
On-pack Labelling and Citizen Recycling Behaviour



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Front cover photography: Radox bottle with front of pack recycling message. Credit Tom Woodhead

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Executive Summary

Within the UK, the vast majority of food packaging contains some sort of information on how to dispose of the product. Additionally, the recycling of packaging has become, for the most part, an embedded behaviour. Improvements to recycling infrastructure and communications as well as a shifting social narrative have been key drivers in implementing what is now largely a social norm¹. However, there are still improvements to make and the presence of recycling labels and information alone is not necessarily sufficient to encourage positive recycling behaviours. For the label or on-pack recycling information to influence citizen behaviour, the citizen must pay attention to the information, understand the information, and act on it at point of disposal. But how often does this actually happen? Human behaviour is complex and an array of on pack information could potentially cause confusion which negatively impacts citizen disposal behaviours leading to waste. This review examines current information, both WRAP published work and externally published work, to provide an evidence base around the effectiveness of on-pack recycling information to encourage citizen recycling behaviours. This review will also contain short recommendations on how on-pack recycling information may be improved based on the information found in the existing literature.

Key Findings

- There is evidence to suggest that citizens do not invest a significant amount of time looking at on pack information when purchasing or disposing. Research has found that citizens report spending no more than 10 seconds examining on-pack labelling when purchasing.
- This behaviour extends into recycling behaviours. 2011 research found that generally citizens do not check packaging for recycling tips prior to disposal.
- Citizens are easily confused by multiple labels. Findings suggest that the green dot is particularly confusing for UK citizens. An observational study conducted by Watch Me

¹ Thomas, C., V, Sharp., 2013. *Understanding the normalisation of recycling behaviour and its implications for other pro-environmental behaviours: a review of social norms and recycling.*

Think found that the majority of citizens knew that crisp packets were non-recyclable, however some pointed out that the green dot present on the packaging made them doubt this assumption.

- Citizens were also highly confused by polymer numbers, not understanding why the labels were there or what information they were trying to convey. This highlights that lack of citizen understanding regarding the various labels currently in use could potentially lead to packaging being disposed of in the wrong waste stream.
- Despite citizens potentially not examining on-pack labelling in too much detail, evidence demonstrates that it is possible to positively influence citizen recycling behaviour with well-designed creative approaches.
- A recent trial conducted by WRAP, in partnership with Boots and Unilever, which tested propensity to recycle based on the use of a recycling sticker on shampoo bottles yielded positive results. 91% of participants that received a bottle with a recycling label disposed of the bottle in the recycling vs. 86% of those that did not receive a bottle with a recycling message. Furthermore, within the treatment group the research observed a 7% increase in reported recycling between pre and post sampling.
- Post-trial surveys demonstrate that when asked why participants recycled their shampoo bottle, many pointed out they did so as a result of the recycling message. Making a clear link between their correct disposal behaviour and the influence of the message.
- Other research in the Netherlands further supports the positive impact of a recycling label through a trial in which recycling labels attached to disposable coffee cups at a university canteen reduced litter rates from 11.2% prior to label application to 6.7% during the use of the labels.
- Citizens have clear preference for which type of labels they find most helpful and easiest to understand. Labels which use a directive tone, essentially telling the citizen what to do, were preferred over advisory tone labels. This preference applied

to on-pack food storage guidance as well as recycling information.

Overall, there is a variety of evidence to suggest that recycling labels can influence citizen disposal behaviours at the point they no longer want the packaging, however the label itself must be designed in a certain way to reach maximum impact on behaviour. Citizens have demonstrated clear preference for a label that is clear to understand, gives straightforward instructions on disposal, and positioning of the label on the front of the packaging would ensure the best possible chance of the citizen taking note of the guidance at the point of disposal.

Methodology

This literature review aims to provide an analysis of current evidence available on the influence of on-pack labelling on citizen disposal behaviour. The review focusses on one primary question and also touches upon several secondary question as set by DEFRA. The primary question this review aims to shed light on is 'what evidence is there on the effectiveness of providing factual and motivational information on the recycling of a product/packaging in influencing citizen decisions at the point they no longer want the packaging?' The secondary areas of focus which will also be touched upon within this review will be:

- What, if anything, is required to potentially influence disposal behaviour beyond factual and motivational information?
- Is there any evidence that multiple labels cause confusion?

Following the provision of a brief by DEFRA highlighting the necessary questions, various stages were undertaken to complete this review. Firstly, literature published by WRAP was reviewed and logged in a spreadsheet to keep track of necessary reports, before then extending the search to wider academically published literature using search engines such as google scholar, the review also includes sources from the grey literature of newspaper reports. These

external reports were also logged within the spreadsheet. The final stage was the completion of the review and supplementary presentation presented to DEFRA. All stages of the review took place in July 2020. It is important to note that while the primary focus of this review is citizen interaction with on-pack recycling labels, this review also pulls evidence from reports which discuss citizen interaction with nutrition and date labels to provide a broader and more holistic view of the influence of on-pack labelling on citizen behaviour.

Regarding the search for external sources, since the review aimed to address several questions regarding on pack labelling, a multitude of search terms were used. Search terms used to find the necessary reports include citizen “understanding”, “interaction”, “attention”, “perception” of on-pack labelling, recycling label “impact”, “effectiveness”, “influence” on citizen waste behaviour, citizen understanding “nutrition label”, “recycling label”, “labelling information”, “design for on-pack labelling”, citizen “confusion” “misinterpretation” multiple labels.

Research both within WRAP published reports and externally published academic literature returned more research on citizen behaviour and nutrition labels/date labels than citizen behaviour linked with recycling labels. This of course suggests that citizen behaviour links with on pack recycling information is a somewhat under-researched topic. Furthermore, of the literature that did cover citizen behaviour and recycling labels, a significant portion focussed on citizen propensity to buy a product based on present environmental information with only a smaller percentage focussing on labelling impact on citizen recycling, therefore being directly linked to the topic of this review.

Introduction

Citizens interact with food packaging practically every day. Each item of packaging dealt with contains a plethora of on-pack information

ranging from nutritional information, cooking instructions, ingredient lists, to recycling information. The ways in which citizens understand this information and the amount of attention that is paid to this information can have an influence on every stage of the citizens use of the packaging from propensity to purchase the item, how they cook the item, to eventually how they may dispose of the packaging. However, purchasing food is a regularly undertaken activity which comes with a lot of subconscious decision making². Furthermore, how citizens understand and are influenced by on-pack labelling can be further influenced by a variety of external factors such as the strength of their kerbside recycling scheme³, how knowledgeable citizens already are about how to recycle specific items⁴, and the ability of the present labelling to catch citizen attention⁵.

The aim of this review is to provide an understanding of how citizen disposal behaviours are influenced by on-pack information. The review will also support these findings with citizen understanding of other on-pack information such as nutrition and date labels in order to provide a broader understanding of how present information on packaging influences citizen behaviour. The information presented below first addresses the secondary questions of this review to provide introductory and contextual information into citizen behaviour and factors influencing citizen recycling behaviour beyond a label alone. Building from this, the review then leads into the main area of research concerning what evidence there is to suggest a label can have an influence as well as what the label must look like in order to reach maximum potential of catching citizen attention and, more importantly, influencing citizen disposal behaviour before providing summary recommendations. The report finishes up by discussing what else can influence recycling beyond the presence of a label and conclusions.

² WRAP. 2019. *Consumer Behaviour, Date Labels, and Food Waste*.

³ Buelow et al., 2010. *The Role of Packaging in Directing Consumer Packaging Waste*.

⁴ Langley et al., 2011. *Attributes of Packaging and Influences on Waste*.

⁵ Carrillo et al., 2014. *Consumers' Perception of Symbols and Health Claims as Health-Related Label Messages: A Cross-Cultural Study*.

1.1. What on-pack information is currently out there?

Packaging is filled with a plethora of information and demand for space on packaging is relatively competitive, with requirements for multiple pieces of information. From the marketing design front of pack, to ingredient lists, nutrition labels, cooking and storage instructions, to eventually disposal there is a whole host of information presented to the citizen when considering a packaged item.

Regarding recycling labelling, there are a variety of symbols and labels currently in use which imply recyclability or some other environmental connection. Figures 1 and 2 below demonstrate the various widely used recycling figures. The mobius loop is a very familiar symbol often seen on packaging which implies that the item can be recycled, however it can sometimes also be used to demonstrate that the product is made from recycled materials, containing a number inside the loop to state what percentage of packaging is from recycled materials⁶. The green dot is a further regularly seen symbol on packaging in the UK, however this symbol does not denote recyclability, instead the symbol represents that for such packaging, a financial contribution has been paid towards the recovery of packaging materials. The green dot is potentially one of the more confusing labels for UK citizens with many thinking that the symbol instead represents ability to recycle calling into question a possible negative effect that the label is having on recycling rates^{7,8,9}. Other recycling labelling includes the informational labelling such as Widely Recycled, Not Yet recycled, and Check Locally. However, even these labels come

⁶ *The Mobius Loop: Plastic Recycling Symbols Explained, 2016.*

⁷ *Confusion over Green Dot Symbol, 2019. WRM.*

⁸ *Green Dot Symbol 'Causing Confusion for Households', 2018. The Times.*

⁹ *The Confusing, But Well-Intentioned Green Dot Programme, 2011. Recycle Nation.*

with further stipulations not given on the label itself. Widely Recycled indicates that 75% or more of UK councils accept this material kerbside which still leaves some room for incorrect sorting¹⁰. The same issue is applied to Not Yet Recycled which instead indicates that it is only recycled by around 20% of councils, meaning in some places it would be correct to recycle the item despite the label¹¹. Given the multitude of symbols and labels currently in use which sometimes come with further stipulations not elaborated on within the label, it is unsurprising UK citizens can easily become confused.



Figure 2: Green dot, Mobius loop, Recycled content



Figure 1: Directional recycling labels

¹⁰ What Do the Different Recycling Symbols Actually Mean? 2018. Huffington Post.

¹¹ Ibid.

1.2. Do citizens pay attention to labelling?

Before discussion on how a recycling label can positively influence citizen disposal behaviour, it is perhaps first pertinent to address whether citizens look at on pack information at all. Several reports highlight that citizens pay little attention to on pack labelling while purchasing food. As has already been mentioned above, purchasing food is a low-involvement process. It is an action that is undertaken frequently with largely no serious concentration or decision making involved as citizens often purchase a bulk of the same items each week. A study from 2015 conducting semi-structured interviews found that 67% of the 30 respondents stated they spent no more than 10 seconds examining on-pack labelling information when purchasing food¹². Further research has found that due to the almost instinctive nature of food purchasing citizens will not read lengthy text on packaging. A study focussing on recycling behaviours in Sheffield in 2011 further supports this finding that, in general, people do not look for recycling tips on packaging at point of disposal¹³. WRAPs recycling tracker 2021 found that on pack recycling labelling was the main source of recycling information for just over one in five (22%) UK citizens.¹⁴

In addition, this subconscious behaviour has been demonstrated within citizens in other countries such as Finland¹⁵. Interviews with experts in the field of packaging manufacturing found that often citizens lacked the ability to expand on reasons as to why

¹² Leek et al., 2015. *Consumer Confusion and Front of Pack (FoP) Nutrition Labels*.

¹³ Langley et al., 2011. *Attributes of Packaging and Influences on Waste*.

¹⁴ WRAP, 2021, Banbury, *Recycling behaviours and attitudes 2021*, Prepared by WRAP

¹⁵ Ryyanen & Rusko., 2014. *Professionals' View of Consumer Packaging Interactions- A Narrative Analysis*.

they interacted with packaging in a certain way. For example, citizens may state that they dislike a certain type of packaging but when pressed were incapable of saying why it is, they felt this way. This suggests that citizens are relatively disengaged with food packaging and current mechanisms for conveying information are not achieving maximum potential to positively influence citizen behaviour.

Part of the issue of citizens not engaging with on-pack information, beyond simple subconscious behaviours, stems from the presentation of the information itself. Research considering the effectiveness of nutrition labels on packaging concludes that so far, nutrition labels have failed to achieve their goal of encouraging healthier food purchases due to the complexity of the label and the placement of the label on the back or side of the packaging¹⁶. This suggests that citizens are relatively disengaged with on-pack information.

However, packaging information is not redundant and can influence citizen behaviour depending on the label and the information it conveys. For example, research conducted by WRAP has found that date labels can have a significant impact on citizen food waste behaviour with citizens likely to dispose of food items based on the date presented on the label even if the food item was still safe to eat¹⁷. Furthermore, attitudes to packaging are linked to the packaging being recyclable. There is a strong correlation between concern around packaging material and how easy it is to recycle said material¹⁸. The more difficult to recycle, the more concern is expressed. For example, pots, tubs, and trays are a concern for 49% of citizens who say they cannot recycle them easily. When asked what changes citizens would most like to see in packaging design, the second highest change is making the

¹⁶ Arrua et al., 2017. *Warnings as a Directive Front of Pack Nutrition Labelling Scheme: Comparison with the Guideline Daily Amount and Traffic Light System.*

¹⁷ WRAP. 2011. *Date Labels and Storage Guidance.*

¹⁸ WRAP. 2013. *Consumer attitudes to food waste and food packaging.*

packaging recyclable (first was packaging keeping food fresh for longer)¹⁹.

These findings highlight that there is a motivation among citizens to recycle packaging, suggesting that the right label may be able to build on this motivation and encourage action. Designing the right label to combat citizen confusion and inattention would have to communicate information with as few words as possible and position itself on the front of the packaging to avoid being ignored on the side or back. In an environment where citizens are paying little attention to the currently available information on pack, placement and design of the label is paramount to grab the citizens attention.

1.3. What other factors influence citizen disposal behaviours beyond the label?

As well as what is presented on-pack, citizen disposal behaviours are also influenced by a variety of other factors external to product packaging. For example, one particular study (focussing on Australian citizens) found that information that was most useful to inform disposal decisions beyond what was presented on pack was informational stickers placed on bins²⁰. Stickers which clearly stated what material was accepted and what was not at kerbside helped to clear up any confusion that may have been caused by misinterpretation of the information given on pack. Further studies also support the conclusion that the strength of the kerbside recycling system plays a supporting role

¹⁹ *Ibid.*

²⁰ *Buelow et al., 2010. The Role of Packaging in Directing Consumer Packaging Waste.*

in influencing citizen disposal behaviours. Recycling infrastructure can have a potentially huge influence on recycling behaviours as inconvenience of recycling can cause citizens to be demotivated, reducing the desire to recycle regardless of what is present on the packaging²¹. Whether the packaging is easy to separate has also been identified as a key factor influencing waste. Where citizens struggle to separate components of the packaging or struggle to understand how to dispose of the separate sections, this can increase the likelihood of waste as citizens dispose of packaging incorrectly either due to a misunderstanding or a lack of desire to properly investigate how to manage the separate components²². In addition to the reasons presented above, individual attitudes towards environmental responsibility and social norms can be a bigger determinant of recycling participation than packaging attributes²³.

1.4. Do multiple labels cause citizen confusion?

As mentioned, packaging today can use a multitude of statements and symbols to communicate environmental information. However, evidence supports the conclusion that multiple labels cause citizen confusion, potentially leading to waste as a result of misinterpretation. Too much on pack labelling and the use of different labels on one pack can demotivate citizens as often citizens are not willing to spend time looking for information on how to interpret the present symbols. Instead citizens are likely to use visible cues to group labels together as meaning the same thing, even if the labels do not actually mean the same thing²⁴. This could

²¹ Xu, D.Y. et al., 2016. *Perceived Key Elements of a Successful Residential Food Waste Sorting Program in Urban Apartments: Stakeholder Views.*

²² Langley et al., 2011. *Attributes of packaging and influences on waste.*

²³ Wikstrom et al., 2016. *The influence of packaging attributes on recycling food waste behaviour.*

²⁴ Dolic et al., 2010. *Consumer Interpretation of Recycling Symbols Used for Printed Products.*

cause misinterpretation of the label thereby negatively impacting waste disposal behaviours.

Interviews with citizens conducted in 2011 included significant commentary on the confusion caused by the difference in recycling labels used by different businesses²⁵. More recent research conducted in 2019 further demonstrates that this label confusion continues to be an issue for UK citizens²⁶. The observational study conducted by Watch Me Think found that all respondents were misled by the green dot, considering it a symbol to denote recyclability. For example, most citizens involved in the study understood that crisp packets cannot be recycled, however some pointed out the packs contained the green dot and as a result doubted the assumption that the packets were not recyclable. As a further demonstration of grouping labels together based on design similarity, within the same study, citizens often viewed the mobius loop and the green dot as communicating the same message as a result of looking somewhat similar. Another clear area of confusion concerned polymer numbers where no participants understood the polymer numbers or what they stood for. This is further supported by Mistry²⁷, who found that the presence of the polymer numbers were used by citizens as recycling symbols as they were framed by the triangle arrows, usually used to imply recyclability. Mistry's research also found that where citizens disposed of waste in the wrong way as a result of misinterpreting the polymer number, citizens became demotivated to continue to recycle.

Mitchell found three main components which contribute to citizen confusion regarding on-pack information: similarity, overload, and ambiguity²⁸. Citizens experience confusion when being confronted with a barrage of information which citizens do not have the time or desire to properly process. If too much information is presented on

²⁵ Langley et al., *Attributes of Packaging and Influences on Waste*. 2011.

²⁶ Watch Me Think. *Research Study into Consumer Plastic Recycling Behaviour*. 2019.

²⁷ Mistry., 2012. *Communication of Recycling through Labelling*. 2012

²⁸ Mitchell et al., 2005. *Towards a Conceptual Model of Consumer Confusion*.

pack, citizens may miss the crucial piece of information being communicated as a result of not processing the information correctly. This of course increases the chance for misunderstanding and could negatively impact waste behaviours as a result.

Confusion regarding multiple on-pack labels also extends to nutrition labels. One study found that when citizens considered nutrition labels, they focussed in on categories seen as most relevant to them. For example, calories or saturated fat levels rather than considering all the categories covered²⁹. This evidence suggests that too much of any on-pack information can cause citizen confusion. Cutting through the information overload will be a necessary part of getting a label to positively influence citizen recycling behaviours.

Evidence around the subconscious nature of food shopping, external factors beyond the presence of a label, and citizen confusion around multiple labels already in use highlight that on-pack information needs to be as clear and as well-presented as possible to have the best chance of succeeding in positively influencing citizen recycling behaviours at the point of disposal.

1.5. What evidence is there on the effectiveness of providing social norming/motivational on the recycling of product to influence

²⁹ Leek et al., 2015. *Consumer Confusion and Front of Pack (FoP) Nutrition Labels*.

citizen decisions at the point they no longer want the packaging?

Although there is a base of evidence to suggest that labels are not something that citizens invest a significant amount of time in examining, there is evidence to support the notion that having a recycling label present on packaging can positively influence citizen recycling behaviours at point of disposal.

One study in Delft demonstrates the positive impact the presence of a label can have on reducing rates of littering³⁰. The study, conducted in 2010, attached an anti-littering label to disposable coffee cups sold at a university canteen. The label was simply designed as a white label with a message in black "Throw this cup in the bin, otherwise it will still be here in 6 months". In total, the experiment covered 5,000 cups of coffee. Before the application of the label the litter rate in the area surrounding the university canteen was 11.2%, with the labels applied, this dropped to 6.7%. Following the end of the experiment, the littering level once again increased to 14.1%. This suggests that the presence of the label does not create a memory effect, however it is perhaps more likely that the experiment simply did not run long enough to create an embedded behavioural effect. The message was translated into both English and Dutch. Here the label was simple and action orientated as well as including an implication of consequences with the phrasing "it will still be here in 6 months". The decrease in littering rates while the label was present and the increase once the label was removed creates a clear link between the presence of the label and the higher levels of correct disposal behaviour.

³⁰ Wever et al., 2010. *Influence of Packaging Design on Littering and Waste Behaviour*.

More recent research conducted by WRAP also finds evidence to support the positive impact a well-designed recycling message may have on disposal behaviours³¹. WRAP, in partnership with Boots and Unilever, conducted a trial experiment in February 2020 to test the application of a recycling message on shower gel bottles to increase participant propensity to recycle. Four groups were sampled, each with a sample size of 1,000. The experiment also tested the influence of priming on the participant and so, alongside splitting the total sample into those that received the shower gel bottle without the message, the sample was also split by those questioned before participation on current recycling behaviours and those that were not.

Primed, sticker (treatment group)	Primed, no sticker (control group)	Unprimed, sticker (treatment group)	Unprimed, no sticker (control group)
n=1000	n=1000	n=1000	n=1000
Asked question about disposal of bathroom items at recruitment	Asked question about disposal of bathroom items at recruitment	Not asked about disposal of bathroom items at recruitment	Not asked about disposal of bathroom items at recruitment

Following the completion of the trial, participants were invited to complete a post-trial survey which received an 86% response rate. The results of the trial were positive and demonstrated a clear difference between the behaviours of those with the recycling message compared to those without. There was also no evidence of a priming effect.

92% of those who were unprimed (not questioned on recycling behaviours prior to participation) and received a bottle with the recycling message placed the bottle in the recycling vs. 84% of those unprimed who did not receive a bottle with the message.

³¹ WRAP. *Boots' Second Sticker Trial: Report of Trial Results and Survey Findings. 2020. Unpublished.*

Overall results show that 91% of those that saw the label placed the bottle in the recycling once they no longer needed the product vs. 86% of those that did not see the recycling message. The post-trial survey also found that these results could be directly attributed to the presence of the message on the bottle. When asked why they had decided to recycle the bottle, 40 out of the 83 people that did not usually recycle shower gel bottles made a clear reference to the message that was present.

Regarding the message itself, it included several design features which may have positively impacted the participants' decisions to recycle. The design incorporated a short message, using a social norming approach- 'Most people recycle me'. The design also incorporated the Recycle Now swoosh, a symbol which many people recognise as implying recyclability³². In addition, the design was green. Adding colour possibly helped to make the label more attention-grabbing and green is a colour further associated with recycling. Finally, the message was of a bigger size and was placed on the front of the bottle meaning it would have been difficult for citizens to miss.



³² WRAP, 2021, Banbury, *Recycling behaviours and attitudes 2021*, Prepared by WRAP

Further positive results for particular recycling labels have also been found in studies conducted further afield in Australia³³. One such study conducted to test citizen understanding of recycling labels available on packaging found that the most well understood labels were those that were 'action-orientated', essentially telling the citizen what to do with the packaging at the point of disposal. The 'remove the cap and recycle PET' label was considered the most useful and most widely understood label among respondents with 82% of participants citing the correct answer regarding how to dispose of an item that had this label.

Given this, it is then unsurprising that the least understood recycling labels were the vague labels which lacked clear direction and instead had phrasing such as 'please dispose of this product thoughtfully'.

The success of action-orientated labels also extends beyond recycling and has seen higher preference among citizens regarding on-pack storage guidance³⁴. For tests ran on pre-packaged carrots, bagged oranges, and bread (on citizens in Germany, Hungary, the Netherlands, and Spain) a directive tone label was preferred compared to an advisory tone label.

1.6. What else may be needed beyond on-pack information to positively influence recycling behaviours?

³³ Buelow et al., 2010. *The Role of Packaging in Directing Consumer Packaging Waste*.

³⁴ Leach, B., O'Brien, R., 2019. *The Effects on On pack On pack Storage and Consumption Guidance on Consumer Waste Behaviours*.

Beyond the impact of on-pack labelling to influence recycling behaviours, there is a collection of articles which point out that specific characteristics of packaging may increase the likelihood of recyclable materials being categorised as waste. Research highlights that packaging materials which are torn or damaged are at an increased risk of being placed in the general rubbish, even if the materials themselves are recyclable. As such, small design changes to the packaging itself beyond the information printed on it may help to positively influence citizen recycling behaviour.

One such study conducted in 2016 on a London university campus found a subconscious tendency among participants to categorise altered packaging material as waste rather than recycling³⁵. The study consisted of an IAT (implicit association test) and a waste compositional analysis among 4 recycling bins in different locations across the campus. The IAT which included 169 participants, asked to quickly categorise pictures shown of altered packaging into either recycling or waste, revealed that 53% of respondents showed a strong effect towards categorising altered packaging as waste and 82% of respondents had a slight effect towards categorising the altered items as waste. Images of these altered items included twisted plastic bottles, ripped cardboard, dented cans. All items which would have been suitable for recycling despite the altered condition. The compositional waste analysis did not reveal any statistically significant results as a result of high levels of mis-categorisation across all 4 of the different recycling bins. However, anecdotal evidence showed that items were often placed in general waste streams where the packaging consisted of multiple recyclable materials such as paper and plastic. Citizens throwing material away rather than separating it out into its various recyclable materials is a conclusion made by other researchers that have found that

³⁵ *Baxter, L.W., Aurisicchio, M., Childs, P., 2016. Tear Here: The Impact of Object Transformations on Proper Disposal.*

citizens find it time consuming to separate the material and are in some cases uncertain about how to separate the material³⁶.

Additional research looking specifically at distortion of paper demonstrates that citizens decisions to recycle paper consistently depended on whether the material was torn/crumpled or intact³⁷. Studies conducted by the authors found that a piece of paper cut into smaller pieces was more likely to be placed in the general rubbish. The argument suggested was the distortion of materials creates the impression of a lower value material leading the citizen to believe that the material is rubbish and therefore non-recyclable. Crumpled pieces of paper were also more likely to be categorized as waste and placed into non-recyclable waste bins suggesting that any distortion to the material increases the chance of it being placed in the general rubbish. Empirical research suggests that this thought process is likely to be as a result of the fact that bigger and more intact packaging items are seen as more useful vs. distorted items of rubbish³⁸.

Langley found that among glass, paper, and plastic, glass was most likely to be recycled³⁹. The argument made to support this is that glass is perceived to be a higher value material among citizens and, unless smashed, will retain its shape during all stages of use and is therefore not susceptible to the same miscategorising as paper and plastic due to damage or distortion.

Building on this research, authors also make some suggestions on how to potentially prevent recyclable items being sent to landfill. For example, certain packaging items come with 'tear here' guidance including perforated tabs or cutting guidelines. These could potentially be re-designed to avoid the tearing of the

³⁶ Henrikson et al., 2009. *Uncertainty Regarding Waste Handling in Everyday Life*.

³⁷ Trudel, R., Argo, J.J., Meng, D.M., 2015. *Trash or Recycle? How Product Distortion Leads to Categorization Error During Disposal*.

³⁸ *Ibid.*

³⁹ Langley et al., 2011. *Attributes of Packaging and Influences on Waste*.

paper⁴⁰. To avoid crumpling of packaging, re-designing the packaging to become stiffer may have beneficial outcomes regarding improving recycling. However, of course this can only be considered where it would be possible to stiffen the packaging and where it would have no impact on the product within. Studies also found that pointing out that crumpled or ripped paper was recyclable increased the correct disposal of crumpled paper⁴¹. Therefore, adding to recycling labels placed on bins or council websites that damaged packaging may still be suitable for recycling could also have a positive impact on recycling behaviour.

Recommendations

Drawing from the research discussed above, it is possible to make some recommendations on what a potentially best performing label would look like.

Placement is key. A label is likely to have the best chance of influencing citizen disposal behaviour if placed on the front of pack. Placing a label on front on pack provides the best chance the label will be noticed by citizens, since information on the back and sides of the pack is often neglected when looking at packaging, either in store or at home.

The label should be directional. Citizens have demonstrated a preference for labels that are directional, essentially telling the citizen how to handle the waste. This leaves no room for doubt and having clear instructions on the label means the citizen does not need to spend time interpreting or looking up what best to do with

⁴⁰ Baxter, L.W., Aurisicchio, M., Childs, P., 2016. *Tear Here: The Impact of Object Transformations on Proper Disposal.*

⁴¹ Trudel, R., Argo, J.J., Meng, D.M., 2015. *Trash or Recycle? How Product Distortion Leads to Categorization Error During Disposal.*

the packaging, something citizens are unlikely to do in the first place. However, this recommendation should be somewhat tempered by the fact that where citizens are confident with a product i.e., they purchase it often, they will often be unlikely to look out for specific on-pack information⁴².

The label should be colour coded. Having the label in colour not only further increases the chance of it being noticed, it also allows the citizen to make connections around how to understand the label based on the colour. For example, traffic light nutrition labels make it easier for citizens to immediately understand what is being portrayed by the label without even necessarily needing to look at the further information being provided. An obvious colour recommendation for a recycling label would be green. Many other recycling labels already use the colour green making it a colour citizens can instantly associate with recycling, further reducing the need for the citizen to spend time examining the label to understand it. Additionally, symbols and logos should come with some kind verbal information to give clear and meaningful instructions. Although using visual attributes such as logos or symbols can be an easy way for citizens to process information, if citizens are unaware of what the symbol is actually trying to convey, this can defeat the purpose of making it easier for citizens to understand on-pack information. The inclusion of short, written explanations to accompany labels can help to remove any room for doubt regarding what a symbol means.

Where possible, there should be consistency in the placement of the on-pack recycling information across brands. Interviews with citizens in Sweden found that one reason for ignoring recycling information on packaging was due to the fact that different brands placed their recycling information on different places across their packaging. Therefore, for some packaging bought information would be on the front, for others on the back. Participants found the lack of placement consistency confusing, making them reluctant to look for

⁴² WRAP. 2013. *Consumer attitudes to waste and food packaging*.

the information as a result⁴³. The effect of placement consistency has been demonstrated by market research which has shown that citizens will often always look in the same place on packaging for ingredient information⁴⁴.

Overall, although a single label may not necessarily be able to incorporate all these elements at once, these recommendations can potentially act as a foundational guide to support any future re-design of on-pack recycling labels.

Conclusion

Citizen recycling behaviour is complex and a decision to dispose of a packaging item in a certain way can be influenced by several factors. As has been demonstrated by the research above, one of these factors can be the presence of an on-pack recycling label. Citizens are motivated to recycle and recycling continues to embed itself as a social norm. The successful use of recycling labels on-pack can help support citizens to make the right disposal choices. Packaging can be one of the best carriers for information on how to properly dispose of an item. However, communicating this information in an effective way is key. Citizens are surrounded by information which may cause information overload and confusion and for items purchased regularly, citizens may choose to disregard the on-pack information altogether^{45,46}. Visual attributes i.e. logos, colours, and symbols have a critical role in attracting citizen attention. Recycling labels can be effective but must be designed and placed optimally to have the best chance of positively influencing disposal behaviour at the point the

⁴³ Henrikson et al., 2009. *Uncertainty Regarding Waste Handling in Everyday Life*.

⁴⁴ Becker, L., et al., 2010. *Tough package, strong taste: the influence of package design on taste impressions and product evaluations*.

⁴⁵ Nemat, B., et al., 2020. *The potential of food packaging attributes to influence consumers decisions to sort waste*.

⁴⁶ WRAP. *Consumer attitudes to food waste and food packaging, 2013*.

packaging is no longer wanted. Based on citizen feedback from the various reports presented within this review, where possible motivational recycling messaging should be on the front of the pack to make them obvious to the citizen and reduce the need to seek out the information. They should convey information with little text. Any text that is used should be clear and directional, making it obvious what the citizen must do when disposing, thereby removing any chance of mistake. The label should be coloured. The use of colours further helps to make the label stand out and can allow the citizen to make subconscious connections about the label's meaning. The creation of an influential recycling label for on-pack use would likely have to fit several design criteria to be in the best possible chance of increasing recycling of packaging. However, this report also notes that there are several other factors that cause incorrect sorting such as the strength of kerbside facilities, the condition of the packaging at point of disposal, and the effort it may require for citizens to recycle the item. Therefore, although a recycling label may hit all the right design points, it must be kept in mind that the label itself is simply one element of a wider infrastructure to help optimise citizen recycling behaviour.

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