

# MSW LFG ENERGY PROJECT SUCCESS STORY

## Gramacho Landfill

### Duque de Caxais, State of Rio de Janeiro, Brazil

#### Novo Gramacho Energia Ambiental

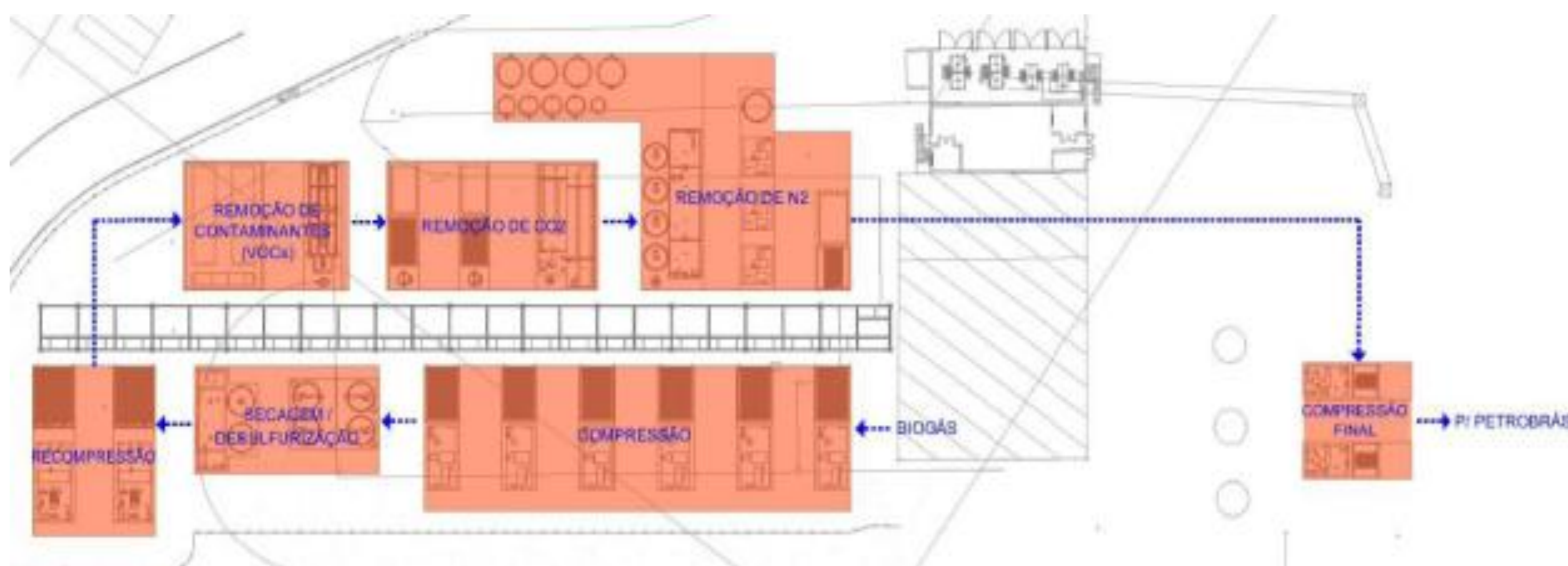
### OVERVIEW OF LANDFILL GAS (LFG) ENERGY PROJECT

Gramacho Landfill, which began filling in 1978, is owned by the Companhia Municipal de Limpeza Urbana (COMLURB). It is a sanitary landfill with a designed area of waste placement totaling 140 hectares. The landfill closed in June 2012 with an estimated 29 million tonnes of waste in place with an average waste depth of 32 meters.

In March 2013, A landfill gas collection system was installed at the Gramacho Landfill to capture gas currently escaping to the atmosphere and send it to a upgrading facility prior to injection into Petrobras's national grid. The collection system consists of approximately 300 new vertical wells spaced 30 to 60 meters apart with wellheads on each well to collect LFG; approximately 50 laterals, each connecting 1-12 vertical wells to the LFG conveyance pipelines; and 25 to 100 in-well leachate pumps for removing liquids from the LFG. The collected LFG is piped to an upgrading facility which treats the gas using Pressure Swing Adsorption (PSA) to remove non-methane gases and concentrate the methane content to at least 92.5% methane (exceeding the Agencia Nacional do Petroleo (ANP) standard of 86% methane). The upgraded gas is transported via a 6km pipeline "Flex Steel Pipe" to the injection point. A backup emergency flaring system also has been installed.

**ESTIMATED PROJECT LIFETIME EMISSION REDUCTIONS: 485,000 MMTCO<sub>2</sub>E**

### LANDFILL BIOGAS COLLECTION SYSTEM



### Aerial View of Landfill and Pipeline



### ENVIRONMENTAL BENEFITS

Gas collection and flaring systems were installed in 2007, this landfill capture project has the opportunity to collect and destroy an average of 21 million cubic meters of methane annually over the next 7 years. This is equivalent to emission reductions of more than 300,000 tonnes of CO<sub>2</sub>eq annually.

Year	2013	2014	2015	2016	2017	2018	2019
Tonnes CO <sub>2</sub> eq from LFG Energy Project	484,699	399,917	337,600	290,737	254,597	225,983	185,828*

\* January through November 2019

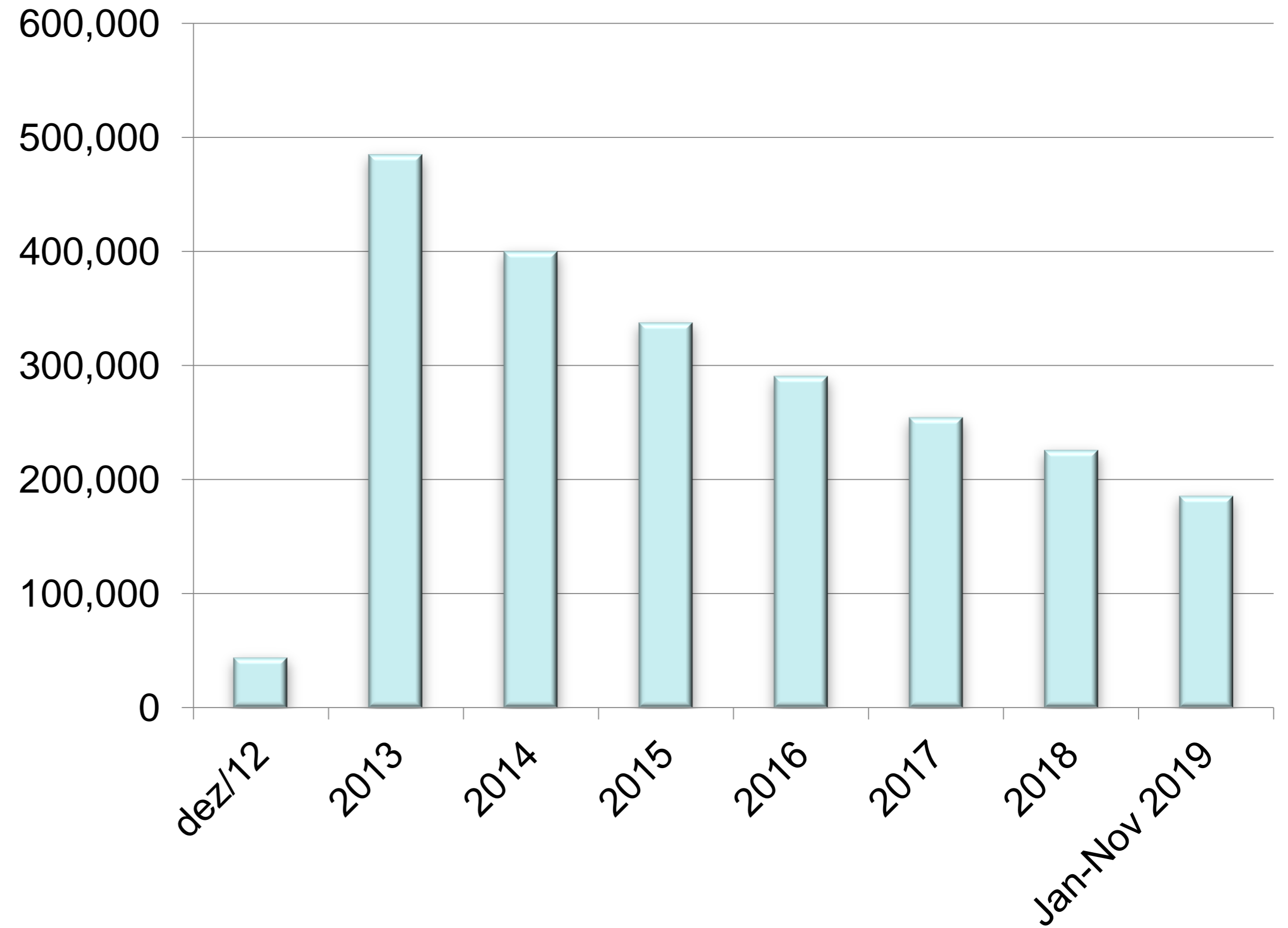
*DISCLAIMER: The information and predictions contained within this poster are based on the data provided by the site owners and operators and site visits conducted by U.S. EPA. The Global Methane Initiative (GMI) cannot take responsibility for the accuracy of these data. It should be noted that conditions 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 landfill gas from the landfill site, which may vary from the values predicted in this report.*

# LFG AND ENERGY GENERATION

Under contract to the U.S. EPA, SCS Engineers estimated the amount of biogas generated by the Gramacho Landfill using the EPA and SCS models. Model input data for the preliminary assessment of a landfill methane capture and use project were provided by Novo Gramacho Energia Ambiental S.A and collected during EPA site visits.



Projection of Emission reductions (t CO<sub>2</sub>e)



## LFG Collection System and Energy Project:

- Number of vertical LFG wells: 300
- Daily cover was applied.
- Landfill site is capped with 30 cm of imported clayey soils.
- Landfill is lined with native bay mud.
- Waste compaction was performed
- Leachate management: interceptor trench around site that drains into leachate holding pond.



## PROJECT ECONOMICS

- **Estimated cost (US\$):** \$100 Million
- **Estimated natural gas offsets at Petrobras plant:** 10%
- **Estimated payback period :** 7 years

## FOR MORE INFORMATION

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