BIOSWITCH

D1.4 SUMMARY OF RESULTS OF REGIONAL AND PAN-EUROPEAN WORKSHOPS

Lead Contractor: Munster Technological University (Institute of Technology, Tralee)

Author(s): James Gaffey, Emily Marsh , Teija Laitinen, Anna Tenhunen, Emma Sidgwick, Marta Macías Aragonés, María del Valle Casado Maestre, Thorkild Frandsen

This document is the BIOSWITCH project summary of results of regional and pan-European workshops (contract no. 887727) corresponding to D1.4 (M10) led by MTU (ITT).

This project has received funding from the Bio Based Industries Joint Undertaking (JU) under the European Union's Horizon 2020 research and innovation programme under grant agreement No 887727.

Project details			
Project acronym	BIOSWITCH	**Start / Duration**	June 2020 / 24 months
Topic	BBI-2019-SO4-S1 - Assist brand owners to 'switch to bio-based'	**Call identifier**	H2020-BBI-JTI-2019
Type of Action	CSA	**Coordinator**	CLIC Innovation Oy
Contact persons	Anna Tenhunen anna.tenhunen@clicinnovation.fi		
Website	www.bioswitch.eu		

Deliverable details			
Number	**D1.4**		
Title	**Summary of Results of Regional and Pan-European Workshops**		
Work Package	**WP1**		
Dissemination level	PU (Public)	**Nature**	**R (Report)**
Due date (M)	31/03/2021	**Submission date (M)**	**31/03/2021**
Deliverable responsible	**MTU (/ITT)**	**Contact person**	**James.Gaffey@staff.ittralee.ie**

Deliverable Contributors				
	Name	**Organisation**	**Role / Title**	**E-mail**
Deliverable leader	James Gaffey	MTU	Principal Investigator	**James.Gaffey@staff.ittralee.ie**
Contributing Author(s)	Emily Marsh	MTU	Bioeconomy Project Manager	**Emily.Marsh@staff.ittralee.ie**
	Teija Laitinen	CLIC	Head of Bioeconomy	**teija.laitinen@clicinnovation.fi**
	Emma Sidgwick	FF	Innovation Manager	**emma.sidgwick@flandersfood.com**
	Marta Macías Aragonés	CTA	Business Development Consultant	**marta.macias@corporaciontecnologica.com**
	María del Valle Casado Maestre	CTA	Business Development Consultant	**valle.casado@corporaciontecnologica.com**
	Thorkild Frandsen	FBCD	Bioeconomy Project Manager	**tqf@foodbiocluster.dk**

This project has received funding from the Bio Based Industries Joint Undertaking (JU) under the European Union's Horizon 2020 research and innovation programme under grant agreement No 887727.

Reviewer(s)	Kaisa Vehmas	VTT	Senior Scientist	**kaisa.vehmas@vtt.fi**
	John Vos	BTG	Senior Consultant	**vos@btgworld.com**
	Anna Tenhunen	CLIC	Project Coordinator	**anna.tenhunen@clicinnovation.fi**
	Heli Kangas	VTT	Technical Manager	**heli.kangas@vtt.fi**
Final review and quality approval				
	Anna Tenhunen	**CLIC**	**Project Coordinator**	**anna.tenhunen@clicinnovation.fi**

Document History			
Date	**Version**	**Name**	**Changes**
11/03/2021	V1	First Draft	
18/03/2021	V2	Second Draft	
31/03/2021	**Final**	**Final Deliverable**	

This project has received funding from the Bio Based Industries Joint Undertaking (JU) under the European Union's Horizon 2020 research and innovation programme under grant agreement No 887727.

TABLE OF CONTENTS

This project has received funding from the Bio Based Industries Joint Undertaking (JU) under the European Union's Horizon 2020 research and innovation programme under grant agreement No 887727.

ACRONYMS AND ABBREVIATIONS

ACRONYM	FULL NAME
BBI JU	Bio-based Industries Joint Undertaking
BBP	Bio-based products
BI	Bio-based Industry
BIC	Bio-based Industries Consortium
BO	Brand Owners
BTG	B.T.G. Biomass Technology Group BV
CE	Circular Economy
CLIC	CLIC Innovation Oy
CTA	Corporación Tecnológica de Andalucía
DoA	Description of Action
EC	European Commission
EoL	End-of-Life
EVOH	Ethylene Vinyl Alcohol
FBC	Food & Bio Cluster Denmark
FF	Flanders' FOOD
ITT	Institute of Technology Tralee
LCA	Life-Cycle Assessment
MTU	Munster Technological University
SDG	Sustainable Development Goals

This project has received funding from the Bio Based Industries Joint Undertaking (JU) under the European Union's Horizon 2020 research and innovation programme under grant agreement No 887727.

SIE	Sustainable Innovations Europe SL
SUP	Single-Use Plastics
VTT	VTT Technical Research Centre of Finland Ltd / Teknologian tutkimuskeskus VTT Oy
WP	Work Package

LIST OF TABLES

LIST OF FIGURES

This project has received funding from the Bio Based Industries Joint Undertaking (JU) under the European Union's Horizon 2020 research and innovation programme under grant agreement No 887727.

This project has received funding from the Bio Based Industries Joint Undertaking (JU) under the European Union's Horizon 2020 research and innovation programme under grant agreement No 887727.

1 INTRODUCTION

This document is a report on the *Summary of results of regional and pan-European workshops* undertaken by the BIOSWITCH project, which provides a multi-actor viewpoint on shaping solutions for the main barriers and risks when switching to bio-based approaches from regional and European-wide perspectives. The BIOSWITCH project develops a systemic framework of brand owners, consumers, public administration and bio-based industry; to encourage, facilitate and accelerate brand owners from different sectors and at different stages of the transition journey to switch-to-bio-based approaches.

The report will detail the approach and implementation of the four regional workshop in Finland, Belgium, Spain and Denmark, and the one pan-European (EU) workshop held in January and February 2021. The main barriers and risks are identified and using a design thinking approach a set of solutions, produced from each workshop, are presented, followed by analysis of the workshop's main findings.

This deliverable 1.4 is part of work package (WP) 1 of BIOSWITCH project and describes the main findings from the work carried out in task 1.5 *Regionals and pan-European co-creation workshop to support brand owners and consumers to switch to bio-based*. For context and description of actions, the objectives of work package 1 and task 1.5 are detailed below in section 1.2 and section 1.3.

1.1 Objective of BIOSWITCH

The main aim of the BIOSWITCH project is to bring Europe to the forefront of the bio-based economy, encouraging and supporting brand owners to switching to bio-based approaches by following a holistic, systemic approach built on two pillars;

- A framework where brand owners are placed as the centre of the public administration-bio-based industry-consumers triangle through a set of events and communication actions that will allow shaping solutions to mitigate their perceived risks; and
- The BIOSWITCH toolbox as the ultimate instrument that will assist them in the bio-based transition journey.

1.2 Objective of Work Package 1

The aim of WP1 (Framework development and mapping and analysis exercise) is to set up the brand owners' networks and to involve public administration, consumers and bio-based industries in the BIOSWITCH framework. WP1 aims:

- To analyse brand owners' needs and perceived risks when switching to bio-based
- To gather best practices and case-studies so they can inspire brand owners

This project has received funding from the Bio Based Industries Joint Undertaking (JU) under the European Union's Horizon 2020 research and innovation programme under grant agreement No 887727.

- To identify motivations and incentives as well as bio-based products' consumer acceptance drivers, and
- To promote a co-creation exercise (via. a design thinking approach) between brand owners, public administration and consumers where all previous information can be analysed and discussed, and efficient solutions to mitigate perceived risks can be developed.

1.3 Objective of Task 1.5

Task (T) 1.5 is the task in work package (WP) 1 that is related to deliverable 1.4 *Summary of results of regional and pan-European workshops*. The main aim of task 1.5 is to organise 4 regional workshops simultaneously in Finland, Belgium, Spain and Denmark in order to capture different viewpoints and take into account local consumer habits. These four workshops will feed into a pan-European co-creation workshop. The workshops are focused on disseminating the results from WP1 and capturing a multi-actor viewpoint on the switch to bio-based approaches;

- Presenting the results of task 1.2 on Needs, Risks and Motivations for Brand owners and Consumers to Switch to Bio-based (from pan-EU survey and regional interviews)
- Presenting best practices and success cases from task 1.3 and evaluating opportunities to meet the needs of both the brand owner and consumer, and
- Presenting a range of policy/incentive measures to address the risks/barriers to brand owner and consumer uptake of bio-based products (task 1.4).

The overall aim of the regional workshops is to bring together important stakeholders, validate the findings of BIOSWITCH framework study and formulate recommendations to further support the uptake of bio-based solutions and the European bioeconomy.

The objectives for each regional workshop and the pan-European workshop;

- To disseminate the BIOSWITCH project results on the on needs, risks and motivations for brand owners and consumers to switch to bio-based, best practices and success cases, consumer drivers and motivations, and policy & incentive measures to meet the needs of both the brand owner and consumer.
- To foster discussion and awareness creation among multi-actor stakeholders.
- To identify the main risks associated with the uptake of bio-based products/brands and help shape a set of solutions.
- To capture different viewpoints, to take into account local consumer habits, including legal and policy viewpoints.
- Promoting the exchange of point of view with consumers and public administration.
- Increase marketability of bio-based alternatives by fostering consumer awareness of the added value of bio-based products compared to fossil-based counterparts.

This project has received funding from the Bio Based Industries Joint Undertaking (JU) under the European Union's Horizon 2020 research and innovation programme under grant agreement No 887727.

2 METHODOLOGY

A series of four regional workshop in Finland, Belgium, Spain and Denmark and one pan-EU workshops were undertaken during January and February 2021. To present the BIOSWITCH findings from the pan-EU and regional studies in relation to brand owner and consumer perspectives of bio-based products (based on our surveys and interviews), as well as desk based research related to potential incentives. The workshops were held to receive feedback and recommendations from various groups such as brand owners, consumers, industry and public administration. The approach and methodology for these events are described in Chapter 2 below, with results described in Chapter 3, and analysis in Chapter 4.

2.1 Regional Workshop Development

A series of 4 regional workshops were implemented during January 2021 organised by MTU (formally ITT), BTG and VTT alongside the relevant regional partners in Belgium (FF), Denmark (FBC), Finland (CLIC) and Spain (CTA). As scheduled the 4 workshops were held during M8, between 20th and 28th January as follows;

- Finland regional workshop: 20th January 2021
- Belgium regional workshop: 25th January 2021
- Spain regional workshop: 26th January 2021
- Denmark regional workshop: 28th January 2021

These workshops targeted relevant stakeholders to BIOSWITCH including brand owners, public administration, academia, consumers and bio-based industry. The objective to present BIOSWITCH findings to date for analysis and to formulate recommendations to mitigate risks and barriers brands face in switching to bio-based approaches, along with further recommendations (that could stimulate brands or consumers) to support market uptake of bio-based ingredients and products. The findings of the 4 regional workshops served as information for a pan-European workshop developing a broader set of EU solutions, held later on 17th February 2021 (see section 2.2 below). All 5 workshops were adapted to an online format due to continuing COVID-19 restrictions. This involved the use of Zoom as a hosting platform for the workshops with MIRO used as a co-creation tool to support interaction between stakeholders (described in section 2.3 below). The format and agenda for the regional workshops were discussed and decided by all WP1 partners. The agenda for the 4 regional workshops was uniform but adapted to the region in question, as follows;

- Presentation of results of the EU and regional barriers, needs, risks and motivations for brand owners and consumers to switch to bio-based, (including a comparison of EU brand perspectives compared with the responses of regional brand interviews from the individual hosting region (Belgium/Denmark/Finland/Spain)) – delivered by MTU.
- Presentation of results of EU consumer drivers and motivations – delivered by VTT.

This project has received funding from the Bio Based Industries Joint Undertaking (JU) under the European Union's Horizon 2020 research and innovation programme under grant agreement No 887727.

- Presentation of a range of policy and incentive measures to address the risks & barriers to brand owner and consumer uptake of bio-based products – delivered by BTG.
- A workshop to rank perceived risks and barriers that brands face in switching to bio-based and the co-development of solutions by stakeholders – delivered by MTU in collaboration with BIOSWITCH partners.

A sample agenda for regional workshops is included in Appendix 1. The decision was taken not to include a presentation on best practices and success cases from T1.3 as this was covered by another BIOSWITCH event *Successful transition from fossil to bio-based products* webinar held on 27th January 2021.

The outreach for the **Finland** regional workshop was led by CLIC Innovation with event advertisement and registrations via Eventbrite. Various platforms were used by CLIC and VTT to advertise the event including LinkedIn, Twitter, CLIC website and newsletter along with targeted emails to identified stakeholders (companies, academia, consumer association).

For the regional workshop in **Belgium**, outreach was led by FF with the event publicized and registrations taking place through the Flanders Food website. The full membership base of FF organisations were invited to participate through email, and the event was also advertised via the FF LinkedIn page.

For the regional workshop in **Spain**, outreach was led by CTA with the event publicised via the CTA website[1]. The event was advertised by email sent to more than 800 contracts (bio-based SME's, public entities, research groups etc.), and was also disseminated via social media and the CTA newsletter which has 6,000 recipients.

[1] https://www.corporaciontecnologica.com/es/agenda/calendario-de-eventos-y-convocatorias/Evento-regional-proyecto-BIOSWITCH/

This project has received funding from the Bio Based Industries Joint Undertaking (JU) under the European Union's Horizon 2020 research and innovation programme under grant agreement No 887727.

For the **Denmark** regional workshop, outreach was led by FBC with event and registration organised through their website (www.foodbiocluster.dk). To target stakeholders an article was placed in the Newsletter of Innovation network for Bioresources (INBIOM) sent on the 16th of December 2020 with 900 recipients. The event was posted numerous times on the Food & Bio Cluster LinkedIn-channel. An article about the event was posted in Food & Bio Cluster Denmark´s email newsletter to bioresources stakeholders (20th of January 2021) with approximately 240 recipients. Direct emails were sent to Danish participants in the BIOSWITCH-survey on risks and motivations for switching to bio-based undertaken in August/September 2020, while direct emails were also sent to the members of the Danish Bioeconomy Panel (25th of January 2021).

2.2. Pan-EU Workshop Development

Following the 4 regional workshops, the regional workshop results were reviewed and analysed by the project team and the pan-European workshop was adapted to incorporate these results. The agenda for our pan-EU workshop was agreed as follows:

- Presentation of results of the EU barriers and risks faced by brand owners switching to bio-based approaches, which include some of the initial solutions to barriers/risks as identified in our regional workshops – delivered by MTU.
- Presentation of results of EU consumer drivers and motivations – delivered by VTT.
- Presenting a range of policy and incentive measures to address the risks & barriers to brand owner and consumer uptake of bio-based products – delivered by BTG.
- A design thinking on the regional workshops to develop a Global set of solutions for perceived barriers and risks – delivered by MTU with support from the BIOSWITCH partners.

The full agenda for the pan-EU workshops is included in Appendix 2. The pan-EU workshop took place on 17th of February 2021 just over two weeks after our final regional workshop. In order to ensure that the full ideas of pan-EU stakeholders could be taken into account within the workshop, the MTU team contacted the attendees on the period leading up to the workshops to ask them to identify any additional barriers or risks which could be considered for prioritization beyond those already considered in D1.1 (our initial brand surveys and interviews) and the regional workshops. Where relevant these were incorporated as barrier and risk options for the pan-EU workshop. As with the regional workshops, Zoom was used as the communication platform, with MIRO used for the interactive workshop, which was designed to suit the format of the design thinking workshop in order to promote ideation and collaboration.

This project has received funding from the Bio Based Industries Joint Undertaking (JU) under the European Union's Horizon 2020 research and innovation programme under grant agreement No 887727.

The outreach for the pan-EU workshop was led by MTU with the event advertised and registration through Eventbrite. BIOSWITCH partners disseminated the event through various platforms including LinkedIn, Twitter, and website by CLIC, VTT, FF and FBC. The event was advertised by SIE on the BIOSWITCH Twitter and newsletter for a wide target audience of brand owners, industry, public administration, consumers, and academia.

2.3 Interactive Workshop Approach

For the interactive workshop component of each event, regional and pan-EU, MIRO served as an online collaborative whiteboard platform. The use of this platform allows stakeholders to vote and prioritize different risks and barriers, and also to share ideas, recommendations and solutions in an interactive setting through the use of sticky notes on previously designed template boards. This approach allowed the participants to be as active as possible while on an online platform for the workshop. During the workshop, a facilitator from MTU guided participants around the board, to discuss and complete the different templates, with commentary and observations provided from the additional BIOSWITCH partners.

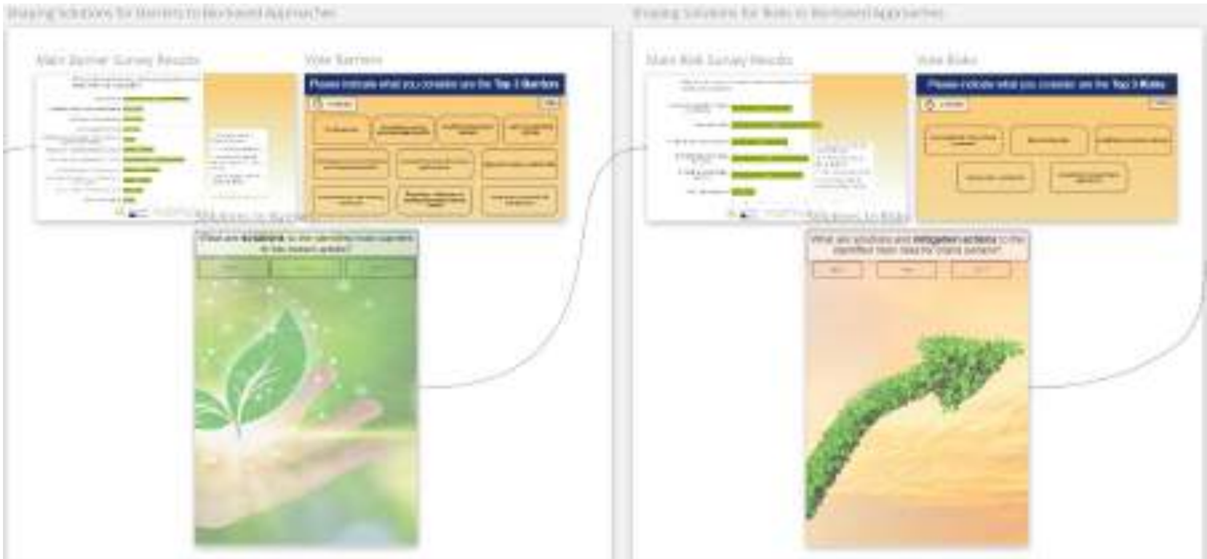

Figure 1. Pre-prepared MIRO board templates for workshops

This project has received funding from the Bio Based Industries Joint Undertaking (JU) under the European Union's Horizon 2020 research and innovation programme under grant agreement No 887727.

2.3.1 Breakdown of workshop questions and templates

2.3.1.1 *Background Question/ICE Breaker*

To begin with we asked the participants to identify which type of stakeholder they were by voting on the sector to which they belong, with options including; Industry, Brand Owner, Public Administration, Academia/Research, Consumer/consumer representative, Other. This gained valuable information while also serving as an icebreaker question and allowed participants to familiarize themselves with the voting tool.

2.3.1.2 *Barrier Question and Solutions*

In the next template we asked the participants of the regional workshops to vote on their top 3 barriers from a pre-set list (developed from previous BIOSWITCH survey findings) including;

- Too expensive
- Uncertainty around environmental benefits
- Insufficient consumer demand
- Lack of supporting policies
- Challenges communicating the environmental benefits
- Uncertainty around functional performance
- Ingredient supply uncertainties
- Incompatibility with existing processes
- Regulatory challenges in placing the product on the market
- Uncertainty of end-of-life management

Based on stakeholder feedback identifying gaps in barriers, a number of new barriers were added to the list of options for the pan-EU workshop including; Concerns around environmental impacts; Lack of knowledge on environmental, social and economic benefits; Lack of standardized certification; Concerns around sustainability of feedstock. After voting, the participants can view the top 3 barriers as voted by themselves and are directed to a new template where they are invited to list solutions to overcoming these top 3 barriers (the results of which are elaborated in Section 3). The templates used are provided below.

This project has received funding from the Bio Based Industries Joint Undertaking (JU) under the European Union's Horizon 2020 research and innovation programme under grant agreement No 887727.

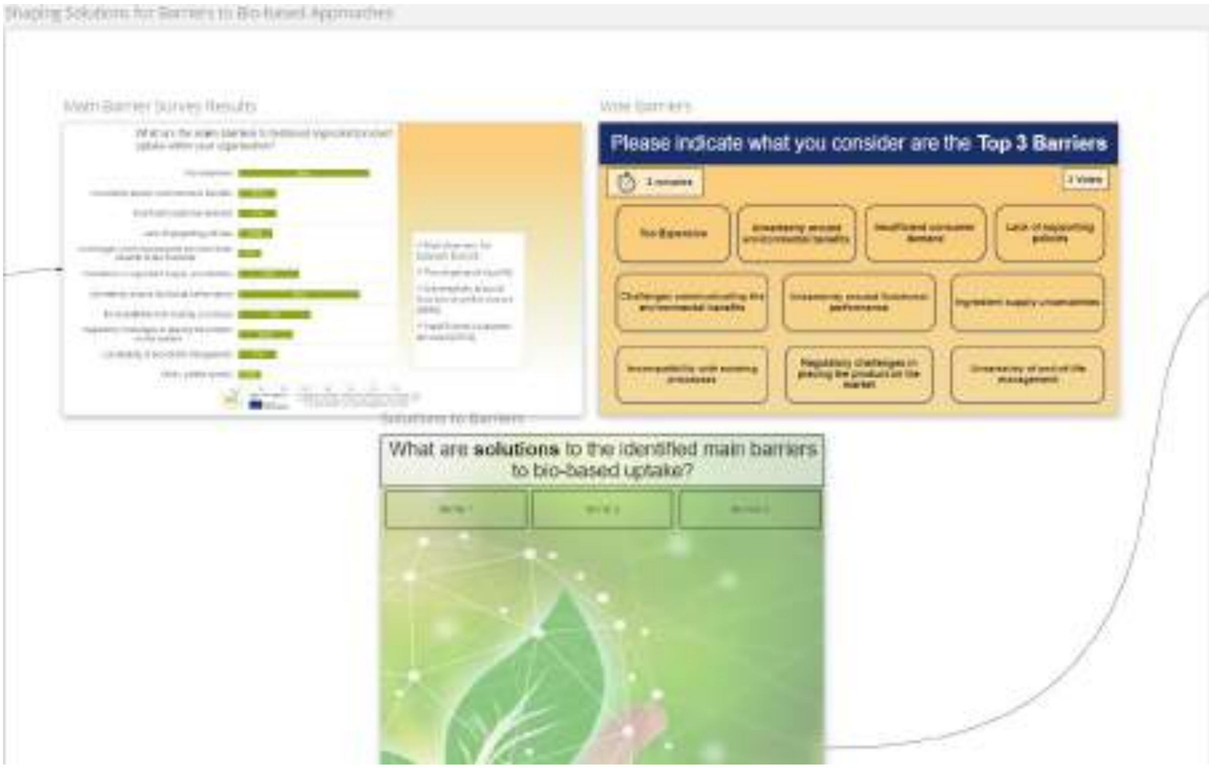

Figure 2. MIRO board for shaping solutions to bio-based approaches

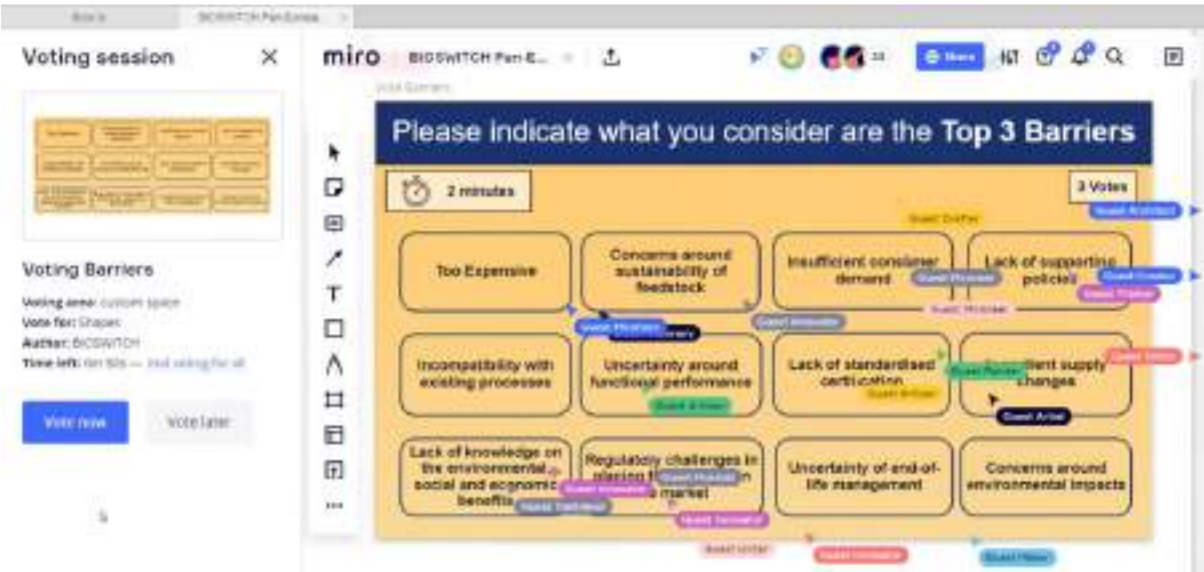

Figure 3. Voting system in MIRO board for regional workshop during interactive session

This project has received funding from the Bio Based Industries Joint Undertaking (JU) under the European Union's Horizon 2020 research and innovation programme under grant agreement No 887727.

2.3.1.3 *Risk Question and Solutions*

The next template asked the participants of the regional workshops to vote on their top 3 risks from a pre-set list (developed from previous BIOSWITCH survey findings) including;

- Incompatibility with existing processes
- Poor functionality
- Insufficient consumer demand
- Supply chain uncertainty
- Uncertainty around future regulations

Based on stakeholder feedback identifying gaps in risks, a new risk was added for the pan-EU workshop only; Cost of production. After voting, the participants were shown the top 3 risks, which they had collectively chosen and were then directed to a new template (the results of which are elaborated in Section 3) where they were invited to list solutions to overcoming these top 3 risks. The templates used are provided below.

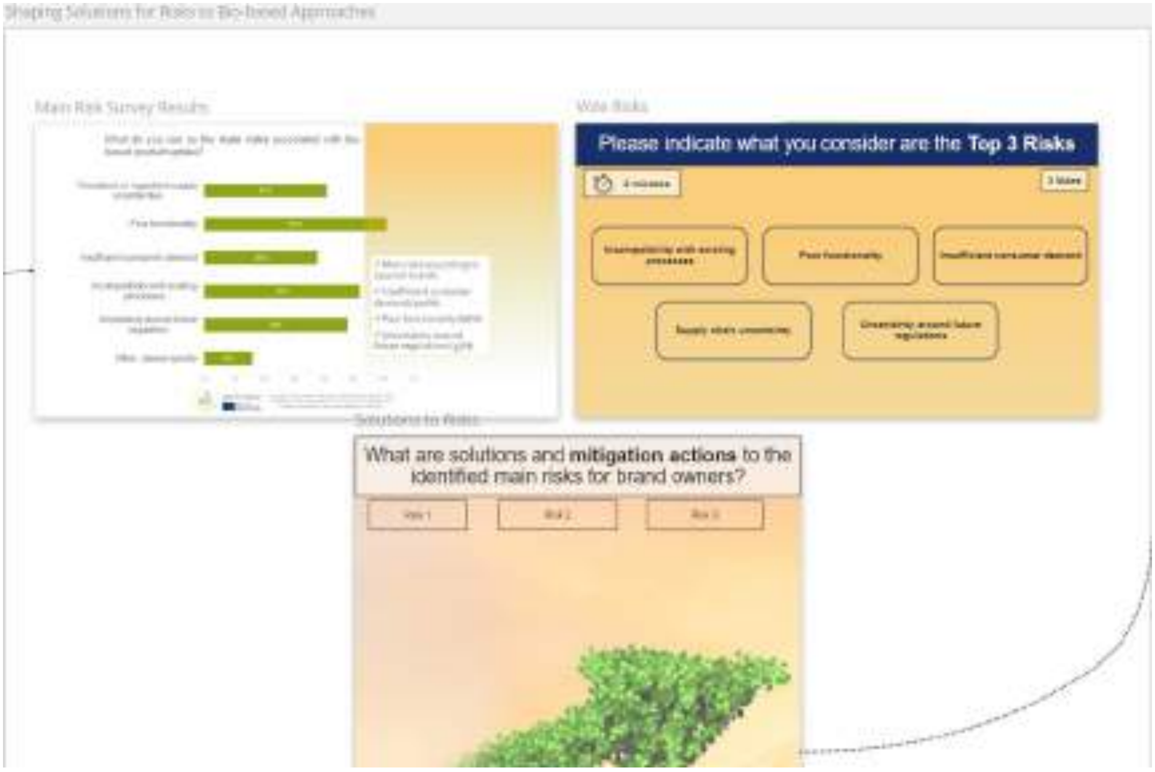

Figure 4. Miro board for shaping solutions for risks to bio-based approaches

This project has received funding from the Bio Based Industries Joint Undertaking (JU) under the European Union's Horizon 2020 research and innovation programme under grant agreement No 887727.

2.3.1.4 *Consumer related solutions*

On the next template, we attempted to gain stakeholder ideas for how to stimulate consumer growth for bio-based products. In this template, it was decided to gain the views of two separate stakeholder groups;

(i) Public Administration, Researchers, and Consumers
(ii) Industry and Brand Owners.

A blank example of the template used is provided below.

Figure 5. MIRO board for shaping solutions to the main barriers of consumer demand

2.3.1.5 *Incentive related solutions*

On the final template, we asked stakeholders to identify potential incentives, which could stimulate uptake of bio-based approaches among brand owners. This was an open board allowing all participants regardless of their sector to openly list their incentive recommendations. A blank example of the template is provided below.

This project has received funding from the Bio Based Industries Joint Undertaking (JU) under the European Union's Horizon 2020 research and innovation programme under grant agreement No 887727.

Figure 6. MIRO board for incentive measures to stimulate uptake of bio-based approaches by brand owners

This project has received funding from the Bio Based Industries Joint Undertaking (JU) under the European Union's Horizon 2020 research and innovation programme under grant agreement No 887727.

3 RESULTS

The BIOSWITCH regional and pan-European workshops were held in January and February 2021. The regional workshops were held online for stakeholders in Finland, Belgium, Spain and Denmark respectively and one pan-European workshop was held online for an European-wide audience. In total, there were 209 participants at the 5 workshops; stakeholders including brand owners, public administration, academia, consumers and bio-based industry, with a target audience of 50 participants. The pan-European workshop had 64 participants from Italy, Spain, United Kingdom, France, Ireland, Germany, Romania, Denmark, Belgium, Greece, Poland, Finland, Switzerland, Bulgaria, Netherlands, Croatia, Portugal and Norway.

The interactive session of the workshop was divided into the following sections;

- Shaping solutions for barriers to bio-based approaches
- Shaping solutions for risks to bio-based approaches
- Consumer demand
- Incentive measures for brand owners

The regional and pan-European workshop results are compared to the trends of the previous findings from the regional and pan-European survey on the on the needs, risks and motivations of brand owners switching to bio-based approaches (D1.1), included below.

3.1 Regional Results and Set of Solutions

What type of stakeholders participated in the workshops?

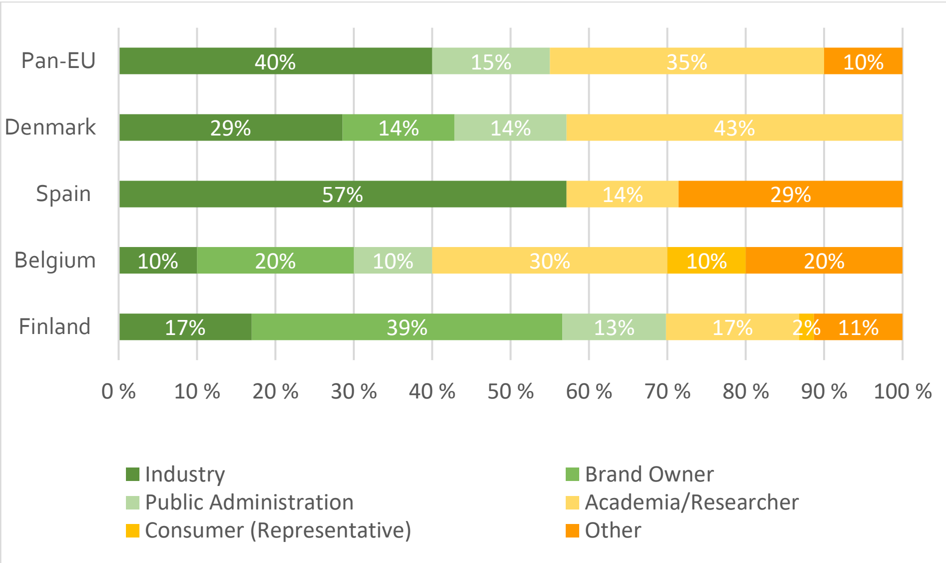

Figure 7. Stakeholders participants in each of the four regional and the pan-European workshop

This project has received funding from the Bio Based Industries Joint Undertaking (JU) under the European Union's Horizon 2020 research and innovation programme under grant agreement No 887727.

The target audience for the workshops included all relevant bio-based value chain stakeholders (industry, brand owners, consumers, academia/researchers, public administration) in order to gain all perspectives via a multi-actor response. Industry and academia/researchers made up the greatest stakeholder type for participants across all workshops. Industry was the largest stakeholder group participating in the Spanish workshop (57 %) and the pan-EU workshop (40 %). For Denmark (43 %) and Belgium (30 %) academia and researchers made up the largest group of stakeholder participating in the workshops, while 39 % of participants in the Finnish workshop were brand owners.

3.1.1 FINNISH REGIONAL RESULTS

What are the main barriers to switching to bio-based approaches considered by the Finnish stakeholders?

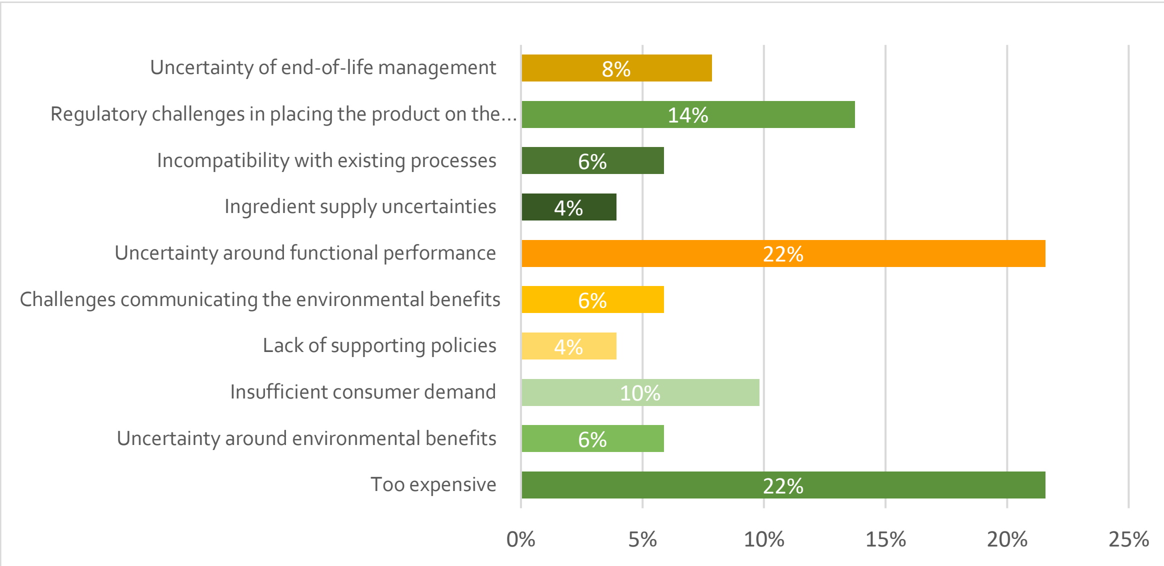

Figure 8. Voting results to the main barriers to bio-based approaches Finland workshop

When asked to vote on what they consider are the top 3 barriers Finnish stakeholders indicated uncertainty around functional performance (22 %) and too expensive (22 %) jointly at the top and regulatory challenges in placing the product on the market (14 %) thirdly. These results vary slightly to the regional interview results of brand owners previously documented in D1.1 wherein; Finnish brands chose; too expensive (50 %), uncertainty around functional performance (50 %), incompatibility with existing process (50 %). The regional workshop results for Finland show stakeholders consider **uncertainty around functional performance** and **regulatory challenges in placing the product on the market** as more of a barrier to switching to bio-based approaches. The regional workshop results are from a wider variety and larger cohort of stakeholders, and the regional interview captured Finnish *brand owner* views only. The regional trends on the main barriers to switching to bio-based approaches are discussed further in section 4.1.

This project has received funding from the Bio Based Industries Joint Undertaking (JU) under the European Union's Horizon 2020 research and innovation programme under grant agreement No 887727.

What are solutions to the identified main barriers to bio-based uptake?

In response to providing solutions to the identified main barriers to bio-based uptake the participants in the Finnish workshop provided the following solutions (Figure 9);

- For availability issues - EU support to development and tax
- Performance evaluation standardised and clear communication
- Functionality profile or selection of a bio-alternative to a fossil material will be different. So customers need to be educated
- More straightforward bio-based regulations
- Cost issue will be tackled with superior performance (biomaterial will be needed less)
- Removing incentives from fossil materials
- studies to convince performance to compare with traditional materials
- Industries collaborate to point out key barriers to Government
- Regulations to give support /advantage for bio-based solutions
- EU tax support
- Information sharing and the positives can make acceptance to higher prices accepted
- More research
- Co-operation through the whole value chain
- Support and accelerate scale-up to reach economies of scale
- Up-scaling of novel product solutions in collaborative projects between Academia, RTOs and industry
- Lack of volunteer policy measures; national & regional pacts, comp. plastics
- Bigger volumes will reduce price - support to new materials and tax-free
- Better availability of support from RDI organisations (accessible, cost-efficient)
- Deeper dialogue with regulators
- Clearer communication of results from existing research studies
- Train decision makers
- New regulations
- Collaborative development of product / packaging designs
- Increase the supply of renewable materials through recycling
- Ensure availability of independent testbeds and pilots in sufficient scale
- Networking to overcome the challenges together
- Highlight climate benefits, note littering in single-use products

This project has received funding from the Bio Based Industries Joint Undertaking (JU) under the European Union's Horizon 2020 research and innovation programme under grant agreement No 887727.

Figure 9. MIRO board of the solutions provided by Finnish stakeholders during the regional workshop

This project has received funding from the Bio Based Industries Joint Undertaking (JU) under the European Union's Horizon 2020 research and innovation programme under grant agreement No 887727.

What are the top risks when switching to bio-based approaches identified by the Finnish stakeholders?

The top risks identified by the Finnish stakeholders participating in the workshop were poor functionality (27 %) and uncertainty around future regulations (23 %). Supply chain uncertainty were ranked jointly third at 17 %. Finnish brand owners in the regional interviews had previously indicated the main risks as being uncertainty over future regulations (100 %), incompatibility with existing process (75 %) and poor functionality (50 %).

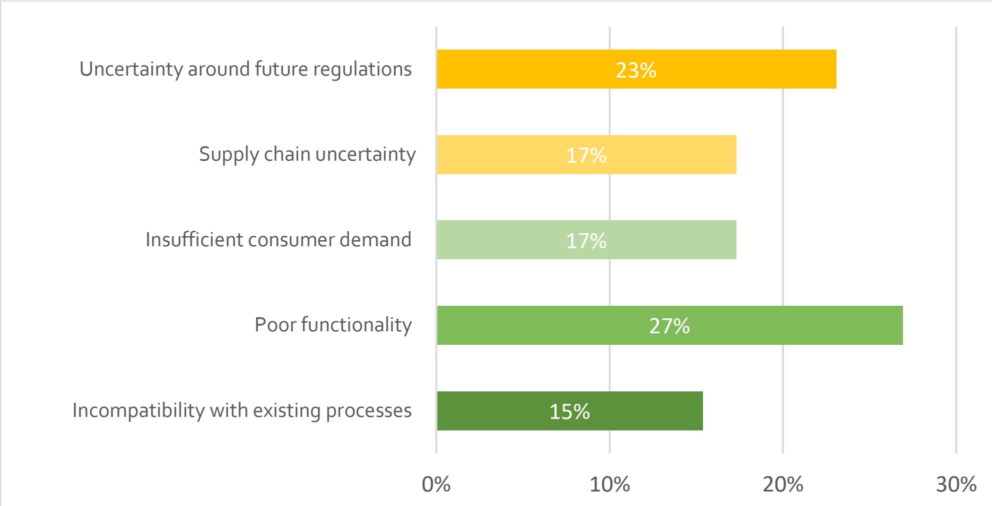

Figure 10. Top 3 Risks voting results Finnish regional workshop

What are solutions and mitigation actions to the identified main risks for brand owners?

The stakeholders at the Finnish regional workshop responded to solutions and mitigation actions to the identified main risks for brand owners by providing the following solutions;

- A bio-based material often is not 1:1 replacement (even it may be actually better) for a non-bio-based incumbent material. Communication required to change in customers' mindset
- No directives in too tight schedule, like SUP (Single-Use Plastics Directive)
- More research needed
- Entire value chain participating in the development
- Recyclability, biodegradability, composability etc. might need different kind of solutions. Clear specs which demands are needed for R&D
- Trailing the new solution actively
- Policy recommendations from the point of view of the whole value chains, Green deals and piloting, public procurement tests
- Lobbying

This project has received funding from the Bio Based Industries Joint Undertaking (JU) under the European Union's Horizon 2020 research and innovation programme under grant agreement No 887727.

- Support for CE (Circular Economy) business models, EoL (end-of-life) by composting
- Cooperation with different parties to find out minimum requirement
- Communication programmes
- Clear regulation for recycling as there is uncertainty some bio-based materials (like cellophane) is bio-based but cannot be recycled
- Clear specifications for the desired product properties for the parties who are making the solutions
- Active communication and media relations
- Regular information and discussion on coming regulations - in Europe, America and APAC (Asia-Pacific countries)
- Multi-discipline research
- Push from regulations/government
- End-of-life aspects integrated into the development of solutions
- Clear information on raw materials and correct recycling
- Development of product designs
- Check the requirements, are they all really needed
- Competitive pricing
- Method on end-of-life possibilities
- Evidence of climate benefits; action to avoid littering and microplastics in composite products, less single use products
- More media attention to bio-based solutions
- Open communication on scenario analyses

This project has received funding from the Bio Based Industries Joint Undertaking (JU) under the European Union's Horizon 2020 research and innovation programme under grant agreement No 887727.

Figure 11. MIRO board of set of solutions produced to mitigate the top risks when switching to bio-based Finland workshop

This project has received funding from the Bio Based Industries Joint Undertaking (JU) under the European Union's Horizon 2020 research and innovation programme under grant agreement No 887727.

What are solutions to the main barriers of consumer demand growth for bio-based products?

The participants in the Finnish workshop were asked to provide solutions to the top 3 main barriers of consumer demand i.e. cost of bio-based products, uncertainty regarding sustainability of bio-based products, and lack of consumer knowledge on the benefits of bio-based. Public administration, researchers, and consumer representative stakeholders provided solutions around greater awareness raising and a standardised labelling system (Table 1). Industry and brand owners focused more on sustainability metrics, showing the impact of choosing bio-based through clear and systematic communication of bio-based content.

Table 1. Consumer demand growth for bio-based products solutions provided by type of stakeholder Finland workshop

Public Administration, Researchers, and Consumers	Industry and Brand Owners
Labelling - understanding what the real benefits are from a sustainability perspective.	Creating common EU wide rules for communicating bio-content and correct recycling on packaging
Expand emission (or non-bio-based ness) trading to consumer level. If you buy a non-bio-based containing product, it will directly cost more.	Transparent sustainability value communication to reduce greenwashing
Greater awareness raising	Clear communication of facts with no jargon
A standardized labelling system would give consumers reliable information of the product	Traffic lights or colour coding indicating the sustainability of the product (based on LCA) in the same way as for food in some countries
Discouraging imagery on fossil-based products	To show the real impact when choosing the bio-based solution. People are willing to impact if it is made easy for them
Simplify & systematize the bio terminology, make the sustainability impact of different options easier to compare	Have patience to get payback for your investment
Climate aspect as well other environmental impacts of materials to be opened in comparisons between materials	Unifying sustainability metrics to clarify communication
It needs to be easy to choose bio-product - visualise the difference	Support to industry leaders to be able to start - others will follow
Dissemination of scientific results with such a way that consumers understand and trust them	Education to support consumer behaviour decision making
	Front running, quick responses, pacts

This project has received funding from the Bio Based Industries Joint Undertaking (JU) under the European Union's Horizon 2020 research and innovation programme under grant agreement No 887727.

What are some potential incentives, which could stimulate uptake of bio-based approaches by brand owners?

Figure 12. Incentive measures to stimulate uptake of bio-based approaches by brand owners Finland workshop stakeholder participants' responses

The participants in the Finland workshop were presented with an overview of the hard and soft measures for the categorisation of incentive measures of direct regulations, economic instruments, voluntary approaches, information and advice sharing systems, market-based signalling approaches, and other measures and instruments. In response to this, the Finnish workshop participants gave the following potential incentives, which could stimulate uptake of bio-based approaches by brand owners;

- Taxing the bio-based solutions less
- Positive image
- National quota/targets for bio-based product/packaging uptake
- Brand image for visibility of sustainability
- Voluntary bio-pacts
- Underline the impact to meet their sustainability targets with choosing the bio-based solutions
- Requirements for bio-based content in some products (obligatory)
- Toxicity (etc) labelling for non-bio-based material containing products
- New Eco-labels
- EU wide common bio-based label

This project has received funding from the Bio Based Industries Joint Undertaking (JU) under the European Union's Horizon 2020 research and innovation programme under grant agreement No 887727.

- Incentives for bio-based products used in sensitive environments
- Agreement within the EU
- A standardized bio-label
- Show the impact in carbon footprint and other criteria that fits into company environmental targets
- Communicating consumer demands to brand owners
- Enforcing regulation (e.g., use of X % renewable material in all packaging)
- Agreement with brand owners, equivalent to the Paris agreement

3.1.2 BELGIAN REGIONAL RESULTS

What are the main barriers when switching to bio-based approaches considered by the Belgian stakeholders?

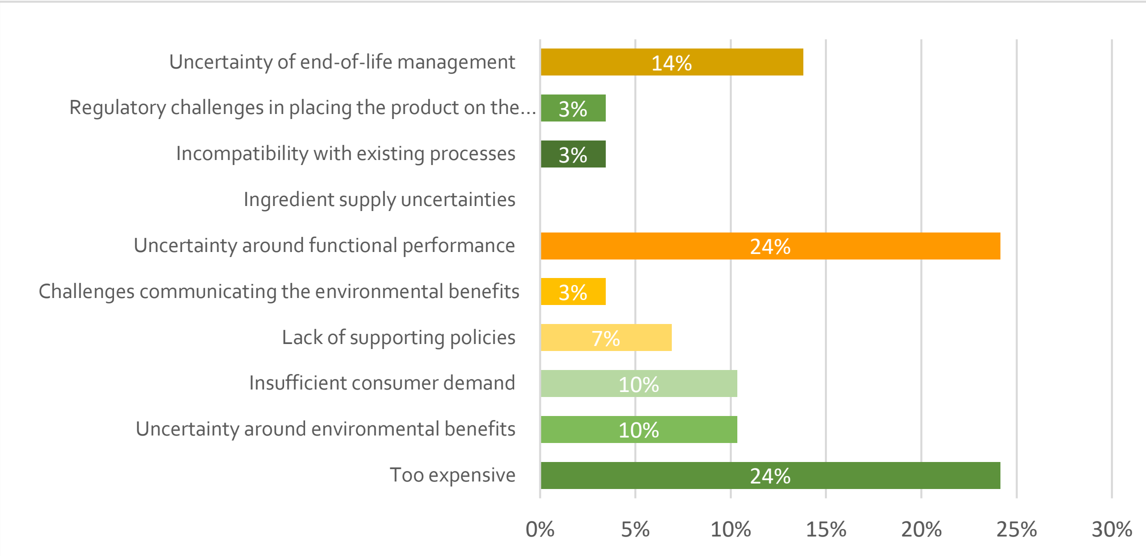

Figure 13. Voting results to the main barriers to bio-based approaches Belgium workshop

For participants in the Belgian workshop cost (too expensive 24 %) and uncertainty around functional performance (24 %) are ranked as the top barriers to the uptake of bio-based products and packaging, with 14 % indicating uncertainty of end-of-life management as the third top barrier. The main barrier being cost is in line with the previously undertaken regional interviews of Belgian brand owners, wherein 83 % of brand owners indicated too expensive as the main barrier. The other main barriers identified by surveyed Belgian brand owners include: lack of customer knowledge on the benefits of bio-based products (50 %), uncertainty around sustainability of bio-based products (33 %). Belgian stakeholders (brand owners, industry, public administration, academia) consider uncertainty around functional performance and uncertainty of end-of-life management as being of higher concern.

This project has received funding from the Bio Based Industries Joint Undertaking (JU) under the European Union's Horizon 2020 research and innovation programme under grant agreement No 887727.

What are solutions to the identified main barriers to bio-based uptake?

In response to providing solutions to the identified main barriers to bio-based uptake the participants in the Belgian workshop provided the following solutions (Figure 14);

- To lower taxes (for bio-based products)
- More research on functionality
- Recyclability of bio-based - existing PP or PE is not recycled, bio PE won't be recycled either
- Increase production
- More information about benefits
- Local production capacity
- Optimize production process
- Engage with waste management companies
- Carbon tax
- barrier possibilities not clear
- Level playing field with (supported) bioenergy options
- More testing of bio-based components
- Waste valorisation
- legislation: min % bio-based used in packaging
- Carbon tax
- Cooperation with waste processors/fermenting
- Cradle to cradle analysis
- Higher production

This project has received funding from the Bio Based Industries Joint Undertaking (JU) under the European Union's Horizon 2020 research and innovation programme under grant agreement No 887727.

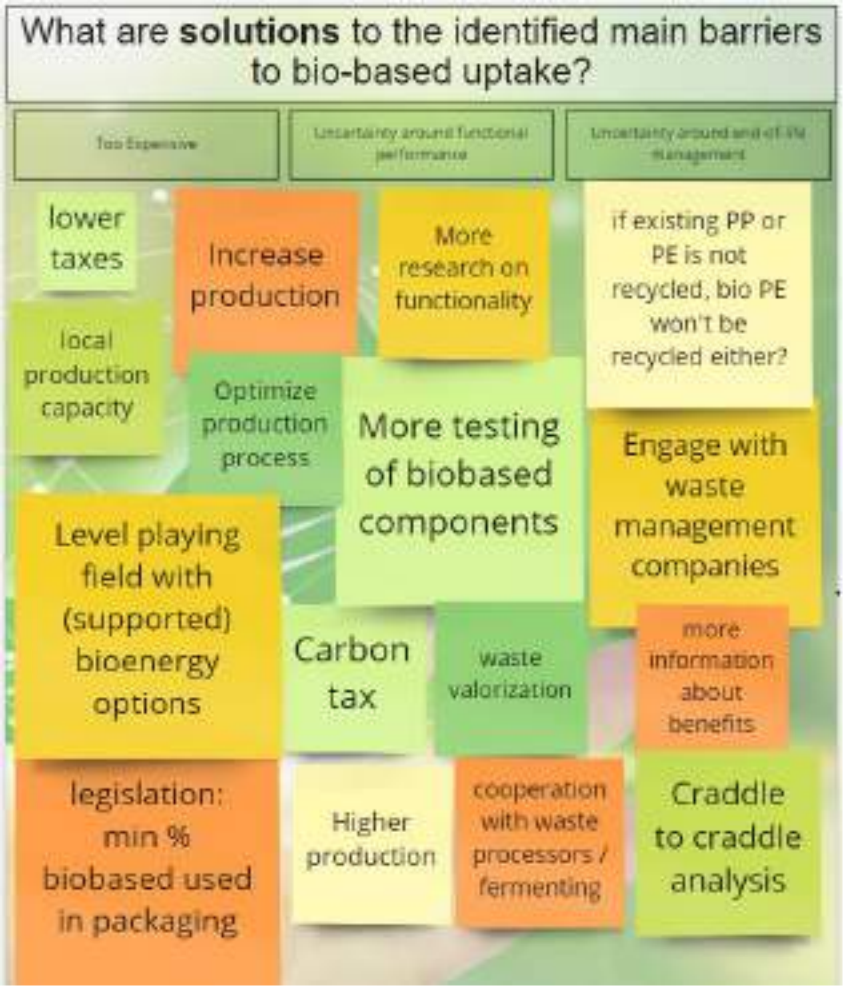

Figure 14. MIRO board of solutions to the identified main barriers to bio-based uptake Belgian workshop

What are the top risks when switching to bio-based approaches identified by the Belgian stakeholders?

For Belgian stakeholders, incompatibility with existing processes (43 %) is the clear top risk associated with the transition to bio-based approaches. Supply chain uncertainty (29 %) is ranked the second associated risk with switching to bio-based. By comparison, in the regional interviews previously undertaken Belgium brands had identified as main risks: poor functionality (66 %), feedstock or ingredient supply chain uncertainties (50 %), and incompatibility with existing process and insufficient customer demand (33 %).

This project has received funding from the Bio Based Industries Joint Undertaking (JU) under the European Union's Horizon 2020 research and innovation programme under grant agreement No 887727.

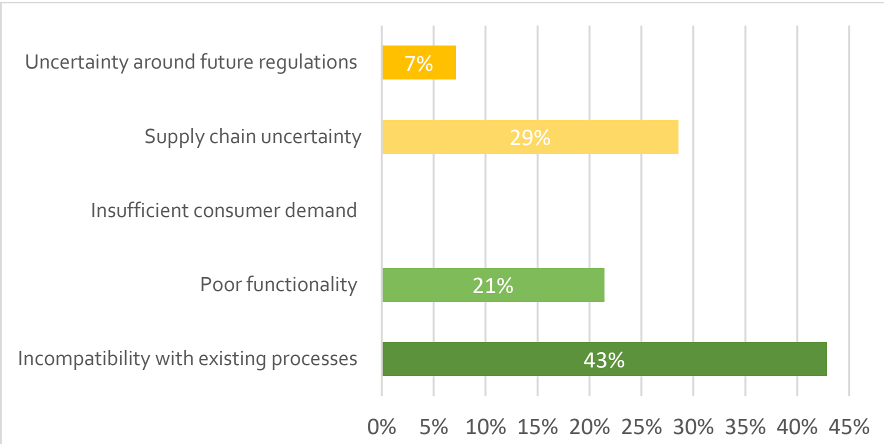

Figure 15. Voting results of top risks considered by Belgian stakeholders

What are solutions and mitigation actions to the identified main risks for brand owners by the Belgian stakeholders?

Figure 16. MIRO board of solutions and mitigation actions to the identified main risks for brand owners Belgium workshop

The stakeholders at the Belgian regional workshop responded to solutions and mitigation actions to the identified main risks for brand owners by providing the following solutions;

- Develop best practices
- Optimization study
- LCA
- Role of barrier layers (EVOH)
- Research and development
- Having the same properties as non-bio-based solutions
- Research
- Change product design to adapt to bio-based components
- Publish documented case studies
- Role of additives

This project has received funding from the Bio Based Industries Joint Undertaking (JU) under the European Union's Horizon 2020 research and innovation programme under grant agreement No 887727.

What are solutions to the main barriers of consumer demand growth for bio-based products?

The participants in the Belgian workshop were asked to provide solutions to the main barriers of consumer demand for cost of bio-based products, uncertainty regarding sustainability of bio-based products, and lack of consumer knowledge on the benefits of bio-based. The participants provided their answer based on type of stakeholder; divided into public administration, researchers, and consumers on the one hand, and industry and brand owners on the other hand (Table 2).

Table 2. Consumer demand growth for bio-based product solutions provided by type of stakeholder Belgian workshop

Public Administration, Researchers, and Consumers	Industry and Brand Owners
Clear product labelling	A good brand purpose
Information campaigns	Clear labelling to inform consumers
Share LCA studies	Certificates
Public education programmes	Right combination of bio-based packaging-and product
Fossil tax	Ethylene vinyl alcohol (EVOH)
Bio-based procurement	Eco labelling
Knowledge sharing	Requirements by law to reduce fossil based components
Make the switch more interesting	Best cases presented
Fund use of bio-based products	Standardisation to make consumers comfortable with bio-based

What are some potential incentives, which could stimulate uptake of bio-based approaches by brand owners?

Belgian stakeholders provided potential incentives, which could stimulate uptake of bio-based approaches under the categorisation of incentive measures of direct regulations, economic instruments, voluntary approaches, information and advice sharing systems, market-based signalling approaches, and other measures and instruments.

This project has received funding from the Bio Based Industries Joint Undertaking (JU) under the European Union's Horizon 2020 research and innovation programme under grant agreement No 887727.

Figure 17. Incentive measures to stimulate uptake of bio-based approaches by brand owners Belgian workshop stakeholder participants' responses

3.1.3 SPANISH REGIONAL RESULTS

What are the main barriers when switching to bio-based approaches considered by Spanish stakeholders?

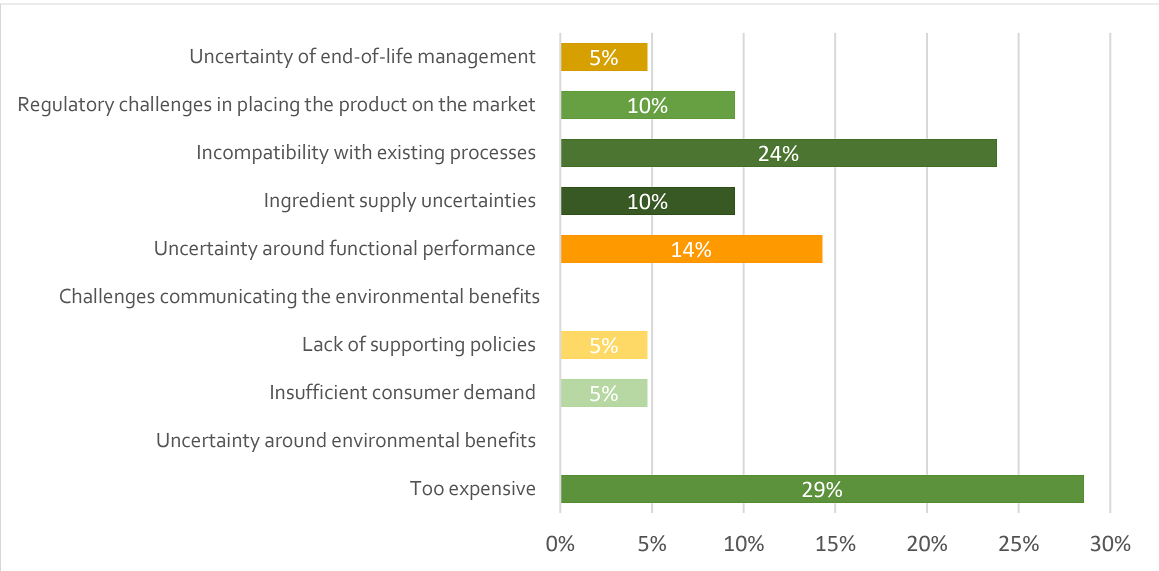

Figure 18. Voting results to the main barriers to bio-based approaches Spain workshop

This project has received funding from the Bio Based Industries Joint Undertaking (JU) under the European Union's Horizon 2020 research and innovation programme under grant agreement No 887727.

The increased cost of bio-based approaches is a key concern for stakeholders in the Spanish workshop, with 29 % voting for too expensive as the top barrier. Incompatibility with existing processes is ranked second (24 %) and uncertainty around functional performance (14 %) is also considered a top barrier by Spanish stakeholders. By comparison, during the previously undertaken regional interviews, Spanish brand owners had chosen too expensive (100 %) and lack of customer knowledge on bio-based products (66 %) as the primary barriers.

What are solutions to the identified main barriers to bio-based uptake?

In response to providing solutions to the identified main barriers to bio-based uptake, the participants in the Spanish workshop provided the following solutions;

- Increasing the demand should decrease the final price
- Measures for doing less expensive the transition periods
- Resistance to thermal processes
- Promote functional studies within Universities
- Increase public funding for projects related to the adaptation of processes
- Grants in development and investments
- Grants for the implementation of technological developments
- Carry on studies that support the benefits
- Amend legislation to promote the creation of a market for bio-based materials
- Public administration promotion measures
- Development New approaches that allow similar results
- Public promotion measures to stimulate the demand
- Public research focussing on bio-based issues
- Value chain development
- Establishment of value chain linkage networks
- Generate market research information
- Financial support for both development and investment.
- Establishment of value chain linkage networks.
- Generate market research information.
- Targeted public research on bio-based issues.
- Promote University-Business collaborations.
- Implementation in production processes as efficiently as possible. (other)
- Establish a clear and concise regulatory framework with finalist funds

This project has received funding from the Bio Based Industries Joint Undertaking (JU) under the European Union's Horizon 2020 research and innovation programme under grant agreement No 887727.

Figure 19. MIRO board of solutions to the identified main barriers to bio-based uptake Spanish workshop

This project has received funding from the Bio Based Industries Joint Undertaking (JU) under the European Union's Horizon 2020 research and innovation programme under grant agreement No 887727.

What are the top risks when switching to bio-based approaches identified by the Spanish stakeholders?

The top risks associated with bio-based approaches identified by Spanish stakeholders are **insufficient consumer demand** and **incompatibility with existing processes, both ranking 30 %.** Supply chain uncertainty ranked third at 20 %. In comparison to the previously undertaken regional interviews, insufficient consumer demand (100 %) was also the top risk identified by Spanish brand owners, along with poor functionality (66 %) and uncertainty around future regulations (33 %) as the main risks associated with bio-based product uptake.

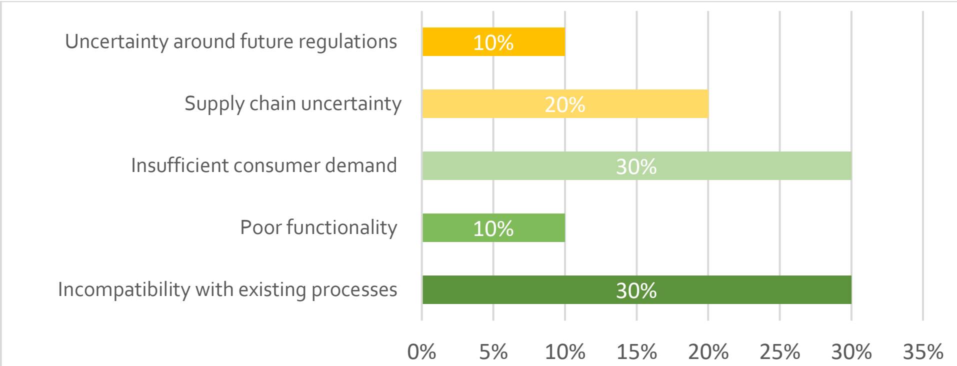

Figure 20. Voting results for top risks Spain workshop

What are solutions and mitigation actions to the identified main risks for brand owners?

Figure 21. Solutions to top risks Spain workshop

The stakeholders at the Spanish regional workshop responded to solutions and mitigation actions to the identified main risks for brand owners by providing the following solutions;

- Consumer awareness
- Financial support
- Networking in the value chain
- Increased consumer information
- Process operability
- More information for consumers
- Public grants for the implementation of technological developments
- Involve stakeholders in the generation of regulations
- Establish a clear and concise regulatory framework with finalist funds

This project has received funding from the Bio Based Industries Joint Undertaking (JU) under the European Union's Horizon 2020 research and innovation programme under grant agreement No 887727.

What are solutions to the main barriers of consumer demand growth for bio-based products?

The participants in the Spanish workshop were asked to provide solutions to the main barriers of consumer demand for cost of bio-based products, uncertainty regarding sustainability of bio-based products, and lack of consumer knowledge on the benefits of bio-based. The participants provided their answer based on type of stakeholder; divided into public administration, researchers and consumers, and industry and brand owners (Table 3).

Table 3. Consumer demand growth for bio-based products solutions provided by type of stakeholder Spain workshop

Public Administration, Researchers, and Consumers	Industry and Brand Owners
Greater dissemination (marketing) of associated benefits.	Trying to get similar prices, similar properties and reduce safety risks
Increase marketing actions around knowledge and create an emotional link with the consumer "consumer experience".	Marketing will be crucial
Inform and educate about the products	Demonstrate improvements (effectiveness)
Increased the awareness raising from the public administration	Increasing marketing through networks and co-operations
Consumers have the information, we should just make some more effort to buy bio although usually it is more expensive	By-product regulation very important
Legislation that favours and encourages the use of bio based raw materials	
Financial aid	
Further promotion and answers	
See what has been done in other more advanced countries	

This project has received funding from the Bio Based Industries Joint Undertaking (JU) under the European Union's Horizon 2020 research and innovation programme under grant agreement No 887727.

What are some potential incentives, which could stimulate uptake of bio-based approaches by brand owners?

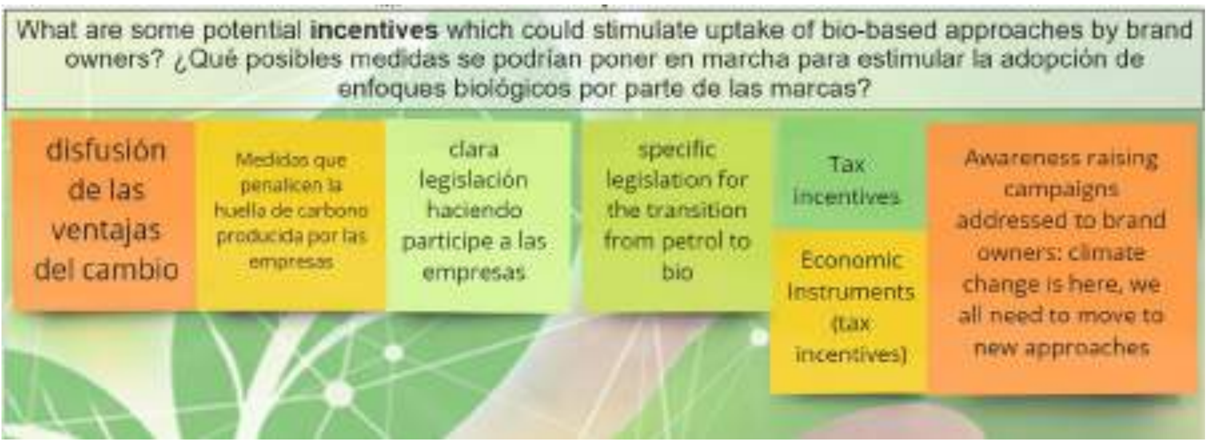

Figure 22. Incentives measures to stimulate uptake of bio-based approaches by brand owners Spain workshop

The incentive measures to stimulate uptake of bio-based approaches by brand owners produced by Spanish stakeholders involved economic instruments and legislation. Awareness raising campaigns addressed to brand owners regarding the need to move to new approaches, tax incentives, specific aid to reduce economic risks, greater dissemination by public bodies, medium-term measures with good training for companies and short-term hard measures to maintain with soft measures are all suggestions made by the Spanish stakeholders.

3.1.4 DANISH REGIONAL WORKSHOP

What are the main barriers when switching to bio-based approaches considered by the Danish stakeholders?

For the Danish stakeholders uncertainty around functional performance (25 %) and uncertainty of end-of-life management (19 %) are considered the main barriers to the uptake of bio-based approaches. Unlike the results from the other workshops, cost does not feature as high a concern for the participants in the Danish workshop, which is discussed further in section 4.1. The third barrier is indeterminate as uncertainty around environmental benefits, incompatibility with existing processes and too expensive all rank the same on 13 % each. In the previously undertaken regional interviews of brand owners, Danish brands had chosen too expensive (57 %), uncertainty around sustainability of bio-based products (42 %), lack of on the market products (42 %) and lack of customer knowledge (42 %) as the primary barriers The regional workshop results vary completely with Danish stakeholders ranking **uncertainty around functional performance** and **uncertainty of end-of-life management** as the main barriers when switching to bio-based approaches.

This project has received funding from the Bio Based Industries Joint Undertaking (JU) under the European Union's Horizon 2020 research and innovation programme under grant agreement No 887727.

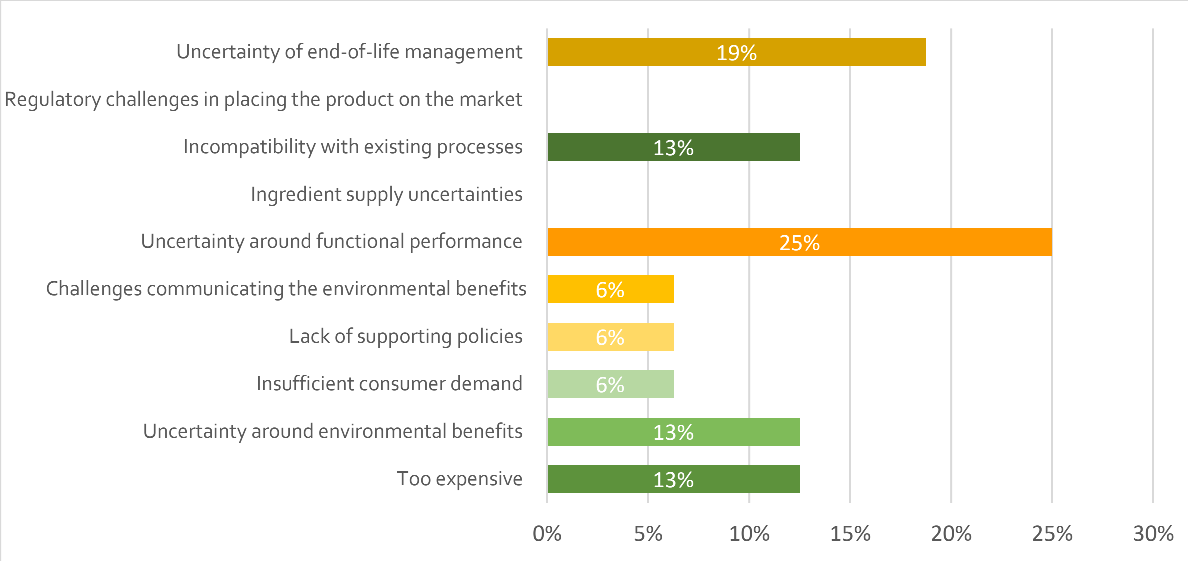

Figure 23. Voting results to the main barriers to bio-based approaches Finland workshop

What are solutions to the identified main barriers to bio-based uptake?

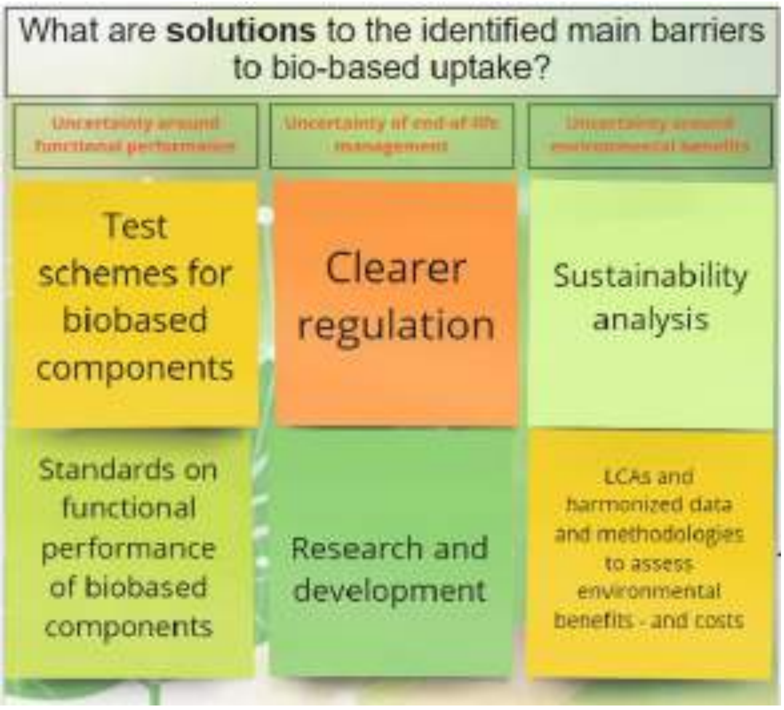

Figure 24. MIRO board solutions to main barriers to bio-based uptake Denmark workshop

In response to providing solutions to the identified main barriers to bio-based uptake, the participants in the Danish workshop provided the following solutions;

- Test schemes for bio-based components
- Sustainability analysis
- Clearer regulation
- Research and development
- LCAs and harmonized data and methodologies to assess environmental benefits and costs
- Standards on functional performance of bio-based components

This project has received funding from the Bio Based Industries Joint Undertaking (JU) under the European Union's Horizon 2020 research and innovation programme under grant agreement No 887727.

What are the top risks when switching to bio-based approaches identified by the Danish stakeholders?

Poor functionality (38 %) is considered the top risk by stakeholders that participated in the Danish workshop. This is followed by supply chain uncertainty (23 %), uncertainty around future regulations (15 %) and incompatibility with existing processes (15 %). By comparison with the previously undertaken regional interviews, Danish brands identified poor functionality (85 %), feedstock or supply chain uncertainties (42 %), and incompatibility with existing processes (28 %) as the top risks. **Poor functionality**, **supply chain uncertainty** and **incompatibility with existing processes** are considered the top risks when switching to bio-based by both Danish brand owners and Danish stakeholders (industry, brand owners, public administration, academia).

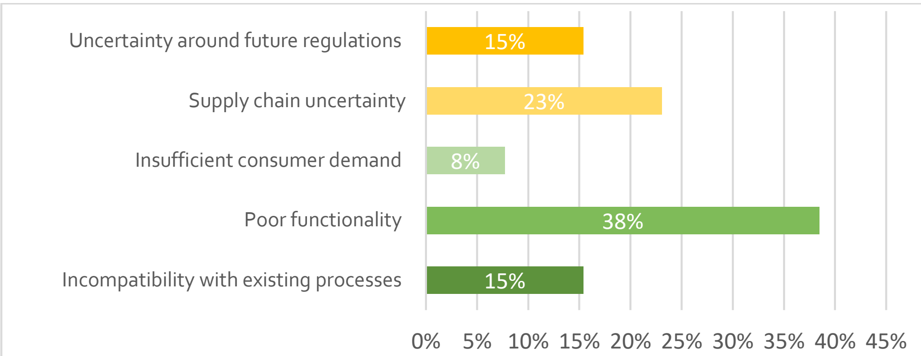

Figure 25. Voting results to the top risks when bio-based approaches Denmark workshop

What are solutions and mitigation actions to the identified main risks for brand owners?

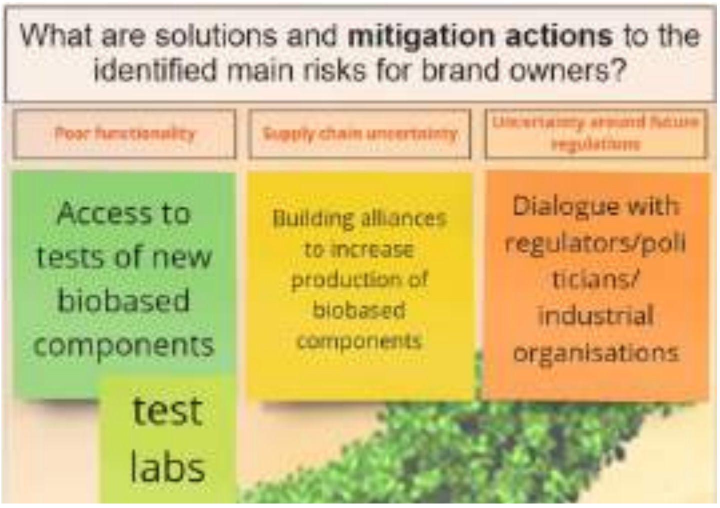

Figure 26. MIRO board Denmark workshop mitigation actions to the main risks for brand owners

The stakeholders at the Danish regional workshop responded to solutions and mitigation actions to the identified main risks for brand owners by providing the following solutions;

- Access to tests of new bio-based components
- Building alliances to increase production of bio-based components
- Dialogue with regulators/politicians/ industrial organisations
- Test labs

This project has received funding from the Bio Based Industries Joint Undertaking (JU) under the European Union's Horizon 2020 research and innovation programme under grant agreement No 887727.

What are solutions to the main barriers of consumer demand growth for bio-based products?

The participants in the Danish workshop were asked to provide solutions to the main barriers of consumer demand for cost of bio-based products, uncertainty regarding sustainability of bio-based products, and lack of consumer knowledge on the benefits of bio-based. The participants provided their answer based on type of stakeholder; divided into public administration, researchers and consumers, and industry and brand owners (Table 4).

Table 4. Consumer demand growth for bio-based products solutions provided by type of stakeholder Denmark workshop

Public Administration, Researchers, and Consumers	Industry and Brand Owners
	Information campaigns on environmental benefits of bio-based products Increased tax on fossil-based products Public procurement schemes to favouritise bio-based products

What are some potential incentives, which could stimulate uptake of bio-based approaches by brand owners?

Figure 27. Incentive measures to stimulate uptake of bio-based approaches by brand owners Denmark workshop stakeholder participants' responses

Participants in the Danish workshop provided some potential incentives, which could stimulate the uptake of bio-based approaches by brand owners under the categories of direct regulations, economic and instruments information and advice sharing systems. The standardisation on qualifications of environmental benefits and quotas for bio-based products are suggested to incentives brand owners.

This project has received funding from the Bio Based Industries Joint Undertaking (JU) under the European Union's Horizon 2020 research and innovation programme under grant agreement No 887727.

3.2 Pan-European Results and Set of Solutions

What are the main perceived barriers to the uptake of bio-based approaches considered by participants of the pan-European Workshop?

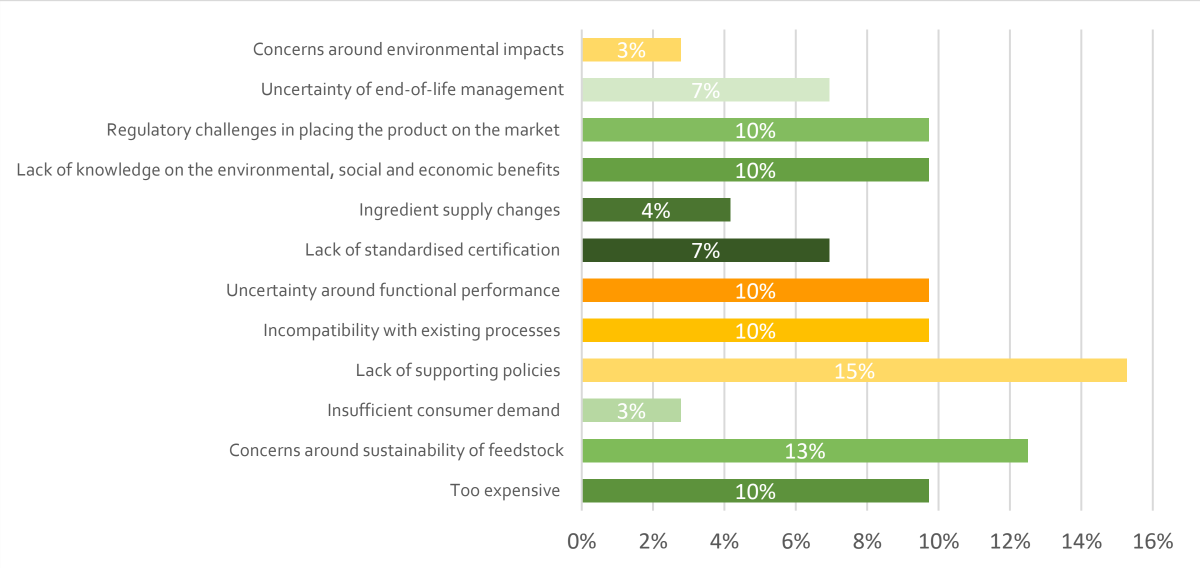

Figure 28. Voting results of the top perceived barriers to the uptake of bio-based approaches pan-European workshop

The perceived barriers to the European bioeconomy that could prevent companies taking up bio-based approaches were evaluated by participants prior to the pan-EU workshop in a pre-workshop questionnaire where additional perceived barriers to the European bioeconomy were provided. Challenges communicating the economic and social benefits, concerns about source of renewable feedstock, and concerns about other environmental impacts (fertilizer use, biodiversity, water use, eco-toxicity etc.) were assessed as being main barriers. These additional barriers were incorporated into the list of main barriers for ranking in the pan-EU workshop. These additional options were described as; 'lack of knowledge on the environmental, social and economic benefits', 'ingredient supply changes' and 'concerns around sustainability of feedstock'. These changes to the identified main barriers were reflected in the ranking of the top 3 barriers by the pan-European workshop participants. Lack of supporting policies (15 %) was identified by the pan-EU stakeholders (academia, consumers, brand owners, public administration and industry) as being the main barrier to bio-based uptake which ranks considerably higher compared to the main barriers identified by brand owners in the previous pan-EU survey (ranked 8th). The re-evaluation of the main barriers has resulted in concerns around sustainability of feedstock ranking as the second main barrier considered by pan-European stakeholders. This is in contrast to the previously undertaken pan-EU survey of brand owners, which indicated cost (58 %) and uncertainty around functional performance (54 %) as the main barriers to bio-based uptake among brand owners. The solutions to these identified main barriers provided by pan-EU stakeholders can be seen below in table 5.

This project has received funding from the Bio Based Industries Joint Undertaking (JU) under the European Union's Horizon 2020 research and innovation programme under grant agreement No 887727.

Table 5. Pan-European workshop set of solutions to the main barriers of bio-based uptake

Barriers	Solutions
Lack of supporting policies	- Specific EPR fees / exemption of plastic tax for bioplastics - Lobby for experimental pilots, piloting to gain experience - Field labs, shared facilities - Advocacy and lobbying in EU level - Maybe not so much about supporting policies as about policies that provide a catalyst for change. They have to decide to change before they look for supporting policies. - Biopreferred policy - Carbon tax - with ringfence for tax to support bio-based - Lobbying - Biopreferred programme and public green procurement is fundamental - Create a backstop consumer to justify scale-up of supply volumes - the public sector being the obvious - Allow waste as feedstock in food packaging and more (currently restricted) - Drop-in replacements available - Incentive to change - give industry a sunset deadline for change (done in past successfully & currently being done with petrol cars. Can do same for packaging, chemicals, materials and more. This will change the upstream supply chains - Simplification of regulatory landscape for product application - Advocacy efforts - Clarification that some bio based materials are drop-ins (they are chemically the same as their fossil counterparts)
Concern over sustainability of feedstock	- Sustainability frameworks and criteria - Focus on real circular uses of biomass - LCAs - Challenge simplistic thinking - Certification systems' - Give transparency about the raw materials used (origin, land use, etc.) - Better use of waste (coproducts) - Transparency and data (LCA etc) - Straight forward and transparent certifications - Prove it by LCA studies: incorporating product-packaging - Trustworthy and recognised certification systems - Assess best use case and value for feedstocks to support high value applications - Blockchain integration in the biomass supply chain - Provide evidence, through LCA etc. that they are sustainable

This project has received funding from the Bio Based Industries Joint Undertaking (JU) under the European Union's Horizon 2020 research and innovation programme under grant agreement No 887727.

Uncertainty about functional performance	- Visibility for the success stories - Pilot scale manufacturing possibilities without a need for high CAPEX investments - Possibility to trial the new bio-based solutions in the end application in early phase - More about novel functionalities rather than comparing to (fossil-based) - Industry is not open for R&D collaborations, especially in assisting start-ups - Interdisciplinary research and industry alliances - Targeted R&D and cluster partnerships with industry & R&D & SMEs - Projects to improve their functionality taking into account the end-of-life - Need for many groups of interest to come together and agree on proposals - Develop tools to provide information on availability of feedstocks

What are the top risks when switching to bio-based approaches identified by the stakeholders participated in pan-European workshop?

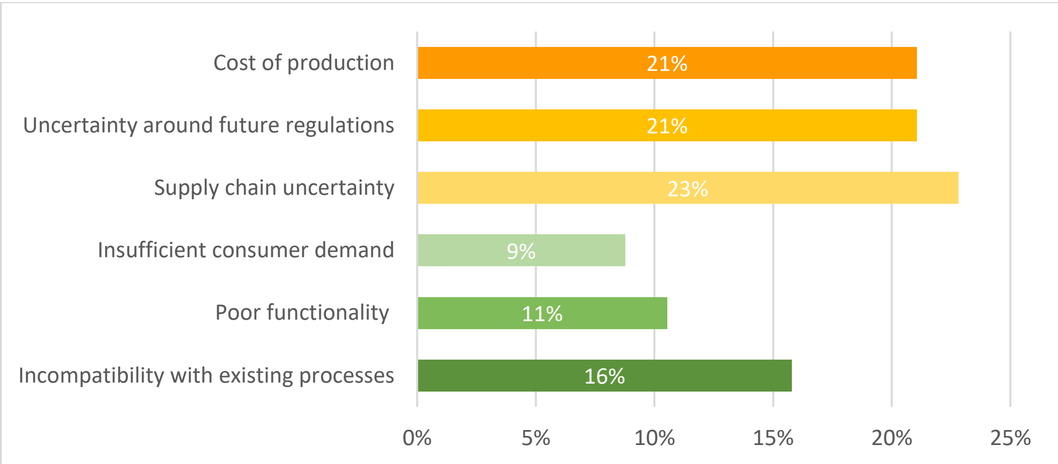

Figure 29. Voting results of the top perceived risks when switching to bio-based approaches pan-European workshop

The additional perceived risks when switching to bio-based approaches from the pre-workshop questionnaire of the pan-EU workshop registered participants gave the additional feedback regarding uncertainty around cost-efficient biological feedstocks availability, origin of feedstock and inability to keep production at previous high scale (Table 6). The re-evaluation of the top risks resulted in the additional risk of cost of production to be included in the list of risks to be voted on in the

This project has received funding from the Bio Based Industries Joint Undertaking (JU) under the European Union's Horizon 2020 research and innovation programme under grant agreement No 887727.

workshop. This is reflected in the pan-EU workshop results as the EU stakeholders ranked cost of production (21 %) as joint second along with uncertainty around future regulations (21 %). The top risk identified by European stakeholders is supply chain uncertainty (23 %). This is a new set of top risks identified by pan-EU stakeholders compared to the main risks associated with bio-based product uptake identified by brand owners in the previously undertaken pan-EU survey, wherein 61 % of brands indicated poor functionality as the primary risk following by 52 % indicating incompatibility with existing processes and 48 % uncertainty around future regulations.

Table 6. Pan-European workshop set of solutions to the top risks when switching to bio-based approaches

Risk	Solutions
Supply chain uncertainty	- Facilitate building new value chains - Partnerships throughout the value chain - Focus on coproducts - Long-term contracts - Brands cannot take all the added-value but must share it along the value chain, especially farmers - Feedstock providers are hesitant to present data from their side - Provide tools to provide information on feedstock availability - Refrain from competing policies, e.g. RED, biodiversity protection, etc. - Some key brands will not switch unless there are competing bio-based suppliers - a challenge for new Innovation and must be tackled head-on - Long-term feedstock offtake agreements - Develop standards to enable trade - Secure decent income to biomass producers (farmers, forest owners, etc.)
Cost of production	- Regulatory incentives from government; equal playing field - Better integration between engineers and innovators - Level playing field with fuels, to get feedstock price at par with fossil feedstock - Economies of scale will solve much of this but it is a catch22 in that reductions in cop will not be Realised until demand/investment is there - hence must create a 'backstop consumer' via public Procurement and/or regulations ringfencing demand volumes - Internalisation of environmental costs of fossil into prices - Price will reduce if enough is made so better processes - Addressed in Long term through economies of scale - Introduction of fossil carbon taxes - Costs of production can be dealt with along with consumer demand
Uncertainty around future regulations	- Must lobby for regulations this risk will stop investors investing in new bio-based innovation - Policy confirmation of the carbon neutrality of biomass

This project has received funding from the Bio Based Industries Joint Undertaking (JU) under the European Union's Horizon 2020 research and innovation programme under grant agreement No 887727.

	- Get regulations to get level playing field with fuels, to get feedstock price at par with fossil feedstock - Cascading use of biomass - Better collaboration between producers and processors - Food use hierarchy - Ensure people are given an opportunity to input to regulations through public consultation - role for Representative bodies to provide submissions in response to such consultations - Get experimental room from government, piloting to gain knowledge to feed back into policy and regulations - Educate investors and banks to de-risk investment for infrastructure financing

Figure 30. Solutions to stimulate consumer demand growth pan-EU workshop

Stakeholders at the pan-EU workshop gave potential incentive measures which could stimulate the uptake of bio-based by brand owners under direct regulations, economic instruments, voluntary approaches, information and advice sharing systems, and market-based signalling approaches (Figure 31);

- Enforce use of environmentally friendly products and inputs especially in agriculture, forestry and food
- Public green procurement
- Benefit: decoupling from fossil resources
- Punish through tax those with higher emissions
- Reduce their climate footprint
- Name and shame the cost to world of petro-consuming product brands

This project has received funding from the Bio Based Industries Joint Undertaking (JU) under the European Union's Horizon 2020 research and innovation programme under grant agreement No 887727.

- Fossil carbon tax
- Sustainability certificates for bio-based products
- Incentivise investment by shareholders in bio-based companies
- Showcase technically superior answers and invest
- Stimulate market demand
- Success stories with bio-based solutions in media: positive publicity and marketing
- Positive incentive for % bio-based in product
- Change in the KPIs of a company
- What is the impact with the bio-based choice to meet the sustainability targets -> LCA data available and comparison to LCA data of fossil based solution
- A framework (backed by regulations set in stone and not able to be changed by elections)
- Submit access to investments to a bio preference (e.g. via sustainable finance)
- Work with green finance as they adopt ESG (Environmental, Social, and Governance) and their new conversation around 'nature capital'
- Focus on some community benefits of bio-based products so benefits to community not brand
- Mistaken view that we should compare functionality rather than promote smart natural products like wool, algae, etc
- Building infrastructures
- Stimulate market demand
- To bring also other technical benefits with the bio-based solutions
- Competitions, and associated PR to reward companies for bio-based activities - peer recognition, supplier and market recognition
- Must offer backstops to enable scale-up while we are developing - so cash flow, demand and more do not cut down new supply for business reasons when the offtake is better for UN SDG (Sustainable Development Goals) and future proofing

This project has received funding from the Bio Based Industries Joint Undertaking (JU) under the European Union's Horizon 2020 research and innovation programme under grant agreement No 887727.

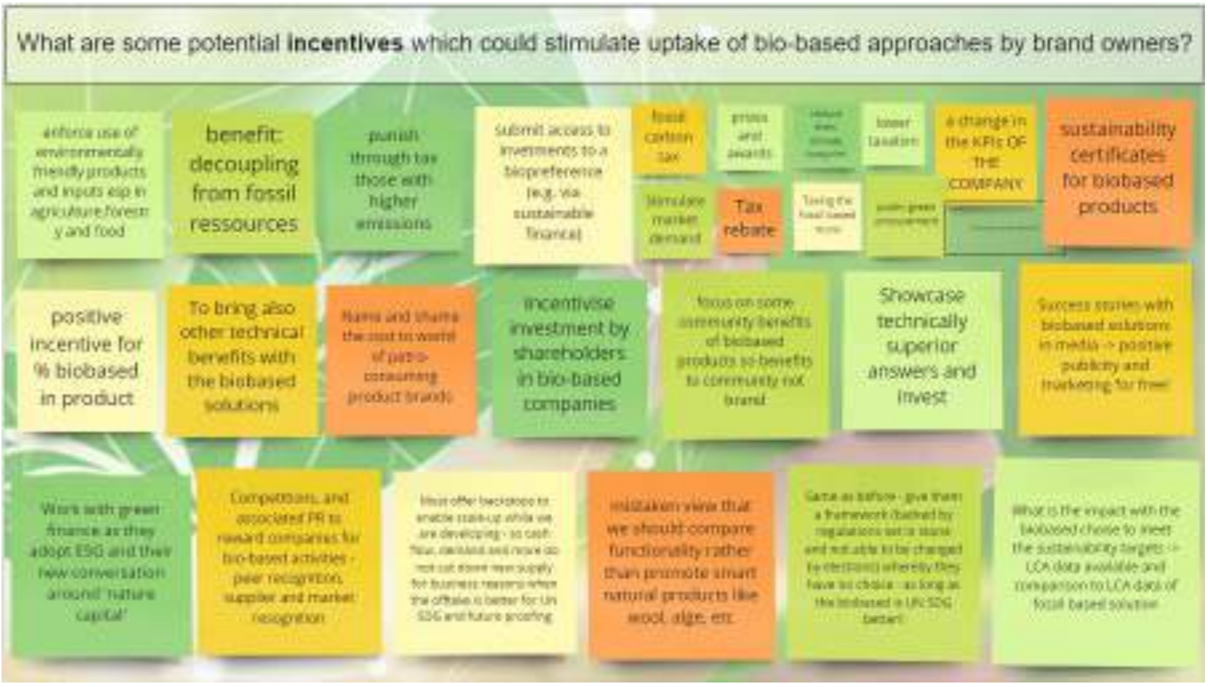

Figure 31. Incentive measures to stimulate uptake of bio-based approaches by brand owners Pan-EU workshop

4 DISCUSSION

4.1 Analysis of stakeholder responses to barriers in uptake of bio-based approaches and solutions for overcoming these barriers

When analysing and comparing the results of our 4 regional workshops as to the barriers of bio-based product uptake we find some trends beginning to emerge. In most cases, a key barrier noted by stakeholders was the costs involved in bio-based product uptake, the fact that the products are considered more expensive that existing fossil-based alternatives. This was found to be the top barrier in Belgium (alongside uncertainty around functional performance), Finland (alongside uncertainty around functional performance) and Spain. Uncertainty around functional performance was the top barrier among Danish stakeholders and jointly among Finnish and Belgian stakeholders. Only in Denmark was cost not viewed as a major barrier, a result that was in keeping with our previous Danish brand interviews (Deliverable 1.1.). Incompatibility with existing processes was a major barrier for the Spanish stakeholders, ranking second as a barrier, with uncertainty around end-of-life management seen as a barrier in Denmark (ranking second) and Belgium (ranking third).

Interestingly when it came to the pan-EU workshop results to barriers in relation to bio-based product uptake, the results varied quite significantly compared with the regional workshops. In this case, lack

This project has received funding from the Bio Based Industries Joint Undertaking (JU) under the European Union's Horizon 2020 research and innovation programme under grant agreement No 887727.

of supporting policies was identified as the top barrier to bio-based product uptake, a barrier, which had not ranked highly with any of the regional workshops. The second highest ranking barrier in our pan-EU workshop was concerns around feedstock sustainability. This was a new barrier, which had been introduced based on feedback from attendees who were invited to submit any barrier gaps, which had not previously been taken into account. Finally, a number of barriers ranked jointly in third place, including; regulatory challenges placing the product on the market, lack of knowledge on environmental, social and economic benefits (new barrier introduced by pan-EU stakeholders), uncertainty around functional performance, incompatibility with existing processes and too expensive.

Solutions to overcome the identified pan-EU and regional barriers to uptake of bio-based products were developed with input from stakeholders in our workshops. These are documented in Section 3. Based on the feedback it was possible to broadly allocate proposed solutions across six different categories;

(i) Policy (regulations and tax)
(ii) Research and Development
(iii) Education and knowledge sharing
(iv) Investment
(v) Labelling and standards
(vi) Stakeholder engagement

Proposed policy solutions include; introduction of a carbon tax (proposed both at EU and regional level), requiring a minimum percentage of bio-based content in certain packaging or products, carbon taxes on products, removal of subsidies on fossil industry, level playing field for bio-based products with bioenergy options, clear regulatory framework and clarity on future regulations to support decision making. R&D solutions proposed include; more comparative studies between bio-based and fossil-based products, more comparative LCA analyses between products and greater market and consumer research on bio-based products. Some proposed Education and Knowledge sharing solutions included helping consumers to recognise bio-based products, educating decision makers, circulating good case studies and success cases and ensuring greater media attention for bio-based products. In relation to investment, solutions included investment in scaling up bio-based product production to reduce costs, and grants for implementing technology developments. Under the category of R&D, standards around functional and environmental performance of bio-based components was proposed, along with clearer instructions regarding the end of life management for bio-based products. Several solutions were proposed which are related to stakeholder engagement including; greater industry dialogue with regulators, more collaborative actions and development and greater cooperation throughout the entire value chain. The consolidated list of solutions from regional events are captured in Table 7, while the set of solutions proposed at the pan-EU workshop are captured in Table 8.

This project has received funding from the Bio Based Industries Joint Undertaking (JU) under the European Union's Horizon 2020 research and innovation programme under grant agreement No 887727.

Table 7. Categorized set of solutions for barriers to switching to bio-based approaches from regional workshops

Category	Set of Solutions
1.Policy (Regulations & Tax)	- Requiring a minimum percentage of bio-based content in certain packaging/products - Establishing a clear regulatory framework - Placing carbon tax on product - Removing subsidies in fossil sector - Providing a level playing field with already incentivized bioenergy options - Improving knowledge and certainty on future regulation to help inform decisions
2.Research & Development	- Improving bio-based product functionality through R&D - Testing schemes or programmes for bio-based components - Improving functionalities to reduce price pressure - Providing more comparative studies between bio-based and fossil products in specific applications - Conducting cradle to cradle and LCA comparative studies - Conducting greater market/consumer research on bio-based products - Ensuring greater collaboration development of packaging design -
3.Education & Knowledge Sharing	- Help consumers to better recognise bio-based products - Educate & demonstrate the benefits of bio-based products to brands and consumers - Educate decision makers - Ensure greater media attention for bio-based products - Circulate good case studies and success stories
4.Investment	- Invest in scaling up bio-based product production to reduce costs - Grants for the implementation of technological developments
5.Labelling, Standards & Certification	- Clearer labelling of bio-based products - Clearer instructions regarding end-of-life management - Standards on functional/environmental performance of bio-based components
6.Stakeholder Engagement	- Greater industry dialogue with regulators - More collaborative ingredient and development - Greater cooperation throughout the entire value chain - Greater engagement with waste management providers/bodies

This project has received funding from the Bio Based Industries Joint Undertaking (JU) under the European Union's Horizon 2020 research and innovation programme under grant agreement No 887727.

Table 8. Categorized set of solutions for barriers to switching to bio-based approaches from regional workshops

Category	Set of Solutions
1.Policy (Regulations & Tax)	- Specific EPR fees / exemption of plastic tax for bioplastics - Introduction of an equivalent of the "Biopreferred" programme to support green public procurement - Carbon tax - with raised finances ringfenced for tax to support bio-based products - Incentivizing change - providing industry with a deadline for change (done in past successfully & currently being done with petrol cars. Could be applied to packaging, chemicals, materials and more. This will change the upstream supply chains
2.Research & Development	- Piloting to gain experience - Trial the new bio-based solutions in the end application in early phase - Assessing best use case and value for feedstocks to support high value applications - Developing tools to provide information on availability of feedstocks to overcome uncertainty in supply chains
3.Education & Knowledge Sharing	- Providing evidence through LCAs that products are sustainable - Providing transparent information about the raw materials used (origin, land use, etc.) - Sharing more information about novel functionalities of bio-based products rather than comparing to (fossil-based) - Educating more about the potential of drop-in replacements which won't impact on functionality (they are chemically the same as their fossil counterparts)
4.Investment	- Investment in pilot scale manufacturing possibilities without a need for high CAPEX investments
5.Labelling, Standards & Certification	- Developing and ensuring trustworthy, transparent and recognised certification systems
6.Stakeholder Engagement	- Advocacy and lobbying for supportive polices at EU level - Lobbying for experimental pilots

This project has received funding from the Bio Based Industries Joint Undertaking (JU) under the European Union's Horizon 2020 research and innovation programme under grant agreement No 887727.

4.2 Analysis of stakeholder responses to risks in uptake of bio-based approaches and solutions for overcoming these risks

The analysis of the trends of risks in bio-based uptake emerging from stakeholders from the 4 regional workshops shows that perceptions and concerns around the functionality of the bio-based products compared with the comparative fossil-based is perceived as the main risk, ranking highest amongst Danish and Finnish stakeholders. For both Belgian and Spanish stakeholders there are concerns over how the bio-based ingredients will fit in with the existing processes of organisations (incompatibility with existing processes) and this is seen as the biggest risk in both countries (in Spain this is the top risk jointly with insufficient consumer demand). As was the case in our regional interviews, Spain is a country where insufficient consumer demand is seen as a major risk in uptake of bio-based approach, something which is less evident in stakeholders from our other participating countries (in Belgium for example, no stakeholders voted insufficient consumer demand as being a top 3 risk). Supply chain certainty is identified as a key risk in bio-based ingredient or product uptake, particularly among our stakeholders in Belgium, Denmark and Spain where it ranked as the second highest risk, while uncertainty around future regulations ranked as the second highest risk in Finland.

Once again, we noticed some considerable differences when comparing the regional workshop findings to the pan-EU workshop results. Incompatibility with existing processes and perceived poor functionality ranked lower among stakeholders in our pan-EU workshops. Here the biggest risk identified was supply chain uncertainty, with stakeholders concerned that a switch to bio-based approaches may be impacted by some issues around the supply of these ingredients. The next highest ranking risk was uncertainty around future regulations, which taken with the barrier results above, indicate that pan-EU stakeholders feel policy has a significant role to play in improving brand and market uptake of bio-based products. The next highest risk identified was cost of production, which again was a new risk, introduced based on feedback from attendees who were invited to submit any risk gaps, which had not previously been taken into account.

Solutions to overcome the identified pan-EU and regional risks to uptake of bio-based products were developed with input from stakeholders in our workshops. These are documented in Section 3. Again these solutions to risks have been allocated across six different categories; (i) Policy (regulations and tax), (ii) Research and Development (iii) Education and knowledge sharing (iv) Investment (v) Labelling and standards (vi) Stakeholder engagement. Policy solutions proposed include government lobbying for dedicated regulations/directives, regulations to support a level playing field between the bio-based product and bioenergy sectors, and also the fossil sector, the avoidance of competing or incompatible policies, and regulations which ensure the sustainability of bio-based feedstocks used. R&D solutions included more emphasis on multi-disciplinary research to optimise bio-based products/components, developing of product design and end of life methods for bio-based components and greater market and consumer research on bio-based products. A number of solutions were proposed under the category of education and knowledge sharing including; greater sharing of bio-based case studies, providing tools to provide information on feedstock availability, sharing of data increasing consumer awareness through media advertisement of bio-based products for consumers and helping consumers to better recognise bio-based products through communication programmes. Solutions proposed under the category of investment included;

This project has received funding from the Bio Based Industries Joint Undertaking (JU) under the European Union's Horizon 2020 research and innovation programme under grant agreement No 887727.

providing public grants for the implementation of technological developments, providing financial support for the development of new bio-based components and educating investors and banks to de-risk investment for infrastructure financing. Solutions which were proposed which can be categorized under labelling, standards and certification include; ensuring clearer labelling of bio-based products and ensuring clearer information of raw materials and correct recycling requirements. A number of solutions were proposed which fall under the category of stakeholder engagement. These include; involvement of industry, brands and all value chain stakeholders in the development of regulations, greater dialogue between regulators, government bodies and industrial organisations, greater collaboration among all value chain stakeholders in bio-based component or product development and ensuring equitable allocation of returns across the value chain. The consolidated list of solutions to risks from the BIOSWITCH regional workshops is captured in Table 9, while the solutions to risks from the pan-EU workshop are captured in Table 10.

Table 9. Categorised set of solutions for risks associated with the switch to bio-based approaches from regional workshops

Category	Set of Solutions
1.Policy (Regulations & Tax)	- Lobbying governments for regulations and directives - Providing a level playing field with already incentivized bioenergy options
2.Research & Development	- Development of product design and end-of-life methods for bio-based components - Multi-disciplinary research, test laboratories and optimisation studies for bio-based components - Greater market/consumer research on bio-based products
3.Education & Knowledge Sharing	- Increasing consumer awareness through media advertisement of bio-based products for consumers - Helping consumers to better recognise bio-based products through communication programmes - Dissemination of bio-based case studies
4.Investment	- Providing public grants for the implementation of technological developments - Providing financial support for the development of new bio-based components

This project has received funding from the Bio Based Industries Joint Undertaking (JU) under the European Union's Horizon 2020 research and innovation programme under grant agreement No 887727.

5.Labelling, Standards & Certification	- Ensuring clearer labelling of bio-based products - Ensuring clearer information of raw materials and correct recycling requirements
6.Stakeholder Engagement	- Involvement of industry, brands and all value chain stakeholders in the development of regulations - Involvement of the entire value chain in development of bio-based products - Increased dialogue between regulators, government bodies and industrial organisations - More collaborative ingredient development - Building alliances and cooperation throughout the entire value chain to increase production of bio-based components

Table 10. Categorised set of solutions for risks associated with the switch to bio-based approaches from pan-EU workshop

Category	Set of Solutions
1.Policy (Regulations & Tax)	- Introducing regulatory incentives from government to provide an equal playing field - Avoiding competing policies, e.g. RED (Renewable Energy Directive), biodiversity protection, etc. - Introduction of policies to ensure the carbon neutrality of biomass - Introducing regulations which provide a level playing field with fuels, to ensure feedstock price is on par with fossil feedstock
2.Research & Development	- Piloting to gain knowledge to feed back into policy and Regulations
3.Education & Knowledge Share	- Providing tools to provide information on feedstock availability, sharing of data
4.Investment	- Educating investors and banks to de-risk investment for infrastructure financing
5.Labelling, Standards & Certification	

This project has received funding from the Bio Based Industries Joint Undertaking (JU) under the European Union's Horizon 2020 research and innovation programme under grant agreement No 887727.

6.Stakeholder Engagement	- Facilitating new value chains partnerships - Sharing of added value along the value chain from brands to farmers - Ensuring better integration between engineers and innovators - Ensuring better collaboration between producers and processors - Ensuring people are given an opportunity to input to regulations through public consultation - Securing decent income to biomass producers (farmers, forest owners, etc.)

4.3 Analysis of workshop recommendations to stimulate consumer demand growth for bio-based products

From our regional and pan-EU workshops a variety of recommendations to support or stimulate consumer demand growth for bio-based products were proposed, and these were captured depending on the type of respondent (i) public administration, researchers and consumers (ii) industry and brand owners. We noted no distinct differences between the stakeholder group recommendations. Education, knowledge sharing and communication are central to many of the proposed solutions including public information campaigns, marketing the benefits of bio-based products, use of environmental destruction imagery on fossil-based products to remove incentives from fossil-based products, better communicating the story behind the bio-based products, and education around bio-based products within primary school educational programmes. There are also proposals on how some policy measures may support consumer demand for bio-based products, including; clear EU-wide relations on communication of bio-based content and end of life management, clear labelling and certification, greater adoption of bio-based products through public procurement programmes, increased taxes on fossil-based products and regulations to reduce fossil based share of products. Other additional proposed solutions include developing cost-competitive products to attract those consumers unwilling to pay a green premium, developing and promoting novel product performance and developing bio-based products, which do not require too much change in adoption by consumers. The full set of regional solutions to stimulate consumer growth are captured in Table 11 with pan-EU solutions captured in Table 12.

Table 11. Final set of solutions to stimulate consumer demand growth from regional workshops

Public Administration, Researchers, and Consumers	Industry and Brand Owners
Increasing awareness through information campaigns and public information programmes	EU-wide regulations on the communication of bio-based content and end-of-life management

This project has received funding from the Bio Based Industries Joint Undertaking (JU) under the European Union's Horizon 2020 research and innovation programme under grant agreement No 887727.

Standardising bio-based labelling system for reliable information Removing incentives from fossil-based products (tax, environmental issues imagery on fossil-based products) Comparisons made between fossil-based and bio-based products Greater marketing of associated benefits of bio-based products	Unifying sustainability metrics with clear labelling & certification standardized across Europe Increasing tax on fossil-based products and regulations to decrease fossil-based share Ensuring public procurement schemes to favour bio-based products Support for industry leaders to encourage others to follow Labelling system for products based on LCA (colour coding)

Table 12. Final set of solutions to stimulate consumer demand growth from pan-EU workshop

Public Administration, Researchers, and Consumers	Industry and Brand Owners
Developing better understanding of consumers motivations for change Stimulating use of bio-based products in industries (positive incentives from government) (B2B) Educating consumers on the understanding of bio-based products and clearly demonstrated benefit to the environment Developing products that do not require significant changes for consumers - e.g. does not require acquisition of new knowledge to use, fits their existing routines and practices	Campaigns which target only the most relevant segment of consumers Communicating the creation story behind the new bio-based solutions Education programs (schools etc) to raise awareness to new generations Ensuring clear communication with an easily understandable sustainability impact of choosing the bio-based solution over the fossil based Developing and promoting novel product performance Ensuring a decent price to attract consumer not willing to pay a green premium

This project has received funding from the Bio Based Industries Joint Undertaking (JU) under the European Union's Horizon 2020 research and innovation programme under grant agreement No 887727.

4.4 Incentive Measures for Stimulating Uptake of Bio-based Approaches by Brand Owners

From the BIOSWITCH regional and pan-EU workshops a variety of recommendations were proposed by stakeholder groups to support or stimulate uptake of bio-based products among brand owners. At the regional workshops these included policy pull measures such as national targets or quotas for bio-based products and packaging, a minimum bio-based content share of bio-based products, tax incentives for bio-based products and carbon taxes for fossil-based incumbents. Financial support (push measure) to develop support development of bio-based component or products is also proposed, along with the development of standardized labelling and supply chain improvements. At the pan-EU workshops, incentive measures proposed included policy pull measures such as green public procurement, carbon tax and incentive based on percentage of bio-based content. Other solutions proposed include greater promotion of company/leaders who adopt bio-based products through competitions, introducing sustainability certificates for bio-based products/components and being able to demonstrate an improved environmental performance through LCA. A full list of proposed incentive measures for stimulating uptake of bio-based approaches among brand owners proposed by stakeholders at the regional and pan-EU workshops is presented in Table 13 below.

Table 13. Incentives measures for stimulating uptake of bio-based approaches by brand owners proposed by stakeholders at the regionals and pan-European workshops

Regional Workshop Incentive Measures	Pan-EU Workshop Incentive Measures
Development of standardised bio-based labelling Introducing national targets for bio-based products/packaging (quotas) Enforcement of a percentage share of bio-based ingredients Introducing tax incentives for bio-based and carbon tax for fossil-based Providing financial support for the development of bio-based products/components Supply chain improvements – increasing communication and	Green public procurement LCA comparison to the impact of bio-based solutions in comparison to fossil based products Carbon tax on fossil-based products Sustainability certificates for bio-based products Showcasing technically superior bio-based alternatives, investing and promoting success stories Providing incentives for bio-based content/share in product Changing the KPIs (Key Performance Indicators) of a company Working with green finance as they adopt ESG (Environmental, Social, and Corporate Governance) and their new conversation around 'nature capital'

This project has received funding from the Bio Based Industries Joint Undertaking (JU) under the European Union's Horizon 2020 research and innovation programme under grant agreement No 887727.

harmonisation to avoid 'bottlenecks'	Introducing competitions and associated PR activities to reward companies for bio-based activities - peer recognition, supplier and market recognition

5 CONCLUSIONS

This report summarised the results of the regional and pan-European workshops and detailed the set of solutions produced from each of the 5 workshops and a final set of solutions for the main barriers and risks when switching to bio-based approaches. The workshop results build on the European and regional results of the regional brand owner interviews and pan-EU survey on the needs, risks and motivations of brand owners switching to bio-based approaches and provides a multi-actor viewpoint on shaping solutions for the main barriers and risks when switching to bio-based approaches from regional and European-wide perspectives.

The report details the methodology and implementation of four regional workshop in Finland, Belgium, Spain and Denmark, and the one pan-European workshop. The 4 regional workshops in Finland, Belgium, Spain and Denmark were organised simultaneously to capture local viewpoints from a variety of stakeholders; industry, brand owners, public administration, consumer representatives and academia. The results of the four workshops fed into and shaped the subsequent pan-European co-creation workshop, along with a pre-workshop questionnaire on additional barriers and risks to bio-based approaches. The re-evaluation produced a new list of perceived risks and barriers, which was ranked at the pan-European workshop. The workshops also focused on disseminating the results from the BIOSWTICH project, with presentation of the results of the EU and regional barriers, needs, risks and motivations for brand owners and consumers to switch to bio-based, results of EU consumer drivers and motivations, and a range of policy and incentive measures to address the risks and barriers to brand owner and consumer uptake of bio-based products. The disseminated information during the workshop provided stimulation for the interactive session of the workshops.

5.1 Take home messages from the regional and pan-European workshops

1. Based on the BIOSWITCH regional multi-actor stakeholder workshops the main barriers to switching to bio-based approaches are according to regional stakeholders; uncertainty around functional performance and too expensive (Finland), too expensive (Belgium and Spain), uncertainty around functional performance (Denmark). This is in

This project has received funding from the Bio Based Industries Joint Undertaking (JU) under the European Union's Horizon 2020 research and innovation programme under grant agreement No 887727.

line with our previously undertaken regional interviews wherein cost was also the main barrier for Finnish, Spanish and Belgian brand owners, and uncertainty around functional performance for Danish brand owners.

2. In contrast, lack of supporting policies is identified as being the main barrier to bio-based uptake among stakeholders at the BIOSWITCH pan-EU workshop. This did not feature as a prominent barrier in the pan-EU survey and the difference is probably due to the multi-actor responses of academia, consumers, brand owners, public administration and industry (pan-EU workshop) compared to only brand owners (pan-EU survey). In the case of the pan-EU survey cost and uncertainty around functional performance were the most prominent barriers perceived by the European brand owners, while in the pan-EU workshop, lack of supporting policies and concerns around sustainability of feedstock were perceived as the main barriers to bio-based.
3. Solutions to overcome barriers associated with bio-based products uptake were broadly allocated across six categories with some of the solutions provided below;
    a. Policy-based solutions e.g. introduction of a carbon tax, requiring a minimum percentage of bio-based content in certain packaging or products, removal of subsidies for fossil industry, level playing field for bio-based products with bioenergy options, clear regulatory framework and clarity on future regulations to support decision making
    b. R&D solutions e.g. more comparative studies between bio-based and fossil based products, more comparative LCA analyses between products and greater market and consumer research on bio-based products
    c. Education and knowledge sharing solutions e.g. helping consumers to recognise bio-based products, educating decision makers, circulating good case studies and success cases and ensuring greater media attention for bio-based products
    d. Investment solutions e.g. investment in scaling up bio-based product production to reduce costs, and grants for implementing technology developments
    e. Labelling, standards and certification solutions e.g. standards around functional and environmental performance of bio-based components was proposed, along with clearer instructions regarding end of life management for bio-based products
    f. Stakeholder engagement solutions e.g. greater industry dialogue with regulators, more collaborative research and development and greater cooperation throughout the entire value chain
4. The top risks to switching to bio-based approaches, according to BIOSWITCH regional stakeholders, were poor functionality (Finland and Denmark), incompatibility with existing process (Belgium), incompatibility with existing process and insufficient consumer demand (Spain).This contrasted with our previously undertaken regional interviews wherein the top risk for Spanish brand owners was incompatibility with

This project has received funding from the Bio Based Industries Joint Undertaking (JU) under the European Union's Horizon 2020 research and innovation programme under grant agreement No 887727.

existing processes and uncertainty over future regulations for Finnish brand owners. The top risk for Belgium and Denmark (poor functionality) was consistent between the regional workshops and previous regional interviews.

5. By contrast, supply chain uncertainty, uncertainty around future regulations, and cost of production were identified as the top risks when transitioning from fossil-based to bio-based approaches according to the European bioeconomy stakeholders (researchers, consumers, brand owners, public administration and bio-based industry). From our previously undertaken pan-EU survey involving only brand owners the primary risks identified were poor functionality and incompatibility with existing processes. As with the identification of primary barriers, pan-EU stakeholders again put greater emphasis on policy as a risk to bio-based product uptake along with supply chain uncertainty.
6. Solutions to overcome risks associated with bio-based products uptake were broadly allocated across six categories with some of the solutions provided below;
    a. Policy-based solutions e.g. government lobbying for dedicated regulations/directives, regulations to support a level playing field between the bio-based product and bioenergy sectors, and also the fossil sector, the avoidance of competing or incompatible policies, and regulations which ensure the sustainability of bio-based feedstocks used
    b. R&D solutions e.g. greater multi-disciplinary research to optimise bio-based products/components, developing of product design and end of life methods for bio-based components and greater market and consumer research on bio-based products
    c. Education and knowledge sharing solutions e.g. greater sharing of bio-based case studies, providing tools to provide information on feedstock availability, sharing of data increasing consumer awareness through media advertisement of bio-based products for consumers and helping consumers to better recognise bio-based products through communication programmes
    d. Investment solutions e.g. providing public grants for the implementation of technological developments, providing financial support for the development of new bio-based components and educating investors and banks to de-risk investment for infrastructure financing
    e. Labelling, standards and certification solutions e.g. ensuring clearer labelling of bio-based products and, ensuring clearer information of raw materials and correct recycling requirements
    f. Stakeholder engagement solutions e.g. involvement of industry, brands and all value chain stakeholders in the development of regulations, greater dialogue between regulators, government bodies and industrial organisations, greater collaboration among all value chain stakeholders in bio-based component or

This project has received funding from the Bio Based Industries Joint Undertaking (JU) under the European Union's Horizon 2020 research and innovation programme under grant agreement No 887727.

product development and ensuring equitable allocation of returns across the value chain

7. Through the BIOSWITCH workshops at pan-EU and regional level, a set of solutions to stimulate consumer demand growth for bio-based products was also co-developed. Education, knowledge sharing and communication are central to many of the proposed solutions including public information campaigns well as school educational programmes, marketing the benefits of bio-based products and better communicating the story behind the bio-based products, while policy measures to support consumer demand could include clear labelling and certification and greater adoption of bio-based products through public procurement programmes. More cost-competitive products to attract those consumers unwilling to pay a green premium and developing and promoting novel product performance and developing bio-based products, which do not require too much change in adoption by consumers were additional proposed solutions.
8. Through the BIOSWITCH workshops at pan-EU and regional level a set of incentives to stimulate uptake of bio-based products was also discussed. These include policy pull measures such as targets or quotas for bio-based products and packaging, tax incentives for bio-based products or content of bio-based and greater public procurement of bio-based product, along with sustainability certificates for bio-based products or components and greater championing or promotion of companies who make the switch to bio-based approaches.

This project has received funding from the Bio Based Industries Joint Undertaking (JU) under the European Union's Horizon 2020 research and innovation programme under grant agreement No 887727.

6 APPENDIX

6.1 Appendix 1: Agenda for Regional Workshops

PRESENTATIONS	
11:30 – 11:40	Welcome and Introduction: BIOSWITCH project overview in a regional context, best practices and regional case study (CLIC/FF/CTA/FBC)
11:40 – 11:50	*Presentation 1:* Results of **needs, risks and motivations** for brand owners and consumers to Switch to Bio-based (ITT)
11:50 – 12:00	*Presentation 2:* Results of **EU consumer drivers and motivations**, consumer acceptance analysis (VTT)
12:00 – 12:10	*Presentation 3:* Presenting a range of **policy and incentive measures** to address the risks & barriers to brand owner and consumer uptake of bio-based products (BTG)
12:10 – 12:20	Ice-breaker poll and instructions for interactive session (ITT)
INTERACTIVE WORKSHOPS	
12:20 – 12:50	**Co-creation Workshop:** Identifying risks (& barriers) to switching to bio-based and developing a set of solutions (ITT)
12:50 – 13:00	Closing of the session (CLIC/FF/CTA/FBC)

6.2 Appendix 2: Agenda for pan-European Workshop

PRESENTATIONS	
09:00 – 09:10	Welcome and Introduction (CLIC) BIOSWITCH project overview in a European-wide context
09:10 – 09:20	Presentation 1 (MTU) Results of needs, risks and motivations for brand owners and consumers to switch to bio-based
09:20 – 09:30	Presentation 2 (VTT) Results of EU consumer drivers and motivations, consumer acceptance analysis
09:30 – 09:40	Presentation 3 (BTG) Presenting a range of policy and incentive measures to address the risks & barriers to brand owner and consumer uptake of bio-based products
09:40 – 09:50	Instructions for interactive session and ice-breaker poll (MTU)
INTERACTIVE WORKSHOPS	

This project has received funding from the Bio Based Industries Joint Undertaking (JU) under the European Union's Horizon 2020 research and innovation programme under grant agreement No 887727.

09:50 – 10:20	Co-creation Workshop (MTU) Identifying risks & barriers to switching to bio-based and developing a global set of solutions
10:20 – 10:30	Q&A and closing of the session (CLIC)

6.3 Appendix 3: Set of solutions to the main barriers & risks when switching to bio-based approaches produced from regional workshops, presented at pan-EU workshop

This project has received funding from the Bio Based Industries Joint Undertaking (JU) under the European Union's Horizon 2020 research and innovation programme under grant agreement No 887727.

This project has received funding from the Bio Based Industries Joint Undertaking (JU) under the European Union's Horizon 2020 research and innovation programme under grant agreement No 887727.