# Case Study

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<td>Sanitary Landfill: Solid Waste to Energy Project</td>
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## Local Partner Organization

**Tanjung Pinang Municipality**

## Geography and Population

Tanjung Pinang is the capital of Riau Islands. Its total area is 239.5 km², with a population of 229,396.

## Contact Information

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<th>Project Coordinator</th>
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## Summary

Roughly 230,000 people of Tanjung Pinang are producing 400 tons of solid waste per day but only 200 tons per day are collected and brought to the landfill.

The 10.8 hectare landfill “Ganet TPA” has been in operation since 1999, and the only fully active landfill is Zone 4 with only 0.69 Hectares.

Although there is a plan to expand the landfill into the available area (8.5 hectares) adjacent to Zone 4, a holistic concept and a vision for the future for management and operation of the current and extended area is required.

Generation of electricity through biogas is an attractive business model for Tanjung Pinang as the electricity selling price structure yields a short payback period of 4 to 5 years. Moreover, Tanjung Pinang is facing power shortages and blackouts occur nearly daily. Therefore any additional power source would be welcome.

The recommendations and cost estimations of producing electricity will be elaborated in the study report. After which, detail engineering study and study on relevant regulations will be done, in parallel to financial sourcing for project implementation.

## Rationale

A city with roughly 230,000 residents, Tanjung Pinang is the capital of Riau Islands being the second...
largest city of Riau Islands. Tanjung Pinang is located south of Bintan island and has ferry connections to Batam (Indonesia), Singapore, and Johor Bahru (Malaysia).

The estimation of solid waste produced per day is 400 tons, and only 50% or 200 tons/day is collected and disposed at the Ganet Sanitary Landfill.

The Sanitary Landfill has the total area of 10.8 hectares, and has 4 dumping zones. Zone 1 and 2 whose combined area is 1.65 hectares, are no longer active zones – garbage can no longer be dumped there. Zone 3, 1.35 hectare, is only partially active having limited area for garbage disposal. Zone 4, 0.69 hectares is the only fully active zone. However, there is a plan to expand the landfill to an area of 8.5 hectares adjacent to Zone 4.

A small-scale biogas collection and electricity production system is installed at the Landfill. The biogas is collected from landfill Zone 3, and the gas is used for cooking at one small kitchen and also used to generate electricity to be used within the compound by a generator.

Tanjung Pinang faces a shortage of electricity. Blackouts occur a couple of times daily, although they last only seconds or minutes during each occurrence. The Municipality is well aware of this power shortage and plans to purchase electricity from Batam Island via undersea water cable. These are high investment cost and perhaps not a sustainable solution as Batam can only sell electricity to Tanjung Pinang during night time when the electricity demand in Batam is low.

As electricity can be produced from Landfill Gas (LFG), Tanjung Pinang will benefit from larger scale biogas collection and electricity production. At least 1 MW/h can be produce from 200 – 400 tons of solid waste per day. The electricity produced will contribute to the very much needed additional source of energy.

Tanjung Pinang in cooperation with GIZ Nexus therefore embark on Sanitary Landfill: Solid Waste to Energy Project

Project Description

The study of existing landfill zones and expansion zone will be done and a Concept Master Plan will be produced.

The study focuses on the following:

- Possible application of new landfill management concept: landfill preparation, pipe and drainage installation, daily cover methods, dumping and compacting methods
- Capturing of LFG (Land Fill Gas) and capturing gas from leachate treatment with appropriate and efficient technology
- Production of electricity from biogas
- And investment cost estimation

Taking into consideration Tanjung Pinang’s power shortage problems and the potential of producing electricity from LFG, comprehensive and efficient collection of solid waste in the city must be implemented. Increasing the amount collected from 200 tons to 400 tons per day will help ensure the stable production of LFG and therefore stable production electricity (1 MW/h)

The installation of a proper piping system is recommended for the LFG collection from Zone 3 and 4.

The preparation of the extended area of 8.5 Hectare will apply a new concept to decrease open area for rain reception, less open area for odor emission, compaction of solid waste into a slope shape, horizontal landfill expansion, top covering with HDPE, and re-use of biogas depleted landfill. The
concept promotes efficient use of the available land as well as efficient LFG collection.

There are alternative uses of LFG, but for Tanjung Pinang the LFG should be used to generate electricity. Not only because of the obvious energy shortage but also it is a profitable business.

Indonesia’s Ministry of Energy and Mineral Resources has recently approved (October 2014) the selling price of electricity produced from biogas. The selling price structure (IDR 1,050/kWh x F or USD 0.08/kWh x F (where F value = 1.6 for Riau Islands region)) is favorable for investment because that price structure will yield a payback period of only 4 to 5 years for an investment to produce 1 MW/h of electricity from biogas (USD 3 Million investment). After 5 years, the Municipality will be able to earn USD 1 Million profit per year.

The recommendations and cost estimation of producing electricity will be elaborated in the study report. Should Tanjung Pinang see implementation possibilities, the detail engineering study and study on relevant regulations would be done, in parallel to financial sourcing for project implementation.

**Stakeholders / Target groups**

**Stakeholders:**

**City Level**
- BAPPEDA
- Cleaning and Parks Department
- The roughly 230,000 people living in Tanjung Pinang

**National Level**
- BAPPENAS
- Ministry of Public Works

**Costs / Financing**

The preliminary cost estimation for producing 1 MW/h of electricity from the LFG is USD 3 million. The investment cost is almost 4% of the total Municipality yearly budget (USD 80 million).

Therefore, it is essential to seek for external financial support.

**Studies / Reports / Training**

Study Report and Recommendations for Tanjung Pinang Sanitary Landfill improvement and Energy Production, January 2015

3 Days Comprehensive Landfill Management, Chiang Mai, Thailand, February 2015

**Results (Impact)**

Decision makers and management are made aware of the possibility to achieve effective landfill management and landfill gas collection for electricity generation and/or fuelling cars.

Tanjung Pinang Municipality officers were capacitated via peer-to-peer learning on Landfill site management Waste to Energy production in Chiangmai Sanitary Landfill.

Methane gas collection provides Tanjung Pinang Municipality opportunities to generate income through selling electricity to the State Electricity Company (Perusahaan Listrik Negara, or PLN).