1. Country and Sector Background

Peru has mostly inadequate solid waste disposal sites around the country. In 2002, about 2.35 million people in Lima, most of whom live in the marginal settlements of the poorest district municipalities (MDs), did not benefit from regular refuse collection services. In the settlements that lack this basic service, garbage piles up around homes and in the streets, or is burned in the open, and vermin and disease vectors proliferate. As a result the residents are exposed to significant public health risks. In addition, dumpsites, landfills and transfer stations tend to be located in the poorer areas of the city, thereby introducing additional public health and environmental problems when they are not properly operated. Notwithstanding the redefinition of the legal framework for municipal solid waste management in Peru, and in metropolitan Lima, progress implementing the Sistema Metropolitano de Gestión de los Residuos Sólidos (Metropolitan System of Solid Waste Management) has been slow, and in many areas nonexistent.

The main issue regarding solid waste management in urban centers of Peru is financial management. Currently, MDs are authorized to collect an “arbitrio” (fee) for service that is nominally set at the cost of providing service, and most MDs collect the fee through a direct billing and collection system, or together with the property tax. Until 1994 the fee was collected together with the electricity bill, and the collection efficiency was over 80%, but this billing mechanism was suspended by the Government of Peru (GoP). Since then, fee collection efficiency has dropped to under 30% in the poorest MDs. The fees collected are required by law to be deposited in special accounts that can only be used by the MDs for solid waste management --this, however, has not been enforced adequately. Finally, for the most part the MDs do not have an adequate cost accounting system that allows for the accurate determination of providing solid waste services, although this is required by Ordenanza No. 295. In the absence of such information, the MDs cannot determine their real costs.
There has been considerable opportunity for private sector participation in the solid waste sector in metropolitan Lima as a result of the favorable legal framework. The main problem however, revolves around the ability of MDs to pay for the municipal solid waste (MSW) management services and therefore the attractiveness of this sector to private operators. The resulting arrears and failure to pay creates pressures for the “informalization” of the private sector and impedes the process of modernization and consolidation of the solid waste sector.

Municipal Solid Waste Management (MSWM), nevertheless, has the potential for an additional income stream –at no direct cost to MDs-- due to the availability of proven methods and technologies to capture and use methane from landfills, and the financial incentive provided by the international market for greenhouse gas emissions reductions created under the Kyoto Protocol. Under the Kyoto Protocol’s Clean Development Mechanism (CDM), Landfill Gas (LFG) recovery provides an important income stream for well managed landfills and consequently improves the economic and financial viability of solid waste management. The GoP has ratified the Kyoto Protocol and through its environmental agency Consejo Nacional del Ambiente (CONAM) has been supporting CDM projects in the country.

Although LFG recovery projects under the CDM are being implemented for a number of years in various Latin American countries, Peru has not had such an operation in place until now. The National Environmental Fund (Fondo Nacional del Ambiente, FONAM) indicates that at least four other landfill operations could immediately benefit from such types of projects, while the potential for further projects could extend to another six of the main urban centers of the country.

2. Objectives

The higher level objective of the proposed Huaycoloro Project is to demonstrate the potential of carbon financing to promote profitable and effective waste management for municipal solid waste landfills in Peru.

The Bank’s participation in the proposed project would support the objectives of employment generation, access to basic services and decentralization as set out in the Country Assistance Strategy (CAS). By demonstrating the potential of well managed landfill operations to generate additional income stream through Certified Emissions Reductions (CER) the Project would aim not only to improve the local and global environment through the landfill gas recovery component, but also to introduce in Peru an opportunity for investments in improvements of municipal solid waste collection and disposal, and to increase Peru’s competitiveness in the international carbon market.

The project aims to promote private sector investment in the collection and use of landfill gas to reduce greenhouse gases and to create Certified Emissions Reductions (CERs) that will grant significant additional income for well-managed municipal solid waste operations.

The key performance indicator is the creation of CERs through the collection and burning of methane. Secondary indicators of success concern future operations of the same type that will appear in the country (demonstration effect) and at a later stage, investments in electricity
generation equipment using the LFG. Power generated using the LFG could be used either locally at the landfill site and/or to supply the network, thereby further reducing greenhouse gases and supplying indigenous, renewable energy to the country’s electricity system.

3. Rationale for Bank Involvement

This project would be the first Landfill Gas recovery project in Peru under the Clean Development Mechanism. The World Bank’s involvement in the project would assist in demonstrating the potential of landfill sites to realize significant additional income related to the reduction of greenhouse gas emissions. Income from carbon financing would assist the project sponsor to raise financing for the project and, as the project is implemented, it would facilitate the transfer of environmentally and economically beneficial technology to Peru. The World Bank has pioneered such transactions in Latin America (Mexico, Brazil), and around the world, and has supported Clean Development Mechanism projects in Peru for small hydroelectric electricity generation projects.

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 ability 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 (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.

4. Description

4.1 Purchase of Carbon Emissions Reductions

The proposed project will purchase Certified Emissions Reductions (CERs) from the Huaycoloro landfill -- a solid waste landfill located in the Huaycoloro Valley in the San Antonio District, City of Chacalla, state of Lima, Peru. The site is operated and managed by PETRAMAS S.A.C., and is considered one of the most modern landfill operations in Peru.

The project will reduce greenhouse gases emissions largely through collecting and burning LFG. Additional emissions reductions may be obtained at a second stage by using LFG as a fuel to generate electricity and displace the site’s diesel generation and to sell power to the main electricity network.

According to the pre-feasibility study the project would reduce about 2 million tCO2e for the duration of the initial 7-year crediting period and about 8 million tCO2e over a 21 year crediting period. The Netherlands Clean Development Mechanism Facility (NCDMF) will purchase 800,000 tCO2e in the first seven years of the operation. The sponsor has indicated that any CERs remaining after the sales to NCDMF will be sold to other parties –various entities have already indicated their interest to purchase such CERs.
The purchase of CERs under this project effectively means that transfer of funds is based on the performance of the project—in terms of actual reduction of greenhouse gas emissions. The emission reductions will be verified annually by an accredited organization and their statement will be transmitted to the NCDMF. Payments to the sponsor will occur upon completion of this independent verification process. Under this arrangement, the project’s sponsor has a clear incentive to maximize the recovery of the LFG, since the sponsor’s revenues from the project are directly proportional to the amount of LFG collected and burned.

4.2 Project components

LFG recovery and combustion

The Huaycoloro landfill site comprises a total of about 1,575 hectares (ha), of which about 240 ha are planned for landfill development. The landfill began accepting waste in 1994 and is currently disposing approximately 2,200 tons per day (over 700,000 tons per year). To date, over 5.5 million tons of waste have been filled in about 35 of the Landfill’s 240 hectares. Future disposal rates assume an annual growth rate of 1.5 percent. The Landfill is estimated to close around 2040 after reaching a total site capacity of approximately 40 million tons.

The capture and combustion of methane (CH4), in an engine generator and/or an LFG flare, transforms the methane into carbon dioxide (CO2)\(^1\) and water. This process results in a substantial net reduction of GHG emissions, because of the avoidance of CH4 release into the atmosphere, which would happen under normal operating conditions at the Huaycoloro landfill.

The project would consist mainly of the installation of a landfill gas collection system to extract and collect LFG, and blower and flaring equipment for LFG combustion. The revenues for the project would come from the sale of CERs of greenhouse gases created by the combustion of methane, which makes up approximately 50 percent of the LFG.

Potential Second-Phase Electricity Generation Component. Instead of simply burning the collected LFG, it is possible to use the calorific content of LFG to drive an electricity generator of up to 5.74 MW. Such generating capacity would far exceed the electricity used for the landfill operations (currently served with generators of about 300kW). However, an additional investment into extending an interconnection line to the main national grid of Peru would allow sale of electricity to other users and provide a source of renewable energy to the system. Revenues for this stage of the project would come from electricity sales (exporting power to the grid) and CERs created by displacing fossil fuel based electricity in the national electricity grid. This potential second phase would provide additional CERs to the project and the company will evaluate its feasibility once the first phase is completed.

5. Financing

Payments for purchase of Emissions Reductions

\(^1\) CO2 emissions from Solid Waste (“SW”) are not considered to contribute to global climate change because the carbon was contained in recently living biomass. The same CO2 would be emitted as a result of the natural decomposition process. According to the approved consolidated baseline methodology for landfill gas project activities ACM0001, the approved global warming potential value for methane (GWPCCH4) for the first crediting period is 21 tons of CO2 equivalent (tCO2e) per ton of methane (tCH4).
6. Implementation

The project sponsor, Petramas, will be the sole developer, owner and operator of the LFG recovery and flaring operation, which will become part of the business activities of the company. A letter of intention (LoI) was signed with the World Bank as a trustee of NCDMF to purchase emissions reductions from the project and a preliminary agreement was reached in August 2005 for the amount of CERs and indicative price to be purchased from the operation. For the potential second phase electricity generation of the project the sponsor is considering partnerships with entities in the electricity sector, however no specific agreements have yet been reached at this stage.

The Clean Development Mechanism Designated National Authority for the Kyoto Protocol in Peru is the Consejo Nacional del Ambiente (CONAM). CONAM is responsible for the registration of the project in Peru and provides confirmation that the project is consistent with the country’s overall sustainable development priorities.

The project will be executed by Petramas as the project sponsor. The country’s involvement is secured by a Letter of Authorization issued by CONAM. Other actors are: the Executive Board (EB) of CDM (the International Regulator), and the government agencies in charged of permits and concessions.

7. Sustainability

The project is expected to be sustainable. The landfill operation and the gas collection are deemed financially feasible and are expected to be sustainable until the closing of the project in 2012. The project would be in compliance with the Bank’s safeguard policies and is expected to remain so.

Policy and regulatory changes in Peru are not expected to affect the overall sustainability of the project, while the Government of Peru has indicated its commitment to the UNFCCC and the Kyoto Protocol, which creates a positive environment for additional projects of this type to be implemented in the country.

The project has a significant replicability potential and the World Bank has approached the Municipality of Lima for a similar project in another landfill operating in Lima, while FONAM has compiled a list of other cities and landfill sites in the country where LFG collection and burning projects could take place.

8. Lessons Learned from Past Operations in the Country/Sector

The World Bank has been involved, initially through the GEF, and more recently using carbon finance, in a number of LFG recovery projects. These projects have demonstrated the potential
of carbon finance to provide additional income to landfill operators and improve the environmental management of landfill operations. Lessons from such operations indicate that full cost recovery is necessary to promote sustainability. The project’s financial analysis has determined that with carbon financing the LFG recovery operation is financially attractive, while under well-managed operational and technical risks, the project’s returns can provide an additional income to landfill site operations that could improve the overall financial performance of the enterprise as a whole.

The operation of LFG recovery projects requires clear managerial and institutional responsibilities as well as technical capabilities. The project at its current stage would be the full responsibility of the landfill owner—and project sponsor—Petramas S.A.C. The sponsor—in response to the World Bank’s strong recommendation—has retained the services of an experienced technical consultant for the detailed design of the landfill gas recovery system and has entered into preliminary discussions on consultant’s services for the initial operational period.

9. Safeguard Policies (including public consultation)

<table>
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<th>Safeguard Policies Triggered by the Project</th>
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<tbody>
<tr>
<td><strong>Environmental Assessment</strong> <em>(OP/BP/GP 4.01)</em></td>
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<tr>
<td>Natural Habitats <em>(OP/BP 4.04)</em></td>
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<td>Involuntary Resettlement <em>(OP/BP 4.12)</em></td>
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<td>Projects on International Waterways <em>(OP/BP/GP 7.50)</em></td>
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The project is located more than 5 km from the nearest population center as required by Peruvian laws, and is not expected to have any significant social impacts. A public consultation on the project was held in April 2005 with the assistance of FONAM (the report is available in project files). Petramas in coordination with FONAM conducted information workshops for the project in population centers located near the landfill zone; an act of the assembly of the community indicates that the project received positive reaction from the local community.

Due to the unique physical characteristics (low groundwater table and negligible rainfall) and adequate management, the existing landfill has no environmental or social issues of concern. No one lives close to the landfill, and it is secured – there are no waste pickers. No critical habitats or otherwise environmentally important areas are nearby. The landfill is well managed and a long-term environmental management plan is being implemented.

* By supporting the proposed project, the Bank does not intend to prejudice the final determination of the parties' claims on the disputed areas
The project only triggers *O.P. 4.01* (Environmental Assessment). No other policies are triggered by this project.

To comply with the requirements of O.P. 4.01, the project sponsor contracted a special annex specifically for the proposed biogas plant to their environmental management plan (EMP). Administrative authorities governing biogas recovery are listed, detailing licensing requirements and regulations. The EMP covers all project phases (design, construction, operation and decommissioning). For each negative impact identified, specific mitigation measures are proposed. For instance, a few examples: (1) noise pollution from construction equipment will be mitigated by requiring mufflers on all transport equipment; (2) to avoid exposure of workers to noise and noxious gas from the capture system, all equipment should have prescribed operation and maintenance schedules; (3) soil and subsoil quality will be protected from pollution from condensed liquids through diligent control of the individual system elements (valves, pipes, etc.). The EMP includes monitoring and contingency plans.

**Public disclosure**
The EMP will be posted on the Bank website, and on the website of a local group before appraisal. There are very few negatively affected people from this project, all local communities will have access to the EA and are currently able to lodge complaints directly with the landfill management company.

10. List of Factual Technical Documents
   - Report of the pump test and pre-feasibility study for landfill gas recovery and energy production at the Huaycoloro landfill Lima, Peru. (SCS Engineers, June 2005)
   - Informe de Presentación a la Comunidad (FONAM, Perú, Abril 2005)
   - Clean Development Mechanism Project Design Document Form (CDM-PDD)
   - Diseño de Sistema de Captación de Biogás y Cálculos de Ingeniería, Relleno Sanitario Huaycoloro, Lima Perú

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