June 2025. Sector snapshot

The bioenergy industry in Catalonia

ACCIÓ Catalonia Trade & Investment

Generalitat de Catalunya
Government of Catalonia

CataloniaConnects

The bioenergy industry in Catalonia: sector snapshot

ACCIÓ
Generalitat de Catalunya

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Carried out by
Strategy and Competitive Intelligence Unit of ACCIÓ
ACCIÓ Business Strategy Unit
Cluster Development

Barcelona, June 2025

1. The bioenergy industry

Bioenergy value chains in Catalonia: solid biomass and biogas

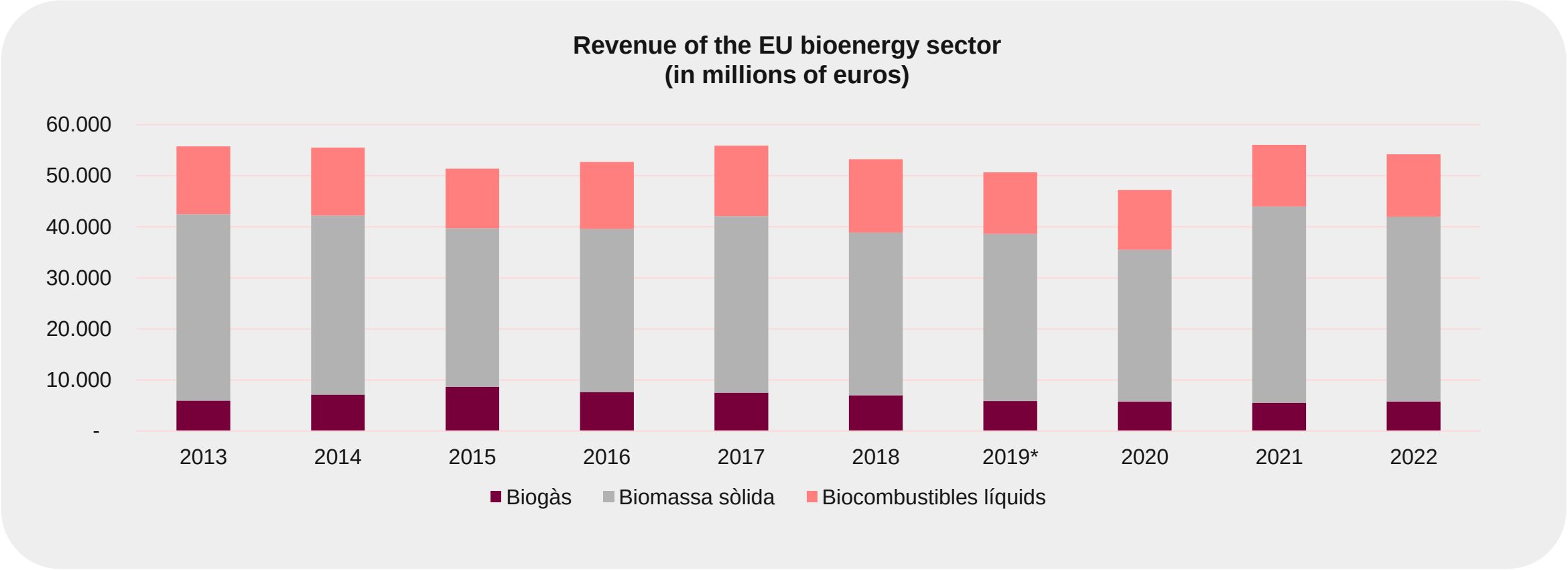
Bioenergy is a renewable energy source produced from biological materials (such as livestock manure, urban organic waste or forest biomass, among others) and the industry encompasses the process from obtaining the resource to its energy recovery and the treatment of the waste it generates. Bioenergy can provide heating, cooling, steam, electricity and fuel for transportation.

The 3 main categories that are distinguished in the field of bioenergy are:

- **Solid biomass**
- **Biogas** and biomethane
- Liquid biofuels

***Source**: Own production*

The EU invoiced more than €54 billion in the bioenergy market in 2022

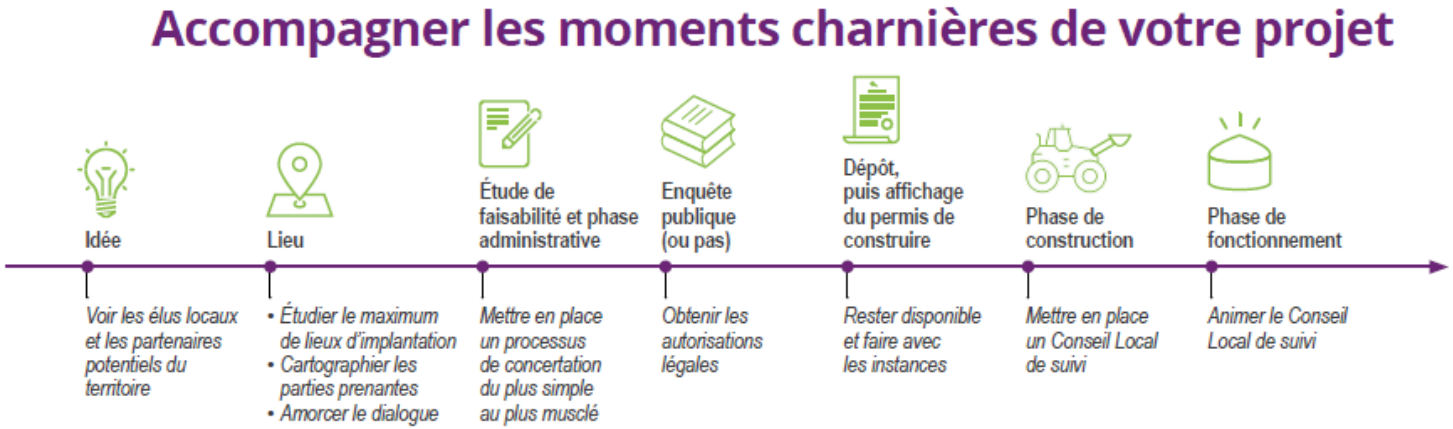


Note: *From 2019, the revenue from the United Kingdom market is no longer considered due to Brexit.* ***Source:*** *Own production based on data from the Statista portal provided by EurObserv'ER*

Initiatives for the development of bioenergy in France: AILE. Association d'Initiatives Locales pour l'Energie et l'Environnement (France) (I)

This association of local energy and environmental initiatives have particularly focused on the challenge of social acceptance and have developed a specific guide.

- **Talk to opposing entities from the onset of the project** when there is a silent majority that takes no position on the project.
- **Avoid large public gatherings**.
- **Propose visits to farms** and arrange question-and-answer sessions with those involved (e.g. explain the principles of methanization, the different types of plants and all the project impacts)
- Define **biogas development models that facilitate social acceptance** (e.g. 50% public sector investment)
- Publicize **reports on the externalities of methanization with academic sources**
- Do **impact studies from logistics** of biogas plants



***Source**: AILE. Association d'Initiatives Locales pour l'Énergie et l'Environnement*

Initiatives for the development of bioenergy in France: AILE. Association d'Initiatives Locales pour l'Energie et l'Environnement (France) (II)

Best practice guide for methanization projects. Dialog with area representatives

Objective: Provide recommendations for establishing effective dialog with local political representatives on agricultural methanization projects.

1. **Initial meeting with the representatives**

- Inform them about the project before they find out about it through other means.
- Select the relevant representatives (mayor, councilor for agriculture, etc.).
- Communicate directly, avoiding intermediaries.

2. **Maintain the dialog: intermediate meetings**

- Notify changes in the project and progress.
- Adapt the information according to the impact on each municipality.
- Coordinate with authorities at different regional levels.

3. **Presentation of the project to the Municipal Council**

- Explain objectives, benefits and potential impacts.
- Answer questions about regulations and environmental effects.
- Plan communication initiatives with the community.

Main concerns of the representatives:

- Environmental impacts and agricultural model.
- Traffic levels and possible inconvenience to the population.
- Social acceptance of the project.

Managing the opposition:

- Be transparent and educational.
- Propose visits to similar facilities.
- Open spaces for debate with the community to address concerns

***Source**: AILE. Association d'Initiatives Locales pour l'Énergie et l'Environnement*

Other initiatives for the development of bioenergy in France

	Bioeconomy For Change	Cluster Méthatlantique	Association des Agriculteurs Méthaniseurs de France	Biogaz Vallée
Initiative	BIOECONOMY FOR CHANGE	methatlantique		biogaz vallée
Scope of action	Bioeconomy	Biogas	Biogas	Biogas
Main objective	Recovery and optimal use of resources of biological origin	Promoting better competition in the biogas industry and professionalization	Promoting the development of methanization for farmers in France	Promotion competition and development of the biogas value chain
Work areas in bioenergy	1. New recovery processes 2. Increased plant productivity 3. Aviation fuels (SAF) 4. CO2 recovery 5. Utilization of digestate	1. Promotion of methanization and revitalization of the sector 2. Professionalization of the biogas value chain 3. Innovating optimization and production modes 4. Sector representation and improved regulatory environment	1. Promotion and awareness 2. Support for industry professionals 3. Institutional representation 4. Innovation and research 5. Education and training	1. Structuring the value chain 2. Easier access to funding 3. Supporting the creation of qualified industrial employment in France 4. Fostering innovation

Access the full report on the bioenergy industry

Examples of companies of interest to the bioenergy sector on an international scale

BIOGAZ TECH

Canadian company with a strong presence in France. It is dedicated to developing turnkey biogas plants: feasibility studies, plant engineering and construction management, search for financing, start-up, plant optimization, support in raw material purchasing processes, etc. They develop plants with methanization, pyrogasification and biogenic CO2 recovery technologies.

EVALOR

Builder of biogas plants for livestock farms. It is a company created on the initiative of agricultural cooperatives. It is responsible for the design, construction and maintenance of biogas plants for the livestock sector through cogeneration or network injection. The company also intervenes in the pre-treatment and management phase of the digestate (composting, fertilization, etc.).

HOST

Dutch company that develops, designs, manufactures and maintains technologies that convert organic waste into renewable biofuels, renewable gases, heat and electricity. These technologies include biogas plants with anaerobic digestion, biomass and waste-fired boiler plants, and gasification technologies.

EVERGAZ

Company that combines the role of promoter and operator of biogas plants with project development engineering for third parties.

NASKEO

Development, construction and commissioning of methanization units. Their work entails engineering, development, construction and maintenance.

CH4 PROCESS

Engineering firm specialized in improving the operational efficiency of biogas plants.

Source: *ACCIÓ*

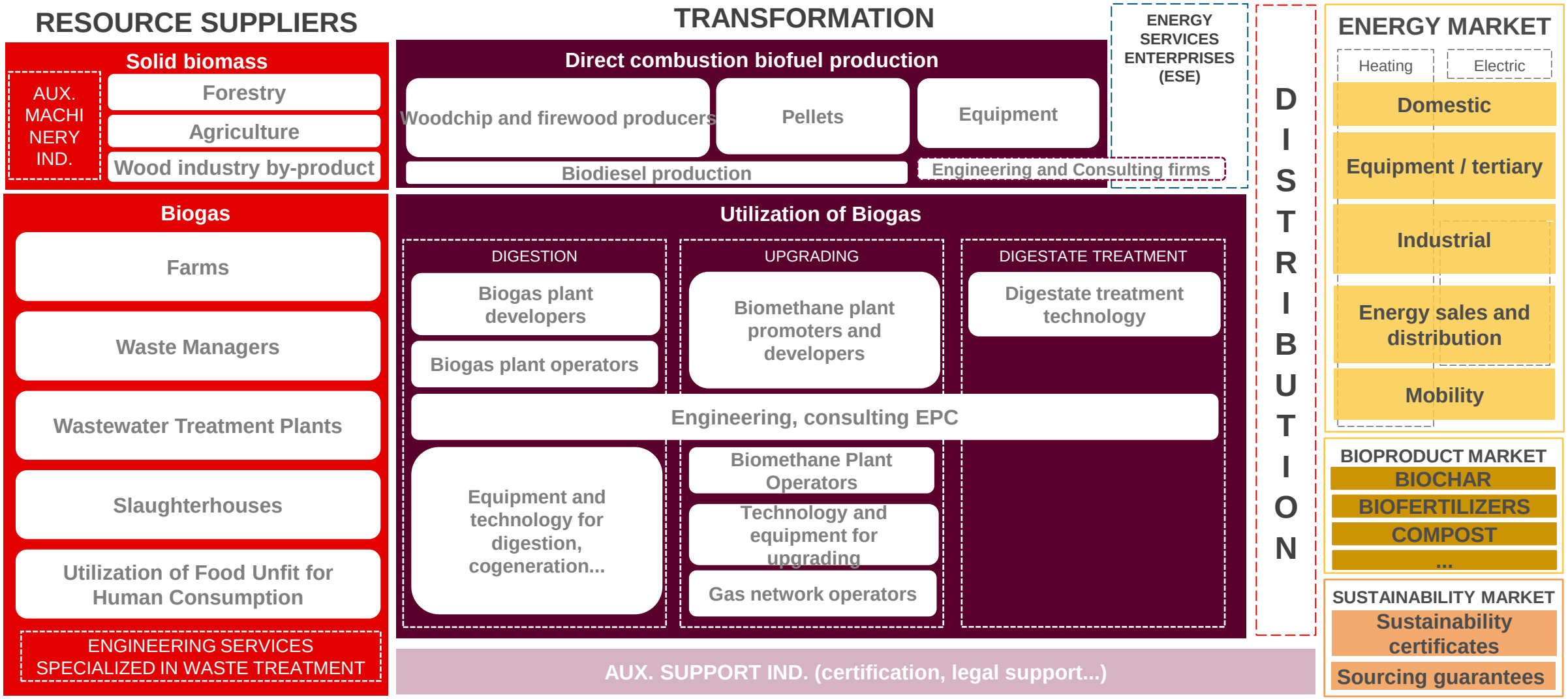
Principals conclusions from the benchmarking

- Public and farmer participation are key to social acceptance and ensuring the plant viability
- Territorial model and plant size adapted to the regional needs
- Setting goals at different scales drives the energy transition
- The role of the public sector has been decisive
- Skilled employment opportunity in rural environments
- Optimization of plant operating costs (OPEX) is a key factor
- French companies with proprietary technology and innovative business models
- R&D in new technologies such as hydrothermal gasification, pyrogasification and methanization
- Biogas transport (BioGNV) and CO2 recovery for different applications are growing opportunities
- France has an annual biomethane production of 13 TWh (2024) and plans to produce 60 TWh (2030)

Source: *Own production*

2. The bioenergy industry in Catalonia

Bioenergy Industry Value Chain in Catalonia (II)



Note: *The companies are a representative sample of each category* ***Source:*** *Own production*

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Bioenergy Industry Value Chain in Catalonia (II)

RESOURCE SUPPLIERS

Solid biomass

AUX. MACHINERY IND.

- Forestry
- Agriculture
- Wood industry by-product

Biogas

- Farms
- Waste Managers
- Wastewater Treatment Plants
- Slaughterhouses
- Utilization of Food Unfit for Human Consumption

ENGINEERING SERVICES SPECIALIZED IN WASTE TREATMENT

TRANSFORMATION

Direct combustion biofuel production

Woodchip and firewood producers

Pellets

Equipment

Biodiesel production

Utilization of Biogas

DIGESTION

Biogas plant developers

Biogas plant operators

UPGRADING

Biomethane plant promoters and developers

DIGESTATE TREATMENT

Digestate treatment technology

Digestate treatment plants

Engineering, consulting EPC

Equipment and technology for digestion, cogeneration…

Biomethane Plant Operators

Technology and equipment for upgrading

Gas network operators

ENERGY SERVICES ENTERPRISES (ESE)

Engineering and Consulting firms

DISTRIBUTION

ENERGY MARKET

Heating	Electric
Domestic	
Equipment / tertiary	
Industrial	
Energy sales and distribution	
Mobility	

BIOPRODUCT MARKET

- BIOCHAR
- BIOFERTILIZERS
- COMPOST
- …

SUSTAINABILITY MARKET

- Sustainability certificates
- Sourcing guarantees

AUX. SUPPORT IND. (certification, legal support...)

Note: *The companies are a representative sample of each category* ***Source:*** *Own production*

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The Bioenergy Sector Ecosystem in Catalonia

Public Administration

Agència de Residus de Catalunya

Centre de la Propietat Forestal

L'ENERGÈTICA
Energia Pública de Catalunya

Generalitat de Catalunya
Institut Català d'Energia

Generalitat de Catalunya
Departament d'Empresa i Treball

Generalitat de Catalunya
Departament d'Agricultura, Ramaderia, Pesca i Alimentació

Generalitat de Catalunya
Departament de Territori, Habitatge i Transició Ecològica

Technology and Research Centers

CTFC

IREC
Shaping Energy for a Sustainable Future

Beta
Biodiversitat, Ecologia, Tecnologia Ambiental i Alimentària

eurecat
Centre Tecnològic de Catalunya

LEITAT
managing technologies

IRTA
Institut de Recerca i Tecnologia Agroalimentàries

Associations and Clusters

ACM Associació Catalana de Municipis

UNIÓ DE PAGESOS

BOSCAT

CONSORCI FORESTAL DE CATALUNYA

CBC
Clúster Bioenergia Catalunya

Other related clusters

INNOVACC

CWP
CATALAN WATER PARTNERSHIP

INNOVI
Clúster Vitivinícola Català

CREC Clúster de residus de Catalunya

CEEC
Clúster d'Eficiència Energètica de Catalunya

Universities and training centers

UAB
Universitat Autònoma de Barcelona

UPC
UNIVERSITAT POLITÈCNICA DE CATALUNYA
BARCELONATECH

UNIVERSITAT ROVIRA i VIRGILI

UVIC
UNIVERSITAT DE VIC
UNIVERSITAT CENTRAL DE CATALUNYA

Universitat de Lleida

Specialized fairs and conventions

EUROPEAN BIOMETHANE WEEK

NET ZERO TECH

CONGRÉS BIT

FECS
Fira de l'Energia i la Construcció Sostenible

CBC
II NIT DE LA BIOENERGIA
L'ENERGIA MÉS CIRCULAR I SOCIAL

Notes: *Partial non-exhaustive representation of some of the main stakeholder in each category of the ecosystem* ***Source:*** *ACCIÓ*

Key data of the bioenergy industry in Catalonia

365
companies

€ 872 M
Turnover 2023

2,650
employees 2023

Note: *Unconsolidated revenue and employee data from the last year available, mostly 2023 and 2022. Source: Own production based on the assembly and analysis of a list of identified companies belonging to the bioenergy sector with data available in ORBIS.*

Profile of Catalan companies in the bioenergy industry

Companies

28.4% of the companies were founded more than 10 years ago

24.2% of the companies are foreign subsidiaries

0.1% of the companies are startups

Turnover

31.5% of the turnover comes from large companies (4.9% of companies)

47.9% of the turnover comes from companies in the province of Barcelona

Employees

77.5% of employees work in companies with over 10 years in existence

74.4% of employees work in micro-enterprises or small businesses

***Source**: ACCIÓ*

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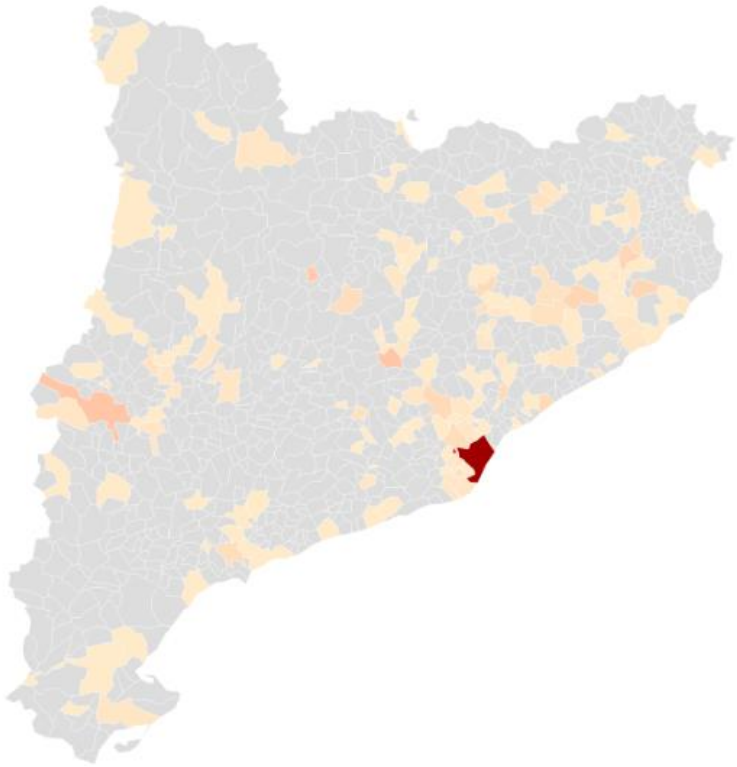
Half of the companies are located in the province of Barcelona

Territorial distribution

The province of **Barcelona** concentrates half of the bioenergy companies in Catalonia.

Barcelonès (15.6%), La Selva (6.3%), El Gironès (6.3%) and Baix Llobregat (5.5%) are the counties with the most companies related to the bioenergy economy

#	City	No. of companies 2025	Turnover €M
1	Barcelona	55	77.2
2	Lleida	10	19.6
3	Manresa	10	12.3
4	Solsona	8	5.0
5	Santa Coloma de Farners	6	9.0
6	Cassa de la Selva	6	8.7
7	Girona	6	49.1
8	Granollers	5	7.0
9	Mataró	5	8.9
10	Celra	4	7.4
11	Cardona	4	0.9
12	Cornellà de Llobregat	4	11.3
13	Vic	4	6.1
14	Terrassa	4	2.6
15	Reus	4	0.3
	Others	230	646.5



***Source**: ACCIÓ, based on Orbis*

Companies in the biomass value chain in Catalonia

BIOMASS VALUE CHAIN	Companies	% of companies	Estimated turnover in bioenergy (€M)	% turnover	Estimated bioenergy workers	% workers
Direct combustion biofuel production	**91**	**68.9%**	**207.5**	**52.1%**	**744**	**75.4%**
Chip production	46	34.8%	71.5	18.0%	378	38.34%
Boilers and equipment (manufacturing, distribution and installation)	28	21.2%	55.1	13.8%	153	15.46%
Biodiesel production	1	0.8%	38.9	9.8%	36	3.65%
Pellet manufacturers	6	4.5%	28.7	7.2%	46	4.66%
Engineering and consultancy	10	7.6%	13.4	3.4%	132	13.32%
Distribution	**5**	**3.8%**	**139.8**	**35.1%**	**33**	**3.4%**
Biomass	4	3.0%	92.1	23.1%	29	2.9%
Biofuels	1	0.8%	47.7	12.0%	4	0.4%
Energy service enterprises	**6**	**4.5%**	**32.7**	**8.2%**	**60**	**6.1%**
Resource suppliers	**30**	**22.7%**	**18.0**	**4.5%**	**149**	**15.1%**
Forestry	17	12.88%	8.0	2.0%	126	12.77%
Agriculture	2	1.52%	4.7	1.2%	7	0.67%
Wood industry by-product	9	6.82%	3.5	0.9%	10	1.01%
Aux. Ind. Machinery	2	1.52%	1.9	0.5%	6	0.63%
Total general	**132**	**100.00%**	**398.0**	**100.0%**	**987**	**100.00%**

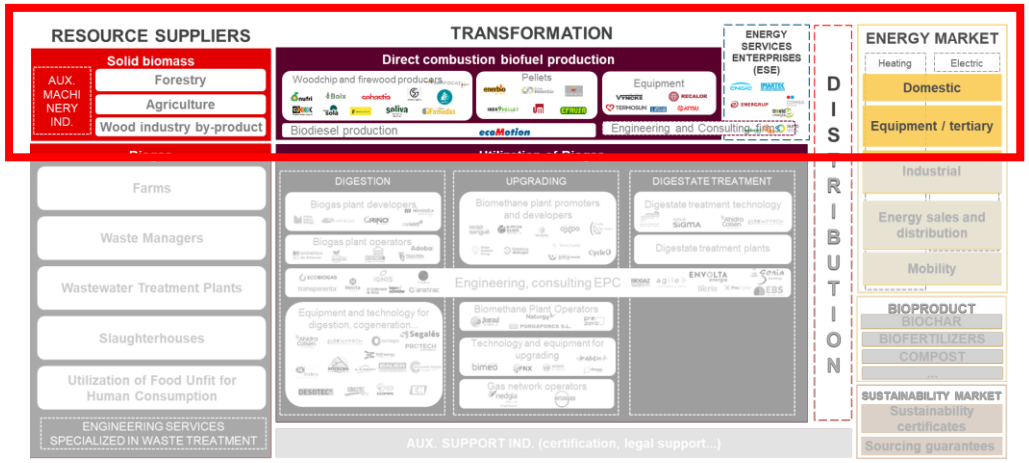
Note: *Unconsolidated revenue and employee data from the last year available, mostly 2023 and 2022.* ***Source:*** *Own production based on the assembly and analysis of a list of identified companies belonging to the bioenergy sector with data available in ORBIS.*

- More than 50% of the companies identified in the bioenergy value chain are dedicated to the field of solid biomass (and in some cases, liquid biofuels). These companies represent **46% of the revenue** of the entire bioenergy value chain.
- This is a **value chain highly focused on the resource** (use of biomass and transformation into wood chips or pellets) with **hardly any auxiliary industry** (boilers, equipment, installation, engineering...).

The biomass value chain in Catalonia (solid biomass and liquid biofuels)

It is a sector with a small number of companies concentrated mainly in the resource extraction and biomass supply phases. Most of the companies come from the forestry and wood sector (forestry management and work, sawmills, etc.).

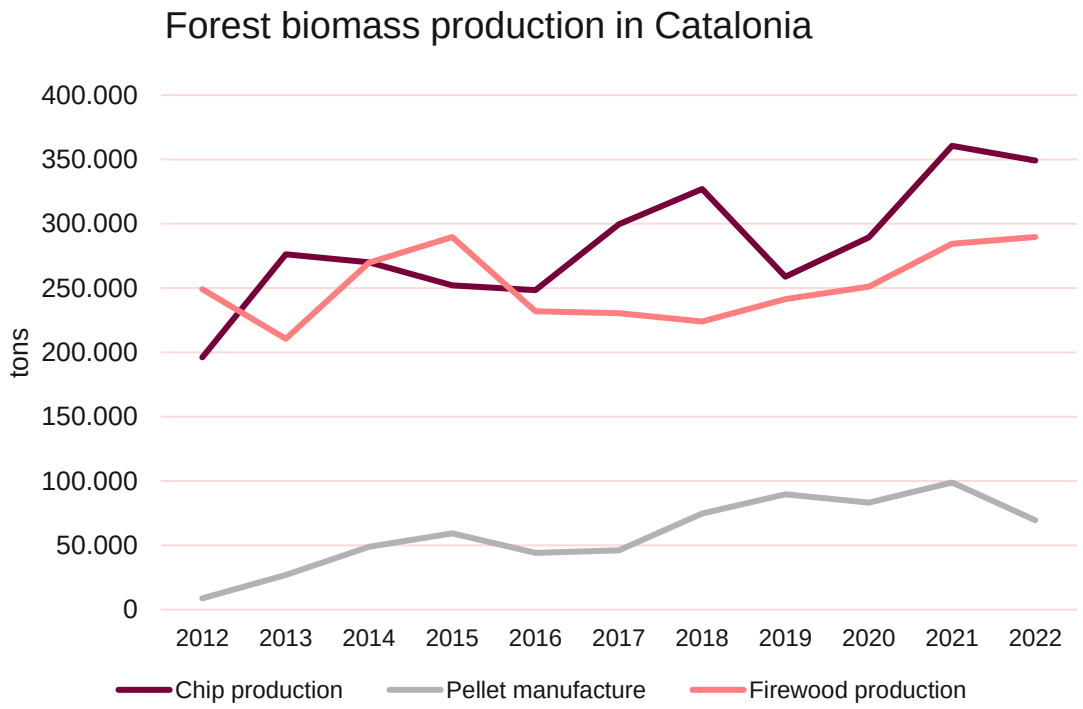
- There is **not much activity related to industrial transformation**. It mostly concerns the production of biomass in the form of chips (1st transformation), while few pellet manufacturing companies (2nd transformation) have been identified.
- The main business model is based on obtaining the resource, biomass production and volume supply service to the end customer.
- There are **few business differentiation strategies** and many involving commodities. However, in some cases a business model emerges that incorporates value-added services for the customer.
- **Equipment manufacturing is the most innovative area**.
- There are companies with **various market positionings according to the characteristics of their biomass**: boilers for industrial use, boilers for the tertiary sector (hotels, schools, rural accommodation, etc.) and domestic boilers.
- Every **market segment presents different purchasing criteria, which condition the biomass production process** from which they are supplied.

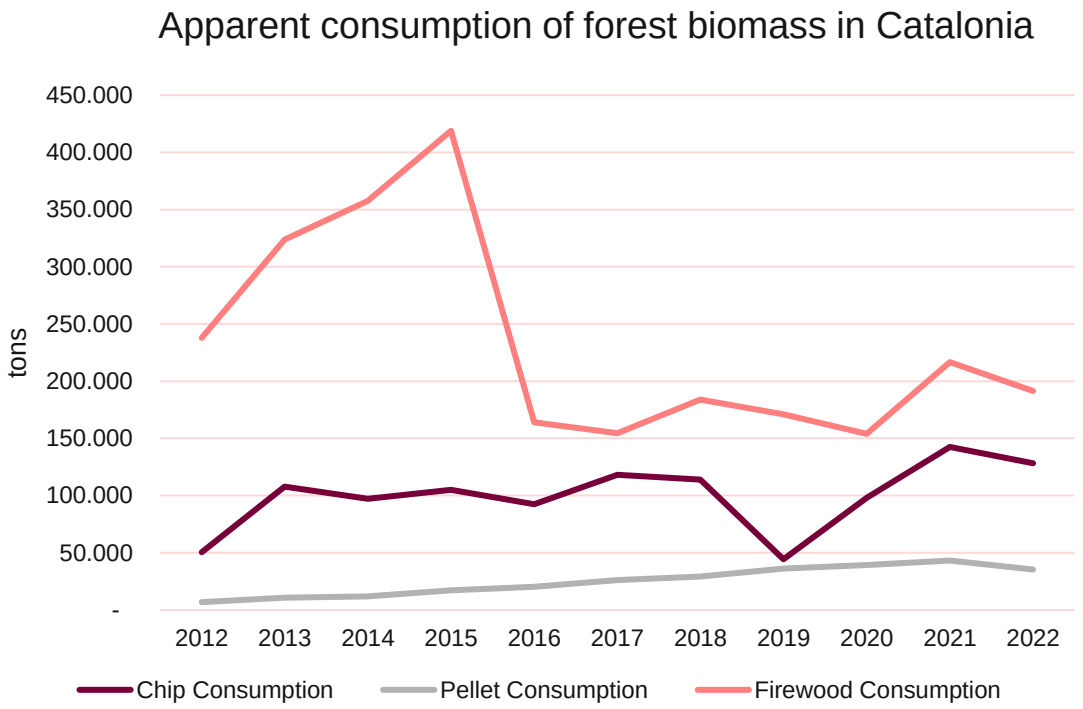


***Source**: Own production*

The biomass market in Catalonia shows scattered growth according to market segment – industrial, main growth lever (I)

- Currently, there are 160 municipal heating networks that use biomass and 40 companies use biomass on a large scale with some notable projects of recent investments (Nestlé, Alier, Nufri...).
- In general, local demand predominates as the main target market, although there is also sizable demand from nearby French industrial market in the South of France





Source: *Own production based on data from the Catalan Forest Observatory*

Size of the biogas value chain in Catalonia

BIOGAS VALUE CHAIN	Companies	% of companies	Estimated turnover in bioenergy (€M)	% turnover	Estimated bioenergy workers	% workers
Transformation	**95**	**87.2%**	**413.3**	**89.1%**	**1,017**	**65.0%**
Upgrading	**25**	**22.9%**	**212.9**	**45.9%**	**300**	**19.2%**
Biomethane plant promoters and developers	12	11.0%	112.8	24.3%	103	6.6%
Biomethane plant operators	7	6.4%	63.1	13.6%	140	8.9%
Network operators	1	0.9%	20.2	4.4%	9	0.6%
Equipment and technology for upgrading	5	4.6%	16.8	3.6%	48	3.1%
Digestion	**66**	**60.6%**	**184.0**	**39.6%**	**670**	**42.8%**
Biogas plant operators	23	21.1%	67.3	14.5%	283	18.1%
Digestion equipment and technology	16	14.7%	55.7	12.0%	200	12.8%
Engineering, consulting and EPC	20	18.3%	44.7	9.6%	169	10.8%
Development of biogas plants	7	6.4%	16.2	3.5%	19	1.2%
Digestate treatment	**4**	**3.7%**	**16.4**	**3.5%**	**47**	**3.0%**
Digestate treatment technology	4	3.7%	16.4	3.5%	47	3.0%
Engineering, consulting and EPC	**14**	**12.8%**	**48.74**	**15.7%**	**546**	**42.4%**
Resource suppliers	**14**	**12.8%**	**50.8**	**10.9%**	**547**	**35.0%**
Total general	**109**	**100.00%**	**464.0**	**100.0%**	**1,564**	**100.00%**

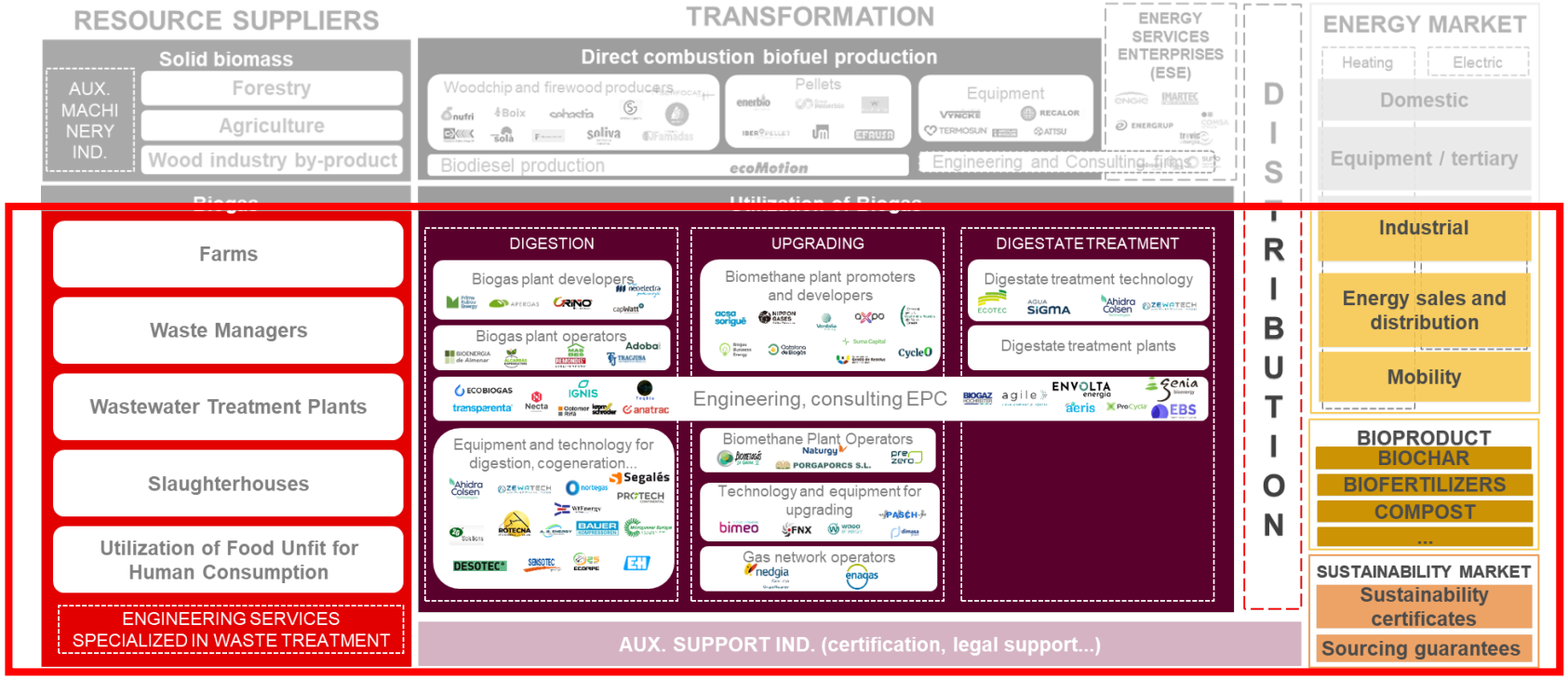
Note: *Unconsolidated revenue and employee data from the last year available, mostly 2023 and 2022.* ***Source:*** *Own production based on the assembly and analysis of a list of identified companies belonging to the bioenergy sector with data available in ORBIS.*

- 45% of companies identified in the bioenergy value chain have to do with the area of biogas. It is estimated that the aggregate turnover of companies in the biogas sector represents 54% of the total turnover of the bioenergy value chain in Catalonia.

The biogas value chain in Catalonia

The biogas value chain integrates the waste generation process and its management, energy transformation in biogas plants, injection into the gas network in an upgrading process, the treatment of digestate and its recovery.

- The origins of the companies are very wide-ranging. The main areas are livestock and agro-industrial, waste, water and energy. It should be noted that the area of origin of each company determines its approach to biogas, the degree of vertical integration and its business model.



***Source**: Own production*

Production process from waste-to-resource to biomethane – Analysis of the biogas and biomethane value chain

INITIAL PLANT INVESTMENT

- Optimal location for waste and proximity to the gas network
- Social/local acceptance
- Procedures involving the environmental, urban planning, energy, etc.

SUPPLY

- Ensuring there are waste resources
- Long-term contracts
- Waste mix
- Optimization of slurry collection systems on farms and liquid-solid separation at source

LOGISTICS WASTE

- Vehicle fleet types
- Specialized transport
- Cost / Km
- Maximum radius
- Speed in processing waste (*fresh slurry)*
- Regulatory limits
- Intermediate stock requirement

DIGESTION ANAEROBIC

- Chosen technology
- Co-digestion systems
- Plant operation and supervision
- Minimum efficiency scale
- Biogas pre-treatment

UPGRADING BIOMETHANE

- Process and technology
- Min. effective scale
- CO2 capture and storage

INJECTION VENDING

- Proximity to the network with sufficient demand
- Reverse flow in case of insufficient demand
- Sale of guarantee of origin certificates
- Uses of biogas
- Biofuels

BY-PRODUCTS

- Liquid-solid separation of digestate
- Digestate recovery (compost, fertilizers, etc.)
- CO2 utilization

Source: *Own production*

A decentralized model in biogas production

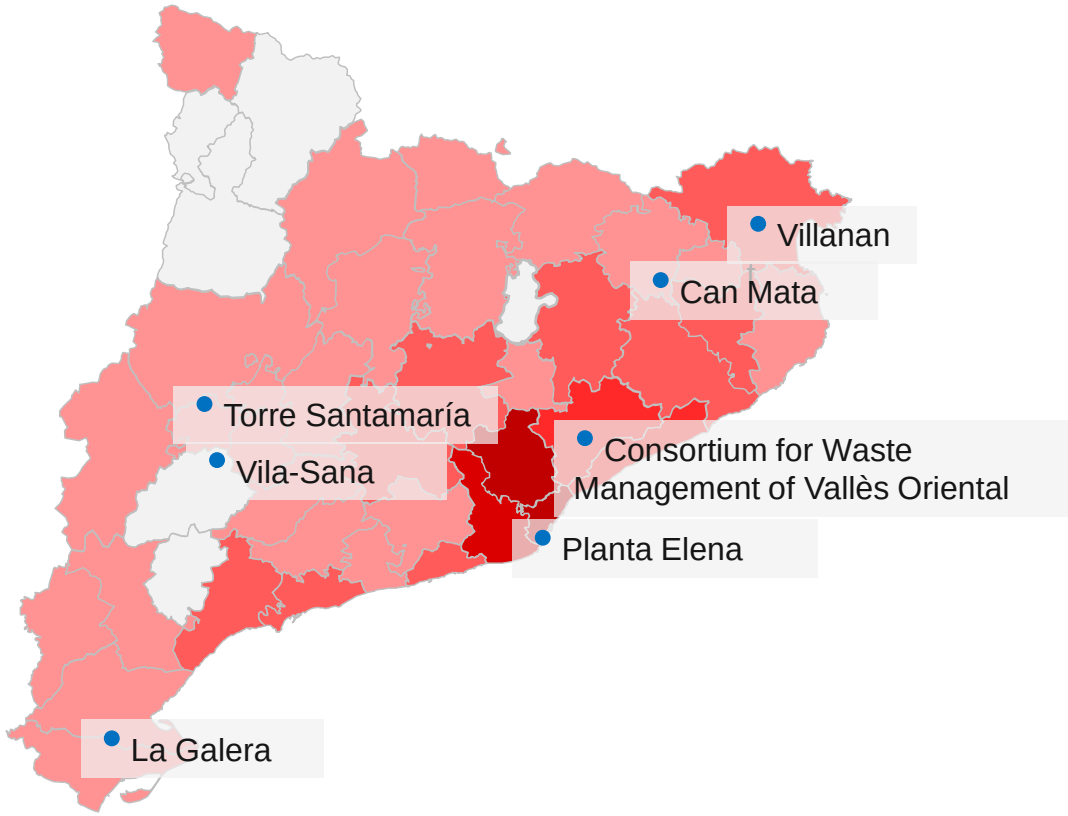
- According to the Catalan Biogas Strategy, in Catalonia there are **72 biogas plants** in operation.

Biogas plants in Catalonia

Sources of biogas	Number of plants in operation (June 2023)
Livestock manure	4
Co-digestion with livestock manure	16
Municipal organic waste	7
Industrial organic waste	5
Controlled waste tanks	10
Urban WWTP sludge	30
Total	**72**

Source: Own production based on data from the Catalan Biogas Strategy

Biomethane plants in Catalonia



Source: *Map of Biomethane Plants in Spain – Rubén Llorente (Ham Group)*

The strategic opportunity of biogas in Catalonia

- Currently, the biogas value chain in Catalonia is a still in development. Its stakeholder come from diverse areas such as livestock, agro-industrial, waste, water and energy.
- Interest in biomethane has grown thanks to its potential linked to waste generation and energy transition policies.
- Most of the business activity focuses on the development and services of biogas plants, but with a low degree of specialization and with biogas as a secondary activity or as a solution to manage one's own waste and produce energy for self-consumption.
- In Catalonia, 40% of the income from biomethane plants comes from the sale of biomethane and 60% from guarantee of origin certificates, with other complementary income such as waste management or the recovery of digestate.

Source: *Own production*

The development of technologies applied to biogas

- In Catalonia, most of the technology used in biogas plants is imported, with the prominence of distribution companies or commercial subsidiaries that install foreign solutions. There are also local manufacturers of generic components (pumps, tubes, instruments, etc.), but few companies with proprietary technology applied to the entire biogas process.

- Key technologies, such as digestion and upgrading, come mainly from leading countries such as Germany, Denmark and the Netherlands. However, there is a small but relevant group of innovative and exporting Catalan companies with specialized proprietary solutions, especially in areas such as slurry or wastewater management.

- These companies have a strong export component and have an aggregate biogas turnover of around €34 million. Its major applications are:
    - **Slurry treatment**: solid-liquid separation, agitation, acidification, nitrogen recovery (ex. Rotecna, Segalés).
    - **Digestion**: improvements in mixing and heating, thermophilic digestion, energy recovery of chicken manure (ex. Ahidra, Ecotec).
    - **Treatment** of digestate: evaporators, recovery of nutrients such as nitrogen and phosphates (ex. Aqua Sigma, Zewatech).

Source: *Own production*

Size of the bioenergy industry in Catalonia

	Companies	% of companies	Estimated turnover in bioenergy (€M)	% turnover	Estimated bioenergy workers	% workers
Transformation	**186**	**51.0%**	**620.8**	**71.2%**	**1,761**	**66.5%**
Direct combustion biofuel production	91	24.9%	207.5	23.8%	744	28.1%
Upgrading	25	6.8%	212.9	24.4%	300	11.3%
Digestion	66	18.1%	184.0	21.1%	670	25.3%
Digestate treatment	4	1.1%	16.4	1.9%	47	1.8%
Distribution	**5**	**1.4%**	**139.8**	**16.0%**	**33**	**1.3%**
Biomass	4	1.1%	92.1	10.6%	29	1.1%
Biofuels	1	0.3%	47.7	5.5%	4	0.2%
Resource suppliers	**44**	**12.1%**	**68.8**	**7.9%**	**696**	**26.3%**
Biogas	14	3.8%	50.8	5.8%	547	20.7%
Biomass	30	8.2%	18.0	2.1%	149	5.6%
Energy service enterprises	**6**	**1.6%**	**32.7**	**3.7%**	**60**	**2.3%**
Aux. Support Industry *(cross-industry)*	**3**	**0.8%**	**1.4**	**0.2%**	**10**	**0.4%**
Total classified companies	**244**	**66.8%**	**863.4**	**99.0%**	**2,561**	**96.6%**
Other companies *	**121**	**33.2%**	**8.6**	**1.0%**	**89**	**3.4%**
Total general	**365**	**100.0%**	**872.0**	**100.0%**	**2,650**	**100.0%**

Note*:** *Refers to very small companies in the bioenergy value chain with little information about their activity (mostly forestry companies, carpentry shops, small installers, etc.).* ***Note: *Unconsolidated revenue and employee data from the last year available, mostly 2023 and 2022.* ***Source:*** *Own production based on the assembly and analysis of a list of identified companies belonging to the bioenergy sector with data available in ORBIS.*

3. Trends, opportunities and challenges in the bioenergy industry in Catalonia

Main trends affecting the field of bioenergy

Opportunities for the development of biogas in Catalonia

- In 2022, the Spanish Government approved the Biogas Roadmap and in 2024, the Generalitat did the same with the Catalan Biogas Strategy, committing to **develop the potential of biomethane as a renewable energy source**.
- According to forecasts, the Spanish market could produce 20 TWh of biogas per year by 2030, of which Catalonia and Northern Aragon would account for almost 30% (5-6 TWh). In comparison, in 2019 Catalonia produced only 0.577 TWh, which indicates very significant growth if projections are met. In fact, according to sources such as the Generalitat or McKinsey, the potential in Catalonia could be between 6 and 7.2 TWh per year in 2030.
- The price of biomethane varies greatly at a European level and is made up of two parts: the value of the molecule itself (similar to that of natural gas, €35-50/MWh depending on the country), and the value of the guarantees of origin (GDO), which can represent up to 75% of the total turnover. These GDOs have a price that varies greatly depending on the market: in October 2024, they ranged between €19 and €23/MWh in countries such as Germany, Denmark or the Netherlands.
- Looking ahead to 2030, biomethane sales prices are expected to be between €80 and €110/MWh. If Catalonia achieves an annual production of 7 TWh, this could translate into revenue of up to **€665 million, a figure that would multiply the current income by twelve.**

***Source**: McKinsey & Company*

Catalonia has a great opportunity in the biogas and biomethane market

- **Abundant raw material:** one of the greatest potentials for supplying resources to produce biomethane, especially from slurry, agricultural waste, food industry waste, municipal organic waste, sewage sludge, etc.
- Need to **manage the environmental challenges** related to waste and its recovery.
- **Well-developed gas network**
- **Strengthens the circular economy lever**: Biomethane promotes a circular economy, as it reuses organic waste to produce clean energy and biofertilizers.
- **Competitive Cost**: Biomethane can have a cost advantage over other technologies for high-temperature industrial processes
- **Promoting sustainability and territorial economic development**: Biomethane plants can generate employment and investment in rural areas.
- Opportunity to develop a **value-added chain** with differentiation strategies in a market that will receive heavy investments

...however, the recent context calls into question the ability to take advantage of this opportunity

- In recent years, several investments have been announced in the development of biomethane projects in Catalonia.
- Some of these investments have not yet materialized, either due to the long period of development of the plants and the granting of authorizations, or as a result of NIMBY-ism and the consequent lack of social acceptance that has prevented the development of some of the announced projects.

Potential challenges of the biomass value chain in Catalonia

Operational Efficiency and Productivity

1. Growing expenses caused by new regulatory requirements (RED III)
2. Cinder management
3. Boiler monitoring
4. Smart plants and predictive maintenance

Innovation and Recovery of Biomass

1. Development of technology applied to biomass
2. Diversification of sources of biomass use
3. New biomass utilization processes
4. Recovery of biomass and by-products (e.g. biochar)
5. CO2 capture
6. Production of advanced fuels such as Sustainable Aviation Fuel
7. Energy recovery of biomass in green chemistry applications

Business differentiation and value-added services

1. Defining differentiation strategies in the biomass sector
2. Developing value-added business services
3. Generation of an ecosystem of new companies

Supply chains and logistics

1. Supply logistics
2. Guarantee of supply at sufficient price and quality
3. Business growth to meet future demand

Drawing talent and training

1. Lack of talent in the initial stages of the value chain (forestry activity)
2. Training of forest owners
3. Training of personnel along the value chain
4. Public awareness about forest management

Development of New Market Segments

1. Biomass as a solution within the framework of the decarbonization strategy
2. Developing the mobility market through fuels from forest biomass (SAF, biodiesel, etc.)
3. Promotion of biomass in new market segments (e.g. tertiary, domestic, etc.)
4. Policies to develop the market, for example industrial heating use
5. Identifying opportunities in the market for guarantee of origin certificates

Forest improvement

1. Cost of extraction and mechanization
2. Biomass certification
3. Improving the traceability of biomass
4. Identifying opportunities in the forestry sector based on the carbon credit market mechanism

Source: *Own production*

Strategic challenges in the biogas value chain in Catalonia

Development of biogas and biomethane plants

1. Defining the optimal plant scale
2. Speculative bubble of biomethane projects and uncertainty about their materialization
3. Connection to the gas network to inject biomethane
4. Immature market (sale of export certificates)
5. Strategic location of the plants: Difficulty in establishing plants close to the main points of waste generation and energy consumption.
6. High investment cost, Opex and access to financing
7. Lack of incentives for demand
8. Cost (LCOE) of other renewables more competitive
9. Underdeveloped specialized support value chain

Access to waste / raw material

1. Guarantee of long-term access to waste in proximity and at a competitive cost
2. Optimized slurry collection and use of methanization power
3. Traceability of waste for certification
4. Plant supply logistics
5. Harnessing the potential of raw material abundance
6. Involving farmers in leading plant development

Social acceptance and Communication

1. Social opposition: NIMBY-ism - especially near plants
2. Education and awareness: Need for effective campaigns to communicate the environmental and economic benefits of biomethane to society.
3. Public trust: Negative perception about emissions, noise, odors and other environmental impacts associated with these plants.

Government permits, regulation and agility

1. Bureaucratic complexity. Slow administrative authorization process with uncertainties in the construction of plants.
2. Lack of knowledge about biogas among administration staff responsible for processing permits
3. Regulatory limits that hinder the viability of plant development
4. Lack of a defined biogas development model (e.g. plant size, priority areas, plant location, etc.)

Digestate treatment

1. Development of solutions for the recovery of digestate
2. Sustainability certification for digestate-derived products
3. Lack of business model for the recovery of digestate

Innovation in the production of biogas and biomethane

1. Dependence on imported technology
2. Development of technologies for optimizing the performance of biogas and biomethane plants
3. Diet optimization for plants
4. Exploration of under-implemented technologies for biogas production
5. Opportunity in green hydrogen and linking the bioenergy value chain

Drawing talent and training

1. Training on biogas and biomethane along the entire potential ideal value chain
2. Attracting talent with expertise in biogas and biomethane (e.g. engineers, etc.)

Success stories of Catalan companies in bioenergy

Leading public project in bioenergy and the circular economy to increase the treatment capacity of the Anaerobic Digestion and Composting Plant, transforming organic waste into biomethane, compost and renewable energy. It has an upgrading plant, solar panels, cogeneration and its own gas station. Led by the Vallès Oriental Waste Consortium and the Besòs Tordera Consortium.

Innovative and internationalized Catalan company, specialized in **the recovery of organic waste and treatment of high-load wastewater**. It develops proprietary technologies such as DIGESMIX or AMFER, with applications in sectors such as the agri-food or paper industry. It leads anaerobic digestion and nutrient recovery solutions, promoting the circular economy.

Multinational located in Mataró, specializing in biomass energy recovery systems from 3 to 11 MW. **It designs solutions for a wide variety of waste, integrates carbon capture technologies and smart systems**. Key in industrial decarbonization and the reduction of fossil fuels.

Initiative promoted by local farmers to recover waste such as pomace, slurry and industrial food by-products. **It produces 20 GWh/year of biomethane and injects it into the Enagás network**. An example of circularity and sustainable management, highlighting the odor capture system that reduces environmental impacts.

Pioneer in biodiesel in Spain, **it transforms animal fats and used oils into advanced biofuels**. With a plant in Montmeló, it produces 31,000 tons of biodiesel per year and collaborates in the production of SAF with TotalEnergies. It exemplifies the integration of bioenergy in the decarbonization of transport, converting waste into sustainable solutions for the mobility of the future.

Source: *Own production*

Thank you

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More information about the sector and related news:
https://catalonia.com/key-industries-technologies/chemical-plastics-green-business/bioenergy-in-catalonia

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