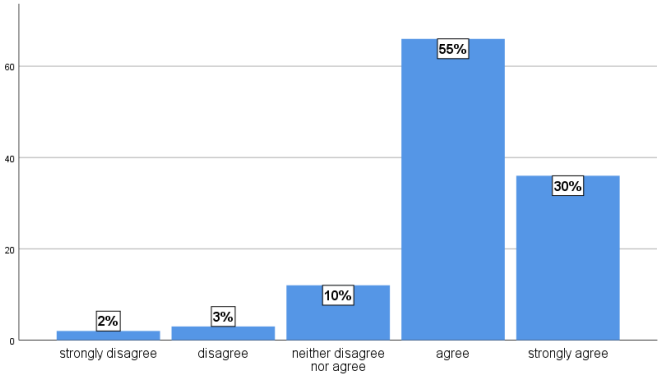
A) I know where the appropriate recyclable bins are located



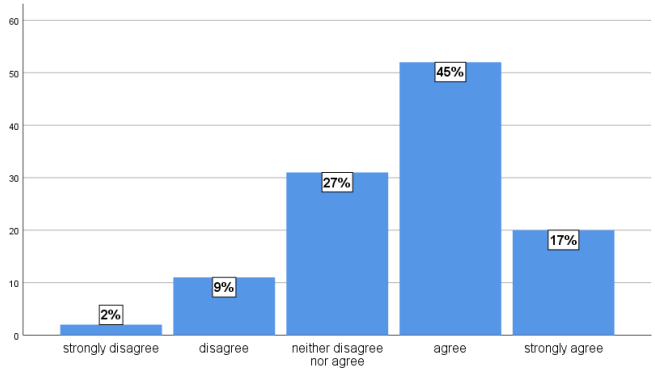
B) I know when all recyclable materials are collected



C) I am always on time with putting my recyclable bins/plastic bags out for collection

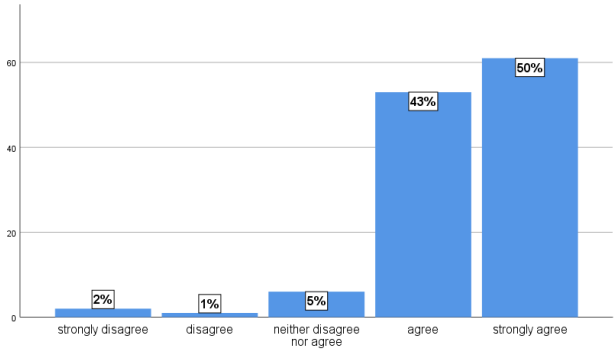


D) The municipality provides me with enough information about the collection schedule

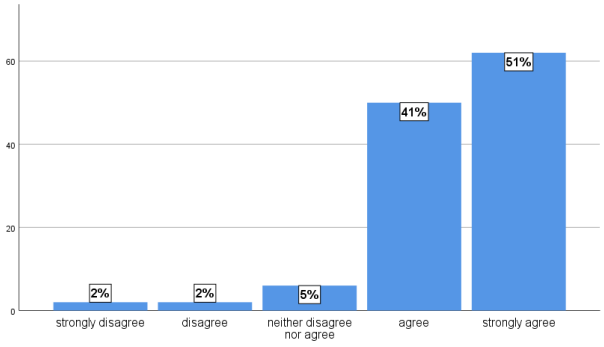


E) The municipality provides me with enough information about where the recyclable bins are

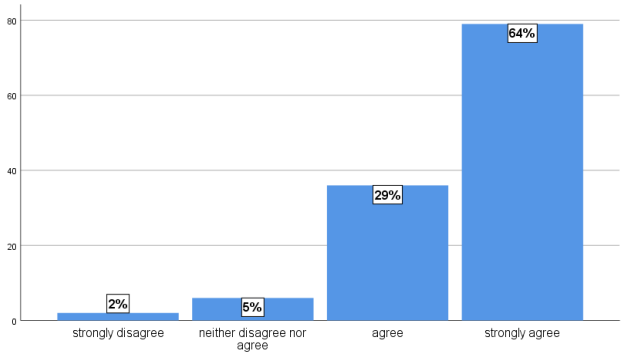
Annex 20: Responses for “awareness of the impacts of recycling” items



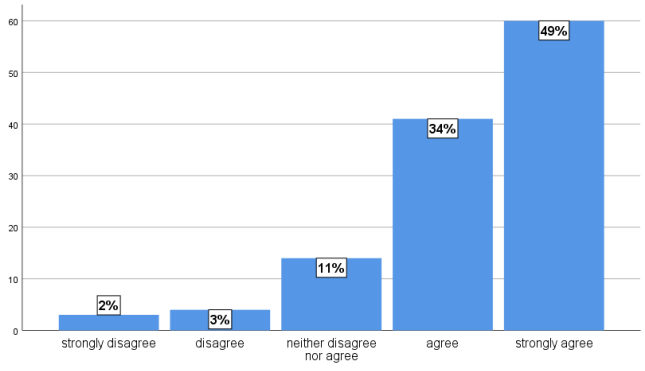
A) I am aware that recycling benefits the environment



B) I believe that I am helping the environment when I recycle

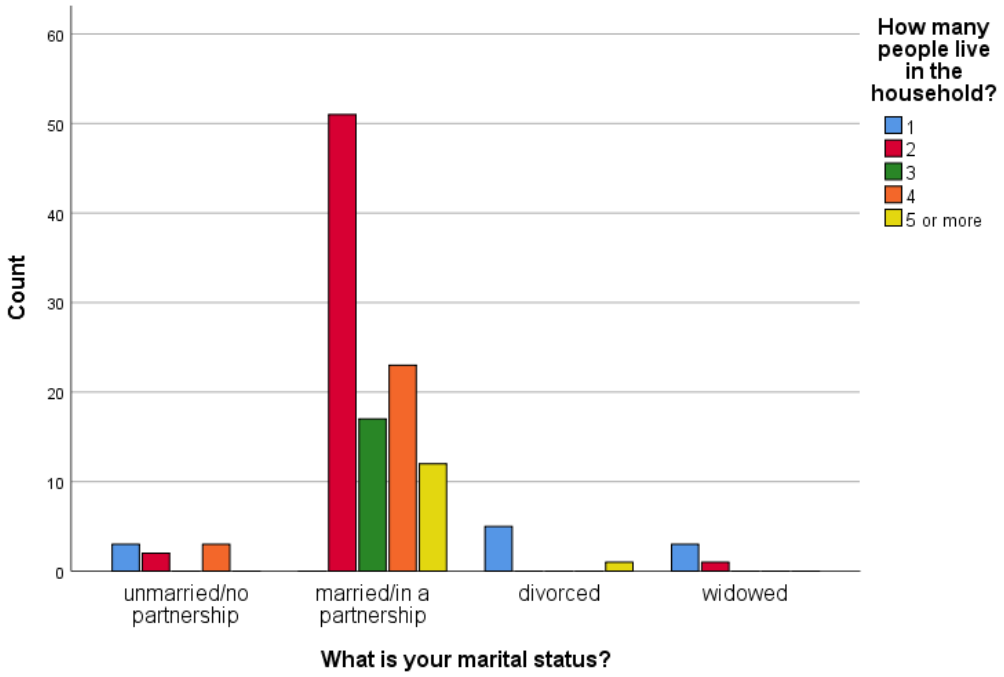


C) I am aware that animals are in danger due to waste such as plastic

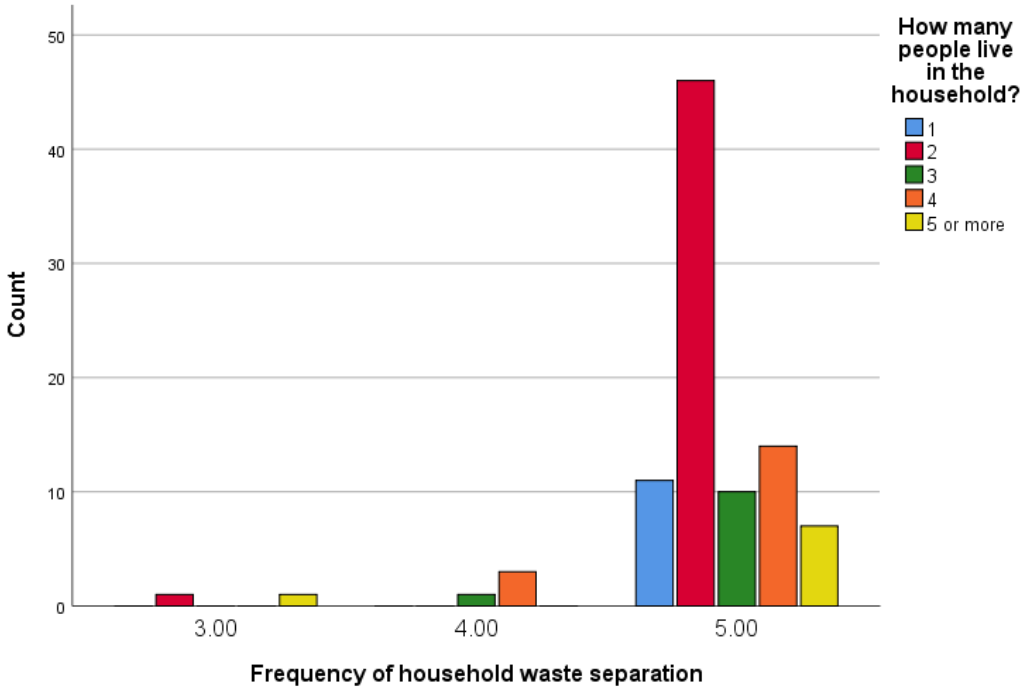


D) I believe that I will harm the environment if I do not recycle

Annex 21: Number of people in the household based on marital status

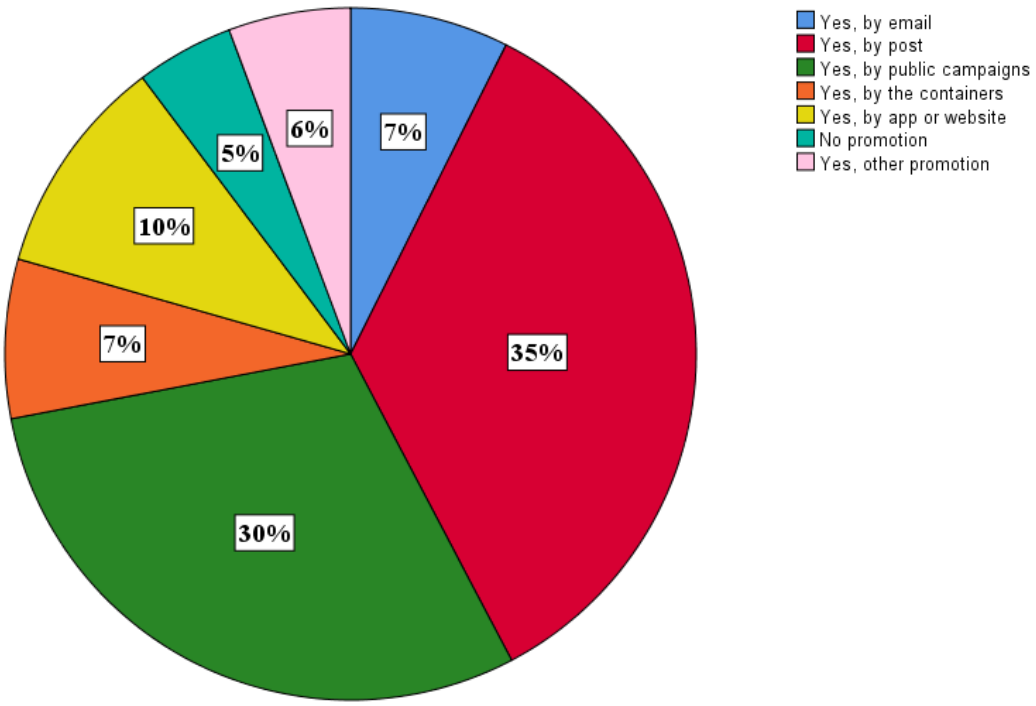


Annex 22: Frequency of separation based on number of people in household



Note that "1" and "2" ("*Never*" and "*Rarely*") are not included in the chart because nobody chose these options. Thus, only "3", "4", and "5" are included which are "*Sometimes*", "*Often*" and "*Always*", respectively.

Annex 23: Ways of information provision



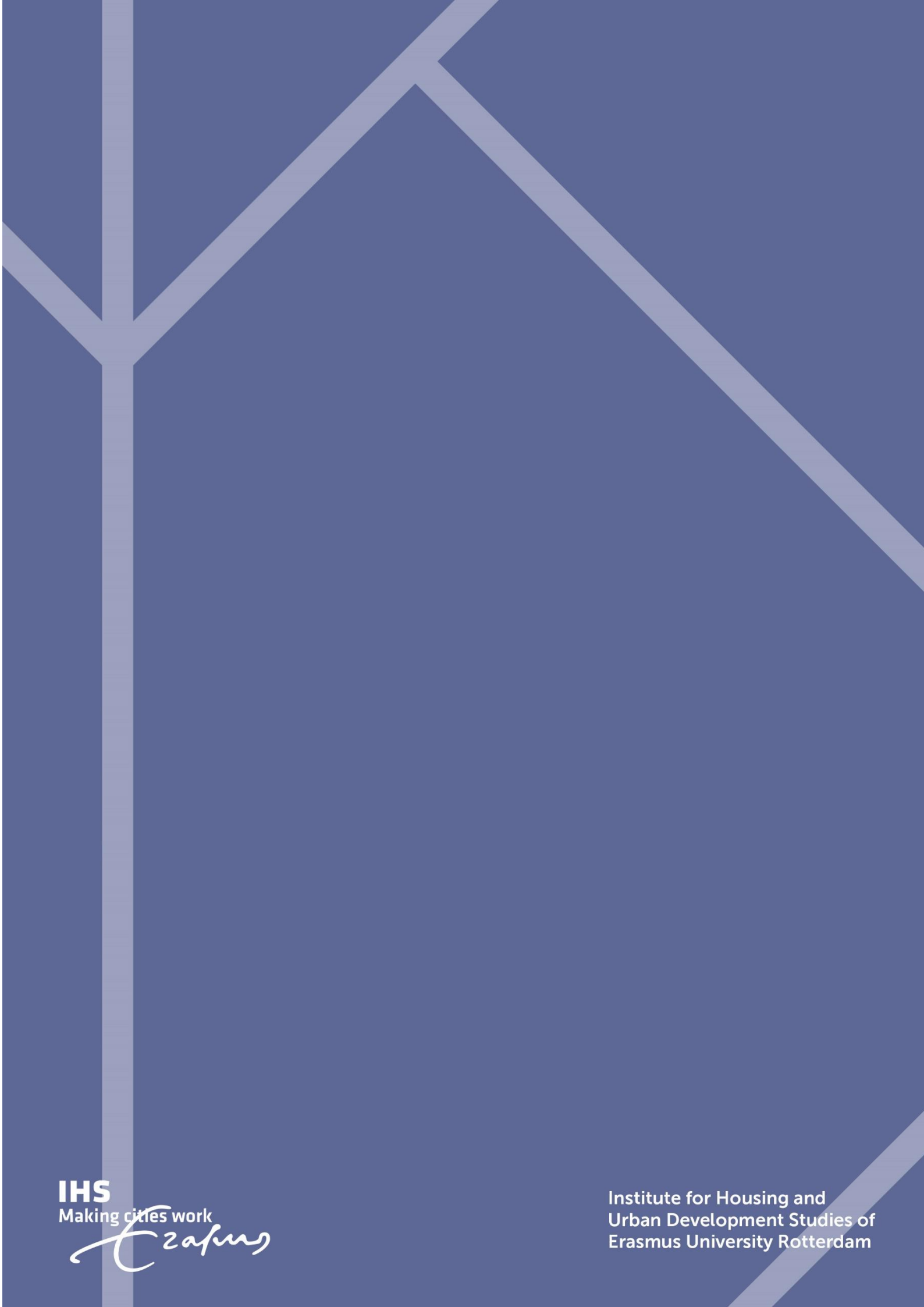
Annex 24: Matrix for sample size selection

Districts	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Binnenstad	1,372	2,685	2,204	1,875	4,048	4,088	1,459	615	6,062	2,396	4,462	843	435	8,136
De Korte Akkeren	2,317	2,917	2,588	1,975	4,946	4,851	2,479	503	6,815	3,585	4,995	845	372	9,797
Bloemendaal	1,860	2,112	2,260	3,296	4,647	4,881	1,427	613	7,488	4,175	4,050	699	604	9,528
Plaswijck	2,818	2,147	3,350	4,254	5,966	6,603	2,068	861	9,640	5,625	5,096	1,165	683	12,569
Noord	2,503	2,666	2,779	2,436	5,079	5,305	1,905	559	7,920	4,049	5,066	769	500	10,384
Kort Haarlem	2,480	2,548	2,861	2,128	4,936	5,081	2,477	637	6,903	3,569	5,119	878	451	10,017
Goverwelle	2,894	2,380	3,568	2,225	5,416	5,651	2,753	664	7,650	4,752	5,077	805	433	11,067
Stolwijkersluis	101	85	152	95	214	219	36	27	370	189	203	29	12	433
*Westergouwe**	332	625	237	51	646	599	358	49	838	404	783	54	-	1,245
													Sum of Gouda population:	**71,931**
Sum	16,345	17,540	19,762	18,284	35,252	36,679	14,604	4,479	52,848	28,340	34,068	6,033	3,490	
Percentage**	**23**	**24**	**27**	**25**	**49**	**51**	**20**	**6**	**73**	**39**	**47**	**8**	**5**	

Districts	1	2	***3***	***4***	5	6	***7***	8	***9***	10	11	12	***13***	**Final scores*****
Binnenstad	17	33	***27***	***23***	50	50	***18***	8	***75***	29	55	10	***5***	4
De Korte Akkeren	24	30	26	20	50	50	25	5	***70***	37	51	***9***	4	2
Bloemendaal	20	22	24	35	49	***51***	15	***6***	79	44	43	***7***	6	3
Plaswijck	22	17	***27***	34	47	53	16	7	77	45	41	***9***	***5***	3
Noord	24	26	***27***	***23***	***49***	***51***	***18***	5	76	***39***	49	***7***	***5***	**8**
Kort Haarlem	25	***25***	29	21	***49***	***51***	25	***6***	69	36	51	***9***	***5***	6
Goverwelle	26	22	32	20	***49***	***51***	25	***6***	69	43	46	***7***	4	4
Stolwijkersluis	***23***	20	35	22	***49***	***51***	8	***6***	85	44	***47***	***7***	3	6

* Some data is missing and thus, excluded from the process
** This is what the scoring was based on

1 – 0 -19 years old
2 – 20 – 39 years old
3 – 40 – 59 years old
4 – 60 years old and above
5 – Men
6 – Women
7 – Non-Western
8 – Western
9 – Native Dutch
10 – Married/In a partnership
12 – Unmarried/No partnership
13 – Separated
14 – Widowed
15 – Total population



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