Alternative proteins Circular Economy

September 2022

NextGen Proteins

Transformation of Biomass into Next Generation Proteins for Food and Feed

NextGenProteins will optimize the production of three alternative proteins and verify their use in various feed and food applications, in order to meet customers' needs and ensure consumer acceptance. The project will contribute to strengthening food security, sustainability, and self-sufficiency of EU protein production by demonstrating the suitability and economic viability of next-generation proteins as part of food and feed value chains; with less strain on natural resources and reduced environmental impacts.

KPMG's objective

The general objective of this work package is to assess the impact of alternative proteins on sustainability aspects, in terms of environmental impacts, economic, and social impact, and value chain risk.

Analysis

Assessing environmental and economic impact, using life cycle assessment methodologies. Assessing the circular economy potentials of the alternative protein production. Performing a multi-criteria value chain assessment.

Communication

Providing clear, relevant, and comparable results of the sustainability of the three alternative proteins that can be effectively communicated to stakeholders and consumers.

What is sustainability?

Definition of sustainable:

General: The capability of maintaining something at length without interruption or weakening.

Environmental science: The quality of not being harmful to the environment or depleting natural resources, and thereby supporting long-term ecological balance:

Definition of sustainable development:

Development that meets the needs of the present without compromising the ability of future generations to meet their own needs'.

It seeks to reconcile economic development with the protection of social and environmental balance.

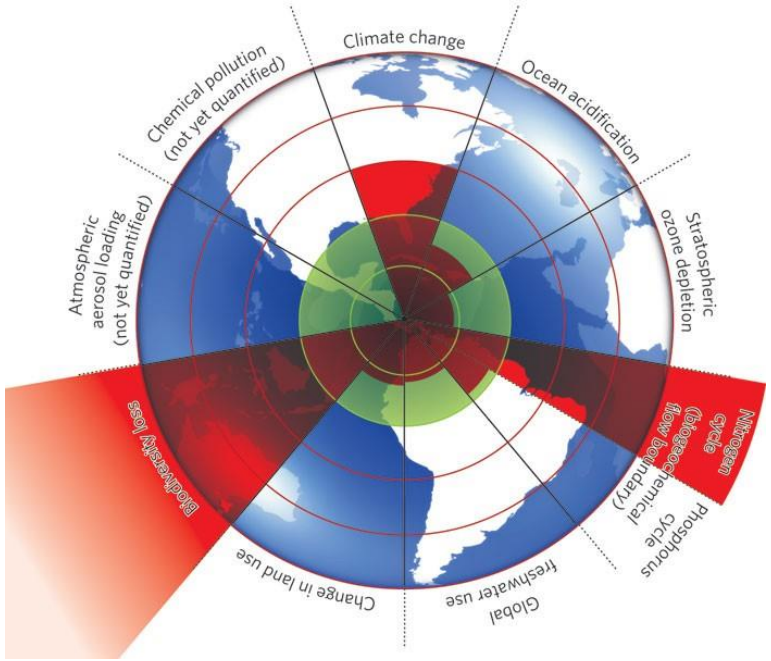
Sustainability from a corporate perspective:

Be profitable using good principles of governance while protecting social and environmental balance.

What is sustainability?

Environmental balance?

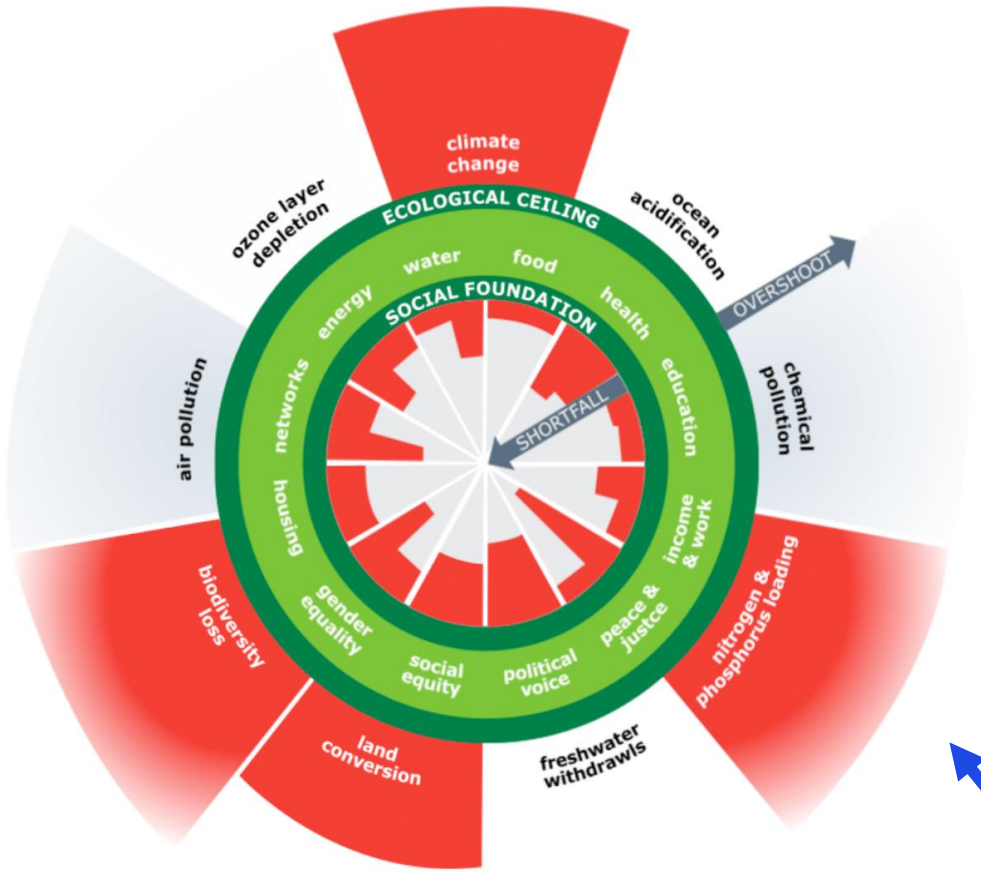
– We need Earth's life-supporting systems such as a stable climate, fertile soils, and a protective ozone layer



Social balance?

– We need life's essentials (from food and housing to healthcare, education and political voice)

What is sustainability?



The donut

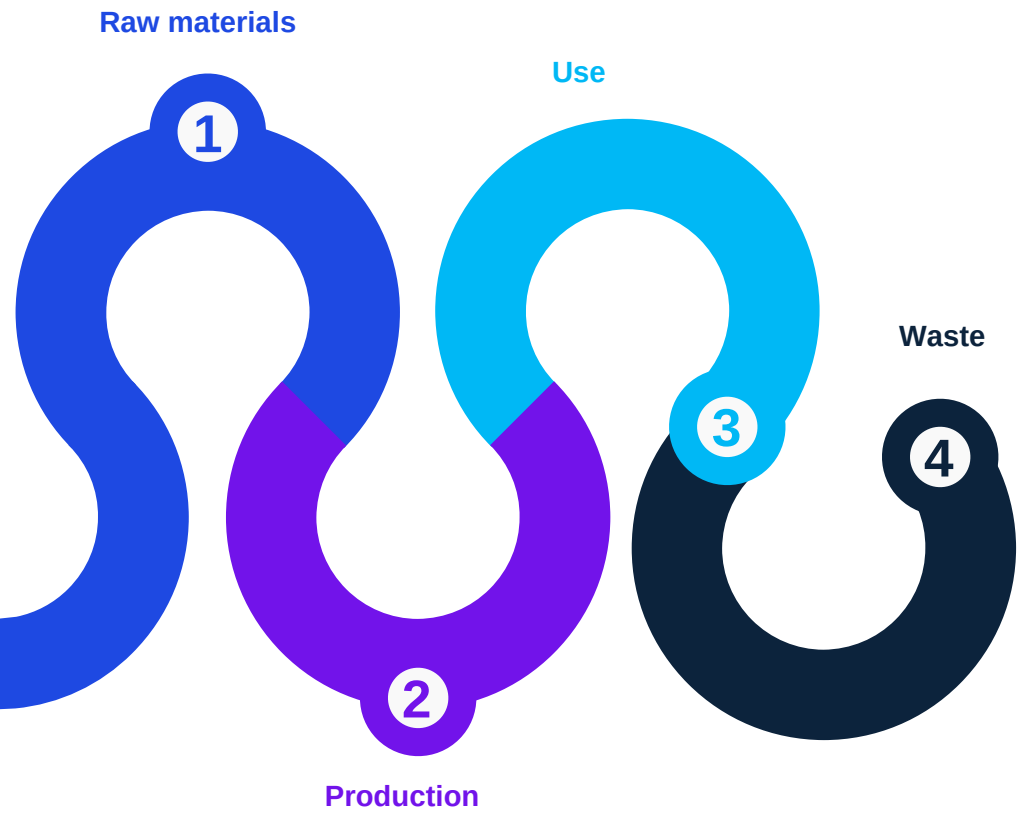
Humanity's 21st century challenge is to meet the needs of all within the means of the planet.

In other words,

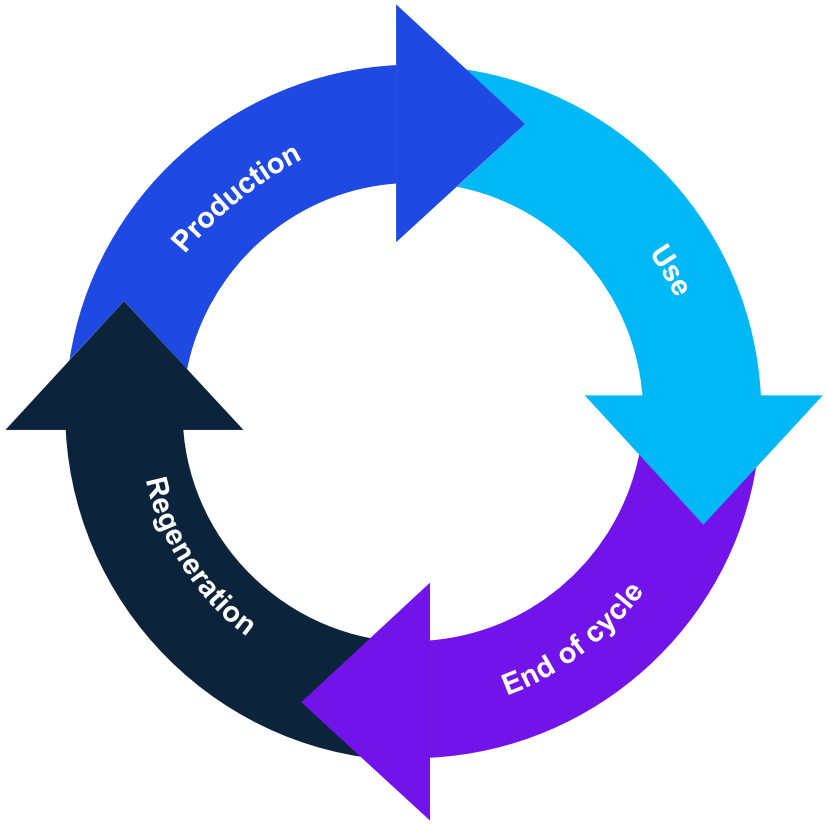
- to ensure that no one falls short on life's essentials (from food and housing to healthcare and political voice),
- while ensuring that collectively we do not overshoot our pressure on Earth's life-supporting systems

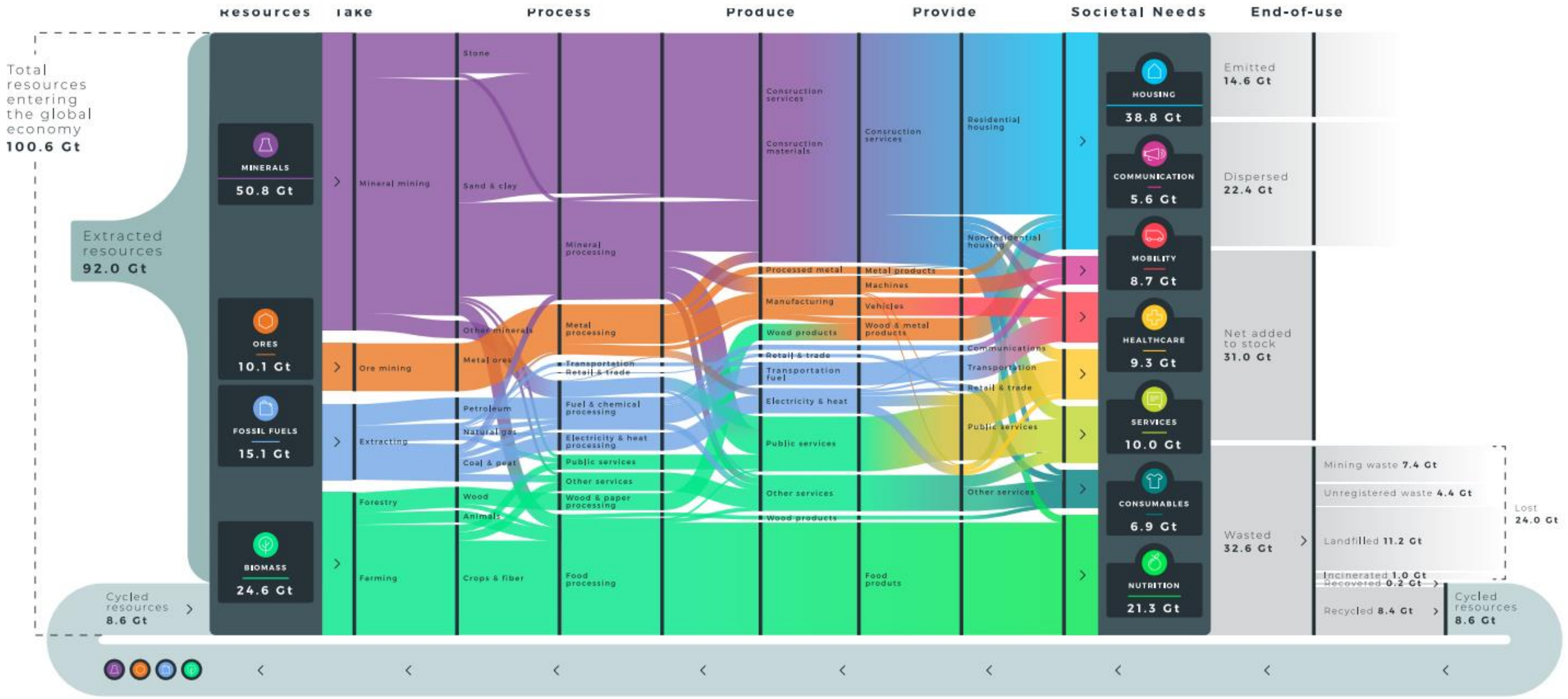
Opportunities in the Circular Economy

Linear economy

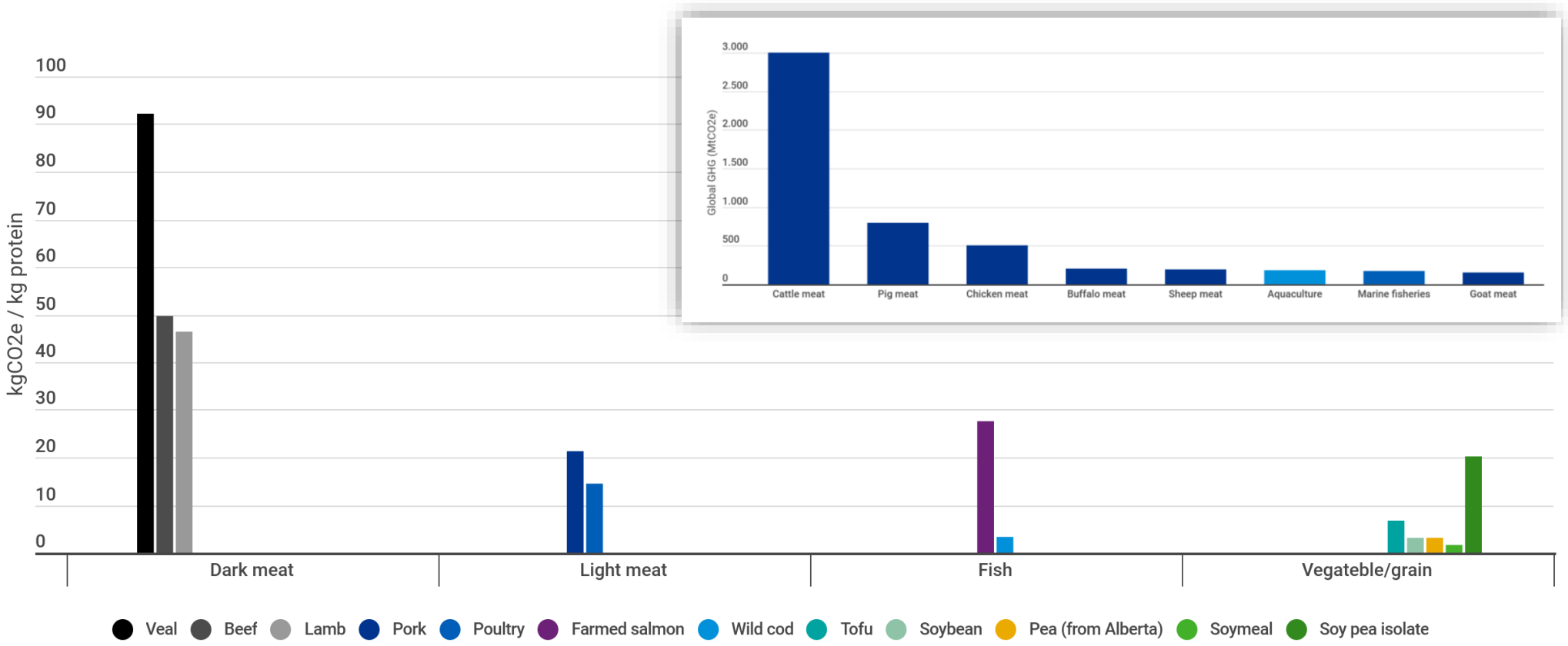


Circular economy





Circular Economy in nutrition



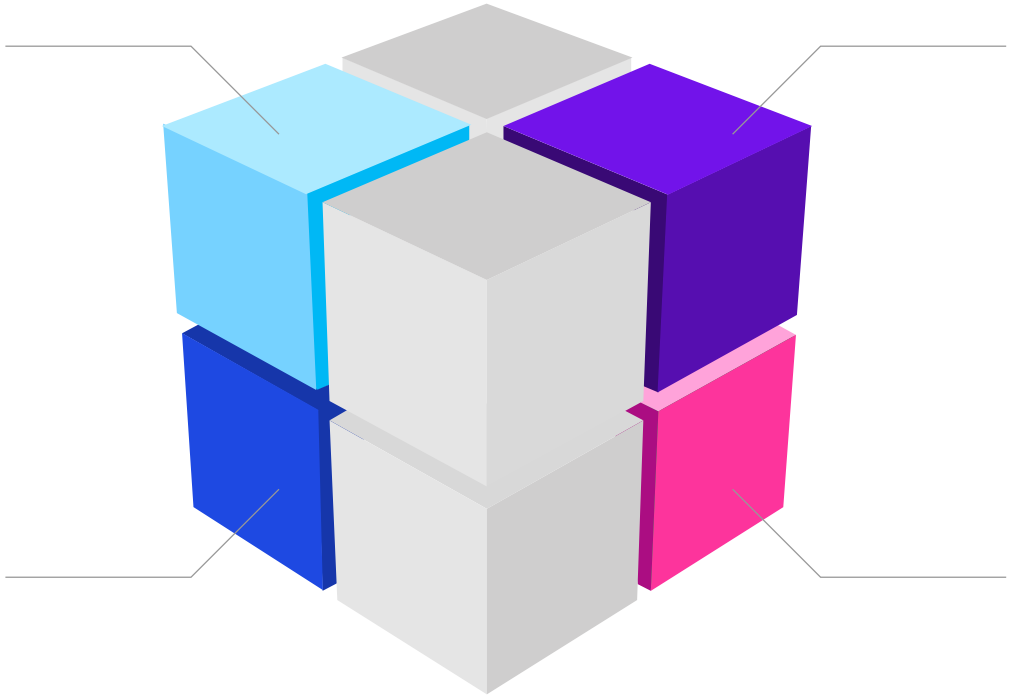
Circular Economy in nutrition

Reduce excess consumption

Replace animal feed with agricultural or food waste, less packaging on food products, increase food sufficiency.

Clean energy use

Replace fossil fuels with renewable energy.



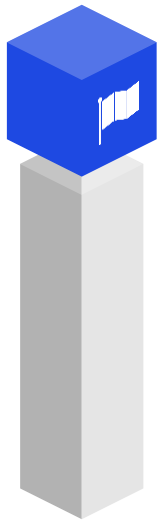
Sustainable food production

Organic food, seasonal & fresh food, regional/local food, own production and sustainable biomass use.

Healthy & Plant based food

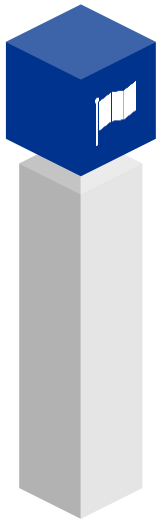
Less sugary foods and beverages, less processing and more plant based food.

Our alternative protein production cases



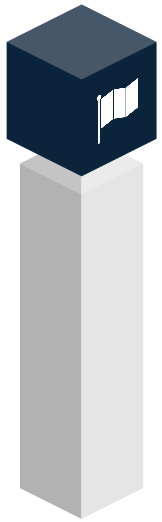
Algae

The algae production case study investigates the production microalgae and microalgae proteins.



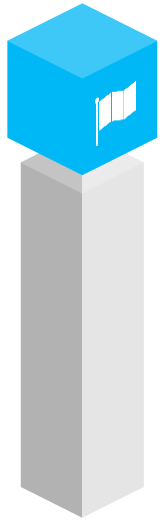
Single cell

The SCP case study examines the production of single-cell proteins, which are composed of dried inactived yeast.



Black soldier fly

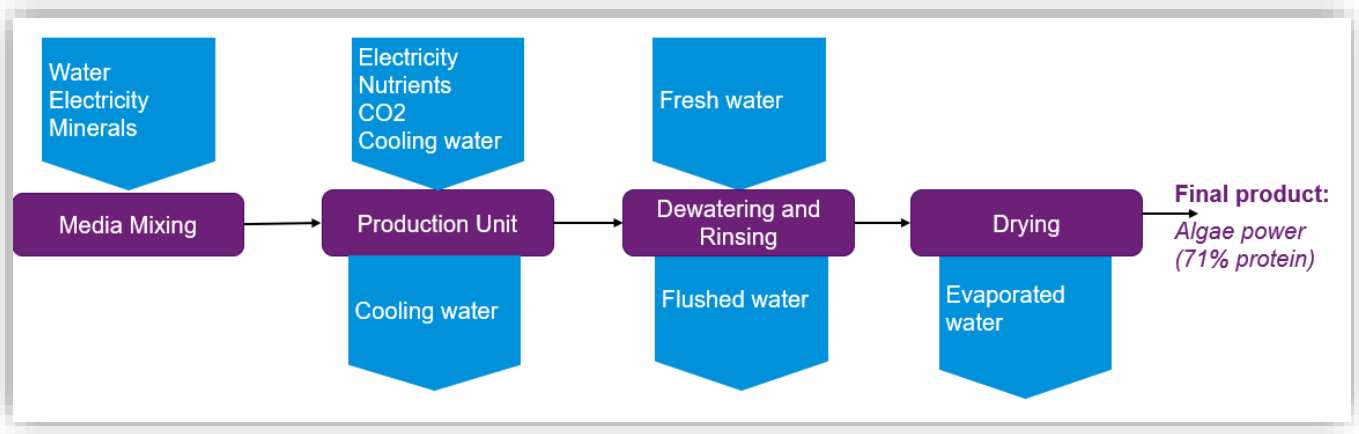
The case study examines the production of protein from the black soldier fly



Crickets

This case study looks at the production of protein from from crickets.

Algae

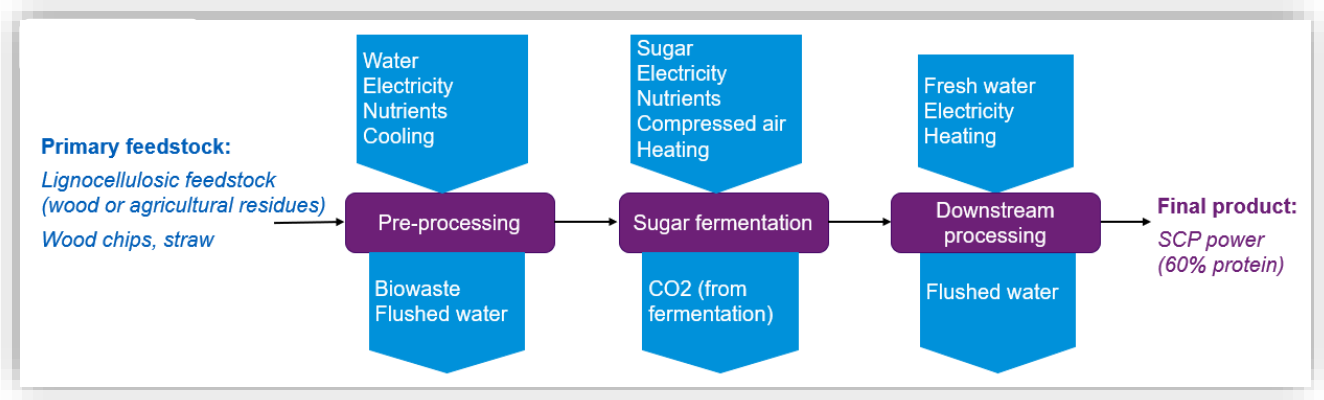


Clean energy use

Sustainable food production

Source	Circular option	Scale of option	Barriers
Carbon dioxide	Direct supply from local industrial source or direct air capture.	Local	- Need for pure CO2 - Infrastructure required
	Supply of captured CO2 from global markets.	Global	- Relatively small existing market - Green price premium
Cooling water	Wastewater from industrial source	Local	- Distance to partner - Infrastructure required
Electricity	Use of renewable electricity	Local	- Supply of renewable electricity
	Purchase renewable energy credits	Global	- Must be in region where CO scheme exists - Green price premium

Single cell

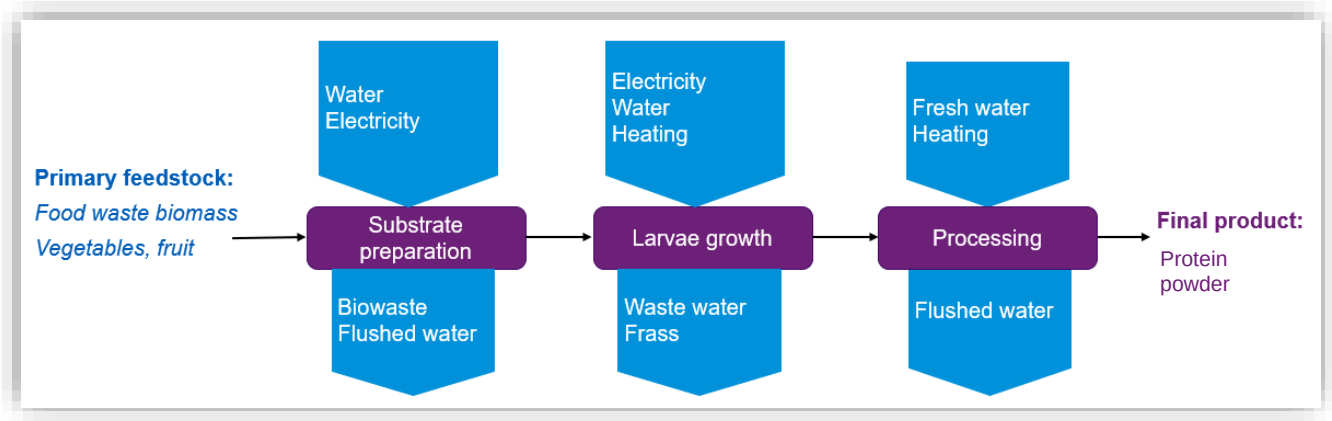


Reduce excess consumption

Plant based food

Source	Circular option	Scale of option	Barriers
Biomass	Use of circular input (i.e. wood chips, saw dust, or residual straw)	Local	- Circular biomass supplier at scale - Need for a consistent composition
Cooling Water	Industrial symbiosis	Local	- Need to find suitable partner
Solid losses (organic)	Anaerobic digestion	Local	- Need to find a suitable partner
Electricity	Use of renewable electricity	Local	- Supply of renewable electricity
	Purchase renewable energy credits	Global	- Must be in region where CO scheme exists - Green price premium

Insects



Sustainable food production

Reduce excess consumption

Source	Circular option	Scale of option	Barriers
Feed	Use circular feed Ensure regenerative farming	Local/Global	- Relatively small existing market - Green price premium
Frass	Internal circulation	Local	- Requires system design
	Industrial symbiosis with nearby industry	Local	- Need to find a suitable partner
Electricity	Use of renewable electricity	Local	- Supply of renewable electricity
	Purchase renewable energy credits	Global	- Must be in region where CO scheme exists - Green price premium

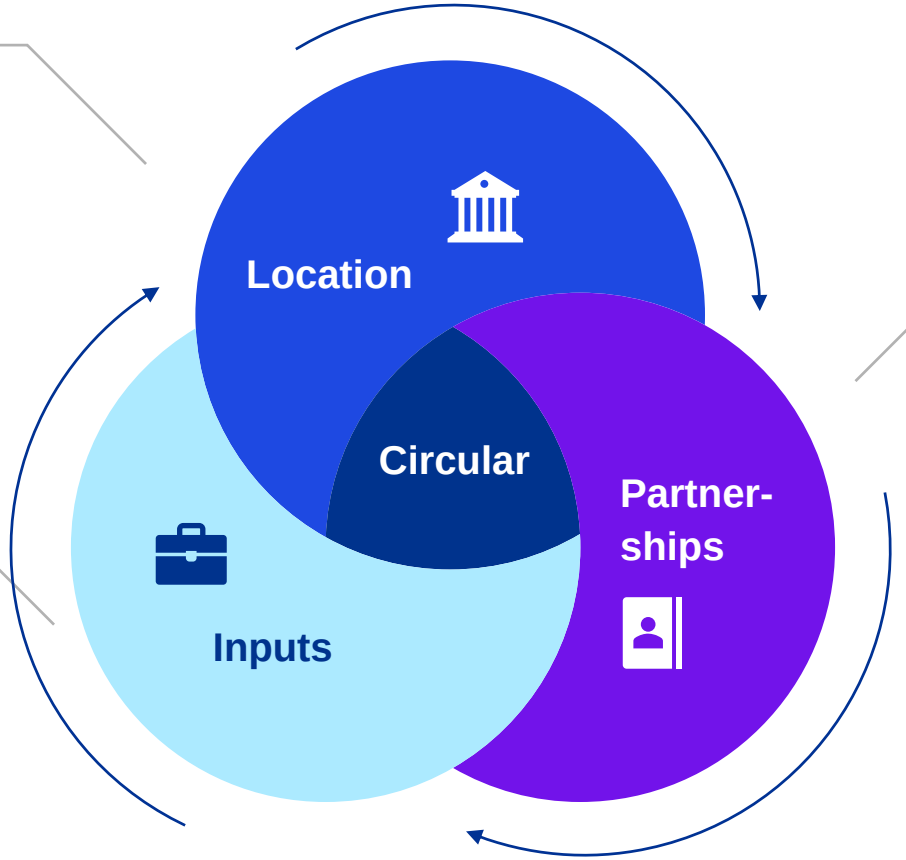
Key elements for success

Site selection

The success of some circular strategies can depend on location, which is important when resource consumption is analyzed. Production would benefit from operating in an eco-industrial park.

Circular inputs

Although the alternative proteins can be effcient when compared with conventional proteins, the effectiveness will depend on the use of wasted biomass inputs and renewable energy.



Local partners

Industrial symbiosis parterships can help producers source waste and wastewater for their own use. Same applies to providers of circular inputs for which demand is higher than supply.

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