



# Personal and structural factors that influence individual plastic packaging consumption—Results from focus group discussions with German consumers



Jasmin Wiefek<sup>\*</sup>, Julia Steinhorst, Katharina Beyerl

*Institute for Advanced Sustainability Studies e.V. (IASS), Berliner Strasse 130, 14467, Potsdam, Germany*

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## ABSTRACT

Plastic waste is perceived as one of the major environmental problems of our times. Nevertheless, rates of consumption of plastic packaging are constantly increasing. Based on focus group discussions with German consumers this study identified personal and structural barriers that hinder a reduced plastic packaging consumption. Combining our findings with those of previous studies, we conclude that fundamental changes in infrastructures and lifestyles, as well as cultural and economic transformation processes, are needed to make zero-waste shopping the norm and unpackaged goods the most affordable and convenient option. The questions ‘Who is shopping?’, ‘What are we shopping?’, ‘Where do we go shopping?’, and ‘When/how often do we go shopping?’ help in identifying the levers for a dissemination of the unpacked concept and also reveal factors that have so far only been marginally discussed in the discourse on the plastic problem and have not yet been systematically linked to it.

## 1. Introduction

Plastic waste in the sea has been reported for the first time in the early 1970s (Kramm and Völker, 2017). Nowadays, microplastics have entered into the environment all over the globe (Jpi Oceans, 2020). Since 2017, all of the top-ten items that were most commonly collected by more than 1 million volunteers during the ‘International Coastal Clean-ups’ were made of plastic. In 2018, food wrappers were the second most common trash item picked up, only surpassed by cigarette butts (Ocean Conservancy, 2019). Even in countries that have a relatively well-developed waste management system, rates of plastic waste have increased tremendously in the last decades. Germany, for instance, generates the highest volume of plastic packaging waste among all European Union member states (Statista, 2020c). Recent studies conducted in several countries indicate that plastic pollution is perceived not only as a major environmental problem but also as a health hazard (Heidbreder et al., 2019). Accordingly, 96 per cent of a representative population survey in Germany stated that they consider it important to reduce packaging waste (Verbraucherzentrale Bundesverband e.V., 2018). Nevertheless, the private end consumption of packaging in Germany has been increasing continuously since 2009. In 2017, the amount of plastic packaging waste generated by end consumers has doubled compared to 1995 (Umweltbundesamt, 2019). Thus, in fact, most people's wish to

reduce packaging waste is opposed to increasing consumption rates.

Therefore, Heidbreder et al. (2019, p. 1086) conclude from their review on perceptions, behaviours and interventions in order to tackle the plastic problem that “more research is needed to identify factors for a general transformation in purchase or reduction behaviour”. Following this call, the aim of our paper is to determine factors that influence individuals’ plastic packaging consumption level in Germany. In view of the gap between intention and behaviour described above, the question that guides us in identifying these factors is: Which barriers prevent individuals in Germany from reducing their everyday consumption of plastic packaging for food and beverages? In countries of the Global North, food packaging accounts for approximately 50 per cent by weight of total packaging sales and for about two-thirds of all packaging waste by volume (Marsh and Bugusu, 2007; Pongrácz, 2007). Therefore, food packaging presents one of the largest groups of plastic packaging waste.

After a brief introduction to the social and environmental risks associated with plastics, we show why a focus on waste prevention strategies is urgently needed. Then, we summarize barriers that have already been reported in the literature to i) reduced plastic consumption, ii) more sustainable behaviour in general and iii) sufficiency lifestyles as one way to reduce the consumption of plastic packaging. In an empirical approach based on focus group discussions with German consumers, we shed light on where, when and why plastic packaging is consumed in

<sup>\*</sup> Corresponding author.

E-mail addresses: [jasmin.wiefek@iass-potsdam.de](mailto:jasmin.wiefek@iass-potsdam.de) (J. Wiefek), [julia.steinhorst@iass-potsdam.de](mailto:julia.steinhorst@iass-potsdam.de) (J. Steinhorst), [katharina.beyerl@iass-potsdam.de](mailto:katharina.beyerl@iass-potsdam.de) (K. Beyerl).

everyday life, what opportunities for a reduced consumption of plastic packaging are considered by consumers, and which barriers consumers perceive as hindering their attempts to avoid plastic packaging. In a synthesis of findings from previous studies and our empirical work, we validate and extend a list of the most significant individual and structural barriers that determine the individual consumption of plastic packaging in everyday life.

### 1.1. Environmental and social risks related to plastics

The production, consumption and disposal of plastics bear diverse environmental and social risks. First, the production of plastic materials relies on crude oil as a non-renewable resource (Comanita et al., 2016; Lewis et al., 2010), but also the fact that the combustion of plastics contributes to global warming is critical (Comanita et al., 2016; Mederake and Knoblauch, 2019). Moreover, plastics entering the environment can cause habitat damage (Comanita et al., 2016; Mederake and Knoblauch, 2019) and threaten wildlife through entanglement or plastic ingestion (Derraik, 2002; Gregory, 2009; Mederake and Knoblauch, 2019). In addition to that, studies have found harmful effects of micro- and nano-plastics on flora and fauna (Jpi Oceans, 2020; Mederake and Knoblauch, 2019).

Second, social risks of plastics include several important aspects, such as the impacts of marine plastic debris on tourism and (subsistence) fishery (Nash, 1992; Thompson, Moore, vom Saal and Swan, 2009), health concerns due to chemical exposure (Mederake and Knoblauch, 2019; Vethaak and Leslie, 2016; Zimmermann et al., 2019), the potential toxicity of plastic particles in human cells and tissues (Vethaak and Leslie, 2016), and plastic debris as potential pathogen and parasite vectors (Vethaak and Leslie, 2016). However, research regarding the potential effects of plastics on human health is still in an early phase (Mederake and Knoblauch, 2019; Rist et al., 2018; Wright and Kelly, 2017). Not least due to the fact that a large proportion of the substances in the chemical mixture of plastics are non-identifiable (PlastX, 2019), the effects of plastic particles are still too poorly understood to make a full assessment of the (eco)toxicological risks to human health and nature (Koelmans et al., 2017; Kramm and Völker, 2017; Vethaak and Leslie, 2016).

Nevertheless, there are sufficient arguments for reducing the increasing consumption of plastics (Kramm and Völker, 2017). As plastic is a very durable material, plastic debris that has already entered the environment will persist for a considerable amount of time (Barnes et al., 2009). Barnes et al. (2009, p. 1985) summarize that “The longevity of plastic is estimated to be hundreds to thousands of years, but is likely to be far longer in deep sea and non-surface polar environments”. Due to this durability, plastic pieces can pose a hazard even decades after they entered the environment. This is illustrated by the example of an albatross that swallowed a piece of a plane which had crashed some 60 years ago (Weiss and McFarling, 2006).

### 1.2. Waste prevention in order to reduce environmental plastic pollution

In Europe, waste management is governed by the revised waste framework directive (WFD). Among other principles, the WFD introduces the concept of the so-called waste management hierarchy (Fig. 1). It establishes a priority order for the policy and practice of legislation on waste prevention and management. It had to come into force in all member states of the European Union by December 2010 at the latest (Bartl, 2014). In this hierarchy, waste prevention is given top priority. The prevention of waste is environmentally beneficial in several ways. It reduces the sheer amounts of material that needs to be produced and, consequently, that potentially can get into the environment. Yet also in terms of climate change impact the prevention of waste is more effective than any other waste management practice. Waste prevention not only avoids net greenhouse gas emissions from treatment and disposal of waste, but also shows noteworthy benefits in avoiding greenhouse gas emissions from less raw resource extraction and manufacturing (United

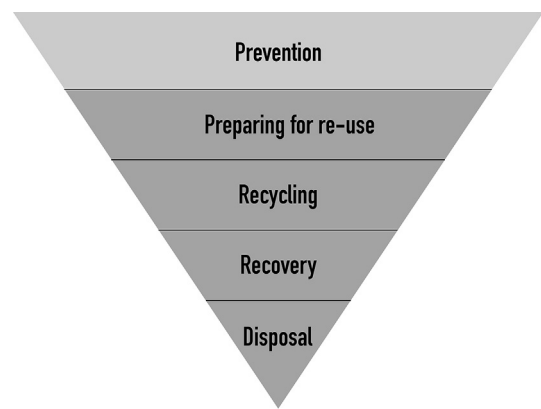


Fig. 1. European Union waste management hierarchy.

Nations Environment Programme [UNEP], 2010).

Still, although plastic is a recyclable material and recycling rates for packaging waste in Europe have increased significantly over the last years (Eurostat, 2020), it can be expected that a further increase of recycling rates will be technically limited and a recycling rate of 100 per cent will not be reached (Bartl, 2014). Despite the fact that recycling shows some ecological advantages, it also depends on additional energy and resources with further transportation need and processing of discarded packages (Pongrácz, 2007). Thus, recycling only treats the symptoms of the plastic crisis and does not address the actual cause, waste generation itself (Bartl, 2014).

With regard to plastic packaging, replacing plastics by other materials may help to reduce the amounts of plastic litter, but with respect to full life-cycle impact analyses (LCA), a substitution of plastics is not necessarily more environmentally friendly (Beitzen-Heineke et al., 2017). For instance, LCA results suggest that replacing a single-use plastic bag with a single-use paper bag may increase rather than decrease environmental impacts, except that paper bags would have a reduced impact in litter because of their faster rate of degradation (Lewis et al., 2010). Glass and aluminium manufacturing are very energy-intensive processes as high temperatures are needed (e.g., Brough and Jouhara, 2020). Up to date, for the various alloys in which aluminium is used, no closed-loop recycling solutions exist (Soo et al., 2018). Aluminium is not recycled as a pure alloy, which leads to downcycling (Soo et al., 2018). Thus, for the manufacture of products made of recycled aluminium, considerable amounts of virgin material must be added (Soo et al., 2018). In other respects, glass is relatively heavy and, therefore, needs more energy for its transportation (Pongrácz, 2007). Refilling glass packaging can also be rather energy-intensive depending on the distances to overcome from shops to refill-centres (Pongrácz, 2007). So, although the substitution of plastic packaging by paper, glass and aluminium packaging helps to tackle the plastic problem, it holds pitfalls regarding other environmental problems. Therefore, we claim that a reduction of the consumption of plastic packaging must be part of an overall strategy to reduce all types of packaging.

### 1.3. Barriers to reduce individuals' plastic packaging consumption

Although there is a high level of problem awareness among German citizens with regard to packaging waste (Verbraucherzentrale Bundesverband e.V., 2018), plastic packaging consumption rates in Germany are still increasing (Umweltbundesamt, 2019). Social scientists have already identified several relevant factors explaining such attitude-behaviour-gaps. We summarize the most important findings below. In addition, we refer to Stengel (2011), who describes five barriers to implementing sufficiency lifestyles. In order to stop the production of excessive waste, sufficiency lifestyles must prevail (Khaw-ngern, Udomphol, Suksong, & Khaw-ngern, 2021). The central element of the

sufficiency approach is the question about 'when do we have enough?' (Huber, 1995). In Thailand, for example, sufficiency-oriented lifestyles are part of the sufficiency economy philosophy, which was developed by King Bhumibol Adulyadej (Khaw-ngern et al., 2021). The sufficiency economy philosophy is intended to serve as a practical guide to which everyone should align their individual behaviour. With regard to consumption, consumers should make their consumption choices conscious that excessive consumption can lead to problems such as waste, pollution and depletion of natural resources (Khaw-ngern et al., 2021). Therefore, they are asked to consume only what they really need and choose products carefully (Khaw-ngern et al., 2021). The consumer responsibility of each individual thus forms a central element in this approach. In the German-speaking sufficiency discourse, a sufficiency lifestyle is understood as a lifestyle in which less resource consumption goes hand in hand with more life satisfaction (Leng et al., 2018). While for a long time implementing or pursuing a sufficiency-oriented lifestyle was considered as responsibility of the individual, the importance of framework conditions that support a sufficiency-oriented life as well as policies that promote sufficiency are now increasingly being discussed in Germany (Schneidewind, 2017). In any case, the concept of sufficiency aims at reducing the absolute amount of consumption (Huber, 1995).

Since the problem of the excessive amount of plastic packaging can only be solved by reducing the absolute consumption of packaging, and thus of purchased products, we assume that the question of barriers to sufficiency can be transferred to the barriers to reducing plastic consumption. Overall, more sustainable and sufficiency-oriented behaviour is impeded by barriers which constitute *personal costs*:

**Habits.** The influence of habits and (social) norms on behaviours related to the use of plastic seems to be the strongest hurdle among all when it comes to reducing plastic packaging (Heidbreder et al., 2019). Heidbreder et al. (2019), for instance, delineate two studies in which forgetting to bring one's own bag was the most common reason for using plastic bags for shopping. Also Gifford (2011) points out that habits are probably among of the most important factors that impede the mitigation of environmental problems.

**Lack of knowledge.** A second major barrier to more sustainable action is that once people are aware of a problem, they do not know what to do about it (Gifford, 2011). In respect to plastics, Heidbreder et al. (2019) summarize that knowledge about plastic-free options and their characteristics is relatively low which can be a barrier to reducing plastic packaging consumption.

**Hygiene.** Another relevant concern is the perception of hygiene. According to a survey study which evaluated the practicality and acceptability of a levy on single-use plastic carrier bags in Australia, 61 per cent of staff members and 22 per cent of customers were concerned about hygiene when they thought about using reusable bags (Lewis et al., 2010). Yet, also objective health risks may arise in zero-packaging stores due to impaired food safety based on cross-contamination and insufficiently cleaned containers (Beitzen-Heineke et al., 2017).

**The price.** At least in the case of Germany, higher prices for groceries packaged in glass compared to groceries in plastic containers (e.g., yoghurt) are a barrier to a plastic-free consumption. Currently, reusable systems are often more expensive than one-way systems because reusable systems require additional logistics and cleaning (Verbraucherzentrale NRW e.V., 2019a). The availability and low prices of plastic bags were also emphasised as important reasons for their widespread use, e.g. in Ethiopia (Adane and Muleta, 2011) and Kenya (Otsyina et al., 2018).

**Convenience.** It is particularly unlikely that habits will change if the new behaviour is more inconvenient. Sun et al. (2017) reported that in China convenience has the most significant impact on the intention to use plastic bags. Similar results were obtained in an interview study with female market vendors from Mali (Braun and Traore, 2015). Vice versa,

European food supply chain experts describe purchasing groceries in a zero-packaging grocery store as inconvenient due to a more time-consuming shopping experience, limited product range and the need to carry containers around all day if people wanted to shop after work (Beitzen-Heineke et al., 2017). An extension of the zero-packaging concept would also require lifestyle-changes and cooking skills of the consumers who also would have to get used to shorter shelf-lives and no imprinted use-by-date reminders (Beitzen-Heineke et al., 2017).

**Social conventions.** One barrier identified by Stengel (2011) concerns the social conventions. The majority of the population follows prevailing opinions, trends and conventions in their way of life (Stengel, 2011). Resisting social conventions is a personal burden (Stengel, 2011). Although there is a high level of problem awareness with regard to plastics (Heidbreder et al., 2019), the daily plastic consumption is a socially accepted standard behaviour.

Apart from these personal costs, plastic-free consumption is constrained by *structural barriers*:

**Diffusion of responsibility.** The diffusion of responsibility constitutes another barrier for sufficiency (Stengel, 2011). Politicians and companies are waiting for signals 'from bottom up', whereas people see themselves as powerless and are handing over responsibility 'to the top' (Stengel, 2011). The diffusion of responsibility for reducing the consumption of plastic bags also played a role in the study of female market vendors in Mali. The vendors emphasised structural problems (e.g., the lack of appropriate waste collection services) and called for political solutions whereas when policy makers were interviewed, they emphasised the consumers' responsibility (Braun and Traore, 2015).

**Consumerism.** This barrier described by Stengel (2011) also explains why plastic consumption is so deeply rooted in our society. It is about the definition of success, happiness, social integration, prosperity; in short: about the shared understanding of a successful life. In the Western industrial nations and increasingly worldwide, this is characterized by consumerism (Stengel, 2011). People share the assumption that those who consume a lot have a good life. The mass-arrival of plastic in Western societies began after the Second World War (Westermann, 2007). Plastic created the conditions for global trade and consumerism (Davis, 2015). Thus, plastic means prosperity and is part of the concept of a modern life (Davis, 2015; Westermann, 2007) which is a hurdle in reducing its consumption.

**Capitalism.** Stengel (2011) also addresses the current economic system as a barrier for the diffusion of sufficiency lifestyles. The capitalist economic system is based on constant economic growth and, therefore, demands an increase in consumption in all areas (Stengel, 2011). Economic growth aspirations presented a major barrier to reducing plastic waste since waste prevention counteracts the economic interests of various stakeholders (Bartl, 2014). For instance, producers' and retailers' interest in increasing sales and turnaround are both drivers for waste generation (Bartl, 2014). And even the waste management sector, collectors, landfill operators, incinerators and recyclers, would have less revenue, if less waste is generated (Bartl, 2014).

Based on this compilation of barriers to reducing plastic packaging consumption, more sustainable behaviour and sufficiency, the aim of our study is to empirically study which barriers individuals in Germany perceive as preventing them from reducing their everyday consumption of plastic packaging for food and beverages.

## 2. Sample & methods

As method of choice we used focus group discussions with German consumers (see Przyborski and Riegler, 2010). These discussions were conducted in Berlin (Germany) on 3 and April 4, 2019. We used focus group discussions as an empirical documentary method focusing on the

collective knowledge stocks and structures that are adopted by the discussion participants and also guide them in their everyday practices (see Przyborski and Riegler, 2010). The aim of the empirical part of our study is to reconstruct the relevance systems of the study participants, whereby the experiences that are common to the group discussion participants form the basis (see Przyborski and Riegler, 2010).

### 2.1. Sample

The sample consisted of four groups with ten participants each. We decided for a  $2 \times 2$  design with the parameters *household size* (one-person household vs. multi-person household) and *income* (low vs. high). Up to four people lived in the multi-person households (the only exception was one individual who lived in a community). For one-person households, the cut-off for the distinction between low vs. high income groups was EUR 2000 net monthly household income. For multi-person households, the cut-off for couples with children was set at EUR 4700 monthly net household income, for couples without children at EUR 3,900, and for single parents at EUR 2300. The group composition was balanced according to gender and age. All participants lived in Berlin and were between 20 and 70 years old. Participants were recruited according to the quota plan by a Berlin market research studio which holds an address file of people who agreed to get registered and invited to join group discussions for market research purposes.

### 2.2. Procedure

Each focus group discussion followed the same procedure. First, the hosts introduced the topic ‘Individual choices regarding packaging for food and beverages’ as the main theme for the discussion. Then, the participants reported which criteria they considered particularly important when doing their grocery-shopping (e.g., freshness, price of products) as well as where they encountered plastic packaging in their everyday life. We presented six types of plastic packaging (e.g., single-use plastic yogurt jar and take-away coffee cup, cf. Image 1) and subsequently, six equivalent reusable packaging options (e.g., refillable yogurt jar made of glass and reusable coffee to-go cup, cf. Image 2) to the participants. The participants discussed which kind of the packaging options they bought or used. In the third section of the session, the participants were asked to discuss the barriers they encountered when trying to avoid plastic packaging. The last section of the group discussion focused on the question ‘What would need to change in order to make it easier for you to purchase food and beverages without plastic packaging in your everyday life?’ and each participant was asked to complete the sentence ‘I could get along a lot easier without plastic packaging in everyday life, if ...’.

### 2.3. Data analysis

We analysed the transcripts of the discussions based on the Grounded Theory Methodology following the approach of Strauss (and Corbin) for coding (see Mey and Mruck, 2010; Strauss and Corbin, 1990). The coder developed guiding questions to ensure sensitivity to discover codes and concepts when working through the material. These questions that led through the material were: When/where/wherefore/how long/how often is plastic packaging used? What is packed in plastic? Who uses plastic packaging? What kind of plastic packaging is used? How is the use of plastic packaging evaluated? Is plastic packaging avoided? If so, how/why/how often/when/where is plastic packaging avoided? When/where is it easy/difficult to avoid plastic packaging? At what point is one (no longer) willing to avoid plastic packaging? What are the reasons to purchase products in plastic packaging, although one would rather avoid it? What are the alternatives to plastic packaging? Where can alternatives to plastic packaging be found? Where/why are alternatives to plastic packaging (not) used? Are unpackaged solutions used as alternatives to plastic packaging?

In the course of the inductive procedure the following code tree resulted: (a) What is important when purchasing groceries, (b) Consumption of plastic packaging, (c) Problem awareness, (d) Avoidance of plastic packaging and use of its alternatives, (e) How to limit plastic consumption. During the coding procedure, the coder constantly took notes in the form of code memos as well as free memos in order to describe the characteristics of the emerging concepts and their links between one another.

## 3. Results

In this section, we depict the focus group participants' reports on their daily use of groceries' plastic packaging (Section 3.1), our observations on participants' problem awareness (Section 3.2), the consumers' ideas on how to reduce groceries' plastic packaging consumption (Section 3.3), and the hurdles they claimed to be confronted with when trying to reduce their level of plastic packaging consumption (Section 3.4). In the following discussion, the empirical results are combined with the barriers reported above in section 1.3 to define a set of relevant factors that determine individual consumption levels of plastic packaging for food and beverages.

### 3.1. Use and avoidance of food plastic packaging

When being asked which foods and drinks the discussion participants usually buy in plastic packaging, one participant's reply put it in a nutshell: ‘products [which] I find again and again as basics in my



Image 1 and 2. Examples of single-use plastic packaging (left image) and reusable packaging options (right image).



refrigerator" (P1, paragraph (para.) 51). As the discussion revealed, this includes water and other beverages, fruits and vegetables, milk and cereal products, meat and cold cuts, confectionery, as well as take-away or convenience foods and beverages. Generally, we observed that the 'standard situation' discussed for purchasing groceries (except for take-away beverages and foods) was shopping in supermarkets and discounters.

During the discussion, the participants mentioned advantages of packaging in general, but also considered plastic packaging unnecessary for certain products as the following quote illustrates: "*Then I had cucumber [ ...]. I am always surprised that it is wrapped in such a plastic foil, which I actually find quite horrible and completely unnecessary*" (P2, para. 48). Further, the participants started to report unsolicitedly that they tried to avoid food plastic packaging. The main reasons they mentioned for their attempts were negative environmental impacts (e.g., the accumulation of large quantities of waste) and health risks (e.g., that nano-plastic particles can be absorbed by the body).

### 3.2. Problem awareness

Overall, the group discussions revealed a high level of problem awareness associated with plastic packaging. Thus, the participants described, for example, that they found themselves in the dilemma between knowing, on the one hand, that plastic bottles may release pathogenic plasticizers into beverages, while on the other hand, they appreciated the fact that plastic bottles are lightweight and easy to transport. At the same time, the participants reported that their own problem awareness and knowledge does not consistently lead to a more plastic-free consumption behaviour.

### 3.3. Consumers' ideas how to reduce groceries' plastic packaging consumption

The discussion participants named some possibilities how to reduce the consumption of plastic packaging. These possibilities can be classified as a) buying items with a plastic-free packaging like metal, paper, glass and porcelain, b) buying groceries unpacked and, c) other and related changes in practices. In the context of zero-packaging shopping, the study participants talked about buying groceries on farmers markets, in zero-waste shops, but also in organic and smaller shops in general as these tend to offer more groceries unpackaged compared to supermarkets and discounters. In addition to that, it was suggested to purchase groceries directly from the farmer. Thus, the choice of the shopping location was one possible change in practices discussed. Other ideas were bringing own bags and containers to the point of sale and growing own fruits and vegetables.

### 3.4. Barriers to avoiding groceries' plastic packaging

Our analysis revealed the following twelve barriers in respect to reducing plastic packaging consumption:

- 1) *Habits*. One hurdle is the missing habit to bring own bags and containers for the grocery shopping. Although some participants reported about investments in reusable to-go cups, refillable water bottles, containers and textile bags, their actual use often fails due to the missing habit of taking them along when leaving home. For example, one participant reported: "*Coffee to-go, that is really my sin. So, I am so ashamed sometimes, yeah, because I often forget to take my cup with me*" (P5, para. 63). Another habit that stands in the way of reducing plastic packaging consumption is the choice of the shopping location. Routinely, the focus group participants mainly shop at supermarkets or discounters and thus chose shopping facilities where relatively few food items are offered unpackaged or without plastic packaging.
- 2) *Lack of knowledge*. We observed a certain lack of knowledge among the participants regarding the question which kind of packaging options are more sustainable than others. For instance, the participants were well informed about plastic-free packaging options available to avoid disposable to-go cups. However, some participants raised doubts whether these plastic-free options are actually more environmentally friendly than disposable plastic cups. These uncertainties seem to undermine people's motivation to avoid plastics. For example, it was said: "*The other day, I read something about this more stable plastic cup which you can also buy at the bakery now. I have no idea how much it costs. Anyway, it will probably take 20 years until it amortises, I mean all the cleaning costs that you have with it and the manufacturing costs. So that lasts/you probably need 20 years/you have to use it every day for 20 years until you have an advantage over the disposable cups. That is crazy, I think*" (P6, para. 168).
- 3) *Hygiene*. Some discussion participants were concerned about the hygienic properties of freely accessible displays of unpacked goods, the use of self-brought packaging, and long-term reusable packaging options in general. One participant stated in this regard: "*Another issue with these things is also cleanliness. There was once this issue, also regarding reusable cups used by children, where they then became seriously ill, because there was mold everywhere. And when I look at this [reusable cup], these cup rim, how do you clean it properly? So, if you would really use this all the time, this coffee cup. So, I think it will then eventually turn/so to be honest/I have an aversion to it. I would rather take something fresh and throw it away than thinking that there are still some bacteria on it because the dishwasher or I myself couldn't clean it properly*" (P7, para. 268). Other discussion participants experienced rejections by the salespersons when bringing their own containers to points of sale. This was explained with obligations to comply with hygiene regulations. Consumers' uncertainties about hygiene and the legal requirements are exemplified in the following dialog: "*A few days ago, I heard on the radio that the organic food stores are now/that you bring [your own containers] along and then/and that they have a problem with it, because it is about hygiene and they don't know whether you bring a clean item or not. And then you may say afterward, 'I got sick', and who is to blame then? So that's another problem that is being addressed now*" (P8). "*Yes, they are not really allowed to do it*" (P9). [...] "*Are they not allowed to do that? Because I saw it in a programme that people go to the supermarket and bring their reusable containers and have the sausages packed in it, or the cheese, or whatever*" (P10). "*Yes, but as I said, there are concerns about that now*" (P8). "*But they do it, don't they? But they are not allowed to do it*" (P10, para. 112–119). Thus, hygienic issues seem to be an obstacle to the reduction of plastic packaging, both on the part of consumers as well as producers and retailers. Some participants also dismissed the idea to drink tap water from refillable bottles instead of buying water in plastic bottles because they assumed tap water to be of bad quality.
- 4) *Material properties*. Some participants reported that they preferred groceries packed in plastic due to the material properties of plastics like being light, shatterproof and tear-resistant. One participant said in this regard: "*That was my experience with these coffee cups or beverage cups, that they are not that leak-proof and you never really know, is this really leak-proof? Already had bad experiences with that*" (P11, para. 231). Another participant remarked: "*Well, as I said, though I think glass packaging is also quite good, I actually buy it very rarely, because then I think, I buy a liter of milk, I buy yogurt and maybe cream or something else and another bottle of water or two and all that in glass, that would be way too heavy for me. So, that is why I think that [plastic] is actually quite practical*" (P12, para. 172–173).
- 5) *Other priorities*. Several participants described how their attempts to reduce their plastic packaging consumption collided with the requirements they experienced in their multiple roles as

individuals. One example given was that parents do not want to pack heavy backpacks for their children and, therefore, use plastic bottles instead of glass bottles. Another example is that parents try to fulfil the wishes their children raise. In this regard one participant reported: *"I live with my little son and he eats a yogurt every day. And he is pretty set in his ways and he always wants one of these. So, they are always individually packaged. Exactly, so I do that, I buy that, although I try to avoid plastic. Exactly, but that [yogurt] is [something] I buy every time I go shopping"* (P6, para. 58).

- 6) *Price*. One additional barrier that some discussants agreed on was that in general, groceries packaged in plastics are cheaper than plastic-free groceries. One participant commented *"Glass bottles simply cost much more. And with children, it is too expensive in daily life"* (P13, para. 312). Another participant summarised that *"the cheaper I want to buy, the more plastic I get"* (P3, para. 294). Moreover, the relatively high initial investment, e.g., for purchasing a refillable stainless steel can, was perceived as another relevant financial obstacle. *"The good items that will do their job, they are also expensive"* (P14, para. 232), added one participant on this issue. At the same time, participants expressed their intention to buy products in plastic-free packaging given that they would cost the same as products packaged in plastic: *"Yes, as she says, the price would have to be the same, then I also buy [glass] bottles"* (P14). *"I think so too, absolutely. The same price//if you had the alternatives for the same price, I would also buy the alternatives immediately"* (P16). *"So, if it would be one-to-one, the products that are important to me, if I pay the same price with no plastic then it is not a problem. But my budget//okay//no, I have to//I can't, because, period. Then I just have to take plastic products, because that is just the way it is"* (P17, para. 340–342).
- 7) *Availability*. By default, the majority of groceries offered in supermarkets and discounters is only available in plastic packaging. Thus, the discussion participants feel like they *have to* buy their everyday groceries in plastic packaging. One participant stated that *"when you go to the supermarket, they [the groceries] always are [in plastic]. So, I do not agree with it, but I cannot really influence it in an ideal way either"* (P4, para. 133).
- 8) *Diffusion of responsibility*. With regard to the attribution of responsibility for solving the 'plastic problem', approaches concerning changes in consumer behaviour vs. changes in the general conditions like infrastructures were discussed. On the one hand, participants argued that the industry was responsible for the fact that so many products are packed in plastic and, therefore, the industry should provide solutions. On the other hand, it was also emphasised that consumers should shop more consciously and avoid products in plastic packaging. The following dialog summarises the discussion well: *"If the industry did not produce it, we would not have the whole problem"* (P15). *"If we did not buy it, though, we wouldn't either"* (P18). *"Yes, but what is not there, I cannot buy"* (P15). *"Yes, that is true, but that is the question of hen and egg, I think"* (P18, para. 508–511).
- 9) *Reachability & infrastructure*. Some participants noted that places like zero-packaging stores or farmer's markets are difficult to reach and getting there would consume more time and effort than stopping by supermarkets or discounters. One possibility to buy meat and sausage products without packaging that was mentioned by the participants was to go to the butcher. With reference to vegan products, one participant commented in this respect: *"And generally, all the vegan substitute products, [...] that is also difficult. You can't buy these at the butcher, I would say, unless you go to a vegan butcher. There is one in Berlin now, but to drive there always is also a bit exhausting"* (P11, para. 60). Due to the fact that zero-packaging stores are yet rather uncommon, many people would have to travel long distances to reach them. The fact that consumers are not necessarily willing to do so is illustrated by the following quote: *"I do try to avoid plastic, but that is no reason for me to refuse to*

*buy a product or to drive another 10 km just to get the product unpackaged"* (P6, para. 119).

- 10) *Time & time structures*. Yet not only distance, but also time is a crucial barrier to plastic-free shopping. Due to long distances to get there, going to plastic-free shops and markets would take up more time for most people. In addition to that, the participants pointed out that the shopping also would take longer if they filled the food in their own containers. Moreover, they would need to clean their own containers, a practice that they also described as time-consuming. Thus, the participants agreed that disposable plastic packaging is a time-saver. Further, the discussion revealed that participants' working hours collide with the opening hours of potentially plastic-free shopping locations, such as zero packaging shops and farmers' markets. Another aspect in which time structures play a role is that a bulk purchase is usually made once a week and that consumers expect the food to be shelf-stable and packaged accordingly. This was highlighted, for example, in the following quotation: *"If you go to a real organic food store, the things [you buy there] spoil a bit faster. And I think there are customers who are annoyed by that. They want to do their grocery shopping once a week. Then, the refrigerator is full for the week and they would become totally frustrated when the tomatoes start to rot somehow not only after a hundred years, but maybe already have a dent after three days"* (P19, para. 361). Thus, although less obvious than the absolute amount of time invested in plastic-free lifestyles, (societal) time structures are also a hurdle with respect to the attempt to reduce plastics consumption.
- 11) *Convenience*. The participants reported that bringing their own containers to the shops is quite inconvenient for them. It would mean to either carrying the containers to work and back again, or having to go out twice. This aspect and the limited opening hours of plastic-free shops and markets require more planning when it comes to the organisation of shopping trips. The fact that convenience represents a barrier is also illustrated in the following quote: *"I often do the grocery shopping after work and actually, I would need to take all the packaging, all the packaging options, with me to work to be able to shop on the way back home. I would never do that"* (P18, para. 208).
- 12) *Consumer culture*. The participants in our focus groups did not attach much importance to the aspect of a 'wide range of products' when shopping. However, it was often emphasised that it is important for the individual to be able to reliably find the product he or she wants in the shop. Thus, indirectly, a wide range of products is demanded from the consumers. However, one participant suspected that a wide range of products is difficult to reconcile with the unpackaged concept: *"But one consequence [of implementing the unpackaged concept] would probably be that the range of products would automatically have to be more limited, right? So, I think if you now imagine a supermarket [...] or so, which is huge, they could actually not do that. That can actually not be realized, I think, with such a product range, and everything unpacked. I would not complain about it, because I do not need so many things, but [...] I think the supermarket has no intention to do so"* (P18, para. 325). The participants also highlighted that the freshness of goods is of great importance to them. However, (plastic) packaging is often necessary to maintain the freshness of food that has to be transported over long distances. Therefore, the expressed desire for fresh food that it is currently not regionally available, impairs the reduction of the consumption of plastic packaging. In addition, people commonly consume spontaneously and do not always want to carry their own containers around. Thus, most spontaneous buyers rely on packed goods.

#### 4. Integration and discussion of results: relevant factors for reducing individual grocery plastic packaging consumption and recommendations for facilitating packaging-free consumption

In this section, we provide an integrated overview of ways for reduced plastic packaging consumption based on our empirical findings and add further options that have not been mentioned by the focus group participants. Furthermore, we discuss the results from the focus groups in the light of the barriers to more sustainable behaviour reported in the literature. In doing so, we identify and summarize specific factors that affect individuals' levels of packaging consumption. The discussion is structured according to overarching questions which we consider as most relevant for societal pathways towards packaging reduction. We further point out future directions for science and practice. Finally, we address the limitations of our study and draw our conclusions.

##### 4.1. Possibilities how to reduce grocery plastic packaging consumption

In the results section, we have depicted the focus group participants' ideas on how to reduce their individual consumption of plastic packaging. These ideas can be grouped into three major areas of practices: a) buying items with a plastic-free packaging, b) buying groceries unpacked and, c) other and related changes in practices (Fig. 2). Although the separation of the single approaches helps to gain a better structured overview, they cannot be seen independent from one another. In order to buy groceries unpacked, own containers need to be brought along. And purchasing food in plastic-free (or plastic-reduced) packaging, such as glass, results in a changed shopping practice. In the case of Germany, there is a deposit on yoghurt jars, so buying yoghurt in a jar instead of a plastic cup means that the jar has to be cleaned and returned to the shop later. These examples illustrate that a reduction of plastic packaging or a development towards more unpackaged offers cannot be reduced to purely technical issues, but include social change. Therefore, for the development of specific changes in infrastructures it is necessary to integrate changes in social practices as well.

Interestingly, we observed in our empirical study that a variety of possible practices with the potential to reduce individual plastic consumption have not been mentioned in the focus group discussions. These include: Avoiding food that needs packaging; buying only as much as is really necessary; buying regionally and seasonally grown fruits and vegetables; consuming on-site instead of take-away; and preparing snacks at home instead of buying to-go. In the following, we further elaborate on the individual practices in the context of the factors that determine individual consumption of plastic packaging. An overview of

the options in which individuals can reduce their plastic packaging consumption is summarised in Fig. 2.

##### 4.2. Factors that influence individual (plastic) packaging consumption levels

According to our analysis, the following questions and factors are relevant for a reduction of individuals' consumption of plastic packaging (Fig. 3):

###### 4.2.1. Who is shopping?

Right from the start of our focus group discussions, the participants reported that they tried to avoid food plastic packaging. We observed a high level of **problem awareness** and the participants agreed among themselves that avoiding plastic packaging was the right thing to do. This indicates that they reacted to a social norm that the proper consumer behaviour should be the avoidance of plastic packaging. A lack of awareness can generally be a barrier to more sustainable action (Gifford, 2011), but in relation to plastic, problem awareness seems to be very high in Germany (Verbraucherzentrale Bundesverband e.V., 2018). Nonetheless, the participants from the focus groups reported that their problem awareness did not necessarily translate into behaviour. In accordance with the review by Heidbreder et al. (2019), we found that people's knowledge about plastic-free options is generally relatively low and our study participants were also uncertain about the sustainability of different packaging options. Thus, clear guidelines about preferable packaging materials should be given to overcome a **lack of knowledge** as a barrier to more sustainable action (cf. Gifford, 2011). As basis for such guidelines, solid research is needed to determine the social and environmental risks of plastic. At the same time, research should pay more attention to the waste prevention approach and put a stronger focus on unpackaged solutions.

Another reason why the intention to avoid plastic packaging is not translated into action is that individuals do not only shop as responsible consumers. Instead, their consumption decisions are also affected by **conflicting priorities** and other specific personal roles they hold. Consumers are also parents, employees, spouses etc. and behave according to the logic of these social roles. Parents, for instance, buy the light plastic bottles for their children's schoolbags; workers buy the coffee to-go on their way to work. Therefore, these different roles should also be considered when designing infrastructural changes and developing communication campaigns to reduce plastic packaging consumption.

In Germany, products in reusable packaging, e.g. dairy products in glass, are often more expensive than products in plastic packaging due to

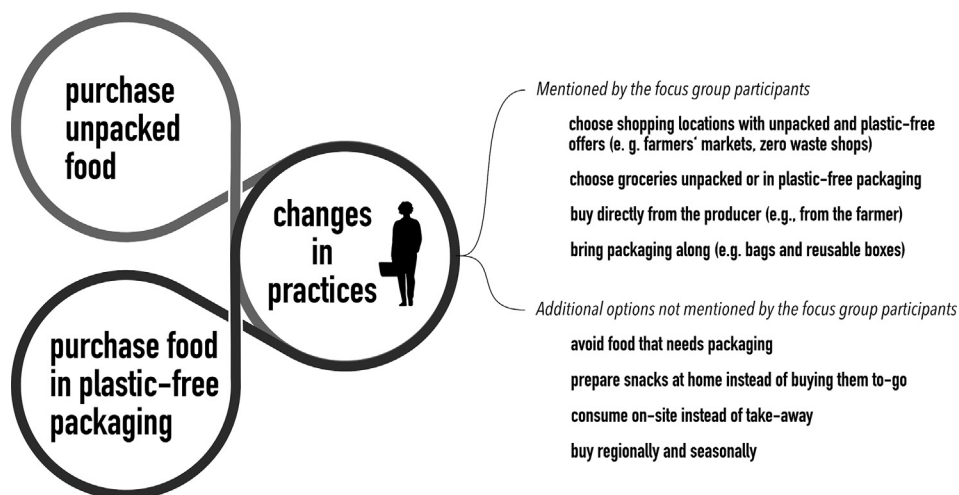


Fig. 2. Possibilities how to reduce food plastic packaging consumption.



Fig. 3. Possibilities how to reduce food plastic packaging consumption.

the costs of cleaning and logistics (Verbraucherzentrale NRW e.V., 2019a). Also, the participants in our study mentioned **price** as a relevant barrier to refrain from plastic packaging. However, depending on individual income conditions, consumers differ in their ability to put the intention to shop plastic-free into action. While a certain fraction of consumers existentially depends on low prices for their groceries, others might decide upon priorities that are not necessarily driven by financial straits. Thus, as the price is a relevant criterion for shopping decisions, it should be ensured that the most sustainable options and zero-packaging offers are also the cheapest. Therefore, political and regulative framework conditions should be developed in order to ensure fair conditions of competition for all producing and selling packaging and groceries. In addition, retailers could provide incentives by offering discounts for customers who bring their own reusable packaging containers.

The question *'Who is shopping?'* is hence helpful in the discussion about measures for a reduced consumption of plastic packaging as it points to the fact that people act in their individual social structures and roles. Thus, different scopes of action (e.g., income) need to be considered and tailored communication approaches (e.g., as good parents, responsible consumers) could prove more effective than a general communication approach for all. In this regard it also seems advisable that researchers, politicians and campaigners should reflect their choice of language when promoting plastic-free consumption. Stengel (2011) reports that most peoples' behaviour is guided by the society's shared descriptive norm (Cialdini, 2003) which relates to the behaviour shown by the majority of the population. Therefore, we recommend not using the often-used term 'alternative' with respect to plastic-free products and practices as this wording indicates that something is divergent from the 'normal' and prevailing practices. The wording 'alternative' could make it more unlikely that the practice will be adopted. Instead, we suggest preferring terms like *'plastic-free options'*.

#### 4.2.2. What are we shopping?

The foods and beverages that are bought in plastic packaging are mostly products of daily use, as the focus group participants described it. Yet, for the reduction of the consumption of plastic packaging individual consumers as well as societies – particularly in the Global North – need to ask what the term 'products of daily need' actually means. The need for plastic packaging depends to a certain extent on the properties of the products consumed: As the discussions from the focus groups indicate, it is mainly animal products such as meat, sausage and dairy products as well as non-regional and non-seasonal products that are usually bought in plastic packaging. Thus, we can assume that eating fewer animal products would reduce the need for plastic packaging. Research should clarify

to what extent, for example, a vegan diet offers the possibility to refrain from (plastic) packaging compared to a mixed diet. Similar to Heidbreder et al. (2019) who identified **habits** as significant barriers to the reduced use of plastic packaging our study provides additional empirical evidence and corroborates previous considerations. While Heidbreder et al. (2019) in their review address habits in the direct use of plastic as well as the lack of a habit of bringing one's own bags to the grocery store as barriers, we add **dietary habits** to the list.

Yet, also the origin of products is crucial in this respect: One important function of packaging is protection and preservation (Pongrácz, 2007). We assume that in order to maintain groceries' freshness, non-seasonal and non-regional fruits and vegetables transported over long distances are more likely to need additional packaging. Therefore, consuming seasonally and regionally produced groceries instead has the potential to decrease plastic packaging consumption. However, consumers of our study seemed to be rather unaware of the fact that vegetables which are currently not in local season require packaging to preserve them over long distances. Some participants of the focus groups complained about plastic packaging that is unnecessary from their perspective. At the same time, in line with other studies (e.g. Statista, 2020a), our results confirmed that freshness of groceries is particularly important to consumers. Therefore, the **consumer culture** of 'everything at any time' (Welzer, 2013), which manifests itself in the unreflecting **demand for the constant availability of fresh non-seasonal and non-regional products**, represents a fundamental hurdle for the reduction of (plastic) packaging. Hence, changing current shopping behaviours becomes a question of changing culture and lifestyles. Overall, a socio-ecological transformation to more sustainable lifestyles is a holistic task. How to agree on shared understandings of such sustainable lifestyles and ways to change the current mainstream are definitely interesting topics for further investigation.

In our empirical study, buying packed groceries was generally reported as convenient and time-saving. As stated by the study participants, products in plastic packaging are often preferred, because the packaging is lightweight, shatterproof and leakproof, and shopping packaged products is generally faster. A time-saving but packaging-intensive category of groceries is **convenience** food. Reducing individuals' consumption rates of pre-prepared and packed meals in favour of buying fresh and unpacked groceries would help decreasing the consumption of packaging. Here, it is also important to keep in mind that cooking habits would also have to change and that adapted storing behaviours and facilities are necessary in order to prevent food waste (White and Lockyer, 2020). A better communication that helps to reduce uncertainties and improve consumers' knowledge might be advisable in this regard. Due to



the shorter shelf lives, it would further be necessary to shop more frequently and in line with actual demand to prevent an increase in food waste. For the avoidance of rebound effects due to increased mobility for more frequent shopping trips, the relevant shopping facilities must be quickly and easily accessible, if possible in walking or biking distance. And although giving up habits and developing new routines is a difficult task (cf. Gifford, 2011), Kröger et al. (2018) report that once new routines are developed for doing the grocery shopping in a zero packaging store, this behaviour is perceived as convenient as buying packed groceries.

Although consumers partly consider themselves as responsible to reduce plastic waste, the force of habits and norms seems to be stronger so they continue shopping in supermarkets and discounters. Thus, the **availability** of unpacked goods in supermarkets and discounters constitutes a major barrier to shop plastic-free from the consumers' point of view. Consequently, consumers perceive manufacturers and retailers as responsible for solving the plastic problem and for offering more unpackaged groceries. Yet, as long as consumers buy groceries packed in plastic, producers and retailers hardly see any incentives to change their practice. Hence, the process of **responsibility diffusion** which Stengel (2011) identified as barrier for the diffusion of sufficiency lifestyles can also be found in the context of reducing the consumption of plastic packaging. Moreover, offering more unpacked groceries would mean that stores would have to reduce their product range because less processed food could be offered (cf. Beitzten-Heineke et al., 2017). However, although the participants in the focus groups did not attach much importance to the aspect of a 'wide variety of products' when shopping, they often emphasised the importance of having the products they wanted available. Yet, such an all-time availability inevitably results in a wide range of goods as shops try to meet a broad range of demands. Thus, a critical point on part of the consumers would be to accept a reduced range of goods. For producers as well as retailers such a change to selling goods unpackaged would mean that not all products could be offered anymore. Therefore, pathways to a reduced consumption of plastic packaging inevitably include the question of 'what are we shopping?'. Furthermore, this aspect raises the fundamental question which products are actually necessary for 'a good life' and what should be considered superfluous so we could forgo it and maybe live even better without. Such questions need to be asked by each individual and also should enter the public dialog.

#### 4.2.3. Where do we go shopping?

'Where do we go shopping?' is also relevant in the context of discussing approaches for the reduction of plastic packaging as the choice of the shopping location is an important factor that determines the consumption level of plastic packaging. The study participants noted that food sold at farmers' markets, in zero waste shops and generally in small or organic shops tends to be offered with less packaging compared to supermarkets and discounters. Farmers selling their products directly and community-supported agricultures are further options to shop plastic-free. However, the focus group participants primarily purchase their groceries in supermarkets and discounters. The reason for this presumably lies in the fact that the **choice of the shopping locations is often based on habits**. Thus, habits also represent a barrier to plastic-free consumption. In addition, the focus group participants reported that shopping facilities where food is offered unpackaged or without plastic packaging can usually only be reached with greater effort. Therefore, in order to support packaging-free shopping, a change in **infrastructures** is necessary and we suggest to politically create conditions that support such retail structures. For instance, increasing the number of zero packaging stores or other shops which offer unpacked goods would lower the barrier of **reachability** of more sustainable shopping facilities. Lower taxes, easier access to bank loans with particularly favourable conditions and preference in public procurement for more sustainable shops could further boost their dissemination (cf. Economy for the Common Good: Felber, 2018).

Yet, previous studies outlined that reusable bags and zero packaging stores raise **hygienic issues** for customers as well as retailers and impede the diffusion of the zero-packaging concept (Beitzten-Heineke et al., 2017). Also, the participants of our empirical study raised hygienic concerns regarding the properties of unpackaged goods, the use of own packaging that is brought along, and long-term reusable packaging options. Since the beginning of the COVID-19 pandemic, consumers have been paying more attention to hygiene when buying food (see for example Statista, 2020b). Thus, establishing trust in food safety is crucial for the expansion of the zero-packaging concept (Beitzten-Heineke et al., 2017). However, hygienic concerns about zero-packaging could most likely be solved by educating people and technological development (Beitzten-Heineke et al., 2017). At the same time, it is necessary to critically examine statutory hygiene regulations and ways to ensure consumer safety while fostering the spread of zero-packaging approaches. Although tap water in Germany has been of excellent quality for years, many consumers prefer buying bottled water (Verbraucherzentrale NRW e.V., 2019b). Also, the participants of the focus groups justified their preference for bottled water with the (allegedly) poor quality of tap water. So, a better communication as well as improved infrastructures that encourage the consumption of tap water could be advisable. Furthermore, it could be questioned whether bottled water as a product is generally needed at all in countries with excellent tap water quality.

#### 4.2.4. When and how often do we go shopping?

Whether consumers shop spontaneously or plan their shopping trip is another relevant aspect that affects plastic packaging consumption. Therefore, the question 'When and how often do we go shopping?' becomes important when addressing the reduction of plastic consumption. According to our results, bringing own bags and boxes is more likely when shopping is being done deliberately and planned. Thus, for a reduced plastic packaging consumption, it would be beneficial if consumers would plan their grocery shopping ahead and would organize necessary bags and boxes in advance. This could also help preventing food waste – an issue that is particularly relevant when buying food unpackaged. When planning and designing communication strategies and adjustments in the retail sector, focusing on planned bulk-purchases vs. small, spontaneous purchases could prove to be one additional strategy to reduce plastic packaging.

Further, foods and beverages for take-away consumption are often packed in plastic. The participants of our study reported that they were able to avoid plastic packaging if they prepared snacks at home instead. Hence, it might be beneficial to encourage people to prepare snacks at home and pack them in reusable containers, discourage them from buying take-away foods and beverages, and promote enjoying drinks or meals at the point of sale. In addition, disposable packaging should be banned from points of sale and reusable take-away packaging should be offered instead.

#### 4.2.5. Framework conditions

Up to now, shopping in supermarkets or discounters has been the **norm**. Even though the participants of our empirical study claimed that they wanted to contribute to the reduction of plastic packaging consumption, they showed hardly any deviations from this norm. Thus, the barrier of social conventions for the diffusion of sufficiency lifestyles (Stengel, 2011) is also confirmed in the field of plastic avoidance. Although there is a high level of problem awareness with regard to plastics (Heidbreder et al., 2019), the daily consumption of products in (plastic) packaging is a socially accepted standard behaviour. This leads back to the point that a fundamental cultural change is needed.

Further, Stengel (2011) highlighted **consumerism** as another major barrier for the adoption of the sufficiency approach. Considering this, it is not surprising that the focus group participants of our study also mainly neglected the approach of an overall reduction of consumption. Yet currently, up to 24 per cent of the groceries purchased in the United States and 12 per cent in Germany are thrown away (Wagner, 2018).

Hence, purchasing more demand-oriented would not only reduce food waste, but also the consumption of plastic packaging. Shops that offer the opportunity to fill up one's own containers facilitate more sustainable shopping as customers can purchase specific quantities of food they need.

But in a **capitalist system** which is subject to the growth paradigm, retailers try to encourage their customers to purchase as much as possible by special offers and advertising (Stengel, 2011). And although waste prevention is at the top of the waste hierarchy, the solutions to solve the global problem of increasing plastic waste are mainly sought in technical solutions for waste treatment and recycling as these open up growth markets and are in line with the economic interests of various stakeholders (Bartl, 2014). Packaging-free purchasing can only be a niche solution in a growth-demanding system and by no means the basis of a growth-based economy (Sattlegger and Raschewski, 2019). Thus, in addition to the mentioned infrastructural and cultural changes, a long-term political and economic transformation towards a post growth society is needed (Sattlegger and Raschewski, 2019) in order to tackle the 'plastic problem'.

#### 4.3. Limitations

The empirical data collection was based on focus groups conducted with consumers from a German metropolis. The recruitment of the market research institute cannot exclude a bias, as the study participants were chosen from a pool of people who had already agreed in advance to participate in upcoming focus groups. This type of recruitment may have implications in terms of that the sample is limited to those who put themselves forward for such research. Due to the group composition and the explorative qualitative nature of our research approach, the results of the focus group discussions cannot be considered representative for the German population. Instead, our qualitative study design intended to discover the depth and qualities of the research field. One result of this study is the presented compilation of factors influencing the consumption level of plastic packaging. From the study results, we further derive hypotheses regarding the barriers to reduced everyday consumption of plastic packaging. In order to obtain a representative picture, these hypotheses were tested in a representative population survey in Germany. The results of this representative study will be published in the near future. Similar representative studies should also be carried out in other countries, whereby reference can be made to our results for the generation of hypotheses or possibly similar explorative, qualitative approaches would have to be taken first. In particular, a comparison with countries from the Global South could be important.

#### 5. Conclusions

The results from the focus group discussions demonstrated that people are well aware of the problem of the current high consumption rates of plastic packaging. At the same time, participants reported that their intention to avoid plastic packaging does not usually translate into action. This is in line with the observation that plastic is regarded as problematic in population surveys, but that the consumption of plastic packaging is steadily increasing. The aim of this study was, therefore, to determine the factors that affect the individual consumption of plastic packaging in everyday life. As our findings illustrate, the reduction of plastic packaging is connected to a variety of barriers, so an active and conscious 'counter-behaviour' is currently needed to avoid plastic packaging. Therefore, infrastructures, lifestyles as well as cultural and economic conditions need to change to make plastic-free and zero-waste shopping the norm and unpackaged goods the most affordable and convenient option. Asking the questions of 'who is shopping?', 'what are we shopping?', 'where do we go shopping?', 'when/how often do we go shopping?' helps in identifying the levers for disseminate the unpacked concept. Asking these questions also reveals factors that have so far only been marginally discussed in the discourse on the plastic problem and have not yet been systematically linked to it. The pivotal changes concern a

reduced consumer demand for products that require packaging, an increase of opportunities to buy goods unpacked as well as more planned shopping and less consumption of take-away foods and beverages. In the context of the desired dissemination of unpackaged solutions and a reduction in the supply of products in plastic packaging, we would like to emphasize that these changes not only require changed supplies and infrastructures, but are also linked to comprehensive changes in everyday consumption practices of consumers which are embedded in specific lifestyles. Therefore, technical, structural and related lifestyle changes should always be thought together. The goal of reducing the plastic packaging use will not be reached by asking consumers to solely shop in zero-waste shops. It requires fundamental societal structural and lifestyle changes as well as a cultural shift. How this change can be initiated and implemented is beyond the scope of this paper. At this point, we hope to start a process of change by outlining these connections.

#### Credit author statement

Jasmin Wiefek: Conceptualisation, methodology, project administration, formal analysis, visualisation, writing: original draft, review & editing.

Julia Steinhorst: Conceptualisation, methodology, project administration, investigation, writing: review & editing.

Katharina Beyerl: Conceptualisation, methodology, project administration, supervision, funding acquisition, visualisation, writing: review & editing.

All authors have read and agreed to the published version of the manuscript.

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#### Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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