Renewable Carbon Concept and Initiative

IPIFF annual conference: Shaping European Food Systems: How insect farming is contributing to the ‘Farm to Fork’ strategy targets

16. November 2022

Achim Raschka,

Head of Technology & Markets
nova-Institut GmbH

nova Institute
for Ecology and Innovation

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SCIENCE-BASED CONSULTANCY ON RENEWABLE CARBON FOR CHEMICALS AND MATERIALS

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nova-Institute was founded in 1994 and has a multidisciplinary and international team of more than 40 scientists

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nova-institute.eu/nova-team

RENEWABLE CARBON

Bio-based CO_2-based Recycling

Circular Economy

nova-Institut GmbH – SME

private and independent research institute;
multidisciplinary and international team of more than 40 scientists

Technology & Markets

- Market Research
- Innovation & Technology Scouting
- Trend & Competitive Analysis
- Supply & Demand Analysis
- Feasibility & Potential Studies
- Customised Expert Workshops

Communication

- Comprehensive Communication & Dissemination in Research Projects
- Communication & Marketing Support
- Network of 60,000 Contacts to Companies, Associations & Institutes
- Targeted Newsletters for 19 Specialty Areas of the Industry
- Conferences, Workshops & nova Sessions
- In-depth B2C Research

Sustainability

- Life Cycle Assessments (ISO 14040/44, PEF Conform)
- Carbon Footprint Studies and Customised Tools
- Initial Sustainability Screenings and Strategy Consultation
- Holistic Sustainability Assessment (incl. Social and Economic Impacts)
- GHG Accounting Following Recognised Accounting Standards
- Critical Reviews for LCA or Carbon Footprint Reports

Economy & Policy

- Strategic Consulting for Industry, Policy & NGO's
- Political Framework, Measures & Instruments
- Standards, Certification & Labelling
- Micro- and Macroeconomics
- Techno-Economic Evaluation (TEE) for Low & High TRL
- Target Price Analysis for Feedstock & Products


adidas

PROTECTS WHAT'S GOOD
Tetra Pak

Public-Private Partnership

BASF
We create chemistry

BMW

BCG


IKEA of Sweden

STAEDTLER

CLIB
2021

cefic

faurecia
inspiring mobility

Deloitte.

ECBF

LEGO

tesa

CO2 VALUE
EUROPE

covestro

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LEIFHEIT
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GO!PHA
Global Organization for PHA

DSM


EY
Building a better
working world

giz
Deutsche Gesellschaft
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CARBON
INITIATIVE
CO2

DUPONT

PORSCHE

KPMG

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WWF

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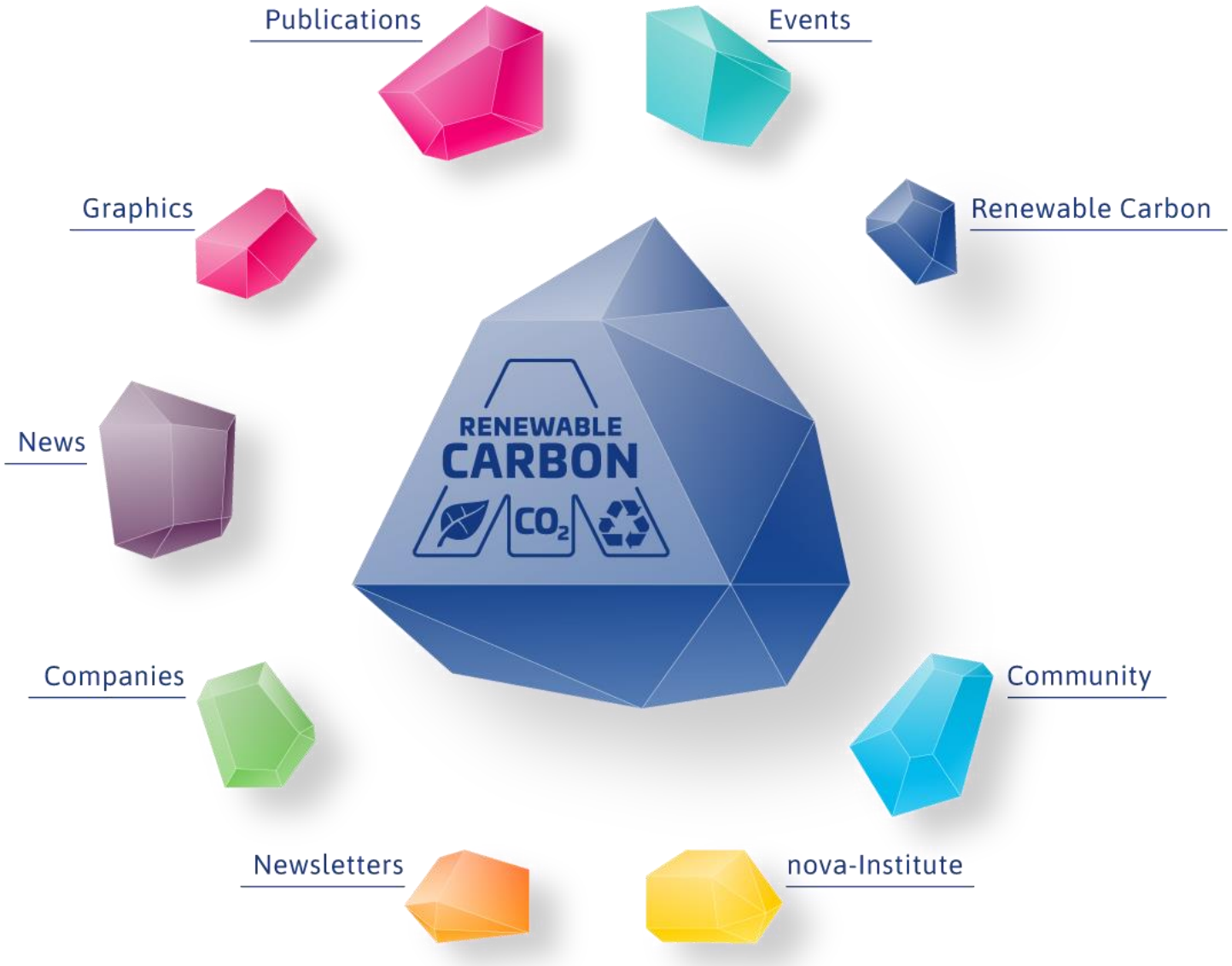

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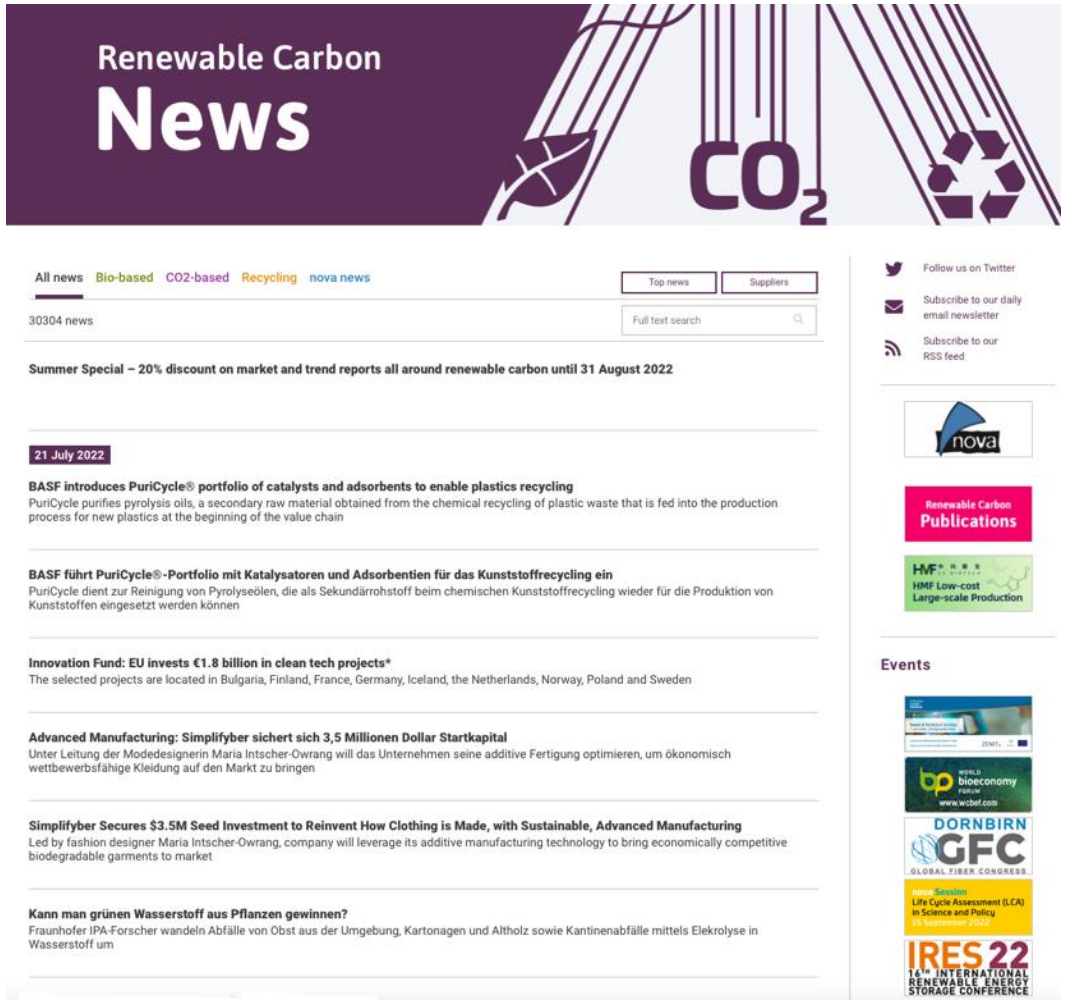
The Most Important Service



RENEWABLE CARBON NEWS

Daily news on Bio-based and CO_2-based Economy and Chemical Recycling Worldwide

333,000 Readers Monthly

> 30,000 Reports

> 14,000 Companies

> 3,700 Twitter Followers: @RenewableCNews

www.renewable-carbon.eu/news

RENEWABLE CARBON INITIATIVE

Renewable carbon concept on one slide

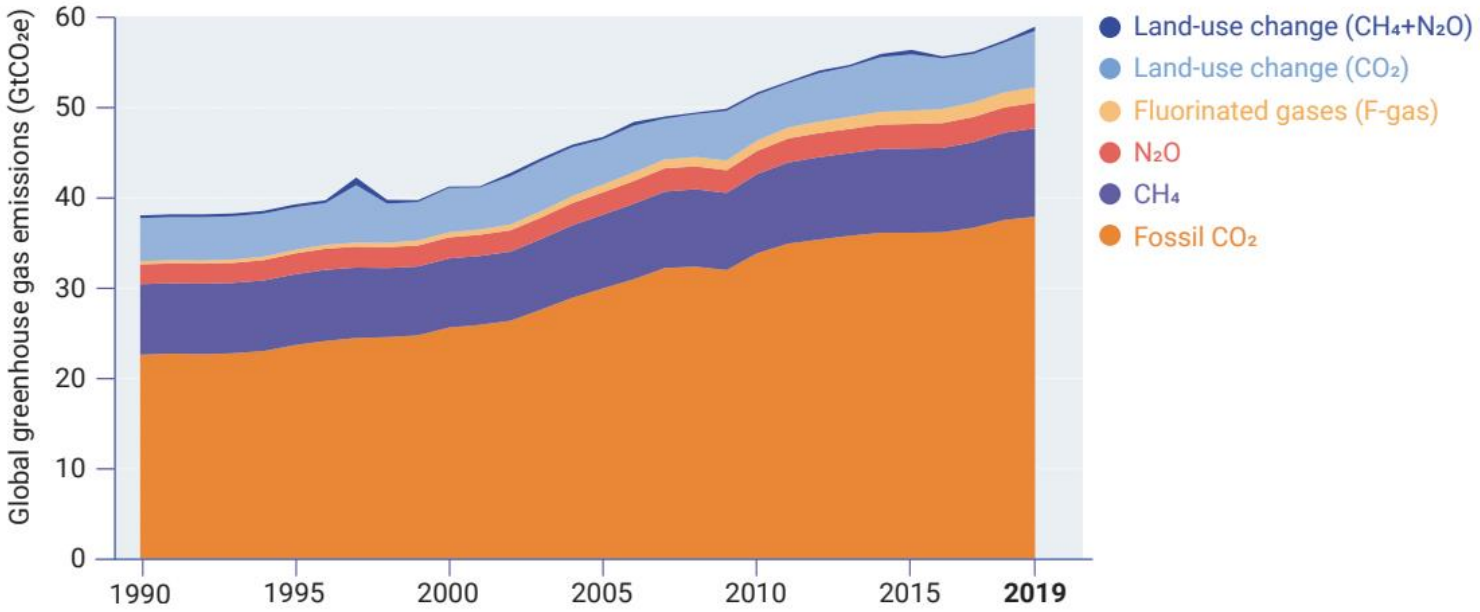
- **72% from the GHG** emissions come from **additional fossil carbon from the ground**
- **Decarbonisation** with renewable energies is a **good strategy for the energy sector**, but not for chemicals and materials, because most of them are based on carbon (just like humans ☺).
- There is a **lasting and even increasing need for carbon** for chemicals and materials.
- The key challenge is to **cover the demand** for carbon by alternative carbon sources.
- Those alternative carbon sources are **biomass**, **CO_2** and **recycling** of carbon containing waste streams (bio and plastic waste) – we need them all together to replace fossil carbon. We call them "**renewable carbon".**
- The **equivalent to decarbonisation** in the energy sector is a transition to **renewable carbon** in the chemical and material industries. And both mean **defossilisation**.

RENEWABLE CARBON

entails all carbon sources that avoid or substitute the use of any additional fossil carbon from the geosphere.

Renewable carbon can come from the atmosphere, biosphere or technosphere – but not from the geosphere. Renewable carbon circulates between biosphere, atmosphere or technosphere, creating a carbon circular economy.

Figure ES.1. Global GHG emissions from all sources



CO_2 Biomass Recycling	Carbon from above the ground
Crude Oil Natural Gas Coal	Carbon from below the ground

Responsible for ~70% of human-made GHG emissions

RENEWABLE CARBON INITIATIVE

renewable-carbon-initiative.com

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> **Shape the Future of the Chemical and Material Industry**

MEMBERS OF THE INITIATIVE

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PARTNERS OF THE INITIATIVE

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The Renewable Carbon Initiative (RCI)

ADMINISTRATIVE OFFICE

nova-Institute

- Initiator and scientific backbone
- Organisation, management and coordination of RCI

MEMBERS

Board

- Strategic direction
- Budget allocation
- Highly active
- Max. 20 members

General assembly

- 2–3 main representatives per member
- Identify / define priorities of RCI
- Decide on future projects

PARTNERS

- Support and promote each other
- Advise on specific topics

ACTIVITIES

- Advocacy
- Scientific background reports
- Position papers
- Networking

WORKING GROUPS - Involvement of all interested members

WG Labelling

- Development of a renewable carbon share (RCS) certificate and label

WG Policy

- Position papers
- Factsheets
- Stakeholder dialogues
- Public consultations of regulations

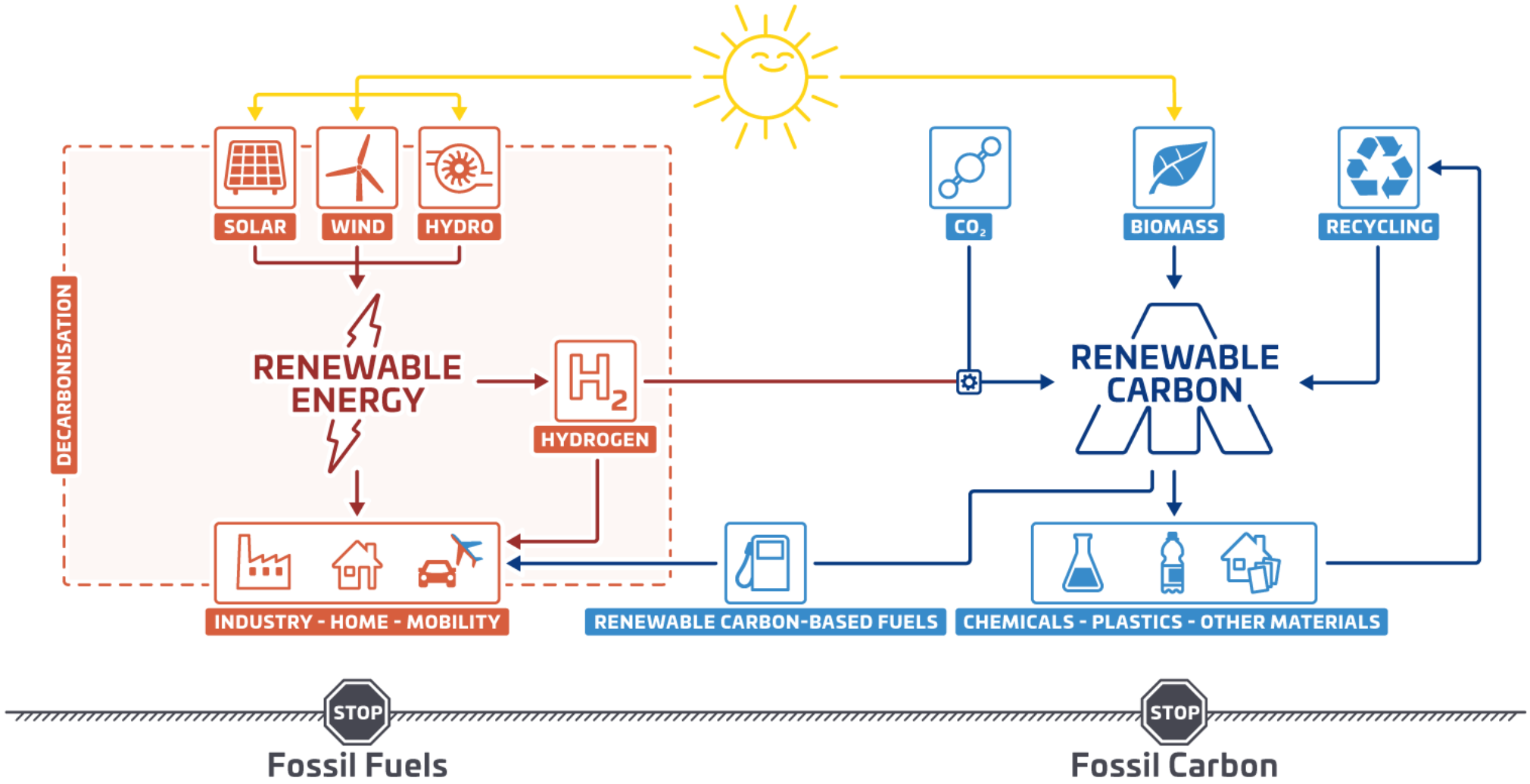
WG Recycling

- Chemical and mechanical recycling
- Position papers
- Strategic reports

WG Sustainability

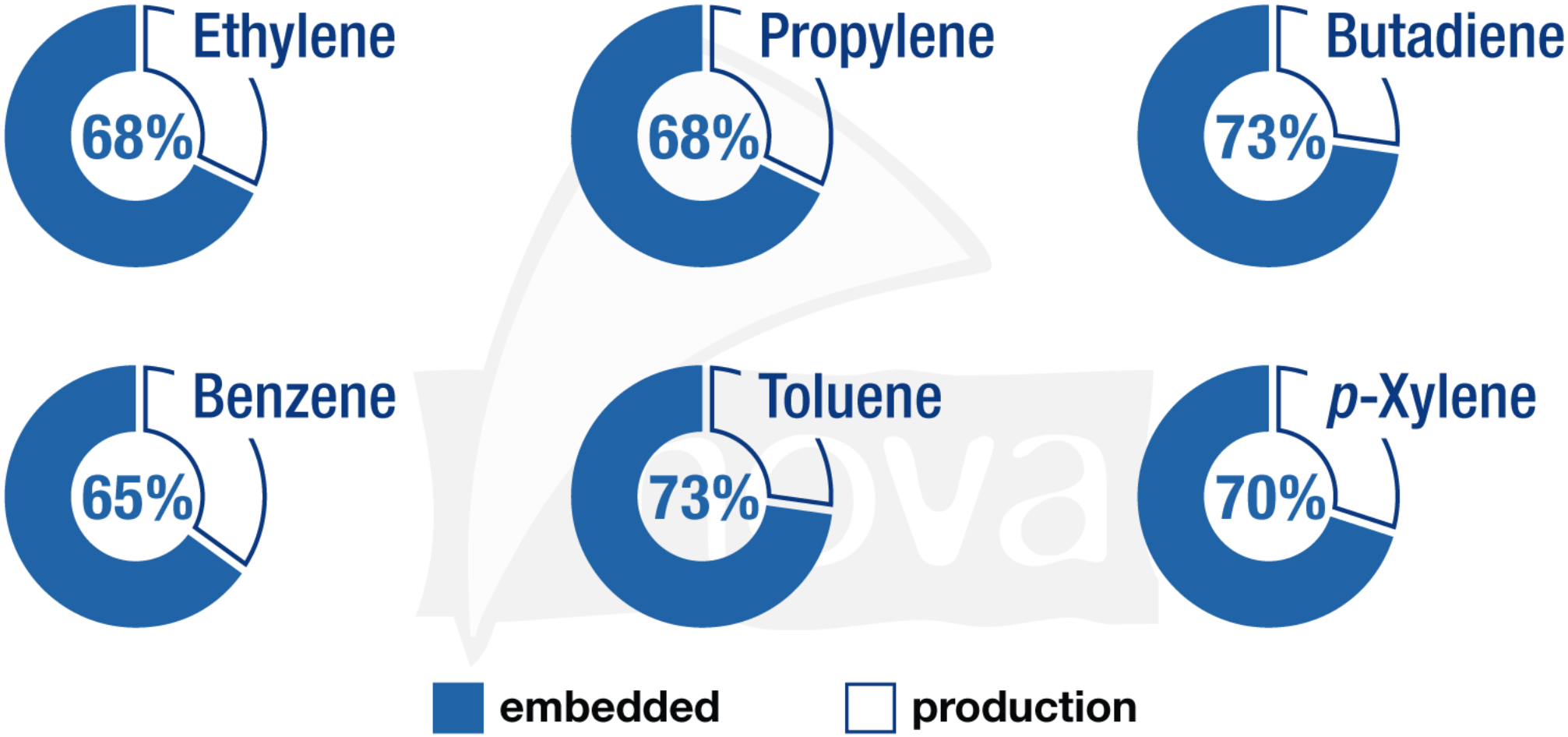
- Deep understanding and harmonisation of sustainability assessment and reporting
- Position papers
- Strategic reports

Renewable Energy and Renewable Carbon for a Sustainable Future



All figures available at **www.bio-based.eu/graphics**

The invisible carbon footprint



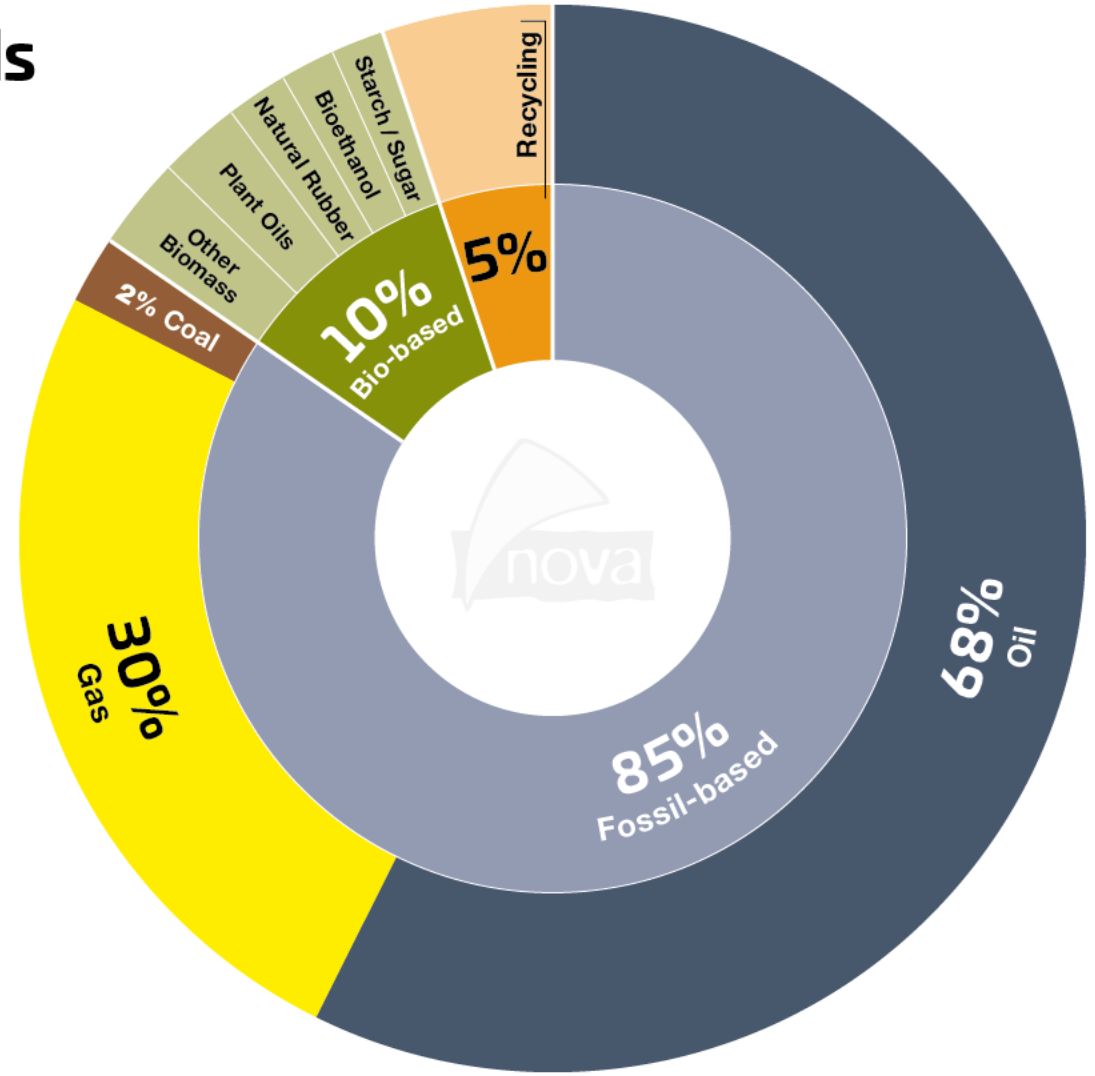
All figures available at **www.bio-based.eu/markets**

Ethylene, propylene, butadiene – Calculations by nova-Institute
Benzene, toluene, *p*-xylene – Source: BioBTX

Global Carbon Demand for Organic Chemicals and Derived Materials

by Type of Feedstock

Total: **450 Mt embedded C/yr**

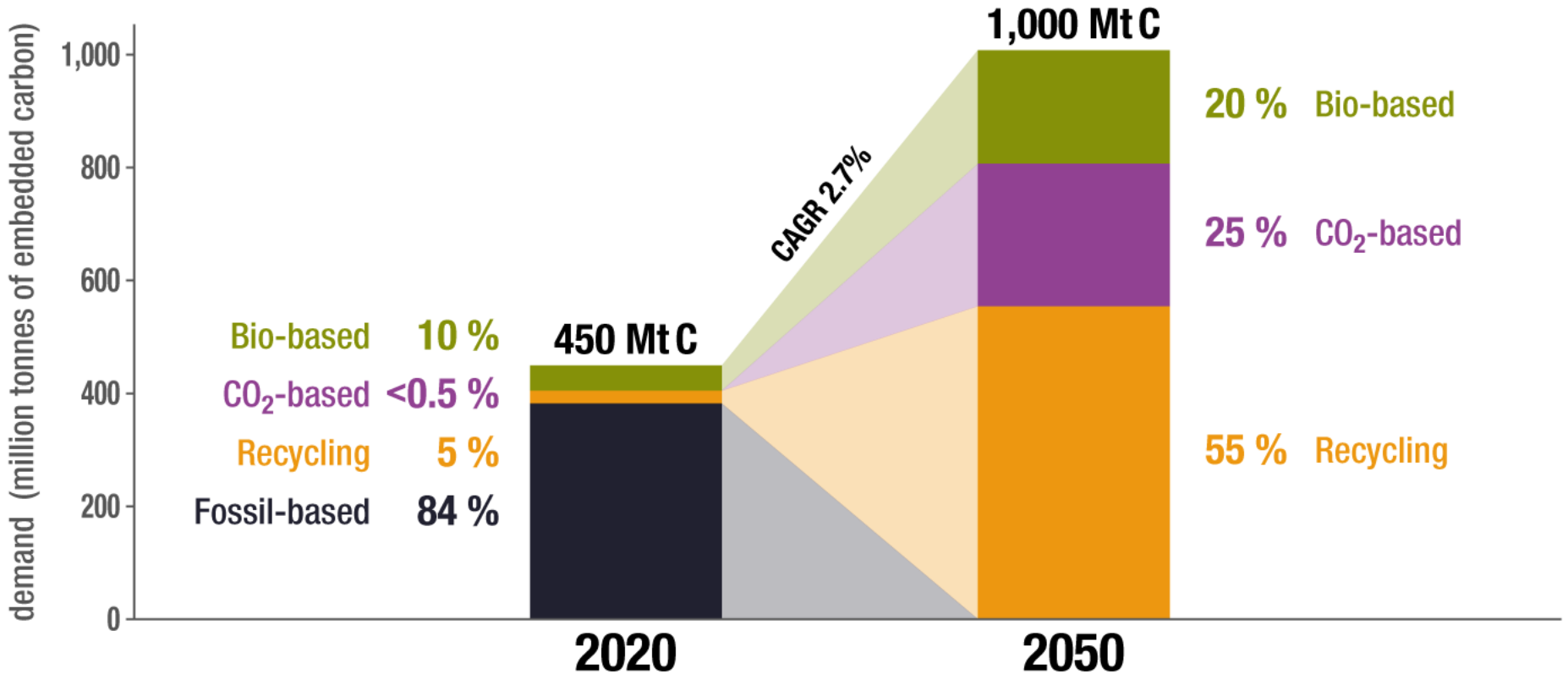


Reference Years: **2015 – 2020**

Main Sources: **Piotrowski et al. (2015), Hundertmark et al. (2018), Levi and Cullen (2018), Skoczinski et al. (2021)**
available at **www.renewable-carbon.eu/graphics**

Global Carbon Demand for Chemicals and Derived Materials

in 2020 and Scenario for 2050 (in million tonnes of embedded carbon)



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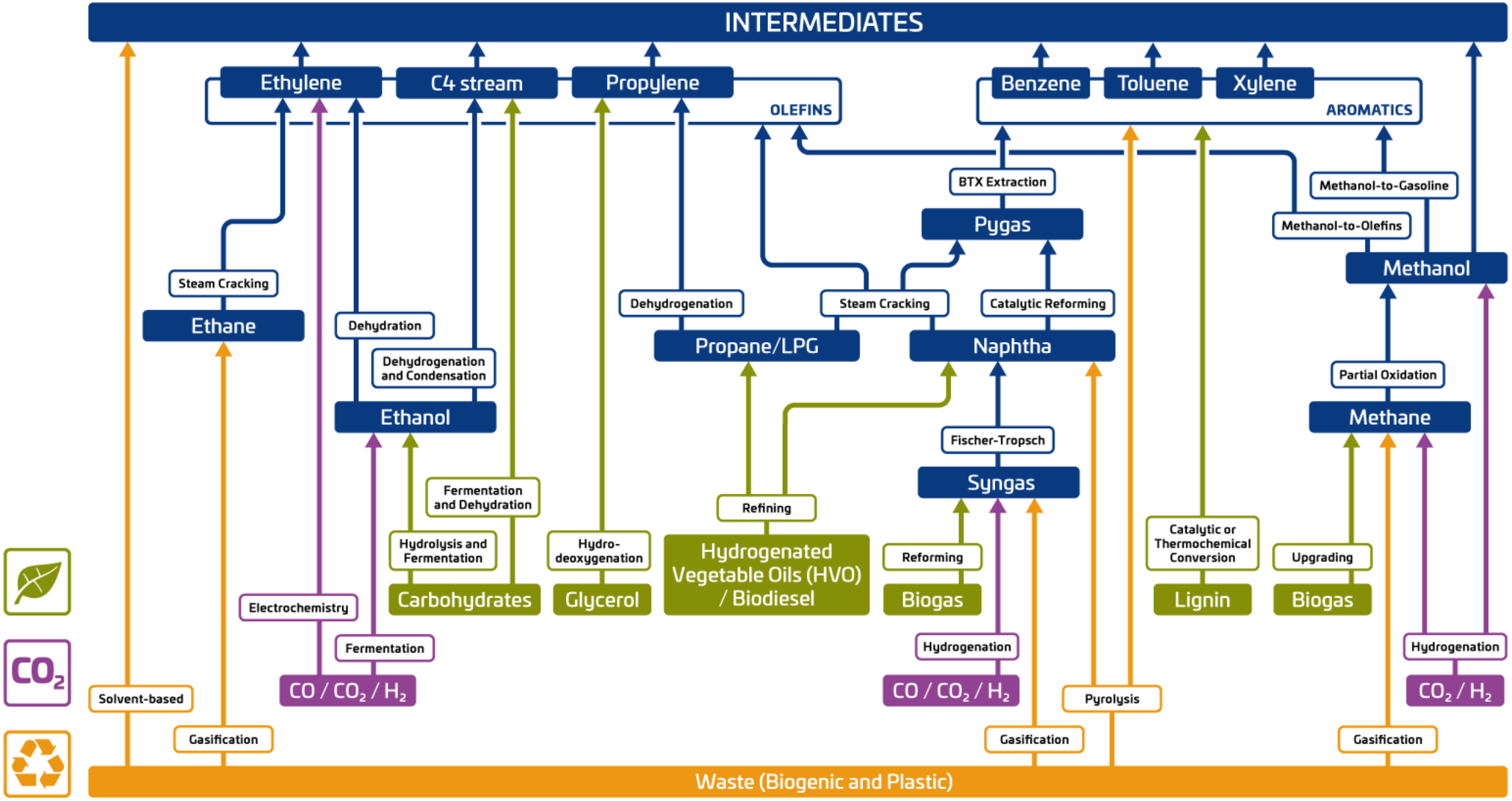
Renewable Carbon Refinery



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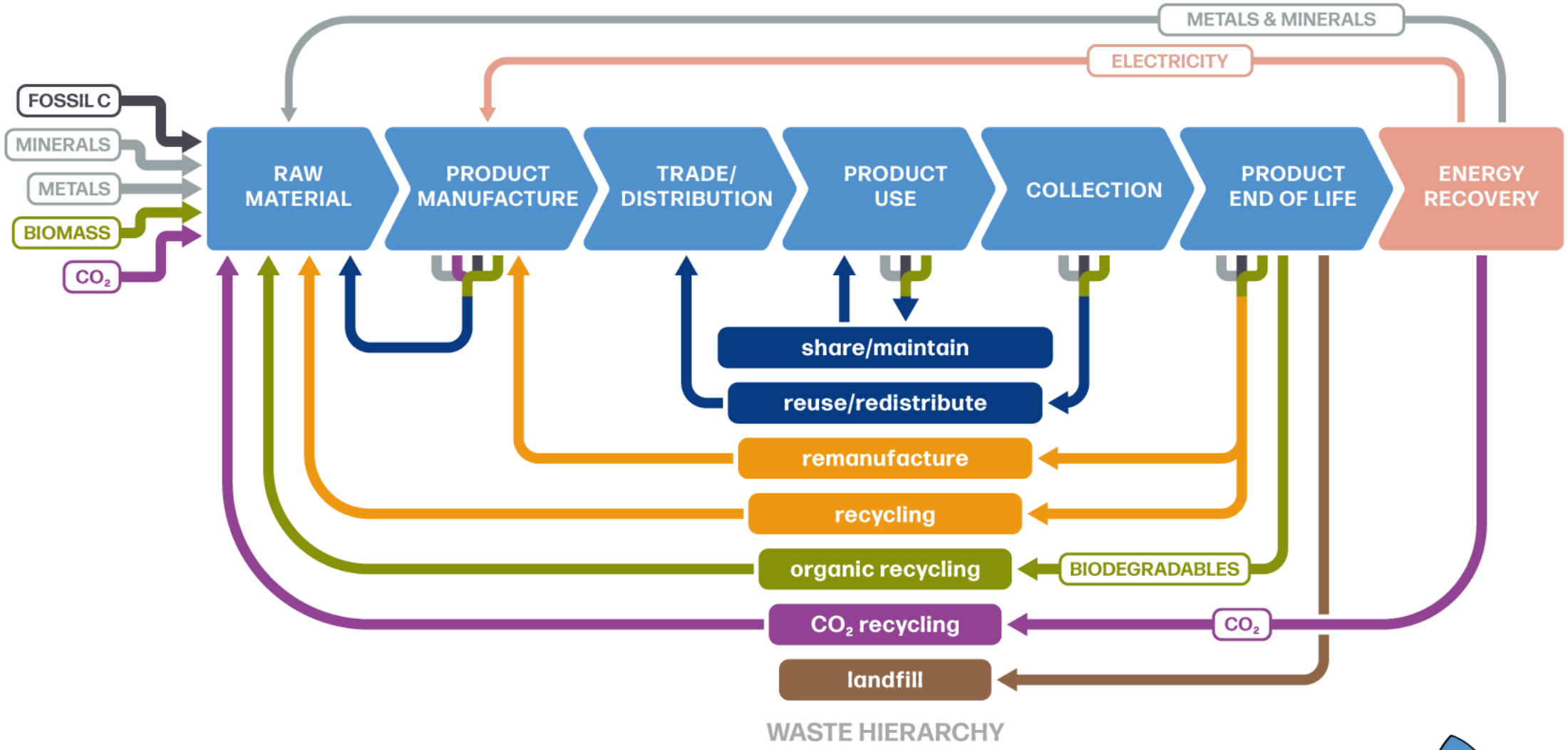
Comprehensive Concept of Circular Economy



available at **www.renewable-carbon.eu/graphics**

How do Insects fit into this?

Insect technologies are a **biotechnological conversion technology** and offer options to **utilize biogenic waste streams** to produce:

Proteins
for food and feed
for industrial applications like adhesives, coatings, fine chemistry

Picture: Ynsect

Oils / Fats
for oleochemistry (surfactants, metal soaps, lubricants)
for cosmetics

Chitin
for materials, coatings
for specific applications (antioxidants, shading, water cleaning)

Faeces – for fertilizers

Other molecules?

Tech4Biowaste

A Dynamic Database of Technologies for Biowaste Utilisation

Achim Raschka, nova-Institut GmbH
achim.raschka@nova-institut.de

This project receives funding from the Bio-based Industries Joint Undertaking (JU) under the European Union's Horizon 2020 research and innovation programme under grant agreement No 101023200. The JU receives support from the European Union's Horizon 2020 research and innovation programme and the Bio-based Industries Consortium.

Strategy

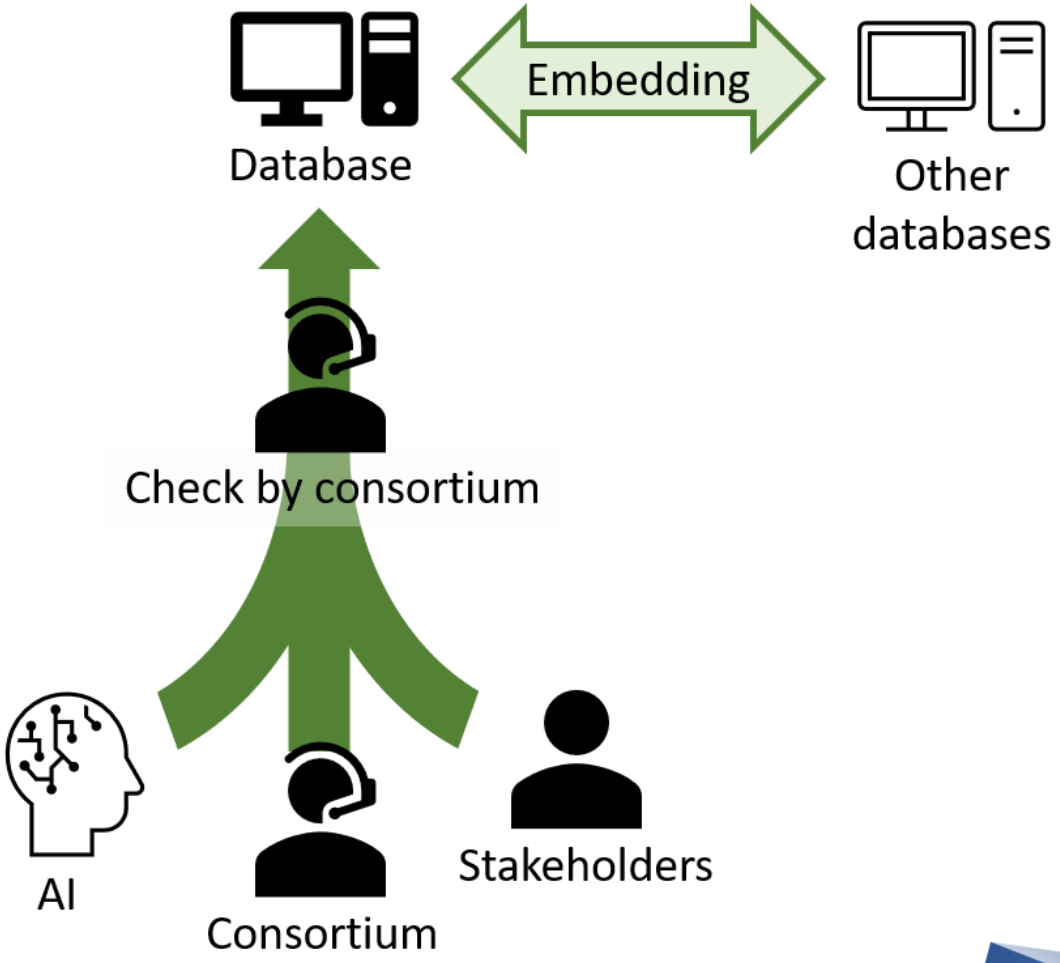
- Explore and quantify the needs of actors in the bio-based sector
- Adopt a hybrid model to populate, update and maintain the database
- Produce a business model and governance structure for long-term operation

Key Considerations and Design Choices

Hybrid Model

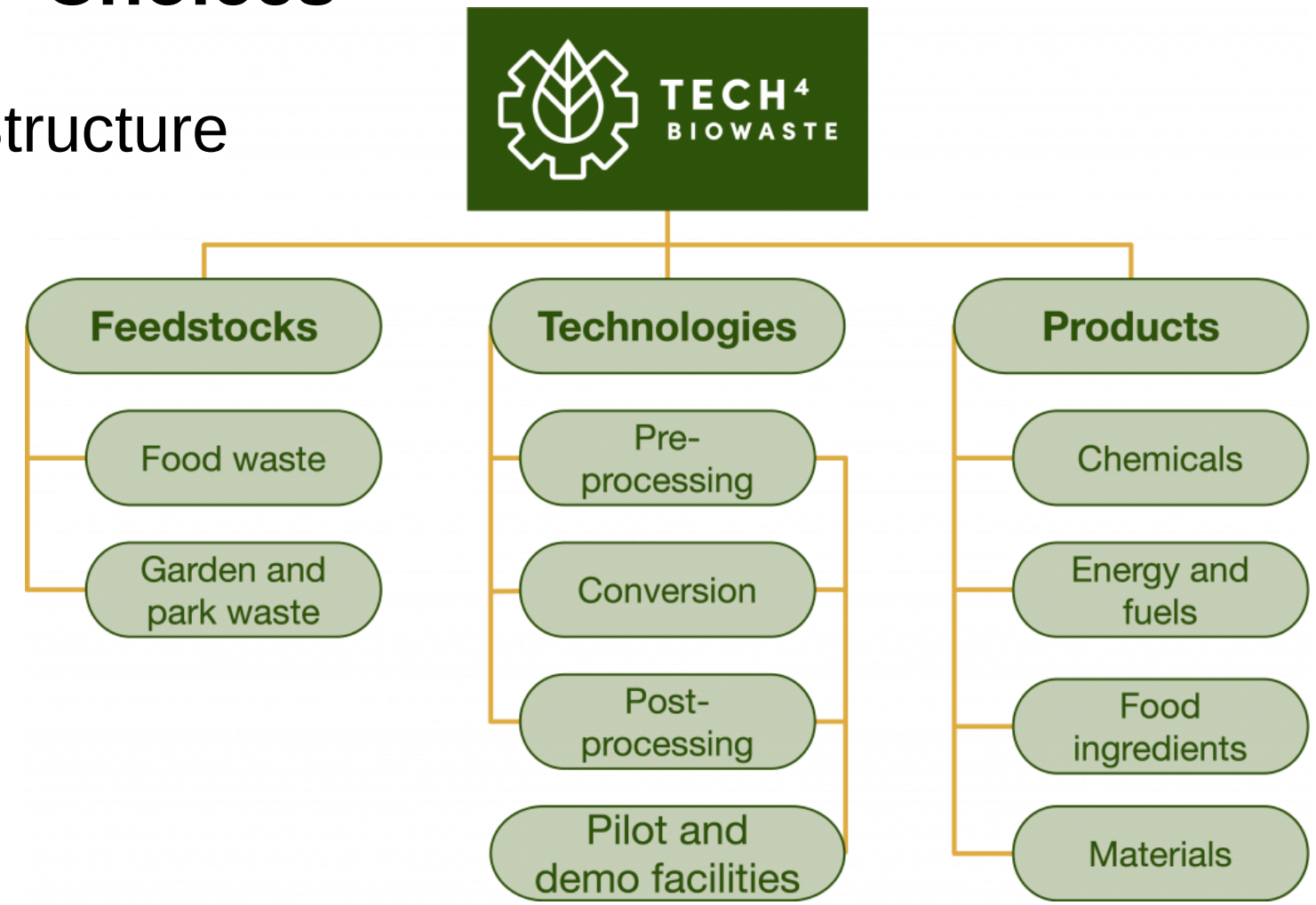
To build, populate and update the database

- Combining contributions from:
- Consortium partners
- External community of volunteers
- Automated contributors



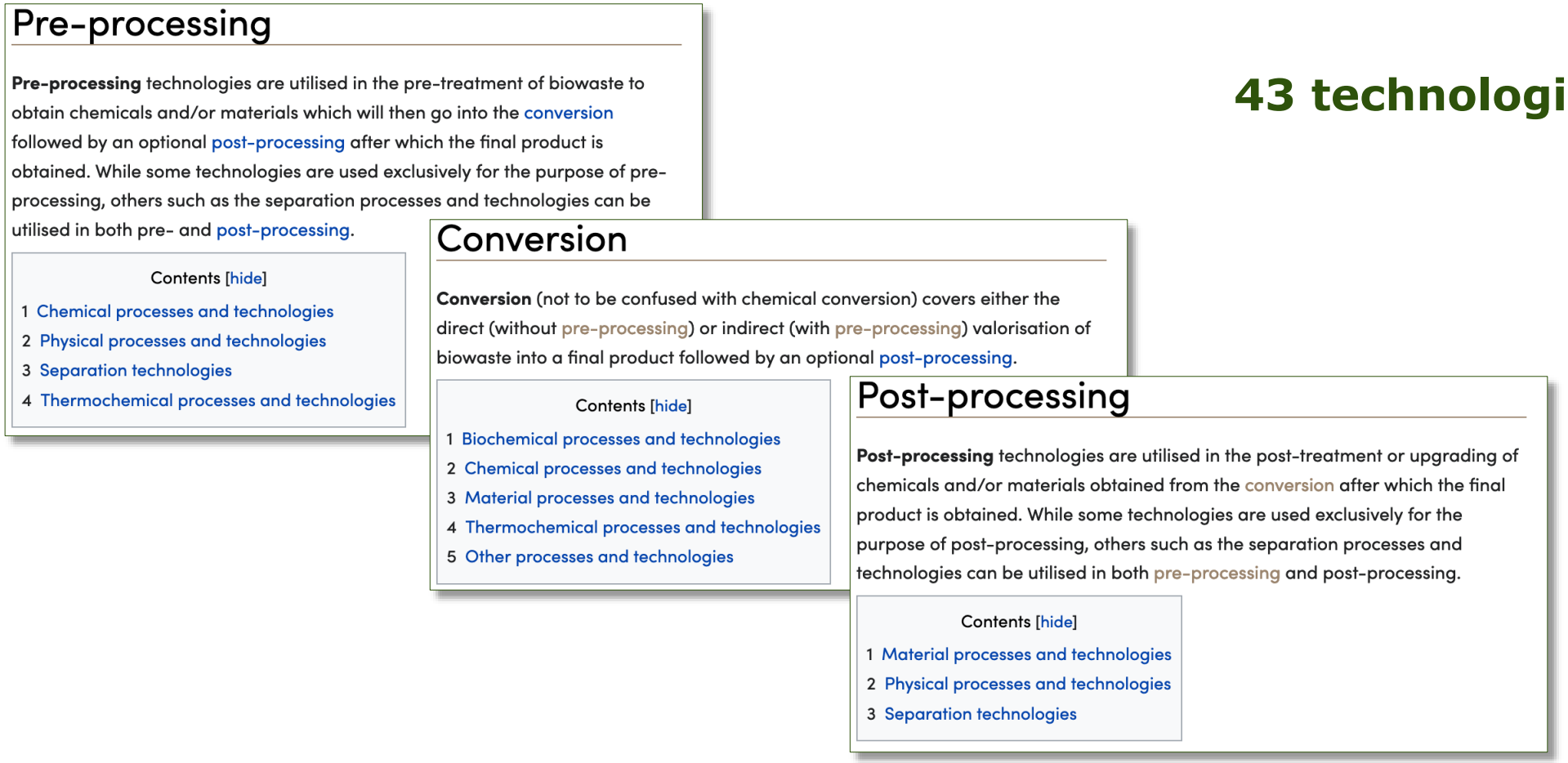
Key Considerations and Design Choices

Database Structure



Tour through the Tech4Biowaste database

Database/article structure, technologies, and other content

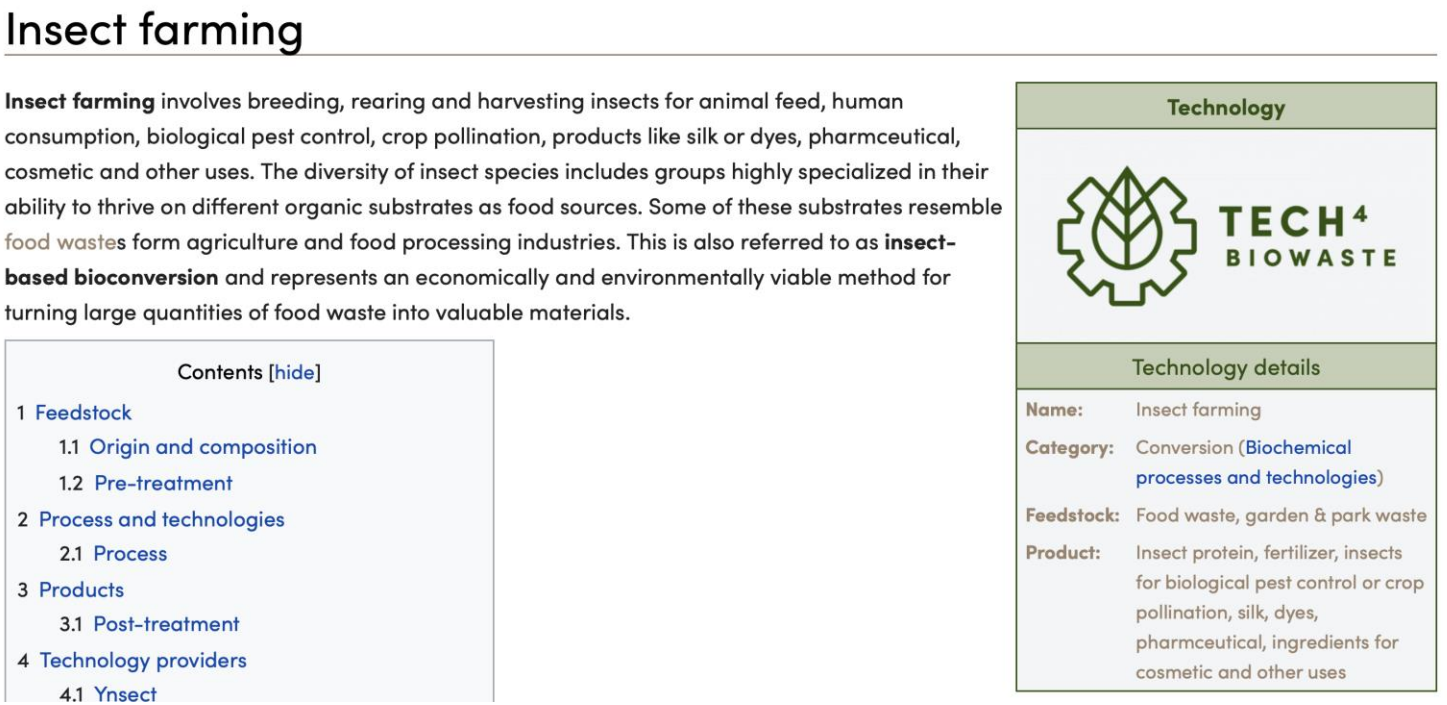


43 technologies

Tour through the Tech4Biowaste database

Database/article structure, technologies, and other content

- Each technology article begins with quickly accessible basic information:
- Short description
- Infobox
- Table of content



Insect farming

Insect farming involves breeding, rearing and harvesting insects for animal feed, human consumption, biological pest control, crop pollination, products like silk or dyes, pharmceutical, cosmetic and other uses. The diversity of insect species includes groups highly specialized in their ability to thrive on different organic substrates as food sources. Some of these substrates resemble food wastes form agriculture and food processing industries. This is also referred to as **insect-based bioconversion** and represents an economically and environmentally viable method for turning large quantities of food waste into valuable materials.

Contents [hide]

1 Feedstock
- 1.1 Origin and composition
- 1.2 Pre-treatment

2 Process and technologies
- 2.1 Process

3 Products
- 3.1 Post-treatment

4 Technology providers
- 4.1 Ynsect

Technology

TECH4 BIOWASTE

Technology details

Name:	Insect farming
Category:	Conversion (Biochemical processes and technologies)
Feedstock:	Food waste, garden & park waste
Product:	Insect protein, fertilizer, insects for biological pest control or crop pollination, silk, dyes, pharmceutical, ingredients for cosmetic and other uses

Tour through the Tech4Biowaste database

Database/article structure, technologies, and other content

Protix [WYSIWYG edit | Wikitext edit]

Insect farming provider

General information			
Company:	Protix		
Country:	The Netherlands		
Contact:	sales@protix.eu		
Webpage:	https://protix.eu		
Technology and process details			
Technology name:		Technology category:	Conversion (Biochemical processes and technologies)
TRL:		Capacity:	$kg \cdot h^{-1}$
Farming area:	m^2/organism	Organism:	Black Soldier Fly (*Hermetia illucens*)
		Other:	
Feedstock and product details			
Feedstock:		Product:	Insect protein, insect oil, fertilizer, fish feed

Contents [hide]

Protix was founded 2009 and is market leader when it comes to verifiable and scalable insect breeding. The black soldier fly (*Hermetia illucens*) is a key player: their larvae provide us with a unique source of protein for food and feed. Protix established a high level of technology and operates on industrial scale. They have a strong focus on research and engineering to continuously further improve quality, controllability, efficiency and overall competitiveness. This project is financially supported by the European fund for regional development:

Keep in Touch

Ways to connect

Email:

info@tech4biowaste.eu

Web:

www.tech4biowaste.eu

Tech4Biowaste group in the Renewable Carbon Community:

renewable-carbon-community.com/tech4biowaste-registration

Coordinator:

John Vos (BTG)

Stakeholder Relations Manager:

Stef Denayer (BBEPP)

Communication & Dissemination:

Freya Sautner (nova)

Save the Date!

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Mr. Guido Müller
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All conferences at
www.renewable-carbon.eu/events

Thank you for your attention!

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Renewable Carbon Economy
Markets & Marketing
Technology Monitoring

Stay in touch: **renewable-carbon.eu/newsletters**

SHAPING EUROPEAN FOOD SYSTEMS

How *insect farming* is contributing to the 'Farm to Fork' strategy targets

16 November 2022

Daniela Battaglia - FAO Rome

ipiff

BETTER INSECT SOLUTIONS
POWERED BY BIG DUTCHMAN, INNO+ & SKOV

bygora

PROTIX

TEBRIO

VISCON logistics

VEOLIA

Food and Agriculture Organization of the United Nations

SUSTAINABLE DEVELOPMENT GOALS

insects as feed and food – their contribution to the SDGs

Daniela Battaglia – IPIFF Annual Conference, 16 November 2022

Food and Agriculture Organization of the United Nations

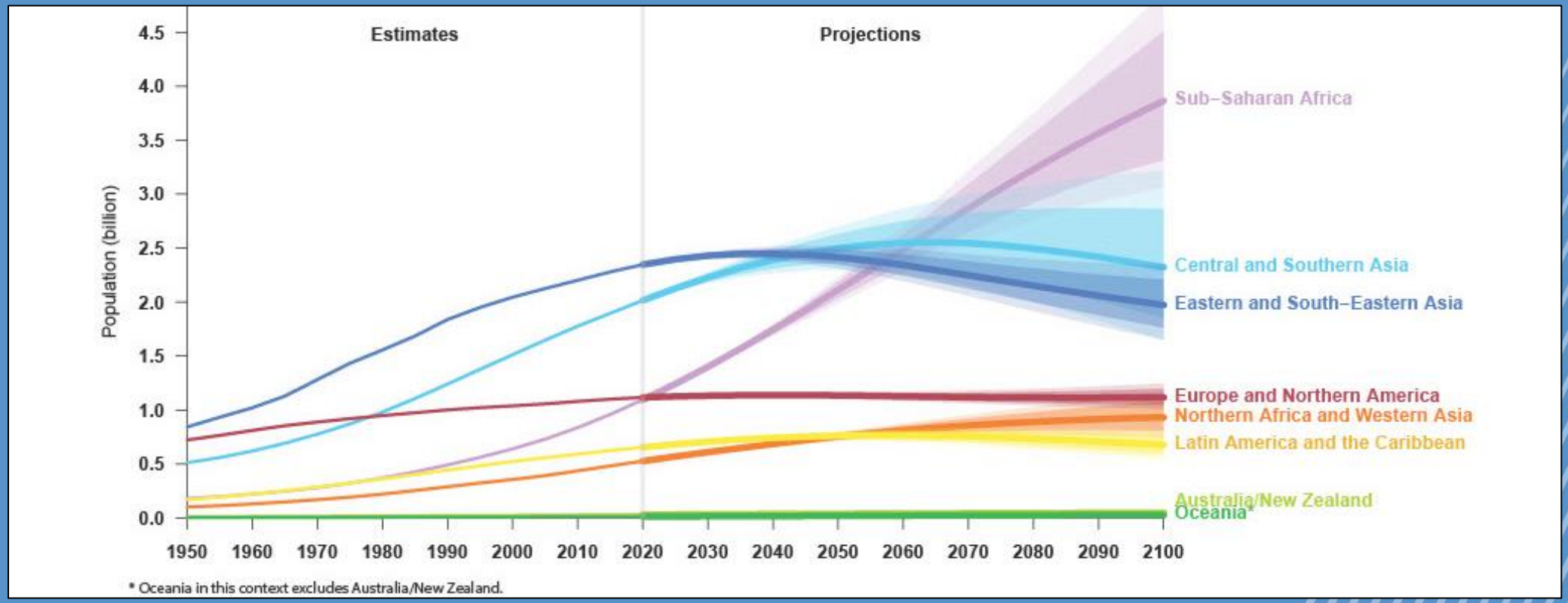
SUSTAINABLE DEVELOPMENT GOALS

Population projections, 2020-2100

Sub-Saharan Africa will account for most of the world's population growth in the coming decades, while some other regions will experience population declines

2021: 7,8 Mrd

2031: 8,6 Mrd



Source: United Nations, Department of Economic and Social Affairs, Population Division (2019). World Population Prospects 2019: Data Booklet (ST/ESA/SER.A/424).

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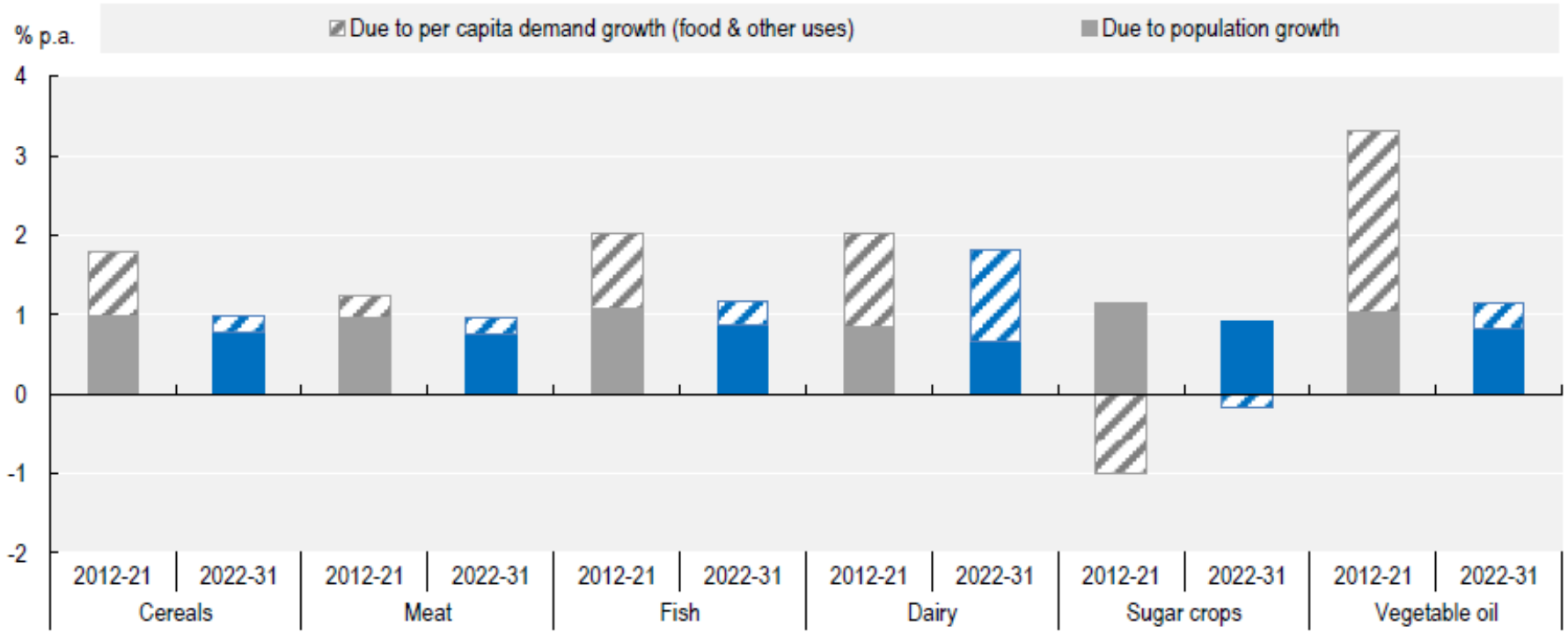
SUSTAINABLE DEVELOPMENT GOALS



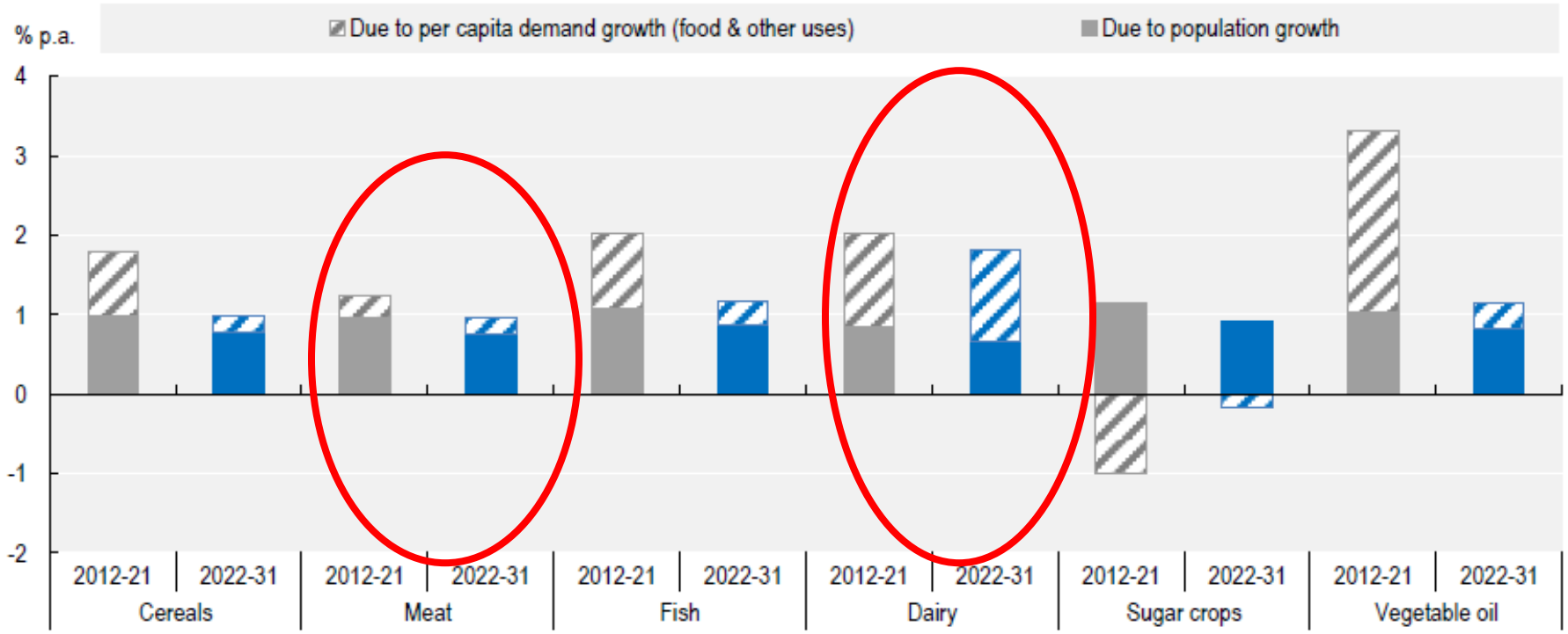
Note: The population growth component is calculated assuming per capita demand remains constant at the level of the year preceding the decade. Growth rates refer to total demand (for food, feed and other uses).

Source: OECD/FAO (2022), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

Global food demand is expected to grow at 1.4% per year over the next decade, driven by population and per capita income growth.

Food and Agriculture Organization of the United Nations

SUSTAINABLE DEVELOPMENT GOALS



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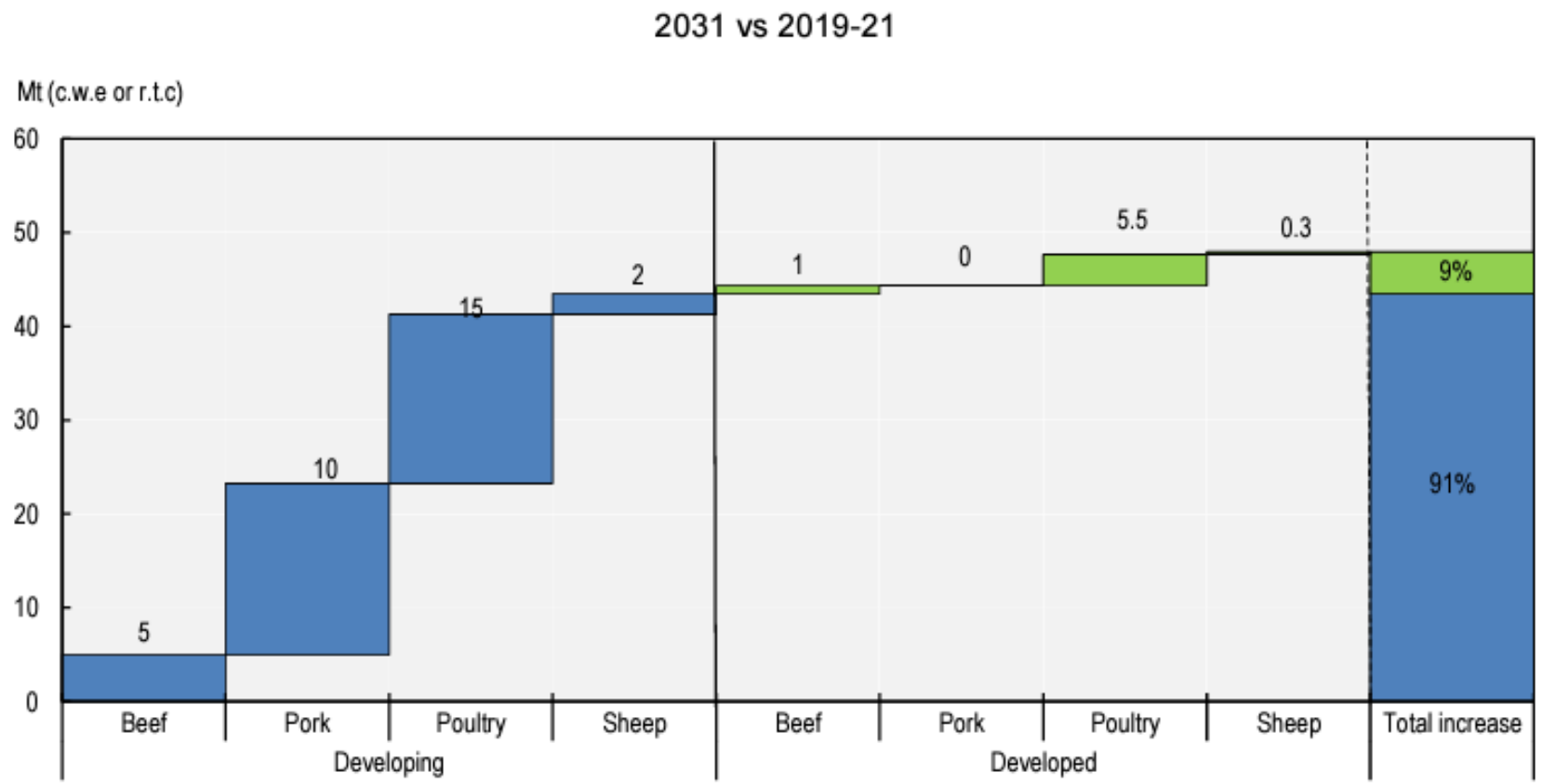
Food and Agriculture Organization of the United Nations

SUSTAINABLE DEVELOPMENT GOALS

meat production has increased by about 110% in the last 30 years and is expected to grow another 8% over the next decade

poultry meat will remain the primary driver of growth in global meat production



Note: c.w.e. is carcass weight equivalent, r.t.c. is ready to cook equivalent.
Source: OECD/FAO (2022), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en

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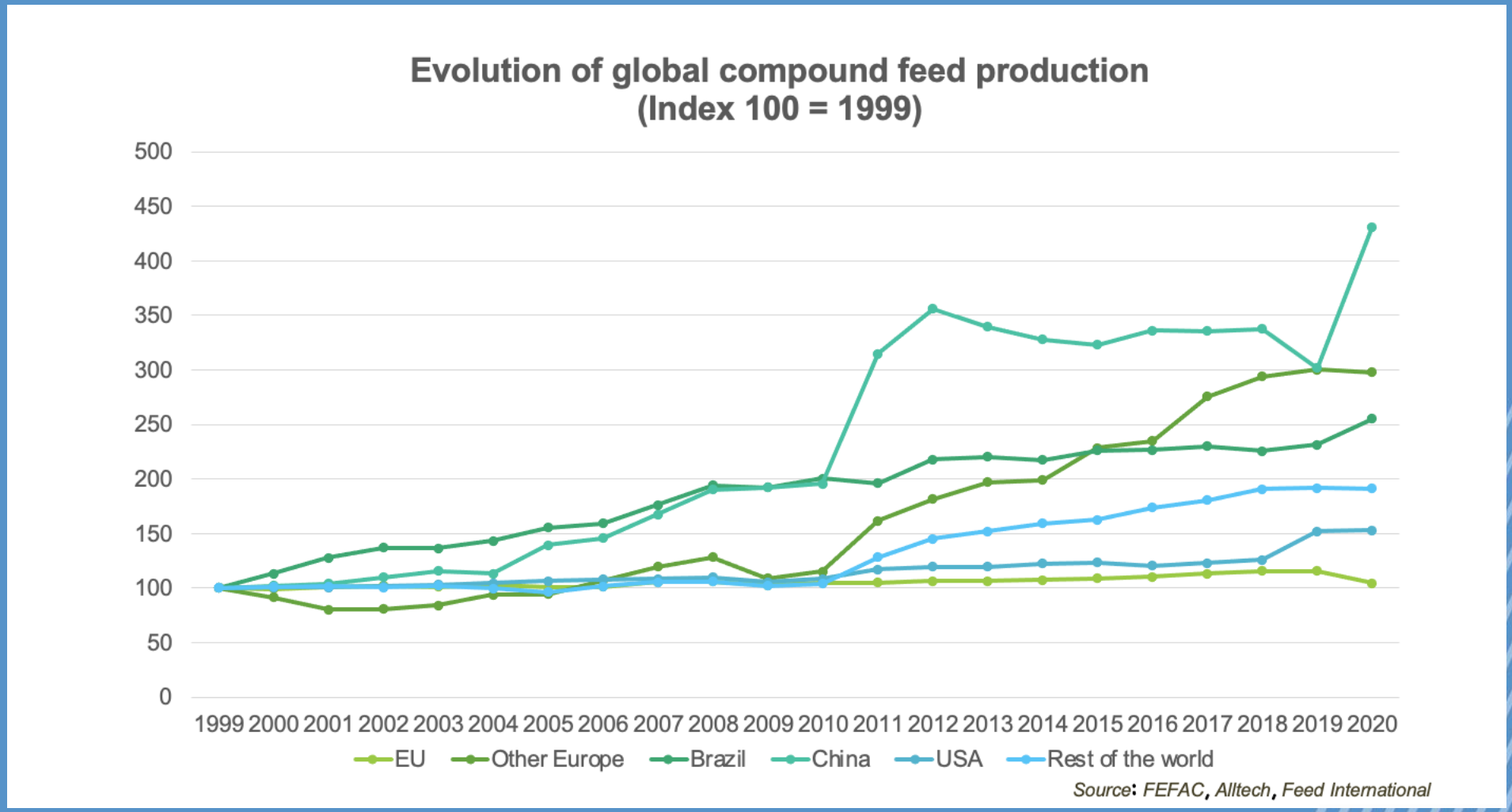
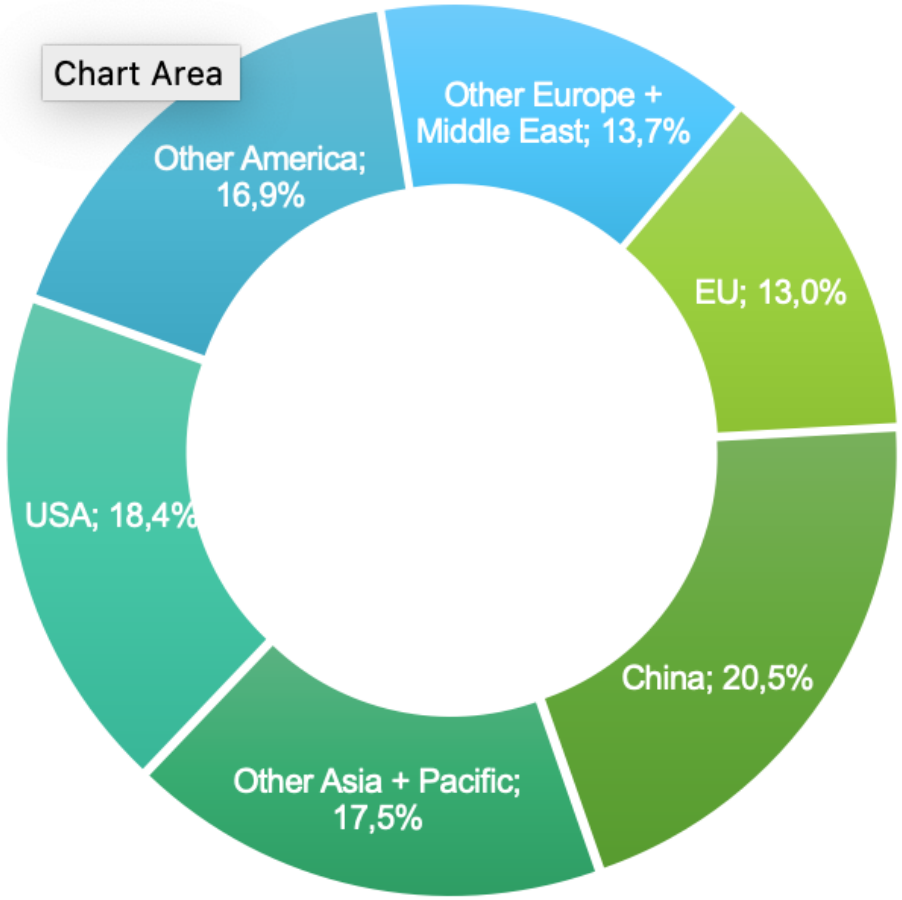
SUSTAINABLE DEVELOPMENT GOALS




AN ESTIMATED
ONE THIRD
OF THE WORLD'S CEREAL HARVEST IS FED TO FARMED ANIMALS.
That would be enough grain to feed about 3 billion people.
Animals Australia
the voice for animals

Market share 2020



Source: FEFAC, Alltech

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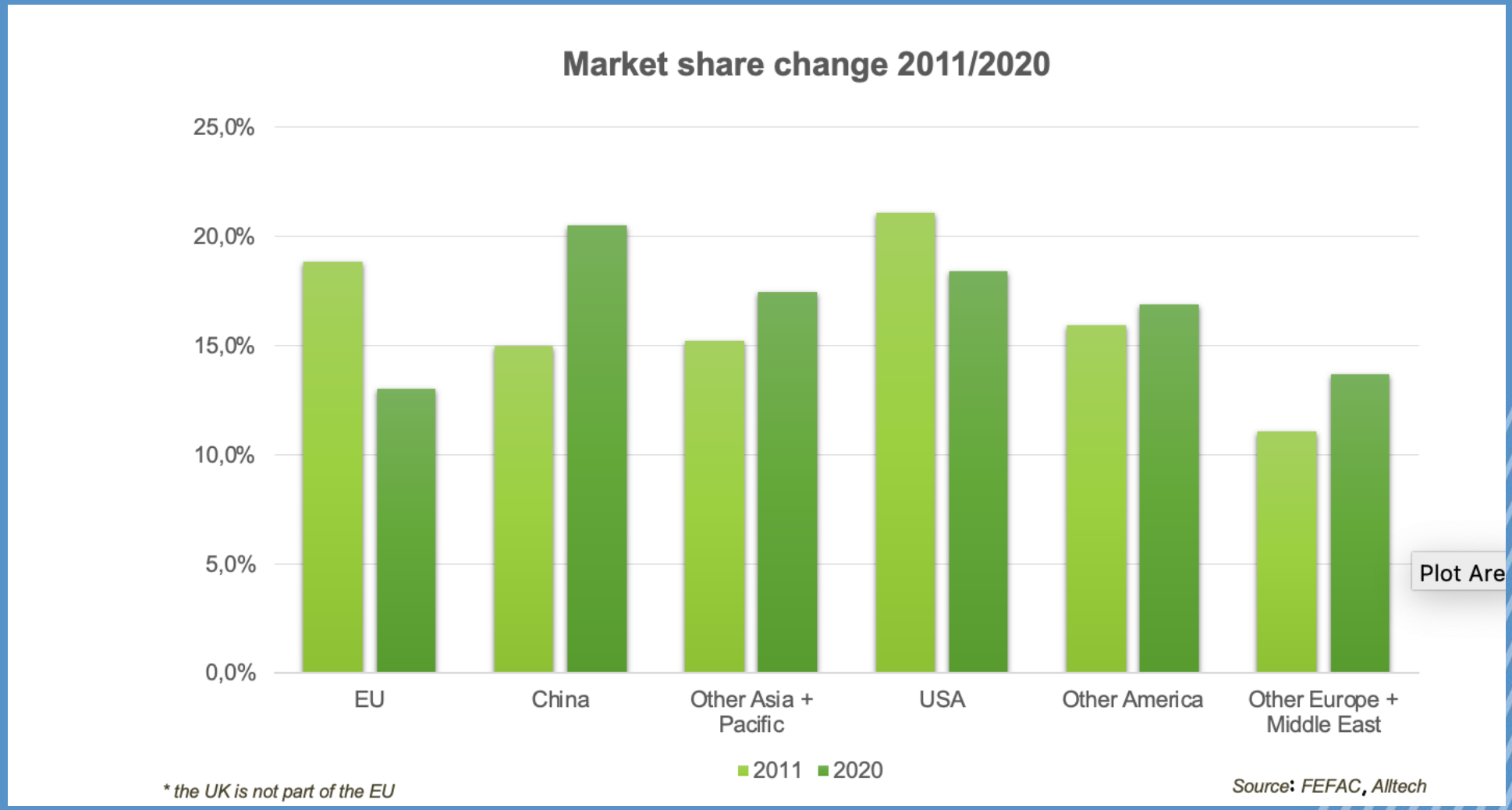
SUSTAINABLE DEVELOPMENT GOALS



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SUSTAINABLE DEVELOPMENT GOALS

EU+UK balance sheet for protein feed materials in 2019/2020

	EU total feed use (mio. t proteins)	EU total feed use of EU origin (mio. t proteins)	Self sufficiency
CROPS	18.36	16.55	90%
Thereof wheat	5.48	5.25	96%
barley	3.72	3.72	100%
maize	5.48	4.04	74%
oilseeds	0.46	0.46	100%
pulses	0.90	0.78	87%
CO-PRODUCTS (*)	20.52	4.91	24%
Thereof (**)Soybean meals	13.51	0.43	3%
Rapeseed meal	4.11	2.96	72%
Sunflower meal	2.90	1.51	52%
OTHER (*)	0.44	0.35	80%
Thereof Fishmeal	0.39	0.30	77%
Skimmed milk powder	0.05	0.05	100%
TOTAL	39.32	21.81	55%

(*) excluding on farm uses
(**) including soy protein concentrate

Source: EU+UK Feed protein balance sheet

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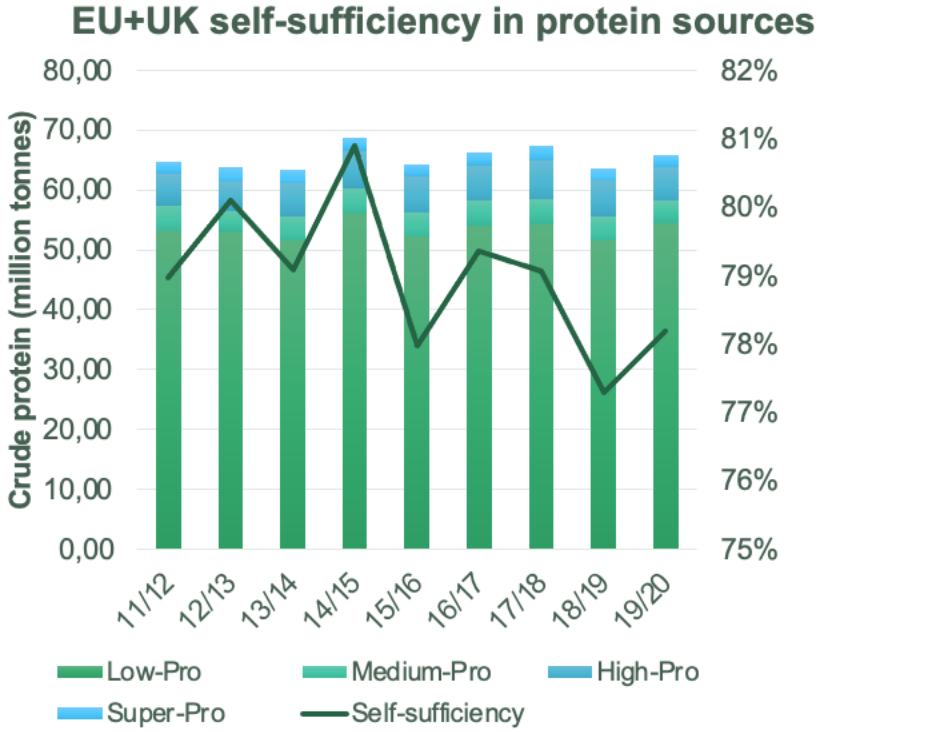
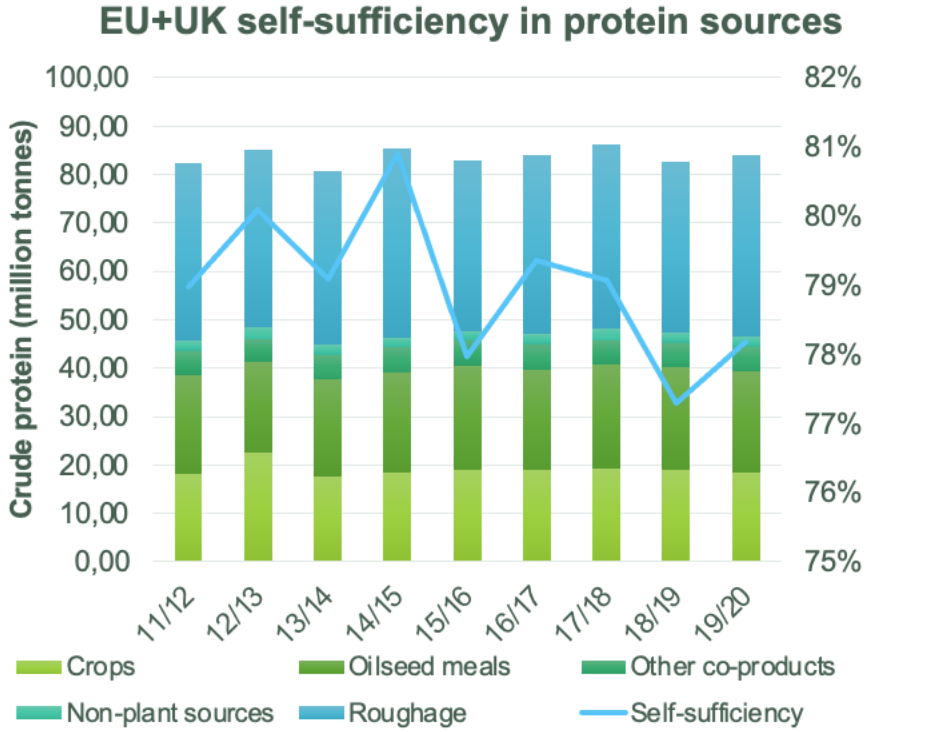
SUSTAINABLE DEVELOPMENT GOALS

Development: EU self-sufficiency in feed



Source: EU+UK Feed protein balance sheet



Source: EU+UK Feed protein balance sheet

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SUSTAINABLE DEVELOPMENT GOALS

definitions

- **820 million people** continue to go **hungry** every day (slowly rising since 2014)
- **931 million tonnes food waste** in 2019. 17% total global food production may be wasted

around a third of the world's food is lost or wasted every year. Losing food implies unnecessary pressure on the environment and the natural resources that have been used to produce it. It essentially means that land and water resources have been wasted, pollution created and greenhouse gases emitted to no purpose.

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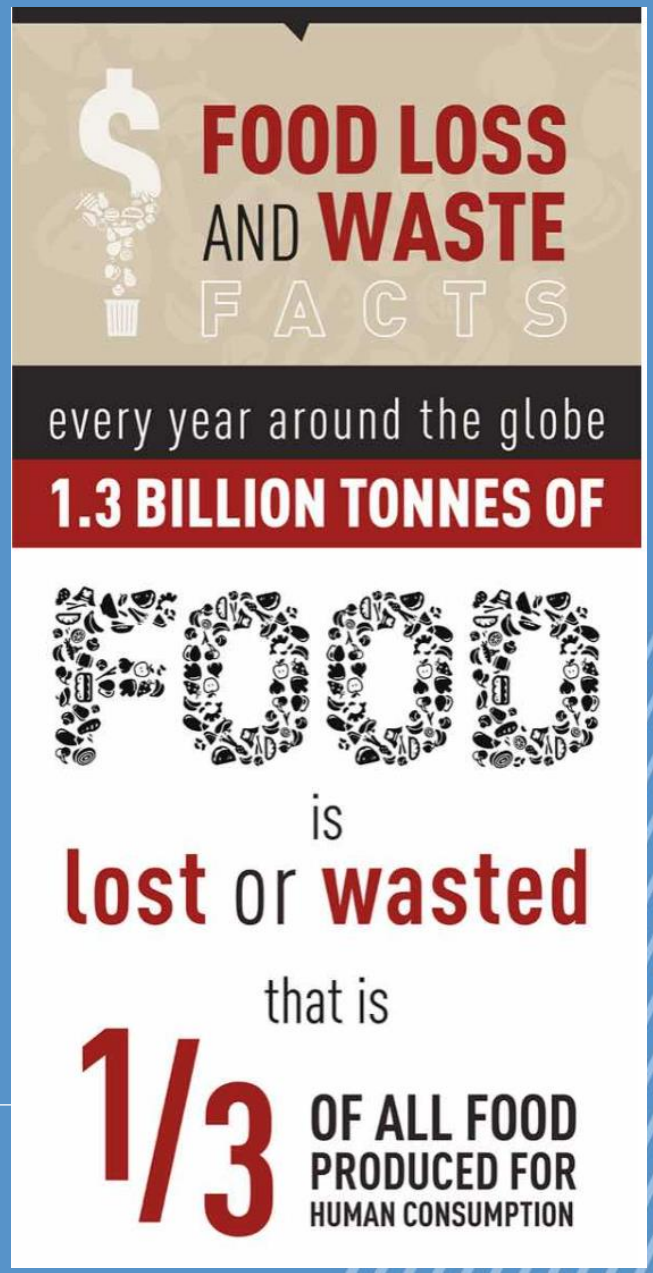

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SUSTAINABLE DEVELOPMENT GOALS

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SUSTAINABLE DEVELOPMENT GOALS

circular bio-economy

circular bio-economy

- feed production contributes to the circularity of food system, recovering nutrients from other processes in the agri-food and biofuel chain which would otherwise be lost and keeping them in the food systems

- Using innovative technologies and alternative ingredients as direct and indirect sources of feed can:
  - minimize the loss of resources and nutrients and increase the efficiency and sustainability of food production.
  - reduce feed-food-fuel competition and the livestock/feed sector's contribution to GHG emissions as well as alleviate pressure on the world's natural resources;
  - reduce food losses and waste while enabling the livestock sector to meet the growing demand for animal source foods in a more sustainable manner.

Food and Agriculture Organization of the United Nations

SUSTAINABLE DEVELOPMENT GOALS

circular bio-economy

- Circularity in food systems (co- and by-products and waste from one production process becomes a resource/input for another) offers ways to minimize the loss of resources and nutrients and increase the efficiency and sustainability of food production.

- Most agro-industrial co- and by-products, former food products (and food waste in some non EU countries, e.g. Japan and South Korea) can be converted into animal feed using proper risk-based measures, technologies and processing methods to ensure their safety and nutritional value for the needs of the animals and their production. It is critical from a safety perspective that the feed chain is not used to dispose of degraded or contaminated materials.

- Insects can be used to recycle those and with their ability to convert low-quality biomass into high-quality proteins and low requirements in terms of land, water and other resources, they can become a sustainable component of animal feed.

Food and Agriculture Organization of the United Nations

SUSTAINABLE DEVELOPMENT GOALS

FAO on insects

In several areas of the world, lack of protein food and feed sources is triggering the search for locally and sustainably produced sources. Insect (the so called, six-legged livestock) production is recognized as a potential solution. It has been estimated that the demand for insect products as animal feed and pet food ingredients, could reach half a million metric tons by 2030.

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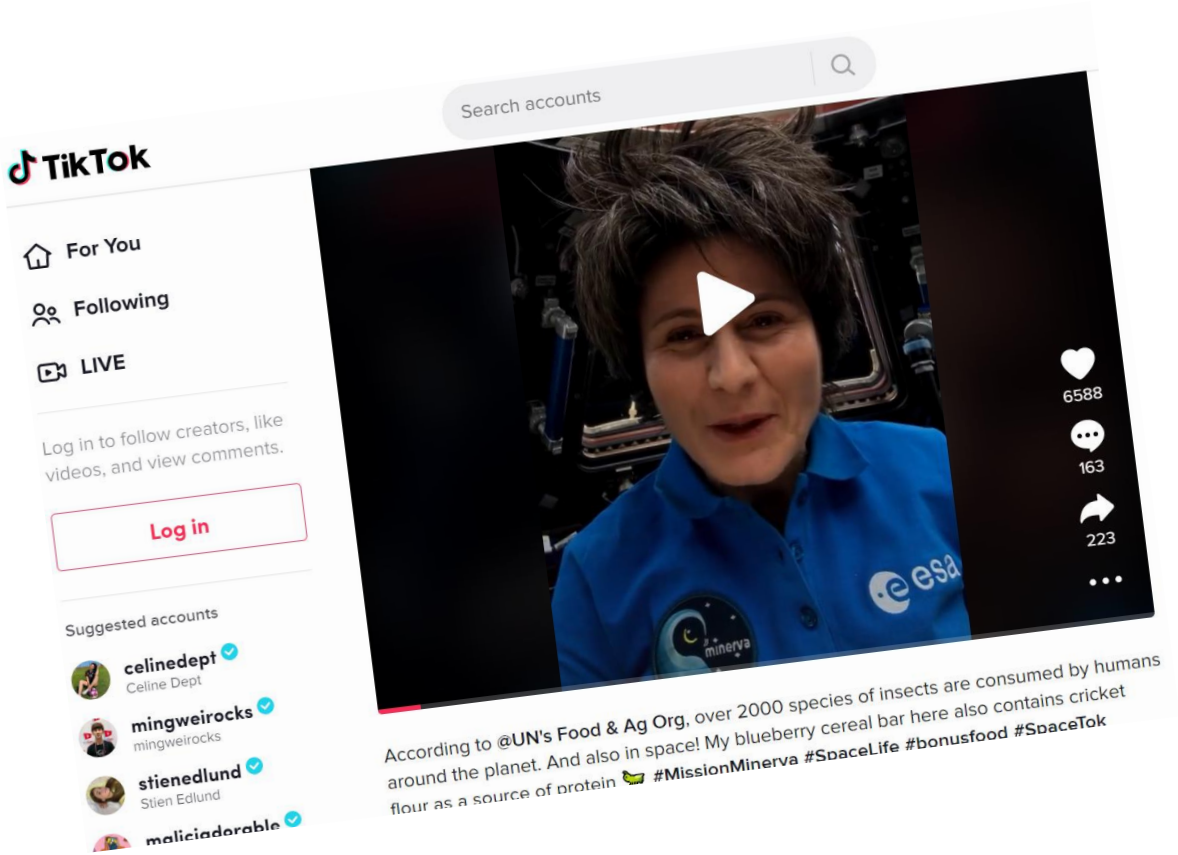

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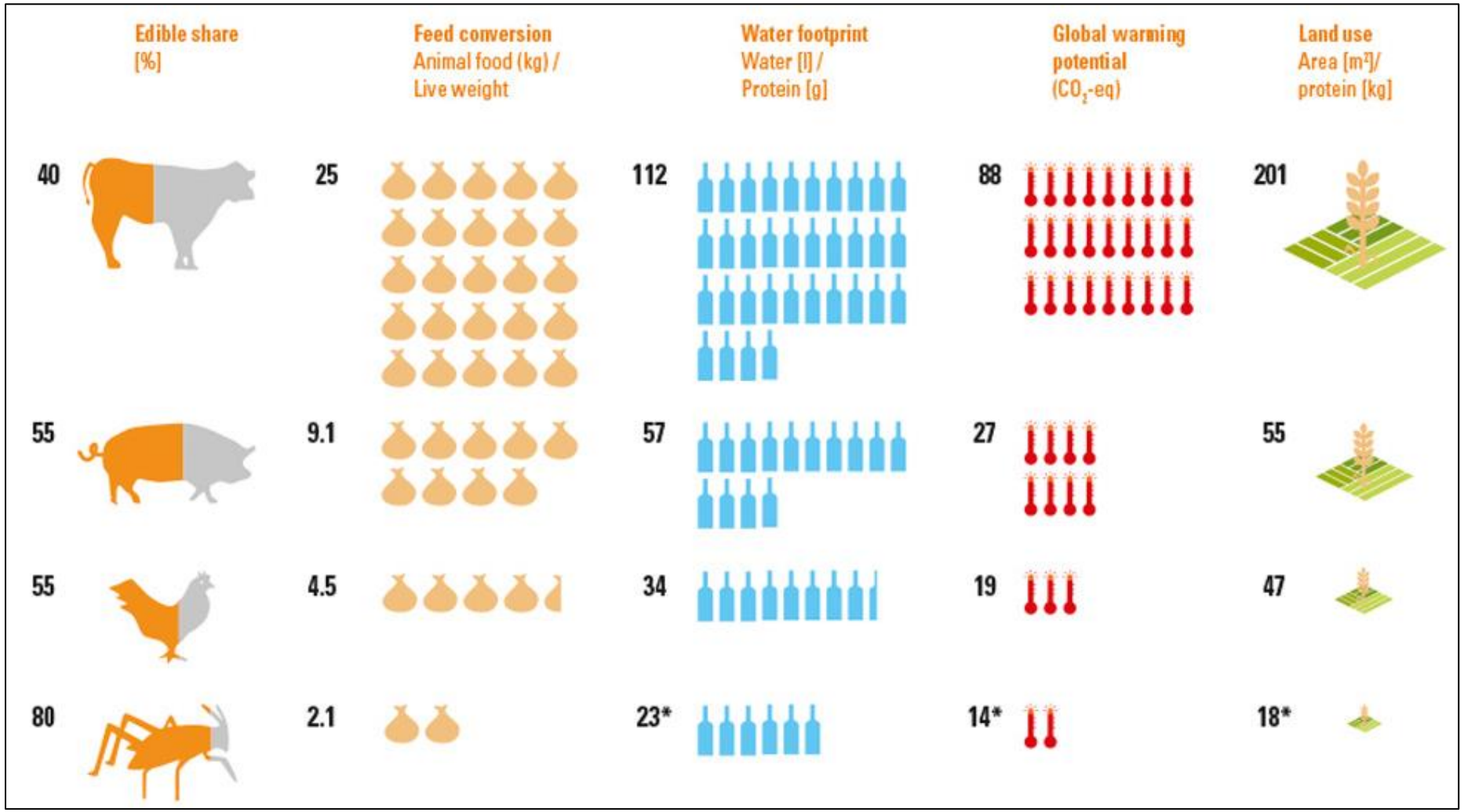
SUSTAINABLE DEVELOPMENT GOALS

FAO on insects

why insects?

Environmental perspective



Source: FAO, 2021