Economic and Social Research Council

Research Centre
Business in Society

Coventry University

SIMBIO
SOCIAL INNOVATION MANAGEMENT FOR BIOPLASTICS

DESIGNING SOLUTIONS

Findings from the second UK SIMBIO Social Innovation Lab

10th June 2021

Acknowledgements:

The Social Innovation labs are a co-creation between the bioplastic supply chain stakeholders and the Centre for Business in Society at Coventry University. SIMBIO Research – Social Innovation Management for Bioplastics – is funded by the UK Economic and Social Research Council (ESRC), grant number: ES/T015195/1. For more information, please visit: **https://www.coventry.ac.uk/research/research-directories/current-projects/2020/simbio/**

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Publication details:
Coventry, United Kingdom, May 2021. Cite as (APA): Tjahjono, B., Beltran, M., Bek, D., Lazell, J., & Bogush, A. (2021). Designing Solutions. Findings from the second UK SIMBIO Social Innovation Lab, 10th of June 2021. In. Coventry: Coventry University, Centre for Business in Society (CBiS).

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Executive Summary

This report presents the main findings from the second Social Innovation Lab 'Designing Solutions', which was held online on the 10th of June 2021 to expand on possible 'solutions' that challenge the norms in bioplastics packaging, identify promising solutions for rapid prototyping, and explore future pathways for improving the sustainable uptake of bioplastics packaging. This report has been produced by leading academics from Coventry University, as part of the research project SIMBIO – Social Innovation Management for Bioplastics – which is funded by the Economic and Social Research Council (ESRC grant number: ES/T015195/1).

Stakeholders from the bioplastics industry, retail sector, consumer associations, government agencies, NGOs and international and UK academics identified three areas of solutions that currently have the highest potential to drive change to a sustainable packaging system. Participants identified: *communication with consumers, certification standards & guidelines,* and *end of life* as the most promising solutions applicable to a biobased biodegradable plastics packaging system (also referred to as 'compostable plastics' in this report). These solutions were seen as complementary and under a dynamic process, which, combined with long-term measures, such as education and policy/ regulatory measures, may help facilitate the sustainable transition of packaging to compostable plastics packaging.

By 2030, the lab participants envision greener values and sustainable practices for consumers and businesses, less complexity and more consistency in the waste management system. In this context, participants also anticipated potential opportunities for compostable plastics packaging to replace plastics packaging that is not recyclable or very difficult to recycle. This sustainable pathway would be supported by the mandatory joint collection of food waste & compostable plastics packaging and appropriate waste management systems (infrastructure and processes) – effectively implemented and available for everyone. They have also foreseen that 'intelligent' packaging could play a role in facilitating the recovery of all packaging materials.

The second lab also proposed that compostable plastics packaging uptake could not be seen in isolation from the packaging system. They also emphasised the improvement needed to clarify the information on all packaging products and the advanced management practices required for the disposal and collection of all recycled materials by the different actors (e.g. workplaces, local councils). Besides, they called attention to the need to find ways to provide alternative solutions for packaging used on a regular basis in homes (e.g. bathroom products in bottles). This type of packaging may be currently highly recycled; however, due to their frequency of use, these packaging forms can also be reused, refilled, or further re-invented.

The envisioned sustainable pathway by 2030 requires a more fine-grained development of innovations that will be discussed in the third social innovation lab, i.e. 'rapid prototyping of potential solutions'. This pathway is expected to be supported by innovations (e.g. product innovation, process innovation, service innovation, etc.) and policy changes.

1. Introduction

Plastic pollution has become widely recognised as a major global environmental problem (1, 2), with severe effects on wildlife aggravated by the prolonged breakdown of fossil-based plastics and limited options for removal, especially in the ocean (3-8). The urgency of this problem has driven legislative changes and policy discussions in the UK to achieve a circular economy, such as: the extended producer responsibility (EPR) for packaging (9), the deposit return scheme (DRS) (10), plastic packaging tax (11), consistency in household and business recycling (12) and mandatory food waste collection (13). In this context, bioplastics materials can be part of the solution to achieve a more circular economy. However, several environmental and social challenges persist throughout the entire bioplastics supply chain from production to end of life.

This report has been produced as part of the research project SIMBIO – Social Innovation Management for Bioplastics – which employs social innovation methods (14) to explore those challenges, particularly for biobased biodegradable plastics, also referred to as 'compostable plastics' in this report, in order to facilitate communication with the stakeholders. This research is funded by the Economic and Social Research Council (ESRC grant number: ES/T015195/1), and organised by leading academics from the Centre for Business in Society (CBIS) and the Centre for Agroecology, Water and Resilience (CAWR) at Coventry University, who work in collaboration with researchers in Brazil, Canada and Poland.

The purpose of this report is twofold. First, it provides the main findings of the second social innovation lab 'designing solutions' organised online on the 10th of June 2021. Second, it highlights key recommendations for the forthcoming third lab – 'rapid prototyping of potential solutions'.

This report is structured into four sections. Section 2 introduces the SIMBIO research project, including the methodology of the SIMBIO research project and the current status of the research, focusing on a detailed description of the 'designing solutions' stage in Section 2.2.3. Section 3 provides the findings from the second social innovation lab. Finally, a set of conclusions and recommendations for innovation to 'prototype' within the third social innovation lab is presented in Section 4.

2. SIMBIO research project overview

2.1 Methodology of the SIMBIO research project

This study utilises a social innovation research design (14) to address the environmental and social challenges of bioplastics packaging throughout its entire supply chain. The research design comprises five stages: 1) 'research & preparation'; 2) 'seeing the system'; 3) 'designing solutions'; 4) 'rapid prototyping of potential solutions', and 5) 'research dissemination and reporting'. (See Figure 1). A more detailed description of the research methods is provided in (15).

Figure 1. Projected timeline 2020-2022.

2.2 Current status of the research

The first three stages of this research project have been completed so far. A brief summary of the findings from the 'research & preparation' and 'seeing the system' stages is provided in Sections 2.2.1. and 2.2.2 respectively. A detailed methodology of the 'designing solutions' stage is described in Section 2.2.3.

2.2.1 Stage 1. 'Research and preparation'

This stage aimed to improve understanding of the different types of bioplastics, their contribution to sustainable development, and their current production, use and end-of-life management processes. At this stage, a literature review, covering academic papers from 2011 to 2021, was conducted along with qualitative interviews with stakeholders from the bioplastics industry. The literature review identified several driving forces behind the changes in the food plastics packaging transition to a circular bioeconomy, particularly for biobased biodegradable plastic materials. Figure 2 exemplifies the driving forces (i.e. external, from the plastic packaging industry and bioplastics niche sector) influencing the transition of sustainable food packaging. See more details in (16).

The supply chain process flowchart and the barriers and opportunities for the bioplastics industry were also identified (17). The findings of this stage – supply chain flowcharts and opportunities and barriers – were presented as inputs in the first social innovation lab 'seeing the system'.

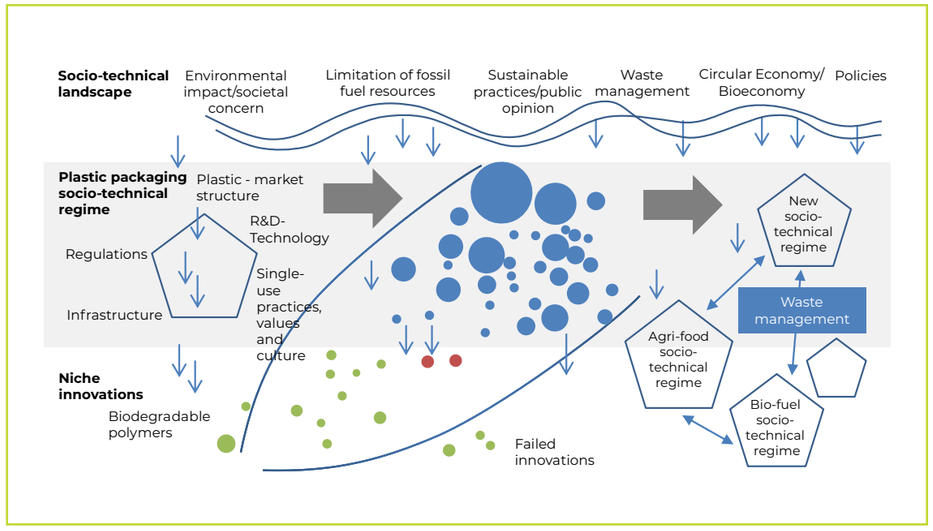

Figure 2. Driving forces influencing the transition of the food plastics packaging system. Source: (16)

2.2.2 Stage 2. 'Seeing the system'

This stage aimed to obtain a consensus and clear understanding of the current packaging supply chain for biobased biodegradable plastic products, identify barriers and opportunities for achieving a more sustainable supply chain, and obtain a clear understanding of the future possibilities for a packaging supply chain.

This stage of the research involved organising a social innovation lab online to collect information from participants to achieve the objectives of this stage. The main stakeholders were invited to participate in the first lab in March 2021. First, the barriers and opportunities that emerged from the first stage of this research were presented, followed by presentations from David Newman from BBIA (Bio-based and Biodegradable Industries Association) and Emily Nichols from REA (The Association for Renewable Energy and Clean Technology). They shared their views on the bioplastics packaging system. Three parallel break-out sessions were organised – production, consumption and waste management – which allowed the participants to identify their position on the supply chain process flowchart, comment on its accuracy, and describe the barriers and opportunities for achieving sustainable growth. See more details in (15).

Ten important solutions emerged from the lab:

a) development of clear and consistent legally binding labelling for bioplastics products;

b) development of clear guidelines for processing compostable plastics packaging waste for the waste management industry;

c) obligatory certification standards to ensure certainty about producers' claims for their products and materials;

d) connection of the current certification standards with a compatible labelling system and procedures for the waste management industry;

e) development of clear and consistent terminology to avoid current confusion between different bioplastics materials;

f) development of educational programmes for home composting of biobased biodegradable plastic products;

g) dedicated use of compostable plastic products for applications that are difficult to recycle;

h) development of an infrastructure for disposing of compostable materials at industrial levels, such as a separate food waste collection bin, processing of compostable packages in composting facilities and adequate anaerobic digestion (AD) plants;

i) research and development of other feedstocks, for example, from waste;

j) adoption of consistent policies to support the use of compostable plastics packaging.

2.2.3 Stage 3. 'Designing solutions'

This stage aimed to expand on possible 'solutions' that challenge the norms in bioplastics packaging, identify promising solutions for rapid prototyping, and explore future pathways for improving the sustainable uptake of bioplastics packaging. This stage of the research also used an online social innovation lab to collect information from participants. The main stakeholders of the bioplastics supply chain were invited to participate in the lab on the 10th of June 2021.

The second lab started with a reminder of the mission of the SIMBIO project and the introduction of the main findings of the first lab by Professor Benny Tjahjono from Coventry University. Moreover, to guide the participants on the selection of impactful solutions (leverage points), 'System Thinking' concepts (18) were introduced by Dr Macarena Beltran from Coventry University.

Following this introduction, the lab featured presentations from Paul Thompson from REAL (Renewable Energy Assurance Limited) and Rob Whitehouse from Garden Organic (GO), who introduced different perspectives: regulatory (certifications) and consumers' perspectives, respectively. Both presentations emphasised the need for cross-collaboration between the various stakeholders.

REAL emphasised that certifications of products need to be combined with clear messages to end-users on disposal. Further collaboration between REAL, OPRL (On-Pack Recycling Label) and retailers was proposed – '…combine REAL's experience in running certification schemes with OPRL's consumers/retailers strengths, so that instructions for how to use the certification marks are integrated within OPRL's guidance'. GO highlighted the long-term solutions, including a combination of dedicated bioplastics applications, mandatory food waste collection policies, more industrial composting facilities, and the homogenisation of packaging labelling to improve communication with consumers. GO also emphasised the importance of educating consumers and businesses.

After these presentations, the participants were asked to prioritise the areas of solutions for sustainable biobased biodegradable plastics packaging (compostable plastics packaging) pathways moving forward. To facilitate the engagement of the stakeholders, the ten solutions that emerged from the first social innovation lab – 'seeing the system' (See Section 2.2.2) – were grouped into six clusters as follows:

- Communication with the consumers
- Educational programmes
- Certification standards and guidelines
- Specific products and more feedstocks
- End of life
- Policies

The Mentimeter online survey (menti.com) was used to gather anonymous feedback in real-time from the stakeholders; the participants were asked to select the three most impactful solutions (clusters) that should be prioritised to unblock the supply chain. The chosen solutions were displayed live on-screen in a graph, with communication with consumers, certification standards & guidelines and end of life receiving the most votes (See Figure 3).

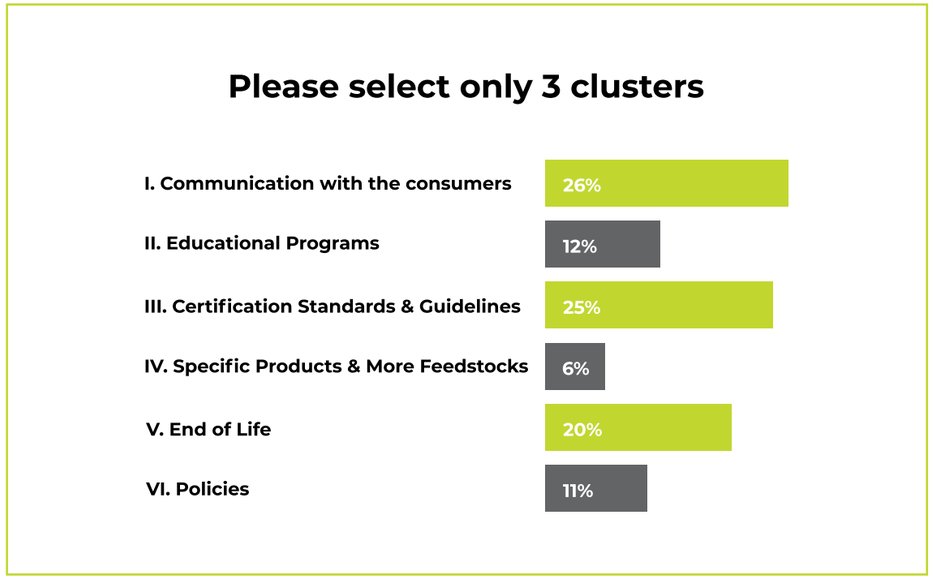

Figure 3. Solutions prioritised by the stakeholders using Mentimeter online survey.

The Mentimeter survey was followed by an activity that allowed participants to re-evaluate and critically appraise plastics packaging. The stakeholders were invited to identify the most 'infuriating' plastics packaging in their daily lives and explain how it can be improved. Finally, the participants were allocated to five break-out rooms to expand on the possible solutions (clusters) prioritised and foresee these solutions over the next ten years.[1]

1. Under the following three key questions: Do you agree with the clusters prioritised? And Why? How do you see these clusters/solutions in the next ten years?

Participants of the 'designing solutions' second social innovation lab

The list of anonymised participants and their backgrounds, broken down into five break-out groups, is shown in Table 1.

Group 1	Group 2	Group 3	Group 4	Group 5
Manager recycling label company (participant 1)	Sustainability manager of bioplastics company (participant 6)	Regulatory adviser (participant 11)	Member consumer association (participant 16)	Academic (international) (participant 21)
Manager certification company (participant 2)	Waste coordinator consumer association (participant 7)	Member consumer association (participant 12)	Member consumer association (participant 17)	PhD student bioplastics (participant 22)
Manager retail company (participant 3)	Academic (international) (participant 8)	Member consumer association (participant 13)	PhD student bioplastics (participant 18)	Member consumer association (participant 23)
Member of a consumer association (participant 4)	Academic (UK) (participant 9)	Academic (UK) (participant 14)	Academic (UK) (participant 19)	Member consumer association (participant 24)
Academic (UK) (participant 5)	Academic (UK) (participant 10)	Academic (UK) (participant 15)	Producer (participant 20)	Academic (UK) (participant 25)

Table 1. List of anonymised participants of the second social innovation lab 'designing solutions'.

3. Findings from ‘designing solutions’ second social innovation lab

This section is divided into three subsections. Section 3.1 reviews the solutions prioritised by the stakeholders (Figure 3) following the methodology explained in Section 2.2.3. Section 3.2 explores the connection between the solutions. Section 3.3 explores how the solutions are foreseen by the participants on a time scale of 10 years, and Section 3.4 outlines participants’ comments resulting from the re-evaluation and critically appraising plastics packaging exercise.

3.1 Solutions prioritised by the stakeholders

According to the stakeholders, the three solutions that currently have the highest potential to drive the change to a sustainable packaging system (in the case of biobased biodegradable plastics packaging) are communication with consumers, certification standards & guidelines and end of life.

3.1.1 Communication with the consumers

Communication with the consumers was pointed out as the solution with the highest potential to drive the change to a sustainable packaging system. It was highlighted that clear and consistent communication requires a reduction in the complexity of the message. The stakeholders emphasised that communication messages should enable consumers to answer: What type of material are bioplastics made from? How and where do you dispose of compostable plastics? The following comment illustrates this issue – ‘There is so much confusion about how to recycle different things, where, in which bin, etc…’ (Break-out group 4, 2021).

• What type of material are bioplastics made from?

The stakeholders mentioned that the correct identification of bioplastics materials is the first stage to guide their disposal. Bioplastics comprise a broad category of polymers that are difficult to identify because they are visually very similar to conventional plastics. Bioplastics have been defined as biobased polymers; derived from biomass or issued from monomers derived from biomass (19). The European Bioplastics Association has provided a wider definition, which has been divided into three main groups: a) fossil-based plastics that can biodegrade; b) biobased (or partially biobased) and non-biodegradable; and c) biobased and biodegradable plastics (20). The SIMBIO labs focus on biobased biodegradable plastics, also called in this report compostable plastics, to facilitate communication with the stakeholders.

• How and where do you dispose of compostable plastics?

The stakeholders mentioned that the correct identification of how and where to dispose of compostable (biobased biodegradable) plastics is a critical challenge. There is a need to better connect household practices with collection services and recycling facilities. Consumers are often exposed to various bin containers, often of different colours, messages and forms, depending on the different local authorities. Therefore, reconfiguration of the communication with consumers depends on the packaging message matching the disposal and collection guidelines (e.g. on the bins and local kerbside collection). Labelling for packaging could play an important role in making it easier for the consumer to identify the type of bioplastics and understand how and where to dispose of bioplastics materials since there are different disposal and recovery/organic recycling routes.

3.1.2 Certification standards and guidelines

The stakeholders recognised regulatory tools, such as certification standards and guidelines for waste management, as useful instruments to support the change to a sustainable packaging system. The primary certification standard that defines the minimum requirements and procedures for biodegradable packaging for industrial composting facilities and AD is the EN 13432 in Europe (21). The EN 13432 standard requires testing of biodegradability, disintegration, the effect on the biological treatment process and the effect on the quality of the resulting compost (21).

A label (logo) is given due to a certification process, which communicates compliance with the predefined requirements. The most commonly used labels for industrial composting in the UK following EN 13432 are the OK Compost from TUV Austria, the seedling logo (licenced by European Bioplastics) and the DIN Geprüft from DIN Certco (22). The stakeholders mentioned the importance of the certification standards for communicating with different supply chain actors. For instance, the stakeholders highlighted the need for homogeneous labelling and mandatory certification for bioplastics packaging.

3.1.3 End of life

End of life was defined as the phase that starts when the consumer disposes of the compostable plastics packaging, including different potential end routes such as home composting, industrial composting, AD or dual processing (AD and composting). However, there is still limited evidence that biodegradable bioplastics can be completely degraded (e.g. to CO_2, H_2O and biomass) via home composting. On top of that, at the moment, there is no appropriate infrastructure in place across the UK to accept these materials unless the compostable plastics (biobased biodegradable) packaging is commercialised through closed-loop systems.

> *"…ultimately what we said is we need to make sure we're getting to the point where these materials are going to be accepted by the waste management company. So, all of this work has got to lead to that."*
> (Break-out group 1, 2021)

The stakeholders emphasised the need for:

- Development of an appropriate waste management system (infrastructure and processes) for processing of bioplastics packaging
- Consistency within the recycling system
- Collection of compostable plastics packaging along with food waste

3.2 The connection between the solutions

The solutions prioritised by the stakeholders should not be analysed in isolation but rather through a dynamic process that recognises the interrelationship between them. Stakeholders emphasised the links between the solutions prioritised and the education & policy/regulatory framework.

Education overlaps with communication and can be seen as complementary. Stakeholders mentioned the need to educate consumers about the environmental impact of plastic materials and guide them in the reduction, reuse, recovery and recycling process. One of the break-out group discussions concluded that 'most of the people … are not indifferent to recycling, they just don't know what to do' (Break-out group 4, 2021). Effective education depends on the development of clear labelling, clear end-of-life processing and an established policy framework –

> *"We need the labelling and the legislation sorted first because [without it] we can't really educate people in any meaningful way."*
> (Break-out group 2, 2021)

Policy and regulatory oversight were also key factors suggested by the stakeholders in making the changes needed to improve the sustainability of the packaging system. A clear policy sets the framework and targets for all actors and ensures that there are no ambiguities. Besides, one of the break-out groups emphasised that science is crucial for driving change by creating evidence. The stakeholders mentioned the importance of the EPR for conventional and bioplastics packaging and the recent policy consultation about the recycling system's consistency and financial incentives to move away from virgin plastics.

3.3 Solutions by 2030

The lab asked the participants to consider how they see these clusters/solutions in the next ten years. The stakeholders foresaw a 2030 scenario with less complexity and more consistency within waste management systems driven by greener values and practices. In addition, they proposed two solutions: mandatory collection of food waste and compostable plastics packaging, and transformation of simple packaging into 'intelligent packaging'.

Greener values and practices. Participants predicted increased greener values and practices by consumers (e.g. the use of less elaborate packaging) and the growing ability of companies to react to those values. Thus, it is expected that companies will push for a stronger ethical and green agenda for sustainable materials.

> *"Moves in retailing products towards more sustainable materials have to be better supported by consumers because of this kind of new generation of ethics that come with them."*
> (Break-out group 5, 2021)

Less complexity and more consistency of the waste management system. The stakeholders have also foreseen less complexity (including communication with consumers) and greater consistency in the waste management system, including collection, prevention, minimisation, reuse, energy and other recovery, recycling, treatment and disposal. The Irish recycling system was suggested as an interesting model to review.

> *"[Irish System] is a lot clearer about where you can put these materials and what you can safely put into a food waste collection."*
> (Break-out group 2, 2021)

Food waste and compostable plastics packaging mandatory collection. It is expected that food waste mandatory collections will be successfully implemented and available to everyone. In this scenario, food waste and compostable plastics packaging will be disposed of and collected together. The stakeholders suggested that to facilitate this scenario, compostable plastics packaging materials should be used when they are in contact with food.

> *"So, our priority should be the various materials that are in contact with organic material. So, we're talking about coffee pods, tea bags, ready meal trays, easy materials."*
> (Break-out group 1, 2021)

Transform simple packaging into 'intelligent packaging' (e.g. QR codes). Some participants also focused on a 2030 scenario in which the technology can positively improve the identification of materials and recovery; one of the stakeholders from the retail sector mentioned that they are working on a similar initiative that will allow scanning bins and packaging with your phone – 'The idea is to scan the right bin, scan the pack, put it in the bin, and get a deposit back. Could be used anywhere' (Participant 3, 2021). Likewise, participants from break-out room 3 mentioned the use of digital coding to improve the recovery of bioplastics materials:

> *"If all products have a little barcode on… I could just scan with my smartphone and it would immediately tell me how… what I should do with this list, how to dispose of it. So, I don't need to worry about all these other labels and information on the package. It's just a simple one-step action."*
> (Break-out group 3, 2021)

3.4 Re-evaluating and critically appraising plastics packaging

The participants were invited to identify the most 'infuriating' plastics packaging in their daily lives and explain how it can be improved. Four themes emerged from the analysis: (1) plastics packaging that is not recyclable or very difficult to recycle; (2) packaging that is used on a regular basis; (3) information on the packaging; and (4) management practices for disposal and collection of recycled materials.

Plastics packaging that is not recyclable or very difficult to recycle. Participants' responses regarding packaging materials that are not recyclable or are very difficult to recycle covered different materials such as pouches, shrink films for vegetables, tea bags, coffee pods, mixed materials, bubble wraps, pens, flexible plastics packaging, etc. Pouches were repeatedly mentioned as 'least favourite packaging' or resulting in a 'feeling of waste'. Besides, shrink films and bags for vegetables/fruits were regarded as a 'nightmare', 'annoying' and/or unnecessary. Certain multi-layered packaging applications were increasingly perceived as unnecessary, such as bags of crisps with six packets inside and packaging used for delivery (often over package products).

The discussions revealed similar arguments for small flexible plastics wraps/seals, e.g. confectionery wrappers, twist wrappers, plastic seals around lids which are unlikely to be recycled with the current recycling system. On a positive note, one participant from the retail sector mentioned the recent advances and efforts to improve the collection system of flexible plastics packaging facilitated by one of the main supermarkets in the UK.

Packaging that is used on a regular basis. Interestingly, some participants also pointed out that plastics packaging used on a regular basis can be re-evaluated. This packaging potentially can be easily recycled or already contains high levels of recycled materials. Examples include plastic bottles and bathroom products, such as bottles of shampoo/conditioners/soaps, and composite packaging such as orange cartons, milk cartons, etc. This may reveal that further effort is needed to increase the reuse of materials, provide different alternatives for refilling and new materials for packaging used regularly.

Information on the packaging. Many statements concerned the lack of clarity in the information on the packaging – 'What do these symbols mean?', as one participant stated:

> *"There's just a plethora of symbols which are completely unreadable. One of them just looks like an open can of tuna, you know, then you've got the Unilever symbol in there as well. I mean, what is all this trying to tell us?"*
> (Participant 15, 2021)

The absence of information on the packaging regarding how to dispose of the product and whether it can be recycled was also mentioned as a major flaw, particularly for expensive products; more effort from certain brands is expected: '£70 a bottle for 50 ml, but then they don't bother to put whether it is recyclable, compostable or whatever. And then it has lots of intricate tubes. It is quite annoying, and I hope they can do more for the money that I spend' (Participant 18, 2021). This is also relevant for increasing the trust in compostable plastics packaging. One of the participants referred to the improvement of the confidence in compostable products using an example of biodegradable claims from a dental floss packaging, emphasising the clarity of the message to understand how to dispose of or compost the product.

Management practices for disposal and collection of recycled materials. Some participants mentioned that the current management practices of local authorities and workplaces for disposal and collection of recycled waste provide many barriers to the recovery of materials. One participant exemplified this mismanagement in the following example:

> *"… we've often, you know, we put the milk bottles in supposedly the recycling section of the bin … actually when the cleaners take it away, it all goes into the same box… But it's like, it's all a bit of a con."*
> (Participant 10, 2021)

Other considerations such as waste of energy in the production of disposable packaging were also mentioned.

4. Conclusion and recommendations for the third social innovation lab

The second social innovation lab findings show that solutions that address communication with consumers, certification standards & guidelines, and end of life have the highest potential to drive the change to a sustainable packaging system, particularly focusing on biobased biodegradable plastics packaging (also referred to as 'compostable plastics' in this report). In general, the stakeholders advocate for less complexity in communication and a more manageable waste management system. For example, a reduction in the complexity of messages on packaging would enable consumers to easily identify the type of bioplastics packaging material and how and where to dispose of them. In this context, labelling may play a role in reducing the complexity, by providing an easily recognisable symbol/logo.

However, these solutions are ineffective without an adequate end-of-life or waste management system (infrastructure and processes) for processing compostable packaging. Otherwise, compostable plastics packaging will end up in incineration plants or contaminating other waste streams. Besides, the solutions prioritised by the stakeholders should be seen as a dynamic process that can be combined with long-term measures such as education and policy/regulatory measures.

Participants also explored how these solutions will evolve in the next ten years; they foresee a future with greener values and practices for consumers and businesses, and less complexity and more consistency in the waste management system. They are also anticipating a *sustainable pathway by 2030 in which compostable plastics packaging replaces plastics packaging that is not recyclable or very difficult to recycle*. This pathway would be supported by the mandatory joint collection of food waste & compostable plastics packaging (a policy for compulsory collection of food waste is under discussion at the moment in the UK).

Besides, the stakeholders imagined a technological innovation by 2030 in which the digital communication in the packaging will simplify the communication with the consumers, improving access to information for recovering bioplastics materials and accessing personalised content according to customised location. Thus, this digital coding will act as a 'mask' to hide complexity for consumers (such as different certification numbers, different labelling (logos), different council recycling guidelines, recognition of the type of bioplastics materials, etc.).

Re-imaging the current packaging products requires a more holistic view of the change to the packaging system in which compostable plastics packaging cannot be seen in isolation. Although the lab participants emphasised the importance of the replacement/elimination of plastics packaging that is not recyclable or very difficult to recycle, in which compostable plastics packaging can be part of the solution, the participants also called attention to new solutions for packaging that are regularly used in the home (e.g. bathroom products such as bottles of shampoo, conditioner or soap). Besides, the efforts needed to increase the recovery of all materials (not only plastic materials) were also highlighted, such as efforts to provide clear information on the packaging and improve management practices for disposal and collection of recycled materials.

A foreseen 2030 scenario, therefore, requires a more fine-grained development of innovations (e.g. 'intelligent' packaging, product innovation, process innovation, service innovation, etc.) and policy changes (e.g. to support a mandatory joint collection of food waste & compostable plastics packaging). It is suggested to 'prototype' these innovations by discussing conceptual models within the third social innovation lab.

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Biographies

Professor Benny Tjahjono

Benny Tjahjono is Professor of Supply Chain Management, and also a co-leader of the Sustainable Production and Consumption cluster at the Centre for Business in Society. His overarching research area includes Sustainable Operations and Supply Chain Management, in particular, the exploration of Circular Economy principles in manufacturing and supply chains. He has a vested interest in ensuring the achievement of the triple sustainability objectives, '*doing good for people, planet and profit*'.

His research track record has been demonstrated by winning and successfully delivering several research grants from EPSRC, ESRC, InnovateUK, European Union, overseas funding agencies and directly from the UK industry. He was a member of a consortium consisting of seven universities in Europe recently being awarded the Horizon2020 MSCA Innovative Training Network aiming to formulate the service-oriented business for the European Circular Economy. His most recent research grant was funded by the Academy of Medical Sciences' Global Challenges Research Fund (GCRF) in the area of Circular Food Supply Chain. Currently he is leading three research projects, one is funded by ESRC in the area of Social Innovation of Bioplastics and the others are funded by EIT RawMaterials (to investigate the recovery of metals in façade industry) and Erasmus+ (to equip engineering students with entrepreneurial skills).

Representing Coventry, he is one of the founding members of the newly established UK-Indonesia Consortium for Interdisciplinary Sciences (UKICIS) with an aim of harnessing the research and knowledge transfer activities between the two countries, in the topical areas of resilience and climate change.

Dr Macarena Beltran

Dr Macarena Beltran is a Research Assistant at the Centre of Business in Society at Coventry University, UK and is part of the Sustainable Production and Consumption cluster research team. Her training in the field of sustainability came from her PhD at Newcastle University in Urban Energy, where she studied how the interactions of physical and occupants' behavioural factors intervene in the energy demand. Her research interest area includes socio-technical research and the exploration of Circular Economy and Bio circular principles in manufacturing and supply chains. She has also worked evaluating the impact of the Office for Students related projects. She has more than 10 years of experience working on assessing and developing supply chains (e.g. Steel and financial companies). Dr Beltran also holds an MA in Planning and Environment Research, a Master in Marketing and Business, Industrial Engineering and a BSc.

Dr David Bek

Dr David Bek is a Reader in Sustainable Economies and co-leader of the Sustainable Production and Consumption Cluster in the Centre for Business in Society. David has extensive experience in undertaking research into sustainability within horticultural supply chains, especially cut flowers. He has worked alongside organisations in the fruit, wine and flower sectors in South Africa to develop training courses and monitoring and evaluation tools to promote enhanced sustainability in practice. He has undertaken work with the UK horticultural sector exploring the sustainability impacts of plastics and growing media. David is currently involved in a project investigating the impacts of Covid-19 upon the resilience of cut-flower supply chains (funded through the UK Department for International Development), whilst he is leading a project funded by the Dutch Sustainability Initiative (IDH), which is seeking to identify certification and assurance mechanisms for promoting sustainability in the global wildflower harvesting sector.

Dr Jordon Lazell

Dr Jordon Lazell has held the role of Research Assistant at the Centre of Business in Society, at Coventry University, UK, since 2013. His research interests lie in the area of food waste, specifically food consumption, waste and mitigation behaviours of consumers as well as food waste within retail supply chains. Jordon is a co-editor of the first Routledge Handbook of Food Waste and is also co-founder and administrator of the International Food Loss and Food Waste Studies Group, a research platform for academics and practitioners operating in this area.

Dr Anna Bogush

Dr Anna Bogush is an Associate Professor at the Centre for Agroecology, Water and Resilience (CAWR, Coventry University, UK). Her research and teaching interests lay in the interdisciplinary area, including chemistry, environmental engineering, material science, circular economy and industrial symbiosis. Her work is largely directed towards understanding the fate of pollutants in the natural-anthropogenic system and developing sustainable materials & technologies using concepts of industrial symbiosis and circular economy to tackle the environmental issues. Currently, she is working on the understanding fate of submicron and microplastics in the environment and developing novel technologies to reduce plastics pollution. She contributed to secure 32 internal and external funding in projects funded by H2020, RAEng, EPSRC/NSFC, COST, UCL, CU, RFBR, RAS, SB RAS, NASU, industry and the Environment Agency. She is an author of 4 book chapters and over 50 peer-reviewed papers. She is an independent external expert in the European Cooperation in Science & Technology (COST Association) and Newton Prize 2020 reviewer (UK National Commission for UNESCO). She is an Associate Editor for the Section 'Circular Economy' within the Journal Frontiers in Sustainability, a topic editor for the journal Minerals (MDPI), and a guest editor of the Special Issue on "Advanced materials in Environmental Chemistry" at the journal "Molecules".

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