

Waste-to-Energy for Santiago, Chile: A Cost-Benefit Analysis

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Why WTE for Santiago Metropolitan Region?



- ✓ Unsustainable waste management, 100% of collected MSW goes to landfill
- ✓ Land in Santiago is scarce: high population, increasing spread of urban areas, and geographical location (trapped between Los Andes Mountain Range and the Coast Mountain Range), makes it difficult to find space for new landfills around the city
- ✓ Landfills will reach their maximum capacity in 20 years from now.
- ✓ WTE plants are in urban areas and actual landfills are outside the urban areas, this will reduce truck travel which in turn will decrease diesel emissions
- ✓ Climate Change: in terms of environmental impacts, for every ton of MSW landfilled, greenhouse gas emissions of carbon dioxide increase by an estimated 1.2 tons.
- ✓ Clean Energy Production: Development of alternative energy sources is a Government priority



Study Objective

The objective of this research is to evaluate the economic and social feasibility of a WTE plant in Santiago Chile.

Methodology

The tool used to assess the economics of a WTE plant is a Cost-Benefit Analysis (CBA). CBA is a standard method of comparing the social cost and benefits of alternative investments projects. The decision criteria used was Net Present Value (NPV)

Chile at a Glance

- ✓ The most stable and competitive economy in Latin America
 - ✓ World Competitiveness Index (WEF): 1st in Latin America
 - ✓ Best Place to do Business (EIU): 1st in Latin America
 - ✓ Index of Economic Freedom: 14th of 157 countries
- ✓ GDP Average Annual Growth (1990-2005): 5.5%
- ✓ Low Country Risk: Standard & Poors and Fitch Rating: A
- ✓ Free Trade Agreements with the USA and the European Union
- ✓ Competitive costs

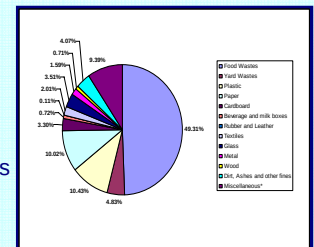
Project Evaluation for La Florida and Puente Alto Municipalities



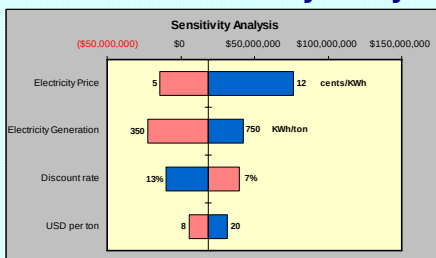
- 1.000.000 inhabitants; generates waste of 24.000 tons/month
- Technology: Martin Grate
- Capacity: 1000 ton/day
- Energy output: 600 Kwh/Ton to be sold commercially
- Capacity 20MW => supplies electricity to 200.000 inhabitants. (½ La Florida)
- Electricity Price: USD \$7,5 cents / kWh
- Tipping Fee: USD14/ton.

Santiago's MSW Overview

Population : 6 Million
MSW generated : 2.7 Million Tons / year
100% collected Waste goes to landfills
Recycling is voluntary (aprox. 9%)
Heating Value : 9.500 kJ/kg



Montecarlo Sensitivity Analysis



Results

Net Present Value (9%, 30 years)*: => USD 18.4 millions

- ✓ Capital Cost: USD 80 million
- ✓ O & M Cost: USD 5.2 million
- ✓ Discount Rate: 9%
- ✓ Pay back period: 17 years
- ✓ Internal Rate of Return (IRR): 11.3%

* Conservative scenario (no government support; low tipping fee; no income from heat)

Conclusion

CBA indicates the project should be undertaken because it has a positive Net Present Value and positive social and environmental externalities (allows sustainable management of waste; provides a competitive new source of energy; and substantially reduces greenhouse gas emissions).

Future Work

- ✓ A detail study of the investment cost
- ✓ Calculate in laboratory the waste heating value for La Florida and Puente Alto Municipality
- ✓ Evaluate commercial use for generated steam