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### Context matters

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GENERAL  
INTRODUCTION

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In one year, humankind produces approximately 1.3 billion tonnes of waste (Hoorweg & Bhada-Tata, 2012), which can build up a mountain 3200m across and almost 2400m high (Lyons, Swann, & Levett, 2015). While the production of waste is increasing, only a small percentage of the waste produced is recycled (Hoorweg & Bhada-Tata, 2012). For instance, in the European Union, only 29% of the municipal waste was recycled and composted in 2012 (European Environment Agency, 2015). What happens to the rest of the waste? Most of the waste still goes to landfill sites or is incinerated, which both contributes to greenhouse gas emissions (Hoorweg & Bhada-Tata, 2012). Another part of the waste is disposed of improperly, resulting in littered environments and 'waste islands' swimming in the ocean. To reduce waste problems, recycling is important. Recycling can contribute to a circular economy by increasing resource efficiency and reducing greenhouse gas emissions (Corsten, Worrell, Rouw, & Van Duin, 2013; European Union, 2014), thereby combatting today's waste problems and the emerging scarcity of resources (European Environment Agency, 2015). Recycling is not only a technical issue, but also a behavioural issue. Specifically, consumers who consistently separate the waste they produce are crucial for a circular economy (Kirchherr, Reike, & Hekkert, 2017). In this dissertation, we<sup>1</sup> focus on the behavioural side of recycling. We define recycling as individuals' waste separation

<sup>1</sup> I use 'we' instead of 'I' throughout this dissertation when I refer to the authors, as the research described is the product of the collaboration between me and my PhD supervisors Linda Steg, Ellen van der Werff, and Berfu Ünal.

intentions and behaviours to allow materials to be re-used. The main aim of this PhD thesis is to understand what motivates individuals to engage in recycling and how recycling can be promoted.

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## INDIVIDUAL AND CONTEXTUAL FACTORS INFLUENCING BEHAVIOUR

What affects individuals' recycling behaviour? The Integrated Framework for Encouraging Pro-Environmental Behaviour (IFEP model; Steg, Bolderdijk, Keizer, & Perlaviciute, 2014; Steg, Lindenberg, & Keizer, 2016) states that both individual and contextual factors and their interaction with each other are important to consider when aiming at better understanding pro-environmental behaviours. Following this notion, we propose that both individual and contextual factors can influence recycling behaviour. Next to these unique relationships between either individual or contextual factors and recycling behaviour, we propose that individual and contextual factors interact in influencing recycling behaviour (see Figure 1). In the following, we elaborate on this reasoning.

INDIVIDUAL FACTORS may explain why in a similar situation, one person recycles and another person does not. Many studies have examined the effect of various individual factors on recycling behaviour, and identified a wide range of individual factors that are related to recycling behaviour, including attitudes (e.g., Schultz, Oskamp, & Mainieri, 1995), norms (e.g., Nigbur, Lyons, & Uzzell, 2010), values (e.g., Ruepert, Steg, & Keizer, 2017) and environmental self-identity (e.g., Van der Werff, Steg, & Keizer, 2013a). In this PhD thesis, we first examine the relative importance of these individual factors in explaining recycling behaviour. Next, we focus on two general individual factors that are likely to affect many

types of pro-environmental actions, including recycling: biospheric values and environmental self-identity.

Values reflect general goals that serve as guiding principles in people's life (Schwartz, 1992; Feather, 1995). As desirable trans-situational goals, they reflect what individuals find important in their lives which, in turn, can affect beliefs, attitudes, norms and behaviours (Feather, 1995; Gardner & Stern, 2002). In the context of pro-environmental behaviour, biospheric values are particularly important as a consistent source of pro-environmental actions (De Groot & Steg, 2007, 2008). Biospheric values reflect how important individuals find it to benefit nature and the environment. Individuals who strongly endorse biospheric values are more likely to focus on and consider the environmental consequences of their actions, and to act pro-environmentally, such as recycling (Feather, 1995; also see Steg & De Groot, 2012 for a review). Furthermore, the stronger one's biospheric values, the more one is motivated to protect the environment, and the more willing one is to put effort into a behaviour that may benefit the environment (Steg et al., 2014; Steg, 2016).

Environmental self-identity has been shown to be another important antecedent of a wide range of pro-environmental behaviours, including recycling behaviour (Van der Werff et al., 2013a; Whitmarsh & O'Neill, 2010). Environmental self-identity reflects the extent to which

one sees oneself as a type of person who acts environmentally-friendly (Van der Werff et al., 2013a). The more one sees oneself as a person who acts environmentally-friendly, the more likely one is to recycle and to also engage in other pro-environmental behaviours.

The reason for this is that people are motivated to act in line with how they see themselves (Van der Werff, Steg, & Keizer, 2014a, 2014b; Kashima, Paladino, & Margetts, 2014).

To sum up, we propose that biospheric values and environmental self-identity may be important individual factors that can explain recycling behaviour.

CONTEXTUAL FACTORS can be defined as characteristics of the circumstances in which recycling behaviour takes place. The context may explain why one person recycles in one situation, whereas s/he does not recycle in another situation. For example, a person may be more likely to recycle his or her paper waste when it is regularly picked up from the kerb than when s/he has to bring it to a paper container that is rather far away. Although relatively few studies have investigated the effect of the context on recycling behaviour, there is some first evidence to suggest that the context in which recycling takes place may affect recycling behaviour (Oskamp, Harrington, Edwards, Sherwood, Okuda, & Swanson, 1991; Schultz et al., 1995). The context has been mostly considered as a factor that can facilitate, enable or inhibit recycling. In this respect, a relevant contextual factor may be the collection system in place that may affect how feasible it is for people to recycle. For instance, a kerbside collection system is commonly considered as an easy collection system to use (Ando & Gosselin, 2005;

Best & Kneip, 2011), which may facilitate recycling behaviour. On the other extreme, some collection systems may make it very unfeasible or even impossible for consumers to recycle certain materials. In Chapter 2, we conduct a meta-analysis to study the relative importance of different contextual factors that may facilitate or inhibit recycling behaviour in the literature. In particular, we examine to what extent the local circumstances (i.e., the recycling facilities in the neighbourhood, the possession of a recycling bin at home, the distance to a recycling location, and the size of the neighbourhood) and the housing situation (i.e., ownership and type of house) are related to recycling.

Importantly, extending the research on contextual factors, we study whether the context can also affect recycling in other ways. Specifically, we test whether the context may not only facilitate or inhibit recycling behaviour but may also make people focus on the environment or strengthen the effect of individual factors on behaviour. We explain our reasoning below. Additionally, we examine the interaction between individual and contextual factors. This notion is in line with the IFE model (Steg et al., 2014; Steg et al., 2016), stating that individual and contextual factors may interact in how they influence recycling behaviour. Interestingly, how individual and contextual factors may interact has been hardly studied, with a few exceptions (e.g., Ruepert et al., 2017). In this dissertation, we aim to address this gap in literature and aim to better understand how individual and contextual factors interact. In the following, we elaborate on three possible ways of how contextual factors may influence recycling behaviour and how they may interact with individual factors.

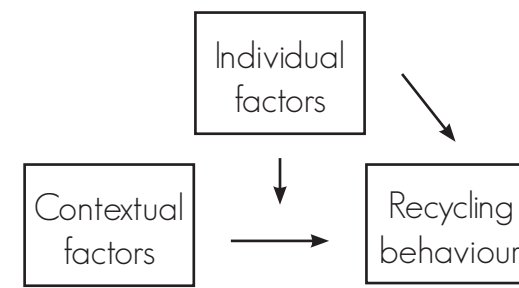


Figure 1. Conceptual model tested in this dissertation.

## PERCEIVED FEASIBILITY OF RECYCLING

The first way of how the context may influence recycling behaviour is by facilitating or inhibiting recycling behaviour. As mentioned above, the collection system in place may be a relevant contextual factor in this respect (Derksen & Gartrell, 1993; Best & Kneip, 2011; Best & Kneip, 2019). We propose that particularly people's perceptions of the ease of using the collection system affect their recycling behaviour rather than the collection system as such (cf. Weber, 2018). Specifically, individuals may differ in how easy they believe it is to use the same collection system. The use of a collection system may be perceived as easy to use by one person, while it may be perceived as relatively difficult to use by another person. These different perceptions may result in different recycling patterns of individuals within the same collection system.

We further propose that the perceived ease of using the collection system affects recycling behaviour indirectly, via the perceived feasibility

of recycling, which reflects the perceived ability to recycle (cf. IPCC, 2018) and the perceived ease of recycling (Rodgers, Conner, & Murray, 2008). Specifically, the easier one perceives the use of the collection system, the more feasible one perceives recycling to be, which, in turn, is likely to stimulate recycling (see Figure 2). We tested this reasoning in Chapter 3, in which we study to what extent the perceived feasibility of recycling is rooted in the perceived ease of using the collection system.

We further reason that perceived feasibility of recycling interacts with biospheric values in affecting recycling behaviour. Two theories would predict an interaction between perceived feasibility of recycling and biospheric values, but they propose different directions of such an interaction. First, the low-cost hypothesis (Diekmann & Preisendörfer, 2003) predicts a linear relationship between the effect of biospheric values and perceived feasibility of recycling. According to this theory, biospheric values are more likely to be related to recycling when recycling is perceived as rather feasible (i.e., associated with low costs), and less likely to be related to recycling when this behaviour is perceived as not very feasible (i.e., associated with high costs). Specifically, the low-cost hypothesis proposes that when recycling is not very feasible, even individuals with strong biospheric values may not engage in recycling behaviour, as in this case they may feel it is too difficult or effortful to recycle. According to the low-cost hypothesis, individuals are more likely to act in line with their biospheric values and to recycle the more feasible recycling is perceived to be.

Second, the A-B-C model (Guagnano, Stern, & Dietz, 1995; Stern, 2000) predicts a curvilinear relationship between biospheric values and recycling behaviour, contingent on the levels of perceived feasibility of recycling. Similar to the low-cost hypothesis, the A-B-C model predicts that when recycling is perceived as not very feasible, biospheric values are not likely to be strongly related to recycling behaviour. Yet, according to the A-B-C model, biospheric values are neither strongly related to recycling when recycling is perceived as very feasible, as in this case most people may engage in recycling behaviour, irrespective of the strength of their

biospheric values. This implies that the relationship between biospheric values and recycling behaviour would be most pronounced when recycling is perceived as moderately feasible (Guagnano et al., 1995; Stern, 2000; Ölander & Thøgersen, 2005). In Chapter 3, we examine the effect of the perceived ease of using the collection system and perceived feasibility of recycling on recycling behaviour, and test whether the low-cost hypothesis or the A-B-C model is more plausible in explaining the interaction between biospheric values and perceived feasibility of recycling.

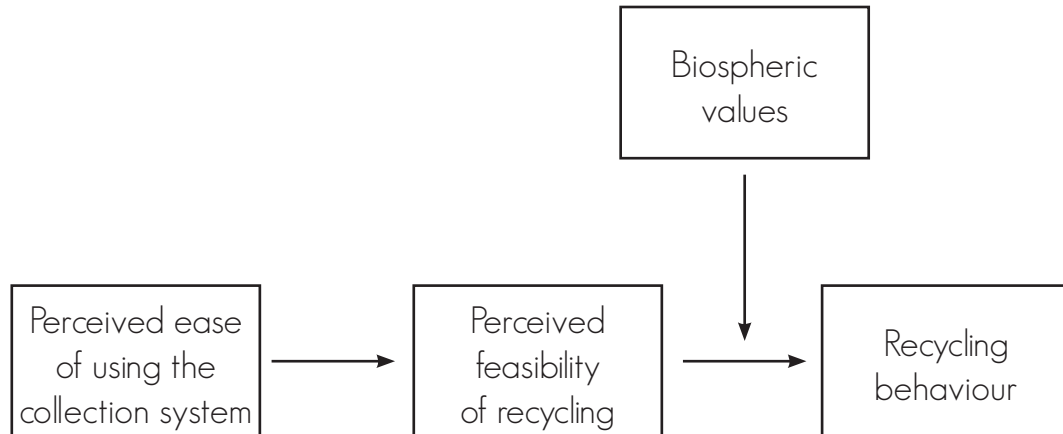


Figure 2. Conceptual model tested in Chapter 3 on how the perceived ease of using the collection system may promote recycling behaviour.

## CONTEXT MAY MAKE PEOPLE FOCUS ON THE ENVIRONMENT

We further propose that the context can stimulate recycling behaviour by making people focus on the environment. The IFEP model (Steg et al., 2014; Steg et al., 2016) states that individuals who are focused on the environmental consequences of their behaviours and on benefiting the environment in a given situation (in the following we refer to this as 'focus on the environment'), are more likely to engage in recycling behaviour. As indicated earlier, people with stronger biospheric values are more likely to be focused on the environment, and to act pro-environmentally, such as recycling (Feather, 1995; also see Steg & De Groot, 2012 for a review). Yet, the focus on the environment may also depend on contextual factors. We propose that a relevant contextual factor that can make people focus on the environment is a packaging design. The more a packaging design makes one focus on the environment, the more likely one should be to recycle that package. There is some evidence to suggest that design can encourage pro-environmental actions (Niedderer et al., 2014; Tromp, Hekkert, & Verbeek, 2011). Yet, not much is known about how, why and under which conditions a packaging design can stimulate pro-environmental actions, amongst this recycling behaviour. We address this research gap in this dissertation.

Importantly, we propose that a packaging design and biospheric values interact - the effect of packaging design on recycling may depend on the strength of one's biospheric values (see Figure 3). In particular, we propose that the effect of packaging design is more pronounced among individuals with moderately strong

biospheric values, as individuals with strong biospheric values may recycle anyway, whereas individuals with weak biospheric values may generally not recycle. For individuals with moderately strong biospheric values, a packaging design may provide an additional push to engage in recycling. This implies that we expect a curvilinear relationship between packaging design and biospheric values (Ruepert et al., 2017; cf. Guagnano et al., 1995). We test our reasoning in Chapter 4, in which we collaborate with designers who design packages that aim to focus people on the environment. To our knowledge, we are the first ones who investigated the influence of a packaging design on recycling behaviour. Such insights are important to understand the potential and to increase the impact of design in stimulating recycling behaviour.

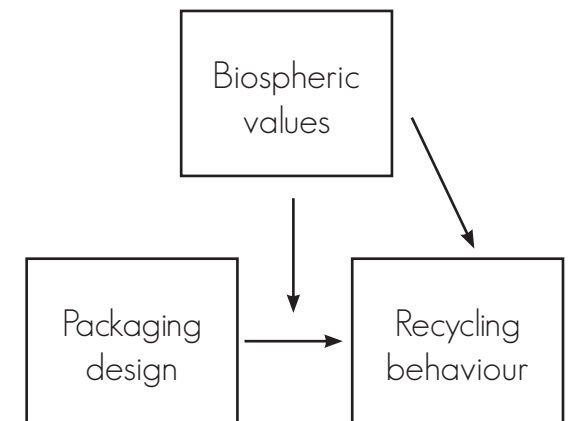


Figure 3. Conceptual model tested in Chapter 4 on how a packaging design may promote recycling behaviour.

## CONTEXT MAY STRENGTHEN INDIVIDUAL FACTORS

A third way of how the context may affect recycling behaviour is by strengthening individual factors. As a case of point, we examine the effect of experiencing an art installation on recycling behaviour. We propose that art can be a powerful tool to stimulate pro-environmental actions, including recycling behaviour. A recent example of an art installation in the public space that tackles the topic of climate change is 'For Forest' by Klaus Littmann in the football stadium in Klagenfurt, Austria. This art installation is based on a drawing by Max Peinter that shows a stadium full of visitors observing a forest inside the stadium. For this, the artist planted a mixed forest of 300 different trees at the pitch of the stadium. With this art installation, the artist aims to confront observers with the widespread attitude and assumption that nature is taking for granted. He aims to make observers aware of that nature may soon be something from the past that can only be viewed in specially designated spaces (<https://forforest.net/>). Yet, most art installations tackling the broad topic of climate change are built on assumptions of artists on factors that may drive behavioural change (Hekkert & Van Dijk, 2014; Niedderer, 2007), which are typically not tested (Niedderer et al., 2014; Aryana & Boks, 2012). In Chapter 5, we test whether an art installation that

integrates scientific theory in the design of the art installation is effective in promoting pro-environmental behaviour. In particular, we propose that an art installation that is designed to strengthen environmental self-identity leads to more recycling behaviour among people who experienced the art installation (see Figure 5). As discussed above, environmental self-identity is an important antecedent of consistent and long-lasting pro-environmental behaviours, including recycling (Van der Werff et al., 2013a, b; 2014a, b). Amongst others, environmental self-identity depends on past behaviours (Van der Werff et al., 2013a; 2014a). When people realize that they have engaged in pro-environmental behaviours in the past, they are more likely to see themselves as a pro-environmental person and are consequently more likely to act pro-environmentally in the future. We propose that experiencing an art installation in which people are, among others, being reminded of one's past pro-environmental behaviours, strengthens one's environmental self-identity. This, in turn, should lead to more recycling behaviour.

In doing so, we follow a novel interdisciplinary approach, integrating insights from art and environmental psychology. Specifically, psy

chologists explicate theories on factors driving pro-environmental behaviour to the artist, the artist embeds one of these theories in the design of the art installation. Next, the psychologists systematically evaluate the effect of the art installation on pro-environmental behaviours. Thereby, we aim to contribute to a better understanding of the extent to which, how and why art can promote pro-environmental actions. As far as we know, we initiated one of the first collaborations between designers, artists and psychologists.



Figure 4. Conceptual model tested in Chapter 5 on how art may promote recycling behaviour.

## CURRENT PHD THESIS

The current PhD thesis aims at better understanding how individual and contextual factors influence recycling, with a particular focus on the role of contextual factors. The reason for this is that a systematic examination of whether, how, and under which conditions contextual factors affect recycling behaviour is understudied in the current literature on recycling behaviour. To address this gap, we specifically examine the underlying process of how contextual factors influence recycling behaviour and how contextual factors interact with individual factors, particularly with biospheric values, using different methods and different indicators of recycling.

This dissertation consists of four papers; each paper addresses a different way of how the context may affect recycling behaviour. We first conduct a meta-analysis to find key individual and contextual factors associated with recycling behaviour (Chapter 2). We expect that there has been little literature on the influence of contextual factors on recycling behaviour, and that most studies have been focused on one way in which the context may affect recycling, namely whether the context facilitates or inhibits recycling behaviour.

Chapter 3 builds on the results of the meta-analysis and investigates how the context - the collection system in place - can facilitate or inhibit recycling behaviour. We argue that individuals' perception of the ease of the collection system are crucial for individuals' perception of the feasibility of recycling, which, in turn, should affect recycling. Furthermore, we expect that the effects of perceived feasibility of recycling on recycling depends on the extent to which

individuals endorse biospheric values.

Chapter 4 addresses a second way of how the context may influence recycling. In particular, we examine whether a packaging design that makes people focus on the environment can lead to more recycling behaviour. We propose that the effect of a packaging design on recycling is more pronounced among participants with moderately strong biospheric values.

Chapter 5 addresses whether art may promote recycling behaviour by strengthening individual factors, in this case environmental self-identity. In all chapters, we do not only examine the effect of the context on intended and self-reported recycling behaviour but also on actual recycling behaviour. We thereby aim to examine whether results are consistent across different indicators of recycling behaviour. We end this dissertation with a discussion of the main findings and the theoretical and practical implications of our findings (Chapter 6).