

U.S. Perspectives on Global Opportunities and Challenges for Landfill Methane Use



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Why Does the U.S. Govt. Care About Global Landfill Methane Emissions?

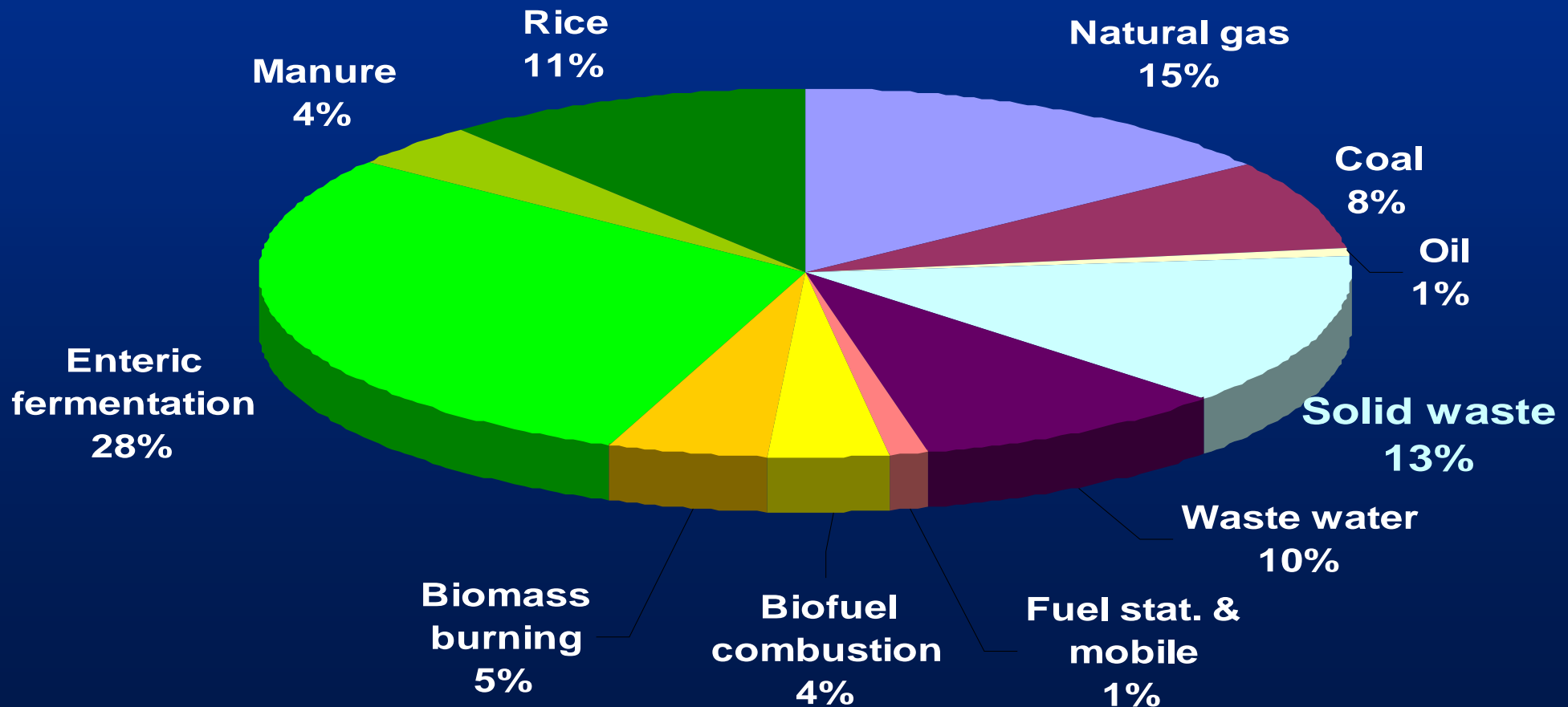


- Landfill methane is a potent heat-trapping gas and it's global.
- Landfills are the third largest human-made source of methane in the world (and rising).
- Global emissions will increase as countries improve landfilling practices.
- LFG energy projects reduce global methane emissions and local air pollution, and create jobs, revenues, and cost savings.
- U.S. ratified United Nations Framework Convention on Climate Change and launched Methane to Markets Partnership (July 2004).

Global Human-Made CH₄ Budget by Source in 2000



Total emissions in 2000 = 5,933 MtCO₂e



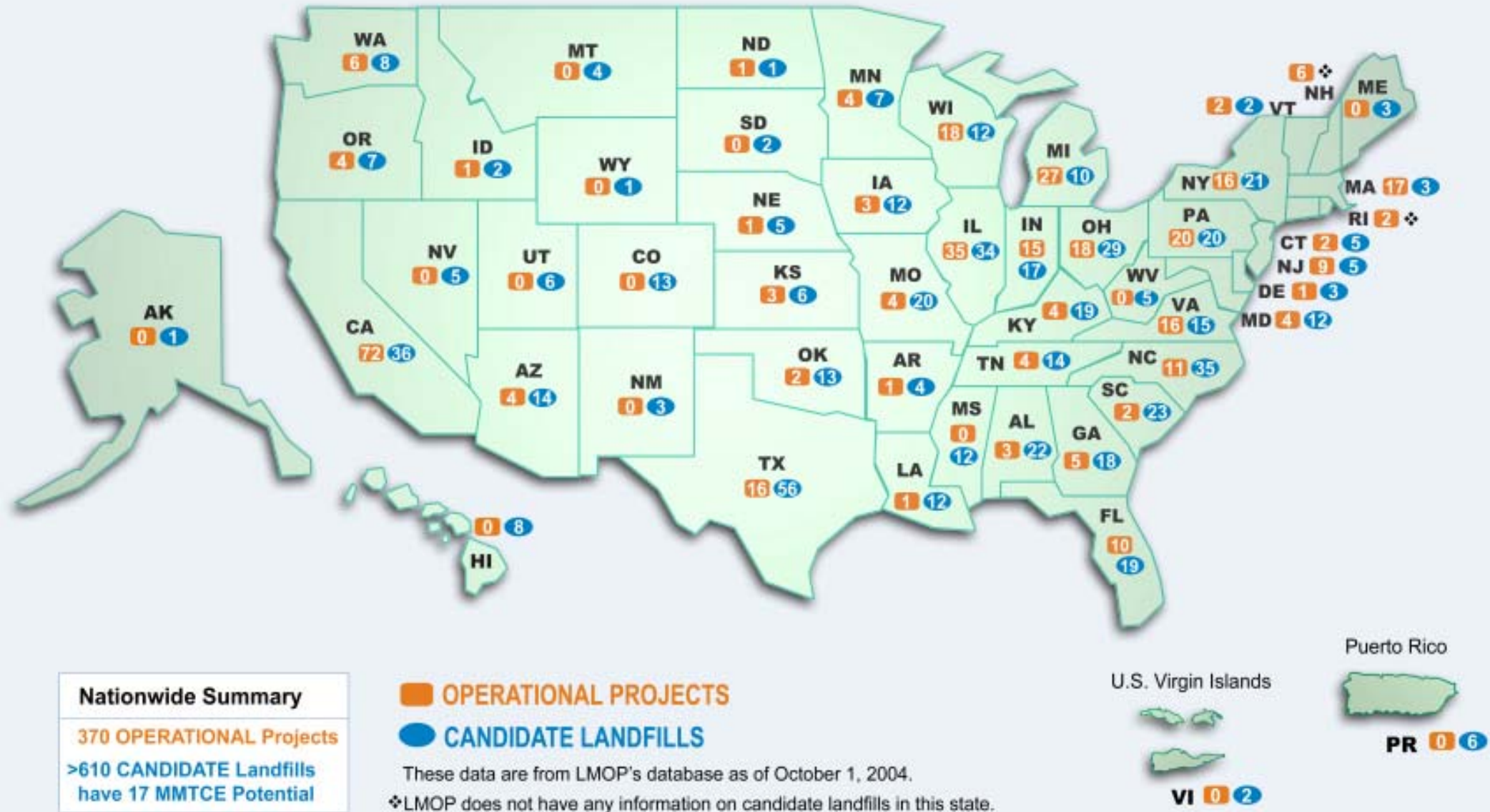
Source: US EPA

Landfill Gas Energy: Advantages



- Combustion destroys methane and other organic compounds in LFG.
- Offsets use of nonrenewable resources (coal, oil, gas) reducing emissions of: SO_2 , NO_x , PM, and CO_2
- LFG is a recognized renewable energy resource.
- LFG projects have on-line availability \longrightarrow over 90%.
- Serves as the “baseload renewable” for many utilities.
- LFG is among the most cost competitive renewable resources available (US\$0.04 - 0.06/kW).
- LFG can act as a long-term price and volatility hedge against fossil fuels.

Status of LFG Projects and Candidate Landfills (U.S.)



Nationwide Summary

370 OPERATIONAL Projects

>610 CANDIDATE Landfills
have 17 MMTCE Potential

OPERATIONAL PROJECTS

CANDIDATE LANDFILLS

These data are from LMOP's database as of October 1, 2004.

❖LMOP does not have any information on candidate landfills in this state.

U.S. Virgin Islands



Puerto Rico



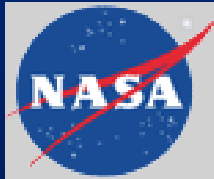
Diversity of LFG Project Types



- **Antioch Community High School (Illinois)**
 - ◆ Landfill former hazardous waste site
 - ◆ 12 microturbines with 360 kW capacity and heat for pool
 - ◆ School expects to save \$100,000 annually.
- **EnergyXchange (North Carolina)**
 - ◆ Business incubator for local artisans (glassblowing and ceramic kiln)
 - ◆ Greenhouses and aquaculture
 - ◆ Saving \$1,000,000 annually
- **Monterrey, Mexico**
 - ◆ First LFG energy project in Mexico
 - ◆ 7 MW of electricity for city transportation and lighting



Look Who's Using Landfill Gas



The Ultimate Driving Machine



From innovation to results.





LFG Policy Drivers in the U.S.

- Regulation
 - RCRA requirements for landfills
 - Air emission regulations for landfills and LFG (e.g., NSPS, MACT)
- Federal and state incentives (e.g., tax credits, low interest loans, grants)
- Demand for renewable energy (state renewable energy standards, green power, RECs)

Global Landfill Methane Emissions Trends



- Industrialized Nations Declining
 - Increased LFG regulation
 - Increased recycling of organics/paper
 - Increased LFG utilization (>1000 worldwide)
- Developing Nations Sharply Increasing
 - Shift from open dumps to sanitary/engineered landfills
 - Increased MSW generation and disposal
 - Lack of LFG regulation and recycling

Challenge: Dumps vs. Sanitary Landfills



- Lack of information on sanitary landfill design, implementation, management, and how to integrate landfill methane capture
- High organics (e.g., food)
- Lack of environmental controls (e.g., air, water & public health impacts)





Challenge: Political Constraints

- Solid waste and landfill management a low budget priority for cities
- Landfill management and methane recovery not a priority for central governments
- Municipal investment needs are not a high priority on the central governments capital investment plan, and munis. lack the funds to finance for themselves this investment



Challenge: Technological Constraints



- Lack of municipal manager understanding of potential for methane recovery and use
- Landfills often physically distant from potential methane clients
- Landfills of medium/small cities may not generate enough garbage to produce enough methane
- Investment in small scale methane production may not attract investors



Challenge: Technological Constraints



- Increase in composting decreases potential methane production
- Projected changes in consumption habits (e.g., increase in plastic bags)
- Translation and adaptation of developed country models (e.g., methane emissions) to developing world

Challenge: Financial Constraints



- Scarcity of Investment Capital
 - Multilateral banks constrained in lending to cities without a sovereign guarantee
 - Domestic capital markets are in a nascent stage of development
- Methane/landfill revenue stream may be insufficient to repay investment with a revenue backed bond, and general obligation bonds not yet be common/marketable in the developing world
- Paying for feasibility studies
- Lack of financial institution understanding of methane projects

Challenge: Managerial Constraints



- Limited municipal capacity to develop bankable projects
- Limited in-country expertise to build and operate sanitary landfills and methane recovery projects
- Limited ability to assess methane potential
- Limited municipal ability to collect and properly dispose of waste



Current Achievements & Near-Term Opportunities



- **Track Record of Operating Projects**, mainly in developed countries (~1100 worldwide)
- **New Projects in Developing Countries** (e.g., Nanjing, China; Monterrey, Mexico)
- **Near-Term Potential CDM Projects** (e.g., Asia, Latin America)
- **Consolidation of small open dumps to regional disposal sites**
- **Emerging LFG technologies showing promise for developing countries**

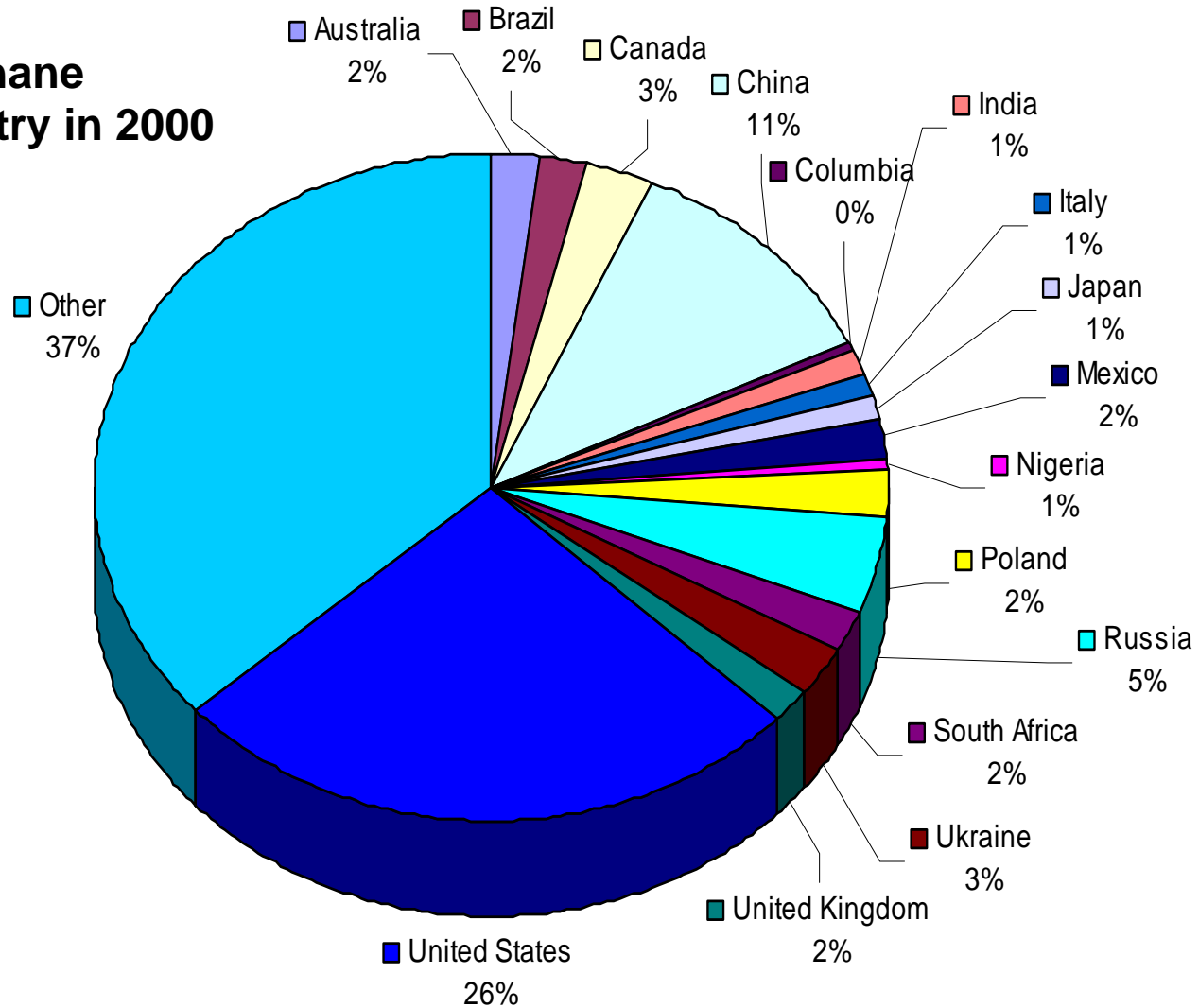
70 kW Microturbine



Landfill Methane Capture and Use Opportunities



Global Landfill Methane Emissions by Country in 2000



U.S.G. Involvement in Landfill Methane

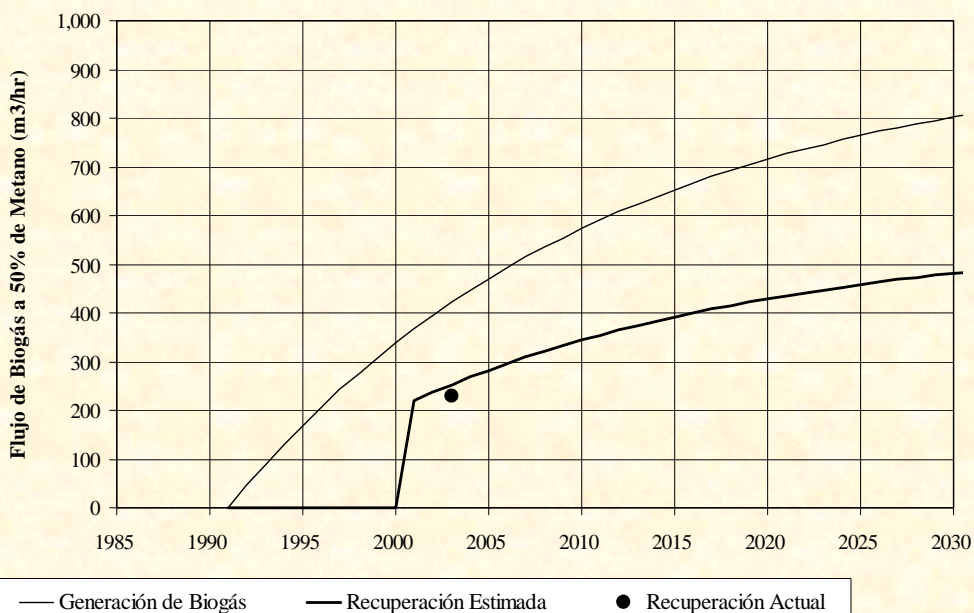


U.S.G. LFG Project Assessment and Training Tools



- International Landfill Database
- International LFG Model (generation and recovery)
- Feasibility Assessments
- Technical Training

Generación y Recuperación de Biogás
Relleno Sanitario Ejemplo



The screenshot shows the website interface for the International Solid Waste Database. It includes the EPA logo, navigation links, a date stamp of April 21, 2004, and a login form. A globe with various national flags is also visible.

United States Environmental Protection Agency
April 21, 2004
About the Project | About The Data | Maps | Help | Contact Us

International Solid Waste Database

The International Solid Waste Database was designed and developed by the U.S. Environmental Protection Agency (EPA) to address the lack of a centralized and comprehensive collection of data on solid waste generation and management practices in developing countries. [Learn More >>>](#)

New User? [Request a Login Here](#)

User Name:

Password:

For More Information...



www.epa.gov/methane/international

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