

WHY WOULD YOU LITTER?

What behavior causes littering in nature reserves and what can be done about it according to rangers



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PREFACE

Dear reader,

You are about to read my master thesis that I wrote to complete the master Environment & Society Studies at Radboud University and obtain my master's degree. The process of writing this thesis started over a year ago when I started thinking about an interesting topic to write about. Littering is something that really bothers me personally, and it is a problem that keeps me wondering: why is this such a problem in society? I mean, how hard can it be to just throw your waste in a bin? In other words: *why would you litter?* Therefore, this seemed like a good topic for me to immerse myself in for the next year. And although it could be stressful at times, I enjoyed learning more about the subject of littering and I am proud of the end result.

There are a few people I want to give a special thanks to. Firstly, I want to thank my thesis supervisor Simone Haarbosch for all her advice, time, and support throughout the entire process. Furthermore, I would like to thank all of the rangers and IVN for the insightful interviews. It was interesting to hear about your experiences and thoughts on the littering issue. And last but certainly not least, I want to thank Esther for giving me the idea for this topic. It has been an adventure from that moment to the completion of this thesis, and I am so grateful for it.

My hope is that this thesis challenges you to think about littering and that it further spreads awareness about the issue. It is something that should not be ignored and definitely not accepted.

Julia Kusters

Best, 19th of December 2022

SUMMARY

Present day, new products are produced and bought constantly, and also easily and constantly thrown away (RamHormozi, 2019). A problem that arises from the increasing amounts of waste is the rise of littering, which remains a problem around the globe (Almosa, Parkinson, & Rundle-Thiele, 2017). It is estimated that between 35 to 140 million kilos of litter per year ends up on the streets or in nature in The Netherlands (Milieu Centraal, n.d.). The problem of littering has various consequences for humans, animals, and the environment. Nature areas are particularly vulnerable to this, as the environment is often already fragile, which means litter can seriously endanger nature in these areas (Brown et al., 2010). In The Netherlands, tourism in nature has increased due to the COVID-19 pandemic, which resulted in many people visiting nature reserves and getting beverages and snacks on the go since restaurants were closed (NOS, 2021). Consequently, 50% more litter was reported to end up in nature in 2020 compared to before the COVID-19 crisis. Besides this, waste dumping also increased due to the COVID-19 pandemic, due to the fact that people were forced to stay home and took the time to renovate their homes or work in their gardens, resulting in busy recycling points and people deciding to dump their waste in nature (RTL Nieuws, 2020).

Existing studies on the topic of littering and tourism are often only focused on beach tourism, or one aspect of littering, such as the use of persuasive messages (Hu, Zhang, Chu, Yang, & Yu (2018). Furthermore, existing studies often only take into account the perspective of visitors that cause litter, which may lead to biases as it is the visitors' perspective of their own behavior. This research will contribute to the existing knowledge by focusing on what behavior causes visitors to litter and what measures can be taken from the perspective of rangers, which has not been done before. In addition, this research includes protected areas in The Netherlands which have not been studied yet from the perspective of rangers. Besides this, the research will address littering behavior as a whole, not only one aspect of littering. This research can be relevant for nature reserves in The Netherlands and organizations in other countries with similar nature reserves, as it clarifies the reason behind littering behavior, which helps to find suitable measures to combat littering.

The aim of this research reads as follows: *to assess the perspective of rangers on what behavior causes visitors of nature reserves to litter, and what measures regarding littering could be suitable to solve this issue.* To achieve the aim of this research, the following main research question was drafted: *what behavior causes visitors to litter and what measures can be taken to change visitors' behavior to reduce littering from the perspective of rangers in nature reserves in The Netherlands?*

For this research, two theories are used to explain the causes of behavior and to identify the used policy instruments. The Theory of Planned Behavior (TPB) is used to explain human behavior by taking into account the intention behind people's decisions (Ajzen, 1991). According to the theory, there are three types of cognitive structures that affect the behavioral intention, and thus the final behavior: the attitude towards the behavior, the subjective norm, and the perceived behavioral control (Ajzen, 1991). To combat societal problems, such as littering, it is often necessary to change behavior (Tummers, 2019). Therefore, Tummers (2019) distinguishes four policy instruments that can be used to change behavior: the carrot (incentives), whip (mandates and bans), sermon (information campaigns), and nudge (choice architecture).

This research uses qualitative research methods since the focus lies on the perspective of rangers and their personal experiences and understanding of the problem. A policy document analysis was used to gain insight into what measures can be used to combat littering in nature reserves in The Netherlands in general, to complement the perspectives of the rangers. Furthermore, ten semi-structured interviews were conducted with rangers from Staatsbosbeheer and Natuurmonumenten from different nature reserves all across The Netherlands. Besides this, two semi-structured interviews were conducted with employees from the nature education organization IVN for verification of the results and to gain another perspective on the littering issue.

The results show that the three cognitive structures all play a role in littering behavior. The attitude towards the behavior causes littering behavior in different ways, depending on the type of littering (recreational litter or waste dumping) and the age group, as younger people are more likely to litter in the case of recreational litter, but adults are the main cause of waste dumping. Of the four policy instruments, three are considered to be the most effective to influence the attitude towards the behavior: the nudge, sermon, and whip (for waste dumping).

The subjective norm causes littering behavior in three ways. Firstly, social norms differ between age groups, as littering is more likely to be seen as acceptable among youths, while it is a no-go for older people. As a result, youths are more hesitant to confront each other about littering than older people. Secondly, locals in small villages have created a habit of dumping their waste in the surrounding nature and have developed the social norm not to tell on each other, which encourages littering behavior. Thirdly, the social norm can be influenced by the connection people have with nature (e.g. visitors with a connection to nature that often visit are less likely to litter than occasional visitors). The policy instrument that is effective for this cognitive structure is the sermon.

The perceived behavioral control can lead to littering behavior through opportunities (the opportunities people have to discard their waste properly), resources (money), and knowledge (knowledge about how waste is supposed to be discarded). For example, littering behavior can be encouraged when there is a lack of bins (opportunities), when people cannot afford to bring waste to a recycling point (resources), or when people mindlessly dump garden waste without knowing the consequences (knowledge). The suitable policy instruments for the perceived behavioral control are the nudge, sermon, and carrot.

Points of improvement for this research are the extension of the TPB with socio-environmental factors, using a larger number of research methods, and increasing the amount of data. A Topic for future research could be the litter in rivers, as this is also a problem for nature reserves near rivers as it lingers on the shores of nature reserves and the sources of this litter are hard to determine as it can come from everywhere. Furthermore, future research could focus on the role of the government in the littering problem in nature reserves, as rangers want more action from the government since the responsibility currently falls upon the nature reserves themselves. In addition, future research could investigate how to include all age groups in nature education, since, for example, children are easy to reach with education, while teenagers are hard to reach even though they are the group that is often responsible for littering.

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List of abbreviations

TPB	Theory of Planned Behavior
TRA	Theory of Reasoned Action
BCW	Behavioral Change Wheel
EU	European Union
NVRD	Vereniging voor afval- en reinigingsmanagement

1. INTRODUCTION

1.1 Background

Consumerism is embedded in our society. It encourages people to purchase increasing amounts of goods and services beyond the basic needs (RamHormozi, 2019). According to the ideology of consumerism, it is considered good for people to spend money on goods and services since it stimulates economic growth and prosperity (RamHormozi, 2019). Although consumerism has been practiced in societies since ancient civilizations, it gained more attention in the eighteenth and nineteenth centuries, during and after the Industrial Revolution, when an increasing amount of goods was available in Europe and the United States of America (RamHormozi, 2019). This means that in the present day, new products are produced and bought constantly, especially in the western world (RamHormozi, 2019). However, this also means that products are easily and constantly thrown away.

To illustrate, in The Netherlands 9,1 billion kilograms of household waste was collected in 2020, while this was 8,5 billion kilograms in 2019. This means that there has been a rise of 6,8% in one year; the biggest raise since 1997 (CBS, 2021). A problem that arises from increasing amounts of waste is the one of littering, which remains an issue all around the globe (Almosa, Parkinson, & Rundle-Thiele, 2017). According to Schutz et al. (2013), litter can be defined as any piece of waste that is inappropriately placed. Littering can range from abandoned car wracks, to chemical waste or single-use plastics, such as bottles or food packaging and everything in between. According to Sibley & Liu (2003), two types of littering can be distinguished: active and passive littering. Active littering refers to deliberately throwing away litter when, for example, walking, while passive littering refers to accidentally abandoning or losing litter when moving elsewhere, which can be more difficult to change than active littering (Rangoni & Jager, 2017). It is estimated that between 35 to 140 million kilos of litter per year ends up on the streets or in nature in The Netherlands, which can eventually end up in the sea due to the wind or via rivers, therefore worsening the plastic soup (Milieu Centraal, n.d.).

The problem of littering has various consequences for humans, animals, and the environment. To begin with, litter is aesthetically unattractive and can cause nuisance, therefore reducing the appeal of public places, such as parks or beaches (Muñoz-Cadena, Lina-Manjarrez, Estrada-Izquierdo, & Ramón-Gallegos, 2012). Furthermore, litter can cause health hazards, for example due to pollution or physical injuries (e.g. due to broken glass) (Muñoz-Cadena et al., 2012). Besides this, tackling the litter problem leads to high costs. To illustrate, the approach to reduce littering in The Netherlands, which includes creating policy, prevention methods, monitoring, cleaning, and processing of waste cost the Dutch government 193 million Euros (Rijkswaterstaat, 2020). Moreover, litter can block drainage systems, which may cause higher risks of flooding (Almosa et al., 2017). In addition, littering can also impact the environment. Littering can endanger and kill wildlife since animals can get entangled in litter and litter can enter the food chain (Almosa et al., 2017). For example, an animal shelter in The Netherlands received a hedgehog that was injured because the plastic ring of a milk container surrounded its entire body (RTL Nieuws, 2019). Furthermore, littering can cause pollution of nature and degradation of the water quality due to the fact that plastic disintegrates into tiny particles called microplastics (Almosa et al., 2017; Natuurmonumenten, 2021). These microplastics never decompose fully and cannot be removed from

the environment due to their small size, and can be especially harmful for animals and humans since they can be ingested and spread throughout the body (Plastic Soup Foundation, n.d.).

Now that the effects of littering have become clear, this thesis will zoom in on one of the more recently popular causes of littering; namely the increase of visitors in nature. Over the years, the amount of tourists visiting natural protected areas has increased globally, which can increase the pressure on the environment (Brown, Ham, & Hughes, 2010). In these protected areas, the environment is often fragile, which means litter can seriously endanger nature in these areas (Brown et al., 2010).

In The Netherlands, tourism in protected areas has especially increased due to the COVID-19 crisis and lockdowns, which resulted in many people visiting natural protected areas to go hiking in nature nearby their living environments (NOS, 2021). Since restaurants and cafés were closed, beverages and snacks were often offered on the go, which according to foresters resulted in an increase of litter, often in the form of cups and bottles (NOS, 2021). The litter ends up in nature, because of overflowing bins or visitors simply not cleaning up after themselves. In 2020, about 50% more litter was reported to end up in nature than before the COVID-19 crisis (NOS, 2021). Due to the great amount of litter, foresters have to clean up litter daily, which can be a time-consuming job (Natuurmonumenten, 2021).

Besides littering due to visitors, dumping bulky waste is also an issue in nature reserves. In the case of this type of waste, people come to nature reserves deliberately to dump waste such as garden and renovation waste, refrigerators, and bicycles (Van Raffe & De Boer, 2007). Illegal waste dumping is seen as a considerable problem according to managers of nature reserves since the waste can be dangerous for humans and the environment (Van Raffe & De Boer, 2007). Moreover, it can be expensive and time-consuming to clean up the waste (Van Raffe & De Boer, 2007). Similarly to the increasing amount of littering by visitors due to COVID-19, the amount of waste that was being dumped also increased (RTL Nieuws, 2020). This was mainly due to the fact that people were forced to stay at home and had time to renovate their homes or work in their gardens, resulting in busy recycling points and people deciding to dump their waste in nature (RTL Nieuws, 2020). Therefore, this thesis delves into the causes of littering behavior and what measures could be taken to reduce littering in nature reserves, from the perspective of rangers.

1.2 Scientific and societal relevance

1.2.1 Scientific relevance

Since littering has negative socio-economic and environmental impacts, it is a topic that is much discussed in the literature. However, the existing literature that is focused on the relationship between tourism and littering is often focused on beach tourism (e.g. Garcés-Ordóñez, Espinosa Díaz, Pereira Cardoso, & Costa Muniz, 2020; Mestanza et al., 2019;) and the marine environment (plastic soup) (e.g. Grelaud & Ziveri, 2020; Abelouah, Ben-Haddad, Alla, Rangel-Buitrago, 2021). Besides this, there are studies that discuss the behavioral aspect of littering in the context of beach tourism (e.g. Beeharry, Bekaroo, Phillips, & Jory, 2017; Portman, & Behar, 2020; Panwanitdumrong, & Chen, 2021). Additionally, there are studies that focus on protected areas on land. For example, Rodríguez-Rodríguez (2012) investigated the types of litter found in 10 national parks in the Autonomous Region of Madrid, and if strict visitor management measures could reduce litter in these zones. Furthermore, Brown et al. (2010) used the Theory of Planned Behavior (TPB) and the elaboration likelihood model of persuasion to evaluate persuasive messages and their impact on visitors'

attitudes, beliefs, and behavior in Mt Field National Park, Tasmania, Australia. Besides this, Hu, Zhang, Chu, Yang, & Yu (2018) used the TPB to explain tourists' behavior with regard to bringing self-generated litter down the mountain in Huangshan National Park in China.

All of this indicates that there is a limited amount of literature on the relationship between tourism and littering, specifically in the context of tourism and littering on land as most studies are focused on beach tourism and the marine environment. However, there are a few studies that address littering in protected areas and use the Theory of Planned Behavior, but these only focus on one specific aspect such as persuasive messages and behavior (Brown et al., 2010) or tourists taking self-generated litter with them (Hu et al., 2018). Furthermore, studies on litter and tourism are often focused on the perspectives of visitors and use surveys as a research method (Hu et al., 2018; Garcés-Ordóñez et al., 2020; Beeharry et al., 2017; Panwanitdumrong, & Chen, 2021). This indicates that the littering problem is often studied from one perspective, which is also the perspective of the group (visitors) that causes the littering, which may lead to biases as it is the visitor's perspective of their own behavior. Therefore, it is necessary to include other perspectives, which in this research will be the perspective of rangers, since they are experts and observants of their protected area, which may lead to having a different view of littering behavior and suitable measures.

The research will contribute to existing knowledge in three different ways. To begin with, this research will focus on what behavior causes visitors to litter and what measures can be taken from the perspective of rangers, which has not been done before. Furthermore, this research includes protected areas in The Netherlands, which have not been studied yet from the perspectives of rangers. Besides this, the research will address littering behavior in protected areas as a whole, not only one aspect such as self-generated litter (Hu et al., 2018).

1.2.2 Societal relevance

To begin with, this research can be relevant for nature organizations in The Netherlands and other countries with similar natural environments, such as Natuurmonumenten and Staatsbosbeheer, since the research is focused on nature reserves in The Netherlands. More specifically, this study included ten cases from both Staatsbosbeheer and Natuurmonumenten. This research clarifies the reasons for littering behavior among visitors, which helps to find suitable measures to combat littering. This contributes to less litter in the natural areas and is beneficial for the organizations and their employees (e.g. rangers), as cleaning up litter can be both time-consuming and expensive, especially with regards to chemical waste.

Furthermore, this research identifies and discusses various policy instruments that can be used to combat the litter problem, where other studies focus on the experiences of visitors or policymakers and politicians, this study captured the point of view of various rangers who have experienced the problem and existing (governmental) documents that describe different measures. Therefore, this research can contribute to finding suitable measures for littering, and decreasing the amount of litter from an empirical perspective.

1.3 Research aim and question

This research is focused on the behavior behind littering and what can be done to combat littering in nature from the perspective of rangers. Therefore, the aim of this research is to assess the perspective of rangers on what behavior causes visitors of nature reserves to litter, and what measures regarding littering could be suitable to solve the issue.

To achieve the aim of this research, the following main research question was drafted:

What behavior causes visitors to litter and what measures can be taken to change visitors' behavior to reduce littering from the perspective of rangers in nature reserves in The Netherlands?

To answer the main research question, the following four sub-questions are formulated:

1. What behavior causes visitors to litter from the perspective of rangers in nature reserves in The Netherlands?
2. What trends in littering behavior can be identified by rangers?
3. What are the experiences from rangers with current instruments that have been used to reduce littering in the past and present?
4. What would be (in)effective instruments to solve littering from the perspective of rangers to reduce littering in the future?

1.4 Terminology

Before delving further into this research, three frequently used terms in this research are defined. The particular definitions were chosen because of their suitability in the context of this research.

The term litter in this research is defined as the following: any piece of waste that is inappropriately placed (Schutz et al., 2013). Furthermore, the term waste can be defined as "material that is left over or unwanted after something has been made, done, used, etc." (Britannica, n.d.). Besides this, waste dumping refers to the unattended and illegal abandonment of waste. This can range from drug waste to bulky waste. Dumping of waste can take place in various places, such as industrial sites, surface water, or nature reserves (informatiepunt leefomgeving, n.d.).

1.5 Thesis outline

In Chapter 2, the theoretical framework for this research is explained, which consists of the Theory of Planned behavior (TPB), the policy instruments for behavioral change, and the conceptual model that is used for this research. This will give insight into the causes of behavior and what policy instruments can be used to achieve behavioral change, which will help answer sub-questions 1, 2, and 3 and ultimately the main research question. Chapter 3 discusses the research strategy and the qualitative methods that are used in this research: the semi-structured interview and policy document analysis which offered insight into the experiences of rangers and used policy instruments. In Chapter 4, the results are given. First, 4.1 discusses the causes of littering behavior, 4.2 delves into the littering trends, and 4.3 discusses the experiences of rangers with policy instruments and results of the policy document analysis. After this, the sub-questions and main research question are answered in chapter 5. Lastly, chapter 6 discusses the reliability and validity, the limitations and improvement of this research, and the recommendations for future research.

2. THEORETICAL FRAMEWORK

This chapter discusses the theoretical framework that is used in this thesis. The chapter starts by giving the background and explanation of the Theory of Planned Behavior (Ajzen, 1991). After this, the background and explanation are given for the four policy instruments for behavioral change by Tummers (2019). Lastly, the conceptual model that is used for this research is explained.

2.1 Theory of Planned Behavior

2.1.1 Background

In theories before the Theory of Planned Behavior, the focus often lay on the influence of the general attitudes of humans on behavior (Ajzen, 1991). In this context, general attitudes refer to attitudes that relate to only one single element of a certain behavior (Ajzen & Fishbein, 1977; Kroesen & Chorus, 2018). For example, the attitude towards littering as a whole, instead of elements of littering such as the attitudes towards waste dumping. Therefore, these theories failed to predict specific behaviors, which led to calls to abandon the attitudes concept (Ajzen, 1991; Wicker, 1969). Besides this, general personality traits were used to predict behavior in specific contexts, which also did not work to predict behavior correctly (Ajzen, 1991). To solve this issue, it was proposed to aggregate specific behaviors across situations, assuming that behavior is not only influenced by a general disposition, but is also influenced by numerous other factors which are specific to a certain situation (Ajzen, 1991). For example, littering behavior in nature reserves might vary between locations (e.g. near a bin or far away from a bin). Through observing behavior on different occasions and situations, other sources that influence behavior cancel each other out, resulting in a more valid measure of behavior (Ajzen, 1991).

Nevertheless, aggregation still does not predict a specific behavior in a certain situation, nor explain behavioral variability in different situations. Therefore, the Theory of Planned Behavior was designed, which seeks to ‘predict and explain human behavior in specific contexts’ (Ajzen, 1991, p.181). The TPB is an extension of the Theory of Reasoned Action (TRA), which was introduced in 1967 and only included the attitude towards the behavior and the subjective norm as cognitive structures (Fishbein, 2008; Niaura, 2013). The TRA assumes that each individual can independently decide if he or she can perform a certain behavior (Gamel, Bauer, Decker & Menrad, 2022). However, the reality is that in some instances, behavior can be restricted by a lack of resources, opportunities, knowledge, skills or abilities (Gamel et al., 2022). Therefore, a third cognitive structure, the perceived behavior control was added.

Through the years, the TPB has been used in various ways, and remains one of the most used theoretical frameworks for studying individual behaviors (Yuriev, Dahmen, Paillé, Boiral & Guillaumie, 2020). The Theory has been used in research with varying subjects, from the investigation of factors that influence the purchase intention of German flower buyers in relation to fairtrade-cut roses (Berki-Kiss, Menrad, 2022), to exploring beliefs that underpin drivers’ intentions to comply with speed limits (Elliot, Armitage, & Baughan, 2005). Besides this, the TPB has been used to gain an understanding of environmental behavior. For example, De Leeuw, Valois, Ajzen, & Schmidt (2015) studies eco-friendly behavior among high schools students, and Liobikienė, Dagiliūtė, & Juknys (2021) uses the TPB to analyze the intention behind using renewable energy. Furthermore, there are studies that use the TPB in the case of waste recycling and waste sorting (Echegaray & Hansstein, 2017;

Wang, Wang, Yang, Li, & Zhou, 2020). In addition, the TPB has been used in the context of littering behavior (Hu et al., 2018; Singh & Kaur, 2020; Brown et al., 2010).

Besides the TPB, a theoretical framework called the Behavioral Change Wheel (BCW) was considered for this thesis. The theory combines the COM-B system, which is a framework to understand behavior and links behavior with intervention functions and policy categories (Michie, Van Stralen, & West, 2011). The theory aims to easily characterize interventions and policies to change behavior (Michie et al., 2011). Therefore, the theory focuses more on interventions and policies, and less on behavior. The COM-B system is also less elaborate than the TPB, as it only includes capability, motivation and opportunity as variables that determine behavior, while the TPB also includes beliefs and norms. Furthermore, the BCW addresses the role of impulsivity, habits, self-control, associative learning and emotional processing, which are not addressed in the TPB (Michie et al., 2011). Since this research is focused on the behavior, and beliefs and norms are of importance in littering behavior, the TPB is a better fit for this research than the BCW.

2.1.2 Explanation of the theory of planned behavior

The theory of planned behavior is a theory that explains human behavior, by taking into account the intention behind people's decisions (Ajzen, 1991). According to the theory, there are three types of cognitive structures that affect the behavioral intention: the attitude towards the behavior, the subjective norm, and the perceived behavioral control. In turn, the behavioral intention determines the final behavior (Ajzen, 1991). Figure 1 displays the model of the TPB.

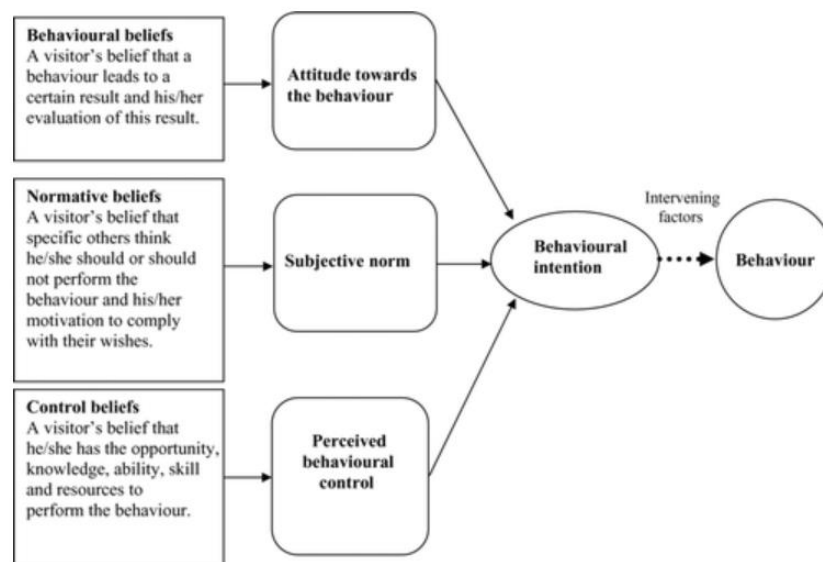


Figure 1: the Theory of Planned Behavior (Brown et al., 2010)

In the model, *behavioral beliefs* refer to what people believe to be the result of a certain behavior, and the evaluation of a certain result (Brown et al., 2010). These behavioral beliefs influence the *attitude towards the behavior*, which entails whether people have a positive or negative stance about a certain behavior (Niaura, 2013). Furthermore, *normative beliefs* are people's beliefs about how they ought to behave according to other people, and the motivation to abide to those norms

(Brown et al., 2010). The normative beliefs affect the *subjective norm*, which refers to people's perception of the social pressure with regard to the behavior (Niaura, 2013). Besides this, there are *control beliefs*, which entail the degree to which people have the knowledge, opportunity, ability, skill and resources to perform a certain behavior (Brown et al., 2010). These control beliefs determine the *perceived behavioural control*, which refers to people's perception of how easy or difficult it is to perform a certain behavior (Niaura, 2013). The cognitive structure that is most (or least) involved in a specific behavioral decision is dependent on the case and population that is being studied (Brown et al., 2010).

The three cognitive structures determine the *behavioural intention* of people, which refers to how much willingness and the readiness of people to perform a certain behavior (Hu, Tang, Qian, Sun & Zhou, 2021). If the behavioral intention of a person is high, it is more likely that the person will perform the behavior (Hu et al., 2021). The behavioural intention leads to the final *behaviour*.

In this thesis, the TPB is used to gain insight into what cognitive structures determine littering behavior in nature reserves in The Netherlands. This research investigates what the behavioral beliefs, normative beliefs, and control beliefs are behind the three cognitive structures, and how they determine the final littering behavior. The theory will be used in an inductive way, meaning that in the analysis, the reasoning goes from the specific observations of littering behavior to general conclusions (Vennix, 2016).

2.2 Interventions for behavioral change

2.2.1 Background

To achieve behavioral change, governments can use various types of policy instruments (Migchelbrink & Raymaekers, 2022). In policy research and practice, there are three classic instruments: the carrot, whip, sermon and nudge (Migchelbrink & Raymaekers, 2022; Tummers, 2019). However, recently a fourth policy instrument has been added to the three classic ones: the nudge (Migchelbrink & Raymaekers, 2022; Tummers, 2019).

The four policy instruments have been used in a number of studies, although the model has not been used in the context of littering in nature reserves prior to this thesis. For example, Raymaekers (2020) used the model in researching the use of nudging and behavioral insights in COVID-19 measures. Furthermore, Andersson & Almqvist (2022) investigate the attitudes of the Swedish general public to the four policy tools.

2.2.2 Explanation of the four policy instruments for behavioral change

To combat societal problems, it is often necessary to change behavior (Tummers, 2019). For example, if the amount of litter needs to be reduced, people need to be stimulated to dispose of their waste in an appropriate place. To change behavior, there are various policy instruments that can be used such as financial incentives, bans and mandates, information campaigns and nudges (Tummers, 2019). However, according to Tummers (2019) it should be noted that support for a certain policy is needed, as a lack of support can backfire and lead to a reduced effectiveness.

Tummers (2019) distinguishes four different instruments that can be used to change behavior: the carrot, whip, sermon, and nudge. The first instrument is called the carrot, which refers to changing behavior by incentives. To illustrate, a study by Hermawan (2019) found that market-based incentives through deposit systems for beverage containers were effective in reducing waste. However, economic incentives may have very little to no effect when they are too small.

Furthermore, the second instrument is the whip, which includes mandates and bans. An example of this in the context of littering is the ban introduced in July 2021 on certain single-use plastics in the European Union (EU) (European Commission, n.d.). In addition, the third instrument is the sermon, which seeks to educate people about a certain topic, for example through information campaigns. An example of such a campaign is ‘Nederland Schoon’ which is a cooperation of the ANWB and the Vereniging voor afval- en reinigingsmanagement (NVRD) and seeks to reduce littering (Milieu Centraal, n.d.). The carrot, whip, and sermon are all based on the notion of rational decision-making, which can be an issue since people do not make thoroughly rational decisions. Therefore, the fourth instrument of nudging was developed. A nudge refers to changing behavior “without prohibiting options or significantly changing its costs” (Tummers, 2019, p. 926). This can be done by emphasizing social norms, as this can change behavior. An example of a nudge regarding littering is the city of Copenhagen, where, as an experiment, green footprints were drawn on the ground that led to bins, which resulted in 46% less litter (iNudgeyou, 2012). Figure 2 gives an overview of the four policy instruments.

	1. Carrot	2. Whip	3. Sermon	4. Nudge
Change via	Incentives	Mandates and bans	Information campaigns	Choice architecture
Slogan	Reward desired behavior!	Make unwanted behavior illegal!	Tell what desired behavior is!	Make desired behavior easy!
Example	Subsidize electric cars.	Prohibit possession of weapons.	Communication campaign for smoking cessation	Change default so people automatically save for retirement.

Figure 2: the four policy instruments for behavioral change (Tummers, 2019)

In this thesis, the model of Tummers (2019) is used to analyze the different measures that are taken to combat littering behavior in nature reserves in The Netherlands. The measures are linked to the four policy instruments, to gain a clear understanding of what types of policy instruments are used, in what ways they are used and what type of behavior they can change. This theory will be used in a deductive way, which means that the reason goes from the general policy instruments to the specific observations in the case of littering (Vennix, 2016).

2.3 Conceptual model

In figure 3, the conceptual modal that is used for this research is shown. In the model, the theory of planned behavior (Brown et al., 2010) and the four policy instruments (Tummers, 2019) are combined into one model to explain the relationship between human behavior and the policy instruments. Therefore, the model can help to answer the main research question and research aim about the causes of littering behavior and the suitable policy instruments to achieve behavioral change. This combination of theories was specifically drafted for this research and has not been used by other previous studies.

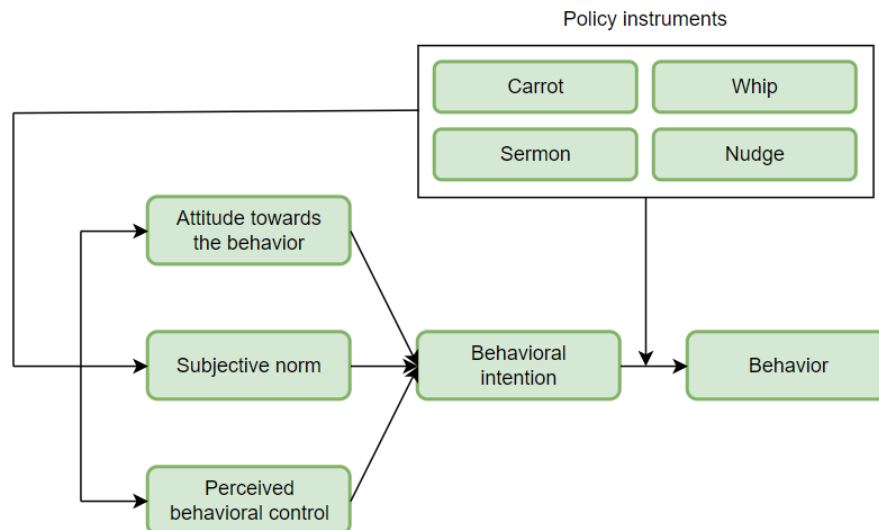


Figure 3: conceptual model

The model shows that the *attitude towards the behavior* affects the *behavioral intention*. For example, when someone takes a negative stance towards littering and disapproves of it, he or she has the willingness to not litter (behavioral intention to not litter). Furthermore, the *subjective norm* influences the *behavioral intention*. This means that when, for instance, someone experiences the social pressure to not litter, he or she might have the intention to not litter. Besides this, the *perceived behavioral control* affects the *behavioral intention*. For example, when someone perceives it as easy to dump waste, he or she could be more willing to litter (behavioral intention). In turn, the *behavioral intention* determines the final *behavior*.

In addition, the four policy instruments the *carrot*, *whip*, *sermon*, and *nudge* can influence all three cognitive structures: the *attitude towards the behavior*, the *subjective norm*, and the *perceived behavioral control*. For example in the case of the sermon, education about littering might be able to change whether people think of littering as positive or negative (attitude towards the behavior), or can inform people of the desired norm (subjective norm). Additionally, education on how waste is ought to be disposed of can change the perceived behavioral control. Moreover, the four policy instruments can influence behavior after the behavioral intention has already been formed, thus influencing the relation between the *behavioral intention* and the final *behavior*.

3. METHODOLOGY

In this chapter, the methodology of this research is discussed. The chapter begins by explaining the research strategy, after which the two research methods that are used for this research are explained: policy document analysis and interviews.

3.1 Research strategy

The research strategy is of great importance when designing a research, as it entails all of the coherent decisions that are made regarding the execution of the research, with the purpose of gaining relevant information and formulating valid answers to the research questions (Verschuren & Doorewaard, 2007). According to Verschuren & Doorewaard (2007), there are three core decisions that have to be taken into account when deciding on the research strategy, (1) whether the research is broad or profound, (2) whether the research takes a quantitative or qualitative approach, and (3) whether the research uses newly collected or/and existing information.

The first core decision that has to be made is if the research is taking a broad or profound approach. In the case of a broad approach, the research is done on a larger scale (e.g. throughout a longer amount of time) and in the case of a profound approach, the phenomenon is studied in a certain time and from different aspects. This research takes a profound approach, as the phenomenon of littering in nature reserves is studied in one moment in time and at a small scale as only ten nature reserves in The Netherlands are included. Furthermore, littering in these nature reserves are studied more in depth by conducting interviews and focusing on the personal experiences and perceptions of rangers. The second core decision is whether the research takes a quantitative or qualitative approach. A quantitative approach emphasizes objective measurements and capture results in numbers, tables and graphs, and focusses on generalizing this data across groups of people (Babbie, 2010; Verschuren & Doorewaard, 2007; Muijs, 2010). A qualitative approach is interpretive and focused on the meanings and perspectives participants have on a certain topic (Verschuren & Doorewaard, 2007; Creswell, 2009). This research takes a qualitative approach as it focusses on the perspective of rangers and their personal experiences and understanding of the littering problem. Therefore, a quantitative approach would not be fitting since it is objective and numerical while in this research the perspectives and personal meanings of rangers is investigated, which is subjective and cannot be expressed in numbers. The third and final core decision is if the research uses newly collected data (primary data) in the field or existing data (secondary data) to come to certain results and conclusions. The advantages of using new data is that it is specifically collected in real time for the research, and is thus more accurate than existing data that is collected for another research (Wagh, 2022). However, the process of using existing data is quicker and easier since the data is already collected. Therefore, it is also more economical than collecting new data (Wagh, 2022). This research uses newly collected data, as the specific data that is needed for this research does not yet exist and it is therefore necessary to collect new data.

These decisions determine which research methods are suitable to use for this research, which is further explained in the following paragraphs.

3.2 Policy document analysis

Desk research can be defined as a research strategy in which the researcher uses already existing information to gain new insights (Verschuren & Doorewaard, 2007). Verschuren & Doorewaard (2007) state that desk research can be characterized by three aspects. To begin with, desk research uses existing materials in combination with reflection on those existing materials. Furthermore, there is no direct communication with the research subject(s), and lastly the researcher uses the materials from a different perspective than intended originally at publication.

Desk research can be divided into two types, literature research and secondary research (Verschuren & Doorewaard, 2007). When using literature research, the focus is on existing specialist knowledge, while secondary research is more focused on existing empirical data, thus being often used in quantitative research. Due to the fact that the nature of this research is qualitative, it was chosen to do a literature research.

In this research, existing policy and working documents on measures to combat littering are analyzed to gain an understanding of the existing measures to combat littering behavior in nature reserves.

3.2.1 Data collection

Existing policy and working documents were used to gain more insight into what measures can be used to combat littering in nature reserves in general, instead of only focusing on what the (in)effective measures are from the perspective of rangers. During the search for policy documents, only three suitable ones were found. The policy documents from Rijkswaterstaat (2018) and SenterNovem (2009) are both governmental documents and were found through the website of Rijkswaterstaat. Both of the documents are focused on recreational littering and not on waste dumping. However regarding policies for waste dumping, only one suitable document with solutions could be found. Therefore, the research from Van Raffe & De Boer (2009) is used in this research to provide information on the possible measures for waste dumping. In Table 1, an overview of the used documents is shown.

POLICY DOCUMENT	SOURCE	TYPE OF DOCUMENT
Inspiratielijst maatregelen zwerfafval gedrag, participatie en beleving	Rijkswaterstaat (2018)	Policy document
Zwerfafval? Niet in mijn gebied: tips voor schone natuur en recreatie	SenterNovem (2009)	Policy document
Afvaldumping in de natuur: Een verkennend onderzoek naar de omvang en achtergronden van afvaldumping in de natuur en een inventarisatie van de mogelijke oplossingen	Van Raffe & De Boer (2009)	Research paper

Table 1: overview of used policy documents

3.2.2 Data analysis

To analyze the data, the relevant parts of the used documents were summarized, which can be found in appendix 1. After this, the summary was further analyzed in Atlas.ti by adding codes to the various solutions brought up in the documents to determine whether the solutions fall under the carrot,

whip, sermon, or nudge in the model of Tummers (2019). The used codes can be found in the codebook in appendix 5.

3.3 Interviews

The first research method that is used for this research is the interview. According to Patton (1980) and Vennix (2016), four types of interviews can be distinguished: the unstructured, semi-structured, semi-structured with a standard questionnaire, and structured interview.

In an unstructured interview, the questions are not defined beforehand, but are decided as the interview progresses (Vennix, 2016). This means that this type of interview is similar to a normal conversation and that the interviewee can elaborate on answers with interruptions from the interviewer being kept to a minimum (Alsaawi, 2014). Therefore, this type of interview is suitable for studies that focus in depth on a certain topic (Alsaawi, 2014). The unstructured interview is not used for this research, since the topics that have to be discussed in the interview are decided beforehand, and not during the interview.

The second type of interview is the semi-structured interview. In the case of this type of interview, an interview guide is drafted with topics that have to be discussed in the interview, but the order and formulation are decided by the interviewer (Vennix, 2016). Similar to this is the third type of interview: the semi-structured interview with a standard questionnaire. However, in this case the order and formulation of the questions is decided beforehand contrary to a semi-structured interview. Semi-structured interviews are fitting for studies where researchers have an overview of the studied topic so they can ask suitable questions and prefer to have in dept responses from interviewees (Alsaawi, 2014). This research uses a semi-structured interview, due to the fact that in the interviews the experiences of the interviewees are the focus and therefore in depth responses are important to understand the experiences fully. However, the topics and corresponding questions are decided beforehand, although on some occurrences the order or questions themselves were changed slightly or other questions were added during the interview.

The fourth type is a structured interview, where the formulation and the order of the questions is decided prior to the interview, as well as the answer categories, which are fixed (Vennix, 2016). Due to this, the structured interview is an effective way to keep the interview focused on the topic (Alsaawi, 2014). However, since the interview is structured, it limits the interviewees to elaborate on answers and the interviewer to interrupt or ask unscripted follow up questions (Alsaawi, 2014). Therefore, this type of interview is suitable for studies where researchers know precisely what information they are seeking (Alsaawi, 2014). This type of interview is not used for this research, since it limits the depth of responses from interviewees, which means it makes it harder to understand the actual experiences of the interviewees. Furthermore, it limits the interviewer from asking follow up questions, which can be pivotal to dive deeper into the experiences of interviewees.

3.3.1 Data collection

For this research, ten interviews were conducted with ten rangers from different nature reserves owned by Staatsbosbeheer and Natuurmonumenten throughout The Netherlands. Before the interviews were held, the concepts of the TPB and policy instruments were operationalized, which can be found in Appendix 2. After this, the interview guide was drafted based upon these variables so the interview guide is in line with the used theories. The interview guide used for the interviews with

the rangers can be found in Appendix 3. The interviews were held over a period of three months prior to writing the results. The rangers were found through the websites of Staatsbosbeheer and Natuurmonumenten and were selected at random, as there were not any requirements that had to be met by the rangers to be selected for the interview. In total 25 rangers were approached by email, from which 13 responded to the email and 10 were actually interviewed, which gives a response rate of 40%. The interviews were for the majority conducted online, but also face-to-face. This was due to the fact that some of the interviewees and nature reserves were further away with large travelling times. Therefore, by conducting interviews online, nature reserves all throughout The Netherlands could be included in the research. Rangers of nature reserves that were within a travelable distance were given the choice to have the interview either online or face-to-face.

It was chosen to interview ten rangers, since data saturation was achieved around this number and similar patterns could be seen in the collected data. Table 2 shows an overview of the characterizations of the interviewees. To protect the anonymity of the interviewees, they are given pseudonyms, which can be found in table 2. Furthermore, the table shows the included nature reserves, to which organization they belong, whether the interviewee is male/female, an indication of their age and their years of experience as a ranger.

PSEUDONYM	NATURE RESERVE	ORGANISATION	MALE/FEMALE	AGE (INDICATION)	YEARS OF EXPERIENCE AS RANGER
Ben	Horsterwold	Staatsbosbeheer	Male	50-60	39
Mark	Rijk van Nijmegen	Staatsbosbeheer	Male	30-40	7
James	Noord-Limburg	Staatsbosbeheer	Male	40-50	13
Michael	Biesbosch	Staatsbosbeheer	Male	40-50	20
John	Oostvaardersplassen	Staatsbosbeheer	Male	50-60	Unknown
Lucas	IJsselvallei	Staatsbosbeheer	Male	40-50	Unknown
Diana	Kop van Noord-Holland	Staatsbosbeheer	Female	30-40	2
Olivia	Vechtplassen	Natuurmonumenten	Female	40-50	Unknown
Sam	Kempen, Midden-Limburg, Zuid-Limburg	Natuurmonumenten	Male	50-60	1
Martin	Nationaal Park Weerribben-Wieden	Natuurmonumenten	Male	50-60	30

Table 2: overview characterizations of the interviewed rangers

Besides the ten rangers, two employees from the nature education organization IVN were interviewed. The two employees were approached by email after being recommended by some of the rangers as interviewees that could be interesting for this research. These interviews were conducted after the interviews with the rangers in the period September-November with the purpose of verifying the results of the initial interview with the rangers and giving an extra perspective on the littering issue. The interview guide used for the interviews with IVN can be found in Appendix 4. Table 3 shows an overview of the characteristics of the interviewees from IVN.

DEPARTMENT OF IVN	MALE/FEMALE	AGE (INDICATION)	YEARS OF EXPERIENCE AT IVN
Noord-Brabant	Male	60-70	9
Rijk van Nijmegen	Male	60-70	Unknown

Table 3: overview of characterizations of interviewees from IVN

3.3.2 Data analysis

The ten interviews with the rangers were recorded with consent of the rangers except for one, since there were technical difficulties and recording was not possible. Therefore, the important parts of the interview were summarized. The relevant parts of the recordings were transcribed, after which codes were attached to the corresponding sections in the transcripts in the programme ATLAS.ti. The codebook with the used codes can be found in appendix 5. Following the coding process, the most relevant quotes in regards to each of the research questions were used in the results (chapter 4).

The two interviews with IVN were also recorded with consent of the interviewees. However, both interviews were not transcribed due to the fact that the purpose of the interviews were verification and gaining an extra perspective, and thus were not directly of great importance for answering the research questions and achieving the aim of this research. Therefore, the interviews are not included in the analysis and results (chapter 4), but are mentioned in the discussion and reflection in chapter 6.3.

4. RESULTS

In this chapter, the results of this research are discussed. The chapter begins with the results of the interviews with the rangers regarding littering behavior, using the TPB by Brown et al. (2010). After that, the observed trends in littering behavior by rangers are discussed, after which results regarding the used and possible policy instruments are further explained.

4.1 Littering behavior

This paragraph discusses the results of the interviews regarding littering behavior as observed by the included rangers, following the three cognitive structures of the TPB (Brown et al., 2010).

4.1.1 Attitude towards the behavior

As shown in figure 1 in chapter 2, the attitude of the behavior is determined by behavioral beliefs, which in this research entails if people realize the consequences of their behavior and their evaluation of the performed behavior. The results of the interviews show that the attitude towards the behavior is mainly dependent on the social group and/or the type of litter. When analyzing the interviews, two types of litter could be distinguished: recreational litter, which includes waste such as plastic bottles, cups, chips bags, and fruit peels, and litter that is associated (illegal) dumping, such as renovation waste and drugs.

Recreational litter

Although recreational litter can be found anywhere in nature reserves, according to four rangers that were included in the research, recreational litter is mostly a problem in the busier areas of nature reserves where visitors come together and stay for a couple of hours, for example places with water and beaches such as the Stadswaard near Nijmegen, the Spiegelplas near Nederhorst Den Berg, and the Biesbosch, but also other places such as bird hides and fishing spots can be hotspots for litter. Ranger Mark from Rijk van Nijmegen explained that litter appears to be thrown away purposefully, even in the presence of waste bins or other resources where people can properly discard waste:

“There are bins [in the stadswaard], extra are placed at the entrance so there are various ways to ensure that people can dispose of their waste in a very easy way. However, this is not done. So I think that people, the people that do that apart from the people who drop something by accident which can happen, just do not see the urgency of taking their waste with them. Maybe it is nonchalance, indifference, maybe that it just does not interest them [...].” - Mark

He further noted that when visitors stay longer in a certain place (e.g. a few hours to picnic), they can become more careless and might have less attention concerning littering:

“Because you see that you have people that just sag, which people should be able to do, but at a certain moment the finesse disappears a little and then it [littering] can occur, than we have less attention for things like that.” - Mark

This indicates that in this case, people may realize the consequences of littering, but lose attention regarding how they should discard their waste. Since littering in these instances is often done purposefully, it can be said that people do in fact consciously evaluate their behavior and the results

of littering, but might not see their behavior as an issue for nature and the people around them, or know it is an issue, but simply do not care due to, for example, indifference or disinterest.

Furthermore, ranger Diana mentioned that when it comes to types of small and organic waste such as cigarettes, chewing gum, and fruit peels, people may be less aware of the consequences: *"[...] But that a lot of people do those sort of things without being aware of it. For example of how damaging cigarette butts, chewing gum, the peels of all of that fruit are [...]"* This indicates that visitors do not fully realize the consequences of these types of waste, and consequently evaluate this behavior as acceptable, since they believe it is not harmful to nature. In addition, she explained that some people place garbage bags beside bins because they think it will get cleaned up anyway, while this can lead to the spreading of waste due to the wind or animals:

"[...] But also for example if a bin is full, people place their waste next to it. Because they think, oh, it will get cleaned up, but often it ends up becoming litter because animals take it or the wind blows it away, so I think that it is often more accidental than that people do it on purpose." - Diana

This indicates that in the case of placing waste beside bins, similar to organic waste, visitors appear to be less aware of the consequences, which leads to these visitors evaluating their behavior as alright, and performing the behavior.

Moreover, three rangers explained how in modern society, some people tend to argue that it is not their job to clean up after themselves, since they believe other people can do that for them (e.g. the ranger). Ranger Sam mentioned in the interview: *"[...] also the argumentation of, also a bit of our society, someone else will clean it up, it is not my job."* He further said that some visitors reason that because they pay taxes, they have ownership of the nature reserves, and therefore can do whatever they desire. This indicates that in this instance, visitors may know the consequences of their littering behavior, but believe it is acceptable since others clean it up anyway.

Six rangers also could see a difference in littering behavior between young people (teenagers, young adults) and middle-aged and older people. Ranger Sam explained for example, that retirees who eat a snack while taking a bicycle tour do not litter often, while younger people who cycle by tend to throw away their waste in nature more frequently. He attributed this to their age, (brain) development, and upbringing:

"[...] what you of course see in large numbers are retirees who go on bicycle rides in groups etcetera, and bring some snacks, they do not throw things in nature quickly. You will see that quicker in the case with young people, partly because of their age and the development of their brain, you name it, but for a big part upbringing." - Sam

Additionally, ranger Martin explained that litter at certain cycle lanes between villages and schools is primarily caused by younger people. Besides this, ranger Michael mentioned that especially people between the ages of 15 and 35 tend to leave an overwhelmingly amount of waste at certain places, who come to visit nature reserves only for social purposes and not because they value nature:

"[...] that is something new we've seen in the Biesbosch in recent years, thousands of young people between the ages of 15 and 35 who just leave a massive amount of waste at the spots where they are. Even when there is a bin two meters away, it doesn't matter, and that are huge quantities, that's what we see." - Michael

This all indicates that regarding recreational litter, there appears to be a difference in awareness of the consequences of littering and the evaluation of littering behavior between older and younger people since older people are more likely to oversee the consequences and evaluate littering behavior as wrong, while younger people think less about the consequences and deem littering behavior as acceptable and thus are more likely to litter.

In the case of recreational waste, it is also important to note that people can also litter by accident, for example by losing litter while hiking or accidentally leaving it somewhere. This is contrary to dumping of waste, which is always done deliberately. Four rangers explained in the interview that the majority of people visiting nature reserves do not litter, are very aware of the problem and generally do not accept it. Ranger Diana mentioned: *"[...] and I think that in general littering isn't, that it is pretty unaccepted, many people find it weird when you throw something away."* In addition, two rangers mentioned when people that visit nature reserves because they enjoy and feel involved with nature, they are generally more aware of the consequences of littering and their behavior. Sam explained: *"Look because the people that are involved with nature, who go to nature because they like it, they think about it in general [...]"* This indicates that when visitors feel connected to nature in a certain place, they are less likely to engage in littering behavior.

Besides littering of recreational waste, the issue of waste dumping also came forward in the interviews and is discussed in the next section.

Dumping of waste

Five rangers mentioned in the interviews that dumping waste in nature reserves, such as renovation waste, garden waste, or drug waste is always done purposefully, as multiple rangers mentioned that people know they are not supposed to leave, for example, their renovation waste at a parking lot or demolish their house and dump it in the forest, hence this is why dumping often happens at quiet, remote places or at night (usually by adults). Ranger Martin mentioned in the interview:

"But what I encounter within the area is really just brought there by adults who put a lot of energy into coming there, because you have to load a boat with something and dump it somewhere in the reed land or forest [...]" - Martin

According to three rangers in the case of renovation and drug waste, people are mostly aware of the consequences of dumping waste and that it is illegal, especially regarding drug waste as it is chemical and can be very harmful for nature. For example, Mark mentioned in the interview about renovation waste: *"Because you know that you are not supposed to throw your waste from your attic, and you know that you shouldn't put your tiles... you know that. I do not believe that is done by accident."* This indicates that these people are aware of the consequences and know that it is bad behavior and evaluate their behavior as such, but people continue to dump it, showing a certain ignorance. Ranger Sam called littering behavior in the case of drug waste antisocial: *"The reason in regards to drug waste, is of course that it is just illegal waste that you cannot get rid of normally. But a lot of costs for waste collection and yes, it is just antisocial behavior."* This shows that similarly to renovation waste, people know the consequences and that it is illegal, but still continue to dump it anyway, even when the nature reserves have to pay for the high cleaning costs.

Ranger James further explained that society is becoming more individualistic and that some people only think about themselves and are not even susceptible when receiving a fine.

“[...] you’ve got people that do not care about anything no matter how good the story is, that live in their own world and it is me, me, me. And society changes more towards that direction, like it is we until it bothers us and then it is me. So those are people that are not susceptible for anything, even when it this their wallet [...].”

This indicates that this group of people is not concerned about the consequences of dumping and still evaluate dumping as acceptable to continue to do it, even when knowing it is illegal and risking getting a fine.

Contrary to renovation and drug waste, in the case of garden waste, four rangers mentioned that people (usually local residents) are not always aware of how garden waste affects nature, as it is also green and does not seem to be harmful. For example, Mark mentioned the following in the interview: *“[...] when you dump garden waste, we do often start the conversation with people, and it are often the locals that do that and you notice that some people are not aware of the consequences, because ‘it is green right?’”* And additionally: *“Only that’s got [garden waste], that’s got less indifference, of course it has that too, but I think that it is more ignorance or thinking that it is innocent, while it actually has an impact.”* This shows that they are not fully realizing the consequences, as a lack of knowledge plays a role in this (further discussed in chapter 4.1.3), which may lead to these people evaluating the result of their dumping garden waste as fine, while it actually can have damaging consequences for nature in the long term due to the introduction of alien species.

Now that the attitude towards the behavior is discussed in regards to both recreational waste and dumping of waste, the subjective norm will be further delved into in the next paragraph.

4.1.2 Subjective norm

The subjective norm is determined by normative beliefs (Figure 1, chapter 2), which include the opinions of others about in this case littering, and the motivation of people to comply with these social rules.

According to all ten of the rangers included in this research, normative beliefs play a role in littering behavior. On a positive note, two rangers explained in the interview that most people disapprove of littering, and therefore by not littering and showing how to keep nature clean, create the social norm. For example, Michael mentioned:

“[...] A big share of the people that visit the Biesbosch sometimes or on a regular basis to enjoy nature or the peace and to relax and meet each other, and their way of acting shows how an area is supposed to be treated: one cleans up waste and does not make a big fire, and does not put on loud music... in that way people make the norm, develop a norm together.” – Michael

This indicates that in this case, the opinion of others that littering is wrong and acting accordingly motivates people to keep nature clean and leads to the development of the social norm that littering is not acceptable. However, there are some groups that uphold different norms, which can lead to litter problems.

The rangers explained how the social norm depends, similarly to the attitude towards the behavior, on the age group. Five rangers mentioned that younger people do not confront each other

about littering easily, whereas older people tend to do this more often. According to Michael, it seems as if these young people uphold completely different norms regarding littering, and that talking to each other about it is unwarranted:

“At the same time you have that user group that consists of the youth that comes to the area purely for social contact and relaxation and uses the area as a decor and thus does not reason out of worth, but only look at can I meet my friends and girls, party, using drugs, etcetera. I don’t necessarily see a direct problem with that if it is contained within a certain range, but the big issue is that those guys have developed social norms in which they don’t confront each other, especially not regarding this. So what we see increasingly is, what we see after the weekend is a barbecue with leftover materials and meat, which is dangerous because animals eat it due to the smell, but at the same time there is soda and beer [...]” – Michael

This quote indicates that because this group uses nature for other purposes and gives it a different value than, for example, regular guests that visit to enjoy nature, they uphold different social norms, which include not confronting each other about littering behavior. This encourages littering behavior, since there are no consequences; no one will say something about it, anyway.

In addition to this, six rangers mentioned that people have become increasingly hesitant to confront other about their littering behavior since they are scared of a negative, even violent, reaction. Sam explained the following about it in the interview:

“Yes, I think that it is very personally and I think that today, people are also hesitant to confront each other, because before you know it, you’ll get a slap in the face. So yes, there are probably people that do that [confronting other on littering behavior], but I can imagine that they have one bad experience and quit.” – Sam

Furthermore, according to ranger Lucas, group size can also influence this, due to the fact that it is more intimidating to confront other people when being in a big group compared to a smaller group, as it creates the feeling that one is standing up alone against a big group of people. In the case of big groups, Lucas mentioned that it does not necessarily matter if concerns younger or older people, as it is never enjoyable to stand alone against a bigger group.

“Well, I think that the adults among each other dare to confront each other, but it also depends on the group, what the group looks like of course. When it is one on one or two they probably dare to say something, but I think that when the group is bigger and is making a mess or lighting a fire, they are more hesitant to say something about it of course. Whether it concerns youngsters or young adults or whatever does not really matter because, well, when you’re alone against a group, that’s not comfortable of course, I get that.” – Lucas

This indicates that the opinion of others can influence littering behavior, as it withholds people from confronting others about littering behavior, and thus consequently, encourage littering behavior.

However, the social control of locals can also work backward, as ranger Martin mentioned that in small towns with tight communities, locals have created a habit of dumping waste in certain places throughout history and have the mutual understanding not to tell on each other and confront each other: *“And regarding social control, in small villages they are, well, I don’t want to say isolated, but they’ve got such a small community that they also don’t tell on each other.”* This again shows the

influence of the opinions of, in this case the locals, who accept littering and do not confront each other about it, which can encourage littering behavior.

One ranger also noted that the degree of social control and the norm is dependent on the interest one has in a certain area. Mark mentioned in the interview: *“I also think it is very dependent on the interest one has. If you just come to recreate, then you feel less of a connection with the area. When you’ve got more of a connection with an area, you also feel the urgency to confront people quicker.”* For example, locals may get frustrated by the litter, and consequently, confront others about it quicker than day trippers, who only come to recreate and do not have a connection with the area. This indicates that the opinion of people with a connection to the area can motivate others to stop their littering behavior, and that people with a connection to an area are more motivated to not litter. He gave an example of the Bizonbaai in the Ooijpolder near Nijmegen, where a lot of regular bathing guests come who feel connected and responsible for the area, which displays the general opinion and leads to a higher social control. He further mentioned that these guests often collect litter and call Staatsbosbeheer to pick it up, which helps to show the desired social norms. In addition, he explained that in the Stadswaard, visitors are able to take bags to collect their waste in, which can help to display and encourage the social norms, as people tend to follow the set example and confront each other quicker. This again shows how the opinion (you should put your waste in a bag) can motivate people to throw away their waste properly.

Besides this, two rangers also said in the interview that litter attracts more litter. This means that when a place is already full of litter, it shows an opinion and encourages and motivates people to throw away their waste in nature as well. This also works the other way around: when a place is clean, it encourages people to keep it clean. Ranger Michael gave an example of this in the Biesbosch, where during the COVID-19 pandemic, employees of the Efteling theme park were deployed to help clean up litter and answer to visitors:

“People were picking up litter and noticed that after a few weeks they were approached more and more while walking, like ‘hey, great that you are doing this, now I get why it is so clean’, so people are... I think that in The Netherlands we accept a lot, it is like that in the whole world it is a problem that is hard to combat directly, but when we do something about it, there are a lot of people that perceive it as positive. So with that you can really influence the norm, I think.” – Michael

The employees were very enthusiastic and got positive reactions back of the visitors they passed; as well as Staatsbosbeheer, which got positive reactions of visitors about the clean state of the area. In this way, the ranger said the social norm is influenced. This indicates that when a place is clean, it shows the opinion that littering is not accepted, which discourages people to litter.

4.1.3 Perceived behavioral control

The perceived behavioral control (do people believe they can perform the behavior?) is determined by control beliefs (Figure 1, chapter 2), which in this research entails opportunity, resources, and knowledge.

Opportunity

In this research opportunity refers to the opportunities to perform a certain behavior, which in this thesis refers to the opportunities people have to discard their waste properly, as this influences littering behavior (Brown et al., 2010). In the interviews, four ways have come forward on how these

opportunities are created: placement of bins, facilitating opportunities for waste collection, municipal waste management and layout changes.

1. Placement of bins

Both Staatsbosbeheer and Natuurmonumenten have a policy of placing few or no bins in nature reserves, as this encourages people to take their waste with them. Although there are legitimate reasons for this policy (further discussed in chapter 4.3.1), it does cause fewer opportunities for people to dispose of their waste in nature. Three rangers mentioned that they receive requests from people to place more bins (e.g. near benches or parking lots). For example, ranger John mentioned in the interview: *"[...] we are asked about placing bins near a bench or at a parking lot, but we don't do it, because it is shown that it [bins] attracts even more litter [...]."*

Nonetheless, there are some areas that do choose to place bins. For example, in the Stadswaard in Nijmegen bins are placed throughout the area and even extra bins are placed near the entrances, to make it easy for visitors to throw away their waste. Furthermore, in the Biesbosch it was chosen to place bins at specifically busy hotspots. Ranger Micheal explained:

"At Staatsbosbeheer in the Biesbosch, we've moved away from the principle of placing no bins. We place bins at certain spots deliberately, which helps and then you've got people that say 'yes, but then it is placed next to it', but I think that is fine, because when it is next to it we can pick it up, and it stays at least in one place." – Michael

Moreover, in the IJsselvallei, bins are placed at parking lots and beaches, in the Weerribben-Wieden, there are bins present on the waterside for boats, and in nature reserves in the Kop van Noord-Holland, bins are placed on the edges of nature reserves.

This indicates that the placement of bins is dependent on the nature reserves, and thus the opportunity to discard waste in bins can vary between nature reserves.

2. Facilitating opportunities for waste collection

Besides placing bins, it is possible to use other means to create opportunities to collect waste. For example, in the Stadswaard in Nijmegen it is possible for visitors to grab paper bags where they can put their waste in. Mark explained: *"[...] there are also signs at the entrance with bags so people can grab a bag and take it with them. Things are explained clearly about what you're supposed to do."*

Furthermore, at the Vechtplassen, people in boats can get garbage bags for their waste. Ranger Olivia explained in the interview:

"[...] and we also have for example garbage bags, but I think they are biodegradable, otherwise you're going to encounter them again. The garbage bags are also imprinted with something like 'take your waste home with you, protect the Spiegelplas, take your waste home' and they are distributed at for example the floodgate, since there is a floodgate between the Vecht and the Spiegelplas, so boats, people in boats get one of those garbage bags..." - Olivia

This indicates that in some of the included nature reserves in this research, opportunities for proper waste collection are facilitated in the form of waste bags or garbage bags. This can create more opportunities for visitors and encourage them to discard their waste properly.

3. Municipal waste management

Regarding waste dumping, people have the opportunity to bring most types of waste, such as renovation waste, garden waste, or domestic waste to the waste recycling point of the municipality. However, the prices of bringing waste to these recycling points differ between municipalities, meaning disposing of waste in some municipalities can be cheap or even free, while it can be quite expensive in others. Ranger James explained in the interview:

“For example, one of the municipalities I work for has changed the entire policy six, or seven years ago, and you could notice that from January 1st, the first half year we got a storm of waste en after that people start to get used to it or dissent from it less, and then it decreases. And then there was last year, when bulky waste, closets and things like that were collected by the municipality free of charge. And that changed again, mattresses cost €40 each, so yeah when you’ve got two mattresses and a new bed then €80 is worth the guess to just dump it somewhere in the forest.” – James

This shows the relationship between municipal waste policies and waste dumping in nature reserves, since it suggests that when these policies and prices change, it affects the opportunities people have to bring their waste to municipal recycling points. According to James, it is therefore necessary for municipalities to draft waste policies that are reasonable for the local population.

4. Layout changes

James also explained that they changed a couple of parking lots in the area to so called ‘visible locations’. He mentioned explained in the interview:

“[...] in the past, there were parking spots that were a bit out of sight, or behind trees or behind bushes, that of course makes it easy to just drive your car over there, open your trunk out of view and drive away from the other side of the parking lot. So we’ve had an idea, I think about eight to ten years ago, where we transformed parking lots to a visible location, which of course also has to do with prostitution, dealing of drugs, that has to do with multiple things. A lot of people want to operate out of anonymity, because of course they do not want to get caught in what they’re doing, this is a sort of discouragement.” – James

This indicates that due to the fact that there is a higher sense of control, fewer opportunities for dumping are created, which means that it discourages waste dumping, and therefore can influence littering behavior.

Resources

In the case of littering behavior, the only resource that came forward in the interviews is money, specifically in the case of waste dumping. According to three rangers, there is a relationship between the costs of bringing waste to a recycling point and waste dumping in nature reserves. The prices of bringing waste to one of these points differ between municipalities: in some cases costs may be low or even free, whereas in other municipalities, costs can be higher. This was already briefly mentioned in the section ‘3. Municipal waste management’, and also by ranger Sam, who explained in the interview: *“[...] there appears to really be a relation between the moment a municipality raises the prices of depositing at a recycling point, and an increase of dumps.”*

This shows that when the prices in these recycling points go up, the amount of waste dumping increases, which indicates that higher prices encourage littering behavior.

This all indicates that money as a resource can influence littering behavior, and that the municipality also plays a part in the issue of littering in nature and can influence the amount of waste that is being dumped. This highlights the importance of properly coordinating waste management policies in municipalities.

Knowledge

Knowledge refers to if people's knowledge is sufficient to perform the desired behavior, which in this research refers to if people understand how waste is expected to be discarded (Brown et al., 2010). For example, in the Stadsward in Nijmegen, signs are placed near the paper bags to draw attention and to inform visitors on how to use the bags. A lack of knowledge about waste has come forward in the interviews in two ways:

1. Garden waste and small organic waste

As discussed in chapter 4.1.1, in the case of garden waste people seem to not fully realize the consequences, which can be attributed to a lack of knowledge about the impact of garden waste on nature. James explained in the interview:

"And furthermore garden waste, that is of course something where people think 'yes, it's green and the forest is also green, so it doesn't matter' and do not think about that it can lead to invasive species, that the bamboo that they've thrown out also attaches to the ground to subsequently create a beautiful field with bamboo in the forest, where it doesn't belong." – James

In addition, knowledge also plays a role in the case of fruit peels, cigarettes, and chewing gum, since people do not always realise the negative impact of these types of waste on nature, and thus throw them away in nature more easily. Ranger Diana mentioned the following in the interview:

"Well, I think that say, you understand that you're not supposed to throw away a cola can, everybody gets that, but the issue of the damage of cigarette butts, and chewing gum and your fruit peels, that is something many people don't realize [...] so that is a piece of knowledge that is missing, actually." – Diana

This indicates that regarding garden waste and small organic waste, there is a lack of knowledge and people appear to litter due to this lack. Therefore, more information on the proper disposal of garden waste and small organic waste could be effective to combat littering behavior.

2. Usage of bins and bin placement

Ranger James explained that he had encountered someone who was putting garbage bags in one of the bins in the nature reserve:

"A couple of years ago I fined someone who I saw opening his trunk, took out a garbage bag and was stuffing it in a bin, and I confronted him about it and then they start saying: 'Well, it is a bin so I am not doing anything wrong, right? I'm throwing nothing in nature?'" – James

This shows how a lack of knowledge about the proper usage of bins can lead to littering behavior, indicating that more information about this topic might be necessary. Furthermore, Diana mentioned that people are sometimes not aware of the fact in her area, bins are only placed at the edges. This results in people littering further into the area, since they are expecting bins to be present within the

whole area. According to her, this was specifically a problem for visitors that do not usually visit nature reserves:

"[...] what you also see is that an audience visited nature that normally didn't come, and was often also not aware that, for example, bins are present at the edge, but not within the area. So they start off like, 'oh we'll throw our coffee cup away later', and then think whatever, and put it somewhere on a bench or something like that." – Diana

This indicates that the lack of knowledge about the locations of bins can lead to littering behavior, which means that it could be beneficial if there was more information about where bins are located.

Another case where lack of knowledge plays a role in littering behavior is placing waste beside bins, as people tend to think it is still placed next to the bin and will get cleaned anyway. Diana mentioned: *"[...] and also that all of the waste that is put next to a bin is very damaging, people don't know that either [...]"* This can be harmful for nature because the wind may blow it away or animals can take it away. This indicates that the lack of knowledge about placing waste next to bins may lead to littering behavior.

4.1.4 Conclusion

The results show that all three cognitive structures (attitude towards the behavior, subjective norm and perceived behavior control) play a role in littering behavior.

1. In short, it can be concluded that the attitude towards littering behavior is dependent on the types of litter and the social group. Regarding recreational litter, it can be said that in general, people are aware of the consequences, but choose to litter anyway and show ignorance and carelessness. However, the consequences may be less known in the cases of, for example, cigarettes, chewing gum and fruit peels, which could increase littering behavior. Furthermore, littering recreational waste can also happen by accident.

In terms of waste dumping, specifically renovation and drug waste, people know the consequences and are aware that it is illegal, but deliberately choose to dump their waste regardless. In the case of garden waste, some people are less aware of the consequences and as a result feel it is acceptable to dump garden waste.

The attitude towards the behavior is also dependent on the social group. Younger people tend to litter more than older people, since younger people may not be fully aware of the consequences and evaluate littering as acceptable, while older people realize the consequences and think littering is unacceptable. Nevertheless, in the case of waste dumping, adults are usually the cause.

2. Normative beliefs, according to all rangers, play a role in littering behavior. The social norm is dependent on age, similar to the attitude towards the behavior. Whereas the social norm among youth is that littering is okay and that it is not something that is talked about, older people find littering wrong and are more likely to confront each other about it. However, over the years rangers have noticed that people have become hesitant to confront each other, as they are afraid of a negative or violent reaction. Furthermore, in cases with tight communities near nature reserves, the analysis showed that locals may have created a habit of dumping waste in nature and have created a norm not to tell on each other. Moreover the results show that when people feel connected and have a sense of ownership, they are more motivated to keep the area clean and confront others

about littering behavior, whereas day trippers for example, feel less connected to the area and feel less motivated to abide by the social norms.

3. The perceived behavioral control is determined by the opportunity, resources and knowledge. In regards to recreational waste, the opportunity for visitors to discard their waste varies between nature reserves. For example, in the Stadswaard in Nijmegen there are bins and bags for visitors to discard their waste in, while in the Kop van Noord Holland, there are only bins on the edges. Overall, Natuurmonumenten and Staatsbosbeheer have decreased the amount of bins, however in some of the reserves they have decided to place bins at hotspots or distribute waste bags, which create more opportunities for visitors to properly dispose of their waste.

In terms of waste dumping, people have the opportunity to bring waste to recycling points. However, due to the fact that prices of bringing waste can range from free to quite high between municipalities, people might not always be able to afford it (not enough resources), resulting in waste dumping.

Finally, knowledge plays a role with for example garden waste, fruit peels, cigarettes, and chewing gum as people do not always realize the damage it can do to nature. In addition, there is sometimes a lack of knowledge about the fact that bins are only placed on the edges of nature reserves, and that it is prohibited to put domestic waste into bins. Besides this, people do not always realize the impact of placing waste next to bins. This lack of knowledge can result in people littering.

4.2 Trends in littering behavior

This paragraph starts with discussing the general trends in littering behavior that came forward in the interviews. After that, littering trends from the perspective of rangers with regard to COVID-19 are explored.

4.2.1 General trends

Littering behavior is ever changing and the interviews showed that there are different trends over the years. The analysis showed five major trends, namely litter in rivers, seasonal changes that influence littering, an increase of volunteering, an increase of hesitance for confrontation, and an increase of immigrants with different norm regarding littering.

1. To begin with, four rangers mentioned the influence of rivers on the amount of litter that is found in nature reserves. For example, Mark explained that especially after high tide, waste from the river Waal washes up on the floodplains. Similarly, ranger Lucas mentioned:

“Look the whole of Europe, we are, it is occasionally said that we [The Netherlands] are the drain of Europe because all of the rivers or crossing through, and that is true since almost everything ends up here, especially during high tide.” – Lucas

Ranger Sam mentioned that due to the floods of July 2021 in parts of The Netherlands, Belgium and Germany, he noticed an increase in litter diffused by the Maas and its tributaries, from material from campsites to refrigerators to containers of frying fat: *“You could really see, you really saw all of society floating past.”*

Similarly, the ranger from the Biesbosch, Michael, also noticed this in his area: *“But for*

example in the case of a flood like last year in July in Germany and Belgium, we find refrigerators from Germany in the area, so that indicates that large things like that just float towards the Biesbosch.” In addition, he also explained that the industry near rivers and inland navigation are polluters of the rivers:

“[...] it is still the case that companies next to the rivers and the inland navigation dump a massive amount of waste, or let the majority blow away by the wind. So that’s something one can see clearly. For example, two years ago there was a really high tide in the Biesbosch, and it revealed that more than three-quarters of waste came from nearby industrial sites and not from further away, no it comes from the modern, Dutch industrial sites.”

He also noticed that when a strong wind comes from the southwest, a lot of industrial waste from the industrial area near Moerdijk blows toward the Biesbosch, which causes unprecedented amounts of litter.

2. Besides litter in rivers, ranger Mark from Rijk van Nijmegen explained that during springtime and summertime, he notices an increase in litter in the Stadswaard, which he attributes to the location near the city of Nijmegen and the younger audience that likes to visit during this time: *“[...] besides that, there is more waste in the Stadswaard during summer and spring. So we see that next to the urban areas – where often a younger audience visits – attracts more, also attracts more litter.”*

Similarly, Michael from the Biesbosch mentioned that during periods of high temperatures, the area attracts more visitors, which results in more litter. He further explained that he also notices that in the past few years, there has been an increase in the amount of young people who litter. Furthermore, Mark noticed a rise in garden waste in the springtime and fall, when people work more in their gardens: *“In particular in the spring when people, or in the fall when people start trimming in their gardens, we can see a significant rise of that [garden waste].”*

3. There are also trends that are indirectly related to littering behavior. Six rangers mentioned that there are volunteers who clean up litter in nature reserves, and according to ranger John, there is a growing group of people who voluntarily clean up litter in nature reserves. For example, he mentioned that he had an appointment with a platform of volunteers who are willing to help clean up litter in the nature reserve. He explained:

“I encounter it more and more, a group that is really cleaning up. And I have an appointment next week with a man from the platform with five hundred volunteers. Don’t hold me accountable on the specific count but I imagined that as a huge group of people that like to go into the area coordinated to clean up with those sticks. It bothers people. Yes, beautiful but also disappointing that it is necessary, that at the same time.” - John

4. Another trend that is observed by six rangers, is that over the years there has been a decrease in the amount of people that dare to confront others on their littering behavior. Ranger Lucas mentioned in the interview when asked about if visitors of nature reserves confront each other about their littering behavior:

“Yes, that does happen, but I notice that it has decreased in the past few years. Because people are scared to say something to each other because they are afraid of getting talked back at, or worse. And you can see that people think ‘I better hold my mouth because I don’t dare to say anything.’ And that in the last years, you just notice that it has increased.” – Lucas

This shows that the hesitation of people to confront each other is caused by fear of getting a negative or even violent reaction. Since people do not easily confront each other anymore, it may be more convenient for people to litter, as the chance of getting called out has decreased.

5. Moreover, ranger James explained that there has been a rise in the amount of distribution centers in the areas near nature reserves. These distribution centers create a lot of employment opportunities, which draws a lot of people in from eastern Europe who have different norms regarding waste, and cause more litter in those nature areas:

“We do notice that around Venlo, that the area is built up in the last few years. With acres, with tens and thousands of acres of distribution centers, which are presented as good for employment, but from the 200 employees, only five are Dutch and the rest of them are brought here from Bulgaria, Hungary, Romania, and Poland and treat their surroundings differently. If it’s ignorance, or... yeah I’ve had a conversation once with the place where they live and they said ‘Yes, we have all the different containers here where they can dispose of their waste’, but why they get in the car and dump it on their way to work is for them a mystery, too.” – James

This shows that it can lead to littering behavior when people have different values on how to treat their living environment (e.g. people that are used to dumping their waste in nature, and therefore think it is acceptable).

4.2.2 Littering behavior and COVID-19

As discussed in the introduction of this research (chapter 1.1) the amount of litter has increased due to the COVID-19 pandemic. In this section, the experiences of rangers about this issue are discussed.

To begin with, five rangers mentioned a significant increase in renovation waste in the area, since more people were renovating their houses during the pandemic. Ranger Mark mentioned in the interview: *“But for example, there are also a lot of people that decide to renovate and such, and the amount of waste dumps is quite significant, and we’ve seen a considerable increase in the corona period.”* Mark also mentioned the increase of renovation and domestic waste dumps, and considered that this may be caused by the fact that municipal recycling points were busy in this period, resulting in more people dumping it in nature:

“[...] but like the start of the corona period, when for instance everyone was at home and had the time to renovate, one could see it increasing. And yeah, everybody is cleaning and it’s busy at the municipal recycling point and people think ‘I am not going to wait for that’, or ‘I am not going to drive that far, I’ll just dump, I’ll just dump it in the forest.” – Mark

However, ranger James explained that this was mainly a problem during the first lockdown, and that the amount of waste being dumped decreased again after that and did not particularly rise in the following lockdowns:

“[...] you could notice in the first lockdown that people didn’t know what to do since they were stuck at home, they couldn’t go to the bar or a restaurant or to a birthday party. So we had some people that strong cleaning rage and we found things like a punctured swimming pool, a couple of tiles that were probably stored in a shed, broken buckets, and you name it. So that was the first, say half year we could see a change. But with the other lockdowns it was less noticeable.” – James

Furthermore, three rangers could also see an increase in the amount of recreational waste that could be found in nature reserves. For example, ranger Sam noticed specifically a lot of face masks: *“Yeah and you could see in corona times, which had to do with the increase of visitors, is an increase of the amount of litter and of course the type of litter, just a lot of face masks.”* In addition, ranger Diana mentioned an increase of toilet paper and to go mugs:

“What we see a lot is toilet paper, you also saw that a lot in the corona period, because of course the gastronomy was closed, so people started using the forest as a toilet. But yeah, toilet paper does not degrade very well, so that was a problem [...] and we had a lot more to-go. So you had a lot more mugs and such [...]” – Diana

According to them, this increase in litter was primarily due to the larger amount of visitors to the area as a result of the lockdowns. Due to the lockdowns, not only the general visitors came to visit these areas, but also people that normally never visit, and thus can have other norms, which can lead to more littering behavior. In addition, two rangers also mentioned that illegal parties were more often held in nature reserves during the pandemic, as people were not allowed to visit each other at home, resulting in more litter. Ranger John explained in the interview:

“And what is furthermore a great annoyance, especially in times of corona, [...] were that party were just held in birdwatching huts, which resulted in a huge mess with Red bull cans in a birdwatching hut, a lot of cigarette butts, drug waste, [...]” – John

All of this shows that during the corona period, rangers experienced an increase of litter, both in recreational littering and waste dumping. However, in the case of waste dumping, the rise was most noticeable with regards to renovation waste. Furthermore, the increase of litter was most noticeable during the first lockdown, and decreased again in the following lockdowns.

4.2.3 Conclusion

There are five general littering trends that rangers have noticed over the years. (1), The sometimes great amounts of waste from rivers can impact nature reserves near rivers, since especially during high tide, waste washes up on the floodplains and can spread on land. (2) There are also seasonal trends in littering behavior: during spring and summertime nature reserves with swimming facilities notice an increase in visitors and thus an increase in litter, specifically from a younger audience. Besides this, more garden waste can be found in nature reserves during the spring and fall, when people work in their gardens more. (3) There is a growing group of people who are passionate about the problem and who voluntarily clean up litter in nature reserves. (4) However, rangers also mentioned that people are becoming more hesitant to confront each other about littering behavior. (5) Additionally, some immigrants may uphold different social norms, which can cause more litter.

Littering behavior has also changed in times of COVID-19. First of all, rangers could see an increase in renovation waste in nature due to the fact that more people decided to renovate their houses. Besides this, rangers mentioned they noticed more recreational waste in the lockdowns, mainly due to the larger amount of visitors, and visitors that normally do not visit nature reserves. Moreover, parties were held in nature reserves due to the fact that people were not allowed to give them at home, which led to more litter in nature reserves.

4.3 Policy instruments and littering

This paragraph will first analyze which policy instruments are already used to achieve behavioral change regarding littering behavior from the experience of rangers. After that, the solutions according to the rangers are discussed, as well as the solutions according to (non)governmental documents.

4.3.1 Used policy instruments for behavioral change

In the interviews, the four policy instruments and the extent to which they are used in the various nature reserves were discussed. Below, the carrot, whip, sermon and nudge and how they are used to combat littering behavior is further elaborated on.

Carrot

The carrot is a policy instrument aimed at changing behavior by incentives and rewarding the desired behavior (Tummers, 2019). This policy instrument came forward the least in the interviews, therefore it is only briefly discussed in this research.

At the level of organizations such as Staatsbosbeheer and Natuurmonumenten, the carrot does not play a role, but on a national governmental level incentives are used to combat littering. For instance, ranger Sam mentioned that the deposit on plastic bottles and cans can help to decrease the amount of litter: “[...] a couple of steps have been taken now with a deposit on cans and small bottles, which of course helps [...].” However, ranger James has some doubts about this, as the deposit is quite small which may not encourage everyone to hand in their bottles, which means these bottles and cans still end up in nature.

“So yeah, and they of course try it with a deposit on bottles now, soon on cans to discourage it, but yeah I think a lot of people think ‘10 cents, what is 10 cents? I’ll just toss it anyway, because then I’ll get rid of it and don’t have a mess myself, that’s worth the 10 cents.’” – James

Whip

The whip is a policy instrument that seeks to change behavior through mandates and bans (Tummers, 2019). In all of the interviews the use of enforcement came forward, especially regarding dumping of waste as this is illegal and people can be given a fine (e.g. according to Natuurmonumenten (2019), the average fine for (garden)waste dumping is 370 Euros). However, according to the rangers, this can be difficult, as the chance of seeing someone dumping their waste is small. Sometimes address details can be traced back by investigating the litter (e.g. through left receipts) and the perpetrator can be confronted, but this is still a small share. Ranger John explained: *“Yes, we do have enforcement agents too, [...] sometimes you can see that there are still receipts in the renovation waste, and we take action. In the past few years, [...] it has basically lead to nothing.”*

Ranger Martin also mentioned that even when they have caught someone and do all of the paperwork, the public prosecution office often still dismisses the case due to a lack of evidence, which means fining people for littering can be difficult:

"[...] I believe that, through the years, we only managed to catch someone in action three or four times, and you're going to hear somewhen and you've got everything on paper and then it's the public prosecution office that says you have not enough evidence, we dismiss the case, so that also happens. So it is very difficult." - Martin

Furthermore, he explained that the fines in The Netherlands are not as high compared to other countries. Therefore people are not scared for the fine, and may tend to litter sooner.

Michael further mentioned that they just had an enforcement action, in cooperation with the police and other governmental organizations in which they also give attention to the littering problem and confront people about it:

"Like past Saturday, there was an enforcement action in the Biesbosch, organized by Staatsbosbeheer, the police, and other governmental services, and we really give attention to the littering problem. We control it, we supervise it, and we start conversations with people and so, it that way we try to keep giving it attention [...]" – Michael

A problem regarding enforcement that was mentioned in four of the interviews, is a lack of supervision due to shortages of employees. Sam explained in the interview:

"What we also have to deal with, is that we have too little supervision in the rural area. In the last years, we gained some enforcement agents on a provincial level, but yeah, they come once, maybe twice in the month in your area, that's it. And also at a certain moment, which can be on weekdays. And at the same time yeah, there is a real shortage." - Sam

This shortage of employees means that it is harder to supervise the area, which can encourage littering behavior as the chance of being fined decreases. Furthermore, ranger Olivia mentioned that due to the shortage of employees, the littering problem is not a priority compared to other issues, and therefore enforcement is more focused on other subjects. *"Well, there is enforcement, but we have, say, a shortage, I think at terrain owners do, so litter is no priority."* Due to this, enforcing the nature reserve is even harder and makes it difficult to properly supervise regarding littering behavior. This means it is easier for people to dump waste and litter and getting away with it unseen.

Sermon

The sermon is a policy instrument that uses information campaigns to change behavior (Tummers, 2019). This policy instrument came forward in all of the interviews and is used in the following ways in the included nature reserves:

To begin with, ranger Mark mentioned that they often organize activities with schools and children to create awareness for the problem among the younger audiences: *"We often organize actions with children and schools, that is also a bit of spreading awareness."* In addition, James explained that when they work with children and youths, they always explain that when there is no bin, they are ought to take their waste back home with them:

“[...] only when we work with youth programs or go into nature with children the whole day, we preferably do not pause beside a bin, but at a place where they’ve got waste and say ‘oh, what do we do with it?’ and then we also do not take a garbage bag or something with us, but say that everything that you can bring from home, full, you can also again take home empty.” – James

Moreover, Diana explained that they sometimes touch upon the subject of littering with school classes: *“[...] and we also go into the area with school classes, en with some classes it’s a theme we discuss.”* This indicates that regarding children and youths, creating awareness of the littering problem and education about it is in some instances done through school visits to nature reserves.

Press and media is also a medium that is often used by rangers for education. For example, ranger Mark mentioned that the press and media are used to draw attention to the issue by writing articles or blog posts and inform people on littering: *“[...] another part is press and media. If you want to give attention to something at a certain moment, you can release an article or write a blog. And in this way, you can draw attention to a certain subject.* Similarly, Diana said she addresses littering in blogs posts, and that she did an item on the TV show *Binnenstebuiten*, where littering was discussed extensively. Furthermore, Olivia had written a column for the local newspaper on littering and calling locals to help clean up. Ranger Sam also mentioned that he sometimes posts a picture on social media when he encounters litter to get attention for the problem. However, he also explained how the amount of people that are reached are limited, as this is dependent on the amount of followers one has on social media and the people that follow rangers are generally lovers of nature and are not the visitors that litter. Therefore, the chance of reaching the people that do litter is very slim.

“[...] also sometimes in the media, on social media, sometimes when I encounter something, I’ll post it, try to post it with a ludic comment. In the end your reach is marginal, it’s dependent on the amount of followers you have and those are in general people that don’t do such things.” - Sam

Additionally, ranger John explained that he used to post about waste dumps on twitter to try to gain the attention of, for example, the local broadcast, but that he does not feel stimulated to do this often, since it does not result in any action to combat the problem:

“And so awareness actions via, you hope via regular media, at least that how I work, I did that a few times in the past, but you see that there are quite a few reactions like ‘this is ridiculous’ and ‘something really needs to happen’, but after that nothing happens. So it also makes me, yeah, not really makes me feel stimulated to post something every time, because then I’ll be the complaining ranger [...].” - John

Besides this, Martin mentioned that he has addressed the littering issue on radio and TV, as well as the newspaper. Nevertheless, he said that over time the attention usually decreases and it is not a hot item anymore. He further explained that sometimes however, using media can work backward. For example, when an article was placed in the newspaper about a clean-up day, it would encourage more people to litter because they assumed their litter would get cleaned up anyway:

“Well, I’ve been on the radio, also on TV to raise awareness, and on one of those days that we collected litter we made a video of the container we’d filled. And what I said that I once made a postcard that made it in the newspaper and addressed the waste problem. But well, after a while it is

diluted and it's not an hot item anymore, and yeah then, then you can see it increasing again. It's even so that when we have a waste collecting day, we do that with the municipality which subsidizes a container or something, that we don't post it in the newspaper anymore because then you've got people that think 'well, they're going to clean it up anyway, so let's go and dump something.'" – Martin

This shows that press and media are often a used method to educate people, as it was mentioned by six of the interviewed rangers. Although it does gain awareness and gives information about the issue, rangers also explained that it has some drawbacks; it does not always lead to actual action, the reach is often marginal, and it can even encourage littering behavior since people think litter gets cleaned up anyway.

Besides using press and media, Mark explained that education can also be done by intentionally having a conversation with (groups of) people that are associated with littering to inform them about the problem and on the consequences of their behavior: *"[...] you can also start a conversation on purpose when you know that something is going on, to educate people about the consequences of something, that they at least know what's going on."* This indicates that education can also be done through just simply starting the conversation with people that may be more prone to littering behavior.

Furthermore, James used education in the form of stickers. He explained that he experienced nuisance from people that would throw their garbage bags into bins in the nature reserve. To tackle this problem, he placed stickers on the bins informing people that it is prohibited to put their household waste in the bins:

"[...] when we had a lot of nuisance from people that were dumping their waste, their garbage bags in our bins, I put a note on the lids of bins that said 'prohibited to discard domestic waste'. It seemed to partially work. It made people aware like, 'oh this is not right' or 'this is not done' or 'this is not supposed to be', yeah. – James

This shows that giving information through, in this case stickers, creates awareness of the problem, and thus can discourage littering behavior in some instances.

Moreover, Diana mentioned that they organized a 'waste bingo' for children in which they had to cross of the types of waste they could find throughout the nature reserve. Besides this, it is possible for children and adults to get a stick and garbage bag to clean up litter when they are hiking through the nature reserve, which creates awareness for the littering problem for adults and children. This can help to discourage littering behavior.

Clean-up actions using the help of volunteers is also an often used strategy to combat littering, as it was mentioned in five of the interviews. Although it might not cause behavioral change directly, it does create awareness of the problem and can show the norm. For example, in the Biesbosch, clean-up actions are organized in the spring in cooperation with partners and other nature organizations. Similarly, ranger Mark mentioned that Rijk van Nijmegen collaborates with other organizations, which can help with spreading awareness and education. For example, he often gets help from

student associations that want to help cleaning up litter and as a result gain a new understanding of the littering issue, and might be more stimulated to confront others on their littering behavior:

“I often get student associations that sign up to come help, for example with cleaning up the floodplains, and then they realize ‘oh, wow’. And in that way you can reach a bunch of people, and those people can actively start conversations about it with others, so that’s really an achievement.” – Mark

This shows how hosting clean-up actions can be an effective way to combat littering behavior. It does not only clean the area of litter, but it also creates awareness among the people that help to clean up as well showing the desired social norm to other visitors.

In addition, John mentioned that in the nature reserve he worked prior, they organized a clean-up action with asylum seekers, who were very enthusiastic about the idea: *“[...] then we asked people from the asylum centre to come along to clean up the mess – they weren’t allowed to work – they found it fantastic.”* This indicates that also including other social groups or refugees can be beneficial for combatting the littering problem, as it can create awareness for the issue within the social group and therefore discourage littering behavior.

Nudge

The nudge is a policy instrument aimed at changing behavior by choosing architecture that stimulates the desired behavior (Tummers, 2019). Nudging was mentioned in nine out of the ten interviews and again, is used in various ways throughout the included nature reserves. Generally, the overall rule that applies in all of the nature reserves of Staatsbosbeheer and Natuurmonumenten is that practically no bins are placed throughout the nature reserves which stimulates visitors to take their waste back home with them. This lessens the amount of litter, since otherwise visitors tend to cram all their waste into bins or simply throw it next to the bin, which results in litter lying beside the bins and further spreading into nature by wind or animals. In addition, bins can be a target for vandalism, which is also solved by removing the bins. Furthermore, placing no bins saves money and time because there is no need for employees to empty the bins. However, some rangers explained that they do not fully abide by these rules. For example, ranger Michael explained that they deliberately choose to place bins at certain spots:

“We place at a couple of spots bins deliberately, which helps and then you’ve got people saying ‘yes, but then it lies next to it’. But I think it’s fine. If it’s next to it we can clean it up, at least it’s less likely to roam around.” – Michael

Ranger James said that bins are still present in his reserve, especially at parking lots and busy spots. Diana further mentioned that there are bins on the edges and some parking lots of nature reserves. Ranger Martin explained that the municipality placed bins among popular bicycle routes by youths, which are used partially. Besides this, he noted that the fewer bins policy at docking places is successful, as the amount of litter has decreased and visitors take their waste back home with them:

“[...] we always have, in the inner area the point of view that we do not place bins at for example docking places, because previous, how do you say it, examples have shown that it only attracts more

litter and that the amount of waste increases which you don't want. And what we see now is that, for example at these docking places, we find less litter because people take it with them [...]" - Martin

However, there are still some remaining spots (often near the waterside) with bins where visitors can dispose of their waste properly.

These examples all indicate that the placement of bins in nature reserves can influence littering behavior. For example, when bins are removed altogether, it can stimulate people to take their waste home with them. However, some rangers also mentioned that they deviated from the general policy of placing no bins, and that bins are placed at certain hotspots where many people come together.

In the Stadswaard in Nijmegen, ranger Mark explained that it is possible for visitors to take bags at the entrance where they can discard their waste in, which are accompanied by signs explaining how to use the bags properly. Additionally, extra bins are placed at the entrance to make it easy for visitors to dispose of their waste. This makes it easier for visitors to dispose of their waste properly. Furthermore, ranger Olivia mentioned that signs were placed in the area calling visitors to take their waste home. Besides this, compostable garbage bags with the same message are handed out at the lock to boat owners.

This shows that waste bags can be used to encourage visitors to dispose of their waste properly, as it makes it more convenient for visitors to dispose of their waste and thus stimulate the desired behavior of not littering.

Moreover, the ranger from the Biesbosch Michael explained that they just started a pilot called 'samen houden we de Biesbosch schoon', with the goal of influencing the norm and changing behavior through communication. This is done by placing signs thanking visitors for keeping the Biesbosch clean, thus using positive framing to include the majority of people that do not litter and the small group that does:

"Positive framing, so you speak to the large majority that does it well and who thinks it's annoying that a small group does not do it. But at the same time the image comes back again and again, at the entrance, at beaches and at the hotspots where the problems are most apparent, small signs come back that again sway 'together we keep the Biesbosch clean, thank you.'" – Michael

Besides this, there is a mascot, a friendly beaver that is on the signs and repeated throughout the reserve. In addition, more bins and containers are placed specifically at hotspots, stickers are placed on the already existing bins and waste bags are handed out, which all stimulates visitors not to litter.

This again shows the use of waste bags to influence littering behavior, as well as using positive framing and a slogan to display the desired behavior.

Ranger James mentioned to combat waste dumping, parking lots were changed into 'visible locations' to make it more difficult to dump waste secretly. He further explained that it does discourage dumping, but that he simultaneously knows that people that are determined to get rid of their waste will find other locations. Therefore, it is a local solution, but not a solution that might work generally.

This shows that changing the layout of parking lots where waste dumping is a problem can discourage dumping by making it harder to dump waste, thus stimulating the desired behavior of not

dumping and bringing it to a recycling point.

4.3.2 solutions according to rangers

In the interviews, rangers were also asked what according to them would be suitable instruments to combat the littering issue. In this paragraph, the solutions from the perspective of rangers will be discussed. Similar to chapter 4.3.1, the solutions are divided into the four policy instruments according to Tummers (2019).

Carrot

The carrot was mentioned in three out of the ten interviews as a solution by the included rangers. Ranger Sam explained he would lobby the government to invest more in a packaging-free society and that to change littering behavior, the government really should take a more guide role, instead of giving everything to the provinces, municipalities and individuals: *“[...] I think that the government should have a guiding role, not a government like right now that gives everything to the provinces, municipalities, individuals, because that doesn’t work.”*

Besides this, James stated that specifically regarding waste dumping, it is essential to find a balance with the municipality due to the fact that in his experience, the policy a municipality upholds in terms of waste can influence waste dumping negatively (e.g. when it is expensive to go to a recycling point). Therefore, the municipality should make it easy for people to dispose of their waste correctly (e.g. by lowering costs at recycling points).

Furthermore, ranger Michael explained that a lack of money and capacity play a pivotal role in the issue: the problem could be easier solved if more money was available from for example the government and if there were more people that could supervise and enforce the area:

“And at the same time it just has to do with money and capacity of enforcement: how much money is available to clean up afterward, how much money is available to clean up actively and how much money is available to supervise that.” – Michael

Whip

In five out of the ten interviews, the whip was mentioned as a solution to combat littering behavior. Michael explained that he thinks it would be effective to invest in more supervision. Similarly, ranger Sam mentioned that, if he had the money, he would use it to get more professional supervision in the nature reserve, due to the fact that this does not only combat littering, but also other issues such as misbehavior of visitors or dogs walking on the loose:

“Yes, I would definitely, besides for littering, commit to more supervision. More supervision in rural areas is also beneficial for other problems. So yeah, leaving the paths, misbehavior from people in nature reserves, dogs that are not on a leash, things like that.” – Sam

Furthermore, John mentioned that specifically in the case of waste dumping, the only thing that might be effective would be an enormous enforcement action, but he stated that the chances of actually catching people would probably still remain small.

Besides this, Michael mentioned that there was enough money and capacity, he would like to invest in more people that could supervise and enforce the nature reserve. Moreover, Diana mentioned that she would like to see more investments in terms of enforcement and having more

time to investigate waste dumps, as well as maybe having camera security, although this means people are needed to monitor the cameras.

"[...] It would be nice if we, for example in the case of waste dumps, could spend more time on investigating who's behind it, because otherwise you clean it up and don't do anything with it. You could even maybe use camera security, but yeah, then you have to pay for the cameras and being able to read it, so yeah." – Diana

Sermon

In eight out of the ten interviews, the sermon was mentioned as an effective solution. Ranger Michael mentioned a good way to combat littering is by keeping the area clean, as littering has the tendency to attract more litter. Similarly, Lucas stated that it could be effective to have more people clean up the area. *"[...] than you would say, yeah, then you would really need people that have the time to clean up litter, that go through the terrain to clean up litter [...]."*

Furthermore, Ranger Mark stated that he thinks education and communication are the most effective ways to combat littering, since ultimately people need to gain awareness of the damage that is caused by litter. According to him, education is a recurring theme in all of the different instruments (e.g. placing signs, bags, strict enforcement, fining people) and together, can be effective when littering is done purposefully.

"Education and communication. I think that you can do many things, but in the end people have to realize that something is damaging, and fining is way, signs is a way, bags is a way, signs are a way, but in the end it has to hit. And then you'll have to combine all these things, and I think education is the recurring theme." - Mark

Besides this, Sam mentioned that he would like to see an information campaign by the government, although he noted that information campaigns are not always said to be effective. Ranger Lucas also mentioned that information campaigns on a national level and using social media to create awareness could be good solutions to combat the littering problem. Adding to this, ranger John mentioned that he would also like to see an information campaign from the provincial or national government that specifically targets youths and young adults (ages 15-25), that are not always concerned about littering and the consequences it can have. However, he is not sure what to do about illegal waste dumping, as these people are hard to reach with an information campaign: *"Some sort of campaign, and targeting people that are say, unaware and incompetent [...] the 15 to 25 year old's that are not concerned about it [...]"*

According to Michael, the problem of littering is not giving a priority in politics and it is seen as a responsibility of Staatsbosbeheer and not as a responsibility of the municipalities or provinces:

"Simply put, what priority do we give it? We can combat this on a grand scale, we can place filter line in the Bieschbos with floaters and rinsers, we can spend tons of money per year on hundreds of people from Rijkswaterstaat to come cleaning it up, but that does not happen. They want to spend 10.000 Euros, fine, that's all right. As long as it is not a political issue, and we do not see it as a big problem, yeah..." – Michael

To get more attention for the problem, he stated that it might be necessary to change their way of communication by strengthening it and clarifying what is happening regarding littering and what needs to be done to combat the issue. He further explained that he thinks it is important to keep

addressing the problem when children or youths come for an excursion and to emphasize that they can really make a difference when they decide to clean up their waste. He further underlined that everyone can contribute, no matter how small it seems. It starts by ourselves.

Additionally, Martin explained that generally, he would focus on changing the way people think (and thus behave) so people gain a better understanding of the consequences of littering, not only for the environment but also for themselves, and the livability. Besides this, he also thinks there is something to gain regarding the youth, as lots of schools surround the area and they could be more involved in the issue. They have done actions for youths in the past, but this could be expanded:

“[...] besides this I might see a chance to include all the schools around here, to include the youth more. We have done actions by standing here and there to start the conversation [...] I think that work could be done in that era.” - Martin

In addition, ranger Diana mentioned that she thinks it would be effective if bins had a sign of some sort that would inform visitors that these bins are the last ones before entering the nature reserve, so visitors are aware of the fact that bins are not present throughout the entire nature reserve: *“[...] also a mention that this is the last bin you encounter, so people are aware of that. I think that gains can be made regarding that, and so more awareness regarding litter.”*

She also noted that more education could be effective if there is more emphasis on the lesser-known types of litter (e.g. fruit peels, chewing gum, cigarettes) and the consequences.

Nudge

Using nudging to change behavior was mentioned in three out of the ten interviews. According to ranger Ben, creating fewer entry roads into the nature reserves to prevent waste dumping could be effective, since waste dumping often happens via these roads. Therefore, fewer entry roads makes it more difficult to dump waste and thus discourages waste dumping. Furthermore, Lucas mentioned that placing more bins at central places could help to combat the littering issue. Besides this, ranger Diana explained that ideally, she would like to have bins placed at all of the entrances.

Other solutions

Ranger Olivia mentioned she would focus on behavioral change to change the source of littering behavior. If the budget would allow it, she would cooperate with another organization that is specialized in changing behavior to write a plan on how to combat littering.

4.3.3. Solutions according to policy document analysis

Besides the solutions to littering that were brought up by the interviewed rangers, there are also documents available that discuss various measures that can be applied to combat littering in nature reserves. The documents that were included can be found in chapter 3.1.1.

Carrot

From the analyzed documents in this research, only Van Raffe & De Boer (2007) mentioned measures that can be classified as the carrot in the model of Tummers (2019). In the document, it was

discussed that people may dump waste in nature reserves due to the waste policy of the municipality or, in the case of drugs, because it is illegal. Since the dumped waste is on their grounds, the terrain owners are held responsible for cleaning it up, which can be costly and seen as unjust by these owners as it is not their waste. Measures that can be taken to combat this are compensation from the government in the form of a subsidy, or allowing owners to deposit waste at the municipality's recycling point for free.

Whip

Rijkswaterstaat (2018) mentions one measure that can be classified as the whip in the model of Tummers (2019). Rijkswaterstaat (2018) recommends to increase the feeling of enforcement, since enforcement is more effective when people feel like it is done actively and when people feel like there is a high chance of getting caught. Due to the fact that actually catching people while they are littering is difficult, giving people the feeling that there is strict enforcement can discourage litter. Increasing the feeling of enforcement can be done by, for example, using a combination of communication and physical enforcement to increase the idea of enforcement, and actually controlling the area actively.

SenterNovem (2009) also mentions enforcement as a solution to littering, which can be labeled as the whip in the model of Tummers (2019). It is explained that enforcement can help to combat littering, especially when fines are clearly communicated and when people realize the costly consequences of their littering behavior. However, enforcement can be difficult in the case of littering, since it is often hard to trace back where litter comes from and actually catch the perpetrator. This means that owners of the terrain are frequently responsible for cleaning up litter and the accompanying costs.

Van Raffe & De Boer (2007) recommend more supervision and higher punishments regarding waste dumping, which can be classified as the whip in the model of Tummers (2019). According to Van Raffe & De Boer (2007), the chance of getting caught while dumping waste is quite small and the fines for dumping are also not exceptionally high (around 370 Euros). Therefore, waste dumping can be discouraged by having more supervision (increasing the chance of catching perpetrators) and raising the fines. However, this may be expensive for organizations, as more supervisors are needed. Therefore, it is a consideration between the costs of employment and the costs of waste dumping. Another option is placing cameras at spots where waste dumping often occurs, or mobilizing locals or visitors to notify the terrain owner when they encounter someone dumping waste (e.g. the number plates of cars).

Sermon

Rijkswaterstaat (2018) mentions four measures that can be classified as the sermon according to the model of Tummers (2019). The first measure is using the right social norm. Displaying the desired social norm can be done by giving a message about how a group of people is ought to act. This can be effective, since people like to belong to a certain group, therefore emphasizing the norms of a group can encourage people to act accordingly. Examples of displaying the social norms are placing signs at bins or at the entrances of nature reserves conforming the social norm (e.g. 'our visitors throw their waste in the designated bins'). The second measure is utilizing local heroes to inform visitors of the desired behavior. This means using role models who appeal to the target audience and are recognizable, and who can become ambassadors for the fight against littering. This can for example be done by using pictures of locals, rangers, or animals with a call to keep the area clean. The third

measure is using authority, which refers to using people that have authority or are famous to emphasize the message of keeping the area clean. The fourth measure entails increasing the sense of ownership, due to the fact that littering is more likely to happen at places that do not feel like they belong to anyone. This makes people feel less responsible and as if there is less social control, and thus more likely to engage in littering behavior. Therefore, increasing the feeling of ownership can help to lessen the amount of litter and can for example be done by showing more clearly who owns the area (e.g. on bins).

SenterNovem (2009) mentions 3 measures that can be classified as the sermon according to Tummers (2019). To begin with, SenterNovem (2009) explains that mobilizing volunteers is an option, due to the fact that it keeps nature clean and creates awareness for littering among the volunteers. The second and third measures are confronting people about their littering behavior and educating children about the correct behavior, as this can create awareness can be beneficial to combat littering behavior. The fourth measure entails giving people insight into the costs of cleaning up litter so people gain understanding of the often high costs and might be discouraged to litter. The fifth measure focusses on informing people more about how much time it takes for different types of litter to break down and what the consequences are for nature. The sixth and seventh measures that are discussed joining national campaigns (such as the national clean-up day) and timing campaigns correctly (e.g. in the summer there is usually more litter from visitors, therefore a campaign could be launched in this season).

Besides this, Van Raffe & De Boer (2007) mention a measure that can be labeled as the sermon in the model of Tummers (2019). According to them, an effective measure to decrease the amount of waste dumping is quickly cleaning up littering in nature reserves by owners and managers, as litter tends to attract more litter. This also means that less litter and a cleaner nature reserve shows the desired social norm. Furthermore, it is stated by Van Raffe & De Boer (2007) that there are people that dump waste due to the fact that they are not aware of the consequences of littering, and think that litter will decompose eventually or that waste around bins will be cleaned up anyway. By educating these people and spreading awareness about the issue, waste dumping can be prevented. Moreover, it can be beneficial to talk and make agreements with the locals near nature reserves, since there are local who live next to a nature reserve and dump their waste in nature. When this occurs, starting a conversation with the locals and make arrangements to stop waste dumping can an effective way to put a halt to waste dumping by locals.

Nudge

Rijkswaterstaat (2018) mentions five measures to combat littering behavior that can be classified as a nudge in the model of Tummers (2019). The first measure is to make bins stand out and to use primes to achieve this (sensory stimuli that activate unconscious knowledge and influence behavior). This means, for example, giving bins bright colors or making sure bins do not have an unpleasant smell. The second measure is to apply footsteps, arrows or lines on the ground leading to bins, since this makes it easier and encourages people to properly dispose of their waste in bins. The third measure that can be taken is to make properly disposing waste fun. Examples of this are talking bins that make a sound, 'waste butlers' that offer waste bags to people, or 'living bins': volunteers that dress up as bins to stimulate people to dispose of their waste properly. However, the effect of this measure is usually temporary and is therefore more suitable for areas where people come together short-term, such as beaches or recreational areas. The fourth measure is to remove resistance to make the desired behavior easier. Decreasing resistance can be achieved by giving people multiple

options so they feel like they have the authority and including people directly in the process of behavioral change. For example, when bins are removed and people resist, it can be beneficial to give people the choice of either removing the bins or giving people the responsibility to manage the bins themselves. The fifth measure is to make public space more appealing and make desired behavior easier in that way. This measure uses the concept of placemaking (arranging the public space in a manner that users feel comfortable in it and experience the place as positive) to make a place appealing, as this can encourage cleaner behavior. An example of this is placing flowers or bushes around bins, due to the fact that green and nature are often linked with clean spaces and therefore discourage leaving waste next to bins.

SenterNovem (2009) also mentions a measure that can be labeled as the nudge. SenterNovem (2009) states that regarding bins, research shows that reducing the amount of bins also reduces the amount of litter and costs of emptying and managing bins, which means it can be beneficial to reduce the amount of bins in nature reserves. Furthermore, it is important to consider the places where bins are placed (e.g. at parking lots, benches or busy spots) and the appearance of bins, since making bins look interesting and fun can encourage visitors to throw away their waste properly. To reduce the costs of emptying and managing bins, it can be beneficial to place underground containers that can store more waste than a regular bin and therefore do not need to be emptied often.

Van Raffe & De Boer (2007) mention two measures that can be used to combat littering behavior regarding waste dumping in nature reserves, which can be classified as nudging in the model of Tummers (2019). To begin with, Van Raffe & De Boer (2007) mention that rearranging the present layout of nature reserves can be used to combat littering behavior regarding waste dumping. Rearrangement can for example be done by moving parking lots to location near houses, which leads to more social control and discourages waste dumping. Besides this, roads and parking lots can be closed altogether, which means there are less ways in nature areas than can be used for waste dumping. However, this also results in that it might be harder for visitors, owners, or emergency services to enter a nature reserve. Furthermore, the municipality can make it free or easy to deposit waste. The reasons to dump waste such as garden or renovation waste are often related to the costs and difficulty of bringing it to a municipality's recycling point. A solution to this could be to make it more affordable or free to bring waste to a recycling point, or picking waste up at people's house so they do not have to drive to the recycling point. This makes dumping in nature harder than properly disposing it, which can result in less waste dumping in nature. For this, cooperation with the municipality is necessary. However, this measure does not decrease the dumping of drugs.

4.3.4 Conclusion

All of the policy instruments came forward in the interviews, however, some were mentioned more frequently than others. The two policy instruments that were mentioned in all of the interviews and used in all of the cases are the sermon and whip. The sermon is the most diverse policy instrument, and is used in various different ways, depending on the nature reserve: for example by giving attention to littering on school excursions among children and youths, using press and media, having intentional conversations with people, placing stickers or creating activities for children and adults, and organizing clean-up days. The whip is also used in all of the included nature reserves and is done by enforcing the area, and confronting and fining people. According to the rangers this is hard, since catching people while they litter is very rare and tracking people down is also not always possible.

There is also a lack of manpower which makes enforcement more difficult. The policy instrument that was most frequently mentioned after the sermon and whip is the nudge, which came forward in 9 out of the 10 interviews. Stimulating less littering is done by decreasing the amount of bins or placing them on hotspots, using signs, waste bags, or changing the layout of popular littering spots. The least mentioned, and thus least used instrument is the carrot. This is mainly due to the fact that incentives are regulated at a national level and not to target littering in nature reserves specifically, but waste reduction in general. However, some rangers said that it can help to reduce litter. All of this indicates that measures are being taken to reduce littering, but when asked what solutions the rangers themselves had in mind, everyone answered that more could be done.

Regarding to which solutions according to rangers themselves would be suitable, most rangers mentioned using more information campaigns (sermon) and increasing the capacity of enforcement (whip). However, in many of the cases, the resources and capacity are limited and littering is not always seen as a priority, which makes it difficult to actually do more to combat the littering issue. A notable fact is that in 5 out of the 10 interviews, rangers want more action on a municipal, provincial, or national level instead of the burden being largely on Staatsbosbeheer or Natuurmonumenten.

5. CONCLUSION

In this chapter, the main research question “*What behavior causes visitors to litter and what measures can be taken to change visitors’ behavior to reduce littering from the perspective of rangers in nature reserves in The Netherlands?*” will be answered. The aim of this research was to assess the perspective of rangers on what behavior causes visitors of nature reserves to litter, and what measures regarding littering could be suitable to solve the issue. The chapter starts by answering the four sub-questions, after which the main research question is answered.

5.1 The causes, trends and solutions of littering behavior

5.1.1 Causes of littering behavior

The first sub-question that is will be answered is: “*What behavior causes visitors to litter from the perspective of rangers in nature reserves in The Netherlands?*” According to the rangers, the three cognitive structure of the TPB (attitude towards the behavior, subjective norm, and perceived behavioral control) all play a role in littering behavior. The analysis showed that the attitude towards littering behavior can cause littering in different ways, depending on the type of waste (recreational litter or waste dumping) and the age group. Recreational waste is often littered on purpose, with visitors knowing the consequences and showing carelessness and ignorance. However, in the cases of small organic waste such as fruit peels, cigarettes or chewing gum, the consequences of littering appear to be less known by visitors, which means littering this type of waste is evaluated as acceptable which can result in littering of this type of waste. According to the rangers, the type of age group also affects the attitude towards littering behavior. Younger visitors are more likely to litter in the case of recreational litter, since they do not always oversee the all the consequences and evaluate littering behavior sooner al acceptable that older people. An overview of the types of recreational litter and the characteristics can be found in Table 4.

In contrast to recreational waste, waste dumping is almost always done on purpose, as people deliberately dump their waste, and is also mainly done by adults. However, in the case of garden waste people may not always realize the consequences and therefore think it is acceptable to dump garden waste, even though it can be damaging the existing nature. Table 5 shows the types of waste dumping and the characteristics.

RECREATIONAL LITTER	CHARACTERISTICS
Synthetic litter	- Consequences are known - Younger visitors more likely to litter
Organic litter	- Consequences are not always known - Younger visitors more likely to litter

Table 4: overview of types of recreational litter and characteristics

WASTE DUMPING	CHARACTERISTICS
Renovation waste	- Consequences are known - Almost always done by adults
Drug waste	- Consequences are known - Almost always done by adults
Garden waste	- Consequences are not always known - Almost always done by adults

Table 5: overview of types of waste dumping and characteristics

Although each of these groups are problematic, it can be expected that interventions for the groups that litter organic waste and dump garden waste might be most successful, as the consequences of their behavior are not always fully known. Therefore, when there is more awareness of the consequences for these groups, they are less likely to litter. The following section delves further into the relation between the subjective norm and littering.

The subjective norm (normative beliefs) can cause littering behavior in three ways. To begin with, the social norms among different age groups plays a role. According to the rangers, littering is more likely to be seen as acceptable by youths and they are hesitant to confront each other about it, whereas older people are more likely to not accept littering and are more quickly to confront others. Due to this difference, it might be necessary to take the different age groups into account when designing instruments to change littering behavior. However, one of the rangers' noted that when it concerns big groups and thus more social pressure, age does not matter as standing up to a big group can be uncomfortable anyway. This hesitance can encourage littering behavior, as visitors may feel more free to litter since they are not going to get confronted. If this hypothesis would be correct, then this would indicate that during COVID-19 times, when it was busier in nature reserves, the increase of litter observed by some of the rangers could also be a result of visitors being afraid to confront each other due to the social pressure.

Furthermore, one ranger who works in a nature reserve close to small towns explained that social norms in towns with tight communities near nature reserves can negatively influence littering behavior, since locals have created a social norm not to tell on each other when waste dumping occurs.

Besides this, the connection one has with an area can influence the social norms, and thus the littering behavior. This is due to the fact that when people feel a connection to an area, they are more motivated to keep it clean and confront others about littering behavior, creating the social norm. On the contrary, day trippers who visit the area less, do not feel as connected and thus not necessarily motivated to keep the area clean.

Finally, the perceived behavioral control causes littering behavior through opportunities, resources and knowledge. To begin with, the opportunities people have to discard their waste, can influence littering behavior and these opportunities differ between nature reserves. For example, in some areas, such as in the IJsselvallei, Kop van Noord-Holland and the Oostvaardersplassen, most bins are gone or only placed at parking lots or on the edges of nature reserves. However, in other areas, such as the Biesbosch and Noord-Limburg, they have decided to keep or place bins and waste containers at busy places where littering occurs mostly. The results showed that rangers in such areas did not necessarily experience more litter, although it is more work to empty these bins. In addition, in some nature reserves such as Rijk van Nijmegen and the Vechtplassen, waste bags are distributed, thus giving visitors the opportunity to dispose of their waste properly. With regards to renovation and (bulky) garden waste, it is possible to bring it to municipal recycling points, thus creating opportunities for proper waste disposal.

Beside the opportunities, resources can also influence the perceived behavioral control and thus littering behavior. The results show that the resource relevant for littering behavior is money, and that it is an issue regarding waste dumping. To illustrate, one of the rangers gave the example that when someone has financial problems and can choose between eating dinner or bringing waste to a recycling point, the choice will probably be dinner. Due to the fact that bringing waste to a recycling point can be quite expensive in some municipalities, people may not always be able to

afford it, resulting in waste dumping. For example, in the municipality of Amsterdam bringing waste to the recycling point is free for all types of waste, while in the municipality of Tilburg some types of waste are free, but for instance renovation waste costs 0,25 Euro per Kg (Gemeente Amsterdam, n.d.; Gemeente Tilburg, n.d.).

Furthermore, knowledge about waste affects the perceived behavioral control and littering. For instance, the results show that according to most rangers, people do not always realize the harmful impact some types of waste (garden waste, small organic waste) and placing waste next to bins can have on nature. The lack of knowledge about these topics can cause littering behavior without people realizing they are littering.

5.1.2 Trends of littering behavior

The second sub-question that will be answered is: *“what trends in littering behavior can be identified by rangers?”* Over the years, there are a five noticeable trends in littering behavior.

1. The interviews showed that nature reserves nearby rivers experience great amounts of waste washing up on the floodplains and spreading throughout the nature reserves, specifically in times of high tide or when heavy rainfall causes flooding in nature reserves. This trend is related to natural causes (fluctuation of water height due to change of seasons), climate change (increase of heavy rainfall) but also to international waste management, as waste from other countries can be found in the Dutch river systems.
2. Nature reserves with water and swimming facilities observe an increase of (young) visitors in the spring and summer, which results in more litter. In addition, due to the fact that people work in their gardens more in the spring and fall, more garden waste can be found in nature reserves in those seasons. These trends are related to changes of the seasons.
3. Rangers noticed that there is an increasing amount of people that are conscious about the littering issue and want to do something about it by cleaning up litter voluntarily. This trend is related to social changes, as there is a rise of awareness about litter among people.
4. Rangers have noticed a decrease in the amount of people that confront each other about littering. People have become more hesitant to do this due to the fact that they are afraid of receiving a negative or violent reaction, which means that the social control may decrease, resulting in more people feeling free to litter. This trend is related to social changes, as there is a change in how people behave with each other.
5. One ranger noticed that some immigrant groups that live or work near nature reserves might uphold different social norms regarding littering (e.g. littering is seen as acceptable or normal in their culture), which results in more litter. This trend is related to cultural differences.

During the COVID-19 pandemic, the rangers also observed that littering behavior in nature reserves had changed. To begin with, the lockdowns caused an increasing amount of people to visit nature reserves, including people that normally do not visit nature. These people visit more out of boredom than out of love for nature, and therefore might not have knowledge on how to behave in nature. This led to more recreational litter, such as to-go mugs, toilet paper and face masks. Furthermore, two rangers also expressed that since people could not meet each other at home, parties were

secretly organized in nature reserves (e.g. at bird hides), resulting in litter. Besides this, the amount of renovation waste being dumped in nature reserved increased in times of COVID-19, as a large amounts of people were renovating their houses.

5.1.3 Used instruments in the past and present

The third sub-question that is going to be answered is: *“what are the experiences from rangers with current instruments that have been used to reduce littering in the past and present?”* In chapter two, the framework of Tummers (2019) was introduced which includes four policy instruments for behavioral change. The results show that mainly the sermon, whip and nudge are used in nature reserves. The interviews showed that the sermon is used five ways by the included nature reserves: (1) by using press and media, (2) placing informative stickers, (3) organizing activities for children and adults, (4) educating children and youths on school excursions, and (5) organizing clean-up days.

While the sermon is used in five ways depending on the nature reserves, the interviews showed that the whip is used in the same way throughout the different nature reserves. The whip entails enforcing and supervising the area, and confronting and fining people that litter. However, rangers noted that the downside of this policy instrument is that in the case of littering, catching perpetrators is hard, as rangers are not always able to track them down and catching perpetrators while they litter is almost impossible. Furthermore, multiple rangers mentioned a lack of manpower, which make proper enforcement even more difficult, and can resulting in more littering behavior and waste dumping since there is less control. Additionally, the nudge is used in nature reserves by decreasing the amount of bins to stimulate visitors to take their waste home, placing (extra) bins at hotspots, using waste bags, signs, or changing the layout to discourage dumping of waste. The carrot was least mentioned in the interviews, as this policy instrument is mainly used on a national level, and not solely for littering in nature reserves. Nevertheless, it can contribute to less litter in nature reserves, since for example, a deposit on plastic bottles stimulates people to hand in their bottles instead of throwing them away. Table 6 gives an overview of the types of policy instruments and the pros and cons.

TYPE OF INSTRUMENT	PROS	CONS
Sermon	- Versatile instrument that can be used in various ways - Can be organized on a small scale	- Not effective for every age group or type of litterers
Whip	- Effective as it hurts people's wallets	- Difficult to fine perpetrators - Need of more manpower
Nudge	- Versatile instrument that can be used in various ways - Can be organized on a small scale	- Might not be effective for everyone (e.g. visitors can still choose to not grab a waste bag or ignore signs)
Carrot	- Combats the root of the problem - Combats the waste problem as a whole (not just in nature reserves)	- It may take a long time to realize this type of policy instrument as it needs to be regulated on a national/EU level

Table 6: overview of the types of policy instruments and the pros and cons

5.1.4 Suitable instruments according to rangers

The fourth and final sub-question is *“what would be (in)effective instruments to solve littering from the perspective of rangers to reduce littering in the future?”* All of the rangers included in this research think more could be done to combat the litter problem, and the analysis showed ways in how this could be done according to them. The most frequently mentioned policy instruments are the sermon and the whip and these are often mentioned in combination. Examples of how the sermon could be useful according to the rangers are keeping nature clean, organizing information campaigns on a national scale, special information campaigns targeting youths, more education about lesser known types of litter and signs on bins. Regarding the whip, rangers would like to see more supervision and enforcement which is beneficial for both recreational littering and waste dumping. One ranger noted that this might be the only instrument that could combat waste dumping, since this group is difficult to reach with other instruments. However, currently there is a shortage of manpower regarding enforcement agents, which means getting more supervision is hard.

The nudge was mentioned three few times, for example with strategic placement of bins or closing entry ways to nature reserves to discourage waste dumping. Therefore, this instrument can target recreational litter (bin placement) and waste dumping (closing entry ways). The nudge might be mentioned less compared to the other instruments due to the fact that it is newer and thus known less than the other policy instruments. The carrot was also only mentioned three times, which might be because this policy instrument is usually used on a national and international scale and therefore not controlled by rangers or nature organizations. Examples that were mentioned by rangers regarding the carrot are lobbying the government to take on a more guiding role in the littering problem and a packaging free society, creating a better balance with the municipality regarding the costs of recycling points to combat waste dumping, and receiving money from the government (e.g. subsidy) so more money would be available, for instance, for enforcement of clean up actions.

5.2 Answering the main research question

In this paragraph, the main research question will be answered: *“what behavior causes visitors to litter and what measures can be taken to change visitors’ behavior to reduce littering in nature reserves?”* In short, all of the cognitive structures (attitude towards the behavior, subjective norm, perceived behavior control) that determine the final behavior play a role in forming littering behavior. To begin with, paragraphs 4.1.1 and 5.1.1 showed that the attitude to the behavior causes different types of behavior, dependent on the type of littering and the social group. This led to five main categories of ‘littering personas’ regarding recreational waste and waste dumping, namely synthetic litter, organic litter, renovation waste, drug waste, and garden waste (see tables 4 and 5). The first policy instrument that can be used to combat these problems from the perspective of rangers is the nudge, by for instance making it easier for people to dispose of their waste properly (e.g. placing bins at hotspots, distributing waste bags), as this stimulates people to throw away their waste and can remind them to throw it away. Besides this, the sermon can be used as an instrument (e.g. placing informational signs at the entrance of nature reserves) to increase the knowledge about the consequences of for example fruit peels, chewing gum, cigarettes or other types where this seems to be the case. Since younger people are a larger cause for littering than older people, it could be beneficial to especially focus on waste education for children and youth (e.g. through excursions, school visits, etc.).

Waste dumping is usually done deliberately and people know generally are aware of the consequences and know that it is illegal to dump waste in nature, especially in the case of renovation and drug waste. An exception is garden waste, as people do not always realize that although it is also 'green', it can damage nature. The policy instrument that could be used to combat waste dumping according to rangers is the whip, for example through strict enforcement and supervision, installing security camera's at popular dumping sites so people realize that there can be consequences for them (e.g. fines) when they dump their waste. For garden waste dumping, the sermon could be effective, for example in the form of an information campaign that educates people about the impact of garden waste on nature, and clarifies the consequences, which could result in less people dumping garden waste.

The subjective norm causes littering behavior in three ways, which was discussed in paragraph 5.1.1. Firstly, the social norms are different among age groups, as youths are more prone to engage in littering behavior than older people. As a result, youths are more hesitant to confront each other about littering than older people. Therefore, the sermon could be an effective policy instrument to decrease by emphasize the social norm in nature reserves, for example by placing signs telling visitor the social norm, or by having (e.g. volunteers) visibly clean up litter so visitors can see that littering is not accepted.

Secondly, the social norm of locals that have created a habit of dumping their waste in nature throughout history can cause them to litter, as they accept it and do not tell on each other, which may lead to these people feeling free to litter, as they are not confronted about it. The policy instrument that could be used to combat this type of littering from the perspective of rangers is the sermon, for example by organizing a campaign specifically targeted to change the social norm among these people, or starting the conversation about the topic of littering.

In addition, the social norms can be influenced by the connection people have with a nature reserve, due to the fact that people are more motivated and care more about keeping the area clean when they feel connected to it. This means that to decrease littering, it can be effective to create a sense of connection or showing ownership, to make day trippers feel like they are to abide by the social rules set by the 'owners'. This can for example be done by placing sign informing visitors about ownership.

The perceived behavioral control can lead to littering behavior and through opportunities, resources and knowledge, as discussed in paragraph 5.1.1. In the case of littering, opportunities refer to the opportunities people have to discard their waste properly. With regards to bulky waste (e.g. renovation waste) people have the opportunity to bring their waste to a municipality's recycling point. The opportunities for recreational waste differ between nature reserves: in some reserves bins are placed in various places in the reserves or there are bags available, whereas in others they are only present at parking lots or hotspots. When there is a lack of opportunities, people might be more prone to littering. Therefore, a suitable policy instrument would be the nudge, as it can be beneficial to place bins or distribute waste bags at busy hotspots. Furthermore, the sermon could be used to inform people beforehand, for instance with a sign or stickers explaining the present opportunities to dispose of waste (e.g. stickers on bins warning visitors that it is the last one before getting further into the area).

Knowledge about waste influences the perceived behavioral control, and thus littering behavior. For example, people are not always aware of the effect of garden waste or small organic waste. Therefore the sermon can be an effective instrument, since educating people about these

types of waste can increase the knowledge and decrease the change of littering. Besides this, the risks of placing waste near bins can be included in information campaigns, as people are not always aware of the risks and damage it can do.

Additionally, high prices for disposing waste at a municipal recycling point can lead to people not being able to afford to bring their waste there, resulting in more waste dumping in nature reserves. Therefore, it is important to keep this at a reasonable price. This can be done by for example, using the nudge as a policy instrument to raise the fixed charges so people can dispose of their waste at a lower price or for free, thus making the desired behavior easy. Besides this, the carrot can be used as an instrument to subsidize recycling points so costs can be lowered.

Taking into account the three cognitive structures and the corresponding policy instruments discussed above, a new conceptual model can be drafted based upon the original conceptual model (figure 1). In the original model, all of the policy instruments affect all three cognitive structures. However, the analysis and conclusion have shown that only certain policy instruments are effective for specific cognitive structures, which is depicted in figure 4.

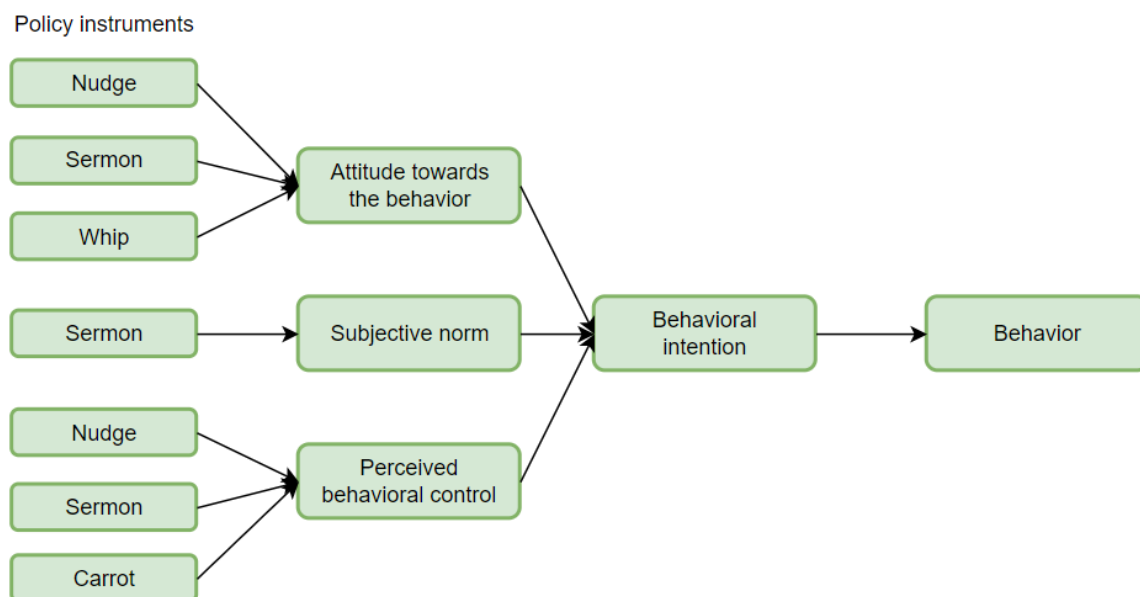


Figure 4: new conceptual model

The model shows that the nudge, sermon and whip are the most effective policy instruments to change the attitude towards the behavior. Furthermore the sermon is the most effective to change the subjective norm, and the nudge, sermon and carrot are the most effective the change the perceived behavioral control. Therefore, it can be concluded that it is important to choose the right policy instrument for the type of behavioral change one wants to achieve. For example, if waste dumping is a frequent problem in a certain nature reserve and the behavior comes from carelessness (attitude towards the behavior) the whip might be the most effective policy instrument (e.g. increase of supervision).

6. DISCUSSION & REFLECTION

This chapter begins by discussing the validity and reliability of this research. After that, a reflection of the research process is given, as well as recommendations for future research.

6.1 Reliability and validity

The reliability of a research refers to the consistency of the results (Heale & Twycross, 2015). However, when considering the nature of qualitative research, the reliability can be defined as “the degree to which other researchers performing similar observations in the field and analysis [...] would generate similar interpretation and results.” (Franklin, Cody, & Ballan, 2010; p. 356). Thus, in qualitative research, the reliability refers to the extent to which the data collection and analysis have a similar answer for multiple participants (Kirk & Miller, 1986). In this research, the results shows similarities between the collected data, indicating that similar results would be obtained if the research was done again. However, due to the nature of qualitative research, the results will probably never be interpreted the exact same way by every researcher. Considering all of this, it can still be said that this research is reliable, as differences in interpretation are part of qualitative research. Besides this, the results showed that there can be significant differences between nature reserves, as they are all unique. Therefore, results can always deviate from each other. Since this research includes different nature reserves (e.g. in terms of location, size, amount of visitors) the chances of covering a wide scope of data increased, increasing the reliability.

According to Heale & Twycross (2015), the validity refers to the extent to which a concept is measured accurately. For qualitative research this refers to the appropriateness of the whole research process, data and tools (Leung, 2015). In this research, the research questions, the theoretical framework and the methodology are all aligned with each other, as everything is based on each other and fits the qualitative nature of this research. Therefore, it can be said that the validity of this research is good, as the aim of this research is measured correctly.

6.2 Reflection

There are a few limitations and improvement in this research, which will be discussed in this section. To begin with, the TPB could be expanded. In this research, the original TPB is used which includes three cognitive structures: the attitude towards the behavior, the subjective norm and the perceived behavioral control. However, there are a number of other studies about littering that use an extended version of the TPB, which includes for example the Environmental Awareness and the Environmental Background of people, as this integrates social-environmental factors that could influence behavior (Panwanitdumrong & Chen, 2021). However, it was a conscious decision to leave these factors out in this research, since the initial model is sufficient for the aim of this research and factors like the environmental background of people might be hard to be observed by rangers.

Besides this, this research only uses two different research methods: interviews and a policy document analysis, which gives a good overall picture and is suitable for the time frame and extend of this research. However, to increase the reliability and validity, additional research methods could be used to gain a broader view of the subject, such as using focus groups (this would also give rangers the opportunity to talk to each other about the subject) or using surveys to reach an

additional broader group of rangers and also gain a quantitative view of the littering problem.

In addition, even though there is not a significant lack of data in this research since data saturation was achieved, conducting more interviews could increase the reliability and validity of this research. There were also recommendations from both rangers and IVN for interesting interviewees (rangers and experts), however, due to a lack of time it was not possible to do more interviews than the twelve that were done in this research.

6.3 Recommendations for future research

To begin with, a topic for a future research could be the relation between waste in rivers and nature reserves, since the interviews showed that nature reserves near rivers experience a lot of waste coming in from these rivers. For example, after high tide waste lingers on the shore of nature reserves, meaning nature reserves bear the responsibility to clean it up again. However, due to the fact that the sources of this waste are hard to determine and can come from anywhere (e.g. industrial sights, other countries), it is difficult to find a solution to this problem. Therefore, further research into this topic is necessary.

Furthermore, future research could focus on the role of the government in the littering problem in nature reserves. The results showed that half of the interviewed rangers want to see more action towards the littering problem from the government, as currently a lot of the responsibility falls upon the rangers and the nature reserves themselves. Nature reserves do not always have the resources or capacity to figure the problem out for themselves, and in some instances the government can influence littering behavior, for example with regards to the relationship between waste dumping and the prices of bringing waste to a municipality's recycling point. This was also discussed in the interview with IVN Noord-Brabant, since it was mentioned that there is little coherence between the government and nature reserves.

Another topic for future research could be the inclusion of all age groups in nature education. Both interviews with IVN showed that education can be an effective instrument to combat littering behavior, but only in certain age groups. For example, children in primary school are easy to reach and are interested in the topic, while teenagers in high school or adolescents are usually not interested and do not really care. Since this is a group that is, as the results of this research showed, prone to littering behavior, it is important to investigate how these groups can be reached as well.

REFERENCES

- Abedoulah, M.R., Ben-Haddad, M., Alla, A.A., Rangel-Buitrago, N. (2021). Marine litter in the central atlantic coast of Morocco. *Ocean & Coastal Management*, 214, 1-12.
<https://doi.org/10.1016/j.ocecoaman.2021.105940>
- Ajzen, I. (1991). The theory of planned behaviour. *Organizational behavior and Human Decision Processes*, 50, 179-211. [https://doi.org/10.1016/0749-5978\(91\)90020-T](https://doi.org/10.1016/0749-5978(91)90020-T)
- Ajzen, I., & Fishbein, M. (1977). Attitude-behavior relations: A theoretical analysis and review of empirical research. *Psychological Bulletin*, 84(5), 888–918. <https://doi.org/10.1037/0033-2909.84.5.888>
- Almosa, Y., Parkinson, J., & Rundle-Thiele, S. (2017). Littering Reduction: A Systematic Review of Research 1995-2015. *Social Marketing Quarterly*, 23(3), 203-222.
<https://doi.org/10.1177/1524500417697654>
- Alsaawi, A. (2014). A critical review of qualitative interviews. *European Journal of Business and Social Sciences*, 3(4), 149-156. Retrieved from <http://www.ejbss.com/recent.aspx>
- Andersson, P., & Almqvist, G. (2022). Carrots, sticks, sermons or nudges? Survey evidence of the Swedish general public's attitude towards different policy tools. *Behavioural Public Policy*, 1-26.
<https://doi.org/10.1017/bpp.2022.31>
- Babbie, E.R. (2010). *The Practice of Social Research*. 12th ed. Belmont, CA: Wadsworth Cengage.
- Beeharry, Y.D., Bekaroo, G., Bokhoree, C., Phillips, M.R., & Jory, N. (2017). Sustaining anti-littering behavior within coastal and marine environments: Through the macro-micro level lenses. *Marine Pollution Bulletin*, 119(2), 87-99. <https://doi.org/10.1016/j.marpolbul.2017.04.029>
- Berki-Kiss, D., & Menrad, K. (2022). The role emotions play in consumer intentions to make pro-social purchases in Germany – an argumenten theory of planned behavior model. *Sustainable Production and Consumption*, 29, 79-89. <https://doi.org/10.1016/j.spc.2021.09.026>
- Britannica. (n.d.). Waste. Retrieved from <https://www.britannica.com/dictionary/waste>
- Brown, T.J., Ham, S.H., & Hughes, M. (2010). Picking up litter: an application of theory-based communication to influence tourist behaviour in protected areas. *Journal of Sustainable Tourism*, 18(7), 879-900. <https://doi.org/10.1080/09669581003721281>
- CBS. (2021). *Grootste toename huishoudelijk afval in bijna 25 jaar*. Retrieved from <https://www.cbs.nl/nl-nl/nieuws/2021/27/grootste-toename-huishoudelijk-afval-in-bijna-25-jaar>
- Creswell, J. W. (2009). *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches* (3rd ed.). Thousand Oaks, CA: Sage Publications.

- De Leeuw, A., Valois, P., Ajzen, I., & Schmidt, P. (2015). Using the theory of planned behavior to identify key beliefs underlying pro-environmental behavior in high-school students: implications for educational interventions. *Journal of Environmental Psychology*, 42, 128-138. <https://doi.org/10.1016/j.jenvp.2015.03.005>
- Echegaray, F., & Hansstein, F.V. (2017). Assessing the intention-behavior gap in electronic waste recycling: the case of Brazil. *Journal of Cleaner Production*, 124(1), 180-190. <https://doi.org/10.1016/j.jclepro.2016.05.064>
- Elliott, M.A., Armitage, C.J., Baughan, C.J. (2005). Exploring the beliefs underpinning drivers' intentions to comply with speed limits. *Transportation Research Part F: Traffic Psychology and Behaviour*, 8(6), 459-479. <https://doi.org/10.1016/j.trf.2005.08.002>
- European Commission. (n.d.). *Single-use plastics*. Retrieved from https://ec.europa.eu/environment/topics/plastics/single-use-plastics/eu-restrictions-certain-single-use-plastics_en
- Fishbein, M. (2008). *Theory of reasoned action*. <https://doi.org/10.1002/9781405186407.wbiecr017>
- Franklin, C.S., Cody, P.A., & Ballan, M. (2010). Chapter 19: reliability and validity in qualitative research. In B.A. Thyer (Ed.), *The Handbook of Social Work Research Methods* (Second Edition). (p. 355-374). Thousand Oaks, CA: SAGE publications Inc.
- Gamel, J., Bauer, A., Decker, T., & Menrad, K. (2022). Financing wind energy projects: an extended theory of planned behavior approach to explain private households' wind energy investment intentions in Germany. *Renewable Energy*, 128, 592-601. <https://doi.org/10.1016/j.renene.2021.09.108>
- Garcés-Ordóñez, O., Espinosa Díaz, L.F., Pereira Cardoso, R., & Costa Muniz, M. (2020). The impact of tourism on marine litter pollution on Santa Marta beaches, Colombian Caribbean. *Marine Pollution Bulletin*, 160, 1-11. <https://doi.org/10.1016/j.marpolbul.2020.111558>
- Gemeente Amsterdam. (n.d.). *Spullen wegbrengen naar een afvalpunt*. Retrieved from <https://www.amsterdam.nl/afval-en-hergebruik/grofafval/spullen-wegbrengen-afvalpunt/>
- Gemeente Tilburg. (n.d.). *Milieustraat*. Retrieved from <https://www.tilburg.nl/inwoners/afval/milieustraat/>
- Grelaud, M., Ziveri, P. (2020). The generation of marine litter in Mediterranean island beaches as an effect of tourism and its mitigation. *Scientific Reports*, 10, 1-11. <https://doi.org/10.1038/s41598-020-77225-5>
- Heale, R., Twycross, A. (2015). Validity and reliability in quantitative studies. *Evidence-Based Nursing*, 18(3), 66-67. <http://dx.doi.org/10.1136/eb-2015-102129>
- Hermawan, S. (2019). Law and Economic Approach to Reduce Marine Plastic Litter in Indonesia. *Advances in Social Science, Education and Humanities Research*, 358, 218-224.

- Hu, J., Tang, K., Qian, X., Sun, F., & Zhou, W. (2021). Behavioral change in waste separation at source in an international community: an application of the theory of planned behavior. *Waste Management*, 135, 397-408. <https://doi.org/10.1016/j.wasman.2021.09.028>
- Hu, H., Zhang, J., Chu, G., Yang, J., & Yu, P. (2018). Factors influencing tourists' litter management behavior in mountainous tourism areas in China. *Waste Management*, 79, 273-286. <https://doi.org/10.1016/j.wasman.2018.07.047>
- Informatiepunt leefomgeving. (n.d.). *Afval dumpen*. Retrieved from <https://iplo.nl/thema/afval/afval-dumpen/>
- iNudgeyou. (2012). *Green Nudge: Nudging Litter Into The Bin*. Retrieved from <https://inudgeyou.com/en/green-nudge-nudging-litter-into-the-bin/>
- Kirk, J. & Miller, M.L. (1986). *Reliability and validity in qualitative research*. Retrieved from <https://dx.doi.org/10.4135/9781412985659>
- Kroesen, M. & Chorus, C. (2018). The role of general and specific attitudes in predicting travel behavior – a fatal dilemma? *Travel Behaviour and Society*, 10, 33-41. <https://doi.org/10.1016/j.tbs.2017.09.004>
- Leung, L. (2015). Validity, reliability, and generalizability in qualitative research. *J Family Med Prim Care*, 4(3), 324-327. <https://doi.org/10.4103/2249-4863.161306>
- Liobikienė, G., Dagiliūtė, R., & Juknys, R. (2021). The determinants of renewable energy usage intentions using theory of planned behaviour approach. *Renewable Energy*, 170, 587-594. <https://doi.org/10.1016/j.renene.2021.01.152>
- McGovern, A., Beange, M., Vargas, E. (2020). Reducing the impact of plastic pollution in a rural coastal Area: Focus on the Hospitality Industry & Tourism of the Central Nicoya Peninsula, Costa Rica. *Sustainable. Communities Review*, 13, 1–25. Retrieved from http://scrjournal.org/SCR%20Spring%202020/Formatted/PDF%20Format/Article%203_Hydroponic%20Vegetable%20Farming.pdf
- Mestanza, C., Botero, C.M., Anfuso, G., Chica-Ruiz, J.A., Pranzini, E., & Mooser, A. (2019). Beach litter in Ecuador and the Galapagos islands: A baseline to enhance environmental conservation and sustainable beach tourism. *Marine Pollution Bulletin*, 140, 573-578. <https://doi.org/10.1016/j.marpolbul.2019.02.003>
- Michie, S., Van Stralen, M.M., & West, R. (2011). The behaviour change wheel: a new method for characterizing and designing behaviour change interventions. *Implementation Science*, 6(42). <https://doi.org/10.1186/1748-5908-6-42>
- Migchelbrink, K., & Raymaekers, P. (2022). Public managers' trust in citizens and their preferences for behavioral policy instruments: Evidence from a mixed-methods study. *Behavioural Public Policy*, 1-24. doi:10.1017/bpp.2022.21
- Milieu Centraal. (n.d.). *Zwerfafval*. Retrieved from <https://www.milieucentraal.nl/minder-afval/voorkom-afval/zwerfafval/>

- Muijs, D. (2010). *Doing Quantitative Research in Education with SPSS*. 2nd edition. London: SAGE Publications.
- Muñoz-Cadena, C., Lina-Manjarrez, P., Estrada-Izquierdo, I., & Ramón-Gallegos, E. (2012). An Approach to Litter Generation and Littering Practices in a Mexico City Neighborhood. *Sustainability*, 4(8), 1733-1754. <https://doi.org/10.3390/su4081733>
- Natuurmonumenten. (2019). *Tuinafval in het bos*. Retrieved from [https://www.natuurmonumenten.nl/natuurgebieden/soesterveen/nieuws/tuinafval-het-bos#:~:text=Een%20boete%20voor%20het%20illegaal,tuin\)afval%20kost%20370%20euro](https://www.natuurmonumenten.nl/natuurgebieden/soesterveen/nieuws/tuinafval-het-bos#:~:text=Een%20boete%20voor%20het%20illegaal,tuin)afval%20kost%20370%20euro).
- Natuurmonumenten. (2021). *Zwerfafval: de natuur betaalt al te lang de rekening*. Retrieved from <https://www.natuurmonumenten.nl/nieuws/zwerfafval-de-natuur-betaalt-al-te-lang-de-rekening>
- Natuurmonumenten. (n.d.). *Gebiedskaart*. Retrieved from <https://www.natuurmonumenten.nl/routes>
- Niaura, A. (2013). Using the theory of planned behavior to investigate the determinants of environmental behavior among youth. *Environmental Research, Engineering and management*, 1(63), 74-81. <https://doi.org/10.5755/j01.erem.63.1.2901>
- NOS. (2021). *Meer zwerfafval in natuurgebieden door wandelaars met snacks en koffie*. Retrieved from <https://nos.nl/artikel/2366632-meer-zwerfafval-in-natuurgebieden-door-wandelaars-met-snacks-en-koffie>
- Panwanitdumrong, K., & Chen, C. (2021). Investigating factors influencing tourists' environmentally responsible behavior with extended theory of planned behavior for coastal tourism in Thailand. *Marine Pollution Bulletin*, 169, 1-12. <https://doi.org/10.1016/j.marpolbul.2021.112507>
- Plastic Soup Foundation. (n.d.). *Plastic Breakdown*. Retrieved from <https://www.plasticsoupfoundation.org/en/plastic-problem/plastic-environment/break-down/>
- Portman, M.E., & Behar, D. (2020). Influencing beach littering behaviors through infrastructure design: An in situ experimentation case study. *Marine Pollution Bulletin*, 156, 1-9. <https://doi.org/10.1016/j.marpolbul.2020.111277>
- RamHormozi, H. (2019). *The anatomy of consumerism: the story of excess, greed, self-indulgence, wealth accumulation, insurmountable waste, and environmental degradation*. Retrieved from https://books.google.nl/books?hl=nl&lr=&id=FS6sDwAAQBAJ&oi=fnd&pg=PR1&dq=consumerism+western+world+waste&ots=pYcXxBcbPu&sig=4NGHHP6DoKbW0k2QsBneHQw_zxY#v=onepage&q=consumerism%20western%20world%20waste&f=false
- Rangoni, R., & Jager, W. (2017). Social Dynamics of Littering and Adaptive Cleaning Strategies Explored Using Agent-Based Modelling. *Journal of Artificial Societies and Social Simulation*, 20(2) 1. <http://doi.org/10.18564/jasss.3269>
- Raymaekers, P. (2020). Het nut van nudging en gedragsinzichten in het coronabeleid. *De Gedragsfactor*, 7, 71-90. Retrieved from

- https://www.researchgate.net/publication/344402824_De_gedragsfactor_Het_nut_van_nudgin_g_en_gedragsinzichten_in_het_coronabeleid
- Rijkswaterstaat. (2018). *Inspiratielijst maatregelen zwerfafval gedrag, participatie en beleving*. Retrieved from <https://www.nederlandschoon.nl/kenniswijzer-zwerfafval/inspiratielijst-maatregelen-zwerfafval-gedrag-participatie-en-beleving/>
- Rijkswaterstaat. (2020). *Kosten voor de aanpak van zwerfafval in Nederland*. Retrieved from <https://zwerfafval.rijkswaterstaat.nl/actueel/nieuws/nieuws/2020/kosten-aanpak-zwerfafval-nederland/>
- Rodríguez-Rodríguez, D. (2012). Littering in protected areas: a conservation and management challenge – a case study from the autonomous region of Madrid, Spain. *Journal of Sustainable Tourism*, 20(7), 1011-1024. <https://doi.org/10.1080/09669582.2011.651221>
- RTL Nieuws. (2019). *Egel gewond geraakt door plastic afval: weer een slachtoffer*. Retrieved from <https://www.rtlnieuws.nl/editienl/artikel/4901201/egel-gewond-plastic-afval-zwerfafval-ring-van-een-melkpak-weer-een>
- RTL Nieuws. (2020). *Desinfectie, meubels en stenen: boswachters zien meer afval in de natuur*. Retrieved from <https://www.rtlnieuws.nl/nieuws/nederland/artikel/5118511/afval-bossen-natuur-boswachter>
- Schultz, P. W., Bator, R. J., Large, L. B., Bruni, C. M., & Tabanico, J. J. (2013). Littering in context: Personal and environmental predictors of littering behavior. *Environment and Behavior*, 45, 35–59. <https://doi.org/10.1177/0013916511412179>
- SenterNovem. (2009). *Zwerfafval? Niet in mijn gebied: tips voor schone natuur en recreatie*. Retrieved from <https://www.nederlandschoon.nl/kenniswijzer-zwerfafval/zwerfafval-niet-in-mijn-gebied-tips-voor-schone-natuur-en-recreatie/>
- Sibley, C. G. & Liu, J. H. (2003). Differentiating active and passive littering a two-stage process model of littering behavior in public spaces. *Environment and Behavior*, 35(3), 415–433.
- Singh, J., & Kaur, R. (2021). Influencing the intention to adopt anti-littering behavior: an approach with modified TPB model. *Social Marketing Quarterly*, 27(2), <https://doi.org/10.1177/15245004211013333>
- Tummers, L. (2019). Public Policy and Behavior Change. *Public Administration Review*, 79, 925-630. <https://doi.org/10.1111/puar.13109>
- Van Raffe, J.K., & De Boer, T.A. (2007). *Afvaldumping in de natuur: Een verkennend onderzoek naar de omvang en achtergronden van afvaldumping in de natuur en een inventarisatie van de mogelijke oplossingen*. (Alterra-Rapport 1530). Wageningen, The Netherlands: Wageningen UR. Retrieved from <https://www.deafvalspiegel.nl/wp-content/uploads/2018/10/Afvaldumping-in-de-natuur-WUR.pdf>
- Vennix, J. A. M. (2016). *Onderzoeks-en interventiemethodologie* (Sixth ed.). Amsterdam: Pearson

- Verschuren, P., & Doorewaard, H. (2007). *Het ontwerpen van een onderzoek* (4e Rev. ed.). Den Haag: LEMMA. Retrieved from https://radboud-bibliotheek-budh-nl.ru.idm.oclc.org/boek/9789059314962/bju30070941.23072009092127_0304
- Wang, S., Wang, J., Yang, S., Li, J., & Zhou, K. (2020). From intention to behavior: comprehending residents' waste sorting intention and behavior formation process. *Waste Management*, 113, 41-50. <https://doi.org/10.1016/j.wasman.2020.05.031>
- Wicker, A.W. (1969). Attitudes versus actions: The relationship of verbal and overt behavioral responses to attitude objects. *Journal of Social Issues*, 25, 41-78.
- Yuriev, A., Dahmen, M., Paillé, P., Boiral, O., & Guillaumie, L. (2020). Pro-environmental behavioral through the lens of the theory of planned behavior: a scoping review. *Resources, Conservation and Recycling*, 155, 1-12. <https://doi.org/10.1016/j.resconrec.2019.104660>
- Wagh, S. (2022). *Public health research guide: primary and secondary data definitions*. Retrieved from <https://researchguides.ben.edu/public-health>

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Appendix 1: Summary of policy documents

For this desk research, three documents were analyzed to investigate what measures to combat littering are mentioned in already existing literature.

Rijkswaterstaat (2018)

Rijkswaterstaat (2018) has drafted an inspiration list of measures that can be taken to combat litter through behavior, participation and experience. Because this research is focused on behavioral change, only the list of measures for behavioral change is taken into account. According to Rijkswaterstaat (2018) behavioral measures are relatively cheap and can have a large and long term effect on the behavior of people. However, the basics should also be in order for these to work: the area should be cleaned sufficiently, there should be enough and effective places where waste can be disposed of, and the area should look neat. Rijkswaterstaat (2018) gives 10 measures for behavioral change:

1. **Make bins stand out and use primes**

Primes are sensory stimuli that activate certain unconscious knowledge and influence behavior based on previously taught behavior (e.g. smells, colors, shapes and words).

Regarding bins, this means for example giving bins bright colors or making sure bins do not have an unpleasant smell.

2. **apply footsteps, arrows or lines**

This measure uses nudging by making it easier for people to perform the proper behavior.

One of the most tested and well-known nudges are green footsteps, arrows or lines on the ground leading to bins.

3. **Make it fun**

This measure uses the fun-theory: gaining attention by making something fun. However, the effect of this measure is usually temporary and is therefore more suitable in areas where various people come together short-term, such as recreational areas or beaches. Examples are talking bins that make a sound, 'waste butlers' that offer waste bags to people, or 'living bins' (people/volunteers that dress up as bins to stimulate people to dispose of their waste properly).

4. **Remove resistance**

Decreasing the resistance is essential in regards to reaching the desired behavior. Therefore, the first step is to acknowledge the resistance and understand the other person. Decreasing resistance can be done by giving people multiple options so they still feel like they have the authority, and including people directly in the process of behavioral change. An example of this is that when bins are removed, people resist. By giving people the choice of either removing the bins or managing the bins themselves, people are given a choice.

5. **Use the right social norm**

People like belonging to a certain group, and this can be taken into advantage by giving a message about how the group is ought to act, thus showing the positive social norm.

Example of this are signs at bins or at the entrance of nature reserves confirming the social norm (e.g. 'Our visitors throw their waste in the bins')

6. **Utilize local heroes**

Use role models who appeal to the target audience, and who are recognizable. These people can become ambassadors for the fight against littering. An example of this is using pictures of locals, rangers, or animals with a call to keep the area clean.

7. **Make public space more appealing (place making)**

Placemaking refers to arranging the public space in a manner that users feel comfortable in it and experience that place as positive. When a place is seen as appealing (e.g. looking neat), it can encourage cleaner behavior. An example of this is placing flowers or bushes around bins, as green and nature are often linked with clean spaces and discourage leaving waste next to bins.

8. **Increase ownership**

Littering happens sooner at places that do not feel like they belong to anyone, since people feel less responsible and there is often a lack of social control. Therefore, increasing the feeling of ownership can help to lessen the amount of litter. This can for example be done by showing more who owns the area (e.g. on bins)

9. **Use authority**

Regarding communication, use people that have authority or are famous to emphasize the message of keeping the area clean.

10. **Increase the feeling of enforcement**

Enforcement is more effective when people feel like enforcement is done actively and that there is a high chance of getting caught. Therefore, it is important to show people that there is enforcement. Actually catching people while they litter is difficult, so it is important to give people the feeling of enforcement. Examples of this are using both communication and physical enforcement to increase the idea of enforcement, and actually controlling the area actively.

SenterNovem (2009)

In the document *Zwerfafval? Niet in mijn gebied: tips voor schone natuur en recreatie* (SenterNovem, 2009), inspiration and tips are given to combat litter in nature areas specifically. The recommended measures are divided in the following three categories: collecting and cleaning up, enforcement, and education and prevention

Collecting and cleaning up

Regarding bins, research shows that reducing the amount of bins also reduces the amount of litter and the costs of emptying and managing the bins. When bins are placed, it is important to consider the place (e.g. at parking lots, benches, or busy spots) and the appearance of the bins, as making a bin look interesting or fun can encourage people to throw away their waste properly. A solution for full bins high costs for emptying and managing is to place underground containers that can store a lot of waste and therefore do not need to be emptied often. Besides this, mobilizing volunteers is discussed as an option, since it keeps nature clean, and creates awareness for littering among the volunteers.

Enforcement

Enforcement can be difficult regarding littering, as it is often hard to trace back where it comes from and catch the perpetrator. This means that in the end, owners of the terrain are often responsible for cleaning up litter. However, enforcement can help to combat littering, specifically when fines are clearly communicated and people realize the (costly) consequences of their behavior.

Education and prevention

Preventing litter can be done by creating awareness, confronting people about their littering behavior and educating children about the right behavior. Other examples of using education is by giving insight into the costs of cleaning up litter (so people realize the (often high) costs), and informing people about how much time it takes for different types of litter to break down and what the consequences are for nature. Beside this, it can be effective and easy to join national campaigns (such as the national clean-up day) and timing campaigns correctly (e.g. in the summer there is usually more litter from visitors, therefore a campaign could be launched in this season).

Van Raffe & De Boer (2009)

Van Raffe & De Boer (2009) discuss several measures that specifically seek to combat (illegal) dumping of waste. Some of the measures can be taken by the owners of a certain area, whereas others require cooperation with the local or national government.

Close roads and paths (rearranging)

Dumping can possibly be decreased by rearranging the present layout of the area. This can for instance be done by moving parking lots to locations near houses, resulting in a high social control. Furthermore, roads and parking lots can be closed altogether, which means there are less ways into nature areas. However, this also means it might be harder for visitors, owners or emergency services to enter a nature area.

Remove litter

To decrease dumping, owners and managers of nature areas should be quick to clean up litter, as this may attract more litter.

Education

There are people that dump waste due to the fact that they are not aware of the consequences of littering, and think that litter will decompose eventually or that waste around bins will be cleaned up. By educating these people and spreading awareness, dumping can be prevented.

Talk and make agreements with the locals

There are areas where locals live next to a nature area and dump their waste in nature. When this is the case, it can be effective to start a conversation with the locals and make arrangements to stop the dumping.

Make it free or easy to deposit waste in the municipality

The reasons to dump waste such as garden or renovation waste are often related to the costs and difficulty of bringing it to a municipality's recycling point. A solution to this could be to make it more affordable or free to bring waste to a recycling point, or picking waste up at people's houses. This makes dumping waste in nature harder than properly disposing it, which may result in less dumping in nature. For this cooperation with the municipality is necessary. However, this measure does not decrease illegal dumping, such as drugs.

More supervision and higher punishments

The chance of getting caught while dumping waste is quite small, and the fines for dumping are also not exceptionally high (around 370 Euros). Therefore, dumping can be discouraged by having more supervision, leading to a higher chance of getting caught) and raising the fines. However, this may be expensive, as more supervisors are needed. It is a consideration between the costs of employment and the costs of waste dumping. An alternative is placing cameras at popular dump spots or mobilizing locals or visitors to notify the terrain owner (e.g. number plates of cars).

Decreasing negative consequences for owners

As discussed before, people may dump waste due to the waste policy of the municipality or because it is illegal, resulting in waste being dumped in nature. Since it is on their grounds, terrain owners are held responsible for cleaning it up, which can be costly and is seen as unjust by these owners. After all, it is not their waste. Solutions for this can be compensation from the government in the form of a subsidy, or allowing owners to deposit waste at the municipality's recycling point for free.

Sources

Rijkswaterstaat. (2018). *Inspiratielijst maatregelen zwerfafval gedrag, participatie en beleving*.

Retrieved from <https://www.nederlandschoon.nl/kenniswijzer-zwerfafval/inspiratielijst-maatregelen-zwerfafval-gedrag-participatie-en-beleving/>

SenterNovem. (2009). *Zwerfafval? Niet in mijn gebied: tips voor schone natuur en recreatie*.

Retrieved from <https://www.nederlandschoon.nl/kenniswijzer-zwerfafval/zwerfafval-niet-in-mijn-gebied-tips-voor-schone-natuur-en-recreatie/>

Van Raffe, J.K., & De Boer, T.A. (2009). *Afvaldumping in de natuur: Een verkennend onderzoek naar de omvang en achtergronden van afvaldumping in de natuur en een inventarisatie van de mogelijke oplossingen*. (Alterra-Rapport 1530). Wageningen, The Netherlands: Wageningen UR. Retrieved from <https://www.deafvalspiegel.nl/wp-content/uploads/2018/10/Afvaldumping-in-de-natuur-WUR.pdf>

Appendix 2: Operationalization

Appendix 2 contains the operationalization of the concepts of the theory of planned behavior (Brown et al., 2010) and the four policy instruments for behavioral change (Tummers, 2019).

Figure 5 shows the operationalization of the behavioral beliefs, the normative beliefs and control beliefs of the theory of planned behavior, based on the model of Brown et al. (2010).

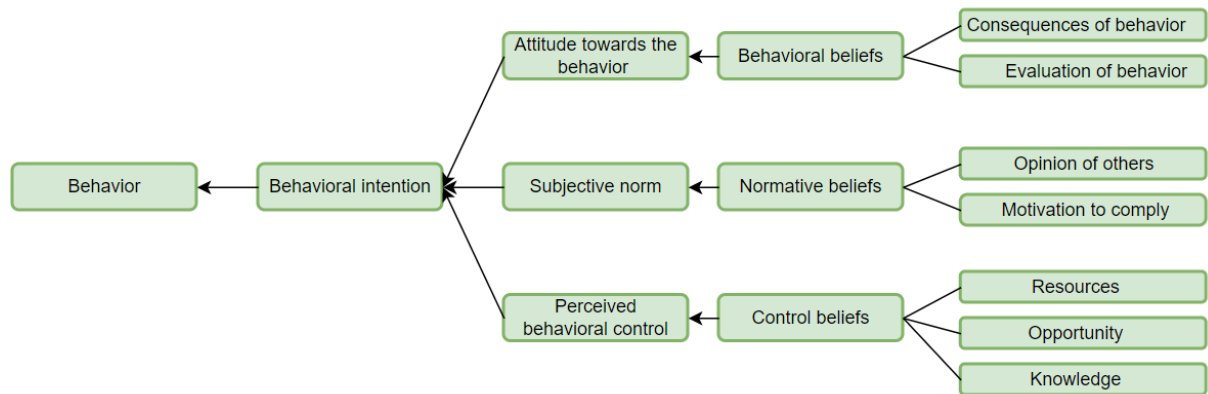


Figure 5: operationalization of the TPB

The figure shows that the behavioral beliefs can be divided into the consequences of behavior and the evaluation of behavior. The normative beliefs contain the opinion of other and the motivation to comply, and the control beliefs contain resources, opportunity, and knowledge.

Figure 6 shows the operationalization of the concepts of the four policy instruments, based upon the model of Tummers (2019).

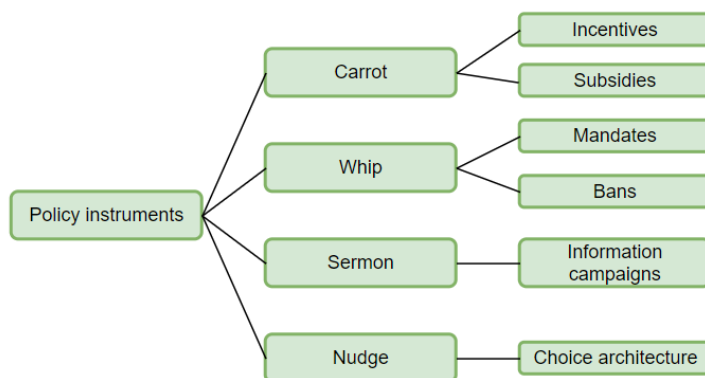


Figure 6: operationalization of the four policy instruments

The figure shows that the carrot contains incentives and subsidies, the whip mandates and bans, the sermon information campaigns and the nudge choice architecture.

Appendix 3: Interview guide rangers

Appendix 3 contains the interview guide used for the interviews with the rangers, which were conducted in Dutch.

Goedemorgen/goedemiddag etc.

Ik doe onderzoek naar zwerfafval in natuurgebieden, specifiek kijk ik naar wat voor gedrag van bezoekers leidt tot zwerfafval, en wat er aan kan worden gedaan en wat er al aan gedaan is, vanuit het perspectief van boswachters. Als je nu vragen of opmerkingen hebt, tijdens of na het interview mag je dat natuurlijk altijd zeggen. Heb je nu al vragen?

- Opnemen?

Introductie vragen

1. Kun je iets meer vertellen over je rol als boswachter?
2. Wat was voor jou de reden om boswachter te worden?
3. Welke rol speelt zwerfafval in de dagelijkse werkzaamheden als boswachter?
 - Ben je er veel mee bezig/komt u vaak zwerfafval tegen in de natuur?
4. Wat voor type zwerfafval kom je tegen/in welke hoeveelheid?
 - Is dit veranderd in de afgelopen jaren (type en hoeveelheid)
 - Is er een verschil voor vs tijdens de corona pandemie?
5. Wat zijn de risico's die zwerfafval met zich mee brengen naar jouw ervaring?
 - Bijv. veel werk, overbelaste vrijwilligers, dieren, veearts kosten door complicaties

Vragen over gedrag (TPB)/maatregelen

6. Denk je dat bezoekers stil staan bij wat voor consequenties zwerfafval heeft op de natuur/resultaten van het gedrag?
 - Consequenties niet duidelijk? Hoe kunnen deze duidelijker worden gemaakt? Wordt hier al iets aan gedaan?
 - In hoeverre hebben de consequenties van zwerfafval ook invloed op de bezoekers zelf? Geven ze om de natuur, of zijn deze consequenties ook direct negatief voor henzelf?
7. In hoeverre beïnvloeden bezoekers elkaar als het gaat om zwerfafval? Is het een sociale norm om afval netjes weg te gooien?
 - Wordt er meer afval in de natuur gegooid wanneer er al veel zwerfafval is? En andersom: als een plaats schoon is, is er dan ook minder zwerfafval? (Mensen hebben dan het idee dat de plaats schoon behoort te zijn, of juist niet)
 - Zijn er ooit maatregelen genomen om op deze manier zwerfafval tegen te gaan, dus door te laten zien wat de sociale normen zijn?
8. Zijn bezoekers gemotiveerd om hun afval op een goede manier weg te gooien, in een afvalbak of thuis?
 - Waaraan merk je dat?
 - Waaruit komt deze motivatie voort denk je? (Andere bezoekers, sociale normen, kennis, geen andere mogelijkheid)

9. Hebben bezoekers de middelen (bijv. voldoende kennis, wil) om te zorgen dat afval niet in de natuur wordt weggegooid?

- Wanneer er te weinig middelen zijn: zijn er maatregelen genomen om dit op te lossen?

10. Welke mogelijkheden zijn er om afval op een goede manier weg te gooien in dit natuurgebied?

- Hoe blijven jullie mogelijkheden ontwikkelen om dat te stimuleren?

- Zijn er voldoende mogelijkheden? Te weinig mogelijkheden: wordt er iets gedaan om het aantal mogelijkheden te vergroten?

vragen over policy instruments

11. Welke maatregelen zijn er genomen om zwerfafval tegen te gaan? Werken deze?

- Subsidies (bijv. voor het maken/uitvoeren van beleid)

- Regels (bevelen/verbieden)

- Informatiecampagnes/punten

- Nudging (makkelijk maken van goed gedrag, in dit geval afval weggooien)

12. Welke maatregelen zijn volgens jou de beste manier om het probleem aan te pakken?

Appendix 4: Interview guide IVN

Appendix 2 contains the interview guide used for the interviews with IVN. The interviews were conducted in Dutch.

Introductie vragen

1. Wat doe je bij IVN vooral? Wat zijn de dagelijkse bezigheden?
2. In hoeverre ben je bezig met zwerfafval? Is het iets wat jullie bij IVN veel bezighoudt?
3. Met wat voor activiteiten zijn jullie bezig rondom zwerfafval?
4. Wat voor soorten zwerfafval vinden jullie het meest?
5. Zijn er bepaalde trends/veranderingen met betrekking tot zwerfafval? Zijn er dingen veranderd door de jaren heen?
 - Voor vs. tijdens corona?

Vragen over gedrag

6. Waar denk je dat het weggooien van afval vandaan komt?
 - attitude towards the behavior (consequences, evaluatie van gedrags
 - Subjective norm (rol sociale normen)
 - Perceived behavioral control (mogelijkheden, kennis, resources)

Vragen over policy instruments

7. IVN is gericht op natuur educatie. Wat doen jullie aan educatie op het gebied van zwerfafval? Werkt educatie in jullie ervaring?
 - Hangt dit af van leeftijdsgroepen/natuurgebied?
8. Hebben jullie ervaring met andere maatregelen om zwerfafval aan te pakken?
 - Whip, nudge, carrot, sermon
9. Welke maatregel is volgen jou het beste/meest effectief?

Appendix 5: Code book

Below, the codes that have been used to analyze the interviews with the rangers and policy documents are shown. The code groups are underlined and are derived from the Theory of Planned Behavior (Brown et al., 2010) and the policy instruments for behavioral change (Tummers, 2019). The codes are based on the operationalization (Appendix 2).

Theory of Planned Behavior

Attitude towards the behavior

Consequences of behavior

Evaluation of behavior

Subjective norm

Opinion of others

Motivation to comply

Perceived behavioral control

Knowledge

Opportunity

Resources

Policy instruments

Whip

Bans

Mandates

Carrot

Incentives

Subsidies

Sermon

Information campaigns/education

Nudge

Choice architecture

There are also codes that have not been assigned to a particular code group:

Acceptance of littering

Littering trends

Role of government