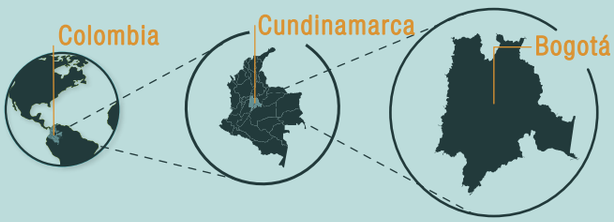
TECHNICAL AND FINANCIAL FEASIBILITY ANALYSIS OF AN ENERGY DISTRICT PROJECT

FOR THE "LAGOS DE TORCA" URBAN DEVELOPMENT PROJECT IN BOGOTÁ, COLOMBIA

DISTRITOS TÉRMICOS
COLOMBIA



GENERAL DESCRIPTION/BASELINE SCENARIO

The "Lagos de Torca" quartier/citadel plans to include 128,000 homes (432,000 inhabitants) in the northern bound of Bogotá, 40% of which will be low-income housing, with all urban services, for example, health centers (including a high-level hospital), shopping centers, supermarkets, and even 38 heated communal swimming pools.

Energy consumption in the area is estimated at 202 million kWh/year, which will double to 411 million kWh/year in 2050.

This implies a level of GHG emissions that starts at 82,500 tonCO2eq/year in 2025 and will progressively increase to 312,000 in 2050.

WASTE TO ENERGY (W2E) IN URBAN DEVELOPMENT PROJECT

Energy District developer: To be defined. Incumbent public utility companies (electricity, gas, water and sewage, and garbage collection).

Energy District service end-users: Mixed urban users, commercial, hospital and residential facilities, urban developments developed in the 34 urban partial plans that make up the Lagos de Torca project.

Role of the municipality: The city, through the Lagos de Torca trust, must ensure the construction of roads and public service networks.

Other stakeholders: Strong interest from the District Secretary of Environment, Secretary of Planning, Secretary of Habitat.

Energy District Application: On-site implementation proposal for a solid waste-to-energy plant generated by the urban developments of the Lagos de Torca urban expansion project, to supply its own electricity and hot water requirements.

Type of Energy District project: Waste-to-energy solution for new green-field developments.

Renewable Energy: It is estimated that the first stages of Lagos de Torca will generate just under 100,000 tons/year of urban solid waste, amount that will reach 354,000 tons/year by 2050.

Energy District Status: Conceptual engineering shared with the District Secretaries of Planning and Habitat of Bogotá.

Proposed Energy District scenario: The project proposes the construction of an urban solid waste digestion plant to produce biogas, which will be used to generate electricity through gas turbines and internal combustion engines, and the subsequent production of hot water through the recovery of heat from the flue gases, equivalent to 214 TJ/year in 2025 and up to 789 TJ in 2050 (74 GWh/year). To reduce licensing costs, implementation requires a partnership with a utility company to collect and transport the waste.

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Secretaría de Estado para Asuntos Económicos SECO

PROJECT BENEFITS

Energy Benefits: It is estimated that GHG emissions will be reduced by 5.8 million tonCO2eq by 2050.

ECONOMIC INDICATORS

The end-user investment project has the following characteristics:

- **Total CAPEX for implementation:** USD $11 million
- **OPEX:** USD $11.5 million/year
- **Revenues from sale of services and products:** USD $13 million/year

The IRR of the project is 12% with a NPV of USD $248,000.

PROJECT SWOT ANALYSIS

Strengths: The project would benefit from the constant and safe generation of urban solid waste, which is theoretically inexhaustible, with low initial costs and proven and reliable technologies.

Weaknesses: The project offers great environmental benefits, but an unattractive return on investment for private investors. The area required for both the utilization plant and the concession areas exceeds 70,000 m2. The commercial value of this land in the vicinity of Lagos de Torca may be restrictive. The operation of biogas plants may generate offensive odors for neighbors.

Opportunities The Lagos de Torca project is in early stages of design and construction, which still allows for modifications to building and utility network designs. The estimated profitability of the project can be substantially improved through a phased, staged implementation and the search for additional customers.

Threats/Challenges: Project implementation requires coordination with public entities and authorities that operate and oversee waste collection and disposal operations.

NORMATIVE FRAMEWORK

Environmental licenses from the District Secretariat of Environment for the valorization plant are required. It must have an environmental impact study. Comply with Bogotá's Territorial Ordinance Plan (POT).

CREG Resolution 005 of 2010, regarding the technical design and operation requirements of the district.

The supply of waste must be done through purchase contracts from companies authorized for that purpose or from recycler associations.

Electricity must be sold under the electricity market current rules.

The plant location can use spaces destined for public utility operations, which would imply that the plant is managed by a public utility company.

NEXT STEPS

Real estate developers should be made aware and informed so that they consider incorporating in their designs provisions that will allow for an eventual integration of their energy systems with the proposed W2E plant in the future.

CONTACT INFORMATION

UNIDO Energy Districts Project in Colombia
Mrs. Cristina Mariaca M.Sc | h.mariacaorozco@unido.org
Mr. Ricardo Baquero M.Sc | r.baquero@unido.org

District Secretariat of Environment of Bogotá
District Committee of Energy Districts.