The contribution of Anaerobic Digestion and Biogas towards achieving the UN Sustainable Development Goals

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EXECUTIVE SUMMARY

In September 2015, the United Nations adopted 17 aspirational Sustainable Development Goals (SDGs) and 169 targets to end poverty and hunger in all its forms, protect the planet from degradation, ensure prosperous, fulfilling and peaceful lives for all to be realised through a global partnership.

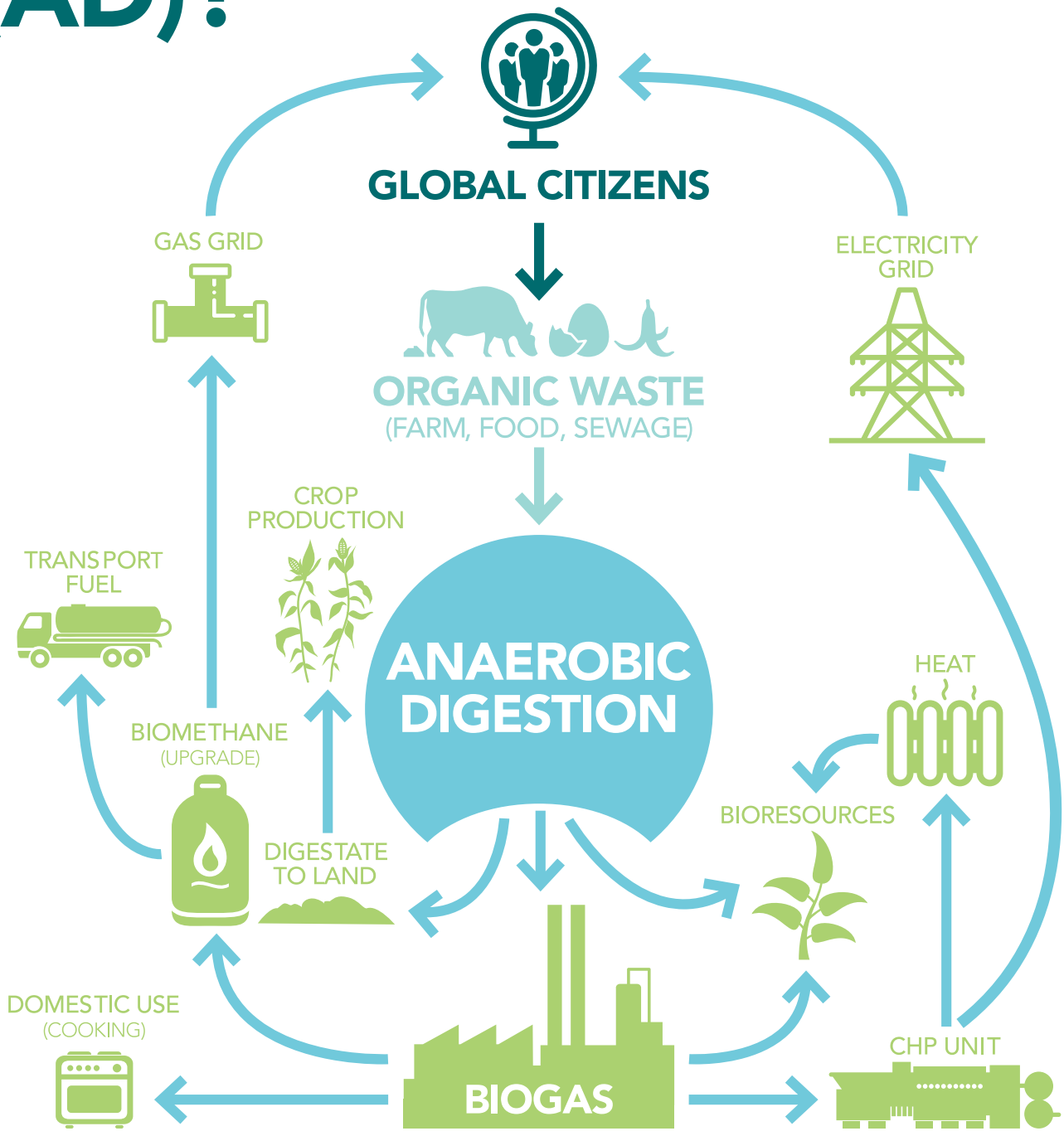
Further in December 2015, 195 countries met at the United Nations Framework Convention on Climate Change (UNFCCC) in Paris and made legally binding commitments to reduce Greenhouse Gas (GHG) emissions to keep the heating of global temperature to less than 2°C, but with a target of less than 1.5°C. Those commitments were ratified by enough nations in October 2016, including the USA, China, India and the EU, to have legal force and therefore to compel countries to take GHG reduction measures within a set time frame. The Paris Agreement came into force on 4 November 2016.

According to the United Nations Environment Programme (UNEP), current commitments made by governments are only sufficient to keep warming below 3°C and, therefore, urgent action is required if we are to avoid dangerous levels of global warming.

Anaerobic digestion (AD) and biogas technologies make a significant contribution to these targets and goals, not only through generating ultra-low carbon energy and biofertiliser, but also through the reduction of harmful methane emissions from food and farming wastes, providing energy and food security, improving waste management and sanitation, and reducing poverty and hunger.

This paper presents the evidence to support the need for wide adoption of anaerobic digestion and biogas technologies in order to meet the UNFCCC COP 21 Commitments and UN Sustainable Development Goals. With the ability to reduce global GHG emissions alone by close to 20%, the potential of these technologies to contribute to a sustainable and carbon neutral future is immense.

WHAT IS ANAEROBIC DIGESTION (AD)?

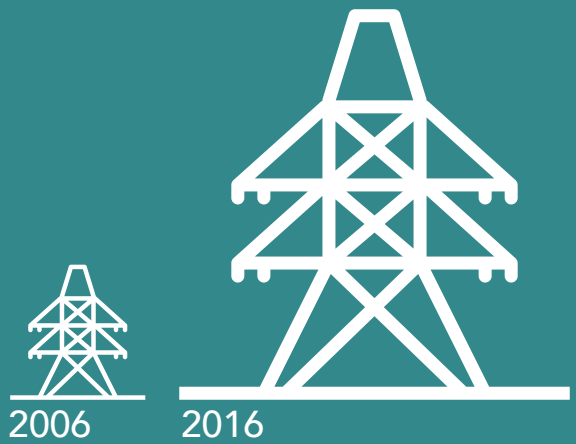


AD is a natural process in which microbes digest plant material in sealed containers, producing biogas which can be used for cooking, heating, cooling and electricity production or upgraded and used for vehicle fuel or gas grid injection. Biogas is a mixture of methane, carbon dioxide and other gases. A co-product of the anaerobic digestion process is a biofertiliser called 'digestate', containing water, crop nutrients and organic carbon for soils. The digestate biofertiliser may be composted or separated into liquid and solid fractions before being applied to land. Where feedstock potentially contains pathogens, AD can reduce or eliminate many of these, so is essential in regions of poor sanitation. AD can also be integrated into biorefineries, supporting the creation of high value bio-products.

Anaerobic Digestion contributes to the UN Sustainable Development Goals and Paris Targets

Anaerobic digestion contributes to at least nine of the 17 Sustainable Development Goals agreed by the countries of the United Nations to be achieved by 2030

With investment in new areas of research, estimates show biogas could produce up to 60%[1] of current coal power generation, thereby reducing global greenhouse gas emissions by 18-20%[2]. This is based on the use of wastes, agricultural residues and novel crops which can be integrated into food and fodder crop cultivation to supply energy and also increase food production[3]. There are currently an estimated 48 million small scale and over 20,000 medium to large scale digesters currently operating globally. The biogas based installed electrical capacity has grown 170% since 2006 to 14.6 GW and employs 381,000 people globally. In addition, biogas is captured from numerous landfills globally, reducing uncontrolled methane gas emissions and odours while generating energy.



[1] The potential for biogas generation, including from CAM crops, is 5.5 PWhe, and coal generation is 9.1 PWhe (i.e. 60% of coal) **http://rsc.li/2fPlsny**

[2] Fossil fuel combustion for energy accounts for 68% of total greenhouse gas emissions. Coal is 45% of the fossil fuel combustion for energy. So coal is over 30% of emissions given that coal has higher emissions per unit of energy produced than fuels such as natural gas. **http://bit.ly/2bPz4Rs** If biogas displaced 60% of coal emissions, it would reduce global emissions by 18%. Biogas also reduces methane emissions from waste and manure management.

[3] **http://rsc.li/2fPlsny**

SUSTAINABLE DEVELOPMENT GOAL	CONTRIBUTION OF AD
 **GOAL 2** End hunger, achieve food security and improved nutrition and promote sustainable agriculture	• Restoring soils through the recycling of nutrients, organic matter and carbon • Increasing crop yields through use of nutrient-rich digestate biofertiliser • Recircularing phosphorus, which is essential for the growth of plants but limited in supply
 **GOAL 3** Ensure healthy lives and promote well-being for all at all ages	• Reducing indoor air pollution by substituting solid biomass-based domestic fuels with biogas • Treating and recycling organic wastes to reduce odours and the spread of diseases
 **GOAL 5** Achieve gender quality and empower all women and girls	• Reducing the burden of collecting firewood to improve the quality of women and children's lives
 **GOAL 6** Ensure availability and sustainable management of water and sanitation for all	• Providing decentralised, local treatment of biosolids in remote and rural communities to reduce odours and the spread of disease • Stabilising and recycling biosolids through anaerobic digestion to allow it to be applied back to land • Reducing the carbon loading of wastewater to reduce impact on water bodies
 **GOAL 7** Ensure access to affordable, reliable, sustainable and modern energy for all	• Reducing dependence on fossil-fuel based energy sources by replacing with biogas • Capturing waste heat from co-generating units linked to biogas plants • Utilising locally produced waste and crops to generate energy for rural and remote communities • Storing biogas to produce energy when required
 **GOAL 9** Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation	• Improving the self-sufficiency and sustainability of industries by extracting the energy from their own effluents • Collaboration between industries and agriculture for mutual benefit • Generating short term construction employment and long term equipment manufacturing and maintenance employment • Encouraging growth of micro-enterprises by providing reliable electricity
 **GOAL 13** Take urgent action to combat climate change and its impacts	• Reducing carbon dioxide emissions by replacing fossil fuel-based energy sources with biogas and commercial fertilisers with digestate biofertiliser • Reduction of methane and nitrous oxide emissions from livestock manures • Capturing emissions from landfills • Reducing deforestation by replacing solid biomass based domestic fuels with biogas
 **GOAL 15** Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reserve land degradation and halt biodiversity loss	• Recirculating nutrients and organic matter in organic wastes through anaerobic digestion and returning them to the soil in the form of digestate biofertiliser • Substituting firewood with biogas as a domestic fuel reduces deforestation

CLIMATE CHANGE MITIGATION

UN SUSTAINABLE DEVELOPMENT GOAL 13
TAKE URGENT ACTION TO COMBAT CLIMATE CHANGE AND ITS IMPACTS

UNFCCC COP21 commitments

In December 2015, 195 countries adopted the UNFCCC Paris Agreement and thereby agreed to a global action plan to keep global warming to well below 2°C with an aim to limit the increase to 1.5°C. The need for peak global emissions to be reached soon and thereafter rapidly reduced has been recognised. In addition to nationally determined targets, commitments from cities, regions, local authorities and the private sector have been invited (European Commission, 2016). The greenhouse gas (GHG) emission reduction benefits of anaerobic digestion can play a role in achieving these targets by abating emissions related to energy production, agriculture and waste management.

Fossil fuel substitution and CO_2 emissions reduction

Globally, heat and electricity production is fuelled primarily by coal, natural gas and petroleum products. Carbon dioxide emissions from consumption of the energy thus produced account for 25% of total anthropogenic GHG emissions (IPCC, 2014). Renewable energy derived from biogas produced from organic wastes and agricultural by-products not only substitutes fossil fuels but also reduces carbon dioxide emissions by completing the carbon cycle.

Methane and nitrous oxide from livestock manures

Livestock emissions account for 14.5% of total anthropogenic GHG emissions, mainly in the form of carbon dioxide, methane and nitrous oxide (Gerber, et al., 2013). Methane (CH_4) and nitrous oxide (N_2O) are greenhouse gases that are 21 and 310 times more damaging than CO_2. Treating manures through anaerobic digestion reduces the formation of nitrous oxide and captures the methane as biogas, which can be used for energy generation. This has the multiple benefits of reduced GHG emissions from farms and energy generation, the substitution of fossil fuels and production of nutrient rich digestate biofertiliser.

Emissions from landfills

While increasing numbers of countries and cities are separately collecting the organic fraction of municipal solid waste, landfills globally still account for 700 million tonnes of methane emissions annually (US EPA, 2012). Extraction of landfill gas from operating and closed landfills and diversion of additional organic waste to AD will lead to reduced emissions, recirculation of nutrients via digestate and use of biogas to generate energy.

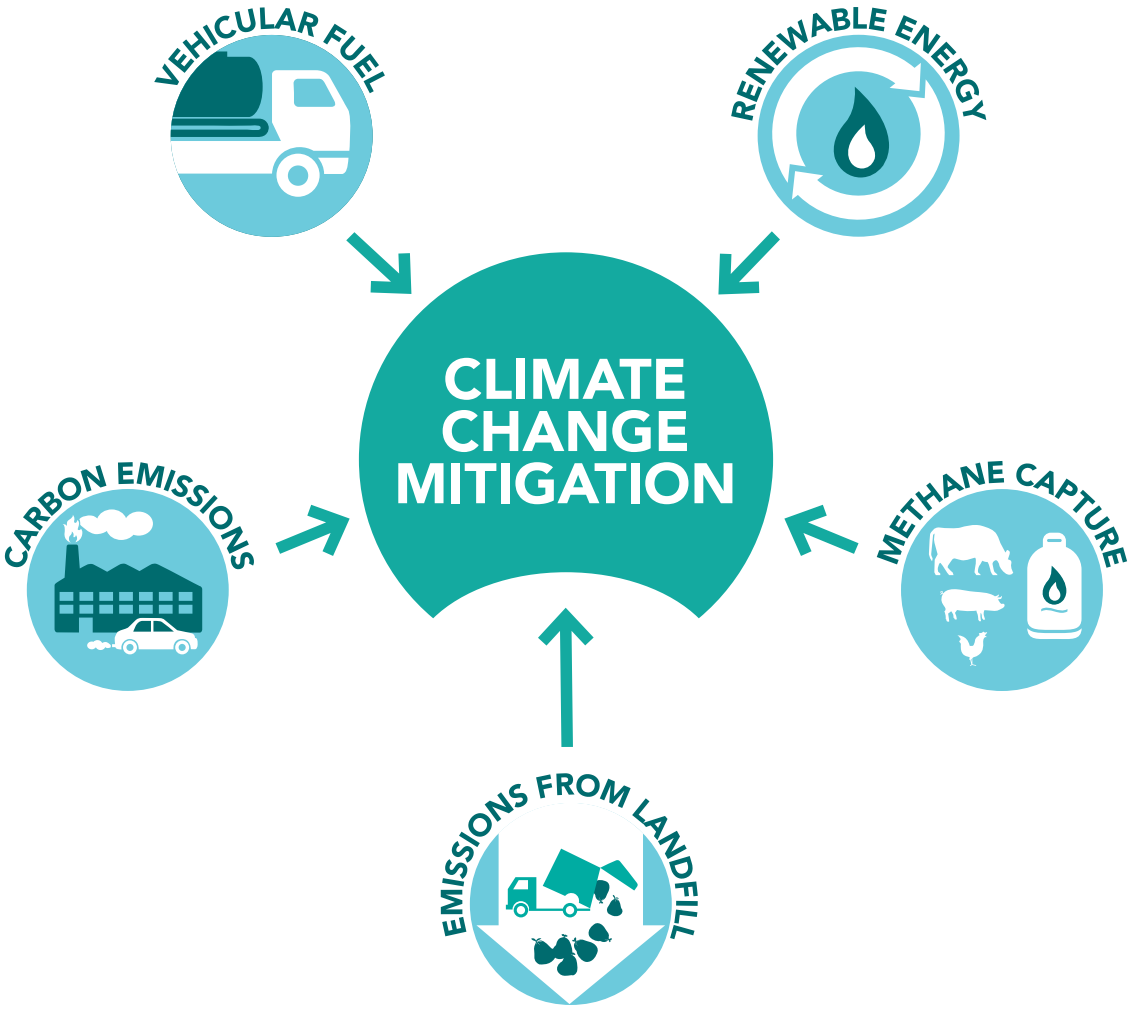
Domestic fuel substitution

Globally, an estimated 1.6 million deaths are attributed to indoor air pollution - caused largely by use of firewood, crop residues, dried animal dung and crop waste as domestic fuel (Berkeley Air Monitoring Group, 2015). Additionally, use of firewood is one of the leading causes of deforestation, which in turn contributes to the build-up of greenhouse gases. The use of biogas produced externally from the digestion of household and agricultural wastes as a cooking fuel can mitigate indoor air pollution and abate deforestation.

Transport sector

The transport sector is fuelled 95% by petroleum based fossil fuels and accounted for 14% of all anthropogenic GHG emissions in 2010. The use of crop and organic waste-derived biogas upgraded to biomethane as vehicular fuel completes the carbon cycle rather than adding further fossil fuel sequestered carbon into the atmosphere.

BIOGAS CAN REDUCE GLOBAL GREENHOUSE GAS EMISSIONS BY 20%



CASE STUDIES

RATCHABURI FARMS BIOGAS PROJECT, Nongbua Farm, Thailand

- Digests swine barn flushing wastewater.
- Reduces emissions by 13,150tCO_2 eq. per annum (CDM registered and verified).
- Replaces fossil-derived imported grid electricity.
- Biofertiliser from the wastewater replaces commercial fertilisers in local farms and school (UNFCCC, 2008).

EXPLOITATION OF BIOGAS FROM CONTROLLED LANDFILL IN SOLID WASTE MANAGEMENT CENTRAL – CTRS / BR.040, Belo Horizonte, Brazil

- Landfill gas generated from 17.4million m^3 of solid urban waste collected over 32 years.
- The landfill gas, primarily methane, is collected and used to power a 4.278MW installed capacity electricity generation plant. The electricity produced is fed into the national grid, substituting fossil fuel based energy.
- Greenhouse gas emissions equivalent to 134,160 metric tonnes of CO_2 eq are offset on an annual basis, in the form of emissions avoided by the capture of landfill gas as well as the generation of renewable energy.

ENERGY SECURITY

UN SUSTAINABLE DEVELOPMENT GOAL 7
ENSURE ACCESS TO AFFORDABLE, RELIABLE, SUSTAINABLE AND MODERN ENERGY FOR ALL

Peak fossil fuel

Globally, approximately 80% of energy is still produced from fossil fuels (International Energy Agency, 2015). With Peak Oil production expected to be reached in the next decade, finding alternative, sustainable sources of energy has become imperative. Anaerobic digestion can play a part in filling the gap by utilising waste-derived biogas to produce energy (electricity, heating, cooling, transport).

Substituting fossil fuels for heat

Both residential and industrial establishments rely on natural gas or oil to meet their heat requirement. Upgraded biogas produced from waste, which has similar properties to natural gas, can support this requirement and reduce dependence on fossil fuels.

Substituting vehicular fuel

Biogas upgraded to compressed or liquefied biomethane can be used to fuel natural gas vehicles like cars, vans, heavy goods vehicles (HGVs) and buses. As of 2015, there are an estimated 22 million natural gas vehicles on the road that can be switched to biomethane without needing modification (NGV Journal, 2015).

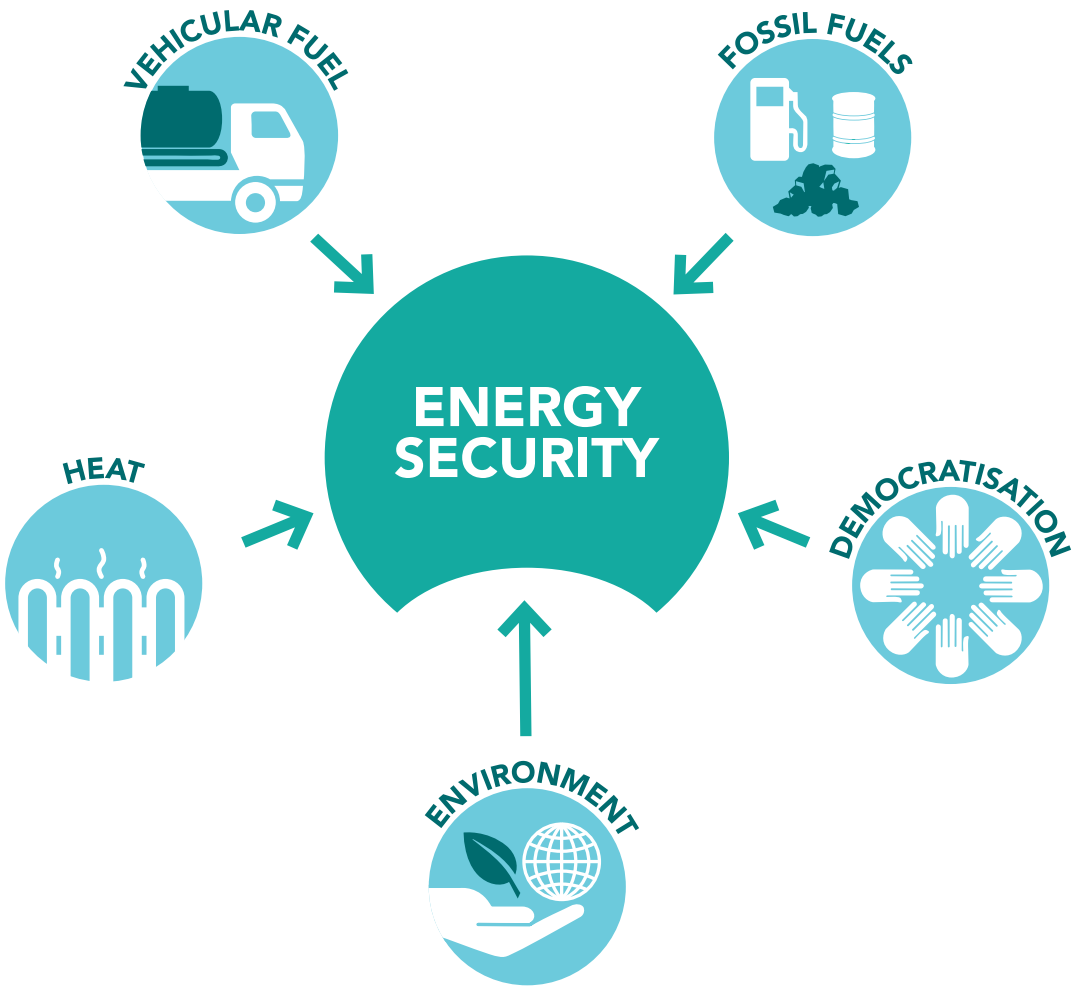
Decentralisation of energy

Anaerobic digestion offers an opportunity for decentralisation and democratisation of energy generation. Rural and remote communities which are not connected to the electricity and gas grids are able to produce their own from the waste and the agricultural residues that they produce and can become energy self-sufficient.

Energy available when it is needed

Anaerobic digestion, once started and stabilised, produces biogas on a continuous basis independently of external environmental factors such as the sun shining or the wind blowing. Biogas when not required can be stored within the digester, in a small scale gas holder or injected into an existing gas grid. It can, therefore, be used to fulfil baseload as well as peak energy requirements in tandem with other energy producing technologies.

BIOGAS FROM THE WORLD'S FOOD WASTE COULD POWER THE WHOLE OF BRAZIL



CASE STUDIES

RAINBARROW FARM ANAEROBIC DIGESTION PLANT, Poundbury, Dorset, UK

- Digests maize and grass silage, potato waste, food waste including chocolate and muesli.
- Exports enough biomethane to the gas grid to fulfil annual heat requirement of 3,200 new build houses.
- Generates electricity to cover parasitic load as well as export to the electricity grid.
- Replaces inorganic fertilisers on the neighbouring farms growing the feedstock.

LINKOPING BIOGAS PLANT, Sweden

- Digests abattoir, industrial organic waste, manure from pigs and cattle and some household waste.
- The biogas produced is upgraded to be used as vehicular fuel for:
  - 64 public transport buses.
  - 12 public filling stations for private cars, taxis and distribution vehicles from different companies.
  - World's first biogas train run between Linkoping and Vastervik, Sweden.
- Resultant emissions reduction from 4.7 million m^3 of upgraded biogas is estimated at 9,000 tonnes CO_2 eq. per year.
- The digestate biofertiliser produced is certified according to the Swedish certification system SPCR 120 and recycled to 17 nearby farms.

FOOD SECURITY

UN SUSTAINABLE DEVELOPMENT GOAL 2
END HUNGER, ACHIEVE FOOD SECURITY AND IMPROVED NUTRITION AND PROMOTE SUSTAINABLE AGRICULTURE

UN SUSTAINABLE DEVELOPMENT GOAL 15
PROTECT, RESTORE AND PROMOTE SUSTAINABLE USE OF TERRESTRIAL ECOSYSTEMS, SUSTAINABLY MANAGE FORESTS, COMBAT DESERTIFICATION, AND HALT AND RESERVE LAND DEGRADATION AND HALT BIODIVERSITY LOSS

Increased crop yields

After digestion of the feedstock, the solid and liquid fractions left over can be used as an organic amendment/soil improver (digestate or composted digestate biofertiliser) on farms in place of energy intensive chemical fertilisers. Use of digestate biofertiliser has been demonstrated to increase crop yields (Consorzio Italiano Biogas e Gassificazione, 2015).

Phosphorus recycling

Phosphorus is widely used in agriculture to promote the growth and maturity of plants. However, the world's phosphorus supply is limited, becoming increasingly scarce and concentrated in only a few countries (most of the world's reserves are owned or controlled by Morocco, China and the US) (Cordell, Drangert and White, 2009). Due to inefficiencies in use, phosphorus is lost to surface water bodies where it causes toxic algal blooms. Phosphorus recovered from dewatering liquors left over from the digestion of waste water can be sold and used as biological struvite on agricultural land.

Soil degradation

Globally, 52% of the land used for agriculture is moderately or severely affected by soil degradation (United Nations Convention to Combat Desertification, 2014). By recycling the nutrients in the soil through the anaerobic digestion of primary, break and catch crops and organic wastes, and returning them to the soil in the form of digestate biofertiliser, desertification of land can be prevented and reversed. This is a vital step towards ensuring food security.

Deforestation

1.6 billion rural people around the world are to some extent dependent on forests for food, fuel or fodder needs. Overcutting of vegetation for use as wood fuel and charcoal in rural communities contributes to deforestation and degradation of forests (Chao, 2012). By digesting livestock manures, agricultural residues and biosolids to generate biogas which can be used as domestic fuel, land degradation and deforestation can be reduced.

Nutrient recycling

In developed countries, where 40% of food waste occurs at retail and consumer levels, collection and treatment of food waste can ensure that the nutrients are returned to farmland in the form of digestate biofertiliser, rather than being lost in landfill or through incineration (FAO, 2011).

THE WORLD'S FOOD WASTE CONTAINS $190 MILLION OF RECOVERABLE MINERAL PHOSPHATE

CASE STUDIES

FARM ON PO RIVER PLAIN, Italy

- Digests animal manure, cover crops including nitrogen fixing plants, livestock effluents, perennials grown on set-aside land or land undergoing desertification, agricultural by- products and organic wastes.
- The biogas generated is used to power an electricity generation unit of 1MW.
- The digestate is applied back to the farm.
- The introduction of anaerobic digestion under the 'Biogas done right' regime has resulted in:
  - Recirculation of nutrients and increase in harvest yield via use of digestate biofertiliser.
  - Significantly increased carbon content of the soils.
  - Better soil coverage and reduced leaching and run-off due to cover crops.
  - Self-sufficiency in fertilisers.
  - Increased production of crop residues such as straw for the livestock.

RICHGRO ANAEROBIC DIGESTION PLANT, Jandakot, Australia

- Digests solid and liquid wastes from nearby breweries, chicken farms, supermarkets and other food and beverage waste.
- The digestate, which is rich in living micro-organisms and nutrients, is blended with other garden composting products to be sold as commercial biofertiliser.
- The biogas produced is used for 2MWe electricity generation which is utilised on-site and excess exported to the grid.
- The excess heat generated is channelled to the on-site hot houses where blueberries are grown.

RURAL EMPOWERMENT /DOMESTIC FUEL SUBSTITUTION

UN SUSTAINABLE DEVELOPMENT GOAL 3
ENSURE HEALTHY LIVES AND PROMOTE WELL-BEING FOR ALL AT ALL AGES

UN SUSTAINABLE DEVELOPMENT GOAL 5
ACHIEVE GENDER QUALITY AND EMPOWER ALL WOMEN AND GIRLS

Domestic fuel substitution

It is estimated that about 3 billion people worldwide rely on solid biomass fuels like dried dung cakes, firewood, crop residues, straw or other agricultural residues for heat and cooking (Berkeley Air Monitoring Group, 2015). The burden of collecting firewood and exposure to air pollutants from domestic cooking bears primarily upon women and children in developing countries. Introduction of anaerobic digestion and biogas as domestic fuel could have a very positive impact on the quality of rural life and indeed is already widely used in countries such as Bangladesh and India.

Indoor air pollution reduction

Approximately 4 million deaths and 110 million disability -adjusted life years have been attributed to the exposure to emissions from burning of solid biomass fuels domestically. The resultant emissions include black carbon, a short lived climate pollutant known to disrupt monsoons and accelerate melting of glaciers, thereby threatening water and food security of the masses (Climate and Clean Air Coalition, 2016). Burning of biogas instead of biomass can reduce the exposure of residents to a number of these pollutants, thus improving their health and wellbeing (Berkeley Air Monitoring Group, 2015).

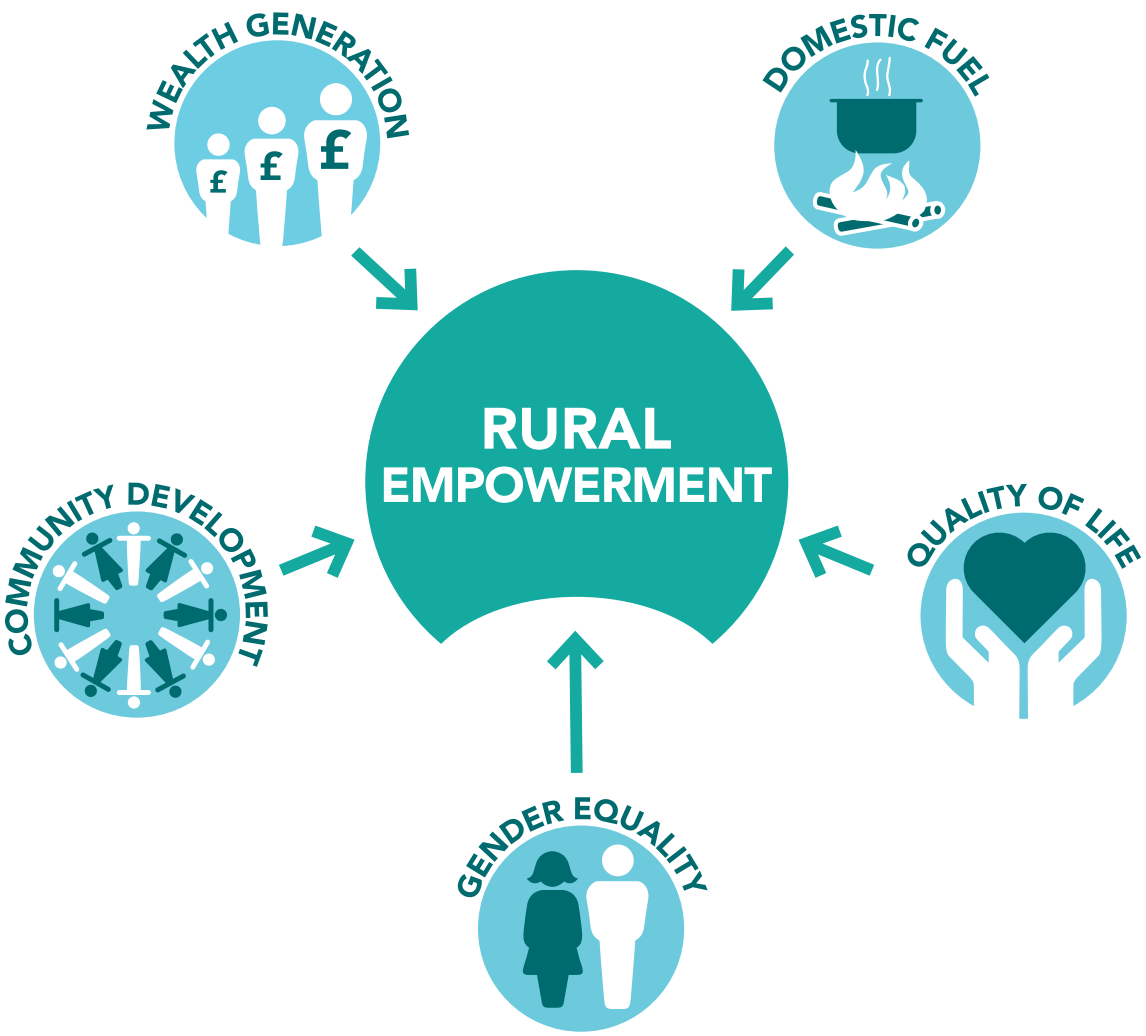
Community development

Biogas can offer the community a unique opportunity of working together during construction of the plant, collection of feedstocks, their digestion and the subsequent distribution of benefits of digestion in the form of biogas, electricity and digestate biofertiliser.

Additional income stream

Anaerobic digestion can also be an opportunity for the household or the community to generate additional income by selling any excess biogas and digestate biofertiliser.

45 MILLION MICRO-DIGESTERS ALREADY PROVIDE CLEAN ENERGY FOR MILLIONS OF 'OFF-GRID' RURAL COMMUNITIES



CASE STUDIES

COMMUNITY OF SANTA ROSILLO, Peruvian Amazonis, Peru

- Isolated community in Peru Amazon of 224 people with no access to the national electricity grid.
- Digests cattle manure collected from the corral of an existing cattle herd.
- Biogas based mini-electrical grid now provides electricity for domestic use, public lighting, institutional use (school, community hall, church) and other productive/business uses.
- Improved pastures and reduced pressure on surrounding forests have been observed.

SOCIAL EDUCATION AND DEVELOPMENT SOCIETY BIOGAS CDM PROJECT, Andhra Pradesh, India

- 4,475 micro-digesters (size $2m^3$) commissioned and 569 under construction, as of 31st October 2015.
- Digest cattle dung for the production of biogas for cooking and hot water heating.
- Reduced burning of firewood collected from a meagre forest area in a drought-prone area for domestic use by diversion to biogas.
- 17,485tCO_2 CDM verified emissions reduced in 2014/15.
- Aimed at social benefits e.g. reduced drudgery for women from firewood collection, better health of women and children by reduced smoke in kitchen, improved education of children with women having more time to dedicate to them.

WASTE MANAGEMENT

UN SUSTAINABLE DEVELOPMENT GOAL 6
ENSURE AVAILABILITY AND SUSTAINABLE MANAGEMENT OF WATER AND SANITATION FOR ALL

UN SUSTAINABLE DEVELOPMENT GOAL 11
MAKE CITIES AND HUMAN SETTLEMENTS INCLUSIVE, SAFE, RESILIENT AND SUSTAINABLE

Sanitation

As of 2015, of the 7.4 billion population of the world, 2.4 billion people still lack basic sanitation. Anaerobic digestion of biosolids promotes a sanitary and hygienic environment by providing decentralised and local treatment of these wastes. This helps in the prevention of bacterial infections, diarrhoeal diseases like cholera, trachoma, schistosomiasis and hepatitis (UNICEF and WHO, 2015).

Sludge stabilisation

In those parts of the world where biosolids are collected and treated in waste water treatment plants, anaerobic digestion can be used to stabilise the sewage sludge before being applied as biofertiliser back to agricultural land. Anaerobic digestion reduces the carbon loading of the water and hence makes the waste water less damaging for aquatic bodies and life, if discharged. Digestion of solid organic waste and wastewater can make these treatment facilities self-sufficient in terms of economics as well as energy. Where the collection infrastructure is not available, small scale decentralised treatment solutions are being developed and implemented.

Landfills

With ever reducing landfill space and the environmental threat it poses to adjoining soil and groundwater, diversion of organic matter from landfills not only offers a way to reduce emissions but is also a responsible waste management strategy. Proper management of organic waste is essential to prevent the spread of diseases like leptospirosis, plague, dengue fever and other bacterial and viral diseases transmitted by mosquitoes, flies, rodents, etc. (Rottier and Ince, 2003) and for improvement of the quality of air in landfill neighbourhoods.

COLLECTION AND TREATMENT OF BIOSOLIDS IN MICRO-DIGESTERS CAN IMPROVE SANITATION FOR OVER 2.4 BILLION PEOPLE

CASE STUDIES

TOILET AND BATH COMPLEX, SULABH INTERNATIONAL, Nasik, India

- Digests excreta collected from 148 toilets used by about 30,000 people everyday.
- Electricity produced covers the illumination and water heating needs of the complex.
- Operated on a pay-per use basis.
- Liberation and rehabilitation of scavengers.

WASTE MANAGEMENT – LOS ANGELES COUNTY SANITATION DISTRICT, California, USA

- Digests primary and secondary wastewater biosolids, urban residential and commercial food waste.
- The biogas produced is used to generate electricity and heat for digester and on-site use. The plant is energy neutral on an annual basis.
- The digestate is used for direct land application, composting or landfill daily cover.
- The project was implemented at an existing municipal wastewater digester and can be replicated by other cities.

SUSTAINABLE INDUSTRIALISATION

UN SUSTAINABLE DEVELOPMENT GOAL 9
BUILD RESILIENT INFRASTRUCTURE, PROMOTE INCLUSIVE AND SUSTAINABLE INDUSTRIALISATION AND FOSTER INNOVATION

Industrial effluents

Digestion of effluents from industrial processes like palm oil mill effluent, breweries, abattoirs etc, can reduce the environmental impacts of these processes and also generate energy for their operations, thus furthering their sustainability and self-reliance.

Collaboration between commercial and agricultural enterprises

Fostering collaboration between complementary agriculture and industries where the former provides the feedstocks for digestion while the latter can use products of digestion, like heat, electricity, biogas or biomethane on-site, is environmentally and economically beneficial for both.

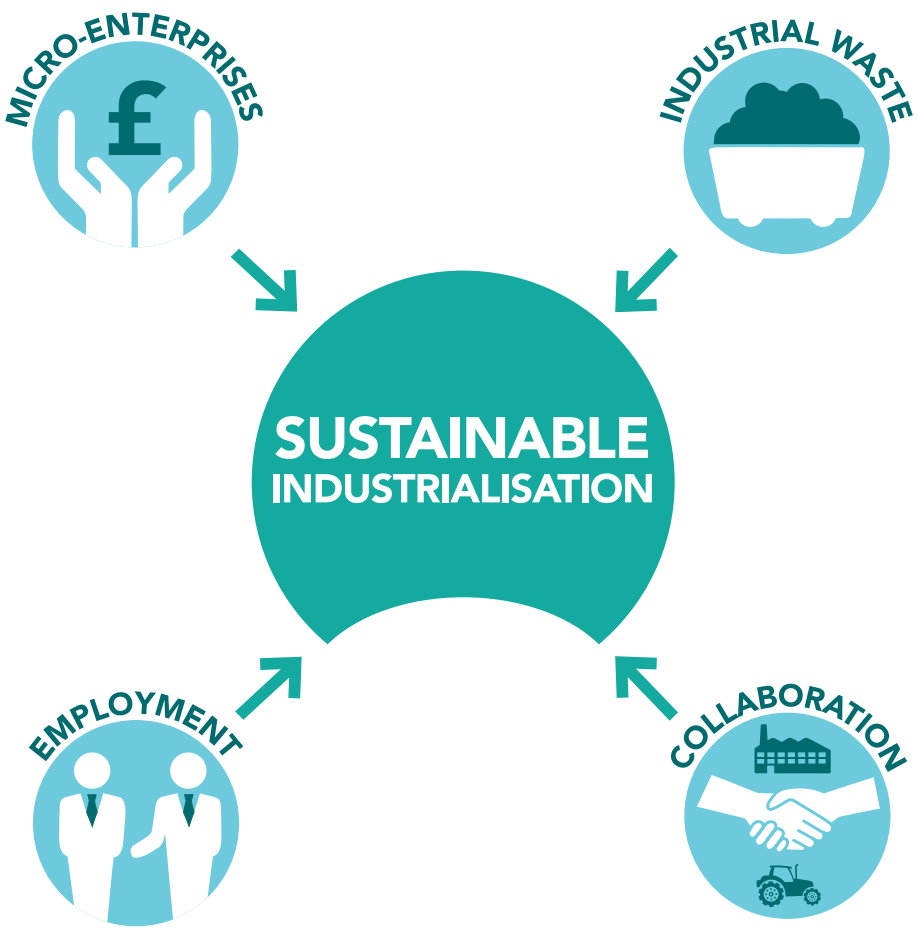
Employment generation

As of 2015, it is estimated that 381,000 people are directly and indirectly employed in the production of energy from biogas (IRENA, 2015). Employment is expected to increase with growth in the sector.

Enterprise development

The availability of reliable electricity encourages the development of small rural enterprises like handicrafts, bakeries, agriculture related businesses, etc. Thus taking the benefits of industrialisation to all sections of society.

700 MILLION TONNES OF METHANE EMITTED FROM LANDFILLS COULD POWER OVER 1.8 MILLION HOMES



CASE STUDIES

BRONKHORSTSPRUIT BIOGAS PLANT (PTY) LTD, South Africa

- Digests cattle manure, paper sludge, food and abattoir waste.
- Under a 10 year renewable energy partnership with BMW, the electricity produced is supplied via the power grid.
- First commercially viable biogas plant in South Africa.
- Strong partnerships between Beefcor, BMW, Bio2Watt, City of Tshwane and Eskom.

BIOGAS PLANT, Skrzatusz, Poland

- Digests distillery slop, potato pulp, corn silage and carrot pomace as the main feedstocks with additional possibility of treating offal and bad quality grain.
- The biogas produced powers a cogeneration unit backed up by a boiler, in the event of engine failure.
- The heat produced is used to meet the needs of the digester and those of the distillery to produce ethanol.
- The electricity is exported to the grid and the digestate is used as biofertiliser by local farms.
- Showcases the use of local waste resources for renewable energy generation.

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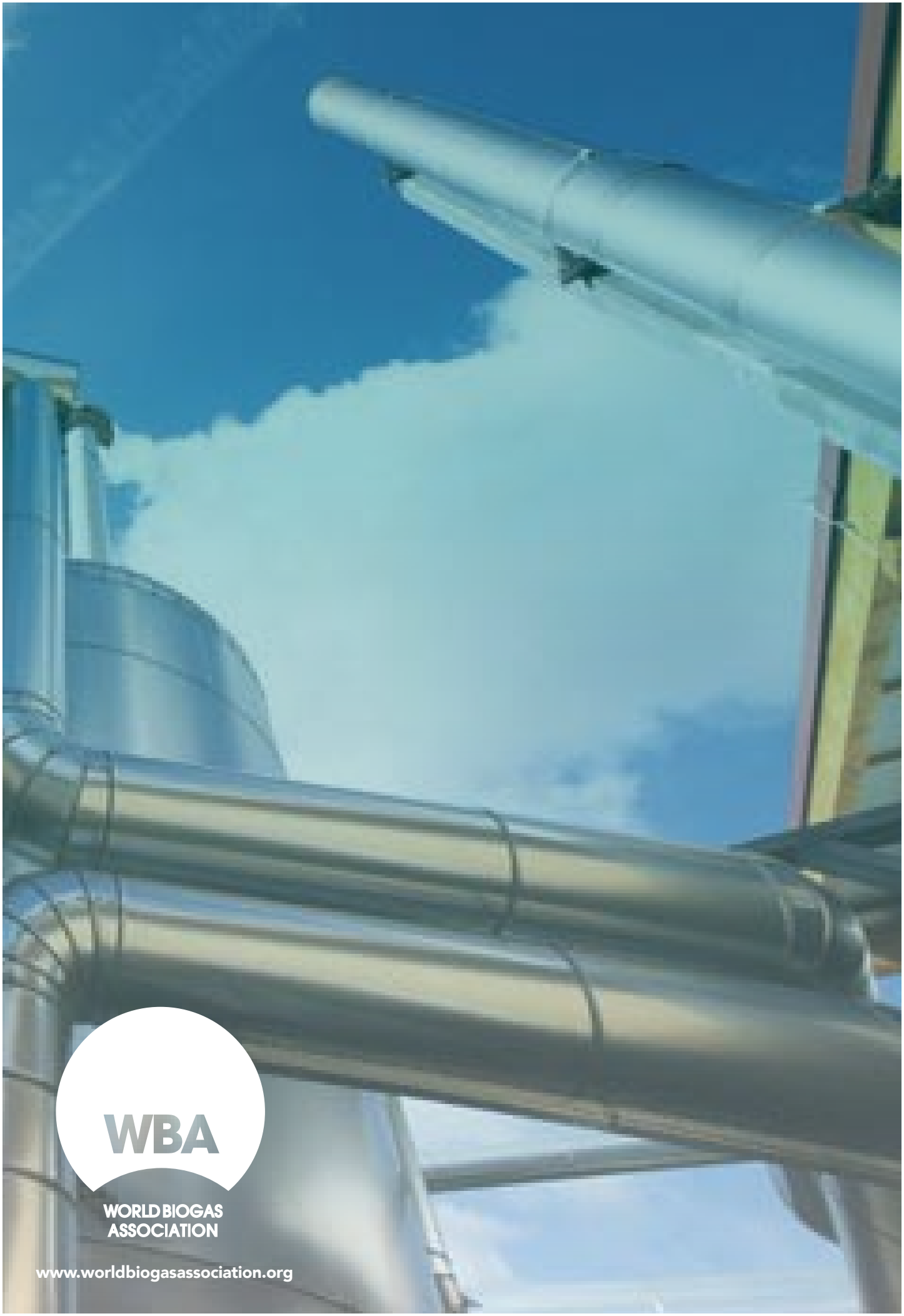
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