

Water Financing Partnership Facility PILOT AND DEMONSTRATION ACTIVITY

Activity Title: Pilot Study on Beneficial Use of Biosolids (Sludge)	
Proposer: Wuhan Urban Drainage Development Company (WUDDC)	
Request Date: 2 April 2008	
Country: P.R.China	Region: Asia
Activity Proposed Start Date: 1 Sep. 2008	Activity Proposed Duration: 6 months
Cost Estimate: \$70,000 (\$50,000 PDA Grant and \$20,000 Government Counterpart)	

1. Background and Rationale

Asian Development Bank is currently supporting investments at Wuhan in wastewater management, capacity building, and water quality modeling (Phase I)(Loan No.1996-PRC) and stormwater management, wastewater management, capacity building and sludge management (Phase II)(Loan No.2240-PRC). Wuhan city is currently preparing a new project for solid waste and sludge management (Phase III). There are 10 wastewater treatment plants (six of which are financed by ADB) in operation with total capacity of 1.59 million tons per day (1.0 million ton/day by ADB Projects), and approximately 500 tons of sludge (containing 80% water) is produced every day. At present, the sludge is transported and disposed of at the landfill plants. According to the Municipal Urban Development Master Plan, the landfills in the municipal suburban areas would be closed in the next several years and sludge disposal would become a major issue for the Government as well as WWTPs. As a technical preparatory work for above mentioned Phase 3 project, Wuhan Urban Drainage Development Co., Ltd (WUDDC) has conducted the initial bench-scale study and experiment on beneficial use of sludge, including land use as fertilizer, extracting the protein from the sludge and soil replacement using sludge by-product hydrolyte. The bench-scale study on extracting the protein from the sludge resulted in reduction of water content in the sludge to 45% (from 80% in the dewatered sludge) thereby the quantity of sludge to be disposed off at the landfill site or incineration plant would be significantly reduced. To implement the proposed pilot study, the international and national consultants will be engaged to further conduct the pilot-scale study on beneficial use of sludge and the optimized options for landfill or incineration, which will essentially provide support and technical justification for preparation of the Phase III Project.

Current Problem

So far, standard discharge for surplus sludge in China is (was) disposal together with household waste on landfills for most WWTPs. Sometimes, surplus sludge is used as fertilizer in agriculture depending on the quality of the sludge and original effluents. Generally, Chinese treatment plants are equipped with simple de-watering Machines (e.g. centrifuges or belt filter presses), generating a sludge with only about 20% of dry material (consistence like tooth-paste).

Due to the consistency of sludge and the increasing quantities, landfill operators began to refuse sludge at their facilities, some waste water treatment plant operators try to postpone sustainable solutions by storing the sludge on the plant and other operators use illegal practices to solve the problem (in some cases of no abstraction of surplus sludge, some plants just add the sludge to the effluent, dump the sludge in remote areas or into the sea)

Solution for Sludge Disposal

There are needs of (i) Introduction of more efficient de-watering, 40% instead of 20% dry material, so that sludge is better to handle on landfills (a truck may drive on it). (ii) More advanced technologies of de-watering equipment is required, e.g. chamber filter presses. In addition, digestion of sludge prior to de-watering and disposal makes sludge more acceptable for landfilling, meanwhile generating methane gas for generating power or heating for the plant or nearby communities (iii) Co-incineration together with coal in thermal power stations; (iv) co-incineration together with gas or oil in cement-factories (both frequently used in some countries like Germany) because incineration in mono incinerators is too expensive to handle. (v) Other technologies are available to properly treat the sludge, however, the sound solution will has to be studied case by case in according to the site circumstance.

In terms of Investment: comprehensive sludge treatment facilities may increase 30-40% of the investment for WWTPs depending on the technologies selected and equipment, the operation cost for sludge treatment facilities is also quite high, therefore, for small sized WWTPs, very few of them handle sludge properly due to related cost.

2. Objectives

The main objective of the proposed program is to conduct pilot-scale study following the bench-scale study on the extraction of protein from sludge that showed reduction of water content in the sludge from 80% to 45%. This pilot scale study is also aimed at further determining the financial viability and environmental sustainability of utilizing sludge for beneficial uses such as for gardening and landscaping, brick production, etc.

3. Scope and location of Work / Description of Activities

The PDA will undertake the following tasks:

- (1) Select the WWTP to establish a pilot facility for sludge processing and reuse. It is currently planned to establish the facility at Nantaizihu WWTP, which is one of the WWTP to be upgraded under ADB-financed Wuhan Phase 2 project.
- (2) Design and establish a pilot-scale sludge processing and reuse facility at the selected WWTP.
- (3) Study the financial viability, and environmental sustainability as well as acceptance by the end users of the recycled biosolids and sludge by-products. The quality of recycled biosolids and sludge by-products would be continuously monitored to ensure the safety of reutilization for landscaping purpose. The end-user surveys would also be conducted.

4. Implementation Schedule

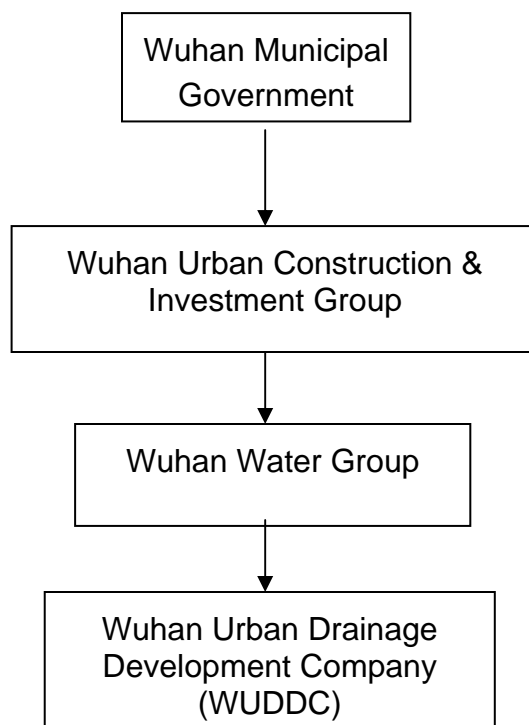
- (a) Selection of WWTP for PDA: 1st week
- (b) Prepare Inception Report: 2^{nc} week
- (c) Design of pilot-scale sludge processing and reuse facility: 1st month.
- (d) Construction of pilot-scale sludge processing and reuse facility: 2nd month.
- (e) Operation & monitoring of pilot-scale sludge processing and reuse facility: From 3rd month to 4th month.
- (f) Prepare Mid-Term Progress Report: 4th month
- (g) Conduct end-user surveys: 5th month.
- (h) Prepare Completion Report: 6th month

5. Institutional Management Arrangements

The main responsibility for implementing this PDA is lodged with the Wuhan Urban Drainage Development Company (WUDDC), which will act as executing agency.

WUDDC will establish a working group, which will be supported by the consultants and specialists to be engaged for the project. The key representatives from the WUDDC, who are currently implementing the loan project, will also participate as key members of the working group for this PDA.

The organizational structure below shows where WUDDC fits it within the structure of the municipal government, etc.



6. Proponent Qualifications

The WUDDC will be the executing agency for the proposed PDA. The WUDDC is the implementing agency for the ongoing ADB Phase I and Phase II loan projects. WUDDC is also responsible for operations and maintenance of wastewater treatment plants in Wuhan (except Hanxi WWTP).

7. Expected Results (outputs/outcomes/effects/impacts)

- Outputs:** Beneficial uses of sludge determined; financial viability and environmental sustainability assessed.
- Outcomes:** Enhanced management capacity of WUDDC for ensuring improved provision of more efficient, reliable wastewater and sludge management services; and effective protection of environment in Wuhan city.
- Impacts:** Improved and cleaner environment in Wuhan City as a result of improved wastewater management.

8. Measurable Performance Indicators

- (a) Determined sludge management option to become part the report on Sludge Management Strategy for Wuhan under the ADB Phase II Wuhan Wastewater & Stormwater Management Project.
- (b) Improved public awareness in resource recovery and environmental protection.
- (c) Increase in beneficial use of biosolids (sludge).
- (d) Decrease in quantity of disposed sludge at landfill sites and/or incineration plant.

9. Stakeholders Participation and Dissemination

Representatives from Wuhan Environment Protection Bureau, Wuhan Water Authority, Wuhan Urban Planning Bureau, Wuhan Urban Construction Committee will provide guidance and advice throughout the implementation of the PDA. The Piloted Communities and representatives from WWTPs will also participate in this PDA.

Experts from suitable local networks like for utilities, Global Water Partnership – China, or engineering association will be informed about the PDA.

The report will be made available in English and Chinese versions

The PDA will also be closely coordinated with ADTA for Urban Wastewater Reuse and Energy Generation from Sludge to ensure wider stakeholder participation during implementation as well as in the actual application of PDA results.

10. Scope for Replication/Use in Other Countries

The expected results of this proposed PDA have high demonstration value and have good potential for replication in the country as well as in other countries in the region, especially in places where wastewater management is actively being addressed and where reuse of treated water and beneficial use of sludge are being considered.

11. Detailed Cost Estimates

Inputs / Expenditure category	Total Costs (in US\$)	PDA Funds	Gov't. Counterpart
1. <u>Consultants/Specialists and Related Expenses:</u>	<u>38,600</u>	<u>38,600</u>	<u>0</u>
(a) Wastewater Engg. Specialist (International): 1 person-month (Salary: \$17,000/person-month for 1 person-month = 17,000)	17,000	17,000	
(b) Wastewater Engg. Specialist (Domestic): 6 person-month (Salary: \$2,000/person-month for 6 person-month = 12,000)	12,000	12,000	
(c) Design of Pilot Plant = 3,000	3,000	3,000	
(d) Pilot Plant Devices Installation = 6,600	6,600	6,600	
	<u>8,900</u>	<u>0</u>	<u>8,900</u>
2. <u>Conferences, Workshops, Surveys, and Related Expenses:</u>			
(a) Venue Rental = 1,000			1,000
(b) Resources (organizers, survey personnel, etc.): \$300 per person x 10 persons = 3,000			3,000
(c) Media Advertisements: \$800 (lot) = 800			800
(d) Sign Boards, Pamphlets, etc.: \$1,200 (lot) = 1,200			1,200
(e) Food & Drinks: \$900 (lot) = 900			900
(f) Transport and vehicles = 2,000			2,000
	<u>7,500</u>	<u>0</u>	<u>7,500</u>
3. <u>Office Equipment, Office Space Rental & Related Services:</u>			1,500
(a) Consumables (Printing paper, toner, etc.) = 1,500			6,000
(b) Office Space Rental: \$500/month x 12 months = 6,000	<u>15,000</u>	<u>11,400</u>	<u>3,600</u>
4. <u>Service Contractor:</u>			3,600
(a) Translator/Interpreter: \$300/person-month x 12 months = 3,600		6,600	
(b) Assistant Researcher: \$550/person-month x 12 months = 6,600		4,800	
(c) Secretary: \$400/person-month x 12 months = 4,800			
Total Cost of PDA	70,000	50,000	20,000