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MASTER THESIS

# PREDICTING PRO-ENVIRONMENTAL BEHAVIOR

Analyzing variables related to plastic waste separation behavior of young people



(Picture: Haagsallerlei, 2009)

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## **PREFACE**

This thesis was written as part of the master program Sustainable Development, track Environmental Governance. During this program I gained a lot of new knowledge and it showed me theories and perspectives that were completely new to me. However, one part that I think is very important for sustainable development and environmental governance, but only was addressed implicitly in this master program, is the understanding of human behavior. Therefore, I wanted to give this a larger role within my master and therefore I choose it as a subject for this thesis.

The five months I worked on this thesis were both challenging and exciting. I want to express my gratitude to my supervisor Frank van Laerhoven for his valuable advice and support. I am pleased to present my final master thesis, which I believe presents significant results and insights. I hope reading this report will be both informative and enjoyable.

## ABSTRACT

Changes in human behavior towards pro-environmental actions and choices are needed to protect the environment. Various approaches that aim to steer behavior exist, including for example policies that provide cost-benefit related incentives or policies in which information is provided. However, to understand the effectiveness of these different types of policies, it has to be understood which factors determine whether people will have the intention to perform pro-environmental behaviors.

One example that shows the importance of behavior for the success of a policy measure is the separation of plastic waste. In the Netherlands recycling plastic waste is relatively new in comparison to other materials and increasingly encouraged. However, the success of increasing plastic waste recycling still highly depends on the behavior of the public. Also particularly important is the understanding of behavior of young people. This generation faces current and future environmental issues, but is less engaged in pro-environmental behaviors than older age groups. Therefore, the aim of this research is to identify the *factors that predict pro-environmental behavior regarding separating plastic waste among young Dutch citizens*.

Potential important factors are derived from the theory of planned behavior (TPB) as described by Ajzen (1985). This theory states that the intention to act is the most important predictor of behavior, which in turn is preceded by attitudes towards the behavior, subjective norms and perceived behavioral control. Moreover, the role of knowledge concerning the behavior and costs required to perform the behavior are studied as well. Also interaction effects with attitudes and these concepts are taken into account.

The strategy of this study is survey research, in which data from 269 university students is obtained through a new developed questionnaire. The data is analyzed with multiple regression analyses. The results of this study show that attitudes, subjective norms, perceived behavioral control and costs are significant predictors of intention ( $p < .01$ ) and that these factors explain  $R^2 = .54$  of the variation in intention scores. The intention to separate plastic waste predicted the actual behavior ( $\beta = .90$ ,  $t(267) = 32.82$ ,  $p < .000$ ). Knowledge scores and interactions were not significant. It can be concluded that the theory of planned behavior can be validated and complemented by taking the role of costs into account. The results imply that campaigns based on solely raising knowledge might not be effective, although awareness raising campaigns which focus on aspects that do predict behavior, i.e. the concepts of the TPB, might be. Reducing costs required to perform the behavior is also likely to be effective in order to stimulate pro-environmental behavior.

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# 1. INTRODUCTION

## 1.1 UNDERSTANDING PRO-ENVIRONMENTAL BEHAVIOR

There is a growing body of scientific evidence that we are living in an unsustainable way by wasting, depleting and degrading the earth's natural capital at an accelerating rate. Potential renewable forests are shrinking and agricultural lands are deteriorating. Moreover, climate change caused by greenhouse gases in the atmosphere poses serious risks to planet and people. Glaciers are melting, sea levels are rising and floods, droughts and severe weathers are increasing (Miller & Spoolman, 2012). Many of these sustainability problems are rooted in human behavior (Bamberg, 2003).

Human behavior is influencing sustainable development in multiple ways. Firstly, technical innovations and efficiency gains tend to be overtaken by consumption growth (Midden, Kaiser & McCalley, 2007). Since 1820, the population increased almost six fold to nearly seven billion people (de Vries, 2013). Also economic activity is growing: average income has risen thirteen fold since 1820, providing people with more goods (de Vries, 2013; Miller & Spoolman, 2012). As the human population grows, even more people are seeking to satisfy their needs and wants by using more recourses (Miller & Spoolman, 2012). It is estimated that humans are now consuming about fifty percent more natural resources than thirty years ago (VanDeveer, 2014). Households contribute to greenhouse gas emissions through everyday behaviors related to energy, such as electricity use, transport use and consumption (Borgstede, Andersson & Johnsson, 2013). In the 2005 Millennium Ecosystem Assessment, released by the UN, it is stated that *'human activity is putting such a strain on the natural functions of Earth that the ability of the planet's ecosystems to sustain future generations can no longer be taken for granted'* (Millennium Ecosystem Assessment Board, 2005, p. 5). Secondly, not only are human activities and consumption overtaking green innovations, behavior of people also determines whether these innovations are accepted and understood, and applied, bought or used (Steg & Vlek, 2009). Citizens can also support or dismiss policies concerning environmental issues and decide whether or not to behave according to the measures (Dill, Mohr & Ma, 2014; Tobler, Visschers & Siegrist, 2012). Lastly, with changes in certain behaviors, sustainable solutions may be less dependent on expensive technological applications. For these reasons, changes in human behavior towards pro-environmental actions or choices are needed to protect the environment.

There are various ways in which the behavior of citizens can be steered towards more environmental friendly practices. Examples are raising taxes of goods or services that harm the environment or encouraging 'green' practices by providing subsidies. However, policy makers are becoming increasingly reluctant to use these economic measures to steer the citizen's environmental friendly behavior. Economic measures have the disadvantages of the possibility of losing public support (e.g. when increasing taxes) or high costs (e.g. when providing subsidies). Therefore, the interest in policy measures that edit choices through cost effective and socially acceptable approaches is increasing (Whitmarsh & O'Neill, 2010). An example of such an approach is the provision of information about various pro-environmental behaviors or the effects of these behaviors. So, a distinction can be made in environmental policy between on the one hand a market-based approach based on reducing the costs or augmenting the benefits associated with environmental friendly behavior and on the other hand approaches with a focus on the provision of information and knowledge raising to achieve a change in the public's behavior without incentives. However, to understand the effectiveness of these

different types of policies, it has to be understood which factors determine whether people will have the intention to perform a certain behavior. Although behaviors and behavior change are studied for centuries in a variety of contexts, it is still not fully understood which factors are most important. Conscientious research is needed to understand behavior change in the context of pro-environmental behavior and to examine what types of environmental policies are effective.

## **1.2 SEPARATING PLASTIC WASTE AS EXAMPLE**

One example that shows the importance of behavior for the success of a policy measure for sustainable development is the recycling of plastic waste. Plastic is nowadays the most commonly used material, as it is very useful due to its durability, light weight and low costs. However, it is also a very problematic material as millions of tons of plastic debris break into micro plastics and form the so called 'plastic soup' in the oceans. Moreover, a lot of energy and processed raw materials are used to construct new plastic. In the EU countries, still nearly 50% of plastic waste is landfilled (European Commission, 2016). Recycling plastic waste can contribute as a sustainable solution for these plastic problems. When plastic waste is separated, it can be used to create new plastic and thus less raw materials and fossil fuels are needed. Also, less plastic has to be burned and less plastics will end up in nature (Plastic Heroes, n.d.).

In the Netherlands, separating plastic waste is relatively new in comparison to the recycling of other materials and increasingly encouraged by governmental bodies. A campaign to stimulate plastic waste recycling was released in the Netherlands in 2008. In this campaign, called 'plastic heroes', information and statements are given about the environmental benefits of plastic recycling, with the use of a website, billboards and commercials. However, the success of this campaign and policy depends on the actual waste separation behavior of the public. Thus, plastic waste separation can contribute as an interesting example in which behavior has to be understood and changed towards pro-environmental practices.

## **1.3 PRO-ENVIRONMENTAL BEHAVIOR OF YOUNG PEOPLE**

Understanding behavior is particularly important when it regards pro-environmental behavior of young people (below 25 year of age). Although the lives of young people can be severely affected by current and future potential environmental issues, research shows that younger people are less concerned about the environment and are less likely to engage in pro-environmental behavior than older age groups (Partridge, 2008; Fielding & Head, 2012; Gronhoj & Thogersen, 2009). Multiple studies show that older people recycle their waste better than young people (Jongeneelen, 2013). The combination of the notion that the young generation 'is the future' and the lack of concern and actions in this age group makes it an important target group for policy measures. Therefore, to contribute to the understanding of the conditions of behavior change in this age group, this cohort should be studied. Besides that, an additional benefit of focusing on a particular age group is that potential confounding effects from the external variable *age* are controlled for.

#### **1.4 RESEARCH OBJECTIVE AND QUESTION**

The aim of this research is to provide knowledge that can contribute to the understanding of pro-environmental behavior. Within this study, the focus is especially on the case of plastic waste separation and on young people. The intention is to design a thoughtful research that is theoretical relevant in answering undecided questions regarding predicting pro-environmental behavior and behavior change. It is aimed for that in the end the results of this study can be used to formulate specific recommendations for policy makers in order to enhance pro-environmental behaviors. So, although this research is mainly theory-oriented, the results of this research are also used to meet social relevance. As emphasized before, a society wide behavior change towards pro-environmental behavior is necessary in order to achieve sustainable development. The research objective that is formulated in this thesis is the following: *'To test which factors predict plastic waste separation behavior of young people in the Netherlands, by testing a set of hypotheses based on previous literature regarding pro-environmental behavior'*.

To achieve this objective, a research question is formulated that will guide this study. The research question that is formulated is: *'Which factors predict pro-environmental behavior regarding separating plastic waste among young Dutch citizens?'*

Factors that are potentially important in predicting pro-environmental behavior are selected from previous literature, as stated in the research objective. Variables are selected about which based on previous literature it can be expected that these factors play a role in predicting pro-environmental behavior. However, also variables about which previous literature is not consistent or convincing are taken into account.

#### **1.5 OUTLINE OF THE THESIS**

After this introduction, this thesis proceeds as follows. Firstly, relevant theories and literature about behavior and behavior change are provided in the next chapter. Also some limitations of these studies and the contribution of this current research are put forward. This theory chapter ends with a conceptual model and hypotheses based on the theory and literature. Thereafter, in chapter 3, the methods of this research are explained. This includes the description of the strategy and sample, the development of the questionnaire and operationalization, and the method of analysis. In chapter 4 the results of the study are provided. In the last chapter, the answer to the research question is given and the results are translated into theoretical and policy implications and recommendations. Also some limitations of this research are put forward in this last section.

## 2. THEORY AND LITERATURE

### 2.1 THE THEORY OF PLANNED BEHAVIOR

Various theories that aim to predict or explain behavior exist. One of the most well-known among these are the theories to predict deliberative behavior developed by Icek Ajzen. According to the theory of reasoned action, the intention to act is the strongest predictor of actual behavior. These intentions are in turn determined by attitudes and perceptions of social pressure (Ajzen & Fishbein, 1980). Thereafter, Ajzen developed this theory further which lead to the *theory of planned behavior* (TPB, depicted in figure 1). In short, this theory states that the most proximal predictors of behavior are behavioral intentions, which are anteceded by *attitudes* (evaluations) towards the behavior, *subjective norms* (views of others) regarding the behavior and *perceived behavioral control* (perceived difficulty to perform the behavior) (Ajzen, 1985; 1991). Thus, according to the theory of planned behavior, the idea is that in order to steer behavior, these three antecedes should be influenced.

The theory of planned behavior seems appropriate for this research because this theory helps to explain or predict behavior and previous research has shown that it can also be used to study pro-environmental behaviors. Although it is developed some decades ago, the theoretical basis seems still relevant. However, because behavior and behavior change are still not completely understood, more research to contribute to this theory is necessary. First, a more extensive description of the TPB is provided. Thereafter, some previous studies that focused on the TPB are put forward.

The theory of planned behavior states that the best predictor of deliberative behavior is the individual's intention to perform this behavior (Ajzen, 1985; 1991). It is assumed that intentions capture the motivational factors that influence a behavior and indicate how hard people are willing to try in order to perform the behavior. Naturally the intention can only find expression in the behavior when the behavior is under 'volitional control', so if the person can decide whether or not to perform the behavior (Ajzen, 1991).

The intention is preceded by three determinants: attitudes toward the behavior, subjective norms and perceived behavioral control. Firstly, *attitudes toward the behavior* regard the degree to which a person has a favorable or unfavorable evaluation or appraisal of the behavior in question (Ajzen, 1991). The attitude toward the behavior is determined by the evaluation of the outcomes associated with the behavior and by the strength of these associations (Ajzen, 1985). Only specific attitudes toward the behavior in question can be expected to predict that behavior (Ajzen, 1991). Secondly, *subjective norms* regard the beliefs about how other people view the behavior in question (Ajzen, 1991; Aronson, Wilson & Akert, 2010). It refers to the perceived social pressure to perform or not to perform the behavior (Ajzen, 1991). So, it regards the person's belief about how the people he/she cares about view the behavior in question (Aronson et al., 2010). Thirdly, *perceived behavioral control* is the extent to which the individual perceives the behavior in question to be under his or her personal control. It also relates to the belief that his or her behavior will successfully promote desired goals. (Ajzen, 1991; Oreg & Gerro, 2006). It refers to the perceived ease or difficulty of performing the behavior and it is assumed to reflect past experience as well as anticipated impediments and obstacles (Ajzen, 1991). According to the theory of planned behavior, the intentions of people are influenced by the ease with which they believe they can perform the behavior. Thus, if people think it is easy to perform a certain



behavior, they are more likely to form the intention to do so than when they believe the behavior is difficult (Ajzen, 1991). Perceived behavioral control is together with intention also believed to be a direct predictor of behavioral achievement (Ajzen, 1991).

The more favorable the attitude and subjective norm regarding the behavior and the greater the perceived behavioral control, the stronger the intention to perform the behavior. However, besides this general rule, the relative importance of attitudes, norms and perceived control in the prediction of intention is expected to vary across situations and behaviors (Ajzen, 1991).

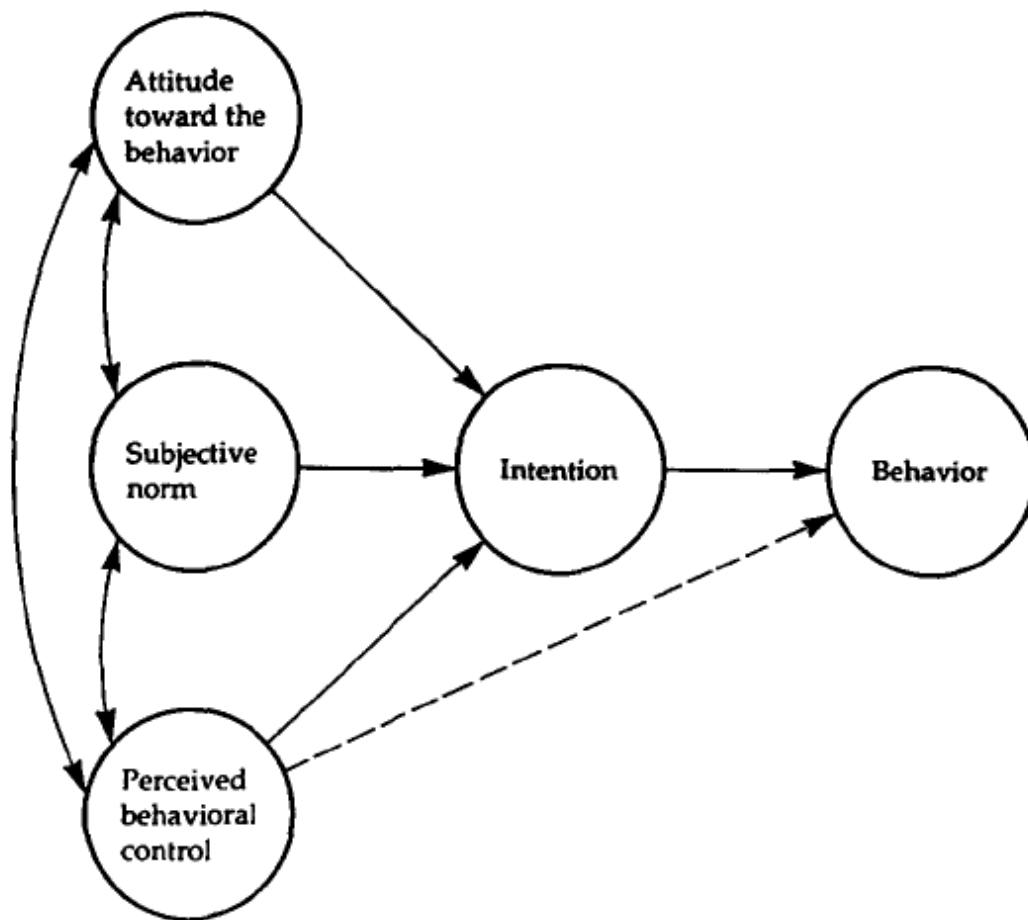


Figure 1. The theory of planned behavior (Ajzen, 1985; 1991)

This theory about behavior change poses interesting options for encouraging pro-environmental behaviors. Various articles already studied the link between norms, attitudes, behavioral control, and pro-environmental behavior. For example, Whitmarsh & O'Neill (2010) found that the variables included in the TPB were predictors for carbon offsetting intention. In a study of Poortinga, Steg & Vlek (2004) attitudinal variables explained a significant but modest amount of variance in various types of home- and transport energy saving measures. Also Oreg & Gerro (2006) concluded that their findings

provide validation for the theories, in that behavioral intentions mediate the role between environmental concern and perceived behavioral control, and behavior (being recycling, refraining from driving and environmental citizenship). In another study, the subjective norm and attitudes toward the behavior predicted the intention to recycle Compact Fluorescent Lamps (Treumann & Holland, 2013). Moreover, the three constructs of the theory of planned behavior were found to account for 46-61 percent of variance in intention scores regarding pro-environmental behaviors in a workplace setting (Greaves, Zibarras, & Stride 2013). Sidique, Lupi & Joshi (2010) concluded that social norms were a significant driver towards drop-off recycling, but found that attitudes about the environmental effects of recycling were not significantly related. In contrast, another study found that attitudes and perceived behavior control were significant predictors of intention of purchase behavior for environmentally sustainable products, but subjective norm was not found to be significant related to this intention (Kumar, 2012). Lastly, Dill et al. (2014) also found partly support for the theory of planned behavior, in that attitudes and perceived behavioral control, but not social norms, predicted walking and bicycling behavior.

## **2.2 CONCEPTS COMPLEMENTING THE TPB**

Many of these studies (e.g. Whitmarsh & O'Neill, 2010, Poortinga et al., 2004; Oreg & Gerro, 2006), despite some significant results, touched upon the idea that only the three antecedents of the theory of planned behavior may be too limited in explaining and predicting pro-environmental behavior. Various authors concluded that other complementing variables are also important in explaining behavior change (e.g. Whitmarsh & O'Neill, 2010; Poortinga et al., 2004). In this thesis the role of two more concepts in predicting pro-environmental behavior is researched, being *knowledge* concerning the behavior and *costs* needed to perform the behavior. There are two main reasons for the selection of these two concepts. Firstly, although it can be expected that these variables play a role in predicting pro-environmental behavior, previous research is inconsistent or unconvincing. Secondly, these two concepts could have important policy implications, as these concepts suit the distinction between policies that provide cost-benefit related incentives on the one hand and those that provide information and aim to raise knowledge on the other.

### ***Knowledge***

The first variable that might play a role in predicting behavior is the amount of knowledge someone has. Knowledge in this research regards knowledge about the particular subject the behavior relates to. This consists of knowledge about the effects of the behavior as well as practical knowledge about how to perform the behavior.

Previous studies regarding the direct role of environmental knowledge in explaining environmental behavior are inconsistent. A review study (Gifford & Nilsson, 2014) found that various articles (e.g. Fielding & Head, 2012) reported environmental knowledge as an important indicator of environmental concern and behavior. Moreover, Andersson & von Borgstede (2010) found that knowledge was related to recycling behavior and Pagiaslis & Krontalis (2014) found a relationship between knowledge and the willingness to use and pay for biofuels. However, other authors, for example Ajzen, Joyce, Sheikh & Cote (2011) and Whitmarsh, Seyfang & O'Neill (2011), found that knowledge alone appears

to have no strong direct effect on behavioral change. A research on the impact on vehicle ownership and use found that knowledge explained some elements of vehicle use and ownership, but not all (Flamm, 2009). Due to these inconsistent results, it is tested again if knowledge explains pro-environmental behavior in this research.

Moreover, it might also be that knowledge plays a more indirect role. This is in line with the reasoning of Gatersleben et al. (2002), who found that there were variations between different behaviors in whether these could be predicted by attitude and they suggested that these differences could be explained by the amount of knowledge. Levine & Strube (2011) studied the role of knowledge and attitudes and concluded that knowledge could have a large role in steering pro-environmental behavior, but that its role is potentially complex. According to these authors, knowledge '*offers an important intervention pathway that is worthy of additional study*' (Levine & Strube, 2011, p. 322). In this thesis, it is expected that there is an interaction effect between knowledge and attitudes in predicting pro-environmental behavior. So, it is expected that attitudes mainly predict intention or behavior if knowledge is high as well. Also, on the other hand, in line with some of the previous literature, it can be argued that knowledge alone, without the presence of favorable attitudes toward the behavior, does not predict pro-environmental behavior as well.

### **Costs**

Another variable that is expected to play a role in predicting intention and behavior are *costs* required to perform the behavior. Costs in this research are understood in a broad sense, so this does not only include monetary costs, but also for example the amount of time and effort needed to successfully perform the behavior. It is expected that when the behavior requires less costs, it is more likely that a person intends to perform the behavior. This is also demonstrated in some previous studies. For example, Sidique et al. (2010) found that recycling convenience was a significant driver of drop-off recycling behavior. Also Best & Kneip (2011) concluded that recycling participation increased when the recycling scheme changed from a drop-off (more effort) to curbside collection system (less effort). However, another study found no effects of the convenience and costs of recycling on recycling behavior (Ramayah, Lee & Lim, 2012). Due to these inconsistent results, also in this study it is tested whether lower costs predict intention and pro-environmental behavior.

Moreover, the cost variable is also expected to influence the relation between attitudes and behavior and thus showing an interaction effect. There are two contrasting views regarding this influence. Firstly, the Low-Cost Hypothesis described by Diekmann & Preisendörfer (2003) states that environmental concerns or attitudes predict environmental behaviors primarily in situations where costs<sup>1</sup> are low and with little inconvenience for individual actors. The explanation for this is that in low cost situations it is easier to transform the attitudes into the corresponding behavior (Diekmann & Preisendörfer, 2003). The authors argue that the costs of a behavior are an important variable that helps to explain the differences in the correlations found between attitudes and behavior. Thus, the low-cost hypothesis assumes an interaction effect: the strength of attitude effects on behavior depends on the cost intensity of the situation. In a high-cost situation, only a small proportion of the actors will have attitudes strong enough to compensate for the costs. If the costs increase even more,

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<sup>1</sup> Diekmann & Preisendörfer also understand costs in the broader sense

this proportion could approach zero, meaning that the effect of the attitude on the behavior decreases even more as well (Diekmann & Preisendörfer, 2003). The authors argue that the low-cost hypothesis points to possible limits of attitude research in high-cost situations.

Diekmann & Preisendörfer (2003) tested the Low-Cost hypothesis in two test strategies. In the first study, sixteen behavior items were ranked according to their cost intensity. The ranking was based on the assumption that the frequency of a behavior indicates its average cost intensity. The effects of environmental concern on each behavior were plotted, resulting in a negative slope, which confirmed the low-cost hypothesis. In a second test strategy, specific behaviors were studied which differentiated actors in low-cost versus high-cost situations with respect to the activity. An example of such a behavior was the recycling of paper, which was more costly for some with a drop-off system in the neighborhood (median distance 300 meters) and less costly for others with a curbside system (distance 0 meters). Again, the results showed that the correlations between environmental concern and behavior were larger in the low-cost group. The authors conclude that the low-cost hypothesis is corroborated by the data and that it merits further investigation (Diekmann & Preisendörfer, 2003). Thus, following this theory it is expected that higher correlations are found between attitudes and behavior when the costs of the behavior are lower.

Secondly, however, the opposite could also be expected. It can be argued that when costs of the behavior are low, attitudes are not a good predictor of behavior, because in case of low costs almost anyone would perform the behavior regardless their attitude. Indeed, some previous studies found results contrary to the Low-Cost Hypothesis, in that the relation between pro-environmental concerns or attitudes and behavior were stronger in high-cost situations. For example, Andersson & Borgstede (2010) found that various variables related to recycling behavior were better predictors in a high-cost recycling situation, concluding that these results contradict the low-cost hypothesis. Other studies on recycling behavior (Best & Kneip, 2011) and on organic food purchasing behavior (Kriwy & Mecking, 2012) found no significant interaction effects at all. Because of these contrasting views about the role of costs or effort in the correlation between attitudes and behavior, these interactions are tested in this thesis as well.

### **2.3 LIMITATIONS IN THE LITERATURE**

Although the theory of planned behavior is already used in research to understand behavioral changes over more than two decades, the precise underlying mechanisms of behavior are still not fully understood and is still studied widely. Moreover, many of the previous studies mentioned in the introduction pose limitations. One of the most important limitations is that in many studies only general attitudes or concerns towards the environment are measured (e.g. Levine & Strube, 2011; Fielding & Head, 2012; Flamm, 2009; Oreg & Gerro, 2006), but the TPB states that only specific attitudes predict specific behavior, also known as the 'correspondence rule' (Ajzen, 1991; Ajzen, 2012). Although general attitudes could help explain a broad range of behaviors, they will account for only little variance in any behavior (Ajzen, 2012). This can result in weak direct relationships between general environmental attitudes or concerns and specific environmental behaviors (Bamberg, 2003). The same might be true for the distinction between general and specific knowledge (as also mentioned

by Ajzen et al., 2011). In this thesis, a specific case is chosen, namely the separation of plastic waste (see section 3.1), in which the concepts can be measured specific to this case.

Another limitation of some of the previous studies regards the operationalization and measurement of the variables, for example by using general questionnaires about the environment. In this research a new questionnaire is developed to evade these limitations. Also in particular the measurements of knowledge and costs pose limitations. Some previous studies measured knowledge by asking the participants to report their own knowledge (e.g. Andersson & von Borgstede, 2010; Pagiaslis & Krontalis, 2014), which is very subjective. Participants' own ideas about their amount of knowledge is likely to be inaccurate. Research shows that what people think they know and what they actually know often does not correspond (Park, Mothersbaugh & Feick, 1994) and that people often overestimate their knowledge (Alba & Hutchinson, 2000). Some other studies only measured general knowledge about the environment (e.g. Levine & Strube, 2011; Fielding & Head, 2012), instead of specific knowledge regarding the behavior in question. In this research, knowledge is measured objectively by a knowledge test consisting of true or false questions, and specific regard to the separation of plastic waste. The measurements of costs varies between the different studies, but often costs are measured in only one way in each study. In this research, different costs aspects associated with the separation of plastic waste are measured. Thereby, one of the types of recycling programs that is taken into account in this research, namely drop-off recycling, is despite the widely implementation relatively little analyzed in the literature (Sidique et al., 2010).

Thus, this study complements the already existing literature by addressing these limitations. By improving the measurements of in particular knowledge and costs, by developing a new questionnaire and by focusing on a specific behavior, this research can give answer to the numerous inconsistent results in the previous studies and the uncertainties regarding the prediction of behavior. The inclusion of the role that knowledge and costs play in the individual intention to separate plastic waste, and its interactions with attitudes, are expected to contribute to the scientific understanding of pro-environmental behavioral change. Understanding of the role of knowledge on the one hand and costs on the other can contribute to the demonstration of the usefulness of different types of policies as mentioned in the introduction of this thesis. The results of this study can provide evidence for decision making regarding whether providing information is useful, or if policy aimed at reducing costs would be more effective. Lastly, this study adds to the already existing literature the focus on the age group of 18-25 years, which is important as pro-environmental concern and behavior is limited in this age group while these young people 'are the future' of this world.

## **2.4 CONCEPTUAL MODEL AND HYPOTHESES**

The description of the TPB and the role of knowledge and costs resulted in the construction of a conceptual model (figure 3). Moreover, from this theory, concepts and the previous discussed literature, the following hypotheses specific to the case of separating plastic waste are formulated:

Hypothesis 1: A favorable evaluation (*attitude*) of the separation of plastic waste predicts the intention to separating plastic waste.

Hypothesis 2: Perceived views and pressures of others (*subjective norms*) to separate plastic waste predict the intention to separate plastic waste.

- Hypothesis 3: A higher degree of *perceived behavioral control* over separating plastic waste predicts the intention to separate plastic waste.
- Hypothesis 4: A higher degree of *knowledge* about separating plastic waste predicts the intention to separate plastic waste.
- Hypothesis 5: A higher degree of *knowledge* about separating plastic waste strengthens the predicting value of a favorable evaluation (*attitude*) on the intention to separate plastic waste.
- Hypothesis 6: Lower *costs* of separating plastic waste predict the intention to separate plastic waste.
- Hypothesis 7(1): Lower *costs* of separating plastic waste strengthens the predicting value of a favorable evaluation (*attitude*) on the intention to separate plastic waste.
- Hypothesis 7(2): Higher *costs* of separating plastic waste strengthens the predicting value of a favorable evaluation (*attitude*) on the intention to separate plastic waste.
- Hypothesis 8: The intention to separate plastic waste predicts the actual behavior of separating plastic waste.

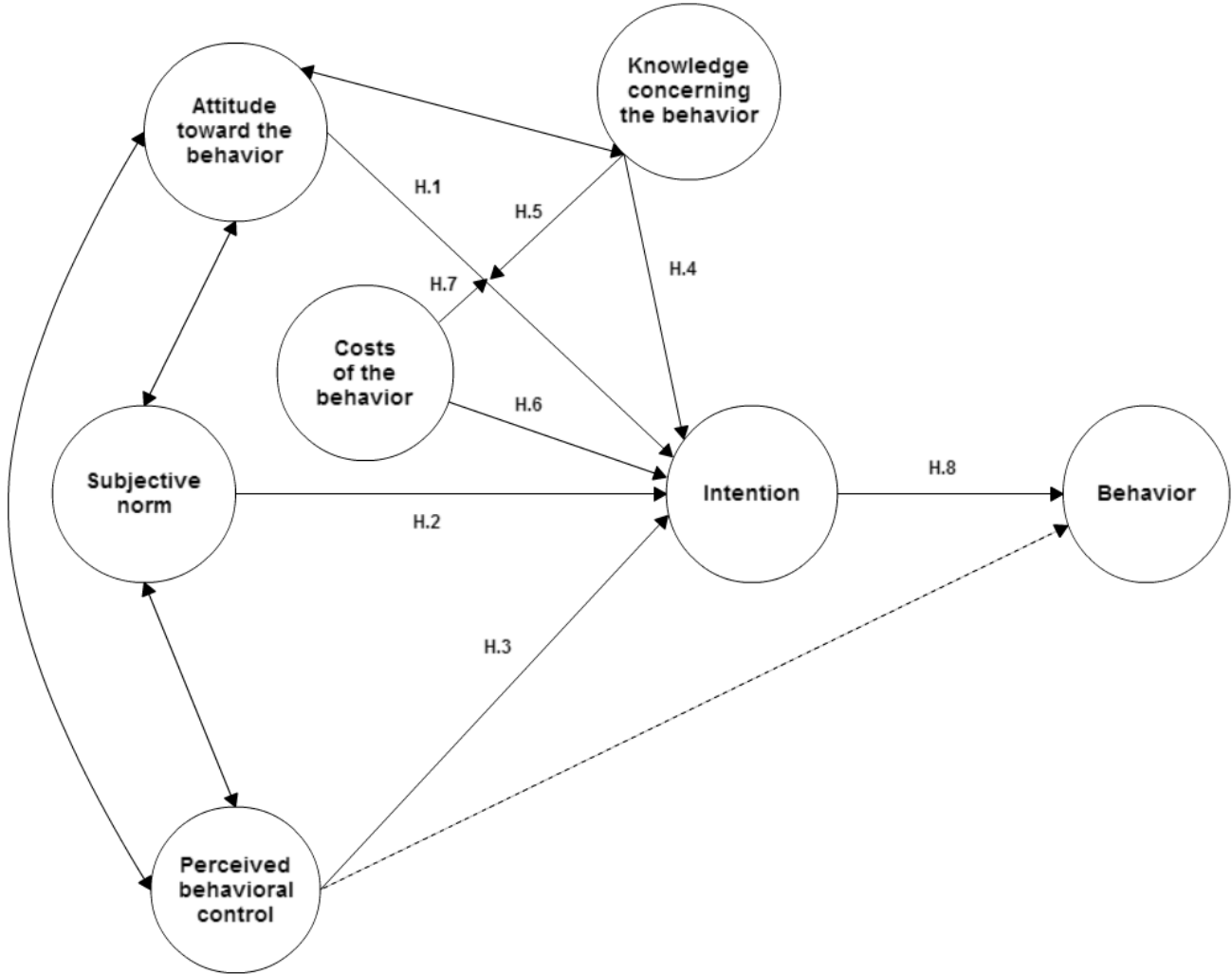


Figure 2. Conceptual model: expanded theory of planned behavior

## **3. METHODS**

### **3.1. RESEARCH STRATEGY**

The strategy that is used for this study is survey research. A survey is characterized by a large number of research units, a random sample, extensive data generation and quantitative data and data-analysis (Verschuren & Doorewaard, 2010). The large scale approach of this research and the random sample selection enables generalizability of the results. The formulation of the research questions calls for a generalized valid statement, for which quantitative survey is most suitable. Because a large sample size is needed, the data collection has to take place in a structured way, so in this research questionnaires with closed questions were used. This questionnaire is developed for this research specifically. By analyzing the quantitative data obtained from the questionnaires, the variables which significantly predict behavior can be identified. Also interaction effects can be tested in this way.

### **3.2 PLASTIC WASTE CASE**

Following the theory of planned behavior, it is more useful to predict a specific behavior with specific variables than predicting general behaviors with broad formulated variables (Ajzen, 1991; 1985; Ajzen & Cote, 2011) and therefore a specific behavior was selected. As explained in the introduction, for this research the case of plastic waste separation is chosen. In most municipalities, the responsibility of the actual waste separation lies upon the public. Separating plastic waste it is relatively new in the Netherlands compared to other materials and increasingly encouraged.

As mentioned before, the campaign 'Plastic Heroes' is released in the Netherlands, in which for example information is provided about the environmental benefits of plastic waste separation to stimulate recycling. Recently a new website was created, with the goal to make this information about plastic recycling even more accessible (Nedvang, 2015a). Also for example folders are sent to provide information about separating plastic (see e.g. Geldof, 2016). It can be assumed that by providing information, the intention is to increase people's knowledge regarding how to separate plastic waste and about the positive effects of waste separation. Therefore it is useful that in this research it is tested whether knowledge does predict the intention to perform this behavior in this case.

Moreover, although in some municipalities plastic waste is separated from the other types of waste in special recycling plants, in most municipalities the citizens have to separate their plastic waste from the other types of waste themselves. Within this system, in particular two waste recycling programs are mainly implemented in the Netherlands: a curbside recycling and drop-off recycling system. In curbside recycling, households are provided with a container or special bags that can be used for plastic waste and this plastic waste is collected every (other) week. In a drop-off recycling program, containers are placed at designated sites in central areas and people have to bring their plastic waste to these containers. Drop-off recycling is less costly in terms of money compared to curbside programs (Sidique, Lupi & Joshi, 2010), but they require more effort from citizens. These behavioral costs in the drop-off situation also differ between people as the containers are unevenly divided in the cities and some people may pass these containers daily or weekly as other may not. Also in the curbside program some

differences in cost can be found, for example people with smaller gardens might not have enough space for a separate plastic waste container. Thus, this case is also very appropriate and useful to measure the role of costs. For these reasons, plastic waste separation can contribute as an interesting case to test these behavioral change theories and concepts in the context of pro-environmental behavior in this research.

### **3.3 PARTICIPANTS**

The amount of participants for this research is 269. Before collecting data, it was decided that a minimum of 100 participants was needed. A first way of calculating the sample size that is needed is by using the equation  $50+8k$ , in which  $k$  is the number of predictors. In this research, there are 5 predictors, thus,  $50+8*5 = 90$  participants are needed. Another calculation is  $104+k$ , resulting in a sample size of 109 (Field, 2009). However, an even larger sample size makes it more likely that significant correlations are found and that the sample represents the population. The amount of 269 participants in this research matches a confidence level of 95% and a margin of error of 5.86 (Survey System, 2012).

The developed questionnaire is provided to a sample consisting of young Dutch citizens. As explained in the introduction, the focus on young people in predicting pro-environmental behavior is important. The average age of the sample for this research was 20.23 years old ( $SD=2.21$ ), with ages ranging from 16 to 25 years. The range of this age group is selected, because it is believed that most of these young people are becoming more independent and explore their identity, but have not reached the adulthood in all its aspects yet (Arnett, 2000). From the age of 26 the majority of people feel that they have reached full adulthood, before this age most people are still in the adolescence or emerging adulthood phase (Arnett & Hughes, 2012). Therefore, the maximum age of the participants of this research was set at 25, to focus on young people (being adolescents or emerging adults) instead of adults. Originally the dataset contained 283 participants, but 14 participants were removed from the dataset as they were older than 25 years and thus did not fit age group of this research.

### **3.4 QUESTIONNAIRE AND OPERATIONALIZATION**

In this thesis a new questionnaire is developed. The development of a new questionnaire is needed as it is believed to give this research further value over previous studies. In many of these previous studies general existing questionnaires are used, for example the New Ecological Paradigm Scale (NEPS), which consists of 15 items measuring general environmental attitudes such as 'humans are severely abusing the environment' (Dunlap, Liere, Mertig & Jones, 2000). In this research a new questionnaire is developed specific to the case of plastic waste separation. This enables the measurement of more specific variables, which are a better predictor of behavior than general ones as explained before (Ajzen, 1991).



The items of the new questionnaire are based on combinations of multiple literature sources<sup>2</sup> to improve its validity, as agreement or overlap on items is an indication of content validity (Cohen & Swerdlik, 2010). The reliability of the survey is tested by measuring the split-half reliability. Also some adjustments were made after a pretest. Pretesting is important as questions that are posing problems can be identified before all data is collected. Studies show that questions identified by the pretest as problematic were more likely to indeed result in respondent problems and in item nonresponse (Presser et al., 2004). In total, data from 22 participants was collected during the pretest phase. In the first phase of the pretest, some cognitive interviews were held among friends and family. During cognitive interviews, participants were asked to report what they thought of the questions when filling in the questionnaire. In this way it is checked whether questions were clear and well understood. After the interviews it became apparent that some adjustments had to be made in the formulation of some items.

After these interviews, the pretest was expanded and questionnaires were distributed at Utrecht University. With this quantitative data some tests were done to decide if all items were useful for the questionnaire. In particular two strategies were used. First, it was checked whether the items discriminated well enough, meaning that there should be enough variation among the answers. When more than 80% of the participants agree or disagree on an item, the item is not very useful in the analyses. Secondly, the Cronbach's alpha ( $\alpha$ ), which is the most common measure of scale reliability (Field, 2009), was calculated with SPSS. Cronbach's alpha is based on split-half reliability, meaning that if a scale is split in half, the person's score on the one half of the scale should be similar to the other half of the scale. Cronbach's measure splits up the data of the scale in every possible way and computes the correlation coefficient for each split. The average of these values is equivalent to Cronbach's alpha. As a rule of thumb, a Cronbach's alpha of  $\alpha=.7$  or  $.8$  is often indicated as a reliable scale. Moreover, it is possible to identify how much items correlate with the other items and how much each item correlates with the total scale, which should not be less than  $.3$  (Field, 2009). The SPSS output of the Cronbach's alpha test also shows the value of  $\alpha$  when each item would be removed. It is possible that one item brings down the alpha and thus could better be removed from the questionnaire. In conclusion, after the pretest some items were adjusted and some were removed from the questionnaire, resulting in the final questionnaire as shown in appendix 3 which was used in this research. After these adjustments the reliability of all scales was above  $\alpha=.7$ .

The operationalization of the variables and some example questions from the questionnaire for each variable are stated below. All items, except the ones for the variable knowledge, can be indicated by the participants on a 5 point Likert scale, ranging from 1 'totally disagree' to 5 'totally agree'. Many items start with 'I think' to stimulate participants to reflect on their own experiences and opinions and to remind them that there are no right or wrong answers. For each TPB variable, 5 or 6 items are formulated in the questionnaire (see Ajzen, 2006<sup>3</sup>). However, behavior and intention were measured with only 2 and 3 items respectively, to avoid too much repetition in the questionnaire. The items for the various variables were mixed up within the questionnaire (as recommended by e.g. Francis et al., 2004), except for the ones measuring knowledge as for these items a separate explanation was

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<sup>2</sup> Including in particular the articles 'Constructing a theory of planned behavior questionnaire' by Ajzen (2006) and 'Constructing questionnaires based on the theory of planned behavior' by Francis and colleagues (2004), and the various articles that are mentioned in the theory section of this thesis.

<sup>3</sup> However, Ajzen frequently also uses only 2 items per variable (e.g. Hrubec, Ajzen & Daigle, 2001; Bamberg, Ajzen & Schmidt, 2003).

needed. Also some other questions regarding the respondent's demographics were asked at the beginning of the questionnaire, namely age, household composition and zip code. Age was asked as the focus of this research is on younger people. Household compositions was expected to be of influence of perceived behavior control, as participants that live with for example their parents, partner or roommates might experience that recycling plastic waste is not under their own control. Zip code was asked as in different municipalities different collection of plastic waste methods are operative. The items per variable are shown in appendix 1 (in English) and appendix 2 (in Dutch). The complete questionnaire can be found in appendix 3.

**Attitude toward the behavior:** This variable regards 'the degree to which a person has a favorable or unfavorable evaluation or appraisal of the behavior in question' (Ajzen, 1991, p. 188), which in this case can be operationalized as 'the evaluation or appraisal of separating <sup>4</sup> plastic waste'. Measurements of this concept in the questionnaire include both instrumental (whether the behavior is useful) and experiential (how it feels to perform the behavior) items (see Ajzen, 2006; Francis et al., 2004). An example of an item that measures instrumental attitude towards separating plastic waste is: 'I think it is important for the environment to separate plastic waste'. An example of an experiential item is 'I don't mind separating plastic waste'. The Cronbach's alpha of the attitude scale is  $\alpha = .706$ .

**Subjective norms:** As this refers to the perceived social pressure to perform the behavior and to the beliefs about how other people view this behavior (Ajzen, 1991), subjective norms can be operationalized as 'perceived views and pressure of others to separate plastics'. Other people in this case are especially people who are important to the participant or people similar to the participant (Ajzen, 2006). In the questionnaire this was often formulated as 'friends and family'. An example of a subjective norm item is 'I don't think it matters for my friends and family whether or not I separate my plastic waste'. The Cronbach's alpha of this subjective norm scale is  $\alpha = .713$ .

**Perceived behavioral control:** This is the extent to which the individual perceives the behavior in question to be under his or her personal control and it refers to the perceived difficulty of performing the behavior (Ajzen, 1991). Thus, in this case it can be operationalized as 'the degree to which separating plastics is perceived to be under personal control and the perceived difficulty to separate plastics'. Items on the questionnaire should reflect someone's confidence that they are capable of performing the target behavior, by assessing the person's capacity and autonomy (see Francis et al., 2004; Ajzen, 2006). An example of a capacity item of perceived behavior control is: 'If I wanted to, I could easily separate my plastic waste and bring it to a container outside my home'. An example of an autonomy item is: 'Whether or not I recycle plastic waste is purely my own decision'. The Cronbach's alpha of this scale is  $\alpha = .736$ .

**Costs:** This variable refers to the actual costs or effort required to separate plastics. It can be operationalized as 'the costs<sup>5</sup> needed to separate plastics'. Costs are first assumed to differ between the two situations regarding waste separation, the drop-off versus the curbside collection program. As explained before, the drop-off program requires more time and effort from citizens. The participants can indicate which plastic waste situation is applicable to them. If participants do not know the

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<sup>4</sup> Consisting of the whole range of behaviors regarding plastic separation: separating the plastics from other waste at home, having a separate container or bag at home to store the plastic for a while, bringing the plastic bag to the container outside, etc.

<sup>5</sup> As mentioned before, consisting of costs in the broadest sense: including time, money, effort and other costs.

situation or do not fill in this question for other reasons, the zip code is used to check which situation is applicable. Secondly, for each situation some separate questions are formulated. For example, for the drop-off situation the question 'I have to travel quite a large distance (e.g. more than 300 m) to a plastic waste container in my neighborhood' is added. An example of an item for the curbside collection method is 'The extra container I got from my municipality impairs the aesthetic value of my garden'. Lastly, two general cost items are formulated, which are filled in by all participants. One of these items is 'I do not have enough space in my home to store an extra bin for my plastic waste'. The Cronbach's alpha was not measured for the cost scale, as the participants fill in different questions and ignore others depending on the situation in the municipality, and the items are not all analyzed as one scale.

**Knowledge:** Specific knowledge regarding separating and recycling plastic waste is measured by stating ten items for which the participants can indicate whether they think the statement is true or false. This method is used as it is expected to be the most objective way of measuring knowledge. In the construction of the knowledge items, it was important that an equal number of correct responses had positive and negative implications of recycling, because it is demonstrated that when participants are uncertain about the right answer, they are likely to choose the answer that reflects their attitude (Ajzen et al., 2011). Thus, if only items about the positive effects of recycling are formulated, the items may actually reflect attitude rather than knowledge. For example, the item 'by recycling plastic waste, less CO<sub>2</sub> will be omitted' is true, and is a positive feature. But the item 'about a quarter of the collected plastic waste cannot be recycled', also true, reflects a negative feature. Lastly, participants were also given the answer option 'no idea'. This option was added to minimize the chance that participants would guess the right answer when in fact they had no idea, and thus would falsely reflect knowledge. In this scale knowledge about both the effects of separating plastic waste (factual knowledge) and the practical knowledge about how to separate plastic waste (action knowledge) are taken into account. Questions measuring factual knowledge consist of several true or false questions as 'Not every type of plastic waste can be recycled'. An example of an action knowledge question is: 'Plastic packages have to be empty before I am allowed to throw it in the plastic container'. The Cronbach's alpha is not measured for this scale, as it regards true or false items, and the items do not necessarily need to be internal consistent.

**Intention:** This regards the expectancy of performing the behavior of separating plastic waste in the future. A timeline of a month is chosen as a longer period is expected to be too vague and difficult to predict for the participants. It is suggested by Francis et al. (2004) that three items can be used to measure intention with adequate internal consistency, namely 'I expect to', 'I want to' and 'I intend to'. In the questionnaire this resulted for example in an item 'I expect to separate most of my plastic waste next month'. Other suggestions for the formulation of intention items are 'I intend to' and 'I plan to' (Hrubes, Ajzen & Daigle, 2001). Based on this, an item was formulated as 'I intend to separate as much plastic waste as possible'. To avoid too much repetition, a total of three items were selected for this questionnaire that measured intention. The Cronbach's alpha for the intention scale is  $\alpha = .887$ .

**Behavior:** This regards the actual behavior of the separation of plastics and is indicated by past behavior of the last month. Ajzen (2006) does recommend to recontact participants after three months to report whether they performed the behavior. However, this method is not feasible for this research as not enough time was available for this. Also it was stated in the questionnaire that it was fully confidential and anonymous and a follow-up could be a threat to anonymity and may even interfere

with honest responding. Moreover, recontacting participants can also result in very low response rates (Beck & Ajzen, 1991). Another method that is suggested and used by Ajzen is to measure past behavior, which could serve as an indication of likely future behavior (Hrubes, Ajzen & Daigle, 2001). Also other studies mentioned in the previous section measured recent behavior (for example Dill et al., 2014; Fielding & Head, 2012; Levine & Strube, 2011; Sidique et al., 2010). It can be expected that if someone has separated most of their plastic waste in the previous month, it is (very) likely that this person would also do so in the next month<sup>6</sup>. Again, a month is chosen as a longer period is expected to be too difficult to think back for the participants, but shorter might not provide adequate answers. The behavior is self-reported, by formulating two statements, including: 'I separated more than half of my plastic waste at home in the last month' also on a Likert scale. The Cronbach's alpha for this scale is not measured, as it contains only two items.

### 3.5 COLLECTION PROCEDURE

In the pretesting phase a combination of collection methods was used. Firstly, the questionnaires were provided to friends and family (N=7). This part of the sample was thus based on 'convenience sampling', meaning that respondents were selected based on their availability. The reason for this is that some cognitive interviews and feedback on the questionnaires was needed, and it was expected that it was more feasible to gain this information from friends and family because this could be too time consuming for random participants. Secondly, a larger part of the data for the pretest was collected at Utrecht University (N=15) based on random sampling.

The remaining data for the actual analysis was also collected at Utrecht University. The main reason to collect data at a university is that it is expected that education level could influence the variable knowledge in this study. That could distort the results. It was assumed that people at the university have similar education levels, and so this third variable effect can be controlled for. Participants were approached in the main canteen. This main canteen was chosen, because the sample should be random and a good representation of the student population, which would be less if students from only one faculty or study field would be asked. Moreover, participants were just asked whether they wanted to fill in a questionnaire, without giving much information about the study or its context, as this could increase the chance of a selection bias. Obtaining a random sample contributes to the generalizability of the results of this study.

At the first page of the questionnaire, the participants were thanked for their participation, it was stated that anonymity and confidentiality would be assured and that participation was fully voluntarily and participants could quit the questionnaire whenever they wanted. Furthermore, the participants were asked to read the questions carefully, but it was explained that they did not had to think too long about each question, that they could fill in their first thought. Lastly, it was stated that the participants could ask questions if items were unclear.

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<sup>6</sup> However, this also implies that behavior measured in this way is also very likely to relate to intention. This would make the result of the regression analysis between behavior and intention less valid. This will be elaborated upon in the discussion section of this thesis.

### 3.6 DATA ANALYSIS

When the data collection was completed, the data was analyzed through statistics using SPSS 22.0. The analysis that was used is multiple regression, which makes it possible to predict an outcome variable from several predictor variables (Field, 2009; Vocht, 2011). With regression analyses statements can be made about how good the prediction based on the variables is and if it is better than a prediction based on chance (Gravetter & Walnau, 2009).

For a standard multiple regression, continuous outcome and predictor variables are needed (Field, 2009). Continuous data can be obtained from the questionnaire by scaling each question on a 5-point Likert scale and compose multiple items (e.g. 5) for each variable. For each variable (or scale) the mean score from the multiple items can be calculated and computed as one variable. Now these predictors can be entered in the regression model and the output can be examined to see which predictors contribute substantially to the model's ability to predict the outcome.

The method of regression that was chosen for this analysis is hierarchical regression, in which predictors are selected based on past work in literature and the researcher decides in which order to enter the predictors into the model. Since the variables of this study have a theoretical basis, it is recommended to use a hierarchical regression (Field, 2009). The predictors from the theory of planned behavior (attitude, social norms and perceived behavioral control) were entered in the first block, as most sound literature was available about these predictors. In the second block, two variables related to costs were entered. The first was the scale consisting of the two general cost items in the questionnaire ('I do not have enough space in my home for an extra container for plastic waste' and 'Storing plastic waste at home looks messy'). The second one was the categorical situation item, for which participants indicated whether they had to drop their plastic waste off at a central site (more effort), or if their plastic waste was collected at their doorstep (less effort). In the third block, the variable knowledge was entered, measured as amount of correctly answered questions. Lastly, the two interaction items were entered, because these were based on least available literature. To be able to measure the interaction effects, new variables were constructed in SPSS resulting in variables 'knowledge X attitude', 'costs items X attitude' and 'cost situation X attitude'. The attitude and costs items were centered to avoid standard high correlations between these variables and the interaction variables. As an extra check for the hierarchical regression, a stepwise regression was also performed. In this method predictors are entered in an order determined by mathematical criteria. Although stepwise regressions are in general only advisable for explanatory work with no existing previous studies (Field, 2009), this method can be used to check if this regression analysis based on mathematical criteria fits the results of the hierarchical regression based on literature. There were no substantial differences between the outputs of the two regression analyses found, so the results of the hierarchical regression seemed adequate.

Before interpreting the regression results, basic assumptions underlying the model were checked (see e.g. Field, 2009). For example, there should be no multicollinearity, meaning that the predictor variables should not correlate too much with each other. This assumption is checked in SPSS with a Pearson correlation matrix and with the variance inflation factor (VIF) and tolerance ( $1/VIF$ ). It appears that there is no perfect multicollinearity between the predictor variables, so this assumption has been met. A second assumption is homoscedasticity, meaning that the residuals at each level of the predictors should have the same variance. This can be checked by making regression plots of the

residuals. The graph shows homoscedasticity if the dots are evenly dispersed, and heteroscedasticity if it funnels out. There seems to be no funnel in the regression plots of the predictors in this research, so it can be concluded that homoscedasticity is also met. Next, the assumption of independent errors, or a lack of autocorrelation, can be tested with the Durbin-Watson test. The test statistic can vary between 0 and 4, with a value of 2 meaning that the residuals are uncorrelated. The Durbin-Watson of the regression of this research is 1.93, which is so close to 2 that the assumption has almost certainly been met. The last assumption is that the errors should be normally distributed, which can be checked by creating histograms and normal probability plots. The histogram shows a bell-shaped curve and the plot a straight line, based on which it can be concluded that the errors are normally distributed. After testing all assumptions, it was concluded that all assumptions for generalization have been met.

After the multiple regression analysis, some separate analysis were performed to analyze some remaining relations. The questionnaire contained five more cost items, two for the curbside situation and three for the drop-off situation. Respondents only had to fill in the items that matched their situation, which thus results in many missing variables on the other items. Therefore, it was not useful to enter these in the multiple regression analysis. Instead, two separate simple regressions were performed. Lastly, another simple regression was done to check whether intention to separate plastic waste predicts the behavior.

## 4. RESULTS

### 4.1 DESCRIPTIVE RESULTS

First, the descriptive statistics of the variables of this study are provided in table 1. The number of participants (N), the mean (M) and the standard deviations (SD) are shown for each variable.

Table 1. *Descriptive statistics variables.*

	<i>N</i>	<i>M</i>	<i>SD</i>
<b>Variable</b>			
Attitude	269	3.77	0.71
Subjective norms	269	2.83	0.68
Perceived behavioral control	269	3.77	0.82
Cost (general items)	269	2.75	1.14
Cost (curbside items)	61	1.92	1.07
Cost (drop-off items)	138	2.68	1.06
Cost (situation)	259	n.a.	n.a.
Knowledge	256	5.18	1.80
Intention	269	3.22	1.30
Behavior	269	3.24	1.51

Next, before the results of the regression analysis are given, some relevant descriptive results are provided. The amount of participants that indicated with a 4 or 5 point on the Likert scale that they have the intention to separate plastic waste the next month is 48.1%. So nearly half of the participants has the intention to separate their plastic waste. Moreover, 53.35% of the respondents indicated that they separated their plastic waste the last month with a score of 4 or 5 points, meaning that about half of the participants performed the behavior of plastic waste separation at least once in the previous month. The somewhat higher percentage for behavior compared to intention is probably caused by the difference in measurements. Intention is measured by three items, while for behavior only two items were used, from which one was 'I separated my behavior *at least once* (...)', which could result in a higher percentage participants indicating that they performed the behavior. Two extra items were constructed to check whether intention always leads to behavior. The first one is 'I notice that although I have the intention to separate my plastic waste, I do not always do this'. For this item only the data from the participants that scored a 4 or 5 on intention was used (N=117). Of these participants, 32.5% encircled a 4 or 5 on the Likert scale. So, from the participants that indicated that they had intention to separate their plastic waste, about one third indicated that they did not always do this. The second item that was formulated is 'I have had the intention in the past to separate plastic waste, but I do not do this'. For this item, only the scores from participants who indicated in the behavior items that they did not perform the behavior were used, as stated in the second part of the item (N=126). It appears that from these participants who do not separate their plastic waste currently, 33.3% indicate with a score 4 or 5 that they did have these intentions in the past. A last interesting finding is that

93.3% of the participants indicate with a 4 or 5 point on the Likert scale that they think it is important for the environment to separate plastic waste.

#### 4.2 REGRESSION ANALYSES

In the multiple regression analysis, the variables that were expected to predict the intention to separate plastic waste were entered. In table 2 the results of this regression are depicted. This table shows that the three variables of the theory of planned behavior, namely attitude, subjective norms and perceived behavioral control, all significantly predict intention. This was predicted in hypotheses 1, 2 and 3 respectively. In hypothesis 4 it was expected that a higher degree of knowledge about separating plastic waste predicts the intention to do so. However, as seen in table 1 in step 3 and 4, the amount of rightly answered knowledge questions does not predict intention. Also the interaction between attitude and knowledge, as formulated in hypothesis 5, was not significant. Next, in hypothesis 6 it was expected that lower costs predict the intention to separate plastic waste. As can be seen in the table, the cost items are a significant negative predictor of intention, meaning that higher costs predict negative intention. Also the situation, in which the amount of costs differ, is a significant categorical predictor of intention. So, both variables that measure costs are significant predictors for intention as was expected. However, the interaction between costs and attitude is not significant, which was expected in hypothesis 7. Neither lower (1) nor higher costs (2) strengthen the predicting value of attitude on the intention to separate plastic waste.

Next to this multiple regression analysis, some separate regressions were performed for some remaining variables that did not fit in the multiple regression model. In the first regression the two cost items for the curbside situation were entered. A significant regression equation was found, in which the curbside cost items predicted intention to separate plastic waste and explained a significant proportion of variance in intention scores ( $\beta = -.41$ ,  $t(59) = -3.44$ ,  $p < .01$ ;  $R^2 = .153$ ,  $F(1, 59) = 11.86$ ,  $p < .01$ ). Secondly, the three items for the drop-off situations also were entered in a simple regression as predictors for intention. Again, the regression equation was significant ( $\beta = -.24$ ,  $t(136) = -2.83$ ,  $p < .01$ ;  $R^2 = .056$ ,  $F(1, 136) = 7.99$ ,  $p < .01$ ). So, also these separate simple regressions provided evidence for hypothesis 6 that lower costs predict the intention to separate plastic waste. Lastly, a single regression was performed to check whether intention to separate plastic waste predicts the actual behavior. As was expected and formulated in hypothesis 8, this was the case ( $\beta = .90$ ,  $t(267) = 32.82$ ,  $p < .000$ ;  $R^2 = .801$ ,  $F(1,267) = 1077.34$ ,  $p < .000$ ).



Table 2. Results multiple regression analysis (dependent variable: intention to separate plastic waste).

	<i>B</i>	<i>SE</i>	$\beta$
<b>Step 1</b>			
Constant	-0.42	0.41	
Attitude	0.67	0.09	.37**
Subjective norms	0.38	0.09	.20**
Perceived behavioral control	0.68	0.08	.42**
<b>Step 2</b>			
Constant	-0.09	0.40	
Attitude	0.62	0.09	.34**
Subjective norms	0.33	0.09	.17**
Perceived behavioral control	0.60	0.08	.37**
Cost (items)	-0.19	0.05	-.16*
Cost (situation)	0.407	0.12	.15*
<b>Step 3</b>			
Constant	-0.27	0.45	
Attitude	0.61	0.09	.34**
Subjective norms	0.33	0.09	.17**
Perceived behavioral control	0.61	0.08	.37**
Cost (items)	-0.19	0.05	-.16*
Cost (situation)	0.39	0.12	.14*
Knowledge	0.03	0.03	.04
<b>Step 4</b>			
Constant	-0.31	0.45	
Attitude	0.63	0.11	.35**
Subjective norms	0.34	0.09	.18**
Perceived behavioral control	0.61	0.08	.37**
Cost (items)	-0.19	0.05	-.16*
Cost (situation)	0.40	0.13	.15*
Knowledge	0.03	0.03	.05
Attitude X Knowledge	-0.02	0.04	-.03
Attitude X Cost (items)	-0.09	0.07	-.06
Attitude X Cost (situation)	-0.08	0.17	-.03

Note:  $R^2 = .49$  for step 1,  $\Delta R^2 = .05$  for step 2 ( $p < .001$ ),  $\Delta R^2 = .00$  for step 3 ( $p > .05$ ),  $\Delta R^2 = .00$  for step 4 ( $p > .05$ ). Sig.: \*  $p < .01$ , \*\*  $p < .001$ .

In section 2.4 of this thesis a conceptual model was developed, in which the three concepts of the theory of planned behavior, knowledge and costs were expected to predict intention, which in turn was expected to predict behavior. Also the expected interaction effects were depicted in this model. In figure 3, the results of this study are showed within this conceptual model, in which the green lines indicate a significant relation and the red lines the not significant results. The thickness of the lines indicates how strong the relation between the variables is.

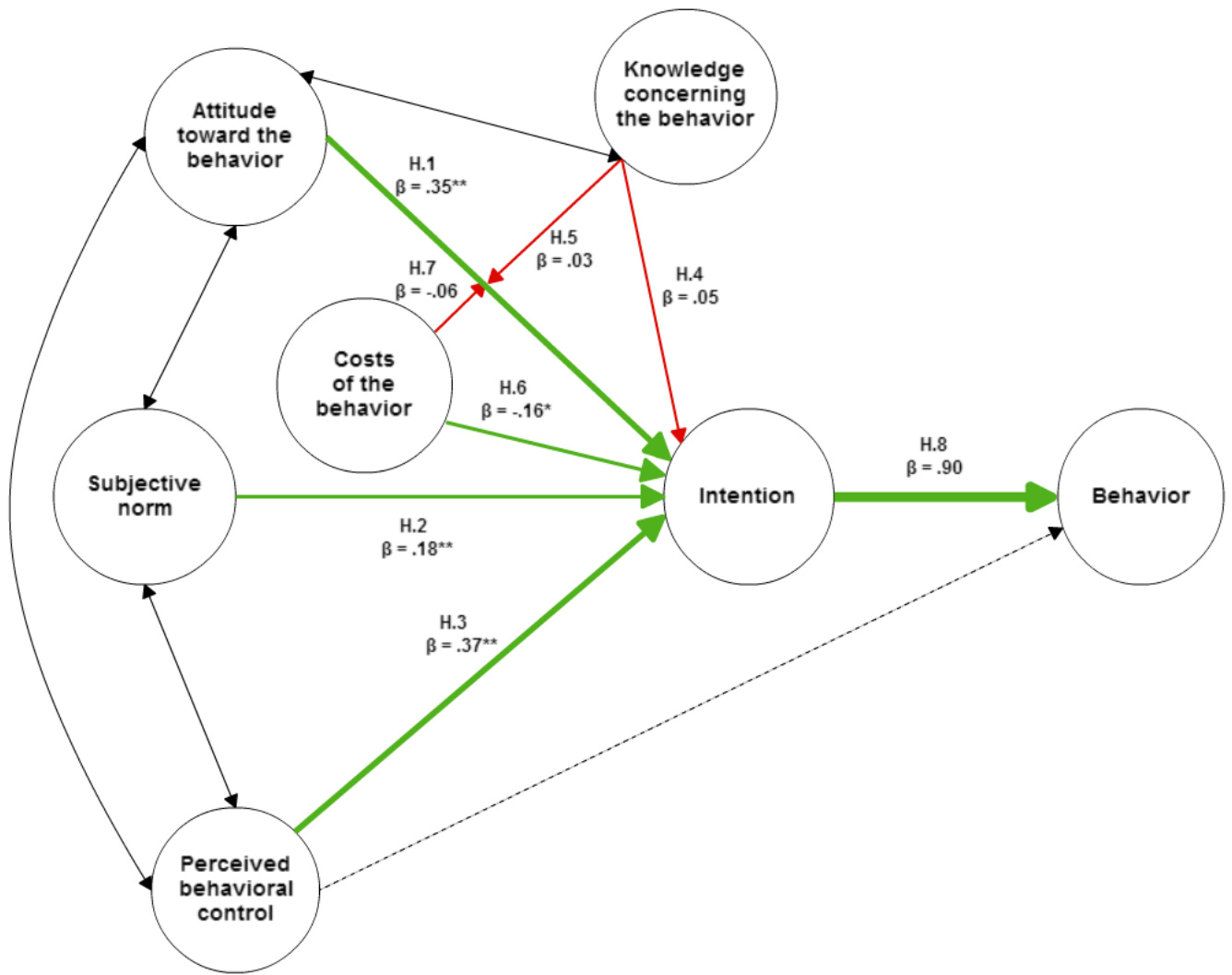


Figure 3. Results in the conceptual model. Note: Green lines indicate a significant predictor (\* p < .01, \*\* p < .001.), red lines not significant. The thickness of the lines indicates the strength of the correlation between the variables.

## 5. CONCLUSION AND DISCUSSION

### 5.1 CONCLUSION: ANSWER TO THE RESEARCH QUESTION

The aim of this thesis was to gain knowledge that contributes to the understanding of pro-environmental behavior, especially of younger people. The study focused on the case of plastic waste separation. This led to the formulation of the research question: *'Which factors predict pro-environmental behavior regarding separating plastic waste among young Dutch citizens?'*. Possible predictors were selected from literature and were tested in this research. From the theory of planned behavior, the factors *attitude towards the behavior*, *subjective norms* and *perceived behavior control* were derived. Moreover, the concepts of *knowledge* and *costs* were added. It was also expected that two interaction effects could be found. It was expected that knowledge strengthens the predicting value of attitudes on intention. The second interaction concerned costs, it was expected that either low or high costs strengthen the prediction of intention based on attitudes. A questionnaire was developed to measure these variables that were expected to predict the intention to separate plastic waste. Data from N=269 participants was used, with ages ranging from 16 to 25 years old. After the data collection, the data was analyzed with multiple and simple regression analyses.

The factors that were found to predict the intention for separating plastic waste among young Dutch citizens were besides the three factors from the TPB, namely attitudes toward the behavior, subjective norms and perceived behavioral control, also costs needed to perform the behavior. This intention in its turn predicts the pro-environmental behavior regarding plastic waste separation. However, knowledge did not predict the intention to separate plastic waste. Also no interaction effects were found. Both knowledge and the amount of costs required to perform the behavior did not strengthen the predicting value of attitudes.

### 5.2 LIMITATIONS OF THIS RESEARCH

Although this research is developed and executed as thoughtfully and precise as possible, this study does have some limitations. Firstly, quantitative research in general has some limitations. The depth in quantitative survey research is limited. The large scale approach of this research enables generalizability of the results, but this imposes limits on the elaboration of the results. Also, the obtained knowledge only concerns the measured variables, causing the probability that other variables that could also be important in explaining behavior are missed. However, the aim of this research was to gain valid statements that could be generalizable to the larger population, for which quantitative survey research is most suitable (Verschuren & Doorewaard, 2010).

A second limitation is that this research does not prove causal relations. Although the regression analysis implies that the intention to separate plastic waste is the dependent variable, it could be that the relation is more complex. The intention or the behavior could also influence the independent variables on its turn. For example, it could be that when someone already has the intention or behavior of separating plastic waste, someone's attitude also becomes even more positive. This coincides with the theory of *justification of effort*, which is the tendency for individuals to increase their liking for

something they put much effort in (Aronson et al., 2010). It can be argued that when someone puts a lot of effort to separate plastic waste, that individual will think even more positive about waste separation than before. However, this possible two-way correlation is not necessarily a problem when predicting intention and behavior. Moreover, proving causality in social research is difficult. An experimental design could show causal links, but experiments do not always reflect reality and ethical dilemmas may occur.

Other possible limitations regard the questionnaire that was developed for this research. There is a chance that when other survey items were developed, the results could be different. This is for example the case with the knowledge questions. It could be possible that other specific knowledge questions do predict intention. However, the questions were selected in such a way that a variety of subjects and types of questions were attained. The results of the other variables are also dependent on the types of items used and the choice for certain items may influence the results. However, the questionnaire was carefully developed with the use of literature. It was also thoroughly pre-tested and for example the Cronbach's alpha was calculated to test the reliability and coherence of each scale. Nevertheless, one more matter in particular concerning the content of the questionnaire should be mentioned here. This matter concerns the choice to include the option 'no idea' in the knowledge section of the questionnaire. As explained before, this option was added to minimize the chance that answers on the questions were guessed rightly when in fact the participant had no idea, and therefore knowledge would be overestimated. However, it might be that this 'no idea' option reflects in some cases instead of knowledge, differences in personalities, for example motivation (to think about the questions extensively) or insecurity (when people have an idea but are not completely sure of the right answer, one person might guess while the other might use the 'no idea' option). However, the option was called 'no idea' instead of 'I don't know' to discourage the participants to choose this option when they did had an idea but had some doubts, and the questionnaire was made as short as possible so participants would not be discouraged to think about every question carefully.

Moreover, intention and behavior were measured in the same questionnaire and at the same time. It can be argued that this way of measurement almost always results in a relation and may not reflect reality. This can affect the validity of this research concerning the relation between these two variables. This research does not prove that intention always proceeds or leads to behavior. To evince this, other types of research is needed, for example longitudinal in which intention and behavior can be measured in several points in time. However, this was beyond the scope of this research due to time restrictions.

A last limitation of this research is that behavior was measured by self-reports, which do not always reflect true behavior due to for example social desirable answers. However, because this study regards a specific behavior, it is expected that false answers are less common than when measuring general pro-environmental behavior, as it is harder to give false statements about performing a specific behavior than about general behavior. Thereby, the questions were formulated in such a way that social desirable answers were less likely, for example by using both positive and negative formulations. Also, the participants in this study filled in the questionnaires by themselves, in which social desirability occurs less than when the questions are asked by an interviewer (Dillman et al, 2014).

### 5.3 THEORETICAL IMPLICATIONS

At the beginning of this thesis, it was stated that although various authors already studied the factors predicting pro-environmental behavior, it was still not fully understood. Moreover, many of these studies posed important limitations, in particular with regard to measurements and operationalization. Therefore, in this thesis the role of these factors was tested again and in this section the results of this research are compared to the results in previous literature.

The first notion in this research is that the three concepts of the theory of planned behavior, namely attitude towards the behavior, subjective norms and perceived behavioral control, all significantly contribute in predicting the intention to separate plastic waste. Also the other statement of the TPB, that intention would predict the actual behavior, appears also to be true in this research. Thus, this research again provided validation for the theory of planned behavior. It appeared that from these three variables of the TPB, attitudes and perceived behavioral control explained a larger part of the variance in intention score than subjective norms. However, the differences in importance between these three variables does not contradict the theory of planned behavior, as Ajzen states that the relative importance of each variable may differ across situations and behaviors (Ajzen, 1991). At least two explanations can be thought of which may explain the relative smaller role of subjective norms in predicting the specific behavior of separating plastic waste. Firstly, separating plastic waste can be seen as less visible than some other pro-environmental behaviors. It is something people mainly do inside their own homes and not something other people might see often. Therefore, people might not perceive social control as much as with some other behaviors and thus plays a smaller role in predicting the behavior. Secondly, compared to the recycling of other types of waste, separation of plastic waste is relatively new. Therefore, the norm that everybody should separate plastic waste may be not as prominent as for example separating glass and paper, which has been the norm for years. Thus, although subjective norms do play a role in predicting the intention to separate plastic waste, these two reasons might help explain why its role is smaller than for some other behaviors.

Besides the three concepts of the TPB, another concept that was found in this research to be of predicting value for the intention to separate plastic waste were costs of the behavior. Costs were measured in multiple ways in this research and all these measures predicted the intention to separate plastic waste. This is in line with the results of Sidique et al. (2010) and Best & Kneip (2011), who also found that cost differences in a recycling program predicted recycling participation. However, Ramayah et al. (2012) found no effects of convenience and costs on recycling behavior. The difference in these results may be explained by the fact that the study of Ramayah contains a Malaysian sample, while this current study and those of Sidique & colleagues and Best & Kneip contain Western samples. Western cultures are known to be more individualistic, while Asian cultures are more collective (Brewer & Yuki, 2010). Thus, in Western cultures the individual inconvenience or costs may be more important. Also in the Malaysian study social norms were found to have the greatest impact on recycling behavior, while in this study attitudes and perceived behavioral control were found to be more important variables from the TPB. This also supports the idea that the results may differ between different cultural contexts.

Other hypotheses that were formulated regarding the role of costs concerned the interaction with attitudes. In the Low-cost hypotheses of Diekmann & Preisendörfer (2003) it was stated that

environmental concerns or attitudes predict environmental behavior primarily in situations where costs are low. However, not much other evidence has been found to support this hypothesis in previous literature. Moreover, other authors (Andersson & Borgstede, 2010) found that various variables related to recycling behavior were better predictors in a high-cost recycling situation. Thus, two contradicting hypotheses concerning the role of costs in strengthening the role of attitudes in predicting intention were formulated in this research. The results of this study showed that there was no interaction effect at all. However, the result of Andersson & Borgstede (2010) can be explained by the way in which low cost and high costs recycling was labeled. The authors asked the participants how often they recycled certain materials and argued that when participants recycled a material more often, it was less costly. However, the frequency of recycling can also be explained by other factors, for instance perceived importance of recycling that material. As an example, batteries are according to these authors labeled as low-cost recycling. However, it can also be argued that many people find it very important for the environment to recycle batteries, while it does not necessarily requires less effort. That may explain why an interaction effect was found. For the "high cost" (or: less frequently recycled) materials, there may be more variation in attitude or environmental concern, meaning that only people who care a lot about it recycle all materials. For the "low cost" (or: more frequently recycled) materials, almost everybody could think it is important to separate these materials, regardless whether or not people are very environmentally minded. Thus this interaction may explain that attitudes explain a larger amount of intention to separate materials that are generally seen as 'less important' to recycle, instead of materials that require more effort to recycle. To summarize, as the results of the study of Andersson & Borgstede (2010) can also be called into question, the results of this current study in which costs are measured in several ways for which no interaction effect with attitudes were found are in line with other previous studies which did not found interactions (e.g. Best & Kneip, 2011; Kriwy & Mecking, 2012). Therefore it can be concluded that there is no valid evidence for both the Low-cost as the High-cost hypotheses to be true.

Another variable that was measured in this study was knowledge. Previous literature regarding the role of knowledge in predicting intention or behavior has been mixed. In this research, knowledge did not predict the intention to separate plastic waste. It appears that the studies which did find a significant role of knowledge in predicting intention or behavior, have severe limitations (as explained in section 2.3). Three differences of measurement may explain the inconsistencies between the results of different studies. First, in some of the studies that found a relationship between knowledge and behavior, self-reported subjective knowledge was measured. However, it can be argued that this method is not valid, as participants who already perform the behavior may overestimate the amount of knowledge they have because it matches their behavior. In this research, objective knowledge was measured by asking questions, so participants would not overestimate their knowledge. Secondly, as also pointed out by Ajzen et al. (2011), in many studies the way in which knowledge is measured reflects the participants' attitudes instead. Especially when respondents are uncertain about the right answer, they often pick the answer that is most consistent with their own attitude (Ajzen, 2011). Therefore, the questionnaire has to be balanced in such a way that an equal number of correct responses reflect positive and negative sides of the behavior. This has been aimed for in this study (see section 3.4), and the results match Ajzen and colleague's expectations that when knowledge items do not necessarily match attitudes, no significant relation between knowledge and intention will be found. Thirdly, in this thesis specific knowledge concerning the behavior and a specific behavior was measured, where in some other articles only general knowledge and behaviors were measured. It can

be argued that in line with the assumption in the TPB that specific variables are more reliable in predicting specific behaviors, this also matters for knowledge and behavior. In conclusion, it appears that the differences between the results can be explained by the differences in measuring knowledge. When knowledge is measured in a more valid way, knowledge does not predict intention.

The other hypothesis of this thesis regarding the role of knowledge was that besides or instead of a direct role of knowledge, knowledge may play a more indirect role in an interaction effect between knowledge and attitudes in predicting intention. Not much was known about this effect in previous literature. However, from this study it appears that knowledge does not strengthen the value of attitudes in predicting intention. So, when the attitude towards the behavior is strong, it does not matter how knowledgeable someone is about the subject the behavior relates to.

Lastly, it should be noted that some differences in the results of this thesis compared to other studies might be explained by the sample of this research. This study focused on young people, because it was argued that focusing on this age group is very important. However, it could be that predicting variables may differ between young people and the general (older) population. In further research the variables for different age groups can be compared to see if the results differ between these groups.

To conclude, it appears that the variables from Ajzen's theory of planned behavior do indeed predict intention, and intention on its turn predicts behavior. This theory can be complemented by taking the role of costs into account. However, these four variables do account for 'only' 54 percent of the variation in intention. Thus, 46 percent of the variation in intention scores is still unexplained. Although in social sciences and in particular in predicting human behavior, which is always more unpredictable than some natural science processes, the  $R^2$  is almost always lower than .50 (Frost, 2013), other variables may be found that can add more predicting value to the model of this research. Further research may focus on again other variables that can complement the theory of planned behavior, so that the prediction of pro-environmental behavior could become as accurate as possible.

#### **5.4 POLICY IMPLICATIONS**

At the beginning of this thesis it was stated that two types of policy measures can be distinguished. A focus on incentives and markets on the one hand and the focus on information provision to edit choices as a cost effective and socially acceptable approach on the other. Although the interest of policy makers for this last option is increasing, questions regarding the effectiveness of these types of policies and uncertainties about behavioral change have to be answered.

Firstly, the results of this research imply that reducing the costs related to the performance of the behavior in question is likely to increase people's intention to perform pro-environmental behaviors. In the case of plastic waste separation, costs can be reduced by changing the drop-off system to a system in which waste will be collected. If municipalities are not able to implement this curbside system, costs can also be reduced by increasing the amount of central containers, as the distance and accessibility of central containers also predicts the intention to separate plastic waste.

Decreasing the costs of the behavior might also increase people's perceived behavioral control, as this also includes the perceived ease of performing the behavior and the feeling of controlling the behavior. As perceived behavioral control is also shown in this research to be a predictor, enhancing this variable is also expected to be effective in stimulating pro-environmental behaviors. If this can be achieved by decreasing costs, this measure's effectiveness might be two-fold.

Secondly, from this research it appeared that knowledge concerning the behavior does not predict the intention to separate plastic waste. This result implies that solely providing information about the behavior in order to enhance people's knowledge does not seem to be a very effective strategy to steer pro-environmental behavior. Also some (field) research shows that providing information often has little or no impact on behavior (Owens & Driffill, 2008; Geller, 1992). An example of such a campaign regarding the separation of plastic waste is the Plastic Heroes campaign, in which a lot of information is provided. In 2015, a new website was released which had the goal to make information about recycling as accessible as possible (Nedvang, 2015a). Although the information seems clear, the results of this study question the effectiveness of these types of campaigns which mainly focus on providing information.

However, although it seems not effective to solely provide information to stimulate behavior, awareness campaigns that go further than only providing information might be beneficial. These campaigns could explicitly focus on factors that have a significant positive effect on behavior, including the factors stated in the TPB. In awareness campaigns, especially the role of attitudes toward the behavior and subjective norms seems useful.

As this research showed, attitudes regarding the behavior do predict the intention to perform the behavior. This implies that awareness campaigns that focus on changing people's attitudes might be effective. Attitudes do sometimes change and often do so in response to social influence (Aronson et al., 2010). Previous research has been done on the conditions under which attitudes change. The Yale Attitude Change approach (Hovland, Janis & Kelley, 1953) is the first study of these conditions, and focused on the source of the communication (e.g. credibility), the nature of the communication (e.g. two-sided arguments which appear not to be designed to influence people) and the nature of the audience (e.g. intelligence level). Moreover, the elaboration likelihood model (Petty & Cacioppo, 1986) specifies under which conditions people will be influenced by the content and when by more superficial characteristics. To achieve long lasting attitude change, one should focus on the content of the message. However, playing on emotions can also cause attitude change by depending on heuristics, or mental shortcuts, according to the heuristic-systematic model of persuasion (Chaiken, 1987). The best strategy for campaigns aiming at attitude change is to use a combination of these strategies. Certain attitudes of some people are based on beliefs, while others may be based on emotions and values. Therefore, it is most effective to use strategies based on both rational arguments and emotional appeals as well (Aronson et al., 2010). In some studies the effectiveness of environmental campaigns and advertisements in changing attitudes has already been demonstrated (see e.g. Mosler & Martens, 2008; Matthes, Wonneberger & Schmuck, 2014). A last important finding is that attitudes of people aged 18 to 25 are most likely to change, since after this age attitudes become more stable and resistant to change (Krosnick & Alwin 1989). This stresses again the importance for policy makers to focus on this age group. To conclude, it can be said that awareness campaigns might



work when they are constructed in such a way that they could change attitudes and not solely focus on increasing the public's knowledge.

Another significant predictor of intention to separate plastic waste was the subjective norm, which implies that policies or campaigns targeting subjective norms might also be effective. People want to conform to social norms, which are the rules for acceptable behaviors, values and beliefs (Aronson et al., 2010). Cialdini, Ceno and Kallgren (1991) have developed a model in which social norms can be used to subtly induce people to conform to correct behavior. Two types of norms are distinguished: injunctive norms which concern what we think other people approve of and descriptive norms which concern perceptions about the way people behave. It was found that injunctive norms are more powerful than descriptive norms in producing desirable behavior. Therefore, to promote pro-environmental behavior, the attention of people has to be drawn to social norms. In campaigns information that communicates injunctive norms has to be present to create pro-environmental behavioral change. Previous studies demonstrated the effectiveness of the use of descriptive norms appeals in encouraging pro-environmental behavior (e.g. Goldstein, Cialdini & Griskevicius, 2008; Schultz et al., 2007). In the case of plastic waste separation, campaigns can be designed which stress that besides separating other types of waste like paper and glass, what most people already do (Nedvang, 2015b), it is also the norm to separate plastic waste. Besides providing information, one of the slogans of the Plastic Heroes campaign is 'it is better to separate plastic waste, doesn't everybody knows that?' (translated from Dutch: 'plastic afval kun je beter scheiden, dat weet toch iedereen?', Plastic Heroes, n.d.). This slogan seems to fit the focus on social norms as it implies that everybody should know that it is better to separate plastic waste and that society approves this behavior. However, another quote on the home page on the website states 'I notice that many of my peers are not aware of waste separation and its effect on the environment'. This quote might be counter-effective, because it implies that separating plastic waste is uncommon and therefore if people conform to this statement they will not perform the behavior. In summary, it might be effective to address social norms in campaigns by stressing the notion that separating plastic waste is socially approved and accepted in society.

To conclude, this research shows that only focusing on information provision policies may not be the most effective way of stimulating pro-environmental behavior and that it is advisable to also take measurements that decrease the existing costs of performing pro-environmental behaviors. The results of this study imply that policy makers can be advised to both develop awareness campaigns that aim at changing attitudes and social norms, but also not to abandon more traditional or straight-forward measures that aim at reducing costs needed to perform the behavior.

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## APPENDICES

### APPENDIX A: QUESTIONNAIRE ITEMS PER VARIABLE (EN)

#### *Attitude toward the behavior (instrumental and experiential):*

- 'I don't mind separating plastic waste'
- 'I find separating plastic waste too much hassle'
- 'I think it is important for the environment to separate plastic waste'
- 'I feel good about myself when I recycle plastic waste'
- 'I don't think it is really helpful if I recycle plastic waste'

#### *Subjective norms*

- 'I think my friends and family find it a good thing to separate plastic waste'
- 'I think my friends and family don't mind whether I recycle plastic waste or not'
- 'I think my friends and family expects me to recycle plastic waste'
- 'I think most of my friends and family recycle plastic waste'
- 'I feel social pressure from friends and family to recycle plastic waste'

#### *Perceived behavioral control (capacity and autonomy):*

- 'If I wanted to, I could easily separate my plastic waste and bring it to a container outside my home'
- 'I am confident that I could separate at least half of my plastic waste next month'
- 'I think separating plastic waste is more difficult for me than for other people'
- 'Whether or not I recycle plastic waste is purely my own decision'
- 'The decision to recycle plastic waste is often beyond my own control'

### *Costs Situation*

Please indicate which system of waste collection is used in your municipality:

'The municipality has given me the possibility to receive an extra container for plastic waste and these containers are collected and emptied at my curbside.'

'In my municipality, I have to drop my waste off in a central plastic heroes container'

'Other, namely':

### *Costs items:*

'I do not have enough space to store my recycled plastic inside my home in a separate container'  
[General]

'Storing my plastic waste inside my home looks messy' [General]

'I have to travel quite a large distance (*e.g. more than 300 m*) to a plastic waste container in my neighborhood' [Drop-off situation]

'I pass a plastic waste container at least once a week (on my way to school, work, groceries etc.)' [Drop-off situation]

'I need a car to transport my plastic waste' [Drop-off situation]

'I do not have enough space outside my house (e.g. in my garden) to stall a separate container for plastic waste' [Curbside situation]

'The container for plastic waste impairs the esthetic value of my garden'. [Curbside situation]

### *Knowledge*

'Not every kind of plastic can be used for recycling'

'There are several kinds of plastic and these have to be separated in the recycling factory before it can be recycled'

'Products like soda bottles can be cleaned and refilled'

'By recycling plastic waste, less CO<sub>2</sub> will be emitted'

'Plastic waste has to be clean before I am allowed to throw it in the plastic container'

'Plastic packages that are half full are also allowed in the plastic container'

'About a quarter of the plastic waste that is collected cannot be recycled'



'Bigger and thicker kinds of plastic, like toys and outdoor furniture, are also allowed in the plastic waste container'

'Recycled plastic can be used to produce fleece sweaters'

'Plastic that is thrown by consumers in the general waste container will be brought to a garbage dump'

#### *Intention*

'It is likely that I will separate plastic waste at home at least once the coming month'

'I intend to recycle plastic waste as much as possible in the coming month'

'I expect that I will separate most of my plastic waste the coming month'

#### *Behavior*

'I separated plastic waste at home in the last month at least once'?

'I separated most part of my plastic waste at home last month'

#### *Intention – Behavior*

'I have had the intention in the past to separate my plastic waste, but I am not doing this currently'

'I notice that although I have the intention to separate my plastic waste, I do not (always) do this'

## **APPENDIX B: VRAGENLIJST ITEMS PER VARIABLE (NL)**

### *Attitude (instrumenteel en beleving)*

- 'Ik vind het niet erg om plastic afval te scheiden'
- 'Ik vind plastic afval scheiden teveel gedoe'
- 'Ik denk dat het belangrijk is voor het milieu om plastic afval te scheiden'
- 'Ik heb een goed gevoel over mezelf wanneer ik plastic afval scheid'
- 'Ik denk dat het niet veel uitmaakt of ik plastic afval scheid of niet'

### *Subjectieve normen*

- 'Ik denk dat mijn vrienden en familie plastic scheiden een goed iets vinden'
- 'Ik denk dat het mijn vrienden en familie niet uitmaakt of ik wel of niet plastic afval scheid'
- 'Ik denk dat mijn vrienden en familie hopen dat ik mijn plastic afval scheid'
- 'Ik denk dat de meeste van mijn vrienden en familie plastic afval scheiden'
- 'Ik voel sociale druk van mijn vrienden en familie om plastic afval te scheiden'

### *Ervaren controle over het gedrag (bekwaamheid en autonomie)*

- 'Als ik zou willen, zou ik makkelijk mijn plastic afval thuis kunnen scheiden en het naar de container buiten kunnen brengen'
- 'Ik ben ervan overtuigd dat ik tenminste de helft van mijn plastic afval zou kunnen scheiden de komende maand'
- 'Ik denk dat het scheiden van plastic afval moeilijker is voor mij dan voor andere mensen'
- 'Of ik wel of niet mijn plastic afval scheid is helemaal mijn eigen beslissing'
- 'De beslissing om plastic afval wel of niet te scheiden heb ik ~~niet~~ zelf in de hand'

### *Kosten (situatie)*

Kunt u aangeven wat de situatie in uw gemeente qua plastic scheiding is?

- 'De gemeente heeft mij de mogelijkheid gegeven om een extra klike voor plastic afval te ontvangen en zij komen deze eens in de zoveel tijd legen'

‘In mijn buurt kan ik mijn plastic afval (alleen) kwijt in centrale containers’

‘Anders, namelijk:’

#### *Kosten items:*

‘Ik heb niet genoeg ruimte in mijn huis voor een extra prullenbak voor plastic afval’. [Algemeen]

‘Het opbergen van mijn plastic afval in huis oogt rommelig’ [Algemeen]

‘De plastic container waar ik mijn afval naar toe moet brengen is redelijk ver (bv. meer dan 300 meter)’ [Wegbreng situatie].

‘Ik kom minstens elke week wel langs de container voor plastic afval (bijvoorbeeld onderweg naar school, werk, of boodschappen)’. [Wegbreng situatie].

‘Voor het wegbrengen van mijn plastic afval heb ik een auto nodig (bijvoorbeeld omdat het een groot volume heeft)’. [Wegbreng situatie]

‘Ik heb niet genoeg ruimte bij mijn huis om de container voor plastic afval die ik van mijn gemeente kon krijgen neer te zetten’. [Ophaal situatie]

‘De extra cliko voor het plastic afval tast de esthetische waarde van mijn tuin aan’ [Ophaal situatie]

#### *Kennis*

‘Niet elk type plastic kan worden gerecycled’

‘Er zijn verschillende typen plastic en deze moeten eerst in een fabriek weer gescheiden worden voordat het gerecycled kan worden’

‘Producten zoals frisdrankflesjes kunnen na grondige schoonmaak weer opnieuw worden gevuld’

‘Door het recyclen van plastic wordt minder CO<sub>2</sub> uitgestoten’

‘Grotere en dikkere soorten plastic, zoals speelgoed of tuinmeubelen, mogen ook bij het plastic afval’

‘Het plastic moet schoon zijn voordat ik het in de plastic afvalbak mag gooien’

‘Plastic verpakkingen die nog deels vol zijn mogen ook bij het plastic afval’

‘Het grootste gedeelte van het plastic dat door consumenten bij het restafval wordt gegooid wordt op een grote vuilnisberg gestort’

‘Van gerecycled plastic kunnen fleecetruien gemaakt worden’

‘Ongeveer een kwart van het plastic dat is ingezameld kan niet gerecycled worden’

### *Intentie*

'Het is waarschijnlijk dat ik in ieder geval een keer mijn plastic afval thuis ga scheiden de komende maand'

'Ik heb de intentie om zoveel mogelijk van mijn plastic afval te scheiden de komende maand'

'Ik verwacht van mezelf dat ik de komende maand het grootste gedeelte van mijn plastic afval ga scheiden'

### *Gedrag*

'De afgelopen maand heb ik in ieder geval een keer mijn plastic afval thuis gescheiden'

'De afgelopen maand heb ik het grootste gedeelte van mijn plastic afval gescheiden'

### *Intentie - Gedrag*

'Ik heb in het verleden wel eens de intentie gehad om mijn plastic afval te scheiden maar ik doe dit niet'

'Ik merk dat ik ondanks mijn intentie om afval te scheiden dit niet (altijd) doe'

## APPENDIX C: QUESTIONNAIRE

Bedankt dat je wilt meehelpen aan dit onderzoek! De vragenlijst is anoniem en ik zal de antwoorden alleen gebruiken voor dit onderzoek. Je deelname is uiteraard vrijwillig en daarom kan je ook elk moment stoppen met het invullen van de vragenlijst. Lees de vragen alsjeblieft goed, maar je hoeft niet al te lang na te denken over je antwoord, vul in wat als eerste bij je opkomt. Als nog vragen hebt, stel ze gerust!

Leeftijd:

Postcode (alleen cijfers is voldoende):

Huishouden: Alleenwonend / Samenwonend met partner / Bij mijn ouders / In een studentenhuus / Anders, namelijk:

Geef voor elke stelling aan in hoeverre je het eens of oneens bent, waarbij: 1 = helemaal mee oneens tot 5 = helemaal mee eens	Oneens ← ----- → Eens				
	1	2	3	4	5
Ik denk dat het belangrijk is voor het milieu om plastic afval te scheiden	1	2	3	4	5
Ik verwacht van mezelf dat ik de komende maand het grootste gedeelte van mijn plastic afval ga scheiden	1	2	3	4	5
Ik vind het niet erg om plastic afval te scheiden	1	2	3	4	5
Ik denk dat de meeste van mijn vrienden en familie plastic afval scheiden	1	2	3	4	5
Ik heb niet genoeg ruimte in mijn huis voor een extra prullenbak voor plastic afval	1	2	3	4	5
Andere mensen, zoals mijn ouders, partner of huisgenoten, bepalen vooral of ik plastic afval scheid of niet	1	2	3	4	5
Het is waarschijnlijk dat ik in ieder geval een keer mijn plastic afval thuis ga scheiden komende maand	1	2	3	4	5
Ik krijg een goed gevoel over mezelf wanneer ik plastic afval scheid	1	2	3	4	5
Ik denk dat mijn vrienden en familie plastic scheiden een goed iets vinden	1	2	3	4	5
Ik denk dat het scheiden van plastic afval moeilijker is voor mij dan voor anderen	1	2	3	4	5
De afgelopen maand heb ik het grootste gedeelte van mijn plastic afval gescheiden	1	2	3	4	5
De beslissing om plastic afval wel of niet te scheiden heb ik zelf in de hand	1	2	3	4	5
Ik vind plastic afval scheiden teveel gedoe	1	2	3	4	5
Als ik zou willen, zou ik makkelijk mijn plastic afval kunnen scheiden	1	2	3	4	5
Ik denk dat het mijn vrienden en familie niet uitmaakt of ik plastic afval scheid	1	2	3	4	5
Ik heb de intentie om zoveel mogelijk van mijn plastic afval te scheiden de komende maand	1	2	3	4	5
Het opbergen van mijn plastic afval in huis oogt rommelig	1	2	3	4	5
Ik merk dat ik, ondanks mijn intentie om afval te scheiden, ik dit niet (altijd) doe	1	2	3	4	5
Of ik wel of niet mijn plastic afval scheid is helemaal mijn eigen beslissing	1	2	3	4	5
Ik denk dat mijn vrienden en familie hopen dat ik mijn plastic afval scheid	1	2	3	4	5
Ik ben ervan overtuigd dat ik tenminste de helft van mijn plastic afval zou kunnen scheiden de komende maand als ik dat zou willen	1	2	3	4	5
Ik denk dat het niet veel uitmaakt of ik mijn plastic afval scheid of niet	1	2	3	4	5
Ik heb in het verleden wel eens de intentie gehad om mijn plastic afval te scheiden, maar ik doe dit niet	1	2	3	4	5
Ik voel sociale druk van mijn vrienden en familie om plastic afval te scheiden	1	2	3	4	5
De afgelopen maand heb ik in ieder geval een keer mijn plastic afval thuis gescheiden	1	2	3	4	5

De volgende vragen testen kennis over het scheiden van plastic. Geef voor elke stelling aan of je denkt dat deze waar of niet waar is. Als je echt geen idee hebt, kruis die optie dan aan.	Waar	Niet waar	Geen idee
Producten zoals frisdrankflesjes kunnen na grondige schoonmaak weer opnieuw worden gevuld			
Het plastic moet schoon zijn voordat ik het in de plastic afvalbak mag gooien			
Ongeveer een kwart van het plastic dat is ingezameld kan <i>niet</i> gerecycled worden			
Er zijn verschillende typen plastic en deze moeten eerst in een fabriek weer gescheiden worden voordat het gerecycled kan worden			
Grotere en dikkere soorten plastic, zoals speelgoed of tuinmeubelen, mogen ook bij het plastic afval			
Het grootste gedeelte van het plastic dat door consumenten bij het <i>restafval</i> wordt gegooid, wordt op een grote vuilnisberg gestort			
Niet elk type plastic kan worden gerecycled			
Verpakkingen die nog deels vol zijn mogen ook bij het plastic afval			
Door het recyclen van plastic wordt minder CO <sub>2</sub> uitgestoten			
Van gerecycled plastic kunnen fleecetruien gemaakt worden			

Kan je aangeven welke situatie qua plastic scheiden bij jou in de buurt van toepassing is?	Kruis aan welke situatie voor jou van toepassing is
De gemeente heeft mij de mogelijkheid gegeven om een extra kliko voor plastic afval te ontvangen en zij komen deze eens in de zoveel tijd legen	<input type="checkbox"/> Ga nu naar vraag A & B
In mijn buurt kan ik mijn plastic afval (alleen) kwijt in centrale containers	<input type="checkbox"/> Ga nu naar vraag C t/m E
Anders, namelijk:	<input type="checkbox"/> Einde vragenlijst

Geef voor de laatste stellingen aan in hoeverre je met deze stelling eens of oneens bent	Oneens      Eens				
	←-----→				
A. Ik heb niet genoeg ruimte bij mijn huis om de kliko voor plastic afval die ik van mijn gemeente kon krijgen neer te zetten	1	2	3	4	5
B. De extra kliko voor het plastic afval tast de esthetische waarde van mijn tuin aan	1	2	3	4	5
C. De container waar ik mijn plastic afval naar toe moet brengen is redelijk ver (bijvoorbeeld meer dan 300 meter)	1	2	3	4	5
D. Ik kom minstens elke week wel langs de container voor plastic afval (bijvoorbeeld onderweg naar school, werk, of boodschappen)	1	2	3	4	5
E. Voor het wegbrengen van mijn plastic afval heb ik een auto nodig (bijvoorbeeld omdat het een groot volume heeft)	1	2	3	4	5

**Bedankt voor het invullen van de vragenlijst!**