ERASMUS UNIVERSITY ROTTERDAM

Erasmus School of Economics

Master Thesis Behavioural Economics

Thesis title: The use of descriptive norms to increase the use of a sustainable service

Student: Nikolaos Plakaros

ID number: 557817

Supervisor: Aurelien Baillon

Second assessor: Marine Hainguerlot

Date final version: 09.02.2022

The views stated in this thesis are those of the author and not necessarily those of the supervisor, second assessor, Erasmus School of Economics or Erasmus University Rotterdam.

Contents

Abstract

The use of normative messages has been widely researched during the last decades, providing mixed results. While most studies report that the use of normative messages induced the desired behaviour, other studies show that these messages can have boomerang effects. The current study focused on the use of weak descriptive norms in order to promote the use of a sustainable service, more specifically the Byewaste app. Byewaste is a start-up which focuses on collecting unwanted items, such as electronics, clothes, toys and books, and giving them a second life. The results of the online survey on 189 individuals living in the Netherlands show that the use of weak descriptive norms did not have positive results; on the contrary, there are some indications that they may even backfire. On top of that, a Latent Class Analysis (LCA) is performed based on the participants' sustainability awareness and sustainable habits, and four distinct classes are identified. While these classes vary in their interest to use the Byewaste app, they did not react as expected to descriptive norms.

Chapter 1. Introduction

Covid 19 pandemic changed many things around the world, and governments relied on individuals to follow some basic rules, like social distancing, wearing masks and staying at home as much as possible. One would expect that whether someone follows these rules or not has to do with this person's beliefs and individual characteristics. However, the research of Bicchieri et al. (2021) has shown that the effect of social norms, and more specifically what others do, and what is socially acceptable, can play an important role as well.

Given their important role in affecting human behaviour, the use of normative messages has been widely researched the last two decades (Schultz et al., 2015). Indeed, many studies have shown that the desired behaviour can be promoted by using normative messages in different contexts, ranging from promoting sustainability in the workplace (Block et al., 2015), to manipulating corruption (Köbis et al., 2015). Additionally, this kind of intervention has caught the attention of researchers and practitioners alike, as they can be powerful and cost-effective at the same time (Yamin et al., 2019).

In this thesis I study whether using descriptive norms can promote a sustainable service, and more specifically the Byewaste app. Byewaste is a start-up, which collects various items individuals no longer need, like electronics, clothes, toys and books, and providing them with a second life. This way, these items do not end up in trash, but they are either being sold in second-hand shops, or they are used in industry as raw materials.

In order to communicate with potential users, Byewaste uses a letter, in which the firm describes the service that is being offered, and calls users to donate the items they no longer need. In the current study, the letter Byewaste developed in a pilot is used to research the efficacy of descriptive norms in an online study.

Additionally, previous research argues that more “green” individuals may respond better to descriptive norms (Demarque et al., 2015) and therefore, data about sustainability awareness and sustainable habits are collected, so individuals can be classified based on their environmental attitude. This way it can be researched whether individuals who care more about the environment react differently to normative messages compared to individuals who are not aware about environmental issues.

The structure of the current study is as follows. Firstly, previous research on descriptive norms is reviewed, with a focus on research about sustainability, as well as to the cases in which the use of descriptive norms has backfired. After that, the methodology of this study is analysed, and the results are presented. Finally, the meaning of the results, implications for Byewaste, and the limitations of the study are being discussed.

Chapter 2. Descriptive Norms

2.1 The Distinction between Injunctive and Descriptive Norms

Cialdini et al. (1991) divided social norms into injunctive and descriptive. Injunctive norms are unspoken rules that imply whether some attitudes or behaviours are socially acceptable (Cialdini et al., 1991). Individuals tend to comply with the injunctive norms in order to gain social rewards, or to avoid punishments. For example, not talking on the phone in a cinema while the movie is playing is an injunctive norm and individuals avoid doing that, otherwise they may face a social punishment, in the form of angry looks or comments from other viewers.

On the other hand, descriptive norms reflect the behaviour of others and individuals think that if others are doing it, then it should be a sensible thing to do (Cialdini et al., 1991). Cialdini (1988, as cited in Cialdini et al., 1991) argues that this is a mental shortcut and following descriptive norms individuals can be more efficient in their decision-making process. If, for example, someone is driving in a highway in a foreign country and most of the cars around are driving beyond the speed limit, then the driver of the car may think that if others are doing it, then it is an acceptable thing to do.

2.2 Descriptive Norms

The usage of descriptive norms has been tested in various contexts, like promoting sustainability in the workplace (Blok et al., 2015), encouraging energy conservation (Nolan et al., 2008; Schultz et al., 2015; Smith et al., 2012), reducing littering (Reno et al., 1993), increasing physical activity (Priebe & Spink, 2012), manipulating corruption (Köbis et al., 2015), promoting sustainable products (Melnyk et al., 2013; Richter et al., 2018) and increasing charitable donations (Agerström et al., 2016).

Despite being used in so different contexts, research has shown that individuals are not aware of the impact descriptive norms have on their behaviour. Nolan et al. (2008) performed a phone study and asked participants whether they try to conserve energy, the reasons behind their actions and whether they believe that their neighbours exhibit the same behaviour. Interestingly, even though participants rated the normative beliefs as the least important reason why they try to conserve energy, these beliefs had a strong correlation with the participant's own conservation efforts.

In addition, the researchers also conducted a field experiment in which they sent residents messages that promoted energy conservation. These messages ranged from environmental reasons to save energy, to descriptive norms messages, describing the behaviour of the residents' neighbours. The results of the field experiment showed that residents who received the descriptive norms messages had the lowest energy consumption one month after they received the message. However, when asked why they tried to conserve energy, residents rated the descriptive norms' influence as the least important reason.

Schultz et al. (2015) performed a field experiment in which they placed in-home displays to 431 single-family households to promote energy conservation. More specifically, they did a randomized control trial with four groups, one control, one with feedback on energy consumption, another one with cost-framed feedback, and finally one condition with a normative message. While the consumption of households with simple and cost-framed feedback did not differ from the control group, households who received the normative message consumed 9% less energy compared to the control one week after the study started, and 7% less after three months. In addition, when interviewed after three months, residents who received the simple or the cost-framed feedback reported that the display encouraged them to reduce their energy usage, while in the norm condition the reported effect on energy usage was significantly lower. Thus, the study of Schultz et al. (2015) confirms the study of Nolan et

al. (2008) that the use of normative messages plays an important role in energy conservation, but this effect is often undetected, as individuals are unaware that the normative messages affect their behaviour.

Based on the finding that the influence of normative information is often undetected, Jaeger and Schultz (2017) argued that behavioural change achieved through normative messages should be perceived as intrinsically motivated. They based their research on the notion that extrinsically motivated commitments only have a short-term effect, while intrinsically motivated commitments induce long lasting changes. To assess whether normative messages promote intrinsic motivation, they performed a field experiment, which took place in times of a drought, with 8879 households in North County San Diego. Participants were randomly assigned to receive information on why they should restrict their water usage, a strong warning in case they do not reduce it, or a normative message; participants in the last two conditions were also asked to commit to reducing their water usage. The results of the study showed that, while the short-term water usage was reduced in all treatment conditions, the only group for which the reduction of the usage remained stable four months after the intervention was the group that received the normative message and chose to commit. This implies that the actions of this group are intrinsically motivated.

2.3 The use of Descriptive Norms in the Promotion of Sustainable Products and Services

Various studies have assessed whether descriptive norms can be used to promote sustainable products and services. Demarque et al. (2015) performed two lab experiments using "weak" and "strong" descriptive norms formulations to nudge students to buy more eco-labelled products in an online environment. "Weak" descriptive norms refer to the instances in which a low proportion of individuals perform an action, while "strong" descriptive norms reflect the majority (Demarque et al., 2015). For example, if 20% of employees of a firm are participating in a marathon, then this is still considered a descriptive norm, but it's a "weak"

one, as less than half are involved in the aforementioned action. On the other hand, if the same percentage was more than 50%, then it would be classified as a “strong” descriptive norm.

Demarque et al. (2015) included four conditions in their first experiment, one control, one weak and two strong descriptive norms conditions. In the weak (strong 1) descriptive norms condition, they informed students that 9% (70%) of previous participants purchased one (at least one) ecological product. In the second strong descriptive norms condition, it was mentioned that on average, previous participants purchased at least two ecological products. In this experiment, all descriptive norms conditions performed better compared to the control group, and there was no statistical difference between strong and weak descriptive norms.

While the percentages used in their first experiment were based on a pilot study, in a second experiment, the researchers added some non-factual extreme cases, like for example 1% or 99% purchased some ecological products. The results of the second experiment showed that only the strong descriptive norms conditions outperformed the control condition, while the weak descriptive norms did not influence how many ecological products participants bought. This provides some mixed results regarding the efficacy of weak descriptive norms. However, the ad hoc analysis showed that participants in the second experiment purchased less sustainable products across all conditions compared to participants in the first experiment, and therefore the sample in experiment 2 is considered less “green”. This, according to the researchers, implies that different social groups can respond differently to descriptive norms.

Melnyk et al. (2013) performed three experiments in undergraduate students to assess whether regulatory focus influences the efficacy of descriptive and injunctive norms. Regulatory focus distinguishes between individuals who focus on promotion (for example in accomplishments) and individuals who focus on prevention (for example on safety and avoiding pain) (Higgins, 1997). In all three experiments, using different sustainable products, the researchers found the same results. To elucidate, while for injunctive norms regulatory

focus did not have an effect, for descriptive norms regulatory focus matters. This means that individuals with a focus on promotion had significantly higher intentions to buy a sustainable product (e.g., Fair trade coffee) compared to the individuals with a focus on prevention. Therefore, according to Melnyk et al. (2013), descriptive norms should be mainly used to promote an action (e.g., to increase charitable donations) and not to prevent one (e.g., to reduce littering).

2.4 The Boomerang Effect of Descriptive Norms

The literature on normative messages has shown that in some cases they can backfire. This is evident in the research of Richter er al. (2018), who performed a field experiment in supermarkets in Norway and Germany using different signs promoting sustainable frozen seafood. The signs were divided into information only, and descriptive norms messages. More specifically, the descriptive norms messages pointed out that "xx% of all customers buying seafood in our shop yesterday chose MSC/ASC", with a clear distinction between weak (4%, 11%, 28%) and strong descriptive norms (52%, 69%, 82%, 90%). The analysis shows that in Norway, the sales of seafood that had a label with either weak or strong descriptive norms were lower compared to the sales of the prompt only condition, while they did not differ to the sales of the control period. In Germany, there was a significant decrease of seafood sales only in the weak descriptive norms condition compared to the control period. This provides enough evidence to conclude that, in this experiment, (weak) descriptive norms have backfired.

Ozaki and Nakayachi (2020) argue that the influence of descriptive norms is moderated by the attitudes or beliefs individuals have on the researched subject. Those who hold positive beliefs about a subject tend to focus on what the majority does, as described by the (strong) descriptive norms, while those who hold negative beliefs focus on the minority, thinking that there are others that do not exhibit the same behaviour, and this way they feel better about themselves. This became evident in the study of Ozaki and Nakayachi (2020), in which they

asked 329 participants from Japan to read a leaflet that contained information on how to prepare for a natural disaster. Half of the participants were presented with a normative message, that informed them that 68.1% of the participants read the leaflet. In addition, participants provided their cognitive, emotional and behavioural attitudes towards the importance of preparation. The results showed that the descriptive norms message had a positive effect on those who had positive attitudes towards preparation and a strong, negative effect on those with negative attitudes, indicating a clear boomerang effect of descriptive norms. However, the same study on US citizens provided insignificant results.

The fact that descriptive norms messages can have a boomerang effect for some and not all individuals was previously reported by Schultz et al. (2007), who performed a research to assess the effects of normative messages on electricity consumption in 290 household in San Marcos CA. The researchers provided normative feedback in every household, informing them whether their energy consumption is below or above average. Those with energy consumption above average decreased significantly their consumption after they received the feedback. However, households who consumed less energy than the average increased their consumption after the feedback. This increase signifies a boomerang effect. Nevertheless, the addition of a smiley face (an injunctive norm) along with the normative feedback acted as a buffer for the destructive effects of descriptive norms for these households.

2.5 The credibility of norms

The use of non-factual extremes by Demarque et al. (2015), raises the question of the credibility of norms. It is widely acknowledged among economists that researchers should not deceive the participants (in other words it is an injunctive norm, and usually researchers who use deception are penalised by other economists as their papers are not accepted in scientific journals (Wilson and Isaac, 2007)). In fact, using deception in experiments has negative externalities (McDaniel and Starmer, 1998). For example, Jamison et al. (2008) intentionally

used deception in an experiment, and then found that participants who had been deceived exhibited different behaviour in next experiments compared to participants who had not been deceived.

Recently, Charness et al. (2021) surveyed 756 scientific researchers around the world and confirmed that most of the researchers believe that deception should not be acceptable. However, as Charness et al. (2021) mention, there are also some "gray areas" which are more acceptable by the scientific community. Also, there is some heterogeneity, as some researchers are not so strict on deception if there is not another way to gather data on an important topic. This last point is in line with Cooper (2014), who argues that deception might be permitted if it does not harm subjects, if it would have been impossible to gather data any other way, if the subjects are informed after the experiment that they had been deceived, and if the value of the study is higher that the costs occurred by deception.

Even though the scope of this thesis is not to provide guidelines or to argue whether deception should be allowed or not, in some cases descriptive norms cannot be tested in any other way, rather than using deception. This makes the discussion about the credibility of norms relevant for this thesis. Discussing specifically about normative messages, apart from Demarque et al. (2015), Rimal et al. (2005) also used non-factual descriptive norms in their experiment to study whether the restructure of normative beliefs can affect individuals' behaviour. More specifically, they informed half of the sample that the popularity of yoga had been on the rise the last 10 years, and the rest of the sample that the popularity of yoga had been declining (both statements could be believable back in 2005, when yoga was not as popular as it is today). However, just before the end of the experiment, participants were debriefed and informed that they were exposed to some non-factual statements, and thus, according to Cooper (2014), this should not be considered deception.

2.6 Hypotheses Development

The main objective of this research is to assess whether normative messages can promote the usage of a sustainable service (Byewaste). The effectiveness of normative messages to motivate specific behaviours has been widely investigated in the scientific literature, with many studies reporting that normative messages can promote the described behaviour (Nolan et al., 2008; Priebe & Spink, 2012; Blok et al., 2015; Schultz et al., 2015; Agerström et al., 2016). Jaeger and Schultz (2017) even argue that behavioural change achieved through normative messages should be perceived as intrinsically motivated, as the behavioural change is lasting, and it does not wear off in the long term. However, the literature review on descriptive norms provides mixed results, as in some cases descriptive norms have backfired (Schultz et al., 2007; Richter er al., 2018; Ozaki and Nakayachi, 2020). Therefore, it is important to first test whether descriptive norms can promote the use of Byewaste in an online study.

Since Byewaste is a start-up, and at the time of the online study (April 2021) it had only performed a pilot study in 3.000 residents, weak descriptive norms are going to be used, as the conversion rate for Byewaste is still low. The literature on weak descriptive norms is not conclusive on whether they have the same effects as strong descriptive norms or not. Kormos et al. (2015) argue that there is a linear relationship from non-existent information, to weak and then strong descriptive norms. This implies that strong descriptive norms can have stronger effects on behavioural change, but weak descriptive norms can have an effect as well (although it may not be so strong). Additionally, in the first experiment of Demarque et al. (2015), both weak and strong descriptive norms messages had the same, positive effects on behavioural change. Therefore, even though some studies suggest that weak descriptive norms may not influence behavioural change (like the second experiment of Demarque et al., 2015), or they

may even backfire (Richter et al., 2018), it is important that their effects on increasing the use of Byewaste are tested. Thus, the following hypothesis is formed:

H1: Individuals who are exposed to normative messages (descriptive norms) report a higher willingness to use a sustainable service (Byewaste).

In a recent report, researchers from Kantar and GFK (2019) identified four distinct customer segments, based on customers' environmental attitudes and buying habits, and they named these four segments as eco dismissers, eco considerers, eco believers and eco actives. Eco dismissers do not have much interest in environmental challenges, and they do not take steps to improve environmental conditions. Eco considerers do not think that plastic is a major problem, but they do take some action to cut their plastic usage. Eco believers identify the problem and take some action, and finally eco actives are considered advocates and they do all they can to be more sustainable. Based on this report, it is expected that a class analysis on the sustainability awareness and sustainable habits of individuals will lead into the same number of classes and similar results.

Moreover, individuals who care more about the environment and have many sustainable habits are expected to be more interested in using Byewaste, compared to those who do not care.

H2: Individuals who are more interested in the environment and have many sustainable habits will are more interested in using Byewaste.

As mentioned earlier, in their two experiments, Demarque et al. (2015) reported mixed results for the weak descriptive norms messages, as the messages had an effect in their first experiment, and no effect in their second. However, the main difference between these two experiments was that in the first one, participants were overall more "green", which may imply that being considerate about the environment may affect someone's choices. In addition, Ozaki

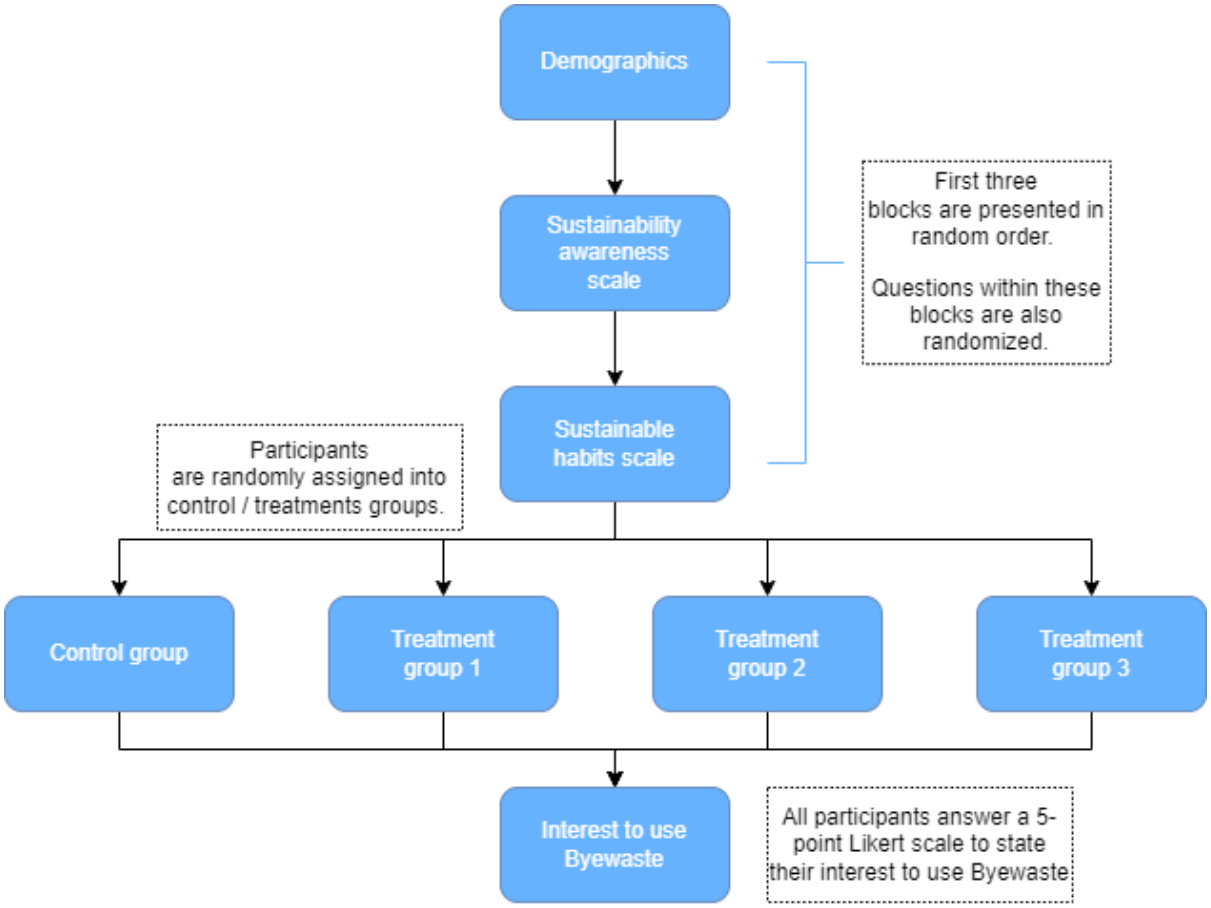
and Nakayachi (2020) argue that the influence of descriptive norms is moderated by the attitudes or beliefs individuals have on the researched subject. Therefore, it is expected that individuals who belong in the classes that care about the environment and have many sustainable habits will react better in the normative messages, compared to those who are not interested about the environmental degradation. Thus, the following hypothesis is developed:

H3: Individuals who are more interested in the environment and have many sustainable habits will be more affected by the use of normative messages.

Chapter 3. Methodology

To test the aforementioned hypotheses, a questionnaire was distributed online. The questionnaire included some demographic questions, and then some questions about sustainability awareness and sustainable habits. Finally, participants were randomly assigned into a control and three treatment groups, as depicted in graph 1. In all groups participants read a letter explaining what Byewaste is and how they can use the Byewaste app. However, the letter was slightly different in the different groups, so the descriptive norms messages can be tested. Finally, after reading the letter, participants were asked to indicate their interest in using the Byewaste app.

Figure 1. The flow of the survey



Sustainability awareness

For the sustainable awareness part, the 11-item sustainability awareness scale was used, measured in a 5-point Likert scale ranging from strongly disagree to strongly agree. This scale was initially developed by Stegg (1999) as a 12-item scale, and used by Gatersleben et al. (2002). However, the scaled used in this thesis was the same as in Blok et al. (2015), who reduced the number of questions of the initial scale to 11. Example questions are: "I worry about environmental problems" and "Environmental pollution affects my health", with some questions being reverse coded.

Sustainable habits

For the measurement of sustainable habits, 11 questions were used, measured in a 5-point Likert scale, ranging from never to always and include questions like "I try to reuse things that can be useful for me and others", and "I separate garbage by type (glass, plastics, paper, organic or other)". These questions were also used by Chuvieco et al. (2018), with the difference that the researchers used 27 questions in total to measure sustainable habits, but I selected 11 of them, based on which ones were expected to be more relevant for individuals living in the Netherlands.

Letter about Byewaste

Following the questions about awareness and habits, participants were randomly divided into four groups, one control and three treatments. The letter that was presented to the control group can be seen in Figure 2 and it is the same Byewaste used in its first pilot study. For treatment groups 1 to 3, a normative message was added as a separate paragraph before the sentence that calls to action (Are you in? Download..). The sentences that added to each group are the following:

1. 20% of those who receive this letter download and use the Byewaste app
2. We just recently started, and already 20% of those who receive this letter download and use the Byewaste app
3. We just recently started, and already 20% of your neighbours have downloaded and used the Byewaste app

As it can be seen, there is a small difference from sentence 1 to 2, and from 2 to 3, so the efficacy of each element can be better accessed. The percentage that was used in the normative message was based on a previous pilot study Byewaste did in the Netherlands. Also, since Byewaste is not yet active in all parts of the Netherlands, it would not make sense to use strong descriptive norms, as participants may feel that this information is false. Finally, the third statement, which refers to the participant's neighbours, cannot be factually correct, as there was not control over the place of residence of the participants. However, at the top of the page participants could read the following text: "Suppose you receive the following letter in your home. Please read this carefully". This makes it clear that this is a fictional scenario, and therefore, even though the third statement is not factually correct, participants are not being deceived.

Dependent variable

After reading the letter, participants were asked to indicate whether they are interested in using the services Byewaste offers. The interest was measured in a 5-point Likert scale, ranging from "not interested at all" to "extremely interested". This question is the dependent variable used in the analysis, as it reflects the interest to use the services Byewaste offers.

Figure 2

Letter used to explain Byewaste

Byewaste

To the resident(s) of this address

Subject:
Giving your old things a second life
Day:
12 April 2021

irado

het goed

Mobility Lab

Dear resident,

Do you have books and (small) electronics that you no longer use? Or toys and textiles? Then, Byewaste is the solution for you.

You don't have to leave the house, queue at the recycling center, or take it to a store! **On April 25, 2021 between 5 pm and 7 pm, Byewaste will pick it up at your front door for free,** and you will get rid of your unused or broken items, which will get a second life.

Are you in? Download the free Byewaste app and register your free collection service.

We turn it into gems! How does it work?

Your offered books, toys, or textiles are, if still in good condition, reused through thrift store **Het Goed**. Your discarded (small) electrical appliances are recycled and are therefore raw materials for new goods. **And that is good for the environment!**

Start now! Het Goed offers a 10% discount coupon if the Byewaste service is used

Robustness of the study

The fact that the order of the questions in surveys can have an effect in the answers given by participants is well documented in the scientific literature (Krosnick & Alwin, 1987; McFarland, 1981; Strack, 1992). The questionnaire design in the current research was divided into four blocks, namely demographic questions, sustainability awareness, sustainable habits, and letter of Byewaste. To avoid order effects, the first three blocks were presented in a random order, as did the questions within each block. The fourth block could not be randomized, since after stating their interest to use Byewaste, participants could use a link to visit the Byewaste's website.

Additionally, to increase the robustness of the study, an attention checking question was used, as in Lacroix and Gifford (2019), asking participants to validate their continued participation by selecting strongly disagree. Previous research has shown that approximately 4% of participants do not provide accurate responses (Petzel et al., 1973; Hartman, 2021). In the current survey, 14.5% of participants failed to pass the attention checking question. This is higher when compared with the 4% that was expected. One reason for this may be that most of the sample is consisted of students, and students may not put much effort into filling questionnaires, especially when they are not getting rewards.

Sample

The online questionnaire was distributed between April 20 and May 31, in a convenience sample. The only restriction to participate in the study was to reside in the Netherlands. After dropping data from the participants who failed to pass the attention checking question, the sample is consisted of 189 valid answers, with 63.8% being females, 34.6% males, and 1.6% non-binary. The average age of participants is 24.9 years (SD=5.78), 90% of

participants have at least a bachelor's degree, and 66.8% are students, while the majority (73.9%) living in a municipality of 75.000 residents or more.

Analysis

The first step in the analysis is to perform a Kruskal-Wallis test to find whether there is a difference between the control and treatment groups. The variable of interest is whether participants are interested in using the services Byewaste offers. Since the data was captured in an ordinal scale, and we want to test for differences between 4 independent groups, Kruskal-Wallis seems to be the best option (McCrum-Gardner, 2008).

After this, a Latent Class Analysis (LCA) will be performed, and the number of classes will be identified. LCA (used for categorical variables), similarly to Latent Profile Analysis (which is used for continuous variables), creates homogenous classes based on unobserved characteristics. The main difference of LCA with other ways to classify data, like for example cluster analysis, is that LCA is a "person-centred" approach, and it can capture the heterogeneity both within and between the different groups (Scotto Rossato and Baer, 2012). In practice, LCA identifies the latent subgroups based on individuals' responses in the variables of interest, and groups individuals together, resulting in homogeneous classes. These classes are independent of each other, and the researcher can decide what is the appropriate number of latent classes that are sufficient to explain the observed data (Oberski, 2016). However, since LCA is model based, there are ways to assess how well a LCA model represents the data. This, according to Nylund-Gibson and Choi (2018), is an advantage of this method, compared to variable-centred methods like cluster analysis.

In this research, the LCA is preferred, as one of the main goals is to assess whether individuals with similar sustainability awareness and sustainable habits have the same reaction when they are exposed to the normative messages. Thus, using LCA and creating

homogeneous classes, the hypothesis that individuals who are more interested in the environment and have many sustainable habits will be more affected by the use of normative messages can be tested.

Finally, since the dependent variable is ordinal, an ordered logistic regression will be run, to identify the effect each normative message and each class have on the interest to use Byewaste. The analysis is done using the statistical software Stata v.16.

Chapter 4. Results

The mean, standard deviation, and the frequencies (for categorical variables) can be seen in Table 1.

Table 1

Descriptive Statistics

		Frequency (Rel. f)	Mean	SD
1	Age	-	24.86	5.78
2	Gender	-	-	-
	Male	65 (35%)	-	-
	Female	120 (64%)	-	-
	Non-Binary	3 (1%)	-	-
3	Municipality	-	-	-
	Less than 25.000	17 (9%)	-	-
	Between 25.000 and 75.000	30 (17%)	-	-
	More than 75.000	133 (74%)	-	-
4	Children	-	.38	.24
5	Awareness	-	3.20	.30
6	Habits	-	3.50	.57
7	Interest	-	-	-
	Not or slightly interested	37 (20%)	-	-
	Moderately interested	50 (26%)	-	-
	Very or extremely interested	102 (54%)	-	-

In Table 2 the Pearson's correlations can be seen. The interest to use Byewaste has a positive and significant correlation with sustainability awareness and sustainable habits.

Table 2

Pearson's Correlation

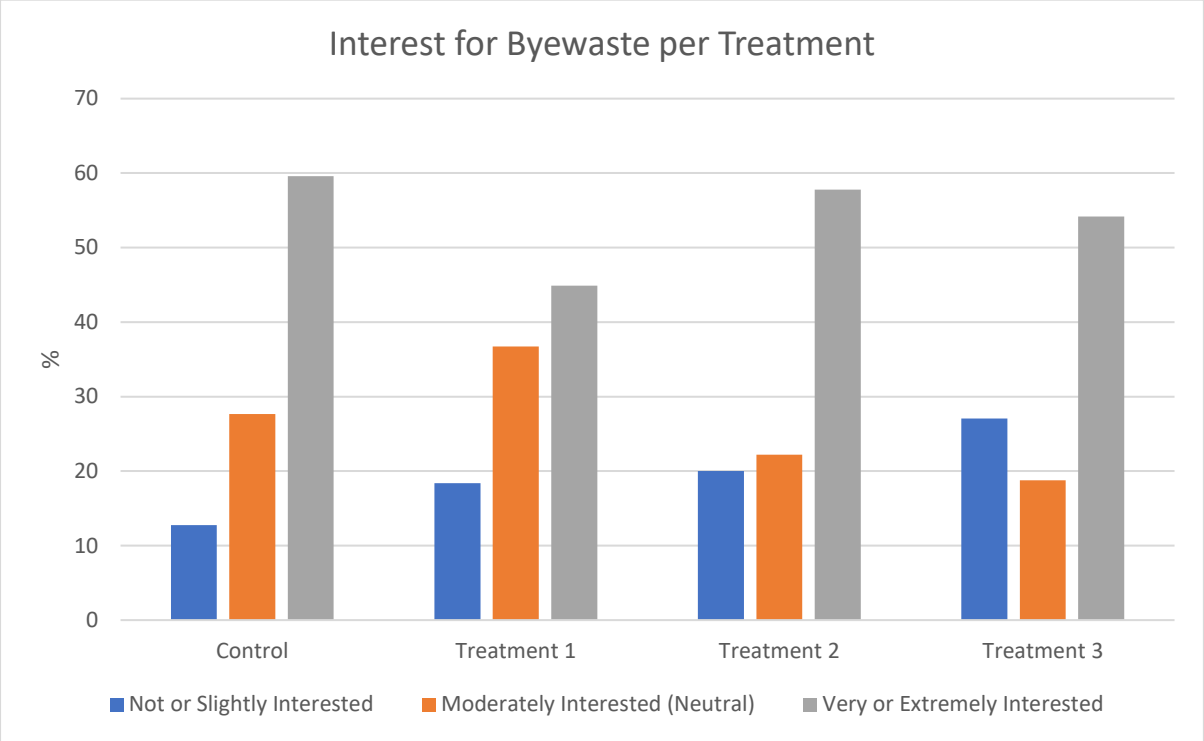
		Mean	SD	1	2	3	4	5
1	Age	24.86	5.78	-				
2	Children	.38	.24	.59**	-			
3	Awareness	3.20	.30	.001	-.02	(.86)		
4	Habits	3.50	.57	.05	-.08	.40**	(.82)	
5	Interest	3.52	1.14	-.03	-.012	.21**	.46**	-

Note. **p<0.01, 2-tailed. N=188. Cronbach's alpha for applicable scales is reported in parenthesis along the diagonal. Awareness, Habits and Interest (to use Byewaste) are measured in a 5-point scale.

The first hypothesis refers to whether the use of normative messages can lead to a higher willingness to use Byewaste. The percentage of individuals who are interested to use Byewaste can be seen in Figure 3. Almost 60% of those who were randomly assigned in the control group were either extremely or very interested in using Byewaste. The same percentage is 45 for treatment 1, 58 for treatment 2 and 54 for treatment 3. From this, it becomes clear that not only the use of normative messages did not have a positive effect on the willingness to use Byewaste, but it may even backfire. Nevertheless, the Kruskal-Wallis test shows that there is not a significant difference in the medians of these four groups (χ^2=0.72, p=0.87). Therefore, hypothesis 1 is not supported.

Figure 3

Willingness to use Byewaste



Based on previous research, it is expected that the LCA will provide 4 distinct classes based on the participants' sustainability awareness and sustainable habits. To identify the right number of classes, I tried various models, starting from 1 class up to 8 classes, and I estimated the Akaike information criterion (AIC) and the Bayesian information criterion (BIC). Using a different methodology, these criteria provide some insights on what the most appropriate model is. As it can be seen in Table 3, based on the AIC, the best model contains 7 classes, while based on BIC the best model contains 4 classes. According to Kuha (2004), the ideal scenario would be that these two criteria point towards the same model, but this is not usually the case in practice. When the two criteria point towards different models, then it is better that the researcher decides based on theory and previous studies (Kuha, 2004). In addition, with 7 classes and 4 experimental groups, several interactions would have just 1 or

2 participants, which would make the statistical analysis difficult. Therefore, based on previous research (Kantar and GFK, 2019) and the BIC, 4 classes are created. [1]

Table 3

Akaike information criterion (AIC) and Bayesian information criterion (BIC) for various models

Model	N	AIC	BIC
c1	194	11204	11348
c2	194	10392	10611
c3	194	10193	10487
c4	194	10116	10485
c5	194	10069	10513
c6	194	10066	10585
c7	194	9987	10582
c8	194	10003	10673

Figure 4 provides an analysis of the sustainability awareness and sustainable habits mean score for each class. Class 1 has the lowest score in both categories, and therefore it represents those who are not aware about environmental issues and do not have many sustainable habits. Individuals who fall into class 2 have a moderate awareness about environmental issues, but they have proportionally more sustainable habits compared to individuals in class 3. Thus, as Ariely (2013) puts it, it could be said that individuals in class

[1] Since the biggest improvement on AIC and BIC happens when we move from 1 to 2 classes, and the sample size is rather small, I also tried to create 2 classes (see appendix B). In the two classes option, there is a clear distinction among those who have high sustainability awareness and many sustainable habits, and those who do not. However, in my opinion the 4 classes are a better way to understand the different groups, and therefore I decided to go ahead with this solution.

2 do the right things for the wrong reasons. As mentioned before, individuals in class 3 do not report many sustainable habits, compared to class 2, but they report a higher awareness. In other words, despite being aware about environmental issues, they do not act to help the environment. This is in line with the value-action gap, which is well established in the scientific literature (Barr, 2006; Chung & Leung, 2007; Chaplin & Wyton, 2014). Finally, individuals who fall in class 4 have the highest scores in both categories, and they represent those who really care about the environment and do something about it. Figure 5 depicts the size of each class. Classes 1 to 3 have a similar size (16-22%), while class 4 is the largest one (42%).

Figure 4

Awareness and Habits score for each class

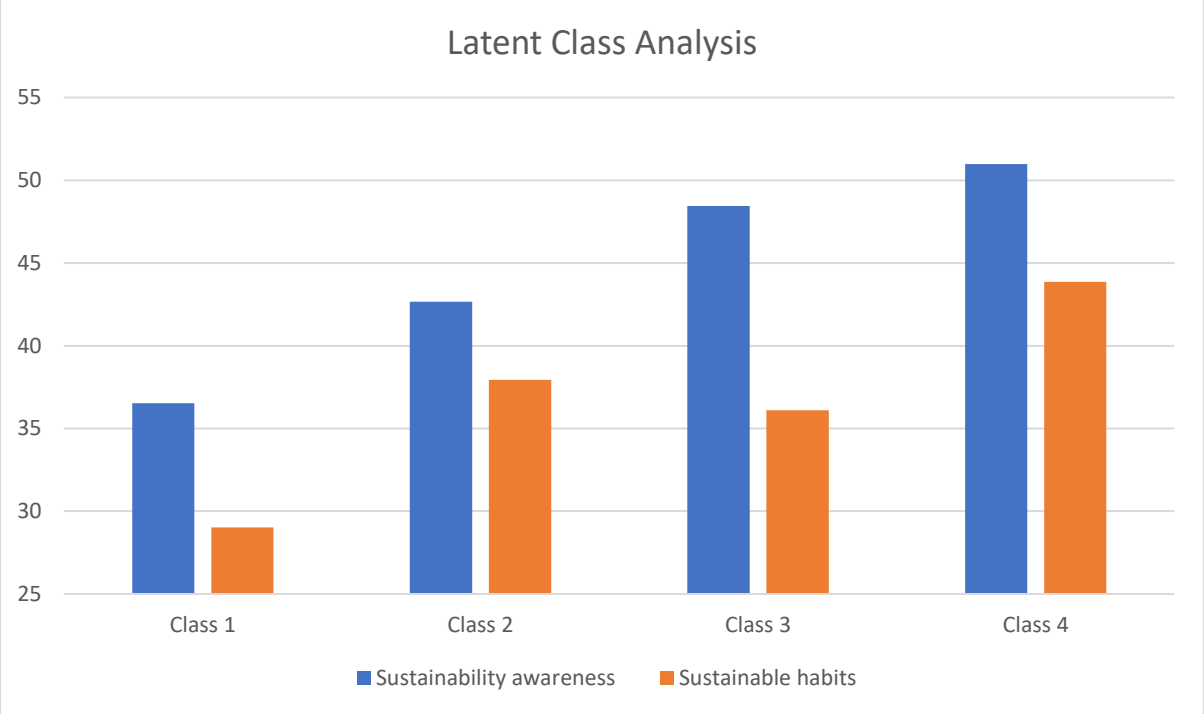
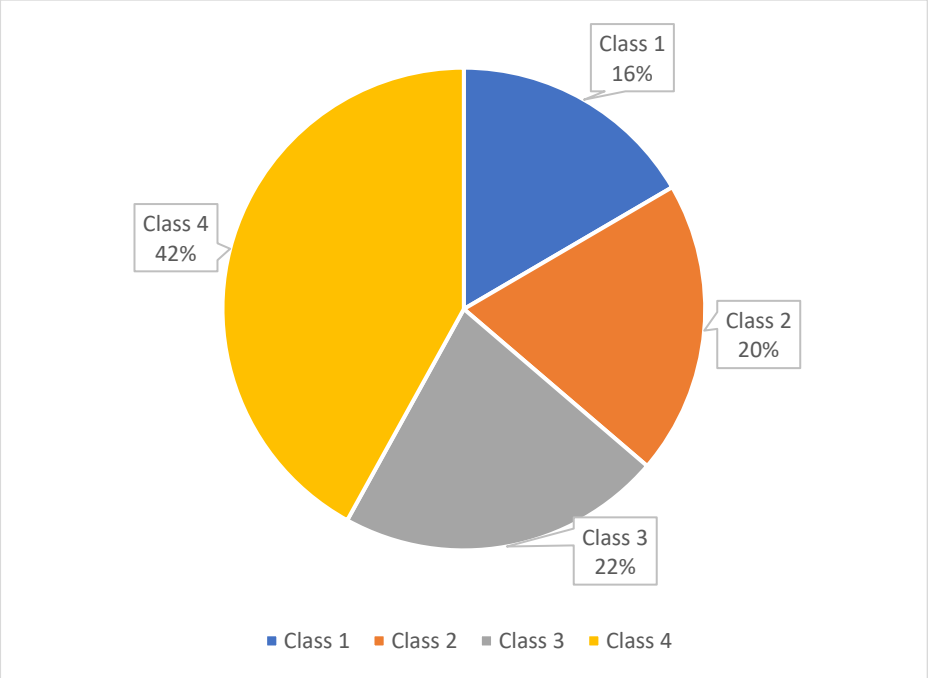


Figure 5

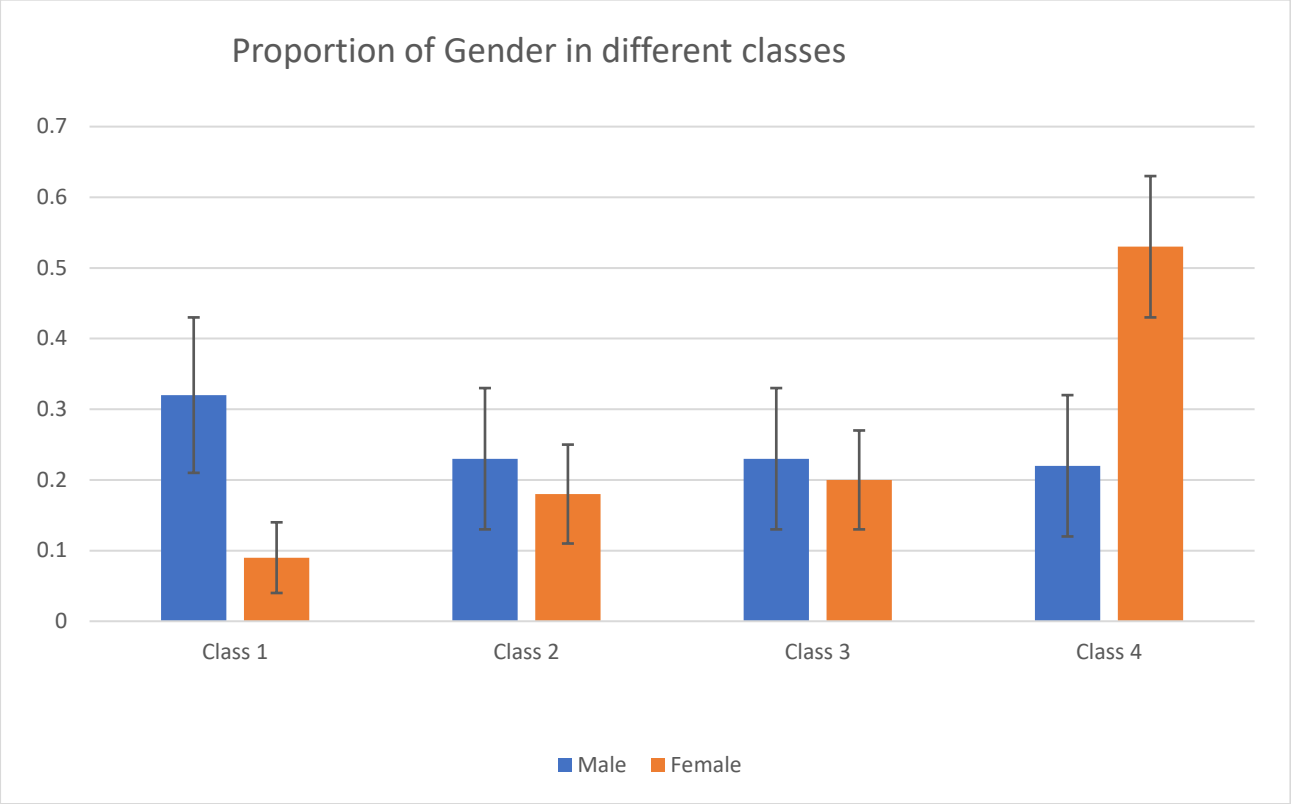
Size of each class



Moreover, Figure 6 shows that there is a significant interaction between the gender of participants and the class they fall into. More specifically, class 1 has more males than females, and class 4 has significantly more females than males. Gender is not significantly different in classes 2 and 3.

Figure 6

Proportion of Gender in Each Class



Based on hypothesis 2, it is expected that those who fall into class 4 will be more interested in using Byewaste. This is (partially) confirmed by Figure 7, as those who fall into class 4 reported a higher interest for Byewaste, compared to classes 1 and 3. However, the difference is not statistically significant between classes 2 and 4. Nevertheless, the ordered logistic regression (Table 4) shows that being in class 4, compared to being in class 1, is 30% more likely to be extremely interested in using Byewaste. Therefore, hypothesis 2 is supported, as individuals who are more "green" are more likely to express their interest for Byewaste.

Figure 7

Interest for Byewaste by class

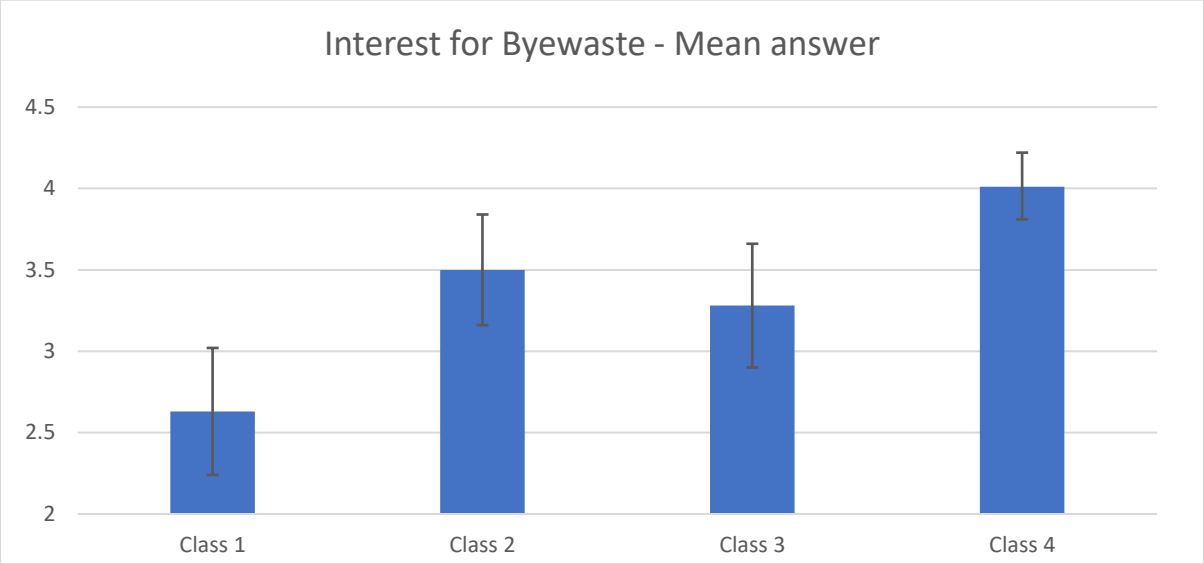


Table 4

Marginal effects of ordered logistic regression[2]

		Not interested	Slightly interested	Moderately interested	Very interested	Extremely interested
Group	Control			Base outcome		
	Treatment 1	.01	.02	.01	-.01	-.03
	Treatment 2	.01	.01	.01	-.01	-.02
	Treatment 3	.001	.004	.003	-.002	-.01
Gender	Male			Base outcome		
	Female	-.01	-.02	-.01	.01	.03
	Non-binary	-.05*	-.13**	-.18**	-.05	.41*

[2] The regression output can be seen in Appendix C

Class	Class 1	Base outcome				
	Class 2	-.09*	-.18**	-.02	.17**	.12*
	Class 3	-.09	-.15*	.01*	.14*	.09*
	Class 4	-.12*	-.26**	-.14**	.21**	.30**
	Age	.001	.002	.001	-.001	-.003

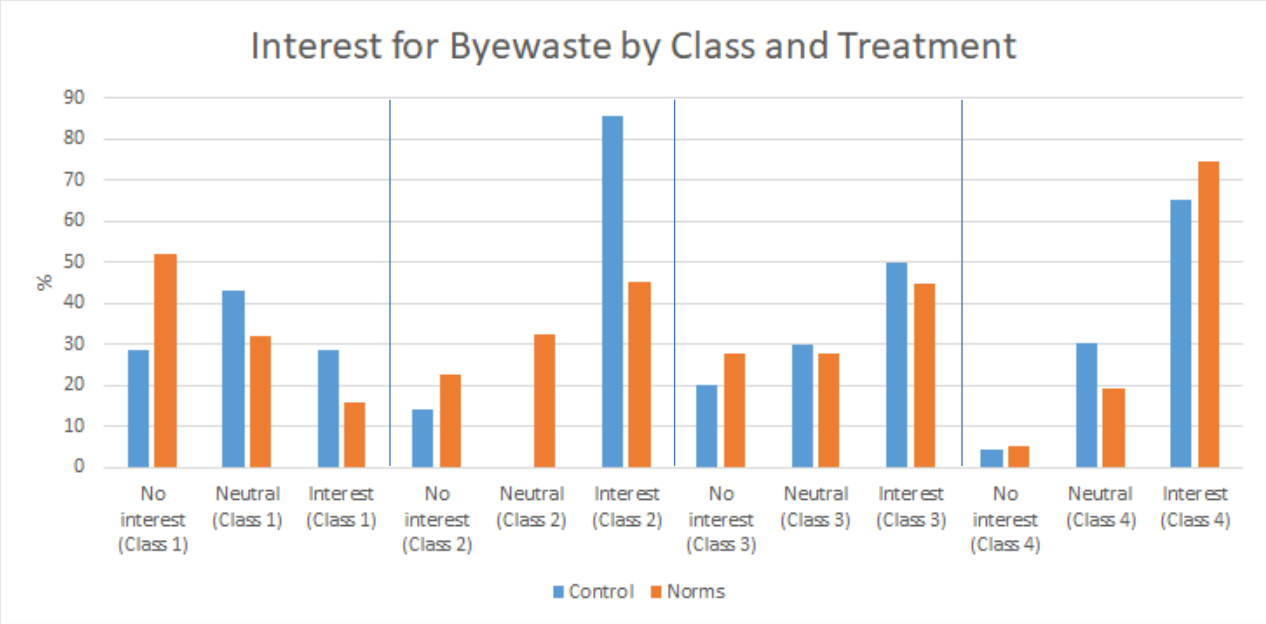
Note. Robust standard errors are used.

** p<0.01, * p<0.05

Figure 8 shows the interest for Byewaste for each class. For simplicity, the three treatments have been merged into one, and therefore it is easier to identify the difference between those who received normative messages and those who were assigned to the control group. In class 1, 52% of those who received a normative message were not interested in using Byewaste, while the same percentage for the control group was 28.6%. Moreover, 45.2% of those who received the normative message in class 2 said they are interested in using Byewaste, while the same percentage in the control group is 85.7%. The interest for Byewaste for classes 3 and 4 is similar between the control and the treatment groups. This indicates that for classes 1 and 2 the use of descriptive norms has boomerang effects, while for classes 3 and 4 it did not have an effect. Nevertheless, due to the small number of participants (in the control group there were just 7 subjects in class 1), the Kruskal Wallis test did not provide statistically significant results. In any case, hypothesis 3 is not supported.

Figure 8

Interest for Byewaste by class and treatment



Chapter 5. Discussion

The primary goal of this study was to assess whether normative messages can increase the use of the Byewaste app, while the secondary goal was to divide users into classes and identify those who are more interested in using Byewaste. The results show that the use of normative messages did not have a positive effect in promoting Byewaste. On the contrary, there are indications that the use of normative messages may even backfire. Additionally, participants were divided into four distinct classes, based on their sustainability awareness and sustainable habits, and the classes with a higher interest for Byewaste were identified.

The results of the current study support the notion that the use of weak descriptive norms may not have the desired effects. Like in the study of Demarque et al. (2015), weak descriptive norms did not promote the desired behaviour. Furthermore, the use of descriptive norms did not have an effect for those who care about the environment (class 4), which contradicts the expectations based on previous research. More specifically, Demarque et al. (2015) suggested that weak descriptive norms had a positive effect for the more "green" individuals, while Ozaki and Nakayachi (2020) assert that normative messages have a stronger effect if individuals have a positive belief about the described behaviour (in this case sustainability). Nevertheless, this is not supported in the current study. Especially for classes 1 and 2, the results indicate that descriptive norms may have boomerang effects, like in the study of Richter er al. (2018). Since individuals in these two classes do not have a high score in sustainability awareness, they may focus on what the majority does (not using Byewaste), and therefore justifying their lack of interest by following the majority.

Irrespective of the normative messages, 4 distinct classes were identified, as in the report of Kantar and GFK (2019). These 4 classes are in line with the literature that supports the value action gap (Barr, 2006; Chung & Leung, 2007; Chaplin & Wyton, 2014). Moreover,

when the interaction between the gender of participants and the classes they fall into was analysed, it became clear that females care more about the environment compared to males, which is also supported by previous research (Dietz et al., 2002) and is, in some cases, attributed to the fact that males characterise sustainability as something feminine (Brough et al., 2016).

Based on what was expected, individuals who fall into class 4 are more interested to use Byewaste, compared to individuals who do not care about the environment (class 1) and those who exhibit the value-action gap (class 3). However, it is interesting that the interest of individuals in class 4 was not statistically different of the interest of individuals who do the right things for the wrong reasons (class 2).

5.1 Implications for Byewaste and future research

The results of this study have important implications for Byewaste. Firstly, Byewaste should not use weak descriptive norms when communicating with new users, as the normative messages did not have a positive effect on the interest to use the Byewaste app, and it is plausible that they can even have boomerang effects for classes 1 and 2. Even though the interest of class 1 is quite low, with or without the use of normative messages, individuals in class 2 report a genuine interest to use Byewaste. Therefore, communicating normative messages to class 2 can lead to undesired outcomes.

Secondly, the division of participants in classes provides interesting insights for Byewaste. It should be clear by now that Byewaste should focus its efforts to individuals of classes 2 and 4. Based on their answers about their habits, these individuals are more likely to join actions in favour of the environment, such as cleaning of beaches and planning new trees, they usually buy items from second-hand shops, and they are part of online groups and pages regarding environmental protection. This is a way to identify those individuals who are more

likely to use Byewaste, and to act as ambassadors, promoting the use of Byewaste to their network.

Thirdly, not only individual's habits, but also their gender seems to be important, as females are more interested in environmental protection (Dietz et al., 2002) and they are the majority of class 4. Thus, Byewaste should primarily focus on acquiring female users, as it is going to be easier, and it will give the firm a boost on their user base.

Despite not producing the expected results in this study, the use of normative messages has promoted the desired behaviour in many previous studies (Nolan et al., 2008; Priebe & Spink, 2012; Blok et al., 2015; Schultz et al., 2015; Agerström et al., 2016). Thereby, Byewaste should experiment more with normative messages, but in a different context. For example, the firm can use normative messages to nudge its users to donate more items, by communicating the number of items other users have donated, or to guide new users to donate a required number of items. To be more specific, when a new user reads the instructions on how to use Byewaste, they can see a pop-up message saying that xx% (for example 70%) of users donate at least 3 items. The use of strong descriptive norms is preferable, as this is shown in the literature to have stronger results (Kormos et al., 2015; Richter er al., 2018).

Additionally, Byewaste could experiment using a combination of descriptive and injunctive norms, as the use of injunctive norms has shown to eliminate the harmful effects of descriptive norms (Schultz et al., 2007). This way, the use of weak descriptive norms may be enough to promote the desired behaviour, if the potential users feel that this behaviour is socially acceptable, and they are going to receive social rewards if they exhibit the behaviour.

5.2 Limitations

As every study, this one has several limitations. Firstly, the convenience sampling method was used, and therefore the sample is not random. Secondly, the sample of the study

has an average age of 24.9 years, while the average user of Byewaste is approximately 45 years old. This could lead to an inflated interest for Byewaste, as younger generations are paying growing attention to environmental issues (Gazzola, 2020). However, the gender of participants is representative of the users of Byewaste, as in this study approximately 64% of participants are females, and percentage is similar in the users of Byewaste.

Moreover, the online and hypothetical setting of the study, in combination with the lack of incentives for participants, may have an effect in the results, as participants may not put enough mental effort to answer all questions truthfully. This is also evident on the high percentage of participants who failed to pass the attention checking question. However, those participants were removed from the study.

Another potential limitation of this study is the social desirability bias. This is evident in online questionnaires, as participants answer in such a way, so their answers are close to the anticipated social norm (Sjöström and Holst, 2002; Mortel, 2008). Since sustainability has become quite important (Pristl et al., 2021) and it is prevalent everywhere, individuals may have reported a higher score in sustainability awareness and in their sustainable habits, in order to be closer to the anticipated norm. Nevertheless, the main objective of this study was to research the differences between individuals. If everyone suffers from the social desirability bias, this can have an effect on how many individuals fall into each class, but the differences between individuals remain the same.

Chapter 6. Conclusion

Descriptive norms have been used in various context in order to promote the desired behaviour. While in many studies normative messages had positive results, in other studies they either did not promote the desired behaviour, or they had the opposite results. This research aimed to find out whether descriptive norms can be used to promote the usage of a sustainable service, more specifically the Byewaste app. Based on the quantitative research, Byewaste should not use weak descriptive norms when communicating with potential users. On the other hand, Byewaste should focus on individuals who care about the environment and have many sustainable habits, as they are more likely to be interested to use the firm's app.

Additionally, the current study contributed to the academic literature, by researching the use of weak descriptive norms in a sustainable service, as well as its interaction with the participant's sustainability awareness and sustainable habits. The results did not confirm the expectations that descriptive norms would have a stronger effect on those who care more about the environment. This may be due to the fact that weak descriptive norms were used, and future research should focus on assessing both weak and strong descriptive norms messages.

References

Agerström, J., Carlsson, R., Nicklasson, L. & Guntell, L. (2016). Using descriptive social norms to increase charitable giving: The power of local norms. *Journal of Economic Psychology*, *52*, 147–153. https://doi.org/10.1016/j.joep.2015.12.007

Ariely, D.(2013, November 27). *Doing the right things for the wrong reasons* [Video]. YouTube. https://www.youtube.com/watch?v=XkfYDhZGAVE

Barr, S. (2006). Environmental action in the home: investigating the 'value-action'gap. *Geography*, *91*(1), 43-54.

Bicchieri, C., Fatas, E., Aldama, A., Casas, A., Deshpande, I., Lauro, M., ... & Wen, R. (2021). In science we (should) trust: Expectations and compliance across nine countries during the COVID-19 pandemic. *PloS one*, *16*(6), e0252892.

Blok, V., Wesselink, R., Studynka, O. & Kemp, R. (2015). Encouraging sustainability in the workplace: A survey on the pro-environmental behaviour of university employees. *Journal of Cleaner Production*, *106*, 55–67. https://doi.org/10.1016/j.jclepro.2014.07.063

Brough, A. R., Wilkie, J. E., Ma, J., Isaac, M. S., & Gal, D. (2016). Is eco-friendly unmanly? The green-feminine stereotype and its effect on sustainable consumption. *Journal of Consumer Research*, *43*(4), 567-582.

Chaplin, G., & Wyton, P. (2014). Student engagement with sustainability: Understanding the value–action gap. *International Journal of Sustainability in Higher Education*.

Charness, G., Samek, A., & van de Ven, J. (2021). What is considered deception in experimental economics?. *Experimental Economics*, 1-28.

Chung, S. S., & Leung, M. M. Y. (2007). The value-action gap in waste recycling: The case of undergraduates in Hong Kong. *Environmental Management*, *40*(4), 603-612.

Cialdini, R. B., Kallgren, C. A., & Reno, R. R. (1991). A focus theory of normative conduct: A theoretical refinement and reevaluation of the role of norms in human behavior. In Advances in experimental social psychology (Vol. 24, pp. 201-234). Academic Press.

Cooper, D. J. (2014). A note on deception in economic experiments. *Journal of Wine Economics*, *9*(2), 111-114.

Demarque, C., Charalambides, L., Hilton, D. J. & Waroquier, L. (2015). Nudging sustainable consumption: The use of descriptive norms to promote a minority behavior in a realistic online shopping environment. *Journal of Environmental* Psychology, 43, 166–174. https://doi.org/10.1016/j.jenvp.2015.06.008

Dietz, T., Kalof, L., & Stern, P. C. (2002). Gender, values, and environmentalism. *Social science quarterly*, *83*(1), 353-364.

Gatersleben, B., Steg, L., & Vlek, C. (2002). Measurement and determinants of environmentally significant consumer behavior. *Environment and behavior*, *34*(3), 335-362.

Gazzola, P., Pavione, E., Pezzetti, R., & Grechi, D. (2020). Trends in the fashion industry. The perception of sustainability and circular economy: A gender/generation quantitative approach. *Sustainability*, *12*(7), 2809.

Hartman, R. (2021). *Did 4% of Americans Really Drink Bleach Last Year?*. Harvard Business Review. Retrieved 26 June 2021, from https://hbr.org/2021/04/did-4-of-americans-really-drink-bleach-last-year.

Higgins, E. T. (1997). Beyond pleasure and pain. *American psychologist*, *52*(12), 1280.

Jaeger, C. M., & Schultz, P. W. (2017). Coupling social norms and commitments: Testing the underdetected nature of social influence. Journal of Environmental Psychology, 51, 199-208.

Jamison, J., Karlan, D., & Schechter, L. (2008). To deceive or not to deceive: The effect of deception on behavior in future laboratory experiments. *Journal of Economic Behavior & Organization*, *68*(3-4), 477-488.

Kantar, GFK. (2019, September). Who cares, who does? https://bioplasticsnews.com/wp-content/uploads/2019/09/Kantar-Who-Cares-Who-Does-Sept2019.pdf

Köbis, N. C., Van Prooijen, J. W., Righetti, F. & Van Lange, P. A. M. (2015). "Who doesn't?" - The impact of descriptive norms on corruption. *PLoS ONE*, *10*(6), 1–14. https://doi.org/10.1371/journal.pone.0131830

Kormos, C., Gifford, R. & Brown, E. (2015). The Influence of Descriptive Social Norm Information on Sustainable Transportation Behavior: A Field Experiment. *Environment and Behavior*, *47*(5), 479–501. https://doi.org/10.1177/0013916513520416

Krosnick, J. A., & Alwin, D. F. (1987). An evaluation of a cognitive theory of response-order effects in survey measurement. *Public opinion quarterly*, *51*(2), 201-219.

Kuha, J. (2004). AIC and BIC: Comparisons of assumptions and performance. *Sociological methods & research*, *33*(2), 188-229.

McCrum-Gardner, E. (2008). Which is the correct statistical test to use?. *British Journal of Oral and Maxillofacial Surgery*, *46*(1), 38-41.

McDaniel, T., & Starmer, C. (1998). Experimental economics and deception: A comment. *Journal of Economic Psychology*, *19*(3), 403-409.

McFarland, S. G. (1981). Effects of question order on survey responses. *Public Opinion Quarterly*, *45*(2), 208-215.

Melnyk, V., van Herpen, E., Fischer, A. R. H. & van Trijp, H. C. M. (2013). Regulatory fit effects for injunctive versus descriptive social norms: Evidence from the promotion of sustainable products. *Marketing Letters, 24*(2), 191–203. https://doi.org/10.1007/s11002-013-9234-5

Van de Mortel, T. F. (2008). Faking it: social desirability response bias in self-report research. *Australian Journal of Advanced Nursing, The*, *25*(4), 40-48.

Nolan, J. M., Schultz, P. W., Cialdini, R. B., Goldstein, N. J. & Griskevicius, V. (2008). Normative social influence is underdetected. *Personality and Social Psychology Bulletin*, *34*(7), 913–923. https://doi.org/10.1177/0146167208316691

Nylund-Gibson, K., & Choi, A. Y. (2018). Ten frequently asked questions about latent class analysis. *Translational Issues in Psychological Science*, *4*(4), 440.

Oberski, D. (2016). Mixture models: Latent profile and latent class analysis. In *Modern statistical methods for HCI* (pp. 275-287). Springer, Cham.

Ozaki, T., & Nakayachi, K. (2020). When descriptive norms backfire: Attitudes induce undesirable consequences during disaster preparation. Analyses of Social Issues and Public Policy, 20(1), 90-117.

Petzel, T. P., Johnson, J. E., & McKillip, J. (1973). Response bias in drug surveys. *Journal of Consulting and Clinical Psychology*, *40*(3), 437.

Priebe, C. S. & Spink, K. S. (2012). Using Messages Promoting Descriptive Norms to Increase Physical Activity. *Health Communication*, *27*(3), 284–291. https://doi.org/10.1080/10410236.2011.585448

Pristl, A. C., Kilian, S., & Mann, A. (2021). When does a social norm catch the worm? Disentangling social normative influences on sustainable consumption behaviour. *Journal of Consumer Behaviour*, *20*(3), 635-654.

Reno, R. R., Cialdini, R. B. & Kallgren, C. A. (1993). The transsituational influence of social norms. *Journal of Personality and Social Psychology*, *64*(1), 104–112. https://doi.org/10.1037//0022-3514.64.1.104

Richter, I., Thøgersen, J. & Klöckner, C. A. (2018). A social norms intervention going wrong: Boomerang effects from descriptive norms information. *Sustainability (Switzerland)*, 10(8). https://doi.org/10.3390/su10082848

Rimal, R. N., Lapinski, M. K., Cook, R. J., & Real, K. (2005). Moving toward a theory of normative influences: How perceived benefits and similarity moderate the impact of descriptive norms on behaviors. *Journal of health communication*, *10*(5), 433-450.

Scotto Rosato, N., & Baer, J. C. (2012). Latent class analysis: A method for capturing heterogeneity. *Social Work Research*, *36*(1), 61-69.

Schultz, P. W., Nolan, J. M., Cialdini, R. B., Goldstein, N. J., & Griskevicius, V. (2007). The constructive, destructive, and reconstructive power of social norms. Psychological science, 18(5), 429-434.

Schultz, P. W., Estrada, M., Schmitt, J., Sokoloski, R., & Silva-Send, N. (2015). Using in-home displays to provide smart meter feedback about household electricity consumption: A randomized control trial comparing kilowatts, cost, and social norms. Energy, 90, 351-358.

Sjöström, O., & Holst, D. (2002). Validity of a questionnaire survey: response patterns in different subgroups and the effect of social desirability. *Acta Odontologica Scandinavica*, *60*(3), 136-140.

Smith, J. R., Louis, W. R., Terry, D. J., Greenaway, K. H., Clarke, M. R. & Cheng, X. (2012). Congruent or conflicted? The impact of injunctive and descriptive norms on environmental intentions. *Journal of Environmental Psychology*, *32*(4), 353–361. https://doi.org/10.1016/j.jenvp.2012.06.001

Steg, L. (1999). Verspilde energie?[Wasted energy?](SCP Report No. 126). *The Hague, the Netherlands: Social and Cultural Planning Office of the Netherlands*.

Strack, F. (1992). "Order effects" in survey research: Activation and information functions of preceding questio

Wilson, R. K., & Isaac, R. M. (2007). Political economy and experiments. *The political economist: Newsletter of the section on political economy*, *14*, 1-7.

Yamin, P., Fei, M., Lahlou, S., & Levy, S. (2019). Using social norms to change behavior and increase sustainability in the real world: A systematic review of the literature. *Sustainability*, 11(20), 5847.

Appendix A

Questionnaire

Standard: Introduction (1 Question)

BlockRandomizer: 3 -

Standard: Demographics (10 Questions)
Block: Awareness questions (1 Question)
Standard: Habits questions (1 Question)

BlockRandomizer: 1 - Evenly Present Elements

Branch: New Branch
If
If This survey is intended for people living in the Netherlands and it takes approximately 5 minutes... Is Displayed

Standard: Control (4 Questions)

EndSurvey: Advanced

Branch: New Branch
If
If This survey is intended for people living in the Netherlands and it takes approximately 5 minutes... Is Displayed

Standard: Treatment 1 (4 Questions)

EndSurvey: Advanced

Branch: New Branch
If
If This survey is intended for people living in the Netherlands and it takes approximately 5 minutes... Is Displayed

Standard: Treatment 2 (4 Questions)

EndSurvey: Advanced

Branch: New Branch
If
If This survey is intended for people living in the Netherlands and it takes approximately 5 minutes... Is Displayed

Standard: Treatment 3 (4 Questions)

EndSurvey: Advanced

Page Break

Start of Block: Introduction

Q0 This survey is intended for people living in the Netherlands and it takes approximately 5 minutes. You can choose whether you want to take it in English or in Dutch. There are no correct answers, so please answer truthfully. Thank you for your participation.

End of Block: Introduction

Start of Block: Demographics

Q1 What gender do you identify as?

- Male (1)
- Female (2)
- Non-binary / third gender (3)
- Prefer not to say (4)

Q2 What is your age?

_____

Q3 What is your marital status?

- Married or domestic partnership (1)
- Widowed (2)
- Divorced (3)
- Separated (4)
- Single, never married (5)
- Prefer not to say (6)

Q4 What is the highest degree or level of education you have completed?

- No formal education completed (1)
- Some High School (2)
- High School (3)
- Bachelor's Degree (4)
- Master's Degree or higher (5)
- Prefer not to say (6)

Q5 Please describe your living situation.

- I live alone (1)
- I live with roommates (2)
- I live with my husband/wife/partner (3)
- I live with my parents (4)
- Prefer not to say (5)

Q6 Are you currently...?

- ○ Employed full time (14)
- ○ Employed part time (15)
- ○ Unemployed looking for work (16)
- ○ Unemployed not looking for work (17)
- ○ Retired (18)
- ○ Student (19)
- ○ Disabled (20)
- ○ Prefer not to say (21)

Q7 What is your annual household income

- ○ Less than €10,000 (9)
- ○ €10,000 - €29.999 (10)
- ○ €30,000 - €59,999 (12)
- ○ €60,000 - €89,999 (15)
- ○ €90,000 - €149,999 (18)
- ○ More than €150,000 (20)
- ○ Prefer not to say (21)

Q9 Do you have children?

- None (1)
- Yes, 1 (2)
- Yes, 2 (3)
- Yes, 3 or more (4)
- Prefer not to say (5)

Q10 What is the population of your municipality (approximately)?

- Less than 25.000 (1)
- Between 25.000 and 75.000 (2)
- More than 75.000 (3)
- Prefer not to say (4)

End of Block: Demographics

Start of Block: Awareness questions

Q11 Please indicate whether you agree/disagree with the following statements.	Strongly disagree (1)	Somewhat disagree (2)	Neither agree nor disagree (3)	Somewhat agree (4)	Strongly agree (5)
Environmental pollution affects my health. (1)	○	○	○	○	○
Environmental problems have consequences for my life. (2)	○	○	○	○	○
I worry about environmental problems. (3)	○	○	○	○	○
I can see with my own eyes that environment is deteriorating. (4)	○	○	○	○	○
Environmental problems are a risk for the future of my children. (5)	○	○	○	○	○
Environmental problems are exaggerated. (6)	○	○	○	○	○
Too much attention is paid to environmental problems. (7)	○	○	○	○	○

The attention given to the greenhouse effect is exaggerated. (8)	○	○	○	○	○
Saving threatened species is unnecessary luxury. (9)	○	○	○	○	○
Please validate your continued participation by selecting strongly disagree. (10)	○	○	○	○	○
A better environment starts with me. (11)	○	○	○	○	○
People who do not take the environment into account try to escape their responsibility. (12)	○	○	○	○	○

End of Block: Awareness questions

Start of Block: Habits questions

Q12 Please select the answer that best fits each statement.	Never (1)	Rarely (2)	Sometimes (3)	Often (4)	Always (5)
I try to reuse things that can be useful for me or for others (furniture, packaging, sports equipment, books, etc.). (1)	○	○	○	○	○
I separate garbage by type (glass, plastics, paper, organic or other). (2)	○	○	○	○	○
I try to save water at home (by showering instead of bathing, faucets economizers, keep the tap not running while brush teeth, etc.). (3)	○	○	○	○	○
I usually buy used items (clothing, books, sports equipment, etc.). (4)	○	○	○	○	○
I buy products labelled as organic. (5)	○	○	○	○	○

I prefer products with recyclable or reusable packaging. (6)	○	○	○	○	○
I usually bring my own bag when I go shopping. (7)	○	○	○	○	○
I try to respect the environment when I visit places of environmental interest (hiking, mountain biking, desert, parks, etc.). (8)	○	○	○	○	○
I try to avoid printing documents to save paper. (9)	○	○	○	○	○
I join actions in favor of the environment in public places (cleaning of beaches, planting trees, etc.). (10)	○	○	○	○	○
I usually read blogs and participate in social networks or pages related to environmental protection. (11)	○	○	○	○	○

End of Block: Habits questions

Start of Block: Control

Q13 **Suppose you receive the following letter in your home. Please read this carefully.**

Q15 Dear resident,

Do you have books and (small) electronics that you no longer use? Or toys and textiles? Then, Byewaste is the solution for you.

You don't have to leave the house, queue at the recycling center, or take it to a store! **On May 30, 2021 between 5 pm and 7 pm, Byewaste will pick it up at your front door for free,** and you will get rid of your unused or broken items, which will get a second life.

Are you in? Download the free Byewaste app and register your free collection service.

We turn it into gems! How does it work?
Your offered books, toys, or textiles are, if still in good condition, reused through thrift store **Het Goed**. Your discarded (small) electrical appliances are recycled and are therefore raw materials for new goods. **And that is good for the environment!**

Start now! Het Goed offers a 10% discount coupon if the Byewaste service is used

---

Q18 Timing

First Click (1)
Last Click (2)
Page Submit (3)
Click Count (4)

Page Break

Q17 Please indicate your interest in the following question.

	Not interested at all (29)	Slightly interested (30)	Moderately interested (31)	Very interested (32)	Extremely interested (33)
Are you interested in using the service Byewaste offers? (9)	○	○	○	○	○

End of Block: Control

Start of Block: Treatment 1

Q19 **Suppose you receive the following letter in your home. Please read this carefully.**

Q21 Dear resident,

Do you have books and (small) electronics that you no longer use? Or toys and textiles? Then, Byewaste is the solution for you.

You don't have to leave the house, queue at the recycling center, or take it to a store! **On May 30, 2021 between 5 pm and 7 pm, Byewaste will pick it up at your front door for free,** and you will get rid of your unused or broken items, which will get a second life.

20% of your those who received this letter download and use the Byewaste app.

Are you in? Download the free Byewaste app and register your free collection service.

We turn it into gems! How does it work?

Your offered books, toys, or textiles are, if still in good condition, reused through thrift store **Het Goed.** Your discarded (small) electrical appliances are recycled and are therefore raw materials for new goods. **And that is good for the environment!**

Start now! Het Goed offers a 10% discount coupon if the Byewaste service is used

Q23 Timing

First Click (1)
Last Click (2)
Page Submit (3)
Click Count (4)

Page Break

Q24 Please indicate your interest in the following question.

	Not interested at all (29)	Slightly interested (30)	Moderately interested (31)	Very interested (32)	Extremely interested (33)
Are you interested in using the service Byewaste offers? (9)	○	○	○	○	○

End of Block: Treatment 1

Start of Block: Treatment 2

Q25 **Suppose you receive the following letter in your home. Please read this carefully.**

Q27 Dear resident,

Do you have books and (small) electronics that you no longer use? Or toys and textiles? Then, Byewaste is the solution for you.

You don't have to leave the house, queue at the recycling center, or take it to a store! **On May 30, 2021 between 5 pm and 7 pm, Byewaste will pick it up at your front door for free,** and you will get rid of your unused or broken items, which will get a second life.

We just recently started, and already 20% of those who received this letter have downloaded and used the Byewaste app.

Are you in? Download the free Byewaste app and register your free collection service.

We turn it into gems! How does it work?

Your offered books, toys, or textiles are, if still in good condition, reused through thrift store **Het Goed.** Your discarded (small) electrical appliances are recycled and are therefore raw materials for new goods. **And that is good for the environment!**

Start now! Het Goed offers a 10% discount coupon if the Byewaste service is used

Q30 Timing

First Click (1)
Last Click (2)
Page Submit (3)
Click Count (4)

Page Break

Q29 Please indicate your interest in the following question.

	Not interested at all (29)	Slightly interested (30)	Moderately interested (31)	Very interested (32)	Extremely interested (33)
Are you interested in using the service Byewaste offers? (9)	○	○	○	○	○

End of Block: Treatment 2

Start of Block: Treatment 3

Q31 **Suppose you receive the following letter in your home. Please read this carefully.**

Q33 Dear resident,

Do you have books and (small) electronics that you no longer use? Or toys and textiles? Then, Byewaste is the solution for you.

You don’t have to leave the house, queue at the recycling center, or take it to a store! **On May 30, 2021 between 5 pm and 7 pm, Byewaste will pick it up at your front door for free,** and you will get rid of your unused or broken items, which will get a second life.

We just recently started, and already 20% of your neighbours have downloaded and used the Byewaste app.

Are you in? Download the free Byewaste app and register your free collection service.

We turn it into gems! How does it work?
Your offered books, toys, or textiles are, if still in good condition, reused through thrift store **Het Goed.** Your discarded (small) electrical appliances are recycled and are therefore raw materials for new goods. **And that is good for the environment!**

Start now! Het Goed offers a 10% discount coupon if the Byewaste service is used

---

Q36 Timing

First Click (1)
Last Click (2)
Page Submit (3)
Click Count (4)

Page Break

Q35 Please indicate your interest in the following question.

	Not interested at all (29)	Slightly interested (30)	Moderately interested (31)	Very interested (32)	Extremely interested (33)
Are you interested in using the service Byewaste offers? (9)	○	○	○	○	○

End of Block: Treatment 3

Appendix B

LCA with 2 Classes

Figure B1

Sustainability awareness and Sustainable habits score per Class

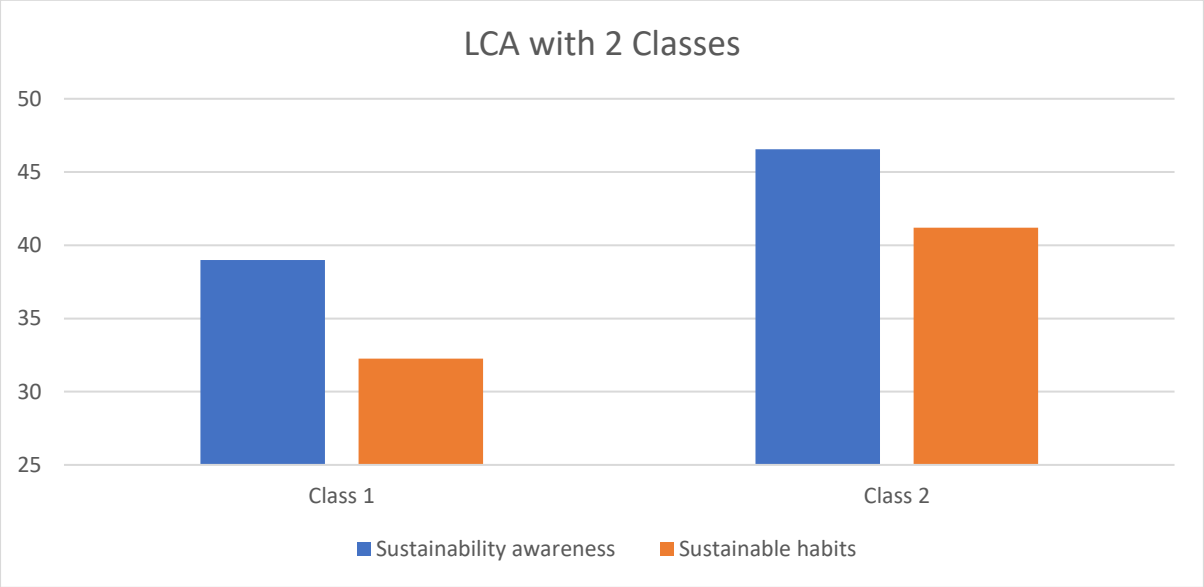


Figure B2

The distribution of Gender in the 2 Classes

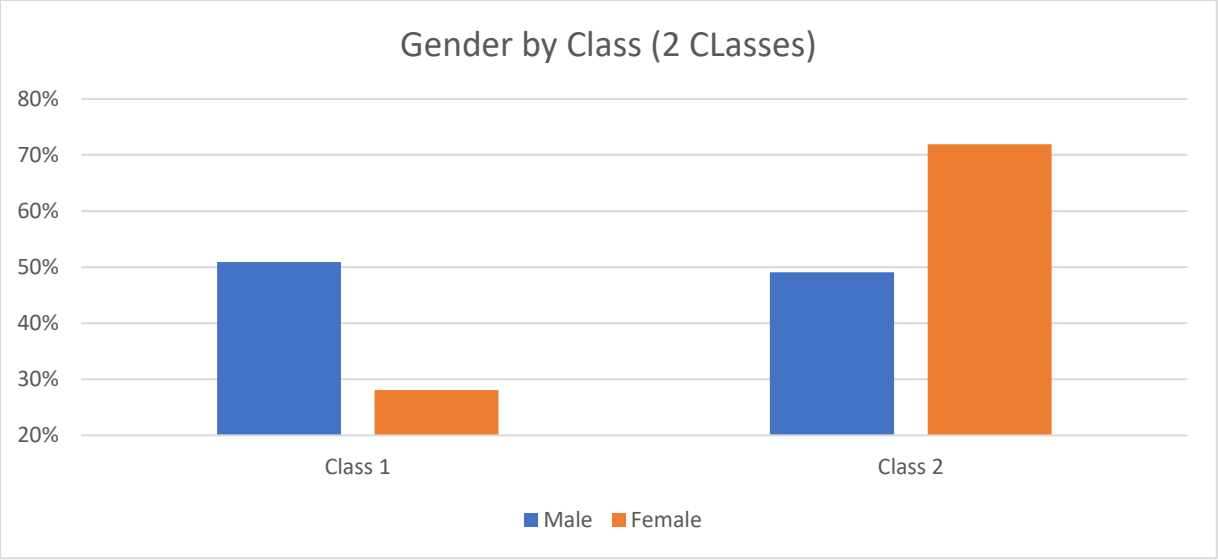


Figure B3

The size of each Class

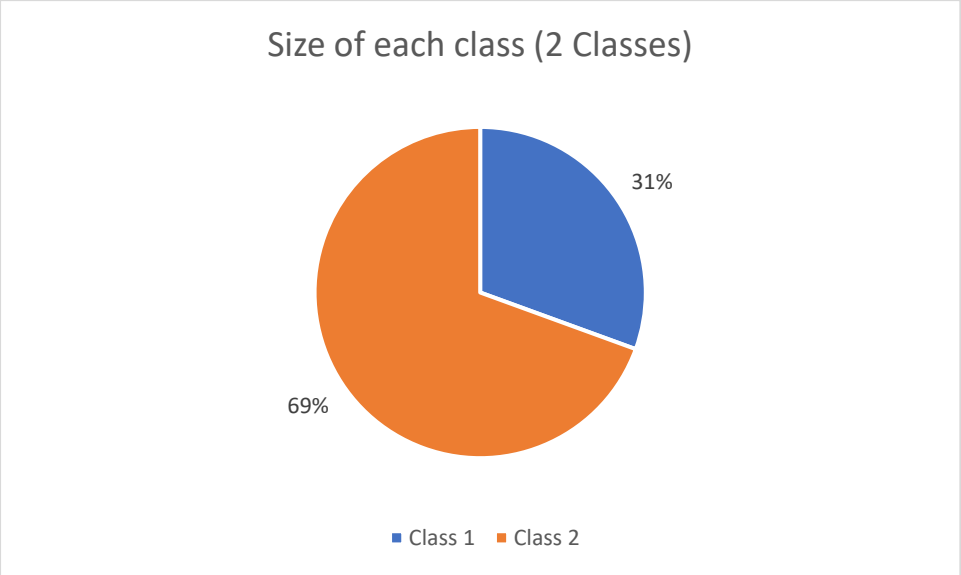
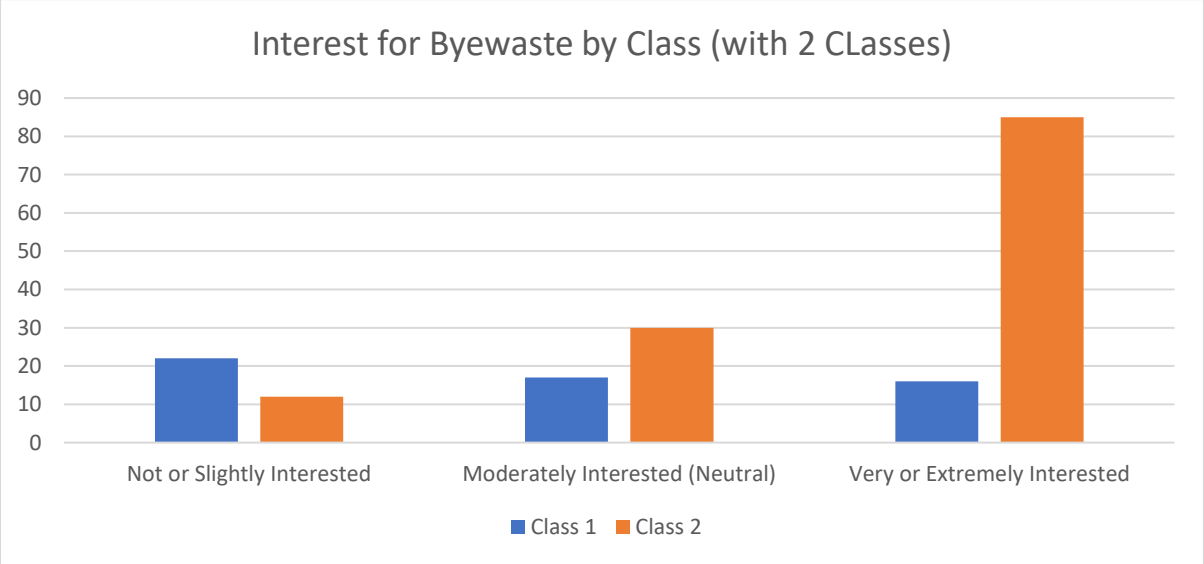


Figure B4

Interest to use the Byewaste app for each Class



Appendix C

Logistic regression Output

		Coef.	Robust Std. Error	z	P>|z|	[95% Conf. Interval]	
Group	Control			Base outcome			
	Treatment 1	-.17	0.40	-.45	0.66	-.96	0.60
	Treatment 2	-.15	0.37	-.39	0.70	-.88	0.59
	Treatment 3	-.04	0.41	-.10	0.92	-.84	0.76
Gender	Male			Base outcome			
	Female	0.18	0.30	0.58	0.56	-.42	0.77
	Non-binary	2.07	0.80	2.59	0.01	0.51	3.62
Class	Class 1			Base outcome			
	Class 2	1.35	4.55	2.96	0.003	0.46	2.24
	Class 3	1.11	4.78	2.33	0.002	0.18	2.05
	Class 4	2.34	4.34	5.40	0.00	1.49	3.19
	Age	-.02	0.20	-.70	0.49	-.06	0.30
	Cut 1	-2.26	0.87			-3.96	-.56
	Cut 2	-.55	0.77			-2.08	0.97
	Cut 3	0.97	0.78			-.56	2.50
	Cut 4	2.57	0.79			1.00	4.13