



BIOENERGY EUROPE
**STATISTICAL
REPORT**
2022

REPORT
BIOGAS





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Bioenergy Europe

Place du Champ de Mars 2A
1050 Brussels
T : +32 2 318 41 00
info@bioenergyeurope.org
www.bioenergyeurope.org

Authors

Cristina Calderón (lead author)
Jérémié Geelen
Jean-Marc Jossart (content & technical guidance)
Mieke Decorte (technical guidance, EBA)

Policy Guidance

Irene di Padua
Daniel Reinemann

Visuals & Promotion

Corinna Sala (statistical report promotion)
Gaia Weber (statistical report visuals)

Supported by:



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ABOUT

THE STATISTICAL REPORT

Every year since its debut release in 2007, Bioenergy Europe's Statistical Report has provided an in-depth overview of the bioenergy sector in the EU-27 Member States.

Bioenergy Europe's Statistical Report has been enriched each year with new figures and information, collecting unique data on the developments of the European bioenergy market from a growing number of international contributors.

Bioenergy Europe develops detailed reports that aid industry leaders, decision makers, investors and all bioenergy professionals to understand the situation of bioenergy in Europe.

With more than 150 graphs and figures, readers of Bioenergy Europe's Statistical Report can get accurate and up-to-date information on the EU-27 energy

system such as the final energy consumption of biomass for heat and electricity, the number of biogas plants in Europe, the consumption and trade of pellets, the production capacity of biofuels and other key information to help break down and clarify the complexity of a sector in constant evolution.

In 2017, the Report was rewarded by the European Association Awards for being the 'best Provision of Industry Information and Intelligence', a recognition after a decade of collective work.



2007

First Statistical Report published

2010

89 pages

2012

+ statistics on ENplus®
+ 2700 downloads
+ (124 pages)

2009

+ analysis on the National Renewable Energy Action Plan
+ (108 pages)

2011

+ pellet chapter
+ (108 pages)

2013

+ socio-economic indicators
+ 2600 downloads

2014

+ EPC European Wood Pellet
+ Overview + expert's view
+ 3000 downloads
+ 158 pages

2016

+ chapter on environmental impact of bioenergy
+ projections on bioheat & bioelectricity
+ awarded as 'the Best Provision of Industry Information & Intelligence' by the European Association Award
+ 4000 downloads

2018

+ report available to the public, free of charge
+ emphasis on providing transparent data & sharing knowledge to support private & public initiatives to promote bioenergy
+ 300 pages

2015

+ statistics on wood chip consumption
+ 200 page report on bioenergy support scheme in Europe
+ key findings report
+ 3500 downloads

2017

+ updated information on bioelectricity / bioheat market & support schemes in all EU28 Member States
+ a separate report on ENplus®

2019 / 2020 / 2021

+ Bioenergy Europe publishes 7 focussed reports published throughout the year

2022

ABOUT

BIOENERGY EUROPE

A bit of history

Bioenergy Europe is the voice of European bioenergy.

It aims to develop a sustainable bioenergy market based on fair business conditions. Founded in 1990, Bioenergy Europe is a non-profit, Brussels-based international organisation bringing together more than 40 associations and 90 companies, as well as academia and research institutes from across Europe.

Our vision

Bioenergy Europe will be the leading player in ensuring that sustainable bioenergy is a key pillar in delivering a carbon neutral Europe.

Our mission

Bioenergy Europe facilitates the development of a sustainable, strong, and competitive bioenergy sector through:

- Promotion towards European policymakers and stakeholders for awareness, acceptance, and reputation of bioenergy.
- Promote the development of consistent, realistic, and sustainable bioenergy scenarios in the heat, electricity, and transport sectors.
- Pro-active proposals to develop more favourable European legislation.
- Market intelligence to support decision making.
- Services to members, including support to advocacy at a national level.
- Tools, including certification schemes, to sustain market growth and credibility.
- Industry collaboration throughout the entire supply chain.
- Promotion of efficient and innovative technologies within the bioeconomy.

OUR ACTIVITIES

Bioenergy Europe carries a wide range of activities aimed at supporting its members on the latest EU and national policy developments. Bioenergy Europe works to voice their concerns to EU and other authorities, including, advocacy activities in key policy areas as well as the organisation of dedicated working groups.

Working Groups

Bioenergy Europe's working groups act as a platform for members to discuss common issues and exchange information on the state of play of bioenergy.

There are currently 8 active working groups:

- Agro-biomass;
- Competitiveness;
- Domestic Heating;
- Pellets;
- Sustainability;
- Wood Supply;
- Task Force Carbon Removal;
- Task Force National Advocacy.

Certification Schemes

Thanks to the experience and authority acquired over the last 20 years, Bioenergy Europe has successfully established two international certification schemes to guarantee high quality standard for fuels, namely, ENplus®, as well as the latest edition in the certification for sustainable bioenergy: SURE.



Networks

Bioenergy Europe is the umbrella organisation of both the European Pellet Council (EPC) and the International Biomass Torrefaction Council (IBTC). These networks have been created thanks to the dynamics of Bioenergy



Europe members. Today, these networks bring together bioenergy experts and company representatives from all over Europe and beyond.

The European Pellet Council (EPC), founded in 2010, represents the interests of the European wood pellet sector. Its members are national pellet associations or related organisations from over 17 countries.

EPC is a platform for the pellet sector to discuss issues relating to the transition from a niche product to a major energy commodity. Issues include the standardisation and certification of pellet quality, safety, security of supply, education and training, and the quality of pellet-using devices. EPC manages the ENplus® quality certification.

Launched in 2012, the International Biomass Torrefaction Council (IBTC), aims to build the first platform for companies that have common interests in the development of torrefied Biomass markets. Currently, the IBTC initiative is supported by more than 20 companies worldwide.

IBTC's objective is to promote the use of torrefied biomass as an energy carrier and to assist the development of the torrefaction industry. In this respect, IBTC's key activities are to undertake studies or projects, and to commonly voice its members' concerns to third parties to help to overcome barriers of market deployment.

For further information on Bioenergy Europe's Networks & Certification Schemes visit www.bioenergyeurope.org

OUR MEMBERS*

As the common voice of the bioenergy sector, Bioenergy Europe, aims to develop a sustainable bioenergy market based on fair business conditions and does so by bringing together national associations and companies from all over Europe – thus representing more than 4000 indirect members, including companies and research centres.

Associations



Academia



Companies



*Members as of June 2022.

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(Exclusive to Bioenergy Europe Members)

This opportunity entails a free of charge promotion for Bioenergy Europe members only. This offer includes the chance to display your organisation's logo as well as a featured 100-word description, placed in 1 of the 7 annual statistical reports of your choice.

This enhanced visibility opportunity is limited and interested members are required to contact the team via info@bioenergyeurope.org

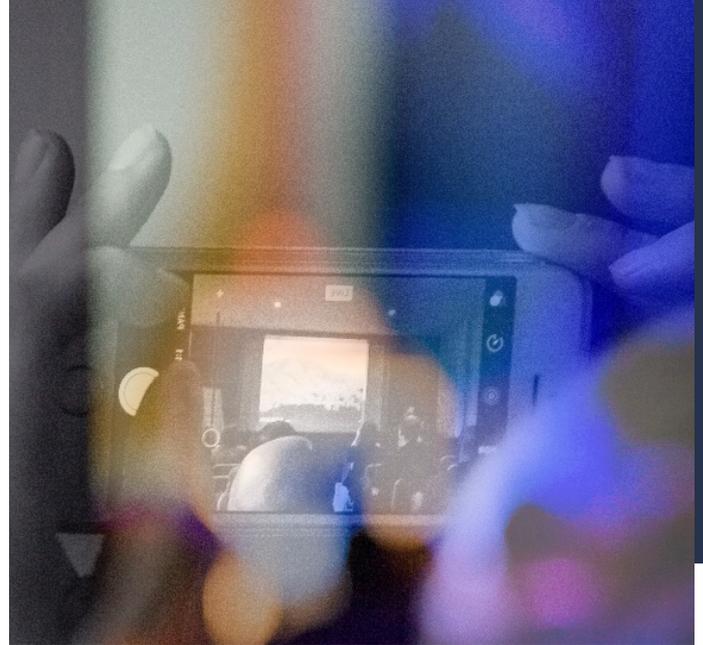
You can find further information about this opportunity on the Bioenergy Europe website.

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Bioenergy Europe
Place du Champ de Mars 2A
1050 Brussels
T : +32 2 318 41 00
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Bioelectricity

Trusted.
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Committed.

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We have extensive experience in testing and inspection services for solid biofuels and biogas – for clients delivering to industrial users – for power generation, as well as commercial and residential users – for heat.

Testing

Solid biofuels:

- Moisture
- Proximate analysis
- Ultimate analysis
- Calorific values
- Halogens
- Major Elements (MAA)
- Minor Elements (Trace)
- Mechanical durability
- Bulk density
- Biomass content
- Length & diameter
- Particle size distribution
- Ash melting behaviour (AFT's)
- DNA (Rice husk)

Biogas:

- Gas composition
- Critical components analysis including sulphur, silica and chlorine
- Oil condition monitoring

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We are SGS – the world's leading testing, inspection and certification company. We are recognized as the global benchmark for quality and integrity.

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For more information valmet.com/emissions





Salón del gas_renovaBle

The exclusive technology fair for professionals aimed at promoting business opportunities between companies related to renewable gas in Spain, Portugal and Latin America, as well as to disseminate and promote the development of biogas and biomethane as a source of renewable energy to society.

The second RENEWABLE GAS FAIR in SPAIN is held in Valladolid on September 28 and 29, 2022.

www.salondelgasrenovable.com

CPL
ACTIVATED CARBONS
Part of CPL Industries

CPL Industries is Europe's leading manufacturer of smokeless domestic solid fuels and is a pioneer in the use of biomass raw materials and techniques such as torrefaction and hydrothermal carbonisation (HTC). Subsidiary CPL Activated Carbons is a supplier of carbon filtration systems and is a major supplier into the bioenergy industry, including biogas and biomethane facilities. In addition to activated carbon media, the company can supply mobile carbon filters and recycles spent carbons at its thermal reactivation facility in the UK.

You can meet the team at the WBA World Biogas Expo at the NEC, Birmingham in June 2022.

www.cplindustries.co.uk

SURE✓

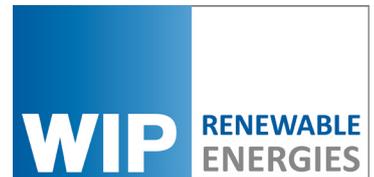
SUSTAINABLE RESOURCES
Verification Scheme GmbH

SURE enables all economic operators along the supply chain, from biomass producers to conversion plants, to prove sustainable use of biomass in electricity production.

SUSTAINABLE RESOURCES Verification Scheme (SURE) is a voluntary certification scheme that aims at ensuring the sustainable and responsible use of biomass within the energy sector. SURE's set of criteria is in accordance with the principles of the European Energy Directive (RED II) and enables all economic operators within the bioenergy sector to demonstrate compliance with RED II requirements.

Interested to learn more? Visit our website:

www.sure-system.eu



WIP is a renewable energy consultancy with a long history of managing research and innovation projects and organizing leading conferences and events in the sector. We offer research, consultancy, communication and exploitation services. With more than 30 years of experience and a multinational team of over 20 people, we have already successfully implemented more than 350 European and international projects in the field of Renewable Energy. Our mission is to contribute to the energy transition by facilitating research, innovation and market integration of renewable energy systems through collaborative efforts across all sectors of society.

www.wip-munich.de

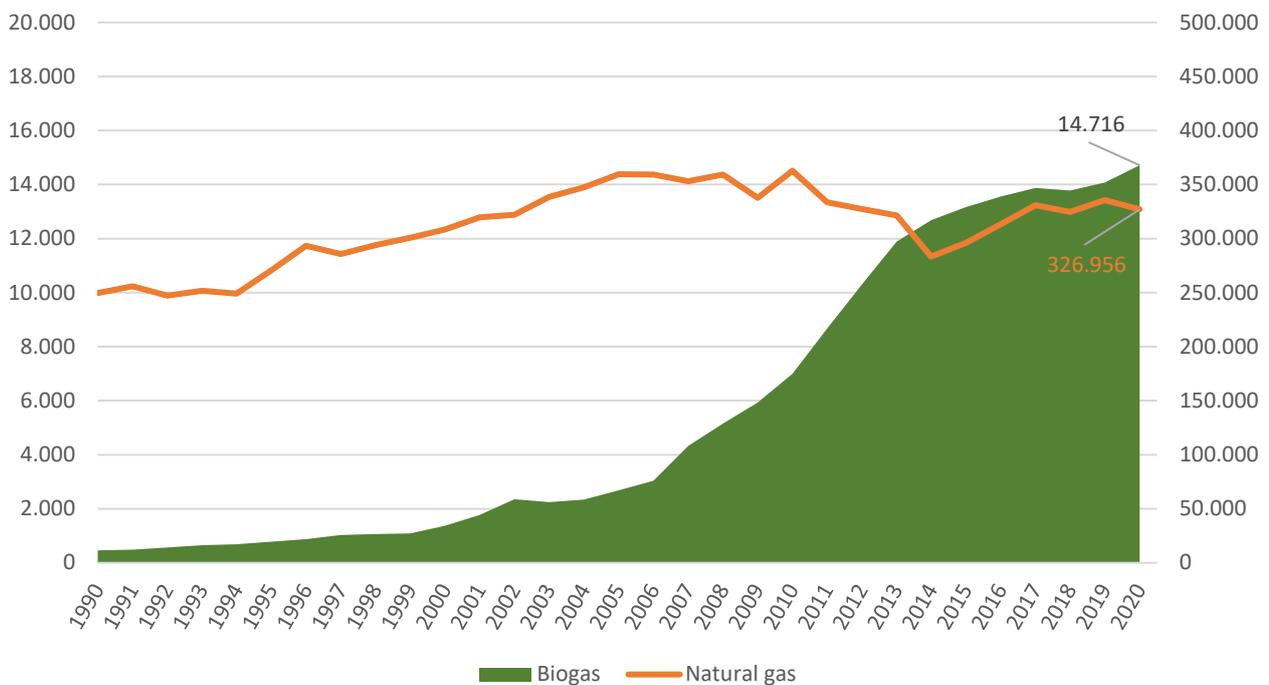
BiOenergy
EUROPE

1. Biogas in Europe

The expansion of the European biogas sector in the recent decades has been greatly accelerated by favourable government measures that have promoted the use of this renewable source in the EU energy system. In 2020 the gross inland energy consumption of biogas reached 14.716 ktoe, a remarkable increase comparing with the 1.376 ktoe in 2000. The contribution of landfill gas recovery to biogas production has been almost constant over the last decade, and the major growth input came from Anaerobic Digestion plants.

In 2020 biogas provided 4,5% of the total gross inland energy consumption of gas for the EU27 and represented 10,5% of the EU27's bioenergy consumption. According to calculations from EBA ([European Biogas Association](#)), biogas will be able to replace 10% of the EU27 gas demand by 2030 and up to 30-40% by 2050. Those figures highlight that with the right policy framework, biogas can represent a reliable solution for the low carbon energy transition.

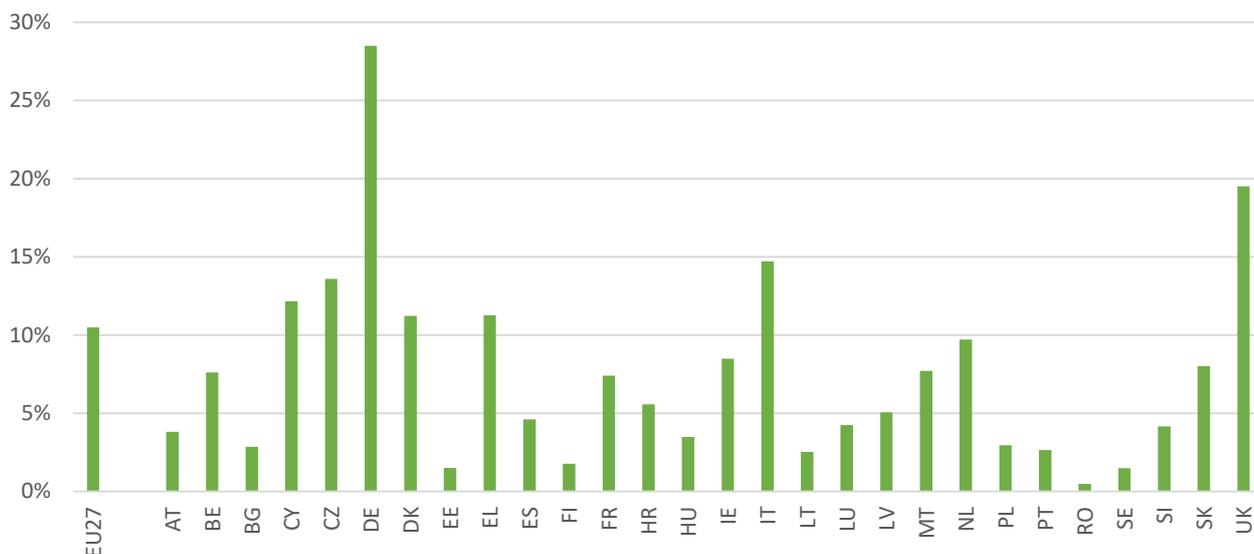
Figure 1 Evolution of the gross inland energy consumption of biogas (left axis) and natural gas (right axis) in EU27 (in ktoe)



Source: Eurostat

Over the last decade, biogas has played a very important role in providing a dispatchable source of heat and power and is expected to continue playing a vital role in years to come. However, the most recent EBA statistics highlight a rather interesting new trend. Indeed, biosourced gas production plants tend to focus on the production of biomethane rather than biogas and it is expected that this tendency will be amplified in the coming decade since biomethane is a versatile energy carrier, suitable for a range of sectors, including transport, industry, power, and heating.

Figure 2 Share of biogas within the total bioenergy gross inland consumption in 2020 (in %)

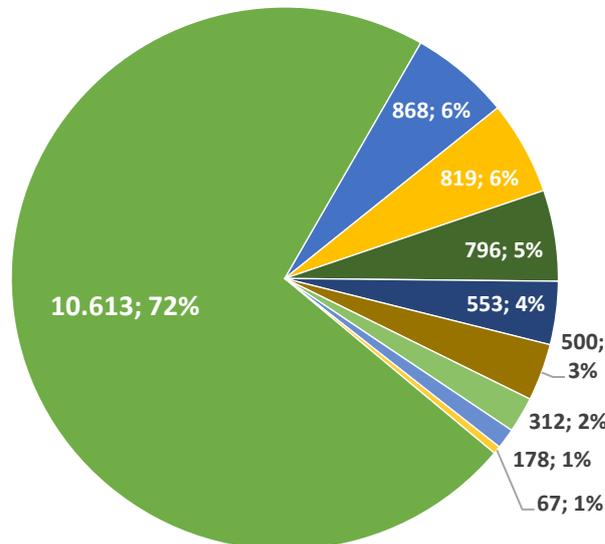


*UK data for 2019

Source: Eurostat

Figure 3 Biogas gross inland energy consumption by end-use in 2020 in EU27 (in ktOE and %)

- Transformation input - electricity and heat generation
- Final energy consumption - agriculture and forestry
- Final energy consumption - commercial and public services
- Transformation input - for blended natural gas
- Final energy consumption - industry sector
- Energy sector within the energy sector*
- Final energy consumption - households
- Final energy consumption - transport sector
- Distribution losses



* Mainly the biogas consumed as energy for support operations in biogas plants

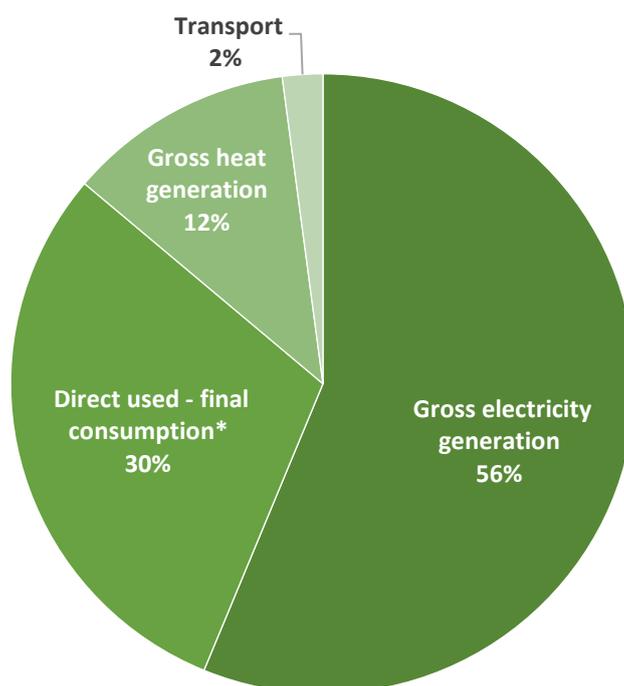
Source: Eurostat

The contribution of biogas to the gas consumption of Member States varies greatly. On average in the EU27, the national consumption is about 4,5% but, in some countries like Germany, it reaches up to 12%. This is also significant as a gross value, as Germany consumes very large amounts of gas. In 2020, the EU27 had a final biogas energy consumption of 8.527 ktOE, and half of that consumption occurred in Germany. In terms of biogas production, the leading countries in the EU27 are Germany, Italy and France, producing 7.745, 2.018 and 1.134 ktOE respectively. When expressed into relative values, the German production amounted for 52,6% of the EU's total production while

this value reached 13,7% for Italy and finally 7,7% for France. However, although Germany is currently ahead, their growth rate is lower than that of France and Italy, and so Germany's share of EU27 production is likely to decline in the coming years.

Currently in the EU27, more than half (56%) of the gross final energy consumption is for electricity generation. Almost one third of final biogas consumption is directly used within different sectors (commercial and services, agricultural, industrial, and residential). Biogas consumed for gross heat generation represents around 12%, while a small but increasing share (2%) is dedicated to transport, mainly as biomethane.

Figure 4 Gross final energy consumption from biogas by end-use in EU27 in 2020 (in %)



* In agriculture, industry, commercial, households & others.

Source: Eurostat

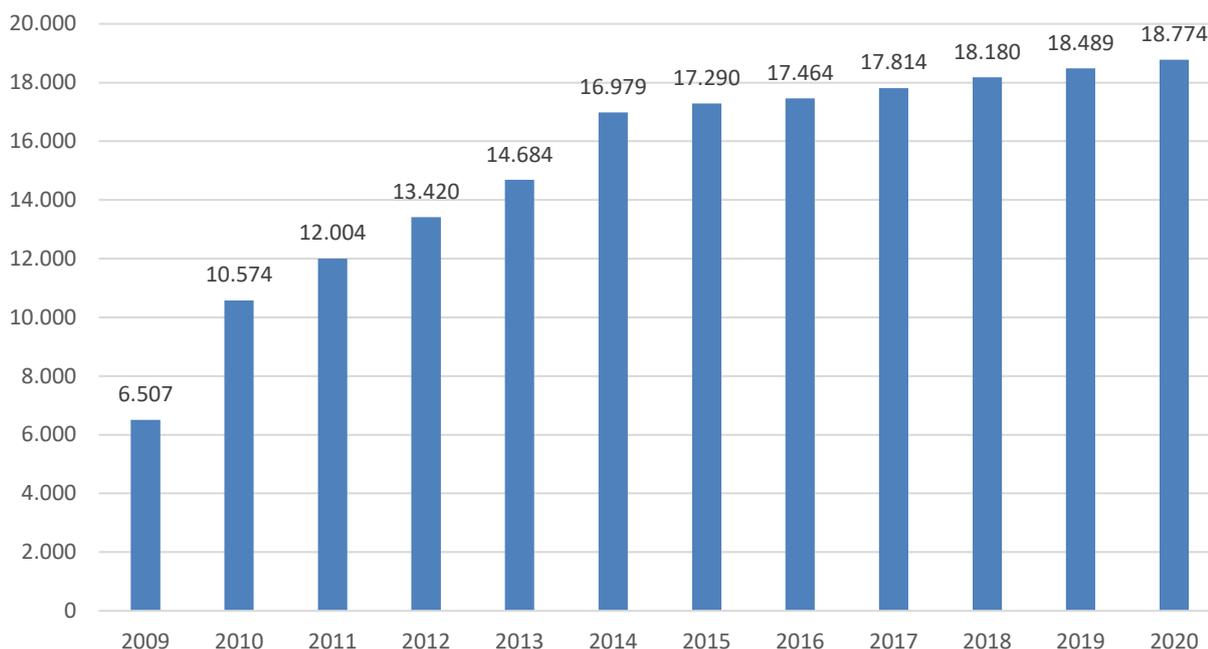
Table 1 Gross final energy consumption from biogas by end-use in EU27 Member States and UK* in 2020 (in ktoe)

	Gross final energy consumption	Gross electricity generation	Derived heat generation	Direct used - final consumption (agriculture, industry, commercial etc.)	Transport
EU27	8.527	4.794	1.001	2.554	178
Growth rate (2019-2020)	5%	1%	4%	6%	11%
AT	77	54	6	17	0
BE	205	87	21	97	0
BG	31	19	4	7	0
CY	11	5	1	5	0
CZ	394	223	17	152	1
DE	4.730	2.880	422	1.351	76
DK	131	58	54	19	0
EE	17	3	3	3	8
EL	71	35	0	36	0
ES	197	76	0	121	0
FI	133	26	19	84	4
FR	561	236	76	250	0
HR	49	36	13	0	0
HU	44	28	3	13	0
IE	28	15	0	13	0
IT	1.013	702	274	36	0
LT	24	13	2	9	0
LU	10	5	3	2	0
LV	57	30	20	8	0
MT	1	1	0	1	0
NL	223	75	10	139	0
PL	220	106	22	92	0
PT	29	22	0	7	0
RO	13	5	4	4	0
SE	155	1	6	60	88
SI	17	10	4	3	0
SK	85	44	17	24	0
UK	798	651	0	148	0

*UK data for 2019

Source: Eurostat

Figure 5 Evolution of the number of biogas plants in Europe*



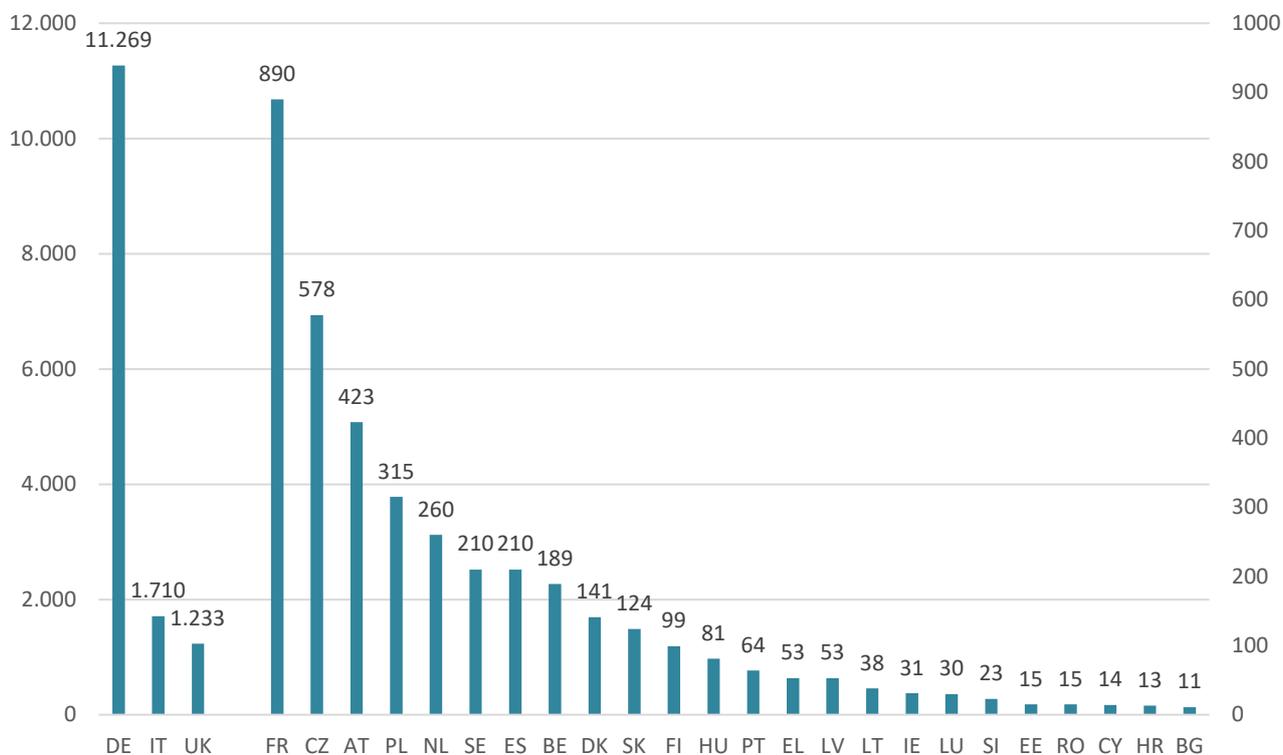
*EU27 + UK + Switzerland + Norway + Serbia + Iceland

Source: European Biogas Association, EBA

The biogas sector is expanding and has experienced major improvements in the last decade in terms of efficiency (both physical and economic) due to research and innovation. While this expansion continues, it is however starting to stagnate. 2009 to 2014 was a period of rapid growth averaging 2.094 new plants per year with an impressive 4.067 new plants built between 2009 and 2010 alone (over a 60% growth rate). Since 2014, growth has slowed with an average of only 299 new plants per year and the most recent data, 2019–2020, was slightly below average with only 285 new plants added. This reduced growth for biogas plants can be partly explained by the larger growth in biomethane plants (indeed, several small biogas plants are being converted to biomethane production).

Focusing on the distribution of these plants within the Member States, it is clear that it is far from uniform, with 60% of the plants installed in Germany (11.269 of the 18.774 in Europe). Only two EU Member States, Germany and Italy, have more than 1.000 plants, but it is likely that France will join them in the next few years if it maintains its current growth rate (+53 plants) given that it has the third highest number of plants in the EU.

Figure 6 Number of biogas plants in EU27 Member States and UK (n° of plants) (separated scale for Germany, Italy and United Kingdom)



Source: European Biogas Association, EBA

The situation of biogas production varies substantially between different countries, both in terms of the production pathways (anaerobic digestion or thermochemical processes) and feedstock used for production (landfill gas, sewage sludge, or other material). In the EU27, biogas production from anaerobic digesters using other material than landfill gas and sewage sludge clearly represents the most common production pathway with more than 80% of the EU27 biogas relying on it.

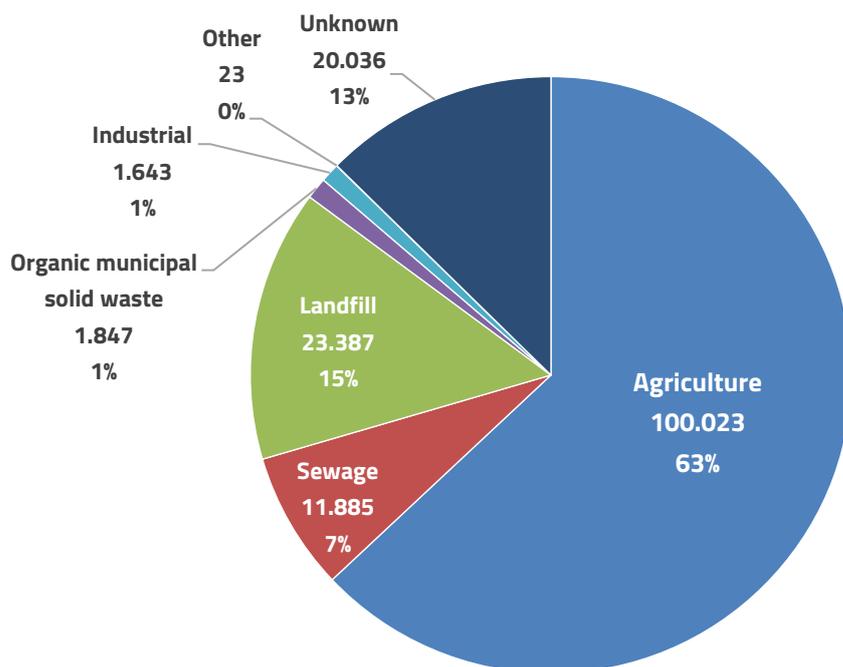
Table 2 Primary Energy Production of biogas by type in EU27 Member States and UK* in 2020 (in ktoe)

	Total Biogas	Landfill gas	Sewage sludge gas	Other biogases from anaerobic fermentation	Biogases from thermal processes
EU27	14.716	1.645	1.150	11.806	116
Growth rate (2019-2020)	5%	4%	2%	5%	-30%
AT	211	1	26	183	0
BE	244	17	27	196	3
BG	53	0	6	47	0
CY	13	0	1	13	0
CZ	594	20	42	533	0
DE	7.745	92	482	7.171	0
DK	511	511	0	0	0
EE	20	2	7	11	0
EL	135	61	22	52	0
ES	323	137	115	71	0
FI	169	13	17	33	106
FR	1.134	312	21	801	0
HR	83	7	3	73	0
HU	89	10	29	50	0
IE	52	29	10	14	0
IT	2.018	281	51	1.679	7
LT	39	7	7	25	0
LU	18	0	1	17	0
LV	80	8	2	71	0
MT	1	0	0	1	0
NL	416	10	67	339	0
PL	322	50	121	152	0
PT	83	66	7	10	0
RO	18	0	0	18	0
SE	186	6	76	104	0
SI	27	1	1	24	0
SK	131	6	8	118	0
UK	2.745	1.082	426	1.237	0

*UK data for 2019

Source: Eurostat

Figure 7 Biogas production per plant type in 2020 in Europe* (in GWh)



*EU27 + UK + Switzerland + Norway + Serbia + Iceland

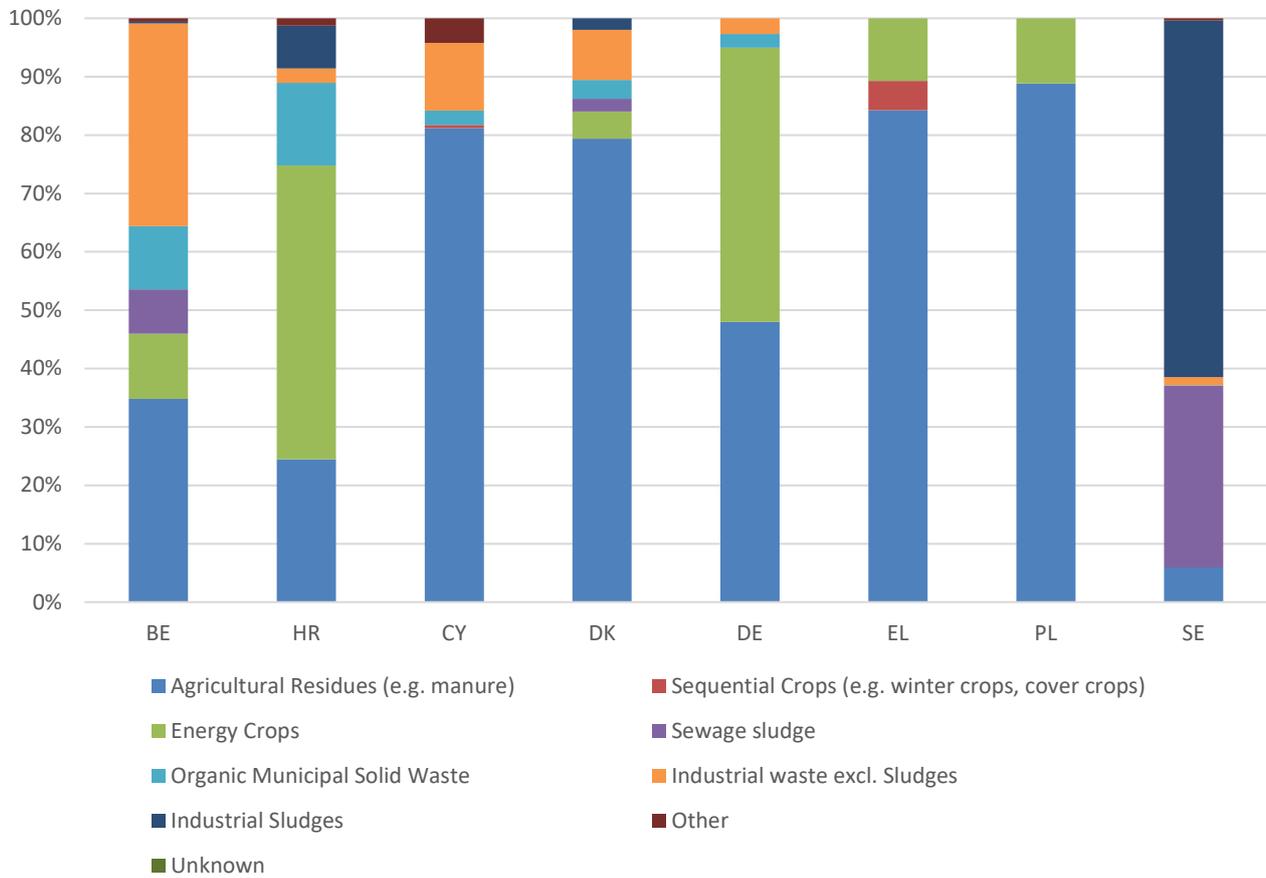
Source: European Biogas Association, EBA

In Europe, about 63% of the biogas has been produced by plants running on agricultural by-products. This dominant proportion illustrates the strong interactions between agriculture and biogas production. In most countries, biogas relies on one dominant feedstock, although which feedstock that is varies between countries based on local conditions.

Figure 8 describes the situation at the Member State level (for countries with available data). It can be seen from this figure that, depending on the Member State, the resource mix used for biogas production varies considerably. Indeed, considering the case of Belgium for example, the biogas production is primarily reliant on agricultural residues as well as industrial waste (excluding sludges) which differs dramatically from the situation in Sweden where production is mainly based on the use of sludge (industrial and sewage).

Energy crops still represent a large part of the feedstock for some countries like Germany and Croatia, despite a recent tendency of countries reducing the share of energy crops in biogas production. Given that some categories are only marginally represented, it seems likely that there are many good opportunities for countries where these resources are abundantly available and underutilized to develop further capacity.

Figure 8 Feedstock use for biogas production in European countries (excluding landfill - expressed as a mass percentage)



Note: data is not available for all countries, the year refers to date of the data

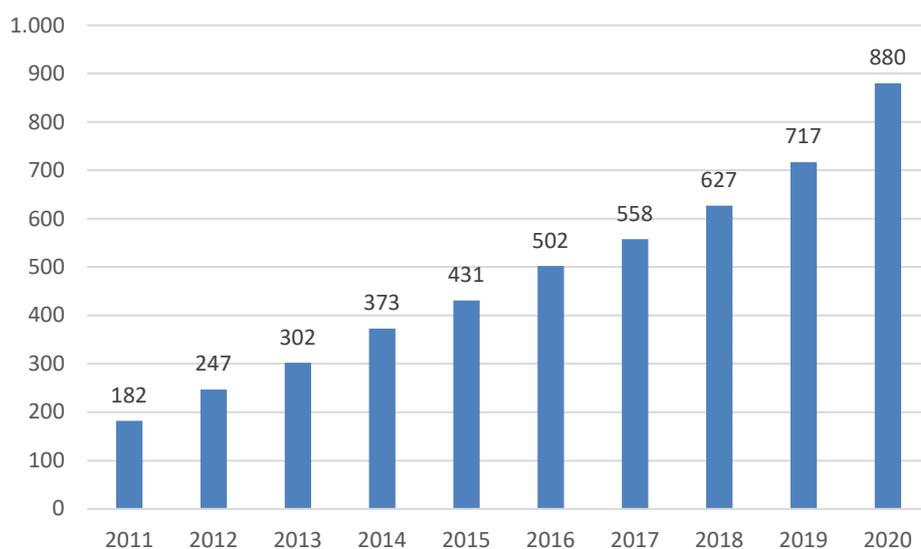
Source: European Biogas Association, EBA

2. Biomethane in Europe

Biomethane is defined as methane produced from biomass, with properties close to fossil gas. The initial product used to produce biomethane is raw biogas, containing 40-60% methane, which is purified (upgraded) to reach a high methane content (usually >96%). Biogas upgraded into biomethane, which has a similar quality to natural gas with respect to methane, trace gases content, etc., can be used as fuel in Natural Gas-powered Vehicles (NGVs) or injected into the natural gas grid as a substitute for natural gas to supply traditional end-users (power plants, industries and households).

Figure 9 shows the growth in the number of biomethane plants in Europe from 2011 to 2020. We can see that in nine years, the number of plants has increased by a factor of 5 and that the last year's growth (between 2019 and 2020, +182 plants) is the largest ever recorded, the previous year being 2018-2019 marked by an increase of 90 plants. By October 2021, the number of biomethane plants in Europe has reached > 1.000 plants (For more information on the biomethane plants in Europe, see the [European Biomethane Map - Gas Infrastructure EuropeGas Infrastructure Europe \(gie.eu\)](https://www.gie.eu)).

Figure 9 Evolution of the number of biomethane plants in Europe*

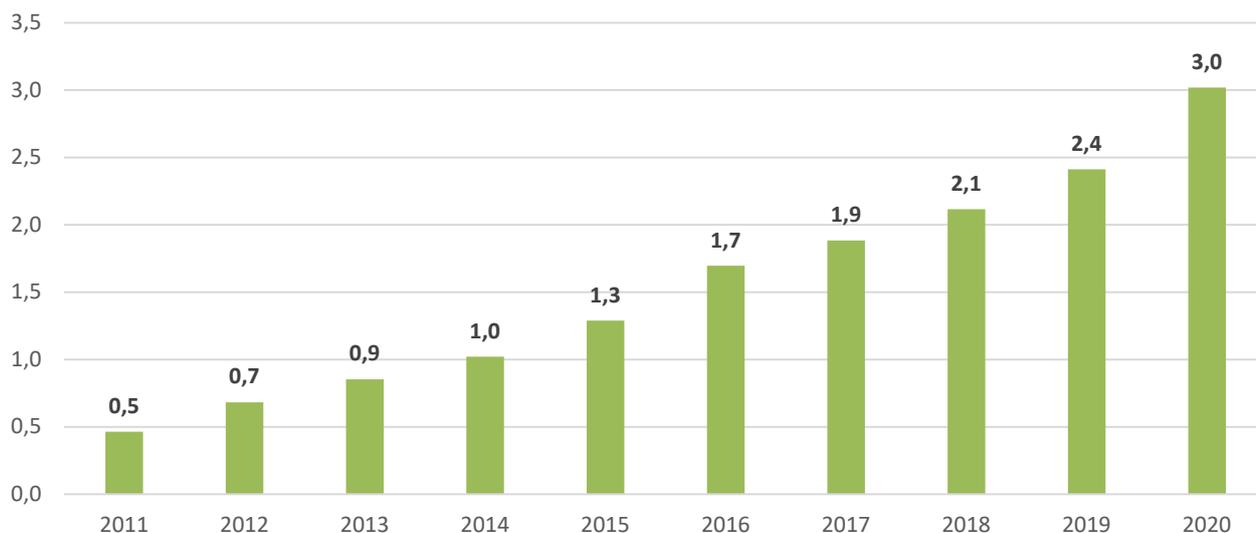


*EU27 + UK + Switzerland + Norway + Iceland

Source: European Biogas Association, EBA

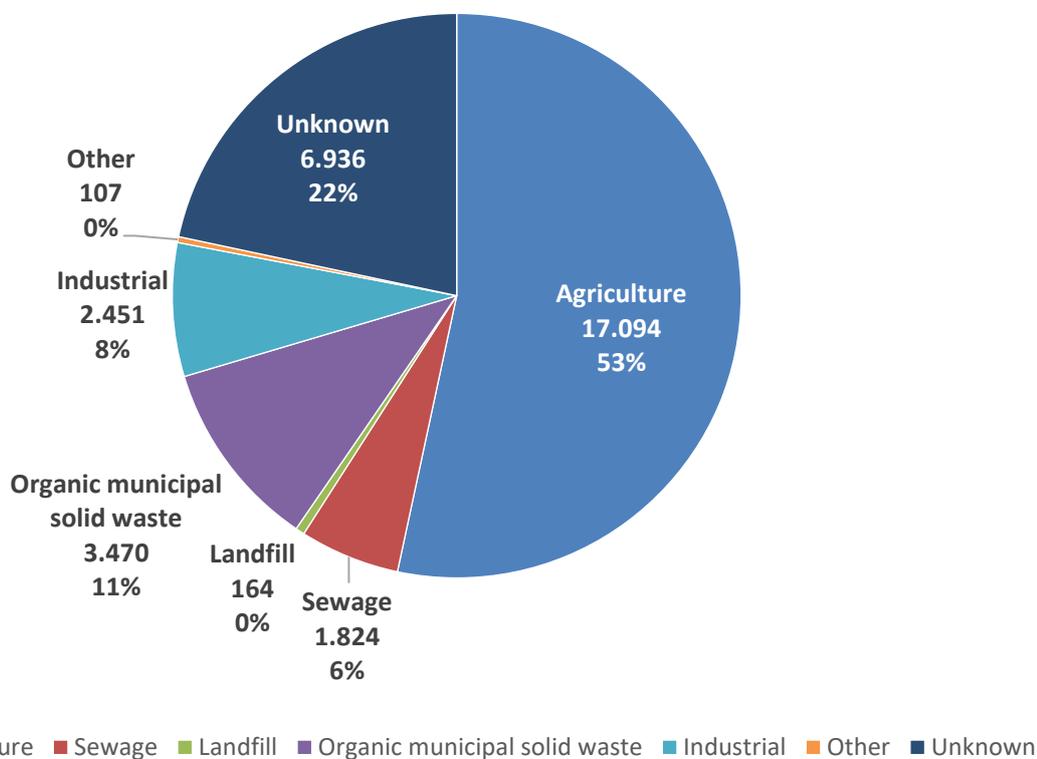
It is also important to note that this increase in biomethane growth is generally at the expense of biogas growth as biomethane is a more refined biogas product. Given the ability to utilize biomethane within all the existing fossil gas infrastructure (which is not the case for biogas), this trend is also likely to increase in the coming years. A further acceleration of this trend is also likely to occur at least up until 2030 due to the new targets set by the European Commission in the [REPowerEU](https://ec.europa.eu/energy/en/strategy) plan which seeks to rapidly reduce the dependence on Russian fossil fuels and accelerate the ecological transition. This plan sets a target of 35 BCM (billion cubic meters) of biomethane to be produced in Europe by 2030, which is a little less than 12 times the current production (represented by Figure 10). To reach this ambitious target, an increase in the number of plants is therefore a necessity.

Figure 10 Evolution of the production of biomethane in Europe* (in BCM)



Looking at the types of feedstocks used for biomethane production in Europe, as for biogas, it is clear that agricultural co-products dominate the mix with nearly 53% of the biomethane produced relying on this feedstock. However, it is interesting to note that this proportion is slightly lower than that for biogas (which amounted to 63% in 2020). Another difference is the higher proportion of organic municipal solid waste and the relatively small share of the feedstock derived from landfills (when compared with biogas).

Figure 11 Biomethane production per plant type in 2020 in Europe* (in GWh)

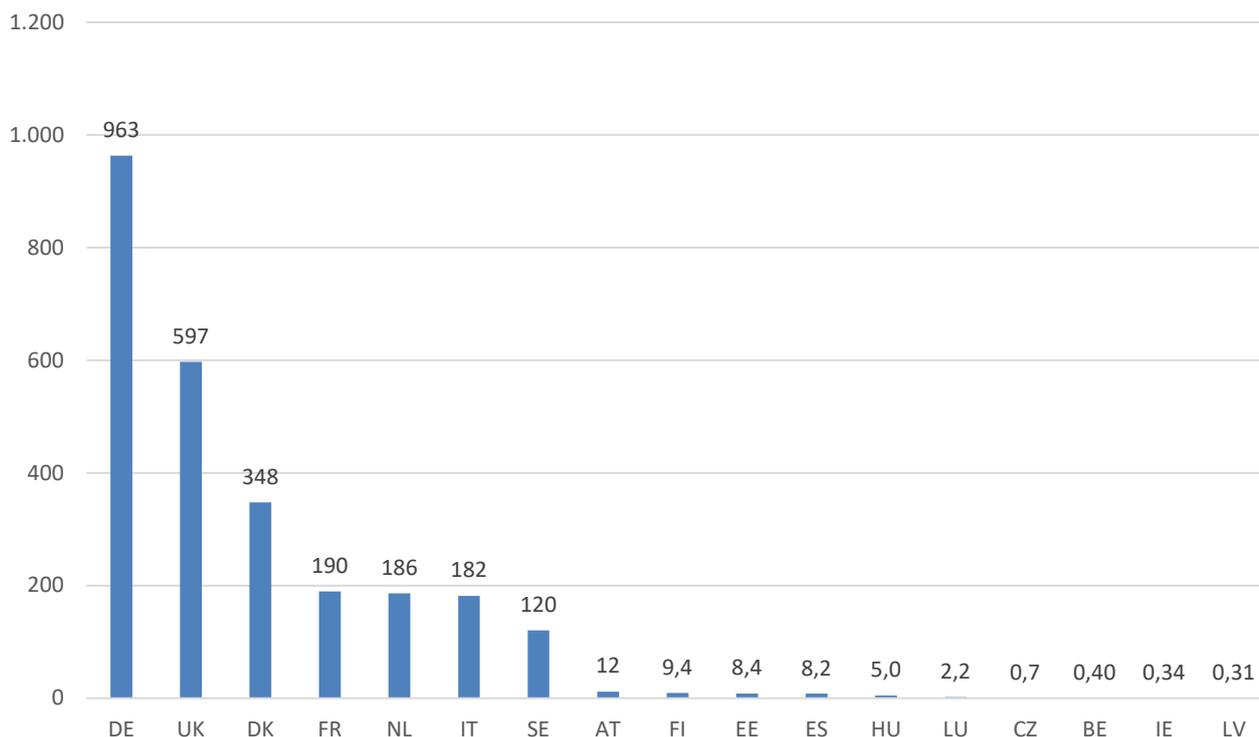


*EU27 + UK + Switzerland + Norway + Iceland

Source: European Biogas Association, EBA

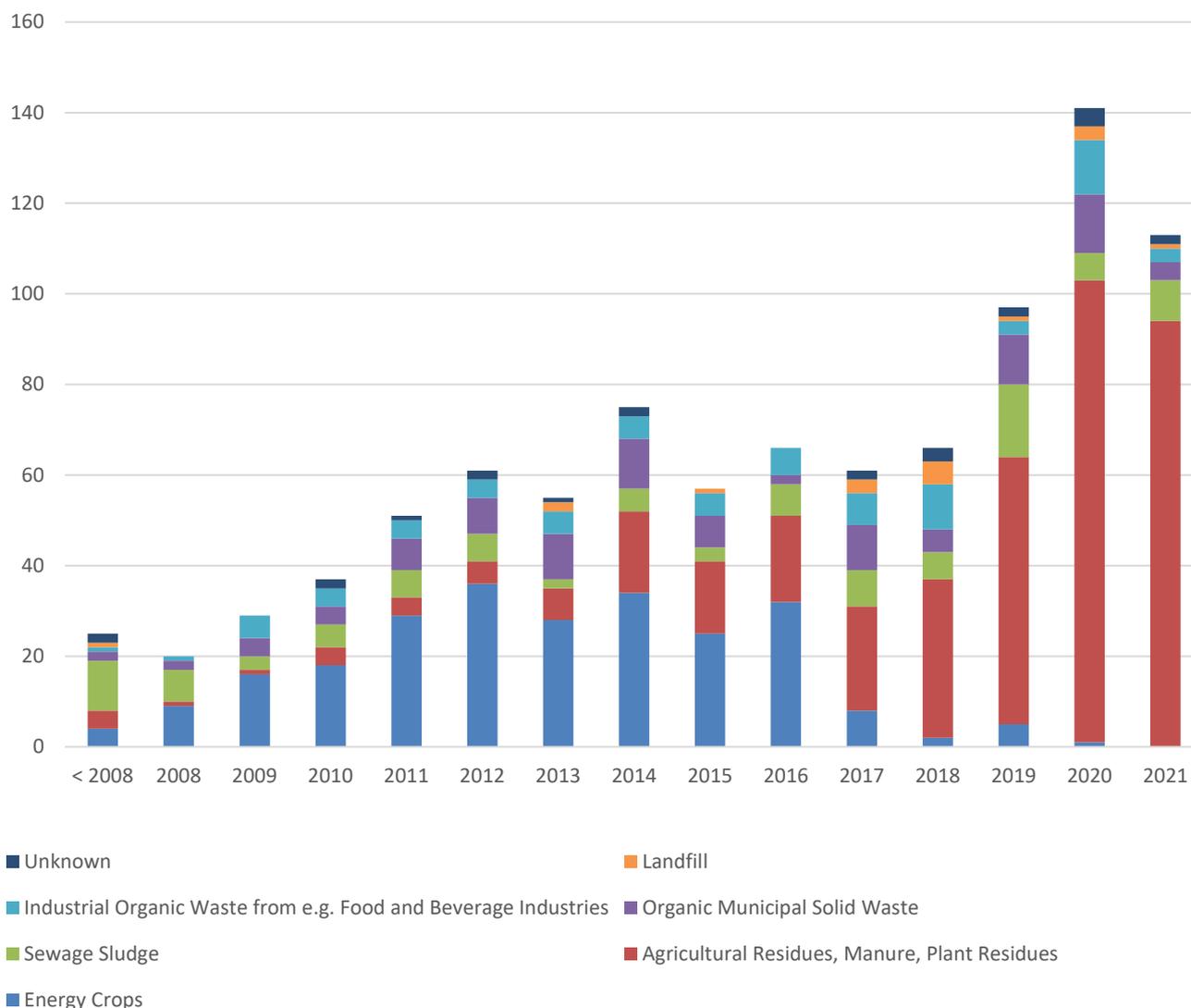
Regarding the production of biomethane on the Member State level (+UK), the general trend shows an increase in production, whose intensity varies according to the country. The largest increase between 2019 and 2020 was observed in Italy, where the growth represented 61%, followed by Denmark (52%) and the Netherlands (47%). However, as mentioned above, there are also some small reductions in production which occurred notably in Austria (-9%) and Finland (-28%). Nevertheless, these reductions represent only a very small quantity in absolute terms, with -1 ktoe and -4 ktoe for Austria and Finland, respectively.

Figure 12 Production of biomethane in European countries in 2020 (in ktoe)



Source: European Biogas Association, EBA

Figure 13 Evolution of newly installed biomethane plants per main feedstock



Source: European Biogas Association, EBA

Figure 13 displays the number of newly installed biomethane plants each year in overall terms, and for each different feedstock type. A clear trend is visible in preferred feedstock usage: 2013 saw the beginning of a move away from energy crops, towards agricultural residues, bio- and municipal waste and sewage sludge. This change partly reflects the fact that growth in biomethane production is no longer located primarily in Germany, with more plants instead being built in France, the Netherlands, Denmark, and Italy. In Germany, a large share of plants run on energy crops, whereas the plants in the countries currently driving the growth in the sector run principally on agricultural residues and to a lesser extent also on bio- and municipal waste and sewage sludge. This trend is expected to continue. Moreover, energy crops are expected to be replaced in the future by sustainable cropping such as sequential cropping and cover crops.

3. Annexes

Definitions

Derived heat (DH)	According to Eurostat, derived heat covers the total heat production in heating plants and in combined heat and power plants. It includes the heat used by the auxiliaries of the installation which use hot fluid and losses in the installation/network heat exchanges. For auto-producing entities (= entities generating electricity and/or heat wholly or partially for their own use as an activity which supports their primary activity) the heat used by the undertaking for its own processes is not included.
Gross electricity generation	The gross electricity generation is measured at the outlet of the main transformers, i.e. the consumption of electricity in the plant auxiliaries and in transformers is included.
Gross final energy consumption	Final energy consumption + consumption of electricity and heat by the energy branch for electricity and heat generation (own use by plant) + losses of electricity and heat in transmission and distribution.
Gross inland consumption	Gross inland consumption is the quantity of energy necessary to satisfy inland consumption of the geographical entity under consideration. It is calculated using the following formula: primary production + recovered products + imports + stock changes – exports – bunkers. International Marine Bunkers are quantities of fuels delivered to ships of all flags that are engaged in international navigation. The international navigation may take place at sea, on inland lakes and waterways, and in coastal waters.

Table 3 Country Codes

EU27	European Union (27 members)	CH	Switzerland
AT	Austria	IS	Iceland
BE	Belgium	NO	Norway
BG	Bulgaria	RS	Republic of Serbia
CY	Cyprus	UK	United Kingdom
CZ	Czech Republic		
DE	Germany		
DK	Denmark		
EE	Estonia		
EL	Greece		
ES	Spain		
FI	Finland		
FR	France		
HR	Croatia		
HU	Hungary		
IE	Ireland		
IT	Italy		
LT	Lithuania		
LU	Luxembourg		
LV	Latvia		
MT	Malta		
NL	Netherlands		
PL	Poland		
PT	Portugal		
RO	Romania		
SE	Sweden		
SI	Slovenia		
SK	Slovak Republic		

Table 4 Symbols and Abbreviations

Symbol	Meaning
,	Decimal separator
.	Thousand
n.a.	Data not available

Table 5 Decimal Prefixes

10 ¹	Deca (da)	10 ⁻¹	Deci (d)
10 ²	Hecto (h)	10 ⁻²	Centi (c)
10 ³	Kilo (k)	10 ⁻³	Milli (m)
10 ⁶	Mega (M)	10 ⁻⁶	Micro (μ)
10 ⁹	Giga (G)	10 ⁻⁹	Nano (n)
10 ¹²	Tera (T)	10 ⁻¹²	Pico (p)
10 ¹⁵	Peta (P)	10 ⁻¹⁵	Femto (f)
10 ¹⁸	Exa (E)	10 ⁻¹⁸	Atto (a)

Table 6 General Conversion Factor for Energy

from	to	1 MJ	1kWh	1 kg oe	Mcal
1 MJ		1	0,278	0,024	0,239
1 kWh		3,6	1	0,086	0,86
1 kg oe		41,868	11,63	1	10
1 Mcal		4,187	1,163	0,1	1



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Supported by:



BiOenergy
EUROPE

Bioenergy Europe
Place du Champ de Mars 2A
1050 Brussels
T : +32 2 318 41 00
info@bioenergyeurope.org



www.bioenergyeurope.org