

**PROJECT INFORMATION DOCUMENT (PID)
APPRAISAL STAGE**

Report No.: 40276

Project Name	Bolivia Urban Wastewater Methane Gas Capture Project
Region	Latin America and the Caribbean
Sector	Sewerage (100%)
Project ID	P104092
Borrower(s)	Republic of Bolivia
Implementing Agency	SAGUAPAC
Environment Category	<input type="checkbox"/> A <input checked="" type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> FI <input type="checkbox"/> TBD
Date PID Prepared	February 9, 2007
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Estimated Date of ERPA Signature	May 03, 2007

1. Key development issues and rationale for Bank involvement

Country and sector issues

In the municipality of Santa Cruz, the sanitation sector faces immediate challenges. Santa Cruz has a population of about 1.3 million, growing at an annual rate of over 6%. Sanitation services in Santa Cruz are provided by 10 cooperatives of which the largest is SAGUAPAC, serving 65% of the city's area. Sewerage coverage in SAGUAPAC's service area is only about 50%, giving Santa Cruz an overall level of sewerage coverage of only 32%. In addition to the immediate public health and environmental effects associated with low sewerage coverage, sewage infiltration into the city's main aquifer will result, within a few years, in irreversible damage. There is therefore an urgent need to increase the coverage of Santa Cruz's sewerage system to avoid the much larger investments associated with developing an entirely new water supply source for the city.

The cooperative has served the city for more than twenty years and has been recognized as one of the best managed in Latin America. It is run by a general assembly that names the top directors and their regulations grant the supervision council a veto right over the management council, which contributes to its stability. The cooperative has already received two Bank credits and technical assistance to train staff, both of which have been used effectively. Although its achievements have been impressive, its long term sustainability has been hindered by the city's constant growth as well as its need to protect the aquifer by reducing the infiltration of raw sewage from housing units not connected to the sewerage system.

A World Bank IDA project, the Bolivia Urban Infrastructure Project, is aimed at improving the access to basic services to the urban poor in Bolivia's major cities through targeted infrastructure investments. Part of this project will include provision for the expansion of sewerage coverage in poor areas of Santa Cruz de la Sierra, involving works to increase the capacity of the three wastewater treatment plants so as to enable them to process increased wastewater flows. These plants will use a lagoon treatment system. Such a lagoon-based process involves the breakdown

of organic matter by colonies of anaerobic bacteria, producing methane, a powerful greenhouse gas contributing to climate change.

Rationale for Bank involvement

In Bolivia, the Bank has experience supporting service delivery and infrastructure projects at the local level as well as through central government institutions. The urban focus of the proposed project also supports Bank involvement, as the Bank brings operational experience in urban development from Latin America and elsewhere, especially urban upgrading in poor neighborhoods, urban transport and sanitation. Since the early 1990s the Latin American region of the World Bank has actively pursued projects of integrated upgrading of urban sanitation. The upgrading projects have typically focused on the city level, taking a geographic approach to poverty targeting, and emphasizing the physical and social improvement of slum conditions. The Bank's city-based urban upgrading projects take a macro perspective to effectively integrate often isolated, low-income communities into the overall fabric of the city. One of the three main components of Bolivia Urban Infrastructure Project (P083979) is to provide wastewater support to SAGUAPAC in Santa Cruz. This carbon finance project will further support SAGUAPAC's goals of expanded wastewater coverage and operational efficiency.

The Kyoto Protocol of the United Nations Framework Convention on Climate Change (UNFCCC) entered into force on February 2005. This international agreement commits industrialized countries to reduce their carbon emissions by an average of 5.2% below their 1990 levels during the period 2008-2012. The Protocol provides for two flexibility mechanisms for meeting these obligations - the Clean Development Mechanism (CDM) and Joint Implementation (JI). The CDM enables industrialized countries to meet some of their obligations through the purchasing of emissions reduction from projects that generate such emission reductions in developing countries (which do not have an obligation to reduce their emissions under the Kyoto Protocol).

The World Bank's involvement in carbon finance helps to ensure consistency between the individual projects it supports and the international dialogue on climate change, while providing the opportunity to mobilize global experts with experience in the field, technical support for project preparation, supervision capacity, and development of linkages with other sources of expertise and funding. By mobilizing the private and public sectors on an important new source of project finance, the Carbon Finance Unit of the World Bank (ENVCF) is developing an important knowledge base and is demonstrating how insights and experience from both sectors can be pooled to mobilize additional resources for sustainable development and address global environmental concerns.

This project fits well with the aims of the both the World Bank and the UNFCCC to use Carbon Finance as a vehicle for the transfer of technology and best practise on low carbon-intensity management of facilities.

The World Bank's involvement in this project, as a trustee of the Community Development Carbon Fund (CDCF), allows purchase of emissions reductions beyond 2012 using the principles of the CDM mechanism. This arrangement reduces the uncertainty regarding the value of

emissions reductions beyond the period mandated by the Kyoto Protocol and enhances the financial viability of the project.

One of the main objectives of the CDCF is to ensure that communities are empowered to play an active role in the delivery of services (social services and economic infrastructure) that help improve their livelihoods and thus reduce poverty. Within this process, communities actively take part in the identification implementation, and monitoring, of those services: - in this case monitorable, quantifiable benefits derived from this project. Another critical goal of the CDCF is to ensure that all the different social groups within a community have equal access, and that the benefits provided by this project yield maximum and sustainable results.

The project would contribute towards mainstreaming cleaner, more environmentally sound technologies into one of the poorest countries in Latin America, and contribute to promoting environmental sustainability in Bolivia by demonstrating the potential of carbon financing to catalyze and advance environmentally beneficial practises. The preparation of this project will require less resources than a stand-alone Carbon Finance operation would since it is associated with the Bolivia Urban Infrastructure Project, and Environmental and Social assessments, financial analysis, and other due diligence has already been completed.

2. Proposed objectives

The overarching objective of the proposed Project is to help mitigate global climate change, by facilitating the use of market-based mechanisms sanctioned under the Kyoto Protocol through support to the urban sanitation sector in Bolivia. To this end, the Project is anticipated to displace over 60 thousand tons of CO₂ equivalent per year of operation, rising to over 100 thousand tons by 2008. The Project will also reduce the local emissions of gasses generated from the treatment facilities, which currently carry unpleasant odors to nearby residential areas.

The project will contribute to the further development of the international carbon market in Bolivia through the supply of Emissions Reductions under the Clean Development Mechanism (CDM) as set forth under Article 12 of the Kyoto Protocol. The key performance indicator is the creation of Emission Reductions (ERs) through the contribution of methane.

The project will also enhance the efficacy of the Bolivia Urban Infrastructure Project in its aims of improving Santa Cruz's urban sanitation infrastructure by providing an additional source of foreign currency to supplement the investment capital SAGUAPAC requires to both extend its urban sanitation service coverage, and maintaining high operation and maintenance standards of the plant.

3. Preliminary description

The project would cover all primary treatment anaerobic lagoons at SAGUAPAC owned and operated wastewater treatment facilities in Santa Cruz. The primary anaerobic treatment lagoons at all four of the facilities covered by this project will be covered by a high-density polyethylene (HDPE) 'geomembrane' sheet, supported by a system of floats and supporting tubes. Perforated PVC tubes, of diameter 75mm, will be used to capture the gas from the lagoons. This will then be transported, via an interconnecting pipe system, to a flare system. By covering the lagoon with a plastic sheet, the temperature of the lagoon (the reactor) is raised, while decreasing the

available oxygen, this will also have the effect of optimizing the anaerobic digestion process, and decreasing retention time in the lagoons, and contributing to increase in the capacity of the treatment plant.

The proposed project will purchase a total number, to be negotiated, of metric tons of CO₂ equivalent (tCO₂e) ERs from the capture of methane gas at the SAGUAPAC wastewater treatment facilities in Santa Cruz.

The methodology to be used is the small-scale methodology AMS.III.H “Methane recovery in wastewater treatment”. The small-scale methodology has been chosen in preference to used is AM0013 “Forced methane extraction from organic waste-water treatment plants for grid-connected electricity supply” as (1) the annual average emission reductions are lower than 60k per year (the threshold for small-scale methodologies); (2) the small-scale methodology has a simplified monitoring plan (implying lower costs to the operator); (3) the ability to hire a single designated national authority for both validation and verification reduces the CDM-related transaction costs; and (4) a shorter commenting period at the project registration stage means that the project can start to generate emission reductions more quickly.

Lessons learned and reflected in the project design

The World Bank has considerable experience in the carbon finance operations from the capture and flaring of methane gas from landfill sites, and this project will leverage the Bank’s experience in carbon finance operations to assist the project entity in dealing with the steps necessary for certification of emissions reductions under the clean development mechanism, including the preparation of the Project Design Document (PDD), development of a new methodology and presentation to the UNFCCC’s Executive Board (EB), verification of the project by Bolivia’s Designated National Authority (DNA), calculation of the baseline and reduced emissions, and certification of the emission reductions by independent auditors. This is the first Carbon Finance operation undertaken by SAGUAPAC, and indeed the first in Bolivia, and experience has shown that the Bank’s participation and transfer of knowledge and skills can be invaluable in ensuring the success, sustainability, and scaling up of such projects.

This project will be the first of its kind under the CDM, both in Bolivia and internationally. It will therefore also provide a learning experience for all involved. A large number of countries in the Latin America region make extensive use of lagoon stabilization pond systems to treat wastewater, many of which would be suitable to develop similar projects. There is therefore a large potential for future scaling-up.

The design of the overall project, of which this is a part, is set out in detail in the Project Appraisal Document for the Bolivia Urban Infrastructure Project (approved by the Board 21 November 2006). SAGUAPAC has been recognized as one of the best managed in Latin America, and two previous Bank-financed projects have been very successful in producing positive results.

Technical

Additionality

Additionality is based on the following considerations: There are no laws or regulations in Bolivia which require the covering of anaerobic digestion lagoons in wastewater treatment plants. The current practice in other similar treatment facilities in Bolivia, and indeed the current practice at the plant which the project seeks to upgrade, is to simply leave these lagoons open to the atmosphere, thereby allowing the methane gas to escape to the atmosphere. The least cost option would be, as is the common practice in Bolivia, not to cover the lagoons. This project is therefore not the least-cost option. The capture and flaring of methane gas from anaerobic digestion lagoons in wastewater treatment facilities is a new application in Bolivia, which this project would pioneer.

Baseline

The existing situation that the facilities are operating close to their maximum capacity (North 1 8,000 m³/day, North 2 30,000 m³/day, East 19,000 m³/day, Industrial 7,000 m³/day). The baseline scenario is that these facilities will be expanded by the Bank-financed project in the case of *Norte 2*, and *Este* facilities, and internally financed by SAGUAPAC in the case of the *Norte 1* and the Industrial Park facility. The new flow capacities will be 15,525 m³/day, 62,353 m³/day, 65,885 m³/day, and 12,000 m³/day respectively. However, the actual flow rates would initially remain as before, rising over time to reach full capacity.

The baseline scenario is based on the assumption that, in the absence of carbon finance revenue, the anaerobic lagoons would be open to the atmosphere, in line with standard practice in Bolivia. Under such a situation, methane produced in the anaerobic breakdown of organic matter escapes into the atmosphere directly.

Based on the current and expected future capacity of all four treatment works included in the project, total baseline emissions are 26 thousand tonnes/yr CO₂e emissions in 2008. Over time, as the sewage network is expanded, and the facilities are used to their full capacity, this will rise to 44 thousand tonnes/yr CO₂e - assumed to occur by the year 2012.

Social

As a Community Development Carbon Fund project, this project will incorporate a Community Benefits Plan, developed by the operator SAGUAPAC to improve sanitation services in the poor neighborhoods surrounding the wastewater treatment facilities. The development and implementation of this plan will be financed from a premium over and above the market price for ERs paid by the CDCF to fund such projects. The community benefits include activities such as neighborhood improvement, increasing sanitation coverage in the area, providing more adequate street drainage to remove a common foci of infection, and improving the sanitation conditions in local hospitals and schools.

Environment

The project's main objective is to reduce the release of methane into the atmosphere, a powerful greenhouse gas. Unlike conventional wastewater treatment plants in Bolivia, this project plans to cover the anaerobic digestion lagoons installed by the project; this will also have the effect of reducing the offensive odours that are currently generated by this plant -located in the centre of an urban area- a problem that has generated a large number of complaints from local residents.

The project is an end-of-pipe methane capture, and is expected to have no negative environmental effects. Combustion of the methane will be monitored and an international 'best-practice' flare system installed. As part of the Environmental Management Plan, a health and safety study was developed. An independent design engineer has reviewed the methane collector system plans – since methane is highly combustible and proper design is important – and elaborated a safety management plan for the installations.

4. Safeguard policies that might apply

Safeguard Policies Triggered	Yes	No	TBD
Environmental Assessment (OP/BP 4.01)	X		
Natural Habitats (OP/BP 4.04)		X	
Forests (OP/BP 4.36)		X	
Pest Management (OP 4.09)		X	
Physical Cultural Resources (OP/BP 4.11)		X	
Indigenous Peoples (OP/BP 4.10)		X	
Involuntary Resettlement (OP/BP 4.12)		X	
Safety of Dams (OP/BP 4.37)		X	
Projects on International Waterways (OP/BP 7.50)		X	
Projects in Disputed Areas (OP/BP 7.60)		X	

5. Financing

Source:

③ Community Development Carbon Fund

(US\$ m)

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6. Contact point

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