Case Study: Solid Waste Management

Country: PHILIPPINES  
City: NAGA CITY, PROVINCE OF CAMARINES SUR  
Key Sectors: SOLID WASTE MANAGEMENT

Local Partner Organization
City Government of Naga
- Naga City Planning and Development Office
- Naga City Environment and Natural Resources Office
- Naga City Solid Waste Management Office

National Government
- Department of Environment and Natural Resources (DENR)

Geography and Population
Naga City serves as the regional center of the Bicol Region, located in Southern Luzon. In 2014, the population is roughly 225,000.

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Summary
The continuous growth and increase in the City’s population results in the increase of municipal solid waste (MSW).

Despite the city’s various efforts in solving the solid waste problems, including the City’s “Diversion Program (since 2005)” which aims to divert the solid waste from the Balatas dumpsite by waste segregation (Goal: to have 0 (zero) solid waste dumped at the site by the year 2025), the Balatas dump site is still receiving at least 80 tons of solid waste per day and has now reached its absorptive capacity. The Diversion program has so far been able to divert from the dump site only 15% of the total solid waste collected.

Within the nexus framework, the waste-to-energy project is one of the priorities of Naga City – considering the dumpsite’s effect on the communities and the governing national law on solid waste.

Facing the problem of the Balatas dump site approaching its absorptive capacity, odor affecting the communities, ground and water contamination from leachate, as well as the new San Isidro site preparation and implementation of suitable technology the City of Naga requested GIZ Nexus to study Naga Solid Waste Management.

As a result, management of the municipality is more informed on how to effectively make use of the loan.
from the central government to tackle urgent landfill problems – specifically on the closure of the Balatas dump site and the preparation of the new San Isidro sanitary landfill and application of suitable waste to energy technology.

However, using large amount of municipal land to apply SSLTES technology to treat the municipal waste could prove uneconomical. Another alternative could be an innovative technology called (Maximum Yield Technology/MYT). MYT is able to recycling up to 90% of the waste requiring little space. Respective options requiring small space for treatment and high recycling potential should be studied in more detail.

Rationale

Naga City serves as the regional center of Bicol Region, located in the eastern part of the Philippines facing the Pacific Ocean. The city’s population in 2014 is roughly 225,000 and is expected to increase in the coming years. Naga’s demographics show that it has a fairly young population, with 55.39 percent of the whole population being comprised by residents 24 years old and below.

A bustling center for various socioeconomic activities in its region, Naga City’s inevitable development meanwhile threatens its environment and natural resources. The continuous increase in the City’s population results in a dramatic increase of municipal solid waste (MSW).

Despite the city’s various efforts in solving the solid waste problems, including the Diversion program (since 2005) which aims to divert the solid waste from the Balatas dumpsite by waste segregation (Goal: to have 0 (zero) solid waste dumped at the site by the year 2025), the Balatas dump site is still receiving at least 80 tons of solid waste per day and has now reached its absorptive capacity. The Diversion program has so far been able to divert from the dump site only 15% of the total solid waste collected.

Other problems which the city is facing with regards to solid waste management include:

1. The odour from the garbage site is strongly disturbing nearby communities.
2. The GHG (Methane, etc.) is being released into the atmosphere due to lack of gas collection.
3. The ground water and water ways are being contaminated due to no HDPE lining at the bottom of the landfill cells and insufficient leachate collection and treatment systems.

Moreover, with the enactment of Republic Act no. 9003 or the Ecological Solid Waste Management of 2000, which prohibits open dumpsite operation and its conversion to controlled landfill, the City of Naga is to comply and close the Balatas Dumpsite. The total area of the site to be closed is 16,978 m2 or 1.7 Hectares.

Once the Balatas dump site is closed, it will be used only as a transfer station. The planned location for the new Sanitary Landfill is a 10 Hectare piece of land in San Isidro. The city plans to implement a waste to energy model there.

Naga City therefore needs technical assistance in closing the Balatas dump site and analysis and preparation of the new San Isidro site for waste to energy implementation.
Within the nexus framework, the waste-to-energy project is one of the priorities of Naga City – considering the dump site’s effect on the communities and the governing national law on solid waste.

In October 2014, representatives from Naga City were invited to visit the Sanitary landfill site at Bantan, Chiangmai, Thailand. Bantan Sanitary Landfill applies appropriate (although not state of the art) technology in landfill cells preparation and control, landfill gas collection, electricity generation from LFG, and fruit drying factory from waste heat. The site designer and operator called the overall above technology: Sustainable Sanitary Landfill to Energy System (SSLTES).

Facing the problem of the Balatas dump site approaching its abs orptive capacity, odor affecting the communities, ground and water contamination from leachate, as well as the new San Isidro site preparation and implementation of suitable technology, the City of Naga requested GIZ Nexus to support the study by SSLTES expert on Naga Solid Waste Management – specifically on the closure of the Balatas dump site and the preparation of the new San Isidro sanitary landfill and application of suitable waste to energy technology. The study was implemented in August 2015.

The study’s recommendations for closing the Balatas dump site are:

1. The shape of the garbage dumped on the site must be modified in order to allow for easy operation of the machineries and allow for installation of HDPE balloon for LFG collection, as well as installation of suction pipes.
2. Build a leachate collection and treatment system as there are none at the moment.
3. The landfill gas (LFG) collected could be supplied to nearby industrial plants for their heat/boiler, or as cooking gas for nearby communities. The LFG could also be processed into compressed biogas (CBG) for cars, as well as used as fuel for producing electricity.

The study’s recommendation for the design of the new San Isidro sanitary landfill are:

1. As a location for dumping the garbage, the new site is more suitable than the old site as it is larger and therefore can receive more garbage (10 Hectares VS 1.7 Hectares). The odor will not be much problem as there very few communities nearby the new site.
2. The site is however located right next to a river and there is a possibility that the river will be contaminated by the leachate. It is mandatory that the City installs proper HDPE lining at the bottom of the landfill cells, and proper leachate drainage and treatment system.
3. If the city plans to have a sustainable landfill by using the SSLTES technology, the city must expand the size of the San Isidro landfill up to 24 Ha. The reason is SSLTES achieves sustainability by cell rehabilitation which means that when a cell is full it will only be rehabilitated after 15 to 20 years (after the organic waste in the cell have all decayed). During the 15-20 years period, the San Isidro landfill area will have to be continuously expanded to accommodate the incoming garbage – hence larger area up to 24 Ha is required. Therefore, if the city is not able acquire such land, other alternative technology to the SSLTES should be explored. LFG collection system should be installed such that San Isidro Sanitary Landfill could use the LFG for nearby industrial plants for their heat/boiler, or as cooking gas for nearby communities, it could also be processed into compressed biogas (CBG) for cars, as well as used as fuel for producing electricity (Note: the Feed In Tariff (FIT) for Biomass = 6.63 php/kwh). LFG collection will reduce the garbage odor as well as greenhouse gas emissions.
4. Using large amount of municipal land to apply SSLTES technology could prove uneconomical. As an alternative technology, Maximum Yield Technology is able to recycle up to 90% of solid waste while requiring little space.

**Stakeholders / Target groups**

**Stakeholders:**
- Naga City Planning and Development Office
- Naga City Environment and Natural Resources Office
- Naga City Engineer's Office
- Naga City Solid Waste Management Office

**Target groups:**
- Communities affected by the dump site, inhabitants of Naga City.

**Costs / Financing**

The City of Naga plans to take a loan from Land Bank of the Philippines or Development Bank of the Philippines between 165 to 200 Million Pesos (3.2 to 3.8 Million EUR) for the closure of the Balatas dump site and the initial preparation of San Isidro landfill to receive the new incoming waste. The loan will be granted by either Land Bank of the Philippines or the Development Bank of the Philippines – the loan application is in the final stages of the process.

**Methodology**

The project is based on a multi-sectorial approach. At municipal level administration/planning offices receive advisory services with regard to integrated resource management in the sectors of energy, water and food security (agriculture). In order to achieve increased planning efficiency a Nexus Task Force steers the Nexus projects ensuring that the nexus approach is embedded and institutionalized in the administrative structure of the city. The Solid Waste Management case study represents one of the activities contributing to the above integrated resource management concept in the dimension of wasteto-energy.

**Studies / Reports / Training**

- October 27 to 29, 2014: Peer-to-peer Learning on Solid Waste Management (Visit to Bantan Sanitary Landfill near Chiang Mai/Thailand)
- October 2015: Naga City Solid Waste Management Report (Recommendations for closure of Balatas Dump site and implementation of waste to energy at San Isidro Sanitary Landfill)
- 14 to 18 November 2016: Maximum Yield Site Visit in China

**Results (Impact)**

- The Mayor, Planning department, Sanitation department, and other concerned departments of the municipality have been made aware of the problems and solutions of the existing and new landfill
- Recommendations on the existing Balatas landfill shape, leachate treatment system construction, and landfill gas utilization were made.
- Recommendations on new site selection and preliminary relevant appraisal of the new San Isidro landfill were made.
- As a result management of the municipality is more informed on how to effectively use of the loan from the central government to tackle urgent landfill problems.