Biogas: Reducing Emissions, Advancing Recovery and Use

The Global Methane Initiative (GMI)

The Global Methane Initiative (GMI) is a voluntary, multilateral partnership that aims to reduce global methane emissions and to advance the abatement, recovery and use of methane as a valuable clean energy source. GMI achieves this by creating an international network of partner governments, private sector members, development banks, universities and non-governmental organizations to conduct assessments, build capacity, create partnerships, and share information to facilitate project development for methane reduction in Partner Countries.

Launched in 2004, GMI is an international effort dedicated to the abatement, recovery and use of methane focusing on five key methane emission sources: agriculture, coal mines, municipal solid waste (MSW), municipal wastewater, and oil and gas systems. GMI works in concert with other international organizations and agreements—including the Climate and Clean Air Coalition, United Nations Economic Commission of Europe, and United Nations' Framework Convention on Climate Change—to reduce greenhouse gas (GHG) emissions. Unlike other GHGs, methane is the primary component of natural gas and can be converted to usable energy. Methane mitigation, therefore, serves as a cost-effective method to reduce GHGs and increase energy security, enhance economic growth, improve air quality and improve worker safety.

Why Target Methane?

Methane is the second most abundant anthropogenic GHG after carbon dioxide (CO_2), accounting for about 20 percent of global emissions. Methane is considered a "short-term climate pollutant," meaning it has a relatively short lifespan in the atmosphere of approximately 12 years. Though methane is in the atmosphere for a shorter period of time and is emitted in smaller quantities than CO_2, its global warming potential (i.e., the ability to trap heat in the atmosphere) is 25 times greater.[1] Thus, methane emissions contribute to about one-third of today's anthropogenic GHG warming.

Methane is emitted during the production and transport of coal, natural gas, and oil. Emissions also result from the decay of organic matter in MSW landfills, some livestock manure storage systems, and certain agro-industrial and municipal wastewater treatment systems. Capturing methane from these sources offers a unique opportunity to mitigate climate change and simultaneously increase available energy supply. Without more stringent reduction measures, however, global methane emissions are expected to increase by nearly 9 percent over anticipated 2020 levels to 10,220 million metric tons of carbon dioxide equivalent ($MMTCO_2e$) by 2030.[2] GMI Partner Countries represent approximately 70 percent of the world's estimated anthropogenic methane emissions. Figure 1 represents methane emissions from the biogas sectors in selected GMI countries.

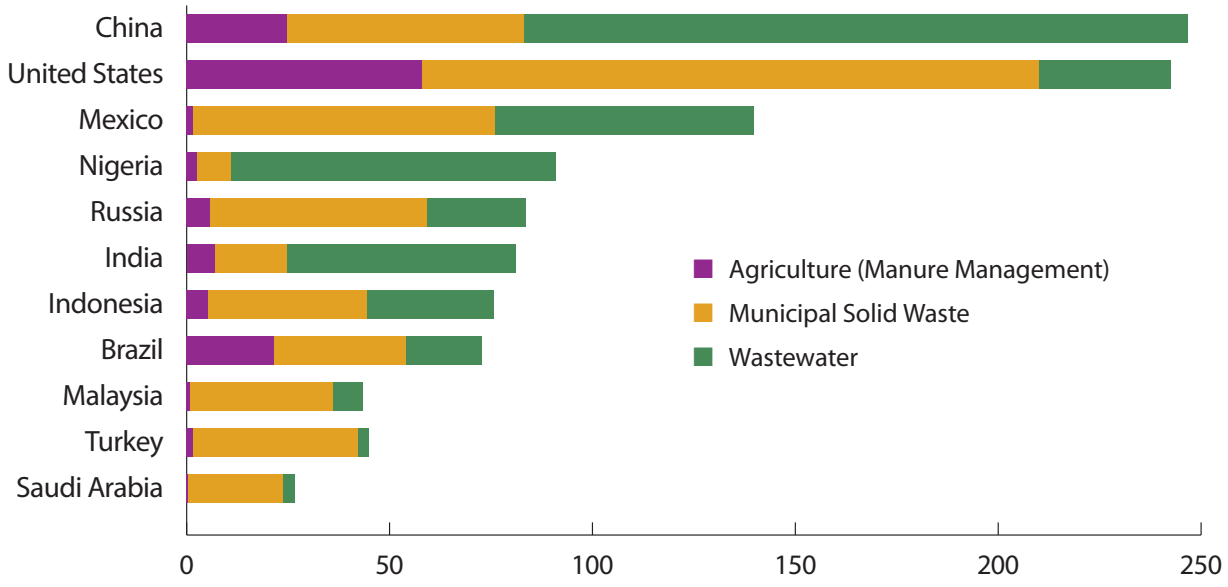
What is Biogas?

GMI defines biogas as the gas that is produced through the anaerobic digestion of the following feedstocks: livestock manure, agro-industrial wastewater and residues, MSW, municipal wastewater, food waste, and other organics (see Figure 2 for examples). Biogas is composed mostly of methane and CO_2, plus small amounts of other gases. Depending on the feedstock and the method by which anaerobic digestion takes place, biogas contains 50 to 75 percent methane and 25 to 50 percent CO_2. The abatement or capture of methane for energy generation is the unifying force binding all the activities of the GMI Biogas Subcommittee.

1 The fifth report of the Intergovernmental Panel on Climate Change (IPCC), released in 2013, included methane GWP values of 28 to 34. The United States and other developed countries are currently using the fourth report's GWP value of 25 to quantify the climate impact of U.S.-government-supported methane reduction projects.

2 U.S. Environmental Protection Agency (U.S. EPA), *Global Anthropogenic Emissions of Non-CO_2 Greenhouse Gases: 1990-203*0 (EPA430-R-12-006), December 2012.

Figure 1. Estimated Biogas Emissions ($MMTCO_2e$) From Top Emitting GMI Partner Countries, 2020



The GMI Biogas Subcommittee

The GMI Biogas Subcommittee focuses on the three biogas-emitting sectors--agriculture, MSW, and municipal wastewater. Combined, these sectors will generate an estimated 2,035 $MMTCO_2e$ of methane emissions in 2020, or 22 percent of total anthropogenic methane emissions. By focusing on these sectors, the GMI Biogas Subcommittee takes advantage of common interests and similarities between biogas energy use, the types of waste managed, waste treatment technologies (specifically in regard to organic waste treatment), and the potential for synergistic projects involving input streams from multiple sources (e.g., co- digestion).

Biogas Abatement, Recovery and Use Opportunities

Common to all three biogas sectors is the ability to utilize anaerobic digesters to treat organic material and produce biogas (and digestate) that can be put to beneficial use, as shown in Figure 3.

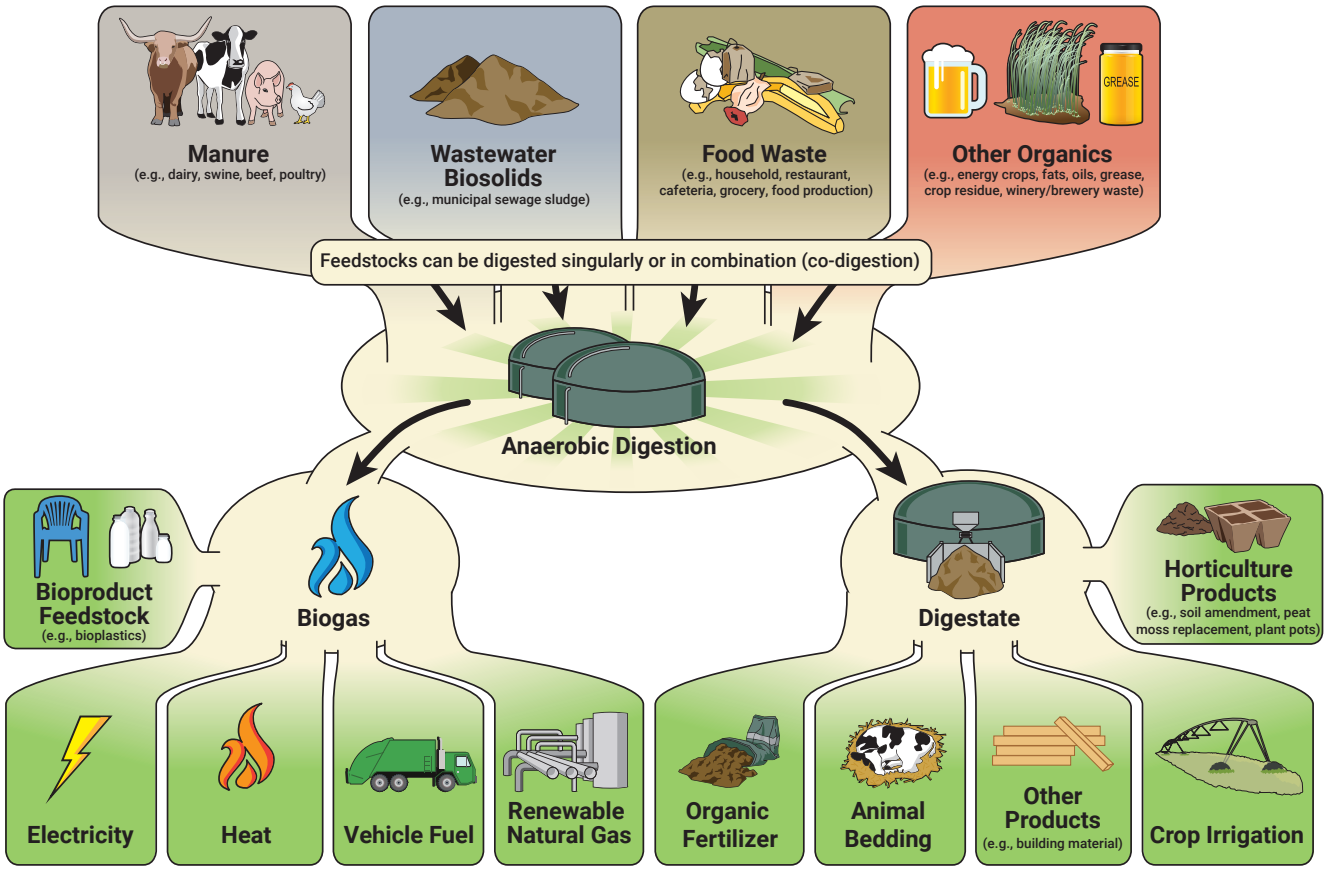
Figure 2. Biogas Generation and Capture in Targeted Sectors

Biogas from animal waste anaerobic digester used as cooking fuel (Philippines)

Biogas from landfill used to create pipeline quality natural gas (China)

Biogas from wastewater sludge treated and sold to gas plant (Chile)

Figure 3. Anaerobic Digestion as a Strategy for Waste Management, Renewable Energy and Bioproducts



Biogas Production and Emission

Methane is produced and emitted from the agriculture, MSW, and municipal wastewater sectors as follows:

Agriculture	Municipal Solid Waste	Municipal Wastewater
Methane is produced by the anaerobic decomposition of livestock manure and the organic components in agro-industrial wastewater in waste management systems such as lagoons, ponds, or anaerobic digesters. The gas consists of approximately 70 percent methane, 30 percent CO_2, and less than 1 percent hydrogen sulfide.	Methane is produced by the anaerobic decomposition of organic matter in MSW landfills, or in anaerobic digesters for organic food waste. This gas consists of approximately 50 percent methane, 50 percent CO_2, and a small amount of non-methane organic compounds.	Methane is produced by the anaerobic decomposition of organic material during the wastewater treatment process. Biosolids removed from the wastewater stream can be treated in anaerobic digesters, producing gas that is approximately 60-65 percent methane with the remainder primarily CO_2.
Manure management will contribute an estimated 286 $MMTCO_2e$ of methane emissions in 2020, roughly 3 percent of total anthropogenic methane emissions.	Globally, landfills are the third largest anthropogenic source of methane, and will account for approximately 12 percent of estimated global methane emissions or more than 1,077 $MMTCO_2e$ in 2020.	Methane from wastewater will contribute an estimated 672 $MMTCO_2e$ of methane emissions in 2020, accounting for approximately 7 percent of total global methane emissions.

Benefits of Methane Capture and Use

Methane capture and use has multiple benefits:

- Reduces GHGs and associated air pollutants.
- Provides a local source of energy that supports energy independence.
- Converts a waste product into a revenue source.
- Creates renewable energy that can replace fossil fuel use.
- Creates jobs related to project construction and operation.
- Enhances local community image as innovative and sustainable.

GMI at Work

GMI brings together the collective resources and expertise of the international community to address technical and policy issues and to facilitate biogas methane abatement, recovery, and use projects in Partner Countries. It facilitates project development and implementation in the following ways:

- Increasing capacity building and outreach efforts.
- Raising awareness about technologies.
- Assisting with project financing.
- Developing sector-specific and country-specific action plans.
- Providing technical assistance to help assess project feasibility.
- Conducting demonstration projects.
- Providing hands-on training and workshops.
- Helping to leverage investment.

Looking Forward

Future work of the GMI Biogas Subcommittee will focus on the following:

- Support to GMI countries to develop Nationally Determined Contributions (NDCs) that include biogas actions.
- Alignment of work across all appropriate biogas sectors with GMI participating partners including policy development, local capacity building, workshops, trainings, conferences, and tools/resources. To the extent appropriate, Biogas Subcommittee members can advise partner initiative members on areas for proposing new activities or seeking funding.
- Development or modification of tools to evaluate biogas technologies and facilitate biogas project development.
- Sharing of policy guidance (with focus on supporting development of NDCs that include biogas actions).
- Development of technical guidance for biogas projects and technologies.
- Improvement of the legal, regulatory, financial, institutional, technological and other conditions necessary to attract investment in biogas projects.
- Presentation of information at conferences, Internet-based meetings, and other events to promote development of favorable biogas policies and successful biogas projects.
- Sharing of experience, success stories, and lessons learned from Partner Countries (biogas policies and incentives, technologies, and projects).

For additional information, please visit the GMI website at: **www.globalmethane.org**

Social Media:

Or contact the **GMI Administrative Support Group (ASG)**
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