

Case Study: Innovative Waste Water Management, Senggarang, Tanjung Pinang, Indonesia

Country:		City:	Key Sector:
Indonesia		Tanjung Pinang (Senggarang)	Wastewater Management
Local Partner Organization		Geography and Population	
Tanjung Pinang Municipality		Area: 131.54 km ² Population: 229,396 registered	
		4 sub districts, 18 urban villages, 166 village clusters (RW), and 674 neighborhood institutions (RT).	
Contact Information			
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Summary

Tanjung Pinang Municipality expressed their interest in innovative waste water management apt for coastal settlement of Senggarang and requested the GIZ Nexus Project to conduct a study in this area.

Senggarang is an urban village of Tanjung Pinang located in a plateau area. Surrounded by sea, Senggarang has been assigned as strategic position for a new city center. Senggarang Administration consists of 7 RW and 16 RT with an area of 23 km². Key characteristics of Senggarang are that a majority of inhabitants live along coastal area and their buildings are located on the sea on stilts. However, there has not been an establishment of a suitable sewerage system yet.

In February 2015, municipal officers of Tanjung Pinang Municipality attended vacuum sewerage technical training in Bangkok organized by the GIZ Nexus Project with the objective of improving perspectives of sustainable wastewater management, understanding principle of vacuum sewerage technology and exploring opportunities for effective implementation of vacuum sewerage system within local infrastructure.

The feasibility study on innovative wastewater management in Senggarang demonstrates potentials of the vacuum sewerage system for improvement of sanitation systems in the settlement.

Rationale

The coastal settlement of Senggarang is a vital residential area of Tanjung Pinang. Located near the city hall and the port of the city with many famous Chinese-Buddhist temples, this settlement has become a strategic location for various activities with high demand of tourists who mostly come from Singapore for praying at the temples. However, with more than 4,000 people living there, the provision of basic infrastructure is still limited, especially sanitation and solid waste infrastructure. The lack of an appropriate sewerage system presents relevant problems with regard to the human

and ecosystem in the settlement.

Sanitation is a predominant concern of most coastal settlements. In the coastal settlement of Senggarang, the sea does not only serve as local dominant source of socioeconomic activities (e.g., fishery, transport, recreation, etc.), it is also the center of unhealthy sanitation practices. A large majority of the buildings on the sea in the settlement has no sewage facilities. Fecal waste containing bacteria, viruses and parasites are openly disposed into the aquatic ecosystems. When people eat food that has been irrigated with the contaminated water of the sea, these micro-organisms can infect people, who in turn will pollute the environment via their feces and/or urine. Although regular tidal washes keep the inshore area less filthy, some of the fecal wastes are still either floating on the sea or remaining on the mudflat.

In the past, providing an effective sewerage system in coastal areas was difficult and costly due to topographical limitations (i.e., flat terrain, rocky surface, etc.) for conventional systems like gravity. However, there are currently affordable-alternative sewerage technologies to deal with these limitations.

Being responsible to provide services to people, the City of Tanjung Pinang needs to start establishing an appropriate infrastructure for sustainable wastewater management in the settlement in order to prevent the future costs of public health, environmental degradation and economic damage.

Project Description

The objective of this pilot project is to provide solutions for an appropriate sewerage system for sustainable wastewater management in the coastal settlement of Senggarang.

The vacuum wastewater collection system, not requiring a gravity slope of 2 % is the most effective solution for managing wastewater in the settlement predominantly on sea. The system is completely sealed (no exfiltration) apt in particular for flat areas, high water table and little space for pipe laying. It moreover requires less construction time, hence less construction costs and reduced inconvenience for the residents. It is also considered as a “low-cost” technology in comparison to the gravity sewer system with less intervention (“minimal invasive intervention”).

A sanitary survey has been conducted by the GIZ Nexus team during 26 February – 4 March 2015 to analyze the existing situation related to wastewater & sanitation aspects in the selected study area. Students of the Universitas Maritim Raja Ali Haji were recruited to conduct interviews in Bahasa. The area of the coastal settlement of Senggarang is approximately 40,000 m² with 438 establishments. During the survey 299 establishments were interviewed, amounting to 68 percent of the total establishments in the settlement. The remaining 32 percent not covered by the survey were abandoned buildings, buildings under construction and establishments where nobody could be reached.

The results show that there are 1,243 residents living in the settlement with an average of 4 people per establishment. Being a historical residential area, a majority of the establishments are residential buildings - 285 houses out of the total surveyed establishments. The number of residents directly influences the quantity of wastewater produced in a community. The average water consumption rate for residents is calculated at 110 liters/person/day. In the settlement, each establishment has a sink in its kitchen and a set of sanitary ware including a toilet and shower in the bathroom. Consequently, the communities here produce more than 136,730 liters/day (136 m³) of grey water. In addition, there is typically also a washing machine per establishment. Washing machines are one of the most water-consuming appliances with 155 liters of water per load on average. These washing machines hence produce an additional significant amount of grey water. Unfortunately, no appropriate sewerage collection and disposal system is provided in the settlement to collect any kind of wastewater. This huge amount of wastewater hence flows to the sea causing marine pollution.

A majority of the establishments on land are using old septic tanks, made of bricks and concrete – up to 80 tanks altogether. As these old septic tanks in their great majority are neither constructed nor maintained properly, they leak fecal matters and bacteria to the ground water and the soil.

There is a common well that 24 households with no water pipe connection use for external consumption. As located far away from the septic tanks, the quality of the water is relatively good compared to the water of the running pipe from the Chinese temple that most residents of the coastal settlement use in their everyday life.

In terms of sanitation problems, the residents complained mainly on bad odor (48 percent), rats (46 percent), and mosquitos (40 percent). Some of them were affected by cockroaches, (21 percent). Only 3 percent of the residents say they have health problems related to the sanitation issues.

Prior to the sanitary survey, there were three official public community consultations held on December 8, 2014, February 26 and 27, 2015 in the coastal settlement of Senggarang. The Tanjung Pinang Municipality team explained about the sanitation problems in the settlement and presented the vacuum sewerage system as a solution to solve the problems of wastewater management. Then, GIZ Nexus team was introduced to the communities as a team to conduct a sanitary survey.

Stakeholders / Target groups

The stakeholders:

- Bappenas-Badan Perencanaan Pembangunan Nasional (National Planning Agency)
- Ministry of Housing and Public Works
- Tanjung Pinang Municipality (Nexus Task Force consists of cross-sectoral agencies such as city planning agency, public works agency, environmental agency, etc.)
- Senggarang urban village
- Government of Riau Islands Province

Target groups:

- Communities and inhabitants of coastal settlement of Sengqarang.

Costs / Financing

Feasibility Study including for cost calculation is elaborate and submitted to the Authorities. The investment costs amount to 26.21 Billion IDR (1,740,495 EUR)

Studies / Reports / Training

- Feasibility Study on Vacuum Sewer System in Coastal Settlement of Senggarang Tanjung Pinang, Indonesia, April 2015
- 1st Asian BILFINGER - GIZ NEXUS Vacuum Sewerage Technical Training, Bangkok, Thailand 16-17 February 2015
- Study report on Senggarang Waste Water Management (February 2017) by The Research Institute for Water and Waste Management at RWTH Aachen University (FiW)

Results (Impact)

- The project area extends to about 40,000 m² in the coastal settlement of Sengqarang, with over 4000 inhabitants. There are high benefits and impact associated with the project as sanitary infrastructure is a social basic need (MDG) improving the quality of life.
- The pilot project on vacuum sewerage is a necessary infrastructure improvement of the coastal settlement for protecting the coast from domestic wastewater that degrades marine ecosystem. The clean waterfront will create more income from tourism that would in turn impact on sustainable development of Senggarang.
- The project can receive revenues from bio solids, which are a nutrient-rich organic compost of collected domestic sewage in the vacuum vessel. These residuals can be recycled and applied as fertilizer to improve and maintain productive soils and stimulate plant growth.
- In addition, if the pilot project installs a wastewater treatment system together with the vacuum station, the treated wastewater can be sold for irrigation purposes to agronomic lands nearby.

- The pilot project will contribute to reducing health risks of waterborne disease outbreaks, especially for the poor households.
- Scaling up for the whole coastal area of Tanjung Pinang is envisaged after the demonstration project has been implemented, monitored and evaluated.
- Throughout the project planning and implementation, the residents of Senggarang will be better informed about sanitation issues, and improved operational performance will result from such awareness. By this, the establishment of the vacuum sewerage system will result in cleaner sea and an improved quality of life.