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# THE ROLE OF INDUSTRIAL BIOREFINERIES IN A LOW-CARBON ECONOMY

## Reference

International Energy Agency (IEA) Bioenergy Technology Cooperation Programme (IEA Bioenergy) & IEA Industrial Energy-related Technologies and Systems (IETS) - Joint Workshop, Gothenburg, Sweden, 16 May 2017. The full report is available from the IETS website.

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## Biorefinery developments

IEA scenario calculations have indicated an important role of biomass to reach greenhouse gas (GHG) reduction targets by 2050-2060. Efficient use of the available biomass will be key and uptake of biorefineries at industrial level will be required to achieve this. The circular economy is the general framing for industrial transformation, which is not only about material recycling, but also about using renewable carbon, in the form of biomass or $CO_2$.

Industrial symbioses and increased integration with a versatile production of added-value biobased products and bioenergy products can have highest impact both for climate goals and economic growth. Current developments in biorefineries are building on the long success of several industries, such as sugar and starch processing, paper and pulp as well as biotechnology and also developments in conventional and advanced biofuels.

Investment needs for biorefineries can be huge and need to be profitable with a fair return on investment. Classical oil-based refineries had more than 100 years to get to the scale and economics they are at today. The biorefinery sector needs to build up in the next few decades. This requires a huge effort from industry, but also the right regulatory environment.

It takes time (sometimes decades) to go through the different development steps, including lab-scale development, testing in a pilot plant, demonstrating in a reference plant, and deployment at industrial scale. Particularly the stages of pilot and demonstration are very cost-intensive and requires partnering. Funding between each round, from pilot over demo to pioneer is difficult to raise without government support. Governments can facilitate the deployment of biorefineries through subsidies for innovation and R&D, support for demonstration and first of a kind plants, government guarantees to reduce investment risks, providing decision tools to show opportunities, but also purchase mandates and/or tax incentives and longterm targets. Real external cost and $CO_2$ price mechanisms should be applied for fossil-based products and fossil subsidies should be removed.

## Deployment barriers and actions to overcome them

Further development of the biorefinery sector requires stable, coherent, consistent and predictable policies, as well as a long term vision to provide long term perspectives for industry. High investment needs and profitability are some of the major barriers for bioenergy and biobased products. Involvement

and cooperation between industry sectors and stakeholders is crucial.

It is essential for success to have the right partners. Connecting industries in regional biorefineries and basing them on existing plants can facilitate a smoother transition, building out step-by-step. It would enable to very efficiently convert biomass to renewable fuels, chemicals and materials at a scale that makes a difference, taking advantage of investments and permits of existing infrastructures. Next to consistent government behaviour, also clear and transparent industry commitments are needed to shape the business environment. Industry can for instance apply an internal value of $CO_2$ for investment decisions, without waiting for government decisions on this. Multidisciplinary research is also a crucial factor. As knowledge and experience is needed in broad areas throughout the value chain, it requires a combination of skills, so there is a need for forming partnerships, including industry, local and national authorities and knowledge institutes.

Communication and education will be crucial pillars. While information needs to be shared between sectors, the scientific community should communicate with industries, the public and policy makers, and create awareness of the benefits of the biobased economy. It is vital to promote success stories of biobased products and show benefits of cooperation with the industry sector.

Education on circular economy and biobased economy should be developed, as well as a transparent knowledge base on the status and prospects of biobased products. This way the value of biobased products kan be made clear to consumers. In terms of standardisation, common language can be developed, e.g. in terms of definitions, measurements, assessments and calculation method for biofuels/biobased products.

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### About IETS

The IEA TCP on Industrial Energy-Related Technologies and Systems (IETS), founded in 2005, is dealing with new industrial energy technologies and systems.

The mission of IETS is to foster international cooperation among OECD and non-OECD countries for accelerated research and technology development of industrial energy-related technologies and systems. In doing so, IETS seeks to enhance knowledge and facilitate deployment of cost-effective new industrial technologies and system layouts that enable increased productivity and better product quality while improving energy efficiency and sustainability.

Through its activities, IETS will increase awareness of technology and energy efficiency opportunities in industry, contribute to synergy between different systems and technologies, and enhance international cooperation related to sustainable development.

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