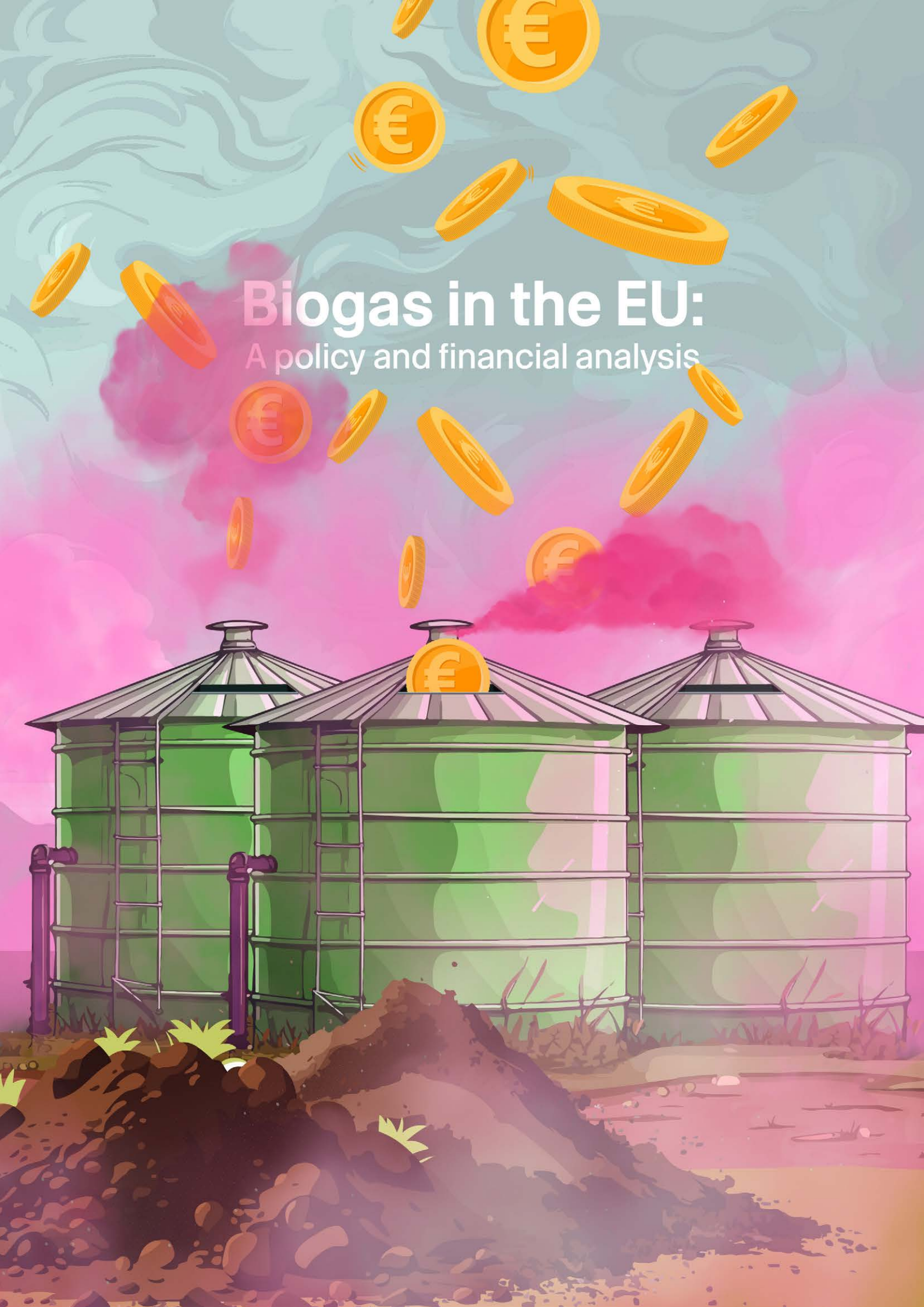

Biogas in the EU:

A policy and financial analysis

This study was commissioned by

This research was undertaken by Profundo: www.profundo.nl

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About this report

This report has been commissioned by the Methane Matters Coalition: a consortium of European non-governmental organisations aiming to reduce methane emissions in agriculture, waste and energy sectors. This research aims to understand the broader market, regulatory, and financial picture of biogas for three main sectors: energy, agriculture, and waste. The primary goal of the research is to provide a concrete analysis of the policy and financial environment for biogas, the potential risks associated with this, and any recommendations for how policies and financial flows can be changed to build a more sustainable and just energy transition.

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Summary

The European Union is the global leader in biogas production, with a production volume of 22.8 billion m3 in 2024. Most biogas is derived from the anaerobic digestion (AD) of organic materials such as energy crops, agricultural and food waste, and manure. Methane captured from landfills and sewage sludge also counts as biogas. Biogas is used for generating heat and power and is further upgraded into biomethane, which is comparable to fossil gas. Biomethane is injected into existing fossil gas grids - for use in households and businesses - and is used as transport fuel (as BioLNG).

This report, commissioned by the Methane Matters Coalition, examines the current status of the biogas industry in the European Union (with specific attention to member states Denmark, Germany, Ireland, the Netherlands, Poland, and Romania) and in the United Kingdom. The report analyses the market developments in the EU as a whole and in the seven countries; the environmental impacts of biogas production; the regulatory frameworks applicable; the level at which regulations cover environmental impacts; public financing schemes for biogas; and bank and investor financing for a selection of biogas companies.

Development of the European biogas market

The development of the European biogas market is driven by a complex mix of political ambitions (increasing domestic energy production, ending gas imports from Russia, reducing greenhouse gas emissions, strengthening rural economies and recycling waste) and commercial interests of different economic sectors: the waste and livestock sector aim to generate income from their expensive waste and emissions problems, while fossil gas suppliers and consumers postpone investments in the energy transition by mixing fossil gas with biogas.

Given these different interests, further growth of the European biogas sector - and especially the production of biomethane - is expected. Project developers have until now committed to invest over EUR 28 billion in biomethane production development in the EU in the coming five years, cementing its expansion pathway

Within the EU, Germany has been the leader in primary biogas production, while France, Italy, and Spain are rapidly developing the biomethane industry, producing biogas and then upgrading it to pipeline quality. Of the focus countries of this report, Germany, the United Kingdom and Denmark saw a strong growth of biogas production already in the past decades and are now experiencing some stabilisation. Growth is stronger in recent years in Ireland, the Netherlands and Poland, while the sector is still in its early stages in Romania.

Environmental and social impacts

While lauded as a renewable energy source by its proponents, the expansion of biogas production can create serious environmental impacts if environmental impact assessments are not properly conducted and expansion exceeds sustainable levels:

- **Methane leakage**: As methane is a very potent greenhouse gas, over 80 times as potent as CO_2 over a 20-year period, the high leakage rates in the biogas supply chain may offset any potential climate benefits.

- **Local impacts**: As methane is a precursor of ground-level ozone, leakages will contribute to air pollution, damaging human health, crops and the environment. Direct application of digestate to land may cause the release of methane and ammonia and the leaching and runoff of mineral nitrogen, affecting local waterways as well as nature. Odour nuisances and heavy traffic will also affect nearby communities.
- **Incentivisation of industrial animal farming**: Reliance on manure as a biogas feedstock creates an incentive for large-scale meat and dairy businesses that are based on poor animal welfare standards that are using enormous areas of arable land to grow feed crops. The methane and ammonia emissions from manure, combined with high enteric methane emissions and high GHG emissions because of land-use change for feed crops, together strongly diminish the positive climate impact of manure-based biogas.
- **Using crops as feedstock**: Using agricultural crops as feedstock is threatening food security and leads to monoculture expansion and GHG emissions caused by land-use change.
- **Postponing the transition to sustainable energy systems**: As it will be impossible to replace all present fossil gas consumption with sustainably produced biomethane, the mixture of biomethane with fossil gas will contribute to prolonging fossil gas dependencies and to postponing much-needed investments in a sustainable energy transition.

Regulatory frameworks in the EU relevant for biogas

At the European Union level, the following policies are most important for the biogas sector:

- The **Renewable Energy Directive** (RED III) mandates a 42.5% share of renewable energy in the EU's energy mix by 2030. REDIII promotes the production of biomethane, its use as transport fuel and its injection into the existing fossil gas grid but discourages its use for electricity production.
- The **REPowerEU** plan outlines the target of producing 35 billion m3 of biomethane annually by 2030.
- The **Waste Framework Directive** obliges separate bio-waste collection and prioritises its conversion into compost or biogas.
- The **Landfill Directive** requires the pre-treatment of waste before sending it to a landfill and encourages biogas production through anaerobic digestion of organic waste.
- The **Nitrates Directive** limits spreading digestate (a byproduct of biogas production) across arable land, but a proposed amendment would allow higher nitrogen levels if digestate is processed into so-called RENURE fertilisers.
- A proposed amendment to the **Energy Taxation Directive** sets a favourable tax rate for biogas and renewable energy sources.
- The **Alternative Fuels Infrastructure Regulation** promotes refuelling points for heavy-duty motor vehicles using BioLNG.
- The **EU Taxonomy** aims to direct public and private investments towards a list of "sustainable" activities, which includes biogas and biomethane production for use as transport fuel.
- The **Corporate Sustainability Due Diligence Directive** fosters responsible corporate behaviour in global value chains, including the imports of feedstocks and feed crops for animal farming.

National biogas policies

The six EU member states considered for the analysis have transposed the mentioned EU directives into their national legislations or are in the process of doing so. The United Kingdom, post-Brexit, retains legacy EU laws such as the Nitrates Directive but is also crafting a new Future Policy Framework for bioenergy.

All seven countries look favourably towards biogas as a component of their future energy mix, but the levels of enthusiasm and support vary. The most ambitious production growth targets seem to be set in the UK (3-4 billion m3 per year by 2050), Ireland (572 million m^3 per year by 2030) and the Netherlands (2 billion m^3 per year by 2030). Most countries focus attention on the upgrading of biogas to biomethane and injecting it into the fossil gas grid, with Denmark being most ambitious by aiming to increase the share of biomethane in the gas grid to 100% in 2030.

Germany, although at present leading biogas production in the EU, has no clear expansion plans. Poland aims to increase biogas production by reducing permitting requirements and by introducing various support schemes. Romania has a more modest goal of a 5% share of biomethane in the national gas grid in 2030, to be increased to 10% by 2050.

Regulatory safeguards

European Union regulations do not address the environmental and social impacts linked to biogas production in a comprehensive way:

- **Methane leakages**: RED III requires the lifecycle GHG emissions of biofuels (including BioLNG) to be at least 65% lower than those of conventional fuels. But the assessment methodology does not take into account that methane leakages are difficult to measure and ignores GHG emissions linked to livestock farming and to locking in existing fossil gas infrastructure.
- **Waste:** The Waste Framework Directive and the Landfill Directive address methane leakages from landfills by promoting the separate collection of organic waste for use in biogas production and requiring pre-treatment of waste before being sent to a landfill.
- **Local impacts**: Water pollution and soil health issues related to biogas production are addressed in the Nitrates Directive, but the proposed amendment on higher nitrogen levels for so-called RENURE fertilisers risks strong negative impacts on waterways, nature and health. The EU Taxonomy labels post-composting of digestate as the preferred option. The Environmental Impact Assessment (EIA) Directive and the Industrial Emissions Directive (IED) address topics such as odour, air quality, and human health, but without specific biogas criteria. Moreover, the absence of intensive cattle livestock farming from the IED creates a regulatory gap.
- **Incentivisation of industrial animal farming**: RED III stimulates the use of manure for biogas and the European Agricultural Fund for Rural Development (EAFRD) supports farm-based biogas financially. As no impact assessment was done for the REPowerEU goal to increase annual biomethane production to 35 billion m3, this policy risks that manure is increasingly used as a feedstock for biomethane.
- **Using crops as feedstock**: RED III still allows the use of (energy) crops to produce biogas, but discourages these feedstocks for transport fuels. The EU Taxonomy excludes crops for biogas production, but the REPowerEU plan still allows their use as feedstock.
- **Postponing the transition to sustainable energy systems**: RED III, AFIR and the EU Taxonomy incentivise injecting biomethane in the EU gas grid and using liquefied biomethane in the current transport infrastructure. All EU policies ignore that locking-in fossil gas infrastructure could lead to the postponing of the energy transition and prolong the demand for fossil gas.

With regard to specific national regulations, Denmark and the UK have policies which address methane leakages in biogas production and transport and Ireland is planning a regulation that specifically deals with the localised impacts of biogas production. None of the seven European countries discourages the use of manure for biogas production, although the climate benefits of this form of biogas are questionable because of enteric fermentation and land-use change. On the contrary, Germany, Ireland, the UK and the Netherlands are actually promoting the use of manure for biogas production.

Limits on the direct use of food and other crops for biogas production - which threatens food security and leads to monoculture expansion and GHG emissions caused by land-use change - exist in Denmark, Germany, Romania and the United Kingdom. None of the seven countries have a policy to address the impact that promoting biomethane could have on postponing the transition to sustainable energy systems.

Public financing for biogas

At the EU level, no specific funding mechanisms have been developed to support biogas and biomethane production, consumption, and trade. But we found the following EU funds subsidising biogas plants in some of the member states researched:

- EU Modernisation Fund: Poland and Romania
- European Agricultural Fund For Rural Development: Germany
- European Funds for Infrastructure, Climate, Environment programme (FEnIKS): Poland – financed from the EU Cohesion Fund and the European Regional Development Fund

On the national level, all seven countries - except for Romania - offer subsidies or other forms of financial support to biogas producers. Feed-in Premiums and Feed-in Tariffs - which guarantee a higher price for biomethane supplied to the gas grid than the price of fossil gas - are being used in Germany, the Netherlands, Poland and the United Kingdom. Direct biogas subsidies are available in Denmark, Ireland, the Netherlands and the United Kingdom.

Biogas companies

More and more major European oil & gas, meat and dairy, and utility companies are active in the biogas sector. We identified 40 of the most important companies in this respect and listed their present or planned production capacities, located in several European countries and sometimes outside Europe. Separately, we identified the largest dedicated biogas companies in the seven countries researched, which are mostly independent companies originating from the agricultural, livestock and waste sectors.

Private financing of biogas companies

We found that the main banks of the major European oil & gas, meat and dairy, and utility companies that are active in the biogas sector, are:

- Oil & gas companies: Citigroup (US), Barclays (UK) and BNP Paribas (France)
- Meat and dairy companies: HSBC (UK), BNP Paribas (France) and JP Morgan Chase (US)
- Utilities: Deutsche Bank (Germany), Société Générale (France) and BNP Paribas (France)

Focusing on the largest biogas companies in each of the seven European countries, we could find private credits provided to eight companies for a total amount of almost EUR 9.5 billion in the period 2016-2025. The largest financiers are NatWest (United Kingdom), BNP Paribas (France), and Santander (Spain).

For five biogas companies we identified investments in their shares and bonds, with a total value of EUR 9.3 billion (May 2025). The most significant investors in these biogas companies were BlackRock (United States), Lazard (Bermuda) and Pictet (Switzerland).

Recommendations to EU and national-level policymakers

Based on the findings of this report, the Methane Matters Coalition recommends EU policymakers to conduct an immediate environmental impact assessment of RePowerEU and appropriately regulate the biogas sector to maximise the application of best practices and minimise environmental harm along the supply chain. Concretely, this means:

- Reconsider the 35 billion m3 biogas and biomethane target set by REPowerEU after a proper impact assessment, to avoid locking in unsustainable production practices and land-use impacts.
- Define where biogas should be used: for peak load electricity production, for heavy industry and for aviation. Biogas should not be used for heating, baseload electricity and road transport, as better alternatives exist.
- Ban food and feed crops as acceptable biogas feedstocks from RED III and other policies, to avoid contributing to food insecurity, monoculture expansion, and indirect land-use change.
- Limit the use of manure as biogas feedstock in RED III, REPowerEU and other policies and make reduction of the number of livestock the leading policy goal, to avoid perpetuating the environmental and animal welfare harms of the current animal protein sector, moving instead towards agroecological farming models.
- Reduce methane emissions from landfills, among others by making sure that the pre-treatment of waste prior to landfilling, mandated by the Landfilling Directive, is implemented and enforced by member states.
- Do not increase the nitrogen limit for RENURE in the Nitrates Directive, as this is incompatible with environmental and water protection goals.
- Mandate in the Nitrates Directive the post-composting of digestate (what remains of the feedstock after biogas production) before its application on land to reduce risks of water pollution.
- Stop and reverse the Omnibus Package for the CSDDD, as the ‘simplification’ of sustainability regulations would make sustainable biogas production more difficult to achieve.

The Methane Matters coalition further recommends policymakers in all seven European countries take all necessary steps, by implementing relevant EU regulations and by supplementing those with additional criteria and safeguards, to regulate the biogas sector and maximise the application of best practices, preventing environmental harm along the supply chain. In the report, this general recommendation is further specified in specific recommendations for the policymakers in each of the seven countries.

Abbreviations

Abbreviation	Explanation
ABC	Applications Budget Cap
ABPR	Animal By-products Regulations
AFIR	Alternative Fuels Infrastructure Regulation
AD	Anaerobic Digestion
ADBA	Anaerobic Digestion and Bioresources Association
BAT	Best Available Techniques
BLE	Federal Office for Agriculture and Food (Germany)
BMWSB	German Federal Ministry for Housing, Urban Development and Building
Bio-CNG	Bio Compressed Fossil Gas
Bio-LNG	Bio Liquefied fossil gas
BioSt-NachV	Biomass Electricity Sustainability Ordinance
BSI PAS	British Standard Institution's Publicly Available Specification
CAP	Common Agricultural Policy
CapEx	Capital Expenditures
CARES	Community and Renewable Energy Scheme
CCGT	Combined Cycle Gas Turbines
CSDDD	Corporate Sustainability Due Diligence Directive
CHP	Combined Heat and Power (production)
CEEAG	Climate, Energy and Environmental Aid Guidelines
CMC	Component Material Categories
CRU	Commission for Regulation of Utilities
CSO	Civil Society Organisation
DACCS	Direct air capture and storage
DEI+	Demonstration Energy and Climate Innovation
DNSH	Do No Significant Harm (criteria)
DüV	Fertiliser Ordinance (Düngeverordnung)
EAFRD	European Agricultural Fund for Rural Development

ECA	Enhanced Capital Allowance
EEA	European Environment Agency
EEG	Erneuerbare Energien Gesetz
EEWärmeG	Renewable Energies Heat Act
EIA	Environmental Impact Assessment
EPG	Energy Policy Group
EPR	Environmental Permitting Regulations
EUDR	European Union Deforestation Regulation
EUR	Euro
FIP	Feed-in Premium
GAR	Green Asset Ratio
GasNZV	Gas Network Access Ordinance (Gasnetzzugangsverordnung)
GBCG	Gort Biogas Concerns Group
GBP	British Pound
GEG	Gesetz zur Einsparung von Energie
GGL	Green Gas Levy
GGSS	Green Gas Support Scheme
GHG	Greenhouse gas
GIG	Green Investment Group
GJ	Gigajoule
GNI	Gas Networks Ireland
GO	Guarantees of Origin
GTAG	Green Technical Advisory Group
GVA	Gross Value Added
GW	Gigawatt
GWh	Gigawatt hours
IEA	International Energy Agency
IED	Industrial Emissions Directive
ILUC	Indirect land use change
KTOE	Kilo tonnes of oil equivalent
LNG	Liquified Fossil Gas
LULUCF	Land Use, Land-Use Change, and Forestry
MER	Millieueffectrapportage (Environmental impact assessment)
NBCG	National Biogas Concern Group (Ireland)
NECP	National Energy and Climate Plan

NFOSiGW	National Fund for Environmental Protection and Water Management
NGO	Non-governmental organisation
NRRP	National Recovery and Resilience Plan
NSCE	National Strategy for the Circular Economy
NVZ	Nitrate Vulnerable Zone
OECD	Organization for Economic Co-operation and Development
OpEx	Operational Expenses
PBL	Netherlands Environmental Agency
PJ	Petajoules
PLN	Polish zloty
PM	Particulate matter
RED III	Renewable Energy Directive
REGO	Renewable Energy Guarantees of Origin
RES	Renewable Energy Sector
RES Act	Renewable Energy Sources Act
RENURE	Recovered Nitrogen from manure
RDP	Rural Development Programme
RHI	Renewable Heat Incentive
RRPRTFC	Renewable Transport Fuel Certificate
RFNBO	Renewable Fuels of Non-Biological Origin
RTFO	Renewable Transport Fuel Obligation
RGGO	Renewable Gas Guarantees of Origin
SEAI	Sustainable Energy Authority of Ireland
SDE++	Stimulering Duurzame Energieproductie en Klimaattransitie
SMEs	Small and Medium-Sized Enterprises
SRF	Scottish Recycling Fund
TJ	Terajoule
TSC	Technical Screening Criteria
TWh	TeraWatthour
UCO	Used Cooking Oil
UDB	Union Database for Biofuels
VOC	Volatile Organic Compound
WFD	Waste Framework Directive
WHG	Federal Water Act (Wasserhaushaltsgesetz)
WBA	World Biogas Association

Introduction

This report, commissioned by the Methane Matters Coalition, examines the current status of the biogas sector in the European Union (with specific attention to member states Denmark, Germany, Ireland, the Netherlands, Poland, and Romania) and in the United Kingdom. The report deals with market developments, environmental impacts, regulatory frameworks, public funding and private investments in the biogas sector.

What is biogas?

Biogas is a mixture of methane (CH_4), CO_2 and small quantities of other gases. The precise composition depends on the type of feedstock used and the production pathway. Most biogas is derived from the anaerobic digestion (AD) of organic materials such as energy crops, agricultural and food waste, sewage sludge, and manure. Methane captured from landfills and sewage sludge also counts as biogas.

Biogas can be used directly for generating heat and power. But it can also be upgraded to biomethane. Similar to fossil gas, methane is the main component of biogas, accounting normally for around 60% of the volume. By upgrading the biogas, which involves removing CO_2 and other gases, it is turned into biomethane with a methane content comparable to that of fossil gas (above 90%). Biomethane can be injected into existing fossil gas grids - for use in households and businesses - and can be used as transport fuel. The latter requires liquifying the biomethane at low temperatures, to turn it into BioLNG.[1]

Global development of the biogas sector

Biogas has been used in domestic and agricultural applications for centuries. Beginning in the 1930s, biogas production increased in some countries to stabilise residual sludge from waste water. Over the years, biogas production was set up on a more industrial scale, especially in Europe and North America, but it was not until later in the 20th century that biogas started playing a tangible role in the energy supply.[2] In the year 2000, the global biogas output made up 7.5 billion m3, and by 2020, annual production had reached 38.1 billion m3. Europe plays a leading role, accounting for more than half of the global production.[3]

This growth of the biogas sector would not have been possible without governmental support, both through legislation promoting biogas (for example, setting national biogas targets, or easing grid connection for biogas plants) and by directly subsidising the industry. The International Energy Agency reports that between 2020 and 2025, over 50 new policies have been introduced to support biogas globally.[4] As for any fast-growing sector, investments and financing by banks and investors also play an enabling role.

Environmental impacts

While lauded as a renewable energy source by its proponents, the expansion of biogas production creates serious environmental impacts if not managed sustainably. These can include:

- Leakage of methane, a very potent greenhouse gas;
- Local impacts on human health, local waterways as well as nature;
- Incentivisation of industrial animal farming, which itself has a strong negative impact on climate, nature food, security and animal welfare; and
- Using crops as feedstock, threatening food security and causing climate emissions.
- Postponing the transition to sustainable energy systems.

Research objective and methodology

This report analyses:

- market developments in the EU as a whole and in seven countries: Denmark, Germany, Ireland, the Netherlands, Poland, Romania and the United Kingdom;
- the environmental impacts of biogas production;
- the regulatory frameworks applicable in the EU and the seven countries;
- the level at which regulations cover environmental impacts;
- public financing schemes for biogas; and
- bank and investor financing for a selection of biogas companies.

The country selection was based on the countries of origin of the partners of the Methane Matters Coalition and on the fact that governments in these countries actively strive for expansion of the biogas sector.

The research done for this report relies on a combination of primary and secondary data sources, analysed between April and June 2025. The policy and regulatory mapping analyses legislative frameworks, policy plans, and support schemes relevant to biogas in each of the target countries. Sources include official government documents, legislative databases, public agency reports and other sources from media, law firms, and NGOs.

The market research draws on reports from national authorities, biogas associations, academic publications, NGOs, and company disclosures. At times, information from industry associations is used due to a lack of other reliable sources for e.g. breakdowns of feedstock. And even where official sources are used, data at times is a couple of years old.

Data on the environmental impacts of biogas are collected from scientific publications, NGO reports and media reports, as well as studies by government agencies.

The financial research analyses private financing for biogas companies, using data from financial databases FactSet, Dealogic, and IJGlobal data and company financial statements.

Brief reading guide

To set the scene, chapter 1 provides a brief overview of the environmental and social impacts of the production of biogas. Chapter 2 summarises the findings of the market and policy analyses at the European Union level, while chapters 3 to 9 discuss the findings for the case studies of the seven selected European countries. In chapter 10 the financing of biogas companies is analysed, while chapter 11 draws conclusions and presents recommendations.

A summary of the findings of this study can be found on the first pages of this report.

CHAPTER 1.

Environmental impacts of biogas

While biogas is generally propagated as a renewable energy source, its production can have serious environmental and social impacts - depending on production systems and feedstocks used. These include the leakage of methane, a very potent greenhouse gas; local impacts on human health, local waterways as well as nature; incentivisation of industrial animal farming, which itself has a strong negative impact on climate, nature, food security and animal welfare; the usage of crops as feedstock, threatening food security and causing climate emissions and further delay of the necessary transition necessary transition of food systems. This chapter describes these environmental and social impacts in more detail, mostly based on the findings of scientific studies.

1.1 Methane leakage

The Paris Agreement on climate change, which came into force in November 2016, aims to ensure that the signatory countries limit the growth of global temperatures to well below 2 degrees Celsius compared to pre-industrial levels, aiming at 1.5 degrees.[5] This goal requires a swift and decisive reduction of the global emissions of Greenhouse Gases (GHG), of which CO_2 is the most important.

Another important GHG gas is methane (CH_4), which has a significantly higher global warming potential (GWP) than CO_2 in the short-term. Over a 20-year period, methane is 84-87 times more potent at trapping heat in the atmosphere than CO_2. Over a 100-year period, its GWP reduces to about 28-36, due to its shorter lifespan in the atmosphere, but this is still considerably higher than CO_2 over this time frame.[6] Although the volume of methane emissions is much smaller than that of CO_2 emissions, the much higher GWP means that methane emissions account for 14.1% of global GHG emissions in 2021, measured in GWP100 CO_2 equivalents, and over 30% when measuring with GWP20.[7] As the world continues to heat, this short-lived nature of methane makes it the best emergency brake for limiting global heating, while the world ramps up efforts toward net-zero carbon emissions.

Acknowledging the strategic importance of bringing down global methane emissions, the Global Methane Pledge was launched in 2021 and now counts 159 countries and the European Commission as signatories. The signatories agree to take voluntary steps as part of a worldwide effort to reduce methane emissions by at least 30% from 2020 levels by 2030.[8] As a significant part of global methane emissions is caused by the

production, transport and consumption of fossil gas (which consists for 90% or more of methane), biogas industry associations are actively promoting the replacement of fossil gas by biogas as a strategy to meet the targets of the Global Methane Pledge and the Paris Agreement.[9]

For various reasons this claim can be challenged. One reason concerns the methane leakages in the biogas supply chain, on which we focus in this section. Other reasons concern the role of biogas in potentially incentivising methane emissions in the meat and dairy sectors, discussed in section 1.3, and the role of biogas in prolonging (rather than replacing) the production of fossil gas, discussed in section 1.5.

Methane leakage is a serious problem across the biogas supply chain. According to a 2025 report by the International Energy Agency (IEA), biogas production can experience leakage rates ranging from 0% up to 12%, with higher levels typically resulting from frequent use of pressure release valves on biodigesters. During the biomethane upgrading process, additional leakage can occur, ranging from 0.2% to 10%, depending on the technology used. For instance, water scrubbers tend to exhibit higher leakage rates than membrane separation systems.[10]

According to the IEA methane leakage from digestate storage also varies significantly, ranging from 0.8% to as much as 15%, depending on whether it is stored in open systems like lagoons or in sealed, gas-tight tanks. Site-specific measurements indicate average total leakage rates of approximately 2.4% for agricultural biogas plants and 7.5% for wastewater treatment facilities. When comparing plant sizes, large-scale operations tend to have lower leakage rates (around 2%) compared to smaller- and medium-scale facilities, which average about 5.5%. To put this into perspective, the global average methane leakage rate from oil and gas production was estimated at around 1.2% in 2024.[11]

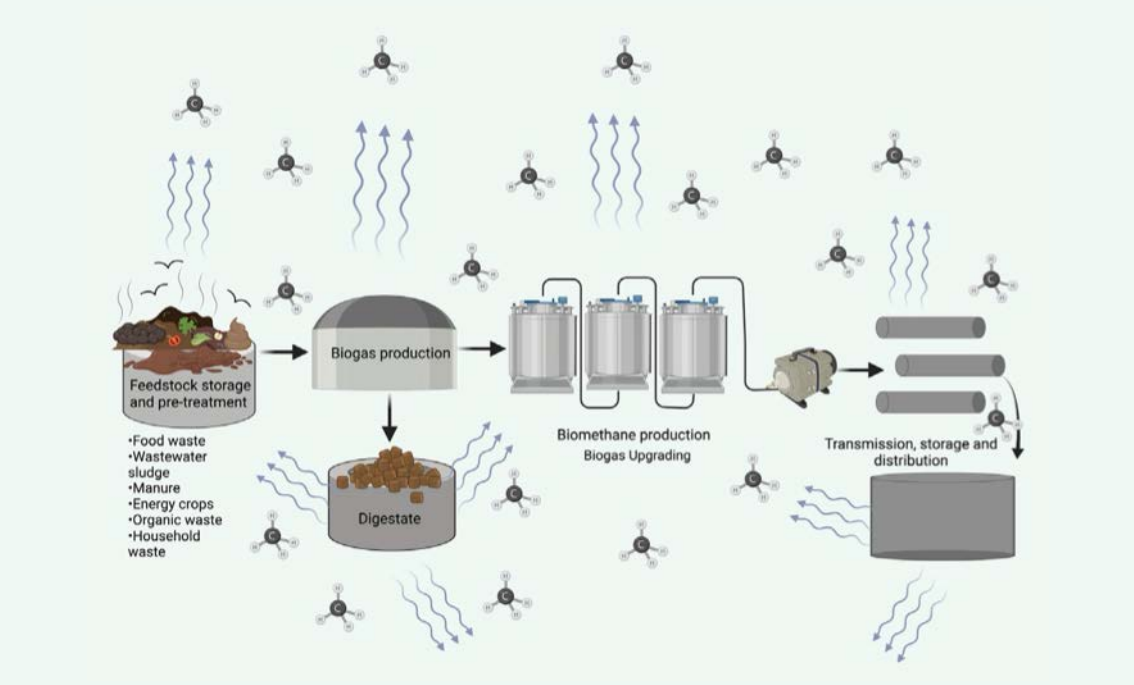


Figure 1. Methane leakage in the biogas production process

Source: *Bakkaloglu, S., J. Cooper and A. Hawkes (2022), "Methane emissions along biomethane and fossil natural gas supply chains", One Earth, 5(6): 724–736.*

Similar data comes from independent scientific studies. A 2018 study by Paolini et al. concludes that emissions of methane and N2O (another potent greenhouse gas) related to the production of biogas occur mostly during biomass storage and digestate management.[12] In a 2022 meta-analysis of 51 previous studies, Bakkaloglu et al. show that the top 5% of methane emitters in the biogas sector are responsible for 62% of emissions. They conclude that methane emissions in the biogas sector could be more than two times greater than previously estimated, with the digestate handling stage responsible for the majority of methane released.[13] Based on this study, environmental organisation Foodrise concludes that currently, the volume of methane emissions per unit of biogas is higher than the methane emissions unit of fossil gas.[14]

Management practices play a huge role in determining the level of methane leakages, according to a 2024 study by Lehtoranta et al. They conclude that without emission reduction practices in the biogas sector, RED II targets may not be met.[15] According to a 2025 study by Hurtig et al., the adoption of a Leak Detection and Repair (LDAR) programme and the alignment to the best practices available to reduce methane losses, could bring both additional revenues to operators and significant climate benefits.[16]

1.2 Local social and environmental impacts

Next to the atmospheric impacts of methane leakages, biogas production can also have a number of negative social and environmental impacts at the local level, depending on production technologies and feedstocks:

- The methane leakages discussed in section 1.1 can have local health impacts as well.[17] A 2023 study by Tamburini et al. reviewed nineteen papers on the potential epidemiological and environmental impacts on human health related to biogas plants. The results of the epidemiological studies revealed a potential exposure to endotoxins and fungi that are associated with respiratory symptoms. Furthermore, the results from the environmental monitoring studies showed significant concentrations of particulate matter, microbial agents, endotoxins, and VOCs in occupational settings.[18] Further to this, methane is a precursor to ground-level ozone, which local and background levels of methane contribute to. Ground-level ozone harms human health and is linked to respiratory diseases and premature deaths.
- When biogas is produced from food waste, manure or sewage sludge as feedstocks, the production process often creates a persistent odour nuisance for neighbouring communities. But there are other social impacts as well. The Stop the Biomethane Rush coalition concludes that profit-driven industrial-scale anaerobic digestion projects place heavy demands on local infrastructure, increase traffic from heavy vehicles, and disrupt rural economies and tourism.[19]

In a recently published study, Dvořák et al. surveyed 446 respondents from four communities affected by biogas facilities in the Czech Republic and Slovakia. Overall, residents reported various negative impacts of plant operation, particularly in terms of reduced quality of life resulting from unpleasant smells, emissions, and increased traffic. Additionally, concerns were expressed regarding the economic viability. The downsides associated with the impact on tourism and the fall in property prices were the least perceived negative impacts.[20]

- Anaerobic digestion for biogas production creates digestate is a byproduct that is rich in nitrogen and phosphorus. It can substitute synthetic fertilisers but often leads to over-application, causing nutrient runoff and leaching. This intensifies nitrogen and phosphorus loading in soils and waterways, both of which have already exceeded safe planetary limits.[21] These impacts extend to the freshwater boundary, as nutrient enrichment contributes to eutrophication, algal blooms, and oxygen depletion in aquatic systems. Without stringent controls, biogas systems risk intensifying systemic environmental pressures.[22] To avoid these downsides of direct application of digestate on land, post-composting of digestate is an effective option to reduce nutrient run off and leaching effects.

- When biogas is combusted to generate electricity or combined heat and power (CHP), additional health impacts can occur. A study by Macor et al. published in 2020 compared the exhaust emissions of biogas and fossil gas engines. Their results show that burning biogas for electricity causes three times more damage to human health than the usage of fossil gas for the same purpose. This damage depends almost entirely on nitrogen oxides (NOx) emissions because a biogas engine produces approximately three times the NOx released by a fossil gas engine. To reduce the toxicity of biogas engine emissions, the authors therefore advise to act on NOx emissions.[23]

1.3 Incentivisation of industrial animal farming

Biogas production in the EU depends significantly on manure and slurry as one of the key feedstocks, accounting for a 24% share of the total production volume.[24] The (subsidised) usage of these feedstocks is creating an additional source of income for the large-scale dairy and meat sectors. This practice runs the risk of locking in industrial animal agriculture systems that are harmful for the planet, for food security and for animal welfare:[25]

- Methane emissions from enteric fermentation and manure management represent roughly 32% of global anthropogenic methane emissions.[26] According to the United Nations Framework Convention on Climate Change (UNFCCC), these direct methane emissions from the livestock sector amounted to 4.9% of global GHG emissions in 2021, expressed as CO_2 equivalents.[27] In the EU, agriculture accounts for 54% of anthropogenic methane emissions, the majority from ruminant livestock.[28]
- The indirect contribution of the livestock sector to global climate change is even larger, because of the enormous amounts of feed crops, such as maize and soy, needed to produce animal proteins. The EU, for instance, imports approximately 35 million tonnes of soy per year, around 9% of global production.[29] These imports are linked to massive GHG emissions, as the expansion of the production of soy and other feed crops is clearly linked to deforestation and land-use change.[30] As a result, it is estimated that food systems currently contribute approximately one-third of total global GHG emissions, with animal-sourced foods a primary driver, accounting for two-thirds of food-related GHG emissions.[31]

Various scientific studies, therefore, conclude that we cannot stay close to a 1.5-degree temperature increase trajectory, as stipulated by the Paris Agreement, if we do not significantly reduce consumption of animal products.[32] A recent survey of over 200 climate scientists concluded that they believe that the emissions from livestock must peak by 2025 in high- and middle-income countries and be cut globally by 50% by 2030.[33]

- In comparison to plant-based proteins, the conversion of animal feed into animal proteins requires much more land to produce the same protein volume. As a result, the growing reliance on animal proteins in European diets increases the competition for arable land in and outside Europe. This is especially threatening food security in the Global South, from where much of the animal feed is imported to the EU. A 2025 study by Nirmal et al., for instance, concludes that alternative protein sources could reduce global resource consumption by up to 70% compared to traditional animal-based proteins, while simultaneously offering comparable nutritional benefits.[34]
- Industrial animal farming is often based on poor animal welfare conditions. Key animal welfare concerns include high stocking densities on farms, the use of individual cages, lack of or insufficient species-specific standards for all farmed animals, routine mutilations, and force-feeding.[35] As manure from animal farming needs to be collected for biogas production, it is most appliable

in intensive systems where slurry is regularly collected from indoor systems. This could lock-in intensive production systems with high absolute emissions, incentivising farming to stock more animals rather than less and in agroecological models.[36], [37]

Despite these strong negative externalities, the meat and dairy sectors in Europe benefit enormously and disproportionately from EU agricultural subsidies. A total of 82% of the Common Agricultural Policy (CAP) subsidies go to animal production, most of which is intensive. Of these, 38% go directly to animal production (mainly dairy) and 44% support intensive animal production indirectly through the production of feed for animals kept indoors (mainly for pigs and poultry).[38]

Using manure and slurry as biogas feedstock creates further incentives to maintain or expand livestock production, when a drastic reduction of production and consumption volumes is essential to meet the EU's environmental and public health goals and keep global warming below 1.5°C.[39] Promoting the use of manure for biogas will make it even harder to switch to a more sustainable food system in Europe, as is the intention of the Farm to Fork strategy of the European Union.[40]

1.4 Using crops as feedstock

The most important feedstocks used for biogas in the EU still are energy crops, grown especially for the production of biofuels or biogas, accounting for a 42% share of the total production volume.[41] With growing populations and the need to protect biodiversity, the global competition for arable land is already intensifying. Climate change will further exacerbate this process, by reducing land areas available for food production. Against this background, it is a worrying development that some biogas producers use agricultural crops as feedstock. This practice is threatening food security and leads to monoculture expansion and GHG emissions caused by land-use change.

Competition for land between food and feed crops on the one hand, and energy crops on the other, is considered a significant negative impact of the biogas industry in the EU. It expands cropland and displaces natural ecosystems, further contributing to biodiversity loss and habitat fragmentation. This practice contradicts the Paris Agreement, that requires signatories to work towards a "climate resilience and low greenhouse gas emissions development, in a manner that does not threaten food production".[42]

1.5 Postponing the transition to sustainable energy systems

Our present economy is completely interwoven with the production and consumption of fossil fuels, many companies are dependent on these energy sources. Transitioning to a sustainable energy system generally requires high investments in new infrastructure and technologies. Replacing fossil gas (partially) with biomethane is therefore seen as a welcome decarbonisation option by many stakeholders, both governments and companies. It means that the existing infrastructure for transporting fossil gas can continue to be used, as well as all kinds of industrial processes which are now using fossil gas, while the companies involved can claim that they are reducing their corporate GHG emissions.

As it will be impossible to replace all present fossil gas consumption with sustainably produced biomethane, the mixture of biomethane with fossil gas will contribute to prolonging fossil gas dependencies and to postponing much-needed investments in a sustainable energy transition. Biogas should not be considered as a silver bullet for decarbonisation of the energy system, concludes the International Energy Agency. Its

production, transportation, and use are causing GHG emissions as well, and the feedstocks currently used to generate biogas are contributing to land use change and cementing unsustainable diets via large-scale animal farming.[43]

Energy experts agree there is a role for biogas in the energy transition, when it is produced sustainably, among others, from separately collected organic waste. A 2021 assessment commissioned by the European Commission concluded that around 24 billion m3 of biomethane could be produced sustainably by 2030 in the EU. But these experts also conclude that this gas should not be used for the heating of buildings or terrestrial transport. The small amounts of biomethane that can be produced sustainably will need to be reserved for chemical production processes, aviation, maritime transport and other hard-to-abate sectors subject to an overall "reduce-demand-and-increase-efficiency-first" approach.[44]

According to the Stop the Biomethane Rush coalition, priority should be given to local production and the direct use of biogas in locations close to its production, favouring the emergence of synergies with related industries, which are necessary for the eco-social transition, use high temperatures, and have no other option for decarbonisation. Its use should also be prioritised for self-consumption in the production plants themselves. This potential for biomethane production will not replace the current uses of fossil gas, which is why its development cannot be an excuse for not addressing the necessary abandonment of fossil gas before 2030 in the electricity sector and in households, and in 2035 in the entire energy system. However, biomethane could serve as a source of manageable electricity generation in small and medium-sized plants.[45]

Both of these areas need to be fully assessed by the EU as part of an environmental impact assessment on the sustainable use of biogas.

CHAPTER 2.

Biogas in the European Union

This chapter gives a general overview of the biogas market in the EU, as well as the regulations that shape it. As the global leader in terms of biogas and biomethane production, accounting for a production volume of 23 billion m^3 in 2024, the EU policies strive for a significant further expansion. While this strong growth will be accompanied by increased environmental risks, the present EU policy framework has insufficient safeguards to prevent these risks from materialising.

2.1 Development of the EU biogas market

Since 2000, the European biogas market has grown strongly. An important political driver has been Europe's policy goal to meet Europe's energy needs more with local sources, to become less dependent on imports and on the volatile prices on the international energy markets. This aligned well with the perceived climate benefit of biogas, which is welcomed by the EU and national governments in their plans to meet the goals of the Paris Agreement. Since the Russian invasion of Ukraine, the energy security factor was further reinforced by the intention to become less dependent on Russian gas imports

Originally, these factors mainly favoured producing energy crops, such as maize, specifically to convert them into biogas. But because of the subsidies for biogas production, other economic sectors started to realise that producing biogas from their waste streams could turn expensive waste problems into additional income flows. Producing biogas now creates value out of household waste, waste from the food industry, agricultural waste and manure, while at the same time reducing waste volumes and emissions (such as dioxin from incinerators and nitrogen and methane from manure) which often exceed EU standards. Rather than reducing the volumes of waste and manure by fundamental changes to our (food) production and consumption patterns, producing biogas became a commercially attractive end-of-pipe solution for the waste and livestock sectors.

The encouraging policies (see section 2.3) and the potential climate benefits of biogas and biomethane also have attracted the interest of economic sectors that are supplying fossil gas (such as energy utilities and oil & gas companies) and that are using fossil gas as energy source (such as transport companies and electricity producers). By mixing fossil gas with biogas, all these companies can claim that they are reducing their corporate GHG emissions. As this strategy helps them to postpone investments in really sustainable technologies, this creates a strong business argument favouring the growth of biogas production.

The following sub-sections will provide key data on the development of the European biogas and biomethane sector, while section 2.2 identifies major European companies investing in the biogas sector and section 2.3 analyses the policy framework of the European Union that is relevant for the development of this sector.

2.1.1. Production volumes

As shown in Figure 2, the growth of biogas production in the European Union was particularly strong from 2000 until around 2015, increasing almost tenfold. In more recent years, growth slowed down.

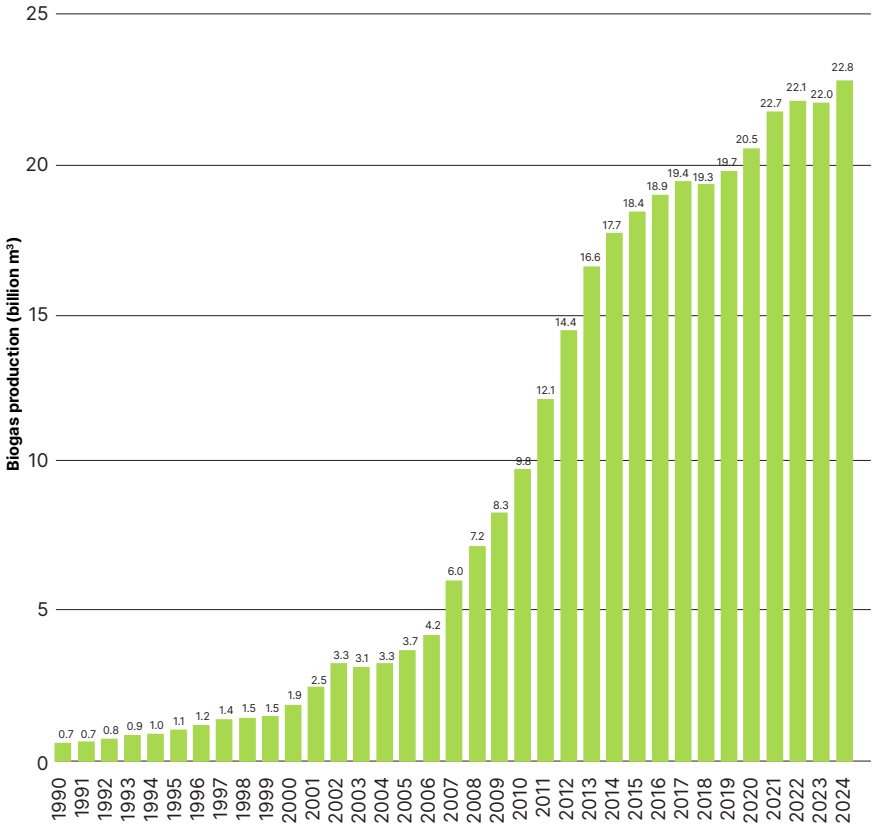


Figure 2. Biogas and biomethane production in the EU27, 1990-2024

Source: *Eurostat (2025, June 25), "Supply, transformation and consumption of renewables and wastes 2015-2024", online: https://doi.org/10.2908/NRG_CB_RW, viewed in July 2025.*

Since 2015, the growth of biogas and biomethane production in the EU-27 was somewhat more modest with an increase of 24% in nine years, from 18.4 billion m3 to 22.8 billion m3 in 2024.[46] Most of this output is still used as biogas and not upgraded to biomethane, but all production growth in the past 5 years is coming from biomethane production, in line with the RePowerEU focus. In 2023, the biomethane production volume alone was 4.9 billion m3, around 22% of the total biogas and biomethane production volume.[47]

As shown in Figure 3, Germany is still by far the largest producer of biogas and biomethane in the EU with a share of 48%, but its production growth in the past ten years was only 5%. Among the other top-5 producers, especially Denmark (+413%) and France (+203%) showed a strong growth in the past ten years.

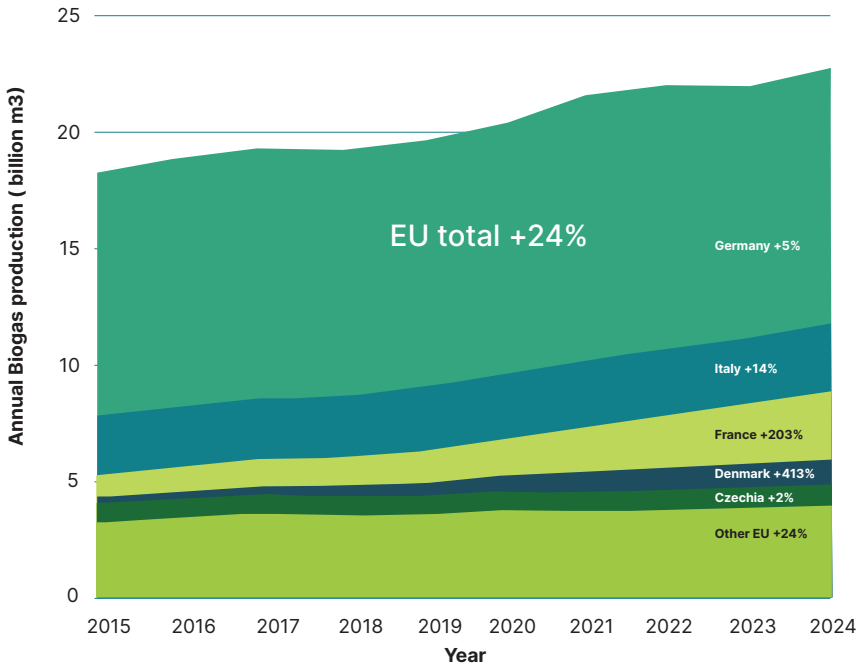


Figure 3. Growth of biogas and biomethane production in main countries, 2015-2024

Source: *Eurostat (2025, June 25), "Supply, transformation and consumption of renewables and wastes 2015-2024", online: https://doi.org/10.2908/NRG_CB_RW, viewed in July 2025.*

The six EU-countries on which this report is focusing (together with the UK), show strong differences in biogas and biomethane production volumes and their share of total EU production (see Figure 4). Germany accounts for 48% of the total EU production volume, followed at a great distance by Denmark (5%), the Netherlands (3%) and Poland (2%). Ireland and Poland each account for only a minimal share.

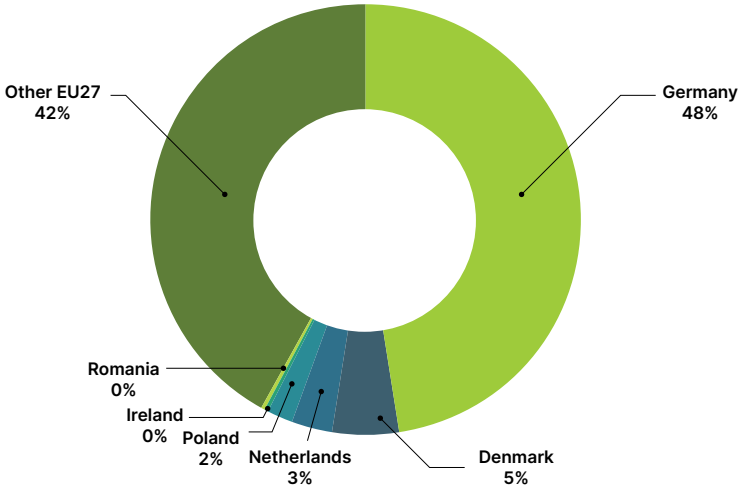


Figure 4. Share of EU27 biogas and bio-methane production of selected countries, 2024

Source: *Eurostat (2025, June 25), "Supply, transformation and consumption of renewables and wastes 2015-2024", online: https://doi.org/10.2908/NRG_CB_RW, viewed in July 2025.*

2.1.2. Biogas and biomethane plants

Similar to biogas production volumes, the number of biogas plants in Europe increased strongly between 2000 and 2015. Since then the growth levelled off. According to the most recent available data from industry organisation Bioenergy Europe, in 2020 there were 18,774 biogas plants in Europe. The majority is located in Germany, where in that year 11,269 biogas plants were operational. Italy followed in second place with 1,710 biogas plants and the United Kingdom had 1,233 plants. Of the other countries covered in this report, Poland had most biogas plants (310), followed by the Netherlands (260), Denmark (141), Ireland (31) and Romania (15).[48]

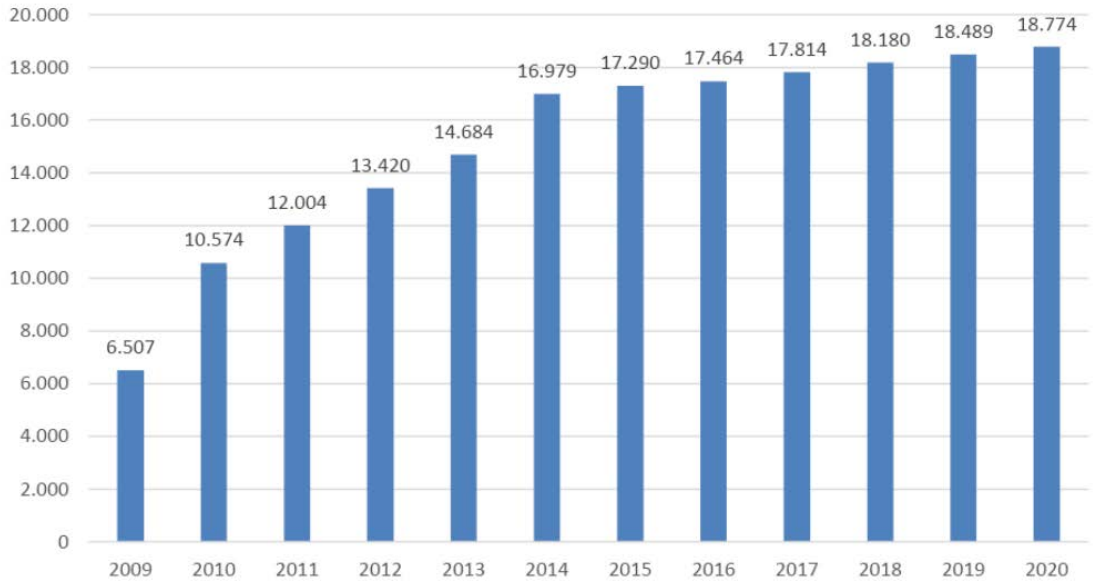


Figure 5. Biogas plants in Europe, 2009-2020

Source: *Bioenergy Europe (2022, June), "Statistical Report 2022 - Report Biogas", p. 17. Data are for the EU27 plus United Kingdom, Switzerland, Norway, Serbia and Iceland.*

The growth of biomethane plants in Europe, producing biogas and then upgrading it to biomethane with more than 90% methane-content, is a more recent development. The European Biogas Association, the European umbrella federation of national biogas industry organisations, reports that by the end of the first quarter of 2025, the number of biomethane plants in the EU reached 1,678, with 168 new plants added since the start of 2024 alone (see Figure 6).[49]

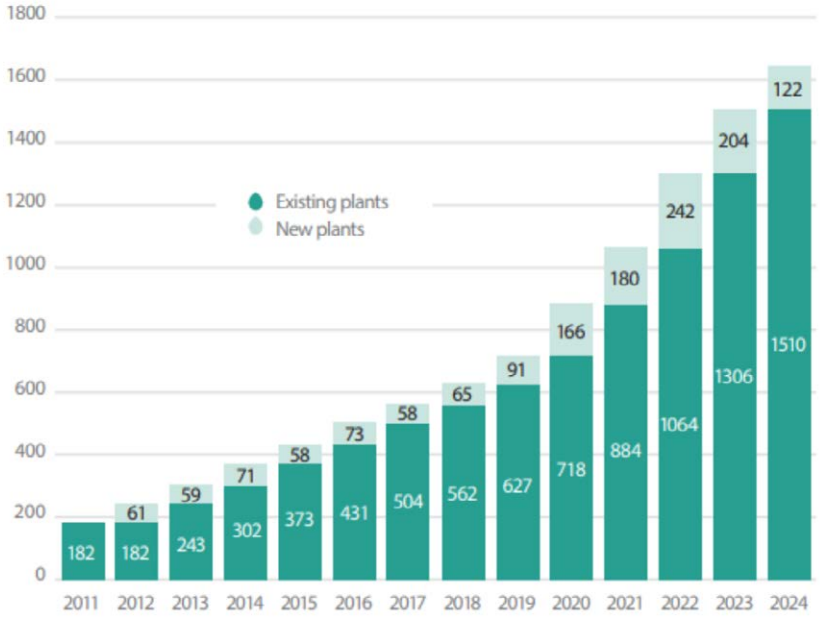


Figure 6. Biomethane plants in Europe, 2011-2024

Source: *European Biogas Association (2025), "European Biomethane Map 2025", online:* https://www.europeanbiogas.eu/europe-an-biomethane-map-2025/, *viewed in June 2025.*

France is leading the way in Europe in producing biomethane, with 760 biomethane plants at present. Germany follows with 260 plants, Italy with 137, the United Kingdom with 119, and the Netherlands with 87 facilities. Of the other countries covered in this report, Denmark has 58 biomethane plants, Ireland has 2 and Poland and Romania have none yet.[50]

2.1.3. Share of final energy consumption

On average, biogas and biomethane accounted for almost 1.0% of final energy consumption in the EU in 2023. But the differences between member states are strong. With a share of 4.1% of its final energy consumption, Denmark has the highest biogas consumption share in the EU. Germany follows with 2.4% of final energy consumption, and Czechia has a 1.6% share. The biogas share in all other EU-countries is below 1%, the shares for the EU countries covered in this report are shown in Figure 7.

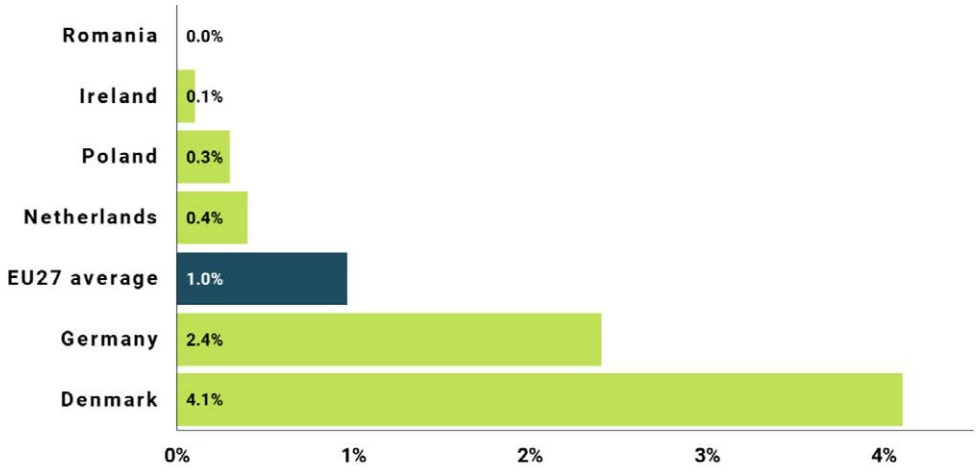


Figure 7. Share of biogas and biomethane in final energy consumption (2023)

Source: *Eurostat (2025, June 25), "Share of renewable fuels in total gross final consumption of energy 2023", online: https://doi.org/10.2908/NRG_IND_RFTCE, viewed in July 2025.*

2.1.4. Final use of biogas and biomethane

In the EU27, biogas is mainly used to generate electricity and heat (61%), as shown in Figure 8. 18% is upgraded to biomethane, while 4% is used for the energy need of biogas plants and distribution losses. The agriculture sector uses 6%, the industry 4% and households 2%.

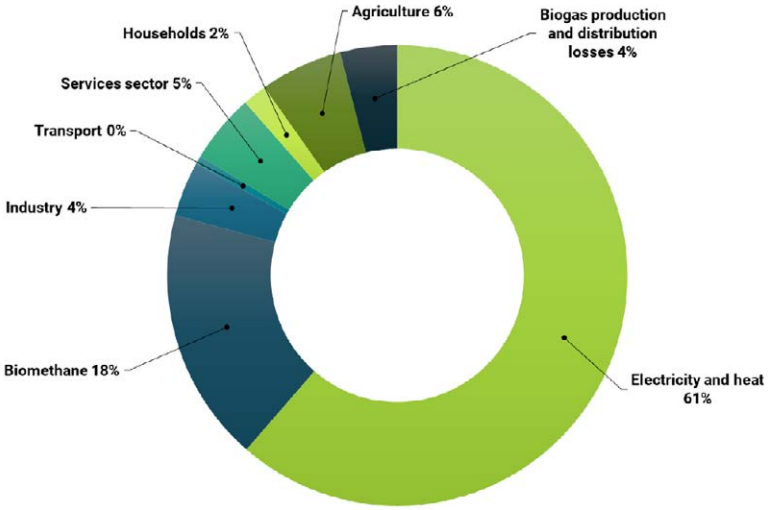


Figure 8. Final use of biogas in the EU27 in 2023

Source: *Eurostat (2025, June 25), "Supply, transformation and consumption of renewables and wastes", online:* https://doi.org/10.2908/NRG_CB_RW, *viewed in August 2025.*

As shown in Figure 8, a share of 18% of the biogas production in the EU27 was upgraded to biomethane in 2023. The use of biomethane is distributed differently across sectors. As biomethane is seen as an alternative for fossil gas, and mixed with fossil gas in national gas grids, it is used for the same applications as fossil gas. In 2023, on average 23% of the biomethane consumed in Europe was used as transport fuel, 17% for heating buildings, 15% for electricity generation and 13% for industry.[51]

But the final use of biomethane differs strongly per country, as shown in Figure 9. While Scandinavia and Italy use biomethane mostly as transport fuel, Belgium uses it mostly in the industry and Switzerland and the Untied Kingdom use a large share for heating homes. In the UK and Germany relatively, much of the biomethane is also used for electricity generation.

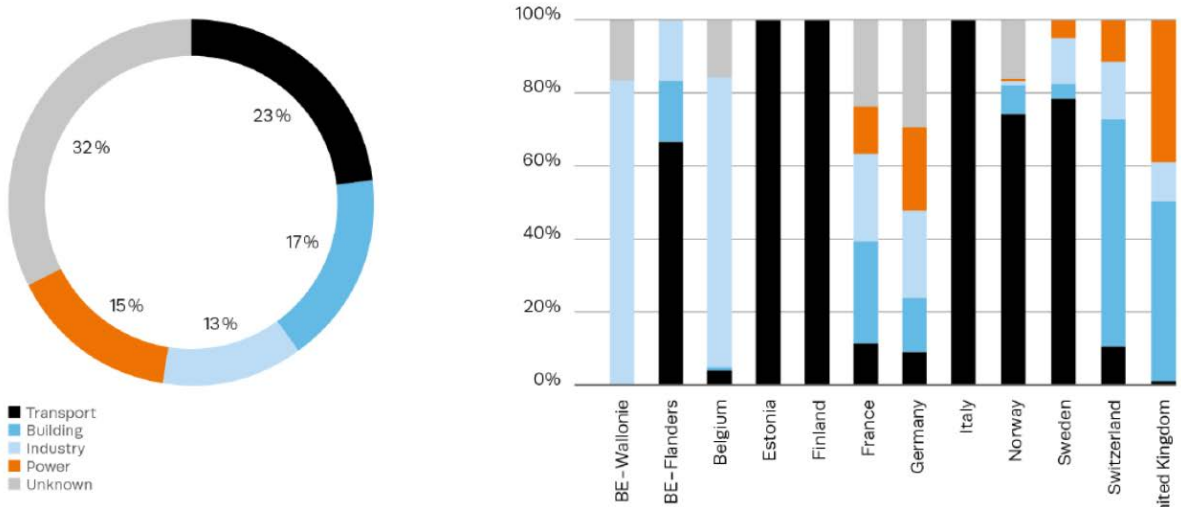


Figure 9. Biomethane use in different European countries, 2023

Source: *European Biogas Association (2024, December 4), "Webinar: EBA Statistical Report 2024 unveiled", p. 30.*

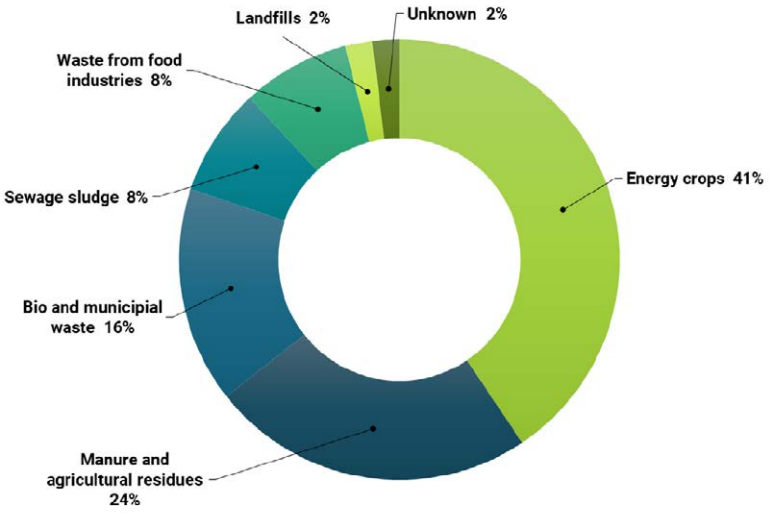
2.1.5. Biogas feedstocks

Historically, much of the biogas production in the EU depended heavily on energy crops as a primary feedstock. However, concerns about land use change, competition with food crops, and biodiversity impacts have led many (but not all) European countries to impose restrictions on the use of energy crops. As a result, the sector has been gradually shifting towards a more diverse feedstock mix that now includes agricultural residues, animal manure, organic municipal solid waste, and industrial waste.[52]

However, crops continue to play an important role as a feedstock for biogas in the EU. The latest available data, for 2019, show a 41% share for energy crops and a 24% share for agricultural waste, which includes manure (see Figure 10).[53]

Figure 10. Feedstocks for biomethane production in the EU, 2019

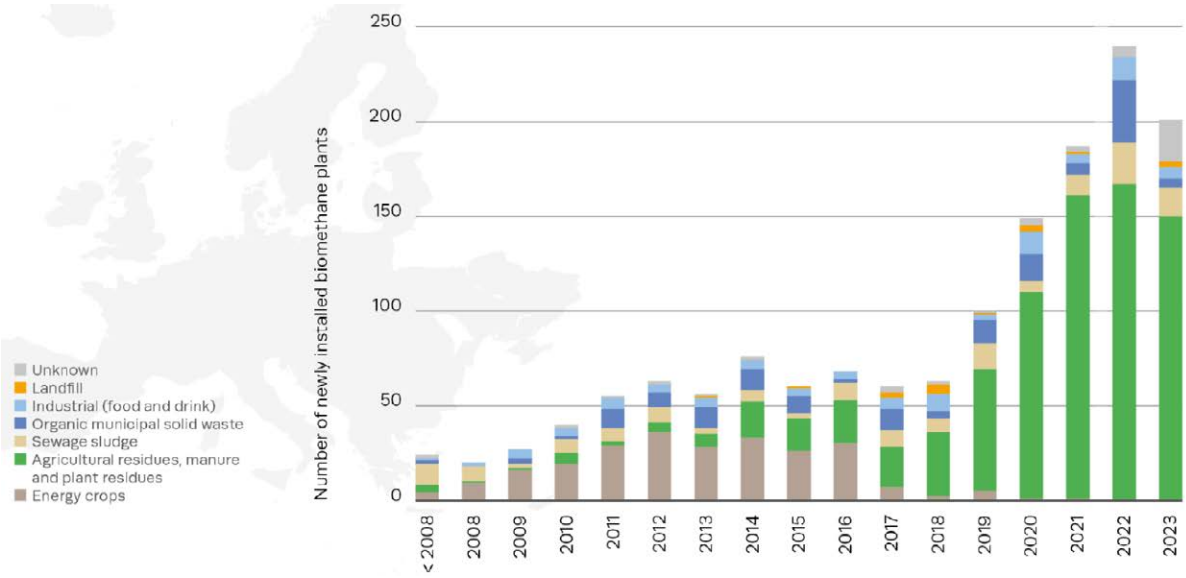
Source: *Wouters, C., M. Buseman, J. van Tilburg, T. Berg, J. Cihlar, A. Villar Lejarrta, J. Jens, A. Wang, D. Peters, and K. van der Leun, K. (2020, December), "Market state and trends in renewable and low-carbon gases in Europe", Gas for Climate & Guidehouse, online: https://www.europeanbiogas.eu/wp-content/uploads/2020/12/GfC_MSTReport_2020_final.pdf.*



The distribution of feedstocks shown in Figure 10, has probably changed considerably in the past 6 years already and is likely to change further. Figure 11 shows that since 2020, no new biomethane plants in Europe were built that use energy crops as their main feedstock. Most new biomethane plants in Europe now rely on agricultural residues as feedstock. This category includes manure, but there are no data specifying the share of manure.

Figure 11. Feedstocks used by new biomethane plants in Europe, 2008-2023

Source: *European Biogas Association (2024, December 4), "Webinar: EBA Statistical Report 2024 unveiled", p. 22.*



2.1.6. Employment and turnover

The direct contribution of the biogas sector to the European economy is not very large. According to EurObserv'ER, an independent project monitoring the development of renewable energy in the European Union, the total turnover of the biogas sector in the EU27 actually decreased in the past seven years, from EUR 8.7 billion in 2017 to EUR 7.2 billion in 2023.[54] This last figure amounts to 0.04% of the total European GDP of EUR 17,200 billion in 2023.[55]

EurObserv'ER also reports that direct and indirect employment in the biogas sector in the EU27 decreased from 64,000 jobs in 2017 to 43,900 jobs in 2023. This decrease is mostly caused by lower employment numbers in Germany, by far the largest employer in this sector. Between 2017 and 2023, the number of German jobs in the biogas sector decreased from 35,000 to 21,600.[56] The European Biogas Association, however, claims 70,000 direct jobs and 170,000 indirect jobs in the European biogas sector in 2023.[57]

2.1.7. Outlook

In response to policy frameworks promoting the further growth of European biogas production (see section 2.3), the European Biogas Association, the organisation representing the biogas industry, reports strong interest by the industry to invest in expansion of biomethane production. Based on a survey among 28 of its members (project developers and investors), the EBA in June 2025 identified investment commitments with a total value of EUR 28 billion in biomethane production for the period until 2030.[58]

According to EBA, the main recipient countries inside Europe will be Spain (expected investment of EUR 4.8 billion), followed by Denmark (EUR 3.1 billion), the United Kingdom (EUR 2.4 billion), and France (EUR 1.7 billion). Of the other countries on which this report is focusing, Poland is expected to be the destination for EUR 1.1 billion in biomethane investments, while Germany can only expect investments with a value of EUR 200 million and Ireland can count on EUR 170 million. Romania is not mentioned as a destination for biomethane investments. But EBA also mentions that for expected investments in European biomethane with a value of EUR 6.8 billion it is not yet clear in which countries the plants will be built.[59]

The EBA further predicts that the reported biomethane investment commitments will lead to an expansion of European biomethane production capacity (6.4 billion m3 per year at the start of 2024)[60] will be expanded with 6.7 billion m3 per year by 2030. They also report that no less than 85% of the planned investments is intended for greenfield biomethane plants. Only 2% will go to converting existing biogas plants to biomethane production facilities, while the remaining 13% of investments is not yet earmarked.[61] This means that the predicted expansion of European biomethane production will be almost entirely additional to the existing production volumes for biogas (17.9 billion m3) and biomethane (4.9 billion m3) in the EU27 in 2024.[62]

Next to policy incentives and investor interest, technological innovations could also contribute to the further expansion of biogas in Europe in the coming years:

- Biogas Upgrading Technologies: Innovations in upgrading raw biogas to biomethane are improving the quality and expanding the use cases of biogas. Techniques such as pressure swing adsorption, water scrubbing, and membrane separation are becoming more efficient and cost-effective.
- Integration with Waste Management Systems: Developments in waste-to-energy technologies are enabling more effective conversion of municipal solid waste into biogas, contributing to both energy production and waste reduction.[63]

2.2 Involvement of major companies in the biogas sector

There is a large diversity of companies active in the European biogas sector. To increase the understanding of which companies play a role, we identified and analysed two groups of companies. The first group consists of major European companies: oil & gas companies, waste and utility companies and meat and dairy companies. The most important European companies (measured by revenues or market capitalisation) in the oil & gas sector, the waste and utility and meat and dairy sectors with headquarters in the EU and UK, or having major operations there, were checked, based on their public disclosures, on their involvement in the biogas value chain.

As a second group we identified the largest dedicated biogas producers in each of the seven focus countries of this report, based on biogas production figures from national associations and the companies themselves. This group of companies mainly consists of independent biogas producers originating from the agricultural, livestock and waste sectors. As countries and sub-sectors differ considerably, approaches to company prioritisation and selection in each country also vary. The overarching principle was to select the major players based on their production, capacity, supply, or investments in biogas production. Lists of these companies can be found in chapters 3 to 9.

Importantly, the selections also feature companies with biogas projects that are not yet operational. These companies were included due to the notably large projected biogas production capacities associated with their planned initiatives - capacities that often exceed those of companies already active in biogas production.

The resulting lists represent companies that are known to produce, trade or distribute biogas or have disclosed major investment plans in the biogas industry. As many of the European companies operate globally and report on a global scale, their production/output/supply data usually refer to their global operations, inside and outside. As far as possible, their (planned) annual production volumes of biogas and biomethane are converted to million m3 of biogas.

2.2.1. Oil and gas companies

Table 1 lists ten major European oil and gas companies involved in the biogas sector.

Table 1. Major European oil and gas companies involved in the biogas sector

#	Company	HQ Country	Annual production, capacity or supply	Estimated biogas supply (in mln m3/yr)	Notes	Source
1	BP	UK	23 mboe/d biogas	2,187	Increased biogas supply volumes by around 5% year on year.	[64]
2	Orlen	Poland	1 bln m3 biogas (planned)	1,000	Investment in biogas or biofuels for use in transport: 200 mln in 2024.	[65]
3	Centrica	UK	15 TWh (managed) biogas in 5 years	480	This company trades, nominates, and transports biogas in Denmark, the UK and Netherlands.	[66]

4	Shell	UK	~1,500 GWh biomethane	241	Nature Energy, which Shell acquired in 2023, is one of Europe's largest producers of RNG. Together with its partners, Nature Energy also owns and operates 13 biogas plants in Denmark and one in the Netherlands. Planned investment in biogas: USD 254 mln.	67
5	Repsol	Spain	1.5 TWh/ year (planned) biomethane	241	Repsol entered biomethane production with acquisition of 40% stake in Genia Bioenergy. Operations include 19 biomethane plants under development, with a total capacity of 1.5 TWh/ year, which will generate renewable gas from agricultural and livestock waste in Spain and Portugal.	68
6	Total Energies	France	1.1 TWh/ year biomethane	177	TotalEnergies' gross biomethane production capacity has almost doubled compared with 2022. It plans to pursue a 2030 target of 10 TWh of net production, mainly in Europe and the US. Leading biogas producer in Poland, Polska Grupa Biogazowa, with a production of 0.4 TWh/y, was acquired by Total in 2023.	69
7	Eni	Italy	50 mln m3 biomethane	80	With the purchase in 2021 of 22 plants in Italy, of which 21 for the generation of electricity from biogas and one OFSMW (municipal solid waste) treatment plant, Enibioch4in has laid the foundations for significant growth in the biomethane sector.	70
8	Cepsa	Spain	100 GWh (planned) biomethane	16	Cepsa and PreZero joint development of plants for biomethane produced from organic waste. The first plant, with an expected capacity of up to 100 GWh, will be located at Cepsa's facilities in Huelva.	71
9	MOL Group	Hungary	12.5 mln m3/ year biogas	12.5	MOL has prepared its biogas roadmap with the ambition to build a unique position in CEE by 2030. It has acquired its first biogas plant near Szarvas, Hungary. The plant processes more than 100,000 tonnes of feedstock, producing more than 12.5 mln m3 of biogas per year.	72
10	OMV	Austria	n/a	n/a	Manufacture of biogas and biofuels for use in transport and in bioliquids is the largest planned investment category (30 mln EUR in 2024, 1.416 bln EUR planned in 2025-2029	73

Source: *Profundo (2025), based on data from multiple sources (see the last column). For conversion factors used, see Appendix 1.*

2.2.2. Utilities companies

The utilities sector includes companies that provide essential services such as electricity, fossil gas, water and waste management to private and corporate customers. Table 2 lists ten major European utilities companies that were found to be active in the biogas sector. Both current production capacity and investment plans were taken into account, depending on the available information.

Table 2. Major European utilities companies involved in the biogas sector

#	Company	HQ Country	Annual production, capacity, or supply	Estimated biogas supply (in mln m3/yr)	Notes	Source
1	Suez	France	1,684 GWh biogas	269.4	Total production of biogas from landfill, WWTP and organic digestors (converted into electricity, heat or injected) across multipole sites	[74]
2	E.On	Germany	1 TWh (traded) biomethane	160.5	E.On Bio Natural Gas supplies the national markets for CHP, heat and transportation as well as the international market.	[75]
3	Engie	France	700 GWh biomethane	112.3	Engie is among the leaders in biogas production in France, through its subsidiary /y/ BIOZ, which develops, finances, and operates AD units. Currently, ENGIE operates 36 production sites in France.	[76]
4	Veolia	France	271 GWh	43.5	Two facilities in France (73 GWh and 163 GWh of biomethane) and 35 GWh of biogas in Brazil.	[77]
5	Pre-Zero	Germany	170 GWh biogas and 70 GWh biomethane	34.2	170 GWh biogas in Spain, plus development of 70 GWh biomethane with Waga Energy and Nedgia. Other countries (e.g. Sweden) are not reported.	[78]
6	Remondis	Germany	158.6 GWh biogas	25.4	Production figures for Germany. No consolidated global reporting identified. Assuming biogas production.	[79]
7	Paprec	France	7.2 mln m^3 biogas	7.2	Production of biogas from organic waste recovery	[80]
8	Biffa	UK	40 GWh biomethane	6.4	Food waste processing biogas plant in the UK, generating up to 6.5MW of electricity - enough to power 15,000 homes.	[81]
9	Renewi	UK	6.3 mln m^3 biogas	6.3	Renewi transforms organic waste into biogas, part of which is converted into bio-LNG	[82]
10	FCC	Spain	n/a	n/a	FCC Medio Ambiente is conducting various production projects for clean energies like biogas, biomethane and biohydrogen from waste.	[83]

Source: *Profundo (2025), based on data from multiple sources (see the last column). For conversion factors used, see Appendix 1.*

2.2.3. Meat and dairy companies

Table 3 provides an overview of 18 major meat and dairy companies in Europe that are involved in the biogas sector. Some of them are involved in biogas or biomethane production themselves, others are supplying feedstocks, such as food industry waste or animal manure, to external biogas producers.

Importantly, the list also features companies with biogas projects that are not yet operational. These companies were included due to the notably large projected biogas production capacities associated with their planned initiatives; capacities that often exceed those of companies already active in biogas production.

The selection process focused on identifying leading European meat and dairy producers that are actively contributing - or planning to contribute - to biogas initiatives. Final inclusion was based primarily on quantitative data (reported in GWh, boe or m3) relating to their biogas production activities. In many cases, information on biogas involvement was sourced directly from companies' official websites, as no centralised or third-party data repositories are currently available.

Table 3. Major European meat and dairy companies involved in the biogas sector

#	Company	HQ Country	Annual production, input or supply	Estimated biogas supply (in mln m3/yr)	Notes	Source
1	Valio	Finland	1,000 GWh (planned)	160	Valio is a Finnish dairy company. It entered into a partnership with St1, an energy company. The initiative aims to produce 1,000 GWh of biogas by 2030.	[84]
2	Danish Crown	Denmark	28 mln m3	28.0	Danish Crown is a Danish pork meat company. The company collaborated with Bigadan, a biogas company, to supply residuals for biogas production.	[85]
3	Atria	Finland	100 GWh (planned)	16.0	The company is a Finnish meat producer, producing beef, pork and poultry. The company is currently building a biogas plant to utilise manure and slurry from production – it will produce 100 GWh of energy annually.	[86]
4	PWH	Germany	80 GWh (planned)	12.8	PWH is one of the leading meat producers in Germany. The company specialises in poultry production. It is currently renovating its biogas plant, which will reach a capacity of 80 mln kWh biomethane.	[87]
5	Cooperl	France	79 GWh	12.7	Cooperl is a leading French pork supplier. The company has a network of 100 farms supplying raw materials for biogas production.	[88]
6	Goodvalley	Poland	55 GWh	8.8	Goodvalley is Polish pork producer. The company owns eight biogas production plants and utilises manure from its pork production to produce biogas.	[89]
7	Arla Foods	Sweden	50 GWh	8.0	Arla Foods is a Swedish - Danish company and one of the world's leading dairy producers. It is active in its biogas lobbying efforts and engages in multiple biogas initiatives across different countries.	[90]
8	Lactalis	France	30 GWh	4.8	Lactalis is a major French dairy producer. On the Torre Santamaría dairy farm in Lleida, Spain, which has been supplying milk to Lactalis, a biogas plant was established on the farm to process cow manure into biomethane, in collaboration with Axpo and Nedgia.	[91]
9	Grupo Fuertes	Spain	4.8 mln m3	4.8	Grupo Fuertes is a leading Spanish pork producer. The company partnered with a biogas production facility to supply manure and waste for biogas production. The estimated biogas production will be 549.4 Nm3/h	[92]
10	Vion Food	Netherlands	4.6 mln m3	4.6	Vion Food is a Dutch meat (pork and beef) producing company. The company engages in biogas production through its subsidiary Ecoson.	[93]
11	Coren	Spain	23 GWh	3.7	Coren is one of the largest meat producers in Spain. The biogas plant operates at the poultry processing center, producing a production of 9,000 m3 per day, with a 70% biomethane content. Coren produces poultry, pork and beef.	[94]

12	Danone	France	36,000 tonnes of manure	3.2	Danone is a large French dairy and food company, supplying manure for biogas production. A notable project in France is Terragre'eau, where a biodigester to turn cattle manure and organic waste was developed.	95
13	Groupe Bigard	France	70,000 tonnes of organic waste	3.1	French meat producer Groupe Bigard supplies waste to external methanisation circuits as part of its 'circular economy' scheme. The group produces beef, mutton and pork.	96
14	Gruppo Veronesi	Italy	17.54 GWh	2.8	Gruppo Veronesi is an Italian meat production company that is actively engaged in biogas production. It uses 100% of the sludge for biogas production.	97
15	Campofrío	Spain	15 GWh	2.4	Campofrío is a Spanish meat production company, which utilises manure from its production for biogas generation.	98
16	Nestlé	Switzerland	4 GWh in Switzerland, 0.27 GWh in Pakistan, 980,000 m3 in Finland	1.7	Nestlé is one of the largest food and beverage producers globally. The company is registered in Switzerland and active in multiple biogas projects in countries outside of the EU - Switzerland, the UK, Brazil, Indonesia, India, and other countries. As a result, it remains difficult to determine the exact quantitative values of the company's contribution.	99
17	Unilever	UK	638,750 m3	0.6	Food and personal care company Unilever engages in various local biogas initiatives. In the Netherlands, Ben & Jerry's factory partnered with Paques, a biogas producer, producing an average of 1,750 m3 of biogas per day. In Romania, Unilever partnered with Genesis Biopartner, a plant currently supplying 2.13 MW of electricity, but Unilever's contribution is not clear.	100
18	Friesland Campina	Netherlands	3.5 GWh	0.6	Since 2011, dairy company Friesland Campina has encouraged member dairy farmers to invest in renewable energy sources. The company engages in various initiatives, including Jumpstart, which led to the production of 40 Nm3/h of biomethane with an efficiency of 99.5%).	101

Source: *Profundo (2025), based on data from multiple sources (see the last column). For conversion factors used, see Appendix 1.*

2.3 EU policy framework

In this section, the key European Union policy instruments relevant for the biogas sector are summarised. Section 2.4 then assesses how these policy instruments deal with the environmental and social impacts of biogas production, as described in chapter 1. The following types of EU policy instruments are considered:

- **Plans**: plans set out strategic goals for the European Union as a whole, which later need to be concretised in legislative acts as directives and regulations, while also giving guidance to subsidy funds.
- **Directives**: directives are legislative acts of the European Union that define policy criteria and set out goals that EU countries must achieve. However, it is up to the individual countries to devise their own laws on how to reach these goals.[102] Therefore, we assess in the country chapters 3 to 8 how the directives discussed in this section are implemented in the national legislation of Denmark, Germany, Ireland, the Netherlands, Poland and Romania. For the United Kingdom, as a former EU-member, we analyse in chapter 9 in how far these EU-directives still have a legacy in their national legislation.

- **Regulations**: regulations are legislative acts of the European Union which become immediately enforceable as law in all EU member states simultaneously.[103]
- **Guidelines**: guidelines set out further rules about regulations.
- **Subsidy funds**: subsidy funds are mechanisms through which the European Union incentivises desired activities of governments, companies and non-profit organisations. Relevant funds are described in this section, while the country chapters list information about specific subsidies from these funds for the biogas sector in the country concerned.

2.3.1. REPowerEU

REPowerEU is the European Union's most recent strategic energy plan, launched in May 2022, to reduce its dependence on Russian fossil fuels and accelerate the transition toward clean, affordable, and secure energy. In response to the geopolitical instability following Russia's invasion of Ukraine, the plan focuses on three pillars: saving energy, diversifying energy supplies, and rapidly expanding renewable energy sources.

While the main focus of the REPowerEU plan is on energy efficiency, solar energy and hydrogen, it also plans to increase biomethane production in the EU tenfold, from today's 3.5 billion m^3 to 35 billion m^3 per year in 2030.[104] The planned strong increase sends a clear message to the member states that biogas must be part of their national strategies, promoting country-level expansion.

The initiative is backed by up to EUR 300 billion in funding drawn from the EU's Recovery and Resilience Facility and other financial instruments. To benefit from support under the Facility, EU governments have to submit National Recovery and Resilience Plans (NRRPs), outlining the reforms and investments they will implement by end-2026, with clear milestones and targets.

While the launch of REPowerEU was rushed after the Russian invasion of Ukraine, no comprehensive sustainability, land use, or environmental impact assessment was published alongside the goal to increase biomethane production to 35 billion m3. NGOs have criticised this lacking assessment, warning that it could lead to unintended environmental and social consequences, such as over-reliance on crops or unsustainable waste sourcing.[105]

2.3.2. EU Renewable Energy Directive

The current version of the Renewable Energy Directive (RED III), which entered into force on 20 November 2023, is already the third iteration of the EU-level renewable energy legislation, building upon and replacing the Renewable Energy Directive (2009/28/EC) and the second Renewable Energy Directive (EU/2018/2001), also know as RED II.

The RED IIII directive recognises that, as fossil fuels are being phased out, bioenergy will have a role to play in the EU energy balance, and therefore, the RED II sustainability criteria are reinforced by the revised directive. In RED III, biogas and biomethane are incorporated into the category of "biofuels and biogas", addressed in Article 28(6).

The following elements of the directive are important:

- **RED II Sustainability Criteria:** The following sustainability criteria are set for biogas and biomethane in RED II and RED III:
    - For use in transport, biogas must deliver GHG savings of at least 65% compared to fossil fuels, unless national schemes set higher thresholds.[106]

- Agricultural feedstock for biomethane must not originate from land with a high biodiversity value, land with high-carbon stock, or land that was peatland in January 2008.[107]

At the same time, wastes and residues (including manure) are treated as having zero GHG emissions for their life cycle up to the point of collection. This applies irrespective of any processing into intermediate products prior to their conversion into the final product.[108]

- **RED III Mass Balance System:** In addition to retaining the RED II criteria, under RED III, a mass-balance system is mandated: every batch of biomethane injected into the grid must be traceable through a European Union database detailing sustainability attributes. This enables Guarantees of Origin (GOs) or equivalent proofs to accompany the gas. In particular, when a batch of renewable gas is recorded in the Union database, Member States must ensure that any associated guarantees of origin are transferred to the Union database at that point. These guarantees must then be cancelled once the renewable gas is removed from the Union's interconnected gas network. After being transferred, the guarantees of origin may no longer be traded outside the Union database.[109]
- **RED III rules to avoid energy crop overproduction:** For the transport sector, RED III allows member states to choose between a 14.5% greenhouse gas intensity reduction by 2030 or a 29% share of renewable energy in final energy consumption by 2030. RED III still allows the use of biogas from energy crops to contribute towards these targets, but creates benefits for the countries that choose not to count them towards the targets. If member states choose not to include biogas made from these feedstocks in their targets for transport fuels, they have the flexibility to either lower RED III's energy-based target or adjust the greenhouse gas intensity reduction target accordingly.[110]
- **Targets for specific feedstocks for transport fuels**: RED III sets new thresholds for the share of advanced biofuels and biogas produced from the feedstocks listed in Part A of Annex IX and of renewable fuels of non-biological origin in the energy supplied to the transport sector. Member states should assure that at least 1% of all transport fuels sold in 2025, and 5.5% in 2030, is produced from the feedstocks listed in this Annex.[111] Permitted feedstocks include materials such as used cooking oil, waste fats, residual biomass, and waste-derived bio-intermediates like bio-crude from lignocellulosic sources. The list also covers various agricultural and forestry residues, animal manure, sewage sludge, algae, and other materials derived from biowaste, as well as broader categories of lignocellulosic feedstock. The European Commission has the authority to adopt delegated acts to add new feedstocks to this list based on scientific input, but it does not have the power to remove any existing entries.[112]
- **RED III incentivises biomethane over biogas:** RED III also envisages the promotion of the production of biogas and its injection into the gas grid, instead of its use for electricity production. As only pipeline-grade biomethane can be injected directly into the existing grid, RED III is effectively incentivising building biogas plants which upgrade all produced biogas to biomethane.

The Directive entered into force on 20 November 2023, leaving member states an 18-month period to transpose most of the directive's provisions into national law.[113] Therefore, the final deadline for the RED III transposition expired on May 21, 2025. By that date, member states were expected to set RED-aligned national targets on:

- Heating and cooling: a strengthened renewables targets requiring binding average annual increases
- Industry: an indicative target of a 1.6% annual increase in renewable energy use and a binding target of 42% renewable hydrogen by 2030
- Transport: Choice for EU countries to adopt either a target of a 14.5% greenhouse gas intensity reduction or a 29% share of renewable energy in final energy consumption, including sub-targets for advanced biofuels and renewable fuels of non-biological origin[114]

However, most countries have so far failed to fully transpose RED III into their national regulation. The EU Commission is "[...]ready to take legal action against EU member states that have not yet transposed".[115] According to a recent Commission media statement, not a single EU country has met the deadline to fully transpose RED III.[116] Other reports highlight that only one member state, Denmark, has fully transposed the relevant RED provisions into national law.[117]

2.3.3. EU Energy Taxation Directive

The EU Energy Taxation Directive at present does not specify different minimum taxation rates for fossil energy and renewable energy. As part of the Fit for 55 package, which aims to reduce greenhouse gas emissions by at least 55% by 2030 compared to 1990 levels, the European Commission in 2021 proposed a revision of the Energy Taxation Directive, introducing new minimum tax rates for different types of fuels. These include:

- Traditional fossil fuels (petrol, gas oil) and non-sustainable biofuels – EUR 10.75 per GJ.
- Fossil gas and LPG (i.e. fossil fuels that are considered less harmful than the previous category, and which still may have some potential to contribute to emission reduction in the short and medium term) – EUR 7.17 per GJ.
- Sustainable but not advanced biofuels – EUR 5.38 per GJ.
- Electricity, advanced biofuels, bioliquids, biogases and renewable hydrogen – EUR 0.15 per GJ. This category will always benefit from the lowest rates.[118]

By proposing preferential tax rates for sustainable biofuels and renewable gases like biomethane, the Directive sends a clear message and mandates member states to support biogas through tax incentives in their national regulatory environments. The revision, proposed in 2021, is currently still under negotiation, and it is unclear when it may be adopted.

2.3.4. EU Waste Framework Directive

The European Directive (EU) 2018/851, commonly known as the New Waste Framework Directive (WFD), mandates the introduction of separate collection of bio-waste as of 1 January 2024. Updating article 22 of the WFD, it stipulates an obligation at the EU level to implement bio-waste collection and lays down some basic waste management principles.[119]

The directive establishes a waste hierarchy that the member countries should apply as a priority order in waste prevention and management legislation and policy:

1. Prevention
2. Preparing for re-use
3. Recycling
4. Other recovery such as energy recovery
5. Disposal.

Under the WFD, the anaerobic digestion of organic waste which results in biogas and digestate, is considered a recycling operation. This classification encourages the development of biogas facilities instead of waste incinerators and landfills. However, as of 1 January 2027, Member States may count municipal bio-waste entering aerobic or anaerobic treatment as recycled only if it has been separately collected or separated at source.[120]

2.3.5. EU Landfill Directive

The Landfill Directive (1999/31/EC), adopted in 1999 and updated in 2018, introduced EU-wide requirements for landfill sites, waste pre-treatment, and waste reduction, aiming to protect human health and the environment. The Directive set out restrictions on sending to landfills any type of waste that can be recycled or used for material or energy recovery from 2030 and introduced a 10% limit on the share of municipal waste landfilled by 2035. Pre-treatment of waste before it can be sent to a landfill, is also required by the directive to minimise methane leakage.[121]

In several countries, the collection of landfill gas still counts as an important source of biogas. The different provisions of the Landfill Directive limit further growth of this practice. Rather, it encourages EU member states to develop national strategies for waste recycling, composting, biogas production (through anaerobic digestion) and materials and energy recovery.[122] But where technically possible and economically viable, landfill gas must still be collected from all landfills receiving biodegradable waste. When energy production from the collected landfill gas is not feasible, flaring is permitted, as this process produces CO_2 instead of methane, which is less potent in terms of its greenhouse impacts.[123]

2.3.6. EU Industrial Emissions Directive

The Industrial Emissions Directive (2010/75/EU), recently amended in 2024, lays down comprehensive rules for preventing and reducing pollution from industrial and livestock-rearing activities across the EU. Its primary goal is to safeguard human health and protect the environment by limiting harmful emissions into air, water, and soil, particularly those involving nitrogen oxide, ammonia, methane, mercury, and carbon dioxide. The directive aims to:

- prevent waste generation;
- improve resource, water and energy efficiency; and
- promote the circular economy and decarbonisation.[124]

The Directive covers a wide range of sectors within its scope, including waste management, slaughterhouses, animal and vegetable raw materials, disposal or recycling of animal carcasses and by-products, and intensive rearing of pigs and poultry. The intensive rearing of cattle is, however, not included.

When the initial directive was published in 2010, the Commission was supposed to review the need to control emissions from, among others, the intensive rearing of cattle and the spreading of manure.[125] While the Commission published a review report in September 2012 that did cover the cattle sector, the spreading of manure was not included.[126]

The 2024 update of the directive recognises again that the Commission should 'comprehensively address the emissions from the rearing of livestock within the Union, in particular from cattle'. But until now, specific requirements and thresholds in the directive only apply to the pig and poultry farming, but not to cattle.[127] The lack of criteria and guidance for the cattle sector and for the use of manure appears to be a regulatory gap, particularly given the role of manure (including from the beef and dairy industry) as a biogas feedstock.

2.3.7. EU Nitrates Directive

Nitrogen is essential for the health and growth of plants, including agricultural crops; however, high levels of nitrogen in soil and water bodies – resulting from overapplication of mineral and organic fertilisers to increase yields – are harmful to people and nature. Excess nitrogen from agriculture is one of the key contributors to water pollution in the EU.

Nitrates from mineral fertilisers reach groundwater through leaching and affect surface water through agricultural runoff. The same happens when manure, slurry and digestate (a byproduct of biogas production) is spread out on agricultural land as a form of fertiliser. Organic nitrogen is less prone to leaching, but since most of the nitrogen in slurries and digestate is mineral and not bound to organic matter, their application may also cause significant leaching of nitrogen. When the levels of nitrates reach high concentrations, the water becomes undrinkable.[128]

In 1991, the EU Nitrates Directive was adopted with an aim to ensure the quality of drinking water and long-term sustainability of the water bodies by limiting or preventing nitrate runoff from agricultural sources that pollute ground and surface waters and by promoting the use of good farming practices (GAP). Under this Directive, EU Member States have to monitor the quality of waters and identify areas that drain into polluted waters or are at risk of pollution.

In areas already polluted by nitrates, the Directive prescribes that the maximum amount of nitrogen from manure that can be spread out on agricultural land is 170 kg/ha per year. At the request of EU Member States, and provided that they justify scientifically that this shall not lead to higher pollution, the Commission can adopt "Implementing Decisions" (commonly referred to as "derogations") that allow the application of higher maximum limits of nitrogen from manure in specific areas and under particular conditions".[129] Commission implementing decisions are currently in force in the Netherlands, Ireland and Denmark.[130] The areas already suffering from high nitrogen pollution are designated as Nitrate Vulnerable Zones (NVZs).[131]

On 19 April 2024, the European Commission opened a public consultation on revising Annex III of the Nitrates Directive, which concerns fertilisers derived from livestock manure. This proposal provides for an increase from 170 to 270 kg per hectare per year of the maximum nitrogen application level, provided that this nitrogen originates from 'Recovered Nitrogen from manure (RENURE)' fertilisers.[132]RENURE is basically a form of digestate, the byproduct of biogas production.

The consultation gathered 1,067 responses from 32 countries. Many responses from NGOs have expressed concerns regarding the implications of such a proposal, flagging in particular its potential adverse impacts on human health and the environment, including the interdependent climate and biodiversity crises.[133] More specifically, NGOs argue that exceeding the threshold of 170 kg of nitrogen per hectare from manure could contribute to water pollution and eutrophication of rivers, lakes and coastal waters. Therefore, they see the existing derogations as an obstacle to more sustainable agricultural practices.[134]

By contrast, in April 2025, the European Biogas Association, together with other industry bodies such as Copa, Cogeca, and the European Agricultural Machinery Industry Association, sent a letter to the European Commission supporting the revision of the directive. The EBA underlined that RENURE materials represent an important opportunity to close nutrient cycles and promote circularity in agriculture. According to the EBA, the revision would allow farmers to replace synthetic fertilisers with recycled nitrogen products derived from manure, thereby reducing Europe's dependence on imported mineral fertilisers and supporting the circular economy.[135] Recovering nitrogen from existing waste streams like manure is indeed less harmful, at least as it does not involve mining operations. However, the levels of nitrogen in many areas in the EU and UK are already very high, and increasing the limits may create more water pollution, regardless of whether the applied nitrogen fertilisers are mine- or manure-based. Because the revision would result in an increased limit, the claim that farmers would replace synthetic fertilisers with recycled nitrogen is untrue as it would allow farmers to in fact use recycled nitrogen in addition to synthetic fertilisers already used.

2.3.8. EU Corporate Sustainability Due Diligence Directive

The EU Corporate Sustainability Due Diligence Directive (CSDDD, 2024/1760) entered into force on 25 July 2024. This legislation's key objective is to foster sustainable and responsible corporate behaviour in companies' operations and across their global value chains.[136] The rationale behind it is to tackle the social and environmental impacts of major companies both in the EU and outside of the Union, and in particular in the Global South.

The CSDDD does not specifically mention biogas. However, its mandate covers all sectors, including those involved in the biogas value chain from agricultural producers to power plants to gas and electricity grid operators and utilities. This means that companies in the scope of the CSDDD (large EU and non-EU entities) dealing with biogas are required to conduct due diligence to demonstrate that their operations and value chains do not contribute to negative environmental and human rights impacts.

Several types of companies are included in the CSDDD scope:

- Large EU limited liability companies & partnerships: +/- 6,000 companies - >1000 employees and >EUR 450 million turnover (net) worldwide.
- Large non-EU companies: +/- 900 companies - > EUR 450 million turnover (net) in EU. The Directive contains provisions to facilitate compliance and limit the burden on companies, both in scope and in the value chain.
- Small- and medium-sized enterprises (SMEs): The proposed rules do not cover micro companies and SMEs. However, the Directive provides supporting and protective measures for SMEs, which could be indirectly affected as business partners in value chains.

Obligations under the CSDDD involve identifying and addressing both potential and actual negative impacts on the environment and human rights within the company's own operations, its subsidiaries, and, when relevant, the operations of its business partners in the value chain. Furthermore, the Directive requires large companies to develop and implement climate transition plans. Such plans must be in line with the Paris Agreement's goal of achieving climate neutrality by 2050 and comply with interim targets set under the European Climate Law.

Companies are expected to bear the costs associated with CSDDD implementation, including the costs of establishing and maintaining the due diligence system and the costs of adapting their business activities along the value chain to the due diligence obligations and implementing transition plans. In addition, Member States are expected to ensure that "[...] victims get compensation for damages resulting from an intentional or negligent failure to carry out due diligence".[137]

It must be noted, however, that many biogas companies are relatively small and will not be covered by the CSDDD. However, for the larger companies discussed in section 2.2, the sustainability requirements for the feedstocks they use for biogas (for example, of the soy used as feed for animals whose manure is then used for biogas plants) may become more stringent.

Originally, the European Member States had to transpose the Directive into national law and communicate the relevant texts to the Commission by 26 July 2026. One year later, the rules would start to apply to the first group of companies, following a staggered approach (with full application on 26 July 2029.[138] Member States were expected to designate an authority to supervise and enforce the rules and ensure proportionate penalties for non-compliance, including fines.

However, after the last elections for the European Parliament in November 2024, the political power balance in Europe has shifted which now affects the CSDDD. On 3 April 2025, the European Parliament adopted the EU Commission's "Stop-the-clock" initiative, part of the so-called Omnibus Package. This means that the implementation dates for many corporate sustainability reporting and due diligence obligations, as well as

the deadline for transposing the due diligence provisions, are postponed. The adoption came just two days after the Parliament voted to approve an urgent procedure, enabling the directive to bypass committee-level discussions and proceed directly to a plenary vote.[139]

Thus, in June 2025, EU member states representatives agreed to the EU Council's negotiating mandate to further simplify and postpone CSRD and CSDDD. The key changes already approved are as follows:

- Member states will have an extra year – until 26 July 2028 – to transpose CSDDD into national legislation.
- The one-year extension will also apply to the first wave of businesses to be affected, namely: EU companies with over 5,000 employees and net turnover higher than EUR1.5 billion, and non-EU companies with a turnover above this threshold in the EU. These companies will only have to apply the rules from 2028.

Application of social and environmental reporting would be postponed by two years for the second and third waves of companies.[140]

Table 4. Potential impacts of the Omnibus Package on the CSDDD requirements

CSDDD requirement	Omnibus proposal	Potential impact
Value chain scope	• Legal mandate for due diligence ONLY at the level of DIRECT business partners, and NOT the entire value chain. • Implied obligation to go beyond Tier 1 ONLY where there is a complaint, credible NGO or media reports about harmful activities. • Due diligence effectiveness relies SOLELY on codes of conduct with direct suppliers and contractual cascading.	• The most severe impacts are rarely present in Tier 1. • Aligning the value chain scope with the member states' legislation repeats mistakes made where Tier 1 suppliers are overloaded with information requests. • NGOs and media become de facto enforcers and need to carry out the due diligence themselves.
Due diligence duty	• Due diligence NO LONGER an ongoing obligation and the tracking of its effectiveness would now take place as little ONLY every 5 years. • REMOVES duty to terminate the business relationships in the case of actual and potential adverse impacts and replaces it with 'SUSPEND' activities	• Companies will no longer monitor and address risks in real-time. • Companies can exploit the lack of obligation to terminate relationships, ignoring human rights or environmental violations
Stakeholder engagement	• Narrows to "RELEVANT" stakeholders, limiting the scope of stakeholders companies need to engage with. • LIMITS to those stakeholders that have a link to the specific stage of the due diligence process being carried out.	• If due diligence is limited to Tier 1 (direct suppliers only), this further narrows scope of stakeholders that companies engage with. • Results in very limited engagement with truly impacted stakeholders.
Legal harmonisation	• PROHIBITS EU Member States introducing legislation that goes further than CSDDD	• CSDDD is intended as a minimum standard, but the proposal establishes a legal ceiling. • This ceiling is lower than current international standards such as the UNGPs and OECD.

Source: *Van der Heide, M. et al. (2025), EU Omnibus Unveiled: Key implications for CSDDD, CSRD & EU Taxonomy, World Benchmarking Alliance.*

2.3.9. EU Guidelines on State aid for climate, environmental protection and energy

The EU Guidelines on State aid for climate, environmental protection and energy[141] were adopted in 2022. According to the EU Commission, state aid is defined as "an advantage in any form whatsoever conferred by national public authorities to undertakings on a selective basis. Therefore, subsidies granted to individuals or general measures open to all enterprises [...] do not constitute state aid". [142]

The Guidelines outline the framework for allocating State aid in the EU to support climate and environmental objectives, including the promotion of renewable energy sources like biogas. Under the Climate, Energy and Environmental Aid Guidelines (CEEAG), biogas and biomethane projects are eligible for State aid provided they meet the sustainability criteria laid out in the RED II and RED III directives.[143] The Guidelines were adopted by the European Commission on 27 January 2022 and apply from 1 January 2022.

2.3.10. EU Alternative Fuels Infrastructure Regulation

The EU Alternative Fuels Infrastructure Regulation (AFIR) is a framework adopted by the EU as part of its broader Fit for 55 package, which aims to reduce greenhouse gas emissions by at least 55% by 2030 compared to 1990 levels. The primary goal of AFIR is to establish a comprehensive network of infrastructure to support alternative transport fuels, thereby accelerating the transition toward low-emission and zero-emission vehicles across the EU.[144] In particular, the Regulation aims to:

- Ensure minimum infrastructure to support the required uptake of alternative fuel vehicles across all transport modes and in all EU Member States to meet the EU's climate objectives;
- Ensure full interoperability of the infrastructure; and
- Ensure comprehensive user information and adequate payment options at alternative fuels infrastructure.[145]

The Alternative Fuels Infrastructure Regulation (AFIR) envisages, among other goals, that member states must ensure the deployment of a sufficient number of publicly accessible refuelling stations for liquefied methane, at a minimum along the TEN-T core network, to enable the circulation of heavy-duty vehicles powered by liquefied methane across the EU.[146] According to the definition used in AFIR, 'liquefied methane' includes liquefied biogas.

2.3.11. EU Carbon Removals and Carbon Farming Certification Regulation

In December 2024, the EU adopted the Carbon Removals and Carbon Farming Certification Regulation (CRCF) creating a voluntary certification framework for carbon removals, carbon farming, and carbon storage in products. The framework sets out criteria for additionality, quantification, long-term storage, and sustainability, with independent verification and tracking requirements. It covers activities such as direct air capture, biochar use, reforestation, peatland restoration, and improved land management. Certification is currently managed by national schemes, with a central EU registry planned by 2028. The Commission is developing methodologies for different practices through expert workshops and aims to support uptake through funding programmes and clearer rules for carbon removal claims.[147]

Currently, emissions reductions from the livestock sector are not eligible for certification. However, the Regulation requires that by 31 July 2026, the Commission should review the inclusion of enteric fermentation and manure management, taking into account opportunity costs, the potential negative effects leading to an increase in GHG emissions, and the 2040 EU climate targets.[148] At the time of writing of this report, it is not yet clear what recommendations the Commission may put forward, and how they will impact the capability and sustainability of manure as a feedstock for biogas production.

2.3.12. EU Taxonomy Regulation

The EU Taxonomy is a comprehensive classification system which categorises sustainable economic activities which are aligned with a net zero trajectory by 2050 and supposed to contribute to the key environmental objectives: climate change mitigation and adaptation, sustainable use and protection of water and marine resources, transition to a circular economy, pollution prevention and control, protection and restoration of biodiversity and ecosystems. Activities that contribute to at least one of these goals are deemed taxonomy-eligible. To be considered taxonomy-aligned, activities should also meet specific Technical Screening Criteria (TSC) and Do No Significant Harm (DNHS) principles, as well as the minimum social safeguards.[149] The EU taxonomy allows financial and non-financial companies to share a common definition of economic activities that can be considered environmentally sustainable. In this way, it plays an important role in helping the EU scale up sustainable investment, by creating security for investors, protecting private investors from greenwashing, helping companies become more climate-friendly and mitigating market fragmentation. [1]

TSCs are activity-specific quantitative or qualitative rules and metrics. They are outlined in the Technical Annex to the final report on the EU taxonomy, as well as in the more operable EU Taxonomy Compass. In terms of eligible activities, biogas is listed as 'Manufacture of biogas or biofuels for use in transport and of bioliquids'. Biogas and biomethane are treated favourably under certain conditions, especially under the climate change mitigation objective.

- **Condition 1:** no food or feed crops are used
- **Condition 2:** emissions (from production, processing, etc.) must be at least 65% lower than those of conventional fossil fuels
- **Condition 3:** Do No Significant Harm (DNSH) criteria are to be met

The following DNSH criteria must be adhered to:

- For biogas production, a gas-tight cover on the digestate storage is applied.
- For anaerobic digestion plants treating over 100 tonnes per day, emissions to air and water are within or lower than the emission levels associated with the best available techniques (BAT-AEL) ranges set for anaerobic treatment of waste in the latest relevant best available techniques (BAT) conclusions, including the best available techniques (BAT) conclusions for waste treatment (204). No significant cross-media effects occur.
- In case of anaerobic digestion of organic material, where the produced digestate is used as fertiliser or soil improver, either directly or after composting or any other treatment, it meets the requirements for fertilising materials set out in Component Material Categories (CMC) 4 and 5 for digestate or CMC 3 for compost, as applicable, in Annex II to Regulation EU 2019/1009 or national rules on fertilisers or soil improvers for agricultural use.[150]

Also, in the Commission Delegated Regulation on Circular Economy (one of the series of delegated regulations under the Taxonomy Regulation), the following TSCs are included, which provide noteworthy indications on the feedstocks to be prioritised, and on post-treatment of digestate to be preferred:

- In these anaerobic digestion plants, source segregated bio-waste from separate collection constitutes at least 70% of the input feedstock, measured in weight, as an annual average. Co-digestion may cover up to 30% of the input feedstock of advanced bioenergy feedstock listed in Annex IX to Directive (EU) 2018/2001, which may not include contaminated feedstock coming from biomass fraction of mixed municipal and industrial waste. The input does not include feedstock excluded

1 https://finance.ec.europa.eu/sustainable-finance/tools-and-standards/eu-taxonomy-sustainable-activities_en#legislation

in Part II of Annex II to Regulation (EU) 2019/1009, for Component Material Category (CMC) 3 (Compost) in accordance with point (c) of that category and for Component Material Category (CMC) 5 (Digestate other than fresh crop digestate) in accordance with point (c) of that category.

- The digestate is preferably composted after anaerobic digestion to maximise the benefits to the soil it is applied to and minimise some potential agro-environmental issues, such as the release of ammonia and nitrates.[151]

Companies required to report on the EU Taxonomy must disclose the value and share of their Taxonomy-eligible and Taxonomy-aligned operational (OpEx) and capital expenditures (CapEx), which are essentially their long-term investments. As most of the companies in the biogas sector are relatively small, not many of them have to disclose this information.

However, the major companies engaged in the biogas sector that are listed in section 2.2 will be obliged to report on their exposure. As biogas and biomethane projects for transport can qualify as environmentally sustainable activities if they meet certain GHG savings and criteria under the EU Taxonomy, they are becoming more attractive for banks and investors interested in increasing their portfolio-level exposure to sustainable debt and investment.

As a regulation, the EU Taxonomy does not require transposition and has been applied directly in the EU member states since it came into force at the EU Level. But the Omnibus package (see section 2.3.8) is now also impacting the EU Taxonomy. If the proposed 'simplifications' of the Omnibus package are approved, they will result in several changes for the Taxonomy application and reporting. These are summarised in Table 5.

Table 5. Omnibus impacts on the EU Taxonomy implementation

Element	Previous rules	Omnibus update
Taxonomy Regulation	Mandatory reporting under Taxonomy rules	Only companies with >1,000 employees and EUR 450 million turnover must report full alignment. Those >1,000 employees but <EUR 450 million turnover can report voluntarily.
Taxonomy Partial Alignment Reporting	Not previously specified	Companies can report partial Taxonomy alignment.
Green Asset Ratio (GAR)	Banks must include all exposures in GAR denominator	Banks can exclude companies outside CSRD scope from GAR denominator.
Taxonomy DNSH (Do No Significant Harm) Rules	Strict DNSH criteria	Simplified: Materiality threshold applies, DNSH reporting burden reduced by 70%.

Source: *D. A. Carlin and Company, (2025, April), Omnibus Changes to European Sustainability Reporting.*

For some market players, for example the major companies engaged in the biogas sector that are listed in section 2.2, these changes mean that they could significantly simplify their disclosure by labelling biogas as immaterial relative to their broader revenue or operations. Companies can also claim partial alignment even if all sustainability criteria are not met.

At the moment of writing this report, the European Parliament appears to be heavily divided over the proposed Omnibus package, and it is not yet clear when and to what extent all the proposed changes may be adopted, with some experts saying the legislative process may take a year to fully complete.[152]

2.3.13. EU Modernisation Fund

The EU Modernisation Fund is designed to facilitate the modernisation of energy systems and the enhancement of energy efficiency across 13 lower-income EU Member States, including Poland and Romania. The funding focus areas include renewable energy, energy efficiency, energy storage, energy networks, just transition in carbon-dependent regions. Biogas production and upgrading to biomethane can be supported for several uses, including heating and cooling from renewable sources and infrastructure for zero-emission mobility. So far, EUR 19.1 billion has been disbursed to projects in the eligible member states over 249 confirmed or recommended investment proposals.[153]

Poland has already benefited from the Fund via the Rural Energy priority programme support scheme with a total allocation of EUR 700 million. It aims at increasing the use of renewable energy sources in rural and semi-rural municipalities, including from biogas.[154] The Romanian government also plans to support the anticipated expansion of biogas-based power generation through the Fund.[155]

2.3.14. European Agricultural Fund for Rural Development

The European Agricultural Fund for Rural Development (EAFRD) channels EU support to rural development programmes (RDPs) which must contribute to EU objectives:

- Improving the competitiveness of agriculture
- Encouraging sustainable management of natural resources and climate action
- Achieving a balanced territorial development of rural economies and communities[156]

The Fund reports the total allocated budget of EUR 95.51 billion for the current funding cycle (2021-2027).[157] Under Rural Development (CAP Pillar II), member states can designate funding for investments in renewable energy, including biogas plants, upgrading to biomethane, digestate use, and related infrastructure.[158]

2.4 How the EU policy framework deals with environmental and social impacts

The overview of the EU policy framework in section 2.3 makes clear that most EU-level policy instruments favour a further growth of biogas and biomethane production. Different policy goals underpin this positive view on the biogas sector:

- Domestic biogas production is seen - especially in the REPowerEU plan - as a means to reduce the European Union's dependence on Russian gas and improve its energy security;
- Biogas is seen as a low-carbon replacement for fossil gas, especially in the transport sector, contributing to the EU's climate change goals. This goal is underpinning RED III, the EU Taxonomy, the AFIR and the proposed change of the Energy Taxation Directive;
- Biogas production is seen as a waste recycling activity, contributing to better waste management and a more circular economy, in the Waste Framework Directive and the Landfill Directive; and
- Biogas production is seen as strengthening rural economies and the agriculture sector, especially lower-income EU Member States, by the EU Modernisation Fund and the EAFRD.

The strong positive view of the biogas sector in the EU policy framework is not accompanied by very comprehensive safeguards to address the (potentially) negative environmental and social impacts of biogas production, as described in chapter 1. The following sub-sections discuss what safeguards can be found in different EU policy instruments with regard to each of these impacts.

2.4.1. Methane leakage

RED III does formulate a safeguard on methane and other GHG emissions, by requiring the lifecycle GHG emissions of biofuels to be at least 65% lower than those of fossil fuels. This condition is also set for the inclusion of projects using biogas as transport fuel in the EU Taxonomy. The lifecycle GHG emissions assessment methodology for bio-based fuels defined by RED III also requires taking into account emissions from waste and leakages.

However, in practice the comprehensive measurement of the actual methane emissions from biogas and biomethane facilities remains difficult, as methane emissions stem from a combination of sources. These include unintended leaks, accidental discharges, and poor operational management, as well as factors influenced by operating practices and varying climate conditions.[159] While specific biogas facilities in practice might not meet the 65% lower emissions criterium of RED III because of these measurement difficulties, EU policies do assume that all biogas facilities meet this criterium.

In addition, RED III, as well as other EU legislation, takes a narrow approach to the GHG lifecycle emissions of biogas production from manure by treating manure as "waste". This means primarily emphasising emissions avoided through improved manure management, while overlooking the broader and significant emissions linked to livestock farming, particularly those generated through enteric fermentation and land-use change (see section 2.4.3).[160] Also, the impact of mixing biogas with fossil gas on locking in existing fossil gas infrastructure and prolonging the use of fossil gas, is not taken into account (see section 2.4.5).

This limited approach to the emissions linked to the use of manure for biogas production could maybe be addressed when the Carbon Removals and Carbon Farming Certification Regulation (CRCF) is revised in 2026, if the directive makes projects aiming for emissions reductions from enteric fermentation and manure management eligible for certification. However, it is unclear which sustainability criteria and assessment methodologies might be applied then.

2.4.2. Local social and environmental impacts

The EU Nitrates Directive addresses water pollution and soil health issues by limiting the application of nitrogen from manure, including in the form of anaerobic digestate, to agricultural land to a maximum of 170 kg/ha per year. This means that biogas producers need more storage facilities or must transport digestate over longer distances to other farms, adding to the operational costs of biogas facilities. If the proposal is adopted to raise this limit to 270 kg/ha in case the digestate is turned into RENURE fertiliser, this safeguard to limit the impact of manure-based biogas production on waterways, soils and nature will be severely undermined.

In principle, RED III requires the consideration of land, air, and water impacts in lifecycle assessments for all biofuels, but these impacts are hardly mentioned, let alone highlighted. The policies discussed in section 2.3 generally assume that these impacts, including odour, air quality, and human health issues, are addressed in general EU legislation, including the Environmental Impact Assessment (EIA) Directive and the Industrial Emissions Directive (IED). These directives have no specific criteria for biogas projects, limiting their effectiveness. And the absence of criteria and guidance for emissions from intensive livestock farming in the IED creates a regulatory gap that also affects the use of manure from the meat and dairy industry as a biogas feedstock.

2.4.3. Incentivisation of industrial animal farming:

The favourable treatment of biogas production from manure in most policies discussed in section 2.3, stands in contrast to several core EU policy objectives. These include the European Green Deal, the Farm to Fork strategy and the European Protein Strategy, which encourages lower consumption of animal-based products.[161]

RED III actually stimulates the use of manure for biogas production, as it requires biogas producers to derive at least 1% of their production from manure, sewage sludge, non-food crops grown on severely degraded land not suitable for food and feed crops in 2025, increasing to 5.5% in 2030. Manure is classified as a waste under RED III, and therefore, is treated as having zero GHG emissions for its life cycle up to the point of collection.

The European Agricultural Fund for Rural Development (EAFRD) considers farm-based biogas to be eligible for financial support, creating incentives for new biogas production plants and facilities for upgrading biogas to biomethane. The fact that the REPowerEU goal to increase annual biomethane production to 35 billion m3 was published without a comprehensive sustainability, land use, or environmental impact assessment, also brings along the risk that much of this expanded production will be using manure as a feedstock.[162] In fact, Figure 11 seems to suggest that this risk is indeed becoming reality, as most new methane plants in Europe in the past few years rely on "agricultural residues and manure" as feedstock.

The positive attitudes of these and other EU policies towards biogas made from animal manure, do not account for its upstream emissions, including those caused by enteric fermentation and the land-use change in the animal feed-producing countries outside of the EU, and contribute to locking in the intrinsically unsustainable livestock sector. A 2024 study by Magnolo et al. therefore suggests that relying on manure means that the EU shifts from a dependence on fossil gas to a dependence on imported animal feed from other continents, undermining the EU's strategic autonomy and potentially reinforcing neocolonial patterns of resource extraction.[163]

2.4.4. Using crops as feedstock

RED III still allows the use of feed and food crops to produce biogas, but does discourage the use of these feedstocks for biomethane used as transport fuel. For this usage, biogas must demonstrate emissions savings of at least 65 % compared to fossil fuels, and the feedstock must not originate from land with a high biodiversity value, land with high-carbon stock, or land that was peatland in January 2008.

To be eligible for funding under the EU Taxonomy, it is required that food and feed crops are not used for the manufacture of biogas. But the indirect use of crops for biogas, which occurs when the biogas is made from manure from livestock fed with feed crops, is not addressed. The REPowerEU plan also still allows using food and feed crops to reach the target to increase annual biomethane production to 35 billion m3.

The fact that key EU policies still allow the use of feed and food crops for biogas production, has met significant criticism. Due to indirect land-use change emissions caused by their cultivation, biomethane derived from silage maize and other food and feed crops does not deliver the substantial greenhouse gas reductions required to effectively decarbonise Europe's gas sector. Additionally, because of variations in life-cycle emissions factors, biomethane produced from silage maize could, under worst-case conditions, generate emissions comparable to those from fossil fuels.[164] Meeting the REPowerEU target is estimated to require between 1.27 million hectares (under the best-case scenario) and 5.29 million hectares (under a realistic case), assuming maize silage would remain the key plant-based feedstock. The latter figure represents 5% of the total arable land in the EU, equal to 20% of its wheat production or over 100% of its rapeseed output.[165]

In practice, however, the discouragement of RED III to use feed and food crops for transport fuels seems to have had a strong impact. Since 2020, no new biomethane plants in Europe have been built that use energy crops as their main feedstock (see section 2.1.5).

2.4.5. Postponing the transition to sustainable energy systems

Many EU regulations, including RED III and AFIR, incentivise injecting biomethane facilities into the EU gas grid and using liquefied biomethane in the current transport infrastructure. This allows companies that were transporting and combusting fossil gas to continue to use their existing infrastructure and facilities, while simultaneously claiming reductions of their GHG emissions.

While this approach has short-term economic benefits, it ignores the long-term consequences. As of 2024, the EU's fossil gas demand was about 330 billion m3.[166] Even if the REPowerEU target to increase annual biomethane production to 35 billion m3 is reached, biomethane will represent just over 10% of the total demand for methane in the EU - with 90% still covered by fossil gas. Mixing biomethane with fossil gas will therefore never bring down GHG emissions fast and far enough, will prolong the use of fossil gas by many companies that could switch to really sustainable energy sources and will only postpone investments in a genuine energy transition. Further these policies make available billions in conjunction with industry investment, funds that could be otherwise spent on policies that are likely to get the EU to greater reductions.

Instead, the EU policies should focus on promoting more sustainable alternatives, including renewable electricity and green hydrogen, limiting biogas production to the volumes that can be produced from sustainable feedstocks. The consumption of sustainably produced biogas should be limited to the use cases where more sustainable energy sources are not viable.

CHAPTER 3.

Biogas in Denmark

Denmark is among the most advanced biogas markets in the European Union. The sector's growth has been driven by a long-standing political commitment to renewable energy and ambitious decarbonisation targets, supported by a combination of direct and indirect subsidies and policy incentives. While Denmark has introduced certain safeguards to encourage biogas production in a more sustainable manner, environmental concerns persist - particularly regarding methane leakage from biogas plants.

3.1 Market overview

3.1.1. Volume and structure

Denmark has seen a strong increase in biogas production and consumption in the past decade. Around a third of the gas consumed from the grid is now biogas.[167] On a European level, Denmark is the fourth-largest producer of biomethane, after Germany, France, and the United Kingdom (see also Figure 3).[168] The country has the highest production per capita in Europe, amounting to 5 GJ (278-185 m3), surpassing Germany, the Czech Republic and Italy (see also Figure 7).[169]

The country's 149 plants (2024) are predominantly large-scale industrial operations, compared to the much smaller plants in other European countries such as Italy, Germany, and France.[170] Denmark has four types of biogas plants: agricultural plants, sewage plants, industrial plants, and landfill plants. Of the 149 plants, 98 (or 66%) are agricultural digesters, owing to a large availability of biomass resources from agriculture and a variety of state support schemes. Denmark is among the countries with the most farm manure per km2 in Europe.[171] The importance of the agricultural sector is also reflected in a high share of arable land (60%) and limited forest area (16%).[172] Sewage plants account for 30% (45) of the plants, in addition to five industrial and one landfill plant (see Figure 12).[173] Agricultural plants accounted for approximately 85% of biogas production in 2022, and this share is expected to stay high in the future.[174] Most biogas plants are located in the western part of the country, where livestock density is highest.[175]

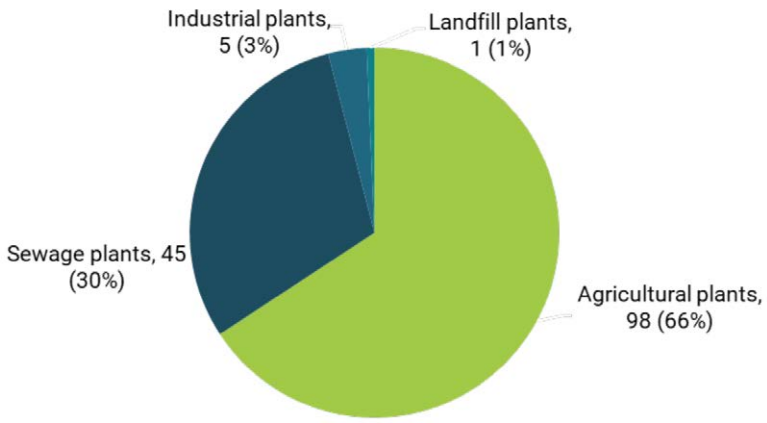


Figure 12. Types of biogas plants in Denmark
Source: *Danish Energy Agency (2024), Liste over biogasanlæg i Danmark, 2024.*

Most of the biomass used for biogas production comes from domestic resources.[176] Livestock waste constitutes around 75% of biomass input at agricultural biogas plants. The remaining 25% consists of organic waste from households and industry, as well as straw and – limited to a maximum share of 4% - energy crops. While straw constitutes a relatively small share of total biomass input, its share is increasing and expected to play an important role in biogas production. Denmark aims to achieve a national gas consumption that is 100% covered by biogas production by 2030.[177]

Biogas production in Denmark has increased rapidly since a new subsidy scheme was introduced in 2012. However, following the closure for new applications in 2018 (see section 3.5.1), the production has stagnated since 2022,[178] at around 29 PJ.[179] State schemes, aim to promote the use of biogas for electricity production, heat production, upgrading to biomethane to feed the gas into the gas grid.[180]

Biogas represents 15% of the bioenergy supply, which is, for a large part, made up of solid biofuels (fuel wood, wood chips, etc) as well as biodiesel and bioethanol.[181] The industry, followed by the residential sector, are the biggest users of biogas (Table 8).

Table 6. Biogas utilisation in Denmark, 2023

Utilisation type	Share (%)
Industry	36%
Residential sector	28%
Energy plants	20%
Commercial and public services	15%
Other	1%
Total	100%

Source: *IEA Bioenergy (2024, December), Implementation of bioenergy in Denmark – 2024 update. Country Reports, p. 16.*

3.1.2. Main biogas companies

The Danish biogas association, Biogas Denmark, counts over 240 members, classified into three different member types:

1. companies with biogas production (A-members)
2. companies without biogas production (B-members)
3. start-up companies (C-members)

The list of 78 A-members was used to select the main domestic biogas producers with the largest production volumes of biogas in millions of m3.[182] Additional data were collected from the websites of the Danish biogas companies.

Table 7. Main biogas companies in Denmark

#	Company	Annual input, production and/or capacity	Estimated biogas supply (in mln m3/yr)	Type	Feedstock	Source
1	BioCirc	1,458,000t waste; 178 million m^3 methane	284.8	Developer / producer	Manure, organic waste	183
2	SBS Kliplev	650,000t waste; 41 million m^3 methane	65.6	Developer	Livestock manure, waste and residual products	184
3	Tønder Biogas	900,000t waste is processed into 40 Nm^3 renewable natural gas - assumed to be biogas.	40.0	Developer / producer	Agricultural and industrial organic waste	185
4	Lemvig Biogas	74,000 MWh	33.0	Producer		186
5	Linkogas	600,000m^3 waste; 17 million m^3 methane	27.2	Developer / producer	80% livestock manure	187
6	Grøngas	465,000t waste; 17 million m^3 methane	27.2	Producer	Livestock manure and other organic residues from agricultural production and food industry	188
7	Greenlab Skive Biogas	500,000t waste	20.0	Producer	Livestock manure and residual products (straw, potato pulp, food and industrial waste)	189
8	Sindal Biogas	200,000t waste	20.0	Producer	Food waste, straw, animal manure and residual products from agriculture and industry	190
9	Ribe Biogas	400,000t waste	14.0	Producer	Slurry	191

Source: *Biogas Danmark and data from multiple sources (see the last column). For conversion factors used, see Appendix 1.*

3.1.3. Contribution to the economy

Biogas contributes to the national economy of Denmark, as the proportion of biogas supplied to the gas grid in Denmark reached approximately 40% of the country's gas consumption in 2023.[192] A 2022 study showed that an increase in the biogas production by 10% of the available farm manure will give a permanent increase of 342 jobs and an extra annual income of approximately EUR 21 million. Consequently, if all available biomass from farm manure were to be used in biogas production, it would result in 3,420 jobs. The report further states that while "the calculated employment effect is quite sizable, it is still somewhat modest compared to the significant employment declines in rural Denmark in recent years."[193]

3.1.4. Development trends

Biogas Danmark, the representing body of the Danish biogas sector, expects to only reach the 100% share of biomethane in domestic gas consumption by 2032.[194] However, the rationale provided, that policy measures are discouraging the use of fossil fuels, including fossil gas, is not entirely clear.

According to the Danish Energy Agency, fossil gas consumption is projected to decline to approximately 30 PJ (840 million m3) by 2030 and 10 PJ (280 million m3) by 2035. This reduction is primarily driven by political measures aimed at phasing out gas use in private homes and district heating. It remains uncertain, however, whether the decline in fossil gas will be fully offset by an increase in biogas consumption.

Biogas Danmark, further projects that biogas production will reach 40 PJ (1.48 billion - 2.22 billion m^3) by 2030, with the growth stabilising after that in the more conservative policy scenario, while production could reach 60 PJ (2.22 billion - and 3.33 billion m^3) if the country will aim for "a more ambitious green policy". Biogas Danmark further anticipates a rising trend in the "methanation of livestock manure" and the use of crop residues, as well as full use of food and industrial waste for biogas production by the end of 2025, while energy crops are expected to be phased out by 2030.[195]

3.2 Sustainability concerns

A notable concern in Denmark is methane leakage from biogas plants. A study conducted by the Danish Energy Agency between 2019 and 2021 among 69 biogas plants - representing 59% of Danish biogas production at the time - revealed issues with valves and uncovered storage tanks, with an average leak rate of 2.5% from biogas production.[196] The lowest average loss was estimated for larger agricultural plants (1.9%), while sewage plants exhibited the highest average loss (7.7%).

This loss of methane could have serious health impacts. To address this leakage problem, a new regulation, which entered into force on 1 January 2023, requires all agricultural, sewage, and industrial biogas plants to implement a self-monitoring programme (see section 3.4.4). In addition, plants will have to be inspected for methane leaks once a year by an independent and verified third party.[197]

Denmark's initial reliance on energy crops like maize for biogas production raised concerns about land use changes and competition with food production. To address this concern, a national cap on the share of energy crops used for biogas production was introduced in 2012. This started with a limit of 25%, which was later tightened to 12%, then 6% and finally to 4%. The aim is to totally phase out energy crops by 2030 (though the regulation needs to be decided still). The use of maize is already prohibited, which will be in place from August 2025.[198]

3.3 Implementation of EU policies

3.3.1. REPowerEU

The first version of the Danish National Recovery and Resilience Plan (NRRP), required by the REPowerEU plan (see section 2.3.1), was published in 2021. It explicitly mentions the government's support for extending the production of biogas and other renewable gases.[199]

Following approval by the European Council approval of Denmark's plan on 13 July 2021, the country's recovery and resilience plan was updated on 9 November 2023, also to introduce a REPowerEU chapter.[200] This new chapter includes one reform, two new investments and two upscaled investments to deliver on the REPowerEU Plan's objectives to make Europe independent from Russian fossil fuels well before 2030.

The reform consists of simplifying and expediting administrative and permitting procedures for the roll-out of district heating projects and the deployment of wind and solar energy on land. In addition, two upscaled investments are supposed to contribute to leveraging biogas as a renewable energy source. One focuses on the capture and geological storage of CO_2 of biogenic or atmospheric origin, and the other on replacing oil burners and gas surfaces with green heating solutions.

The last version of the NRRP included 37 investment streams and 7 reforms, for a total value of EUR 1,812 million (EU grants and national resources combined). The Danish recovery plan, therefore, channels 60% of the funds to green initiatives,[201] according to the Commission's definition. This is significant in relation to the EU's criterion that at least 37% of the funds in the plan must contribute to the green transition.[202]

3.3.2. EU Renewable Energy Directive

As of September 2024, Denmark was the only country which reported to have fully transposed into national law EU Renewable Energy Directive (RED III), which aims to accelerate permitting procedures for renewable energy projects.[203] However, following further examination as part of the infringement procedure process, the European Commission concluded that Denmark's legal transposition was incomplete, and decided to send a letter of formal notice to Denmark in May 2025.[204] The country had two months to respond and complete the transposition. At the time of writing this report, no further update was found on the European Commission's website.

The provisions which Denmark had not transposed, according to the European Commission, include measures to simplify and accelerate permitting procedures both for renewable energy projects and for the necessary infrastructure projects to integrate the additional renewable energy into the electricity system. They also include clear time limits for permit-granting procedures targeted to specific technologies or types of projects, the strengthening of the role of the single contact point for applications, and the presumption that renewable energy projects and the related grid infrastructure are of overriding public interest.[205]

3.3.3. EU Nitrates Directive

Along with the Netherlands and Ireland, Denmark benefited from a derogation under the Nitrates Directive. Some farms were allowed to apply 230 kg of nitrogen (N) from livestock manure per hectare annually, compared to the standard EU limit of 170 kg.[206]

However, in April 2024, the Danish government announced its decision not to seek a further extension of the derogation after July 31, 2024, based on discussions with the European Commission about the country's water quality.

Consequently, it might increase the costs for certain dairy farmers who will have to rent more land to ensure they have enough area to spread manure and slurry and comply with the EU limit of 170 kg or provide an incentive for farmers to use the manure and slurry in biogas production instead of spreading it on land.[207]

3.3.4. EU Waste Framework Directive

The Waste Framework Directive includes a target to recycle and prepare for reuse, by 2025, 55% of municipal waste generated (see section 2.3.4). In June 2022, the European Environment Agency released an early warning assessment[208] aiming to conclude whether Denmark was at risk of missing the targets.

Denmark has transposed the amended Waste Framework Directive in its Act No 807 of 9 June 2020 and Act No. 645 of 19 May 2020 amending the Environmental Protection Act.

Regarding a separate collection system for household waste, the assessment mentions that "as of July 2021 and by end of 2022 at the latest, all households should have collection of food waste, and from 31 December 2023 the municipalities are required to establish a separate collection scheme for garden waste from households."[209] Biowaste treatment will be privately organised, and municipalities have to tender the treatment of bio-waste.

In addition, the report estimates that the current capacity for AD of food waste covers 72-87% of the food waste potential (related to both food waste from households and the service sector). Furthermore, it is estimated that it is the current available capacity for biowaste treatment is slightly below 80% of the total generated biowaste. However, the Danish authorities report that the required additional capacity demand for the treatment of biowaste will be covered by the private sector or the municipalities.[210]

In addition, Denmark has legally binding national standards for compost quality, meaning that biowaste must comply with a certain limit value (maximum allowable concentrations of certain substances or contaminants in bio-waste) before being used in the biogas process.[211]

3.4 National policy and legislative framework

3.4.1. Danish Climate Act (2020)

In June 2020, Denmark adopted its Climate Act (Klimaloven), which legally binds the country to reach climate neutrality by 2050 and deliver a 70% reduction in GHG emissions by 2030 compared with 1990 levels.[212]

In December 2022, the government increased the goal for 2050 to 110% neutrality, corresponding to a capture of around 8 million tonnes of CO_2 per year, while announcing that climate neutrality would be reached already in 2045.[213]

The Danish Council on Climate Change, an independent body, evaluates government policies and provides recommendations to ensure targets are met.

3.4.2. National Energy and Climate Plan (NECP)

Denmark's latest National Energy and Climate Plan (NECP) submitted in June 2024[214] covers five dimensions of the EU Energy Union: decarbonisation, energy efficiency, energy security, internal energy markets and research, innovation and competitiveness.

Denmark aims to achieve a 100% non-fossil gas supply by 2030, primarily through the production of upgraded biogas (biomethane) and e-methane. This goal is supported by a significant increase in biogas production (see section 3.1.1).

The NECP explains that before 2019, biogas in Denmark was supported by various subsidies targeting electricity and heat production, industrial use and transport. However, in 2018, Denmark decided to close biogas support schemes for new plants and introduced a tender-based approach, with five tenders up to 2030 to enhance efficiency and cost-effectiveness. However, biogas plants built before 2020 continue to receive aid until the end of the 20-year support period,[215] meaning in practice that a major share of biogas produced in the country is still subsidised.

3.4.3. Law on the Promotion of Renewable Energy

The law on the Promotion of Renewable Energy aims to promote the production of energy using renewable energy such as wind, hydro, biogas, biomass, solar, wave and tidal energy and geothermal heat. It is the legal basis for achieving national GHG emission reduction targets. The law provides detailed Feed-in Premium (FiP) tariffs for wind, biomass, biogas and other renewable energy source electricity production.[216] Under a FiP scheme, electricity from renewable energy sources (RES) is typically sold on the electricity spot market, and RES producers receive a premium on top of the market price of their electricity production. FiP can either be fixed (i.e. at a constant level independent of market prices) or sliding (i.e. with variable levels depending on the evolution of market prices).

3.4.4. Regulation to limit methane losses from biogas plants

In 2023, new rules regarding methane leaks from biogas plants came into force after studies showing a worrying level of methane leaks (see section 2.1). The regulation requires yearly leak detection of biogas plants and reporting by third-party controllers to the Danish Energy Agency as well as implementation of a customised leak detection and repair program. In addition, the regulation requires biogas facilities to minimise their methane leakage to less than 1%.[217] Non-compliance can result in a suspension of state support and fines. The effects of the regulation should be monitored through measurement campaigns.[218] In addition, Denmark is a signatory of the Global Methane Pledge, however, it has not yet developed a National Methane Roadmap and Action Plan with a 2030 methane emissions target.[219] According to Green Transition Denmark and the Methane Matters Coalition, to ensure compliance with the Paris Agreement, Denmark should reduce its methane emissions by 40-45% in 2030, compared to 2020.[220]

3.4.5. Law on Sustainable Biofuels and on the Reduction of Greenhouse Gases from Transport

The Law on Sustainable Biofuels and on the Reduction of Greenhouse Gases from Transport, first introduced in 2009 and amended multiple times since then, mandates companies in Denmark to add a minimum of 7.6% (energy percentage) biofuels in fuel sold (diesel and gasoline) for transportation on land. This percentage has increased in 2024 from the previous 5.75%.[221] Biofuels include bioethanol mixed in gasoline, biodiesel mixed in diesel, and biomethane mixed in fossil gas. Biofuels based on waste and residue count double regarding meeting the requirement. The law specifies that biofuels must meet the sustainability criteria set by the EU.

3.4.6. Climate Agreement on Green Power and Heating

The 2022 Climate Agreement on Green Power and Heating sets a political ambition for Denmark to be 100% supplied with biogas (upgraded biogas and e-methane) by 2030 and to phase out fossil fuel-based heating services in all buildings by 2035.[222] The agreement also targets the complete elimination of oil boilers for heating and promotes the conversion to district heating projects where possible or the use of heat pumps.

Since 2021, Denmark has implemented regulations to limit the use of energy crops in biogas production, primarily to improve sustainability and reduce the climate impact of biogas (see section 3.2).[223]

3.5 Support schemes and market mechanisms

3.5.1. Biogas subsidy levels

A Danish subsidy scheme for biogas entered into force in 2012. Including a fixed subsidy level across eligible biogas producers, it was targeted at increasing the production of biogas for electricity production, processing, heat production, and upgrading to biomethane, where the latter was to be injected into the gas system to displace fossil gas. The subsidy scheme implemented in 2012 was closed for new applications in 2018, but as subsidies were granted for a 20-year period, the major share of biogas produced in Denmark today is still subsidised.[224]

Since 1 January 2020, Denmark has introduced a tender-based approach with five tenders up to 2030 to enhance efficiency and cost-effectiveness. In December 2024, the EU Commission approved a EUR 1.7 billion Danish State aid scheme to support the production of biomethane and e-methane to be injected into the grid. The scheme aims to support the construction of new plants and the extension of existing plants, if they comply with the emission criteria set in the EU RED. Under the scheme, the aid will take the form of a price premium per GJ of biogas produced, also called "Feed-in Premium scheme (FiP)" (see section 2.4.3), paid on top of the market price for fossil gas, over a 20-year period.[225]

3.5.2. Danish NECCS Fund

On 4 December 2021, a political majority in the Danish Parliament signed a sub-agreement under the Finance Act for 2022, introducing a new subsidy fund, the NECCS fund of DKK 2.6 billion (approximately EUR 335.5 million).[226] The Fund supports capture and geological storage of biogenic CO_2 (carbon dioxide released as a result of the combustion or decomposition of organic material), aiming to achieve negative emissions of 0.5 million tonnes per year from 2025 to 2032.

The beneficiaries of the fund are emitters of biogenic CO_2. The REPowerEU Chapter of the Danish NRRP states that the specific technologies in mind are biogas upgrading plants, industrial processes, energy and waste sectors including biomass, and, finally, CO_2 captured through direct air capture and storage (DACCS).[227]

The fund operates with a support period of 8 years, which is intended to ensure that the cheapest biogenic sources are not committed long-term to storage purposes but can be released for utilisation purposes.

In April 2024, the Danish Energy Agency completed a tender published in August 2023 and awarded contracts to three companies: BioCirc CO_2 ApS, Bioman ApS, and Carbon Capture Scotland Limited. Together, the projects are meant to ensure the capture and storage of 160,350 tonnes of CO_2 annually from 2026 to 2032.[228]

3.5.3. Guarantees of Origin (GOs)

In Denmark, the biogas certification scheme - also known as Renewable Gas Guarantees of Origin (RGGOs) - and Guarantees of Origin (GOs) play significant roles in promoting renewable energy. RGGOs verify the origin of non-fossil gas, such as biogas, while GOs track and certify the renewable origin of electricity, gas, and hydrogen.

The certification scheme is compatible with the EU-wide system of Guarantees of Origin (GOs) as per the Renewable Energy Directive (RED II). It aims to facilitate consumer choice, which could indirectly act as a market incentive for renewable production. Energinet is the issuing body for guarantees of origin for renewable electricity, gas, and hydrogen in Denmark.[229]

In general, biomethane GOs in Denmark are issued based on the amounts of biogas fed into the gas system and granted feed-in support.[230]

3.5.4. Tax exemption for carbon-neutral biogas

At the end of 2024, Denmark's Ministry of Taxation said it was considering exempting CO_2-neutral biogas from taxation. The Ministry conducted a study to assess the possibility of exempting biogas that does not already receive support from other schemes and concluded that "[i]t will be possible to exempt biogas that does not receive production support from both CO_2 tax, emission tax, and energy tax. This can be done by using guarantees of origin that document that the biogas comes from renewable energy sources".[231]

3.5.5. Tax on diesel

To reduce the environmental impacts of the transport sector and incentivise the use of biofuels, the Danish government decided to adopt various measures. First, from January 2025, the diesel tax has increased by DKK 0.50 per litres (EUR 0.07).[232] Secondly, since January 2025, the Danish toll system for truck drivers has changed. Indeed, the government has introduced a mileage-based road tax on heavy-duty vehicles (HGVs) based on their CO_2 emissions, with green vehicles paying the lowest tax.[233] The new toll system will be introduced in three phases:

- 2025: Applies to lorries 12 tonnes or more
- 2027: Extended to vehicles 3.5 tonnes or more
- 2028: Expanded to cover the entire public road network.

3.5.6. Carbon tax for industry

In June 2022, the Social Democratic Party (Socialdemokratiet), The Liberal Party (Venstre), the Green Left (Socialistisk Folkeparti), the Danish Social Liberal Party (Radikale Venstre) and the Conservative People's Party (Det Konservative Folkeparti) concluded an agreement on a Green Tax Reform for Industry, whereby the parties agreed to introduce a new CO_2 tax for companies in most sectors.[234]

On 4 June 2024, the Danish Parliament approved a new CO_2 tax for fossil fuel usage that has taken effect on 1 January 2025. This tax is set to deliver a CO_2 reduction of 4.3 million tonnes by 2030 hence being on crucial enabler to achieve the country climate targets (see section 2.4.1).[235]

For companies outside the EU's quota trading system, the CO_2 tax entails a payment of EUR 100 per tonne of emitted CO_2 in 2030, while the rate for companies covered by the quota system is set at EUR 50 per tonne of emitted CO_2.[236]

3.5.7. Climate tax on agriculture

In November 2024, the Danish government, business and non-government actors agreed on a Green Agreement, which includes the following measures.

- From 2030, a tax on emissions of DKK 300 (EUR 40) per tonne, rising to DKK 750 (EUR 100) per tonne in 2035.
- A tax deduction or "tax break" (60%) to incentivise farms that have low emissions. This reportedly equates to an effective carbon tax of DKK 120 (EUR 16) in 2030 and DKK 300 (EUR 40) per tonne in 2035.

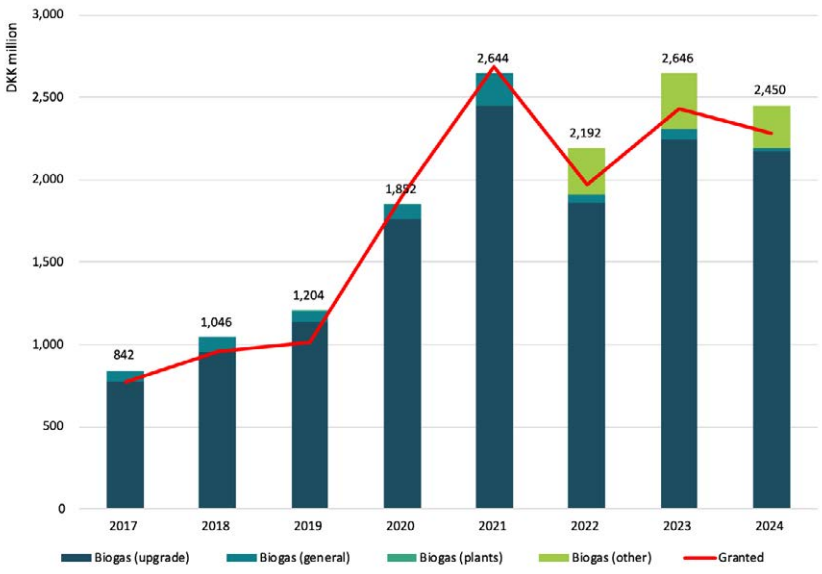
- Proceeds of the climate tax will be returned to the agricultural sector as a transition-scheme to be reinvested into green initiatives, climate technology, and production transformation.
- Approximately DKK 40 billion (EUR 5.4 billion) will be allocated to a new Green Landscape Fund ("Den Grønne Arealfond"). The Green Land Fund will channel money into reforesting 250,000 hectares of farmland by 2045 and extracting 140,000 hectares of lowland by 2030 to make at least 20% of Denmark's nature protected.[237]

With this tax, Denmark would be the first country in the world to tax its agriculture sector to reduce greenhouse gas emissions. The sector is responsible for approximately 28% of Denmark's total GHG emissions and over 80% of methane emissions.[238] The tax creates a financial incentive for farmers to route manure and organic residues into biogas plants,[239] which risks reinforcing the current intensive livestock model. Indeed, as highlighted by Green Transition Denmark,[240] while the tax aims to encourage climate-efficient agricultural production, it does not incentivise a reduction in the overall livestock production.[241] Encouraging manure-based biogas production could indirectly sustain or even increase the number of livestock, thereby maintaining high levels of enteric fermentation, the primary source of agricultural methane. This raises concerns not only about the long-term effectiveness of the tax in reducing methane emissions but also about its environmental and animal welfare implications.

3.5.8. Subsidies and grants financing

To stimulate biogas production, Denmark used Feed-in-Tariffs (FIT) between 2012 and 2019. FIT are a type of subsidy payment based on the quantity produced, of biomethane in this case, and fed into the gas grid over a fixed period of time.[242] Currently, the support scheme for biomethane is a combination of a fixed and variable premium, which the beneficiary receives on top of the price from selling the gas, so that the aid covers the cost difference between fossil gas and biomethane. Right now, tendered support is capped to a level of EUR 13.4/GJ (about EUR 50/MWh).[243]

The Danish Energy Agency, a governmental body under the Ministry of Climate, Energy and Utilities, oversees Denmark's energy and supply sectors such as electricity, natural gas, water and telecommunications. The agency is in charge of Denmark's green transition towards climate targets set by the government (see 3.4.1). In addition, the agency manages the funds for grants and subsidies decreed by the government. Figure 1 presents as stacked bars the total amounts authorised for subsidies and grants to biogas-related projects between 2017 and 2024. The overlapping line graph in red presents the actual amount paid in subsidies, which is usually slightly less than what is approved.



As can be seen in Figure 1, the Danish government, through the Danish Energy Agency, has been increasingly promoting biogas production and refining, especially in the last five years. While the allocated funds to biogas projects totalled around DKK 1.0 billion (EUR 133 million) between 2017 and 2019, the value increased to DKK 2.5 billion (EUR 335 million) on average since 2020.

Figure 13. Funds allocated by the Danish Energy Agency (2017 – 2024, DKK mln)

Source: *Own elaboration based on Danish Energy Agency (n.d.), "Mal and resultater", online:* https://ens.dk/om-os/maal-resultater, *visited in June 2025.*

Figure 14 provides an overview of how biogas subsidies in 2024, with a total amount of DKK 2.45 billion (EUR 328 million) were divided across different biogas producers. The two companies that received most support in 2024 were Nature Energy (DKK 610 million - EUR 81.8 million), and BioCirc (DKK 409 million - EUR 54.8 million). The top five is completed by SBS Kiplev with DKK 88.6 million (EUR 11.9 million), Biogadan with DKK 78.9 million (EUR 10.6 million) and E.ON GreenLab Skive with DKK 71.1 million (EUR 9.5 million).

The information presented in Figure 14, which is only for 2024, was obtained through email communication with the Danish Energy Agency. However, when requesting the information for the other years (2016 – 2023), we were informed that the information is not publicly available.[244]

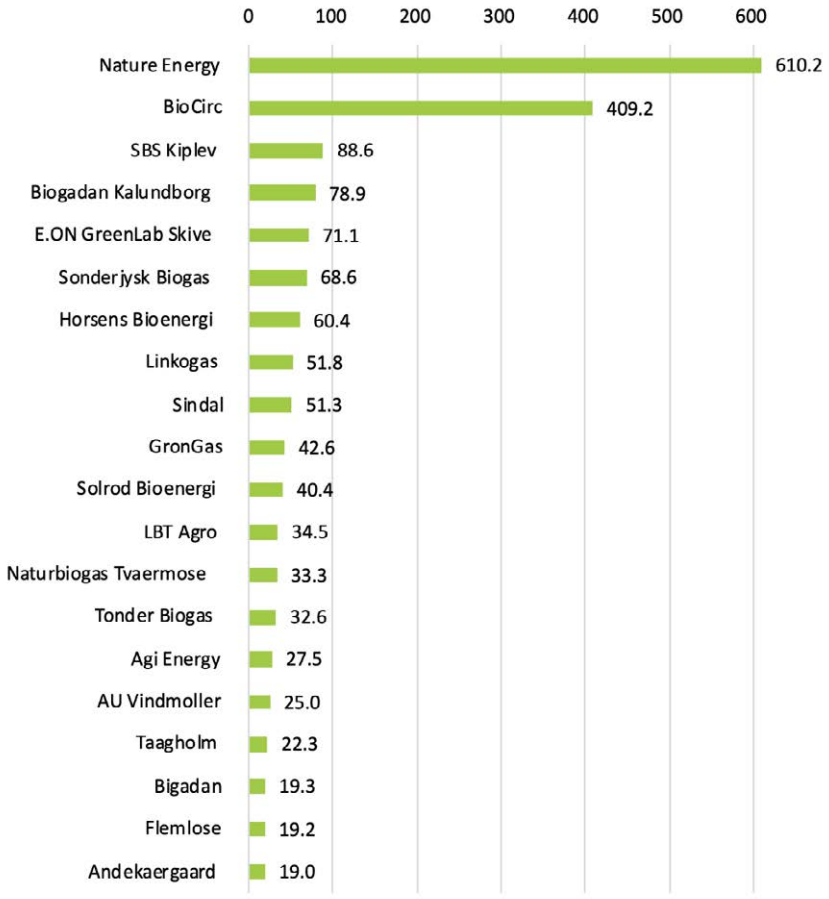


Figure 14. Subsidies granted to Danish biogas companies in 2024 (DKK mln)
Source: *Own elaboration based on information provided by the Danish Energy Agency.*

3.6 Final remarks

Denmark stands out as one of the most advanced biogas markets in the EU and is Europe's fourth-largest biogas producer. Currently, biogas represents around 40% of the gas consumed from the grid, and the country has set a target to achieve 100% biogas or biomethane consumption by 2030. The expansion of the biogas sector has been supported by a long-standing policy commitment to renewable energy and ambitious decarbonization targets. The sector is well-integrated into the national energy system, with biogas increasingly used for electricity, heat, and grid injection. The removal of the biogas subsidy scheme in 2020 reflects the sector's maturity.

Biogas production in Denmark is driven by a strong enabling environment, including a high share of arable land, (direct and indirect) subsidies and Feed-in Premiums, and robust infrastructure for district heating and CHP generation. Political momentum is also strong, with biogas framed as a strategic tool to reduce reliance on fossil fuel imports, particularly in response to the geopolitical context surrounding Russian gas.

Denmark has also adopted measures to safeguard sustainability, such as setting a threshold for energy crops and phasing out maize as a feedstock, to prevent land-use conflicts and ensure environmentally responsible production. However, the sector remains heavily reliant on livestock manure - particularly from Denmark's intensive pork industry - which is a major source of pollution and raises broader concerns about the overall environmental footprint of biogas feedstock.

The country also adopted a regulation (2023) on methane leakage, which requires biogas facilities to minimise their methane leakage to less than 1%. Nevertheless, the reduction effect of this new regulation remains to be observed and will need to be closely monitored. In addition, Denmark still needs to publish a National Methane Roadmap and Action Plan with a 2030 methane emissions target.

While biogas is currently produced entirely within the country, continued attention will be needed to ensure feedstock sustainability and to optimise the sector's contribution to Denmark's broader energy transition. A key development to follow is the implementation of the recent tripartite agreement which aims to reduce nitrogen pollution, support nature restoration and reduce emissions from the agriculture sector through the introduction of a CO_2 tax. However, while the tax aims to encourage climate-efficient agricultural production, it does not incentivise a reduction in the overall livestock production. Hence, it remains to be seen whether the agreement will be accompanied by concrete measures to support a structural shift away from intensive animal farming towards more plant-based production systems.[245]

CHAPTER 4.

Biogas in Germany

Germany is the leading biogas-producing country. With about 10,000 plants in operation, it accounts for about 48% of the total EU biogas production. At the same time, through a combination of market trends and regulatory interventions, the number of plants added each year has been decreasing; the focus is currently on making existing biogas plants more flexible. Despite a number of environmental and social concerns, the German policy framework treats biogas and biomethane as important components of the country's energy transition and creates favourable conditions for their expansion.

4.1 Market overview

4.1.1. Volume and structure

As of the end of 2024, Germany was the major biogas producer globally with about 87 TWh/year (11.6 – 17.4 billion m3). These figures include biogas produced for all types of end use, including electricity and heating, which are the most common uses of biogas in Germany. Roughly 10,000 biogas plants operate in Germany.[246] Of these 10,000, the largest share (about 8,300 as of the end of 2021) was represented by the biogas plants in the agricultural sector, which contributed 27.2 TWh/year (3.63 – 5.44 billion m3) and 16.9 TWh/year (2.25 – 3.38 billion m3) to the production of electricity and heat supplies, respectively.[247] On the EU level, Germany accounts for just under 50% of the total output, though demonstrating a slight downward trend from 52% in 2020 to 49% in 2023.[248]

According to the World Biogas Association (WBA), the German biogas sector largely relies on the farming industry as a source of feedstock. Thus, crops account for 48.9% of all feedstocks, followed by animal manure with 44.5%.[249] Fachagentur Nachwachsende Rohstoffe, an agency funded by the German Ministry of Agriculture, reports that in terms of manure, cattle plays the most important role, accounting for 79%. Minor roles are played by pig slurry and poultry slurry, with other manure types only marginally contributing to the biogas production.

Table 8. Manure use in biogas production in Germany, by type, 2022

Type of Manure/Substrate	Share (%)
Cattle Slurry	68%
Cattle Solid Manure	11%
Pig Slurry	11%
Slurry/Solid Manure, not specified	5%
Poultry Manure / Dried Chicken Droppings	4%
Pig Solid Manure	1%
Horse/Sheep/Goat Manure	<1%
Total	100%

Fachagentur Nachwachsende Rohstoffe e. V. (2023), Basisdaten Bioenergie Deutschland 2024, Gülzow-Prüzen, Germany: Fachagentur Nachwachsende Rohstoffe e. V., p. 47.

As for agricultural feedstock, maize continues to be the key contributor to biogas production, at 74% of the total. Grass silage accounts to roughly 13%, while other crops, including beetroot and cereals, contribute less about 1- 3% each.

Table 9. Manure use in biogas production in Germany, by type, 2022

Type of Agricultural Feedstock	Share (%)
Maize Silage	74%
Grass Silage	13%
Cereal-GPS	6%
Sugar Beets	3%
Catch Crops	1%
Corn-Cob Mix / Corncob Silage	1%
Cereal Grain	1%
Other	1%
Total	100%

Source: *Fachagentur Nachwachsende Rohstoffe e. V. (2023), Basisdaten Bioenergie Deutschland 2024, Gülzow-Prüzen, Germany: Fachagentur Nachwachsende Rohstoffe e. V., p. 46.*

In terms of utilisation, most biogas is divided between electricity generation and heating, with transportation fuels accounting for less than 2% of the total biogas utilisation. According to a recent research paper, in 2023, biogas and biomethane generated 7.1% of the total gross electricity in Germany.[250] The figure, though impressive, does not mean that all of this biogas was sustainably produced, in particular, taking into account the over-reliance of the biogas industry on energy crops and manure, and all the environmental trade-offs, including air and water pollution.

Table 10. Biogas utilisation in Germany, 2023

Utilisation type	Volume (GWh/y)	Volume (mln m3/y)	Share (%)
Electricity	31,300	4,173 - 6,260	57.4
Heating	22,300	2,973 - 4,460	40.9
Vehicle fuel	965	128.7 - 193.0	1.7
Flaring	n.d.		n.d.
Total	54,565		100%

Source: *IEA Bioenergy (2024), Country Report Summary 2024 – Task 37: Energy from Biogas, Paris, France: IEA Bioenergy, p. 32*

4.1.2. Main biogas companies

With about 10,000 producers, the German biogas market appears to be fragmented, where even the largest players by installed capacity account for just 1-3% of the total production each. Biogas facilities are often operated by individual farmers or small cooperatives. While there are larger companies in the sector, such as EnviTec Biogas, Weltec, Shell Energy Deutschland, and others indicated in the table below, overall, the market remains largely decentralised. The company selection is based on the publicly reported installed and planned capacity, either in GWh of electricity equivalent or tonnes and m3 of biogas production capacity. As Germany is a global leader in biogas, several German companies are also major biogas plant developers and providers of biogas plant maintenance services. Several such companies have been included in the selection owing to their far-reaching impacts as biogas-enablers at the German, EU, and global levels.

Table 11. Major biogas companies in Germany

#	Company	Annual production or capacity	Estimated biogas supply (in mln m3/yr)	Type	Notes	Feedstock	Source
1	Bmp greengas	4 TWh/a	641.9	Trader	Europe's leading distributor of biomethane, bmp greengas manages a portfolio volume of over 4 TWh/ year, focusing on purchasing, sales, and balancing group management.	Not explicitly disclosed	251
2	Weltec Biopower	280 mln standard m^3 of raw biogas a year (~2,700 GWh)	432.0	Owner / operator and Plant developer	Operates 11 own production facilities. Over 400 biogas plants built worldwide.	Manure and slurry, grass, whole plant silage, sugar beets, landscaping materials, food waste, sewage sludge	252
3	Verbio Vereinigte BioEnergie	1,980 GWh biomethane (2023/24)	317.8	Owner / operator	Increased capacity from 1,300 GWh; a significant producer of biomethane.	Agricultural waste, mainly distillery slop and straw	253
4	Shell Energy Deutschland	Planned: 400-500 GWh biomethane + 100,000 tonnes of bioLNG (~1250 Gwh)	~272.8	Owner / operator	Planned plants in Karstädt and Steinfeld. The new bio-LNG plant opened in 2024 and is located at Shell's Energy and Chemicals Park Rheinland near the German city of Cologne	Manure, organic waste	254
5	EnviTec Biogas	~1,500 GWh biomethane (2023)	240.7	Owner / operator, developer	Operates 81 plants; expanding to ~1,800 GWh in 2025.	Maize, whole-plant silage, cereals, grass silage, cattle slurry, pig manure, poultry manure	255
6	DAH Gruppe	805 GWh biomethane & 290 GWh electricity from biogas	175.6	Owner / operator	Operates 24 biogas plants across Germany.	Grass, maize, manure, millet, poultry manure	256
7	VNG	835 GWh	134	Owner / operator	With 40 plants at 34 locations in Eastern Germany as well as in Lower Saxony, BALANCE Erneuerbare Energien GmbH (part of VNG) has become one of the most important players in the German biogas market.	Substrate mixture consisting of plant materials such as maize, whole plant silage and residual materials such as dry chicken manure.	257
8	PlanET Biogas Group	n/a	n/a	Developer	With over 870+ implemented biogas plants, more than 150 biomethane plants and an annual turnover of around 120 mln euros, PlanET Biogas Group is one of the market leaders in the sector.	Manure from livestock, such as cows, pigs, and poultry, slaughterhouse waste, crop residues	258
9	agriKomp	n/a	n/a	Developer	Realised about 1,000 biogas plants with a total installed capacity of about 300 MWe globally, including 550 plants in Germany	Liquid manure, energy crops, agricultural residues	259
10	BioEnergie grünes Deutschland	n/a	n/a	Plant service	Servicing and maintenance of over 600 biogas plants as well as the biological monitoring of over 300 biogas plants worldwide	Energy crops such as maize, liquid manure, wastewater, sludge, pulps, and fats.	260

Source: *Data from multiple sources (see the last column). For conversion factors used, see Appendix 1.*

4.1.3. Contribution to the economy

According to the German industry association Fachverband Biogas, the sector generates over 13 billion euros in annual turnover within the country and about 2.5 billion euros in export revenues (as of 2023).[261] Much of the export revenues is, presumably, derived from the export of technologies and services, when the German companies design, construct, and service biogas and biomethane facilities in foreign countries. Thus, according to a data provider Volza, 78 German suppliers were involved in biogas projects in 17 countries, mostly in India, the US, and Turkey.[262] In addition, the sector employs over 50,000 people.[263]

4.1.4. Development trends

The German biogas market is demonstrating mixed development trends. The overall capacity and the number of plants that were growing rapidly from the early 1990s onwards, stagnated with only minor increases after 2021.[264] A number of reasons contributed to these trends.

On the one hand, both EU and German national legislation appear to favour biogas. For example, the Renewable Energy Directive (RED III) sets a goal that by 2025, 1% of all energy used in the transportation industry in Europe must come from advanced biofuels, biogas, and renewable fuels of non-biological origin (RFNBO). By 2030, this target will increase to 5.5%, including at least 1% from RFNBOs. Therefore, a sizable market for biogas in transport may be created.[265] The Building Energy Act (Gebäudeenergiegesetz - GEG), was believed to positively contribute to further expanding the biogas and biomethane sectors in Germany':[266] The GEG envisages that:

- Since January 1, 2024, only heating systems based on 65 percent renewable energy may be installed in new buildings within new development areas.
- Longer transition periods are planned for new buildings constructed in vacant lots, as well as for existing buildings. This will enable better coordination of investment decisions with local heating planning. Municipalities nationwide must determine by mid-2028 at the latest (major cities by mid-2026) where heating networks or climate-neutral gas networks will be expanded in the coming years.[267]

As the new government has announced to abolish the GEG in its coalition agreement, it remains unclear what role biomethane will play in the building sector going forward. As of now the Building Energy Act suggests that the fossil gas sector could be replaced by biogas. However, in the long term, the limited available biomethane will be needed in other sectors. Using biomethane for heating homes is inefficient and costly, and helps sustain the fossil industry's business model in heating. Furthermore, the amount of sustainably produced biogas will likely be insufficient to meet the demand for sustainable fuels resulting from the GEG requirements.

In addition to the supportive regulatory developments, Germany's robust unsustainably large agricultural sector provides a steady supply of feedstocks for biogas production. It is often overlooked, however, that the agriculture-based feedstocks (be it energy crops or manure from the expanding export-oriented meat sector) are not intrinsically sustainable. The high density of livestock farming results in substantial manure availability, while crop residues and organic waste from food processing offer additional biomass sources. Food and feed crops, in particular, maize, continue to be directly used for biogas production, with crops accounting for almost half of all feedstocks.[268] This abundance supports the operation of the roughly 10,000 plants, predominantly situated on farms, and may support further biogas expansion. Currently, only about 30% of manure is utilised in biogas production plants,[269] which creates the impression that the base for developing new biogas facilities is almost unlimited. This is not the case, as the current dietary patterns based on animal proteins are unsustainable in the long run, and in contradiction with the EU Farm to Fork and Protein Strategies. Bringing these patterns in line with the EU goals will likely mean a decrease in livestock farming, and hence, a drop in the amount of manure available for biogas.

With the ongoing geopolitical uncertainties, including the Russian invasion of Ukraine, resulting in severing ties with Russian gas suppliers, trade wars, and fluctuating energy prices, biogas remains an important, though limited, alternative to fossil gas in some sectors. At the same time, there are many factors that speak against further development of the biogas market in Germany. First, due to the ongoing electrification of transport, including commercial trucks and river vessels, the long-term demand increase for biogas as an alternative fuel in the transport sector may turn out to be limited.[270] In the generation sector, the anticipated long-term decline in green hydrogen prices (from around 2030–2035 onwards)[271] may challenge the competitiveness of biomethane in residential and industrial heating applications, such as district heating networks. Similarly, the growing electrification of heating solutions (e.g., heat pumps and electric boilers)[272] and increased renewable energy capacity (resulting in greater availability of green electricity) will make the use of biomethane and other energy carriers in residential heating contexts less relevant.

Ambiguous and contradictory regulatory decisions (for example, temporarily classifying brown grease as an advanced biofuel in Germany in 2023, leading to its increased imports and a drop in the demand for biogas) as well as the planned abolishment of the Building Energy Act, add further uncertainty and limit potential investments in future biogas projects. However, such temporary signals are less important than the science-based concerns over the long-term sustainability of the biogas industry, justifiably raised by the German civil society.

Thus, numerous papers h considerably contributes to GHG emissions. Other points of criticism include the ethical aspects of using food crops as feedstock, the uncontrolled leakage of methane from biogas facilities, the lack of a competent monitoring authority, [273]digesters.[274]

4.2 Sustainability concerns

Methane leakages remain one of the key concerns for the sustainability and safety of the biogas and biomethane industry. According to a 2019 study, which surveyed 964 AD facilities in Germany and the UK, 85% of plants suffer from methane leakages.[275] The climate consequences of methane, which accounts for about 30% of the current rise in global temperatures,[276] are obvious. These leakages jeopardise Germany's climate commitments and undermine its efforts to decarbonise its energy consumption. However, apart from the direct and immediate negative impacts on the climate, methane leaks pose other threats. Thus, when mixed with air, biogas can become highly explosive, especially in enclosed spaces near ignition sources. Moreover, it contains hydrogen sulphide (H_2S), a toxic gas that can build up in poorly ventilated areas and go undetected, potentially leading to fatal exposure for humans entering such spaces.[277]

As the use of cattle and other animal manure for biogas and biomethane production in Germany increases, concerns have emerged about the sustainability of this practice. As of 2019, The main types of manure used as a feedstock were cattle slurry (72%), solid cattle dung (9%), pig manure (10%), poultry manure (3%), solid pig dung (1%), and dry poultry manure (1%).[278] Previously considered a waste product that farmers spread on fields or paid to dispose, manure has now become a commodity, creating a market that may inadvertently incentivise animal farming, one of the largest sources of greenhouse gas emissions. While repurposing manure aligns with circular economy principles and appears beneficial on the surface, the broader system of intensive animal agriculture remains fundamentally unsustainable if long-term net-zero targets are to be achieved.[279] Incentivising industrial indoor animal farming also counteracts the EU and German efforts to promote sustainable and healthy diets. These include the European Green Deal and the European Protein Strategy, which advocates for reduced consumption of animal-based proteins.[280]

According to a 2024 Foodrise report, biogas increases the EU's reliance on intrinsically unsustainable livestock production, which depends on imported feed and on the extensive use of grassland for grazing, which constitutes the major land use associated with the livestock industry.[281] Soy, as a key source of high-value protein in animal farming, is associated with transportation footprint and key driver of land conversion in valuable non-forest ecosystems (in particular, tropical savannahs, but also other grasslands and wetlands) currently not protected under the EU Deforestation Regulation (EUDR). Germany is heavily reliant on soy imported soy feed. According to ClientEarth, in 2022, it imported roughly 2.3 million tonnes of soymeal, half of which came from Brazil.[282] In 2023, in the pig industry alone, 740,000 tonnes of soy were used as feed. ClientEarth also reports that "[…] soy used to feed German pork and poultry has high risk of exposure to human rights violations and deforestation in Brazil".[283]

A study focusing on the State of Brandenburg found that the rise in maize cultivation for biogas production between 2008 and 2018 intensified competition between energy crops and food crops. It suggests that "[maize] cultivation can represent a much higher proportion in certain [German] regions, forming significant hotspots of spatially concentrated maize production".[284] The negative impacts of such concentration include a decline in soil fertility, a reduction in biodiversity on agricultural land, and an increased nitrogen use. Furthermore, the study states that the growing demand for manure as biogas feedstock incentivises large-scale industrial cattle production based on farming without grazing, "[…] as manure collection is not possible in pasture-based systems. In order to use the manure for biogas production, cattle must be kept in stables".[285] This, in turn, creates even more demand for local maize and imported soy as animal feed. According to the German Environmental Agency (UBA), to ensure a comprehensive life cycle assessment, it is essential to account for climate-relevant emissions arising from the cultivation of substrates specifically grown for biogas production – such as energy crops like maize – including those resulting from direct land-use change (e.g., converting previously fallow land to energy crop cultivation) and indirect land-use change from displacing food crops to accommodate energy crops.[286]

The German Climate Action Plan 2050 states that AD plants in the biogas sector have been responsible for the increasing ammonia emissions in Germany over the recent years.[287] In addition, impurities in biogas, such as hydrogen sulphide and volatile organic compounds, pose health risks, including respiratory problems and other serious health issues.[288] Water pollution from manure and nitrogen is also a significant environmental issue in Germany. Currently, over 15% of the country's groundwater bodies are threatened by excessive levels of nitrate pollution.[289]

Apart from the health issues relevant to the neighbouring communities, biogas production has also been subject to worker safety concerns. Thus, since 2005, at least 17 people have been killed and 74 injured in accidents at biogas plants, according to the UBA.[290] UBA further reports that between 2009 and 2019, the number of accidents remained high at 3.5 to 5 per 1,000 biogas plants per year.

In addition, accidents involving the uncontrolled release of substrates, liquid manure, or digestate, sometimes in volumes reaching up to 14,000 m3, represent serious hazards. These events, often referred to as "liquid manure tsunamis," can inundate buildings, devastate aquatic life, and inflict substantial harm on protected ecosystems. Safety inspections of biogas facilities in recent years have revealed that roughly 70% to 85% of the plants assessed exhibit major safety shortcomings. This rate of serious deficiencies is nearly double that found in inspections of other types of industrial plants.[291]

As the Building Energy Act encourages the use of biomethane in residential heating boilers, it risks locking in dependence on the fossil gas network, potentially hindering more suitable renewable energy sources, and postponing the transition to sustainable energy systems.

4.3 Implementation of EU policies

Germany demonstrates a complex legal landscape, which at the national level regulates biogas production, transportation, its utilisation in the electricity and heat market, the role it plays as a fuel, and its contribution to the emissions trading system. As an EU member state, it's subject to European legislation, including the EU Renewable Energy Directive (RED III), REPowerEU Plan, EU Taxonomy Regulation, and other relevant laws. This section examines how the EU-level legislation is transposed in Germany, and what implication it has for the biogas industry.

4.3.1. REPowerEU Plan

In June 2024, the EU Commission positively evaluated Germany's updated National Recovery and Resilience Plan (NRRP). The plan currently envisages EUR 30.3 billion in grants and includes 17 reforms and 28 investments. According to the Commission, the plan demonstrates a strong focus on energy transition and increases the amount of funds dedicated to meeting the country's climate goals from 47% to 49.5%.[292]

To reach the renewable energy targets, Germany has introduced incentives to stimulate the biogas sector. The Parliament approved a biomass package that increases the flexibility bonus from EUR 65 to EUR 100 per kilowatt and extends the second remuneration period, aiming to promote the profitable operation of biogas plants. Additionally, the tender volume for biogas plants is set to increase, with 1,300 MW planned for 2025 and 1,126 MW for 2026. Biogas plants with a capacity of 326 MW are to be put out to tender in 2027 and 76 MW in 2028. This increases the tender volume to a total of 2.8 GW.[293] These initiatives pave the way for the expansion and modernisation of current facilities.

4.3.2. EU Renewable Energy Directive

As of May 2025, EU Renewable Energy Directive (RED III) was not yet transposed into national legislation in Germany. The German Federal Ministry for Housing, Urban Development and Building (BMWSB) drafted legislation titled "Entwurf eines Gesetzes zur Umsetzung der Richtlinie (EU) 2023/2413 in den Bereichen Windenergie an Land und Solarenergie sowie für Energiespeicheranlagen am selben Standort" (Draft Act to Implement Directive (EU) 2023/2413 in the Areas of Onshore Wind Energy, Solar Energy, and Co-located Energy Storage Facilities). This draft aims to simplify and expedite permitting processes for renewable energy projects, including the designation of acceleration areas and streamlined procedures for projects outside these zones. The draft law was approved by the German federal cabinet on July 24, 2024, following consultations with states and stakeholders in April 2024. However, it has not been enacted into law as of June 2025.

4.3.3. EU Nitrates Directive

In Germany, the EU Nitrates Directive has been transposed into several national regulations. The Fertiliser Ordinance (Düngeverordnung (DüV))[294] regulates when, where, and how fertilisers, including manure and digestate from biogas plants, may be applied. It includes limits on nitrogen and phosphorus applications, timing restrictions, and storage requirements based on EU law. Digestate is treated the same as manure under the DüV. Its application must comply with nitrogen limits (170 kg N/ha/year).

The Federal Water Act (Wasserhaushaltsgesetz (WHG))[295] ensures that water bodies are protected against nitrogen contamination. In addition, federal states, the constituent parts of Germany, can define "red areas" (regions with high nitrate levels in groundwater) to ensure stricter protection, including further reductions in

fertiliser applications. Manure Ordinance (Wirtschaftsdüngerverordnung, (WDüngV)) deals with the handling and transportation of manure and sets requirements on how these should be documented. It applies to all actors, including biomethane producers.[296]

At the same time, the European Commission initiated infringement proceedings against Germany for insufficient implementation of the directive. As a result, stricter rules were adopted in 2020 and 2021. Germany implemented a substantially revised Düngeverordnung, establishing frameworks for designating nitrate-polluted zones ("AVV GeA") and setting stricter regional controls. In 2023, the Commission dropped the charges against Germany.[297]

4.4 National policy and legislative framework

4.4.1. Integrated National Energy and Climate Plan

EU Member States are required to develop and regularly update their integrated national energy and climate plans (NECPs) based on a common template.[298] The most recent German NECP was adopted in August 2024. The plan recognises biogas (and more specifically, biomethane) as a solution that can contribute to the integration of renewable energies into the electricity market and promotes its use as fuel, including for public transport. In addition, the NECP mentions government measures to encourages the 'conversion of existing biogas plants to use greater volumes of liquid manure, the gas-tight storage of fermentation residues in existing plants, funding research and development as well as pilot and demonstration projects for the co-digestion of livestock manure with other residual materials'.[299] The type of measures are not further explained.

At the same time, the plan envisages that the first-generation biofuels based on food and feed crops will not receive additional support, as bioenergy production should rely primarily on waste and residual materials. Furthermore, it states that expansion of the area under cultivation for bioenergy crops is not planned and will not be considered suitable and sustainable 'due to land use restrictions'.

4.4.2. Renewable Energies Act

The updated Renewable Energies Act, (Erneuerbare Energien Gesetz – EEG),[300] came into effect in January 2023 and, according to the then German Federal Government, represents 'the biggest amendment to energy legislation in decades'.[301] The key goal of the EEG is to increase the share of renewable electricity consumption in Germany to at least 80% by 2030, and to 100% by 2035, with an ambitious goal to ensure the country's almost complete independence of fossil fuels in electricity supply. EEG sets out more favourable conditions for wind energy (higher financial participation of municipalities), solar energy (higher remuneration rates for new photovoltaic systems that are installed on rooftops), and energy storage (for example, by providing funding for innovative concepts for combining renewable energy sources with local hydrogen-based electricity storage).

In the biogas sector, operators of combined heat and power (CHP) plants using biomethane can receive subsidies per kilowatt-hour of electricity if they prove that an equivalent amount of biomethane has been fed into the gas grid. This support is granted for 20 years from commissioning and is dependent on compliance with technical and documentation standards, such as heat utilisation and feedstock tracking. According to the Deutsche Energie-Agentur (German Energy Agency, Dena), a federally-owned German company which provides services to design and implement the Federal Government's energy and climate policy goals, all newly built biomass power plants are required to take part in an annual tendering process. In this system, operators must submit bids to determine the specific subsidy rate they will receive, calculated as a market premium. The rules apply uniformly for all plants over 150 kWh, with no distinction based on feedstock type, or technology used. As a result, all biomass-based electricity generation technologies will compete

directly against one another. A major policy shift is also underway: funding is gradually being redirected from biomass to biomethane. Biomass tender volumes will decline steadily, dropping from 600 MW in 2023 by 100 MW each year, reaching 300 MW by 2026. Meanwhile, the capacity offered for biomethane tenders will grow, reaching 600 MW in 2026.[302]

Additional regulations include a "maize cap" limiting the share of maize and cereal grains in feedstocks to 35% in 2025, which will drop to 30% by 2026, and then to 25% in 2027[303]. These restrictions are facing opposition from the farmers and industry associations. Thus, the Bavarian Farmers' Association (BBV) is calling for it to be raised back to 40%, while the bioenergy industry also opposes limiting corn use.[304]

The limitation appears to be in line with the EU Taxonomy Regulation, which strictly requires that food and feed crops are not used for the manufacture of biofuels. At the same time, the EEG encourages manure fermentation, providing, for example, specific support for small slurry systems.[305] Limiting the use of crops, though definitely beneficial in terms of land use, may create additional demand for other feedstocks. Given that many of them are less efficient in energy content, installations may require even larger volumes of such feedstocks, including manure.[306]

Furthermore, new biomethane plants with a capacity of 10 MW or more must be hydrogen-ready by 2028, aligning with Germany's broader transition toward hydrogen as a renewable energy carrier.

Even though the EEG appears to be overall supportive of biogas in general, and particularly to its upgrading into biomethane, industry groups are advocating for even more generous and long-lasting incentives, even claiming that "[it was] ...completely incomprehensible that in the middle of [the] far-reaching energy crisis, a sustainable domestic energy source such as biogas [was] being curbed in the production of electricity, heat, and biomethane".[307]

4.4.3. Biomass Electricity Sustainability Ordinance and Biofuel Sustainability Ordinance

The Biomass Electricity Sustainability Ordinance (BioSt-NachV) was adopted to implement the previous version of the EU RED. Currently, BioSt-NachV in the version of December 2, 2021, is in force.[308] The ordinance established a certification system designed to ensure that the production and processing of biogas adhere to strict ecological and social sustainability standards. In the electricity sector these requirements apply to biogas plants with a total rated thermal input of 2 megawatts or more. These requirements include criteria for the sustainable sourcing of biomass, such as excluding material from land with high biodiversity value or significant carbon stocks. In addition, the electricity produced from these fuels must achieve a minimum greenhouse gas savings of 70 or 80 percent, depending on the plant's commissioning date. Compliance with these requirements must be documented through an electronic sustainability certificate.[309]

The Biofuel Sustainability Ordinance (Biokraft-NachV) implements the European Union's sustainability standards in the biofuel sector. Only biofuels produced sustainably, as specified in the Biofuels Sustainability Ordinance, should qualify for inclusion in the greenhouse gas reduction quota. To be eligible, biofuels must meet certified standards for protecting ecologically sensitive habitats and maintaining sustainable agricultural practices in biomass cultivation. Additionally, the entire production process must demonstrate a greenhouse gas emission reduction of at least 70% compared to fossil fuels.

In Germany, sustainability certifications are overseen by the Federal Office for Agriculture and Food (BLE), which currently manages these certificates through the Sustainable Biomass System (Nabisy). Nabisy is planned to be replaced by the Union Database for Biofuels (UDB), an EU-level system aligned with the Renewable Energy Directive, with the primary purpose of preventing double-counting of sustainability attributes in cross-border trading of certificates. UDB is currently operational and serves as the centralised system for sustainability certification and traceability of biofuels across EU member states. It was launched by the

European Commission in 2023 and has been fully operational since November 21, 2024, covering both liquid and gaseous renewable fuels, and enabling comprehensive traceability throughout the supply chain from the origin of raw materials to the final fuel placed on the EU market. As of April 2025, the BLE continued to manage sustainability certificates through the Nabisy system;[310] it remains unclear when integration with the UDB will be finalised.

4.4.4. Gas Network Access Ordinance

The Gas Network Access Ordinance (Gasnetzzugangsverordnung – GasNZV) is a German federal regulation that governs access to gas supply networks. Initially adopted in 2005, it was revised in 2010, effective from September 9, 2010. Article 33 of the GasNZV ensures that biogas has a priority grid connection. Thus, grid operators at all pressure levels must give priority to connecting biogas producers to the gas grid immediately upon request, and must also bear most of the grid connection costs (75%), while the biogas feeder is required to cover the remaining 25%. According to the Dena, "[...] the costs for the grid connection and the first kilometre of the connecting pipeline are capped at a maximum of EUR 250,000 for the biogas feeder. The grid operator cannot refuse the feed-in of biogas in accordance with Section 34 (2) sentence 2 GasNZV with reference to existing capacity bottlenecks in the grid".[311] Beyond receiving priority for grid connection, biomethane producers are also granted preferential access to the gas network. Network operators are required to prioritise entry and exit contracts with customers transporting biomethane, as long as the gas is compatible with the existing infrastructure. Additionally, operators must make all economically viable efforts to optimise the network's technical capacity and maintain a minimum availability of 96%.[312]

4.4.5. Global Methane Pledge

At COP26 in 2021, Germany committed to the Global Methane Pledge (GMP), signalling its intention to intensify efforts to cut methane emissions on a global scale. As a GMP Champion (member of a small group of countries leading international methane efforts and strengthening domestic methane mitigation efforts),[313] Germany works alongside participating and prospective countries to promote stronger international methane reduction measures. Domestically, beyond aligning with European climate targets and related policy tools, Germany has outlined a national strategy for cutting greenhouse gas emissions through its Federal Climate Change Act. This legislation mandates a reduction of at least 65% in total greenhouse gas emissions, including methane, by 2030, and a minimum of 88% by 2040, compared to 1990 levels. The ultimate goal is to reach greenhouse gas neutrality by 2045. Post-2050, the country aims to achieve a negative emissions balance. A key challenge moving forward will be the effective management of remaining methane emissions, which must be addressed in the near term.[314]

4.4.6. Other relevant legislation

Other relevant regulations include the Renewable Energies Heat Act (EEWärmeG) and Building Energy Act (GEG).

The Renewable Energies Heat Act was introduced in Germany in 2009. Its main goal was to increase the use of renewable energy sources for heating and cooling in buildings. Biogas and biomethane were officially recognised as renewable energy sources under the law. This means using biogas/biomethane to produce heat counts toward meeting the requirements of the EEWärmeG. Owners of new buildings had to cover part of their heat demand with renewable energy, or take equivalent measures (like extra insulation). Using biogas or biomethane (for example, biogas in a CHP — combined heat and power — unit or a boiler, and biomethane in heating when its directly injected into the gas grid) could fulfil these obligations. To promote the uptake of renewable energy, the law envisaged support programmes, with EUR 500 million in funding

available annually at the initial stage in 2009-2012.[315] The EEWärmeG was merged into the broader Building Energy Act (GEG) in 2020, so it's no longer a standalone law. But the fundamental principles, including promoting biomethane and biogas for heating, remain under the GEG.

- According to the International Energy Agency, "In 2023, the German Federal Government approved amendments to the Building Energy Act [GEG] for new heating systems to use at least 65% renewable energy from 2024 onwards and for fossil fuels to phase out from heating by January 2045 in line with its climate-neutrality target. The ban will initially apply to new buildings, while existing buildings will still be allowed to use a gas system until the deadline for municipalities to submit a heat plan (2026 for large cities and 2028 for towns). New gas boilers will continue to be allowed to be installed, if these boilers are operated with renewable gas, including hydrogen and biomethane".[316] The following requirements are set for biomass and biogas: A maximum of 40% cereal grain or maize may be used.
- Recording must be done in a mass balance system.[317]
- As the new government is planning to abolish the Building Energy Act (GEG), there is considerable uncertainty about what the future framework will look like. It remains unclear whether the 65% renewable energy requirement will withstand these reforms. The government's announcement of a 'technology-neutral approach' suggests, however, that thresholds for the use of biomethane may be eased rather than tightened.

4.5 Support schemes and market mechanisms

In Germany, incentives for biogas and biomethane are structured primarily through the EEG and recent biomass/biomethane-specific support, aiming to make installations more flexible, sustainable, and grid-compatible. First, the EEG guarantees preferential access to the grid and long-term remuneration. Plants generating electricity from biogas receive a fixed tariff, or, since the 2014 and 2017 reforms, a combination of market premium and auction-based support, with payments over 20 years. Small installations (under 150 kW electric) can still benefit from straightforward feed-in tariffs, helping farms and small operators secure a stable return.[318]

Recognising the shifting energy landscape, Germany recently introduced a flexibility bonus to reward biogas plants capable of adjusting generation to match fluctuations in wind and solar feed-in. Originally EUR 65 per kW, this bonus has been increased to EUR 100 per kW annually. To qualify, plants must operate flexibly and, if electricity prices are low (below EUR 0.02/kWh), subsidy payments are suspended, ensuring prioritisation of grid stability and renewable balancing.[319]

4.5.1. Subsidies and grants financing

Germany has supported biogas for electricity generation since 2004, initially through an open-access Feed-in Tariff (FiT) scheme and now via tendering.[320] This FiT scheme, introduced with the Renewable Energy Sources Act (EEG) in 2000, guaranteed a premium 20-year price for biogas-derived energy, which significantly boosted the German biogas sector.[321] However, by 2020, many pioneer projects began losing their guaranteed FiT, posing challenges for biogas power production, primarily by farmers.[322] This led to a decrease in the overall number of biogas plants for the first time in 2020, a trend expected to continue as more plants exit the FiT arrangement. While larger plants can compete in government auctions and flexible biogas producers can receive a premium, few have participated in auctions so far.

Although biogas subsidies were initially set to end in 2024, the Bundesministerium für Landwirtschaft, Ernährung und Heimat (BMEL) confirmed in February 2025 that it would secure funding for existing biogas plants.[323] The BMEL stated that the Federal Office for Agriculture and Food (BLE) publishes European Agricultural Fund for Rural Development payments per beneficiary, though out of the companies in scope considered in the research, only DAH Group received funding in 2023 or 2024.[324] As can be seen in Table

12, most of the subsidies provided by the EU Agricultural Fund payments are to companies not related to biogas. However, the information provided in Table 12 is biased since the EU Agricultural Fund does not present categorisations of the type of companies funded or the use of proceeds of the funds provided. As a consequence, Table 12 presents the grouping for "Biogas related (potentially)" based solely on company names containing "biogas" (or a similar wording). This implies that there might be several companies that do not have biogas in their company name but that are involved in biogas-related projects.

Table 12. EU Agricultural Fund subsidies for biogas companies in Germany

Year	Subsidies (EUR mln)	% of all German subsidies of the Fund
2023	1,748	24.8%
2024	4,562	17.0%

Source: *Own elaboration based on information from the European Agricultural Fund for Rural Development.* [325]

In February 2025, the German Parliament amended the Renewable Energy Sources Act, significantly increasing tender volumes for biomass, particularly in 2025 and 2026. This amendment, coupled with a substantial increase in the flexibility premium and an extension of the follow-up subsidy for existing plants from ten to twelve years, aims to incentivise investments in flexible electricity supply and improved heating networks. The goal is to optimise funding for system-supporting, flexible electricity generation from biomass and enhance planning security for existing biogas plants, especially those connected to municipal heating grids. Future biogas use will primarily focus on offsetting fluctuations in wind and solar energy, with funding limited by operating hours and suspended during periods of low electricity prices. To encourage this demand-based operation, the flexibility surcharge has been significantly raised from EUR 65 to EUR 100 per kilowatt per year. [326]

4.6 Final remarks

Germany is a leader in biogas production both in the EU and globally, with about 10,000 plants and significant technical potential for expansion of biogas production and upgrading it to biomethane. This potential, however, can hardly be considered sustainable because of its reliance on Germany's massive livestock industry (ignoring the imperative to limit it to meet the climate and dietary goals) and energy crops.

Despite the 'potential' cited by policymakers and industry associations, the development of the biogas industry has been slowing down, with less raw biogas plant capacity added each year. This could be partially attributed to the mixed attitudes towards biogas in the EU and German legislation. Though both EU and national-level regulations treat biogas positively, the policy focus has shifted from stimulating new production to making plants more flexible and to upgrading biogas to biomethane for grid injection and use in transport. After decades of overly favourable conditions, biogas is being treated with a more market-based approach, and more stringent environmental requirements are applied. At the same time, biogas is still treated as a sustainable alternative, in particular, as a transport fuel, and is prioritised in grid connection for the electricity and gas grids, leading to dangerous lock-in effects in the fossil infrastructure.

Biogas production and utilisation have also raised a number of environmental and ethical concerns, including the controversial use of food and feed crops for production (more than half of the feedstock is based on such crops, predominantly maize), incentivising unsustainable large-scale animal farming (and the ensuing climate change, animal welfare, and healthy diets impacts), and human health risks due to ammonia emissions and biogas impurities. Though these concerns are partially covered by general legislative frameworks, they are not sufficiently addressed in biogas-specific regulations, creating a policy gap that needs to be addressed.

CHAPTER 5.

Biogas in Ireland

The biogas market in Ireland is in the early stages of development; therefore, specific on-the-ground environmental impacts of biogas production have not yet been experienced or documented. At the same time, the Irish Government considers biogas to be an important component of the country's economic development and energy security, committing to supporting the delivery of up to 5.7 TWh of indigenously produced biomethane by 2030 (approximately 572 million m³ of upgraded biomethane) under the recently published National Biomethane Strategy. The Government is also planning to use some of the EUR 988 million in grants that it expects to receive under the EU's Recovery and Resilience Facility to that end. With these massive expansion plans and ample state support, any environmental and social risks of biogas development should be carefully considered.

5.1 Market overview

5.1.1. Volume and structure

Currently, biogas plays a limited role in Ireland's energy consumption, with just about 1% across all use cases. The Sustainable Energy Authority of Ireland (SEAI) reports that as of 2023, biogas accounted for 0.05 TWh of electricity production, or about 0.2% of all generation.[327] According to IEA Bioenergy, certain amounts of biogas are "[...] now also upgraded to biomethane to be injected into the fossil gas grid – in 2022, this represented less than 0.1% of gas consumption from the grid."[328]

Biogas production has also been relatively stable between 2010 and 2022, at around 2.2 PJ (87 - 111 million m³) annually.[329] According to Energy Ireland, as of October 2024, alongside Ireland's 2 biomethane plants, there were over 40 AD facilities which produced a total of 580 GWh (82.9 to 105.5 million m³) of biogas.[330] IEA Bioenergy provides a higher estimate (see Table 13).

Table 13. Biogas production in Ireland, 2024

Plant type	Number of plants	Share (%)	Production (GWh/year)	Production (million m3/year)	Share (%)
Wastewater treatment plants	15[3]	20.5	n.d.	n.d.	n.d.
Bio-waste	3	5	30.7	4.0 - 6.0	4.1
Agricultural	12	20	56.0	7.5 - 11.2	7.4
Industrial	4	7	76.2	10.2 - 15.2	10.1
Biomethane	3	5	2.8	3.7 - 5.6	3.0
Landfill	22	37.5	566.8		75.3
Total	59		752.4	100.3 - 150.4	

N.D. *= no data;* [a] *Data difficult to obtain*

Source: *IEA Bioenergy (2024), A perspective on the state of the biogas industry in 12 member countries of IEA Bioenergy Task 37, Paris, France: IEA Bioenergy, p. 36.*

Currently, most of the biogas production in Ireland is related to landfills (over 75%), followed by industry-based feedstock (10.1%) and agricultural-based products (7.4%). With less than 60 plants in total, Ireland lags far behind many other EU states and the UK, where Northern Ireland alone currently has almost 80 AD plants in operation.[331]

However, the currently modest production and consumption figures and the small number of production facilities are expected to rise dramatically, as the Irish Government's plan of 5.7 TWh/year of indigenously produced biomethane by 2030 (approximately 570 million m^3/year of upgraded biomethane) will likely require the construction of over 200 agriculture-based AD plants between 2025 and 2030.[332]

Biogas usage is gradually shifting from being solely dedicated to electricity generation toward combined heat and power (CHP) plants, as well as applications in industry and services, including as fuel for heavy vehicles. A small amount of biogas is now also upgraded to biomethane and injected into the fossil gas grid (as of 2022, this accounted for less than 0.1% of grid gas consumption).[333]

5.1.2. Main biogas companies

Compared to fossil gas, biogas plays only a minor role in Ireland's energy mix. Combined, the various applications of biogas account for just over 1% of total gas consumption. However, its usage is gradually shifting from being solely dedicated to electricity generation toward combined heat and power (CHP) plants, as well as applications in industry and services, including as fuel for heavy vehicles. A small amount of biogas is now also upgraded to biomethane and injected into the fossil gas grid (as of 2022, this accounted for less than 0.1% of grid gas consumption).[334] At the same time, several major development plans for new biogas projects have been announced, notably by Greengate Biogas, CycleØ Group, and Heygaz Biomethane. The selection has been made based on the installed or planned capacity. In addition, projects in liquified biogas as a fuel, as well as equipment producers, have been considered.

Table 14. Main biogas companies in Ireland

	Company	Annual production or capacity	Estimated biogas supply (in mln m3/yr)	Type	Notes	Feedstock	Source
1	Greengate Biogas	1.8 TWh biomethane (planned)	288.9	Producer	The plant will process up to 700,000 tonnes of agricultural residues to produce approximately 250 GWh of biomethane and to capture 30,000 tonnes of biogenic CO_2 per annum.	Cattle and pig slurry, farmyard straw manure and poultry manure	335
2	CycleØ Group	160 GWh biomethane (planned)	25.7	Producer / Developer	Plans to invest 100 mln EUR to build 4 new agri-based biogas plants across Ireland	Slurry, manure and agri-waste	336
3	Heygaz Biomethane	80 GWh installed 50 GWh planned, biogas	20.8	Producer / Developer	Operates and develops 20+ biogas assets in 5 countries (Spain, Portugal, Ireland, Greece, Norway),	No data	337
4	Bia Energy	5 MW / 120 GWh biomethane	19.3	Producer	Owns and operates an AD plant close to both Dublin Port and Airport. The plant has an electrical grid connection for up to 5 MW and will soon have the capacity to produce over 120 GWh of Biomethane per year.	Short-dated and surplus packaged food from retail, hospitality, agriculture and food producing sectors	338
5	GreenGas AD Plant	1 MW / 2.4 mln m^3 biogas	2.4	Producer	Currently GreenGas AD Plant produces over 2.4 mln m^3 biopgas to produce electricity and heat through use of a high efficiency combined heat and power unit (CHP).	Manure and slurry from poultry and dairy farms	339
6	Carbon AMS	8,450 kW/h[2]	2.2	Producer & developer	Involved in the operation, maintenance, and management of 22 plants.	Grass silage, whole crop hybrid rye, beef cattle slurry, sugar beet, distillery waste	340
7	Stream BioEnergy	3 MW biogas	0.8	Producer	The plant processes 40,000 tonnes per annum of chicken litter, and in doing so produces 3 MW of renewable electricity, enough to power 6,000 homes.	Chicken manure	341
8	Nephin Renewable Gas (NRG)	n/a	n/a	Producer / Developer	NRG's ambition is to become Ireland's leading biomethane development company	No data	342
9	Flogas	n/a	n/a	Producer	Flogas, part of DCC plc, the first Bio-CNG refuelling station in Ireland, with a capacity of 50 HGVs/d.	No data	343
10	Irish Industrial Tanks	n/a	n/a	Equipment producer	Provides AD modular bolted storage and containment solutions for biogas industry	Not applicable	344
11	ClonBio Group	n/a	n/a	Producer	Involved in producing renewable biogas and advanced biomethane,	No data	345

Source: *Data from multiple sources (see the last column). For conversion factors used, see Appendix 1.*

5.1.3. Contribution to the economy

Though the data on the current economic contribution and employment in the biogas industry in Ireland is not readily available, the SEAI states that in the long term, the sector will likely account for an estimated 3,000 permanent jobs by 2050, as well as for around 5,000 jobs in the construction phase.[346]

Forecasts for the input of the biogas industry into Ireland's GDP by 2050 also varies, depending on different scenarios. According to the SEAI, the estimated contribution made to GDP by the biogas and biomethane industry operations (measured as Gross Value Added, GVA) could make up between EUR 32 million and EUR 400 million annually by 2050 in direct effects. In terms of indirect effects, depending on different scenarios, the contribution may reach from EUR 9 million to EUR 16 million or from EUR 108 billion to EUR 199 billion.[347]

In terms of international trade, biogas in Ireland remains a closed-loop domestic resource, with no export/import activity yet. The absence of trade is explained by the currently very low domestic production, and the absence of facilities to produce liquified biogas (or bio-LNG) to be transported by marine vessels. When – and if – Ireland's ambitious biogas plans are realised, such infrastructure may also be put in place to facilitate international trade in biomethane, in addition to the two existing underwater pipelines connecting Ireland to Scotland and the Isle of Man.

5.1.4. Development trends

To support the delivery of up to 5.7 TWh (572 million m^3) of indigenously produced biomethane by 2030, as outlined in the National Biomethane Strategy (see section 5.4.3), a vast biogas market needs to be developed. To assess the potential production capacity and the willingness of the market players to participate in this endeavour, Gas Networks Ireland, the semi-state body responsible for operating, developing, and maintaining Ireland's national gas distribution and transmission network, conducted a feasibility study, by sharing in 2022/23 a Biomethane Request for Information (RFI). Though the underlying idea was to "[...] assess the future infrastructure requirements for biomethane integration into the gas network", the RFI results also provide a valuable insight into the actual potential for biogas plants development. In total, 176 responses were received, with a total potential capacity of 14.8 TWh (1.48 billion m^3) of biomethane production by 2030 across the country – almost twice as much as envisaged in the National strategy. The median plant size of these prospective production plants has been estimated at 40 GWh.[348]

Teagasc – Ireland's Agriculture and Food Development Authority, the national body providing integrated research, advisory and training services to the agriculture and food industry and rural communities – provides the following estimates of the amount of feedstock for an average plant (which is estimated to be a 20 GWh (2 million m3) facility, much smaller than the 40 GWh (4 million m3) median plant envisaged by the GNI): "A 20 gigawatt hour (GWh) biomethane plant would require about 37,000t of feedstock. About 60% of that would be crops and 40% would be animal slurry. Around 400ha to 500ha of land would be required to grow that crop. A 20GWh plant would require 4% of the feedstock from the land in a 10km radius around it. An estimated land area of 120,000ha will be needed to produce grass silage to feed the digesters [and] this is circa 3% of the total agricultural area. In addition, winter slurry from 1,300,000 cattle will be required which represents 20% of all winter cattle slurry produced in Ireland".[349] The calculations are made based on the Government-supported target of 150 to 200 operational AD plants by 2030.

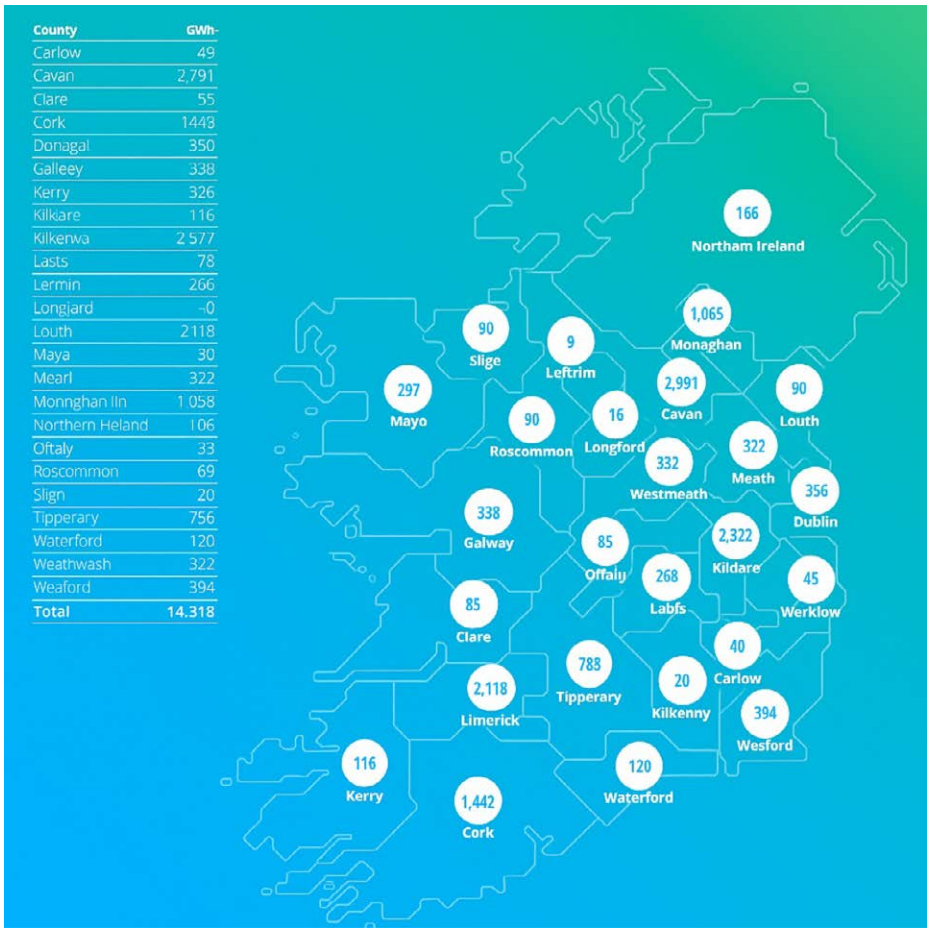
Gas Networks Ireland survey also provides an insight into the types and shares of feedstocks that the prospective plants are planning to use in biogas production as shown in Table 15.

Table 15. Prospective use of feedstock by type, 2024

Feedstock type	Share
Animal slurry	38%
Forage (silage, multispecies)	28%
Other crops	14%
Commercial biodegradable materials	11%
Processing by products	8%
Other	0%
Total	99%

Source: *Gas Networks Ireland (2023), Biomethane Energy Report, Cork, Ireland: Gas Networks Ireland, p. 31*

The use of animal slurry, silage, and 'other crops' indicated by many of the prospective biogas producers may mean that these development plans will also support the country's already significant livestock industry, conserving the animal protein-rich dietary patterns which are unsustainable in the long run, and creating competition between food and energy crops in a world where hunger and malnutrition are still to be overcome. These challenges will need to be addressed and mitigated for in the expansion of the biogas sector in Ireland.



Networks Ireland, p. 21

Figure 15. Potential biogas capacity in Ireland by 2030, by county (GWh)

Source: *Gas Networks Ireland (2023), Biomethane Energy Report, Cork, Ireland: Gas*

5.2 Sustainability concerns

The biogas market in Ireland is in its early stages of development; as a result, concrete environmental impacts from biogas production have yet to materialise or be documented. However, with the launch of the ambitious National Biomethane Strategy in 2024 (see 5.4.3) it is essential that potential environmental and social risks associated with biogas development are carefully assessed from the outset.

Many Irish NGOs and community groups, including An Taisce – The National Trust for Ireland, one of Ireland's oldest and largest environmental organisations, are concerned about the potential externalities of biogas production, underlying that the country's pasture-grazed system is likely not suitable for large scale production of biogas via AD, and stressing that "[...] fugitive methane losses in leakage from AD plants and from digestate spreading [...] can cancel out much of the claimed climate benefits."[350] Such emissions are often associated with conventional open slurry tank storage,[351] typical of older technology or early-generation biogas plants. Plants that have been designed more recently, or are currently being constructed, usually ensure that digestate storage is gas-tight covered, and hence pose much less risk of storage-related fugitive emissions.[352] An Taisce also raises a number of other science-based concerns, including the risk of increased nitrogen volumes (and the subsequent soil health and water quality issues, including impacts on aquatic biodiversity). In addition, it states that since the national strategy does not explicitly prohibit the use of grain and maize as feedstock, a shift to the production of energy crops for the planned AD plants may undermine Ireland's food security.[353]

Other environmental groups are also voicing their concerns about the potential negative impacts on the rural environment and local communities. The National Biogas Concern Group Ireland (NBCG), a coalition of grassroots community organisations across Ireland that advocate for stricter environmental, planning, and safety regulations on industrial-scale anaerobic digestion (biogas) plants to protect rural residents, wildlife, natural resources, and compliance with European law, envisages the following risks:

- Industrial sites in rural communities that lack appropriate infrastructure (e.g. roads, alternative water supplies, emergency response)
- Increased traffic on rural roads that are neither wide nor ready for heavy loads, with impact to the local community using them (e.g. cycling, walking, running)
- Health and Safety concerns due to proximity to residential dwellings
- Potential for water and air pollution, with an impact on biodiversity
- Lack of transparent and open engagement with local communities.[354]

Lack of community engagement and insufficient public awareness and acceptance of new AD plants in Ireland is also highlighted by local groups opposing specific projects, for example, the Gort Biogas Concerns Group (GBCG). The group has been trying to block the planned biogas plant in their community, claiming that the "[...] size, scale and location of this plant would negatively impact all aspects of life in Gort and bring no recognisable benefits for local residents."[355]

Concerns voiced by NBCG, GBCG, and similar groups are substantiated, fact-based and motivated by community and environmental protection, however their framing tends to emphasise worst-case or under-regulated scenarios. Therefore, their science-led criticism does not mean biogas is fundamentally flawed, but it warns that without stronger oversight, adverse outcomes are likely. In addition, acceptance by local communities is an essential part of the biogas businesses' social licence to operate.

Irish governmental institutions have also raised concerns about the potential environmental and health-related issues of the biogas industry. In 2024, the Environmental Protection Agency (EPA) stated that there are additional concerns associated with the use of biosolids resulting from the AD process that should be taken into account, including the presence of pathogens, microplastics, PFAS chemicals, and other contaminants. Furthermore, the management and regulation of organic fertilisers and biosolids currently raise important issues for both environmental protection and public health.[356]

5.3 Implementation of EU policies

5.3.1. REPowerEU

Ireland has been allocated EUR 914 million in grants for its NRRP, which consists of 16 investment projects and nine reform commitments.

Ireland's first NRRP was published in 2021[357] and covered three main priority areas:

- Advancing the Green Transition;
- Accelerating and Expanding Digital Reforms and Transformation; and
- Social and Economic Recovery and Job Creation.

Following Council approval of the plan on 8 September 2021, Ireland's NRRP was updated on 21 June 2024 to introduce a REPowerEU chapter.[358] The last version of the plan included 19 investment streams and 11 reforms, for a total value of EUR 1,163 million (EU grants and national resources combined). Many of these investments will aim to accelerate the deployment of renewable energy sources, including the production of biomethane through a dedicated strategy (see 5.4.3) and capital grant scheme.

5.3.2. EU Renewable Energy Directive

As of 15 May 2025, the EU Renewable Energy Directive (RED III) has not yet been fully transposed into Irish law. Ireland is also one of 26 EU states that have been sent letters of formal notice for failing to fully transpose the directive into national law.[359] Subsequently, the European Commission issued a reasoned opinion highlighting gaps in Ireland's transposition, particularly regarding guarantees of origin and sustainability criteria for biofuels, bioliquids, and biomass fuels.[360]

5.3.3. EU Regulation on animal by-products not intended for human consumption

In the EU, organic waste treated in AD facilities and the subsequent handling of digestate must comply with strict rules to avoid the risk of transmitting diseases to humans or animals.

In Ireland, the legislation also attempts to reduce the spread of disease by introducing alternative pasteurisation standards: the national processing standard of heating to 60°C or above for 48 hours twice; or an operator's own pasteurisation standard, provided it achieves all conditions laid out by EU/national legislation and has been validated.[361]

The Animal By-products Regulations (ABPR) require slurry imports in excess of 5,000 tonnes wet weight from other farms to be pasteurised.[362] The pasteurisation step can be seen as an economic challenge as it increases the capital and operational costs of the plant and requires additional heat energy; this can act as a disincentive to importing slurry quantities of more than 5,000 tonnes. The SEAI also outlines that this rule could represent an obstacle to the development of co-op or community digesters, "[...] which due to the structure of the Irish agricultural sector where there are a large number of small farms, may be necessary to access sufficient quantities of feedstock for an AD plant."[363]

Overall, pasteurisation requirements for animal by-products can create an incentive to use energy crops rather than manure in anaerobic digestion plants in Ireland, despite the latter offering greater climate benefits in terms of GHG emission reduction, if done with the necessary safeguards.

5.3.4. EU Nitrates Directive

As mentioned in section 2.3.7, Ireland is one of three European countries that has a derogation under the EU Nitrates Directive. The derogation in place since 2007 allows certain farmers to apply livestock manure nitrogen at rates up to 250 kg N/ha/year, instead of the default 170 kg N/ha/year limit.[364] A new derogation was granted for 2022–2025, under stricter environmental conditions following concerns about declining water quality. In 2023, due to water quality trends, the European Commission introduced stronger measures for the protection of water quality.[365]

On 19 April 2024, the European Commission opened a public consultation on revising Annex III of the Nitrates Directive, a proposal to which many NGOs have expressed concerns (see section 2.3.7).[366]

If Ireland implements a RENURE policy, it could classify certain treated manures (like digestate from biomethane production) as "mineral fertilisers" rather than organic manures. This would remove current restrictions linked to the 170 kg/ha organic nitrogen limit and make it easier for farmers to substitute chemical fertilisers with digestate, particularly on farms that do not produce enough organic manure themselves. This could reduce reliance on synthetic fertilisers but may also lead to significant water pollution if not managed sustainably. As detailed elsewhere in the report, ensuring the post-composting of digestate (what remains of the feedstock after biogas production) before its application on land to reduce nitrogen run off and water pollution is essential.

5.4 National policy and legislative framework

5.4.1. Climate Action and Low Carbon Development (Amendment) Act 2021

Ireland's Climate Action and Low Carbon Development Act embeds the process of setting binding emission-reduction targets in law. Specifically, the Act establishes the framework for Ireland to meet its international and EU climate commitments, aiming for net-zero emissions by 2050 and a 51% reduction in emissions by 2030, relative to a 2018 baseline.

According to the Act, the government must adopt carbon budgets that are consistent with the Paris Agreement and other international obligations. All forms of GHG emissions, including biogenic methane, will be included in the carbon budgets, and carbon removals will be taken into account in setting budgets. However, it is up to the government to decide on the trajectories for different sectors.[367] The Act stipulates that measures to be implemented for each sector will be detailed in a Climate Action Plan, which must be updated annually.

To meet these national targets, Ireland has implemented sector-specific emissions ceilings defined in a Climate Action Plan, which sets maximum allowable emissions for key sectors.

Ireland's latest Climate Action Plan 2025[368] was published in April 2025 and details targets and measures for "high-impact sectors", including electricity, the built environment, transport, agriculture, and industry.

More information on sectoral targets[369] and on the potential for biogas contribution are summarised in Table 16.

Table 16. Sectoral 2030 GHG reduction targets in Ireland and potential opportunity for biogas contribution

Sector	Target (baseline 2018)	Potential for biogas to contribute
Electricity	75% reduction in GHG emissions by 2030	Upgraded biogas (biomethane) can be co-fired in gas turbines or used in dedicated combined[3] heat[3] and[3] power (CHP) units to provide renewable electricity alongside wind and solar.
Built environment	Residential: 40% reduction in GHG emissions by 2030 Non-Residential: 45% reduction in GHG emissions by 2030	Biomethane can fuel boilers and small district[3] heating networks, reducing reliance on oil and fossil gas.
Transport	50% reduction in GHG emissions by 2030	Biomethane can be used as a transport fuel to decrease reliance on fossil fuels. The plan identifies fleet electrification and biofuels as essential enablers to reach this target."[370]
Agriculture	25% reduction in GHG emissions by 2030	Digestate, a nutrient-rich by-product of the anaerobic digestion process, can be used as a biofertilizer, reducing the demand for synthetic, mineral fertilisers, whose production is energy-intensive and carbon-intensive
Industry	35% reduction in GHG emissions by 2030	Biomethane can be used as a renewable option for high-temperature industrial heat and fuel switching in the cement sector

Source: *Gov.ie (2025, April 15), "Government approves Climate Action Plan 2025", online: https://www.gov.ie/en/department-of-climate-energy-and-the-environment/press-releases/government-approves-climate-action-plan-2025/, viewed in June 2025.*

In the Climate Action Plan, biogas (upgraded to biomethane) is qualified as a renewable energy source with the potential to contribute to the decarbonisation of heat, power and transport.

The Climate Action Plan 2025 mentions some key actions already taken by the government in 2024 to accelerate the development of the biomethane sector including:

- The publication of the National Biomethane Strategy (see 5.4.3);
- The launch of grant aid towards the biogas sector (see 5.5); and
- The reopening of the Organic Farming Scheme.

In addition, the Climate Action Plan lists some measures and actions that will support the delivery of Ireland's climate action ambition. These measures include the production of up to 1 TWh (100.3 million m^3) of biomethane energy by 2025 and the construction of 20 large AD plants by 2025 and up to 200 by 2030.[371]

The Irish Strategic Investment Fund has established a EUR 200 million dedicated biomethane fund, and the Renewable Gas Forum Ireland, the national industry coordination and advocacy body for non-fossil gas has made a submission to the Government for EUR 100 million funding through 2025. The government recently allocated EUR 3 million in state investment in budget 2023 to help reach a target of 150–200 operational anaerobic digestion plants by 2030.[372]

However, most of these public investments are directed at industrial-scale AD facilities, designed to mobilise large-scale private capital and supply biomethane into the national gas grid.[373] This illustrates the fact that the government's current strategy is focused on creating a viable market for commercial developers, rather than enabling farmers to invest in community-shared or farm-scale plants.[374]

5.4.2. National Energy and Climate Plan (NECP 2024)

The first Irish NECP was published in 2019 and was updated in July 2024.[375] It collates the policies, measures and actions related to energy and climate outlined in a range of government plans, such as the Climate Action Plan, the National Development Plan, and Project Ireland 2040, into one cohesive document.[376] The NECP covers five dimensions of the EU Energy Union: decarbonisation, energy efficiency, energy security, internal energy markets and research, innovation and competitiveness.

The plan recognises biogas (and more specifically, biomethane) as a solution that can contribute to the reduction of greenhouse gas emissions. The first NECP reaffirmed an indicative target for indigenous biomethane production at 1.6 TWh (160.5 million m^3) by 2030 which was initially mentioned in the 2019 Climate Action Plan. This target was revised upwards at 5.7 TWh (572 million m^3) by 2030 in 2024 at the launch of the National Biomethane Strategy (see 5.4.3).[377]

The NECP also discusses the Renewable Transport Fuel Obligation (RTFO), which mandates a certain percentage of renewable fuels in transport energy (for more information on RTFO see 5.5.3). At the same time, the plan highlights two main obstacles to the achievement of the renewable energy share in transport in Ireland:

- the EU RED limit of 2% on supply of biofuel and biogas from food and feed crops and;
- the limit in Ireland on the supply of biofuel from high indirect land use change (ILUC) risk feedstock at 2019 levels and a linear reduction to 0% by 2030.[378]

5.4.3. National Biomethane Strategy

In May 2024, Ireland launched its National Biomethane Strategy,[379] the first major policy statement on biomethane, representing an important milestone in the development of an indigenous sector.

The Strategy was finalised after a public consultation on its draft, which took place between January 2024 and March 2024.[380]

The primary objective of the National Biomethane Strategy is to support the delivery of the government's target of up to 5.7 TWh (572 million m^3) of nationally produced biomethane by 2030, set as part of its climate action plan.[381] This target aims to cover approximately 10% of the country's gas demand.[382]

The then Minister for Agriculture, Food and the Marine, Charlie McConalogue, highlighted the strategy as an opportunity for farmers to diversify their income by allocating agricultural land not only for food production but also for renewable energy projects, positioning agriculture as a key player in Ireland's renewable energy transition.[383]

The SEAI identified that in terms of employment, between the construction and operation of AD plants in its 'Increased Biomethane' scenario,[2] approximately 3,000 jobs could be created in the rural economy in Ireland.[384]

Beyond income diversification opportunities for farmers and job creation in rural areas, the strategy also emphasises the role of biomethane in helping Ireland to:

- Meet its legally binding climate targets;
- Reduce emissions in the agriculture and energy sectors;
- Promote the replacement of chemical fertilisers with biobased alternatives; and
- Enhance gas security and diversification of supply.

2 Increased injection of biomethane into the gas grid utilising the most accessible and least cost injection points.

The National Biomethane Strategy sets out the necessary policy and regulatory measures and provides a roadmap for developing a large-scale biomethane industry in Ireland. The strategy is described as "[...] agri-led and farmer-centric with a focus on the supply of suitable feedstocks, including animal slurries."[385]

The Strategy sets out twenty-five key strategic actions across five pillars, including: sustainability, demand for biomethane, bioeconomy and circular economy, economics of biomethane, and enabling policy requirements. Table 17 provides the general description and strategic ambition for each pillar.

Table 17. Key pillars of Ireland's National Biomethane Strategy

Key pillar	Description	Strategic ambition
Sustainability	Ensure biomethane is produced in an environmentally sustainable manner, having regard to established goals for the protection and restoration of water, soil, biodiversity, and ecosystem services, while availing of opportunities to pursue those goals as co-benefits of biomethane production.	Development of a Biomethane Sustainability Charter, implementation of the Renewable Energy Directive sustainability criteria and enhancing the training and education available to biomethane developers.
Demand for biomethane	Develop biomethane in Ireland for end uses which should include hard-to-abate sectors that currently have limited or no alternative options to decarbonise.	Strategy implementation will encourage the development of an indigenous biomethane sector and contribute towards the reduction of fossil gas use in industrial heat and transport sectors.
Bioeconomy and circular Economy	Ensure that the biomethane strategy, bioeconomy and circular economy development are integrated.	Exploration of R&D opportunities to ensure that the full range of benefits of producing biomethane with other biobased products and biorefining are considered.
Enabling Policy Requirements	To ensure timely development of a biomethane industry in Ireland, various enabling policies must be delivered, and current impediments	Development of a communications strategy to perceive positive messages in relation to AD and the benefits it can offer. Address potential bottlenecks to the development of an AD industry in Ireland

Source: *National Biomethane Strategy (2024)*

The strategy mentions that to ensure sustainable biomethane production and "protect against unintended negative consequences", participants in the biomethane industry must adhere to key requirements that will be included in a Biomethane Sustainability Charter. The Charter should be fully developed in consultation with policy, industry, and societal stakeholders and include safeguards on land use, water quality, biodiversity, fertiliser use, carbon sequestration, and other lifecycle sustainability issues.[386]

An interdepartmental biomethane implementation group oversees the implementation of the Strategy and the development of the Sustainability Charter, which is currently under preparation.

The strategy also identifies support mechanisms to enable the development of the biomethane sector in Ireland, including capital grant support and a Renewable Heat Obligation (RHO), which are further detailed in section 5.5.

5.5 Support schemes and market mechanisms

5.5.1. Biomethane capital grant support scheme

The National Biomethane Strategy introduces a EUR 40 million Capital Grant Scheme aimed at supporting the development of AD facilities. This initial funding is intended to aid capital investment for the construction of plants, including upgrades to existing biogas plants, as well as the development of new plants. A second round of capital grant funding is planned from 2026 to 2030, contributing to the production of at least an additional 1.5 TWh (150.45 million m^3) of indigenous biomethane.[387]

In August 2024, following a call for expressions of interest, the then Ministry for Agriculture, Food, and the Marine announced the opening of applications for the Biomethane Capital Grant. In total, 23 applications were received.[388] In September 2024, the government announced that letters of offer had started to be issued to successful applicants of the scheme.[389]

Twenty percent of total capital investment costs per applicant will be payable to successful projects subject to a maximum level of funding of EUR 5 million per project.

5.5.2. Renewable heat

Ireland remains heavily dependent on fossil fuels for heating, with 90.2% of its heat demand met by fossil fuels in 2023.[390] In response, the government has introduced several policy measures aimed at decarbonising the heat sector. Some of these policies are challenging where biomethane may be promoted where better alternatives exist.

- **Support Scheme for Renewable Heat (SSRH)**

The SSRH was designed to increase the energy generated from renewable sources. More specifically the scheme has been developed to financially support the adoption of renewable heating systems by commercial, industrial, agricultural, district heating and other non-domestic heat users not covered by the EU Emissions Trading Scheme.

The scheme is composed of two support mechanisms:

- An installation grant for air source, ground source and water source heat pumps; and
- Operational support for biomass and anaerobic digestion heating systems.

The scheme includes detailed sustainability criteria in line with the RED III.[391] Among the sustainability criteria, the scheme specifies that biomass fuels derived from agricultural biomass must not originate from raw materials sourced from land with any of the following characteristics:

- high biodiversity value (i.e. primary forests, specially protected areas, special areas of conservation and highly biodiverse grasslands)
- high carbon stock, (i.e. wetlands, continuously forested areas)
- that was an undrained peatland in January 2008.[392]

Project Ireland 2040 sets out an allocation of EUR 300 million for the rollout of the Scheme for the period up to 2027.[393]

The SSRH is administered by the SEAI, which is responsible for evaluating and processing applications and making payments to participants in the form of operating aid and investment aid.[394]

On 14 May 2025, the Department of the Environment, Climate and Communications launched a public consultation on overcoming a potential restriction on expanding the SSRH operational aid for biomass and anaerobic digestion (that is, biogas) to larger energy users, including those in the EU Emissions Trading Sector (EU ETS).[395]

- **Renewable Heat Obligation (RHO)**

To further support the decarbonisation of the heat sector, the Government has agreed to the introduction of a RHO.[396] The RHO, still under finalisation, is a compulsory, downstream obligation placed on suppliers of fossil heating fuels (oil, LPG, gas, coal, peat). It aims to support the decarbonisation of the heat sector and reduce dependence on imported fossil fuels.[397]

The RHO will mandate that suppliers ensure a set percentage - still to be defined - of the heat energy they sell is renewable, either by blending in biomethane or by purchasing and surrendering RHO certificates linked to renewable heat generation, thereby stimulating demand for certified biomethane.

As part of the development of the RHO, the government has conducted public consultations and stakeholder engagement activities between 2021 and 2024. One of the most shared feedback items was to emphasise the need to develop complementary incentives to foster the production of renewable fuels for use in the heat sector, flagging that the RHO alone will not be sufficient to encourage and maintain the development of a biomethane sector in Ireland. [398]

The final design of the RHO has not been published yet and is facing multiple delays. According to the Irish Farmers Journal, the RHO is *''unlikely to be in place by January 2026.''*[399]

5.5.3. Renewable Transport Fuel Obligation (RTFO)

The transport sector is Ireland's second-highest emitting sector, accounting for 21.4% of total greenhouse gas emissions in 2023.[400]

The RTFO, introduced in 2010, is a key tool for achieving the national Climate Action Plan targets of reducing transport emissions by 50% by 2030, as well as meeting European targets for the renewable energy share in transport. The State also aims to ensure compliance with European sustainability and GHG reduction criteria through this framework.[401]

The RFTO represents a market opportunity for biomethane as it requires suppliers of mineral oil to ensure that 25% (by energy content) of the motor fuel (gasoline and motor diesel) they sell in Ireland is renewable.[402]

The RTFO includes an additional obligation for "advanced biofuels" and a cap on fuels produced from food and feed crops. For 2025, the advanced obligation is 1.5% (by energy content), and the rate is meant to increase each year.

Achievement of the renewable energy share in transport in Ireland is constrained by the EU RED limit of 2% on supply of biofuel and biogas from food and feed crops[403]. There is also a limit in Ireland on the supply of biofuel from high ILUC-risk feedstock, no more than the supply in 2019 and a linear reduction to 0% by 2030.

5.5.4. Guarantees of Origin (GOs)

The National Biomethane Strategy recognises the ongoing development of a framework for GOs for non-fossil gases, including biomethane. GOs provide a certification mechanism that discloses the origin of gas to end-consumers.

The Commission for the Regulation of Utilities (CRU) has been required to establish a Supervisory Framework for GOs that will be further handled by the Gas Networks Ireland.[404] In that context, the CRU has published a consultation paper on 10 April 2025, seeking feedback from relevant stakeholders "including producers, gas suppliers, consumer interest groups, industry groups, members of the public and all other interested parties".[405] The consultation lasted 6 weeks, and the CRU is expected to publish a Decision paper in Q3/ Q4 2025.[406]

The consultation paper indicates that each GO must include (at minimum) the following information:

- The energy source from which the renewable gas was produced, and the start and end dates of production;
- State that it relates to renewable gas, to differentiate it from GOs for other energy carrier types, i.e. electricity, or heating and cooling;
- The identity (name of the person, or body corporate if a company), location, type, and capacity of the installation where the renewable gas has been, or was originally, produced and GO originally issued;
- The name and location of the last person (or body corporate if a company) to whom the GO has been transferred;
- Whether the installation has benefited from investment support, and whether the volume of renewable gas has benefited in any other way from a national support scheme, and the type of support scheme;
- The date on which the installation became operational;
- The date and country of issue and a unique identification number for each GO; and
- A valid sustainability certificate reference number, issued by an EU voluntary scheme.[407]

By providing more transparency on the origin of non-fossil gas, the introduction of GOs aims to create market confidence among industry stakeholders and attract investments in the biogas industry.[408]

5.5.5. Subsidies and grants financing

Since December 2017, the SSRH (see section 5.5.2) has the primary objective to contribute to meeting Ireland's renewable energy targets and reduce greenhouse gas emissions. The programme is administered by the SEAI.[409] According to the National Biomethane Strategy (see section 5.4.3), there were 23 applications for the Biomethane Capital Grant Scheme (see section 5.5.1), which grants up to EUR 5 million per applicant and a total of EUR 40 million.

On request about the information of the companies involved in the programme and the subsidies granted, the SEAI indicated that "[at] this stage, no funding has been paid out under the scheme as yet. Details will be made available once claims have been calculated and final payments are processed."[410]

Ireland, through the SEAI, finances (mostly academic) research projects related to energy transition and CO_2 reduction. The programme's objectives are to support solutions to overcome barriers to market uptake, enhanced Ireland's RD&D capacity, provide guidance and support to policy makers and to accelerate competitive energy-related products and systems.[411] While the programme is designed to fund research into energy transition and CO_2 reduction, and therefore isn't directly for the production of biogas, it has nonetheless supported some related projects. Furthermore, despite not directly supporting projects involved in the production of biogas or related operations, it remains the most pertinent funding programme currently operating in Ireland.

As can be seen in Figure 16, the SEAI has granted between 2015 and 2024 on average between EUR 15 million to EUR 20 million in research projects, except for 2018, when it financed EUR 52 million in projects, and in 2023, when it financed EUR 40 million in projects. Furthermore, according to the published data, only a small fraction, between 10 to 20 percent, of such financing was for biogas-related projects.

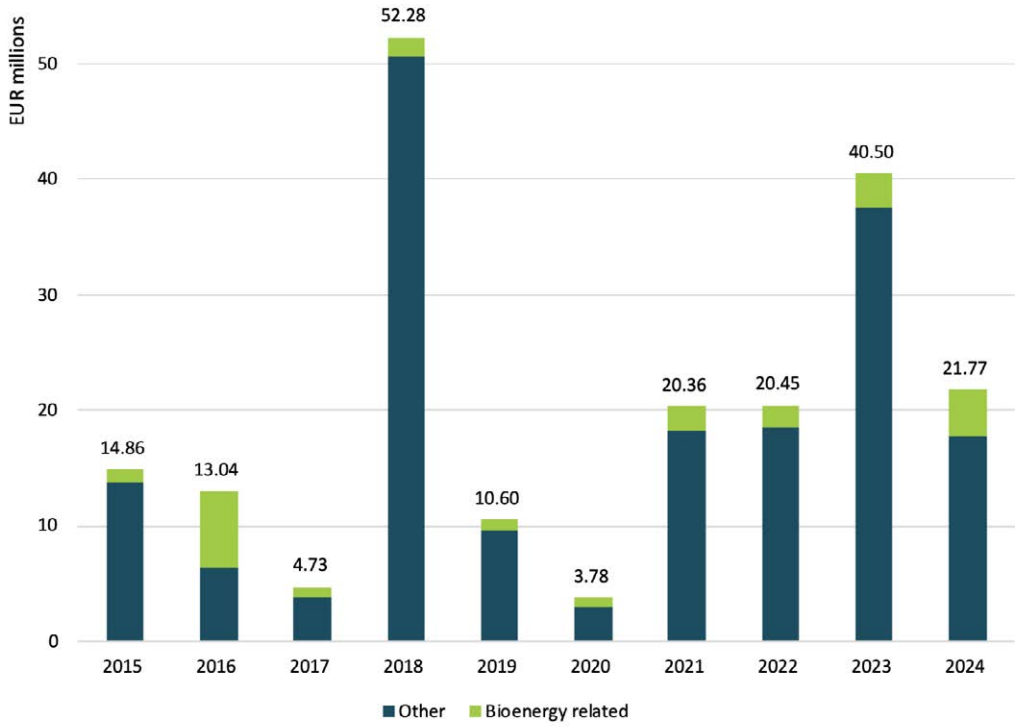


Figure 16. Sustainable Energy Authority of Ireland financed projects (EUR mln)

Source: *Own elaboration based on information from the Sustainable Energy Authority of Ireland (n.d.), "SEAI national energy research funding programme", online: https://www.seai.ie/seai-research/research-funding/research-development-and-demonstration-fund, visited in June 2025.*

5.6 Final remarks

The biomethane industry in Ireland is in its early stages compared to more mature markets in other EU countries like the Netherlands or Denmark. Currently, biogas plays a limited role in Ireland's energy consumption, with just about 1% across all use cases. Most of the production is associated with landfills; however, potential feedstocks exist in the current meat and dairy farming system and from grass silage. At the same time, the new government has reaffirmed its predecessor's biomethane ambitions by committing to "offer financial incentives for the National Biomethane Strategy", as laid out in the 2025 Programme for Government. It has also endorsed the Strategy's goal to achieve 5.7 TWh ((572 million m^3) of national biomethane production annually by 2030.[412]

Several enabling factors support the development of biogas in Ireland. Currently, 86% of Ireland's total energy supply is derived from imported fossil fuels, creating a strong case for national biogas to enhance national energy security.

The country also has one of the highest per capita biomethane production potentials in the EU, owing to its strong agricultural base. However, methane is also the second-largest source of national GHG emissions, accounting for approximately 28.9 % of total emissions in 2023, primarily from agricultural activities such as enteric fermentation and manure management.[413] Additional drivers to the development of the biomethane industry include the EU landfill diversion requirements under the Waste Framework Directive, the Support Scheme for Renewable Heat (SSRH), which reduces capital and operating costs for eligible producers, and the forthcoming Renewable Heat Obligation (RHO), which is expected to create market demand for biomethane in the heat sector. That said, the RHO's scope remains uncertain, particularly regarding how far it will incorporate environmental sustainability criteria and how stringent those criteria might be. At the same time, Ireland's Climate Action and Low Carbon Development Acts provide legal certainty and long-term policy direction for decarbonisation efforts.

Despite these signals, several challenges remain. Ireland's electricity and heat generation remains dominated by fossil fuels, and the RHO has yet to be fully implemented. High capital costs and the absence of a State-guaranteed price or Feed-in Tariff for biogas make it difficult for AD projects to attract financing. As a result, banks remain cautious, and farmers are hesitant to invest. The permitting process for AD plants is also considered burdensome and inconsistent, with no standardised requirements, which slows down project development.[414] Moreover, the sectors being prioritised for biomethane use, may have better alternatives that could be utilised instead, e.g. for road transport and home energy, risking the postponement of fossil fuel phase out, where fossil gas may continue to fill the gap of biomethane in the national gas grid.

Sustainability concerns will play a key role in shaping the future of the biomethane sector in Ireland. All AD plants will be required to meet environmental sustainability criteria set out in RED II and RED III and the Sustainability Biomethane Charter still needs to be published. Yet, these methodologies do not include the full life cycle emissions from manure, disregarding the wider methane pollution from enteric fermentation in Ireland.

There are also social and ethical concerns, as biogas is increasingly promoted as a supplementary income stream for farmers, including through the use of food and feed crops. This raises questions about land use priorities, potential competition with food production, and broader sustainability impacts.

While Ireland's national regulations are increasingly favourable to biogas and offer both regulatory and financial incentives for its development, most of public investments are directed at industrial-scale AD facilities, designed to mobilise large-scale private capital and supply biomethane into the national gas grid. More institutional and market incentives are needed to support small-scale or farm-based AD projects and encourage cooperative approaches between farmers, dairy and food processors. These considerations must come with a full environmental impact assessment in Ireland, including local community and agroecological farming voices.

CHAPTER 6.

Biogas in the Netherlands

Biogas production in the Netherlands is increasing, but its contribution to the economy remains limited. Fossil gas, though planned to be phased out, is still the dominant source of energy. This is probably because of the environmental and other concerns related to biogas production. Due to high livestock density, co-fermentation of manure is an important source for biogas production, but other raw materials remain limited.

6.1 Market overview

6.1.1. Volume and structure

The Netherlands has around eighty digesters that produce biomethane, ranging from small tanks to large-scale installations. Small tanks (mono-manure digesters) are mainly located in farmers' yards, while larger installations can be found on industrial or port sites.

Biogas saw a strong growth from 5 PJ in 2005 up to 12 PJ in 2010 (185 – 278 million m3), followed by a period of stabilisation until 2018, with some renewed growth since then.[415] In 2022, the Netherlands produced approximately 18 PJ of biogas (667 million – 1 billion m3).[416] Currently, around 300 million m^3 of biomethane are produced annually.[417] This corresponds to approximately 1% of the total fossil gas consumption in the Netherlands.[418]

Since 2015, energy generated based on biogas increased by 90% (from 2,965 GWh in 2015 to 5,625 GWh in 2023). In 2023, almost 8% of the Dutch energy supply (import plus production minus export) came from biofuels and waste. Oil is the largest source of the Dutch energy supply (41%), followed by fossil gas (36%).[419] The Netherlands does not import biogas.

Biomethane has been produced at landfills for years but is declining because of decreased waste dumping. Other sources, including digesters at waste processing companies, industry and agriculture, are becoming more important. In recent years, biomethane from manure digestion has increased.[420]

The Netherlands is a small and densely populated country with high energy demand from industry. Because primary domestic biomass resources other than livestock are limited, residues and waste are key feedstocks, complemented by imports.[421] According to a 2021 study, biogas produced in the Netherlands (excluding

landfill plants) originates from municipal waste (ca. 40%), co-digestion of agricultural/municipal/industrial side streams (ca. 40%), and sewage sludge (ca. 20%).[422] There are 320 sewage treatment plants in the Netherlands, a quarter of which produce biogas.[423]

Table 18 shows which sectors use biomethane.

Table 18. Distribution of biomethane consumption in the Netherlands

Use	Consumption (TJ)	Share in total
Heating	5,029	51%
Electricity	1,438	15%
Transport	1,554	16%
Non-energy uses	586	6%
Transformation losses*	1,209	12%
Total production	9,816	100%

Source: *CBS (2024, September 2), "Hernieuwbare energie in Nederland 2023", online: https://www.cbs.nl/nl-nl/longread/rapportages/2024/hernieuwbare-energie-in-nederland-2023/8-biomassa, viewed in June 2025.*

Source: ** These transformation losses occur mainly in the conversion of biogas for the production of electricity, whether or not in combination with heat.*

6.1.2. Main biogas companies

Table 19 lists important biogas producers in the Netherlands. This is based on a longlist extracted from the membership of Platform Groen Gas, an umbrella organisation of four players in the Dutch green gas branch (including Groen Gas Nederland, 2bcm Alliantie, Biogas Branche Organisatie and the Vereniging Industriële Vergisters). Companies report their biogas production in m3 or kiloWatthours. If this information was not found, company documents were screened for other capacity indications, including the number of households powered and tonnes of waste processed. Two companies have been selected because of their robust capacity expansion plans. No information about current capacity was found.

Table 19. Major biogas companies in the Netherlands

#	Company	Annual production, input and/or capacity	Estimated biogas supply (in mln m³/yr)	Type	Feedstock	Source
1	Sustainable Fuel Plant	1,400,000t of waste is processed into 40 million m³ biomethane and 40 million m³ biogas.	104	Developer / producer	Organic waste, animal by-products	424
2	Stokman		64.0	Developer	Liquid manure	425
3	BMC Moerdijk	400,000t of waste / 290.000.000 kWh capacity of green energy (assumed to be biogas)	46.4	Producer	Poultry manure	426
4	Bio Energy	45 million m³ bio-methane	45.0	Developer / producer	Wood waste	427
5	Bio Energy Coevorden (Varo)	215,000t of waste	26.0	Producer	Biomass from animal farming, agriculture and food waste	428
6	Cosun Beet Company	more than 25 million m³ of biogas	25.0	Developer / producer	Sugar beet residual flows	429
7	Engie NL	137 GWh, 200 GWh planned by 2030	21.9	Producer	Organic waste, animal manure	430
8	Biovalue	200,000t of waste / 3,000t bio-LNG	6.0	Developer / producer	Organic waste, incl. agricultural waste, (animal) food waste, sludge.	431
9	Ecoson (Darling Ingredients)	100,000t of waste, partially processed into biogas (unclear how much)	n/a	Developer / producer	Liquid manure	432

Source: *Platform Groen Gas and data from multiple sources (see the last column). For conversion factors used, see Appendix 1.*

6.1.3. Contribution to the economy

Despite the increased production of biogas, its contribution to the Dutch economy is rather limited. According to the IEA, biogas accounts for approximately 10% of the bioenergy supply and 0.7% of the total energy supply.[433] No up-to-date statistics could be found on the contribution of the biogas sector to the Dutch economy in terms of employment, the number of enterprises working on it, or other information.

6.1.4. Development trends

Biogas production is growing steadily, and biomethane injection into the fossil gas grid is growing as well. While the country has rather limited cultivated area, livestock density is very high, and thus the estimated biomethane potential in collectable manure is relatively high (almost half of that in Germany).[434]

Since 2018, the share of manure fermentation has grown in the production and consumption of biogas mainly as a result of the production of biomethane. Biogas from manure for electricity and heat production has been decreasing in recent years.

There has been a significant shift in focus on agricultural biogas installations from co-fermentation of manure towards mono-fermentation of manure. This has been due to high costs of coproducts, low electricity prices (resulting from competition from solar and wind energy), and a decrease in government subsidies for co-fermentation. However, biomethane projects are being stimulated. Mono-fermentation does not require off-farm inputs, and new mono-fermentation installations better suit the different scales of farms.[435]

A major driver for developing biomethane is that the Dutch government has committed to decreasing the role of fossil gas. Because of safety reasons for the inhabitants of the province of Groningen, a region that has suffered severely from earthquakes due to fossil gas production, this fossil fuel is planned to be phased out by 2050.[436] To realise the gas transition, the focus is on energy savings and replacing fossil gas with biomethane, hydrogen gas, or other renewable energy options.

6.2 Sustainability concerns

The ambition to produce biogas on a large-scale leads to several sustainability concerns in the Netherlands. A primary concern relates to the available feedstock.[437] Energy crops will likely have to be grown, which could lead to competition with animal feed production.[438] The increasing demand for agricultural waste for biogas production leads to competition for resources already putting pressure on the availability of residual flows for animal feed and human food.

The use of these residual flows is increasingly used by companies in the food industry to produce biogas themselves. Facing CO_2 levies on their business operations, this can be more financially attractive than selling their surplus for processing into animal feed.[439] Energy producers benefit from less stringent requirements and subsidy incentives, while animal feed producers experience stricter regulations.[440]

Doubts exist about the sustainability value of biogas plants, as they also use energy themselves and the waste streams need to be transported to the digester, significantly increasing freight traffic. Both energy use and transport emit GHG.

Manure yields relatively little energy, while co-fermentation does more. This raises the question of what the added value of the manure in the digester is and whether the added other feedstocks (including grass, maize, or other waste) should not be better used as animal feed instead of being a co-product for fermentation.[441]

Concerns also exist about the Netherlands locking itself up in an unsustainable 'extraction' system as it has to secure the supply of manure for biogas production in which large companies like Cargill are investing in in the Netherlands. This contradicts the country's efforts to decrease the number of livestock to reduce nitrogen from manure spreading.[442]

Environmental organisations have expressed safety concerns about incidents with methane leakage from manure digesters, which impacts soil, water, and air and could negate emission reductions. According to those organisations, little research has been done into these impacts.[443] However, others refute these concerns with data on very low leak rates.[444]

Finally, there are instances of digester odour and noise nuisance in the surrounding communities of biogas plants in the Netherlands.[445]

6.3 Implementation of EU policies

6.3.1. REPowerEU

In 2022, the Netherlands published its NRRP in light of REPowerEU (see section 2.3.1). The plan has a main focus on offshore wind and green hydrogen, biogas is not a central component of the Dutch NRRP. However, the plan does refer to the country's objectives to increase biomethane production as spelt out in the National Climate Agreement (see section 6.4.1).

6.3.2. EU Renewable Energy Directive (RED III)

As of May 2025, the Netherlands has not yet transposed the third iteration of the Renewable Energy Directive (see section 2.3.2).[446] The European Commission has formally reprimanded the Netherlands for delays in implementing RED III provisions on permitting procedures for renewables.[447]

In response, the Dutch Ministry of Climate and Green Growth is working to designate so-called "acceleration areas" at the municipal, provincial, and national levels. Within these zones, permitting procedures for "renewable energy" projects – including biogas - can be streamlined under specific conditions.[448] Once these geographic zones are established, environmental and nature impacts will be assessed earlier - at the regional level - enabling faster project-level licensing. In principle, this will eliminate the need for project-specific Environmental Impact Assessments (Project MER) and species protection assessments.[449] The mapping of these acceleration areas is expected to be completed by February 2026, with implementation planned for July 2026.[450]

As part of the RED III transposition, the Dutch government has set a 2030 target requiring 5.5% of total energy consumption to come from advanced biofuels, with at least 1% derived from non-fossil fuels that do not rely on agricultural biomass.[451] However, the government acknowledges that achieving these targets will demand a significant scale-up in biofuel use.[452]

The Netherlands Environmental Assessment Agency (PBL) has expressed concerns about the feasibility of meeting these goals. Key challenges include limited availability of bio-based raw materials and constrained production capacity.[453]

6.3.3. EU Nitrates Directive

In the Netherlands, implementation of the Nitrates Directive (see also section 2.3.7) is partially regulated through the Manure and Fertilisers Act (Meststoffenwet). Since 2006, the country has made use of a derogation allowing farms with grazing livestock to apply up to 250 kilograms of nitrogen per hectare under certain conditions.[454] However, due to ongoing water quality issues, the European Commission announced in 2022 that this derogation will be phased out by 2026.[455] As a result, the amount of manure that farmers are permitted to apply will be substantially reduced. While the government will lower the national ceiling for manure production, the permitted application volume is decreasing at a faster rate, likely exacerbating the country's manure surplus in the coming years.[456] However, the Dutch Minister of Agriculture, Nature and Fisheries has made a formal request to the commission to extend its derogation on the Nitrates Directive, with the aim of continuing to emit more nitrogen pollution that other EU countries for longer.[457]

In this context, the use of manure as feedstock for biogas generation is seemingly not losing traction as a proposed solution for manure management in the Netherlands. This underestimates the fact that anaerobic digestion itself does not eliminate nitrogen in the process. As a matter of fact, most of it remains in the digestate and treatment must be applied to ensure this is reduced before applying digestate as fertiliser (see EU Policy section on the Nitrates Directive for more on the challenges posed here).

6.3.4. EU Waste Framework Directive

The Waste Management Act (LAP) (Wet Afvalbeheer) transposes the EU Waste Framework Directive (see section 2.3.4) into Dutch national law. It requires the Dutch government to develop a national waste management plan every six years.[458] The current plan, known as LAP3, is nearing the end of its term. Its successor, the Circular Materials Plan, is currently being drafted and is expected to be implemented by the end of 2025.[459]

The national waste management plan establishes minimum standards for the treatment of organic waste. It mandates that organic waste from both households and businesses must be either composted or fermented to produce biogas, with subsequent recycling of the digestate—for example, as a fertiliser.[460] In this way, the plan actively promotes the generation of biogas from residential and commercial organic waste streams.

Notably, the upcoming plan does not impose minimum treatment requirements for manure .[461] As a result, the national waste management plan appears to offer little direct incentives nor disincentives for biogas production through (mono-)manure fermentation.

6.4 National policy and legislative framework

6.4.1. National Climate Agreement

The National Climate Agreement outlines the Dutch strategy for meeting the goals of the Paris Climate Agreement, specifically aiming to reduce greenhouse gas emissions by 49% by 2030 compared to 1990 levels. Within this framework, biomethane - referred to as “green gas” in the agreement - plays a crucial role. The Climate Agreement sets a target of producing 70 PJ of biomethane annually by 2030, equivalent to approximately 2 billion m^3.[462]

The PBL has expressed concerns about meeting this target. For example, fermenting manure from dairy cattle requires modifications to livestock housing to enable the use of fresh manure. Moreover, permitting challenges result in long lead times for biogas projects, with frequent legal objections and appeals. The agency notes that in some cases, it may be more cost-effective to use biogas directly rather than upgrading it to biomethane for injection into the fossil gas grid.[463]

Despite concerns about its feasibility, the ambition stipulated in the National Climate Agreement serves as a cornerstone for related policies and legislative initiatives, providing the foundation for various support schemes and market mechanisms aimed at scaling up biogas and biomethane production and integration into the national energy system. These policies and legislations are described in more detail in the sections below.

6.4.2. National Methane Strategy

Being a signatory of the Global Methane Pledge, the Netherlands published its National Methane Strategy in 2022.[464] The plan describes how the Dutch government envisions to achieve a 30% reduction in methane emissions by 2030, structured around five sectors responsible for Dutch methane emissions, including electricity, industry, build environment, mobility, and agriculture. Notably, the plan does not comprise any new policies but mainly outlines how the Dutch Climate Agreement (see section 6.4.1) attributes to the envisioned methane reductions, including ambitions to increase biogas production.[465]

6.4.3. Permit requirements

Developing a power generation facility in the Netherlands typically requires obtaining one or more environmental and planning permits. Projects involving the construction of new buildings to house energy installations require an environmental and planning permit under the Environment and Planning Act (Omgevingswet).[466] This integrated act streamlines and consolidates regulations relating to construction, environment, nature, and spatial planning.[467]

In certain cases - such as facilities expected to generate significant nitrogen emissions (e.g., biomass plants) - an additional permit concerning flora and fauna activities is mandatory. This ensures compliance with ecological protection regulations, especially in or near Natura 2000 areas.[468]

Depending on the nature, size, and location of the project, an Environmental Impact Assessment (Milieueffectrapportage) (MER) may be required. The MER is a formal process used to evaluate the potential environmental consequences of proposed developments. It serves as a decision-support tool for permitting authorities and typically includes assessments of air quality, noise, biodiversity, water use, and land impact. Not all projects require a full MER. In some cases, a MER-screening suffices to determine whether a full assessment is needed. Whether or not a MER is required depends on criteria outlined in Dutch and EU environmental legislation. [469]

6.5 Support schemes and market mechanisms

6.5.1. Sustainable Energy Production and Climate Transition (SDE++) subsidy scheme

Main support vehicle for biogas production in the Netherlands is the subsidy scheme Sustainable Energy Production and Climate Transition (SDE++) (Stimulering Duurzame Energieproductie en Klimaattransitie).[470] Production of biogas is eligible under this subsidy scheme.[471] In some cases – portrayed in Table 20 - applicants will have to demonstrate that the biomass used meets the RED sustainability criteria.

Table 20. Biogas production subject to RED sustainability criteria under SDE++

SDE ++ categories, other than wood pellet facilities	Definition used for power output	RED criteria apply to power outputs of
Solid biomass for the generation of heat and/or power	Boiler's nominal input capacity	≥ 7.5 MW (1.6 - 2.4 mln m^3)
Liquid biomass for the generation of heat and/or power	Boiler's nominal input capacity	No lower threshold
Production of biogas for the generation of heat and/or power	Boiler's nominal input capacity	≥ 2 MW (427 - 640 mln m^3)
Production of biogas to feed into the gas network	Nominal sustainable gas power output	≥ 2 MW (427 - 640 mln m^3)

Source: *Netherlands Enterprise Agency (2024, 6 August), "Sustainability criteria biomass RED SDE++ ", online: https://www.rvo.nl/subsidies-financiering/sde/aanvragen/red-sde, viewed in May 2025.*

The SDE++ scheme operates through a phased annual tender process, in which projects are selected based on cost-effectiveness in terms of CO_2 reduction. The subsidy compensates for the unprofitable portion of production costs, bridging the gap between the cost of renewable and non-fossil energy or emission reduction technologies and the market price of fossil alternatives. This support, often referred to as a form of Feed-in Premium (FiP), is granted for a duration of 12 to 15 years. It functions as a guaranteed minimum income, meaning payments are only made when market prices fall below the FiP level set for a particular category.[472]

For the year 2024-2025, the SDE++ budget amounted to EUR 11.5 billion, for all phases (allocated over periods of 12 or 15 years) and categories combined.[473] For the year 2025-2026, total available SDE++ amounts to EUR 8 billion.[474] While biogas production is eligible under the SDE++ scheme, historically, the proportion of subsidies provided to biogas compared to other renewable energy sources, has been relatively low, as further specified in section 6.5.5.[475]

6.5.2. Demonstrating Energy and Climate Innovation 2025 (DEI+) subsidy scheme

The Demonstration Energy and Climate Innovation (DEI+) (Demonstratie Energie- en Klimaatinnovatie) subsidy scheme, launched by the Dutch government, aims to support projects that contribute to national climate goals. Each eligible activity may receive funding for a maximum period of four years. To qualify, a project must demonstrate a measurable contribution to national CO_2 reduction within ten years of its initiation.[476]

Eligible activities include, amongst other, the gasification of biogenic waste streams for the production of biogas or biofuels. The feedstock used must qualify as waste streams or as products, materials, or substances that cannot be processed at a higher level in the waste management hierarchy, as defined by the EU Waste Framework Directive.[477] Additionally, the feedstock must comply with Annex IX of the EU Renewable Energy Directive and with the sustainability criteria spelled out in the Directive.[478]

For 2025, the total available budget for biogas production facilities under the DEI+ scheme amounts to EUR 109 million, with a maximum subsidy of EUR 30 million per project.[479]

6.5.3. Environmental Taxes Act (Wet Belastingen op Milieugrondslagen)

Under the Environmental Taxes Act (Wet Belastingen op Milieugrondslagen), an energy tax exemption applies to biogas that is self-generated and used by the producer.[480] It remains unclear how much this exemption comprises in monetary terms, as the Dutch Central Bureau for Statistics only reports on the total amount of energy taxes collected, without a breakdown into the different components of the energy taxation.[481]

6.5.4. Green Gas Blending Obligation (Bijmengverplichting groen gas)

Currently under proposal, the green gas blending obligation (Bijmengverplichting groen gas) will require gas suppliers to incorporate a certain proportion of "green gas" into their supply. The Dutch government defines green gas here as "a gas mixture produced by the fermentation or gasification of bio-based raw materials and having the same composition as natural gas" and is treated as synonymous with biomethane.[482]

Through the legislative initiative, the Ministry of Economic Affairs and Climate aims "[...] to increase the production of green gas in the Netherlands by offering producers long-term certainty about the direction of the market."[483] In doing so, the proposal seeks to stimulate the production, distribution, and use of biomethane across the country.

The legislation will specifically mandate Dutch energy providers to blend fossilgas with biomethane. Rather than specifying the required volume of biomethane (e.g., in cubic meters), the regulation sets targets based on GHG emissions avoided across the value chain. The methodology for calculating these avoided emissions aligns with the EU RED.[484]

Scheduled for implementation in 2026, the regulation sets an annual avoided emissions target under the blending obligation. This target will rise from 0.8 megatons of CO_2-equivalent emissions in 2026 to 3.8 megatons by 2030. This target equals an estimated production of 1.1 billion m3 of biogas in 2030.[485]

6.5.5. Subsidies and grants financing

As mentioned in section 6.5.1, since 2011 the Netherlands has had a FiP scheme for grid-injected biomethane, with diversified payments based on the feedstock mix used and on the reported GHG emission reduction. The Dutch FiP programme was initially called SDE+ (Stimulering Duurzame Energieproductie or Stimulating Sustainable Energy Production). The programme provided a subsidy that covered the difference between wholesale market prices of electricity and the cost price of electricity from renewable sources. [486] In 2020, the SDE+ programme was replaced by the SDE++ programme (Stimulering Duurzame Energieproductie en Klimaattransitie or Stimulating Sustainable Energy Production and Climate Transition).

Figure 17 presents the budgeted amounts in the SDE+ and SDE++ programs between 2016 and 2023. The shaded area represents the total budgeted amount for the subsidies, while the stacked bars are the actual amount disbursed to biogas-related projects (lime green) and other renewable energy projects (dark blue). The budgeted amount in the first years of the programme was very close to the actual disbursements, while in the last two years for which information is available, there is a considerable mismatch between the budgeted amount and the disbursements.

Furthermore, as can be seen in Figure 17, the grants to biogas-related projects have been relatively stable during the period under analysis. While in 2016, the budget allocated to biogas projects was EUR 1.2 billion, between 2017 and 2022, the allocated budget was about EUR 0.5 billion. Only in 2023, there was an increase in subsidies to biogas projects when the amount in subsidies reached EUR 1.4 billion. The total subsidy amount for biogas in the period 2016-2023 was EUR 6.1 billion.

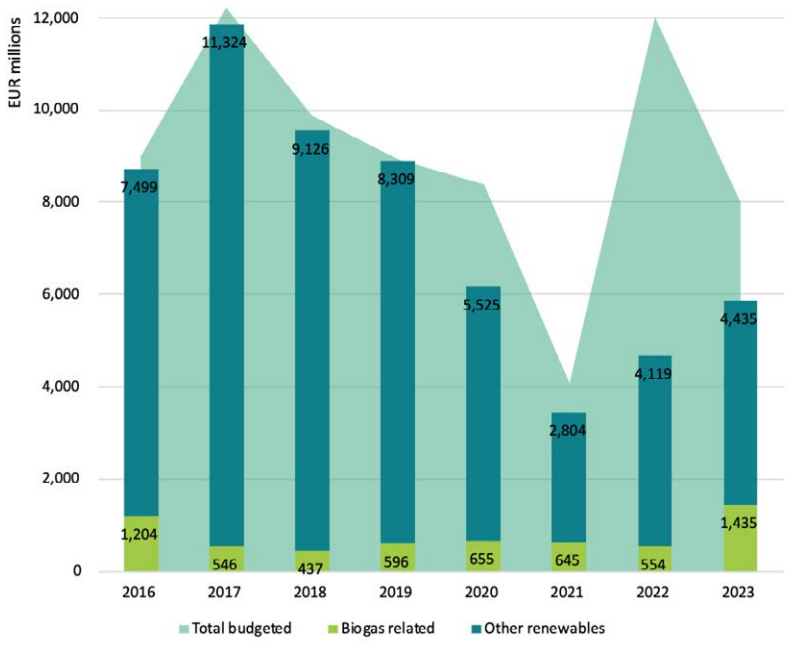


Figure 17. SDE+ and SDE++ subsidies – budgeted vs provided (2016 – 2023, EUR mln)

Source: *Own elaboration based on information from IEA (2018, July 19), "Feed-in Premium Programme SDE + (Stimulering Duurzame Energie +)", online: https://www.iea.org/policies/5012-feed-in-premium-programme-sde-stimulering-duurzame-energie, viewed in June 2025 and Rijksdienst voor Ondernemend Nederland (2025, April 8) "Feiten en cijfers SDE +(+)", online: https://www.rvo.nl/subsidies-financiering/sde/aanvragen/feiten-en-cijfers, viewed in June 2025.*

In addition to the SDE+ and SDE++ programs, the Netherlands also has the Renewable Energy Transition (Hernieuwbare Energietransitie (HER+)), the Demonstrating Energy and Climate Innovation (Demonstratie Energie Innovatie (DEI+),

see section 6.5.2) and the EZ Energy Innovation (EZ Energie Innovatie). These programmes can be used to finance different technologies related to CO_2 reduction, including the production of biogas or related inputs, technologies and uses.

Table 21. HER+, DEI+ and EZ Innovation subsidies to biogas-related projects (EUR mln)

Programme	Year	Biogas - Fermentation	Biomass for biogas	Direct use of biogas	Renewable gas
Demonstratie Energie Innovatie (DEI+)	2015	4.50			
	2016	3.22			
	2021		2.52		
	2023		1.26		
	2024		0.13		
EZ Energie Innovatie	2012	0.08			
	2016	0.47			
	2017	0.50			
	2018	0.33			
	2019			0.10	
	2022			0.27	
	2023			0.17	
Hernieuwbare Energie (HER+)	2012	8.31			
	2013	4.18			
	2014	2.90			
	2015	10.55			
	2016	6.92			
	2017	2.80			
	2018	2.39			
	2019	5.39			1.11
	2020				0.30
	2021				2.26
	2022				0.63
	2023				2.05

Source: *Own elaboration based on information from TopSector Energie Nederland*

6.6 Final remarks

Biogas production and consumption have increased over the years in the Netherlands, but their role in the national energy consumption remains limited. Fossil gas, though planned to be phased out, is still the dominant source of energy. Due to an unsustainably high livestock density, co-fermentation of manure is promoted as a source for biogas production, further fuelling the discussion around the potential lock-in of industrial animal farming in the Netherlands.

In the Netherlands, the regulatory and policy environment has been structured in a way that prioritizes and facilitates the development of biogas across its production, use, and distribution. A national target of 70 PJ (2 billion m^3) of biomethane by 2030 situates biogas as a material component of the country's climate policy, despite ongoing debate around its sustainability and long-term viability.[487] Several subsidy schemes - such as the SDE++ - have been designed to reduce financial risks for biogas producers, thereby lowering market entry barriers. A mandatory biomethane blending obligation, scheduled for implementation in 2026, will require gas suppliers to blend biomethane with fossil gas, with the stated aim of reducing overall emissions. This is intended to offer producers market stability, although the environmental efficacy of such blending compared to renewables like wind and solar, remains subject to scrutiny.

Waste management policies also require that organic waste be either composted or fermented, creating indirect pressure to route waste streams into biogas production and away from more sustainable uses. Furthermore, the ongoing manure surplus and nitrogen crisis have created conditions under which biogas - particularly anaerobic digestion of manure - is increasingly framed as a practical waste management tool, ccausing significant controversy regarding environmental trade-offs, efficiency and impacts on local communities.

Despite the policy push, numerous structural and regulatory challenges persist. As of May 2025, the Netherlands has not yet transposed the EU Renewable Energy Directive (RED III) into national legislation, leading to formal warnings from the European Commission. Finally, although biogas is eligible for public subsidies, it has historically received a relatively small portion of SDE++ funding compared to other, renewable technologies - a pattern that may signal underlying concerns or limitations associated with its broader deployment.

CHAPTER 7.

Biogas in Poland

Biogas production in Poland is accelerating. The governmental and business discourse on biogas is positive, creating a fostering environment for the sector's expansion. The industry estimates that the country currently uses only 3% of its biogas production capacity, and the authorities aim to accelerate the industry's growth by providing various incentives and subsidy schemes.

7.1 Market overview

7.1.1. Volume and structure

With 442 biogas plants registered at the end of 2024, the biogas sector is growing in Poland year to year. Currently, there are 180 agricultural biogas plants, 65 micro-plants and 195 wastewater biogas production plants.[488] Despite these growing numbers, the industry estimates that Poland currently utilises as little as 3% of the country's potential biogas production capacities.[489] Meanwhile, the sector holds considerable potential for expansion. The Polish government aims to propel the acceleration of the national biogas market, offering various incentives and subsidy programmes.[490] In 2023, 6.8 million tonnes of feedstock were utilised for biogas production, and agricultural residuals accounted for 88%.[491]

7.1.2. Main biogas companies

The companies selected below are identified as key players in the Polish biogas market landscape. The selection was based on their total reported biogas production capacity when reported. The size of the company and its position in the Polish market were also taken into consideration. The companies were found through advanced Internet research. The list provides a selection of significant biogas market players in Poland in no particular order. It does not aim to rank companies involved in biogas production comprehensively.

The biogas market in Poland is currently developing. Many international companies are entering the market with plans to expand biogas production capacity in Poland massively [492]

Table 22. Major biogas companies in Poland

#	Company	Annual capacity	Estimated biogas supply (in mln m3/yr)	Type	Notes	Feedstock	Source
1	Orlen	7.1 MW	1,000	Developer / producer	Orlen is one of Central Europe's most significant energy and fuel suppliers. The company currently owns four biogas production plants in Poland. Orlen intends to increase biofuel production to produce 1 billion m3 of biogas annually.	Agricultural substrates	[493]
2	Veolia Polska	(planned) 140 mln m3	140	Developer / producer	Veolia International is one of the biggest biomethane producers in Europe and aims to implement its expertise in biogas production in Poland to produce 140 mln m3 of biogas by 2030.	Agricultural substrates, organic waste	[494]
3	Enricom Biogas	3 * 700 m3/hr	5.4	Developer / producer	The initial portfolio of three 700m3/hr biomethane projects in Northwest Poland.	Agricultural substrates	[495]
4	Enea	9 GWh	1.4	Developer / producer	Enea Group, a prominent energy company in Poland, integrates biogas production within its renewable energy portfolio. The company operates two agricultural biogas plants located in Gorzesław and Liszków.	Agricultural substrates	[496]
5	E.on Group	8,000 MWh	1.3	Developer / producer	E.on Group is one of the largest energy producers in Europe and plans to expand its capacity further in Poland.	Agricultural substrates and waste	[497]
6	Axpo	6,640 MWh	1.1	Developer / producer	The company plans expansion in Poland. Axpo is a leading international company with large biogas production capacities around Europe.	Agricultural substrates	[498]
7	Biogal	2.99 MW	0.8	Producer	Biogal is a local biogas producer. They entered the market in 2015 and were one of the pioneers of the Polish biogas market.	Agricultural substrates	[499]
8	Oczyszczalni cieków w Łodzi	2.7 MW electricity, 3.5 MW heat	0.7	Producer	The wastewater treatment plant in Łód produces biogas. The Group Wastewater Treatment Plant in Łód is one of the largest in Poland.	Wastewater	[500]
9	Biogazownia órawina	2 MW	0.5	Developer	The Biogas plant was established in 2014. An agricultural biogas plant processes substrates through wet methane fermentation under mesophilic conditions.	Agricultural substrates and organic waste	[501]

Source: *Data from multiple sources (see the last column). For conversion factors used, see Appendix 1.*

7.1.3. Contribution to the economy

The authorities portray the acceleration of the biogas sector as an opportunity to foster the economic development of rural regions in Poland by creating various jobs in that sector.[502] Despite the low general unemployment rate of 5.2% in April 2025, which places Poland among the EU member states with the lowest rates, rural unemployment is still an issue in Poland.[503] Rural communities would benefit from income diversification, making them more resilient and future-proof to uncertain weather conditions that already impact agricultural production.[504]

7.1.4. Development trends

Poland has considerable potential for biogas market expansion.[505] The country has the second-largest number of farms in the EU, after Romania.[506] This results in a wide availability of agricultural substrates for potential biogas production. Consequently, investors worldwide have recognised Poland's biogas potential. An increasing number of foreign capital investments are allocated to the biogas sector, with multinational companies like Axpo or E.ON expanding their capacities in Poland.[507]

The Polish Government recognises the potential for accelerating the biogas industry, as it is perceived as a helpful tool to meet energy transition targets and stimulate the expansion of the country's alternative energy market.[508] The government allocated significant financial support for biogas projects, offering subsidies and co-financing opportunities for relevant investments (see section 6.5). These incentives are aimed at propelling the growth of the national biogas production potential.[509]

From the perspective of internal affairs, Polish authorities increasingly view the expansion of biogas as a critical instrument for safeguarding national energy security.[510] In the face of mounting geopolitical uncertainties, the government sees the development of domestically sourced energy as essential to reducing reliance on foreign energy imports.[511] Therefore, biogas is also framed as a homegrown solution that strengthens the country's resilience against external energy shocks. By integrating more biogas into the national energy mix, the government aims to diversify energy sources, insulating the country from disruptions tied to international supply chains and political instability.

Despite the country's potential for biogas expansion, paradoxically, multiple factors decelerate this process. First, the regulatory landscape causes many uncertainties and often complicates permit procedures.[512] The government has undertaken action to ease legislative procedures through the Act on Facilitation of Agricultural Biogas Plants (2023) (see section 7.4.2). Nevertheless, despite these efforts, the industry is still dissatisfied with the challenging legislative procedures, which are presented as one of the most significant obstacles to accelerating the biogas industry.[513] Further, the high costs of infrastructure and technology required for biogas production prevent many small-sized companies and individual farmers from committing to biogas production.[514] This economic factor, combined with complicated subsidy applications, slows down the acceleration of the biogas market.[515]

Waste management is yet another challenge, considering that biowaste management and biogas production are closely intertwined. In Poland, the level of separated biowaste collection is insufficient, and the current processing infrastructure lacks modern solutions and technologies. [516]

Another challenge is the structure of farms in the country. Currently, many small-scale, family-owned farms do not produce enough substrates nor possess the spatial-economic opportunities to contribute to biogas production.[517] However, the average size of agricultural farms increases year-to-year. In 2024, the average farm size was 11.59 ha, 11.35 ha in 2020 and 9.85 ha in 2010. This increase in the average size of agricultural farms in the country creates a favourable long-term scenario for the biogas industry.[518]

Challenges to expanding the biogas market may also stem from public perception. One key concern involves the impact of biogas installations on local communities. Issues such as odour emissions and the potential environmental effects of plants on their immediate surroundings frequently arise in public debates.[519] Another factor relates to the perception of EU policies, particularly the European Green Deal. A significant portion of the Polish population remains sceptical of the EU's push toward carbon neutrality, which can translate into reduced public support for the phase-out of fossil fuel-based energy production. While the influence of these attitudes varies across regions, they nonetheless represent an important consideration in assessing the overall market landscape.[520]

7.2 Sustainability concerns

Biogas is often perceived as a silver bullet in Poland's clean energy narrative. National authorities portray the acceleration of the biogas industry as an effortless solution to the country's pressing climate and energy challenges.[521] In line with this positive framing, scaling up biogas use directly supports compliance with the key EU frameworks driving the net-zero transition - the European Green Deal and the RED.[522]

More than just a tool to reduce emissions of energy sources, biogas is presented as the catalyst for embedding circular economy principles into national infrastructure.[523] Since biogas production enables the conversion of waste to energy, it promises substantial gains in waste management and resource efficiency of the national waste management systems.[524] Government discourse frequently highlights the dual benefit: environmental sustainability and economic modernisation. However, officials acknowledge that to unlock biogas's full potential, significant investment in bio-waste collection and separation infrastructure is required.[525]

This deceptively positive perception of biogas leads to a point where crucial environmental and social ramifications of biogas market expansion are overlooked. Firstly, especially in rural areas with a high rate of animal farming, biogas production can lead to water and air contamination due to increased ammonia emissions.[526] Another issue concerns the disposal of wastewater and other residuals generated during the biogas production. Ensuring that waste management procedures and systems address these issues is crucial.[527] Another concern regarding an increased biogas production is the loss of biodiversity, as using an increased amount of land for biogas plants can disturb local ecosystems.[528] Accounting for the negative social implications of the increased biogas production is essential as well. Firstly, the increased presence of multinational biogas corporations causes a shift in power dynamics (land ownership, use of advanced technologies). Local farmers worry that they have little to no resources to engage in smaller-scale biogas production. The presence of multinational corporations can lead to social inequalities and unfair agricultural practices, in which those who produce crops solely for biogas production benefit most.[529]

7.3 Implementation of EU policies

7.3.1. REPowerEU

To meet its obligation with regard to the REPowerEU plan (see section 2.3.1), in 2022, Poland published its NRRP.[530] In the plan, the Polish government announced its ambition to expand Biogas production in Poland through financial support systems and regulatory reform, which are further assessed in the sections below.

7.3.2. EU Renewable Energy Directive (RED III)

Poland initially implemented the first iteration of the EU RED (see section 2.3.2) through the Renewable Energy Sources (RES) Act of 2015.[531] This legislation, which has undergone several amendments, forms the legal foundation for renewable energy production, including agricultural biogas, bioliquids, and other renewables. It defines key concepts such as biomethane and outlines the conditions for producing biogas and upgrading it into biomethane. The Act also establishes various support mechanisms, detailed further in section 7.5 below.

Under the RES Act, biomethane is defined as "[a] gas obtained from biogas, agricultural biogas or renewable hydrogen, subjected to a purification process, fed into a gas network or transported in compressed or liquefied form by means of transportation other than gas networks, or used to fuel motor vehicles without being transported."[532] As such, in Poland, biomethane refers to purified agricultural biogas or biofuels, but the term may also include RFNBOs.

At the time of writing, the RES Act in force was amended most recently in 2023. The 2023 RES Act underscores the strategic importance of biomethane for meeting EU climate targets. The Polish government emphasized that leveraging domestic biomethane potential is crucial for achieving these goals. The new provisions aim to eliminate barriers hindering biogas and biomethane production and encourage investment in related infrastructure.[533]

Although the technical ability to inject purified agricultural biogas into gas networks had existed for years, no installations were operational in Poland by 2023.[534] The 2023 RES legislation was aimed at changing this by stimulating investment in biogas purification and biomethane production facilities, as well as expanding or upgrading gas networks to support biomethane injection. The 2023 RES amendments also broaden the legal framework to include:

- Electricity generation and fuel production from agricultural biogas and bioliquids;
- The introduction of guarantees of origin for renewable hydrogen and biomethane;
- Biomethane generation from agricultural biogas; and
- Allowing energy cooperatives to engage in biomethane production.

To streamline project implementation, the Act simplifies administrative procedures, particularly those tied to construction law and RES facility permitting.[535] Notably, biogas generating micro-installations (<50 kW capacity, connected to a power grid with a nominal voltage lower than 110 kW, or with a generating thermal capacity in cogeneration not exceeding 150 kW, where the total installed electrical capacity does not exceed 50 kW), do not require obtainment of an entry in the register of regulated activities. Other installations must be entered into a register of producers of agricultural biogas or a register for bioliquid producers - kept by the Director General of the National Support Centre for Agriculture.[536]

At the time of writing, Poland is in the process of transposing RED III into national legislation, having led to further proposed amendments to the RES Act, including amendments to the Energy Law Act of 1997.[537] A key focus of these changes is the legal facilitation of biogas and agricultural biogas transportation via direct pipelines - an option that was previously unavailable due to the exclusion of biogas from the statutory definition of gaseous fuels. The new legislative draft sets out to change this by granting legal recognition to biogas as a transportable fuel and thus enabling the construction and use of direct pipelines.[538]

Nevertheless, the draft imposes specific obligations on entities intending to utilise such infrastructure. One significant requirement is the need to secure prior approval from the President of the Energy Regulatory Office before any pipeline construction begins. In addition to obtaining regulatory clearance, entities operating direct biogas pipelines will be accountable for ensuring the safe and effective functioning of the system. This

includes the development and implementation of emergency procedures that reflect the unique properties of biogas in contrast to fossil gas. Furthermore, operators must comply with specified quality standards for the biogas transmitted, which will be established through a separate legal act.[539]

The draft legislation also introduces a support scheme for large-scale biomethane installations, as discussed further in section 7.5 below.[540] At the time of writing, these proposed amendments had passed a first reading in the Polish Parliament, with a second reading pending.[541]

7.3.3. EU Waste Framework Directive

The EU Waste Framework Directive (see section 2.3.4) is transposed into Polish national law through the Waste Act of 2012, amended in 2023.[542] The Waste Act lays down specific measures for the protection of the environment, human life and health by preventing and reducing the generation of waste and the negative impact of waste generation and management. The act also aims to reduce the overall impact of resource use with the objective of moving towards a circular economy. [543]

With respect to biogas, it is noteworthy that the Act does not apply specific regulations for waste streams destined for use in biogas or in a composting plant.[544] As spelled out in the 2023 Act on the Facilitation of Agricultural Biogas Plants (see section 7.4.2), regulatory exemptions for specific types of biomass, allowing the use of certain feedstocks without the need to comply with waste regulations.[545]

7.4 National policy and legislative framework

7.4.1. National Energy and Climate Plan (NECP)

In 2019, Poland published its NECP for the 2021–2030 period.[546] The plan highlights the strategic role of biogas, particularly in CHP generation. It emphasises the advantage of biogas's storage capability, which allows for flexible energy regulation. However, high investment costs are cited as a key factor limiting the expansion of biogas plant capacity.

The plan emphasises an economic perspective, suggesting biogas offers added value by enabling the utilisation of environmentally harmful waste, such as animal by-products and landfill gases. The NECP anticipates increased use of biogas-derived energy in the power sector. Depending on local needs, biogas facilities are envisioned to supply electricity, biomethane, heat, or cooling, leveraging regionally available resources.

In promoting energy from biomass, the plan notes that Polish agriculture possesses significant biomass resources, including by-products from farming and agri-food processing, which - according to the plan - should be harnessed for biogas production. The potential of agricultural biogas is also expected to grow, in line with the expansion of Poland's agricultural sector.

Overall, the NECP reflects the Polish government's supportive stance towards biogas development. Nonetheless, it acknowledges local community resistance as a barrier to the construction of biogas facilities.[547] While the plan underlines the value of biogas in complementing variable renewable sources like wind and solar, it does not set any concrete targets for increasing biogas production.[548]

Poland is currently in the process of updating its NECP, with a draft already released.[549] In its assessment of the draft update, the European Commission has called on the Polish government to address several key areas related to biomass and biomethane. Specifically, the Commission urges Poland to:

- Provide projected biomass supply trajectories by feedstock type and origin, distinguishing between domestic production and imports;
- Assess the domestic availability of forest biomass for energy use during 2021–2030, in line with the strengthened sustainability criteria under the amended Directive (EU) 2018/2001;
- Evaluate the compatibility of projected forest biomass use with Poland's obligations under the revised LULUCF Regulation for 2026–2030, and outline national measures to ensure compliance; and
- Introduce additional measures to support the sustainable production of biomethane, considering Poland's biogas and biomethane potential, fossil gas consumption patterns, infrastructure, digestate utilisation, and potential biogenic CO_2 applications[550]

As such, the Polish government is stimulated by the European Commission to scale-up its potential for biogas production.

7.4.2. Act on Facilitation of Agricultural Biogas Plants (2023)

In 2023, the Polish government enacted the Act on the Facilitation of Agricultural Biogas Plants.[551] The Act introduces a range of measures designed to streamline investment processes and encourage the growth of the agricultural biogas sector. Key provisions include:

- Streamlined construction procedures for agricultural biogas plants, significantly accelerating project timelines;
- Simplified network connection conditions, making it easier to connect biogas facilities to the power grid;
- Land use exemptions, removing the requirement to change the designated purpose of farmland for facilities up to 1 hectare in size, when located on a farm, provided that the local spatial development plan allows for agricultural, industrial, service, or storage use;
- A dedicated siting procedure for larger plants (above 1 MW, 213 - 320 million m3 biogas), requiring a location resolution by the municipal council;
- Regulatory exemptions for specific types of biomass, allowing the use of certain feedstocks without the need to comply with waste regulations; and
- Facilitated use of fermentation by-products as fertiliser, making nutrient recycling more accessible to farmers[552]

With these measures, the Polish government aims to remove barriers to the development and operation of agricultural biogas facilities in the country. [553]

7.4.3. Sector agreement for biogas and biomethane development

On 23 November 2021, at the initiative of the Minister of Climate and Environment, representatives from government bodies and the biogas and biomethane sector signed a cooperation agreement aimed at fostering the development of these industries in Poland.[554]

The agreement establishes an ongoing platform for collaboration among stakeholders, promoting coordinated efforts to accelerate the growth of biogas and biomethane. It highlights the potential benefits across various sectors, including the economy, environment, energy security, technology, and society.

The agreement signals the government's aspiration to produce a significant amount of biogas so as to meet a substantial portion of national natural gas demand in the future. The agreement was intended to strengthen the role of domestic producers, support the development of a biomethane market, which is framed as essential to enhancing the resilience of Poland's national economy. Beyond energy transition, the growth of these sectors is seen as a strategic opportunity to boost the global competitiveness of the Polish economy. [555]

7.5 Support schemes and market mechanisms

7.5.1. Rural Energy Priority Programme

The Rural Energy priority programme support scheme has a total allocation of EUR 700 million (PLN 3 billion) , with up to EUR 455 million (PLN 1.95 billion) available as non-repayable financing and up to EUR 245 million (PLN 1.05 billion) in repayable forms.[556] The Ministry of Climate and Environment did not report whether these amounts constitute annual available budgets, but given the large amount available under each of these support schemes, presumably the mentioned numbers constitute the total available budget for a number of years.[557]

The programme focuses on increasing the use of renewable energy sources in rural and semi-rural municipalities. It targets existing and emerging energy cooperatives - specifically those producing electricity, biogas or heat for internal use - as well as individual farmers, including both natural and legal persons and organisational entities without legal personality.[558]

The programme is funded through the EU Modernisation Fund (see section 2.3.13). [559]

7.5.2. Enhancing Energy Security through Biomethane Use Priority Programme

In addition, Poland plans to introduce a support programme called "The Enhancing Energy Security through Biomethane Use Priority Programme". The programme is envisioned to provide up to EUR 240 million (PLN 1 billion) in support, equally divided between non-repayable (EUR 120 million; PLN 500 million) and repayable (EUR 120 million; PLN 500 billion) financing. The Ministry of Climate and Environment did not report whether these amounts constitute an annually available budget but given the large amount available under each of these support schemes, presumably the mentioned numbers constitute the total available budget for a number of years.[560]

This programme intends to support investments in biogas infrastructure, including the construction, expansion, or modernisation of facilities for AD of biowaste, food waste, sewage sludge, and animal by-products. It will also cover the installation of purification systems for biomethane production and integration with the gas grid, or conversion into bio-LNG or bio-CNG for transport or self-use. The scheme is intended for entrepreneurs.

A second round of public consultation concluded on 12 January 2025. Following requests for clarification from the European Investment Bank (EIB), the programme is being revised and may be resubmitted in a future EIB funding cycle.[561]

This support scheme is also funded through the EU Modernisation Fund (see section 2.3.13). [562]

7.5.3. High-Efficiency Cogeneration from Biogas Produced from Biomass, Including Municipal Waste programme

The High-Efficiency Cogeneration from Biogas Produced from Biomass, Including Municipal Waste programme allocates EUR 240 million (PLN 1 billion) to support the generation of electricity and heat through high-efficiency cogeneration systems fuelled by biogas derived from biomass sources.[563] Under the programme, financing will be provided exclusively for fermentation installations that use biogas to generate electricity and heat in high-efficiency cogeneration conditions, with a total installed capacity of at least 1 MW (213 - 320 million m3 biogas). Funding will be offered in the form of a grant covering up to 40% of eligible costs, as well as a loan of up to 100% of eligible costs. The announcement of the call for proposals is planned for the turn of 2025 and 2026. The programme will be implemented until 2030.[564]

7.5.4. European Funds for Infrastructure, Climate, Environment (FEnIKS)

Funded by the European Funds for Infrastructure, Climate, Environment 2021-2027 (FEnIKS 2021-2027) programme, the Polish Ministry for Climate and Environment has dedicated EUR 338 million to support the development of renewable energy infrastructure. This fund targets installations for electricity and heat generation, as well as the production of fuels - specifically biomethane - from non-fossil energy sources. The support also includes energy storage systems directly linked to specific RES installations or community energy projects, along with the necessary grid connections. The programme is open to corporate beneficiaries. However, no calls for applications are currently active.[565]

7.5.5. National Reconstruction Plan

With a budget allocation of approximately EUR 188.5 million (PLN 845 million) in grant funding, Investment G1.1.2 under the National Reconstruction Plan aims to promote the development of local renewable energy sources through community-led initiatives. The programme supports energy communities, including energy clusters, cooperatives, and similar entities, with a focus on both foundational and large-scale renewable energy projects.[566]

Eligible beneficiaries include both existing energy communities and entities planning to establish such structures. Currently, there are no open calls for applications under this program. Additionally, there is no available information regarding a so-called “Promotion Fund”; the oversight of agri-food product promotion funds falls under the responsibility of the Ministry of Agriculture and Rural Development.[567]

7.5.6. Additional support schemes under proposal

Under the 2023 amendment to the Renewable Energy Sources (RES) Act, the Polish government established a Feed-in Premium (FiP) support mechanism for biomethane. This system provides subsidies to bridge the gap between market prices and production costs for producers who inject biomethane into the gas network, thereby promoting its integration into the national energy system.[568]

Furthermore, the European Investment Bank (EIB) approved a programme for high-efficiency cogeneration from biomass-to-biogas projects in Poland. This programme complements the support currently provided by the National Fund for Environmental Protection and Water Management (NFOSiGW) for municipal and agricultural biogas plants.[569] The initiative will have a budget of EUR 238 million from the Modernisation Fund (see section 2.3.13).

7.5.7. Subsidies and grants financing

As it has been detailed in the previous subsections, Poland has actively promoted the use and production of different non-fossil energy sources including biogas. However, the government does not publish detailed information about the companies receiving the subsidies and the amounts actually paid.

For instance, in 2015 the RES Act (see section 7.3.2) introduced a Feed-in Tariff support mechanism, including for agricultural biogas. This law entered into force in 2016 and had auctions between December 2016 and spring 2017. After a pause, when the law was amended to make sure it was in line with EU rules on fair competition, there were new auctions since the end of 2018 and the beginning of 2019. The program considers five "auction technology baskets" out of which two focus on biogas:

- Basket 1: Installations using only biogas from landfills, sewage treatment plants, among other uses of biogas and biomass
- Basket 3: Installation of agricultural biogas

In 2021 the law was revised, and the support schemes (Feed-in Tariffs) were extended until 30 June 2024. Unfortunately, there is no publicly available information as to the actual amounts paid in subsidies or grants under this scheme.

Another program actively supporting biogas in Poland is the Modernisation Fund (see section 2.3.13). In 2022 Poland applied for funding from the Modernisation Fund for two biogas related programmes: "Energy for Rural Areas" and "Development of cogeneration based on municipal biogas".[570]

The programme "Development of Cogeneration Based on Municipal Biogas" was implemented by the NFOSiGW to promote energy production by using biogas. The investments are related to construction of new, expansion or modernisation of existing installations for the fermentation of selectively collected municipal bio-waste and the use of the obtained biogas to generate energy in high-efficiency cogeneration conditions. The programme runs from 2022 until 2030.[571] The NFOSiGW offers cofinancing and loans from the Modernisation Fund. The total budget of the program amounts to PLN 1.5 billion (EUR 350 million).

Although applications for the program have been available for several years now (as of the second half of April 2024) the NFOSiGW has signed only two co-financing agreements, both with ProNatura Inter-Municipal Waste Disposal Complex in Bydgoszcz. The company received almost PLN 60 million (EUR 14 million) in co-financing from the NFOSiGW and PLN 63 million (EUR 14.7 million) in the form of a loan to build a municipal biogas plant.[572]

The second program under the Modernisation fund, the Energy for Rural Areas programme (Energia dla wsi), focuses on subsidising biogas plants. So far, PLN 1 billion (EUR 239 million) has been allocated to this programme for the construction of agricultural biogas plants.

According to the Government of Poland's Modernisation Fund website,[573] the government has granted a total of PLN 325 million (EUR 74 million) for the construction of biogas plants between 2023 and 2025 (see Table 23).

Table 23. Modernisation fund subsidies to biogas projects in Poland (2023 – 2025)

Year	Funding (PLN mln)	Funding (EUR mln)
2023	145.41	32.02
2024	153.54	35.76
2025	26.62	6.30

Source: *Own elaboration based on information from the Polish website on the Modernisation Fund.*[570]

Finally, this year, Poland will launch a new auction-based support scheme for biomethane production in installations above 1 MW - the previous programme was for installations producing less than 1 MW. According to the regulatory impact assessment, the proposed support system will contribute to the installation of approximately 53 biomethane installations with an average capacity of 2.8 MW by 2030.[574]

7.6 Final remarks

Despite various challenges, the biogas market in Poland is experiencing significant developments and is expected to accelerate in the upcoming years. Government programmes offering incentives and subsidies, increasing foreign capital investments, and a well-developed agricultural sector all foster the sector's considerable potential. The government perceives the acceleration of biogas shares as a positive step towards the transition to renewable energy sources.

The expansion of the biogas sector is faced with various challenges. Legislative, environmental, and social barriers continue to hinder the sector's development in Poland. While the government has made efforts to streamline the regulatory processes, actors involved in the biogas market still see plenty of room for further facilitation. Moreover, high upfront costs for biogas installation are also a significant concern. There are also environmental concerns, particularly about air pollution and land use, which need to be addressed. There are also technological barriers, such as a lack of the latest technology for bio-waste separation, that need to be considered. In addition, public scepticism towards sustainable solutions causes significant social challenges.

Despite these obstacles, the underlying market conditions in Poland provide a solid foundation for the acceleration of the biogas industry. Such acceleration, however, is not immune to potential environmental and human health issues, including air pollution resulting from impurities, risk of leakages, animal welfare concerns, and the biogas-driven boost for the meat and dairy industries, supporting the utterly unsustainable dietary patterns.

In recent years, the Polish government has taken significant legislative and financial steps to stimulate the development, production, and distribution of biogas and biomethane. From the launch of the 2021 Sector Agreement to the enactment of the 2023 RES Act, these initiatives reflect a growing commitment to advancing biogas and biomethane production, distribution, and application. In doing so, the government not only highlights the critical role of these energy sources in achieving national climate targets and supporting the energy transition, but also frames biogas and biomethane as strategic tools for enhancing the international competitiveness of the Polish economy.

Central to the Polish efforts to stimulate biogas and biomethane is the RES Act of 2015, which lays the foundation for non-fossil energy production and has undergone several amendments to better align with EU directives and national energy transition goals. The 2023 amendment to the RES Act enhanced legal

clarity around biomethane, expanding eligibility for its production - including energy cooperatives - and introducing administrative simplifications that ease project implementation. The amendment also launched a Feed-in Premium (FiP) system, providing subsidies to biomethane producers injecting into the gas grid, thereby making biomethane more competitive in the energy market.

In recent years, the Polish government has additionally sought to reduce regulatory hurdles, by streamlining construction and permitting processes, simplifying land-use requirements, and offering regulatory exemptions for certain feedstocks - as spelled out in the 2023 Act on the Facilitation of Agricultural Biogas Plants. These changes lower the administrative and financial barriers associated with building and operating biogas installations.

Complementing legislative reforms are a variety of financial instruments designed to catalyse investment. Various support schemes jointly allocate over EUR 1 billion to expand non-fossil energy, including biomethane production and storage systems in the coming years.

Despite this supportive policy environment, several structural and market barriers remain. One of the reported issues is the underdeveloped infrastructure for biomethane injection into the gas grid - no operational installations existed as of 2023, despite the technical capacity being available. Additionally, the NECP identifies high upfront investment costs and local community resistance as impediments to the expansion of biogas facilities. Although the Polish government perceives the agricultural sector as holding significant potential for biogas feedstocks, this potential remains - as of yet - largely untapped.

CHAPTER 8.

Biogas in Romania

This chapter examines the biogas sector in Romania, beginning with key environmental and social sustainability concerns associated with biogas production and use. It then explores the current market outlook and development prospects. The analysis considers the evolving European and national regulatory landscape, assessing how legislative frameworks either support or constrain the sector's expansion. Finally, the chapter outlines the range of incentives in place, including both direct and indirect subsidies.

8.1 Market overview

8.1.1. Volume and structure

Currently, the biogas sector in Romania is in the early stages of development. According to the report Mapping the State of Play of Renewable Gases in Europe (2020) developed with EU support, the country had 15 biogas plants in operation with a total installed capacity of 16.4 MW.[575] In May 2025, during the Budapest Biogas Summit, it was announced that "[...] in 2025, biogas production [was] expected to reach 23 megawatts across 28 facilities, and over the next decade, it could grow to twice the EU average".[576] Therefore, between 2020 and 2025, the total capacity is expected to increase by about 40%, and the number of plants to almost double. The relative increase would have been impressive, if the absolute figures had not been so insignificant. Overall, Romania ranks very low in terms of biogas capacity and production compared to other EU member states.[577] The currently meagre biogas production figures make its application marginal in all potential use cases, including electricity production, built environment, and as a transportation fuel.

At the same time, Romania has been identified as a country with one of highest potentials in Europe for biogas expansion, ranking number 7 the EU.[578] Most of the anaerobic digestion (AD) potential is expected to rely on sequential crops (a second crop before or after the harvest of the main food or feed crop on the same agricultural land during an otherwise fallow period), agricultural residues, and animal manure, and to a much lesser extent on industrial wastewater, permanent grassland, biowaste, roadside verge grass, and sewage sludge.[579] It has also been forecasted that by 2050, the total technical potential for the production of biomethane in Romania will make up about 65 TWh/year, largely relying on energy crops (60%), forest residues (17%), straw (13%), manure (7%), and biowaste (4%).[580]

8.1.2. Main biogas companies

Romania has a relatively small biogas sector and fairly modest biogas targets. According to its Energy Strategy, Romania plans to reach a 5% share of biomethane in the gas network by 2030 and 10% by 2050.[581] According to a report published by the Energy Policy Group (EPG) in 2023, Romania ranked among the lowest EU member states in both primary biogas production and its use for electricity generation. In 2022, Romania's biogas output totalled only 0.03 bcm, with an installed generation capacity reaching 23 MW.[582] The total installed capacity of 23 MW is distributed among 28 plants with an average capacity of 0.75 MW. Because Romania has a relatively small biogas sector and modest biogas targets, only a limited number of biogas production plant operators with an average capacity (either installed or planned) well above the national average level have been selected.

Table 24. Main biogas companies in Romania

#	Company	Annual production or capacity	Estimated biogas supply (in mln m3/yr)	Type	Notes	Feedstock	Source
1	Genesis Biopartner	2.99 MW electrical and 2.87 MW thermal / 7 million and 9 million m3 biogas production.	16.0	Producer	Biogas plant in Cordun commune, Neamt County, an investment of about EUR 17 mln	Waste from supermarkets, retail, hotels, and restaurants	[583]
2	BSOG Energy	15 MW (together with DN Agrar Group)	3.9	Producer	DN Agrar Group and BSOG Energy, an energy company specialised in the development of biomethane projects (owned by Black Sea Oil & Gas), signed a cooperation agreement for the largest biomethane production project in Romania, with a total capacity of 15 MW.	Manure	[584]
3	DN Agrar Group	15 MW (BSOG Energy)	3.9	Producer	DN Agrar Group, the largest dairy farm in Romania (Dutch investment) and BSOG Energy signed a cooperation agreement for the largest biomethane production project in Romania, with a total capacity of 15 MW.	Manure	[585]
4	Ecoterra Biogas	2,974 Mwe / 2MW/h	0.5	Producer	Ecoterra owns and operates the Moara biogas plant, which produces biogas from energy crops (field maize refuse). The two Jenbacher Type-4 engines use biogas as fuel to produce electricity and heat in high efficiency cogeneration.	Initially energy crops, being upgraded to be able to use food waste and municipal waste.	[586]
5	Genia Bioenergy	1 MW	0.3	Plant developer	The purpose of this plant is to offer a sustainable solution to the management of 60,000 tonnes of livestock and agricultural waste per year through the generation of renewable energy from which both the city council and residents can benefit.	Livestock and agricultural waste	[587]
6	Clarke Energy Romania	n/a	n/a	Plant developer	Clarke Energy Romania (former TEB Energy Business) developed the largest biogas plant in Romania. The Moara Project produces biogas from energy crops.	Initially energy crops, being upgraded to be able to use food waste and municipal waste.	[588]

Source: *Data from multiple sources (see the last column). For conversion factors used, see Appendix 1.*

8.1.3. Contribution to the economy

As of 2025, biogas production capacity (23 MW across 28 facilities) in Romania remains very low, meaning that the sector does not provide a significant contribution to the country's GDP and employment.

8.1.4. Development trends

The Romanian Government is planning to increase biomethane production and use. Its Energy Strategy, which is further discussed below, appears to be a driver for expanding the production of biogas and its upgrading to biomethane, aiming to substitute up to 5% of fossil gas in its network by 2030 and up to 10% by 2050. Such policy developments will likely enhance the role biogas plays in the country's consumption and send a signal to the private sector that the demand for biogas will likely be increasing. It is expected that about 501 ktoe of biomethane can be produced from the waste- and agriculture-based feedstocks by 2050.[589]

To meet this target, Romania will need to construct a vast number of new biogas production plants, and an increase in new biogas projects can already be observed. In 2024, DN AGRAR Group, Romania's largest integrated livestock farming company, has entered into a cooperation agreement with BSOG Energy—an energy firm specialising in biomethane projects and part of Black Sea Oil & Gas. The joint project, estimated at over EUR 30 million in investment, aims to establish Romania's largest biomethane production facility, with a planned capacity of up to 15 MW. DN AGRAR will provide the feedstock under a long-term contract to ensure a sustainable supply, while BSOG Energy will oversee the facility's development.[590] Multinational players, including the French energy giant Engie, have also expressed interest in developing biogas projects in Romania.[591]

8.2 Sustainability concerns

Due to its low biogas production and utilisation, Romania does not seem to experience the negative impact associated with this industry. However, taking into account the Romanian Government's biogas expansion targets and the country's ample potential for feedstock production, several impacts must be anticipated.

Improper storage or over-application of digestate can pollute groundwater with nitrates and eutrophicate nearby rivers and lakes. Romania already struggles with nitrate pollution in some agricultural zones, so, given the proposed biogas expansion plans, this may become a significant concern if digestate is not properly regulated. According to the Romanian Ministry of Agriculture and Rural Development, the mismanagement of manure and slurry is already the key concern in terms of anthropogenic nitrate pollution, particularly in the mountainous regions of the country, which heavily rely on grazing-based animal farming.[592]

The sector can also have negative human health implications. Biogas, while generally considered a cleaner and renewable energy source, can pose serious human health risks if not properly purified before use. This becomes increasingly relevant as Romania aims to scale up biomethane production to meet its 5%–10% gas grid targets. While comprehensive epidemiological studies in Romania are still lacking, international research has documented increased respiratory symptoms and odour-related distress in communities near poorly managed biogas plants. Medical research has shown that both employees working at and residents living in close proximity to biogas production facilities could be potentially exposed to a range of pollutants, including particulate matter PM10 and PM2.5, ozone, nitrogen dioxide, sulphur dioxide, certain bacteria and fungi, endotoxins, and some volatile organic compounds VOCs.[593]

These considerations appear to be relevant for Romania, which, according to an EU/OECD report, saw 103 premature deaths from air pollution per 100,000 in 2024. Though not the highest figure in Europe (North Macedonia being the leader with 255 deaths per 100,000 inhabitants), it is still considerably higher than in many other countries, including those with a robust biogas industry (Germany – 39, Netherlands – 32, Denmark – 21).[594]

8.3 Implementation of EU policies

8.3.1. REPowerEU

In 2021, Romania published its first National Recovery and Resilience Plan (NRRP) to support the objectives outlined under the REPowerEU initiative (see section 2.3.1).[595] A revised version of the plan was released in December 2023.[596]

Although biogas is not a central focus of Romania's NRRP, the plan includes targeted investments to support integrated communal manure recovery systems, composting facilities, and compost management equipment, particularly for communities with large-scale farms and existing biogas infrastructure. Notably, the NRRP outlines the development of five biogas systems serving such communities, each with a minimum electrical and thermal capacity of 300 kW. These installations are required to adhere to the DNSH principle and comply with sustainability criteria, including restrictions on biofuels derived from food and feed crops, as stipulated in Article 26 of the RED II, along with its associated implementing and delegated acts.[597]

8.3.2. EU Renewable Energy Directive (RED III)

At the time of writing, Romania has yet to transpose EU Renewable Energy Directive (RED III, see section 2.3.2) into national law, although a draft legislation was published in 2024.[598] This draft includes a requirement for fuel suppliers to ensure that, by 2030, at least 29% of final energy consumption in the transport sector is derived from non-fossil energy sources, with a specific sub-target of 5.5% target for advanced biofuels, biogas and RNFBOs.[599] Advanced biofuels and biogas must be produced from feedstocks explicitly listed in Annex 10, Part A of the 2018 Ordinance No. 80.[600] This list excludes energy crops as direct inputs, allowing only residues from energy crops - such as peeled corn cobs or nut shells - to be used as feedstock. However, at the time of writing, this draft legislation has not yet been formally adopted.

The legislation currently in force reflects Romania's transposition of RED II through Ordinance No. 1165 on the Promotion of the Use of Energy from Renewable Sources.[601] establishes a target requiring that 14% of total energy consumed in the transport sector originate from nonfossil energy sources, with 3.5% specifically derived from biofuels, biogas, or RNFBOs – also restricted feedstocks listed in Annex 10, Part A of the 2018 Ordinance No. 80.[602] Thus, while the 2024 draft proposal introduces a substantially higher target for nonfossil energy in the transport sector, it envisions only a limited role for biofuels and biogas in achieving this strengthened objective.

8.3.3. EU Waste Framework Directive

Romania has transposed the EU Waste Framework Directive (see section 2.3.4) into national legislation through the Emergency Ordinance No. 92/2021 on the Waste Regime, with its most recent amendments adopted in 2023.[603]

Among other provisions, the Waste Regime Law establishes obligations for the separate collection of waste to ensure that waste streams are prepared for reuse, recycling or other recovery operations. As of December 2023, local public authorities are required to ensure the separate collection of bio-waste, in addition to the separate collection of other waste streams already mandated prior to 2023.[604] Notably, the legislation specifies that bio-waste treated through aerobic or anaerobic processes is counted as recycled only if it has been collected separately.

8.4 National policy and legislative framework

8.4.1. National Energy and Climate Plan 2021-2030

The Romanian NECP 2021 - 2030, published in April 2020, outlines national objectives for reducing greenhouse gas emissions and increasing the share of renewable energy.[605] The renewable energy strategy is structured across four key dimensions:

- Energy efficiency
- Energy security
- The internal energy market; and
- Research, innovation, and competitiveness.

Biogas is not a central component of Romania's 2020 NECP. Instead, the plan emphasises the development of technologies and research related to biofuels and biogas production, positioning biogas primarily within the dimension of research, innovation, and competitiveness. With respect to the other three dimensions, the plan places stronger emphasis on energy sources like hydropower, solar and controversial energy sources like fossil gas and nuclear power. Biogas and biomethane are notably absent from the list of prioritised energy sources. [606]

The NECP identifies several barriers to the development of biogas in Romania. A primary concern is the absence of reliable national data on the potential of biogas and biomass resources. This issue is further exacerbated by ambiguities in the legal framework, which hinder the clear classification of certain materials - such as firewood, widely used in rural households - as biomass.[607]

At the time this report was prepared, Romania was in the process of revising its NECP, with an initial draft released in 2023.[608] In response, the European Commission issued recommendations, urging Romania to introduce more concrete actions to support the production of biomethane. These suggestions reference the country's untapped biogas potential, its reliance on fossil gas, available infrastructure, and possibilities for utilising digestate and biogenic CO_2.[609]

Following this guidance, the Romanian government released a second draft of the updated NECP in 2024.[610] This version includes plans to integrate biomethane into the national gas transmission grid, targeting a 5% share by 2030 and 10% by 2050. Through these measures, Romania aims to raise the contribution of non-fossil energy sources to final energy consumption and curb methane emissions, thereby expanding the role of biomethane in its energy portfolio, as depicted in Figure 18.

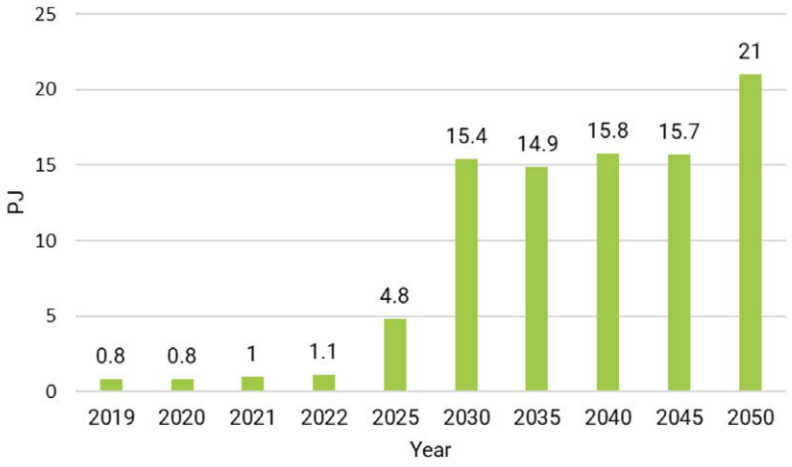


Figure 18. Estimated biogas / biomethane production trajectory in Romania

Source: *Government of Romania (2024, September), Updated National Integrated Energy and Climate Plan, Second Draft Version, p. 75, data originally expressed in KTOE converted to PJ .*

The NECP further specifies that the Romanian government seeks to build new biomass and biogas-fired Combined Cycle Gas Turbines (CCGT) – a type of power plant that utilises both gas and steam turbines to generate electricity - and CHP power generation capacity, with a targeted electricity generation capacity of:[611]

- New biomass cogeneration (CHP) capacity: 10 MW (2,133 – 3,200 million m3) installed each year until 2050
- New biogas CHP capacity: 5 MW (1,066 – 1,600 million m3) installed each year until 2050
- New biogas CCGT capacity: 5 MW (1,066 – 1,600 million m3) installed each year until 2050

8.4.2. National Strategy for a Circular Economy (2023)

The Romanian NSCE is a roadmap for accelerating Romania's transition from a linear to a circular economic model.[612] The strategy was formally adopted by the Romanian government in September 2022.[613]

With respect to biogas, the NSCE states that increasing the collection of biowaste is needed in order to meet the targets set out in the NECP (see section 8.4.1).[614] The NSCE suggests that the number of biogas producers in Romania was limited, primarily due to insufficient biowaste supply.[615] Furthermore, in a report published in March 2025, the EEA highlighted structural barriers to the expansion of composting and AD, pointing specifically to Romania's limited capacity for separate biowaste collection. According to the EEA, in 2023, the country's infrastructure could treat only about 27% of the approximately 1.7 million tonnes of biowaste generated annually.[616] Notably, the EEA's analysis appears to emphasise infrastructural shortcomings over bio-waste supply constraints as the principal factor behind the low number of biogas operators in Romania. This suggests a potential misalignment in the framing of the problem between national and European-level assessments.

8.4.3. Global Methane Pledge

While Romania is a signatory of the Global Methane Pledge, committing to a collective 30% reduction in global methane emissions by 2030 (compared to 2020 levels), the country has not published a National Methane Strategy yet.[617] As a result, it remains unclear how the Romanian government plans to reduce methane emissions and what implications this target will have for the production, distribution, and consumption of biogas and biomethane in the country.

8.5 Support schemes and market mechanisms

8.5.1. Sustainable Development Programme 2021-2027

The 2024 NECP states that the Romanian government intends to support the planned expansion of biogas-based power generation (see section 8.4.1) through the so-called Sustainable Development Programme 2021-2027 (Programul Dezvoltare Durabila (PDD).[618] According to the NECP, this programme is structured around four main priorities:

- Development of water and wastewater infrastructure and transition to a circular economy
- Protecting the environment by preserving biodiversity, ensuring air quality and remediating contaminated sites
- Promoting climate change adaptation and risk management
- Promoting energy efficiency, smart energy systems and networks and reducing greenhouse gas emissions.[619]

The 2024 NECP references a 2021 publication that provides detailed information on the Sustainable Development Programme, including budget allocations by activity type.[620] According to the 2021 document, a total of EUR 20 million was allocated for energy production from biomass.[621] A more recent version of this document, published in 2024, indicates an allocation of EUR 10 million for the same category.[622] While neither document explicitly states whether these figures represent annual allocations, the discrepancy suggests that the amounts may correspond to yearly budget cycles.

The programme is co-financed by several EU instruments, including the European Regional Development Fund, the European Social Fund+, and the Cohesion Fund.

Eligibility for funding under the programme requires that activities align with the DNSH principle. Furthermore, biogas projects must rely on organic waste and residues as feedstock. The use of energy crops is explicitly excluded in order to prevent adverse land-use changes.[623]

8.5.2. EU Modernisation Fund

The 2024 NECP also indicates that the Romanian government plans to support the anticipated expansion of biogas-based power generation (see section 8.4.1) through the EU Modernisation Fund.[624] This fund is designed to facilitate the modernisation of energy systems and the enhancement of energy efficiency across 13 lower-income EU Member States (see section 2.3.13).

8.5.3. Subsidies and grants financing

Romania is one of 16-member state recipients of the EEA–Norway Grant.[625] The fund - which is financed by Norway, Iceland and Liechtenstein - aims to contribute to a more equal Europe and to strengthen the ties between the donor countries and the recipients.

Under the EEA–Norway Grants program, Aquaserv received more than EUR 2 million to reduce GHG emissions. Aquaserv plan to achieve its GHG reductions by using biogas for electricity and thermal energy, while also improving energy efficiency in water and wastewater infrastructure and industrial processes.[626]

Another EU level programme of which Romania is recipient is the Modernisation Fund (see section 8.5.2). Since the start of the programme in 2021, Romania has received EUR 5,539.1 million, although it should be noted that this amount was not awarded to biogas-related projects only, but also to solar and wind power projects and other technologies related to curbing CO_2 emissions.[627] Based on the annual reports from the Modernisation Fund, Romania has not applied for funds for biogas-related projects between 2021 – 2023 financing rounds. [628]

The only subsidies provided by the Modernisation Fund related to biogas is one granted to BSOG Energy, a subsidiary of Black Sea Oil and Gas, which in turn is owned by Carlyle Group and the European Bank for Reconstruction and Development (EBRD). Unfortunately, there is no information about the amount granted to BSOG Energy for the development of the biogas plants.

8.6 Final remarks

Currently, Romania has a relatively small biogas market, with a total installed capacity of 16.4 MW over 15 facilities. At the same time, Romania ranks very high in terms of biogas potential based on feedstock availability. Given the generally supportive EU and country-level regulations, Romania may see a considerable increase both in biogas production and its upgrading into biomethane. At the same time, the potential negative environmental and social consequences are not always taken into account. For example, an increase in biogas use in CHP plants may lead to increased human health issues, while Romania is already demonstrating relatively high avoidable mortality rates related to pulmonary conditions related to poor air quality.

At the time of writing, Romania presented a mixed landscape of both barriers and emerging opportunities for biogas production, use, and distribution. A significant barrier is the delayed transposition of the Renewable Energy Directive III (RED III), which limits policy clarity. While a draft legislation was published in 2024, formal adoption had not yet occurred as of mid-2025.

Several systemic issues constrain Romania's biogas sector: reliable national data on biomass and biogas is reportedly missing, and ambiguities in legal classifications for various biomass materials cause policy uncertainty. Infrastructure is reportedly identified as another critical bottleneck: by 2023, only an estimated 27% of bio-waste generated annually was processed, largely due to limited capacity to collect separate waste streams at that time. However, as of December 2024, the separate collection of biowaste has been mandated nationwide, a development that may help to alleviate this constraint.

Biogas has not been prominently featured in its National Recovery and Resilience Plan (NRRP) or in the current National Energy and Climate Plan (NECP). The existing NECP – published in 2020 - positions biogas mainly in the context of research and innovation, with limited integration into core energy strategies.

Nonetheless, there seems to be a regulatory window-of-opportunity for the promotion of biogas production, distribution and use. Under its 2022 transposition of RED II, Romania mandates that at least 14% of transport energy consumption must come from non-fossil sources by 2030, with minimum sub-targets for advanced biofuels and biogas leading up to 3.5% by 2030. These targets are expected to rise to 29% and 5.5%, respectively, under the forthcoming RED III transposition. Additionally, Romania's revised NECP draft from 2024 introduces plans to integrate biomethane into the national gas grid, targeting 5% share by 2030 and 10% by 2050. It also outlines annual installation targets for new biogas-based power capacity. Support schemes such as the Sustainable Development Programme and the EU Modernisation Fund offer targeted funding, particularly for projects that use organic waste and meet environmental standards. These developments signal growing attention for biogas in Romania's energy transition strategy.

CHAPTER 9.

Biogas in the United Kingdom

After several decades of growth, the biogas sector in the UK is well-developed. The regulatory landscape and an overall positive framing of biogas create favourable conditions for its development. The biogas market is currently expanding at a moderate pace. This chapter examines the key environmental and social sustainability concerns, followed by the current market outlook and development prospects. It also analyses the UK regulatory framework, discussing how the national legislation supports – or limits – biogas deployment. Finally, the chapter outlines the range of incentives in place, including both direct and indirect subsidies.

9.1 Market overview

9.1.1. Volume and structure

The UK is among the top five leading biogas producers in Europe.[629] Data for 2023 shows that there are 615 operational plants, with a total capacity of 571 MWe (272 million m3). These include 408 farm-fed plants, with a total capacity of 244 Mwe (116 million m3). The remaining 207 plants are waste-fed. These figures show that approximately half of the total biogas production capacity is generated from crop-fed AD plants, with the remaining part being generated from waste-fed AD plants. [630]

In 2023, the total share of renewable energy sources accounted for 46.4%.[631] Bioenergy accounted for 48% of renewable energy sources used, with most of the remainder coming from wind (26%), waste (15% for both renewable and non-biodegradable waste), heat pumps and solar (4.5% each).[632]

The biogas market in the UK reached an acceleration peak growth between 2014 and 2017. Since then, the sector has gradually expanded at a steady pace. This is also determined by the fact that an estimated 90% of wastewater is already used for biogas production, and therefore, expansion possibilities in this sector have become limited. As for agricultural and industrial biowaste, the development of new biogas plants has been modest since the peak in 2017 (see Figure 19). [633]

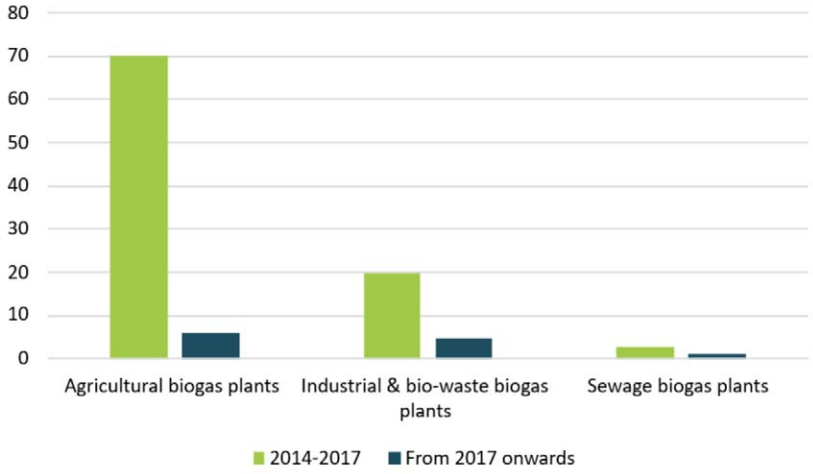


Figure 19. Biogas development trends in the United Kingdom

Source: *Own elaboration based on IEA Bioenergy (2024, September), A Perspective on the State of the Biogas Industry in 12 Member Countries of IEA Bioenergy Task 37, p. 58.*

From 2019 onwards, the UK's electrical capacity based on biogas has remained steady at around 0.7 GW pure electrical and 1.8 GW combined heat and power.[634] In 2023, 6.7 million tonnes of biomass were used as feedstock for biogas production. [635]

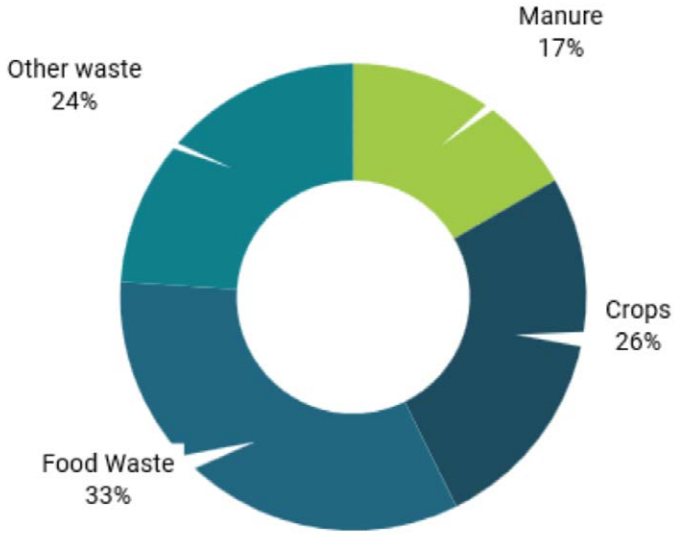


Figure 20. Feedstocks used for biogas production in the UK, 2023

Source: *Own elaboration based on the Department for Environment, Food & Rural Affairs (2024, June 27), Bioenergy Crops in England and the UK: 2008-2023.*

The feedstock distribution in 2023 is presented as follows: manure accounted for 17%, crops for 26%, food waste for 33%, and finally, other waste, not derived from food or crop waste, which accounted for 24%. Moreover, in 2023, 133,000 hectares of agricultural land were used to grow crops for biogas production, which corresponds to 2.2% of the total arable land in the UK. [636]

9.1.2. Main biogas companies

The selection of companies is based on a long list derived from, among others, the European Biogas Association, Corporate and research members based in the UK, as well as the Industry Directory of the Anaerobic Digestion and Bioresources Association (ADBA).

The UK has around 700 AD plants in operation. Of these plants, over 130 upgrade their biogas to biomethane for injection in the national grid, generating an estimated 6 TWh (1 billion m3) of biomethane each year. This is enough to heat around 500,000 homes.[637]

As most companies report on the amount of energy generated per annum, tonnes of waste being processed and/or thenumber of households powered by the gas produced, the list is mostly based on a combination of those criteria. Company documents that were consulted included websites and annual reports.

Table 25. Main biogas companies in the United Kingdom

I#	Company	Annual production, input and/or capacity	Estimated biogas supply (in mln m3/ yr)	Type	Feedstock	Source
1	Future Biogas	500 GWh	80.2	Developer / producer		638
2	Severn Trent	450,000t waste / 350,000 MWh biomethane	56.2	Developer / producer	Food waste	639
3	Swancote Energy	75,000t waste / 30,000 MWh biomethane	48.1	Producer	Food-, agricultural waste, animal by-products, sludge	640
4	Biogen UK	300,000 MWh green energy - assumed to be biogas	48.0	Producer	Organic waste from supermarkets, hospitality, food manufacturers, farmers and local authorities	641
5	ReFood	203,963t waste / 104,544 MWh	16.7	Producer	Commercial food waste	642
6	BioticNRG	Since ~sept 2022: 164,956t waste / 50,552 MWh	2.8	Investor / developer / operator		643
7	Eco Sustainable Solutions	13,237 MWh - assumed biogas	2.1	Developer / producer	Food waste, 'other organic material'	644
8	Biffa	315,000t waste / 6,500,000 MWh (capacity)	1.0	Producer	Food and 'green waste'	645
9	Material Change (HeathPatch Group)	250,000t waste	n/a	Developer / operator / producer	Grown crops, waste	646
10	Engie UK	n/a	n/a	Developer / producer	Organic waste, from local farms and food production	647

Source: *Sources: European Biogas Association, Anaerobic Digestion and Bioresources Association, and data from multiple sources (see the last column). For conversion factors used, see Appendix 1.*

9.1.3. Contribution to the economy

The biogas market contributes modestly to the UK's economy. In 2023, the market generated revenue of GBP 4.1 billion (EUR 4.8 billion) and is expected to grow at a moderate rate to reach GBP 4.8 million (EUR 5.5 million) by 2030.[648]

Government authorities frequently emphasise the sector's potential to generate significant employment opportunities.[649] At present, the industry supports approximately 4,800 jobs, spanning both operational and supply chain roles.[650] Industry lobby groups project that the expansion of biogas infrastructure could create up to 60,000 jobs by 2030.[651]

However, while these figures indicate a meaningful contribution to the labour market, an in-depth analysis shows the contrary. The UK labour market is relatively stable, with a national unemployment rate of around 4.6%.[652] More importantly, rural unemployment, where biogas plants are typically located, is comparatively low, averaging just 2.5% and consistently lower than in urban areas.[653] This implies that biogas lobby groups are framing job creation in the sector as a necessary solution to a problem that isn't actually a pressing socio-economic issue.

9.1.4. Development trends

The mainstream political narrative around biogas in the UK remains positive.[654] The UK's authorities are committed to integrating biogas into the country's total energy mix. Ambitious climate goals combined with supportive policies and regulations foster a supportive environment for the biogas market's growth in the UK.[655]

Multinational corporations are constantly expanding their biogas operations in the UK. A notable example of corporate involvement in biogas production in the UK is a 2023 partnership between AstraZeneca and Future Biogas, one of the UK's leading biogas producers. This agreement, signed initially for 15 years, will deliver around 100 GWh (47.6 million m3) of electricity generated with biogas annually. [656]

However, despite regulatory support, many small-scale biogas plants in the UK are expected to close by 2031. These closures are primarily due to the fact that most of the current subsidies for the biogas industry will expire by 2027.[657] This uncertainty, combined with the high costs of modernising ageing infrastructure, is projected to result in the UK losing up to 2000 GWh (952 million m3) of annual electricity generation from this segment.

9.2 Sustainability concerns

In the UK, biogas has been framed as an alternative to fossil fuels, an attractive solution to address unsustainable energy production by transforming organic waste into energy.[658] Positioned as a renewable substitute for fossil fuels, the ability to transform agricultural and food waste into usable energy is seen as offering a sustainable and circular approach.[659] The government swiftly identified the biogas market as a way to advance the energy transition without the need for drastic infrastructural changes. In this light, biogas has been integrated into the UK's broader energy and climate strategy, with public policy increasingly favouring its acceleration through regulatory incentives such as the Green Gas Support Scheme and the Renewable Transport Fuel Obligation (see section 8.5).[660]

However, while biogas is politically attractive and presented as a foundation of a greener energy future, its expansion raises pressing environmental and social concerns that complicate this optimistic narrative.[661]

One of the most significant environmental issues associated with biogas production in the UK is methane leakage.[662] An increased number of biogas plants may lead to a rise in the UK's national methane emissions.[663] Further, inefficient plant management might result in leakages, causing water and air pollution. This concern is especially vivid among rural communities, which have a biogas installation in close proximity.[664] Civil society groups are also increasingly concerned with the consequences of biogas leakages and pollution on their health and local biodiversity, as well as daily struggles with unpleasant odours and devaluation of their properties.[665] Moreover, rural communities express dissatisfaction about often being overlooked in the decision-making process, having little to no say in biogas infrastructure developments in the rural areas where they live.[666] Protests against biogas installations are often organised by rural communities around the country.

A further challenge lies in feedstock sustainability and land use.[667] Scaling up biogas production demands increasing volumes of organic material, often sourced from manure, food waste, or specially cultivated energy crops. These factors, combined with the emerging debate on land scarcity in the UK, raise the question of whether crop cultivation solely for biogas production is an optimal use of the limited available land. [668] Therefore, this poses serious sustainability concerns, as dedicating arable land to biogas feedstocks can lead to soil degradation, reduce food crop availability, and incentivise monoculture practices.[669] Biogas produced from cultivated energy crops also abandons the narratives on circularity benefits, as while it might be claimed that biogas produced from waste contributes to the 'closed loop' principles, this cannot be said about biogas

produced from energy crops.[670] Additionally, animal rights groups are alarmed that an increasing demand for biogas feedstock could specifically incentivise large-scale or industrial livestock operations, as these systems produce more concentrated sources of feedstock. This raises major animal welfare concerns.[671]

9.3 Regulations similar to EU policies

9.3.1. Powering Up Britain: Energy Security Plan

The UK's Powering Up Britain plan is a document with similar goals to the REPowerEU Plan. It was adopted in April 2023 and reflects Britain's aspiration to ensure domestic energy security following Russia's invasion of Ukraine and other geopolitical instabilities, while remaining consistent with the country's net-zero target. Both documents aim to scale up biomethane, renewables, and hydrogen, and thereby improve energy security. Both also see the energy transition as an opportunity for industrial growth and carbon neutrality. At the same time, while REPowerEU is more aggressive and centralised, with big, quantifiable targets and major EU-level funding, Powering Up Britain is more market-led, lacks specific biomethane targets, and is less focused on immediate energy crisis response.

According to the plan, in the medium term, the direct use of fossil gas in the housing sector is expected to decline, with low-carbon alternatives increasingly replacing it. Domestically produced biomethane has already been playing a growing role, with increasing volumes injected into the gas grid under the Green Gas Support Scheme (GGSS) in 2023-2024. At peak production, the GGSS has been projected to support enough biomethane injection to heat approximately 200,000 homes annually; however, it is unclear if these targets have been reached. The government plans to consult on a new policy framework for biomethane to succeed the current GGSS, which was supposed to close to new applicants in 2025, but was extended until 2028. This new plan will, the Government hopes, help to lower carbon emissions, reduce dependence on fossil gas, and enhance the diversity of gas supply.[672]

9.3.2. Biomass Strategy

The UK Biomass Strategy[673], adopted in August 2023, recognises that biomass is a flexible and valuable resource that can be used to generate electricity, provide heating, transport fuel, and even replace fossil fuels in the production of materials, chemicals, and everyday products. The strategy outlines how the government plans to boost the sustainability of biomass and expand its use across different sectors to help meet the UK's goal of reaching net-zero emissions. It builds on the 2021 Biomass Policy Statement and the Powering Up Britain strategy, both of which underline biomass as a key part of delivering a fully decarbonised power system by 2035, while maintaining energy security.

Chapter 7 of the Strategy, focusing on biomass uses across the economy, pays considerable attention to biomethane production and greening the gas grid. According to it, the UK Government believes that the direct injection of biomethane into the existing gas grid provides for a cost-effective way to contribute to the legally binding carbon budgets in the short term. It sees biomethane as a means to decarbonise the country's gas supplies and commits to supporting biomethane injection well into the early 2040s.[674]

Overall, the Biomass Strategy treats biomethane as an integral part of the UK energy security and net zero pathway and praises it for the flexibility of application: direct injection into the gas grid to replace fossil gas in heating, electricity, generation, and as fuel to decarbonise heavy transport. The strategy also underlines the role that biomethane could play as a feedstock for many industrial applications and for the production of hydrogen via the steam methane reformation (SMR) process.[675]

The strategy discusses the supposed benefits of biomethane for improving the circularity of [the British] food systems, as resulting digestate could reduce the need for fossil fuel-based fertilisers, and increased treatment of slurries in AD could reduce the carbon emissions associated with agriculture.[676]

The Biomass Strategy also claims that biomethane production is going to be beneficial for the country's waste reduction targets. In particular, it is expected to contribute to:

- Exploring options for the near elimination of biodegradable waste to landfill from 2028 (England);
- Meeting an ambition to work towards eliminating food waste to landfill by 2030 (England); and
- Meeting the target to recycle 65% of municipal waste by 2035.[677]

In addition to food waste, sewage sludge and slurries, the strategy envisages the use of other feedstocks, including perennial and non-perennial crops (grown as part of an integrated crop rotation regime), as well as other sources, such as slurry lagoon gas capture, landfill gas upgrading and advanced gasification of biomass.[678]

The strategy also positions biogas as an important contributor to the economic development of rural areas, particularly those with lower regional GDP than the national average, by creating new jobs and developing skills required for the green energy transition.

According to the strategy, 6.2 TWh (622 million m3) of AD-produced biomethane was injected into the British grid in 2022, with up to 13 TWh (1.3 billion m3) by 2035 envisaged under the Carbon Budget Delivery Plan (2023),[679] and an overall ambition of 30-40 TWh (3-4 billion m3) by 2050 and ensure that the UK can reach its net zero goals in a cost-effective manner.[680] To achieve these goals, a number of support mechanisms and incentives have been developed. These are discussed in the next sections of this chapter.

9.3.3. Nitrate Vulnerable Zones (NVZs)

Nitrate Vulnerable Zones (NVZs) are designated areas at risk from agricultural nitrate pollution. In the UK, NVZs are primarily regulated by legislation derived from the EU Nitrates Directive (91/676/EEC), which has been retained in domestic UK law following Brexit under the EU (Withdrawal) Act 2018. This means that the regulatory basis for NVZs remains rooted in the Nitrates Directive, but it now functions as UK domestic law.

The principal laws governing NVZs vary by UK nation:

- England: Nitrate Pollution Prevention Regulations 2015 (SI 2015/668)[681]
- Wales: Water Resources (Control of Agricultural Pollution) (Wales) Regulations 2021[682]
- Scotland: The Action Programme for Nitrate Vulnerable Zones (Scotland) Regulations 2008[683]
- Northern Ireland: The Nitrates Action Programme Regulations (Northern Ireland) 2019 (SR 2019 No. 81)[684]

All four regulations have retained the limit of 170 kg of livestock manure per hectare, including anaerobic digestate. Therefore, NVZs may have a significant impact on biogas production, particularly when it comes to digestate management, which is a major by-product of AD. While NVZ rules do not directly restrict the production of biogas itself, they place strict limits on how and when the resulting digestate can be stored and spread on land, which can affect the economic and logistical feasibility of biogas projects. For example, the limit on the amount of digestate that farmers can spread decreases potential demand for it, meaning

that biogas plants may need additional tanks to store digestate or need to transport it over longer distances to farmers further away from the plant, thus increasing costs. As NVZs constitute about 55% of the land in England,[685] these risks may be relevant to many AD facilities in the country. The 2021 Wales regulations apply nationwide, not just in designated NVZs. This means NVZ-style restrictions now apply across all of Wales, which is a more stringent approach than in England.[686]

9.4 Other relevant national regulations

9.4.1. Global Methane Pledge and the Methane Action Plan

Understanding the need to tackle methane emissions, which accounted for 14% of the overall GHG emissions in the country (mostly coming from agriculture (49%), waste (30%) and fuel supply (8%) industries), in 2022, the UK signed the Global Methane Pledge.[687] To implement its commitments under the Pledge to reduce global methane emissions by at least 30% by 2030 compared to 2020 levels, the UK Environment Agency has published the Methane Action Plan, aiming to:

- improve the data of sectors it regulates to support better decisions and targeted action by improving how methane is measured, monitored, reported and modelled
- maximise the effectiveness of the regulation to enable and encourage operators to reduce methane emissions and maximise utilisation efficiency:
    - reduce and, where possible, prevent emissions from sectors regulated by the Agency for methane losses, such as landfill sites, and anaerobic digestors operating under Environmental Permitting Regulations (EPR)
    - continue to provide technical assistance to policymakers in government to help shape future regulations to deliver further reductions in methane emissions.[688]
- work with external partners to share knowledge to improve the collective understanding of how to reduce methane, measuring standards and monitoring approaches.

In terms of biogas and biomethane, the Plan aims to ensure preventing or reducing fugitive emissions by covering open post-digestion storage (with collection and use of currently fugitive biogas) and, at a later stage, consider measures to allow methane capture on farms and hydrogen conversion on AD plants converting biomethane to hydrogen.[689]

9.4.2. UK Taxonomy

Following its decision to leave the EU, the UK can no longer directly use the EU Taxonomy; however, it has been decided that the UK should develop and implement its own national green finance taxonomy based on international standards and best practices, and interoperable with other such frameworks. In 2020, former Chancellor Rishi Sunak first announced the plans to implement a green taxonomy, which would build on the scientific metrics of the EU taxonomy. A newly set up UK Green Technical Advisory Group (GTAG) would review these metrics to ensure they suit the UK market.[690] These plans were reconfirmed in May 2023, along with a suggestion to develop a transition taxonomy or to include certain transitional activities within one Taxonomy.[691]

During its mandate, the GTAG developed and published 11 policy statements and recommendations for the government on how the UK Taxonomy should be developed, operated, and maintained. However, no draft taxonomy text has been produced so far (or, at least, no such draft has been published). In November 2024, the Government launched a UK Green Taxonomy Consultation to collect the stakeholder opinions on the role and the added value of the future UK Green Taxonomy within the broader context of sustainable finance regulations.[692] The consultations were closed for responses in February 2025. No information on the next steps, potential sectoral scope, its role within the broader sustainable finance legislation, or other details has been disclosed. Overall, the Taxonomy development process has been, so far, disappointingly slow.

At the same time, the lack of tangible progress on the Taxonomy development provides a window of opportunities for civil society, particularly environmental NGOs, to intervene and advocate for robust sustainability safeguards on biogas – and the wider bioenergy sector – or for the complete exclusion of this sector from the future Taxonomy.

9.5 Support schemes and market mechanisms

9.5.1. Green Gas Support Scheme (GGSS)

The Green Gas Support Scheme (GGSS) envisages tariff support for biomethane, which is produced using AD, and is injected into the UK gas grid. The scheme was initially planned for the period of 2021-2025, ending on 30 November 2025; however, following a mid-term review, it was extended until 31 March 2028, and is currently open for applications in England, Scotland and Wales.[693] Previously, biomethane production was supported via the Non-Domestic Renewable Heat Incentive (RHI), which was discontinued in March 2021. Currently, GGSS is administered by Ofgem (Office of Gas and Electricity Markets), the UK energy regulator.[694]

According to the UK Department for Energy Security and Net Zero, the GGSS tariffs are calculated to compensate plants for the building of new infrastructure to produce biomethane and ongoing operation costs [and are] funded by the Green Gas Levy, which is applied to all licensed fossil fuel gas suppliers.[695]

The support under GGSS is subject to two separate budget caps:

- The Applications Budget Cap (ABC): a cap against which applications to the scheme are checked to ensure that there is available budget based on their estimated production and resulting spend.
- The Overall Scheme Expenditure Budget Cap (OSEB): set above the ABC, this cap directly correlates to levy collection.[696]

The GGSS also provides for a degression mechanism designed to prevent 'over-compensation' when more biomethane is deployed than originally expected. The mechanism will do so by automatically reducing the tariffs available for new applicants by 10% if set expenditure thresholds within a quarter are expected to be exceeded.[697]

The Government expects that at peak production, biomethane facilities will generate enough gas to provide heating for about 250,000 housing units, resulting in up to 4.4 million tonnes of CO_2e in carbon savings, and 10.7 million tonnes of CO_2e during their lifespan.[698]

Under GGSS, biogas is eligible for support if it is produced from solid biomass, solid waste or liquid waste. The feedstock requirements impose an annual cap on periodic support payments for biomethane production when more than 50% of the total biogas yield (measured by energy content) comes from fuel sources that are not considered wastes or residues.[699] Therefore, the scheme provides more favourable conditions for manure, landfill, and food waste-based stock feedstocks, as opposed to energy crops.

9.5.2. Renewable Transport Fuel Obligation (RTFO) and biomethane

The Renewable Transport Fuel Obligation (RTFO) requires that suppliers of fossil petrol and diesel to the UK market must blend a certain percentage of renewable fuels, mostly biofuels, starting with 9.6% in 2021 and with a target to increase the share to 14.6% by 2032. Currently, further increases beyond 2032 are not envisaged. The British Parliament provides the following details on this policy:

- The RTFO applies to companies that supply 450,000 litres or more of any road transport fuel for use in the UK during the course of an obligation year (15 April to 14 April of the following year). This volume includes all fossil fuels and biofuels.
- Those companies supplying less than 450,000 litres can still participate and generate credits.
- Fuel suppliers meet this obligation by supplying renewable fuel or purchasing renewable transport fuel certificates (RTFCs) from other suppliers or buying out of the obligation.
- RTFCs are issued to suppliers of sustainable renewable transport fuel, and this trading mechanism enables obligated suppliers to meet their obligation in a "cost-effective manner".
- There is a buy-out price for compliance, currently set at 50p/litre. This was increased from 30p/litre in 2020 as the cost of blending was reaching the buy-out level, diminishing the incentive to blend versus buying out of the obligation. This increased the cost of fuel by 2p/litre for the consumer.[700]

Biomethane and chemically intermediate fuels are eligible under the RTFO;[701] however, they must meet additional criteria set out in the RTFO Guidance for Biomethane, including as a chemical precursor.[702]

9.5.3. Future Policy Framework for Biomethane Production

The Government is looking at the big picture to understand what's supposedly holding back the growth of the biomethane industry and how to fix those issues. This includes exploring the best mix of guidance, rules, and possibly a market-based system to support biomethane. They're also looking at how future policies could help make sure there's enough feedstocks for anaerobic digestion in the long term.

The key aim of the Future Policy Framework for Biomethane Production[703] is to support biomethane after the Green GGSS is discontinued. In particular, its rationale includes removing barriers to market growth and ensuring its long-term commercial viability.

At the same time, the Biomass Strategy envisages developing the overarching biomass sustainability rules under a cross-sectoral sustainability framework[704] that will bring together the different schemes and checks for environmental impacts of biomass production and use. In line with these plans, the proposed biomethane framework aims to develop robust sustainability criteria for biomethane production to reduce negative impacts and ensure the uptake of new and cleaner technologies. The Government also recognises that it must ensure that any negative environmental impacts are 'appropriately managed'.[705] Underestimating that ammonia emissions are among the most significant negative impacts, it is "bringing forward a range of actions to reduce them, as set out in the Clean Air Strategy".[706] The Government also claims that the existing Industry standards, including the Environment Agency's Quality Protocols and the British Standard Institution's Publicly Available Specification (BSI PAS 110: Specification for whole digestate, separated liquor and separated fibre derived from the anaerobic digestion of source segregated biodegradable materials) are sufficient to avoid or mitigate the environmental impacts.[707]

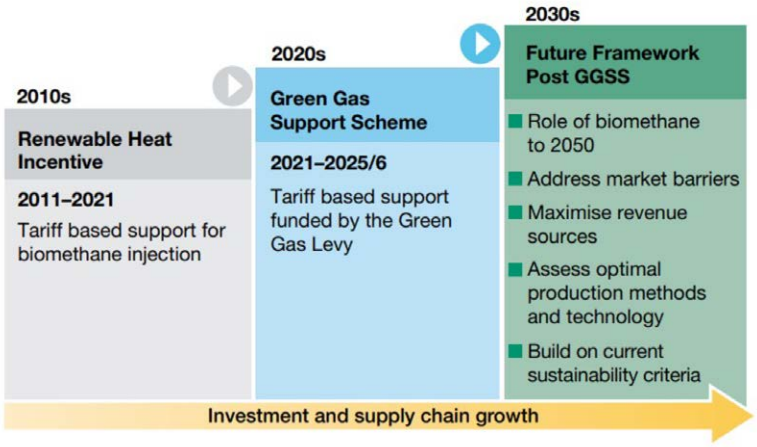


Figure 21. Future policy framework for biomethane production in the UK

Source: *UK Government, Department for Energy Security and Net Zero (2023), Biomass Strategy 2023, London, United Kingdom: Department for Energy Security and Net Zero, p. 159.*

With the GGSS scheme expiring in 2028, the Government is exploring other tools and mechanisms, both Government-led and market-based, to ensure biogas and biomethane expansion in 2030 and, in the long run, as part of its 2050 net-zero ambition.

9.5.4. Subsidies and grants financing

The UK has offered a variety of financial support mechanisms to bolster the AD and broader bioenergy sectors. Historically, schemes like the Non-domestic Renewable Heat Incentive (RHI), FiT, and the Renewables Obligation (RO) provided direct financial payments for renewable heat and electricity generation, though many of these have since closed or been replaced. For instance, the RHI, which ran from 2014 to 2022, promoted renewable heat use, while FiTs, introduced in 2010, incentivised low-carbon electricity, including from AD. The RO, active since 2002 (and 2005 in Northern Ireland as NIRO), placed obligations on electricity suppliers to source renewable energy. Though the scheme was closed for new applications in 2017, some generating entities are still benefiting from it based on long-term contracts, although these will end from 2027.[708] Beyond these, specific initiatives such as Renewable Energy Guarantees of Origin (REGOs), Renewable Transport Fuel Obligation (RTFO) for sustainable low-carbon fuels, and Green Gas Trading (GGT) also supported various aspects of bioenergy.

Many of the incentives are not financed by the Government. Instead, the costs are incurred by fossil-based energy producers or suppliers, who include them in the prices for the energy consumers. Thus, GGSS support is financed via the Green Gas Levy (GGL).[709] For RTFO, suppliers (if they choose not to redeem Renewable Transport Fuel Certificates) are obliged to pay a fixed sum for each litre of fuel for which they wish to 'buy-out' of their obligation.[710]

In addition to direct incentives (largely paid for by energy consumers via a levy) the government has provided broader financial support for businesses in the bioenergy sector. The Enterprise Finance Guarantee (EFG) facilitates commercial lending for SMEs lacking sufficient security, while the Enhanced Capital Allowance (ECA) scheme offers tax relief for investments in energy-saving equipment, including certified Combined Heat and Power (CHP) units. Scotland had its own initiatives, such as the Scottish Recycling Fund (SRF), which supported materials reprocessing, including industrial food and drink waste. Organisations like NNFCC also offer direct assistance to businesses in navigating funding opportunities for bioenergy and AD projects, from feasibility to development.

More recent and ongoing schemes demonstrate continued government commitment. The Green Gas Support Scheme (GGSS), introduced in 2021 and open until March 2028, offers tariff support for biomethane injected into the gas grid, funded by the Green Gas Levy (GGL) on gas suppliers.[711] The FiT scheme was succeeded by the Smart Export Guarantee (SEG), which provides payments to small-scale renewable electricity generators, although a very small percentage of these payments have gone to AD installations.[712] Furthermore, the Clean Heat Grant, renamed the Boiler Upgrade Scheme, replaced the RHI in 2022 to assist property owners in transitioning from fossil fuel heating systems.[713] Community-focused support has also been available

through initiatives like the Community and Renewable Energy Scheme (CARES) in Scotland, offering loans for early-stage renewable energy projects with community benefits,[714] and the Rural Community Energy Fund (RCEF) in England, which supports community-led renewable energy projects.[715] Investment firms like the Green Investment Group (GIG), formerly a UK government entity, continue to offer capital for renewable energy projects, with waste-to-energy, including AD, as a priority area.[716]

This research did not identify a centralised or even a programme-specific fund that lists the amounts granted in subsidies and the recipients of such benefits. Furthermore, it could not identify a source that listed at least the main sector or type of operations receiving the government funds. No answers were received on information requests to multiple agencies.

9.6 Final remarks

The UK has a well-established biogas market and holds a leading position among European countries in biogas production. The positive narrative, consistently promoted by both national and local authorities, alongside a supportive regulatory framework, has created an environment conducive to market growth. However, despite these favourable conditions, the industry's growth has significantly slowed since its peak between 2014 and 2017, now advancing at a more moderate pace. The overly optimistic portrayal of biogas, both as a crucial contributor to the country's energy transition and an economic driver, can sometimes obscure the more complex realities of the sector. While this narrative is heavily endorsed by businesses and policymakers, it tends to downplay the sustainability challenges inherent in biogas production.

Rural communities, in particular, are increasingly vocal about the negative impacts of biogas expansion. Concerns about noise pollution, unpleasant odours, and potential health and safety risks are often underestimated. Additionally, residents report a devaluation of property values due to the aesthetic and environmental degradation of rural landscapes. The growing evidence of methane leaks, as well as water and air pollution, further raises concerns about the overall environmental advantages of biogas. In light of these concerns, the public's perception of biogas is shifting.

The UK Government considers biogas and biomethane to be an integral part of the country's energy security, and an important contribution to the 2050 net-zero target. The key policy documents, including the Powering Up Britain: Energy Security Plan and the Biomass Strategy, treat this technology favourably, claiming its versatile application in heating, electricity production, transportation fuels, and as a feedstock for the chemical industry. Biomethane expansion is also believed to positively contribute to the (unavoidable) food and agricultural waste reduction targets, and to support the rural economy and job creation. Thus, in the Resources and Waste Strategy, the government also indicated its intention to undertake and publish a review of policy measures aimed at enhancing bio-waste recycling via anaerobic digestion and composting. The goal is to optimise the advantages of these approaches while effectively managing any associated risks. This review would explore potential synergies between food waste, other bio-waste streams, and renewable energy production to facilitate the decarbonisation of transport, heating, and electricity generation. Additionally, the government aims to ensure that farms can continue to use anaerobic digestion, where suitable, to manage agricultural waste, converting it into energy and digestate that can be returned to the land as nutrients.[717]

The Government has been supporting biomethane production for many years, first via the Non-Domestic Renewable Heat Incentive (RHI), which was discontinued in March 2021, and currently via the RTFO and the GGSS (recently extended until 2028). It also communicates its plans to develop a new policy framework to continuously support biogas and biomethane deployment in the 20230s and 2040s.

At the same time, certain legal limitations to biogas production persist, mainly via the NVZs, an EU-legacy legislation that was retained after Brexit and transposed into national legislation in England, Wales, Scotland, and Northern Ireland, limiting nitrogen application.

Some potential for policy interventions from civil society, including environmental NGOs, remains. For example, the Future Policy Framework is still to be developed, providing opportunities for inputs and public debate. In addition, the slow progress of the UK Taxonomy also allows the CSOs to intervene by advocating for robust sustainability safeguards on biogas – and the wider bioenergy sector – or for the complete exclusion of this sector from the future Taxonomy, thus making it more difficult for the biogas sector to access sustainable finance mechanisms and support from the sustainability-focused investors.

CHAPTER 10.

Bank and investor financing of biogas

To get an insight into private financing flows to the production of biogas in the EU and the UK, this chapter looks at private credits and investments flowing to two groups of companies. The first group are the major European oil & gas, meat and dairy, and utility companies listed in section 2.2 of this report. The second group are the largest biogas producers in each of the seven countries, as identified in chapters 3 to 9.

Section 10.2 analyses creditor financing for these two groups, in the period 2016 to May 2025. Section 10.3 presents the identified investments in bonds and shares of these two groups at the latest filing date.

10.1 Types of financing

Financial institutions offer two primary methods of financing to companies: providing loans and underwriting services, or acquiring company shares and bonds. Commercial banks typically provide loans and underwriting services, while investment banks, insurance companies and pension funds often invest by holding shares and bonds.

“Corporate loans” involve borrowing money, typically from commercial banks, in either short-term (under one year) or long-term (over one year) terms. Short-term loans are usually bilateral, while larger, long-term loans often involve a syndicate of banks and require significant guarantees. Underwriting services such as “share issuances” allow companies to raise equity by offering shares on a stock exchange. In contrast, “bond issuances” are similar to cutting a large loan into smaller, tradable pieces and selling each piece to investors - not banks!

Finally, from an investor perspective, “holding and managing shares” involves financial institutions acquiring company shares, becoming part-owners, and potentially influencing the company’s strategy. On the other hand, “holding and managing bonds” involves financial institutions acquiring bonds issued by companies, which makes them creditors rather than owners (as holding shares does), entitling them to principal repayment and predefined interest but without influence over the company.

Appendix 1 provides a more detailed description of the types of financing considered in the research and the methodology used to identify financial links between financiers and investors and companies.

10.2 Credit financing for biogas companies

10.2.1. Credit financing to major European oil and gas, meat and dairy, and utility companies

Many of the major European oil & gas, meat and dairy, and utility companies that we analysed in section 2.2 are active in the biogas sector, however biogas production does not represent a large share of their total assets or revenues. We researched the total credit financing provided to these companies in the period 2016-2025, without differentiating whether the financing was used for biogas-related projects or other company operations. Such differentiation would require an additional in-depth analysis of the company's operations, corporate structure and use of proceeds of the received financing. Table 26 shows that, between January 2016 and May 2025, we could identify credit financing for at least EUR 800 billion going to the selected oil and gas, meat and dairy and utilities companies (see section 2.2), compared to less than EUR 10 billion for the largest biogas producers in each of the seven countries in the same period.

Table 26. Credit financing to groups of biogas companies (2016-2025, EUR bln)

Company groups	Underwriting	Loans	Total
Oil and gas	242.5	118.8	361.3
Meat and dairy	104.4	128.7	233.1
Utilities	115.7	95.4	211.1
(Dedicated) Biogas companies	7.6	2.1	9.7

Source: *Own calculations based on information obtained as described in Appendix 1*

As only a small proportion of the credit amounts flowing to European oil & gas, meat and dairy, and utility companies, as mentioned in Table 26, is used for investments in biogas, it is not useful to further break-down these amounts per bank. But Table 27 does give an indication of who the main banks of these groups of companies are, based on both biogas- and non-biogas-funding amounts.

Table 27. Main creditors of groups of biogas companies (2016-2025)

Company groups	Bank	Country
Oil and gas	Citigroup	United States
	Barclays	United Kingdom
	BNP Paribas	France
	Bank of America	United States
	Goldman Sachs	United States
Meat and dairy	HSBC	United Kingdom
	BNP Paribas	France
	JPMorgan Chase	United States
	Citigroup	United States
	UBS	Switzerland
Utilities	Deutsche Bank	Germany
	Société Générale	France
	BNP Paribas	France
	Mitsubishi UFJ Financial	Japan
	UniCredit	Italy

Source: *Own calculations based on information obtained as described in Appendix 1*

10.2.2. Credit financing to dedicated biogas companies

We could find private credit financing to nine of the most important biogas companies in the seven European countries, identified in chapters 2 to 8. Together they received on average EUR 500 million yearly between 2016 and 2021 mainly through loans. Since then, the amount of financing received by such companies increased to EUR 1.1 billion in 2022, EUR 2.2 billion in 2023 and EUR 2.9 billion in 2024. The biogas companies are financed mainly through loans, with just a noticeable contribution via underwriting services in 2023 and 2024.

As can be seen in Figure 22, there is a considerable increase in the amount of financing provided to biogas companies in the second half of the period under analysis (2022-2025) considering that the information for 2025 is only for the first half of the year. Though it cannot be confirmed based on the available information,

the increase since 2022 is potentially related to the introduction of REPowerEU Plan, which aimed to reduce the EU's dependence on Russia's fossil fuels and to accelerate the green transition, including the production of biogas what gave a push for the development of biogas related projects. Finally, in 2018 it is observed that there was not financing identified to the companies in scope.

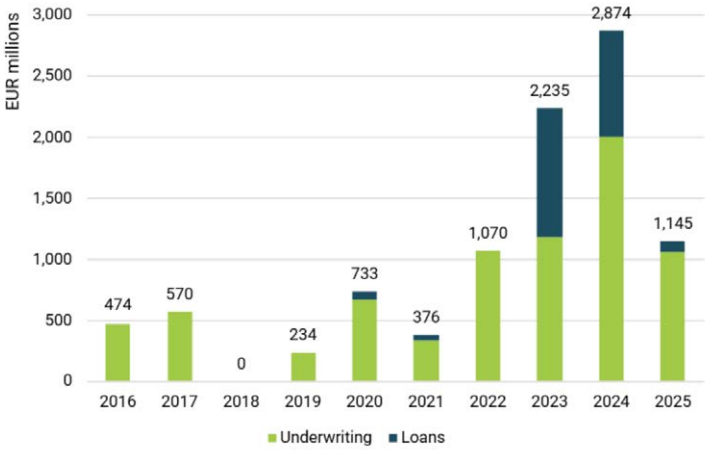


Figure 22. Loans and underwriting to biogas companies per year (2016-2025, EUR mln)

Source: *Own calculations based on information obtained as described in Appendix 1.*

Most of the credit financing identified has been received by two companies: Severn Trent (based in UK), which received at least EUR 7.1 billion (or 73% of the identified financing) and Enea (based in Poland), which received at least EUR 1.5 billion (16%). The rest of the identified companies receiving financing are DAH Group (Germany), Welter Biopower (Germany), SFP (Denmark), Biogen (UK), Future Biogas (UK), Verbio (Germany) and BioCirc (Denmark), each one receiving between EUR 100 million and EUR 240 million (see Figure 23).

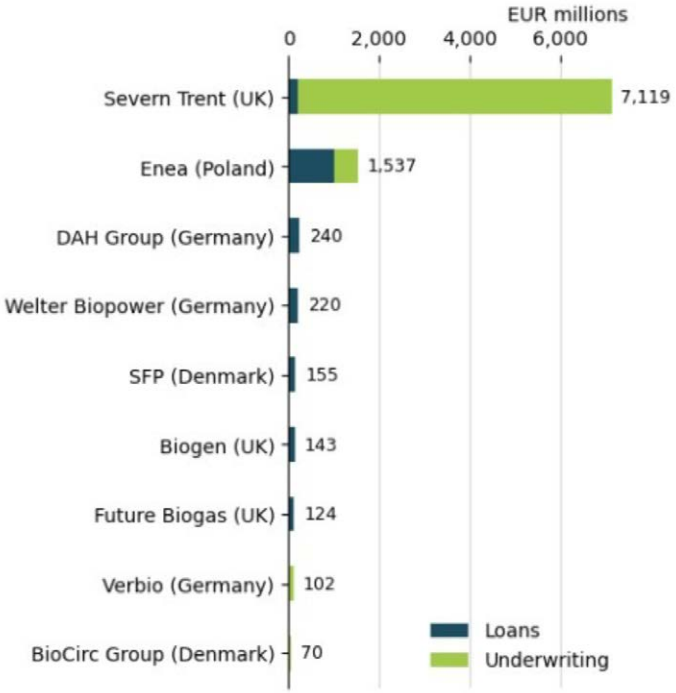


Figure 23. Loans and underwriting to biogas companies per company (2016-2025, EUR mln)

Source: *Own calculations based on information obtained as described in Appendix 1*

Figure 24 shows which financial institutions provided credit financing to these biogas companies in 2016-2025, whereby the number in parentheses refers to the number of biogas companies they financed. The largest financier is NatWest (United Kingdom), which provided more than EUR 1.1 billion in loans and underwriting services to three biogas companies. Other major financiers are BNP Paribas (France), which financed EUR 0.8 billion to two companies and Santander (Spain) with EUR 0.6 billion to one company.

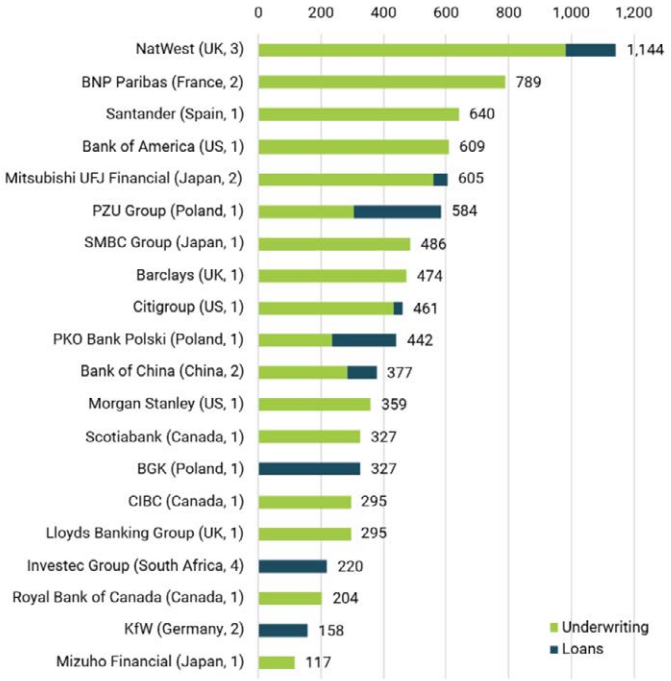


Figure 24. Main creditors of biogas companies (2016-2025, EUR mln)

Source: *Own calculations based on information obtained as described in Appendix 1*

10.3 Investment financing for biogas companies

10.3.1. Investments in major European oil and gas, meat and dairy, and utility companies

As of the latest reporting date (May 2025), we found investments with a total value of EUR 639 billion in shares and bonds of the major European oil & gas, meat and dairy, and utility companies that we analysed in section 2.2. That compares to investments with a value of EUR 9.3 billion in shares and bonds of the largest biogas producers in each of the seven countries.

Table 28. Investments in groups of biogas companies (May 2025, EUR bln)

Company groups	Shareholdings	Bond holdings	Total
Oil and gas	290.0	32.5	322.5
Meat and dairy	234.3	10.5	244.8
Utilities	54.0	17.8	71.9
(Dedicated) Biogas companies	7.8	1.5	9.3

Source: *Own calculations based on information obtained as described in Appendix 1.*

As in the case of the credit financing, it was not in the scope of this research to determine the proportion of the total investment financing received by the major European oil & gas, meat and dairy, and utility companies that was utilised in biogas-related projects. Then, it is only as informative to present the main financial institutions investing in shares and bonds of the selected companies. As can be seen in Table 29, there are some recurrent names in terms of the main financial institutions investing in the selected companies, namely the American asset manager BlackRock, Vanguard and Capital Group and the Norwegian Government Pension Fund Global (GPFG).

Table 29. Main investors in groups of biogas companies (May 2025)

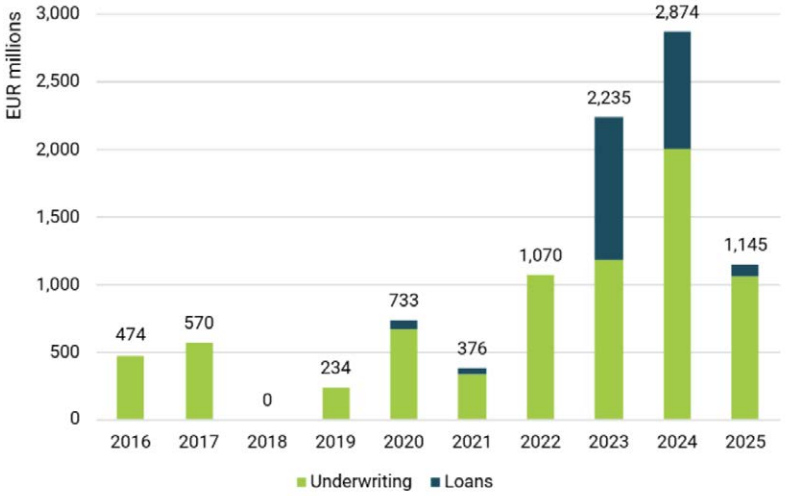
Groups of biogas companies	Investor	Country
Meat and dairy	BlackRock	United States
	Vanguard	United States
	UBS	Switzerland
	GPFG	Norway
	Capital Group	United States
Oil and gas	Quilter	United Kingdom
	BlackRock	United States
	Vanguard	United States
	GPFG	Norway
	State Street	United States
Utilities	BlackRock	United States
	Capital Group	United States
	Vanguard	United States
	Caisse des Dépôts	France
	Crédit Agricole	France

Source: *Own calculations based on information obtained as described in Appendix 1.*

10.3.2. Investment financing to dedicated biogas companies

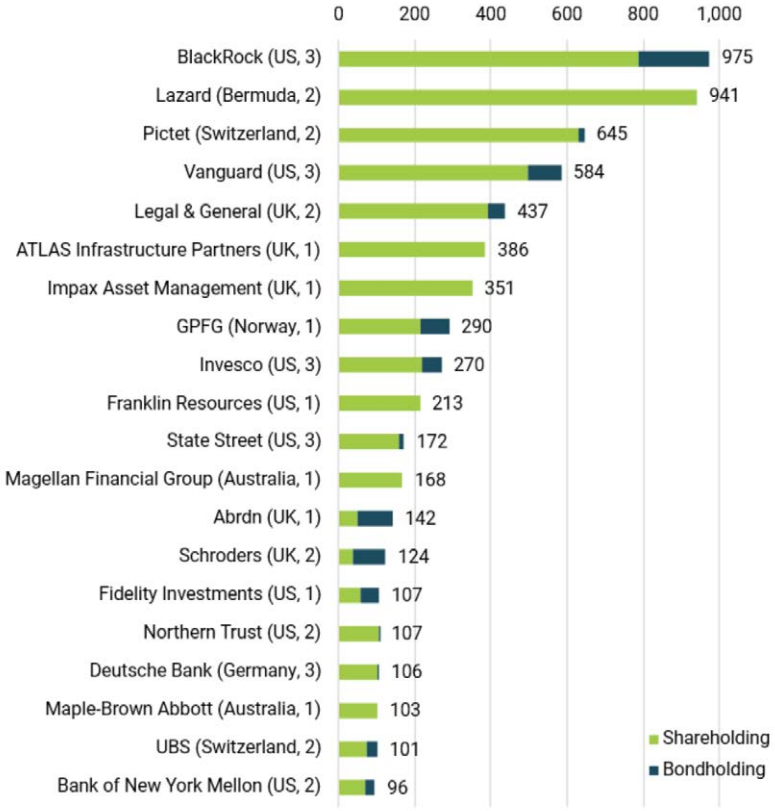
This research identified investment financing for five of the main biogas companies active in the seven European countries. Specifically, as seen in Figure 25, the main recipient of investment financing was Severn Trent (based in UK), which had received about EUR 9 billion at the latest filling date. The remaining companies identified received much less, Enea (based in Poland and receiving EUR 256 million), Verbio (Germany, EUR 67 million), Biogen (UK, EUR 7 million) and EnviTec Biogas (Germany, EUR 3 million).

Figure 25. Investments in biogas companies per company (May 2025, EUR mln)
Source: *Own calculations based on information obtained as described in Appendix 1.*



The main investors in shares and bonds of these five biogas companies are BlackRock (based in United States), which has investments for EUR 975 million in three companies (see number in parentheses in Figure 26), followed by Lazard (Bermuda), with investments for EUR 941 million in two companies, Pictet (Switzerland) with EUR 645 million in two companies, Vanguard (United States), with EUR 584 million in three companies and Legal & General (UK), with investments for EUR 437 million in two biogas companies.

Figure 26. Main investors in biogas companies (May 2025, EUR mln)
Source: *Own calculations based on information obtained as described in Appendix 1.*



Investments by institutional investors in the European biomethane sector are expected to grow. For example, the Spanish insurance company Mapfre recently set up a dedicated biomethane fund aiming to raise EUR 100 million for 20-25 biomethane plants in Spain over a five-year period. The Dutch pension fund ABP allocated EUR 250 million into bioenergy infrastructure firm BioticNRG via its asset manager APG. Investors such as KK Invest, DBC Invest, Copenhagen Infrastructure Partners, Goldman Sachs Asset Management, and others are also looking actively for opportunities to invest in biomethane production.[718] Overall, biomethane appears to be more attractive to investors because its 'competitor' – hydrogen – requires a more complex and expensive infrastructure and considerable amounts of capital expenditures from its developers.

CHAPTER 11.

Conclusions and recommendations

This chapter draws conclusions on the current status of the biogas industry in the European Union (with specific attention to six EU member states) and in the UK. Separate conclusions are drawn on the market developments in the EU as a whole and in the selected countries, on the environmental or social impacts of the sector, on applicable regulatory frameworks and how they cover the mentioned impacts, on public financing for biogas and on private financing identified for a selection of biogas companies. Based on these conclusions, we have drawn recommendations at EU and national levels on how regulations may be improved to better address and mitigate the environmental and social impacts of biogas and to promote more sustainable alternatives.

11.1 Market developments

Most biogas is derived from the anaerobic digestion (AD) of organic materials such as energy crops, agricultural and food waste, and manure. Methane captured from landfills and sewage sludge also counts as biogas. Biogas is used for generating heat and power and is further upgraded into biomethane, which is chemically comparable to fossil gas. Biomethane is injected into existing fossil gas grids - for use in households and companies - and is used as transport fuel (as BioLNG).

The development of the European biogas market is driven by a complex mix of political ambitions (increasing domestic energy production, ending gas imports from Russia and reducing greenhouse gas emissions) and commercial interests of different economic sectors: the waste and livestock sectors aim to generate income from their expensive waste and emissions problems, while fossil gas suppliers and consumers postpone investments in zero-carbon technologies by mixing fossil gas with biogas.

Due to these different interests and policy goals, the European Union has developed into the global leader in biogas production. The EU's production volume of 22.8 billion m3 in 2024 accounts for more than half of global biogas production.

Further growth of the European biogas sector is expected, with industry sources estimating that almost 60% of the EU's potential biogas production capacity still has to be developed. Within the EU, Germany has been the leader in primary biogas production, while France, Italy, and Spain are rapidly developing the biomethane industry, producing biogas and then upgrading it to pipeline quality. Project developers have until now committed to invest over EUR 28 billion in biomethane production development in the EU in the coming five years, cementing its expansion pathway. Table 30 details further how biogas markets are developing in six EU member states and in the United Kingdom.

Table 30. Status of the biogas markets in seven European countries

Country	Development of the biogas market
Denmark	Denmark experienced a decade of strong growth of biogas production, with the highest production per capita and the highest share in primary energy production in Europe, based on manure from its large livestock sector. The sector currently sees a stabilisation due to less favourable market conditions.
Germany	Germany is the largest biogas producer in the EU. A large share is based on energy crops, while the high density of livestock farming results in substantial manure availability. Crop residues and organic waste from food processing offer additional biomass sources. This abundance supports the operation of the current 11,000+ plants, predominantly situated on farms. Recently, the development of the biogas sector has been slowing down, with less capacity added each year.
Ireland	The biogas industry in Ireland is in its early stages, playing a limited role in energy consumption. Most biogas still originates from methane capture on landfills. Industry groups and the government see significant potential in using manure from meat and dairy farming and grass silage as feedstocks, potentially boosting the market in the short and medium terms.
Netherlands	Biogas production is growing steadily, and biomethane injection into the fossil gas grid is growing fast. Livestock density is high, causing excessive nitrogen emissions by the livestock sector that are above what is allowed by the Nitrates Directive. Using manure for biogas production is seen as part of the solution to this crisis. The government policy to reduce both domestic fossil gas production and the reliance on Russian gas imports, further creates demand for biomethane.
Poland	Poland currently has a relatively small biogas sector. However, industry groups hope biogas production will grow more rapidly in the coming years, using feedstock from the agriculture and livestock sectors. Availability of public financing and an increased presence of multinational corporations are also seen as favourable conditions for rapid growth of the biogas market.
Romania	The biogas market in Romania is still rather small. New projects are now being developed, both locally funded and via foreign investments, creating the potential for gradual market growth.
United Kingdom	The UK biogas market peaked between 2014 and 2017, placing the country among the top five biogas producers in Europe. Since then, growth has been more moderate.

Germany remains Europe's largest biogas producer, followed by Italy, France and Denmark. As can be concluded from Table 30, Germany, Denmark and the UK saw a strong growth of biogas production already in the past decades and are now experiencing some stabilisation. Growth is stronger in recent years in Ireland, the Netherlands and Poland, while the sector is still in its early stages in Romania.

11.2 Environmental and social impacts

Although promoted in the EU and the UK as a sustainable energy source, especially in comparison with fossil gas and other fossil fuels, the expansion of biogas production risks strong environmental impacts. These vary across countries, but the main concerns are:

- **Methane leakage**: The International Energy Agency (IEA) has estimated leakage rates across the biogas lifecycle, from 0.1% - 2.4% at feedstock reception to as much as 12% during production. Methane leakage from digestate storage also varies significantly, ranging from 0.8% to as much as 15%. As methane is a very potent greenhouse gas, 84-87 times as potent as CO_2 over a 20-year period, these leakage rates raise concerns that biogas emissions may offset any potential climate benefits.

- **Local environmental and social impacts**: As methane is a precursor of ground-level ozone, leakages will contribute to air pollution, damaging human health, crops and the environment. Direct application of digestate to land may cause the release of methane and ammonia and the leaching and runoff of mineral nitrogen, affecting local waterways as well as nature. Odour nuisances and heavy traffic will also affect nearby communities.
- **Incentivisation of industrial animal farming**: Reliance on manure as a biogas feedstock, is perpetuating intrinsically unsustainable diets largely based on animal proteins and is supporting large-scale meat and dairy businesses. These sectors use enormous amounts of feed crops, such as maize and soy, increasing the competition for arable land in and outside Europe. Furthermore, industrial animal farming is often based on poor animal welfare conditions and causes high enteric methane emissions, as well as high GHG emissions because of the land use change often associated with growing feed crops. Taking these different GHG emission sources into account, manure-based biogas supply chains may emit more CO_2-equivalents per unit of energy than fossil gas.
- **Using crops as feedstock**: With growing populations and the need to protect biodiversity, the global competition for arable land is already intensifying. Climate change will further exacerbate this process, by reducing land areas available for food production. Against this background, it is a worrying development that a significant part of European biogas production is still based on agricultural crops as feedstock. This practice is threatening food security and leads to monoculture expansion and GHG emissions caused by land-use change.
- **Postponing the transition to sustainable energy systems**: Replacing fossil gas (partially) with biomethane has the short-term advantage that the existing infrastructure for transporting fossil gas can continue to be used, as well as industrial processes which are now using fossil gas. In the long-term, as it will be impossible to replace all present fossil gas consumption with sustainably produced biomethane, this will prolong fossil gas dependencies, increase fossil gas consumption and postpone much-needed investments in a sustainable energy transition.

11.3 Policy frameworks

Based on a mix of different policy goals - including the promotion of domestic energy production, ending gas imports from Russia, reducing greenhouse gas emissions, strengthening rural economies and recycling waste - EU policymakers consider biogas and biomethane as important components of the EU's present and future energy mix. Key EU policies stimulating biogas - and in particular biomethane - are:

- **REPowerEU Plan**: REPowerEU is the European Union's most recent strategic energy plan, launched in May 2022, to reduce its dependence on Russian fossil fuels and accelerate the transition toward "clean, affordable, and secure" energy. It aims to increase biomethane production in the EU from today's 4.9 billion m^3 to 35 billion m^3 in 2030.
- **EU Renewable Energy Directive (RED III)**: The Renewable Energy Directive (RED) is the main EU policy to stimulate renewable energy, launched in 2009 and updated in 2018 and 2023. RED III mandates a 42.5% share of renewable energy in the EU's energy mix by 2030. It promotes the production of biomethane as a transport fuel and its injection into the existing fossil gas grid, but discourages its use for electricity production.
- **EU Waste Framework Directive**: Adopted in 2018, the Waste Framework Directive obliges member states to implement separate collection of organic waste and to prioritise "recycling". The directive considers anaerobic digestion of organic waste, resulting in biogas, as a recycling operation, as long as the remaining digestate is suitable to be applied onto soils and beneficial to soils and agriculture.
- **EU Landfill Directive:** Last updated in 2018, the Landfill Directive requires the pre-treatment of waste before sending it to a landfill, limiting the practice of capturing biogas from landfills. Rather, it encourages biogas production through anaerobic digestion of organic waste.

- **EU Nitrates Directive**: Already adopted in 1991, the Nitrates Directive aims to ensure the quality of drinking water and the long-term sustainability of the water bodies by limiting or preventing nitrate pollution from agricultural and livestock sources. This directive does not encourage biogas production from manure, but allows it as long as the remaining digestate is not applied to land or if the application does not exceed 170 kg of nitrogen per hectare.
- **EU Alternative Fuels Infrastructure Regulation (AFIR)**: The AFIR stimulates biomethane as transport fuel. It requires Member States to have sufficient refuelling points for heavy-duty motor vehicles using liquefied methane - which includes liquefied biomethane.
- **EU Taxonomy Regulation**: The EU Taxonomy Regulation in 2021 introduced a comprehensive classification system which categorises sustainable economic activities that are aligned with a net-zero trajectory by 2050 and that are supposed to contribute to key environmental objectives. The regulation aims to direct public and private investments towards this list of activities, which includes biomethane production for transport fuels.
- **EU Corporate Sustainability Due Diligence Directive (CSDDD)**: Adopted in 2024, the EU Corporate Sustainability Due Diligence Directive (CSDDD) aims to foster sustainable and responsible corporate behaviour in companies' operations and across their global value chains. The CSDDD could impact the use of imported feedstocks for biogas production, both directly and indirectly (if biogas is produced from the manure of livestock fed with imported feed crops).

In addition to these existing EU policies, some new proposals are under discussion at the EU level:

- **EU Energy Taxation Directive Revision**: An Energy Taxation Directive revision proposed in 2021, but still under discussion, instructs member states to set a tax rate of EUR 0.15 per GJ for biogas and some other energy sources. This compares with a tax rate of EUR 10.75 per GJ for traditional fossil fuels.
- **EU Nitrates Directive**: A proposal launched in 2024 by the European Commission to amend the Nitrates Directive, promotes the processing of manure into biogas and so-called 'Recovered Nitrogen from manure (RENURE)' fertilisers. For RENURE, the maximum application of nitrogen would be increased to 270 kg/ha per year.
- **Omnibus Package**: The CSDDD transposition in national laws has been postponed in April 2025 by the Omnibus Package and the ensuing Stop-the-clock Directive. If and how the CSDDD will be further weakened is still debated.

Not all EU member states have yet implemented the existing EU directives into national legislation. When they are implementing directives, member states often add elements or shift the emphasis to some extent. This makes it useful to also analyse their policies at the national level. As a non-EU member, this is even more relevant for the United Kingdom, that has a mix of its own regulations and some legacy regulations from the period of its EU membership.

Details on the regulatory frameworks for the biogas market in the seven European countries can be found in chapters 3 to 9. Table 31 summarises briefly the general policy climate for biogas in the seven countries.

Table 31. Policy climate for biogas in seven European countries

Country	Summary of the national policy climate
Denmark	Denmark's Climate Act has set ambitious targets to reach climate neutrality by 2045 and deliver a 70% GHG emissions reduction by 2030, compared with 1990 levels. Biogas plays an important role in this strategy, as the share of biomethane in the Danish gas grid should increase from almost 40% in 2023 to 100% in 2030.
Germany	After decades of favourable conditions in Germany, biogas is now being treated with a more market-based approach by the Renewable Energy Sources Act (EEG), which includes more stringent environmental requirements. Biogas is still seen as a sustainable alternative, in particular as a transport fuel, and is prioritised in grid connection.
Ireland	Irish authorities consider locally produced biogas to be an important component of the country's future energy needs as a replacement for imported fossil gas. The National Biomethane Strategy has been designed to support the delivery of the government's target of up to 572 million m^3 of biomethane annually by 2030, equivalent to 10% of the country's gas demand.
Netherlands	The 2019 Dutch Climate Agreement comprises an ambitious target of producing approximately 2 billion m^3 of biomethane by 2030 and from 2026 gas distributors should blend fossil gas with biomethane. But allocation of the country's renewable energy support scheme (SDE++) to biogas has been low compared to other energy sources.
Poland	In Poland, biogas seems to be perceived as a silver bullet for the country's energy transition. In recent years, regulatory restrictions – including permitting requirements – have been reduced and the country has introduced various support schemes to enable further expansion of biogas production, distribution and use in the country.
Romania	The 2024 draft of Romania's National Energy and Climate Plan (NECP) aims to integrate biomethane into the national fossil gas transmission grid, targeting a 5% share by 2030 and 10% by 2050.
United Kingdom	The UK retains legacy EU laws such as the Nitrates Directive but is also crafting a new Future Policy Framework for bioenergy. The UK Biomass Strategy recognises biomethane from anaerobic digestion and upgraded landfill gas as key for heat, power, transport and negative emissions, potentially supplying 3-4 billion m3 per year by 2050.

From Table 31 we can conclude that all seven countries look favourably towards biogas as a component of their future energy mix, but the levels of enthusiasm and support do vary. The most ambitious production growth targets seem to be set in the UK (3-4 billion m3 per year by 2050), Ireland (572 million m^3 per year by 2030) and the Netherlands (2 billion m^3 per year by 2030). Most countries target upgrading of biogas to biomethane and injecting it into the fossil gas grid, with Denmark being the most ambitious by aiming to increase the share of biomethane in the gas grid to 100% in 2030. Germany, although at present leading biogas production in the EU, has no clear expansion plans.

Of the two remaining countries, in which the biogas sector is still small, Poland aims to increase biogas production by reducing permitting requirements and by introducing various support schemes. Romania has set a more modest goal of a 5% share of biomethane in the national gas grid in 2030, to be increased to 10% by 2050.

11.4 Regulatory safeguards

European Union regulations do not address the environmental and social impacts linked to biogas production in a comprehensive way:

Methane leakage: The emissions assessment methodology for bio-based fuels defined by RED III requires takes into account emissions caused by leakages. RED III requires the lifecycle GHG emissions of biofuels (including BioLNG) to be at least 65% lower than those of fossil fuels. This condition is also set for inclusion

of projects using biogas as transport fuel in the EU Taxonomy. But in practice, methane leakages are difficult to measure and all biogas projects are supposed to meet the 65% emission reduction target. Also, because emissions linked to livestock farming and to locking in of existing fossil gas infrastructure are not taken into account in the methodology.

The Waste Framework Directive promotes the separate collection of organic waste and its use for biogas, while the Landfill Directive prioritises biogas production over sending waste to a landfill and also requires pre-treatment of waste before being sent to a landfill. Together, these directives limit methane leakages from (biogas capture on) landfills.

Local impacts: The Nitrates Directive limits the application of nitrogen from manure, including in the form of anaerobic digestate, to agricultural land. But if the European Commission proposal is adopted to raise the limit from 170 to 270 kg/ha per year if the digestate is turned into RENURE fertiliser, manure-based biogas production will have stronger negative impacts on waterways, nature and health. The EU Taxonomy labels post-composting of digestate as the preferred option.

Other EU-policies promoting biogas assume that local impacts, including odour, air quality, and human health issues, are addressed in general EU legislation, including the Environmental Impact Assessment (EIA) Directive and the Industrial Emissions Directive (IED). These directives have no specific criteria for biogas projects, limiting their effectiveness. And the absence of intensive livestock farming from the IED creates a regulatory gap.

Incentivisation of industrial animal farming: The EU biogas policies contradict the goal of the European Green Deal. RED III stimulates the use of manure, requiring biogas producers to derive at least 1% of their production from manure and some other feedstocks in 2025, increasing to 5.5% in 2030. The European Agricultural Fund for Rural Development (EAFRD) considers farm-based biogas to be eligible for financial support. The REPowerEU goal to increase annual biomethane production to 35 billion m3 was published without a comprehensive environmental impact assessment, with the risk that manure will be increasingly used as a feedstock for biomethane.

Using crops as feedstock: RED III still allows the use of feed and food crops to produce biogas, but does discourage the use of these feedstocks for biomethane used as transport fuel. To be eligible for funding under the EU Taxonomy, it is required that food and feed crops are not used for the manufacture of biogas. The REPowerEU plan also still allows using food and feed crops to reach the target of increasing annual biomethane production to 35 billion m3.

Discouraging the use of crops as feedstock seems effective, though, as since 2020 no new biomethane plants in Europe have been built that use energy crops as their main feedstock. However, the result seems to be that the indirect use of crops for biogas, which occurs when the biogas is made from manure from livestock fed with feed crops, is increasing (see previous bullet).

Postponing the transition to sustainable energy systems: RED III, AFIR and the EU Taxonomy incentivise injecting biomethane in the EU gas grid and using liquefied biomethane in the current transport infrastructure. All EU policies ignore the long-term consequences of locking-in fossil gas infrastructure, postponing the energy transition and prolonging demand for fossil gas.

Table 32 provides an overview of how the seven European countries address the first four environmental impacts in specific regulations. In the case of the six EU member states, we only listed regulations that go beyond the requirements of the European Union. The fifth impact, postponing the transition to sustainable energy systems, is left out of the table as none of the seven countries has any policy to address this impact.

Table 32. Environmental and social impacts in biogas regulations of seven European countries

Country	Methane leakage	Local impacts	Animal farming	Crops as feedstock
Denmark	The 2023 regulation on methane leakage from biogas plants requires yearly leak detection and reporting by third party controllers to the Danish Energy Agency as well as implementation of a customised leak detection and repair program.	No policy.	With its Green Tripartite Agreement, Denmark has agreed to impose a climate tax on the agriculture sector to reduce greenhouse gas emissions. The implementation of the agreement, including the tax, is currently being negotiated.	Since 2012, regulations limit the use of energy crops in biogas production. A ban on the use of maize as a feedstock is in effect since August 2025.
Germany	Methane leakages are addressed via country-level technical standards like TRAS-120 & TA Luft.	The Federal Water Act (WHG) ensures that water bodies are protected against nitrogen contamination. The Manure Ordinance (WDüngV)) deals with the handling and transportation of manure, including for biogas production.	No policy. On the contrary, the Integrated National Energy and Climate Plan (NECP 2024) actually encourages biogas plants to use greater volumes of liquid manure.	The Renewable Energies Act (EEG) in 2012 limited the use of maize or cereal grains as feedstock in new biogas plants. In early 2025, further lowering of this "maize cap" was proposed.
Ireland	No policy.	A Biomethane Sustainability Charter is under development and should include safeguards on land use, water quality, biodiverstttity, fertiliser use, carbon sequestration, and other lifecycle sustainability issues.	No policy. On the contrary, the National Biomethane Strategy actually promotes the use of animal manure as feedstock for biogas production.	No policy. The National Biomethane Strategy allows the use of agricultural feedstock, including grass silage and manure, for biomethane production.
Netherlands	No policy.	Environmental Impact Assessment requirements deal with these impacts. But they are envisioned to be reduced in certain so-called ''acceleration areas'' as part of the Dutch transposition of RED III.	No policy. On the contrary, to deal with the Dutch ''manure crisis'', expansion of manure-based biogas production is actually encouraged.	No policy.
Poland	No policy.	No policy.	No policy.	No policy.
Romania	No policy.	The National Recovery and Resilience Plan requires biogas plants to adhere to Do No Significant Harm principles.	No policy.	The National Recovery and Resilience Plan requires biogas plants to restrict the use of food and feed crops, in line with RED III.
United Kingdom	The Environmental Permitting Regulations (EPR) in 2016 introduced Leak Detection and Repair (LDAR) measures for biogas plants, landfills, and biomethane upgrading facilities.	No policy.	No policy. On the contrary, the Green Gas Support Scheme (GGSS) explicitly supports biogas projects that use manure.	The Renewable Transport Fuel Obligation (RTFO) and the GGSS include limits on the use of food and feed crops.

From Table 32 we can conclude that Denmark and the UK have specific policies which address methane leakages in biogas production and transport. Ireland is planning a regulation that specifically deals with the localised impacts of biogas production. For none of the seven European countries, the significant negative impacts of the livestock sector on climate change, other environmental issues and animal welfare are sufficient reasons to discourage the use of manure for biogas production, although Denmark is in the

process of implementing a climate tax on the agriculture sector to reduce its greenhouse gas emissions. On the contrary, Germany, Ireland, the UK and the Netherlands are actually promoting the use of manure for biogas production. Limits on the direct use of food and other crops for biogas production, exist in Denmark, Germany, Romania and the United Kingdom.

11.5 Public financing for biogas

Biogas production is supported in the EU and in the seven countries by different public funding schemes. We collected data on public subsidies and loans provided to the biogas sector since 2016, both by EU funds and by national support schemes.

At the EU level, no specific funding mechanisms have been developed to support biogas and biomethane production. But more general funding mechanisms for economic development and for the agricultural sector, are used for grants to biogas plants. In particular, we found the following EU funds subsidising biogas plants in some of the member states researched:

- EU Modernisation Fund: Poland and Romania
- European Agricultural Fund for Rural Development: Germany
- European Fund for Infrastructure, Climate, Environment (FEnIKS): Poland

A similar fund, although not managed by the EU, is the EEA-Norway Grants programme. Romania received over EUR 2 million from this fund to reduce greenhouse gas emissions through biogas production and increased energy efficiency.

Next to subsidies from EU-funds, six out of the seven European countries we researched have their own financial support mechanisms for biogas (see Table 33).

Table 33. Public funding for biogas in seven European countries

Country	Public biogas funding
Denmark	Since 2020, the Danish Energy Agency has increased funding for biogas projects to a yearly average of around DKK 2.5 billion (EUR 335 million). In 2024, a total of 20 Danish biogas companies received subsidies, with Nature Energy and BioCirc receiving most support.
Germany	Germany has supported biogas electricity generation since 2004, initially through a Feed-in Tariff (FiT) scheme and now via tendering. While the FiT scheme boosted the biogas sector, the loss of guaranteed prices for pioneer projects led to a decrease in biogas plants in 2020. Despite the end of biogas subsidies in 2024, funding for existing plants was secured in 2025.
Ireland	Ireland's new Biomethane Capital Grant Scheme, administered by the Sustainable Energy Authority of Ireland (SEAI), has not yet disbursed any funding. The SEAI also funds research projects related to energy transition and CO_2 reduction, though only a small fraction has been granted for biogas-related projects.
Netherlands	The Netherlands had a Feed-in Premium (FiP) scheme for grid-injected biomethane, initially called SDE+, which provided a subsidy for renewable electricity, green gas, and CHP production. The SDE+ programme was replaced by SDE++ in 2020. The total subsidy amount for biogas in the period 2016-2023 was EUR 6.1 billion.
Poland	The Renewables Act 2015 introduced Feed-in Tariff (FiT) support for agricultural biogas. The National Fund for Environmental Protection and Water Management (NFOSiGW) provides subsidies to municipal and agricultural biogas plants.
Romania	No financial support mechanism for biogas.
United Kingdom	The UK government has extended the Green Gas Support Scheme until 2028 and offers various financial support mechanisms for the biogas and bioenergy sectors, including direct incentives like the Renewable Heat Incentive (RHI), Feed-in Tariffs (FiTs), and the Renewables Obligation (RO). Furthermore, initiatives like Renewable Energy Guarantees of Origin (REGOs), Renewable Transport Fuel Obligation (RTFO), and Green Gas Trading (GGT) have also supported the bioenergy sector. Despite the variety of funds and programmes, this research did not identify detailed information about the government subsidies and its recipients, despite contacting multiple agencies.

Table 33 shows that, except for Romania, all seven countries offer subsidies or other forms of financial support to biogas producers. Feed-in Premiums and Feed-in Tariffs are being used in Germany, the Netherlands, Poland and the United Kingdom. Direct biogas subsidies can be found in Denmark, Ireland, the Netherlands and the United Kingdom.

11.6 Biogas companies

There is a large diversity of companies active in the European biogas sector. To increase the understanding of which companies play a role, we identified and analysed two groups of companies. The first group consists of major European companies: oil & gas companies, waste and utility companies and meat and dairy companies (see section 2.2). These companies are all active in the biogas sector as producer or trader. Table 34 shows the main biogas producers and traders among this group of major European companies. Often, their biogas production facilities are located in several countries, inside and sometimes outside Europe.

Table 34. Main biogas producers and traders among major European companies

Company	HQ country	Sector	Estimated biogas supply (in mln m3/yr)
BP	United Kingdom	Oil & gas	2,187
Orlen	Poland	Oil & gas	1,000
Centrica	United Kingdom	Oil & gas	480
Suez	France	Utilities	269
Shell	United Kingdom	Oil & gas	241
Repsol	Spain	Oil & gas	241
Total Energies	France	Oil & gas	177
Valio	Finland	Dairy	160
E.On	Germany	Utilities	160

As a second group we identified the ten largest biogas producers in each of the seven countries, based on biogas production figures from national associations and the companies themselves. Although there is some overlap with the first group, this group mainly consists of independent biogas producers originating from the agricultural, livestock and waste sector. Lists of these companies can be found in chapters 3 to 9, while Table 35 presents the top-3 companies for each country.

Table 35. Main biogas producers in seven European countries

Country	Producer #1	Producer #2	Producer #3
Denmark	Biocirc	SBS Kliplev	Tønder Biogas
Germany	Bmp greegas	Weltec Biopower	VerBio
Ireland	Greengate Biogas	CycleØ Group	Heygaz Biomethane
Netherlands	Sustainable Fuel Plant	Stokman	BMC Moerdijk
Poland	Orlen	Veolia Polska	Enricom Biogas
Romania	Genesis Biopartner	BSOG Energy	DN Agrar Group
United Kingdom	Future Biogas	Severn Trent	Swancote Energy

11.7 Bank and investor financing for biogas companies

To get an insight into bank and investor financing flows to the production of biogas in the EU and the UK, we analysed a selection of major European oil & gas, meat and dairy, and utility companies (see section 11.6). Between January 2016 and May 2025, we could identify credit financing with a value of at least EUR 800 billion to these companies, without differentiating if the financing was used for biogas-related projects or other corporate activities. The main banks of these three groups of companies are, based on both biogas- and non-biogas funding amounts:

- Oil & gas companies: Citigroup (US), Barclays (UK) and BNP Paribas (France)
- Meat and dairy companies: HSBC (UK), BNP Paribas (France) and JP Morgan Chase (US)
- Utilities: Deutsche Bank (Germany), Société Générale (France) and BNP Paribas (France)

Focusing on the largest ten biogas producers in each of the seven European countries (see section 11.6), we could find private credits provided to eight companies, for a total amount of almost EUR 9.5 billion in the period 2016-2025. Credit amounts increased significantly in the past few years, to EUR 2.2 billion in 2023 and EUR 2.6 billion in 2024. The largest financier is NatWest (United Kingdom), which provided more than EUR 1.1 billion in loans and underwriting services to three biogas companies. Other major financiers are BNP Paribas (France), which financed EUR 0.8 billion to two companies and Santander (Spain), with EUR 0.6 billion to one company.

We also identified investments in the shares and bonds of five biogas companies, as of May 2025, with a total value of EUR 9.3 billion. The most important investors in these biogas companies were BlackRock from the United States (EUR 975 million invested in three companies), Lazard (Bermuda, EUR 941 million in two companies) and Pictet (Switzerland, EUR 645 million in two companies).

11.8 Recommendations to EU policymakers

Many of the rules governing biogas and biomethane production and use are either directly regulated by EU policies or depend on how these policies are transposed into the national legislations of the member states. Therefore, improving the EU-level regulatory landscape provides leverage to impact how biogas is treated in all member states. Based on the findings of this report, the Methane Matters Coalition makes the following recommendations to EU policymakers to regulate the biogas sector to maximise the application of best practices and minimise environmental harm along the supply chain. Concretely, this means:

- **Reconsider the biomethane production target and its requirements fter a comprehensive environmental impact assessment**
  Complete an impact assessment of the 35 billion m3 target combined with the production methods, to provide a basis for reconsidering to which extent biogas can contribute to EU renewable energy targets. The current EU framework, especially through RED III and REPowerEU, sets an overly ambitious biomethane target of 35 billion m3 by 2030, a strong increase from today's level of 4.9 billion m^3. This goal creates market and political incentives that risk locking in unsustainable production practices and land-use impacts.

- **Define where biogas should be used and not used**
  Evaluate for which purposes biogas is the best alternative and therefore could be earmarked as part of the impact assessment of the target for biogas production in the EU. This could consider: for peak load electricity and co-generation production (supplementing wind and solar energy), for heavy industry and as a raw material for aviation fuel. Better alternatives exist for baseload heating and electricity and for road transport and these incentivise production at a scale beyond what is sustainable and they should therefore not be considered.

- **Ban food and feed crops as eligible biogas feedstock**
  Completely ban the use of food crops, including maize, as feedstock and discourage the use of energy crops by excluding crop-based biogas production from any incentives and subsidies programmes. Despite offering some flexibility to the member states and discouraging the use of feed and food crops, the RED III directive still permits the use of food and feed crops for biogas production - as does REPowerEU. This policy position will contribute to food insecurity, monoculture expansion, and indirect land-use change.

- **Limit the use of manure as an eligible biogas feedstock in line with its full life cycle emissions, updating REDIII calculations to account for this**
  Ensure that livestock manure is fully accounted for in the RED III methodology, limiting its use as a sustainable feedstock in line with its full lifecycle emissions and updating the EU Taxonomy. The reduction of overall livestock numbers must be the leading policy

goal. Using manure from intensive livestock farms as biogas feedstock, perpetuates an unsustainable animal protein sector with its environmental and animal welfare harms. EU and national subsidies for biogas production under RED III, the Energy Taxation Directive, and any schemes provided at the member states' level must not incentivise the further expansion of the industrial livestock sector.

- **Ensure pre-treatment of waste to reduce methane emissions from landfills**
  Ensure that the pre-treatment of waste prior to landfilling - as agreed in the Landfilling Directive - is implemented and enforced in all member states. This will reduce methane emissions from landfills as far as possible, by avoiding, recycling and processing waste first before using it as a source for biogas production.

- **Stop the use of subsidies for new landfill methane production**
  Linked to 'treatment' issue above: ensure that EU and national subsidies are not used for methane capture from new landfills, but instead focus on the treatment of waste before disposal. These subsidies will otherwise further incentivise landfiling of untreated waste.

- **Do not increase the nitrogen limits from RENURE**
  Maintain the 170 kg N/ha cap, restrict derogations, and ban the use of digestate from intensive livestock operations as RENURE material unless full lifecycle impacts and pollution risks are independently verified. The proposed revision to the Nitrates Directive and other EU legislation that would allow up to apply to arable land 270 kg N/ha via Recovered Nitrogen from manure (RENURE) fertilisers, made from the digestate that is a byproduct of biogas production, is incompatible with environmental and water protection goals.

- **Mandate the post-composting of digestate before its application on land**
  Reinforce the EU Taxonomy, which already labels post-composting as a "preferable" option in the Nitrates Directive, and in other polices relevant to biogas and biomethane. Post-composting of digestate before its application on land avoids the release of methane and ammonia, odour nuisance, and loss of mineral nitrogen by leaching and runoff.[719]

- **Stop and reverse the Omnibus Package**
  Stop the Omnibus Package and to ensure a stricter, rather than more relaxed, approach to sustainability reporting. While the proposed changes to the CSDDD, CSRD and other directives do not directly impact biogas-specific legislation, the overarching Omnibus approach to 'simplification' of sustainability regulations can have far-reaching consequences for the biogas and biomethane sectors as well. Thus, the materiality threshold and the possibility to report 'partial' Taxonomy alignment create a risk of underreporting on biogas sustainability (for example, as large meat and dairy or fossil fuel companies render biogas as immaterial compared to their core business) and can boost greenwashing when projects that do not fully meet sustainability criteria are reported as partially aligned.

11.9 Recommendations for the seven European countries

The Methane Matters coalition recommends policymakers in all seven European countries take all necessary steps, by implementing relevant EU regulations and by supplementing those with additional criteria and safeguards, to regulate the biogas sector to maximise the application of best practices and minimise environmental harm along the supply chain. In the following sections, this general recommendation is further specified in specific recommendations for the policymakers in each of the seven countries.

11.9.1. Recommendations for policymakers in Denmark

The following recommendations are made to policymakers in Denmark:

- **Ensure transparency and accountability in the implementation of the Green Tripartite Agreement**
  The Danish Government should report on a regular basis on the deployment of the various measures stated in the Green Tripartite Agreement, including the implementation of the proposed tax on livestock emissions, which aims to encourage farmers to change their practices and contribute to the goal of reducing agricultural emissions by 55% to 65% in 2030, compared to the 1990 level. The government should also disclose how tax revenues are allocated, particularly whether and how they support environmental restoration, social equity, and just transition measures. In addition, authorities should monitor and publicly report on the effectiveness of subsidies provided to farmers for reducing greenhouse gas emissions from nitrogen fertilisation, with particular attention to actual reductions in nitrogen pollution in soils and water bodies.

- **Strengthen monitoring of methane leakage from biogas plants**
  The Danish government should report on the effectiveness of the regulation to limit methane emissions from biogas production and on the impact of the Green Tripartite Agreement on methane emissions, in line with the recommendations formulated by Green Transition Denmark and the Methane Matters Coalition in a 2024 report on Methane Emissions in the Danish context..

- **Develop a National Methane Action Plan with short-term reduction targets**
  The Danish Government should develop a National Methane Roadmap and Action Plan showing how the country will reduce its methane emissions by at least 30% in 2030 compared to 2020.

11.9.2. Recommendation to policymakers in Germany

The following recommendation is made to policymakers in Germany:

- **Phase out biogas subsidies for industrial livestock integration and redirect support to agroecological models**
  German policymakers should exclude biogas plants linked to intensive livestock operations from receiving public subsidies (EEG payments, flexibility premiums, CAP funds). Instead, the German government should incentivise integrated agroecological models, such as small-scale mixed farms using genuine waste streams, crop rotation, and pasture-based systems, and link biomethane subsidies to reduced livestock densities and lower nitrogen inputs. Germany's biogas sector is deeply intertwined with livestock farming, as many biogas plants rely on manure from large-scale animal operations. This creates a perverse incentive structure that reinforces factory farming, contributing to excessive greenhouse gas emissions, poor animal welfare, antimicrobial resistance, and nitrate pollution.

11.9.3. Recommendations to policymakers in Ireland

The following recommendations are made to policymakers in Ireland:

- **Ensure that the biomethane targets are consistent with the amount of biogas that can be sustainably produced**
  The Irish authorities should lower its production targets based on the available amounts of truly sustainable feedstock, including avoidable food waste, sewage waste, and animal manure from existing farms, without any expansions of meat and dairy production. Using food and feed crops must be completely banned. Under the Biomethane Strategy, the Irish Government plans that the biogas industry will be supplying up to 5.7 TWh (572 million m^3) of indigenously produced biomethane annually by 2030. The Strategy recognises that food waste is the most optimal feedstock, and also that it is not available in sufficient amounts. In fact, it says that Ireland's entire biowaste sector can contribute a total of up to 1 TWh of biomethane, well below the 5.7 TWh target.

- **Urgently adopt and publish the Biomethane Sustainability Charter**
  The Government of Ireland should deliver on its own commitment to urgently deliver the Biomethane Sustainability Charter. This should be a binding document for all players along the biomethane value chain from farmers to utilities, requiring stringent safeguards in terms of methane leaks, air and water quality, human health and animal welfare.

- **Respect the EU-wide nitrogen application levels for animal manure and oppose the RENURE changes to the Nitrates Directive**
  The Government of Ireland should oppose changes to the nitrogen application cap in the EU Council and to stop applying for any future derogations under the existing limits. Ireland is one of three European countries that have a derogation under the EU Nitrates Directive, allowing some farmers to apply more nitrogen from animal manure per hectare. In 2024, the EU Commission opened a public consultation on revising Annex III of the Nitrates Directive, aiming to increase the maximum nitrogen application level from 170 kg to 270 kg per hectare, provided that this nitrogen originates from 'recovered nitrogen from manure (RENURE)' fertilisers.

11.9.4. Recommendations to policymakers in the Netherlands

The following recommendations are made to policymakers in the Netherlands:

- **Introduce a moratorium on biomethane from manure sourced from industrial animal farming**
  While the expansion of biomethane production in the Netherlands is still in its early stages, the government's intention to significantly increase production by using large quantities of animal manure contrasts sharply with the country's dramatic nitrogen crisis and the need to significantly and rapidly reduce livestock numbers. Dutch policy-makers must review biomethane policies and subsidies as laid out in this research, stop any incentives that could lock in industrial animal farming, and ensure that biomethane policies are co-designed and coherent with efforts to reduce the number of animals.

11.9.5. Maintain stringent MER-requirements for biogas production facilities and distribution channels in allocating so-called ‘’acceleration areas” under RED III

The Government of the Netherlands should maintain a so-called *Project-MER* (i.e. a project-based environmental impact assessment) requirement for biogas production facilities and distribution channels. While the Dutch government is in the process of identifying so-called ‘’acceleration areas” for the Dutch energy transition as part of its transposition of RED III, regulators must ensure that environmental safeguards for biogas production facilities and distribution channels are maintained.

- **Respect the EU-wide nitrogen application levels for animal manure and oppose the RENURE changes to the Nitrates Directive**

The Government of the Netherlands should oppose changes in the EU Council to increase the maximum nitrogen application level and to stop applying for any future derogations under the existing limits. The Netherlands is one of three European countries that have a derogation under the EU Nitrates Directive, allowing some farmers to apply more nitrogen from animal manure per hectare. In 2024, the EU Commission opened a public consultation on revising Annex III of the Nitrates Directive, aiming to increase the maximum nitrogen application level from 170 kg to 270 kg per hectare, provided that this nitrogen originates from ‘recovered nitrogen from manure (RENURE)’ fertilisers.

11.9.6. Recommendation to policymakers in Poland

The following recommendation is made to policymakers in Poland:

- **Align biogas development with circular economy and waste hierarchy principles**
  Policymakers in Poland should prioritise investment in separate bio-waste collection and pre-treatment infrastructure to ensure high-quality feedstock for biogas plants. This should be coupled with tightened controls on feedstock sourcing to avoid the use of agricultural crops, animal manure and materials that could otherwise be reused or recycled higher up the waste hierarchy. Biogas can contribute to circular economy goals, but only if waste streams are managed properly.

- **Strengthen legal and regulatory frameworks**
  Introduce stricter national regulations for large-scale industrial farms supplying feedstock to biogas plants.

  Establish minimum distance requirements between biogas installations and residential areas to protect communities from odour, noise, and emissions.

  Ensure effective environmental permitting and monitoring to prevent water and soil pollution.

- **Promote socially inclusive biogas models**
  Prioritise support for small and medium-sized biogas plants linked to cooperatives, and municipal waste management systems, rather than large industrial facilities.

  Encourage community ownership and benefit-sharing schemes, so that local residents gain direct advantages from biogas projects.

- **Ensure transparent and participatory decision-making**

  Make public consultations mandatory for new biogas projects.

  Provide local communities with legal tools to influence investment decisions and to contest projects that significantly threaten quality of life.

- **Introduce stricter feedstock sourcing rules**

  Restrict the use of feedstock from industrial farms, particularly slurry and manure from concentrated animal feeding operations (CAFOs), due to their negative environmental and social impacts.

  Promote the use of separately collected bio-waste, agricultural residues, and other waste streams that are consistent with circular economy principles.

11.9.7. Recommendations to policymakers in Romania

The following recommendations are made to policymakers in Romania:

- **Prioritise strengthening bio-waste collection and pre-treatment infrastructure**

  Policymakers in Romania should prioritise expanding separate bio-waste collection and pre-treatment infrastructure. This could include making separate bio-waste collection mandatory for municipalities above a certain population threshold, with clear implementation deadlines and penalties for non-compliance. In parallel, public-private partnerships could be actively encouraged to accelerate technology deployments for bio-waste pre-treatment. Romania's limited capacity to collect and process bio-waste - with only around 27% currently treated – represents a major bottleneck for responsible biogas development. Without addressing this, Romania's biogas industry risks relying on energy crops, with associated land-use and food security concerns.

- **Integrate health and air quality safeguards into biogas expansion plans**

  Policymakers in Romania should require health risk assessments – including specific focus on air pollutants and odours - as part of environmental approvals for biogas plants. Given Romania's already high rate of air pollution-related mortality, particular care is needed to ensure that the biogas sector does not add to the burden of respiratory disease through poor biogas plant design or management. Biogas production, distribution and use are still in a nascent stage in Romania, but the government has plans to expand the sector in the coming years. As these plans advance, it is vital that health and air quality protections are fully integrated into permitting and regulatory processes.

11.9.8. Recommendations to policymakers in the UK

The following recommendations are made to policymakers in the UK:

- **Redirect the Green Gas Support Scheme (GGSS) to sustainable options**
  The UK Government should complete a full environmental and cost-benefit review of GGSS to make sure that funding is redirected to sustainable options such as circular waste management. The GGSS, extended to 2028, continues to channel subsidies into biogas plants without sufficient guarantees that they reduce emissions or support circularity. Notably, Ofgem, the scheme operator, has been criticised for failing to consistently monitor feedstock sustainability and traceability.

- **Ensure the proposed UK Taxonomy strictly conditions biogas**
  The UK Government should ensure the Taxonomy defines clearly the conditions for inclusion of biogas plants: how the environmental impacts of biogas production should be addressed and what is expected from feedstocks in terms of emissions and impacts throughout their supply chain to align with the UK's climate change, biodiversity, clean water and nitrogen emission targets. The UK Green Taxonomy is still under development (as of 2025), presenting a critical opportunity.

APPENDIX 12.

Biogas conversion factors

Conversion factors used in this report are shown in Table 36.

Table 36. Conversion factors for biogas and biomethane

Unit	Equals	Note
1 m^3 biogas	0.5 - 0.75 m3 biomethane	
1 m^3 biogas	0.625 m3 biomethane	Estimate used to convert production capacities
1 m^3 biomethane	36 MJ	
1 m^3 biomethane	9.97 kWh	
1 m^3 biogas + biomethane	30 MJ	Estimate used to convert EU statistics
1 million m^3 biomethane	6,123 barrel of oil equivalent	
1 million m^3 biomethane	857 ton of oil equivalent	
1 million m^3 biogas	3,839 barrel of oil equivalent	Estimate used to convert production capacities
1 MW production capacity	1,600 MWh/year	Estimate, based on 200 days of 8 hours

Source: *Sources: RNR (n.d.), "Faustzahlen", online :* https://biogas.fnr.de/daten-und-fakten/faustzahlen, *Viewed in July 2025; Unitjuggler (n.d.), "Converter", online: https://www.unitjuggler.com/.*

APPENDIX 13.

Financial research methodology

This appendix presents the scope and methodology used in the financial research. Specifically, it presents a detailed description of the type of financing considered, its sources and how the identified financing is attributed to each financial institution involved in the deal. Finally, this appendix discusses the limitations of the methodology used, the reasons behind such limitations and the measures taken to reduce their impact on the results.

Scope of the research

The private financing research focuses on a selection of companies (see section 10) engaged in the production or supply chain of biogas that are financed by financial institutions. This research covers corporate lending and underwriting services between January 2016 and May 2025. In terms of investments, this research considers share and bond holdings at the time of the research, May 2025, or the latest filing available.

Data sources

This research uses different sources to collect and retrieve the financial information of the financiers of equity and liabilities issued by the selected companies. Specifically, this research uses the databases FactSet and Dealogic to retrieve most of the information regarding the loans, bonds and shares issued by the selected companies. However, because these databases do not capture all the bilateral financing, this research also uses other sources such as the project finance database IJGlobal, annual reports, financial statements, company registries and media archives.

↘ Types of financing

Financial institutions can finance companies through two main means. They can either provide loans and underwriting services to companies or acquire the shares and bonds issued by such companies. In the first scenario, financial institutions, especially commercial banks, can provide credit to a company by providing them with loans and the services of underwriting shares and bond issuances. In the second scenario, financial institutions, especially investment banks and pension funds, can invest in the equity and debt of a company by holding their shares and bonds. This section outlines the different types of financing, how they are researched and the implications for the study.

↘ Corporate loans

The easiest way of financing is to borrow money. In most cases, money is borrowed from commercial banks. Loans can be either short-term or long-term. According to accounting principles, short-term loans (including trade credits, current accounts, leasing agreements, among others) have a maturity of less than a year and are categorised as current liabilities. Short-term loans are mostly used for day-to-day operations and are usually referred to

as working capital. Since short-term loans usually do not involve considerable amounts of money, they are often provided by a single bank via bilateral transactions, which do not require substantial guarantees by the company.

On the other hand, long-term loans have a maturity of more than a year, usually between three to ten, and are categorised as non-current liabilities. Long-term corporate loans are commonly useful to finance expansion plans, which are expected to generate revenues after some time. Nonetheless, the proceeds of long-term loans can be used for other types of company operations. Since long-term loans usually involve considerable amounts of money, they are often provided by a syndicate of banks—a group of banks brought together with the end of financing a specific project. Additionally, the bank syndicate will only undersign the loan agreement if the company can provide enough guarantees that interest and principal repayments will be fulfilled.

As there are different categories of loans according to their maturity, loans can also be categorised according to their purposes. As it was just mentioned, one specific form of corporate loan is **project finance**, which is an earmarked loan for a specific project. The other usual category for loans is **General corporate purposes / working capital**. This latter category is used when the company does not have a specific purpose for the loan or would rather not disclose it. The final use of the proceeds of specific loans is generally difficult to ascertain.

Share issuances

Issuing shares on the stock exchange allows a company to increase its equity by attracting new capital from a large number of new and existing shareholders. When a company offers its shares on the stock exchange for the first time, it is called an Initial Public Offering (IPO). When a company's shares are already traded on the stock exchange, this is called a secondary offering of additional shares. To arrange an IPO or a secondary offering, a company needs the assistance of one or more banks, which will promote the shares and find buyers who will become shareholders. Therefore, the investment bank's role in this process is very important, though temporary. The investment bank initially purchases the shares and then promotes the shares and finds shareholders. When all the issued shares the financial institution has underwritten are sold, they are no longer included in the balance sheet or the financial institution's portfolio. However, the assistance provided by financial institutions to companies in their share issuances is crucial. They provide the company with access to capital markets and guarantee that the shares will be bought at a pre-determined minimum price.

Bond issuances

In a certain way, bonds are a mix between loans and share issuances. On the one hand, bonds can best be described as cutting a large loan into small pieces to sell each piece separately to a lender. The different pieces of the bond are sold by using underwriting services, as in the case of the share issuances. Bonds are issued on a large scale by governments and, to a lesser extent, by corporations. Also, like shares, bonds are traded on the stock exchange. To issue bonds, a company needs the assistance of one or more banks which act as underwriters of a certain amount of the bonds. Underwriting is, in effect, buying a piece of the bond with the intention of selling it to investors. The role of the underwriters is very important because if they fail to sell the bonds they have underwritten, the underwriters will end up owning the bonds.

Holding and managing shares

Financial institutions can acquire shares of a certain company through the funds they manage or through their own funds, making the financial institutions part-owners of the company that issued the shares. Share ownership, especially if it is a considerable percentage, gives the financial institution a direct influence on the company's strategy and operations. The magnitude of the influence depends on the amount of shares the bank holds.

As financial institutions actively decide in which sectors and companies to invest and, as just described, are able to influence the company's business strategy, this research investigates the shareholdings of financial institutions of the selected companies. Shareholdings are only relevant for stock-listed companies. Not all companies in the study are listed on a stock exchange.

Researching a company's shareholdings has a number of peculiarities that have implications for the research strategy: Firstly, shares can be bought and sold on the stock exchange from one moment to the next. Financial databases keep track of shareholdings through snapshots or filings. This means that when a particular shareholding is recorded in the financial database, the actual holding, or a portion of it, might have already been sold, or more shares might have been purchased. The other main implication for the research is that share prices are constantly fluctuating. As a consequence, the shareholding amounts identified in the research will not probably reflect the actual level of shareholdings by a given financial institution; it will reflect the level the financial institution had at the time of the research.

Holding and managing bonds

Similarly to shareholdings, financial institutions can acquire bonds issued by a certain company. The main difference between owning shares and owning bonds is that the latter does not give the bondholder influence over the company's strategy and operations, i.e., holding bonds does not make the holder a co-owner of the company issuing the bonds; it makes it its creditor. That is, the bondholder is entitled to repayment after a certain number of years, at the bond's maturity, and to a predefined interest rate during the years.

Financial institutions financing contributions

Loans and underwriting services

In the case of syndicated loans and underwriting of bond and share issuances, the individual bank contributions are presented, to the largest extent possible, as they are recorded by and retrieved from the financial databases, company filings or media publications. However, in many cases, only the total value of a loan, the bond or share issuance is known, with no further information as to the amount or percentage contributed by each participant of the loan or issuance. Consequently, in such cases, the amount that each financial institution commits to the loan or issuance must be estimated.

Profundo has developed a methodology based on a beta regression model to estimate the financial institutions' contributions based on the available information. Specifically, when the fees charged by each financial institution are available, this research estimates each financial institution's contribution as a proportion of the total fees received by all financial

institutions. Then, the estimated proportion (for instance, if Bank A received 10% of all fees) is applied to the total deal value (assuming a deal of US$10 million, Bank A would be assigned a contribution of US$1 million or the 10% of US$10 million).

When the deal's fee data is missing or incomplete, this research uses a book ratio approach. The book ratio determines the deal's distribution between bookrunners, managers and other participants.

The beta regression model considers the following variables:

- The number of participants
- The ratio between book runners and participants
- A dummy variable highlighting if the financial institution is acting as book runner
- Dummy variables differentiating between the type of financing: Corporate loan, Revolving credit facility, bond issuance and share issuance.

Given the above variables, the book ration methodology fits a beta regression model of the form:

where is the inverse of the Logit function, is each of the variables considered and are the parameters to estimate.

Share and bond holdings

The market value, the number of shares, as well as the number of bonds held by financial institutions are reported in the financial databases used in the research. Hence, no estimations are performed to determine the individual contributions of the financial institutions.

Data limitations

As mentioned before, the private financing research uses databases FactSet and Dealogic. These data sources, though extensive, have several limitations in the coverage of financing and investment that can be retrieved:

Loans

Information from the financial databases used primarily includes syndicated lending, i.e. two or more financial institutions providing a loan to one company. Usually, the financial databases do not have data on bilateral lending, i.e. loans arranged between one bank and one company. Consequently, bilateral funding is mostly not covered in this research. This is the result, among others, of differences in the requirements of different jurisdictions in terms of reporting and whether the company is listed on the stock exchange or not.

This limitation is addressed by doing an extensive manual review of the company's annual reports, company sites, the chamber of commerce where the company is incorporated. In addition, the above-mentioned limitation is addressed by using other data sources such as IJGlobal, PitchBook.

Bond and shareholdings

The financial databases collect data on bonds and shareholdings from fund filings, company reports and stock exchanges. As a result, share and bond holdings data coverage is generally better for asset managers and the asset management arms of insurance companies and banking groups. Other financial institutions that do not offer asset management activities, such as pension funds and insurance companies, are not required to publish their investment portfolios. Those who publish their portfolios are not always covered by the financial databases. Profundo maintains a database of pension fund portfolio disclosures. These are updated at least once a year.

Another limitation of share and bond holdings data is that, as described at the end of Sections · and ·, the positions held in bonds and shares are easily and constantly changing. Consequently, bonds and shareholders identified during the course of the research may have sold or increased their positions or otherwise changed the composition of their investment portfolios.

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