1. **Country and Sector Background**

With a total population of over 11 million inhabitants, Tianjin City Appearance Commission has the overall responsibility of providing municipal solid waste collection and disposal services. Based on 2004 data, solid waste management services were provided to approximately 6.5 million urbanized residents, collecting approximately 5,800 metric tons per day. Tianjin is one of the four cities in China that are under direct administration of the central government. It is the most important port city in northern China on the Coast of Bo Hai Sea. It is located at 120 km south east of Beijing.

Tianjin Municipal Government (TMG) seeks to develop Tianjin as the key international port city to be integrated into the overall long-term economic and social development plans for northern China.

Tianjin Clean Energy & Environmental Engineering Co. Ltd. (TCEE) is a municipal government owned agency, established for the purpose of developing and operating the landfill gas recovery and utilization project at the Tianjin Shuangkou Solid Waste Landfill site and to engage the World Bank in registering this project under the Clean Development Mechanism (CDM) of the Kyoto Protocol and to enter into agreement for the purchase of emission reductions generated by the project.

2. **Objectives**

The objective of this project is to support TMG’s improved solid waste disposal practices in a more environmentally friendly manner than has been the current practice, thereby leading to substantial greenhouse gas emission reductions, estimated at approximately 0.6 Mio. tCO2e/yr by 2012, the end of the Kyoto commitment period. Reductions of methane emissions and other non-methane organic compounds (NMOC’s) to the atmosphere are
to be achieved through a landfill gas collection and treatment system; utilization of the biogas as fuel for electrical power generation and a stand-by flare unit for destruction of excess methane and other air pollutants.

3. **Rationale for Bank involvement**

Landfill gas recovery and utilization at a municipal solid waste landfill facility has substantial environmental benefits over the usual practice of waste disposal at landfill sites in China. The project will reduce the volumes of methane and NMOC’s emissions to the atmosphere, thereby greatly improving regional air qualities, odor emissions as well as reducing the emission of methane, a potent Greenhouse Gas (GHG) that contributes to Global Warming. Collected methane can be used as a fuel for energy production which will further off-set the consumption of conventional fossil fuels for energy production. In order to effectively implement this landfill gas to energy project, waste disposal practices at the landfill site would need improvements and tighter environmental monitoring and control. Through these improved site management and operating measures, the landfill site would reduce its potential threats to local groundwater resources and soil contamination.

TMG will be responsible for making the required project investment. Considering the environmental and economic benefits of the project, the Bank is entering into an emission reduction purchase agreement with TCEE and providing assistance in to Tianjin for registration of the project as a CDM project under the Kyoto Protocol. The Bank has a long and productive association with Tianjin over the last ten years in improving the city’s urban environment infrastructure and is well positioned to advise the Tianjin government on its solid waste management plan and practices, given its experience in implementing similar projects worldwide.

The fact that methane emission reductions from landfill gas recovery and utilization projects is an important element in a GHG reduction strategy qualifies these projects for registration under the CDM and access to carbon finance. The Bank manages carbon finance Trust Funds and can directly provide these additional sources of revenue. The Bank thereby assists Tianjin to access financing for the project from the sale of CERs – which will substantially improve the project’s financial viability and support financing of the O&M costs of the landfill facility.

4. **Description**

The Tianjin Shuangkou Landfill Gas to Energy project involves the following key components:

- The construction of well fields with a series of gas extraction wells interconnected with lateral and header pipe network;
- Gas extraction blower(s), gas treatment facilities (condensate removal, filter, etc.) and gas compressor(s);
- Electrical power generation unit(s), transformer substation and power transmission lines;
• A stand-by gas flare unit;
• Associated system controls, safety and monitoring equipment.

In addition to the gas recovery and utilization system, the waste deposit area at the Tianjin Shuangkou landfill will be properly graded, compacted and appropriate cover material will be applied, thereby improving environmental conditions on site and improving gas production volumes.

5. Financing

Tianjin Municipal Government will make all necessary investment for the project through TCEE. Total capital investment for the project is estimated at US $4.52 million.

6. Implementation

The TMG made the decision to investigate the feasibility of the project in the summer of 2004. After an initial review by the Bank, Tianjin started pre-feasibility studies in early 2005. Since then, Tianjin has established a company, the Tianjin Clean Energy & Environmental Engineering Co. Ltd. (TCEE), with a mandate to develop and implement the project. TCEE is a state-owned municipal agency jointly owned by the Tianjin Municipal Administration Commission, Tianjin City Appearance Commission and the Shuangkou Municipal Solid Waste Landfill. At this time, TCEE has retained engineering consulting firms for preparation of the detailed Feasibility Study and Environmental Impact Assessment documents. TCEE has also explored various business models and has decided to take the Design-Build-Operate approach and engage a private sector company. Discussions on the terms and conditions for the DBO contract are currently underway.

On March 23, 2006, TCEE and the Bank have reached a tentative Emission Reduction Purchase Agreement (ERPA). The Bank has retained JEC Shanghai Ltd as consultant to prepare the necessary Project Design Document (PDD). The project is currently at the detailed feasibility and engineering design stage and construction is due to start in mid 2007.

7. Sustainability

Tianjin Shuangkou Municipal Solid Waste Landfill site was the first sanitary landfill facility in Tianjin. The project was financed with a Bank loan. Construction of the site started in 1999 and it started to receive waste in 2001. Shuangkou landfill site is currently the largest landfill disposal site in Tianjin.

Original design of the landfill facility included a base liner, leachate collection and treatment plant on-site. Vertical wells were constructed for passive venting of landfill gas. No provisions were made for active recovery and utilization of landfill gas.

At this time, site conditions are less than desirable. Significant re-configuration of the waste fill area would be required, operating methods should be improved and adequacy of groundwater monitoring wells should be further assessed. Therefore, this carbon
finance project plays an important role in minimizing potential environmental damages through improved site operations and providing increased revenue for landfill operation.

Tianjin has four additional municipal solid waste landfill facilities. It is expected that experience gained through the development of Shuangkou landfill as a CDM project would contribute significantly to future similar projects.

8. Lessons Learned from past operations in the country/sector

Experience has shown that achieving significant impact in a major urban area in China requires consistency of approach, careful planning, and time for maturation of essential and often challenging policy reforms and initiatives. In addition, innovation in financing techniques requires adequate preparation as well as comprehensive identification of potential pitfalls.

Effective landfill gas recovery and utilization project within the overall scope of the municipal solid waste management and environmental program in Tianjin was therefore developed with thorough consideration of a wide range of options, focusing on the financial and environmental implications. Concerns over investment requirements, project management and operating experience, long-term financial viability, energy utilization options and marketability, and environmental benefits were thoroughly considered.

TCEE has retained competent local engineering organizations in preparing its feasibility study and environmental assessment reports. Furthermore, TCEE intends to retain a reputable global corporation (with specialized international and China experience) as its DBO contractor. These measures, coupled with its own staff with extensive experience in project development, particularly for Bank financed urban infrastructure projects, will further ensure satisfactory implementation of the project.

9. Safeguard Policies (including public consultation)

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<td>Projects on International Waterways</td>
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10. Policy Exceptions and Deadlines

None applicable
11. **Results assessment arrangements completed**

The Bank has retained an international consultant firm JEC Shanghai Ltd which has specialized experience in CDM projects, to prepare the Project Design Document. The PDD will specify project monitoring requirements. Furthermore, project registration as a CDM project under the Kyoto Protocol will ensure monitoring and reporting requirements. - **YES**

12. **Cofinancing agreements signed**: NA

13. **List of Factual Technical Documents**

Tianjin Shuangkou Landfill Gas Recovery Project - Project Idea Note

Shanghai JEC (March 31, 2006): Project Design Document (PDD) for Tianjin Shuangkou Landfill Gas Recovery and Gas Utilization Project

14. **Contact Point:**

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