



# Guidelines to Foster Consumer Acceptance of Products Made from Recycled Plastics

Athanasios Polyportis<sup>1</sup> · Lise Magnier<sup>1</sup> · Ruth Mugge<sup>1,2</sup>

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## Abstract

The circular economy can reduce the environmental footprint of today's consumption and close the resource loop through circular material flows. Companies are encouraged to follow circular principles, such as using more recycled plastic materials. This initiative seems promising; however, it will only be successful if consumers are willing to adopt products that are made from recycled plastics. Consumers often have a positive image of products made from recycled plastics; however, they are also concerned about the perceived product risks. How can companies increase the appeal of recycled plastics to consumers? In this paper, we propose a set of seven guidelines intended to highlight the value of products made from recycled plastics, tackle any perceived risks, and thereby enhance consumer acceptance of such products. Specifically, we highlight how aspects related to product design, marketing elements and business models, can increase consumer evaluations and adoption of products made from recycled plastics. The proposed guidelines provide future directions that could be inspiring for both academics and managers interested in the topics of consumer behaviour, circular economy, and sustainability.

**Keywords** Products made from recycled plastics · Circular economy · Guidelines · Sustainability · Design · Consumer acceptance

## Introduction

Unsustainable production and consumption patterns are the main threats of environmental preservation. Plastics production is expected to double over the next 20 years due to an increased usage in various applications [36]. At least 14 million tons of plastics end up in the ocean each year. Plastic debris is currently the biggest type of waste in the ocean, making up 80% of all marine debris found from surface waters to deep-sea sediments [31]. If we want to prevent plastic leakage into the ocean and minimize

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✉ Athanasios Polyportis  
a.polyportis@tudelft.nl

<sup>1</sup> Faculty of Industrial Design Engineering, Delft University of Technology, Landbergstraat 15, 2628CE Delft, the Netherlands

<sup>2</sup> Amsterdam Business School, University of Amsterdam, Plantage Muidergracht 12, 1018TV Amsterdam, the Netherlands

the environmental damage of this “plastic soup”, we must close the circular loop and reduce plastic consumption by changing how we design, use, and reuse plastics.

The principal concept of the circular economy is that material flows are restored through closed-loop processes, because of which valuable resources are not lost, but reused or recycled, resulting in less waste (MacArthur [40]). Indeed, nowadays, companies are encouraged to follow these principles and to use more circular materials, such as recycled plastics [45]. However, consumers also play a decisive role in the success of the aforementioned circular economy concept because their choices can either support or impede circularity [17].

Recycling is not the most preferred loop in a circular economy [65], for reasons such as potential loss of value compared to the value attributed to the original product (downcycling,[32] and incremental energy usage. Nonetheless, it is an unavoidable loop for most products at a certain moment in their lifecycle. To realize the full potential of the circular economy practices, such as recycling and reuse of plastics, consumers should perceive and evaluate circular products positively. Only if their perceptions towards products made from recycled plastics are positive, consumers will be encouraged to adopt them, and the circular loop will be successfully closed. To assess products made from recycled plastics as viable alternatives to the traditional purchase of products made from virgin materials, consumers need to perceive adequate benefits and only limited risks in these products.

Although consumers generally have a positive image of products made from recycled plastics [17, 35], past research suggested that they often do not have trust in the environmental impact of their consumption patterns and corporate green advertising claims [23], Nyilasi et al. [48]; [59]. Furthermore, consumers may not recognize the sustainable alternatives made from recycled plastics or have concerns about the product’s perceived contamination [44], quality, and functionality [38, 39, 60]. For companies, it is critical to attenuate these phenomena and augment consumer acceptance. An important question in this respect is: How can marketers and designers trigger positive inferences towards products made from recycled plastic or counterbalance any negative associations, to increase their appeal to consumers?

To shed light on this question, we conducted a comprehensive analysis of primary scientific research and of existing corporate marketing practices on products made from recycled materials. More specifically, we first reviewed the most relevant scientific articles on the field of consumer acceptance of recycled plastics from a pool of articles that was also used for a scoping review on consumer acceptance of products made from recycled materials (see [52] for more details). Then, we searched for corporate marketing practices that were used to promote products made from recycled plastics. We formulated a set of recommendations based on this analysis of the literature and existing marketing practices. In addition, we drew on scientific literature on general consumer behaviour theories and theories related to other pro-environmental behaviours to fine-tune the proposed recommendations and elaborate on the underlying psychological mechanisms.

This process resulted in a set of seven guidelines that companies can use to foster consumer perceptions and acceptance of products made from recycled plastics. For each guideline, we use prior literature findings on how this could augment consumer acceptance of product made from recycled plastics. Furthermore, we elaborate on the potential challenges that companies interested in using these guidelines should tackle.

## Guidelines

### Guideline 1: Ensuring Trust in Environmental Impact

While many product attributes can be verified through personal experience or information search, sustainability claims are typically credence claims, which consumers are unable to verify directly and that at face value must be accepted as truthful [14]. To answer the demand for more sustainable products, companies sometimes wrongly advertise their products as sustainable, which is also referred to as greenwashing. Specifically, greenwashing corresponds to a mismatch between the corporate environmental performance of a company and its green advertising communications [23], Nyilasi et al. [48]). As a result, consumers have gradually lost trust in environmental claims.

Research has identified several possible strategies to produce environmental claims that are authenticated adequately by consumers. Companies developing new sustainable products and services, such as products made from recycled plastics, can implement these to ensure trust in their environmental impact.

#### (a) Communicate the Corporate Environmental Performance

Companies should communicate about their corporate environmental performance. The efforts a company dedicates in its general environmental performance will help consumers to trust the environmental claim about a specific product made from recycled plastics. Corporate environmental performance is composed of a firm's record of (1) environmental impact, (2) regulatory compliance, and (3) organizational processes [22]. The engagement of a company in all domains of corporate social responsibility (e.g. social responsibility, use of green energy, local production) can help to reduce consumer skepticism towards communications about the environmental impact of one of its products. Consequently, communicating the environmental performance of the company will improve its reputation [16], which will be beneficial to ensure the success of the products made from recycled plastics.

Being transparent about all aspects of the value chain is an interesting way to communicate the corporate environmental performance, which in turn can make recycled product claims more credible. For instance, Patagonia has a dedicated webpage (<https://www.patagonia.com/our-footprint/>) where they disclose information relevant to their environmental and social responsibility programs, to promote their corporate environmental performance (Patagonia [51]).

#### (b) Communication Through Eco-Labels

Eco-labels work like certification marks or seals of approval to cue consumers about the environmental qualities of a product or service while assuring them of the truthfulness of these claims [6]. They are information tools that “aim to internalize the external effects on the environment of the production, consumption and disposal of products” [15], p. 321). Past research suggested that government or third-party independent labels are perceived as more credible than corporate labels by consumers [21, 53]. To ensure consumers' trust about the environmental impact of products made from recycled plastics, companies should seek to have their activities certified by independent third parties. B Corporation certification is an example of a third-party certification (<https://bcorporation.net/directory/eco-birdy/>) that is globally recognized for companies putting efforts into social and environmental responsibility (B Corporation [7]).

Nonetheless, it is important to note that these certifications are voluntary. In addition, there are different types of certifications and labels, which means that not all products are comparable on the same characteristics. Further policy changes on this specific aspect can increase the impact of eco-labels on the acceptance of product made from recycled plastics.

(c) Communicating Argument Specificity

Specific arguments are arguments that contain sufficient detail to substantiate claims in concrete terms [6]. Research has demonstrated that consumers prefer more detailed or specific information to support green claims, and the more tangible and concrete the claim is, the more positive they tend to assess the product and the brand [43]. Providing specific arguments about their environmental impacts may increase consumer trust in companies' claims and could therefore represent an interesting strategy for companies using recycled plastic. For example, carbon labelling including a carbon footprint and reduction efforts by the company is highly supported by individuals [37], Packaging [49]. Providing figures of the carbon captured in the recycled materials (instead of them being burnt) or the weight of waste materials recycled in a company's products represent other types of specific arguments which may ensure that the environmental claims are trusted. A representative example relates to the brand Bureo that claims to have collected "3.4 million pounds of discarded fishing nets to date" from coastal communities in South America (<https://bureo.co/>).

Another example is the brand Veja that has a dedicated webpage (<https://project.veja-store.com/en/single/transparency/>) where they disclose information about the sustainability of their product (Veja [66]). The information available ranges from test reports about the chemical safety of their shoes, to the costs of a pair of shoes paid to their factory in Brazil (18.21 euro) in comparison to a (published) quote provided by a non-sustainable Chinese factory (5.3 euro), to a detailed table of their textiles and leather consumption, with recycled plastic accounting for 40.7% of their material use (Veja [66]).

## Guideline 2: Bring Environmental Impact Closer to the Individual Consumer

This guideline is related to guideline 1c on argument specificity but goes one step further. Research has shown that pollution and environmental problems are still abstract to a lot of individuals [55, 68]. For example, they may see them as mostly relevant for other countries or only as a problem for the far future. Therefore, based on the Construal-Level Theory (Trope and Liberman [61]), it is suggested that companies should communicate the positive environmental impact of their initiatives in a proximal or close way [56, 68]. In this context, psychological proximity helps in making product environmental sustainability more concrete or more tangible to individuals. For instance, communications that relate the more immediate impact of recycling plastics for a given city, region, or neighbourhood can make outcomes seem more tangible and relevant to people. Drawing on people's attachments to a specific place [26], emphasizing personal experiences with environmental impacts can then lead to better acceptance of products made from recycled materials.

For example, Better Future Factory, an innovative product design company specializing in sustainable plastic products, has advertised that they used plastics collected from the Amsterdam canals (Better Future Factory [10] ; cf. Figure 1) to make the positive environmental impact of their products closer to their Dutch consumers.

**Fig. 1** Better Future Factory advertises that it has created plant pots made from plastics collected from the canals of Amsterdam (“De Groenste Grachten Pot”) for their client Elho. [https://betterfuturefactory.com/portfolio\\_page/elho-sustainable-flower-pots/](https://betterfuturefactory.com/portfolio_page/elho-sustainable-flower-pots/)



### Guideline 3: Informing Consumers About Recycling Content History

Past identity salience is a concept coined by Kamleitner, Thürridl, and Martin [33], in which a biographical transformation of a product is made salient in the new identity of the product. For example, a backpack that is made from recycled material from an old airbag can communicate this past identity of having been an airbag in its design. Research has demonstrated that making a product’s past identity salient tends to boost demand across a variety of recycled products. This phenomenon is explained by the fact that past identity salience induces narrative thoughts about these products’ biographies, which in turn allows consumers to feel special (also see [3]). Interestingly, another line of research has shown that product transformation salience, which is defined as the extent to which recyclables are associated with the new products they could be transformed into, can increase consumers’ tendency to recycle [69]. More specifically, the researchers found that consumers are inspired by the transformation of recyclables into new products and that this inspiration process motivates them to recycle.

Many examples can be found in practice where the past identity of product is made salient in the identity of the new product. For instance, the brand Bureo commercializes sunglasses made from recycled fishing nets (<https://bureo.co/>). Similarly, coffee trays made from recycled coffee packages are produced by Better Future Factory from Rotterdam (Better Future Factory [11]; cf. Figure 2).

Obviously, this guideline cannot be followed by all companies producing products made from recycled plastics. For example, it is understandable that companies using mixes of low-quality plastics could not easily identify a clear biographical transformation for their products. On the other hand, it may also be worthwhile to communicate about the past identity in a more general way, for example, by suggesting that a product is made from a specific municipality’s household waste.

**Fig. 2** Coffee trays made from recycled coffee packages by Better Future Factory. [https://betterfuturefactory.com/portfolio\\_page/selecta-coffee-trays/](https://betterfuturefactory.com/portfolio_page/selecta-coffee-trays/)

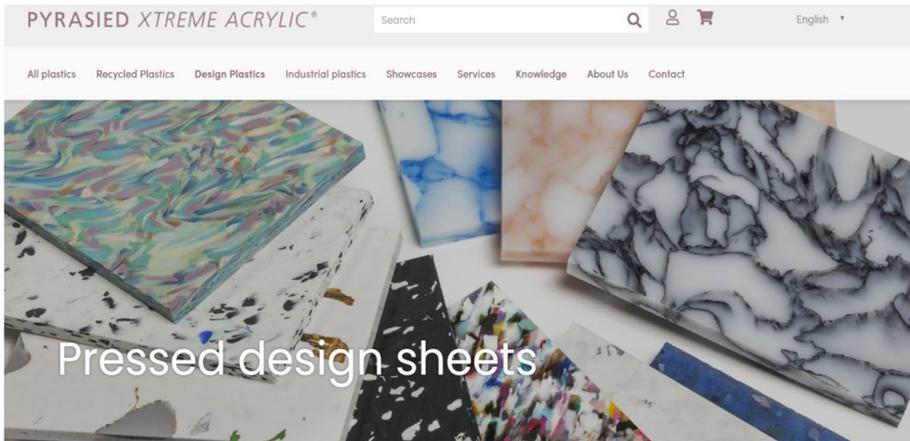


#### **Guideline 4: Signalling a Person's Environmental Identity—on the Role of Recognisability**

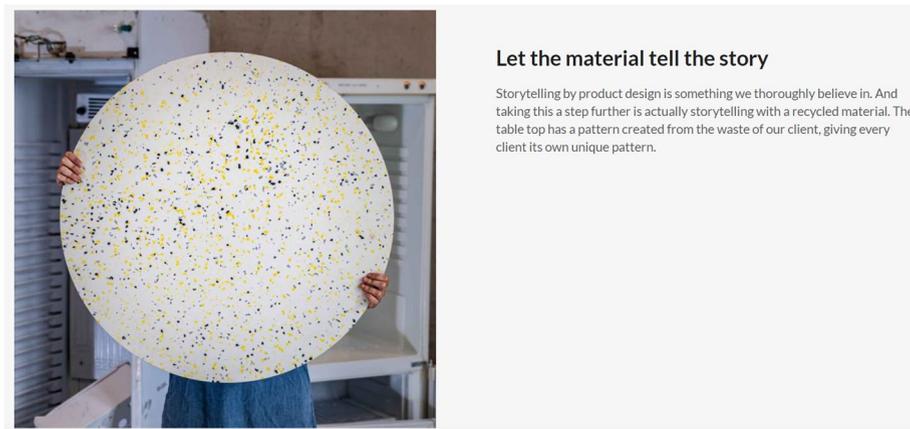
People value products not just for the functional benefits that these products bring, but also use products to express and signal one's identity to themselves and to others [9]. These products show who the owner is as an individual and what values (s)he considers important, and therefore helps him/her to show a consistent and positive self-image [68]. This self-signalling value of products is well-known for clothing and furniture, but it also applies to other consumer durables [28]. For example, if a person considers him/herself as having a tough personality, (s)he is more likely to be attracted to a Jeep as this would enable him/her to express this personality [27]. Based on this self-signalling theory, research on sustainable consumer behaviour has shown that if a person is environmentally concerned, and considers this an important part of their identity, they are more motivated to choose sustainable products, such as products made from recycled plastics, because these products are consistent with and allow them to express their environmental values [62, 63].

Using such signals of one's environmental values may also trigger other sustainable behaviours. People have a need to maintain a consistent image of the self and the regular reminder of their own environmental values (e.g. because of the daily use of the sustainable cup) may lead to self-consistent, other sustainable behaviours in the future [64]. Prior research has unveiled that purchasing products that are conspicuously made from recycled materials can potentially improve an individual's image [29, 68].

This provides interesting opportunities for companies producing products made from recycled plastics. Companies can stimulate the self-signalling value of products made from recycled plastics by making it clear that the product is made from such materials. Nonetheless, without any recognizable elements on the appearance of the product, it is hard to recognize that the product is made from recycled materials, such as recycled plastics. Recognisability of recycled products is a concept suggesting that the fact that a product is made from recycled plastics can be reflected in its visual appearance [41]. Higher recognisability has been found to increase willingness to pay a premium for a variety of product categories such as textiles, durables, and FMCGs [41]. Recognisability may therefore have a positive effect on consumer responses towards products made from recycled plastics.



**Fig. 3** PyraSied Smile Plastics: PyraSied design sheets made from recycled plastic bottles. <https://www.pyrasied.nl/en/product/smile-plastics/>



**Fig. 4** Better Future Factory recognizable tabletops made from recycled waste. [https://betterfuturefactory.com/portfolio\\_page/circular-brainstorm-room-furniture/](https://betterfuturefactory.com/portfolio_page/circular-brainstorm-room-furniture/)

Visual elements are primarily processed by consumers and are beneficial in drawing attention and in subsequent product categorization [20, 57]. Providing visual elements that enhance recognisability of the recycled materials may include a specific pattern or texture on the product. For instance, PyraSied, a Dutch distributor of sustainable acrylic and design plastics on behalf of Smile Plastics and Plasticiet, advertises decorative design sheets made from plastic waste. These design sheets are characterized by a recognizable pattern suggesting that the recycled plastic is a mix of different origins (PyraSied [54] cf. Figure 3).

In addition, synthesizing on the present guideline on visual recognisability and the effort to commit to actual storytelling about a product made from recycled materials (Guideline 3), Better Future Factory designs tabletops with recognizable patterns

created from the waste of its client, thus providing every client its own unique pattern (Better Future Factory [12]; cf. Figure 4).

Apart from visual solutions, a verbal statement included on the product, or its packaging, is a way of creating recognizable products made from recycled plastics. Such verbal elements are associated with more intentional cognitive processing and are usually direct and easy to understand [42]. For instance, Noissue, a New Zealand-based company specialized in sustainable packaging, designs and sells padded mailers made from recycled plastics with a unique verbal statement on them that reveals the recognisability of the recycled material (Noissue [47] – c.f. Figure 5).

In addition, consumers may use sustainable products as a status symbol, especially when these products are conspicuously consumed [29]. For certain categories, the sustainable alternative is more expensive, even though there are some quality concerns, which can make them a costly signal. An example is a Tesla car that is an expensive electric car but has a smaller range than traditional gasoline cars. Purchasing such conspicuous green products shows that one is willing and financially able to incur the costs of suboptimal products for the good of society. This can give the person social reputation and status. Implementing recycled materials in such status objects or stressing the possible status enhancement of products in the communication may be other possible options for companies to improve the acceptance of products made from recycled plastics.

A limitation of this self-signalling guideline is that it requires the target group of the product to be environmental concerned and eager to further reduce their environmental impact via more sustainable behaviours. If the target group is less likely to appreciate environmental values, this strategy may be risky as consumers may approach these products with scepticism and may easily associate them with greenwashing [50], ultimately leading to rejection of products made from recycled plastics. Furthermore, it is important to realize that products used in public generally have better self-signalling qualities than privately consumed products [68].

**Fig. 5** Noissue padded mailers made from recycled plastic with the verbal statement “Hey! I’m a recycled, padded mailer.” on the product. <https://noissue.co/marketplace/recycled-padded-mailer/>



## Guideline 5: Tackling the Perceived Quality and Performance Risks

Even though consumers generally have a positive image of sustainable products, they often have concerns about their expected quality and functionality [38, 39]. The fact that a product is made from recycled materials can decrease consumers' perceived quality of the product [2, 35, 60], leading to higher performance risk, and therefore to higher financial risk, through decreased perceptions of the product's value for money [30].

Luchs et al. [39] unveiled that consumers associate products that are valued as ethically superior (i.e. having attributes that reflect moral principles, such as sustainability) with gentleness-related attributes (e.g. safety, health), and products that are valued as ethically inferior with strength-related attributes (e.g. quality, functionality). Because of these associations, the positive effect of product sustainability of products made from recycled plastics on consumer preferences is reduced when strength-related attributes are valued, sometimes even resulting in preferences for less sustainable product alternatives (sustainability liability).

One guideline to counterbalance these perceptions is to provide the capability or services to satisfy users' needs without needing to own physical products (access and performance model; [13]). For instance, offering a service which includes using the product, instead of a one-time purchase of the product, is a promising business model that may eliminate any quality or functionality risks. Examples are a subscription or a rental business model through which firms ensure that the product (e.g. a coffee machine or a washing machine) works well for a long time and if needed provide maintenance and/or repair works.

Another suggestion includes explicitly communicating arguments regarding the product strength of products made from recycled plastics. Luchs et al. [39] showed that the potential negative impact of sustainability on product preferences can be mitigated by using explicit cues about product strength. For instance, a tag with the verbal statement "Guaranteed strong" on a tire made from recycled materials may alleviate the sustainability liability hypothesis. Such explicit cues can be used to reassure consumers that products made from recycled plastics also score high in terms of their performance.

## Guideline 6: Reducing Perceived Contamination Risk

Contamination risk is perceived when people feel uncomfortable or even disgusted when using specific products, such as those that contain recycled materials [4, 8]. Research has shown that highlighting the recycled nature of a product made from recycled plastics leads to higher perceived contamination, and therefore to lower purchase intentions [41, 44]. The phenomenon seems to be amplified for apparel products that are touching the skin. For instance, consumers express lower intentions to purchase and make use of a product made from recycled plastic bottles when it is touching the skin (e.g. a t-shirt) compared to one that is not in direct contact (e.g. a backpack).

Meng and Leary [44] explained these perceptions from an evolutionary perspective, the motive to be protected from disease and pathogenic agents is an ancient psychological mechanism that still prevails in human beings (also check Fundamental Motives Framework; [34]). Disgust deriving from products made from recycled plastics can serve as an emotion to inferring extreme displeasure, ultimately resulting in aversion to these products [44].

Companies can harness this effect by using recycled plastics only for the products for which no close skin contact is expected and preferring new materials [67] for other product categories for which higher levels of contamination can potentially be experienced. Furthermore, although companies cannot control consumers' initial perceptions of products made from recycled plastics, they can easily control their packaging and communication messages. Such messages can be designed to compensate for the contamination associations. From this perspective, another proposition for designers and marketers may derive as a generalized extrapolation of recent findings on the adoption of refurbished products [67]. More specifically, designing a sparkling clean label or providing a certificate that the product made from recycled plastics is clean may be an effective contamination-reducing strategy.

Finally, companies can counterbalance the effects of perceived contamination by exploiting the evolutionary response to attractive others by using the products made from recycled plastics. More specifically, the inclusion of an attractive individual of the opposite sex [5] can act as a source of positive contamination [5] and reverse the potential contamination risk deriving from the recycled plastics [44]. Hence, an additional proposition for reducing the contamination risk of products made from recycled plastics includes exposing consumers, through images that are part of, for instance, the packaging or promotion of the product, to attractive others in order to achieve positive contamination and increased purchase intentions.

### **Guideline 7: Highlighting the Innovativeness of Using Recycled Content**

Thus far, it is more common to use virgin plastics than recycled plastics for many consumer products. Consequently, consumers may perceive the use of recycled plastics in products as a novel technological solution. Purposefully presenting the recycled plastics as an innovative material can help to make it more appealing to consumers. Research demonstrated that consumers associate novel technology and new features as a signal of additional value provided by the manufacturer (Carpenter et al. [18]; [46]), and will therefore evaluate the product as being superior. Correspondingly, if consumers recognise the implementation of recycled plastics in a product as a new, ground-breaking technology, this product will be more positively evaluated.

An example of a company using this guideline is the electronics company Sony. On their website, Sony communicates the use of a new recycled plastic, named SORPLAS, for certain products (Sony UK [58]). Specifically, they highlight the fact that the recycled material is ground-breaking and that it was the result of long-term development. As a result, the recycled plastic material but also the brand Sony are positioned as being innovative and technologically advanced. This may trigger positive quality inferences for the recycled material and thereby counterbalance the negative quality associations that most recycled plastics trigger.

This strategy may be especially interesting for a target group that is high in innovativeness and novelty seeking. Some consumers value new offerings more than others and are more inclined to actively seek and purchase these.

Some potential limitations of this strategy are that it may be short-lived. If using recycled plastics as a material will be more common, the novelty will decrease as consumers will see the material used in many products. Furthermore, presenting recycled plastics as a novel material will be more likely to positively influence consumer acceptance if the

material is different from other recycled plastics. Otherwise, a potential false advertising claim may backfire and be interpreted as greenwashing.

## Conclusion

Following the principles of the circular economy, plastic waste can re-enter the production loop and be transformed into new products. Consumers can contribute to closing the circular loop, by lowering consumption but also by purchasing sustainable alternatives. Hence, consumers play a critical role through their decisions that can foster or obstruct this circular process [17].

Product design, marketing elements, and business models can help towards encouraging more sustainable production and consumption patterns, including the adoption of products made from recycled plastics. In the present opinion paper, we have formulated seven design guidelines to highlight the value of products made from recycled plastics, attenuate the effects of any perceived risks, and thereby promote consumer acceptance of such products. Future research could empirically test these guidelines to uncover under which conditions they will increase consumer acceptance of products made from recycled plastics and explore additional ways to encourage adoption.

In addition, the perspective for these guidelines is mostly based on psychological mechanisms that can specifically enhance consumer acceptance of products made from recycled plastics. In contrast, other economic or social factors that influence consumption for all sorts of products were not included in our set of guidelines because these were considered too general. Although these factors could potentially influence the acceptance of products made from recycled plastics, they were not deemed specific to such products made from recycled plastics and therefore less valuable for our guidelines. For instance, aspects related to price as a determinant of consumer adoption of products made from recycled plastics were not included in this paper. Literature in marketing has demonstrated that a decrease in price increases consumers' willingness to purchase a product. However, it is important to note that price is also used by consumers as a proxy for quality [24, 25]. As a result, price should also not be set too low to prevent consumers to develop negative inferences about the quality of the product. We excluded price from our guidelines because we believe that the price effects for products made from recycled plastics will not differ from products made from different materials. Similarly, some elements related to the social aspects of choice were excluded from our guidelines, yet are likely to influence choice for products made from recycled plastics as they affect consumption in general. Specifically, prior literature has demonstrated that social factors are among the most influential factors in terms of effecting sustainable consumer behaviour change [1, 68]. Individuals are indeed influenced by social norms in their consumption choices (e.g. [19]). As such, if choosing products made from recycled content would become a social norm, individuals would be more likely to consider it the appropriate behaviour and to choose them over products made from virgin materials.

Most importantly, the present guidelines call for synergies between NPD managers, marketers, and designers to purposefully design and commercialize products made from recycled plastics and thereby contribute to a more sustainable future.

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## Declarations

**Competing Interest** The authors declare no competing interests.

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