



WASTE MANAGEMENT IN HAÏTI.



AN OPPORTUNITY FOR GONAÏVES.
OUR CONTRIBUTION TO THE PARIS AGREEMENT
ON CLIMATE CHANGE.

INTEGRATED WASTE MANAGEMENT AND GLOBAL DEVELOPMENT STRATEGY

Founded in 2012 by Biothermica Technologies Inc (Canada), Terre des jeunes transnational (Canada) and Terre des jeunes Gonaïves (Haïti), Bioénergie Haïti (BEH) is a non-profit, locally-owned technology corporation active in Haiti's Artibonite region and in the municipality of Gonaïves. BEH is gradually setting up waste collection routes and will manage a modern landfill site for municipal and agricultural waste with an aim to generate electricity and cooking gas, and be a major player in sustainable development, greenhouse gas reduction and the fight against climate change.

After spearheading a number of awareness campaigns for a clean city since 2013, BEH began waste collection operations in 2017 thanks to a \$1M grant from the International climate cooperation program from the Quebec government following the Paris Agreement on climate change and a \$1.2M in kind contribution from the BEH founders.



***Waste is a precious resource.
Even more so if it is
community-managed.***
Cleanup operation, Gonaïves, 2017.

CIRCULAR ECONOMY.

FROM WASTE COLLECTION TO LANDFILL TO ENERGY

The project is composed of three main pillars:

- A collection service for urban and agricultural residual materials;
- The construction and operation of a technical landfill site;
- The production of electricity from landfill gas coupled with a photovoltaic power plant.

As of 2021, the technical landfill site (TLS) will receive urban waste from the commune of Gonaïves and agricultural waste from the communes of Ennery and L'Estère. The TLS will feature a weighing station for garbage trucks, a leachate collection and treatment facility, and a biogas capture and flaring system. Eventually, by 2025, the TLS will be able to receive about 100,000 tons of waste.

A 1 MW biogas powered plant will be functional by 2024. In order to attain faster revenue generation, thus financing the chain of operations on the TLS, a 2 MW solar-powered plant will be installed by 2022 — given the reaching of an agreement with Électricité d'Haïti (EDH), the Haitian state-owned agency responsible for electricity management.

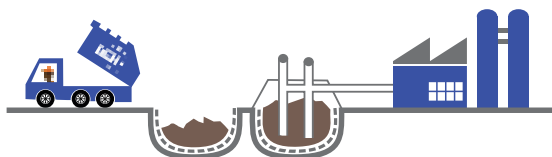
Running two types of power plants in parallel will level electricity production around the clock and adapt to demand - the TLS acting as a biogas (i.e. energy) storage.



Bioénergie Haïti (BEH) is a locally-owned, non-profit technology corporation, owner and manager of the project, land and infrastructure.



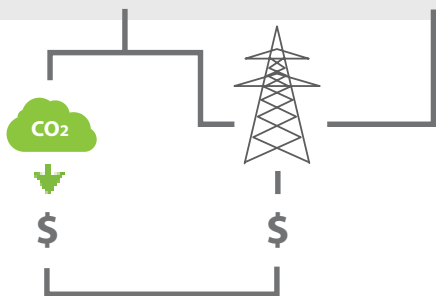
Waste collection



Landfill and biogas capture



Solar and biogas co-energy

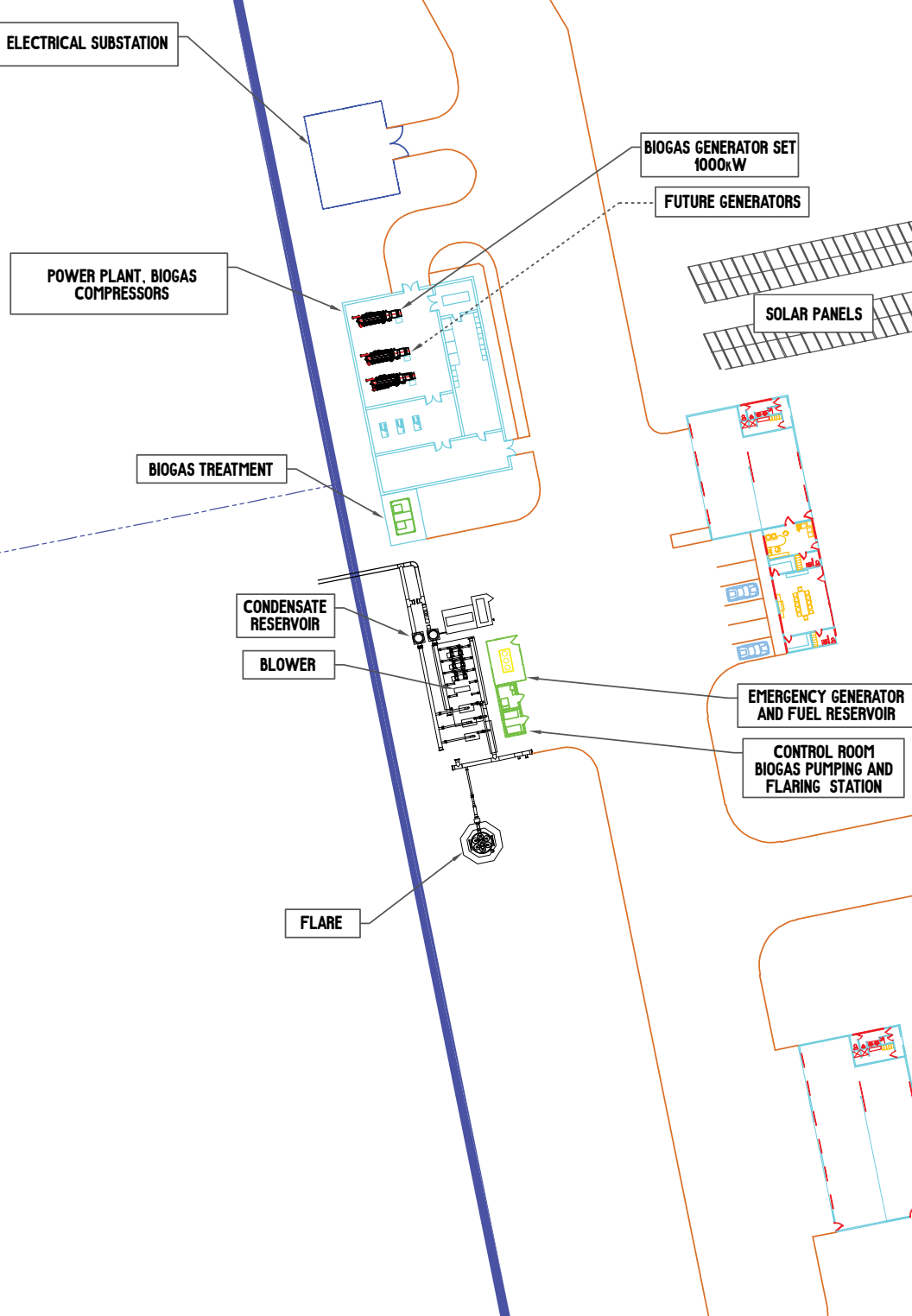


Revenue from energy production and carbon credits



Financing of operations leading to job creation, and improved health and environment

AND THE CYCLE GOES ON...



A CONCRETE PROJECT WITH POSITIVE IMPACTS



This project will generate significant socio-economic impacts over the next 25 years, among them:

- Reduction of 7.3 million TeqCO₂ of greenhouse gases;
- Substitution of some 2 million barrels of oil equivalent;
- Improvement of Haiti's commercial balance by \$150-200M;
- Creation of more than 600 direct and indirect jobs;
- Carbon credit sales on the international market;
- Model technology project that is reproducible elsewhere in the country;
- A clean and tourism-friendly city.



Left: view from the north of the proposed landfill site, facing south-east.

Right: visit to the proposed landfill site by Biothermica, April 2018.

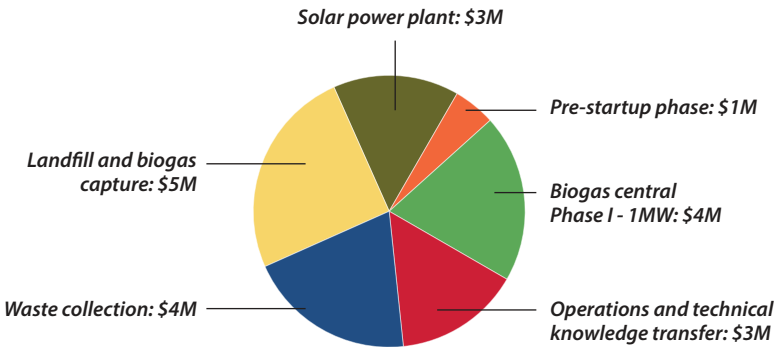
ENERGY KNOW-HOW.

FINANCING

The total estimated cost of the project, from inception to self-sufficiency through the sale of energy and carbon credits, is \$20M USD. The financial package for these capital expenditure investments (CAPEX) is made up of two parts: 1) Donations from the international climate financing programs, following the Paris Agreement on climate change, and 2) Subordinated debt with low interests.

Note: the designated land was declared of public utility by the Haitian government in 2011 and will be transferred to BEH for a nominal fee.

BEH plans to gradually increase its recurring revenue from the sale of electricity and/or cooking gas, as well as carbon credits, and use that revenue to set up and maintain waste collection, modern landfill infrastructure and the landfill gas power plant. In addition to its methane combustion technology, a solar photovoltaic installation is planned to ensure stable, long-term electricity production.



TIMETABLE AND PROJECTIONS

Landfill operations are slated to start in 2021. During the course of 40 years, BEH anticipates the treatment of 10 million cubic meters of waste, of both municipal and agricultural origin. In terms of greenhouse gas, a reduction of 7.3 million TeqCO₂ is anticipated over this period, peaking at 300,000 TeqCO₂/year after 15 years.

2017-2018 Waste collection start-up

2019-2021 Landfill site construction

2022-2023 Initial biogas flaring + 1st carbon credits + solar power

2024-2025 1-3 MW power generation

2026-2033 4-7 MW power generation

2034-2044 8-10 MW power generation

INITIAL FINANCING



This project is made possible by the financial participation of the founding members and of the Quebec Government through its International climate cooperation program (PCCI), with the cooperation of the city of Gonaïves. Ce projet est réalisé grâce à la participation financière des Membres Fondateurs et du gouvernement du Québec à travers son Programme de coopération climatique internationale (PCCI), avec la coopération de la ville des Gonaïves.

FINANCIAL INDEPENDENCE. RECURRING REVENUE.



Above: General annual assembly of Bioénergie Haïti, September 2017.¹

Below: signature of a long-term agreement with the municipality of Gonaïves, Oct. 2011.

(1) Dieuseul Augustin, BEH President and managing director; Guy Drouin, President, Biothermica Technologies Inc., Pierre Luckson Junior (APDIA), Johnny Joseph (Terre des Jeunes Gonaïves), Sylvestre Josué (ALCE), Pierre-Charles Luxene (Société civile organisée), Saint-Louis Jose Dieulaine PH, assistant mayor of Gonaïves, Excellent Joseph, assistant mayor of Gonaïves, Ronite Magoffie (Association des femmes), Guillaume Lacroix and Jean-Pierre Franzidis (Biothermica), and Lydie Servanin (Terre des jeunes transnational) (not in the photo).

BIOENERGIE HAÏTI AND ITS PARTNERS

From the get-go, BEH has made **exemplary governance** a priority.

BEH is a non-profit, locally-owned **technology corporation** set up by three founding members following a long-term agreement, signed on October 11, 2011, between Biothermica and the municipality of Gonaïves for a project encompassing waste collection, landfill gas valorization and carbon credits sales. Article 4 of the agreement mandates the creation of BEH as owner-operator of the infrastructure, under the supervision of Biothermica, who is responsible for financing and technical knowledge transfer. BEH's statutes were approved on February 12th, 2012 and define **three categories of members**.

Founding members: Biothermica Technologies Inc (Canada)
Terre des jeunes Gonaïves (Haïti)
Terre des jeunes transnational (Canada)

Institutional and civil society members: Idevet (Idées vertes)
Société civile organisée
Alliance des femmes des Gonaïves
Association des producteurs pour le développement intégré de l'Artibonite (APDIA)
Association des Leaders Chrétiens pour l'environnement (ALCE)

Consulting member: Municipality of les Gonaïves

COOPERATING FOR A CLEAN CITY.

MAKING TECHNOLOGY ACCESSIBLE TO LEAST DEVELOPED COUNTRIES

Partnering with Biothermica, a leader in sustainable waste management for 30 years, BEH has access to world-class know-how and capacity building for an efficient technology transfer program in waste management and collection, landfill operation and energy production from biogas, based on modern environmental regulations, providing the Gonaïvien population and Haïti essential knowledge for waste valorization.

BEH is the **owner-operator** of its infrastructure whose acquisition is ensured through international financing. Electricity production and the sale of carbon credits will finance operations and secure long-term, stable **recurring revenue**.

Through its **knowledge transfer program** overseen by Biothermica, BEH offers technical and management training to local communities, ensuring not only local ownership but the know-how to ensure long-term sustainable viability of the project. Such long-term planning and community ownership is the BEH vision for greenhouse gas reduction and the fight against climate change.

In addition, the BEH model is designed from the start to be **reproducible** elsewhere in Haiti and in other least developed countries which are otherwise unable to finance sustainable management of municipal and agricultural waste.

TECHNOLOGY FOR THE PEOPLE.



*Landfill gas to energy project CDM
(UNFCCC) project no 0167 in
El Salvador by Biothermica*



*Cleanliness campaign, pilot neighbourhood,
Gonaïves, January 2018.*



COMMUNITY-DRIVEN CHANGE

BEH's founding members have combined over 30 years of international development experience through concrete reforestation projects; waste-powered sustainable energy production; and education and awareness campaigns in least developed countries centered around environmental, sustainable development and climate issues.

BEH's local civil society partners are paramount to the project's long-term success. Its entire model aims to ensure **management by and for the community**, inclusive of all income levels, with a particular focus on women.

These partners also provide a **network of volunteers**, involved citizens, local leaders and role models. For example, BEH has organized several neighborhood meetings, awareness campaigns and cleanliness campaigns involving hundreds of volunteers.

As a **non-profit corporation**, BEH reinvests its revenues in infrastructure, knowledge transfer and setting up a local small business ecosystem in the waste management space.

COMMUNITY SELF-RELIANCE.



*Above: Community organizing, January 2018.
Below: Bioénergie Haïti volunteers.*



WE ARE HERE TO STAY

Education. Environment. Energy. BEH's activities encompass no less than 14 of the 17 sustainable development goals put forth by the United Nations, for example:

- By enlisting Haitians to work in key positions;
- By creating jobs, with a focus on women;
- By cleaning up plastic-clogged streets and gutters and, by extension, the air and adjacent ocean;
- By making Gonaïves more tourism-friendly;
- By improving health and quality-of-life indicators for the citizens of Gonaïves;
- By generating clean, renewable, local energy;
- By offering clean cooking gas as an alternative to wood charcoal and deforestation;
- By improving Haiti's trade balance through the replacement of imported fossil fuels by solar and biogas;
- By capturing and transforming methane, a greenhouse gas 25 times more potent than CO₂;
- By raising community awareness and promoting volunteerism for waste-related activities;
- Through technical knowledge transfer and capacity building;
- By planting tens of thousands of trees around the landfill site.

SUSTAINABLE. DEVELOPMENT.





CLIMATE CHANGE, A CRITICAL ISSUE

It is time for **climate action**: concrete projects with immediate benefits.

Worldwide, bad waste management is responsible for 15% of greenhouse gas emissions¹ and for the pollution of air, land and ocean.

Transforming methane into electricity with BEH's technology generates **clean, local, renewable energy** in the form of electricity or cooking gas, thus reducing the pressure on fossil energy sources and forests; and contributing to mitigate climate change.

Coupling the biogas power plant with a solar farm will ensure stable and continuous electricity production.

WASTE ACTION IS CLIMATE ACTION.

(1) According to Global Waste Management Outlook, 2015, by the UNEP (United Nations Environment Programme) et ISWA (International Solid Waste Association).



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