


Case Study		
Country:	City:	Key Sectors:
Viet Nam	Da Nang	Waste water management
Local Partner Organization		Geography and Population
<p align="center">Da Nang People’s Committee Department of Natural Resources and Environment Department of Planning and Investment</p>		<p>Da Nang, the largest city in the Central Viet Nam, has 942,132 inhabitants. Country population 86.93 million</p> 
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Summary

In order to find an adequate solution for sustainable waste water treatment for Da Nang City 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 and hotels for energy production, the treated waste water for irrigation purposes (urban agriculture, green areas) and the remaining agricultural residues as organic fertilizer.

The DPI and DoNRE intend to implement a pilot on vacuum sewer collection in An Hai Bac Ward with 110 households to gain concrete experiences on the technology which apparently is apt for waste water collection and treatment in Da Nang because of the high ground water table, narrow walkways/accessibility to connect septic tanks, the pollution of the groundwater and the river with coli bacteria and the unaffordable costs of conventionally separated waste water and drainage water systems to be installed.

Rationale

Vietnam is a rapidly urbanizing country. In the last decade, the country’s urban population increased from 18 million to 25 million and is projected to reach 45 million (50% of the population) by 2025.

The high rate of urban growth and increasing urban population density exerts a rising pressure on physical urban infrastructure in particular in major cities. The inadequacy of urban infrastructure including water, sanitation and energy are major constraints reducing Vietnam’s competitiveness, quality of life and future development perspectives.

The situation is aggravated through a large number of urban centres alongside the 3000 km of coastline facing rising sea levels, high ground water levels, wetlands (alluvial soil) with rivers flowing into the ocean, frequent flooding, typhoons and low tides draining the groundwater into the rivers and the ocean.

Access to adequate sanitation services is in particular low throughout the urban centres. The majority of the households dispose of septic tanks, however, they have no installed openings for maintenance and emptying.¹ Moreover, only the effluent of the septic tanks is connected to the sewer lines – where available.

For this reason the waste water treatment plants only receive diluted waste water hardly disposing of sludge to be used for energy production or organic fertilizer.

However, large areas are covered by inefficient treatment plants and their respective ponds emitting methane gas to the environment with an impact 25 times higher than CO₂ emissions (ecological footprint).

The sludge remains behind in the septic tanks hardly ever emptied with crumbling bottoms and faecal matters penetrating into the ground water while the ventilation pumps contaminate the air by emitting methane gas.

Individual septic tanks are not considered an adequate solution for urban agglomerations because:

- It is uneconomical;
- their construction cannot be controlled in particular with regard to whether the bottom is sealed;
- the durability extends to maximum 3-5 years of complete tightness (if built out of brick or concrete), thereafter contamination to the surrounding soil and ground water occurs;
- they emit methane to the air through their ventilation pumps.

It is hence important to introduce an economical and technically feasible waste water treatment system to connect the toilets of individual households, hotels, restaurants and other commercial units in inner urban areas directly to the sewer lines. This should be accompanied by a compulsory connection regulation to make the system effective.

The Authorities of **Da Nang** are committed to developing the city into a “green” city by 2025.

In this context, **Da Nang** is trying to pursue a sustainable wastewater strategy.

The World Bank is supporting this strategy by its “Da Nang Sustainable City Development Project”.

With Da Nang being built on wetland (alluvial soil) at the coast line with a river entering one can assume that the ground water has already contaminated the river and the ocean. With the low tide the groundwater is drained into the river and the ocean on a regular basis.

Da Nang being a beautiful city and a hotspot for tourism is sitting on a “time bomb” with all its unemptied

¹ For emptying a septic tank a hole has to be drilled into the floor destroying the tiles.

septic tanks not sealed (any more) at the bottom. There is a high concentration of fecal matters inside the septic tanks trickling down to the groundwater.

Project Description

The aim of the project is to expand access of city residents to improved drainage, waste water collection and treatment services.

The GIZ “Integrated resource management in Asian Cities: the urban nexus” (thereafter called “GIZ Nexus Project”) has identified the following pilot project in Da Nang together with their Partners from Department of Planning and Investment (DPI) approved by Da Nang People’s Committee (DPC):

“Vacuum waste water collection, waste water treatment (biogas production) using the byproducts (irrigation water and fertilizer from biogas plant) for urban agriculture”.

In order to implement the project a Nexus Task Force (NTF) has been officially created by the People’s Committee of Da Nang City and a Memorandum of Understanding (MoU) has been signed to formalize and structure the cooperation between GIZ Nexus Project and DPI.

A cooperation between the World Bank and GIZ is aimed at also promoted by DPI, DoNRE and DPC. Experience sharing and mutual consultation are ongoing.

A feasibility study on a vacuum sewer collection system for Pilot Project An Hai Bac Ward in the Eastern Coastal Area of Da Nang including a cost comparison between gravity sewer and vacuum sewer has been conducted between April and August 2014. On this basis, the pilot project is supposed to be implemented once the funds have been made available by DPC. Scaling up for the whole Eastern Coastal area of Da Nang is envisaged after the demonstration project has been implemented, monitored and evaluated.

Stakeholders / Target groups

Stakeholders:

- People’s Committee of Da Nang City (DPC) – City level
- Department of Planning and Investment (DPI) – City level
- Department of Natural Resources and Environment (DoNRE) – City level
- Department of Construction (DoC) – City level
- Department of Agriculture and Rural Development (DARD) – City level
- and other related departments and sectors under the delegation of DPC.
 - The World Bank

Target groups:

Residents of An Hai Bac ward as well as decision-makers and the population of Da Nang city.

Methodology

A Nexus Task Force was established by resolution of DPC to accompany the process of definition and elaboration of the pilot project. The results were presented to the Nexus Task Force in all stages of preparation.

As a first step, a household survey has been conducted in March 2014 to get a preliminary idea of the sanitary conditions of the households in the selected pilot area.

Between April 12-22, 2014 an in - depth physical survey on the 110 households, their bathrooms, toilets, kitchens and septic tanks including the walkways behind the houses as well as the complete sewer/storm water drainage system was conducted in An Hai Bac Ward in the Eastern Coastal Area of Da Nang. The septic tanks were analyzed in detail in order to identify practical technical solutions of bypassing them in order to connect the black and grey water directly to vacuum sewer collection chambers and a vacuum collection station.

During a public consultation on April 13, 2014 with the citizens of An Hai Bac Ward the concept was explained. The inhabitants of An Hai Bac Ward agreed and supported the research work pro-actively allowing access to the individual households including taking measurements of heights, widths, and locations of bathrooms, toilets, kitchens, corridors and sewer connections including distance to sewer lines. During this effort, one septic tank (Ly Van To, Household No. 21) was emptied and analyzed before and after with a borescope.

On the basis of these measurements technical drawings for each household have been elaborated in AutoCAD including the proposed individual technical solution for every household. Based on these drawings a concept for the connection of each household to the new vacuum sewer collection system to be installed was elaborated.

The concept presented here follows a strategy of “**minimal invasion**” into existing structures and the privacy of households (bathrooms, toilets, kitchens).

Costs / Financing

The total investment of the pilot project amount to **VND 6,753,720,129 (EUR 231,300)** (taxes, overheads and profit **not** included). This includes the costs for connection pipes from 110 houses, construction costs of system network and equipment costs.

Studies / Reports / Training

Reports:

- Rapid Appraisal on Urban Agriculture in Da Nang City, Viet Nam/November 2013
- Vacuum waste water collection, waste water treatment (biogas production) using the by-products (irrigation water and fertilizer from biogas plant) for urban agriculture / Report on research on vacuum sewer collection system for Pilot Project An Hai Bac Ward in Eastern Coastal Area of Da Nang, Vietnam GIZ/April 2014, updated in August 2014
- Summary Report of Survey at High rise Buildings in Da Nang Eastern Coastal Area for the Pilot Vacuum Sewer System/Da Nang/Vietnam/June 2014
- Summary Report of Survey at Hotels and Resorts in Da Nang Eastern Coastal Area for the Pilot Vacuum Sewer System Da Nang/Vietnam/June 2014
- MORGENSTADT BENCHMARKING AND CITY DEVELOPMENT CONCEPTS, the Urban Nexus & Sustainable Urban Governance/ Fraunhofer Institute for Industrial Engineering IAO/July 2014

**Study Tour:**

Study tour to Dubai/UAE visiting reference vacuum sewer system installations/June 2- 5/ 2014.

Results (Impact)

Demonstration project on vacuum sewer collection system for Pilot Project An Hai Bac Ward in Eastern Coastal Area of Da Nang is ready for implementation. Da Nang "Priority Infrastructure Investment Project/Project Management Unit" (PIIP PMU) belonging to the Department of Transport, is preparing tendering documents for financing via the World Bank "Da Nang Sustainable City Project" already approved.

Scaling up for the whole Eastern Coastal area of Da Nang is envisaged after the demonstration project has been implemented, monitored and evaluated.

Awareness has been created among Da Nang decision makers on vulnerability of city with regard to pollution of coast line and river because of inappropriate waste water management with septic tanks and combined surface and waste water drainage system.

Vacuum sewer as alternative to costly gravity sewer has been presented including feasibility considerations with regard to investment and operation and maintenance.