

Bio-based and biodegradable materials critical for a circular economy

I am writing to you in my role as COO of the Bio-based and Biodegradable Industries Association (BBIA) to highlight how the bio-based sector is critical for a circular economy, and to the UK achieving its Net Zero commitment.

A once-in-a-generation opportunity

Bio-based chemicals and materials designed, developed, and manufactured in the UK offer a once-in-a-generation opportunity to secure industries in the transition away from oil-and-gas. Building from world-leading expertise in these sustainable technologies, we can create a resilient engine for net-zero, securing and growing hundreds-of-thousands of highly skilled and productive jobs.

Manufactured chemicals are in everything we use in our daily lives – plastics, food, textiles, energy, batteries, defence products, mobile phones, and medicines. They are vital to our food security, the clothes we wear, heating our homes, affording national security, enabling communications, and delivering treatments for diseases.

Today, almost all chemicals are manufactured from fossil oil-and-gas¹, and are responsible for ~10% of Global-Greenhouse-Gas-Emissions².

As global temperatures continue to rise, the drive towards a more environmentally friendly economy is not an option; it is a necessity. We simply cannot afford to keep digging up fossil resources and releasing more carbon dioxide into the atmosphere. It's time to start using carbon that is already above ground (or in our soils). Future sources of carbon for the chemical industry include biomass, carbon dioxide capture, and recycled feedstocks.

The UK Bio-based sector has ambition

Bio-based chemicals and materials are derived from renewable biological resources like plants, algae, mycelium and organic waste – known as 'biomass', reducing dependence on fossil oil and gas¹.

The UK chemicals industry has an ambition. By 2050, it will have doubled in size whilst sourcing 30% of its carbon feedstock from biomass². **With the right support bio-based chemicals and materials have the potential to generate upwards of £204 billion annual revenue for UK plc by 2050³ and significantly contribute to the UK's Net Zero commitment.**

Evidence has shown that starting with the adoption of just fifteen high-potential bio-based chemicals will achieve more than 5.2 million-tonnes CO₂eq GHG-savings annually⁴. This is greater than the CO₂eq GHG-savings generated through the Road Traffic Fuel Obligation in 2021⁵.

¹ The Royal Society: Catalysing change: Defossilising the chemical industry Policy Briefing - [defossilising-chemical-industry-report.pdf \(royalsociety.org\)](#)

² Innovate UK: Sustainable carbon ambition for the UK chemicals industry - [Sustainable carbon ambition for the UK chemicals industry - Innovate UK Business Connect \(ktn-uk.org\)](#)

³ Data from reference no.2, extrapolated to 2050 at CAGR of 9% (Chemicals Global Market Report 2024, research and markets)

⁴ DESNZ: Project contract PS22436 - Economic and climate benefits to the UK of an increased use of bio-based chemicals (RAF097/2223) 2024, unpublished

⁵ HMG: The Renewable Transport Fuel Obligation - an essential guide Road Traffic Fuel Obligation <https://assets.publishing.service.gov.uk/media/65a8113db2f3c60013e5d4ce/rtfo-essential-guide-2024.pdf>

Think global, act local

The very nature of biomass means that rurally based businesses and communities can use local biomass – agricultural crop residues, non-agricultural organic waste, and forest products – to create bio-based chemicals and materials, reducing transport emissions and creating local value chains. In addition, this can encourage farmers to adopt sustainable farming techniques like agroforestry, crop rotation, and using composts and/or digestates. These techniques can enhance soil fertility, biodiversity and carbon sequestration. By "thinking global" in terms of adopting the overarching goals of sustainability and a circular bioeconomy, and "acting local" through targeted initiatives using local resources, the bioeconomy can drive rural regeneration.

UK leadership can preserve competitive advantage

The UK has a sustained record of global academic excellence in bio-based chemicals research, underpinning the potential for UK businesses to be industrial leaders in this space. Other areas of the world are already implementing policies to drive bio-based sectors forward but the UK risks losing its competitive advantage if action is not taken soon.

The policy and regulatory landscape encompassing bio-based materials and chemicals is complex and spans several Government departments. This has led to conflicting policies and regulations that hinder commercialisation of these vital products^{6,7}.

Previous government strategies have promised support for bio-based materials but translation into policy and regulations has not yet been realised:

- In 2018 the UK's Bioeconomy Strategy⁸ (now withdrawn) recognised the vital importance of bio-based materials, with a vision to *"enable rapid development and deployment of new technologies, including, regulation and industry guidance on waste; the impact of bio-based procurement and standards for bio-based plastics and other bio-materials"*
- In 2021 the UK's Innovation Strategy⁹ stated that *"engineering biology will help lessen our dependence on fossil fuels and simplify global supply chains, shifting us from an oil-based economy towards a bio-based economy. Where fossil-derived fuels or plastics are required, biomanufacturing will deliver biobased and waste-derived alternatives in 80% of the cases by 2035"*.

No time to waste to get to "no waste"

The opportunity to create value is intimately linked to the chance to minimise avoidable waste. Bio-based materials and chemicals can be derived from low value biomass, and in many cases can be designed for circularity. The future bioeconomy offers the promise of an end to linear management of wastes, where products at the end of life instead become valuable resources for new materials and chemicals.

The Covid pandemic demonstrated the potential for industry and academia to accelerate translation of research excellence into urgently needed practical application. It reduced the time taken to develop a vaccine from the previous record of 5 years to under a year, from design to patients receiving doses.

The defossilisation of the chemicals and materials industries is no less of an urgent challenge. We must act now to secure the future prosperity and wellbeing of society by supporting the transition to climate-positive industries.

From concept to the manufacture of a bio-based chemical can take many years, if not decades¹⁰ – a timeline we simply cannot afford to work to when transitioning away from oil and gas.

⁶ BB-REG-NET - [Bio-based and biodegradable materials regulatory network - BBIA](#)

⁷ Imperial College London: Engineering Biology Metrics and Technical Standards for the Global Bioeconomy [Standards-and-metrics-for-the-bioeconomy_EMBARGO-until-070524.pdf \(imperial.ac.uk\)](#)

⁸ HMG: Growing the bioeconomy: a national bioeconomy strategy to 2030, 2018 - [UK Innovation Strategy: leading the future by creating it - GOV.UK \(www.gov.uk\)](#)

⁹ HMG: Innovation Strategy, 2021 - [UK Innovation Strategy: leading the future by creating it - GOV.UK \(www.gov.uk\)](#)

¹⁰ Insights from BBIA members, unpublished

The UK bio-based chemicals and materials sector is ready

The ambition of the bio-based sector is clear, but the lack of a level playing field for the sector is stifling progress. We call upon the Government to support the sector, through three key actions:

01 Roadmap to accelerate development and commercialisation

As the UK transitions away from fossil-based oil and gas, we must ensure we maintain and grow our ability to manufacture sustainable bio-based chemicals and materials in the UK.

This requires a dedicated road map which builds on our great chemical industry heritage and assets, and provides investment in new biorefineries. Ring-fencing 25% of national non-food biomass feedstock for bio-based chemicals and materials would be a great starting point.

02 Create a level playing field

Bio-based chemicals materials come with an inherent green tax, competing with subsidised fossil-based oil and gas.

To create a level playing field, bio-based content must be considered as 'recycled content' in plastics, in relation to the plastics packaging tax and a mass balance approach for biomass in bio-based materials should be agreed and promoted.

Similarly, the plastics packaging tax should consider bio-based content as 'recycled content' in compostable plastic packaging and in compostable fibre-based composite packaging when it includes sufficient compostable plastic that it is within scope of this tax.

03 Lead by example

The UK government must lead by example and create a market for sustainable bio-based chemicals and materials in the UK, by implementing government procurement processes that drive and accelerate the adoption of the sector.

By 2030, mandate that 30% of all chemicals and plastics procured by the NHS must be made from sustainable bio-based chemicals and materials.

04 Enabling a truly circular economy

Soil is vital to sustaining life on Earth, producing our food and sustaining rich ecosystems. Yet in recent years soil in the UK has become heavily degraded through over-use, erosion, compaction, and pollution. Organic recycling offers the opportunity to create nutrient- and organic-matter-rich compost to replenish our soils, and to reduce GHG emissions by halting our current landfilling and incineration of organic wastes.

To regenerate our vital agricultural soils, certified compostable packaging must be incentivised, and allowed to be collected with household food waste, or dry recycling, to then be treated by suitably equipped and/or designed anaerobic digestion, industrial composting or integrated AD and composting processes.

This once-in-a-generation opportunity is here, and the bio-based sector is ready. The size of the prize is large, but action is needed to ensure the UK reaps the benefits of the transition away from oil and gas to a more sustainable circular economy – one in which **bio-based chemicals and materials have the potential to generate upwards of £204 billion annual revenue for UK plc by 2050 and significantly contribute to the UK's Net Zero commitment.**

I would welcome the opportunity to discuss this further with you – please call or email me at jen.vanderhoven@bbia.org.uk.

Dr Jen Vanderhoven

COO, BBIA

Email: Jen.vanderhoven@bbia.org.uk

Phone: 07305 241288

About the BBIA

BBIA¹¹ is a UK trade association focused on accelerating the adoption of bio-based, biodegradable, and compostable chemicals and materials and final products in the UK, to reduce our reliance on fossil resources and create a sustainable circular economy.

Benefits of Bio-based chemicals and materials

- Bio-based chemicals and materials are derived from renewable biological resources like plants, algae, mycelium or waste biomass (including biowaste), reducing dependence on fossil oil and gas¹¹.
- They are renewable and can provide biodegradable alternatives, presenting opportunities to reduce waste and carbon emissions, and decrease the accumulation of chemicals and plastics in the environment¹².
- They can be less toxic than their fossil incumbents, improving safety for workers and consumers¹¹.
- Growing biomass supports farmers with non-food-based income, and can create new jobs and economic growth, particularly in rural areas¹³.
- Bio-based chemicals and materials can utilise waste streams and manufacturing/processing by-products, improving resource efficiency¹¹.

¹¹ Bio-based and Biodegradable Industries Association [Home - BBIA](#)

¹² Supergen Bioenergy Hub: Carbon for chemicals. How can biomass contribute to the defossilisation of the chemicals sector? - <https://www.supergen-bioenergy.net/wp-content/uploads/2024/08/Carbon-for-chemicals-report-final.pdf>

¹³ Nature: Principles, drivers and opportunities of a circular bioeconomy - [Principles, drivers and opportunities of a circular bioeconomy | Nature Food](#)

Bio-based chemicals and materials in practice

Bio-based materials reduce reliance on fossil resources

Plastic packaging generates the most plastic waste of any sector, and its production is responsible for 4.5% of global greenhouse gas emissions¹⁴. As of 2015, more than 3.1 billion tonnes of plastic packaging waste have been generated, yet only 9% of that has been recycled, 12% incinerated and 79% has accumulated in landfills or the environment¹⁴. Novel packaging materials, made from non-fossil resources, such as seaweed, plants, mycelium and waste materials are already making a positive contribution to achieving Net Zero, and reducing microplastic accumulation in the environment⁴. By using biomass as a feedstock for materials and using appropriate material types in 'makes sense', targeted product formats, we avoid adding any further carbon dioxide to the atmosphere and reduce our reliance on fossil resources⁴.

Biodegradable mulch film reducing plastic pollution across the UK

Plastic pollution is growing relentlessly as waste management and recycling fall short. Plastic mulch films are often used in agriculture to cover the soil around plants. While they have several benefits, such as weed suppression, moisture retention, and temperature control, the use of plastic mulch films has detrimental environmental consequences; when not removed they contribute to plastic pollution. This has spurred the development of certified soil-biodegradable mulch films, which, in contrast to conventional mulch films, do not need to be removed, but are ploughed under after harvest, where they completely biodegrade in the soil¹⁵. This has many benefits for farmers and for society. Above all, it reduces the amount of persistent microplastics in agricultural soils caused by the remains of conventional plastic mulch films, and thus contributes to sustainable food production that keeps agricultural soil healthy and productive for a longer time¹⁶.

Compostable packaging reducing food waste and methane emissions

Nine and a half million tonnes of food waste are generated by the UK every year. This waste is primarily sent to landfill, where it decomposes and accounts for 8% of all UK greenhouse gas emissions, and 31% of methane emissions¹⁷. There is a huge opportunity to prevent these emissions by organically recycling food waste and returning that of its carbon and nutrient content that remains back to soils – replenishing our agricultural land. For effective household food waste collection, the use of compostable liners in kitchen caddies and food waste bins has been shown to significantly increase household participation¹⁸. Other packaging that tends to be contaminated with food waste when discarded, and hard to recycle by mechanical recycling, should also be compostable and collected with food waste, for example, coffee pods, fruit and vegetable stickers, teabags¹⁹ and coffee bags.

¹⁴ 10 shocking facts about plastics. National Geographic – [Learn About Plastic Pollution \(nationalgeographic.com\)](https://www.nationalgeographic.com/learn/about-plastic-pollution/)

¹⁵ European Bioplastics (2023) Q&A on certified soil-biodegradable mulch films – [Q&A on certified soil-biodegradable mulch films – European Bioplastics e.V. \(european-bioplastics.org\)](https://www.european-bioplastics.org/q&a-on-certified-soil-biodegradable-mulch-films)

¹⁶ OECD. Global Plastics Outlook: Policy Scenarios to 2060. (Organisation for Economic Co-operation and Development, Paris, France, 2022) <https://doi.org/10.1787/aa1edf33-en>

¹⁷ Office for National Statistics (2021) A review of household behaviour in relation to food waste, recycling, energy use and air travel – [A review of household behaviour in relation to food waste, recycling, energy use and air travel – Office for National Statistics \(ons.gov.uk\)](https://www.ons.gov.uk/air-travel/a-review-of-household-behaviour-in-relation-to-food-waste-recycling-energy-use-and-air-travel)

¹⁸ International Solid Waste Association (2023) A Practitioner's Guide to Preventing and Managing Contaminants in Organic Waste Recycling – [iswa.org/wp-content/uploads/2023/11/14803_ISWA-Contaminants-Report-2023_60pp_v8-DIGITAL.pdf](https://www.iswa.org/wp-content/uploads/2023/11/14803_ISWA-Contaminants-Report-2023_60pp_v8-DIGITAL.pdf)

¹⁹ A Plastic Planet (2021) The Compostable Conundrum, Making sense of when to use compostable materials – [bioplastics.org.au/wp-content/uploads/2023/04/The-Compostable-Conundrum-A-Plastic-Planet_Oct-2021-1.pdf](https://www.bioplastics.org.au/wp-content/uploads/2023/04/The-Compostable-Conundrum-A-Plastic-Planet_Oct-2021-1.pdf)