

Press release

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Major hurdles leading to a lack of level playing field for bio-based industry

The bio-based industry faces a number of regulatory and standardisation hurdles for market entry. Based on these barriers, a missing level playing field for bio-based products hampers investments in this industry, which limits the chance of future technological developments and innovations to mature and enter the market at commercial scales. Five main themes have been studied for several product value chains and first conclusions are drawn in a public EU research report. The project has identified that the development and application of CRISPR technologies, furan-based chemistry and valorisation of lignin into products as three important industry trends for those value chains.

What are the future trends of the bio-based industry and which hurdles limit the full deployment of innovation in the bioeconomy?

STAR4BBI is an EU-funded project that has carried out extensive analysis on these issues to receive answers directly from the industry. Seven different bio-based value chains, represented by leading companies, have been investigated to find out about existing regulatory and standardisation hurdles as well as the future industry trends and innovations:

Current regulatory and standardisation hurdles

Through literature analysis and interviews with experts presenting the selected value chains, STAR4BBI concluded the following hurdles that limit the development of bioeconomy, towards full deployment:

- **End-of-life**, where a number of hurdles are present, including the fact that there is no general agreement as to which end-of-life option (recycling, digestion, composting, incineration, landfilling) for a given bio-based product is the most preferable. The result is confusion on how to dispose of biodegradable or bio-based products: f.i. different municipalities in one country have different regulations. Furthermore, there are conflicting interests between bioplastics/bioproduct producers and waste processing companies/recyclers.
- Over the last years many **certification** schemes have been developed that are similar and overlapping. However, even with the existing number of certifications on the market, some properties of bio-based products can still not be certified with the existing certification systems. In the end, companies have no opportunity to certify and communicate about certain advantages of bio-based contents in their product.

- **Biofuel policy** is one of the central hurdles of the bio-based products' industry in Europe. Presently, there is no legislative mechanism to support and regulate the uses of available biomass for producing chemicals and materials, whereas the RED of 2009 and the RED II proposal are giving large incentives for biomass use in biofuel and bioenergy sectors. As a result, biomass prices go up and this leads to investors retracting from putting money in bio-based chemistry and materials.
- **Communication and image:** Bio-based materials are highly diverse and vary in terms of structure, processes, feedstocks and applications. Hence, communicating this complex information to experts, and even more so to consumers, is challenging for the bio-based industries. Additionally, image is an issue because NGOs tend to claim that crops which can be used for food should not be utilized for other purposes, although there is increasing evidence that livelihood of farmers and food security in general benefit from the use of food crops for materials or fuels.

CRISPR technologies, valorisation of lignin into products and furan-based chemistry from sugars as future industry trends for chosen value chains

What are the future industry trends of the chosen supply chains in the bioeconomy and how intervene current regulatory and standardisation systems with these developments?

Based on the interviews with companies from the selected value chains and other relevant stakeholders, complemented by an in-depth analysis of scientific literature, three innovative technologies have been identified that promise to become potential drivers of change for the future of the European bio-based industry.

CRISPR technologies

One of these technologies was identified to be the **CRISPR technique**. Among different genome editing methods, CRISPR/Cas9 is becoming very popular among the scientific audience because it is faster, cheaper, more accurate, more efficient and therefore more user-friendly than traditional gene editing techniques.

- Challenge of this technology: Regulation, ethical concerns and social acceptance are the key constraints that prevent Europe from taking advantage of modern genome editing technologies. EU States have varying positions as to how to regulate CRISPR technologies. Therefore, the further development, and positive impact of these technologies for the bioeconomy in Europe will only be possible when regulatory and social acceptance is in place.

Valorisation of lignin into high value products

Currently, operating biorefineries receive and process enormous quantities of biomass and, while cellulose and hemicellulose are used in the paper industry and fermentation processes, lignin is considered a waste product and burned for heat and power. Lignin has unique properties including its highly aromatic nature and lower oxygen content compared to polysaccharides (polymeric carbohydrate molecules, another component of wood fibres), making it a highly interesting biopolymer to be converted into chemical building blocks, bio-fuels and bio-based materials.

- Challenges of this technology: Efforts on converting lignin into high valuable products through fast pyrolysis is still a challenge, as pyrolysis is an energy intensive process. This increases production costs and makes the resulting products not competitive in comparison to petrol-based alternatives.

Furan-based chemistry from sugars

This is another innovation that is expected to bring larger improvements to producing bio-based resins and polymers. Especially 2,5-furandicarboxylic acid (FDCA) is a highly promising bio-based building block, which is advocated as a green replacement for fossil-based terephthalic acid (PTA). PEF is recyclable, which offers converters and brand owners the opportunity of a closed loop product lifecycle. Additionally, it offers improved performance properties for finished products.

- Challenges of this technology: The main problem is the difficulty to produce high purity FDCA, making the current price unacceptable. The investigation of the synthesis and modification of PEF, PPF, and PBF has become an important topic in both the industrial and academic communities.

Outlook

The research of STAR4BBI project shows that the existing policy and standardisation hurdles create disadvantageous conditions for the bio-based industry, especially for material use in comparison to biofuels. This limits investments and prolongs the time to overcome the technical challenges of promising technologies, delaying their entrance to the European market.

The full text of the STAR4BBI reports on market entry barriers and technology trends presented in this article can be found following this link: <https://nimbus.nen.nl/index.php/s/8OExi5Z6fF8eKcL>. The next steps of the STAR4BBI project will include proposals for revision of standards and regulations concerning identified hurdles.

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STAR4BBI is an EU funded project focusing on Standards and Regulations for the Bio-based Industry. The project has started on September 2016 with the duration of 36 months. It is led by the Netherlands Standardisation Institute NEN and comprises the consortium members nova-Institute, TU Berlin and Wageningen University.

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