Behavior Change as Part of the Solution for Plastic Pollution

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Introduction

Problem awareness of the public and risk perception are important elements to understand people's mental representation of a hazard, in understanding the "status quo", of current beliefs and opinions (for more on risk perception see Felipe-Rodriguez et al. in this volume). Nevertheless, further actions need to follow if we want to change the "status quo" and encourage environmentally friendly behaviors. Therefore, the following chapter aims to provide an overview of how social and environmental psychology approaches focusing on behavior change can be applied to plastic pollution and in this way contribute to solutions. To clarify, environmental psychology is defined "as the discipline that studies the interplay between individuals and the built and natural environment" (Steg et al. 2018, 2). This chapter will introduce different theoretical models and approaches of behavior change, followed by techniques used in the context of consumer-focused interventions. Moreover, we summarize potential barriers towards environmentally friendly behaviors known as "Dragons of Inaction". Lastly, we emphasize the importance of intervention development, evaluation, and communication techniques firmly based on scientific evidence from social and environmental psychology. This chapter does not present a complete literature review on what has been done (for reviews see Heidbreder et al. 2019 and Nuojua et al. 2021). Instead, it aims to explain how interventions reducing plastic consumption can be developed using theories from psychology.

Exploring the Role of Environmental Psychology in the Plastic Discourse

Human activities are the sole cause of plastic pollution in our natural environment (Pahl and Wyles 2017); hence, behavior change can be one solution to tackle plastic pollution. Behavioral approaches are on the rise but

still underrepresented in the plastics discourse (Nuojua et al. 2021; SAPEA 2019). Investigating behavior and its antecedents from an environmental psychology perspective is also gaining importance in other environmental contexts such as nature conservation and climate change. However, the positive impact of environmental psychology knowledge about climate change action (Steg 2018; van Valkengoed and Steg 2019) and conservation efforts (Nielsen et al. 2021; Schultz 2011) has not reached its full potential (Nielsen et al. 2021; Whitmarsh et al. 2021).

One way forward is to focus on environmentally impactful behaviors understood as individual behaviors which have a significant influence on changing the structure or dynamics in our environment (Stern 2000) and to do so systematically (Nielsen et al. 2021), using qualitative and quantitative research.

This is a useful starting point for this chapter and more broadly for scientists working on tackling plastic pollution. Plastic production, consumption and disposal are all influenced by human behavior from different stakeholders at different levels (Pahl et al. 2020). Therefore, we hope that the relevance of environmental psychology continues to become more apparent in the wider scientific discourse and across disciplines. We suggest a focus on the potentially riskiest plastics and behaviors as well as underlying human factors, which are relevant for that specific plastic being produced, used, and disposed (see also SAPEA 2019). Interdisciplinary collaborations are therefore necessary to understand the plastic system fully. The technical life-cycle assessment of a problematic plastic product, for example, developed by environmental engineers will be useful for environmental psychologists wanting to explore predictors of behavior to develop communication and behavior change interventions. Whereas, the research informed interventions will be beneficial for governments and municipalities on a local, national or international level to have a positive real-life impact for its communities such as a decrease in plastic pollution. The EU-funded H2020 LimnoPlast project, for instance, investigates microplastics pollution and solutions in Europe's freshwater ecosystems from an environmental, technical, and societal perspective (https://www.limnoplast-itn.eu/). The psychologists in the project investigate the perceptions of experts and laypeople to work towards suitable risk communication and behavioral change measures; all under consideration of current research insights about psychological and contextual constraints. This is crucial for the progress towards the reduction of plastic pollution, thus we interweave these in the

remainder of the chapter, starting with a discussion of the awareness-behavior gap.

The Awareness-Behavior Gap

Awareness-raising among citizens—an often-proposed action against plastic pollution—is an important part to tackle plastic pollution. However, it is not the complete answer to this problem. Europeans, for instance, are aware of the plastic problem and express concern regarding a range of impacts (Davison et al. 2021; European Commission 2020); however, research has shown that problem awareness is only one of many variables influencing sustainable behavior (Heidbreder et al. 2019; van Valkengoed and Steg 2019).

A Small Thought Experiment:

Imagine you are being invited to a barbecue with a few friends at a public barbecue place. The sun is shining and your work for today is done. There is only one more thing to do—buying a bottle of wine or non-alcoholic beverage from the supermarket and bringing cutlery for everyone. Now you have the choice to bring the stainless steel cutlery you have at home or to buy the single-use plastic cutlery at the supermarket. Both options have their advantages and disadvantages.
What do you bring and why?

Many different factors appear to influence people's choice of reusable cutlery or single-use cutlery. We are going to explore one of the factors influencing this decision below because being aware of the negative impact of, in this case, single-use plastic will probably not be the main factor determining the choice.

Heidbreder et al. (2019) identified a gap between the awareness of plastic pollution and related behaviors, that is, even if people know about the negative impacts of plastic pollution, they do not always act accordingly (see also Stieß et al. in this volume). Instead, their behaviors are mainly predicted by habits, social, and situational factors. A potential explanation of why awareness alone will not change environmental behavior can be found in the norm-activation model (Schwartz 1977; Schwartz and Howard 1981). The

norm-activation model, originally developed for explaining altruistic behavior assumes that a feeling of moral obligations (personal norm) influences people's actions in moral situations (Schwartz 1977; Schwartz and Howard 1981). To do so, the personal norm—understood as the representation of personal values in the present moral situation—needs to be activated to trigger the action (Schwartz 1977; Schwartz and Howard 1981).

Personal norms will be activated in people when 1) they become aware of the need that someone or something needs help (awareness of need), 2) they become aware that certain actions have consequences—that these can increase or decrease the problem (awareness of consequences), 3) they ascribe personal responsibility to the problem (ascription of responsibility), 4) they feel capable of helping or doing something against the problem (self-efficacy; Schwartz and Howard 1981).

Even though people are typically aware of the consequences when they are buying single-use cutlery, it is not given that they will choose the latter. It could be that the person does not feel responsible for global plastic pollution, rather ascribing the responsibility mainly to the producers, retailers or broadly to industry instead of themselves. It also could be that the person does not feel capable of acting environmentally friendly in the situation, which will hinder the activation of the moral obligation and make the purchase of single-use plastic cutlery more likely.

To summarize, personal norms—as the moral influence on acting in an environmentally friendly manner—need to be activated in people by different factors, one of them being aware of needs and consequences.[1] Awareness does play a role but is only one factor of many and often has no direct influence on behavior. That means if behavior change is the aim, raising awareness of need and consequences should be accompanied by information about individual responsibility and information about how to act (morally) "right" or socially appropriate in the given situation.

Behavior Change: From Theory to Practice

Personal norms are not the only behavioral motivator. In case a practitioner (e.g., a municipality managing a public barbecue area or local waste

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1 Due to the similarity of *awareness of need* and *awareness of consequences* multiple researchers have adapted the model and been only using one of the constructs (Klöckner 2013a).

collection) would like to create an intervention to decrease people bringing single-use plastics to the area, it helps to understand why people use single-use plastics in the first place. Therefore, in this section, we would like to dive deeper into the mechanisms of behavior and behavior change. We introduce two currently used and fairly extensive models as examples—the *comprehensive action determination model* and the *stage model of self-regulated behavioral change*. In this chapter, they are guiding the exploration of behavioral determinants and we are using them as adaptable frameworks.

Prediction Model: The Comprehensive Action Determination Model

Various theories and models have been used to predict environmental behavior outcomes and to investigate possibilities for transforming environmental behavior and its motivators. However, many theories reduced the prediction of behavior to a few of these motivators. Some focused on normative, some on non-normative motivators. Environmental psychologists (Klöckner 2013a; 2015; Klöckner and Blöbaum 2010), therefore, concluded that a model with normative and non-normative motivators was needed and joined three commonly used models: The theory of planned behavior (Ajzen 1991), the norm activation model (Schwartz 1977; Schwartz and Howard 1981) and the value-belief-norm theory (Stern 2000). Based on these theories the comprehensive action determination model was developed (Klöckner 2013b; see Fig. 1). The theories complement each other, as the often-criticized missing morality construct in the theory of planned behavior can be implemented when considering variables from the norm activation model and value-belief-norm theory (Klöckner 2013a). Additionally, none of the original theories explains repetitive behavior well and therefore, habit strength was included in the comprehensive action determination model. It is empirically supported and has been tested with different environmental behaviors (Klöckner 2013a). The comprehensive action determination model focuses on intrapersonal constructs, but also includes social and situational influences. As mentioned above, the intrapersonal constructs are divided into normative and non-normative parts (also defined as moral and nonmoral) which influence each other and can directly or indirectly motivate behavior. Values, ecological worldview, awareness of consequences and ascription to responsibility indirectly motivate behavior, therefore, their influence can be interrupted or

weakened by various factors such as competing attitudes, low perceived behavioral control etc. (see Fig. 1). Nevertheless, they play an important role as they, together with social norms, create moral obligations (Klöckner 2013a). Moreover, personal norms, social norms, attitudes, and perceived behavioral control influence behavioral intention, whereas intention, perceived behavioral control, and habits influence behavior. They are the direct behavioral motivators (Klöckner 2013a).

Fig. 1: The comprehensive action determination model. (Source: Adapted from "How powerful are moral motivations in environmental protection?: An integrated model framework." by C.A. Klöckner 2013. In Handbook of moral motivation, p. 462.
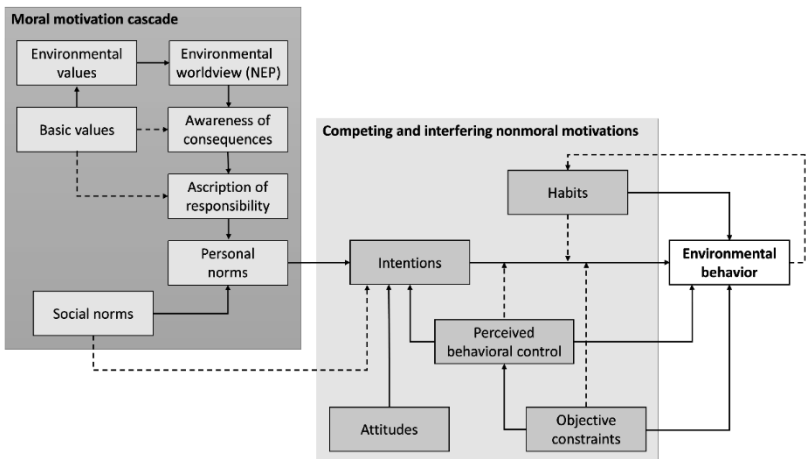
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The values specifically studied in the context of environmental behavior and therefore, relevant for the comprehensive action determination model, are biospheric, altruistic, and egoistic values. Biospheric and altruistic values are defined in terms of concern towards nature (biospheric) and human wellbeing (altruistic), respectively, whereas egoistic values are defined in terms of concern about or interest in oneself (Stern 2000; Stern and Dietz 1994). Values are linked with ecological worldview (a measure created by Dunlap et al. 2000). The ecological worldview contains the beliefs that human behaviors threaten nature, that natural resources are finite and that humans should not rule over nature (Dunlap et al. 2000). People with strong biospheric and altruistic values are likely to have a more ecological worldview while people with strong egoistic values are likely to have a less

ecological worldview (Klöckner 2013a). Based on the value-belief-norm theory, the ecological worldview takes its place as a link between values and personal norms instead of its classical interpretation as an environmental attitude (Stern 2000).

Norms are the shared beliefs of a person on how they should act. They can be categorized by how externalized or internalized they are. Internalized norms such as personal norms are understood as "the self-expectations for specific action in particular situations that are constructed by the individual." (Schwartz 1977, 227). As described in the previous sections, personal norms need to be activated and are expressed as "feelings of moral obligation" (Schwartz 1977). On the other hand, social norms are external and broadly described as the perceived social pressure to perform a behavior relevant to other people (and reinforced by rewards or punishments) in a certain situation (Schwartz 1977). However, a study about recycling and organic food purchase with Portuguese and Brazilian participants showed that personal norms predicted the environmentally friendly behaviors better than social norms (Bertoldo and Castro 2016).

All the constructs described above are normative motivations to act environmentally friendly. The great strength in the comprehensive action determination models lays in its wide scope—combining normative motivations with non-normative motivations to predict environmentally friendly behavior. The latter include attitudes and perceived behavioral control. Based on Ajzen's theory of Planned Behavior (1991), attitudes are understood as the degree of the person's evaluation (favorable or unfavorable) towards a specific behavior and its outcomes, whereas, perceived behavioral control is understood as the perceived ease or difficulty of an action. It is manifested by past experiences and perceived anticipated barriers (Ajzen 1991). According to the comprehensive action determination model, all of these factors influence behavior in diverse ways and therefore, need to be targeted differently (Klöckner 2015).

Moreover, the comprehensive action determination model includes habit strength (more details found in Box 1) as a predictor for repeating behaviors, as habit strength moderates the relationship between the intention and the actual behavior. The stronger the habit, the weaker the influence of intention on behavior (Klöckner 2013a).

Box 1: Habitual Behavior and Plastic Consumption

Habits are a key predictor of plastic consumption and they are closely interlinked with context (Heidbreder et al. 2019). One example in regards to plastics is a study by Romero et al. (2018) with Brazilian immigrants in Canada. In this study, participants compared their old environmental attitudes and behaviors in Brazil to their present attitudes and behaviors using self-assessment. The participants reported that they already felt pro-environmental before moving and that the use of plastic bags was "just a habit" (Romero et al. 2018, 8) of them in their home country. After they migrated to Canada, the participants reduced plastic bag usage while no environmental attitude change was reported. Moreover, this fits with the assumption that individuals only reconsider their habits when the context changes drastically (Steg and Vlek 2009).

Furthermore, habits are woven with situational factors such as convenience. A study with participants from South Africa showed "convenience" (51 percent) was chosen as the main reason for plastic bag usage. In comparison, forgetting to bring their reusable bag was selected by 13 percent of the participants (O'Brien and Thondhlana 2019). This is in line with past research finding similar results regarding respondents using plastic bags out of convenience (Braun and Traore 2015), next to using plastic bags because of easy access or their low price (Adane and Muleta 2011; O'Brien and Thondhlana 2019).

Heidbreder et al. (2019) point out that social interventions (political and psychological) seem to also be potentially effective for habits. For example, a voice prompt from cashiers (asking if customers want a free plastic bag in Japanese supermarkets) led to a decrease of plastic bag usage of 5 percent, in comparison to cashiers handing out plastic bags to the customers without asking (Ohtomo and Ohnuma 2014). One study in Portugal reported that avoiding payments of a plastic carrier bag tax was one of the main reasons for not using plastic bags in the short and medium term (Martinho et al. 2017). Moreover, after the implementation of the charge, Portuguese participants from another study reported developing reuse habits and a reduction of single-use plastic usage (Luís et al. 2020). Nevertheless, long-term changes need to be investigated further (Heidbreder et al. 2019).

Generally, habits fulfil a function to achieve specific goals, they are automatic behavioral patterns and bound to a certain stable situation

(Verplanken and Aarts 1999). They develop through positive reinforcement (e.g., achieving the situational specific goal) of the repeated behavior.

Example: Reducing Personal Clothing Consumption

Synthetic microfibers are one of the major microplastics sources in European rivers (Siegfried et al. 2017), plus experts working on plastics perceive the impact of textile microfibers as one of the riskiest on the natural environment and human health in comparison to other sources, such as bigger plastic items breaking down (Grünzner et al. 2021). Moreover, fast fashion—which is mainly using synthetic fibers and harmful chemicals—has taken over the clothing market (Niinimäki et al. 2020); hence, people's reduction in their clothing purchases can contribute to decreasing microplastics pollution.

Joanes et al. (2020) applied the comprehensive action determination model to determine the most influential intrapersonal factors for reducing clothing consumption. This is highly valuable as pathways for behavioral interventions can be identified. The results from their two studies show that across five countries (Germany, Poland, Sweden, United States and United Kingdom; n = 5,185), personal norms and social norms were the strongest predictors for intention to reduce clothing consumption, followed by attitudes. Norms having the strongest effect led the authors to the assumption that clothing purchase behavior has moral components. Perceived behavioral control had a negative relationship with purchase behavior (measured daily, during a two-week period). That means that the more participants felt capable to reduce clothing purchases, the least they bought. Perceived behavioral control was rated high across all countries and the authors suspect that this could be due to the easy nature of the consumption behavior. Consumers are theoretically able to reduce clothing purchases right away. Nonetheless, intention to reduce clothing consumption was not related to perceived behavioral control. Moreover, the authors included a measure of impulsive purchase behavior and past behavior. Impulsive purchase behavior was related to past as well as actual purchase behavior, which made the authors conclude that the behavior in question can be non-intentional or potentially even automatic sometimes.

Several potential intervention approaches are proposed by Joanes and their colleagues (2020): 1) Increasing (and activating) personal norms through wide-spread information campaigns about the environmental

impact of clothes, such as where and how much pollution it causes; providing specific groups with information about how resources can be saved when reducing one's clothing purchase; increasing awareness about the impact of individual clothing consumption. 2) Instructing consumers to reflect on past purchases to make them think about unnecessary purchases and potentially influence future behavior. 3) Exploring strategies based on self-regulation theory including goal setting, implementation intentions or if-then plans to tackle the intention-behavior gap to increase the success rate of the action or in this case non-action e.g., no purchase (Bamberg 2013; Nielsen 2017; Sheeran and Webb 2016).

Stage Model: The Stage Model of Self-Regulated Behavioral Change

Following up on our last example of clothing purchases, we want to introduce the intention-behavior gap and explain why applying the stage model of self-regulated behavioral change can help to increase the success of translating the behavioral intention into doing the behavior. The study from Joanes et al. (2020) found that the higher a participant scored on the importance of the goal to reduce clothing consumption, the fewer clothing items were purchased. Nonetheless, the effect was small which the authors suspect could be related to the frequently observed intention-behavior gap. A reason for this could be that prediction models such as the comprehensive action determination model frame behavior change as a static process at one point of time even though behavior change often occurs over a longer time period (Gollwitzer 1990).

In response to this issue, Bamberg (2013) suggested applying a stage approach—studying people's voluntary change—which has been shown to be successful in targeting behaviors related to health (see e.g., Schwarzer 2008). The stage model of self-regulated behavioral change (Bamberg 2013, Fig. 2) integrates the model of action phases (Gollwitzer 1990) and determinants from the norm-activation model (Schwartz 1977; Schwartz and Howard 1981), theory of planned behavior (Ajzen 1991) and health action process approach (Schwarzer 2008).
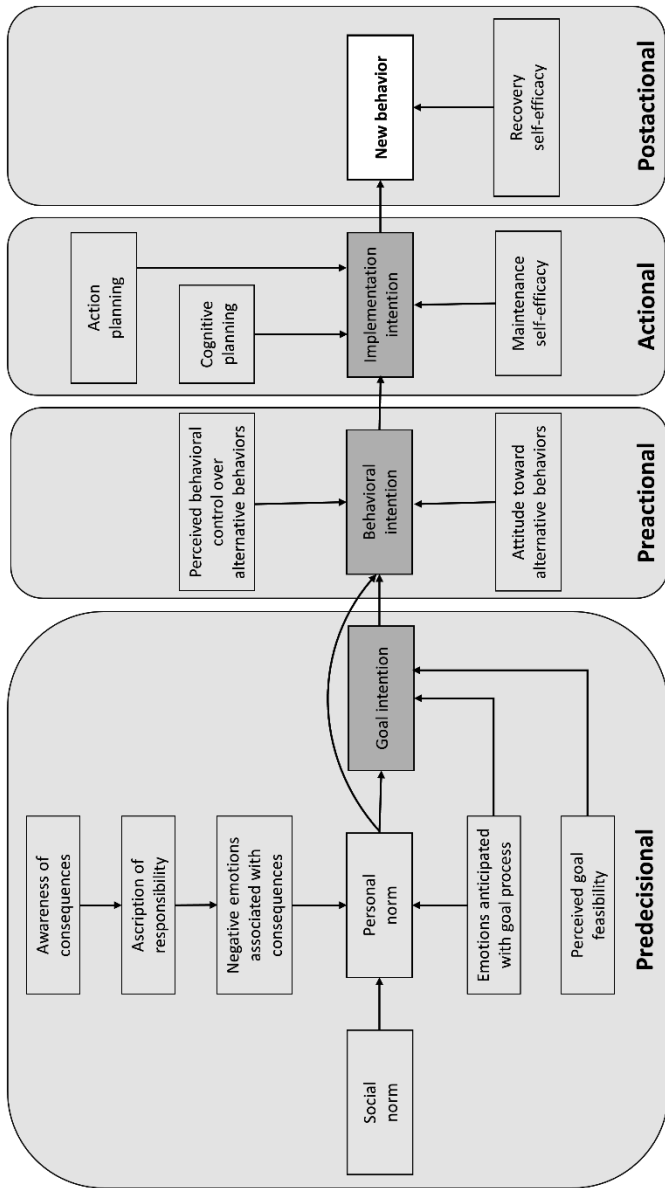
Fig. 2: *The stage model of self-regulated behavioral change. (Source: Adapted from Journal of Environmental Psychology, 33, Bamberg, Applying the stage model of self-regulated behavioral change in a car use reduction intervention, p. 69, Copyright 2013 by Elsevier)*

The four action phases (predecisional, preaction, actional and postactional)
—understood as stages of decision-making—build the frame whereas the
different intentions (goal-, behavioral- and implementation intention) alter
the stage transition, influenced by various psychological factors.

Behavior change is driven by a change in intentions, progressing from
one stage to the next one and, therefore, changing the old (potentially
environmentally harmful) to a new behavior (potentially environmentally
friendly). In the predecisional stage—such as described in the norm-
activation model—a person becomes aware of a problem and their moral
obligation (activated personal norm) to form a goal intention to change the
behavior leading to the problem in question. In the preactional stage, the
person weighs between different behavioral alternatives and decides on the
most fitting options, which is influenced by the attitude and perceived
behavioral control towards the alternative, and leads to forming the
behavioral intention to do the behavior. In the actional stage, the chosen
behavioral alternative is put into action in the situation where the old
behavior normally occurs. To do so, planning abilities and maintenance of
self-efficacy forms the implementation intention. In the postactional stage,
it is the person's task to reflect on their decisions and, if interpreted as
successful, the new behavior will be maintained and relapse into the old
behavior avoided.

In a recent review by Keller, Eisen and Hanss (2019), the authors
concluded that the stage model of self-regulated behavioral change has
received empirical support for its general framework applied to various
behavioral domains; nonetheless, the models' determinants differ in their
prediction power across behaviors. Moreover, the self-assigned stage
membership may be biased and further validation of measures opera-
tionalizing the stages is needed. However, practically speaking, interventions
with stage-tailored information have been shown to be more effective in
fostering stage progression and behavior change than have non-tailored
interventions (Keller et al. 2019).

Example: From Single-Use to Reusable Drink Cups

A recent study showed that single-use cups and lids were among the top ten
items littering our aquatic environments worldwide (Morales-Caselles et al.
2021). Paper cups tend to come with an internal plastic film that can
discharge microplastics when used with hot water (Ranjan et al. 2021).

Consumer reduction of single-use cups thus is beneficial for the natural environment and potentially for health. Economic incentives alone do not seem to trigger the needed reduction in single-use cups and a mix of measures, including internal motivators, are needed (Poortinga and Whitaker 2018; Sandhu et al. 2021). Therefore, underlying psychological influences of alternative sustainable behaviors such as using a refundable cup from a city-wide deposit scheme, bringing one's own cup and reducing one's consumption to tackle the problem have been investigated (Keller et al. 2021).

The study by Keller et al. (2021) used the stage model of self-regulated behavioral change as the underlying framework and found that it partly explained single-use cup consumption and its sustainable alternative behaviors. For example, stronger implementation intentions predicted (self-reported) reduced consumption and own cup usage. That means, people reduced their consumption when they were outdoors or used their own cup to buy a take-away drink when they actively planned their action in the specific situation beforehand.

Keller et al. (2021) suggest that interactive campaigns such as websites or apps can be used to check people's stage and follow up with stage-appropriate information (such as in Klöckner and Ofstad 2017) or help them find the needed information (such as in Sunio et al. 2018). For example, Klöckner and Ofstad (2017) designed a website with stage-appropriate information in three different categories: 1) Why should I do something?; 2) What can I do?; How do I master the challenge? Each section told the story of three people and their individual goals to reduce their consumption (in this case beef). For example, the first subpage had information about why they reduced their consumption (targeting the preaction stage). The second subpage had information about how they reduced their consumption (targeting the preaction stage) and the third subpage had information about their challenges and how they overcame them (targeting the action and preaction stage).

Moreover, Keller et al. (2021) approve of further regulatory measures and propose that labelling products as non-recyclable could be beneficial to enhance the problem awareness of consumers. Moreover, labelling products clearly as non-recyclable, linked with a picture of the harm they can cause (e.g., a picture of a local animal eating microplastics), could increase the feeling of moral obligation even stronger.

Box 2: Behavioral Barriers—The Dragons of Inaction

Plastic reduction behavior such as shopping plastic-free can be demanding and impractical for consumers. People may encounter structural or situational barriers regarding their purchase behaviors e.g. encountering long ways to the zero-waste supermarket or farmers market, financial constraints when buying more expensive unpacked alternatives, no availability of unpacked alternatives in the local supermarket etc., which hinder the reduction of plastic waste even when consumers are motivated. However, researchers investigating environmentally friendly behaviors—including behaviors such as buying green and recycling—have also emphasized the importance of psychological barriers even where there are no structural or situational barriers (Gifford 2011; Gifford et al. 2018; Gifford and Chen 2017; Lacroix et al. 2019). Knowing these barriers and investigating which ones are hindering the implementation of the sustainable action can help practitioners to understand their target population and therefore, design tailored measures to foster sustainable change (Lacroix et al. 2019).

One popular concept focusing on the psychological barriers of people is the so-called "Dragons of Inaction" (Gifford 2011). Lacroix, Gifford and Chen (2019) developed the *Dragons of Inaction Psychological Barriers Scale* measuring five barrier domains (change unnecessary, conflicting goals and aspiration, interpersonal relations, lacking knowledge, and tokenism). *Change unnecessary* describes the person's general belief that their individual action is not needed along with a denial of the importance to act and problems concerning the natural environment. *Conflicting goals and aspirations* represent perceived barriers such as strong habits, time constraints and fear of failure. *Interpersonal relations* cover feelings such as embarrassment and worry because of social disapproval. *Lacking knowledge* is based on a person's confusion about environmental topics and their uncertainty of where to get information from—also described by the authors as "a person's claim of ignorance, that one simply does not know how to change" (Lacroix et al. 2019, 11). *Tokenism* consists of the person's beliefs that responsibility lies in external entities such as industry, as they cause bigger environmental damage than oneself and the belief that one's personal actions are "enough". Lacroix et al. (2019) propose to use the scale to investigate if interventions are successful in reducing the perceived barriers and with that enhancing sustainable behavior.

A similar approach was suggested by Pahl et al. (2017) to connect people's passion for the ocean to daily behaviors and foster a likely reduction of individual plastic product consumption and their proper disposal. Following up on that, Luo et al. (2021) showed that visualizing marine consequences of plastics at recycling bins in an office building in Canada decreased plastic waste by 17 percent.

Interventions: What Needs to be Considered for Successful Behavioral Interventions?

A recent scoping review on behavior interventions focusing on plastic pollution concluded that research and assessment methods need to be improved as approaches differ greatly. Moreover, the review stated that measurement of actual behaviors (instead of predictors) and their impacts on the plastic systems are currently lacking (Nuojua et al. 2021). Therefore, having covered the recent theoretical background quite extensively, we will now provide some practical guidelines on how to implement behavior-targeted interventions. The *four key issues for encouraging pro-environmental behavior* and the *community-based social marketing approach* will be presented, followed by a brief introduction of useful intervention tools such as cognitive dissonance, goal setting, social modelling, and prompts. We do not want to reinvent the wheel, and we cannot present all approaches comprehensively. Instead, we selected established concepts that are hopefully useful to a wider interdisciplinary audience, encouraging collaboration to tackle plastic pollution beyond one single discipline and enhance the understanding of the importance of behavioral approaches.

Implementation of Interventions

Successful and effective behavior-targeted interventions need to be developed and evaluated systematically (McKenzie-Mohr and Schultz 2014; Steg and Vlek 2009). Therefore, social psychologists have developed a set of guidelines to ensure high-quality interventions. Both approaches are focusing on the individual as the change agent within the community.

The *four key issues for encouraging pro-environmental behavior* (Steg and Vlek 2009) are divided in the identification of the behavior in need of change (1) and behavior relevant determinants (2) mentioned earlier, followed by designing the interventions with the appropriate strategies, its application (3) and evaluation (4). Below we display the leading questions for the systematic process of interventions proposed by Steg and Vlek (2009, 310):

I. Which behaviors should be changed to improve environmental quality?
1. Select behaviors having significant negative environmental impacts
2. Assess the feasibility of behavior changes
3. Assess baseline levels of target behaviors
4. Identify groups to be targeted

II. Which factors determine the relevant behavior?
1. Perceived costs and benefits
2. Moral and normative concerns
3. Affect
4. Contextual factors
5. Habits

III. Which interventions could best be applied to encourage pro-environmental behavior?
1. Informational strategies (information, persuasion, social support and role models, public participation)
2. Structural strategies (availability of products and services, legal regulation, financial strategies)

IV. What are the effects of interventions?
1. Changes in behavioral determinants
2. Changes in behaviors
3. Changes in environmental quality
4. Changes in individuals' quality of life

A similar approach, proposed as guidance for practitioners, emerged a few years later named *Community-based social marketing* (McKenzie-Mohr 2011; McKenzie-Mohr and Schultz 2014). This framework consists of several steps. The first three steps are similar to the approach proposed by Steg and Vlek (2009). Step four and five of the community-based social marketing framework consider the context of the intervention's implementation more

carefully than the approach above. The approach is broadly centered around 1) the thorough choice of which behavior(s) to target; 2) the detection of the associated barriers and benefits; 3) the development of strategies based on effective tools suitable for addressing the barriers and benefits; 4) the trialing of the intervention with a small sample and once shown as effective its (5) broad implementation and ideally (mid-and long-term) evaluation (McKenzie-Mohr 2011; McKenzie-Mohr and Schultz 2014).

Following these guidelines should result in better, hence, effective interventions as they are based on "carefully studied" tools (McKenzie-Mohr and Schultz 2014). Nevertheless, the intervention tools in the next section are context and behavior dependent and therefore, are unlikely to work in all contexts and for all target groups. It is important to systematically analyze why interventions did and why they did not result in behavior change as well as sharing these results as this will help to improve the development of interventions. Moreover, it is crucial to acknowledge that the community-based social marketing approach is used by researchers as well as by practitioners. This is a strength as it is versatile, but can also be a weakness as it can lead to misuse if it is not applied correctly. Therefore, intervention effectiveness can vary greatly. For instance, interventions in an intercultural setting which proofed to be effective in one community might not work for another due to the differences in personal, cultural or situational factors (Bosse 2010; Leenen 2005), especially when the intervention disrupts peoples every-day life (Richter, Grünzner and Klöckner, under review) such as using a playful tool like a board game as intervention to foster discussions about difficult and even conflict evoking topics (e.g., http://www. savannalife.no/).

For example, a study with Norwegian students and university employees found that proper waste disposal at work was mainly motivated by intentions, perceived behavioral control, personal and social norms as well as habits (Ofstad et al. 2017). Whereas, a study with an island community in Indonesia found that individual factors such as awareness were not considered when they thought about plastic pollution. For them, social-factors such as collective beach cleans or waste disposal organized by the community were things which came to mind first (Phelan et al. 2020).

In the first and second step of the community-based social marketing approach, it is important to listen to what the community members—respectively members of the target group—have to say about their personal, cultural and situational setting. Moreover, listening to their experiences

during and after the intervention is essential to not undermine their voices, to choose the fitting intervention and to evaluate it appropriately.

Intervention Tools

Various tools, grouped in informational (motivational-focused) and structural (context-focused) strategies can be used to foster environmental behavior change (Steg and Vlek 2009). Both strategies are important and their effectiveness is dependent on the target behavior. Structural strategies—also known as hard measures—aim to make sustainable action easier and harmful action harder in a specific context. This can take the form of physical changes (increasing proximity to recycling bins), but also the implementation of legal measures (banning primary microplastics in personal care products) fall into this category (Steg and Vlek 2009). They are especially useful when external barriers make sustainable behavior difficult and can potentially influence behavioral determinants indirectly. Informational strategies—also so-called soft measures —on the other hand, can help to increase public support for structural changes (Steg and Vlek 2009). They are especially beneficial when external barriers are low and the sustainable behavior in question is easy to implement for the individual (e.g., no perceived barriers present) (Steg and Vlek 2009).

The intervention tools which are going to be presented are based on the findings of a meta-analysis investigating the effectiveness of intervention-based research targeting different sustainable actions such as various kinds of recycling (public, curbside, central) and conservation behaviors (energy, water, gasoline etc.) in an experimental setting (Osbaldiston and Schott 2012).

We are going to present a short description of the treatments, which were explored in the meta-analysis—sorted from low to high engagement for the participants. *Making it easy* describes the reduction of barriers to make the more sustainable behavior the easier option such as reducing the distance of recycling bins (McKenzie-Mohr and Schultz 2014; Osbaldiston and Schott 2012). *Prompts* are simple cues closely presented to the behavior in question such as "put plastic in the yellow bin" (McKenzie-Mohr and Schultz 2014; Osbaldiston and Schott 2012). They need to be self-evident, obvious and should focus on behaviors that encourage a sustainable action instead of avoiding a non-sustainable one (McKenzie-Mohr and Schultz 2014).

Justifications (declarative information) are pieces of information that explain why a certain behaviour should be done e.g., by illustrating the pathway of waste and explaining how misplacement of recyclable items lead to landfills or contamination of the natural environment etc. (Osbaldiston and Schott 2012). *Instructions (procedural information)* are pieces of information, which explain how to do a certain behavior e.g., by explaining the proper disposal of different kinds of plastics (Osbaldiston and Schott 2012). *Rewards* are one kind of incentive and generally consist of a positive outcome initiated by a specific behavior (McKenzie-Mohr and Schultz 2014). However, in the meta-analysis, they were described as a "monetary gain that people received as a result of participating in the experiment" (Osbaldiston and Schott 2012, 272).² *Social modeling* describes a variety of tools—such as social diffusion or norms—in which information is passed on by someone who encourages a specific sustainable action (Osbaldiston and Schott 2012). *Social diffusion* describes the adoption of sustainable behaviors by people because of the influence of significant others who already act sustainably. *Normative messages* can take form in information about how other people act and keeping the referent group more generic or self-determined is advised (McKenzie-Mohr and Schultz 2014). *Cognitive dissonance*—e.g., the conflict between the underlying pro-environmental attitude and environmental harmful behavior—was achieved by techniques such as foot-in-the-door. Meaning that participants were invited to do a smaller task—one to which participants easily agree—followed by an invitation to a more extensive one which is the actual targeted behavior (Osbaldiston and Schott 2012). *Feedback* is described as information that was given about past behavior over a certain amount of time (Osbaldiston and Schott 2012). *Commitment* to carry out a certain behavior was implemented in the interventions in verbal or written form e.g., signing a pledge card (Osbaldiston and Schott 2012). *Goal setting* in the interventions was advocated by providing the participants with a fixed goal, provided by the researchers, such as reducing their consumption by a specific amount in a certain time period (McKenzie-Mohr and Schultz 2014).

The researchers found that interventions in which cognitive dissonance, goal setting, social modeling or prompts were present were the most effective. However, intervention success across various behaviors differed and the authors concluded that "low-engagement treatments are appropriate

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2 The context in which the reward is placed is crucial when interpreting the results. It needs to be distinguished if participants are rewarded for taking part in the experiment itself or if they are rewarded when showing the sustainable behavior during the experiment.

for low-effort behaviors and high-engagement treatments are effective for high-effort behaviors" (Osbaldiston and Schott 2012, 280). Moreover, most interventions had multiple treatments in place. The most successful combinations were: Instructions and goals, prompts and making it easy, cognitive dissonance and justification, prompts and justification, rewards and goals, commitment and goals. Feedback and instructions seemed to have a smaller effect in comparison to the other treatments listed below. Moreover, feedback did not appear to be as effective in combination with other treatments in comparison to the presented alternatives.

Overall, each of the treatments displayed has been implemented in the interventions in various ways as main treatment or support. The meta-analysis summarized various treatments, but there are far more techniques at hand which have not been studied thoroughly. Nevertheless, the researchers were able to quantify the effectiveness of treatments across different environmental behavior domains. Recycling is one of the most extensively studied behaviors and even though it plays an important role in the reduction of plastic pollution, it is also important to look into consumption behaviors across different plastic sources to reduce the use of plastic overall. Therefore, more experiments looking into behaviors causing plastic and microplastics pollution is needed. Moreover, a systematic review focusing on the effectiveness of various intervention techniques or—if enough studies are found—a meta-analysis to quantify the various effects can help to create extensive research informed advice for practitioners.

Conclusion

In this chapter, we gave insights into environmental psychology approaches and their potential to increase the effectiveness of environmental behavior change interventions targeting plastic pollution.

To summarize, there is no one fits all solution when wanting to tackle environmental behavior. Some behaviors have stronger moral components, some are more influenced by the individual's perception of control (how easy or difficult it is doing a behavior) and others are strongly habitualized. It is key to understand these characteristics of the target behavior and also the system in which it takes place: Will a change of the behavior lead to an effective outcome in comparison to alternative measures? Will it be feasible

to change considering internal and external constraints? If so, further development of the intervention can follow, using the series of steps introduced above, under consideration of the target-specific behavioral drivers and barriers.

Finally, behavior change is one part of the solution to reduce plastics in our natural environment, as "the consumer" plays one role in a complex system. A reduction in consumption behavior and an increase in recycling behavior is a start and can empower individuals. Nevertheless, it will not solve the problem on its own. Harmonized and immediate actions from different stakeholders such as governments, businesses, and communities worldwide combining pre- and postconsumption solutions are needed to achieve the necessary reduction of plastic polluting on our planet (Lau et al. 2020). For that reason, governments expressed their willingness to sign an international agreement tackling plastic pollution during the last meeting of the United Nations Environment Assembly and researchers are currently pushing for an "international legally binding agreement" targeting plastics on its complete life cycle (Simon et al. 2021).

Author contributions

Maja Grünzner conceptualized the outline and wrote the manuscript. Sabine Pahl supervised and edited the work.

References

Adane, Legesse, and Diriba Muleta (2011). Survey on the usage of plastic bags, their disposal and adverse impacts on environment: A case study in Jimma City, Southwestern Ethiopia. *Journal of Toxicology and Environmental Health Sciences*, 3 (8), 234–248.

Ajzen, Icek (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes,* 50 (2), 179–211.

Bamberg, Sebastian (2013). Changing environmentally harmful behaviors: A stage model of self-regulated behavioral change. *Journal of Environmental Psychology*, 34, 151–159.

Bertoldo, Raquel, and Paula Castro (2016). The outer influence inside us: Exploring the relation between social and personal norms. *Resources, Conservation and Recycling*, 112, 45–53.

Bosse, Elke (2010). Vielfalt erkunden–ein Konzept für interkulturelles Training an Hochschulen. In Gundula Gwenn Hiller and Stefanie Vogler-Lipp (eds.). *Schlüsselqualifikation Interkulturelle Kompetenz an Hochschulen*, 109–133. Wiesbaden: VS Verlag für Sozialwissenschaften.

Braun, Yvonne A., and Assitan Sylla Traore (2015). Plastic bags, pollution, and identity: Women and the gendering of globalization and environmental responsibility in Mali. *Gender and Society*, 29 (6), 863–887.

Davison, Sophie, Mathew P. White, Sabine Pahl, Tim Taylor, Kelly Fielding, Bethany R. Roberts, Theo Economou, Oonagh McMeel, Paula Kellett, and Lora E. Fleming (2021). Public concern about, and desire for research into, the human health effects of marine plastic pollution: Results from a 15-country survey across Europe and Australia. *Global Environmental Change*, 69, 102309.

Dunlap, Riley., Kent Van Liere, Angela Mertig, and Robert Emmet Jones (2000). Measuring endorsement of the new ecological paradigm: A revised NEP scale. *Journal of Social Issues*, 56 (3), 425–442.

European Commission (2020). Attitudes of European citizens towards the environment (No. 501; Special Eurobarometer). 15.07.2021 https://europa.eu/eurobarometer/surveys/detail/2257

Gifford, Robert (2011). The dragons of inaction: Psychological barriers that limit climate change mitigation and adaptation. *American Psychologist*, 66 (4), 290.

Gifford, Robert, and Angel K. S. Chen (2017). Why aren't we taking action? Psychological barriers to climate-positive food choices. *Climatic Change*, 140 (2), 165–178.

Gifford, Robert, Karine Lacroix, and Angel K. S. Chen (2018). 7—Understanding responses to climate change: Psychological barriers to mitigation and a new theory of behavioral choice. In Susan Clayton and Christie Manning (eds.). *Psychology and climate change. Human perceptions, impacts, and responses,* 161–183. Cambridge: Academic Press.

Gollwitzer, Peter (1990). Action phases and mind-sets. In E. Tory Higgins and Richard M. Sorrentino (eds.). *Handbook of motivation and cognition: Foundations of social behavior,* 2, 53–92. New York: The Guilford Press.

Grünzner, Maja, Sabine Pahl, Mathew White, and Richard C. Thompson (2021). *Expert perceptions about microplastics pollution: Potential sources and solutions.* Study presented online at the Society for Risk Analysis – Europe conference, 13−16 June 21, in Espoo, Finland.

Felipe-Rodriguez, Marcos, Gisela Böhm, and Rouven Doran (2022). Risk perception: The case of microplastics. A discussion of environmental risk perception focused on the microplastic issue. In Johanna Kramm and Carolin Völker (eds.). *Living in the plastic age. Perspectives from humanities, social sciences and environmental sciences.* Frankfurt, New York: Campus.

Heidbreder, Lea Marie, Isabella Bablok, Stefan Drews, and Claudia Menzel (2019). Tackling the plastic problem: A review on perceptions, behaviors, and interventions. *Science of the Total Environment*, 668, 1077–1093.

Joanes, Tina, Wencke Gwozdz, and Christian Klöckner (2020). Reducing personal clothing consumption: A cross-cultural validation of the comprehensive action determination model. *Journal of Environmental Psychology*, 71, 101396.

Keller, Anna, Charis Eisen, and Daniel Hanss (2019). Lessons learned from applications of the stage model of self-regulated behavioral change: A review. *Frontiers in Psychology*, 10, 1091.

Keller, Anna, Jana Katharina Köhler, Charis Eisen, Silke Kleihauer, and Daniel Hanss (2021). Why consumers shift from single-use to reusable drink cups: An empirical application of the stage model of self-regulated behavioural change. *Sustainable Production and Consumption*, 27, 1672–1687.

Klöckner, Christian (2013a). A comprehensive model of the psychology of environmental behaviour—A meta-analysis. *Global Environmental Change*, 23 (5), 1028–1038.

Klöckner, Christian (2013b). How powerful are moral motivations in environmental protection?: An integrated model framework. In Karin Heinrichs, Fritz Oser, and Terence Lovat (eds.). *Handbook of moral motivation*, 447–472. Rotterdam: SensePublishers.

Klöckner, Christian (2015). *The psychology of pro-environmental communication: Beyond standard information strategies*. London: Palgrave Macmillan.

Klöckner, Christian, and Anke Blöbaum (2010). A comprehensive action determination model: Toward a broader understanding of ecological behaviour using the example of travel mode choice. *Journal of Environmental Psychology*, 30 (4), 574–586.

Klöckner, Christian, and Sunita Prugsamatz Ofstad (2017). Tailored information helps people progress towards reducing their beef consumption. *Journal of Environmental Psychology*, 50, 24–36.

Lacroix, Karine, Robert Gifford, and Angel Chen (2019). Developing and validating the Dragons of Inaction Psychological Barriers (DIPB) scale. *Journal of Environmental Psychology*, 63, 9–18.

Lau, Winnie, Yonathan Shiran, Richard Bailey, Ed Cook, Martin Stuchtey, Julia Koskella, Costas Velis, Linda Godfrey, Julien Boucher, Margaret Murphy, Richard Thompson, Emilia Jankowska, Arturo Castillo Castillo, Toby Pilditch, Ben Dixon, Laura Koerselman, Edward Kosior, Enzo Favoino, Jutta Gutberlet, Sarah Baulch, Meera Atreya, David Fischer, Kevin He, Milan Petit, Rashid Sumaila, Emily Neil, Mark Bernhofen, Keith Lawrence, and James Palardy (2020). Evaluating scenarios toward zero plastic pollution. *Science*, 369 (6510), 1455–1461.

Leenen, Wolf-Rainer (2005). Interkulturelle Kompetenz: Theoretische Grundlagen. In Leenen, Wolf-Rainer, Harald Grosch, and Andreas Groß (eds.). *Bausteine zur interkulturellen Qualifizierung der Polizei*, 63-110. Münster: Waxmann.

Luís, Sílvia, Catarina Roseta-Palma, Marta Osório de Matos, Maria Lima, and Cátia Sousa (2020). Psychosocial and economic impacts of a charge in lightweight plastic carrier bags in Portugal: Keep calm and carry on? *Resources, Conservation and Recycling*, 161, 104962.

Luo, Yu, Jeremy Douglas, Sabine Pahl, and Jiaying Zhao (2022). Reducing plastic waste by visualizing marine consequences. *Environment and Behavior*, 54 (4), 809–832.

Martinho, Graça, Natacha Balaia, and Ana Pires (2017). The Portuguese plastic carrier bag tax: The effects on consumers' behavior. *Waste Management*, 61, 3–12.

McKenzie-Mohr, Doug (2011). *Fostering sustainable behavior: An introduction to community-based social marketing*. Gabriola Island: New society publishers.

McKenzie-Mohr, Doug, and Paul Wesley Schultz (2014). Choosing effective behavior change tools. *Social Marketing Quarterly*, 20 (1), 35–46.

Morales-Caselles, Carmen, Josué Viejo, Elisa Martí, Daniel González-Fernández, Hannah Pragnell-Raasch, Ignacio González-Gordillo, Enrique Montero, Gonzalo Arroyo, Georg Hanke, Vanessa Salvo, Oihane Basurko, Nicholas Mallos, Laurent Lebreton, Fidel Echevarría, Tim van Emmerik, Carlos Duarte, José Gálvez, Erik van Sebille, Francois Galgani, Carlos García, Peter Ross, Ana Bartual, Christos Ioakeimidis, Groka Markalain, Atsuhiko Isobe, and Andres Cozar (2021). An inshore–offshore sorting system revealed from global classification of ocean litter. *Nature Sustainability*, 4 (6), 484–493.

Nielsen, Kristian Steensen (2017). From prediction to process: A self-regulation account of environmental behavior change. *Journal of Environmental Psychology*, 51, 189–198.

Nielsen, Kristian Steensen, Viktoria Cologna, Florian Lange, Cameron Brick, and Paul Stern (2021). The case for impact-focused environmental psychology. *Journal of Environmental Psychology*, 74, 101559.

Nielsen, Kristian Steensen, Theresa Marteau, Jan Bauer, Richard Bradbury, Steven Broad, Gayle Burgess, Mark Burgman, Hilary Byerly, Susan Clayton, Dulce

Espelosin, Paul Ferraro, Brendan Fisher, Emma Garnett, Julia Jones, Mark Otieno, Stephen Polasky, Taylor H. Ricketts, Rosie Trevelyan, Sander van der Linden, and Diogo Veríssimo (2021). Biodiversity conservation as a promising frontier for behavioural science. *Nature Human Behaviour*, 5 (5), 550–556.

Niinimäki, Kirsi, Greg Peters, Helena Dahlbo, Patsy Perry, Timo Rissanen, and Alison Gwilt (2020). The environmental price of fast fashion. *Nature Reviews Earth and Environment*, 1 (4), 189–200.

O'Brien, Joshua, and Gladman Thondhlana (2019). Plastic bag use in South Africa: Perceptions, practices and potential intervention strategies. *Waste Management*, 84, 320–328.

Ofstad, Sunita Prugsamatz, Monika Tobolova, Alim Nayum, and Christian Klöckner (2017). Understanding the mechanisms behind changing people's recycling behavior at work by applying a comprehensive action determination model. *Sustainability*, 9 (2), 204.

Ohtomo, Shoji, and Susumu Ohnuma (2014). Psychological interventional approach for reduce resource consumption: Reducing plastic bag usage at supermarkets. *Resources, Conservation and Recycling*, 84, 57–65.

Osbaldiston, Richard, and John Paul Schott (2012). Environmental sustainability and behavioral science: Meta-analysis of proenvironmental behavior experiments. *Environment and Behavior*, 44 (2), 257–299.

Pahl, Sabine, Isabel Richter, and Kayleigh Wyles (2022). Human Perceptions and Behaviour Determine Aquatic Plastic Pollution. In Friederike Stock, Georg Reifferscheid, Nicole Brennholt, and Evgeniia Kostianaia (eds.). *Plastics in the aquatic environment – Part II. Stakeholder's role against pollution*. Cham: Springer.

Pahl, Sabine, and Wyles, Kayleigh (2017). The human dimension: How social and behavioural research methods can help address microplastics in the environment. *Analytical Methods*, 9 (9), 1404–1411.

Pahl, Sabine, Kayleigh Wyles, and Richard Thompson (2017). Channelling passion for the ocean towards plastic pollution. *Nature Human Behaviour*, 1 (10), 697–699.

Phelan, Anna, Helen Ross, Novie Andri Setianto, Kelly Fielding, and Lengga Pradipta (2020). Ocean plastic crisis—Mental models of plastic pollution from remote Indonesian coastal communities. *PloS One*, 15 (7), e0236149.

Poortinga, Wouter, and Louise Whitaker (2018). Promoting the use of reusable coffee cups through environmental messaging, the provision of alternatives and financial incentives. *Sustainability*, 10, 873.

Ranjan, Ved Prakash, Anuja Joseph, and Sudha Goel (2021). Microplastics and other harmful substances released from disposable paper cups into hot water. *Journal of Hazardous Materials*, 404, 124118.

Richter, Isabel, Maja Grünzner and Christian A. Klöckner (2022). Global disruptive communication: The thin line between destruction and disruption in intercultural research. In Christian A. Klöckner and Erica Löfström (eds.). *Disruptive environmental communication – Shaking the tree, shaking humanity* [Unpublished manuscript].

Romero, Cláudia Buhamra Abreu, Michel Laroche, Golam Mohammed Aurup, and Sofia Batista Ferraz (2018). Ethnicity and acculturation of environmental attitudes and behaviors: A cross-cultural study with Brazilians in Canada. *Journal of Business Research*, 82, 300–309.

Sandhu, Sukhbir, Sumit Lodhia, Alana Potts, and Robert Crocker (2021). Environment friendly takeaway coffee cup use: Individual and institutional enablers and barriers. *Journal of Cleaner Production*, 291, 125271.

SAPEA, Science Advice for Policy by European Academies. (2019). A scientific perspective on microplastics in nature and society. Berlin: SAPEA.

Schultz, P. Wesley (2011). Conservation means behavior. *Conservation Biology*, 25 (6), 1080–1083.

Schwartz, Shalom H. (1977). Normative influences on altruism. *Advances in Experimental Social Psychology*, 10, 221–279.

Schwartz, Shalom H., and Judith A. Howard (1981). A normative decision-making model of altruism. *Altruism and Helping Behavior*, 189–211.

Schwarzer, Ralf (2008). Modeling health behavior change: How to predict and modify the adoption and maintenance of health behaviors. *Applied Psychology*, 57 (1), 1–29.

Sheeran, Paschal, and Thomas L. Webb (2016). The intention–behavior gap. *Social and Personality Psychology Compass*, 10 (9), 503–518.

Siegfried, Max, Albert A. Koelmans, Ellen Besseling, and Carolien Kroeze (2017). Export of microplastics from land to sea. A modelling approach. *Water Research*, 127, 249–257.

Simon, Nils, Karen Raubenheimer, Niko Urho, Sebastian Unger, David Azoulay, Trisia Farrelly, Joao Sousa, Harro van Asselt, Giulia Carlini, Christian Sekomo, Maro L., Per-Olof Busch, Nicole Wienrich, and Laura Weiand (2021). A binding global agreement to address the life cycle of plastics. *Science*, 373 (6550), 43−47.

Steg, Linda. (2018). Limiting climate change requires research on climate action. *Nature Climate Change*, 8 (9), 759–761.

Steg, Linda, Agnes E. van den Berg, and Judith I. M. de Groot (2018). Environmental psychology: History, scope, and methods. In Linda Steg and Judith I. M. de Groot (eds.). *Environmental psychology: An introduction*, 1–11. Hoboken, NJ: Wiley.

Steg, Linda, and Charles Vlek (2009). Encouraging pro-environmental behaviour: An integrative review and research agenda. *Environmental Psychology on the Move*, 29 (3), 309–317.

Stern, Paul C. (2000). Toward a coherent theory of environmentally significant behavior. *Journal of Social Issues*, 56 (3), 407–424.

Stern, Paul C., and Thomas Dietz. (1994). The value basis of environmental concern. *Journal of Social Issues*, 50 (3), 65–84.

Stieß, Immanuel, Luca Raschewski, and Georg Sunderer (2022). Everyday life with plastics: How to put environmental concern into practice(s). In Johanna Kramm

and Carolin Völker (eds.). *Living in the plastic age. Perspectives from humanities, social sciences and environmental sciences.* Frankfurt, New York: Campus.

Sunio, Varsolo, Jan-Dirk Schmöcker, and Junghwa Kim (2018). Understanding the stages and pathways of travel behavior change induced by technology-based intervention among university students. *Transportation Research Part F: Traffic Psychology and Behaviour*, 59, 98–114.

van Valkengoed, Anne M., and Linda Steg (2019). Meta-analyses of factors motivating climate change adaptation behaviour. *Nature Climate Change*, 9 (2), 158–163.

Verplanken, Bas, and Henk Aarts (1999). Habit, attitude, and planned behaviour: Is habit an empty construct or an interesting case of goal-directed automaticity? *European Review of Social Psychology*, 10 (1), 101–134.

Whitmarsh, Lorraine, Wouter Poortinga, and Stuart Capstick (2021). Behaviour change to address climate change. *Current Opinion in Psychology*, 42, 76–81.