### Case Study

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<th>Country:</th>
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<td>P.R. China</td>
<td>Binhai Economic-Technological Development Area (Weifang)</td>
<td>Vacuum Sewer System for different usages</td>
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### Local Partner Organization

**Binhai Planning and Construction Bureau**

### Geography and Population

Costal plain topography in the coast of Bohai Sea with total population of 96 600 and urban part of it ca. 60 000 – 70 000.

### Contact Information

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### Summary

In order to find an adequate solution for sustainable and energy saving waste water collection, conveyance and treatment for Weifang Binhai Economic & Technological Development Area (thereafter called Binhai), the GIZ Nexus Project promotes the waste water vacuum sewer collection system allowing also further usage of sludge combined with organic waste from households, restaurants, hotels and public resort places for energy production. And what’s more, the treated waste water could be used for irrigation purposes (urban agriculture, green areas) and the remaining agricultural residues for organic fertilizer and night soil.

### Rationale

Established in August 1995, Binhai is a national economic and technological development area approved by the State Council. Covering an area of 677 km², it has a population of ca. 96,600. The national level Development Zone Binhai possesses a large state-owned industrial land with an area of 400 km² for use. The land can be transacted conveniently, which would guarantee the demand of any project construction and provide broad development space for the enterprises in this area. Continuously, Binhai has been accredited as National Demonstration Zone invigorating the Sea by Science and Technology, National Innovation Base for Rejuvenating Trade through Science and Technology and National Demonstration Eco-Industry Park. Accordingly in Binhai a broad variety of industrial sectors has been developed. These include equipment manufacturing, electronics, new material, ocean and petrochemical industry, wind and
photovoltaic power generation as well as seaport logistics such as warehouse logistics, processing and distribution, etc.

All these factors have contributed to the fast growth and prosperous expansion of a newly built urban and industrial area on the former costal saline and alkaline soil. The modern urbanization which undergoes elsewhere in China is just happening outside the former village residents’ front doors.

In the villages to be integrated into the urban areas the traditional open-air septic tanks/holes are still being used.

- Septic tank involves anaerobic bacterial environment which ideally decomposes waste discharged into the tank;
- However, preventive maintenance is required to remove irreducible solids that gradually fill the tank, reducing greatly its efficiency;
- Black-water constitutes only around 10% of domestic waste-water being discharged;
- However, this modest volume contains about approx.99% of pathogens (causing typhoid, bilharzias, and diarrhea);
- Black-water contains 90% of nitrogen, 80% of phosphorus and 40-75% of organic matter (BOD);

For the newly developed blocks and buildings in urban areas, in order to find an adequate solution for sustainable waste water treatment a more efficient and effective waste water collection and transportation system should be implemented instead of the waste water collection through gravity pipes.

The vacuum sewer collection system considered to be introduced in Binhai is for waste water within low and medium dense residential, industrial, commercial or mixed areas. It is an alternative to conventional gravity sewer systems under special conditions such as:

- high water table
- flat costal terrain
- area with lakes, rivers, beaches, tidal ground or islands
- public resort places with regular population variations

Technically vacuum sewer collection is feasible in Binhai. Binhai is a location that meets the requirements to implement the vacuum sewer. It lies on the flat coastal plain in the Bohai coast with very high water table; It has tidal beaches and islands. They are easily to evolve into public resort places with seasonal tourism.

The aim of the project is to demonstrate to Binhai Government, city residents and the industrial sector an economically feasible and energy saving system to collect and transport the waste water, produce energy (electricity and heat), irrigation water and fertilizer for non-food crops (“close the loop”). A cooperation between the Binhai Planning and Construction Bureau and GIZ/Nexus is also aimed at disseminating the know-how acquired to other Chinese cities.

Binhai Municipality is to ensure the project implementation financially.
Project Description

Since in Binhai there are a series of possibilities to implement the vacuum sewer system, the initial on-site studies and feasibility report including the cost calculations are crucial. Through the close collaboration with Binhai Municipality GIZ Nexus Project will participate with advisory service in the concretization of the project concept with regard to designing and implementation of the vacuum system, energy and fertilizer production.

The following decisions should be made after clarifying the project possibilities, whether the vacuum system/pipes be laid

- inside a large public building (vacuum sanitation system) to collect toilet waste only for this building or outside all smaller buildings and houses within 5 Kilometer radius to collect their indoor waste water;
- for the new residential blocks under construction or village houses renovation;
- for the public resort places to meet its seasonal uses or the decentralized waste water treatment plants in Binhai.

Before the actual implementation it is important to calculate the project costs and compare them with the costs of gravity systems. Judged from Binhai’s extremely flat costal topography, to dig deeper and wider trenches to lay the bigger gravity pipes would be more expensive and unwanted. After Binhai Municipality has decided upon the demonstration site, it will be easy to calculate the costs in detail for vacuum and gravity sewer in order to compare and choose the adequate solution.

Beforehand Binhai Municipality will propose the project to the Weifang City Communist Party Committee or People’s Parliament to get their approval. For a convenient financial assistant to facilitate the start-up, Binhai Municipality will request funding from Ministry of Housing and Urban-Rural Development (MoHURD) in Beijing prepared for the city since the beginning of 2014.

Stakeholders / Target groups

Stakeholders:
- Binhai Planning and Construction Bureau
- Weifang City Communist Party Committee
- Weifang People’s Parliament
- Weifang Planning and Construction Bureau
- Department of Building Energy and Science & Technology, MoHURD

Target groups:
Residents and industrial sectors of Weifang Binhai Economic & Technological Development Area.

Costs / Financing

A preliminary cost calculation is to be made within the framework of a Feasibility Study. Report. A comparison between gravity sewer and vacuum sewer will be part of the feasibility study.

Studies / Reports / Training

Semi-decentralized concept for wastewater management in Binhai (Weifang, China)/Fraunhofer IGB/Stuttgart/November 2014