BUSINESS MODEL PROFILES: ENERGY
SUMMARIZED FROM THE FORTHCOMING PUBLICATION
RESOURCE RECOVERY FROM WASTE

CGIAR RESEARCH PROGRAM ON Water, Land and Ecosystems
LED BY: IWMI International Water Management Institute

Generating Power from Municipal Solid Waste

Business characteristics

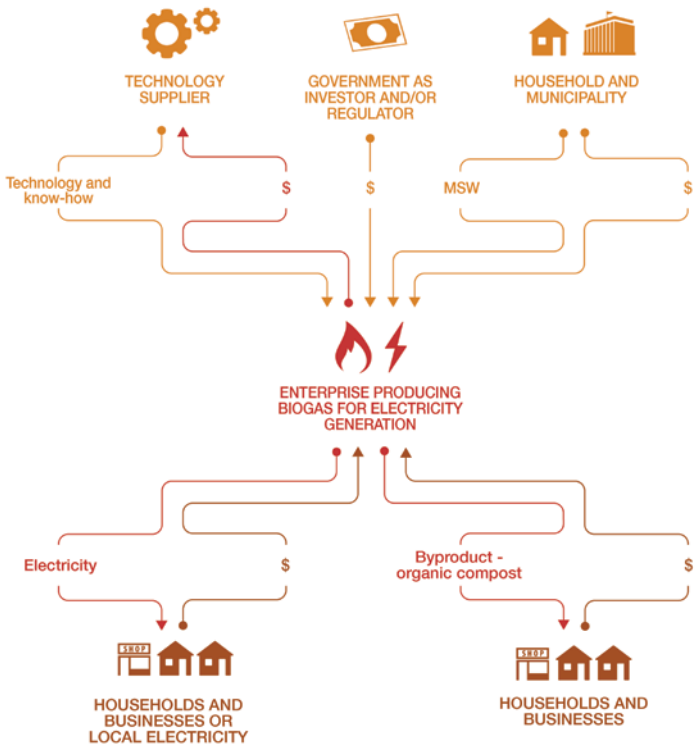
Geography	Applicable to cities and towns that generate large quantities of organic solid waste
Scale of production	About 145 MWh-9 GWh/year of electricity and 180-12,000 tons/year of organic compost
Type of organization	Private energy company or public-private partnership (PPP) with a local municipality
Investment cost range	About USD 180,000 for a small plant and up to USD 11 million for a large plant
Key costs	Investment costs (building, equipment, and transmission and distribution lines), and operation and maintenance costs (training, utilities, labor)
Revenue stream	Sale of electricity, waste collection and management fees, and potential sale of carbon credits and compost

Business model

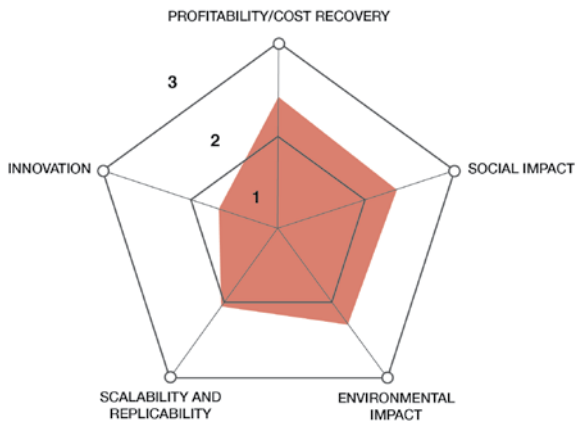
The business model processes segregated organic components of municipal solid waste (MSW) to generate electricity and produce compost to sell to households, businesses and/or local electricity authorities. Segregated organic waste is sent to a bio-digester to produce biogas, which is used to sustainably generate electricity. The model also provides waste collection and management services as well as producing organic compost from bio-slurry.

The business can be set up by a standalone private enterprise or a PPP, where a private entity partners with the municipality to manage the solid waste generated by the city. The biogas plant is constructed, operated and maintained by the private enterprise and then run either on a Build, Own, Operate basis, where the company becomes the electricity provider, or on a Build, Own, Operate, Transfer (BOOT) basis, where the plant is transferred to the municipality after the given period. In addition to electricity sales and waste collection charges, revenue can also be generated from trading carbon credits, and selling compost and recyclables.

BUSINESS MODEL VALUE CHAIN



Business performance



The business scores highest on profitability due to its multiple strong revenue sources (sale of electricity, waste collection and management fees, sale of recyclables, and potential for sale of carbon and compost) and diverse customer base.

Main risks

Market risks: If electricity tariffs are decided by a regulatory commission and the state utility is the sole buyer, the bargaining power of the business producing and selling electricity will be low.

Competition risks: The business has to compete with other enterprises generating electricity from cheaper fuel sources (e.g., coal). It also has a higher risk in procuring MSW, if it is not able to obtain a contract with the municipality.

Technological risks: The technological process used might not be available in developing countries and requires skilled labor.

Political and regulatory risks: In regions where electricity is dominated by the public sector and regulations do not allow the sale of electricity, the business model cannot be established.

Safety, environmental and health risks: Processing MSW poses a high risk for environmental pollution and human health, if appropriate measures are not taken. These include possible methane leakages, contamination of water bodies, and health and safety risk for workers.

Case study: Pune, India

The local government in the city of Pune, India, has implemented the Zero Waste Electoral Ward initiative, which includes a biogas from MSW project. Set up by a PPP between the Pune Municipal Corporation (PMC) and a number of private companies, national agencies and non-governmental organizations (NGOs), the project generates electricity from MSW through a biogas plant to provide street lighting for a 4 km long stretch of road. It also produces bio-sludge fertilizer used for the maintenance of 112 municipal parks and gardens.

The project has been made possible due to a multi-stakeholder partnership, where different entities assist on various tasks, including door-to-door collection of waste, processing MSW collected to produce biogas, electricity and bio-sludge, generating awareness for the project, and collecting and processing dry waste (particularly plastics). This has provided income for various actors, including the cooperative of waste pickers, which receives payment from PMC and households; the technology provider, paid by PMC for the installation and operation of the plant; and PMC itself through the saving of 144 megawatt hours (MWh) per year of electricity purchases. It has also generated employment and reduced greenhouse gas (GHG) emissions through avoided electricity consumption.

Key performance indicators (as of 2014)

Capital investment:	USD 180,000		
Labor:	Three full-time employees and one half-time employee		
Operation and maintenance cost:	USD 18,000/year		
Output:	300-325 m^3 of biogas a day through the processing of 5 tons of MSW per day, generating 144 MWh per year, and 180 tons/year of bio-sludge used as manure		
Social and environmental impact:	Job creation, MSW management, municipal lighting services and reduction of 76.1 tons of CO_2 equivalent of GHG emissions per year by reducing electricity consumption		
Financial viability:	Payback period: ~ 6 years	Rate of return: 16%	Gross margin: 62%

For more information on the business model and related cases, see Chapter 5 of **Otoo, M.; Drechsel, P. (Eds.). 2017.** ***Resource recovery from waste: Business models for energy, nutrient and water reuse in low- and middle-income countries.*** **London: Earthscan/Routledge. In press.** The book has been produced by the Resource Recovery and Reuse subprogram of the International Water Management Institute (IWMI), under the CGIAR Research Program on Water, Land and Ecosystems (WLE) and its Rural-Urban Linkages Research Theme. The support of the Swiss Agency for Development and Cooperation (SDC), the International Fund for Agricultural Development (IFAD), and CGIAR Fund Donors (www.cgiar.org/about-us/our-funders/) is gratefully acknowledged.