

MSW PROJECT OPPORTUNITY

Olusosun, Abule Egbe and Solous

Lagos, Lagos State, Nigeria

Lagos Waste Management Authority (LAWMA)

OVERVIEW OF MSW PROJECT:

Olusosun, Abule Egbe and Solous Landfills began filling in 1991, 1984 and 1996 respectively. These three landfills are owned and managed as controlled landfills by LAWMA. The designed area of waste placement for Olusosun is 42 Ha, Abule Egbe 9 Ha and Solous 19 Ha. Currently, the Olusosun closed and advanced cells contain 7,768,778 metric tons (17,263,951,111 m³) of waste in place with an average waste depth of 17.5 meters, while Abule Egbe and Solous landfills contain 1,256,363 and 1,591,459 metric tons (i.e., 2,791,917,778 m³ and 3,536,575,556 m³ respectively) with average waste depth of 12.5 and 11 meters respectively. The Olusosun landfill portion containing closed and advanced cells is designed with a capacity of about 22,000,000 metric tons (about 49 billion m³) and is expected to close in 2025 with an estimated 95% of municipal wastes in place. The Abule Egbe landfill has a waste capacity of about 1.3 million metric tons (about 2.8 billion m³) and has been closed since 2009 with an estimated 95% municipal waste in place. Solous landfill is designed to contain about 5,000,000 metric tons (i.e., about 11.1 billion m³) of waste and is expected to close in 2023 with an estimated 90% municipal waste containment.

TYPE OF PROJECT: The project activity is to build, operate and maintain a LFG recovery and utilization system on the three (3) landfill sites in Lagos, Nigeria. The 1st phase of the project is intended to include an initial LFG flaring system. The proposed project activity will consist of gas collection network, an extraction and flaring system. The 2nd phase will be an electricity generation plant interconnected to the national grid at the largest landfill site. The installation of LFG facilities is proposed to commence August 2013 with the aim of completing the project in early 2014.

ESTIMATED ANNUAL EMISSION REDUCTIONS: 129,932 MTCO₂E

PROJECT HIGHLIGHT(S)

A feasibility analysis for potential LFG recovery and utilization opportunities at the three (3) landfill sites, funded by the United States Environmental Protection Agency (U.S. EPA) under the Global Methane Initiative—formerly the “Methane to Market Partnership”—has been undertaken. Currently, this project activity has been registered under the Kyoto Protocol’s Clean Development Mechanism (CDM) for Certified Emission Reductions (CERs) commercialization.



DISCLAIMER: The information and predictions contained within this poster are based on the Project Design Document (PDD) and Final Feasibility Reports prepared for these landfill sites. 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 biogas from the landfill site, which may vary from the values predicted in this report.

LANDFILL GAS AND ENERGY POTENTIAL

Under contract to Aply Carbon who estimated the amount of biogas generated by these three Landfill (Olusosun, Abule Egba and Solous) using three integrated official models from the UNFCCC and the U.S. EPA: FOD, MEX, and CAM model. Model input data for the preliminary assessment of a landfill methane capture and use project were provided by LAWMA and collected during Aply Carbon site visits in October 2011 (Abule Egba) and February 2012 (Olusosun and Solous landfill).

Other Landfill Physical/Operational Data

- Quantity of waste generated annually in Lagos: over 3.6 million metric tons.
- Quantity of waste collected per day: About 900 metric tons (i.e., about 2 million m³) in Solous, 2,600 metric tons (i.e., about 5.8 million m³) in Olusosun, while Abule Egba is closed and inactive.
- Quantity of waste accepted annually: over 320,000 metric tons (i.e., over 700 million m³) at Solous and about 1 million metric tons (i.e., about 2.2 billion m³) in Olusosun.
- Quantity of waste generated per capita: 0.63kg per person/day.
- The governor's platform in Olusosun Landfill site is capped with clay material while Solous and Abule Egba are not capped.
- Landfills are naturally lined with lateritic clay.
- Waste compaction is performed with 50T waste compactors.

Waste composition

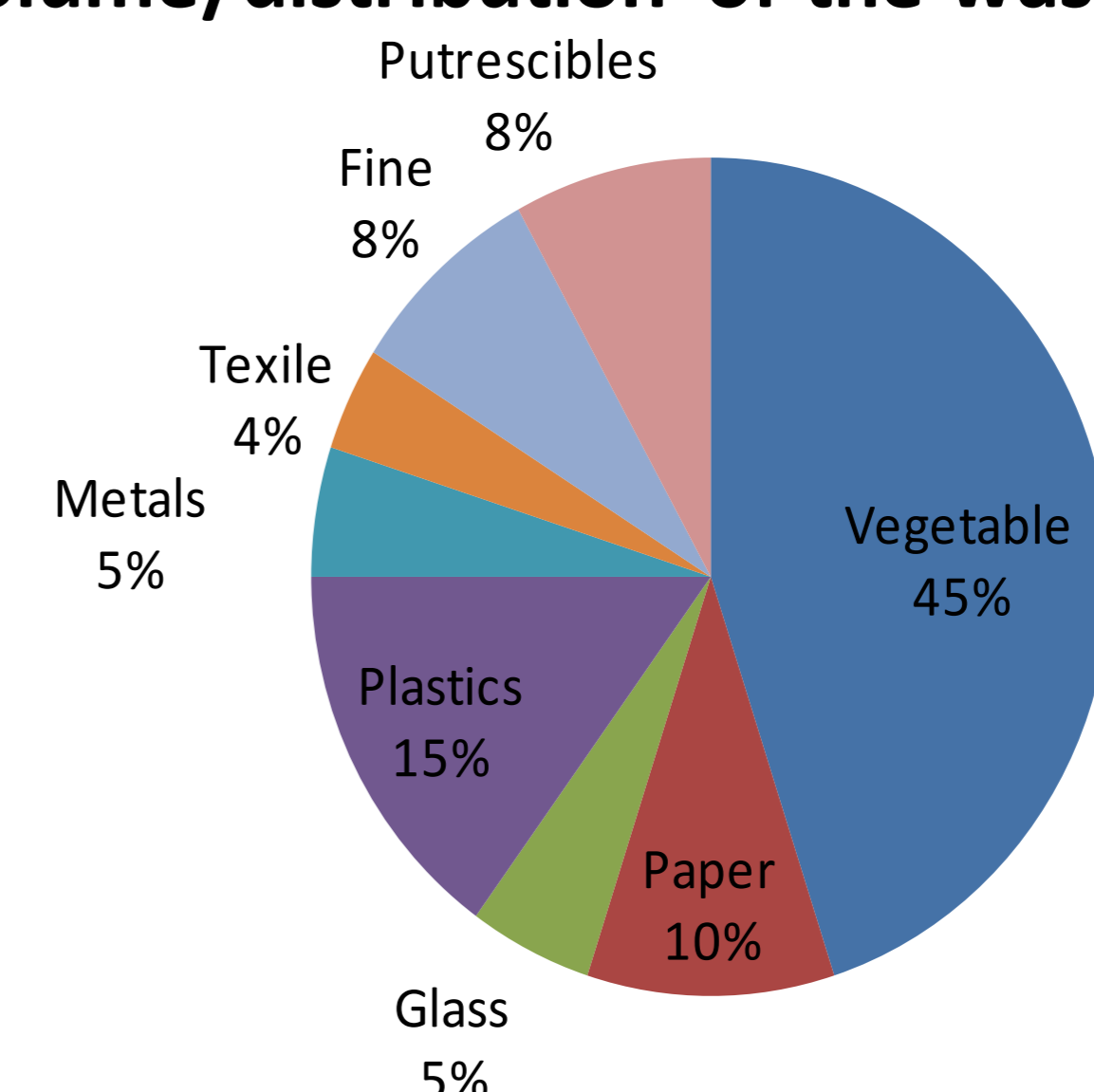
Type of Waste	Percentage
Vegetable	45
Paper	10
Glass	5
Plastic	15
Metal	5
Textile	4
Fine	8
Putrescibles	8

Average Waste Density:
0.45Kg/m³

Biogas Modeling Inputs:

- **CH₄ generation potential (Lo):**
fast – decay organic waste: 67.6 m³/Mg
slow – decay organic waste: 189.0 m³/Mg
- **CH₄ generation rate constant (k):**
fast – decay organic waste (e.g., food): 0.23
slow – decay organic waste (e.g., rubber): 0.027
- **Potential CH₄ generation capacity (Lo): 82.0 m³/Mg**
- **Methane Generation constant (k): 0.08**
- **Percent methane: 50%**
- **Gas recoverable rate : 30% (low value)
60% (high value)**

Pie Chart showing the % volume/distribution of the waste stream



Values for these modeling variables have been developed based on the waste composition data, average annual precipitation at Olusosun, Abule Egba and Solous, and the results of a pump test conducted in June 2012. 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 biogas was estimated by applying a gas availability factor to the results of the biogas generation model.

PROJECT ECONOMICS

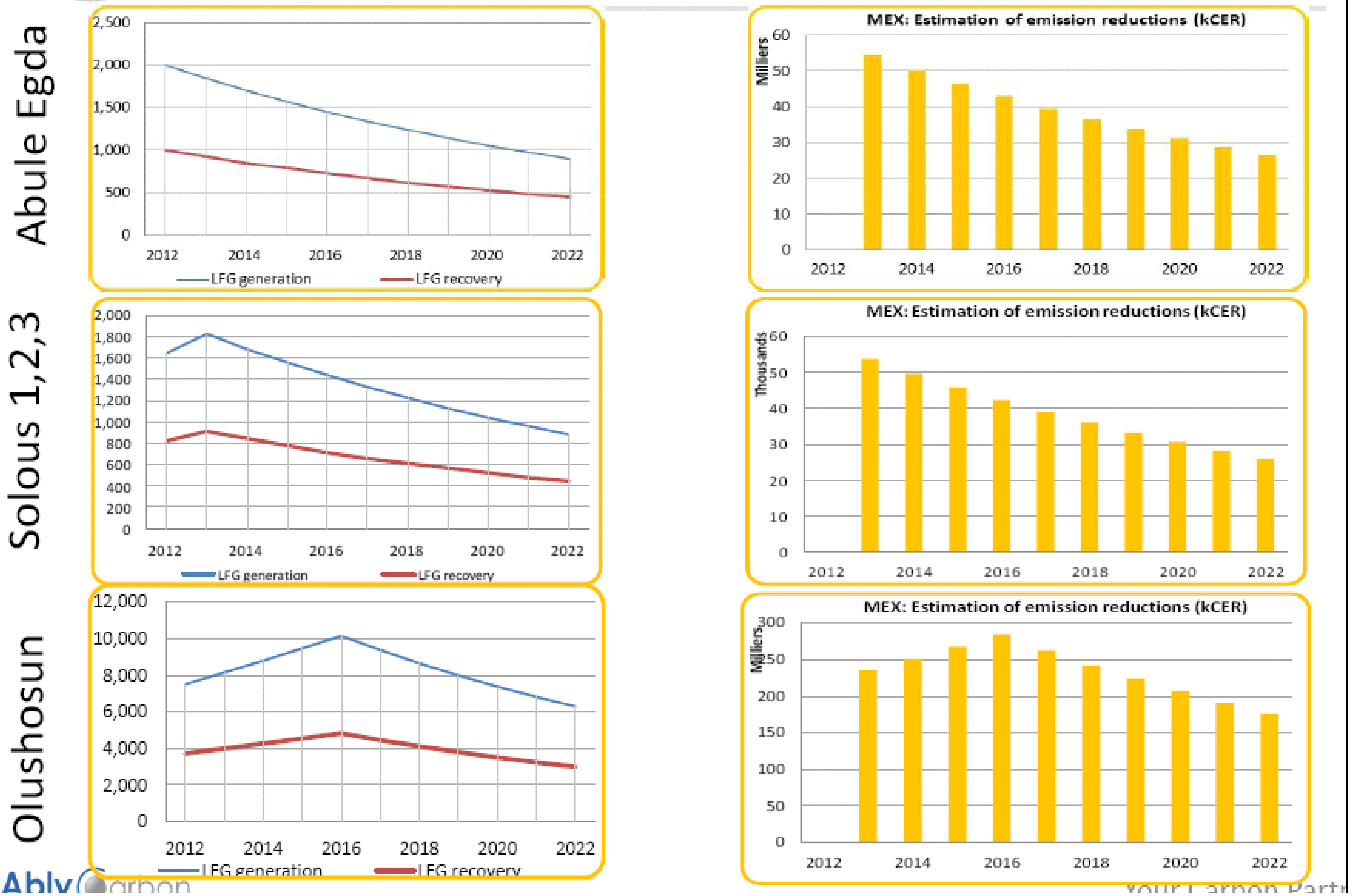
Estimated Installed Cost: US\$13,918,000
Operation & Maintenance (US\$/year): US\$1,082,000
Estimated electricity offsets (US\$/year): over US\$10 million

ENVIRONMENTAL BENEFITS

Assuming that a gas collection and flaring system is installed in 2013, this landfill capture project has the opportunity to collect and destroy an average of 9.6 million m³ of methane annually over the next 10 years. This is equivalent to emission reductions of more than 120,000 tonnes CO₂ annually.

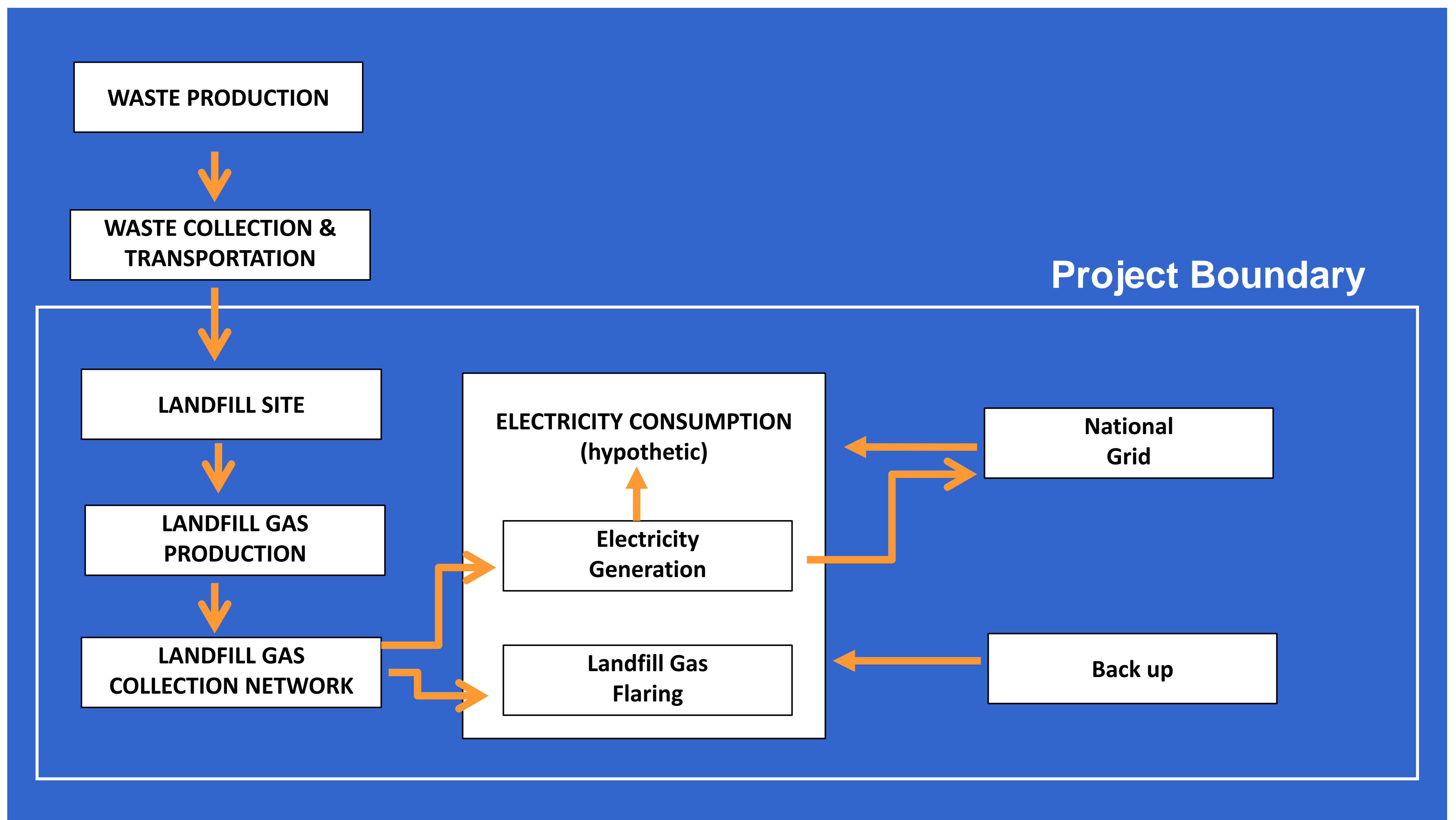
Year	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Tonnes CO ₂ eq from Flaring Activities	129,932	129,932	129,932	129,932	129,932	129,932	129,932	129,932	129,932	129,932	129,932	TBD	TBD	TBD	TBD

LFG flow and the related emission reductions over the next 10 years for Olushosun, Solous and Abule Egba



1	Olushosun	Average of LFG flow (LFG Recovery)	3,946 Nm ³ /h
		Expected Emission Reductions (1 KCER = 1k tCO ₂)	2,340 k t CO ₂ e
2	Solous 1, 2 and 3	Average of LFG flow (LFG Recovery)	669 Nm ³ /h
		Expected Emission Reductions (1 KCER = 1k tCO ₂)	384 k tCO ₂ e
3	Abule Egba	Average of LFG flow (LFG Recovery)	694 Nm ³ /h
		Expected Emission Reductions (1 KCER = 1k tCO ₂)	390 k tCO ₂ e

PROPOSED LANDFILL BIOGAS COLLECTION SYSTEM



FOR MORE INFORMATION

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