



# WBA

**WORLD BIOGAS  
ASSOCIATION**

This factsheet is part of a series being produced by the **World Biogas Association (WBA)** on the value of biogas production and use globally. You can find the full series on our website, [www.worldbiogasassociation.org](http://www.worldbiogasassociation.org).



# HOW CAN BIOGAS HELP MITIGATE CLIMATE CHANGE?

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**FACTSHEET 2**

## What is the problem?

Total anthropogenic greenhouse gas (GHG) emissions continue to increase, with around half of cumulative anthropogenic CO<sub>2</sub> emissions between 1750 and 2010 occurring in the last 40 years (IPCC: 2014). The Intergovernmental Panel on Climate Change (IPCC) find that CO<sub>2</sub> emissions from fossil fuel combustion and industrial processes contributed about 78% of the total GHG emission increase from 1970 to 2010, with a similar percentage contribution for the period 2000-2010 (IPCC: 2014).

## Who should be acting to address climate change?

The Paris Agreement, designed to limit average global temperature rise this century to well below 2 degrees Celsius above pre-industrial levels and to pursue efforts to limit the temperature increase even further to 1.5 degrees Celsius, is the first step in the global response to the threat of climate change. Achieving this ambitious goal requires all countries to put forward their best efforts through Nationally Determined Contributions (NDCs). The challenge is a collective one and businesses, NGOs, cities, and civil society across the globe have a key role in reducing emissions.

Studies by the World Bank show that the current average temperature rise of around 1°C above pre-industrial levels is creating dramatic climatic changes, with heat and weather extremes already impacting people, damaging crops and coastlines, and putting food, water, and energy security at risk (World Bank: 2014). Even if all of the pledges made at the UNFCCC COP21 in Paris were achieved, the planet would be on a course for warming of 2.6-3.1°C by 2100 (Joeri Rogelj et al: 2016).

## Why is biogas relevant to climate change?

The biogas industry is uniquely positioned to help achieve emissions reductions and mitigate many of the impacts of climate change through capturing organic wastes, producing renewable energy, and returning nutrients and organic content to the soil.

Biogas is generated through anaerobic digestion (AD), a natural process in which microbes digest organic material in sealed containers, producing biogas which can be used for cooking, heating, cooling, and electricity production or upgraded and used for vehicle fuel or gas-grid injection. This can be done on a micro scale (for buildings or small communities) and on a macro scale (for cities). Biogas can also be naturally occurring, rather than produced in digesters, such as in Lake Kivu in Africa and in mines.

## How biogas is involved in many different parts of the economy/environment

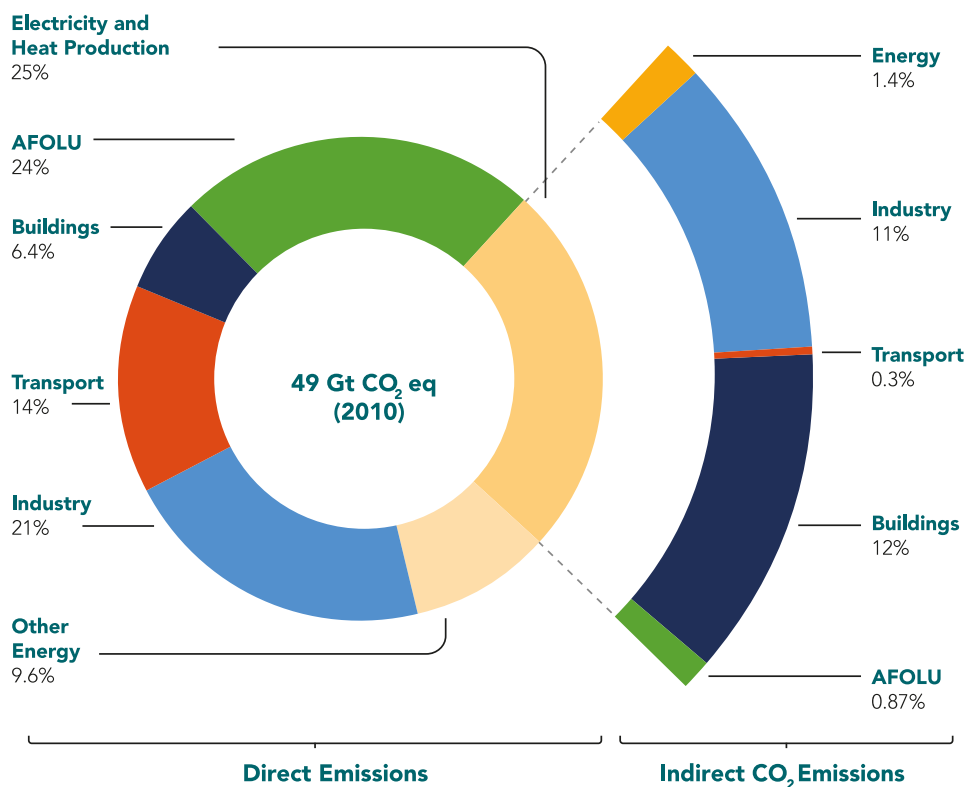
Biodegradable wastes are ubiquitous: they derive from multitudes of human social and economic activities. Such wastes can be found in: food waste from homes, restaurants, shops, and caterers; industrial production; agricultural wastes from animal husbandry, crop cultivation, and food production (such as dairy); and sewage sludge from wastewater treatment, both at city and local community level. All of these wastes emit methane but can be collected and taken to AD plants to produce renewable heat and energy, either for local use or for distribution into wider grids.

## How can biogas help reduce GHG emissions?

To achieve the Paris Agreement goals, emissions from energy generation must fall to around 80kg of CO<sub>2</sub> per MWh by 2040 – only renewables provide for this future (IEA: 2016). Biogas provides a means of mitigation to reduce the sources or enhance the sinks of greenhouse gases.

Biogas is a uniquely flexible form of energy generation. It can be used to generate baseload electricity, meet high-demand periods, provide low-carbon heat, or be upgraded for use as a transport fuel. As the graphic below shows, each of these sectors has high emissions (IPCC: 2015).

## Greenhouse Gas Emissions by Economic Sectors



**AT A GLANCE:** BIOGAS CAN REDUCE GLOBAL GHG EMISSIONS BY 18-20% AND PROVIDE RENEWABLE ENERGY FROM THE WORLD'S FOOD WASTE, INDUSTRIAL PRODUCTION WASTES, FEEDSTOCKS FROM AGRICULTURE AND SEWAGE.

**BIOGAS CAN CONTRIBUTE TO REDUCING GHG EMISSIONS IN THE FOLLOWING WAYS:**

Source of GHG emissions	Contribution of biogas
<b>GHG emissions from electricity generation</b>	<p>Renewable energy supplied 23.7% of global electricity in 2016 (REN21: 2016). Yet direct CO<sub>2</sub> emissions from the energy supply sector are projected to almost double or even triple by 2050 (IPCC: 2014). Despite low global prices for all fossil fuels and ongoing fossil-fuel subsidies, renewable generation saw record new capacity connected in 2015 and 2016. Wind and solar energy has led this charge but biogas is crucial to balance these intermittent electricity supplies.</p> <p>Biogas can reduce global emissions by 18-20%. It can be combusted to produce electricity and heat, which can be used on site or fed into electricity or district heating networks, or fed straight into the grid. For countries that do not have these networks, renewable-based mini-grids are becoming more commonplace.</p>
<b>GHG emissions in heat supply</b>	<p>Energy used for heating or cooling accounts for about half of the total world final energy consumption, with around 75% of this derived from fossil-fuel sources (REN21: 2016).</p> <p>For high-income economies, use of biomethane in existing gas networks helps reduce emissions, limits the inconvenience of change for gas customers and society overall, and provides the least expensive means of decarbonising the heat supply (Energy Networks Association: 2016).</p>
<b>GHG emissions from transport</b>	<p>There is huge potential for biogas to help decarbonise the transportation sector, which according to the IPCC accounts for 14% of global GHG emissions. 95% of the world's transportation energy comes from petrol-based fuels, largely gasoline and diesel.</p> <p>Using natural gas in place of petrol or diesel provides significantly reduced GHG emissions. Heavy-duty vehicles switching to CNG or LNG from petrol and diesel will see savings of 16% for CNG and up to 15% for LNG. Blending natural gas with just 20% renewable gas will reduce GHG emissions by 40% compared with oil-derived fuels (NVGA Europe: 2017).</p>
<b>GHG emissions from organic wastes</b>	<p>Emissions from the decomposition of food waste and other organic wastes contribute to climate change by releasing gases into the atmosphere. Globally, 46% of solid waste is organic (World Bank: 2012) and there is great potential to capture emissions and use the gas as a renewable energy source. Biogas can be generated through anaerobic digestion or landfill sites, the latter of which emit 799 million tonnes of CO<sub>2</sub>e per year or 11% of global emissions. GHG emissions also result from sewage waste. This too can be captured and used to generate renewable energy.</p> <p>Capturing and harnessing biogas from these waste streams increases awareness which can contribute to behavioural change. This can lead to reductions in waste and improved resource efficiency, in turn further reducing emissions.</p>
<b>GHG emissions from agriculture</b>	<p>After the energy sector, agriculture is the second largest GHG emitter, with farms accounting for 12% of total global GHG emissions (IPCC: 2014).</p> <p>Around 20% of these emissions result from manure, and continue to grow by around 1% per year (IPCC: 2014). Manure management systems such as AD or slurry lagoons capture this methane as it is emitted. Farms may use this gas on site to reduce their energy demand, and in some countries they may receive financial incentives for generating the renewable gas and exporting it to energy networks.</p> <p>Another important source of emissions is synthetic fertilisers, which account for 13% of agricultural emissions (IPCC: 2014). Digestate, a co-product of the AD process, avoids synthetic fertiliser use, reducing costs and associated emissions. Spreading it onto land can improve soil quality and reduce pesticide use and water demand, supporting farmers. Within 10 years synthetic fertilisers will overtake manure as a larger source of agricultural emissions. Land-use change, notably deforestation caused by farm expansion, accounted for a further 4% of global GHG emissions (WRI: 2014).</p>

## Policy recommendations

### High-income economies

- Efforts should be made to ratchet up Nationally Determined Contributions (NDCs) to increase emissions reductions under the Paris Agreement.
- We also encourage the adoption of renewable energy targets. These are critical alongside pathways for achieving these targets, including sub targets for electricity, heat, and transport.
- GHG emissions reduction can be supported through the introduction of tougher emissions limits for industry. As we detail below, WBA can help you identify best practice and advise on implementation.
- Bioenergy mandates for transport and heat should be introduced so that renewable energy efforts do not focus solely on electricity generation, where savings are easier to achieve.
- Crucial to reducing emissions and limiting average global temperature increases to 2°C or 1.5°C is stopping subsidies for fossil fuels. By diverting these subsidies to renewable energy production, we can achieve increased production as well as reduced emissions. Subsidies will only be required until there is a sufficiently high carbon price.
- High-income countries should also introduce resource efficiency measures such as separate food waste collections and a ban on sending organic waste to landfills.

### Middle-income economies

- Every country should ensure that policies are in place to transition from coal and oil to natural gas and biogas.
- We encourage the use of all wastes for bioenergy. Food waste, industrial production wastes, agricultural wastes and sewage all provide energy potential while simultaneously recycling these wastes and reducing emissions from them.
- Digesters should be mandated for highly profitable industries such as palm oil that emit methane from the burning of wastes.

### Low-income economies

- We encourage countries to invest in decentralised energy generation as well as traditional large power stations. Countries should subsidise and encourage the use of clean fuels for domestic heat and energy supplies and remove subsidies for fossil fuels.
- Government incentives should be introduced for the generation of renewable energy. This could be supported by a programme to support the collection of waste, rewarding per tonne of waste collected.



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## What can you do now to make a difference?

- a.** As a policy maker you can *initiate a discussion with stakeholders* on implementing the policy priorities listed above. Comprehensive support from wide sectors of the economy and society will be needed to implement policy changes. WBA can facilitate the discussion around changes to energy and waste-management policies.
- b.** Analyse *which policies are achievable in what time frame* in your specific context. Small steps forward are better if they are all you can achieve, rather than attempting a major reform that is widely opposed. WBA can help you understand and implement policies.
- c.** *Encourage understanding* of how other countries and cities have succeeded in adopting policies. WBA can help you with arranging site visits, meeting officials from other countries, and exchanging experiences.
- d.** As a business, *sustainable practices should be made a core value*. Biogas adoption may help reduce GHG emissions in your operations, reduce the treatment costs of biodegradable wastes, and create energy and heat for your plant needs.

For more information on the SDGs and biogas, please read our comprehensive report available for free at

[www.worldbiogasassociation.org/wba-report/](http://www.worldbiogasassociation.org/wba-report/).

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