

Science for Environment Policy

Circular economy: consumer attitudes to products made from urban bio-waste

Biodegradable waste, or bio-waste, from urban areas is being used to produce a bio-based material to replace plastic – this is relevant to the sustainable development of a circular economy (CE), which requires the innovative use of waste materials. Understanding public attitudes to such materials, and the drivers influencing their uptake, is key to their viability. This study explores how consumers respond to products made from regenerated bio-waste.

Urban bio-waste includes the organic parts of solid waste from restaurants and homes, and waste from gardens, parks and commercial food processing. Bio-waste has a cost, with management of private household food waste alone costing nearly 100 billion euros annually in the EU, but it is also a valuable resource: it can be used for compost or livestock feed, for instance, and can even be redistributed for human consumption.

The European Commission adopted a [Circular Economy \(CE\) strategy](#) in 2015: one of its aims, is to 'close the loop' by diverting urban bio-waste from landfill into new processing mechanisms that can transform waste back into a useful product or raw material. Recently, bio-waste from urban waste has been used to create a bioplastic made of polyhydroxyalkanoates (PHAs). These claim to be biodegradable, a factor which could avoid or reduce plastic-waste problems, may alleviate the costs involved in managing urban bio-waste and could help to move towards a more sustainable CE.

This study, funded by the Horizon 2020 Programme under the [RES URBIS¹](#) project, aimed to explore the factors contributing to mass-market uptake of regenerated biowaste products, focusing on consumer perception and behaviour. So far, research has mainly focused on the technical aspects of bioplastic production, but consumer acceptance is key for a product to be viable. For example, the researchers highlight that consumers may dislike bio-based products due to a perception of them being 'used' or 'dirty', found in previous studies with consumer surveys² and through asking consumers to list adjectives they associate with 'remanufactured goods'.³ These findings may help with gaining consumer acceptance and with mass-market appeal, may help inform governments on how to integrate consumers into CE constructs and aid practitioners in developing closed-loop supply chains (CLSC) to overcome consumer prejudices.

The researchers developed their research model based on available literature and 'prospect theory,' which regards consumers as assigning a value to each prospective choice when making a purchase. Dependent variables are: consumer involvement (in other words, consumer perception of the importance of that product category, e.g. interior design goods); green self-identity (a consumer's overall appraisal of the net benefit of a product or service, based on the individual's environmental desires and sustainable expectations⁴); willingness to pay for eco products; past experience with eco products; and intention to switch to using eco products.

The method adopted to gather consumer opinions involved showing consumers images of two different chairs — a high-end catalogue mock-up of a designer chair and an Ikea catalogue mock-up of a 'convenience chair.' Each image was accompanied by a descriptive label containing information about PHA and bio-based products. A market-research company posed questions to 100 UK respondents via an online survey as a preliminary test to check the clarity of the explanations and whether the chairs appeared to be designer or convenience. This was all proven to be effective.

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1. <https://www.resurbis.eu/>

2. Jiang, Z., Zhou, T., Zhang, H., Wang, Y., Cao, H. and Tian, G. (2016). Reliability and cost optimization for remanufacturing process planning. *Journal of Cleaner Production*, 135, pp.1602-1610.

3. Abbey, J., Meloy, M., Guide, V. and Atalay, S. (2014). Remanufactured Products in Closed-Loop Supply Chains for Consumer Goods. *Production and Operations Management*, 24(3), pp.488-503.

4. See: Chen, Y. S., & Chang, C. H. (2012). Enhance green purchase intentions: the roles of green perceived value, green perceived risk, and green trust. *Management Decision*, 50(3), 502-520.

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The researchers then surveyed 230 different UK respondents, of whom 220 provided a usable set of responses that could be further analysed. They were then randomly assigned to either the designer or convenience chair, and asked a series of questions designed to indicate their attitude toward the product, purchase intention, green self-identity and switching intention. Participants were also asked about their past purchase experience and willingness to pay for eco products, as well as standard demographic queries. To rule out alternative explanations, the analysis included questions about product attractiveness, value and perceived risk; none of these acted as causes in the decision-making process.

The results show that product involvement does not affect purchase intention for bio-based products — and this should encourage the development of a broad range of new products in this area. Green self-identity plays a mediating role in the relationship between a consumer's involvement in a product and their intention to purchase and willingness to pay for, or switch, to it. Age and past purchase experience affect perceptions of and reactions to bio-based products. Older consumers show a higher willingness to pay, and respondents with past experience of purchasing eco products have greater intentions to purchase and switch to bio-based products.

These findings illustrate that consumers are willing to participate in similar CE initiatives, and demonstrate to companies that PHA-based bioplastics created from urban bio-waste can lead to lower costs and more sustainable closed-loop systems. The researchers propose that this study shows the market is potentially ready for these products and that investing in supply-chain reconfiguration can be viable.

