Biogas in the Baltic Sea Region

- Current state of affairs 2021

BioFuel Region™

Supported by Swedish Institute

Preface

This report has been developed within the project Baltic Biogas Circles in 2021. The project aims to share knowledge, maintain, and extend the current collaborative network between northern Sweden, Finland, the Baltic States and Poland. The project partners work towards elaborate project ideas for the next EU programme period to develop the biogas sector.

Ida Norberg
Project manager, BioFuel Region

2021-08-31

The report and information from webinars and the digital study visits within the project Baltic Biogas Circles are available at: https://biofuelregion.se/en/projekt/baltic-biogas-circles/

Table of Content

Introduction

This report gives an overview of the biogas situation in the countries around the Baltic Sea. The distributions of the raw material used, the production of biogas and biomethane is different in the countries. The refuelling infrastructure and the number of vehicles also differs a lot around the Baltic Sea. One reason for the differences between the countries is the different policy situations, regarding incentives and regulations.

Biogas

Biogas constitutes mainly of methane and carbon dioxide together with small amounts of water, sulphur, and other contaminations. The process of biogas production is described in Figure 1.

Production of biogas contributes to a local circular bioeconomy. By treating a certain substrate that is defined as waste and get out energy together with a valuable digestate containing nutrients, the waste is turned into a resource. There are several advantages in relation to the biogas process, of where one is to decrease the import of artificial fertilizers, which has a big climate impact.

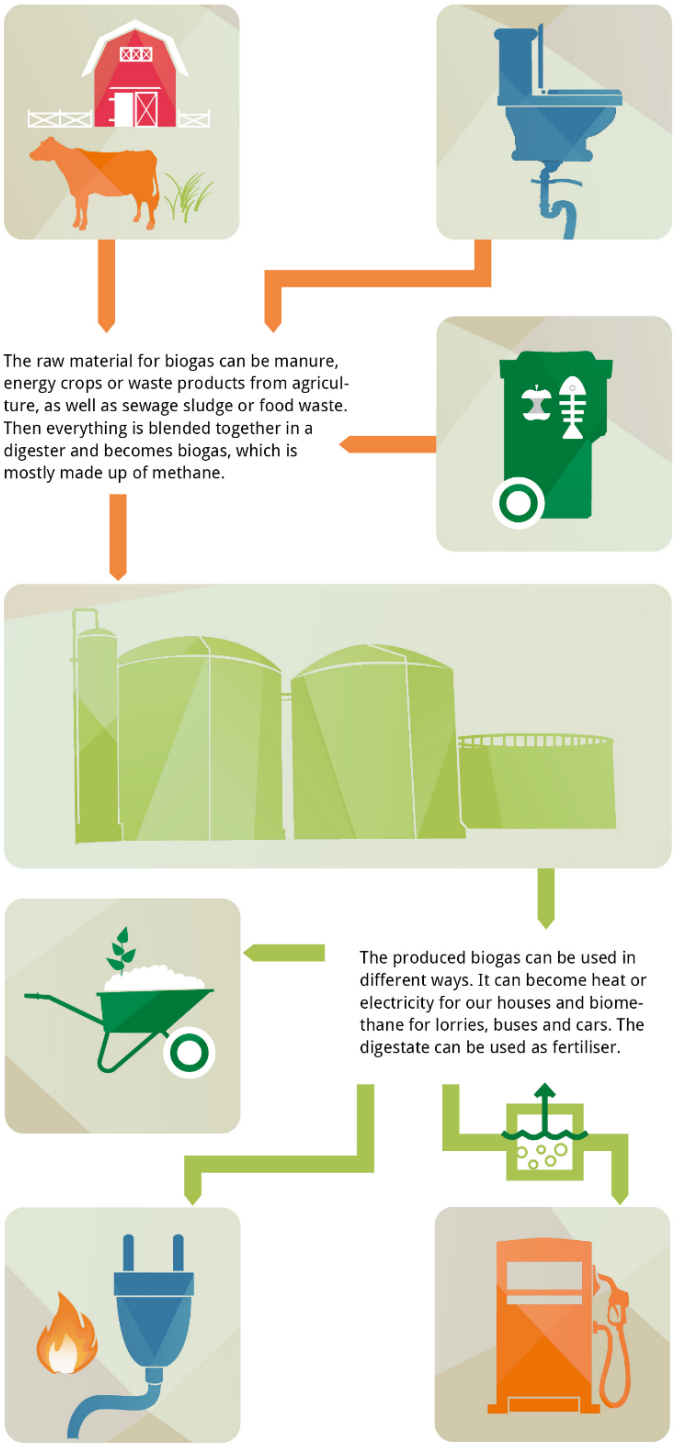


Figure 1. Description of the biogas process.

Upgrading of biogas – biomethane

The upgrading of biogas to biomethane can be done using different upgrading techniques. The upgrading process is described in Figure 2 as well as the process for natural gas. Upgraded biogas constitutes of around 97% of biomethane, which meets the standards to be injected into the natural gas grid or used as vehicle fuel in CNG-vehicles.

Different upgrading techniques are described at a webinar within the project Baltic Biogas Circles.[1]

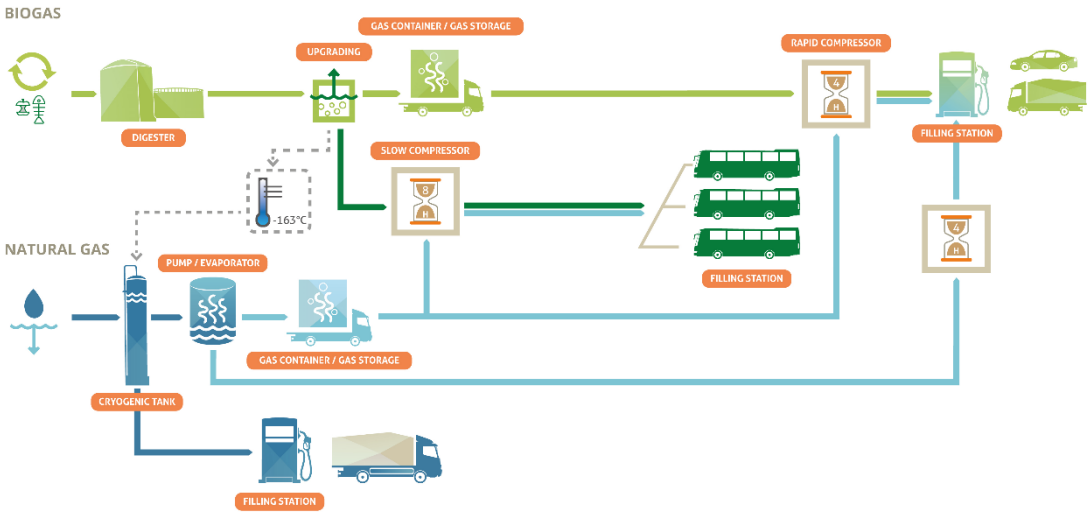


Figure 2. The process for biogas through upgrading to biomethane and usage as biomethane as vehicle fuel. The process for natural gas is also described.

[1] https://biofuelregion.se/en/projekt/baltic-biogas-circles/baltic-biogas-circle-webinars/ Visited 26 Aug. 2021.

Denmark

General description of the biogas situation in Denmark

The first farm-scale biogas plant was established in 1975, while the first centralized biogas plant was built in 1984.[2] In 2011, the number of biogas plants peaked at 196 followed by a decrease to 141 plants in 2019. The main reason was the closing of several smaller wastewater treatment plants, where the sludge instead is transferred to bigger wastewater treatment plants. The production of biogas was 1842 GWh in 2019. Denmark had in 2019 a production of 2667 GWh of biomethane, which is the second biggest producer of biomethane in Europe. In 2011 biomethane production started and a shift from biogas to biomethane began.

Raw material

The raw material used for biogas production is distributed as follows:[3]

- Agriculture – 40%, 56 plants
- Sewage – 35%, 50 plants
- Landfill – 20%, 28 plants
- Other – 5%, 7 plants

Production and use

In 2019 it was 141 biogas plants with a biogas production of 1842 GWh available for electricity generation in Denmark.[4] The electricity production from biogas was 700 GWh in 2019.

The number of plants producing upgraded biomethane started in 2012 and in 2019 it was 42 plants producing 2667 GWh of biomethane. The rapid growth of the biomethane sector reflects the ambitious renewable gas targets in Denmark. All biomethane plants except from two, are connected to the gas grid. The main end-uses for biomethane are transport and high-temperature industrial processes. Regarding upgrading of biogas, there are mainly three types of techniques used; chemical scrubbing, water scrubbing and membrane separation.[5]

In 2020, Denmark produced 1.4 bcm of natural gas. The production has decreased during the past fifteen years; in 2005 there was a natural gas production of 10.9 bcm.[6]

Handling of digestate

The main use of digestate in Denmark is as fertilizer in agriculture.

Refuelling infrastructure

Today, there are 19 Bio-CNG filling stations in Denmark. All stations provide 100% bio-CNG through the gas grid, which is documented by certificates.[7] There are no LNG refuelling infrastructure in Denmark.

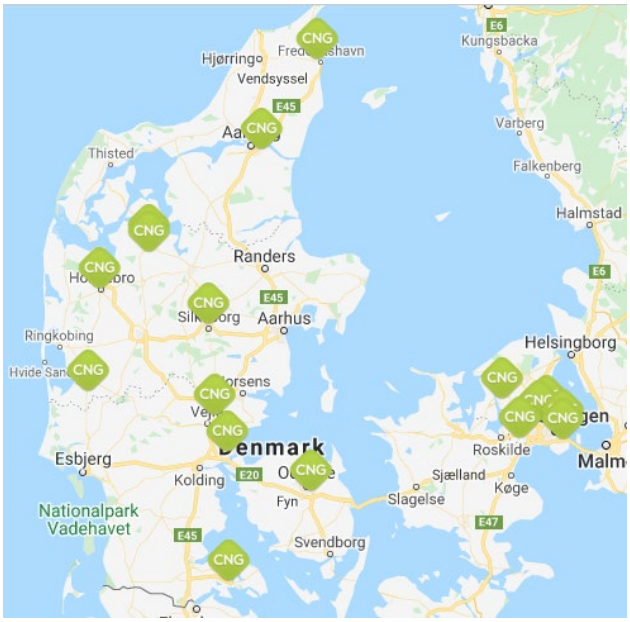
Gas grid operators are obliged to connect biomethane plants upon request. But the injected gas has no preferential use as compared with domestic natural gas production and import.[8]

---

[2] Decorte, Mieke (EBA); Tessens, Sam (Biogas-E); et al. 2020. D6.1 | Mapping the state of play of renewable gases in Europe. Download at: https://www.regatrace.eu/wp-content/uploads/2020/02/REGATRACE-D6.1.pdf p. 25.
[3] EBA 2020. "Statistical Report of the European Biogas Association 2020." Brussels, Belgium, January 2021. p. 74.
[4] EBA 2020. "Statistical Report of the European Biogas Association 2020." Brussels, Belgium, January 2021. p. 74.
[5] EBA 2020. "Statistical Report of the European Biogas Association 2020." Brussels, Belgium, January 2021. p. 76.
[6] https://www.statista.com/statistics/703582/denmark-natural-gas-production/ Visited 25 Aug. 2021.
[7] EBA 2020. "Statistical Report of the European Biogas Association 2020." Brussels, Belgium, January 2021. p. 75.
[8] Decorte, Mieke (EBA); Tessens, Sam (Biogas-E); et al. 2020. D6.1 | Mapping the state of play of renewable gases in Europe. Download at: https://www.regatrace.eu/wp-content/uploads/2020/02/REGATRACE-D6.1.pdf p. 26.

Vehicle situation

In 2021, the number of passengers gas vehicles were 135. The number of gas buses in 2021 was 169.[9]



Policy situation

In 2018, Denmark enacted an energy agreement which is in line with the Paris agreement and will work to reach zero net emissions by 2050 and 55% renewable energy by 2030.[10]

In Denmark, the biogas is exempted from CO_2-taxes. Biomethane, which are injected to the gas grid is tax wise regarded as natural gas and taxed with CO_2 and energy taxes.

The biogas sector in Denmark has been supported for a long time with subsidies for upgraded biogas, combined heat and power, transport, and process industry. Recently in 2020, the subsidy scheme for biogas and biomethane was closed. Biogas plants currently in operation will receive guaranteed support for electricity production from biogas for 20 years minimum until 2032. New biogas plants producing electricity have the same subsidy as solar power and wind, which is based on tenders.[11]

[9] https://www.statistikbanken.dk/10220 Visited 28 Jun. 2021.
[10] EBA 2020. "Statistical Report of the European Biogas Association 2020." Brussels, Belgium, January 2021. p. 74.
[11] Decorte, Mieke (EBA); Tessens, Sam (Biogas-E); et al. 2020. D6.1 | Mapping the state of play of renewable gases in Europe. Download at: https://www.regatrace.eu/wp-content/uploads/2020/02/REGATRACE-D6.1.pdf p. 25.

Estonia

Biogas history in Estonia goes back to the 1980s when two piggeries invested in a biogas production facility. They did not work properly, and a new attempt was made in 1990s with methane collection from landfills, WWT-plant. In 2008 the first agricultural plants started and in 2021 there are a 17 biogas plants in Estonia. The focus is on CHP production, but there are 4 plants upgrading to biomethane. Some cities have introduced biomethane as a transport fuel. Regulations and legislation make the situation regarding biogas development somewhat uncertain. The price premium support to biomethane producers will last till November of 2023. After that the Guarantees of Origin (GOs) of biomethane are tradeable with liquid transport biofuel GOs, which also means that the price of biomethane GOs are at the same range as the price of liquid biofuels.

Raw material

The different raw materials used for biogas production in Estonia is manure, sewage sludge, industrial process wastewater sludge and landfill gas. The distribution raw material of the 17 CHP plants is:[12]

- Agriculture – 5 plants
- Wastewater sludge – 4 plants
- Industrial process wastewater sludge – 4 plants
- Landfill gas – 4 plants

Of these plants, one agriculture and two landfill are closed.

Production and use

2019 the biogas production available for electricity generation in Estonia was 100 GWh. The biomethane production was 63 GWh. In Estonia, the total consumption of energy in 2016 was 231 PJ of whereas natural gas represents 7% (18 PJ). Renewable energy sources have a share of 17.5% or 40 PJ.[13] The biomethane production 2020 was 97408 MWh. Biogas used in CHPs 2020 was 29391 MWh.[14] Even though, the distribution of the number of plants are relative evenly distributed between the different substrates, the highest biogas production is from the agriculturally based biogas plants (16 of 25 MW in 2019).[15]

The first biomethane plant Green Gas OÜ started to produce biomethane with an annual capacity of 5-6 million Nm^3 from aspen pulp wastewater in 2018. The second biomethane plant Biometaan OÜ started to produce biomethane in annual capacity of 1.3 million Nm^3 from agricultural residues and biomass in June 2018.[16] In 2020, two additional biomethane plants started, both with the use of agricultural feedstock.[17]

Domestic biomethane production has no preferential access as compared with domestic natural gas production and import. There is no natural gas production in the country, everything is imported via pipeline from Russia and from Finland via the Baltic Connector. Natural gas in LNG mode is imported from Russia and from Lithuania.[18] The natural gas is mainly used for heat and power production. The last years, the annual consumption of natural gas has been around 500 million Nm^3.

---

[12] Ahto Oja, personal correspondence, 2021.
[13] https://www.ieabioenergy.com/wp-content/uploads/2018/10/CountryReport2018_Estonia_final.pdf p. 2.
[14] Ahto Oja, personal correspondence, 2021.
[15] EBA 2020. "Statistical Report of the European Biogas Association 2020." Brussels, Belgium, January 2021. p. 77.
[16] Decorte, Mieke (EBA); Tessens, Sam (Biogas-E); et al. 2020. D6.1 | Mapping the state of play of renewable gases in Europe. Download at: https://www.regatrace.eu/wp-content/uploads/2020/02/REGATRACE-D6.1.pdf
[17] EBA 2020. "Statistical Report of the European Biogas Association 2020." Brussels, Belgium, January 2021. p. 78.
[18] Decorte, Mieke (EBA); Tessens, Sam (Biogas-E); et al. 2020. D6.1 | Mapping the state of play of renewable gases in Europe. Download at: https://www.regatrace.eu/wp-content/uploads/2020/02/REGATRACE-D6.1.pdf

All biomethane is used in the transport sector. City after city e.g., Tartu, Pärnu, Võru, Kuressaare and Tallinn will use CNG buses in public transport. 70% of CNG consumption in transport is biomethane.

Biomethane is marketed in blend with natural gas, but in practice the biomethane molecules reach to filling station only in one place in Estonia (Koksvere biomethane filling station), in other cases the biomethane molecule is used in natural gas pipe system in food industry and in heating sector and biomethane certificates are cancelled in transport.

Handling of digestate

Digestate from agriculture plants goes back to the fields. For sewage plants it is a big problem. Today it is used for landscaping (free of charge) and nutrients are therefore lost. This is more of a legal problem then technical. In Kuressaare it is not used anymore for landscaping since the digestate sinks after a while and is now given away for free. In Tallinn it is used for compost and goes to the park. This is an expensive handling. At the Haeska farm, the digestate is treated and the solid fraction is used as bedding materials for the cows at the farm.[19]

Refuelling infrastructure

There are 25 refuelling stations for bio-CNG in Estonia of which one are pure bio-CNG (Koksvere biomethane filling station).[20] The Estonian gas transmission network comprises 885 km of gas pipeline.[21] There are two LNG refuelling stations.

Vehicle situation

In 2020, there was around 1600 CNG vehicles in Estonia.[22]

Policy situation

The Ministry of Economic Affairs and Transportation of Estonia (MKM) is responsible also for Energy, including renewable energy. The MKM prepared and Government of Estonia adopted the Estonian Long-Term Energy Strategy to 2030 in 2018, where biomethane plays an important role to reach the national target.[23] Estonia has committed itself to a target of 25% share of renewable energy in gross final energy consumption in 2020, including 10% for the transport sector. Estonia reached the overall target already in 2011 (25.5%).

Another MKM Regulation was adopted 2015 and includes the investment support for methane public buses. Up to 30% from total investment cost is supported, not less than 400000 euro and not more than 4 million euro. The first positive case was implemented by the Pärnumaa Public Transport Centre. This Regulation also states the support to CNG filling stations. A Feed-in premium is used in Estonia to pay a bonus to the biomethane producers with floating rate, which depends on the natural gas price in Baltic Natural Gas Spot. So-called sliding price allowing variations of the premium as a function of the prevailing natural gas price.

[19] Post, Lauri (Haeska Farm) https://biofuelregion.se/en/projekt/baltic-biogas-circles/digital-study-trip/ Visited 26 Aug. 2021.
[20] https://www.ngva.eu/stations-map/
[21] https://www.entsog.eu/sites/default/files/files-old-website/publications/GRIPs/2017/entsog_BEMIP_GRIP_2017_Main_web_s.pdf
[22] Ahto Oja, personal correspondence, 2021.
[23] Decorte, Mieke (EBA); Tessens, Sam (Biogas-E); et al. 2020. D6.1 | Mapping the state of play of renewable gases in Europe. Download at: https://www.regatrace.eu/wp-content/uploads/2020/02/REGATRACE-D6.1.pdf

Finland

The first biogas plant in Finland was built in the 1930's in Helsinki. In 2019, there were 99 biogas plants producing around 1 TWh biogas, which corresponds to 474 GWh biogas available for electricity generation. It was also 17 biomethane plants producing 156 GWh.[24] The positive trend is believed to continue at least according to the new national action plan for biogas from 2020.

Raw material

The biogas plants are using the following feedstocks:[25]

- Agriculture – 19%, 19 plants
- Sewage – 18%, 18 plants
- Landfills – 33%, 33 plants
- Other feedstocks, mainly municipal and industrial waste – 29%, 29 plants

Production and use

In 2018, Finland produced around 1 TWh of biogas.[26] This corresponds to 474 GWh of biogas available for electricity generation, from which 180 GWh of electricity was generated (2019). The total biogas production capacity was 97 MW, which corresponds to 37 MW of installed electric capacity.[27]

The development of biomethane plants in Finland has increased from 2 in 2011 to 17 in 2019. The most common upgrading technique is ammonia scrubbing, which is used by 7 (41%) plants.[28] In 2018, 54 GWh of biomethane, which corresponds to over half of the total biomethane production was used in the transport sector. This was also 53% of the gas used as a traffic fuel (2019).[29]

There is no production of natural gas in Finland. The consumption of natural gas was 24.7 TWh in 2018.[30]

Handling of digestate

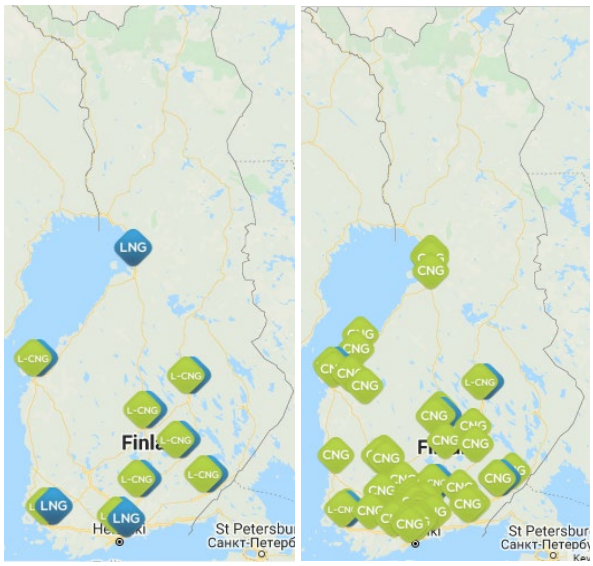
In 2016, 50% of the digestate from sewage biogas plants was used as plant soil, around 40% as fertilizer in the agricultural sector and <10% was used for storage and covering of landfills.[31] Generally in Finland, the treatment of digestate and development of organic fertilizer products is gaining more and more attention, not only because of environmental reasons but also from the financial terms.[32]

---

[24] EBA 2020. "Statistical Report of the European Biogas Association 2020." Brussels, Belgium, January 2021. p. 85.
[25] EBA 2020. "Statistical Report of the European Biogas Association 2020." Brussels, Belgium, January 2021. p. 85.
[26] Decorte, Mieke (EBA); Tessens, Sam (Biogas-E); et al. 2020. D6.1 | Mapping the state of play of renewable gases in Europe. Download at: https://www.regatrace.eu/wp-content/uploads/2020/02/REGATRACE-D6.1.pdf p. 29.
[27] EBA 2020. "Statistical Report of the European Biogas Association 2020." Brussels, Belgium, January 2021. p. 86.
[28] EBA 2020. "Statistical Report of the European Biogas Association 2020." Brussels, Belgium, January 2021. p. 87.
[29] EBA 2020. "Statistical Report of the European Biogas Association 2020." Brussels, Belgium, January 2021. p. 86.
[30] https://energiavirasto.fi/documents/11120570/12722768/Raportti-kaasun-toimitusvarmuus-2019.pdf/7325ed49-38a0-e8d4-6d70-f527e2e4bc2d/Raportti-kaasun-toimitusvarmuus-2019.pdf
Visited 26 Aug. 2021.
[31] Saarela, Johan (Stormossen Oy); Palmborg, Cecilia (SLU) et al., Botnia Näring i Kretslopp. Nulägesrapport 2019. Download at: https://biofuelregion.se/wp-content/uploads/2020/05/Nul%C3%A4gesrapport-Botnia-N%C3%A4ring-i-Kretslopp-maj-2020.pdf
[32] Decorte, Mieke (EBA); Tessens, Sam (Biogas-E); et al. 2020. D6.1 | Mapping the state of play of renewable gases in Europe. Download at: https://www.regatrace.eu/wp-content/uploads/2020/02/REGATRACE-D6.1.pdf p. 30.

Refuelling infrastructure

In 2021, there are 59 CNG and 11 LNG filling stations in Finland.[33] Of those, 19 Bio-CNG and 5 Bio-LNG stations provide biomethane only.[34]



In Finland, there is a natural gas grid in the southern part of Finland. Five biogas plants (around 10% of the biomethane) are connected to the gas grid, which means that the off-grid infrastructure is very important.[35]

Domestic biomethane production has preferential access as compared to domestic natural gas production and import. When injecting biogas to the transmission system, a biomethane producer must pay the connection fee and the transfer fees. The grid operator is responsible for the rest of the investments.[36]

Vehicle situation

In Finland, around 13000 gas vehicles were registered in March 2021.[37]

Policy situation

In January 2020 a national biogas action plan until 2024 was published.[38] There are no government strategic targets in place for biogas or biomethane, but there is a target of 50000 passenger gas vehicles by 2030.

There is a state grant for investment projects that promote the use of production of renewable energies, advance energy efficiency and reduce the environmental effects caused by energy production and use, called energy aid (2018 to 2022). Additionally, between 2018-2021 there is investment aid for filling stations investments and converting passenger cars to gas (1000 € per car).[39]

Biogas and biomethane in all end-use applications are exempt from excise duties.[40]

Imported biomethane is exempt from excise duty and custom fees. Natural gas is duty free when coming from outside the EU, but the VAT and excise duties shall be carried.[41]

---

[33] https://www.ngva.eu/stations-map/ Visited 31 Aug. 2021.
[34] EBA 2020. "Statistical Report of the European Biogas Association 2020." Brussels, Belgium, January 2021. p. 86.
[35] Decorte, Mieke (EBA); Tessens, Sam (Biogas-E); et al. 2020. D6.1 | Mapping the state of play of renewable gases in Europe. Download at: https://www.regatrace.eu/wp-content/uploads/2020/02/REGATRACE-D6.1.pdf p. 29.
[36] Decorte, Mieke (EBA); Tessens, Sam (Biogas-E); et al. 2020. D6.1 | Mapping the state of play of renewable gases in Europe. Download at: https://www.regatrace.eu/wp-content/uploads/2020/02/REGATRACE-D6.1.pdf p. 30.
[37] https://liikennefakta.fi/fi/ymparisto/henkiloautot/liikennekaytossa-olevat-henkiloautot-kayttovoimittain Visited 15 Jun. 2021.
[38] Decorte, Mieke (EBA); Tessens, Sam (Biogas-E); et al. 2020. D6.1 | Mapping the state of play of renewable gases in Europe. Download at: https://www.regatrace.eu/wp-content/uploads/2020/02/REGATRACE-D6.1.pdf
[39] Decorte, Mieke (EBA); Tessens, Sam (Biogas-E); et al. 2020. D6.1 | Mapping the state of play of renewable gases in Europe. Download at: https://www.regatrace.eu/wp-content/uploads/2020/02/REGATRACE-D6.1.pdf
[40] EBA 2020. "Statistical Report of the European Biogas Association 2020." Brussels, Belgium, January 2021.
[41] Decorte, Mieke (EBA); Tessens, Sam (Biogas-E); et al. 2020. D6.1 | Mapping the state of play of renewable gases in Europe. Download at: https://www.regatrace.eu/wp-content/uploads/2020/02/REGATRACE-D6.1.pdf

Germany

General description of the biogas situation in Germany

Germany is the largest producer of biogas in the world with over 11000 biogas plants and 232 biomethane plants in 2019. The total biogas and biomethane production were 92 TWh in 2019. The main end-use for biomethane is electricity production.

Raw material

The distribution of the raw materials used for biogas production are:

- Agriculture (including organic municipal and industrial waste) – 85%, 9527 plants
- Sewage – 11%, 1274 plants
- Landfill – 4%, 468 plants

Production and use

The biogas production available for electricity generation from the 11269 biogas plants was 82 TWh in 2019. The biomethane production from the 232 biomethane plants was 10 TWh in 2019. There is an ongoing development of biomethane in the transport sector. 660 GWh of the produced biomethane was used in the transport sector in 2019, which is an increase relative to 2018 (401 GWh).

The main end-use of biomethane is electricity production, which is supported by the Renewable Energy Law. Of biomethane plants producing Bio-CNG on site, all plants except 2 are connected to the gas grid.

In Germany, the imported biomethane will be used primarily for the heating purposes. Its application in the transportation fuel market will not be recognized in terms of the carbon footprint reduction requirement. Germany itself belongs to the biomethane export nations and has the last years been between 150 and 200 GWh.[42]

Practically, the whole amount of biomethane produced in Germany will be injected into the gas grids. The costs for the biomethane injection into the gas grid will be shared between the plant operator and the gas grid operator in the proportion 25/75% accordingly.[43]

The production of natural gas in 2020 was 6 bcm.[44] In 2019, the total consumption of natural gas in Germany was 95 bcm, which correspond to 26% of the total energy consumption.[45]

Handling of digestate

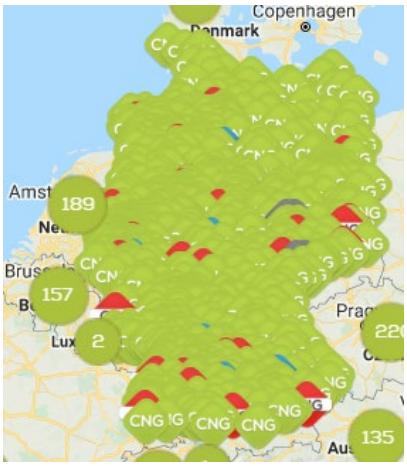
Almost half of the total 180 million tonnes of digestate that is produced in EU is in Germany.[46] The main use of digestate from agricultural biogas plants is direct land application. Secondly, the digestate is separated in liquid and solid phase using screw-presses in order to increase the capacity of the biogas plant and get a better usage of the digestate. Further digestate treatment is currently only feasible for a minority of biogas plants mainly due to economic reasons.[47]

---

[42] Decorte, Mieke (EBA); Tessens, Sam (Biogas-E); et al. 2020. D6.1 | Mapping the state of play of renewable gases in Europe. Download at: https://www.regatrace.eu/wp-content/uploads/2020/02/REGATRACE-D6.1.pdf p. 33.
[43] Decorte, Mieke (EBA); Tessens, Sam (Biogas-E); et al. 2020. D6.1 | Mapping the state of play of renewable gases in Europe. Download at: https://www.regatrace.eu/wp-content/uploads/2020/02/REGATRACE-D6.1.pdf p. 34.
[44] https://yearbook.enerdata.net/natural-gas/world-natural-gas-production-statistics.html Visited 16 Jun. 2021.
[45] https://yearbook.enerdata.net/natural-gas/gas-consumption-data.html Visited 24 Jun. 2021.
[46] https://ec.europa.eu/environment/chemicals/reach/pdf/40039%20Digestate%20and%20Compost%20RMOA%20-%20Final%20report%20i2_20190208.pdf Visited 25 Aug. 2021.
[47] https://johnnurmisensaatio.fi/wp-content/uploads/2019/05/germany_biogas-risk-assessment_final.pdf Visited 25 Aug. 2021.

Refuelling infrastructure

There are approximately 900 CNG filling stations in Germany, 250 of them provide biomethane share in CNG. More details of the filling stations can be found in the reference to the map.[48]



The usage if liquefied biomethane in Germany as a transportation fuel has not been established jet because of missing regulatory framework.[49] However, in 2021 there are 72 refuelling stations for LNG.[50]

Vehicle situation

In Germany, there are almost 400000 gas vehicles, accounting for 0.8% of all vehicles. Most of them are converted gasoline cars.[51]

Policy situation

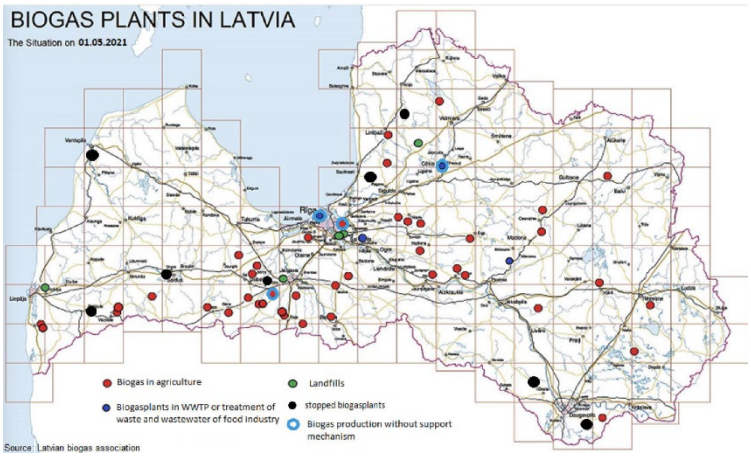
Germany was one of the first European countries to implement a subsidy for renewable electricity production. In the Electricity Feed-In Law was introduced, which was superseded by the Renewable Energy Sources Act (EEG or Erneuerbare-Energien-Gesetz) in 2000. This was a real push for the biogas development and by 2002, the biogas production was tripled. The EEG was revised several times and in 2017 it was switched to a tendering system, designed to steer electricity production towards a more market driven principle. In 2020, the Renewable Energy Directive (RED II) was implemented into the national and, it is expected, that the share of biomethane in the fuel market will increase.

The incentive scheme for the biomethane utilization is different depending on the specific market; heat, electricity or transport. More details of the subsidies can be found in the report REGATRACE.[52]

The tax reduction is another effective support mechanism for establishing the biomethane utilization.

[48] https://www.ngva.eu/stations-map/ Visited 24 Jun. 2021.
[49] Decorte, Mieke (EBA); Tessens, Sam (Biogas-E); et al. 2020. D6.1 | Mapping the state of play of renewable gases in Europe. Download at: https://www.regatrace.eu/wp-content/uploads/2020/02/REGATRACE-D6.1.pdf p. 34.
[50] https://www.ngva.eu/stations-map/ Visited 31 Aug. 2021.
[51] https://auto-gas.net/government-policies/autogas-incentive-policies/germany/ Visited 22 Jun. 2021.
[52] Decorte, Mieke (EBA); Tessens, Sam (Biogas-E); et al. 2020. D6.1 | Mapping the state of play of renewable gases in Europe. Download at: https://www.regatrace.eu/wp-content/uploads/2020/02/REGATRACE-D6.1.pdf p. 32-33.

Latvia



In 2007 there were only three biogas plants in Latvia. Since support system based on a feed-in tariff was released in 2007, the number of biogas plants increased rapidly to 60 plants in 2016 with a total installed capacity of 61.156 MW. In 2015 biogas plants in Latvia produced 374.87 GWh of electrical energy and worked with approximately 80% load.[53] However, the number of plants has decreased during the past five years and currently 49 biogas plants are operating in Latvia producing electricity and heat. Raw material comes mostly from agricultural and food waste and energy crops. The transport sector accounts for 31% of total final energy consumption in the country.[54]

Raw material

Main raw material for biogas production is agricultural and food waste and energy crops like maize. One plant is using sewage sludge and two food production wastewater. Six plants are operating in municipal landfills. Different types of biomass are used as the raw material for biogas production in Latvia. Mostly the manure from cattle, pigs and poultry is used, as well as maize and grass silage and remains in grain driers dropout. A variety of food production waste, vegetable waste, greenhouse waste, non-standard potatoes, damaged food, slaughterhouse waste and residues of milk processing also is utilised.

14500 GWh of natural gas was imported and used during 2019.

Production and use

In 2020 there were 49 biogas plants in Latvia with a total capacity of 56.636 MW.[55] In 2019, 315.7 GWh electricity was produced using around 890 GWh of biogas.

There is no natural gas production in the country, everything is imported. Main use is for electricity and heat production.

Handling of digestate

The main use of digestate is to directly use it as a fertilizer for agriculture land, without a postproduction process. One biogas plant, Egg Energy, which is using 100% poultry manure as substrate is producing fertilizer from the digestate. Both pellets and a liquid fertilizer concentrate is produced.

[53] Kalnina, I., Rugele, K. and Rubulis, J. Digestate management practices in Latvia from nitrogen perspective. Riga Technical University. In Energy Procedia 147 (2018) p. 368–373.
[54] Anda Jekabsone, personal correspondence, 2021.
[55] Anda Jekabsone, personal correspondence, 2021.

Refuelling infrastructure

In 2019 there were no public refuelling station in Latvia. However, there are five refuelling stations for CNG registered in Latvia; three in Riga, one in Jekabpils and one in Saldus.

Vehicle situation

In 2019 there was a limited amount of registered CNG vehicles in Latvia; 50 cars, 18 trucks and 7 buses.[56] There are one city with CNG buses; Jekabpils.

Policy situation

Among EU countries Latvia has one of the lowest shares of energy from renewable sources in transport with a use of less than 4% of energy from renewables. Still, government strategic targets for usage of biomethane for 2020, 2030, 2050 are missing. The legal framework in Latvia is quite complex and is also changing rapidly.[57]

Latvia started to support electricity generation from biogas in 2009, which had a clear impact on biogas production 3 years later in 2012. Since then, the production continued to grow steadily to reach 87.8 ktoe in 2015, which is considerable for such a small country. Based on the production growth rate prior to 2008, 70.6.8 ktoe of the 2015 biogas production is likely to have been caused by the start of the FiT in 2009 (+510.7%). Different tax regulation mechanisms are in place in the country for relevant biogas installations.

The introduction of a subsidised electricity tax in 2014 (decrease in revenue for renewable electricity producers) along with the termination of legal support for the construction of new plants in 2017 until 2020 (extended and never renewed), severely impair the ability of the sector to develop further.

Contracts between government and biogas operators for receiving FiT was closed for 10 years, so for the first stations the support has ended, and within next few years it will end for all the biogas operators. There are 4 biogas plants operating without any support, and 7 has ended their production already.

It is likely that biogas sector will reduce the production capacity significantly during next 3-5 years.

[56] Kristine Vegere, Latvian Biogas Association, personal correspondence, 2021.
[57] Decorte, Mieke (EBA); Tessens, Sam (Biogas-E); et al. 2020. D6.1 | Mapping the state of play of renewable gases in Europe. Download at: https://www.regatrace.eu/wp-content/uploads/2020/02/REGATRACE-D6.1.pdf

Lithuania

There are around 40 biogas plants producing heat and electricity in Lithuania. In 2020 there were no biomethane production. It was planned for the first biomethane plant with around 12 GWh total annual production in 2020, but there is no further information on the status of that project to be found.[58]

Raw material

The production of biogas includes mainly five feedstocks:[59]

- Agriculture – 14 plants, 41.7 Mm^3
- Sewage sludge – 8 plants, 15.2 Mm^3
- Biowaste & industrial waste – 5 plants
- Landfill – 9 plants, 10.7 Mm^3

Production and use

The total energy production in 2015 was 83 TWh of which natural gas constituted of 29%. Between 2011 and 2016, the consumption of natural gas has slightly decreased from around 35 TWh to 23 TWh, which mainly is due to an increase in the use of biofuels in the heating sector, energy efficiency etc. Around 50% of the natural gas is used in the production of fertilizers.[60]

In 2020, the 40 biogas plants produced heat and electricity at a capacity of 30 MW.[61] None of the plants are connected to the gas grid.

Handling of digestate

The main use for the digestate from agricultural sector is as a fertilizer. In Lithuania, the liquid phase of digestate is often free of charge and the solid phase is sold through commercial agreements with local farmers.[62]

Refuelling infrastructure

There is no biogas used for upgrading to biomethane and used as vehicle fuel in Lithuania. However, there are no restrictions and standards for blending biomethane with natural gas into the gas grid once the biomethane fulfils the quality requirements.

The investment cost of grid connection is covered 40% by the grid operator and 60% by biomethane producer. The connection costs include constructing connecting pipeline and valve station.

[58] Decorte, Mieke (EBA); Tessens, Sam (Biogas-E); et al. 2020. D6.1 | Mapping the state of play of renewable gases in Europe. Download at: https://www.regatrace.eu/wp-content/uploads/2020/02/REGATRACE-D6.1.pdf

[59] https://www.beic.nu/resources/02_Andrius_Tamosiunas.pdf Visited 18 Jun. 2021.

[60] BEMIP Gas Regional Investment Plan 2017 p. 52.

[61] BEMIP Gas Regional Investment Plan 2017 p. 55.

[62] Jurgutis, L.; Šlepetiene, A.; Šlepetys, J.; Cesevi˘ciene, J. Towards a Full Circular Economy in Biogas Plants: Sustainable Management of Digestate for Growing Biomass Feedstocks and Use as Biofertilizer. *Energies* **2021**, *14*, 4272. https://doi.org/10.3390/en14144272

While gas upgrading, compression, gas metering and gas quality measurement facilities must be installed by biomethane producer.[63]

In 2020, there was six refuelling stations for CNG registered at the NGVA-site in Lithuania.

Vehicle situation

The number of CNG vehicles in Lithuania the year 2020 was 181, which is almost twice as much as the 100 CNG vehicles in 2019.[64]

Policy situation

Today, there are no support scheme for production of biomethane, except for a 40% discount for connection fee. A feed-in-tariff was proposed in 2012, but it never became a reality. However, there are hope for supporting elements in the coming years.

Regarding imported biomethane, it is treated equally as the domestic biomethane.

In the clean fuel action plans, there are plans for installation of liquefied natural gas refuelling points on motor roads for the year 2025.[65]

[63] Decorte, Mieke (EBA); Tessens, Sam (Biogas-E); et al. 2020. D6.1 | Mapping the state of play of renewable gases in Europe. Download at: https://www.regatrace.eu/wp-content/uploads/2020/02/REGATRACE-D6.1.pdf

[64] https://www.eafo.eu/countries/lithuania/1742/summary Visited 26 Aug. 2021.

[65] Sjögren, Jerker and Madsen, Kia. (Capital Region of Denmark) Clean fuel deployment in the Baltic Sea Region. 2019. Download at: https://www.uudenmaanliitto.fi/files/24717/Clean_Fuel_Deployment_Status_Quo_Report_GoA_2.4.pdf

Poland

In 2019, it was 315 biogas plants in Poland producing 3 180 GWh of biogas available for electricity generation. Today, there are no biomethane production and hence, all biogas is used for heat and electricity. There are support mechanisms for biomethane production under development, which is expected to be implemented in the coming years.[66]

Raw material

The feedstocks for the 315 biogas plants are even distributed between:

- Agriculture – 33%, 103 plants
- Sewage – 34%, 109 plants
- Landfill – 31%, 97 plants

The development the past ten years is mainly an increase in the use of agricultural feedstock.[67]

Production and use

In 2019, 3 180 GWh of biogas was produced, from which 1209 GWh of electricity was generated. The total installed biogas capacity is 636 MW, corresponding to 242 MW installed electric capacity.[68]

Today, there are no production of biomethane in Poland.

The natural gas production in Poland 2020 was 6 bcm (Billion cubic meters), which correspond to 2% of the production in Europe.[69] The total energy consumption in Poland 2014 was 95 Mtoe. Of that, 13.3% (21 bcm[70]) was natural gas, which is the third largest source of energy in Poland.[71]

Handling of digestate

In Poland, the digestate is mainly used as fertilizer.

Refuelling infrastructure

Today, there are 24 registered CNG refuelling stations in Poland, and eight LNG filling stations (see figures on next page).[72]

Vehicle situation

The total number of vehicles has not been able to be found, but there was around 800 of CNG buses in 2021.

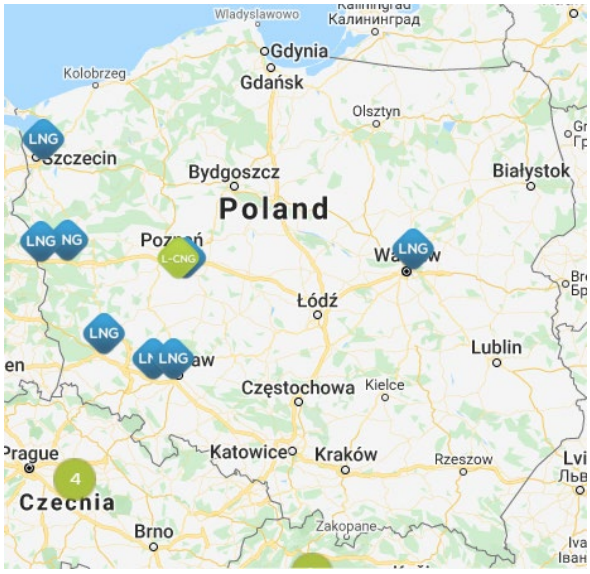
Policy situation

Today, there are no financial support for biomethane production in Poland. The legislation is also unclear. However, there are discussions regarding a support scheme for biomethane from anaerobic digestion. The drivers for biomethane development are the EU requirements of RED and RED II and the decarbonisation of transport.[73] The demand for biomethane on the Polish market is mainly pushed by the Biofuel Act.

---

[66] EBA 2020. "Statistical Report of the European Biogas Association 2020." Brussels, Belgium, January 2021. p. 103.
[67] EBA 2020. "Statistical Report of the European Biogas Association 2020." Brussels, Belgium, January 2021. p. 103.
[68] EBA 2020. "Statistical Report of the European Biogas Association 2020." Brussels, Belgium, January 2021. p. 103.
[69] https://yearbook.enerdata.net/natural-gas/world-natural-gas-production-statistics.html Visited 16 Jun. 2021.
[70] https://yearbook.enerdata.net/natural-gas/gas-consumption-data.html Visited 24 Jun. 2021.
[71] BEMIP Gas Regional Investment Plan 2017. p. 58.
[72] https://www.ngva.eu/stations-map/ Visited 31 Aug. 2021.
[73] Decorte, Mieke (EBA); Tessens, Sam (Biogas-E); et al. 2020. D6.1 | Mapping the state of play of renewable gases in Europe. Download at: https://www.regatrace.eu/wp-content/uploads/2020/02/REGATRACE-D6.1.pdf


Калининград
Gdańsk
Olsztyn
Szczecin
Białystok
Poland
Łódź
Prague
220
Ostrava
Brno
CNG


Władysławowo
Калининград
Gdynia
Kołobrzeg
Gdańsk
Olsztyn
Szczecin
Bydgoszcz
Białystok
Poland
Łódź
Lublin
Częstochowa
Kielce
Katowice
Kraków
Rzeszów
Prague
4
Czechia
Brno
Zakopane
LNG
L-CNG

Sweden

The Swedish biomethane market is to a large extent off-grid with several small local and regional grids or stand-alone biogas gas plants and filling stations. The gas pipeline infrastructure is limited to the south-western part of Sweden where the transmission network is connected to European gas network via Denmark. There is also a regional gas network in Stockholm, fuelled with locally injected biogas and shipped LNG.[74]

Raw material

The feedstock used by around half of the 210 biogas plants in Sweden is sewage sludge. The distribution is as follows:[75]

- Agriculture – 21%, 45 plants
- Sewage – 52%, 109 plants
- Landfill – 25%, 52 plants
- Other – 2%, 4 plants

In Sweden, there are no production of natural gas.

Production and use

The biogas production in Sweden in 2019 was in total around 2.1 TWh[76], divided in 760 GWh of biogas and 1350 GWh of biomethane production. The higher amount of biomethane production as compared to biogas is unique for Sweden in Europe. The total biogas production has slightly increased during the past five years, but the electricity production has been decreasing from 62 GWh in 2015 to 39 GWh in 2019. The usage of the biogas in 2019 was in specific heat applications (300 GWh), co-generation of thermal energy (98 GWh), industrial and other applications (75 GWh) and electricity generation (39 GWh).[77]

The dominating technique for upgrading biogas to biomethane is water scrubber, which is used by 43 plants in Sweden.[78] Of the upgraded biogas, the biomethane, 87% is used as transportation fuel for road transport. Around 0.5 TWh of the biomethane is injected to the south-western gas grid (connected to the European gas grid) and in the Stockholm gas grid, the rest is used locally or trucked to filling stations.[79] The trend for biomethane has been an increase to 2014 when it stabilized at around 1.5 to 1.6 TWh per year since then. The average biomethane share has however continued to increase and was 94% in 2018. Biomethane is sold as a CNG/CBG blend (Fordonsgas) and the biomethane share differs but should never be less than 50% CBG (according to an industry agreement). At many stations 100% biomethane is offered.[80]

The sold volume of liquified biomethane increased fivefold during 2019 as compared to 2018 and continued to increase during 2020. During 2020, the total sold volume of liquified CNG was 75 GWh of which 48% was liquified biomethane.[81]

---

[74] Decorte, Mieke (EBA); Tessens, Sam (Biogas-E); et al. 2020. D6.1 | Mapping the state of play of renewable gases in Europe. Download at: https://www.regatrace.eu/wp-content/uploads/2020/02/REGATRACE-D6.1.pdf
[75] EBA 2020. "Statistical Report of the European Biogas Association 2020." Brussels, Belgium, January 2021. p. 105.
[76] https://www.energigas.se/fakta-om-gas/biogas/statistik-om-biogas/ Visited 31 Aug. 2021.
[77] EBA 2020. "Statistical Report of the European Biogas Association 2020." Brussels, Belgium, January 2021. p. 106.
[78] EBA 2020. "Statistical Report of the European Biogas Association 2020." Brussels, Belgium, January 2021. p. 107.
[79] Decorte, Mieke (EBA); Tessens, Sam (Biogas-E); et al. 2020. D6.1 | Mapping the state of play of renewable gases in Europe. Download at: https://www.regatrace.eu/wp-content/uploads/2020/02/REGATRACE-D6.1.pdf
[80] Decorte, Mieke (EBA); Tessens, Sam (Biogas-E); et al. 2020. D6.1 | Mapping the state of play of renewable gases in Europe. Download at: https://www.regatrace.eu/wp-content/uploads/2020/02/REGATRACE-D6.1.pdf p. 50.
[81] https://www.energigas.se/fakta-om-gas/fordonsgas-och-gasbilar/statistik-om-fordonsgas/ Visited 16 Jun. 2021.

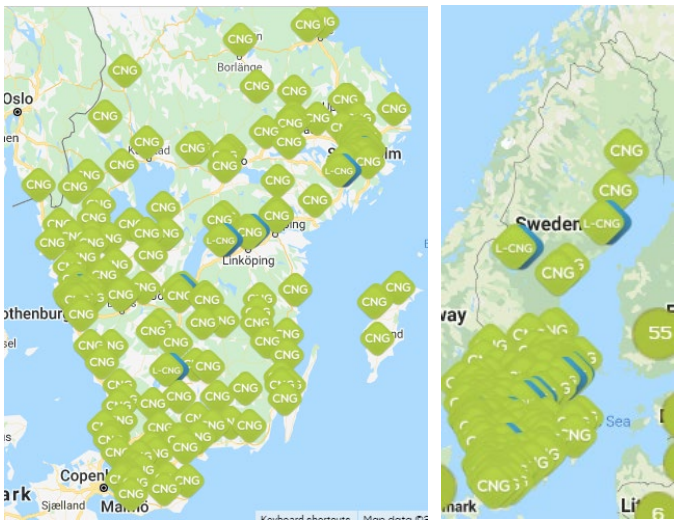
In 2019, the total gas consumption in Sweden was 1.1 bcm.[82] Regarding connection of biomethane to the natural gas grid, the biomethane producer pays for the cost of the connection investment and is also responsible for gas quality measurements. At local/regional grids there may be other procedure (up to the grid owner).[83]

Handling of digestate

During 2018 nearly 2.8 million tonnes of digestate was produced and 86% were used as fertilizer in the agricultural sector. The digestate from farming (manure) and household waste plants was 2.15 million tonnes and nearly all was used for fertilizing. 40% of the digestate from sewage plants was used for fertilizing and the rest for landscaping or covering of landfills.

Refuelling infrastructure

In 2021, there was 204 public CNG filling stations and around 60 non-public filling stations. It was also 25 filling stations for liquified gas, LNG.[84] The development of the L-CNG infrastructure is believed to continue in the coming years.



Vehicle situation

In 2019, there was around 54000 gas vehicles in Sweden, of where 2600 buses and 1000 heavy duty vehicles.[85]

Policy situation

The main drivers for decarbonisation in Sweden the past 30 years has been the incentives of high CO_2 and energy tax on fossil fuels and tax exemption for renewables. In sectors with high taxes, for example the transportation sector, the biomethane has been used to a large extent, but for sectors with lower taxes like in the industry, the tax advantage is lower and hence, there has been a minor use of biomethane instead of natural gas in that sector. However, during the last 2-3 years, the subsidised imported biomethane has been rather competitive with natural gas and the biomethane demand in the industry has been increasing.[86] The tax exemption for biogas and biomethane has been prolonged to 2030.

In Sweden, there are a Local climate investment programme, which gives up to 45% for all types of GHG reduction measures, including support to biomethane plants and filling stations (Klimatklivet 2015-2023). There is also an ongoing innovation cluster (2018-2021, around 20 million Euros) called DriveLBG, which supports investments in LBG investments, including biomethane liquefaction plants, filling infrastructures and long-haul heavy-duty vehicles.

In Sweden, a Biogas Market Investigation was done in 2020, which has been presented but not yet implemented by the parliament. In this, the production goal is set to 10 TWh of biomethane by 2030 and different production supports for biogas from manure, upgrading and liquefaction.[87]

---

[82] https://yearbook.enerdata.net/natural-gas/gas-consumption-data.html Visited 24 Jun. 2021.
[83] Decorte, Mieke (EBA); Tessens, Sam (Biogas-E); et al. 2020. D6.1 | Mapping the state of play of renewable gases in Europe. Download at: https://www.regatrace.eu/wp-content/uploads/2020/02/REGATRACE-D6.1.pdf
[84] https://www.ngva.eu/stations-map/ Visited 31 Aug. 2021.; https://www.energigas.se/fakta-om-gas/fordonsgas-och-gasbilar/statistik-om-fordonsgas/
[85] https://www.energigas.se/fakta-om-gas/fordonsgas-och-gasbilar/statistik-om-fordonsgas/ Visited 16 Jun. 2021.
[86] Decorte, Mieke (EBA); Tessens, Sam (Biogas-E); et al. 2020. D6.1 | Mapping the state of play of renewable gases in Europe. Download at: https://www.regatrace.eu/wp-content/uploads/2020/02/REGATRACE-D6.1.pdf p. 49.
[87] EBA 2020. "Statistical Report of the European Biogas Association 2020." Brussels, Belgium, January 2021. p. 105.

Summary and conclusions

The development in the biogas sector has been dependent on incentives and different kind of subsides on a political level. This is probably one reason why there is such a big difference in the countries around the Baltic Sea, see Table 1. Germany is the biggest producer of biogas in the world, see Figure 3. In a comparison of biomethane production per capita from year 2019, Denmark has the highest production with 7.5 (highest in Europe) followed by Sweden at 7.0 and Finland at 3.1. Then, Germany (2.9) and Estonia (1.6) is also mentioned but, Latvia, Lithuania and Poland are not included.[88] Production of biomethane, i.e., upgraded biogas to vehicle quality and the possibility to be injected into the gas grid, is highest in Germany. However, both Denmark and Sweden are also in a strong development phase in the biomethane sector. In Latvia, Lithuania, and Poland there are no upgrading biogas plants at all. Of the feedstock used, agriculture is the dominating source (Figure 4). Liquified biomethane, LBG (or LNG) is produced in Sweden and Finland. The infrastructure as well as long-haul vehicles has been developed the past five years and is believed to continue the coming years. In 2021, there are refuelling stations for LNG/LBG in Estonia, Finland, Germany, Poland, and Sweden.

Table 1. Summary of the biogas data from the countries around the Baltic Sea. CNG = compressed natural gas or biomethane. LNG = liquid natural gas or biomethane.

Country	Denmark	Estonia	Finland	Germany	Latvia	Lithuania	Poland	Sweden
Biogas plants	141	15	99	11269	49	36	309	210
Biogas production available for electricity generation, GWh	1842	100	950	82000	890	150	3180	760
Electricity production, GWh	700	38	180	31042	315	n/a	1209	39
Biomethane production, GWh	2667	63	156	10000	-	-	-	1350
CNG vehicles	304	1600	13000	400000	75	181	800 (buses)	54000
CNG/CBG Filling stations	19	25	52	900	5	6	25	265
LNG/LBG Filling stations	-	2	11	72	-	-	8	25

[88] EBA 2020. "Statistical Report of the European Biogas Association 2020." Brussels, Belgium, January 2021. p. 34.

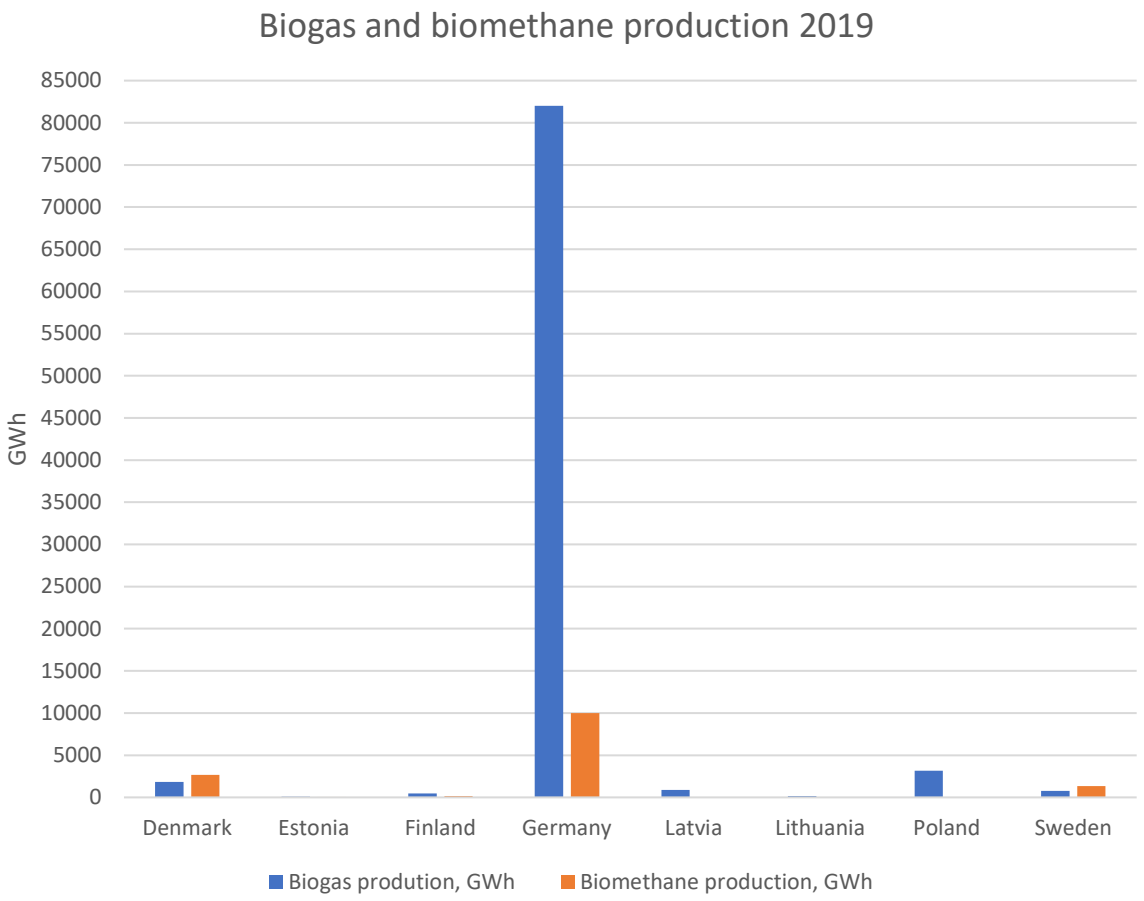


Figure 3. The production of biogas available for electricity production and biomethane the year 2019 in the countries around the Baltic Sea Region.

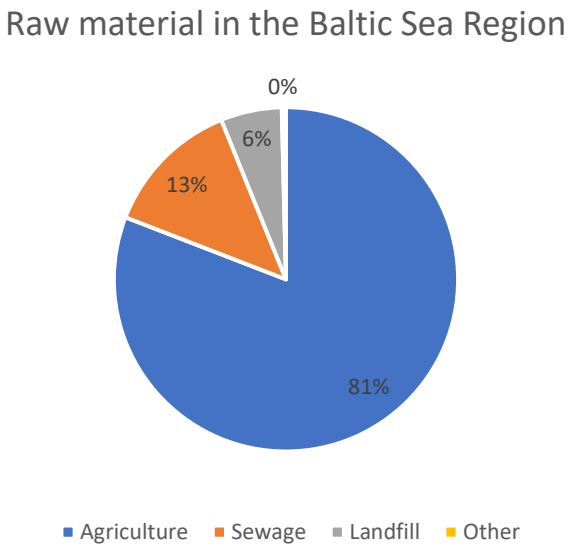


Figure 4. The raw material for biogas and biomethane production in the Baltic Sea Region.

Explanation of technical words

Bcm	Billion cubic meters
WWT	Wastewater Treatment
CNG	Compressed natural gas
CBG	Compressed biomethane
LBG	Liquid biomethane
LNG	Liquid natural gas
CHP	Combined Heat and Power
MKM	The Ministry of Economic Affairs and Transportation of Estonia
FiT	Feed in Tariff
NGVA	The Natural & bio Gas Vehicle Association
Mtoe	Million tonnes
RED/RED II	Renewable Energy Directive

Baltic Biogas Circles

BALTIC regional promotion of BIOGAS as alternative transport fuel in CIRCuLar EconomieS

A frontline project for next generation development in the biogas sector that will educate and inform individuals to promote the spread of knowledge about biogas and expansion of LNG (liquefied natural gas) and CBG (compressed biogas) stations in the Baltic Sea region. And by maintaining and extending current collaborative networks in the Baltic Sea region Baltic Biogas Circles will work towards elaborating new project ideas for the next EU program period.

PROJECT PERIOD	BUDGET
Sept. 2019 – Aug 2021	**€ 53,000**

Estonian Biogas Assciation | Zemgale Planning Region | Ekodoma Saaremaa Municipality | City of Gdynia |Gasum Sverige |Stormossen Oy

This project is funded by the Swedish Insitute