

MSW PROJECT OPPORTUNITY

VINCA LANDFILL

BELGRADE, SERBIA

MUNICIPALITY OF BELGRADE

OVERVIEW OF MSW PROJECT

The Vinca Landfill began operations in 1977. The Landfill is owned and operated by the Municipality of Belgrade. This landfill is a managed landfill with a designed waste footprint of 28 hectares (ha). There are currently about nine million tonnes of waste in place with a total site design capacity of about 11 million tonnes. Although the site is scheduled to close in 2016, it will likely remain open beyond 2016 as the new landfill site being developed and prepared will likely not be ready to accept waste in 2016.

PROJECT TYPE: Landfill gas (LFG) projections indicate that a LFG project may be possible at the Vinca Landfill. Options include electricity generation, direct utilization, and flaring only. Based on EPA's projections, a maximum flow of approximately 2,000 m³/hr of LFG at 50 percent methane could potentially be collected – enough to produce approximately 3,000 kW of electricity. There are also some industries located near the Landfill that could potentially use the LFG as a fuel source in their operations.

The feasibility of any of these projects would require additional information from the Landfill and surrounding area, such as exact locations of electricity distribution and transmission lines and nearby industrial facilities' energy requirements and interest in pursuing a LFG energy project.

ESTIMATED PROJECT LIFETIME EMISSION REDUCTIONS: 1.3 MMTCO₂E

LANDFILL LOCATION AND ASSISTANCE REQUESTS



The Municipality of Belgrade seeks specific cooperation to advance the development of this project:

- Site evaluation and preparation for a LFG energy project.
- A partner or investor to build, own, and operate a project.
- The Landfill is not under any contract for LFG energy and utilization at this time.

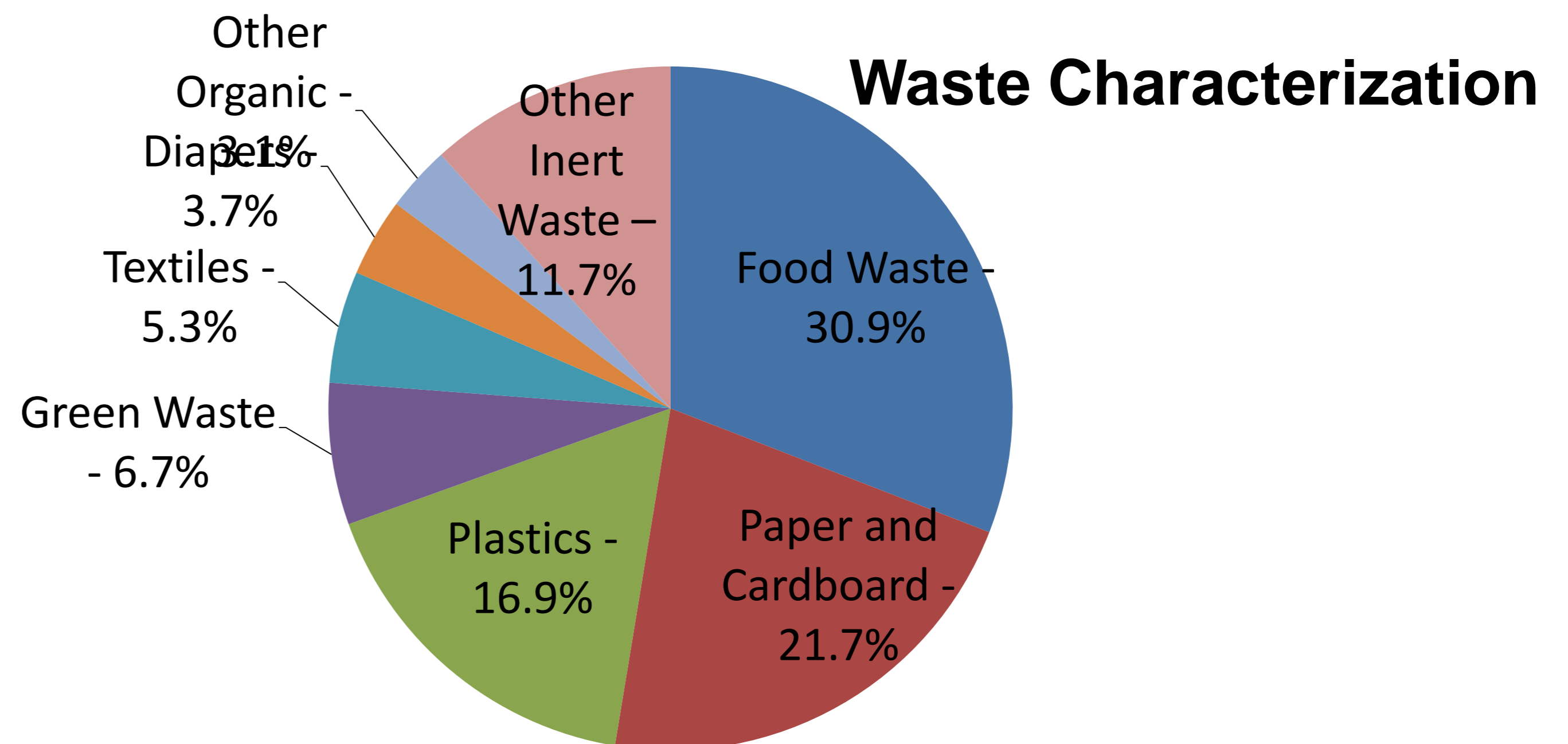
DISCLAIMER: The information and predictions contained within this poster are based on the data provided by the site owners and operators and site visits conducted by U.S. EPA. The Global Methane Initiative (GMI) cannot take responsibility for the accuracy of these data. It should be noted that conditions on landfills will vary with changes in waste input, management practices, engineering practices, and environmental conditions (particularly rainfall and temperature). GMI does not guarantee the quantity or quality of available LFG from the landfill site, which may vary from the values predicted in this report.

LANDFILL GAS AND ENERGY POTENTIAL

Under contract to the U.S. EPA, SCS Engineers estimated the amount of LFG generated by the Vinca Landfill using a draft version of EPA's Central Europe Model that is currently under development. Model input data for the preliminary assessment of the methane capture and use project at the Vinca Landfill were obtained from the Municipality of Belgrade and collected during EPA site visits in September 2011 and 2012.

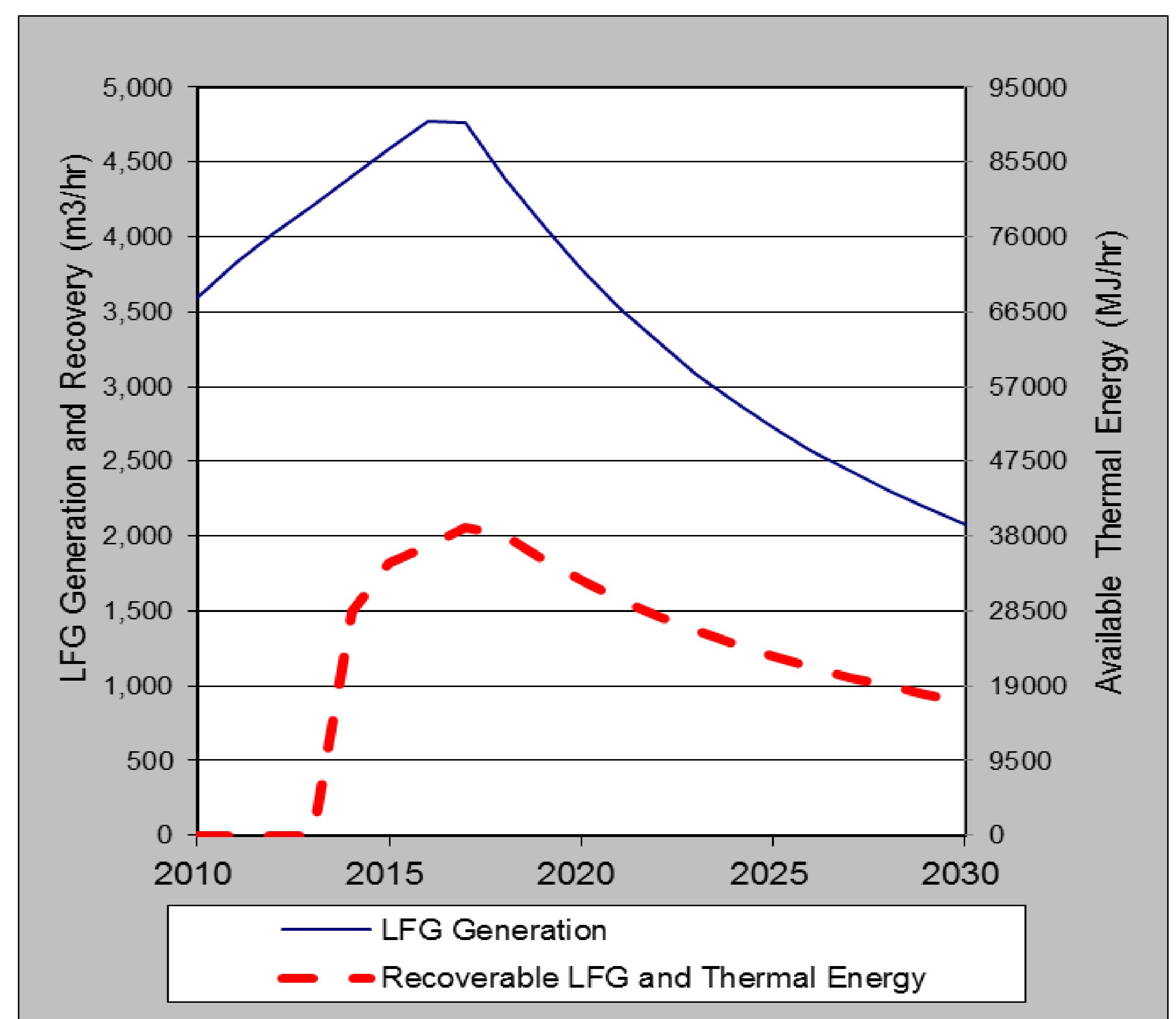
Other Landfill Physical and Operational Data:

- Site received more than 550,000 tonnes of waste in 2011 and there are nearly 9,000,000 tonnes of waste-in-place.
- Soil is used to cover the waste materials, except on the Landfill's steep side slopes.
- Waste is compacted using compactors and bulldozers.
- No engineered leachate collection system exists; however, leachate collects in trenches around the site.
- No LFG collection and control system is currently in place.



Landfill Gas Modeling Inputs:

- **CH₄ generation potential (Lo):**
 63 m³/Mg for fast-decay organic waste (e.g. food)
 84 m³/Mg for medium-decay organic waste (e.g. garden)
 147 m³/Mg for slow-decay organic waste (e.g. textiles)
 180 m³/Mg for very slow-decay organic waste (e.g. wood)
- **CH₄ generation rate constant (k):**
 0.14 for fast-decay organic waste (e.g., food)
 0.070 for medium-decay organic waste (e.g., paper)
 0.028 for slow-decay organic waste (e.g., rubber)
 0.014 for very slow-decay organic waste (e.g. wood)
- **Percent methane: 50%**



Values for these modeling variables have been developed based on the waste composition data and average annual precipitation at the Vinca Landfill. It is not feasible to collect all the gas generated at the site for flaring or energy recovery given site conditions and collection system limitations. Therefore, the amount of recoverable LFG was estimated by applying a gas availability factor to the results of the LFG generation model (graph above).

Recoverable LFG = 65% Landfill Area Available for Gas Collection x 65% Gas Collection Efficiency = 42%

ENVIRONMENTAL BENEFITS

Assuming that an active gas collection and flaring system is installed in 2014, this landfill capture project has the opportunity to collect and destroy an average of 7.4 million cubic meters of methane annually over a 12 year period. This is equivalent to emission reductions of more than 1.3 MMTCO₂e over the life of the project.

Year	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Tonnes CO₂eq from Flaring Activities	120,047	128,121	135,987	131,633	132,997	122,513	113,180	104,856	97,418	90,758	84,780	79,402

FOR MORE INFORMATION

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