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Improving the public acceptance of bio-based products and processes at regional and local level

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Project Overview

BIOBRIDGES is a 24 months action aiming at boosting the marketability of bio-based products - BBPs by establishing close cooperation and partnership between bio-based Industries - BBI, brand owners and consumers' representatives. The ultimate goal is to stimulate and support the active engagement of and interaction among all stakeholders (including local communities and local authorities) and improve market acceptance of BBPs.

BIOBRIDGES will design and implement replicable methodologies, procedures and good practices supporting multistakeholders' interaction, leading to new cross-sector partnerships. Main activities will be:

- Identify the cooperation challenges among consumers, brand owners and BBI
- Create a sustainable multi-stakeholder community involving consumer representatives, BBI and brand owners from different bio-based economy clusters and stimulate dialogue and cooperation
- Following a co-creation approach, increase consumers' and brand owners' awareness, confidence and trust on the benefits of BBPs compared to the fossil-based counterparts,
- Support the establishment of at least 2 new cross-cutting interconnections in bio-based economy clusters and define replicable procedures and good practices leading to the establishment of new cross-sector partnerships and business opportunities
- Stimulate the multi-stakeholder discussion toward pre-and co-normative research, new standardisation/labelling and emerging co-creation models (B2B and B2C).

At the end of the project, at least 2 new cross-sector interconnections in bio-based economy cluster will be established, while the foundations for the creation of new ones based on the arguments, best practices and recommendations deriving from the project will be formed.

The BIOBRIDGES consortium merges a variety of complementary expertise, aiming to build a consistent multi-actor approach integrating 9 partners already involve in other projects like BIOWAYS, BIOVoices and BIOSTEP.

Consortium	
Estonia	Civitta Eesti As
Italy	Fva Sas Di Louis Ferrini & C
Greece	Q-plan International Advisors Pc
Germany	Ecologic Institut Gemeinnützige GmbH
Italy	Agenzia Per La Promozione Della Ricerca Europea
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1. EXECUTIVE SUMMARY

This paper provides three recommendations to improve the public acceptance of bio-based products and processes:

1. **Improve knowledge, education, and awareness on the bioeconomy.** Even though bio-based products and processes generally are viewed positively, the public remains ill-informed on what they exactly constitute and what benefits they could offer. This lack of knowledge combined with high expectations on product performance could result in expectations not being met, and thus, disappointment. In turn, this could obstruct the market uptake of bio-based products.
2. **Facilitate a transparent and credible participation of civil society in the development, implementation, and monitoring of bioeconomy strategies.** Civil society, distinctively not guided by government or business interests, is a key bioeconomy stakeholder due to its commitment to social progress. In this light, consumers and citizens should play an active role as co-creators in innovation processes and strategy development related to the bioeconomy.
3. **Strengthen the regional dimension of the bioeconomy.** Over the years, regions have increasingly become acknowledged – including in EU policy – as key actors that are in a unique position to foster bioeconomy development. Regional bioeconomy clusters are essential for citizens and consumers to experience the economic, social and environmental benefits of the bioeconomy. However, it has turned out that a significant portion of European regions are not able to fully seize their bioeconomy potential.

These recommendations are accompanied by concrete actions and good practice examples, based on stakeholder feedback received during the BIOBRIDGES project (2018-2020), relevant results of other EU-funded projects, as well as the results of a targeted literature review.

Bio-based products and processes constitute a key element of the bioeconomy. Over the years, the European Commission has increasingly directed effort towards moving away from a fossil-based economy and promote the use of biomass as a renewable alternative, an ambition consolidated with the revised 2018 European Bioeconomy Strategy and Action Plan.

Even though many policy makers are convinced of the bioeconomy's environmental, economic and social added value, it has turned out that citizens are not always equally enthusiastic, or even reject the concept. Different factors, or a combination thereof, can be attributed to this resistance, ranging from considerations concerning sustainability issues associated with the widespread use of biomass (e.g. biofuels competing with food production), to fear of being exposed to increased noise and air pollution due to newly built biorefineries in communities.

Securing widespread public acceptance for bio-based products and processes is a hurdle the EU needs to take to truly move away from fossil fuels, in addition to ensuring that biomass is sourced sustainably. Because without the support of citizens, establishing a market for these products will be challenging, if not impossible.

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2. Introduction

There is a continuously growing political interest in the bioeconomy at EU level. It holds the promise to reduce Europe's dependency on fossil-based resources, to contribute to climate mitigation and a carbon-neutral future and at the same time to strengthen the EU's industrial base, create jobs and revitalise rural areas, as outlined in the 2018 European Bioeconomy Strategy and Action Plan (European Commission, 2018a). Despite these potential positive impacts, for the bioeconomy to truly be sustainable and deliver its social, economic and environmental potential, close attention should be paid to whether biomass – such as agricultural crops and wood products, is sourced sustainably. The bioeconomy is only as sustainable as the biomass that is used as input. And even though biomass is renewable, there is a limit as to how much of it can be used without exceeding the regeneration capacity of nature.¹

Apart from the economic and environmental relevance of the bioeconomy, the European Commission recognises the role of society in the transition from a fossil-based towards a biomass-based economy in the 2018 Bioeconomy Strategy and Action Plan (European Commission, 2018a). The EU's Bioeconomy Strategy, as well as some national bioeconomy strategies (e.g. Austria, Germany, Italy), often address the role of society in the context of creating public acceptance for bio-based products. The former, for example, discusses the issue of boosting market uptake and consumer confidence by using instruments such as labels and standards, specific to bio-based products. In other words, ensuring that there is a market for bio-based products and processes. At the same time, the European Commission notes that the public consultation on updating the 2012 European Bioeconomy Strategy and Action Plan already showed that increasing public awareness and knowledge about all areas of the bioeconomy posed a major challenge (European Commission, 2018b).

More recently, a study indicated that **the public still largely remains uninformed about the bioeconomy**. They require more information and background knowledge to form an opinion on it (Hempel, Will, & Zander, 2019). What is clear, however, is that **public engagement is critical to improve the public acceptance of the bioeconomy, including bio-based products and processes**. Not least to avoid the occurrence of the “Not in my backyard” (also known as “NIMBY”) problem; citizens objecting to development projects (e.g. related to large-scale biomass production and processing) because they fear it will negatively impact their community. Considering that the European Commission estimates that the EU will require approximately 300 additional biorefineries by 2030 to meet market demand, and aims to rapidly deploy local bioeconomies across Europe, the possibility of community resistance to these developments is to be expected.

Improving knowledge, education and awareness plays a key role in securing citizen's support for the bioeconomy, but other aspects are pertinent as well; **involving civil society and reinforcing the regional dimension**. This paper provides recommendations on how to effectively put these objectives in practice. Based on stakeholder feedback received during 24 workshops organised in nine countries across Europe under the BIOBRIDGES project²,

¹ For example, a future increase in demand for bioenergy in the EU could lead to biodiversity loss not only in Europe, but also globally – the EU is currently a net importer of biomass – as a result of heightened logging activities.

² See Annex A for an overview of the workshops organized by the BIOBRIDGES project.

relevant results of other EU-funded projects (e.g. [BioSTEP](#), [BIOWAYS](#), [Open-Bio](#)), as well as the results of a targeted literature review, it puts forward three specific recommendations. The recommendations – each contextualised and sub-divided in several concrete actions – provide insight on **how to improve the public acceptance of bio-based products and processes**³. Good practice examples are listed for each, to provide inspiration as to what these actions could look like. The recommendations are relevant for public authorities interested in boosting the uptake of bio-based products or implementing their own bioeconomy strategies, but also for the monitoring and evaluation of the updated EU Bioeconomy Strategy and Action Plan of 2018. Considering that in the revised Circular Economy Action Plan of 2020 the European Commission states that it will enable greater circularity by, among others, “[. . .] supporting the sustainable and circular bio-based sector through the implementation of the Bioeconomy Action Plan”, the recommendations are also relevant in this regard.

³ According to the European Commission, bio-based products are “[. . .] are wholly or partly derived from materials of biological origin, excluding materials embedded in geological formations and/or fossilised. In industrial processes, enzymes are used in the production of chemical building blocks, detergents, pulp and paper, textiles, etc. By using fermentation and bio-catalysis instead of traditional chemical synthesis, higher process efficiency can be obtained, resulting in a decrease in energy and water consumption, and a reduction of toxic waste. As they are derived from renewable raw materials such as plants, bio-based products can help reduce CO₂ and offer other advantages such as lower toxicity or novel product characteristics (e.g. biodegradable plastic materials).” (European Commission, n.d.)

3. Recommendations for increased public acceptance of bio-based products and processes

3.1. Improve knowledge, education and awareness on the bioeconomy

3.1.1. Background

Academics widely use the concept of bioeconomy and predominantly agree over its characteristics, even though several definitions co-exist (Hempel, Will, & Zander, 2019). Following the publication of the 2012 Bioeconomy Strategy and Action Plan, more research has been conducted to better understand the public's perception of the bioeconomy and more specifically, bio-based products. Generally, consumers seem to have positive associations with bio-based products, but their lack of knowledge on the bioeconomy and limited access to robust product information could pose a threat to an increased market uptake of the latter.

In recent years, several EU-funded projects have implemented a number of consumer surveys that addressed the public acceptance and perception of bio-based products, such as the Open-Bio project, the BIOWAYS project and the STAR-ProBio project (Meeusen, Peuckert, & Quitzow, 2015; Karachaliou, Tsagaraki, Delioglani, & Kouzi, 2016; Lada, et al., 2019). Even though these surveys had slightly different focal points, some similarities in the results related to consumers' perception of bio-based products can be observed. Consumers expressed a willingness to buy bio-based products, but at the same time were unfamiliar with what they exactly constituted. In some cases, this could lead to high expectations on product performance – related to e.g. bio-based content – which could end in disappointment. Moreover, consumers consistently confirmed the usefulness of a (multi-criteria) labelling scheme to stimulate the market uptake of bio-based products. The [STAR-Bio](#) project concluded that: “Being able to prove and communicate that sustainability criteria are met will be a key acceptance driver for bio-based products” (Lada, et al., 2019).

The BIOBRIDGES project also conducted a consumer survey from June throughout October 2020; most respondents (81.4%) stated that they did not work in the bioeconomy sector. It was translated into nine languages and filled out by people from different age groups, educational backgrounds and sectors. In total, 1014 respondents took part from all over the world, but a large portion came from Croatia, Estonia, Germany, Greece, Italy, Portugal, Slovakia, Spain and the Netherlands. The preliminary survey results, summarized in Box 1, corroborate the survey results of the EU-funded projects mentioned above.

Box 1. Selection of preliminary-survey results of the BIOBRIDGES project

Respondents were asked to rate their awareness on the bioeconomy and bio-based products, using a 1-5 rating. With regard to the bioeconomy, a little less than one-fifth (19.3%) of respondents indicated they had never heard about the bioeconomy before. More than half (54.1%) picked a rating between 2-3, which implies they had heard about the concept before, but remained uninformed about what it entails exactly. The remaining respondents (26.5%) expressed a relatively high degree of familiarity. The results were to a large degree similar for bio-based products. Overall, however, respondents seemed to be slightly more familiar with bio-based products compared to the bioeconomy.

More than two-thirds of the respondents (67.1%) indicated a higher willingness to pay for bio-based products compared to fossil-based products, although the majority thereof (41.4%) would only pay up to 5% more. Around one-fifth stated that they would only buy the former at the same price as the latter. Approximately four out of every five respondents (79.9%) indicated that labels would help them to choose bio-based products over fossil-based products. Moreover, around one-fourth (25.6%) disclosed that they considered the amount of bio-based contents in a product as the most important information that they would like to see on such a label. Others prioritized information on the recyclability of bio-based products (17.2%) or how to dispose of bio-based products properly (16.2%).⁴

With regard to what motivates respondents to buy bio-based products, the three most often picked multiple-choice answers included, respectively, contributing to reduced pollution, it being a sustainable choice and pushing other brands to switch to other bio-based products. On the other hand, not wanting to pay so much, not having enough information, and not being able to pay so much were most often listed as reasons not to buy bio-based products. In a similar fashion, respondents could be motivated to buy bio-based products by receiving clear information on the products end-life, clear information on the whole value chain and financial incentives. Notably, the former most often picked researchers as from whom they would like to receive more information on bio-based products, as well as TV and social networks.

Other research findings confirm that the public is unfamiliar with bio-based products. They feel badly informed and find it difficult to take the “right” decisions (Hempel, Will, & Zander, 2019). Not understanding the benefits of bio-based products proves to be a barrier to their consumption (Pfau, Vos, Dammer, & Arendt, 2017). Even more so, this lack of understanding can lead to negative feelings or distrust (Sijtsema, et al., 2016). In addition, limited knowledge of the bioeconomy, including bio-based products and processes, is viewed as a major factor that could hinder public involvement (BioSTEP project, 2016). The fact that a product is bio-based is merely one factor that consumers take into account in their decision-making process. They perceive such a characteristic as an additional benefit, but personal benefits, such as e.g. price, looks and convenience, weigh more heavily (Pfau, Vos, Dammer, & Arendt, 2017).

⁴ Based on a selection of preliminary survey results of the BIOBRIDGES project. The project team will produce a detailed analysis of the survey results in D6.2 “Biobridges’ Action Plan for raising consumers’ awareness on bioeconomy and bio-based products”.

3.1.2. Actions

To improve knowledge, education and awareness on the bioeconomy, we recommend taking the following actions:

- D **Enable a broader societal discussion on sustainability issues associated with the bioeconomy.** Before promoting acceptance for bio-based products, sustainability issues associated with the bioeconomy should be discussed with the broader public. To facilitate this discussion, which can also help to manage the expectations of consumers on the potential of bio-based products, society needs transparent, evidence-based information. The European Commission and EU Member States should invest more in socio-economic and ecological research on the bioeconomy; many financial resources are currently reserved for technology-oriented research instead (Wolff, Kiresiewa, & Möller, 2020). This shift in focus is relevant for long-term planning; for Horizon Europe (2021-2027), it is foreseen that 10 billion EUR will be invested for research and innovation in food, agriculture, rural development and the bioeconomy, more than three times the amount reserved (3.85 billion EUR) for Horizon 2020 Societal Challenge 2 (2014-2020), which included food, sustainable agriculture and forestry, marine, maritime and inland waters research, and the bioeconomy (European Commission, 2018b).
- D **Further invest in the standardisation and labelling of bio-based products (preferably on a European level).** The results of different surveys indicate that the standardisation and labelling of bio-based products could have a significant positive impact on their uptake by boosting consumer confidence. A potential label should be multi-criteria as opposed to a single criterion, with sufficiently strict requirements to prevent greenwashing. As the European Commission points out, using EU funds to address methodological and data challenges would help make results publicly available, which in turn would lower the cost of conducting environmental analyses of bio-based products and their supply chain (European Commission, 2018b). This would also allow for a high degree of harmonization across the EU, ensuring that the same information on bio-based products is provided to all European consumers. Products should have a coherent and consistent narrative, with all production phases being sustainable from a social, environmental and economic perspective (Meeusen, Peuckert, & Quitzow, 2015).
- D **Provide research funding for science communication.** Investing in effective and interesting ways to make the public familiar with bioeconomy research could help to improve their understanding of the concept; clarifying, for example, the differences between the term “bioeconomy”, “circular economy” or “green economy”. Since limited knowledge of bio-based products and processes potentially poses a barrier to public involvement, such an effort could make a big difference. In this light, it is important to offer small bits of information and prevent an information overflow.⁵ Specific communication activities could include; a campaign on packaging accompanying a comparative purchase of normal plastics and bioplastics; a lecture series at universities shedding light on different facets of bioeconomy and discussing contents, processes

⁵ Highlighted during workshop in Germany (Bonn, 29 May 2019)

and product innovations with interested students and citizens; a bio-based parade (exhibition) drawing attention to innovative products; and YouTube videos.⁶

- D **Use success stories to help the public to better understand the bioeconomy concept.**⁷ Success stories can be used to communicate to the public in a tangible way the multiple benefits – e.g. the use of renewable resources, but also price, looks and convenience, which bio-based products can offer over fossil-based products. Since acquiring personal benefits plays a key role in consumers’ purchasing decisions, only stating that a product is bio-based will often not be sufficient to sway them. The communication should aim for a high degree of transparency.
- D **Pick the appropriate channel to disseminate information on the bioeconomy.** Generally, organizations that take on the role of communicators and facilitators at the regional level should be trustworthy, such as museums (BioSTEP project, 2016). The target audience should be taken into account when deciding on how to convey the message. The Commission Expert Group on Bio-based Products provides detailed suggestions/assessments in this regard, by dividing the general public into three separate groups; consumers, adolescents and NGOs, and suggesting different mediums for each; including TV, social networks and the press office, respectively (Expert Group on Bio-based Products, 2017).

3.1.3. Good practices

To improve knowledge, education and awareness on the bioeconomy, we recommend drawing inspiration from the following examples:

Bio-based circular economy in Pays de la Loire region, France

The Pays de la Loire (Western France) regional council approved a circular economy action plan in October 2019, which identified the agrifood industry and maritime industry as high potential sectors, among others (Pays de la Loire Region, 2018). In this light, the regional council participates in the [BIOREGIO](#) project, which is supported by the INTERREG Europe Program (Pays de la Loire Regional Council/Association of the Chambers of Agriculture of the Atlantic Area, 2019). Together with other stakeholders in the BIOREGIO project, the regional council published a roadmap called “Biobased Circular Economy Action Plan” to foster the bio-based circular economy in Pays de la Loire. This has proven to be a useful starting point for developing a sustainable and circular bioeconomy strategy at the regional level.

The Roadmap identifies agriculture, agrifood and fishing as the leading economic sectors in the Pays de la Loire Region and elaborates on four actions that are implemented over the period 2020-2021; communication, awareness raising and information based on concrete examples; enhancing the bio-based circular economy component in the Circular Economy Regional Call for Projects; enhancing supervision and coherence of initiatives on the territory; and implementing action research involving research laboratory and local authorities.⁸ The

⁶ Highlighted during workshop in Germany (Bonn, 29 May 2019)

⁷ Highlighted during workshop in Spain (Jaén, 17 May 2019)

⁸ The complete description of these four action points can be found in the bio-based circular economy action plan of the Pays de la Loire region:

https://www.interregeurope.eu/fileadmin/user_upload/tx_tevprojects/library/file_1576567323.pdf

action related to awareness raising is achieved by organizing events and participating in exhibitions related to the circular economy and/or bioeconomy, realizing a webinar within the Chambers of Agriculture of the Atlantic Area, as well as implementing awareness-raising actions aimed at consumer citizens (Pays de la Loire Regional Council/Association of the Chambers of Agriculture of the Atlantic Area, 2019).

Bioeconomy as topic of “Year of Science” in Germany

Starting in 2000, the German Federal Ministry of Education and Research (short “BMBF”) organizes an annual “Year of Science”. Until 2010, the topics were limited to individual disciplines, but after 2010 the focus shifted to interdisciplinary topics of the future. For the year 2020, the bioeconomy was selected as a topic, which was extended to also include the year 2021. The goal is to “[. . .] show, in a dialogue with people, what research in the field of the bioeconomy already has to offer – from energy production from biomass, car seats made of plant fibres to basic chemical substances of plant origin” (BMBF, 2020). There will be a new participatory format for the production and use of bioplastics set in a competitive context, as well as podcasts on the bioeconomy and a hackathon on the development of sustainable solutions for fashion. It is noted on the “Year of Science” website that for the bioeconomy to succeed, society should drive comprehensive change forward together (BMBF, 2020).

3.2. Facilitate a transparent and credible participation of civil society in the development, implementation and monitoring of bioeconomy strategies

3.2.1. Background

The extent of public acceptance of the bioeconomy is closely connected to the mode of participation that is granted to civil society⁹ or its representatives (BioSTEP project, 2016). Triple-Helix organisations – academia, industry and government – mainly shape bioeconomy strategies and clusters (Gerdes, Kiresiewa, & Porsch, 2017; Kiresiewa, et al., 2019a; Kiresiewa, Gerdes, & Hasenheit, 2019b). To increase the demand for bio-based products, consumers and citizens should be actively involved from the very beginning in the innovation process (Golembiewski, Sick, & Bröring, 2015). It is important that this should not just remain a “talking exercise”, but be based on active involvement (BioSTEP project, 2016). In line with the Quadruple Helix Model, for society as a whole to appreciate the value chains of the bioeconomy, Civil Society Organizations (CSOs) and the general public should participate as co-creators in research and innovation agenda-setting (Gerdes H. , et al., 2018). Some are of the opinion that instead of talking about public “acceptance”, “involvement” might be the more appropriate term (BioSTEP project, 2016). It should be noted, however, that NGOs and CSOs do not always represent a broad mix of citizens (BioSTEP project, 2016).

The importance of support from civil society is underscored by the existence of the “Not in my backyard” (short: NIMBY) problem. The NIMBY problem occurs when citizens oppose a

⁹ According to the European Commission, a civil society organisation is a “Non-governmental, not-for-profit organisation that does not represent business interests. Pursues a common purpose for the good of society.” (European Commission, 2018c)

development project – such as wind parks or landfill sites, because they fear it will negatively affect their living area. This problem is also relevant for the bioeconomy, for example, when a local community opposes the construction of a biorefinery due to the fear of pollution and noise. An example thereof is the resistance by local politicians and residents in Diemen, the Netherlands, against the construction of the largest national biomass refinery by Vattenfall. The latter was forced to postpone their definitive decision whether to proceed with the construction, and will wait for the Dutch national government to indicate whether or not there is still political support for biomass as a source of heat (Ekker, 2020; van Zoelen, 2020).

3.2.2. Actions

To facilitate a transparent and credible participation of civil society in the development, implementation and monitoring of bioeconomy strategies, we recommend taking the following actions:

- D **Involve civil society early on in the development, implementation and monitoring of bioeconomy strategies.** Participatory events, such as those initiated in the context of EU-funded Coordination and Support Actions (CSA), offer a useful tool for this purpose.¹⁰ Due to the importance of regions for the successful deployment of the bioeconomy, representatives of local and regional CSOs, but also local and regional authorities, should be encouraged to participate (Gerdes, Kiresiewa, & Porsch, 2017). To address the NIMBY problem, consumers and citizens should be able to have a real impact on the formulation of bioeconomy strategies, involving them from start to end (and beyond), so they can contribute every step along the way and assess whether their input is taken up (ibid.). At the same time, the potentials and limitations of participation should be clearly communicated beforehand, as to not disappoint expectations.¹¹
- D **Provide civil society with appropriate instruments to engage in co-creation events.**¹² Co-creation promotes the collaboration of different bioeconomy stakeholders with the goal of developing new ideas and concepts. However, even though their input is of great value since they voice citizens' concerns, engaging civil-society representatives can be difficult due to their limited time and financial capacities¹³, as opposed to e.g. private-sector representatives. By ensuring that financial and timing issues do not constitute barriers for participation, the former can more easily take part in co-creation events. Providing public funding and accommodating their schedule could help to this end. Possible formats for co-creation events are a hackaton-type of event where a problem-owner (e.g. bio-based industry, farmer or forester) outlines its challenges and ask external participants to “hack” this challenge in a gamified setting.¹⁴
- D **Clearly define which government departments are responsible for what part of the bioeconomy strategy.**¹⁵ The bioeconomy covers many different sectors and a

¹⁰ Highlighted during workshop in Portugal (Lisbon, 29 May 2019)

¹¹ Highlighted during workshop in Germany (Halle, 13 May 2019)

¹² Highlighted during workshop in Germany (Bonn, 29 May 2019)

¹³ Highlighted during workshop in Germany (Halle, 13 May 2019)

¹⁴ Highlighted during workshop in Slovakia (Nitra, 24 September 2019)

¹⁵ Highlighted during workshop in Croatia (Zagreb, 4 July 2019)

range of policy domains. Accordingly, this requires the involvement of and cooperation between various government departments (also referred to as the “whole-of-government” approach) (Gerdes, Kiresiewa, & Porsch, 2017). By clarifying and assigning responsibilities to all relevant departments with regard to developing the bioeconomy strategy, a high degree of transparency can be achieved (including accountability).

- D **Ensure that different administrative levels align their jargon and make it understandable.** Policy makers should establish a clear terminology to ensure that they share a common language with all stakeholders, providing a solid foundation for debating bioeconomy-related matters. Currently, local stakeholders often do not understand the terminology used by higher administrative levels, which can lead to inertia and scepticism. The fact that several definitions of the bioeconomy co-exist is an example thereof. The increased transparency could improve the participation rate of stakeholders.¹⁶

3.2.3. Good practices

To facilitate a transparent and credible participation of civil society in the development, implementation and monitoring of bioeconomy strategies, we recommend drawing inspiration from the following example:

Bioeconomy Action Forum, Germany

denkhausbremen, a non-profit association committed to global environmental justice, together with the Environment and Development Forum (“Forum Umwelt und Entwicklung“), has established the Bioeconomy Action Forum (“Aktionsforum Bioökonomie“). NGOs that are part of the Forum develop and publish common positions on key aspects of the bioeconomy debate, which are then introduced into the public debate and relevant policy processes. The project also creates dissemination materials for the interested public and the association’s own channels and publishes its results via social media and the press (Umweltbundesamt, n.d.). The Bioeconomy Action Forum was partly founded because, with a few exceptions, German environmental and development associations have only been marginally involved in the bioeconomy debate (Forum Umwelt und Entwicklung, n.d.). The project is funded by the German Federal Environment Agency and the Federal Environment Ministry. It initially ran from 2018-2020, but was renewed with a second term running from 2020-2022.

3.3. Strengthen the regional dimension of the bioeconomy

3.3.1. Background

In recent years, the regional potential of the bioeconomy has been widely recognized and became a priority in relevant political strategies at EU and Member State level. The second pillar of the 2018 EU Bioeconomy Strategy focuses on deploying local bioeconomies rapidly

¹⁶ Highlighted during workshop in Italy (Napoli, 4 October 2019)

across Europe through supporting regions and EU Member States to develop bioeconomy strategies, among others (European Commission, 2018a). And for good reason; European regions need to implement the bioeconomy to achieve the expected effects on jobs, growth, GHG emissions and the environment, regardless of their socio-economic structure, natural conditions and research profile (Spatial Foresight et al., 2017).

Accordingly, regional bioeconomy clusters, in which value chains and available expertise are concentrated in specific areas, are critical for the bioeconomy to succeed (Gerdes, Kiresiewa, & Porsch, 2017). Networking – which provides value added to SMEs – is essential for this purpose (SCAR BSW/BBI JU, 2019). In a workshop organized by the BIOBRIDGES project, participants indicated that establishing bioeconomy clusters, as well as facilitating direct interaction, can help to overcome collaboration challenges between feedstock owners and bio-based industries.¹⁷

However, it has been found that the development of the bioeconomy, strongly influenced by the capacity of relevant actors to engage with others to build new bio-based value chains and clusters, varies strongly between regions (Gerdes, Kiresiewa, & Porsch, 2017). Over one-third of European regions are estimated to have low bioeconomy maturity, meaning that they cannot fully exploit existing potential on their own and so are slow to generate new bio-based economic, social and environmental benefits (Spatial Foresight et al., 2017). As a result, personal benefits do not materialize for citizens, which in turn might harm public acceptance of the bioeconomy.

3.3.2. Actions

To strengthen the regional dimension of the bioeconomy, we recommend taking the following actions:

- D **Promote networking and knowledge exchange within regional bioeconomy clusters.** Clusters play a crucial role for bringing stakeholders together by facilitating collaboration and exchange. Cross-sectoral get-togethers, for example a factory tour, can be an effective instrument for bringing actors together and planning joint activities. The focus should be on identifying, communicating and fostering concrete synergies between different actors in regional bioeconomy clusters, since it helps making the latter more attractive. A review of regional and national bioeconomy clusters conducted in the frame of the BIOBRIDGES project identified that the formation and effective management of clusters is hampered by a number of factors, particularly in countries which are considered “moderate innovators” by the European Innovation Scoreboard (Kiresiewa, Gerdes, & Hasenheit, 2019b). A lack of public support from regional and local authorities is an important hurdle that needs to be overcome for a better and more effective management and performance of clusters. The coordination and facilitation efforts by public bodies are key in connecting relevant actors. Such efforts, as well as financial and organisational supportive policies, are key needs for businesses engaged in new bio-based value chains. Successful (public) facilitators often take a cross-sectoral approach and foster technology transfers from academia to the private sector.

¹⁷ European Workshop II: Mentimeter results.

- D **Reserve funding for regional innovation labs/pilot projects.** Establishing innovation labs is essential for finding new uses for biomass, whereas pilot projects are pivotal for demonstrating innovative applications on a large scale. Building the required industrial installations is expensive and in some cases poses an implementation barrier. The 2018 EU Bioeconomy Strategy acknowledges the importance of promoting pilot actions to support local bioeconomy development via various Commission instruments and programs, such as the European Maritime and Fisheries Fund and European Rural Development Fund, which is a step in the right direction.¹⁸
- D **Promote monitoring efforts at the regional level.** EU-level monitoring efforts are already well underway: the Joint Research Centre (JRC) has created the EU Bioeconomy Monitoring System, an interactive dashboard that provides an overview of European trends in indicators related to the EU bioeconomy and is hosted by the Knowledge Centre of Bioeconomy.¹⁹ The JRC states that the system should be able to highlight synergies and trade-offs on the global, EU, national and regional level, among others (Giuntoli, et al., 2020). However, the JRC at the same time acknowledges that the Bioeconomy Monitoring System is EU-centric in nature. Considering the increased regional importance of the bioeconomy, sufficient bioeconomy data should also be available on this level to facilitate effective policy-making.

3.3.3. Good practices

To strengthen the regional dimension of the bioeconomy, we recommend drawing inspiration from the following examples:

Collaboration between Swedish regions

Sweden's 21 regions gather bioeconomy data – which is updated annually and aggregated on a national level – to boost regional bioeconomy development. Statistics are publicly available as an interactive web tool and cover industries that are fully or partly producing goods and services that connect to the use of biomass (plants, forestry, animals and fish). The tool covers bioeconomy data such as value added, net turnover, gender specified employment and greenhouse gases. The development of this tool is the result of regional collaboration and reasons for setting it up include: gathering basic data to set targets; facilitating policy-making; measuring results; and attracting investments.²⁰

¹⁸ The Pilots4U database provides an overview of multipurpose open access pilot and demo-infrastructure for the European bioeconomy: <https://biopilots4u.eu/>

¹⁹ The EU Bioeconomy Monitoring System can be found here: https://knowledge4policy.ec.europa.eu/bioeconomy/monitoring_en

²⁰ The web tool with regional bioeconomy statistics can be found here (in Swedish): <https://app.powerbi.com/view?r=eyJrIjoibjQ4NTFkZjgtMmlyZC00NGNkLTgwNzAtN2MzOTFhZGU2NjBlliwiidCI6IjlyZjA4NWJILWI1MjMtNGVhYS05YT13LTQyZjZjYjExZTBiNiIsImMiOjh9%20>

The BLUEBIO ALLIANCE (BBA)

The BLUEBIO ALLIANCE (BBA) is a non-profit Portuguese association, founded in Cascais in July 2015, which represents a wide variety of players in the marine bioresources and blue biotech value chain, ranging from raw material producers, R&D units, biotech SMEs, transforming centres and manufacturers, public sector & governmental entities, support companies and final consumer product developers. BBA does not directly supply marine bioresources, but seeks to support and enhance the value chain of the latter and identifies four key areas of actions:

1. **Organising and streamlining the value chain**, through the gathering and sharing of information, organising networking opportunities, promoting companies, influencing public authorities, fostering legislation, creating incentives and launching mobilisation projects at national level.
2. **Promoting collaboration** between research and knowledge centres and companies, promoting the training of academic staff in business issues and fostering the cross-fertilisation of knowledge between them through actions focused on cooperation and sharing.
3. **Internationalizing** the network of partners by promoting relevant information (market intelligence), supporting its integration in international networks and platforms and its access to the global market for biotechnological applications.
4. **Promoting funding**, by supporting the application for structural public funds and the direct invitation to tender of European funds, as well as actions to promote private national and international investors and the banking system (BLUEBIO ALLIANCE, 2015).

4. Annex A. Overview of co-creation events organized by the BIOBRIDGES project

Table 1 provides a brief overview of the all the co-creation events that the BIOBRIDGES project organized between September 2018 and December 2020.

Table 1. Overview of co-creation events

Scope/country	Organizing partner	Total
Regional		4
Italy	FVA	1
Spain	ASEBIO	1
Slovakia	PEDAL	1
Estonia	CIVITTA	1
National		14
Portugal	LOBA	2
Germany	ECO	2
Croatia	PARTICULA	2
Slovakia	PEDAL	2
Italy	APRE/FVA	2
Estonia	CIVITTA	1
Greece	Q-PLAN	2
Spain	ASEBIO	1
European		6
Workshop I	APRE	1
Workshop II	PEDAL	1
Workshop III	FVA	1
Workshop IV	PEDAL	1
Workshop V (Bridge2Brand)	FVA	1
Workshop VI (Bridge2Brand)	FVA	1
Total co-creation events: 24		

Table 2 provides an overview of the total audience reached (per type of stakeholder).

Table 2. Audience reached (per type of stakeholder)

Research	Industry	Civil Society	Public Sector	Other
358	347	114	81	218
Total audience: 1118				

Deliverables 5.1-5.3 provide a detailed overview of the co-creation events' outcomes. These three documents can be found on the results section of the BIOBRIDGES website and are referred to as "Proceedings from EU, national and regional co-creation events and policy debates": <https://www.biobridges-project.eu/results/>

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