This is a new section of the Public-Private Partnership Resource Center website and is currently in draft form. Your feedback is welcome: If you would like to comment on the content of this section of the website or if you have suggestions for links or materials that could be included please contact us at ppp@worldbank.org.

Photo Credit
Waste-to-Power Model for ERP, Landfill

Waste-to-Power Model for ERP

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On this page: *Waste-to-Power leveraging a New-Build-Finance-Bulk-Tariffs model - Model 9 in the ERP Project Guidelines. Read more below, or visit Strategic Guidance for Country System Assessments, Guidance for Countries in Assessing ERC Projects, or Mobilizing ERC Finance.*

Project Type: Tech-based avoidance project

Sector: Waste

Applicable Project Methodology: ACM0001 – Consolidated baseline and monitoring methodology for landfill gas project activities

The activities under the project are designed to establish a system that can collect, transport, and treat landfill gas, with the purpose of generating electricity for the project's own use and selling any surplus power to the grid.

Proposed Structure of this Public Private Partnership (PPP) Model

The project will be leveraging a **New-Build-Finance-Bulk-Tariffs** model. To enable alignment of interests, a new project company may be formed in which the operator of the landfill partners with an experienced power producer. The waste will be collected from the landfill to the new facility to be built, requiring tipping fees to be paid by the current landfill operator for the reduction of waste under its management. In return, the landfill operator may benefit from the sale of the emission reduction credits (ERCs) in the voluntary carbon markets, as well as the sale of power to distributors via the new project company, of which it holds equity interest. The grantor will provide the concession to build and operate the waste-to-power facilities for a fixed period, after which it will take over ownership and operation.

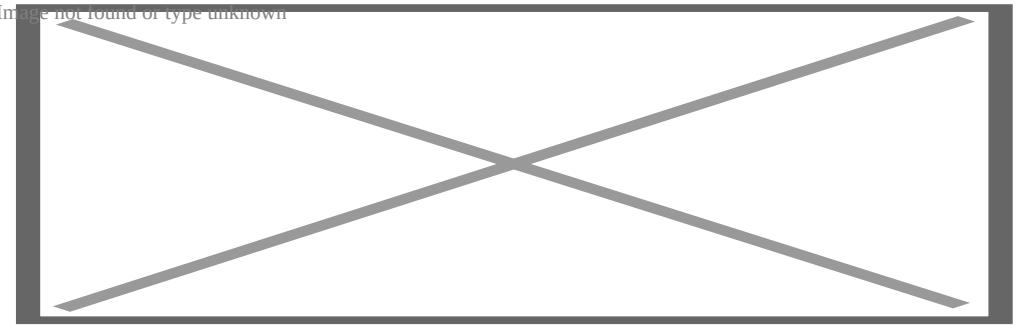
Table 1: Model Attributes

Dimension	Attribute	Description
Business	*New*	This model assumes that the private entity currently provided the concession to operate the landfill will be provided the authorization to engage in this project in partnership with an experienced power producer, creating a new entity that will enable alignment of interests.
	Existing	

Dimension	Attribute	Description
Construction	*Build* *Refurbish*	The model involves building new infrastructure to enable the landfill gas capture, as well as the waste-to-power plant in the vicinity of the landfill.
Private Funding	*Finance*	The project company will be charged with raising financing for the new installation, both from financial institutions as well as the voluntary carbon markets.
Service	*Bulk* *User*	Revenues of the project company will be coming from the power distributors that it engages with for the sale of power generated by the plant.
Revenues	*Fees* *Tariffs*	Revenues in this model will originate from the electricity tariffs to be paid as contracted by power distributors

Proposed risk allocation of the Public Private Partnership Model

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Key features of PPP structure

- Private sector entity to design, build, finance, operate and maintain landfill gas plant via concession agreement with the ministry/ government or state-owned entity
- The private sector entity acts as the implementation partner, and is responsible for all activities related to the implementation, management, monitoring and reporting of the project over the project crediting period
- In exchange, private sector entity can earn the revenue from the ERCs generated from the project
- The government or state-owned entity benefits from the cost savings from not needing to treat landfill waste

Expected ERC end use

- End use can belong to project developer as part of additional revenue stream

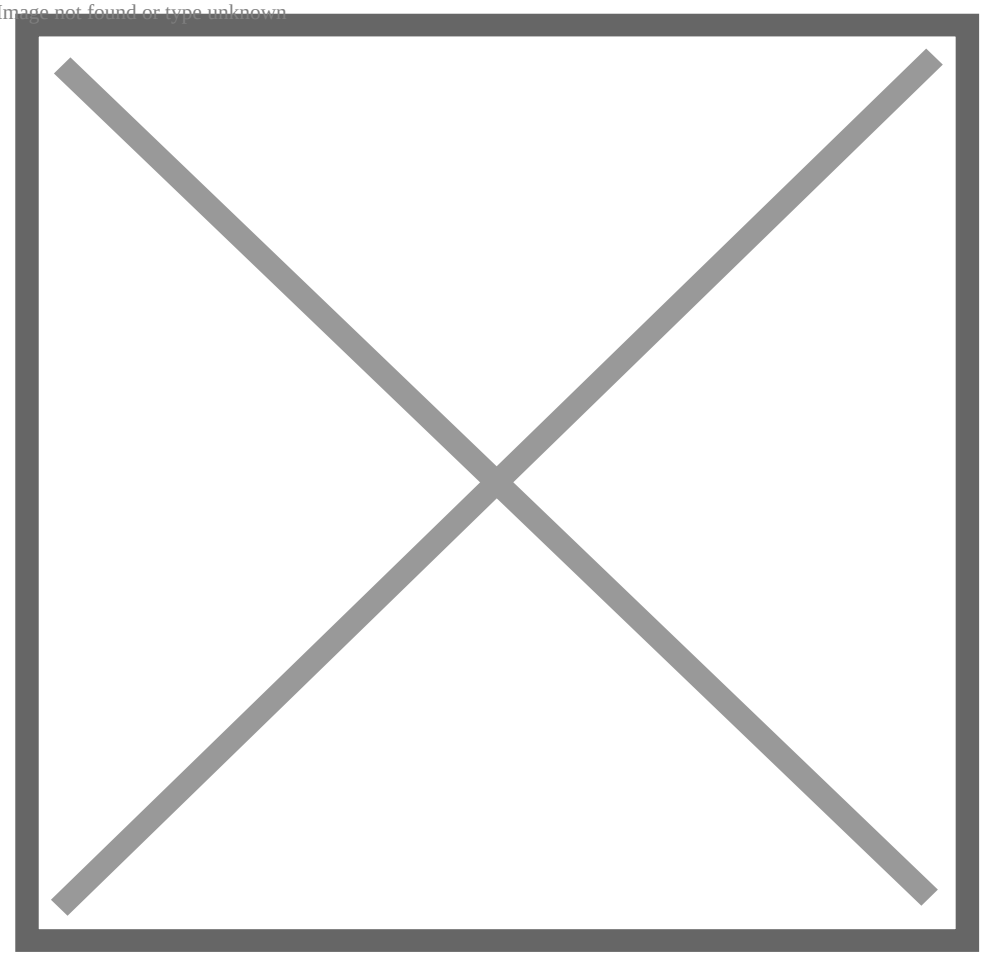
Key considerations/risks for proposed project

- Extensive stakeholder engagement required to ensure buy-in from operators of landfill sites as well as any other relevant stakeholders
- Need to ensure adequate technical local expertise in day-to-day execution to ensure minimal carbon leakage from treatment of landfill waste
- Stable political environment key to enable smooth execution of landfill gas
- Partnering with a service provider for the project's marketing, sales and pricing is needed to identify potential offset buyers, negotiate contracts, and secure good target price per tonne to enable the financial viability of ERC generation
- Contracting a monitoring, verification and reporting (MRV) service provider with experience in conducting MRV and preparing the necessary documents for generating ERCs in a voluntary carbon

market standard will reduce risk of registration and issuance delays or bottlenecks, and strengthen credibility of project's carbon integrity quality

Figure 1: Financing and Activity Flows for the Model

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Case study: Exploitation of the Biogas from Controlled Landfill in Solid Waste Management Central, Brazil

Project description

This project includes a system to collect, transport, and treat landfill gas, generating electricity for self-use and feeding into the national grid. The project reduces greenhouse gas (GHG) emissions by destroying methane in high-temperature flares, which has 21 times greater GHG potential than carbon dioxide, and replacing electricity from fossil fuels.

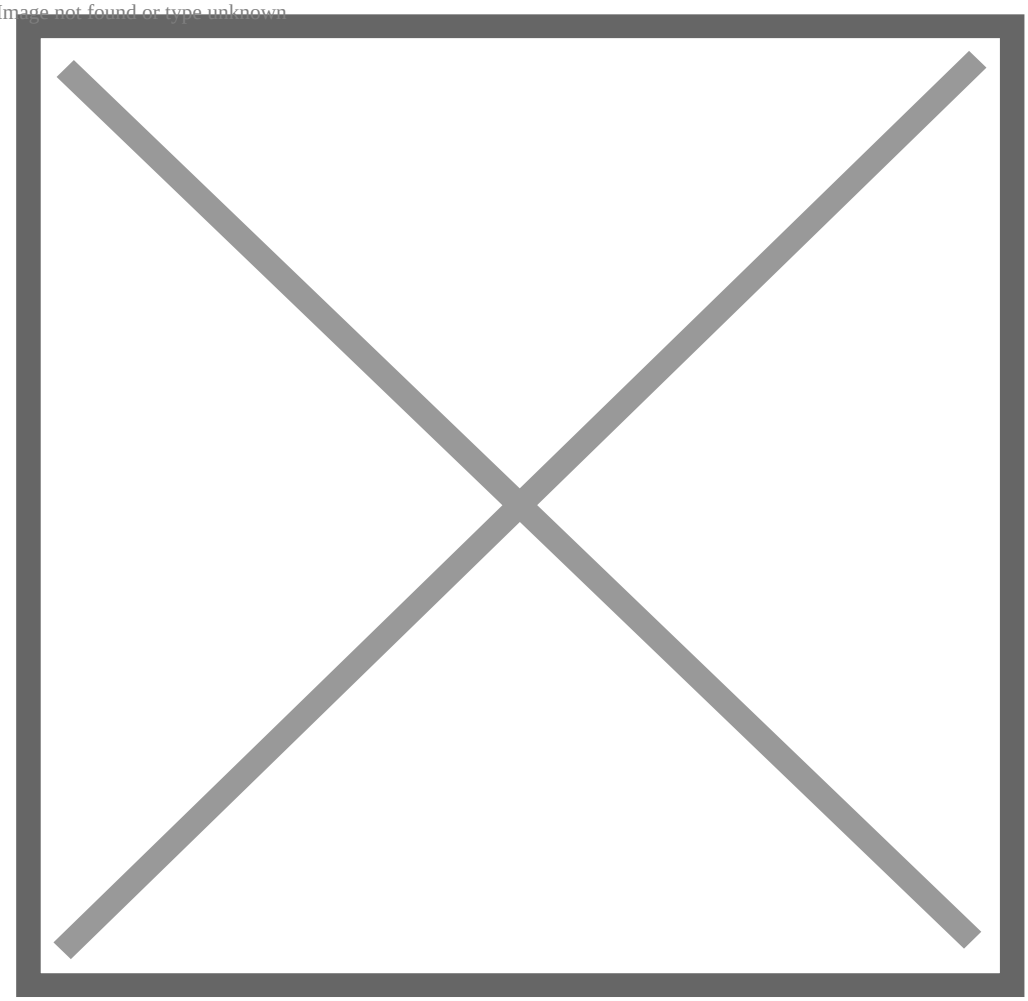
The landfill site in which landfill gas is collected occupies a total area of 114.9 hectares (ha), with 65 ha planned for municipal waste treatment and disposal. The landfill serves the municipality of Belo Horizonte in Brazil which has a population of 2.7 million (M) residents.

Targeted results

Expected annual ERCs generated from the program will be 112,011 tonnes.

Figure 2: Structure of Case Study PPP

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Consórcio Horizonte Asja signed a concession contract between Municipality of Belo Horizonte to have the right to exploit the landfill gas arising from wastes from the CTRS / BR.040 landfill. Consórcio will invest and operate its landfill gas electricity plant that collects waste from the CTRS / BR.040 landfill. The renewable electricity generated from the plant will be sold to the national grid. At the end of concession agreement, the project will be transferred back to municipality of Belo Horizonte.

Summary of the model financials

Assuming a similar project context as the case study, the estimated Net Present Value (NPV) without ERC in- and outflows – only considering non-ERC inflows through other revenue streams or cost savings enabled by the project – is negative at $1.7M[1]. With ERC cashflows, the total project will still have a negative NPV of $1.5M, which helps make landfill gas projects a bit more financially viable. It should be noted that the overall NPV of project will likely improve beyond ERC crediting period as revenue generated from electricity sale continue to recur.

Table 2: Summary of sources of inflows and outflows and key assumptions

Value component	Assumptions	Sources

ERC revenues or inflows	• Three issuances across the project's 10-year crediting period, at year 3, year 7 and year 10 • $7.35 per tonne today for 43,860 estimated tonnes of ERCs likely generated in the first issuance • 10% price increase to $8.09 for 87,720 estimated tonnes of ERCs likely generated for the second and third issuance	Average price of Waste Disposal project in Asia, VCS and GS
Non-ERC revenues or inflows	• Annual average output of 17,479 megawatt hours (MWh) • Annual expected electricity sale of $1,025,767 • Expected electricity sale of $58.70 per MWh	Brazil landfill gas benchmark
Project investment and implementation cost	• Total investment cost of $5,086,037 • Annual plant operation cost of $485,042 • Annual operation cost on ERC production of $165,612	Brazil landfill gas benchmark
ERC generation	• $10,000 for the project's registration and first issuance • $15,000 for each verification process across three issuance cycles • $0.14 per tonne for subsequent issuances	Verra Fee Schedule

Table 3: Net cashflows summary (in USD)

Components	Sum of initial outlays	Sum of in- or outflows from crediting period	Total cashflow
ERC Component			
Revenues/Inflows	0	653,987	653,987
Costs/Outflows	0	-52,522	-52,522
Net value	0	601,465	601,465
Primary/Non-ERC Component			
Revenues/Inflows	0	10,257,674	10,257,674
Costs/Outflows	-5,086,037	-6,506,543	-11,592,579
Net value	-5,086,037	3,751,131	-1,334,906
Net Present Values			
NPV	-$1,541,960		
NPV (ERC Component)	$178,826		
NPV (Non-ERC Component)	-$1,720,787		

Footnote 1: All prices are expressed in United states Dollars (USD)

Related Content

- **Guidance for Countries in Assessing ERC Projects (Download PDF version)**

Additional Resources

- Climate-Smart PPPs
- Finance Structures for PPP

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