



**WORLD
BIOENERGY
ASSOCIATION**

2025 | 12th Edition

GLOBAL BIOENERGY STATISTICS REPORT



Disclaimer

WBA publishes the Global Bioenergy Statistics reports annually to increase awareness of the role of bioenergy in the global energy mix. The reports are prepared with the extreme care and due diligence. Even though every effort is made to ensure the highest quality in data presented in the report, WBA cannot be held liable for the accuracy of the information presented.

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About Us

The World Bioenergy Association is the global organization dedicated to **supporting the wide range of actors in the bioenergy sector**. Our mission is the **sustainable** development of **bioenergy** globally. Our members include national and regional associations as well as companies in the entire biomass to energy value chain including equipment manufacturers, fuel producers, traders, CHP facilities, utilities etc. from more than 40 countries.

Fields of Action:

At WBA, we share **knowledge** on the **latest developments in bioenergy** including markets, policies, technologies, finance etc. through our publications, events, webinars and partnerships with international organizations.

Our members:



List of WBA Members as of November 2025

Membership

WBA proudly represents our members from a wide variety of stakeholders, sectors, and geographies. Our members benefit from a variety of opportunities to share, learn and interact with the bioenergy community worldwide. Membership benefits include:

- Access to **member exclusive** reports, studies, and analysis on latest developments
- **Speaking opportunities** at various WBA events including webinars
- Join as official WBA delegates to **international energy** and **climate conferences**
- Participation in **internal working groups**
- **Promotion of products** and **services** through various communication channels

Welcome to join the leading global bioenergy community!

Summary

Global energy supply reached 622 EJ in 2023, with fossil fuels still providing more than 80%. Renewables continued to expand, reaching 92 EJ, a 3% increase from 2022. Bioenergy maintained a steady 9% share of the total supply, contributing 56 EJ, its highest level to date, and a 2% increase from 2022 to 2023.

Biomass supply was largely driven by solid biomass, which made up 83% of the total output. Most of it was in the form of traditional biomass like wood fuel and charcoal. Europe remained the largest market for wood pellets, while Vietnam strengthened its position in Asia with a 33% production increase, now accounting for more than half of the regional output.

Bioenergy contributed across all end-use sectors: electricity, transport, and heat. In power generation, bioenergy produced 711 TWh in 2024, representing 7% of global renewable electricity. Asia accounted for half of this output. In heat production, bioenergy remained the dominant renewable option, supplying 73% of renewable heat worldwide. Europe was the clear leader, responsible for three-quarters of global bioheat.

In transport, biofuels consumption reached 4.73 EJ in 2023, nearly 90% of all renewable energy used in the sector. Over the last five years, biofuel use has grown by more than 20%, supported by blending mandates in at least 35 countries. Ethanol was the largest biofuel produced, with global output of 118 billion liters in 2024, led by the United States and Brazil, which together accounted for 80%. India followed as the third-largest producer with 6.48 billion liters. Biodiesel output reached almost 50 billion liters, with Indonesia, the EU, Brazil, and the U.S. as the main producers.

Bioenergy installed capacity reached 151 GW in 2024, almost tripling in Asia over the past decade, driven by China, India, and Japan. Growth also occurred in France, where the country reached 3.35 GW in 2024, a 60% year-to-year increase. Despite this, overall growth slowed to 3% in 2024, after already weak additions in 2023.

Employment and investment trends also marked the progress of bioenergy. The sector supported 3.9 million jobs in 2023, with liquid biofuels providing over 70%. Investment is also increasing, projected to reach USD 16 billion in 2025, a 13% rise from the previous year, mainly in biodiesel and ethanol projects.

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1. Introduction

The Global Bioenergy Statistics report is the World Bioenergy Association's annual effort to provide a clear and data-driven picture of how bioenergy is developing around the world. Since its first edition in 2014, the report has become a reference point for understanding the role of bioenergy in the global energy system. The 2025 edition, the 12th in the series, continues this work with updated data, expanded coverage, and trends in bioenergy generation, in all its forms, liquid, solid, and gas fuels, as well as socioeconomic aspects like job creation and sector investment.

This edition presents data for 2023 and 2024, drawing from an expanded range of sources, including government databases, international organizations, and independent research platforms. The report is organized to highlight global, regional, and national developments.

It covers global renewable energy figures, biomass supply, installed capacity, bioelectricity and bioheat generation, and transport biofuels, while also focusing on emerging technologies, such as Sustainable Aviation Fuels (SAF).

The goal of the Global Bioenergy Statistics 2025 is to present the latest figures and to provide the context needed to interpret them. This report seeks to inform industry leaders, government representatives, researchers, and civil society working towards the deployment, adoption, and advancement of sustainable bioenergy solutions worldwide.

To get in touch with WBA, please send an email to info@worldbioenergy.org.

World Bioenergy Association



2. World Energy Mix

Total Energy Supply

Global energy supply reached a record 622 EJ in 2023. Fossil fuels continue to lead, delivering over 80% of the total supply. Renewables also hit a new peak at 92 EJ, accounting for roughly 15% of the mix. Although growth remains modest, renewables posted the fastest expansion among all sources, increasing by 3% year-on-year. Bioenergy played a central role, contributing 56 EJ or about 9% of global energy supply, its highest level to date, and a 2% increase in value from 2022.

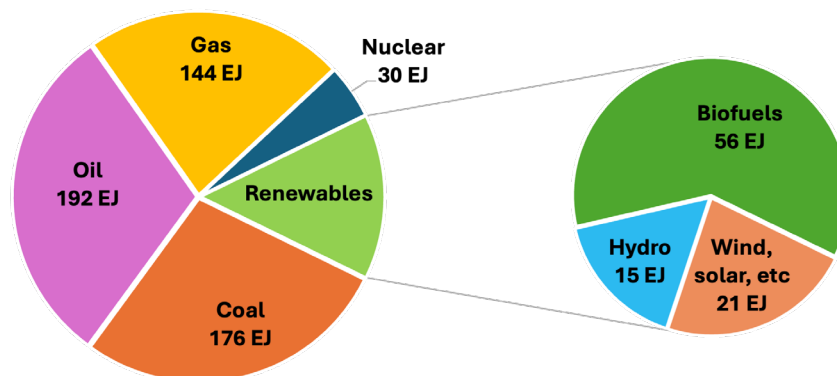


Figure 1. Global Total Energy Supply in 2023. **Source:** IEA

Total Energy Consumption

Global final energy consumption reached a record 429 EJ in 2023, up 2% from 2022. Fossil fuels continued to dominate with more than 80% of total use, while biofuels and waste held a stable 9% share over the past decade. Other renewables, including wind and solar, increased by 6% compared to 2022, although their share remains modest.

Among renewables, solid bioenergy was the most significant, contributing 16 EJ (3.5%) of global final energy consumption. Coal demand rose by 1% in 2023 to 37 EJ, with China accounting for 58% of global use, the world's largest coal consumer. Oil products remained the largest single source of final consumption at 173 EJ, followed by electricity and heat at 107 EJ and natural gas at 70 EJ.

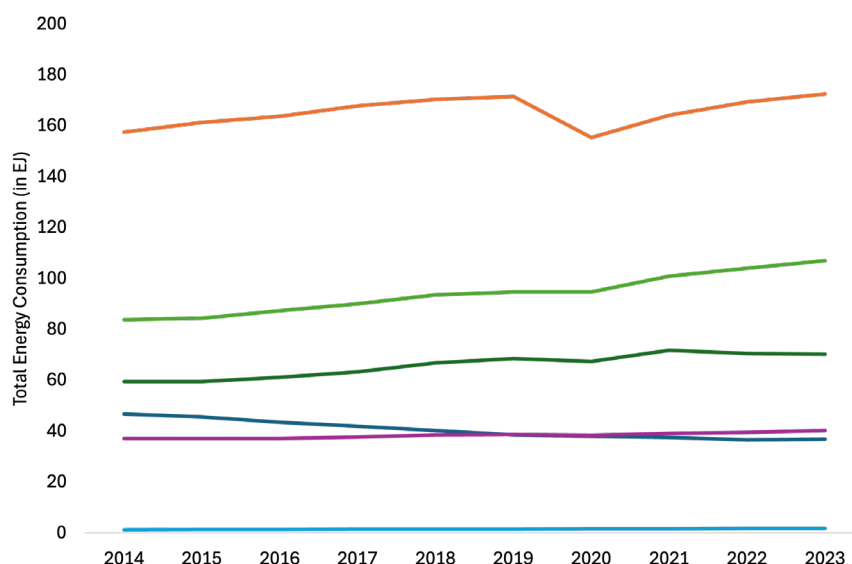


Figure 2. Global Total Energy Consumption. **Source:** IEA



3. Renewable Energy Status

Electricity

Renewable electricity generation reached 9,836 TWh in 2024, marking a 10% increase compared to 2023. Hydropower remained the largest source, accounting for 45% of total renewable electricity generation. Solar power showed the fastest growth with a 28% year-on-year increase, while bioenergy continued its steady expansion, rising by 3 % reaching 698 TWh in 2024.

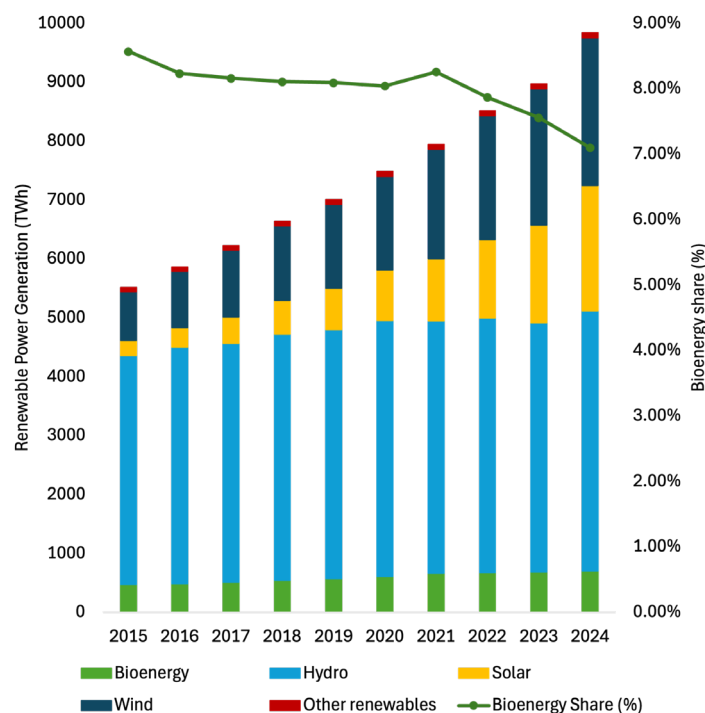


Figure 3. Global Renewable Electricity Generation. Source: Ember

At a regional level, Asia had the highest contribution to renewable electricity generation, accounting for 48% of the total global output. Bioenergy grew the largest in Africa, with a 40% increase from 2023 to 2024, reaching 4.41 TWh, maintaining only 1.84 % of its renewable electricity mix, while in Europe, bioenergy accounted for 10% of the renewable power generation in 2024.

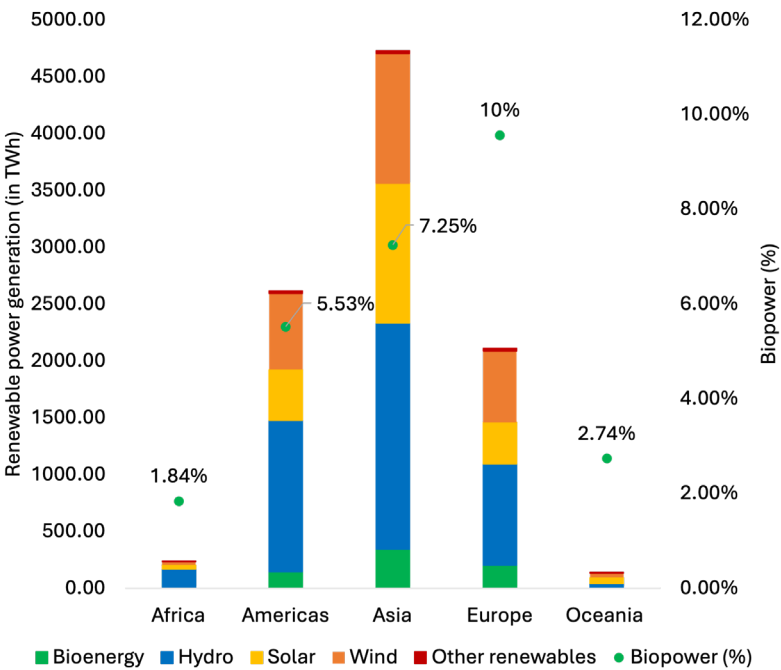


Figure 4. Global Renewable Electricity Generation by Continent in 2024. **Source:** Ember

Heat

Global renewable heat production reached 1.64 EJ in 2023, generated from both heat-only and combined heat and power plants. Bioenergy remained the dominant source, providing 73% of the total. Bioenergy’s share in heat generation has steadily declined from 87% in 2014 to 73% in 2023.

Table 1. Global Renewable Heat Production

	Total	Bioenergy	Geothermal	Solar Thermal	Bioenergy (%)
2010	0.81	0.78	0.03	0.000	96
2015	1.12	0.95	0.17	0.001	84
2020	1.55	1.21	0.34	0.003	78
2021	1.67	1.30	0.37	0.003	78
2022	1.63	1.22	0.40	0.003	75
2023	1.64	1.20	0.44	0.003	73

All values in EJ. **Source:** IEA

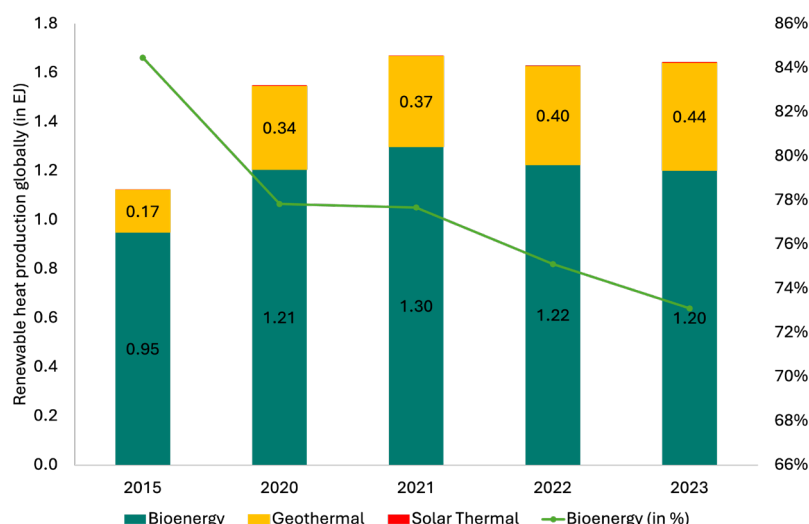


Figure 5. Global Renewable Electricity Heat Production

At a regional level, Europe produced more than 65% of global renewable heat output in 2023, a 3% decrease from 2022. Bioenergy covered almost 95% of the total production, but the reduction of solid biomass use was the primary driver for the decline in 2023. In Asia, China accounts for more than half of the heat generated from bioenergy and nearly 90% of the world's geothermal heat production.

Table 2. Global Renewable Heat Production by Continent in 2023

	Total	Bioenergy	Geothermal	Solar Thermal
Africa	-	-	-	-
Americas	0.058	0.058	-	-
Asia	0.49	0.104	0.39	-
Europe	1.09	1.04	0.05	0.003
Oceania	-	-	--	-

All values in EJ. Source: IEA

Transport

Energy use in the road transport sector reached just over 92 EJ in 2023, surpassing pre-pandemic levels for the first time. Fossil fuels are still the largest source of energy, increasing 3% in 2023.

Within the renewable sources, biofuels remain the largest, accounting for 4.7EJ in 2023, 4% of total transport energy, and 89% of all renewable alternatives. Additionally, biofuel consumption increased by 12% in 2023, marking the largest rise in more than a decade.

As of 2025, at least 37 countries had adopted and/or announced biofuel blending mandates¹, while only four countries (Canada, India, Brazil, and Vietnam) introduced direct fiscal or financial incentives to support biofuels in the transport sector².



Figure 6. Renewable Energy Use in Transport. **Source:** IEA

At a continental level, the Americas dominated renewable transport energy consumption with 3 EJ, of which 98% came from biofuels, with Brazil and the United States the main contributors in the region. Brazil stands out with renewables accounting for 28% of transport energy in 2024, mainly from ethanol and biodiesel, which experienced an increase in consumption of 30% and 19%, respectively³. In the United States, renewables supplied 6.75% of transport energy, entirely from biofuels, a 5% increase from 2023.

Asia and Europe followed, each contributing around 1.0 EJ, with biofuels representing 76% and 85% of their respective totals. In the European Union, renewable energy use in transport grew by 6% between 2022 and 2023, largely supported by higher biofuel consumption. In 2023, the sector was powered by 27.5 TWh of renewable electricity and 0.89 EJ of biofuels, together covering 10.1% of total transport energy demand⁴.

Table 3. Renewable Energy Use in Transport by Continent in 2023

	Total	Biofuels	Renewable Electricity	Biofuels (%)
Africa	0.008	0.003	0.005	36
Americas	3.04	2.99	0.047	98
Asia	1.01	0.767	0.243	76
Europe	1.05	0.889	0.162	85
Oceania	0.047	0.034	0.013	72

All values in EJ. **Source:** IEA



4. Biomass Supply

In 2023, the global domestic supply of biomass totalled 56 EJ, a 2% increase compared to the previous year. Solid biomass, including pellets, briquettes, and traditional uses, remained the largest type of biomass, accounting for over 83% of the supply. While this category remains the backbone of biomass use, growth has been modest in recent years.

By contrast, biogas and liquid biofuels have shown steady gains, with biogas rising to 1.72 EJ and liquid biofuels reaching nearly 5 EJ in 2023, both recording their highest levels over the past five years.

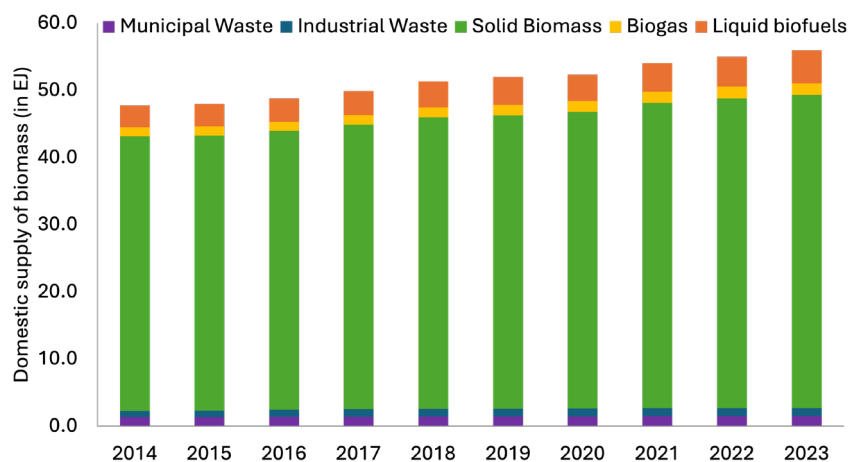


Figure 7. Global Biomass Supply. Source: IEA

Wood Fuel

In 2023, more than 1.7 billion m³ of wood fuel were produced globally. Africa and Asia led the global production with shares of 42% and 35% respectively. Americas with 16%, and Europe followed with 6%.

Table 4. Global Wood Fuel Production

	World	Africa	Americas	Asia	Europe	Oceania
2019	1700	688	268	628	106	10
2020	1697	694	263	625	106	10
2021	1713	701	274	616	111	10
2022	1727	709	281	614	114	10
2023	1728	721	275	610	112	10

All values in million m³. **Source:** FAOSTAT

Wood Charcoal

Wood charcoal remains an important, but inefficient, solid bioenergy carrier. Global production increased by nearly 2% in 2023, primarily driven by rising output in Asia. Total production in Asia increased by 12% in 2023, with India, Thailand, and China as the biggest producers in the region. Africa continues to dominate supply, accounting for 65 % of global production, with Ethiopia and Nigeria among the leading contributors. Brazil, however, remains the single largest producer worldwide, representing 12% of total output.

Table 5. Global Wood Charcoal Production

	World	Africa	Americas	Asia	Europe	Oceania
2019	53	35	9.22	9.08	0.64	0.04
2020	54	35	9.36	8.92	0.63	0.04
2021	56	36	10	8.72	0.49	0.04
2022	58	38	10	8.97	0.57	0.04
2023	59	38	10	10	0.54	0.04

All values in million tons. **Source:** FAOSTAT

Wood Pellets

In 2023, global wood pellet production saw a small reduction compared to 2022, from 48.1 to 47.1 million tons. Europe leads the production by contributing about 24 million tons, more than half of global production. Germany remained the top producer in Europe, responsible for nearly 15% of the region's output.

The Americas produced over 30% of the global total, with the United States and Canada dominating the region's production. The U.S. alone accounts for 67% of all America's production, and more than 20% of the global output, making it the leading global producer.

In Asia, Vietnam saw a significant increase in pellet production, rising by 33% and moving into the second spot globally. This boost made Vietnam responsible for over 50% of Asia's pellet production.

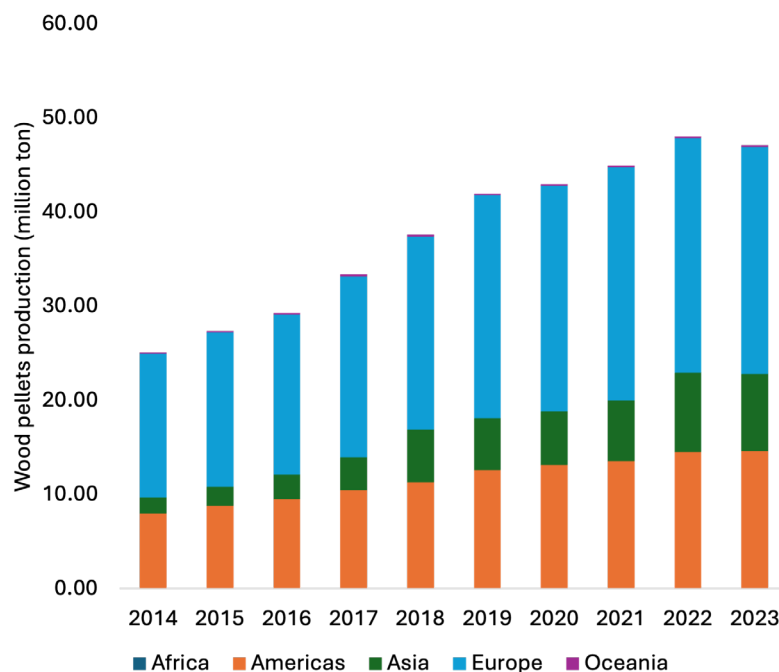


Figure 8. Global Wood Pellet Production

Trade

The United States remains the leading wood pellet exporter, reaching nearly 10 million tons in 2024. Exports account for almost all of its production, with the UK and Japan alone covering more than 80%. Vietnam has consolidated its position as the second-largest exporter, with output rising to 5.9 million tons in 2024. Backed by policy initiatives such as Power Plan VII, which prioritizes renewable energy sources, including biomass in the power mix, Vietnam now directs about 95% of its pellet exports to South Korea and Japan. Over the past five years, its exports have grown by around 20% and are expected to keep increasing in response to Asian demand.

Canada, Latvia, and Estonia round out the top five exporters. Canada's shipments have remained relatively steady at around 3 million tons. Exports from Latvia and Estonia have declined in recent years but seemed to start recovering in 2024. The increase in import demand from the UK, has made a 75% growth in imports of Latvian wood pellets, making the largest partner for the now expanding Latvian market⁵.

Table 6. Top 5 Largest Wood Pellet Exporter Countries.

	2019	2020	2021	2022	2023	2024
United States	6.92	7.26	7.42	8.98	9.57	9.96
Vietnam	4.94	3.56	3.37	4.29	4.78	5.90
Canada	2.63	2.90	3.26	3.50	3.32	3.04
Latvia	2.22	2.36	2.51	1.69	1.31	1.80
Estonia	1.13	1.09	1.56	1.38	1.12	1.16

All values in million tons. Source: Trade Data Monitor

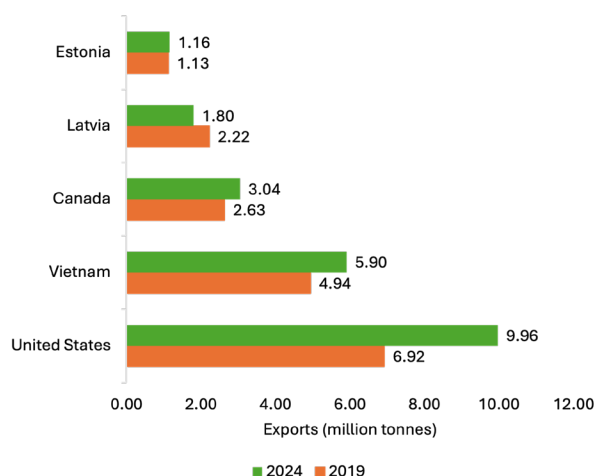


Figure 9. Top 5 Exporter Countries of Wood Pellets

On the import side, the United Kingdom remains the largest wood pellet importer and reached a record 9.32 million tons in 2024 after a dip in 2022–2023, driven by lower global wood pellet prices and rising bioenergy demand. Japan and South Korea have also seen steady growth, with imports rising to 6.38 million tons and 4.02 million tons, respectively, reflecting increasing demand for biomass in power generation.

Table 7. Top 5 Largest Wood Pellet Importer Countries.

	2019	2020	2021	2022	2023	2024
United Kingdom	8.70	8.96	9.13	7.52	6.36	9.32
Japan	1.61	2.03	3.12	4.41	5.80	6.38
South Korea	3.00	3.00	3.36	3.92	3.73	4.02
Denmark	3.13	2.63	3.23	2.83	2.47	2.51
Netherlands	1.24	2.44	2.74	2.82	2.33	1.50

All values in million tons. **Source:** Trade Data Monitor

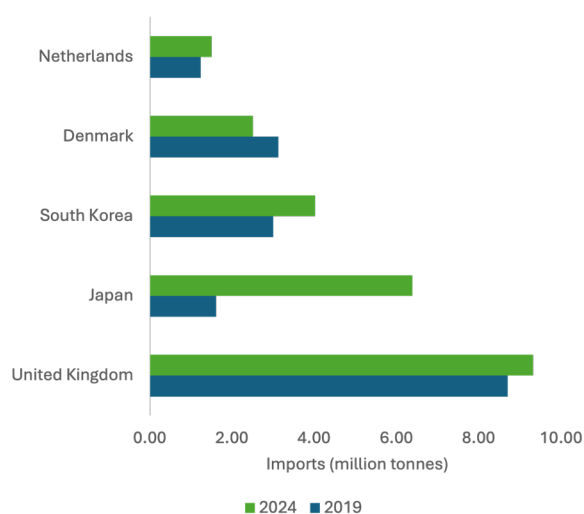


Figure 10. Top 5 Importer Countries of Wood Pellets



Regional Update: European Wood Pellet Sector

The EU's wood pellet sector has been marked by a volatile market in the last couple of years. By 2024, wood pellet consumption fell to 22.6 million tonnes, the first drop since 2015, and a 6% decline from 2023. A reduced industrial and residential demand drove this change, mainly attributed to mild winters, high stock levels, and low power prices⁶.

Production reached almost 20 million tonnes in 2024, with Germany being the top producer with 4 million tonnes, followed by France at 2.5 million tonnes. In the Nordic countries, like Sweden and Finland, production has stagnated, making the region dependent on imports from the Baltics, where growth is being constrained by limited raw materials availability and regulatory challenges⁷.

Additionally, policy changes could also impact the sector. For example, the EU Deforestation Regulation (EUDR), with a compliance deadline now set for December 2026, will enforce stricter sustainability criteria for imports that could affect trade dynamics⁸.

Agricultural Crops

Over the next decade, global production of ethanol and biomass-based diesel is projected to expand, with crops expected to remain the primary feedstocks. Ethanol production continues to rely mainly on maize and sugarcane, while biodiesel is largely based on vegetable oils and used cooking oil.

Wheat

Wheat used for biofuels accounts for about 8 million tonnes annually, or roughly 1% of global production. This indicates that the role of wheat in biofuel supply remains limited compared to its importance as a staple food crop, and its contribution to energy markets has not required significant changes in yields or harvested areas. In 2024, it is estimated that ethanol production from wheat was slightly higher than 3 billion liters globally.

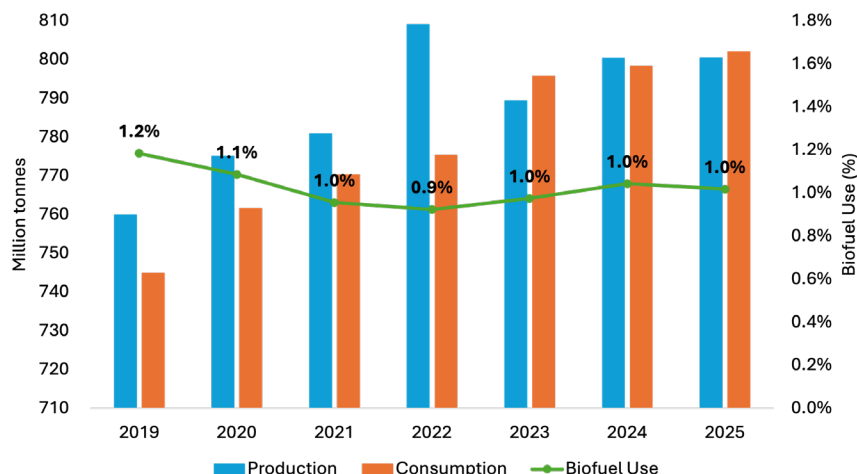


Figure 11. Global Wheat Production, Consumption, and Biofuel Usage. **Source:** OECD-FAO

Maize

Maize continues to be the leading feedstock for ethanol production, with the United States and China producing 62 and 8 billion liters, respectively, in 2024. Over the past five years, maize use for biofuels has grown by about 11 percent, while the harvested area has remained stable. This trend underscores the role of yield improvements, which are expected to rise slightly in 2025, in meeting both food and fuel demand without expanding cropland.

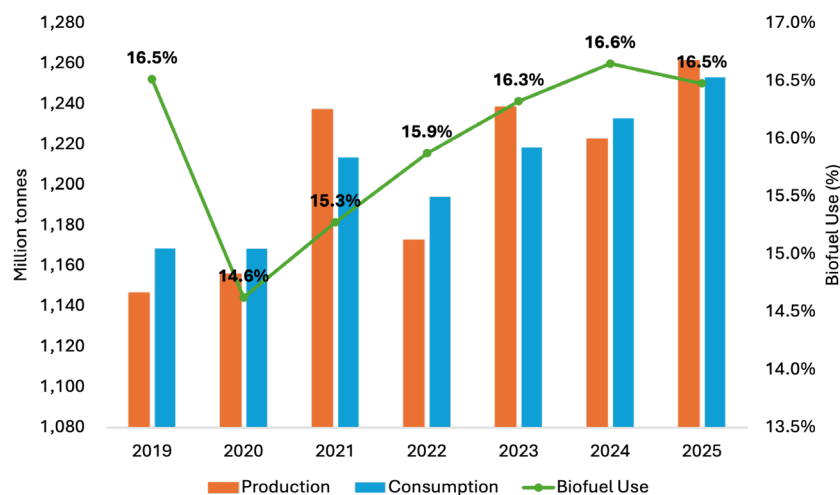


Figure 12. Global Maize Production, Consumption, and Biofuel Usage. **Source:** OECD-FAO

Other Coarse Grains

Coarse grains, including oats, sorghum, barley, and mixed grains, are an important feedstock for ethanol production in the European Union. Global biofuel use of coarse grains has steadily increased, rising from 3.96 Mt in 2021 to a projected 4.37 Mt in 2025, exceeding pre-pandemic levels. Harvested area and yields, however, remain relatively stable.

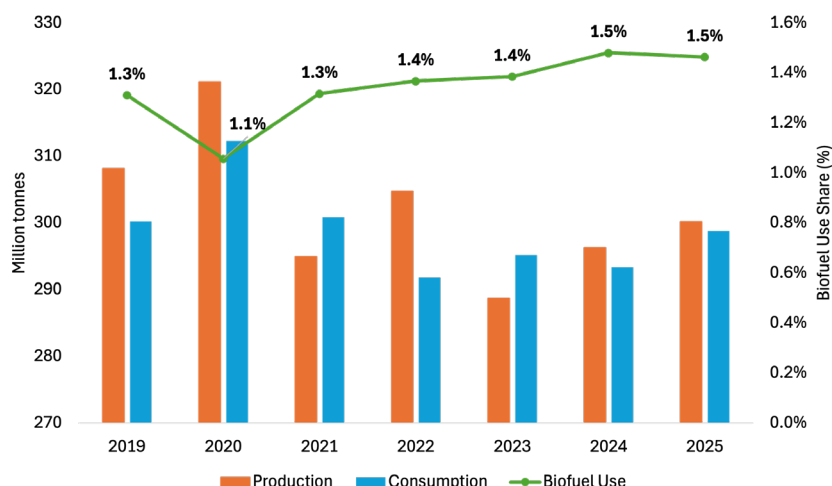


Figure 13. Global Coarse Grains Production, Consumption, and Biofuel Usage. **Source:** OECD-FAO

Vegetable Oils

Vegetable oils, including palm, rapeseed, and soybean oils, are crucial for biofuel production around the globe. Since 2019, the use of vegetable oils for biofuels has increased by over 40%, matching the rise in global biodiesel production.

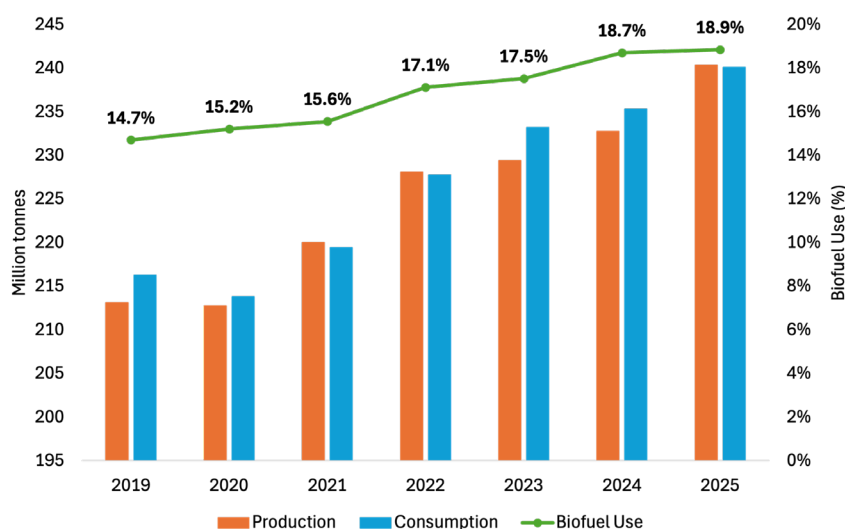


Figure 14. Global Vegetable Oils Production, Consumption, and Biofuel Usage. **Source:** OECD-FAO

Sugarcane

Sugarcane is a cornerstone of global ethanol production, with Brazil accounting for nearly one-third of global output by using it as the primary feedstock. India, the second-largest producer, has rapidly expanded ethanol production, more than tripling volumes in the past five years.

Global biofuel use from sugarcane has risen steadily, surpassing pre-pandemic levels and projected to reach 427 Mt in 2025. Notably, this growth has not come from agricultural expansion, as sugarcane area has remained stable at around 25 Mha since 2019.

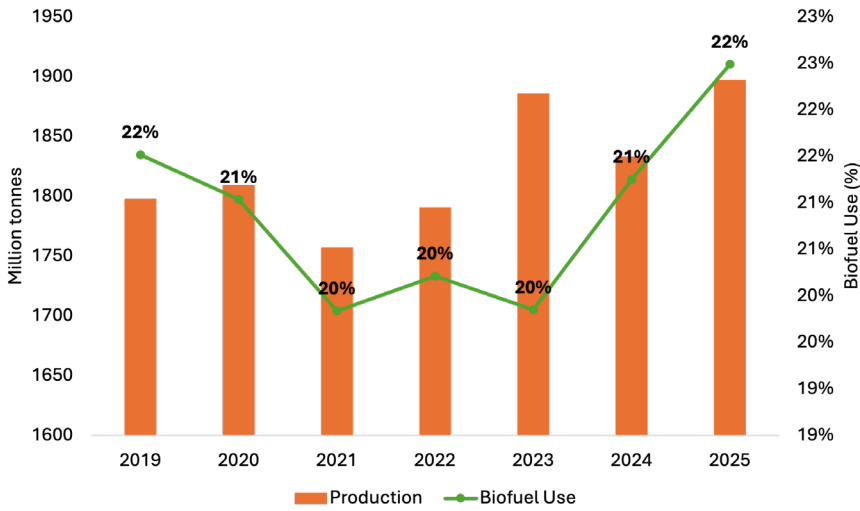


Figure 15. Global Sugarcane Production, Consumption, and Biofuel Usage. **Source:** OECD-FAO

Waste to Energy

Energy supply from municipal and industrial waste increased steadily from 2.27 EJ in 2014 to 2.71 EJ in 2023. In 2023, total generation fell slightly compared to 2022, mainly due to a 2% decrease in municipal waste output, while industrial waste continued to rise marginally. Municipal waste remains the dominant source, though its growth has slowed in the last couple of years, suggesting limited expansion in new recovery capacity. In contrast, industrial waste shows a gradual but consistent increase, reflecting better utilization of process residues and efficiency gains in industrial energy recovery.

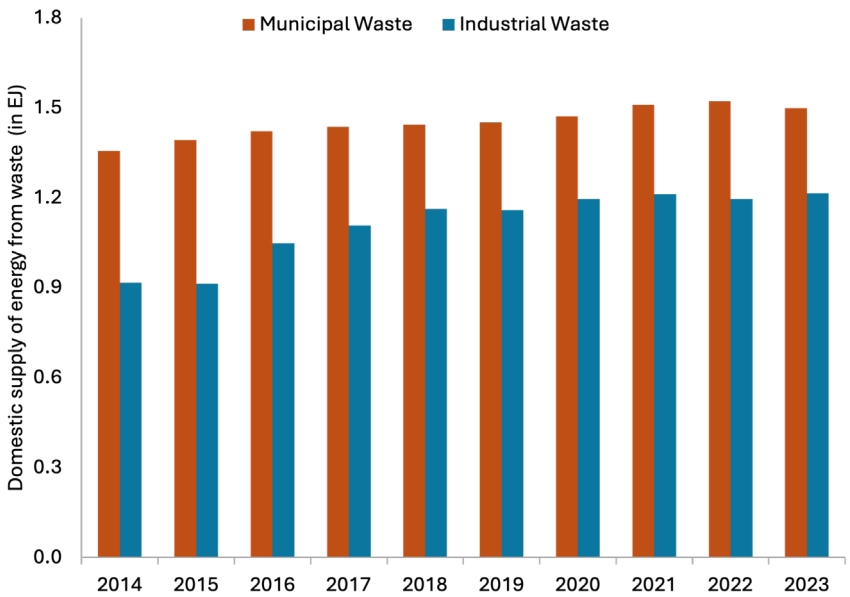


Figure 16. Global Energy Supply from Waste



Regional Update: Waste to Energy

EU Renewable Municipal Waste to Energy

There are 394 waste to energy (WtE) operating plants across the EU. In 2023, the EU generated 0.37 EJ of primary energy from renewable municipal waste, which represented a decrease of 4.5% from the previous year, and a second year in a row with a negative trend. In addition to this, the portion of renewable industrial waste added 0.063 EJ⁹.

France, Sweden, and the Netherlands were the countries with the largest decrease in energy recovery from WtE plants, while countries like Lithuania, Latvia, and Czechia recorded a growth of 88%, 80%, and 14% respectively.



5. Biopower Installed Capacity

Global installed bioenergy power capacity has grown by 58% over the past decade, reaching 151 GW in 2024. Annual growth slowed in recent years, with only a 2% increase in 2023, followed by 3% in 2024. The strongest additions in 2024 came from the France, Iran.

Asia remains the leading region, having nearly tripled its capacity over the last decade, primarily driven by China, India, and Japan. In Europe, France expanded its capacity by 60% in 2024, thanks to the sharp increase in biomass use by cogeneration plants and heating networks¹⁰.

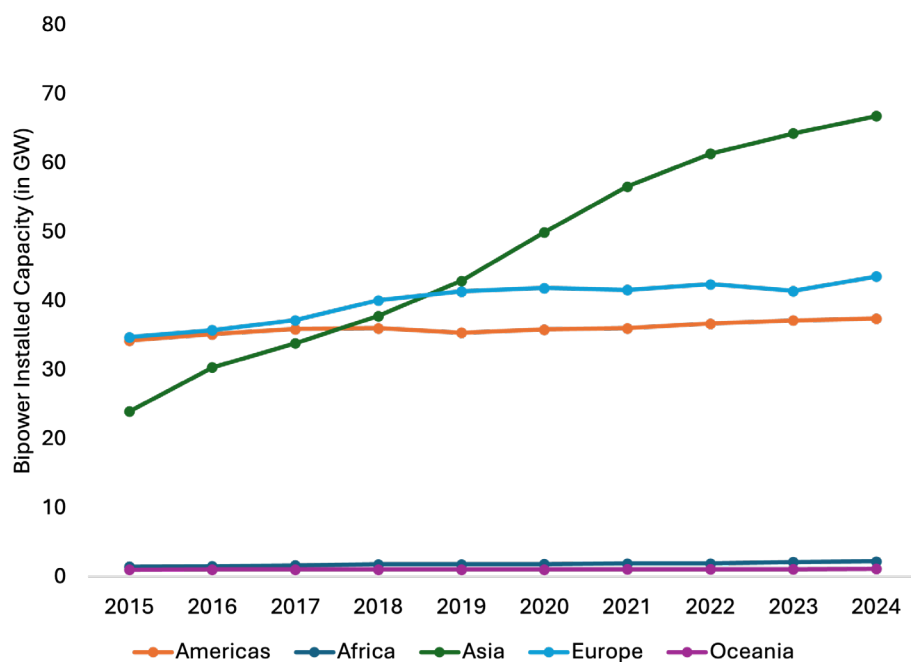


Figure 17. Global Biopower Installed Capacity. **Source:** IRENA

At a national level, China has maintained the world's largest installed bioenergy capacity for six consecutive years, although in 2024 it recorded its slowest growth rate of the past decade. Brazil, the second-largest producer, reached 18 GW in 2024, with sugarcane bagasse accounting for 18% of its electricity generation. India has doubled its capacity since 2015, with a 5% increase year-on-year basis. The country is on its way to reaching its 50% renewable installed electricity capacity by 2030, currently at 46%, where biomass cogeneration accounts for almost 5% of total output.

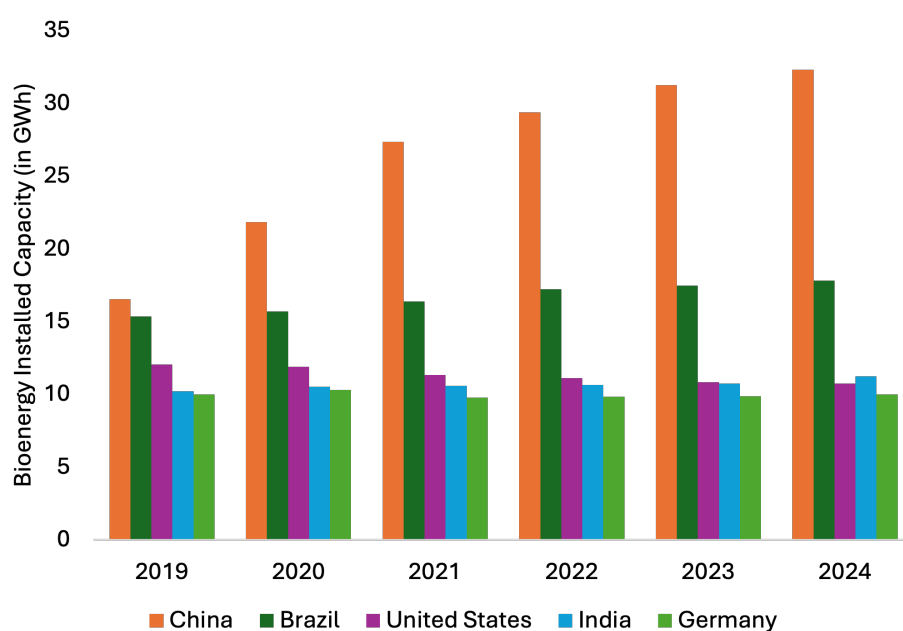


Figure 18. Top 5 Largest Countries in Biopower Installed Capacity

Where was capacity added?*

JAPAN

Ishinomaki Hibarino Biomass Power Plant¹¹

With construction started in 2020, the plant, developed by Japanese-based Renova Inc., has announced the start of operations in March 2024. The plant has a capacity of 75 MW and is fuelled by wood pellets and palm kernel shells. Annual production of power is estimated to be approximately 530 GWh, equivalent to powering 170,000 households yearly.

Aichi Tahara Biomass Power Plant¹²

Developed jointly with Osaka Gas, Enewill, and Marubeni Clean Power Corporation, the plant started construction in 2022 and announced operations starting in November 2024. With a capacity of 75 MW and annual power generation expected at 530 GWh, the plant will power 150,000 households. The main fuel is wood pellets.

GERMANY

Boehringer Ingelheim Biomass Power Plant¹³

In July 2024, Boehringer Ingelheim, a German pharmaceutical company, inaugurated its new biomass power plant. The facility uses 100% regionally sourced wood waste, including wood pellets and timber, to generate power and heat. It supplies more than 80% of the headquarters' electricity needs and recovers waste heat to provide heating and hot water across the site.

IRAN

West Tehran Wastewater Biogas Power Plant¹⁴

The largest concentrated biomass power plant in Iran was inaugurated in April 2024. Operating on biogas, the facility has an installed capacity of 7.2 MW and is expected to generate 50 GWh of electricity annually. The project also includes a wastewater treatment facility, which aims to reduce fuel consumption by utilizing the recovered heat to raise the temperature in anaerobic digestion tanks.

FRANCE

Green Energy Sully Project¹⁵

In Sully-sur-Loire, France, Swiss Krono France, a manufacturer of wood-based products, partnered with Dalkia and Meridiam to decarbonize its production site. The multi-fuel biomass unit, inaugurated in September 2024, has a capacity of 63 MW and can operate on various feedstocks such as bark and wood dust. The energy generated will replace a significant share of the site's gas use, covering approximately 80–95% of its total energy demand.

Albioma Power Plants in French Overseas Territories

Albioma, an independent renewable energy producer, has been converting its coal-fired power plants in Reunion, Guadeloupe, and Martinique to run on biomass. The facilities primarily use bagasse, a byproduct of sugarcane processing that is readily available on the islands. During the off-harvest season, the plants supplement their fuel supply with imported wood pellets. These conversions have significantly increased the demand for industrial pellets in France¹⁶.

**Selected projects and geographies*



6. Biopower Generation

Bioelectricity

Bioelectricity generation peaked at 698TWh in 2024, with a 2.96% growth rate year-on-year basis¹⁷. Asia remains the largest producer with 343 TWh, representing nearly half of global output. However, growth in the region has slowed to its lowest level since peaking in 2021, reflecting a combination of slower capacity additions in China and India. In Europe, generation rose by 2% year-on-year, supported by stable demand for power, yet output remains below the higher levels recorded in 2021.

Table 8. Global Bioelectricity Generation

	World	Asia	Europe	Americas	Africa+Oceania
2020	602	234	209	152	7.26
2021	656	277	222	150	7.29
2022	670	306	213	144	7.05
2023	678	329	198	144	7.06
2024	698	343	202	145	8.25

All values in TWh. Source: Ember

In 2024, China accounted for 30% of global bioelectricity generation, producing 209 TWh. Despite its leading position, the country recorded its lowest growth rate of the past decade. Brazil ranked second with 58 TWh, with more than 60% generated with sugarcane bagasse¹⁸.

Bioenergy also plays an important role in the national electricity mix. In Uruguay and Estonia, it supplied over 20% of total electricity generation, while in Denmark and the United Kingdom, the shares were 19% and 14%, respectively¹⁹.

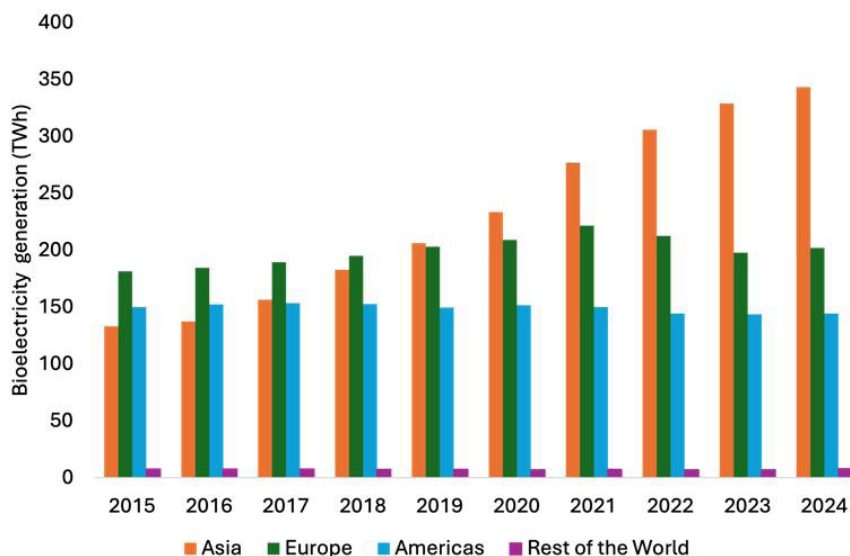


Figure 19. Global Bioelectricity Generation by Continent

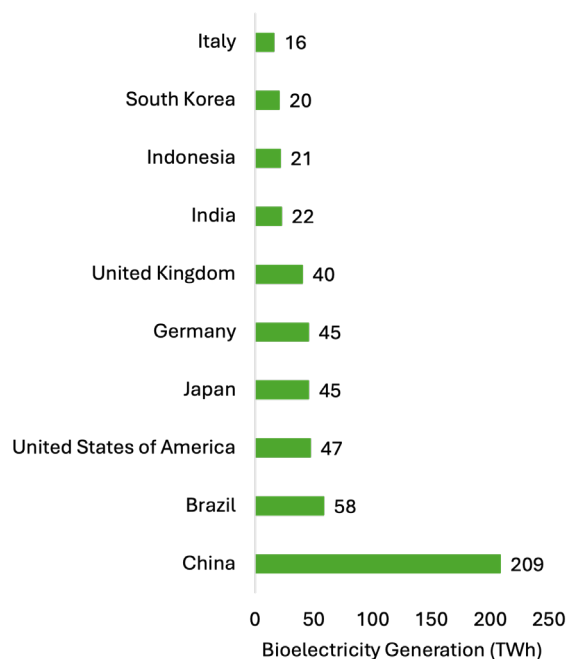


Figure 20. Top 10 Countries with the Largest Bioelectricity Generation in 2024

Electricity only and CHP Plants

In 2023, electricity-only biomass plants reached a peak of 6.66 EJ of biomass usage, continuing a steady upward trend that has doubled their output within the decade. Solid biomass accounted for 5.2 EJ or nearly 80% of the total input. China accounts for over half of the use of solid biomass in electricity-only plants worldwide.

Both municipal and industrial waste have remained relatively stable at around 0.3 EJ and 0.7 EJ, respectively, while biogas use has slightly declined since peaking in 2021. Liquid biofuels contribute only marginally, with no significant changes over the past five years.

Table 9. Use of biomass in electricity-only plants

	Total	Industrial Waste	Municipal Waste	Solid Biomass	Biogas	Liquid Biofuels
2019	5.12	0.323	0.647	3.71	0.439	0.002
2020	5.32	0.293	0.650	3.93	0.441	0.002
2021	5.98	0.273	0.666	4.53	0.510	0.002
2022	6.32	0.276	0.684	4.86	0.502	0.002
2023	6.66	0.278	0.694	5.20	0.484	0.002

All values in EJ. Source: IEA

In 2023, biomass use in CHP facilities totalled 3.45 EJ, down from a 2022 peak of 3.83 EJ. Solid biomass represented nearly 70% of the total, though its consumption fell by about 13% year-on-year, driving most of the overall decline.

Europe accounted for almost half of global biomass use in CHP plants, consuming roughly 86% of the solid biomass, primarily in the form of pellets and wood chips for industrial and residential heating²⁰.

Table 10. Global Use of Biomass in CHP Plants

	Total	Industrial Waste	Municipal Waste	Solid Biomass	Biogas	Liquid Biofuels
2019	3.39	0.166	0.569	2.26	0.392	0.001
2020	3.46	0.160	0.583	2.32	0.398	0.001
2021	3.61	0.166	0.604	2.46	0.376	0.001
2022	3.83	0.155	0.591	2.70	0.378	0.0004
2023	3.45	0.160	0.566	2.35	0.375	0.0003

All values in EJ. Source: IEA

Bioheat

In 2023, global heat production from biomass reached 1.2 EJ, with solid biomass accounting for more than half of the total. Over the past five years, total bioheat production has remained relatively stable, fluctuating between 1.17 and 1.30 EJ. While industrial and municipal waste contributions have been steady.

At a continental level, Europe plays a central role in the bioheat sector, producing 75% of global bioheat output and consuming nearly 90% of the solid biomass used for heat generation in 2023. Asia consumed a quarter of the global output of industrial waste for heat production in 2023.

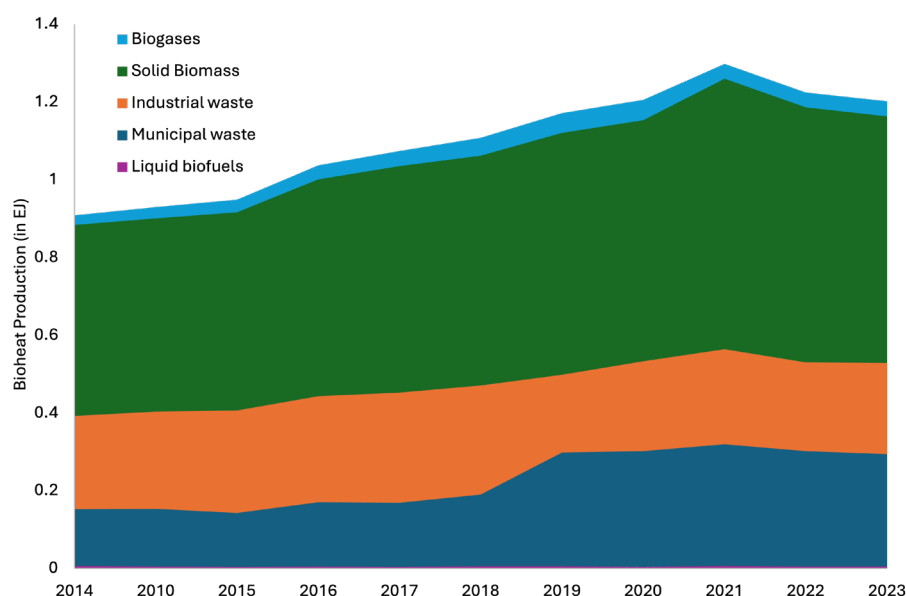


Figure 21. Global Bioheat Production by Source

Heat only Plants

Bioheat is generated through either heat-only plants or combined heat and power (CHP) facilities. Heat-only plants are designed exclusively to produce heat, which is sold to residential, commercial, or industrial consumers. In 2023, biomass use in heat-only plants reached 0.63 EJ, with solid biomass accounting for nearly 59% of total consumption.

Europe remains the leading region, producing about 70% of the world's bioheat from heat-only plants, mainly from solid biomass. Contributions from municipal and industrial waste have been relatively stable over the past five years, while biogas and liquid biofuels continue to play a minor role.

Table 11. Use of Biomass in Heat-Only Plants

	Total	Municipal Waste	Industrial Waste	Solid Biomass	Biogas	Liquid Biofuels
2019	0.536	0.130	0.077	0.324	0.00581	0.00008
2020	0.574	0.168	0.076	0.323	0.00552	0.00004
2021	0.644	0.181	0.080	0.376	0.00849	0.00013
2022	0.595	0.164	0.078	0.344	0.00832	0.00011
2023	0.628	0.167	0.083	0.369	0.00857	0.00013

All values in EJ



7. Biofuels

Liquid Biofuels

Global liquid biofuel production reached a record 192 billion liters in 2024, an 8% increase from 2023, continuing its steady rise over the past decade. Ethanol remains the largest biofuel produced at 121 billion liters, largely sustained by the United States and Brazil. Biodiesel output peaked at 50 billion liters, while renewable diesel emerged as the fastest-growing segment, peaking at 20 billion liters, almost tenfold since 2014. Biojet fuel, though still marginal, almost doubled in 2024 to 1.44 billion liters, signaling the first steps of sustainable aviation fuels into the market.

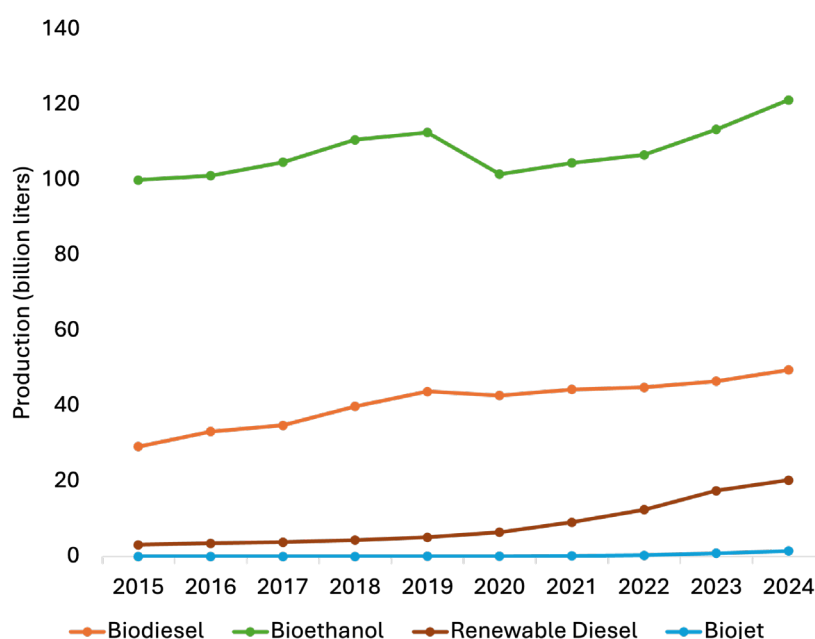


Figure 22. Global Production of Liquid Biofuels. **Source:** IEA

Ethanol

Global ethanol production reached 121 billion liters in 2024, representing more than 60% of global liquid biofuel output. The United States and Brazil remain the largest producers, each growing 4% year-on-year and together supplying over 80% of global volumes.

In 2024, Brazil's ethanol consumption surged by 30%, primarily driven by substantial growth in corn ethanol production, which led to an increase in biofuel availability and competitiveness²¹.

Likewise, production growth rate was the highest in Asia-Pacific, at around 17%, with China, India, and Thailand accounting for nearly 97% of the Asian markets²². India stood out with 23% growth to 6.5 billion liters in 2024.

In contrast, China's ethanol sector continues to lag. The national average blend rate remains at 2%, well below the E10 target announced in 2017, and consumption is projected to fall by 11% in 2025 due to rapid EV uptake. Still, cooperation is expanding; in May 2025, Brazil and China signed an agreement to boost Brazilian ethanol exports²³.

As part of its biofuel roadmap update, Indonesia plans to introduce an E5 bioethanol blend in 2025 for the unsubsidized gasoline market, with E10 scheduled between 2029 and 2035.

In the EU, production has been rising since 2020, supported by growing demand and limits on imports. France leads EU output, contributing more than 20% of total production.

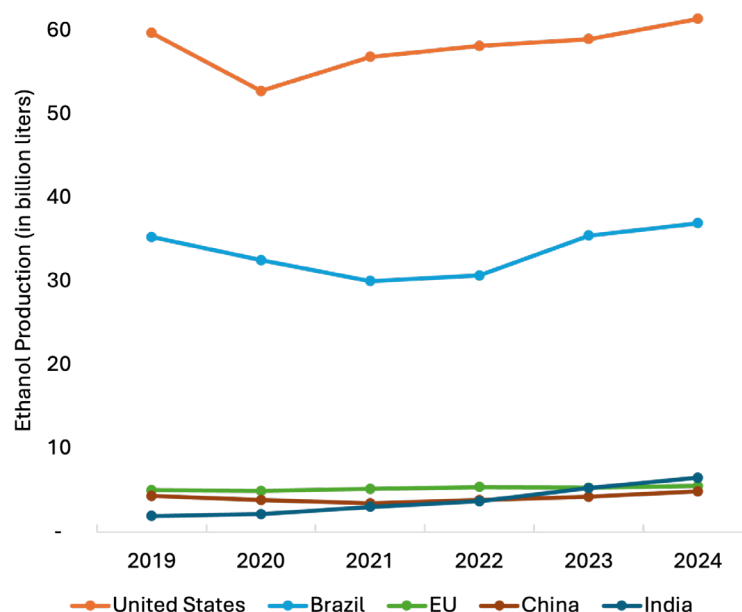


Figure 23. Top 5 World's Largest Ethanol Producers. **Source:** USDA-GAIN

Country Update: India

The 2018 National Policy on Biofuels in India has had a great impact on the adoption of ethanol in India. The policy aims at reducing fossil fuel dependency and supporting renewable fuels. Additionally, the Ethanol Blending with Petrol Program (EBP) has been a key driver in ethanol production, promoting a diverse set of feedstocks, such as sugarcane syrup, molasses, damaged grains, and corn.

In 2024, the total output for fuel ethanol registered a 23% increase from 2023, reaching 6.5 billion liters. By February 2025, India had reached a 17.98% blending rate, coming closer to its E20 target with a fast-tracked deadline in November 2025. It is estimated that more than 18,000 retail outlets now supply E20 fuel across the country²⁴.

To reach its target and support the setting up of ethanol production plants while ensuring feedstock supply, the government has been implementing a set of mechanisms. For example, in March 2025, the government announced a new scheme for Cooperative Sugar Mills for converting their existing sugarcane-based plants into multi-feed-based ethanol plants, to promote the diversification of feedstocks.

Additionally, the government has set higher procurement prices for corn to boost its use for ethanol fuel production, which led to an increase from 32 million tonnes in 2023 to 7,961 million tonnes of corn kernel for ethanol production in 2024²⁵.

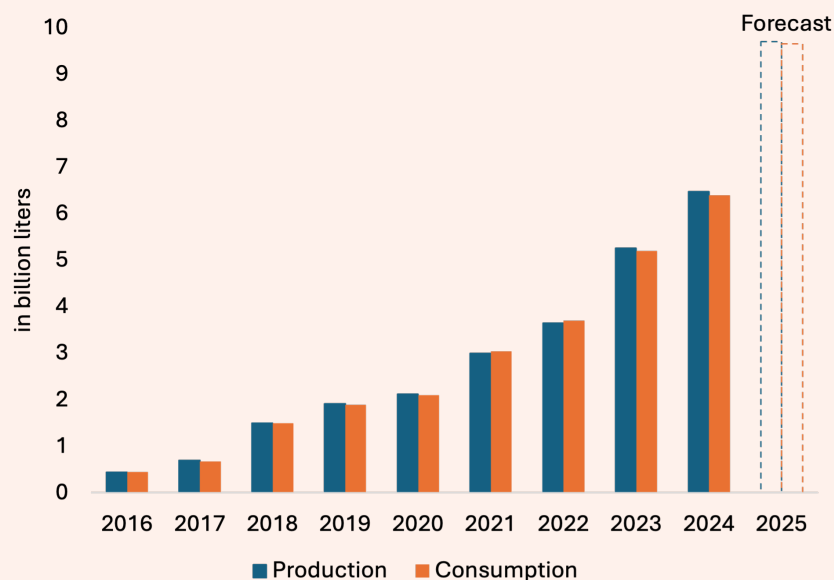


Figure 24. Production and Consumption of Ethanol in India. **Source:** USDA-GAIN

Biodiesel

Fatty acid methyl ester (FAME), or biodiesel, reached 50 billion liters in 2024. Indonesia, the world's largest biodiesel producer, is preparing to raise biodiesel blend rates, with B40 set for 2025 and B50 between 2028 and 2035. Consumption is projected to rise by about 10% in 2025 compared to 2024. Road testing for B50 has started, with full introduction expected in 2026, requiring around 19–20 billion liters of biodiesel²⁶.

Brazil increased biodiesel production by 20% in 2024, maintaining its lead over the United States for the third year in a row, mainly driven by the implementation of B14 from March 2024 onwards. In the European Union, Germany and Poland together accounted for nearly half of the total output.

In China, biodiesel production peaked at 3.24 billion liters in 2023 but experienced an 18% decrease by 2024. This drop follows the EU's anti-dumping measures, which reduced profitability and forced many plants to shut down, as nearly 80% of China's biodiesel had been exported to the EU²⁷.

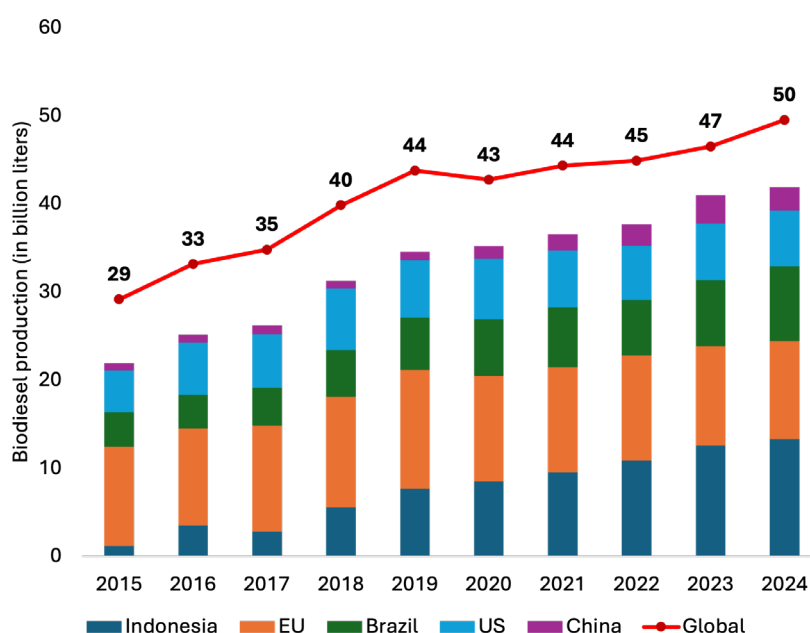


Figure 25. Top 5 Largest Biodiesel Producers. Source: USDA-GAIN

Renewable Diesel

Hydrotreated Renewable Diesel (HDRD), also known as renewable diesel, is produced through the hydrotreatment of vegetable oils or animal fats. In 2024, global production reached 20 billion liters, marking its highest level to date. Despite continued expansion, the annual growth rate slowed to 16%, the lowest increase observed in the past five years.

The United States remained the world's largest producer, surpassing 13 billion liters in 2024. This marked a 20% increase from 2023 and more than three times the volume produced in 2019. Consumption has also expanded consistently, rising almost tenfold between 2019 and 2024. On the contrary, in China, similar to the biodiesel industry, the renewable diesel production is estimated to drop due to reduced export demand.

Within the EU, the Netherlands is the largest producer of renewable diesel, accounting for nearly 30% of the region's total output. Neste, the world's leading producer of renewable diesel and sustainable aviation fuel (SAF), contributed almost one-fifth of global production, amounting to approximately 3.8 billion liters in 2024²⁸. The company operates biorefineries in Singapore, Finland, and the Netherlands, along with a joint operation in Martinez, California.

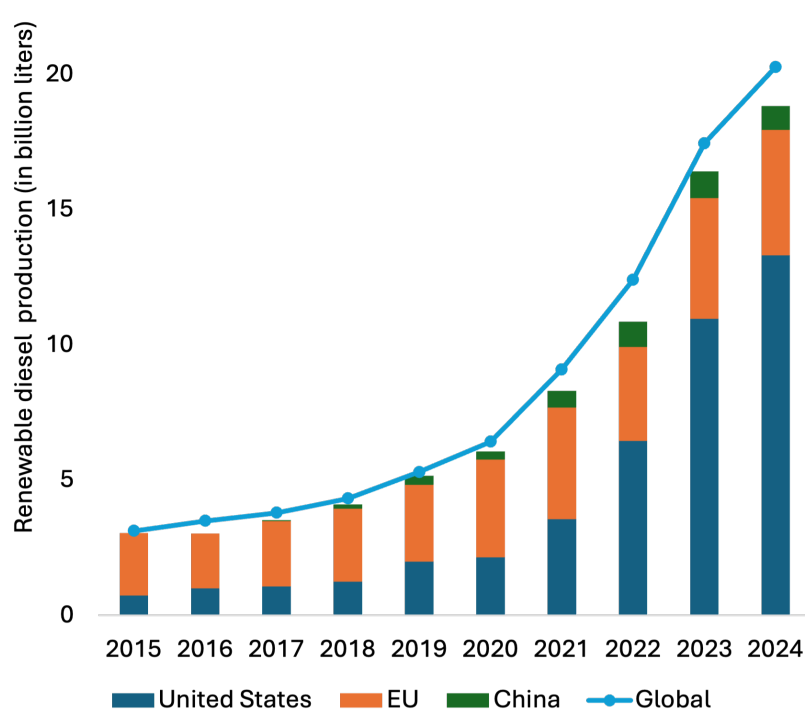


Figure 26. Top 3 Largest Renewable Diesel Producers. **Source:** USDA-GAIN

Sustainable Aviation Fuel (SAF)

SAF production reached 1.3 billion liters in 2024, doubling the output from 2023. Despite this growth, SAF accounts for only 0.3% of global jet fuel use, highlighting the scale of the gap. Commitments from roughly 60 airlines to source 10% SAF by 2030 equate to around 16 billion liters of additional voluntary demand²⁹.

The industry, however, faces structural limitations. About 82% of the announced capacity through 2030 depends on HEFA technology, but the availability of waste oils and fats is too limited to support long-term growth. To fulfill increasing demand beyond 2030, expanding alternative pathways such as Alcohol-to-Jet, Fischer-Tropsch, and e-SAF will be crucial.

Here are some regional updates:

UNITED STATES

SAF production in the US is expanding rapidly, driven by a mix of policy tools like the SAF Grand Challenge, Renewable Fuel Standards (RFS) obligations, and the Low Carbon Fuel Standard in California. Capacity has increased by 15 from the start of 2024 to early 2025, given the start of new projects like Phillips 66, Diamond Green Diesel, and smaller producers like New Rise Renewables and Par Pacific³⁰. Despite this momentum, the US Energy Information Administration estimated that SAF will still account for less than 2% of US jet fuel demand in the near term. Reliance on imported feedstocks, such as used cooking oil, remains a vulnerability, particularly in the context of trade frictions with China³¹.

EUROPE

In Europe, blending mandates under the ReFuelEU regulation came into force in 2025, creating a sharp rise in demand. Production capacity stood at 0.76 billion liters in 2024, while demand is projected to reach 1.43 billion liters in 2025. By 2030, mandated demand is set to grow to 5.2 billion liters, climbing further to 15.6 billion liters by 2035.

Current announcements suggest 4.94 billion liters of capacity by 2030, slightly below demand³². However, with only 30% of projects either operational or under construction, Europe risks shortfalls and a growing dependence on imports. The situation is complicated by a temporary oversupply in 2024, which pushed prices down and caused delays in project timelines.

In the UK, a separate SAF mandate requires at least 2% of jet fuel to come from SAF starting in January 2025, equal to about 288 million liters. This share is scheduled to rise to 10% by 2030 and 22% by 2040. Current supply is limited, with only one facility, Phillips 66's Humber refinery, producing around 50 million liters annually from co-processed waste oils. Future growth will depend on new projects such as LanzaTech Dragon (expected 102 million liters of alcohol-to-Jet fuel from 2026) and Altalto Immingham (20 million gallons per year from 2027). Together, these developments will gradually expand the UK's SAF capacity, though significant scaling will still be needed to meet rising demand³³.

CHINA

China is emerging as a key player in the SAF market, with consumption set to grow from less than 12.5 million liters in 2023 to about 62.5 million liters in 2025³⁴. This early growth is being driven by a national pilot program that mandates a 1% blend on selected flights, as part of the 15th five-year plan (2025-2030).

On the supply side, more than 40 projects are planned, and production capacity could

reach between 3.0 and 3.8 billion liters by 2025, largely based on HEFA technology. Looking ahead to 2030, China is projected to represent nearly half of Asia's announced SAF capacity, reaching an estimated 6.5 billion liters³⁵.

Despite this rapid build-out, the sector faces limited availability of waste oil feedstock, relatively weak policy support, and downward pressure on prices. These factors could create risks of overcapacity unless demand grows in step with supply³⁶.

Still, the long-term outlook is positive. Both passenger and cargo aviation offer strong demand potential, and since most Asian SAF production meets EU RED requirements, the region currently acts as a net exporter. However, if China's domestic market continues to expand, it could eventually shift the balance from exporting to meeting its own rising needs³⁷.

Biogas

In 2023, the generation capacity of biogas and biomethane increased by 4% globally. Global biogas production stood at 1.76 EJ in 2023, while demand reached 0.82 EJ and is projected to continue rising. Growth is expected to be concentrated in Europe and China, which remain the key drivers of market expansion. Despite this progress, production still represents only a fraction of the estimated global potential. The IEA places this potential at around 1,000 bcme (equivalent to 35.8 EJ), with Brazil, China, and India together accounting for about 80%. This highlights a significant untapped opportunity, particularly in emerging markets where large feedstock availability and growing energy needs could accelerate future deployment.

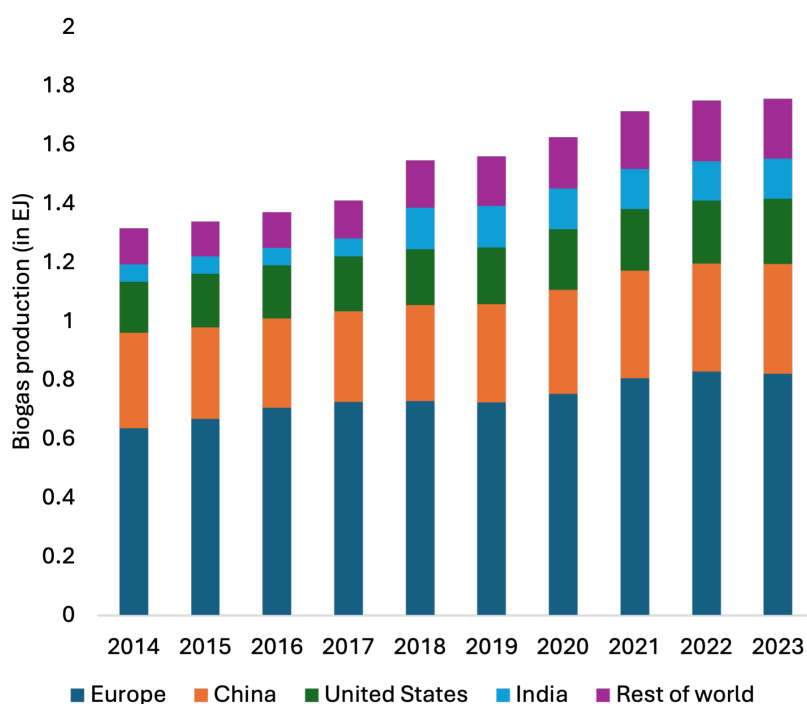


Figure 27. Global Biogas Production. **Source:** IEA

Country Update: Brazil

Brazil’s biogas industry is expanding rapidly, driven by new policies and growing investment, yet it still represents a relatively small part of the country’s overall energy mix. In 2024, biogas accounted for only 1.8% of the domestic energy supply and about 2.5% of total gas consumption. Most of the produced gas is used for electricity generation, with a smaller share in combined heat and power plants. Upgrading biogas for grid injection or use in transport remains limited but is expected to grow in the coming years³⁸.

As part of the Fuel of the Future Law (2024), the National Decarbonization Program for Natural Gas Producers and Importers aims to cut greenhouse gas emissions by blending increasing shares of biomethane into the gas network, starting at 1% in 2026 and reaching up to 10% by 2036.

The sector’s infrastructure is also scaling up. In 2024, Brazil had 1,633 registered biogas plants, a year-on-year increase of 18%, with a total installed capacity of 4.7 billion cubic meters. Of these, 1,349 facilities focused on electricity generation, while 54 produced biomethane³⁹. If current projects are realized, biomethane output could triple by 2026, with supply expected to grow by 107% in 2025 and nearly 200% between 2024 and 2026⁴⁰.

While landfill gas remains the primary feedstock, there is significant untapped potential from agricultural residues and by-products such as vinasse from ethanol production. Currently, about one-fifth of methane emissions from waste are captured as biogas, accounting for 75% of total production⁴¹.

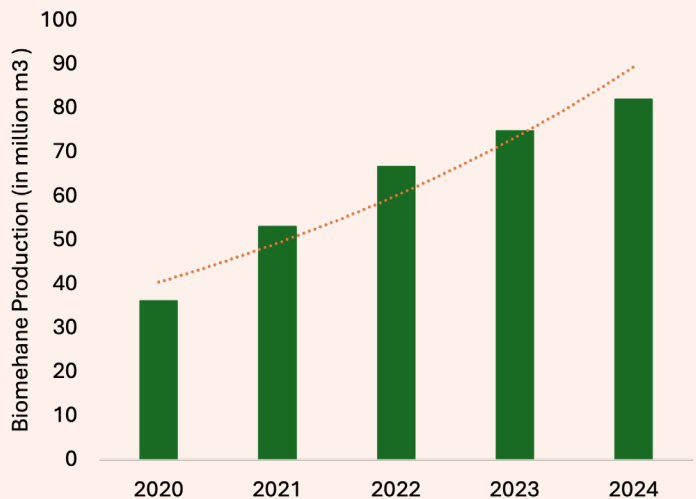


Figure 28. Brazil’s Biomethane Production. Source: ANP/SPC (Brazil)



8. Bioenergy Investments

According to the International Energy Agency (IEA), global investment in the bioenergy sector is expected to increase to more than USD 16 billion in 2025, which is a 13% increase from 2024, and the highest increase on record⁴². Almost half of this figure is for the liquid biofuels sector, which has risen in numbers in 2023 and 2024.

Within the biodiesel and ethanol sector, Brazil, the United States, and India are major players. In Brazil, for example, the new Fuel of the Future law could mobilize around USD 4 billion annually in biofuel investments over the next decade, adding to the USD 3 billion invested in the biofuel sector annually in the country⁴³. A major industry player, Raizen, had already announced an investment of USD 2 billion for building nine second-generation ethanol plants by 2035, as a joint venture with Shell and Cosan⁴⁴.

Developing HVO/HEFA production is also a major player in the sectoral investment portfolio. As the shift away from fossil fuels becomes more urgent, several oil refineries are diversifying their operations and investing in biofuel production facilities, with over 40 projects planned by 2030, especially in HVO and SAF⁴⁵. The largest player in the growth of refining capacity and investment in the sector is the United States, covering up to 70% of global investment in biojet kerosene⁴⁶. Projects like the conversion of Phillips 66's Rodeo refinery in California brought a USD 1.3 billion investment in 2024.

Within the biogas sector, Europe accounted for 60% of the global investment in 2024, supported by regional and national policies (e.g., REPowerEU plan)⁴⁷. Additionally, investments in CCUS reached more than USD 4 billion in 2024, a 35% increase year on year. Within this figure, bioenergy with carbon capture and storage (BECCS) projects have been aided by government funding for operational subsidies. For example, in Sweden, the Stockholm Exergi Project has been granted USD 1.8 billion, and in Denmark, USD 1.2 billion, and USD 24 million have been allocated to build a BECCS hub and three additional BECCS facilities, respectively⁴⁸.

9. Appendix

Geographical coverage

Africa: Algeria, Angola, Benin, Botswana, Burkina Faso, Burundi, Cameroon, Cape Verde, Central African Republic, Chad, Comoros, Congo, Cote d'Ivoire, Democratic Republic of the Congo, Djibouti, Egypt, Equatorial Guinea, Eritrea, Ethiopia, Gabon, Ghana, Guinea, Guinea – Bissau, Kenya, Lesotho, Liberia, Libya, Madagascar, Malawi, Mali, Mauritania, Mauritius, Morocco, Mozambique, Namibia, Niger, Nigeria, Reunion, Rwanda, Sao Tome and Principe, Senegal, Seychelles, Sierra Leone, Somalia, South Africa, Sudan, Swazi-land, Togo, Tunisia, Uganda, United Republic of Tanzania, Western Sahara, Zambia, Zimbabwe.

Americas: Antigua and Barbuda, Argentina, Aruba, Bahamas, Barbados, Belize, Bermuda, Bolivia, Brazil, British Virgin Islands, Canada, Cayman Islands, Chile, Colombia, Costa Rica, Cuba, Dominica, Dominican Republic, Ecuador, El Salvador, Falklands Islands, French Guiana, Grenada, Guadeloupe, Guatemala, Guyana, Haiti, Honduras, Jamaica, Martinique, Mexico, Montserrat, Nicaragua, Panama, Paraguay, Peru, Puerto Rico, Saint Kitts and Nevis, Saint Lucia, Saint Pierre and Miquelon, Saint Vincent and the Grenadines, Suriname, Turks and Caicos Islands, United States of America, Uruguay, Venezuela.

Asia: Afghanistan, Bahrain, Bangladesh, Bhutan, Brunei Darussalam, Cambodia, China, Hong Kong SAR, China, Macao SAR, Democratic People's Republic of Korea, India, Indonesia, Iran (Islamic Republic of), Iraq, Israel, Japan, Jordan, Korea Democratic Republic, Kuwait, Lao People's Democratic Republic, Lebanon, Malaysia, Maldives, Mongolia, Myanmar, Nepal, Oman, Pakistan, Philippines, Qatar, Saudi Arabia, Singapore, Sri Lanka, Syrian Arab Republic, Thailand, Turkey, United Arab Emirates, Viet Nam, Yemen.

Europe: Albania, Austria, Belarus, Belgium, Bosnia and Herzegovina, Bulgaria, Croatia, Czech Republic, Denmark, Estonia, Finland, France, Germany, Gibraltar, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Montenegro, Netherlands, Norway, Poland, Portugal, Republic of Moldova, Romania, Russian Federation, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, The Former Yugoslav Republic of Macedonia, Ukraine, United Kingdom.

Oceania: Australia, New Zealand

Glossary

Bioenergy: Bioenergy is equal to the sum of industrial waste, municipal waste, primary solid biofuels, biogas, bioethanol, biodiesel, other liquid biofuels, charcoal, etc.

Geothermal: Geothermal energy is the energy available as heat emitted from within the earth's crust, usually in the form of hot water or steam.

Municipal Waste: Municipal waste consists of products that are combusted directly to produce heat and/or power and comprises wastes produced by households, industry, hospitals, and the tertiary sector that are collected by local authorities for incineration at specific installations. Municipal waste is split into renewable and non-renewable.

Industrial Waste: Industrial waste of non-renewable origin consists of solid and liquid products (e.g. tyres) combusted directly, usually in specialized plants, to produce heat and/or power. Renewable industrial waste is not included here but with solid biofuels, biogases or liquid biofuels.

Solid Biofuels: Primary solid biofuels are defined as any plant matter used directly as fuel or converted into other forms before combustion. This covers a multitude of woody materials generated by industrial process or provided directly by forestry and agriculture (firewood, wood chips, bark, sawdust, shavings, chips, sulphite lye also known as black liquor, animal materials/wastes and other solid biofuels).

Biogases: Biogases are gases arising from the anaerobic fermentation of biomass and the gasification of solid biomass (including biomass in wastes). The biogases from anaerobic fermentation are composed principally of methane and carbon dioxide and comprise landfill gas, sewage sludge gas and other biogases from anaerobic fermentation.

Liquid Biofuels: Liquid biofuels are a sum of Biogasoline, biodiesel, and other liquid biofuels.

Ethanol: An alcohol with broad application in the chemical sector and as a fuel additive. When produced from bioresources it is known as bioethanol, which has applications as biogasoline (a liquid fuel) and as a biochemical.

Biodiesel: Diesel-equivalent fuel made from the transesterification of vegetable oils and animal fats, hydrogenated vegetable oil (HVO), thermal processes such as gasification and fermentation. To be a low-emissions fuel, the non-bioenergy inputs (such as hydrogen for HVO, or methanol for transesterification) must be from low-emissions hydrogen. Biomethane: Biomethane is a near-pure source of methane produced either by "upgrading" biogas (a process that removes any carbon dioxide and other contaminants present in the biogas) or through the gasification of solid biomass followed by methanation. It is also known as renewable natural gas.

Wood Fuel: Roundwood that will be used as fuel for purposes such as cooking, heating, or power production. It includes wood harvested from main stems, branches, and other parts of trees (where these are harvested for fuel) and wood that will be used for the production of charcoal (e.g. in pit kilns and portable ovens), wood pellets, and other agglomerates. The volume of roundwood used in charcoal production is estimated by using a factor of 6.0 to convert from the weight (mt) of charcoal produced to the solid volume (m³) of roundwood used in production. It also includes wood chips to be used for fuel that are made directly (i.e. in the forest) from roundwood. It excludes wood charcoal, pellets and other agglomerates. It is reported in cubic metres solid volume under-bark (i.e. excluding bark) .

Wood Pellets: Agglomerates produced either directly by compression or by the addition of a binder in a proportion not exceeding 3% by weight. Such pellets are cylindrical, with a diameter not exceeding 25 mm and a length not exceeding 100 mm. It is reported in metric tonnes.

Wood Charcoal: It covers the solid residue of the destructive distillation and pyrolysis of wood and other vegetal material.

Electricity Only: Refers to plants which are designed to produce electricity only. If one or more units of the plant are a CHP unit (and the inputs and outputs cannot be distinguished on a unit basis) then the whole plant is designated as a CHP plant.

Heat Only: Refers to plants (including heat pumps and electric boilers) designed to produce heat only and that sell heat to a third party (e.g. residential, commercial or industrial consumers) under the provisions of a contract.

CHP: Refers to plants that are designed to produce both heat and electricity (sometimes referred to as co-generation power stations). If possible, fuel inputs and electricity/heat outputs should be on a unit basis rather than on a plant basis.

Other coarse grains: Defined as barley, oats, sorghum and other coarse grains in all countries except Australia where it includes triticale, and in the European Union where it includes rye and other mixed grains.

Vegetable Oils: Defined as rapeseed oil (canola), soybean oil, sunflower seed oil, coconut oil, cottonseed oil, palm kernel oil, groundnut oil and palm oil.

Data Sources:

- Ember. Electricity Data Explorer. [Link](#)
- Eurostat. Barometer Reports. [Link](#)
- FAO. FAOSTAT. [Link](#)
- International Energy Agency (IEA) (2025). Energy Statistics Data Browser. [Link](#)
- International Renewable Energy Agency (IRENA) (2025). Renewable Capacity Statistics. [Link](#)
- OECD. OECD Data Explorer. [Link](#)
- U.S Department of Agriculture – Global Agricultural Information Network. US-DA-GAIN Biofuels Report. [Link](#)

Conversion Factors:

Volume

- 1 m³ = 1,000 litres (l)
- 1 US gallon = 3.785412 l
- 1 Imperial gallon = 4.546090 l

Biofuels Conversion

- Ethanol: 21.4 MJ / l
- Biodiesel: 32.7 MJ / l
- HVO: 34.4 MJ/l
- Petrol: 36 MJ/l
- Diesel: 41 MJ/l

Energy Unit Conversion*				
Multiply by:	GJ	Toe	MBtu	MWh
GJ	1	0.024	0.948	0.278
Toe	41.868	1	39.683	11.630
MBtu	1.055	0.025	1	0.293
MWh	3.600	0.086	3.412	1

*Energy values taken from Eurostat Statistics ([Link](#)), and HVO values from Neste Renewable Diesel handbook ([Link](#))

Also, approximately:

1.7 liters of ethanol ≈ 1 liter of petrol

1.2 liters of biodiesel ≈ 1 liter of diesel

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