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METHANE EMISSIONS FROM WASTE MANAGEMENT IN DEVELOPING NATIONS

by Scott Johnson*

Greenhouse gas (“GHG”) emissions from energy production and transportation often dominate the anthropogenic climate change debate. While the attention paid to non-carbon dioxide (“CO₂”) GHGs in economic analyses of GHG abatement has increased in recent years,¹ developing nations must not ignore, and should promote the mitigation of, methane (“CH₄”) emissions from municipal solid waste (“MSW”) management.

As organic wastes decompose in the anaerobic conditions of modern, sealed landfills (“sanitary landfills”), landfill gas forms,² which consists of approximately 50 percent CH₄, 50 percent CO₂, and small concentrations of other organic compounds.³ A potent GHG,⁴ CH₄ accounted for approximately fifteen percent of total global GHG emissions in 2000.⁵ Waste management, including MSW landfilling, was responsible for approximately 21 percent of such methane emissions.⁶

While most developed nations regulate landfill CH₄ emissions, many developing countries do not.⁷ Historically, developing nations have not been significant landfill CH₄ emitters,⁸ due to the use of open dumps, which allow oxygen to permeate the waste and limits CH₄ formation.⁹ However, rapid increases in population, income, and industrialization increase MSW generation.¹⁰ Developing nations also face escalating CH₄ emissions¹¹ as they divert more MSW into sanitary landfills, a practice intended, paradoxically, to improve public health and environmental conditions.¹² Thus, as MSW generation and sanitary landfilling increase, global atmospheric CH₄ emissions also likely will increase,¹³ perhaps by as much as nine percent between 2005 and 2020.¹⁴

Non-CO₂ GHG emissions growth, including CH₄ emissions, is predicted to be greatest from 1990–2020 in the Middle East (197 percent), Africa (104 percent), Latin America (86 percent), South and Southeast Asia (64 percent), and China/Centrally Planned Asia (58 percent), while projected emissions in developed nations are expected to increase only ten percent during that period.¹⁵ China is illustrative of the potential risk, as it now generates more MSW than any other nation, a dubious honor that until recently belonged to the United States.¹⁶

While population growth in China, which more than doubled between 1950 and 1990, is stabilizing, its annual per capita

economic growth, averaging approximately nine percent over the past 25 years, is unprecedented.¹⁷ Presently, China’s quarterly GDP growth exceeds ten percent,¹⁸ having hovered steadily around that level since 2001.¹⁹ Moreover, many urban centers in China are transitioning to sanitary landfilling as their primary MSW management strategy, while they continue to struggle with unsurpassed generation increases, changing MSW stream composition, and minimal waste reduction efforts.²⁰ MSW generation in urban China alone could increase 250 percent from its 2004 volume by 2030.²¹ Never has a nation experienced as large, or as rapid, an increase.²²

In light of the potential for increased CH₄ emissions from rapidly developing nations, policymakers and the public in such nations, as well as the international community, should recognize and seize the opportunity to reduce atmospheric CH₄ concentrations. Because CH₄ is the primary constituent of natural gas²³ and is recoverable for use as an alternative energy resource,²⁴ such programs may simultaneously and effectively serve the dual purposes of abatement of landfill CH₄ emissions and reduction of fossil fuel consumption. By doing so, developing nations that pose a potential CH₄ emission risk might achieve a substantial reduction of that risk while at the same time being able to use recovered energy for further development.



Developing nations also face escalating CH₄ emissions as they divert more municipal solid waste into sanitary landfills.

Endnotes:

¹ U.S. ENVIRONMENTAL PROTECTION AGENCY, INTERNATIONAL ANALYSIS OF METHANE AND NITROUS OXIDE ABATEMENT OPPORTUNITIES: REPORT TO ENERGY MODELING FORUM, WORKING GROUP 21 1 (June 2003), available at <http://www.epa.gov/nonco2/econ-inv/pdfs/methodologych4.pdf> (last visited Jan. 31, 2007).

² U.S. ENVIRONMENTAL PROTECTION AGENCY, GLOBAL ANTHROPOGENIC EMISSIONS OF NON-CO₂ GREENHOUSE GASES: 1990–2020 6-2 (June 2006), available at <http://www.epa.gov/nonco2/econ-inv/pdfs/GreenhouseGasReport.pdf> (last visited Jan. 31, 2007) [hereinafter ANTHROPOGENIC EMISSIONS]; U.S. ENVIRONMENTAL PROTECTION AGENCY, GLOBAL MITIGATION OF NON-CO₂ GREENHOUSE GASES, Section III. Waste, at 1 (June 2006), available at <http://www.epa.gov>.

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epa.gov/nonco2/econ-inv/international.html (last visited Jan. 31, 2007) [hereinafter GLOBAL MITIGATION].

³ GLOBAL MITIGATION, *supra* note 2 at III-1; EPA.gov, Landfill Methane Outreach Program, <http://www.epa.gov/lmop/overview.htm> (last visited Jan. 31, 2007) [hereinafter LMOP].

⁴ GLOBAL MITIGATION, *supra* note 2, at sec. I. Technical Summary at 1-2.

⁵ ANTHROPOGENIC EMISSIONS, *supra* note 2, at 1-3 (Table 1-2).

⁶ ANTHROPOGENIC EMISSIONS, *supra* note 2, at 1-3 (Table 1-2).

⁷ GLOBAL MITIGATION, *supra* note 2, at III-2.

⁸ GLOBAL MITIGATION, *supra* note 2, at III-6.

⁹ GLOBAL MITIGATION, *supra* note 2, at III-3.

¹⁰ ANTHROPOGENIC EMISSIONS, *supra* note 2 at 6-2; GLOBAL MITIGATION, *supra* note 2, at III-2.

¹¹ GLOBAL MITIGATION, *supra* note 2, at III-1.

¹² ANTHROPOGENIC EMISSIONS, *supra* note 2, at 6-3; GLOBAL MITIGATION, *supra* note 2, at III-1.

¹³ GLOBAL MITIGATION, *supra* note 2, at III-6.

¹⁴ GLOBAL MITIGATION, *supra* note 2, at III-1.

¹⁵ ANTHROPOGENIC EMISSIONS, *supra* note 2, at 2-2.

¹⁶ WORLD BANK, WASTE MANAGEMENT IN CHINA: ISSUES AND RECOMMENDATIONS 5 (May 2005), available at <http://siteresources.worldbank.org/INTEAPREGTOPURBDEV/Resources/China-Waste-Management1.pdf> (last visited Jan. 31, 2007) [hereinafter WASTE MANAGEMENT].

¹⁷ WORLD BANK, PARTIALLY AWAKENED GIANTS: UNEVEN GROWTH IN CHINA AND INDIA 2 (Nov. 2006), available at <http://econpapers.repec.org/paper/wbkwbr/wps/4069.htm> (last visited Jan. 31, 2007).

¹⁸ WORLD BANK, QUARTERLY UPDATE (CHINA) 2 (Nov. 2006), available at http://siteresources.worldbank.org/INTCHINA/Resources/318862-1121421293578/China06-11_en.pdf (last visited Jan. 31, 2007).

¹⁹ World Bank, Quick Query, <http://www.worldbank.org/data/dataquery.html> (select “China,” click Next, select “GDP Growth,” click Next, select 2001–2005, click Next, Show Report) (last visited Jan. 31, 2007).

²⁰ WASTE MANAGEMENT, *supra* note 16, at 1.

²¹ WASTE MANAGEMENT, *supra* note 16, at 5.

²² WASTE MANAGEMENT, *supra* note 16, at 1.

²³ GLOBAL MITIGATION, *supra* note 2, at I-3.

²⁴ LMOP, *supra* note 3.