

Enhancing soil health with digestate application

4 per 1000 Virtual Fair 2024

Lucile Sever, EBA Policy Officer for Circular Economy

EBA – representing the full value chain



≤ 300
MEMBERS

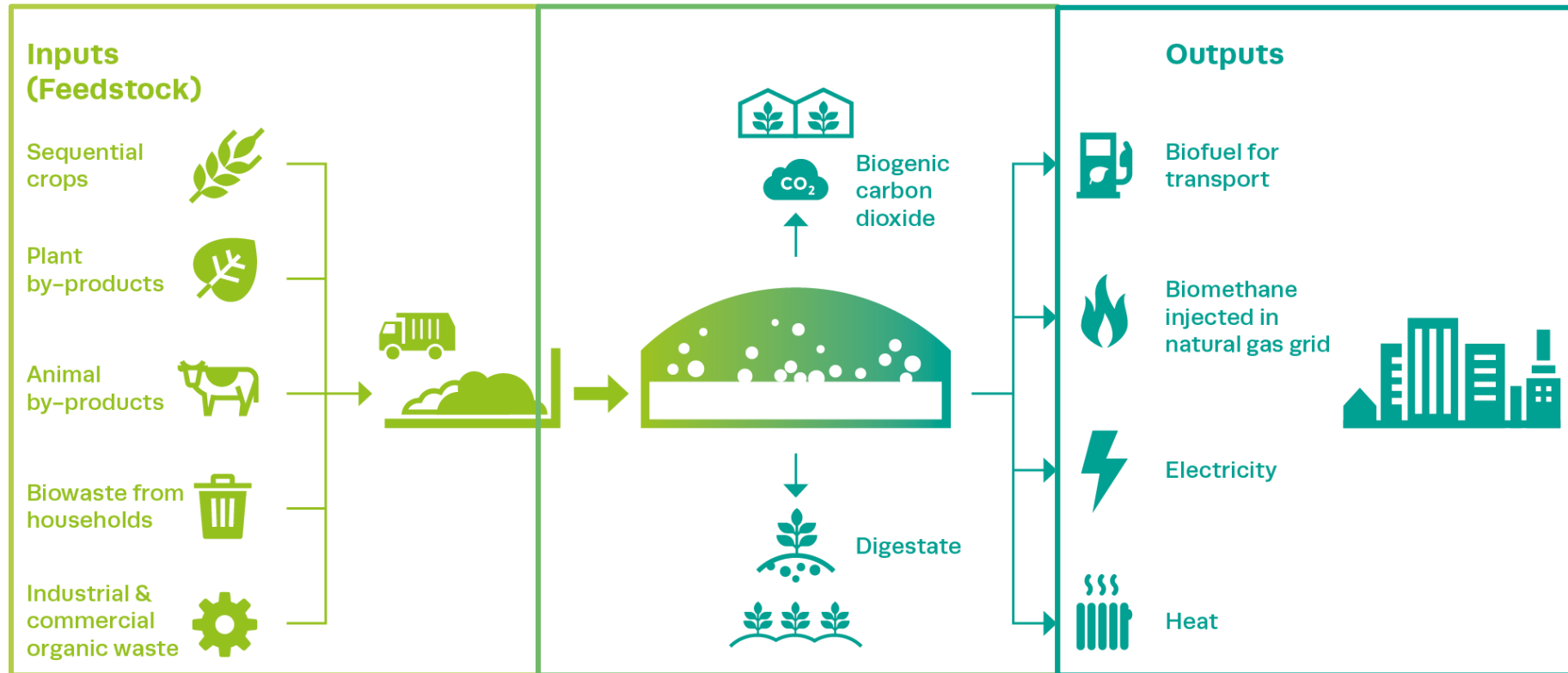
250
COMPANIES

50
NATIONAL ASSOCIATIONS

35
COUNTRIES



A circular economy with biogases



Organic material as input
(i.e. food waste, agricultural waste)

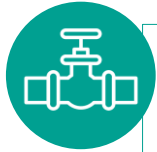
Biogas composition
60% Biomethane
40% Carbon Dioxide

Digestate & bio-CO2
as co-products

Biogas upgrading
Biomethane < 99%
=
Natural gas

21 bcm of biogases in Europe in 2022

Combined biomethane and biogas production in Europe



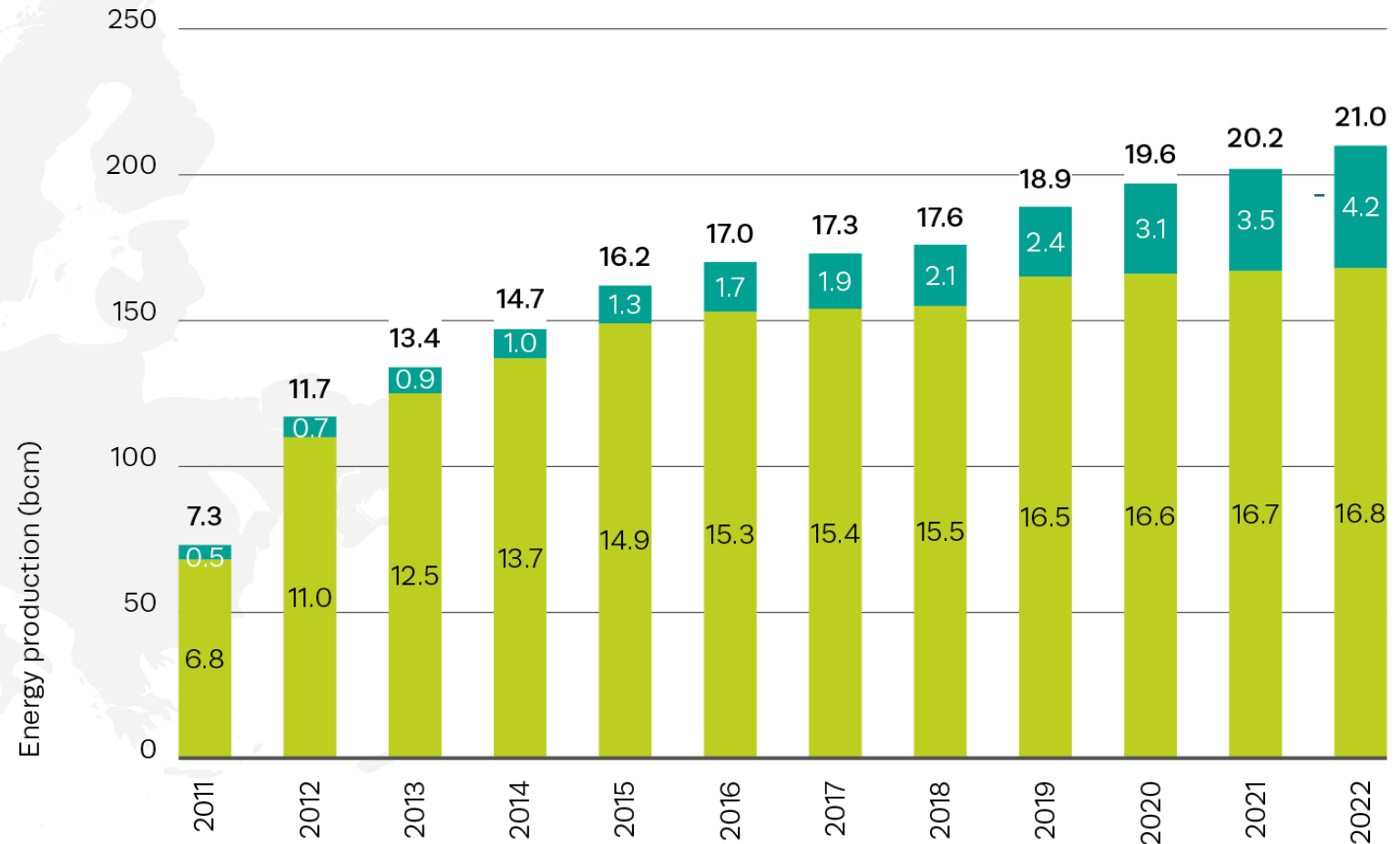
> **gas demand of Poland**

= 6% EU gas consumption



20% biogases upgraded

18 bcm produced in EU-27

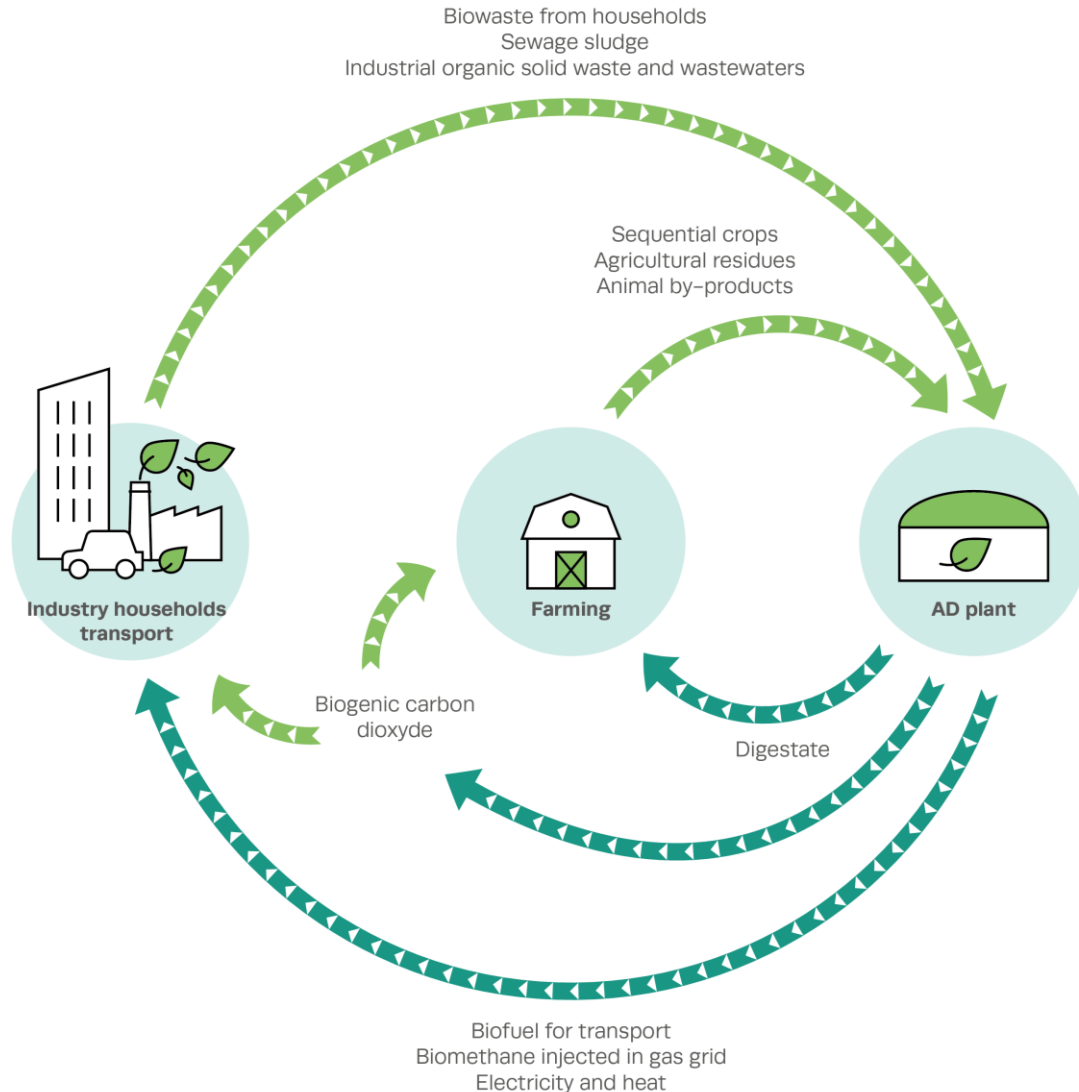


20%

■ Energy from biogas (bcm)
■ Energy from biomethane (bcm)

What is digestate?

Schematic overview of the inputs and outputs of the biogases production process



During anaerobic digestion, **biogas is produced** along with **digestate**.



Digestate contains a higher proportion of **readily available nutrients** than in the raw feedstock.



The same amount of **stabilised organic matter** is present in the digestate than in the raw feedstock.

→ **Digestate is a valuable organic fertiliser and soil improver.**

Digestate: an alternative to synthetic fertilisers



31 Mt (DM)
digestate produced
Europe, **2022**

Digestate can already displace:

15%

Nitrogen-based fertilisers

(N demand in EU-27: 11.1 Mt/year)

11%

Phosphorus fertilisers

(P demand in EU-27: 2.8 Mt/year)

6%

Potassium fertilisers

(K demand in EU-27: 3.1 Mt/year)



GHG reduction potential when
displacing synthetic N-fertilizers
with digestate

10 Mt
of CO₂ equivalent
in 2022

Natural gas is the main feedstock and
energy source to produce **synthetic**
fertilisers

The replacement of 15%
of **synthetic nitrogen fertilisers** with
digestate could save today around

2 bcm of natural gas

Digestate is an enabler of carbon sequestration



9,3 Mt of Total Organic Carbon, **2022**

More **stable organic carbon**, particularly **recalcitrant to biodegradation**

- High potential for **carbon sequestration**
- Leads to **humus** and **structure formation** in the soil and increases its **fertility, functionality, microbial activity, aeration, and water storage capacity**

Carbon sequestration potential of digestate

	% of remaining TOC after 92 days
Solid fraction of digestate	86%
Digestate 1	73%
Digestate 2	56%
Cattle manure	58%
Maize straw	43%

*Reuland, G.; Sleutel, S.; Li, H.; Dekker, H.; Sigurnjak, I.; Meers, E. Quantifying CO₂ Emissions and Carbon Sequestration from Digestate-Amended Soil Using Natural ¹³C Abundance as a Tracer. *Agronomy* 2023, 13, 2501.*

➔ The application of (solid fraction) digestate on soil is both a **sustainable soil management** and a **carbon farming practice**

European digestate production



Most common end-use:
directly applied biofertiliser

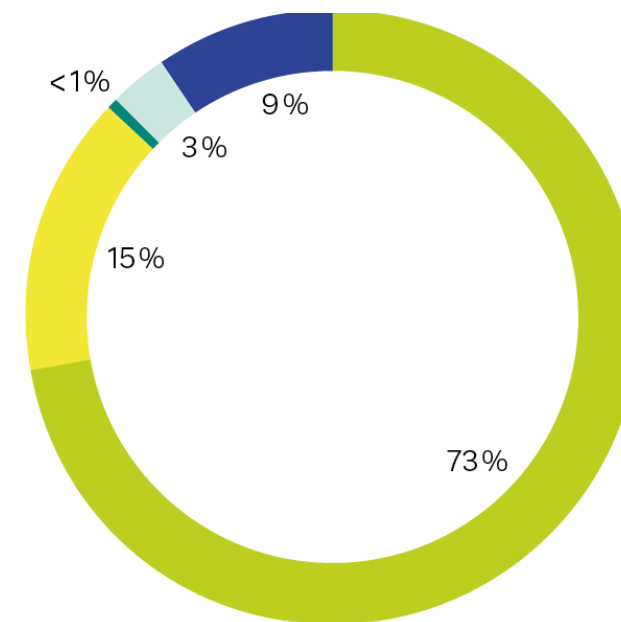


Mostly non-separated digestate
Austria, Denmark, Germany, Poland,
Slovakia, Sweden, and Ukraine



Mostly liquid digestate
Serbia, Croatia, Slovenia, UK,
Switzerland and Belgium

Digestate end-uses in Europe



- Usage as a biofertiliser (direct)
- Usage as a biofertiliser (after upgrading)
- Biological processing (nitrification/denitrification)
- Exported
- Other usage

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Digestate valorisation routes

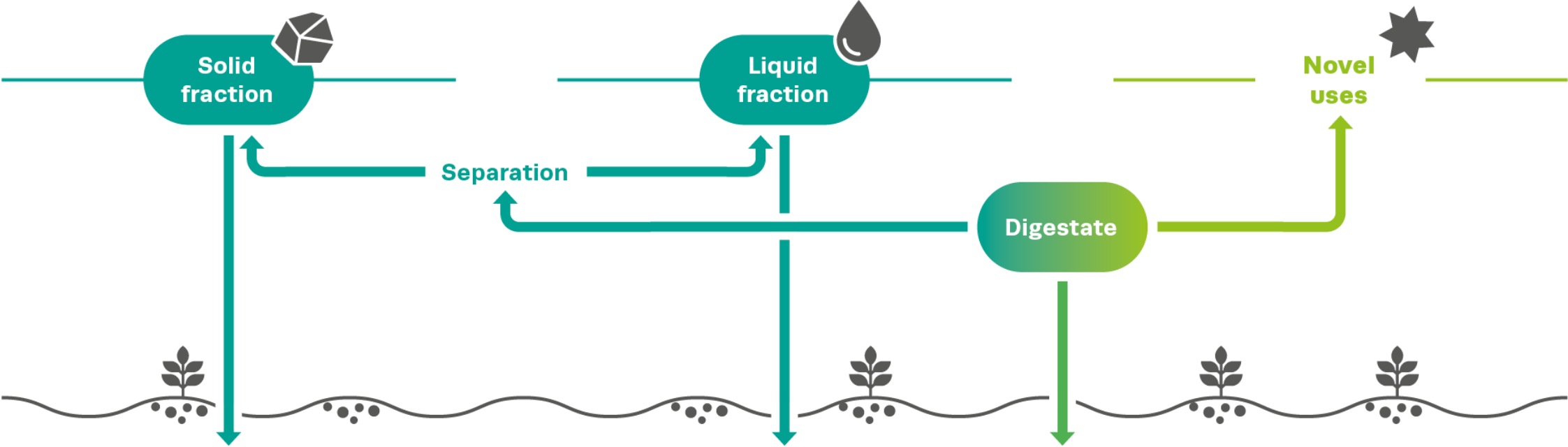
Nutrient recovery char, hydrochar, biofuels

- Pyrolysis
- Gasification
- Hydrothermal carbonization

- Membrane filtration
- Reverse osmosis
- Evaporation
- Ammonia stripping and scrubbing
- Struvite precipitation
- Microalgae growth

Range of different value added products

- Insects cultivation
- Pretreatment agent
- Substrate for microbial fuel cells
- Medium for hydroponics
- Production of volatile fatty acids (VFAs)
- Bio stimulants



EU regulatory challenges and opportunities for digestate



Challenges

- **Fertilising Products Regulation** (EU 2019/1009): setting heavy requirements for digestate to be CE-marketed as organic fertiliser or soil improver.
- **Animal By-Products Regulation** (EC 1069/2009 & EU 142/2011, EU 2023/1605): setting additional requirements for certain animal by-products to be placed on the market.
- **Nitrates Directive** (91/676/EEC): restricting the application of digestate from manure.
- **Sewage Sludge Directive** (86/278/EEC): restricting the application of digestate from sewage sludge in agriculture.



Opportunities

- **Soil Monitoring Law**: promoting the application of circular fertilisers as a sustainable soil management practice.
- **Common Agricultural Policy**: rewarding the use of circular fertilisers through eco-schemes.
- **Waste Framework Directive**: encouraging the recycling of bio-waste through anaerobic digestion with use of digestate.
- **Urban Wastewater Treatment Directive**: stimulating the recovery of nutrients from sewage sludge.

THANK YOU!

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