

Analysis

How biosolutions contribute to the Sustainable Development Goals



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The potential of biosolutions

The world's temperature is rising, and the climate crisis is becoming more and more urgent. It is crucial to reduce the emissions of greenhouse gases and use our resources more sustainably to ensure a healthy planet for future generations. Global decarbonization needs to be accelerated if the world's countries are to achieve the UN Paris Agreement of a global temperature increase well below 2°C and pursuing efforts to limit it to 1.5°C.

At the same time, it is important geopolitically to ensure a stable supply of raw materials and energy. The world's population is expected to increase to 9.7 billion people in 2050 ([UNPFA](#)), which puts even greater pressure on the planet's already limited resources. If we want to address these challenges, innovation and the use of new technologies are key.





What are biosolutions?

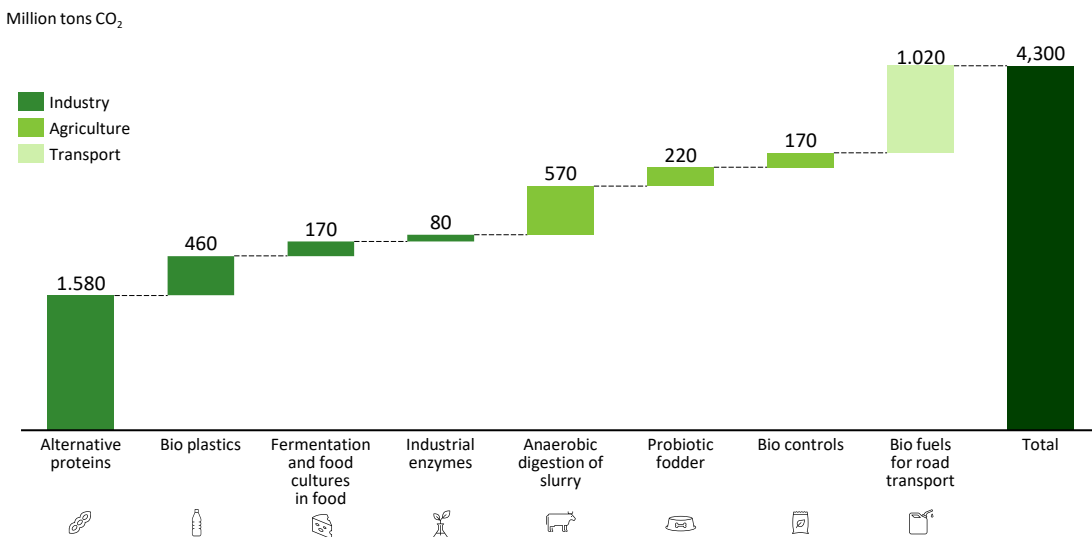
Biosolutions are **sustainable solutions** produced with the use of **biotechnology**, i.e., living microorganisms such as bacterial cultures, fungi, algae and/or their products, such as enzymes, proteins and pheromones, etc.

for concrete applications and products that are used in other industries' manufacturing processes and as end products to **enable sustainable transformations such as emission reductions.**

Biotechnological solutions, also known as *biosolutions*, have the potential to accelerate the necessary green transition in a wide range of areas. Using nature’s own toolbox, fermentation technology and microorganisms can replace fossil methods with biological solutions – and thereby reduce our environmental and climate footprint. With the technologies and biosolutions, we know today, it is possible to reduce CO₂e emissions by 4,300 million tons by 2030, corresponding to 8 percent of the world's annual CO₂ emissions (Copenhagen Economics, 2022).

Further, the global market for industrial biosolutions will reach 600 billion dollars by 2026 according to a study by Iris Group (2021). Therefore, biosolutions have tremendous potential in terms of both the green transition and growth, job creation, and exports.

Figure 1. Selected biosolutions’ global emission reduction potential in 2030



Source: Copenhagen Economics based on HBS Economics (2021b), IEA Sustainable Development Scenario, FAO, Poore and Nemecek (2018)

The contribution of biosolutions to the SDGs

Biosolutions represent innovative approaches where living microorganisms like bacteria, enzymes, and fungi are utilized in the development of products and technologies. These solutions have the potential to contribute to several of the United Nations' Sustainable Development Goals (SDGs). The following pages present an overview of selected SDGs that biosolutions contribute to.



SDG 2 – Zero hunger

2 ZERO HUNGER



SDG 2 encompasses various objectives, including ending global hunger, achieving food security and improved nutrition, as well as promoting sustainable agriculture. A wide range of biosolutions can contribute to achieving SDG 2.

Protein biscuits in Ethiopia with enzymes

A partnership (P4G) led by DanChurchAid with Novozymes, Engsko and Arla Foods Ingredients, has developed a protein-rich biscuit using enzymes and whey protein, which is intended to be produced locally in Ethiopia. This biosolution helps increasing the nutritional content of food and enables at the same time local production in a developing country.

Edible microalgae

The Danish company NatuRem Bioscience is developing healthy, sustainable, and edible microalgae. These algae contain a high amount of essential nutrients, making them a potentially crucial food source in the future.

Likewise, Danish company Algiecel produces microalgae biomass and oxygen using CO₂ emissions and LED lights. The microalgae can be utilized for feed production among other applications ([Algiecel](#)). For more info on Algiecel's technology please jump to [page 11](#).



The world's growing population will be demanding an increasing production of protein, and this demand will continue to rise in line with population growth and a growing middle class with higher purchasing power. Several Danish biotechnology companies are working to ensure that the world will not face a protein shortage in the future.

Affordable protein with health benefits

FERM FOOD utilizes fermentation technology on plants and grains to create healthy and natural plant-based ingredients that are economically and environmentally sustainable. The products are unprocessed or minimally processed foods, which has several health benefits compared to ultra-processed foods. Flavoring and texture substances, coloring agents, emulsifiers and preservatives are examples of ultra-processed foods. Ultra processed foods are often linked to the occurrence of obesity, diabetes, dementia, cancer, etc. ([FERM FOOD](#)).

High-protein animal feed

The Danish company Unibio converts natural gas into high-protein products through a fermentation process. These products can be used as a supplement for animal feed and potentially as food for humans in the future ([Unibio](#)).

European Protein works to enhance the health and productivity of animals through fermented proteins ([European Protein](#)).



SDG 6 – Clean water and sanitation

6 CLEAN WATER AND SANITATION



SDG 6 aims to improve water quality and strengthen the management of water resources to ensure access to clean drinking water for all.

Clean water with the nature's own proteins

80 percent of the world's population suffer from threats to their water security according to IPCC ([Jiménez Cisneros et al., 2014](#)). 2.4 billion people lived in so-called "water-stressed" areas in 2020 ([The United Nations](#)). Especially the dry regions with large populations will be severely affected by the water scarcity, including Central Asia, the Middle East, and significant parts of India ([videnskab.dk](#)).

The Danish company Aquaporin has a mission to ensure better access to clean water. By rethinking water filtration, Aquaporin has developed a technology to integrate natural aquaporin proteins, constituting nature's own water purification, into their membranes. The natural architecture of the membranes makes the membranes faster at filtering water than traditional synthetic water filtration membranes. These biomimetic membranes can purify and recycle water in industries, households, and even by NASA in space ([Aquaporin](#)).



SDG 12 – Responsible consumption and production

12 RESPONSIBLE CONSUMPTION AND PRODUCTION



SDG 12 entails reducing human footprint on nature, both in terms of how we produce and consume resources. Various biosolutions exist can contribute to achieving this SDG.

Solutions for reducing food waste

SDG 12.3 is to halve global food waste by 2030. Currently, up to one-third of all food produced is wasted across the value chain. By using biosolutions in food production, it is possible to extend the shelf life of various food products and thus reduce food waste. In Europe, 17 percent of all yogurts are discarded. Calculations from the ingredient company Chr. Hansen A/S show that it is possible to reduce this figure by 30 percent by extending the shelf life of yogurt using cultures, including lactic acid bacteria. By extending the shelf life of yogurt by one week, we could potentially reduce around 250,000 tons of CO₂ annually in the EU ([Chr. Hansen A/S](#)).



Sustainable materials

One of the major sources of climate impact is the process of manufacturing and burning oil and fossil fuels. Oil is a central component in the production of a range of materials as well as energy and goods. Up to 8 percent of global oil production is used to manufacture plastic products, which has a significant impact on the environment and climate ([World Economic Forum](#)). Biosolutions can contribute by replacing traditional methods with biological alternatives and ensure a more sustainable production and consumption.

Biobased plastics captures CO₂

The Danish company Pond Biomaterials uses fermentation technology to convert plants into 100 percent biobased plastics. In this process, they capture CO₂ from the atmosphere. Pond's bioplastics can be used in a wide range of production processes, including textiles ([Pond](#)). The global demand for plastic is expected to reach 548 million tons by 2030 according to an analysis by [HBS Economics](#). Replacing conventional fossil-based plastics with bioplastics represents a significant climate potential.

Biocement

Cement production is another significant contributor to global CO₂ emissions, responsible for approximately 7 percent of these emissions according to the [European Commission](#).

Biomason utilizes microorganisms to cultivate biocement. The stated objective of Biomason is to achieve a 25 percent reduction in carbon emissions from the concrete industry by 2030, primarily through the adoption of biocement ([Biomason](#)).



SDG 13 – Climate action

13 CLIMATE ACTION

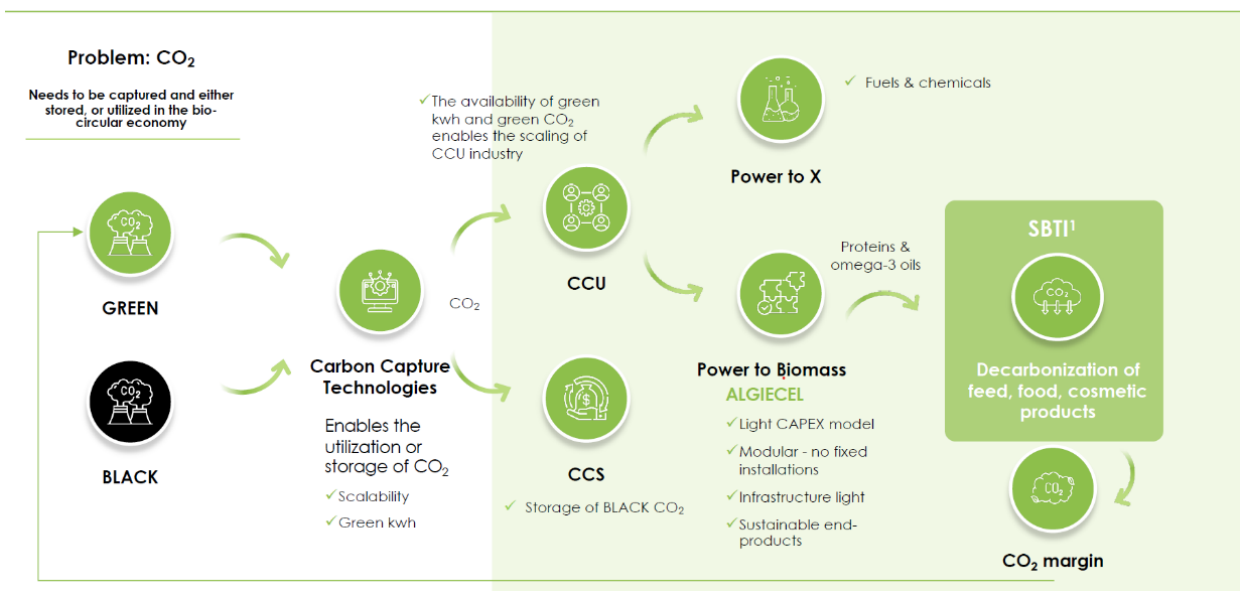


SDG 13 covers a broad portfolio of targets and indicators related to climate action and climate adaptation. Droughts, tropical cyclones, and floods cause damages amounting to billions of dollars every year.

Biosolutions can make plants and crops more resilient, allowing them to better adapt to changing weather conditions. Biological solutions such as algae and microorganisms can play a role in CCS (Carbon Capture and Storage) technologies by absorbing and converting CO₂ into biomass, which can help reduce CO₂ emissions.

In this context, Algiecel can also contribute to reducing the CO₂ footprint since they capture CO₂ with their technology and convert it into oxygen and biomass.

Figure 2. The role of Algiecel in the carbon economy (WIP)



Source: Algiecel

SDG 15 – Life on land

Biosolutions are also important in relation to SDG 15, which is about protecting, restoring, and supporting the sustainable use of ecosystems on land, combating desertification, halting land degradation, and biodiversity loss.

Microbiological solutions for agriculture

Various microbiological solutions can help increase efficiency in food production, reduce the environmental footprint for the agriculture sector, and enhance crop resilience to climate changes. Biological plant protection agents can shield plants from pests and diseases, thus eliminating the need for chemical solutions such as pesticides.

Biostimulants and pheromones

As part of the company's portfolio, Syngenta Nordics A/S offers biostimulants that can enhance plant health by strengthening their natural capabilities to protect and promote plant growth (Syngenta Nordics).

Danish BioPhero's insect pheromones can contribute to a more sustainable global agriculture. BioPhero's mission is to replace chemical insecticides with biological insect pheromones. Growers can prevent new generations of targeted pests from emerging by applying pheromones in a field, thus confusing the male insects and disrupting the mating (BioPhero).

15 LIFE ON LAND





SDG 17 – Partnerships for the goals

SDG 17 focuses on strengthening the global partnerships for sustainable development and increasing resources to achieve the Sustainable Development Goals.

In Denmark, there are numerous examples of cross-sectoral and public private partnerships created with the aim of promoting sustainable development. Denmark has a strong tradition of bringing together public organizations, private companies, and NGO's to collaborate on common goals. One example is the Alliance for Biosolutions. Together with various biosolutions stakeholders the alliance works to promote the potential of the biosolutions sector the green transition ([Alliance for Biosolutions](#)).





The examples above are not an exhaustive list of biosolutions related to the 17 Sustainable Development Goals. They are presented to give an idea of the wide scope and potential of biosolutions within several sectors and SDGs. Other examples of sectors where biosolutions can play a positive role in the green transition include:

- Waste reduction
- Energy production from organic material
- Sustainable forest management
- Overall climate resilience



ALLIANCE FOR BIOSOLUTIONS

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