



**THE U.S. GOVERNMENT'S
GLOBAL METHANE INITIATIVE ACCOMPLISHMENTS**






ANNUAL REPORT DECEMBER **2013**



CONTENTS

- Letter from the Acting Assistant Administratoriii

- Introduction 1

-  Agriculture 8
-  Coal Mines11
-  Municipal Solid Waste..... 13
-  Oil and Gas Systems 16
-  Wastewater 21

- Looking Forward23

December 2013



Dear Colleagues,

As the new Steering Committee Chair, it is my privilege to announce this year's report on the U.S. Government's Global Methane Initiative (GMI) Accomplishments for the year 2012 with a few key highlights from 2013. It has been a busy and productive year. On July 18, 2013, the U.S. Senate confirmed Gina McCarthy as Administrator of the U.S. Environmental Protection Agency. In her previous role as Assistant Administrator of the EPA's Office of Air and Radiation, Administrator McCarthy served as the GMI Steering Committee Chair. We thank her for her strong leadership and service to this dynamic initiative and wish her all the best in her new role.

Our global partners in the GMI have continued to make significant strides in reducing methane emissions around the globe with hundreds of projects now in operation and highlighted on the GMI website at www.globalmethane.org. The United States is committed to this important and urgent work of reducing emissions of methane, a potent greenhouse gas and Short Lived Climate Pollutant that is emitted from a variety of industrial activities and can be harnessed for energy. In June 2013, President Obama issued his Climate Action Plan, which reinforces the commitment of the United States to leadership on international efforts to address climate change. The plan specifically recognizes the U.S. leadership to reduce methane emissions through both the GMI and the Climate and Clean Air Coalition (CCAC).

The GMI strives to build capacity, overcome barriers to methane reduction projects, and identify emission reductions associated with its efforts. I am happy to report the Initiative's work has continued with another strong year with significant progress made on identifying new methane reduction opportunities and a successful 2013 methane expo event. During 2012, the United States contributed nearly \$10 million toward capacity building and technical assistance efforts aimed at mitigating global methane emissions through the GMI. Specific activities included conducting training and workshops, developing guidance and outreach materials, supporting country-wide emissions inventories, and performing site-specific measurement and pre-feasibility studies. In 2012 alone, these efforts led to reductions of more than 23 million metric tons of carbon dioxide equivalent from U.S. Government supported methane projects.

The United States was pleased to take a leadership role in the Methane Expo 2013, held in Vancouver, Canada in March 2013. U.S. agencies played an integral role in Expo planning and preparation across all five GMI sectors, developing technical agendas and project showcases. The event attracted more than 450 attendees and featured nearly 100 project opportunities and success stories. It was encouraging to see firsthand all of the activity and innovation on display at this premier international forum. We greatly appreciate the government of Canada—in particular, Environment Canada—for hosting this successful event.

The GMI's successful model of international collaboration to achieve significant methane emission reductions served as a platform for the 2012 launch of the CCAC. As of September 2013, the CCAC had grown to 33 country partners and more than 30 non-state partners. GMI's experience and expertise has been instrumental in designing and implementing several CCAC initiatives focused on methane.

As the new chair of the GMI Steering Committee and as a representative of EPA, it has been a privilege to work with many of you on these important efforts. I look forward to the United States' continued leadership in global methane mitigation over the coming year, especially as we plan to celebrate our ten-year anniversary of this important Initiative.

Sincerely,

A handwritten signature in black ink, appearing to read "J. G. McCabe".

Janet G. McCabe
U.S. Environmental Protection Agency
Acting Assistant Administrator, Office of Air and Radiation
Steering Committee Chair, Global Methane Initiative



INTRODUCTION



After another year of droughts and extreme weather events, the urgent challenge that climate change poses is apparent across the globe. Methane emissions account for more than one-third of total anthropogenic (or man-made) climate forcing, making methane the second most important greenhouse gas (GHG). Methane is also a constituent of natural gas, so capturing it offers a unique opportunity to increase energy security while mitigating climate change. By targeting five main methane sectors (agriculture, coal mines, municipal solid waste [MSW], municipal wastewater, and oil and gas), the Global Methane Initiative (GMI) provides an international framework for reducing and recovering methane gas as a clean energy source, with significant benefits to the global environment, the economy, and human health.

Goals and Benefits

GMI aims to reduce methane emissions in an effort to combat climate change, enhance economic growth, bolster energy security, and improve local environmental quality and industrial safety. Through its public-private partnerships, GMI helps develop projects that address five primary methane emission sectors.

GMI Partner Countries work with a network of public and private sector organizations to foster methane abatement, recovery, and use across international borders and industry sectors. Their activities include conducting technology transfer, improving local capacity, providing project development and implementation support, and marketing project opportunities. In 2012, U.S. efforts in support of GMI yielded emission reductions of more than 23 million metric tons of carbon dioxide equivalent (MMT CO_2E).¹

Methane emissions can be cheaper to reduce than CO_2 emissions, and many cost-effective and economically viable opportunities exist worldwide. Overall, the potential for methane mitigation at or below \$0/MMT CO_2E is approximately 1,000 MMT CO_2E , and the mitigation potential more than doubles—to 2,000 MMT CO_2E —at a cost of \$30/MMT CO_2E .² Methane's short lifespan in the atmosphere means that mitigating it can significantly decrease climate change (see below).

Why Target Methane?

Methane (CH_4) accounts for 14 percent of global GHG emissions with an estimated 7,196 MMT- CO_2E of anthropogenic emissions in 2010. While methane is emitted in smaller quantities than carbon dioxide (CO_2) and remains in the atmosphere for a shorter period, its ability to trap heat in the atmosphere—which is called “global warming potential”—is 28 times greater than that of CO_2 . Because of this, methane has a stronger influence on climate change during its 12-year atmospheric lifetime than CO_2 . Methane's short atmospheric lifespan, however, presents opportunities for mitigating global warming in the near term.

For more information on methane emission sources and trends, see EPA's global projections report for non- CO_2 gases (issued in December 2012) at: www.epa.gov/climatechange/EPAactivities/economics/nonco2projections.html.

¹ Total (cumulative) emissions estimates are revised annually to reflect the dynamic nature of methane reduction projects that operate over a period of multiple years, and the best available data on project operations.

² U.S. EPA. 2013. *Global Mitigation of Non- CO_2 Greenhouse Gases: 2010–2030*. EPA 430-R-13-011. www.epa.gov/climatechange/Downloads/EPAactivities/MAC_Report_2013.pdf

Organizational Structure

GMI includes an international network of national governments, industry, development banks, universities, and non-governmental organizations (NGOs), united in promoting methane emission reduction projects across the globe. GMI aims to provide project development support, with active engagement from the private sector. Its framework comprises the Steering Committee, the Administrative Support Group (ASG), five technical subcommittees, and the Project Network, which brings together representatives from the private sector and NGOs (see Figure 1).

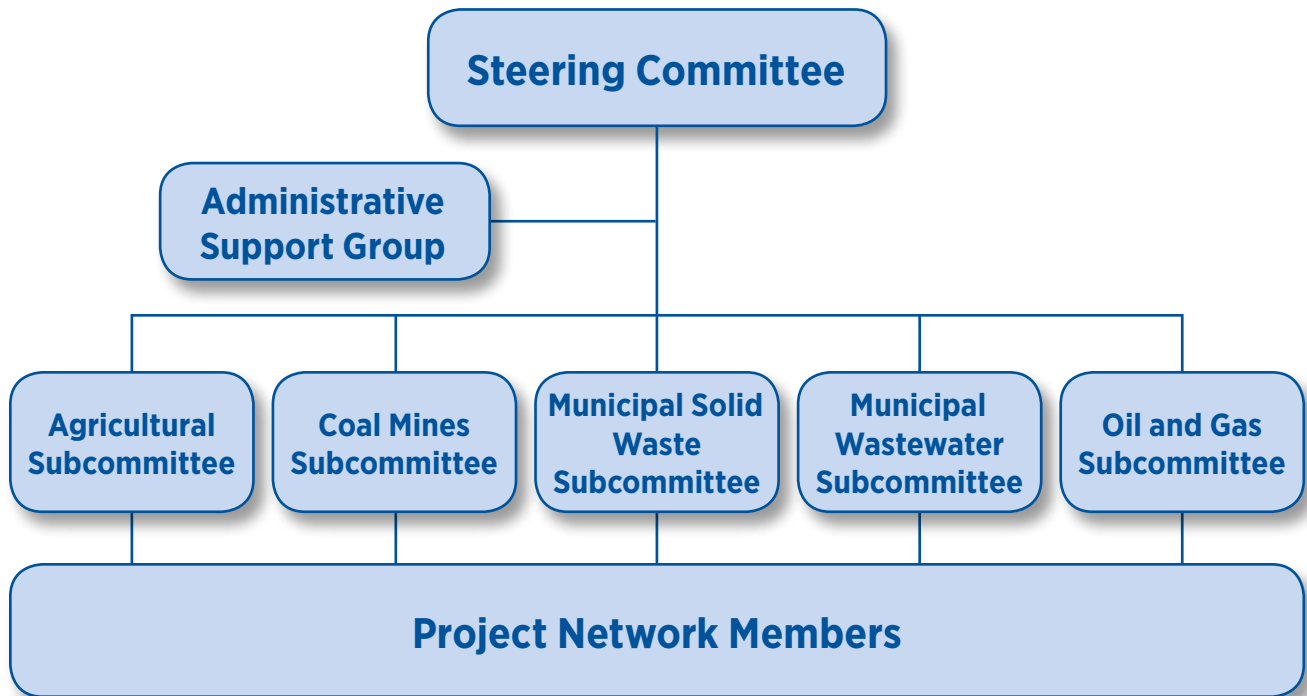
The Steering Committee guides the work of the Partnership. The ASG serves as the Secretariat and is hosted by EPA. The five technical sector subcommittees—Agriculture, Coal Mines, MSW, Municipal Wastewater, and Oil and Gas—are responsible for guiding and assessing sector-specific activities and assisting

Partner Country delegates and Project Network members. Partner Countries have developed their own plans for each sector and are now working on overarching country plans that outline opportunities for building capacity, transferring technology, and promoting private investment across all sectors in which they participate.

Continued Growth

As of September 2013, GMI encompasses 41 Partner Countries and the European Commission, and the Project Network has grown to nearly 1,300 organizations that span six continents and a wide range of industries. This expansion represents a tripling in the number of Partners and more than a 10-fold increase in Project Network members since the program began in 2004.

Figure 1: GMI Organizational Structure



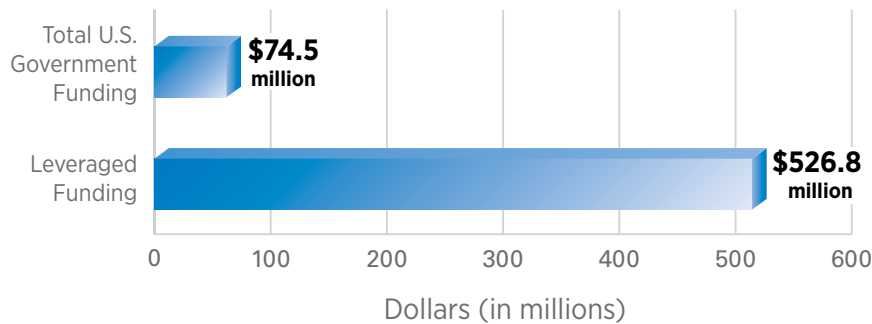
Approaching 10th Anniversary

The year 2014 will mark the 10th anniversary of GMI and its efforts to facilitate global cooperation on methane emission reductions. This landmark will be documented through an anticipated Partnership-wide accomplishments video highlighting GMI's achievements since 2004, as well as an accompanying all-partnership meeting in the coming year. The United States will play a leadership role in documenting all GMI successes and in planning for the all-partnership meeting.

U.S. LEADERSHIP

U.S. government-related GMI efforts are led by EPA and involve the collective efforts of other federal agencies and departments, including the U.S. Agency for International Development (USAID); the U.S. Departments of Agriculture, Energy, and State; and the U.S. Trade and Development Agency. Since GMI's inception in 2004, the United States has invested approximately \$74.4 million in the Initiative (see Figure 2).

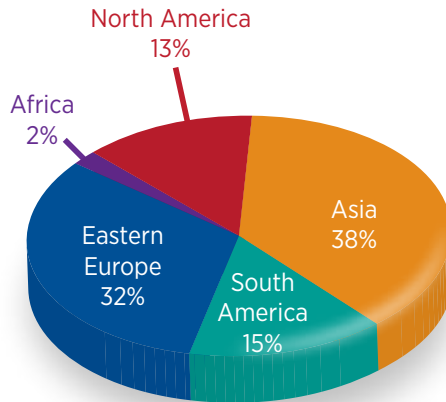
Figure 2: U.S. Government Funding and Leveraged Funding, FY 2005–FY 2012



U.S. resources support a number of diverse activities, including conducting pre-feasibility and feasibility studies at potential project sites, building capacity through technology transfer and training, developing tools and

resources for methane emissions mitigation and use, and supporting the work of the ASG across 26 Partner Countries in all regions (see Figure 3).

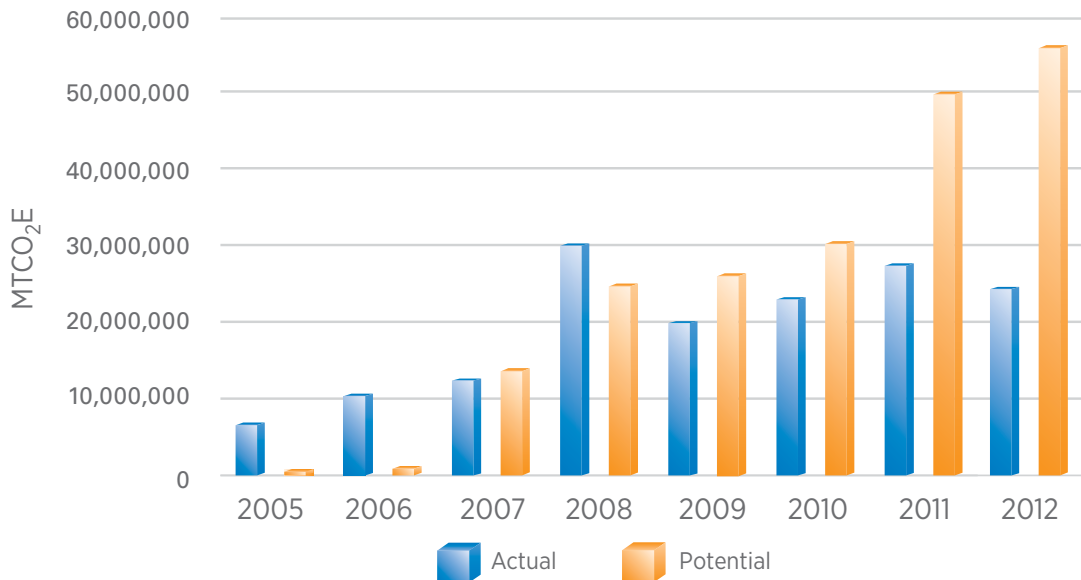
Figure 3: FY 2012 Expenditures by Region



The consistently strong U.S. government support for GMI has been a major contributor to the Partnership's growth in size, scope, and influence during its first nine years. In 2012, U.S. support for GMI-related projects

and activities helped achieve the following impressive methane emission reduction results and opportunities (see Figure 4).³

Figure 4: Annual Methane Emission Reductions from U.S.-Supported Projects, 2005–2012



³ "Actual" emission reductions are those that have been achieved and measured from implemented projects in any given year. "Potential" emission reductions have been identified through GMI capacity building activities (e.g., pre-feasibility or feasibility studies) as those that could be realized if the emission reduction project(s) were fully implemented.

U.S.-Supported International Coalition Complements GMI Efforts

The success of GMI has significantly contributed to the founding of other collaborative partnerships. Announced by former U.S. Secretary of State Hillary Clinton and former EPA Administrator Lisa Jackson during the official launch event in February 2012 (see right), the Climate and Clean Air Coalition (CCAC) is focused on reducing short-lived climate pollutants (SLCPs) including methane. It held its first ministerial meeting in April 2012 in Sweden. The Coalition has expanded from six initial partners to 33 country partners⁴ to date.

The CCAC has formally launched initiatives aimed at accelerating emission reductions of black carbon, methane, and HFCs. Several of the CCAC initiatives include a strong focus on methane mitigation and were conceived of, proposed, and designed by GMI Partner Countries and other stakeholders based upon U.S.-supported technical expertise, work, and experiences in these sectors. These CCAC initiatives are intended to build on GMI accomplishments in its respective sectors, and to leverage the high-level political will created by the CCAC to scale up the potential emission reductions achievable in these sectors.

- MSW Management Initiative.** This initiative works to address methane, black carbon, and other air pollutants emissions across the MSW sector by working directly with cities and national governments. Through this initiative, the CCAC will work with cities to identify and facilitate a variety of efforts, including capping and closing open dumps, capturing and utilizing landfill gas, and ensuring proper waste handling and organics management. The methane reduction aspects of this initiative build upon the work of the GMI MSW Subcommittee, including its recently developed best practices guidance document (see page 13). The first phase of the MSW initiative will focus on working with approximately 10 cities to guide the development of a robust framework for action, including cities that need direct technical assistance as well as cities that will play a mentoring role.



Former U.S. State Department Secretary Hillary Clinton and former EPA Administrator Lisa Jackson—along with representatives from Bangladesh, Canada, Ghana, Mexico, Sweden, and the United Nations Environmental Programme—at the CCAC launch.

- Oil and Natural Gas Production Initiative.** This initiative seeks to work with key stakeholders to encourage cooperation and to support the implementation of cost-effective measures to substantially reduce methane and black carbon emissions from natural gas venting, leakage, and flaring. The initiative's importance was highlighted with a statement signed by 13 CCAC Partner Ministers,⁵ calling for the oil and gas industry to cooperate on this issue. This initiative builds on the technical expertise and industry knowledge of GMI, EPA's Natural Gas STAR International (NGSI) Program, and the World Bank-led Global Gas Flaring Reduction (GGFR) Partnership.
- Agriculture Initiative.** The CCAC agriculture initiative will support action to reduce methane and black carbon emissions from agriculture processes while promoting greater food security, agricultural productivity and livelihoods, environmental sustainability, and broader climate objectives. This initiative complements and leverages ongoing work embarked upon by GMI, the United Nations Food and Agriculture Organization (FAO), the World Bank, and others involved in black carbon mitigation.

⁴ As of September 2013 from the CCAC website: www.unep.org/ccac/Partners/CountryPartners/tabid/101711/Default.aspx.

⁵ www.unep.org/ccac/Portals/24183/docs/CCAC%20Ministers%27%20Statement_25%20January%202013.pdf.

CROSS-CUTTING U.S. GOVERNMENT EFFORTS

Since GMI's inception, the U.S. government has been actively advancing methane mitigation across all sectors by promoting specific reduction opportunities (described subsequently in each of the sector chapters), ongoing capacity building and technology transfer, and enhanced tracking of project activities. Some of these efforts are highlighted below.

Ongoing Capacity Building and Technology Transfer

U.S. expertise has been instrumental in developing capacity and delivering technical skills to many Partner Countries. By sponsoring, organizing, and leading subcommittee meetings, technical workshops, and trainings, the United States has transferred vital knowledge and expertise to international counterparts that facilitate the development of methane capture and use projects. In 2012, EPA worked closely with the government of Canada to organize and plan Methane Expo 2013 (see page 7). The United States supported more than 20 workshops in more than a dozen Partner Countries, and undertook numerous site visits, measurement studies, study tours, and technology demonstrations around the world.

Enhanced Project Tracking and Emission Reduction Reporting

In recent years, EPA has developed a more robust and simplified tracking system to increase the capacity, speed, and efficiency of data collection among Partner Countries. The Customer Relationship Management (CRM) database acts as a centralized clearinghouse—not only for GMI-specific activities, but also for broader methane activities by combining data from existing sectoral databases, including international agriculture, coal mine methane (CMM), and MSW data systems.

In 2012, EPA oversaw development of a new Web interface that uses the GMI CRM data to generate user-friendly reports for the agriculture, MSW, and wastewater sectors. In 2013 and 2014, EPA will lead efforts to create Web-based interfaces for the coal mining and oil and gas sectors.

Convening Joint Biogas Subcommittee Meetings

In July 2012, the United States supported a GMI Tri-Subcommittee meeting in Singapore, which convened delegates from the Agriculture, MSW, and Municipal Wastewater Subcommittees. These three sectors all promote the collection and use of biogas, so there are similarities in the technologies and approaches each sector employs and the barriers and challenges each sector faces. Conducting combined meetings increases collaboration and communication across the subcommittees, in addition to conserving resources.

As an example of the cross-cutting issues and influences among these sectors, the suggested development of the agricultural project case study guide was a result of the MSW sector's recent *International Best Practices Guide for Landfill Gas Energy Projects* (see page 13). Additionally, the other sectors discussed developing Statements of Purpose similar to the Agriculture Subcommittee (see page 10).

In 2012, the United States Department of State commissioned a study⁶ to RAND Corporation to evaluate GMI and better understand the program's value to State Department's climate change mission. The study included an exhaustive review of GMI-funded activities, database analysis, interviews, and site visits to India, the Philippines, and Mexico. The study concluded GMI has contributed to reducing methane emissions and that GMI activities continue to seed methane reduction efforts around the globe. It also found that GMI's approach has appeal as a cost-effective method to reduce GHG emissions and attract Partner Country participation, with Department of State fulfilling an important and unique role in fostering and supporting GMI.



⁶ www.rand.org/content/dam/rand/pubs/technical_reports/TR1200/TR1250/RAND_TR1250.pdf

METHANE EXPO 2013



12 - 15 March 2013

METHANE EXPO 2013 DRAWS HUNDREDS FROM AROUND THE WORLD

Held in March 2013, the Expo drew more than 450 attendees representing 44 countries from around the world. The United States undertook significant planning and activities leading up to the Expo, to plan the technical sessions and develop project opportunity and success story case studies.

The Expo offered numerous forums for government, private sector, and NGO participants to engage in high-level plenary sessions and talks, detailed technical discussions on issues related to promoting methane projects and reductions in each of the GMI sectors, educational site tours of methane reduction activities, Steering Committee and subcommittee meetings, and a poster area that included more than 90 methane emission reduction projects that showcased real, on-the-ground GMI accomplishments. These ongoing activities and project opportunities—if fully implemented—would yield more than 135 MMTCO₂E in emission reductions.

The opening plenary featured a keynote address by Canada's Environment Minister, the Honourable Peter Kent, as well as presentations by EPA Acting Assistant Administrator and GMI Steering Committee Chair Janet McCabe and the Honourable Terry Lake (British Columbia's Minister of Environment).

Outcomes from Steering Committee discussions included revising guidance and encouraging action planning, forging closer links and leveraging CCAC activities, and commemorating GMI's 10-year anniversary (e.g., Partnership-wide accomplishment report, all-partnership meeting) in 2014.

For more information on the Expo, including the proceedings and posters, see the Expo website at www.globalmethane.org/expo/index.html.



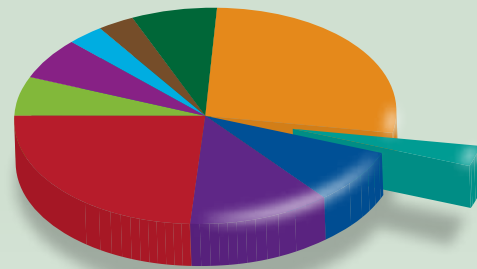
The Honourable Peter Kent, Canada's Minister of the Environment (*Photo by Bayne Stanley/Courtesy of Environment Canada*).

AGRICULTURE



The primary sources of methane emissions from agriculture include enteric fermentation, livestock waste management, rice cultivation, and agricultural waste burning. Of these, livestock waste management offers the most viable, near-term opportunities for methane recovery and utilization. In 2010, global methane emissions from livestock manure were estimated to be approximately 229 MMTCO₂E, accounting for 3 percent of total global methane emissions.⁷

Through GMI, in 2012, the United States contributed to projects aimed at reducing emissions from farms in China and the Philippines, as well as led efforts to develop GMI Agriculture Subcommittee support materials. Many of the supported activities will continue to reduce methane emissions in future years.



Agriculture (Manure Management) Accounts for 3 Percent of Global Methane Emissions

Collaborating to Reduce Emissions from Farms in China

The United States, the World Bank, and the FAO are working together on the Guangdong Agricultural Pollution Control Project. The goal of this project is to reduce water pollution releases from Chinese farms by introducing improved agricultural and waste and wastewater management practices in select areas of the Guangdong Province. Several of the improved practices also reduce methane emissions.

As part of the project, a pilot hi-rise swine building (see photo) has been constructed onsite and shows promise for replication throughout the Chinese pork industry. In a hi-rise building, a slatted floor is installed on the second floor of the structure where pigs are raised. This allows swine waste to pass through to the ground floor, where sawdust bedding absorbs the

organic material and initiates an aerobic composting process. This manure management method could replace typical flush manure buildings and liquid manure storage, thereby also reducing methane emissions.



Comparative flush building (left) and the pilot hi-rise building (right)

⁷ U.S. EPA. 2012. *Global Anthropogenic Non-CO₂ Greenhouse Gases Emissions: 1990–2030*. EPA 430-R-12-006. www.epa.gov/climatechange/EPAactivities/economics/nonco2projections.html.

Ongoing Demonstration Project in the Philippines

EPA continues to support anaerobic digestion (AD) project development in the Philippines. The agriculture sector contributes 71 percent of the Philippines' methane emissions, of which livestock manure accounts for approximately 10 percent.⁸ Because many of the emissions are from small farms, EPA has focused on supporting small-scale AD technology development, including fixed domes, stacked domes, and tubular and bag digesters.

The Buklod-Unlad Multi-Purpose Cooperative is working to promote AD projects and potentially become an aggregator for Clean Development Mechanism Program of Activities small-scale projects. The Cooperative, with technical support from EPA, developed three bag digester demonstration projects on small swine farms in the Philippines. The Cooperative has plans to assist its members in installing digesters and to develop partnerships with local governments to promote and install digesters.

Building Capacity in Vietnam

Implementing Analysis and Investment for Low-Emission Growth (AILEG) Project

USAID's Enhancing Capacity for Low Emission Development Strategies (EC-LEDS)/AILEG project supports the government of Vietnam in providing systems to collect, archive, and distribute economic and emissions data. This work has included preparation of a report⁹ by Bloomberg New Energy Finance and Abt Associates, with input from AILEG partners, that examined technology for livestock biogas, the potential

benefits and economic feasibility of farm-scale biogas in Vietnam, and the finance needs to scale up in-country technology. It also explored ongoing practices livestock methane capture and electricity production in Vietnam. Through this project, Vietnam's Ministry of Agriculture and Rural Development now has more advanced, efficient, and localized tools available to help plan for low-emission growth in the agriculture sector. This aligns with one of the stated goals of Vietnam's Green Growth Strategy to reduce GHG emissions

USDA Vietnam Training on Mitigating GHG Emissions in the Rice Sector

While the GMI agriculture sector is primarily focused on reducing methane produced by agri-industrial waste, the United States also has supported capacity building and outreach to reduce methane in the rice sector. USDA's Foreign Agriculture Service and employees of Vietnam's National Agricultural Extension Center (NAEC) attended an EC-LEDS workshop and participated in technical field visits in Can Tho, Kien Giang, and An Giang, Vietnam. During the sessions, NAEC staff members learned practical strategies to

mitigate GHG emissions in the rice sector using alternate wetting and drying techniques combined with fertilizer management, while optimizing rice yields and lowering input costs. The activity is being implemented in partnership with the Mekong Research Development Institute, the Environmental Defense Fund's Vietnam Low Carbon Rice Project, and Can Tho University. NAEC also participated in two U.S.-government-facilitated workshops designed to provide practical techniques for reducing methane from rice production.

⁸ Ibid.

⁹ "Livestock Methane Capture and Electricity Production in Vietnam: Status, Feasibility, Economics, and Potential," Bloomberg New Energy Finance and Abt Associates, Washington, D.C., expected publication in 2013.

through the development of sustainable, organic agriculture and improved competitiveness of agricultural production.

Demonstrating Sustainable Agricultural Practices

The U.S. government and Vietnam's NAEC facilitated four workshops on strategies and techniques for GHG emission reductions from the livestock and other

agriculture sectors, while increasing profitability in those sectors. Workshop participants discussed practical techniques, including feed and manure management strategies for cattle. NAEC will apply these techniques through demonstration projects, and develop outreach materials that will be disseminated to their extension staff throughout the country. These techniques contribute to the Vietnam Ministry of Agriculture's goal of reducing agricultural GHG emissions by 20 percent by 2020.

Advancing Ideas Raised in Singapore

During the July 2012 GMI Agriculture Subcommittee meeting in Singapore, members discussed several new and ongoing efforts to encourage and increase subcommittee participation.

In advance of the Singapore meeting, the Agriculture Subcommittee co-chairs developed a Statement of Purpose as a means to encourage subcommittee participation, better define the subcommittee's focus, and make the subcommittee more beneficial to its members. The document defines the subcommittee's mission and focus as well as the delegates' and Project Network members' roles. The draft Statement of Purpose was discussed at the July 2012 subcommittee meeting. It underwent minor revisions based on comments received at the meeting, and the final version is now available on the GMI website at www.globalmethane.org/documents/ag_statement_of_purpose.pdf.

Another Agriculture Subcommittee suggestion included development of a case study guide for agricultural AD projects. Creating this guide will increase subcommittee participation and help delegates play a more meaningful role in subcommittee project development. Community Development Research (CDR), a GMI Project Network member, developed a case study template with input from the co-chairs and EPA. Partner Country delegates and Project Network members then completed case study templates for projects in their respective countries, and the case studies were compiled in a draft report titled *Successful Applications of Anaerobic Digestion from Across the World*. The final report is posted on the GMI website at www.globalmethane.org/documents/GMI%20Benefits%20Report.pdf.

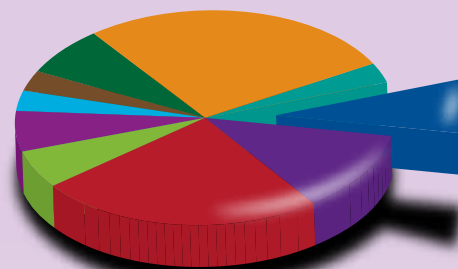


Photo by: Erwin Soo from Singapore, Singapore

COAL MINES

Removing fugitive methane gas from underground coal mines and using it in profitable and practical ways can improve worker safety, enhance mine productivity, increase revenues, and reduce GHG emissions. In 2010, global methane emissions from coal mines were estimated to be approximately 587 MMTCO₂E, accounting for 8 percent of total global methane emissions.¹⁰

The United States is fostering international collaboration through GMI to advance methane capture and use projects that brings more gas to market. In 2012, U.S. efforts in this important sector focused primarily on EPA collaboration with Australia and India, providing key information in China and Mongolia, and capacity building in Vietnam.



Coal Mines Account for 8 Percent of Global Methane Emissions

Supporting CMM Abatement Seminar and GMI Coal Subcommittee Meeting in Australia

In September 2012, the United States collaborated with the Australian government, which hosted a CMM abatement seminar in Sydney, to hold the GMI Coal Subcommittee in conjunction with the seminar.

In response to significant carbon price implementation costs that might be faced by Australia's coal mines, the Australian government developed a transitional assistance package for the coal industry. The Coal Mining Abatement Technology Support Package will provide support for the research, development, and demonstration of CMM abatement technologies. The Australian Department of Resources, Energy and Tourism hosted the seminar to raise awareness of the program and explain how the assistance can be used to support technology development and transfer. The seminar also connected the Australian coal industry with CMM

abatement technology providers, provided information on future international investment opportunities, promoted Australia's expertise and technologies related to CMM recovery and use, and identified safety and regulatory issues associated with CMM abatement technology.

Hosting the seminar in conjunction with the GMI Coal Subcommittee meeting leveraged the expertise and industry participation in the seminar and made the discussion especially productive.



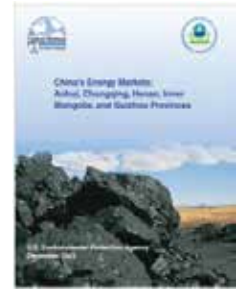
Wayne Calder, of Australia's Department of Resources, Energy and Tourism, addressing seminar participants.

¹⁰ U.S. EPA, 2012.

Providing Key Information About Opportunities in China's Energy Markets

The United States continues to provide key information about CMM opportunities in China, the world's leading coal producer and emitter of CMM. In December 2012, EPA updated its 2011 report on China's energy markets in Anhui, Chongqing, Henan, and Guizhou Provinces. The updated report now includes the energy market-related results of a CMM feasibility study conducted in China's Inner Mongolia Province. It encompasses

China's coal, electricity, and natural gas markets, and includes analyses based on several comprehensive CMM recovery and utilization feasibility studies funded by EPA. The studies can be found on EPA's Coalbed Methane Outreach Program website at www.epa.gov/cmop/international/china.html.



Collaborating with India on Ongoing and New CMM Activities

In 2012, the United States continued its longstanding support for CMM capacity building in India, one of the world's leading coal producing nations. EPA worked with the Coal Mine Planning and Design Institute, which hosts the India CBM/CMM Clearinghouse, and the Central Institute of Mining and Fuel Research to study CMM development in India's coalfields. EPA extended its sponsorship of the CBM/CMM Clearinghouse,

founded in 2008 to promote CMM/CBM development in India. The Clearinghouse serves as an in-country repository and resource, conducting activities such as publishing information (e.g., CMM development opportunities, technical papers, newsletters) on its website, facilitating training programs, sponsoring seminars, and conducting trainings.

Continuing Support for Emissions Inventory and Pre-feasibility Studies in Mongolia

The United States supported Mongolia's efforts in 2012 to launch its emerging CMM industry. EPA met with Mongolian government officials, Mongolian Nature and Environment Consortium (MNEC) staff, and several Mongolian mining companies to discuss current GMI efforts and potential pre-feasibility studies. With U.S. funding support, MNEC conducted a CMM resource assessment and emissions inventory at five mining areas, held training sessions about how to collect and analyze field samples, and prepared a brochure for decision-makers, scientists, and the public. EPA is working with Mongolia to assess the potential for CBM and underground coal gasification projects at the Baganuur open pit coal mine.



Tour of Naryn Sukhait Surface Mine.

Identifying Opportunities for Future Collaboration in Vietnam

The United States continues to work with its Vietnamese counterparts from the Institute of Mining Science and Technology (IMSAT) to follow up from a previous scoping mission and identify areas in which Vietnam might benefit from EPA's assistance, including capacity building in the mining sector, introducing best practices, and assessing CMM and ventilation air

methane resource development potential associated with specific gassy coal mines.

In 2012, EPA participated in an IMSAT workshop on CMM and met with the Mine Safety Center and several mines to identify areas in which Vietnam would benefit from additional training.



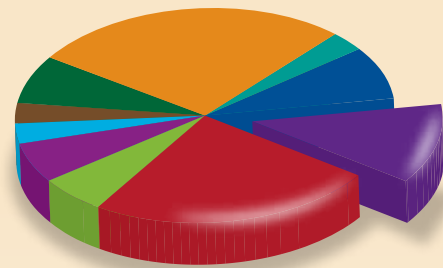
MUNICIPAL SOLID WASTE

MSW management and treatment activities account for an estimated 12 percent of methane emissions worldwide, or 847 MMTCO₂E, in 2010.¹¹ There are opportunities to reduce methane emissions by collecting landfill gas (LFG) and using it to fuel boilers, engines, or other technologies. Methane emissions from MSW can also be reduced by modifying how waste is treated. For example, organic fractions of the MSW stream can be diverted from landfills and disposed of at anaerobic digesters, composting facilities, or waste-to-energy facilities.

In 2012, the United States' efforts produced and advanced guidance to encourage landfill gas energy (LFGE) or direct LFG use projects, provided technical assistance (e.g., landfill inventories, LFG modeling), and conducted integrated solid waste management (ISWM) trainings in Partner Countries. These EPA-supported activities will continue to advance methane emission reduction opportunities in the years to come.

Developing Guidance Material

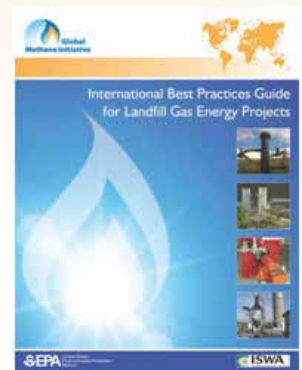
The United States continues to develop guidance documents and other materials to help grow methane emission reduction projects worldwide. For example, in 2012, EPA produced GMI's new *International Best Practices Guide for Landfill Gas Energy Projects* (www.global-methane.org/tools-resources/tools.aspx#three), which provides a broad overview of the LFGE project development process and presents the technological, economic, and political considerations that typically affect the success of LFGE projects in international settings. The guide is a comprehensive document, which presents best practices that encourage environmentally and economically sound LFGE projects and connects stakeholders with available information, tools, and services for:



MSW Accounts for 12 Percent of Global Methane Emissions

- Resolving flaws in solid waste disposal site design and operation.
- Designing and operating successful LFG collection and control systems.
- Estimating the volume of LFG available for a project.
- Selecting appropriate technologies for energy recovery.

The guide is intended for national, regional, and local government officials; landfill owners; energy service providers; corporations and industries; and representatives of not-for-profit organizations. EPA extends gratitude to the peer reviewers of the guide who contributed to its production.



¹¹ U.S. EPA, 2012.

EPA also assembled the *Resource Packet for Industrial Use of Landfill Gas* (found at www.globalmethane.org/tools-resources), a collection of documents that provide background information on how direct-use projects historically have been developed, data needed to begin evaluation of a direct-use project, and general considerations related to the development of a direct-use project. There are two collection forms that outline the information needed to evaluate both the energy potential from a solid waste disposal site and the energy utilization profile of an industrial facility.

The United States supported the development of Request for Proposals (RFP) guidance materials for Mexico and Colombia, which have significantly benefited local municipalities.

- The Border Environment Cooperation Commission partnered with the International City/County

Management Association to create an LFGE guidebook for Mexican municipalities that provides tools for developing and implementing an LFGE or flaring project, including how to issue an effective RFP. Using this experience, EPA staff provided technical assistance to Mexico City, which resulted in the issuance of an RFP for a project at the Bordo Poniente landfill. This project will collect LFG from the landfill's 72 million tons of MSW and use it to generate electricity for sale to the government of Mexico City.

- The Colombian Center for Cleaner Production developed two guidebooks for landfills on how to conduct a pre-feasibility study and how to undergo the bidding process for an LFGE project. The Center also helped the municipality of Urao develop an RFP and conducted a regional training workshop for landfills and municipalities based on the guidebooks.

Developing Landfill Inventories in Partner Countries

The United States has continued to work closely with Partner Countries and stakeholders to promote MSW projects and develop national landfill inventories.

- In Bulgaria, EPA visited five landfills accompanied by Bulgaria's EnEffect Center for Energy Efficiency to collect information about historical waste acceptance rates, waste characterization, and biogas project data, where applicable.
- The Philippine Council for Industry, Energy, and Emerging Technology Research and

Development-Department of Science and Technology, identified a total of 1,125 sanitary landfills, controlled disposal facilities, and open dumpsites and collected geographic data for entry into a Geographic Information Systems (GIS) database.

- In Serbia, EPA began work with the University of Novi Sad to foster project opportunities by collecting technical site information for a country-wide landfill database and a pre-feasibility study at the Novi Sad landfill.

Providing New LFG Project Technical Assistance

By providing technical assistance to landfills in Argentina, Russia, and Ukraine, the United States leveraged new investments in LFG collection and supported beneficial energy-use projects.

- EPA supported the Argentina Chapter of the International Solid Waste Association to evaluate LFG availability at the Neuquén landfill. After measuring sufficient gas quantities, the organization installed seven horizontal gas collection wells and an LFG flare and also installed and tested a small engine to generate electricity.

- EPA worked with the Siberian State Industrial University to provide technical assistance for an LFG flare project at the recently closed Central landfill of Novokutznetsk. University and technical consultants drilled three test wells to evaluate the viability of an LFG project at the site, and EPA provided technical support in selecting the gas collection system. The flare began operating at the landfill in late 2012.

- In Ukraine, EPA provided technical assistance and training on LFG generation and recovery potential from Ukraine's Kiev #5 landfill, culminating in a US\$1.5 million private-sector investment in five

180-kilowatt (kW) Tedom engine generator sets. In April 2012, the engines began operating at the landfill, generating 900 kW of renewable energy.

Conducting ISWM Trainings in Partner Countries

In 2012, EPA conducted 10 training sessions in seven Partner Countries—Brazil, Chile, the Dominican Republic, Indonesia, Nigeria, Peru, and the Philippines—that provided training to nearly 1,000 people in total. The trainings covered topics such as ISWM principles; landfill operations and maintenance (e.g., daily cover, waste compaction, landfill fires, controlling surface water and leachate); and the fundamentals of biogas generation, capture, and beneficial use, including aspects of gas collection system design and LFG recovery technologies.



LFG Workshop in the Dominican Republic.

Developing MSW Sector Action Plans

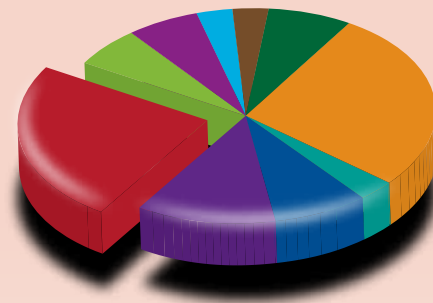
The United States continues to support the development of national action plans for methane emission reduction and LFG projects. Project Network member CDR—in collaboration with the Ethiopian Environmental Protection Agency—submitted an action plan that analyzed solid waste management capacity and collection activities in three Ethiopian municipalities: Addis Ababa, Mekele, and Dire Dawa. The study concluded that, although there is funding available for capital investment projects, a significant gap in resources exists for long-term technical capacity building and operations

and maintenance of solid waste management systems. The action plan was designed for incorporation into Ethiopia's climate strategy, known as Climate Resilient Green Economy Strategy (CRGE), and the national economic plan, known as the Growth and Transformation Plan (GTP). Together, these strategies promote efforts to achieve a more carbon-neutral future. The action plan adds value to the goals of the CRGE and GTP by filling capacity gaps to reduce emissions from the growing urban solid waste management sector.

OIL AND GAS SYSTEMS

Methane is the primary component of natural gas. Emissions from oil and natural gas systems are primarily the result of normal operations and system disruptions, yet these emissions can often be avoided through implementation of cost-effective technologies and practices. In 2010, global methane emissions from oil and natural gas systems were estimated to be approximately 1,677 MMTCO₂E, accounting for 24 percent of total global methane emissions.¹²

In 2012, the United States provided measurement study support, participated in global workshops, and collaborated on international efforts targeting methane emissions in oil and gas operations. EPA continued to facilitate cooperative mitigation activities that resulted in reducing methane emissions, thereby enabling natural gas savings and associated economic and energy supply benefits.



**Oil and Gas Accounts
for 24 Percent of
Global Methane Emissions**

China National Petroleum Corporation (CNPC): Replication of Efforts and Success Resonate

CNPC has been an active participant in GMI since 2008, undertaking numerous efforts in recent years to identify and reduce methane emissions from its operations. CNPC is now requiring its subsidiaries to report their GHG emissions annually to CNPC's head office. This is driving interest in not only quantifying emissions, but also identifying cost-effective opportunities to reduce emissions.

Based on a GMI-supplied recommended list of measurement tools, CNPC Research Institute of Safety & Environment (RISE) has equipped itself and trained personnel to develop internal measurement programs, with the goal of identifying and quantifying methane emission reduction opportunities. As a result of the measurement work conducted by EPA and experts

from CNPC RISE, CNPC views the venting and flaring of casing gas in its oilfields as a major source of methane emissions, thus presenting an opportunity to conserve a valuable nonrenewable resource. EPA introduced CNPC RISE to the concept of using micro-condenser systems as a practicable means of conserving small to medium volumes of casing at well sites. As a result, CNPC is now funding a major project to develop its own micro-condenser technology, which the corporation hopes to propagate through its oilfields.

EPA will continue providing technical support to CNPC RISE on its micro-condenser development project and work with CNPC RISE to build capacity at CNPC subsidiary oilfield companies. EPA will also support these subsidiaries by sharing information on cost-effective

¹² U.S. EPA, 2012.

control technologies for methane emission reductions at oil and natural gas facilities, developing reliable GHG

emissions inventories, and implementing methane emission reduction projects.

Completion of the Russian Gas Sector Website

With U.S. support, the Environmental Defense Fund (EDF) developed a much-anticipated website on the Russian gas sector (www.russia-gas.ru). Completed in late 2012, this website stems from EDF activities, which sought to establish a reliable, cost-effective system for monitoring and managing methane emissions from Gazprom, one of Russia's largest oil producers and holder of the world's largest natural gas reserves. The initial project-related efforts included conducting a regional pilot study to assess Gazprom's methane emissions and potential cost-effective project opportunities, as well as providing recommendations for establishing a corporate methane management system. This project also analyzed advanced economic mechanisms for attracting investment for viable methane emission reduction projects.

The new website links to a number of Russian natural gas sector websites, including the homepage for VNIIGAZ, Gazprom's scientific research institute. Pending approval, all project-related information—such



as Gazprom VNIIGAZ's pilot inventory report, the report on corporate emission management system recommendations, and presentations from the December 2010 Yamburg and October 2012 Moscow training workshops—will be available on the website.

Workshops and Meetings with Country or Regional Focus

In 2012, EPA conducted or participated in numerous oil and gas sector workshops around the world—including Colombia, Indonesia, Mexico, and Russia—as well as sponsored workshops with a regional focus (e.g., the Middle East), which together provided training for

nearly 500 people. These workshops covered a variety of topics related to oil and gas operations, such as industry best practices to detect, quantify, and reduce methane emissions.

Undertaking Field Emissions Measurement Studies

During 2012, the United States was involved with a variety of field measurement studies and/or follow-on activities (e.g., final reports) in several regions. The measurement team sought to help oil and gas companies identify potential leaks and/or other sources

of methane emissions from their operations. On study completion, the measurement team often conducted closing meetings or workshops to discuss preliminary findings and next steps.

Asia

In February 2012, the United States performed measurement studies at Indonesia's Star Energy KF and KRA platforms in the Kakap Oilfield (Natuna Sea), then conducted a field study at the Star Energy Floating Storage and Offloading facility and again at the KF platform in September. The studies sought to establish actual emission estimates, showcase the advantages of conducting leak inspection using infrared cameras, and encourage Star Energy to implement technologies and practices that reduce methane emissions.

In April 2012, EPA conducted a measurement study at a major western China oilfield, supporting a casing gas recovery project being evaluated by Frontier Energy and its Chinese partner, Beijing Petroeast Petroleum Equipment Limited. The work included measuring casing gas flows at a representative number of wells and analyzing the gas to determine its composition. Based on the strength of the initial results, Frontier Energy has undertaken additional delineation of the opportunity. EPA also conducted field trainings and demonstration activities focused on measurement and analysis of methane emissions from Sinopec's Dong Ying storage tanks.

In June 2012, the measurement team conducted simultaneous leak detection and measurement tests at the GAIL Hazira facility in India. The measurement team also met with GAIL officials to review previous Vijapur field study findings and convey the importance



Measurement study at Indonesia's Star Energy KRA Platform

of establishing an internal GAIL team for leak detection and measurement. During the trip, the measurement team also studied several operations (e.g., storage tanks, vaporization system, import terminal) of Petronet, a NGS Partner.

South America

In May 2012, EPA undertook measurement studies at several of Colombia's Ecopetrol locations, including the Provincia Plant as well as the Suerte Collection, Santos, and Bonanza Stations. The study's findings are important because Ecopetrol increasingly focuses attention on reducing GHG emissions, increasing operating efficiency, decreasing royalty fees paid to the government, and generating additional sales revenue as well as improving site safety.

Collaboration with the Mexico Low Emission Development (MLED) Program

Building on previous efforts to support development of GHG emissions baseline and marginal cost abatement tools, EPA and USAID collaborated with the MLED program in 2012 to update this information. The MLED program addresses three objectives: 1) contribute to the development and implementation of a comprehensive and sustainable low emissions development strategy for Mexico; 2) support ongoing government efforts to expand the application of monitoring, reporting and verification systems for GHG emissions in Mexico; and 3) promote clean energy through interventions that impact policy development, financing, and institutional

and technical capacities needed for the further development and deployment of clean energy in Mexico. One of MLED's tasks was to update the GHG emissions baseline and marginal cost abatement analysis for PEMEX. This synergistic support of PEMEX's efforts to quantify its GHG emissions and evaluate mitigation options contributes to the company's ability to prioritize and undertake methane emission reductions, thus furthering the goals of both MLED and GMI.

Advancing Partnerships with Oil and Gas Companies

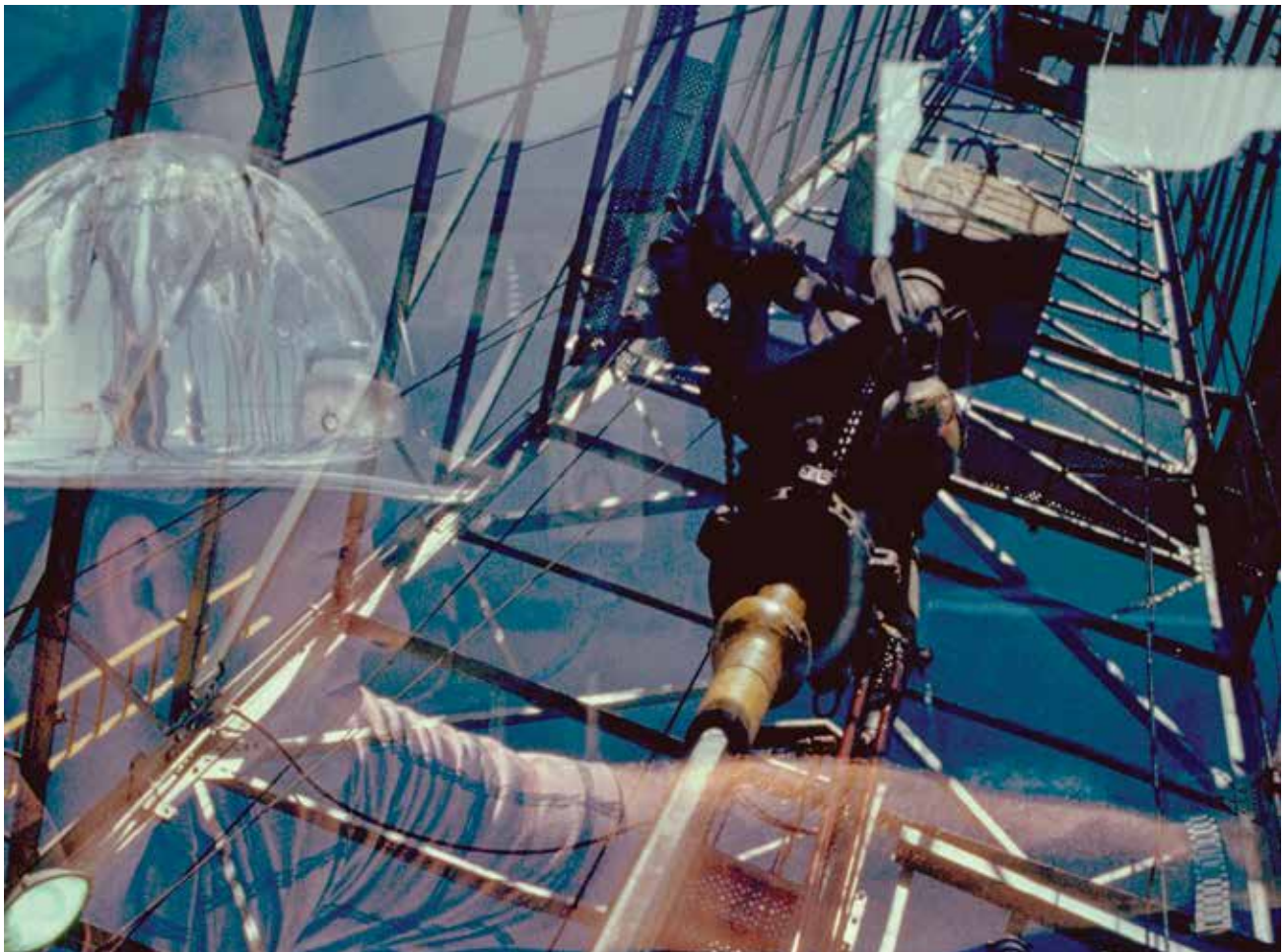
In 2012, the United States met with several oil and gas companies to discuss opportunities to work with GMI to reduce GHG emissions.

- VICO Indonesia
- Petronas, Malaysia's government-owned oil and gas company
- PTT, Thailand's largest oil and natural gas firm
- Salym Petroleum of Russia
- TNK-BP, Russia's third-largest oil producer

In June 2012, India's Petronet LNG signed a partnership agreement with EPA to encourage future

methane reductions. At the signing ceremony, EPA described GMI and its goals, discussed methane as a potent GHG, and encouraged Petronet LNG to become a leader in reducing methane. Participants also discussed preliminary measurement study findings (see above).

Ecumed Petroleum, a Tunisian gas company, also signed a partnership agreement with EPA. This new partnership came about from a connection made via EPA's participation in a December 2011 World Bank GGFR workshop, thus emphasizing the benefits of participation in industry-related events.

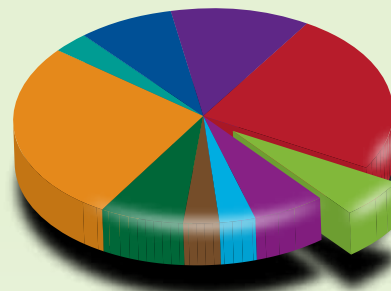


WASTEWATER



Methane is produced when the organic material in municipal wastewater decomposes anaerobically. Varying amounts of methane are emitted during the collection, handling, and treatment of wastewater depending on methods employed. In 2010, estimated global methane emissions from municipal wastewater accounted for 6 percent of total global methane emissions, or approximately 512 MMTCO₂E.¹³ A number of techniques to reduce or recover and use wastewater methane can yield substantial energy, economic, environmental, air quality, and public health benefits.

The United States has been actively involved in helping establish and promote this new GMI sector, focusing on subcommittee recruitment and outreach in 2012.



**Wastewater Accounts
for 6 Percent of
Global Methane Emissions**

Standing Up the Subcommittee and Continued Leadership

Throughout 2012, the Municipal Wastewater Subcommittee continued to establish itself after officially being added as the fifth GMI sector in October 2011. As co-chair representing the United States, EPA

played an active role in identifying and recruiting subcommittee delegates and Project Network members and planning and organizing the three subcommittee meetings held in 2012.

Developing Key Subcommittee Documents

The United States led development of the Municipal Wastewater Subcommittee Action Plan, which lays out a framework for the subcommittee's activities. Specifically, the action plan:

- Gives an overview of wastewater methane mitigation, recovery, and use opportunities and describes available technologies and best practices.
- Identifies key barriers and issues for project development.

- Identifies possible cooperative activities to increase methane recovery and use in the sector.
- Proposes outreach to engage Project Network members.
- Discusses country-specific needs, opportunities, and barriers.

The subcommittee adopted this plan at the July 2012 meeting in Singapore. A key focus in the coming year will be for Partner Countries to develop draft sector

¹³ U.S. EPA, 2012.

action plans describing how they will seek to reduce wastewater methane emissions. The United States also led the development of a sector-specific GMI fact sheet that summarizes the municipal wastewater sector and the activities the subcommittee plans to pursue. The fact sheet—presented to the subcommittee during Methane Expo 2013 in Vancouver, Canada—was published in 2013.



La Farfana Wastewater Treatment Plant (WWTP): Santiago, Chile

LOOKING FORWARD

GMI aims to reduce global methane emissions and advance the abatement, recovery, and use of methane as a valuable clean energy source. The U.S. government continues to lead this effort by building capacity, sharing information, and removing barriers to methane emission reduction project development in GMI Partner Countries.

Recognizing that methane mitigation is an essential part of the climate change solution, the United States will continue to support methane emission reduction capacity building and project development through GMI by implementing its Action Plan, encouraging greater CCAC engagement and coordination, and acknowledging GMI's 10th anniversary.

Specific efforts to be undertaken by the U.S. government over the coming year include:

- **Implementation of the President's Climate Action Plan.** President Obama's Climate Action Plan calls upon U.S. agencies to convene and develop an Interagency Methane Strategy that addresses key sectors including oil and gas systems, landfills, coal mining, and agriculture. In accordance with the Climate Action Plan, the United States will also maintain its leadership of GMI and CCAC.
- **Continued Refinement and Implementation of the U.S. GMI Action Plan.** In 2012 and early 2013, the United States developed a draft GMI Country Action Plan, which describes ongoing voluntary and regulatory methane emission reduction activities within the United States, as well as U.S. activities with international partners to promote GMI objectives to build capacity and encourage the initiation of more methane emission reduction projects around the world. This plan is intended to be a "living document" that will be regularly

updated to reflect U.S. priorities to support GMI. The United States will implement items in the plan over 2013 and 2014, and will continue to refine included elements to reflect progress and new priorities.

- **CCAC Engagement/Coordination.** Over the past nine years, the United States has worked with GMI Partner Countries and Project Network members to build capacity around the world to identify and address methane emission reduction opportunities in the five sectors targeted by GMI. The Initiative has developed a network of expertise, technological solutions, and governmental institutions that have been instrumental in achieving significant methane emission reductions. Through GMI's institutional expertise and network of key actors, the United States is well positioned to work jointly with CCAC to continue to push for increased reductions.
- **Anticipated 10-Year Accomplishments.** In 2014, it will have been 10 years since the former Methane to Markets Partnership was launched in November 2004.¹⁴ The United States will be instrumental in supporting GMI's efforts to celebrate its 10th anniversary by preparing a Partnership-wide accomplishments video to highlight the Initiative's achievements and lessons learned.¹⁵ The U.S. government will also play a supporting role in organizing an all-partnership meeting, bringing together GMI Partner Countries and Project Network members to acknowledge the strides made over the first 10 years of the Initiative.

¹⁴ In 2010, the Methane to Markets Partnership was relaunched as GMI with a broader scope (e.g., inclusion of wastewater sector, abatement) and expanded collaboration.

¹⁵ The *Partnership Accomplishments: 2004-2009* report (www.globalmethane.org/documents/par_110609.pdf) covered the first five years.



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