Document of
The World Bank

FOR OFFICIAL USE ONLY

Report No: 33761-PE

PROJECT APPRAISAL DOCUMENT

ON A

PROPOSED PURCHASE OF EMISSIONS REDUCTIONS

BY THE NETHERLANDS CLEAN DEVELOPMENT MECHANISM FACILITY

IN THE AMOUNT OF
(EURO 3.8 MILLION EQUIVALENT)

FROM

PETRAMAS S.A.C.
(LIMA, PERU)

FOR THE

HUAYCOLORO LANDFILL GAS RECOVERY

September 30, 2005

CURRENCY EQUIVALENTS

(Exchange Rate Effective September 2005)

Currency Unit	=	Nuevo Sol (SDR)
1 SDR	=	US$ 0.307
1 US$	=	SDR 3.25
1 EU€	=	US$ 1.2

FISCAL YEAR

January 1	–	December 31

ABBREVIATIONS AND ACRONYMS

CDM	Clean Development Mechanism
CER	Certified Emissions Reduction
CH4	Methane
CO2	Carbon Dioxide
CONAM	*Consejo Nacional del Ambiente* -- National Environmental Council
DOE	Designated Operational Entity
EMP	Environmental Management Plan
ER	Emissions Reduction
ERPA	Emissions Reduction Purchase Agreement
FONAM	*Fondo Nacional del Ambiente* -- National Environmental Fund
GHG	Greenhouse Gas
GoP	Government of Peru
LFG	Landfill Gas
MD	Municipal Districts
MSW	Municipal Solid Waste
MSWM	Municipal Solid Waste Management
NCDMF	Netherlands Clean Development Mechanism Fund
SEIN	*Sistema Eléctrico Interconectado Nacional* – National Interconnected System
UNFCCC	United National Framework Convention on Climate Change

Vice President:	Pamela Cox
Country Manager/Director:	Marcelo Giugale
Sector Manager:	Susan G. Goldmark
Task Team Leader:	Demetrios Papathanasiou / Dan Hoornweg

PERU
Huaycoloro Landfill Gas Recovery

CONTENTS

Page

A. STRATEGIC CONTEXT AND RATIONALE

1. Country and sector issues

1. 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.[1] 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,[2] and in metropolitan Lima,[3] progress implementing the *Sistema Metropolitano de Gestión de los Residuos Sólidos* (Metropolitan System of Solid Waste Management) has been slow, and in many areas non-existent.

2. 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[4] --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.

3. 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.

4. 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

[1] MML/DMSC, *Plan de Emergencia Ambiental, para el Manejo de los Residuos Sólidos, a Nivel Provincial*, Lima, 31 Jan 2002.
[2] *Ley No. 27314 Ley General de Residuos Sólidos*, 2 July 2000.
[3] *Ordenanza No. 295* creating the *Sistema de Gestión de los Residuos Sólidos en Lima Metropolitana*, 27 Oct 2000. The corresponding *Reglamento* was promulgated by *Decreto de Alcaldía No. 147*, 6 Jan 2002 and subsequently modified by *Decreto de Alcaldía No. 093*, 2 Mar 2003.
[4] Article 46 of Ley No. 27314 requires the establishment of a municipal *cuenta especial intangible*.

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.

5. 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. Rationale for Bank involvement

6. 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.

7. 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.

8. The Kyoto Protocol of the United Nations Framework Convention on Climate Change (UNFCCC) has recently entered into force (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 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).

3. Higher level objectives to which the project contributes

9. In Peru, key areas of government focus include competitiveness of the country, equity and social justice, and development of institutions to support an efficient, transparent, and decentralized state. In terms of infrastructure, increased private sector engagement and development is a key priority for the government in a range of infrastructure areas, including electricity generation and distribution, in selected water supply and sanitation systems, and in the highway sector. The GoP's strategy is to improve the efficiency of management of these services and to attract private sector investment to expand services.

10. 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.

11. 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.

B. PROJECT DESCRIPTION

1. Purchase of Carbon Emissions Reductions

12. 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.

13. 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.

14. 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.

15. 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.

2. Project development objective and key indicators

16. 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.

17. 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. Project components

LFG recovery and combustion

18. 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. A Site Plan showing the existing landfill configuration and facilities is presented in Annex 4.

19. The capture and combustion of methane (CH4), in an engine generator and/or an LFG flare, transforms the methane into carbon dioxide (CO2)[5] 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.

20. 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.

[5] 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 (GWPCH4) for the first crediting period is 21 tons of CO2 equivalent (tCO2e) per ton of methane (tCH4).

21. The budgetary costs for the initial LFG collection and flaring system construction are estimated to be about US$1.9 million. These costs are associated with the proposed gas collection system described in Annex 5, including: gas extraction wells, header and lateral piping, condensate management, and installation of a blower and enclosed flaring station. A more detailed outline of these costs and their associated quantities is presented in Annex 5.

22. 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. The initial cost for implementing an LFG-fueled 5.74 MW (gross) Internal Combustion engine power plant is estimated to be approximately US$5,300,000 --this cost is additional to the LFG collection and flaring system. LFG recovery projections indicate that there should be sufficient LFG to support this size power plant through 2019.

23. This potential second phase would provide additional CERs to the project and the company will evaluate its feasibility once the first phase is completed. For the purposes of this project and the quantity of CERs to be purchased, this phase is not necessary and is not presented in detail in this project analysis[6].

4. Lessons learned and reflected in the project design

24. 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.

25. 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.

[6] The pre-feasibility study for the project presents the option and its financial analysis; additional information are provided in the technical annexes.

5. Alternatives considered and reasons for rejection

26. Alternative landfill sites were considered for an LFG recovery project in Peru, while the carbon finance unit --assisted by the National Environmental Fund of Peru (FONAM)-- has identified other potential sites where such projects may be possible. Huaycoloro is owned by a private operator that has full control of the operation and has been actively seeking ways to optimize the financial and environmental performance of the landfill site. Petramas was the first landfill operator to sign a preliminary agreement with the World Bank to develop a CDM project. It is expected that a successful demonstration project would increase the likelihood that more projects of this type will be implemented in Peru.

C. IMPLEMENTATION

1. Partnership arrangements (if applicable)

27. The project sponsor is Petramas S.A., a 100% private company, registered in Peru, with core business activities in municipal solid waste management.

28. The Netherlands Clean Development Mechanism Facility (NCDMF) was established in may 2002 between the IBRD and the State of the Netherlands as a facility to purchase GHG emissions reduction (ER) credits. The Agreement, signed with the Netherlands' Ministry of Environment (VROM), supports projects in developing countries in exchange for ER credits under the CDM as established by the Kyoto Protocol. The NCDMF is managed by the World Bank as a trustee on behalf of the Government of the Netherlands.

29. NCDMF purchases high quality GHG ER which could be registered with the UNFCCC for the purposes of the Kyoto Protocol. NCDMF enters into Emissions Reduction Purchase Agreements (ERPA) with 'project sponsors', defining the quantity, price and other delivery conditions of ER to be purchased by NCDF, including the monitoring and verification protocols to enable quantification, verification and certification of ER actually achieved. To increase the likelihood that the ER will be recognized by the Parties to the UNFCCC, independent experts from the engineering and economic consulting industry and the global certification and audit industry provide baseline validation and verification/certification services for ER transactions that respond to UJNFCCC rules as they develop.

30. The NCDF has a target of placing up to 70 million Euros in projects leading to emission reductions of approximately 16 million metric tons of C02 equivalent until the end of 2012. The NCDF has entered into purchase agreements to purchase ER credits from renewable energy, energy efficiency, and fuel switching CDM project activities.

2. Institutional and implementation arrangements

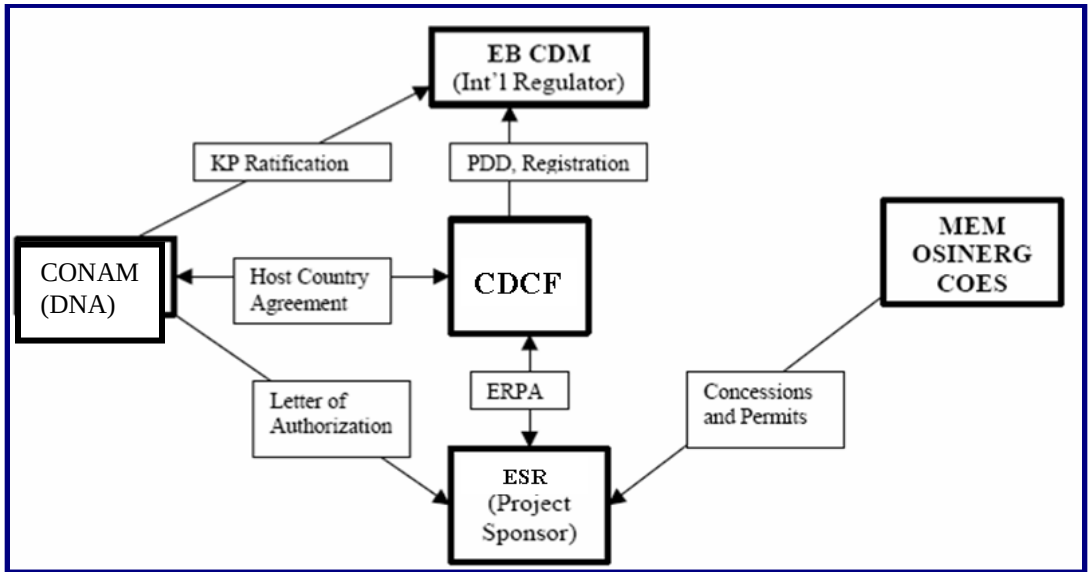
31. The project sponsor, Petramas, will be the sole developer, owner and operator of the LFG recovery and flaring operation, which will become part of the business activities of the company.

32. 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.

33. 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.

34. 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. The figure below outlines the actors and responsibilities for CDM projects in Peru.

Figure 1: Institutional Arrangements for CDM Projects in Peru



3. Monitoring and evaluation of outcomes/results

35. The project will reduce GHG emissions compared to the baseline that would occur in its absence. There are two sources that are releasing GHG that would be mitigated by the project: (i) the landfill gas to be released to the atmosphere in the Huaycoloro landfill business as usual; and, (ii) the fossil fuel-based electricity generation that supplies electricity to the national electricity system (SEIN)[7].

[7] Fossil fuel base electricity comprised 14% of total electricity supplied to the *SEIN* in 2003.

36. Taking into account national and/or sectoral policies and circumstances for the first source, ERs would not occur, because the federal legislation of solid waste management in Peru, solely given by the national law 27314 on Solid Waste (General Law of Solid Residues), does not have a specific requirement for the collection and combustion of LFG. Articles 87 and 88 of this law set minimum installation and operating conditions for landfills, respectively, and they include LFG control and LFG evacuation chimneys, but no regulatory percentage of the LFG to be controlled is given. Venting wells, without any flaring (which would not destroy any methane but avoid explosions) are not directly prohibited in any law in Peru. Furthermore, this requirement of installing venting well and gas control, is not systematically enforced in Lima; according to FONAM8, as of today, the city of Lima should be generating 5,850 metric tons daily9 out of which, 761 metric tons (13%) are thrown in clandestine dumps.

37. Taking into account national and/or sectoral policies and circumstances for the second source, ERs would not occur because of the high initial investments costs and uncertainties regarding the non-existent experience of such projects in Peru, the difficulty of obtaining long-terms Power Purchase Agreements (PPA) with creditworthy entities, and the uncertainty regarding pricing of electricity in the Peruvian system.

38. The monitoring of the emissions reductions will be carried out by an accredited Designated Operational Entity (DOE), as required by the CDM rules. The DOE is an independent entity accountable to the supervising bodies of the CDM and will be responsible for validating the project activities and verifying and certifying anthropogenic GHG emissions reductions. In addition, the DOE will be responsible for disclosing any potential conflict of interest arising from the project, as well as maintaining records for the validation, verification and certification. This would be part of the normal validation and verification process of the emissions reductions as required by the CDM project cycle[10]. Using actual recorded data for the measured flows and characterization of the LFG that is collected and flared, as well as the flaring equipment, the DOE will monitor the creation of CERs. The monitoring process essentially uses direct reading instrumentation with straight line calculations to present the emission reductions associated with the combustion of the LFG.

4. Sustainability and Replicability

39. 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.

40. 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.

[8] Source: Huaycoloro Carbon Finance Document.
[9] Huaycoloro landfill receives an average of 2,500 tons daily from the city of Lima.
[10] See also sections 6.2 -6.5 in the "Handbook for the Preparation of Landfill Gas to Energy Projects in Latin America and the Caribbean", ESMAP, January 2004,

41. 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.

5. Critical risks and possible controversial aspects

Risks	Risk Mitigation Measures	Risk Rating
Regulatory and institutional risks	Peru has been financially stable for the last years. This stability is not guaranteed in the future. While Peru has made significant progress in the privatization of the sector and the regulatory environment is well established, reversibility of policies may be an issue in the long run, both for the MSWM framework and climate change policies.	M
Sponsor inexperienced in LFG recovery and flaring	Project sponsor is employing specialized consultants for the detailed design of the project and to provide supervision during construction as well as training and advice in the initial operational period.	M
Financial Closure for LFG recovery and flaring project	The sponsor will be financing a considerable part of the investment on its balance sheet, and likely through a balance sheet loan, or a lease agreement with local banks. The project's financial rate of return indicates significant equity returns for the operation. The signing of the ERPA will consolidate the sponsor's equity commitment and will likely assist in raising the additional financing needed.	S
Resource Risks	Pre-feasibility study modeling and on-site pump tests indicate sufficient availability of LFG. The growth of MSW in the Lima area and the limited options for refuse disposal suggest that LFG will be available for the project period and beyond.	L
Overall Rating		**M**

S: Substantial; M: Moderate; L: Low

6. ERPA conditions and covenants

Effectiveness Conditions

1. Standardized ERPA, between Petramas and IBRD-NCDMF, including covenants on insurance, monitoring, verification, certification, compliance with safeguard policies, as well as payments for, and delivery of Emissions Reductions
2. Approval of ERPA by NCDMF
3. Permits and licenses required under national/local law to execute the project.
4. Issuance of a Letter of Approval from the Designated national Authority to the CDM and notification by the GoP to the Secretariat of the UNFCCC, in a manner satisfactory to the NCDMF, of the ERPA.

D. APPRAISAL SUMMARY

1. Economic and financial analyses

42. The analysis considers the following main costs and benefits: (i) investment costs for LFG recovery and flaring; (ii) operation and maintenance costs; (iii) economic value of emissions reductions.

43. Capital expenditures are based on feasibility study estimates for the equipment installed, including assembling and testing, covering the flaring equipment, gas plant, generation system, and its connection to the grid. Capital costs for the LFG recovery and combustion operation are estimated at USD 1.9 million.

44. It should be noted that both for the financial and the economic analysis of the project the economic value of CERs was assumed to be at the price proposed in the NCDMF ERPA. However, there is significant uncertainty on the actual marginal cost of CO2 emissions, with a number of scholar studies pointing at levels significantly higher. As a result the estimated economic rates of return (EIRR) are likely to be conservative.

45. Based on the above assumptions, the EIRR for the LFG recovery and combustion for the project period (to year 2012) is estimated at 64%, while for the project's lifetime (to year 2026) it is about 67%. The estimated economic Net Present Value (NPV) of the project calculated at a 10% discount rate is about USD 4.2 million during the project's lifetime. More details are presented in Annex 9, and a summary of the economic results in the table below:

Economic Results	
ERR (life time)	67%
ERR (2012)	64%
NPV (LifeTime) @ 10%	$12,779,604
NPV (2012) @ 10%	$4,248,379
NPV (LifeTime) @ 14%	$8,462,067
NPV (2012) @ 14%	$3,359,594

46. The LFG recovery and combustion project has been analyzed to estimate the financial returns of the project for the project sponsor Petramas. The project has been treated for tax purposes as a marginal cost to the operations of Petramas subject to the full corporate tax rate, and assuming a 10% depreciation rate for project investments. Using the assumptions as above, assuming an operation fully financed on equity, and taking into account the taxes to be paid by the project the project's financial internal rate of return (FIRR) is estimated at about 45% (to 2012). The project's financial NPV, for the lifetime-period of the project, at a discount rate of 18% (benchmark equity return for private investors in Peru) is about USD 4.2 million.

47. The company's financial statements for the years 2002, 2003 and 2004 have also been reviewed, as provided by the sponsor. Petramas financial figures present a company that has been growing rapidly and steadily improving its financial position for the period examined. At the end of 2004 the company had total assets of about USD 3.3 million compared to about USD

1.1 million in 2002. In the end of 2004 the company's balance sheet records a total accumulated equity of about USD 1.7 million.

48. While the company has experienced strong growth and appears to be in good financial standing, a comparison of the size of the initial investment required and the financial strength of the company indicates that Petramas could face difficulties in financing the LFG recovery project on its balance sheet. However, in discussions with the project team the sponsor has indicated that the financial returns of the project are very attractive for the company itself and would proceed with the investment. As shown in the analysis above, the project's FIRR would be attractive for commercial banks in Peru and the sponsor, as well as the project team, considers that the existence of a signed ERPA, combined with an initial equity commitment from the sponsor, would facilitate financial closure for the project. Petramas is also considering the use of leasing schemes for the equipment of the LFG recovery Facility that would likely provide additional tax benefits to the company's LFG operation.

49. In conclusion, the project's ERR indicates that the LFG operation at the present level of CER costs is highly beneficial from an economic point of view. In terms of financial returns the project is also highly profitable, and is expected that the sponsor will be able to proceed with the investment once the ERPA is in place either by using a considerable percentage of its accumulated equity, or by a combination of equity and balance sheet loan and/or a lease scheme for the equipment through a commercial bank.

2. Technical

50. The technical design of the project is based on a pre-feasibility study in which pump tests were conducted at the landfill and the recovery potential at the landfill and the expected LFG recovery rate were estimated. The tests were funded and supervised by the World Bank supported by a report for the Energy Sector Management Assistance Program (ESMAP)[11]. A first-order decay model, essentially a modified version of the EPA's LandGEM used for estimating the LFG recovery potential of landfills, was developed based on actual LFG collection/recovery data from over 150 sites across the U.S. calibrated for differences and trends in projected composition of waste in the Huaycoloro landfill.

51. The model was adapted using refuse filling history, assuming a methane content of 50%, and appropriate decay rate constants and methane generation potential assumptions. The pre-feasibility study calculated three LFG recovery scenarios: low, middle-range and high, as follows:

i. The low recovery scenario assumes that a moderate level of skill and effort is employed in the operation and maintenance of the collection system. System coverage is assumed to be 50 percent during the years that the landfill is expected to be operating (through 2040). The low recovery estimates are deemed to be conservative and should be employed only if a large margin of safety is needed.

[11] Handbook for the Preparation of Landfill Gas to Energy Projects in Latin America and the Caribbean – ESMAP, January 2004

ii. The mid-range recovery scenario assumes that a moderately high level of skill and effort is employed in the operation and maintenance of the collection system. System coverage is assumed to be 75 percent during the years that the landfill is expected to be operating (through 2040). The mid-range recovery scenario presents the best estimates of likely recovery.

iii. The high recovery scenario assumes that highest possible level of skill and effort is employed in the operation and maintenance of the collection system. System coverage is assumed to be 95 percent during the years that the landfill is expected to be operating (through 2040). The high recovery is ambitious and attainable only if the maintenance of an optimal LFG recovery system is considered to be a top priority.

The following table presents the results for the middle-range scenario

Year	Potential LFG Recovery Rate (m^3/hr)	Estimated System Coverage (%)	Projected Actual LFG Recovery Rate (m^3/hr)
2006	4,887	75%	3,665
2007	5,302	75%	3,976
2008	5,695	75%	4,272
2009	6,070	75%	4,553
2010	6,429	75%	4,821
2011	6,772	75%	5,079
2012	7,102	75%	5,326
2013	7,419	75%	5,565
2014	7,727	75%	5,795
2015	8,025	75%	6,018
2016	8,314	75%	6,236
2017	8,597	75%	6,448
2018	8,873	75%	6,655
2019	9,143	75%	6,858

52. The technical designs for the recovery operation include: (i) approximately 135 extraction wells each one of which will be fitted with a wellhead with a flow control valve and gas monitoring ports; (ii) installation of approximately 9,700 meters of piping to connect the extraction wells with the flare station and LFG control plant; (iii) installation of a condensate management system; and (iv) installation of a blower and flaring station. Detailed technical designs for the operation have been commissioned by the project sponsor and the study is now mostly completed.

53. The technical approach for the LFG operation is proven, and with appropriate supervision during construction the project should not present major difficulties during construction. During

operation the sponsor will have to apply best practices to optimize LFG collection while maintaining the quality of the operations of the overall landfill. For the initial operation period Petramas will be employing specialized consultants to provide training to its staff on the LFG recovery and combustion. The financial incentives to create the CERs would ensure that the sponsor will make every reasonable effort to optimize the LFG operation and return to more specialized technical assistance as needed during the project's operational period.

3. Fiduciary

54. **Payment and Flow of Funds**: At the time of the signing of each ERPA, an anticipated schedule of payments based on the delivery of ERs will be prepared. The project sponsor(s) shall make requests for payment to the World Bank Carbon Funds under the ERPA. The first payment from the Carbon Funds to each eligible renewable energy project will be agreed to in the ERPA and will occur upon declaration by the Carbon Funds that relevant conditions have been met. Thereafter, the Carbon Funds will only pay each eligible project upon successful transfer of ERs. The involvement of the World Bank Carbon Finance Business will expire after ERs up to the total contract amount of tCO2e have been delivered. In the event that the project sponsor fails to deliver the quantity of ERs for any given calendar year as set forth in the ERPA, the project sponsor will be required to make-up the shortfall over the course of the following calendar year or as other period agreed with CDCF. Apart from the CFB's support, the project does not include any World Bank or IFC financing. Payments are made directly to the sponsor's bank account from CDCF. The procedures are monitored and authorized by the World Bank's Trust Fund Unit under OPCS's supervision.

4. Social

55. 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.

5. Environment

56. 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. 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.

57. The project only triggers *O.P. 4.01* (Environmental Assessment). No other policies are triggered by this project.

58. 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. The relevant sections of the EMP and monitoring plan are included in Appendix B.

Public disclosure

59. 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.

Key Safeguards issues

6. Safeguard policies

Safeguard Policies Triggered by the Project	Yes	No
Environmental Assessment (OP/BP/GP 4.01)	[X]	[ ]
Natural Habitats (OP/BP 4.04)	[ ]	[X]
Pest Management (OP 4.09)	[ ]	[X]
Cultural Property (OPN 11.03, being revised as OP 4.11)	[ ]	[X]
Involuntary Resettlement (OP/BP 4.12)	[ ]	[X]
Indigenous Peoples (OD 4.20, being revised as OP 4.10)	[ ]	[X]
Forests (OP/BP 4.36)	[ ]	[X]
Safety of Dams (OP/BP 4.37)	[ ]	[X]
Projects in Disputed Areas (OP/BP/GP 7.60)*	[ ]	[X]
Projects on International Waterways (OP/BP/GP 7.50)	[ ]	[X]

7. Policy Exceptions and Readiness

No policy exceptions are anticipated for the proposed project.

* *By supporting the proposed project, the Bank does not intend to prejudice the final determination of the parties' claims on the disputed areas*

Annex 1: Country and Sector Background

PERU: Huaycoloro Landfill Gas Recovery

Country Background:

Peru has had four years of sustained economic growth with an average growth of four percent. The economic program of the present administration has focused on maintaining macroeconomic stability, with the goal of supporting a sustained recovery in economic activity and employment in a context of low inflation and limited external vulnerability.

The government strategy to reduce poverty is organized around three central objectives, which form the framework for the CAS: (i) competitiveness and employment generation; (ii) equity and social justice, including access to health, education, culture and basic services; and (iii) institutionality, creating an efficient, transparent and decentralized state. Key to these objectives is the presence of an economic program and institutions ready to buffer the impact of shocks, and thus ensure that poverty reduction gains are not lost, while addressing structural sources of poverty. In light of the high dollar indebtedness of the economy, government is working to strengthen fiscal balances through controls on expenditures, improved debt management, and increased tax collections, as well as initiating a national competitiveness program for addressing barriers to private sector growth and increasing exports. However, a lack of government resources and the GOP's fiscal austerity measures present challenges in achieving these goals.

Municipal Solid Waste Management Background:

Peru has mostly inadequate solid waste disposal sites around the country. Notwithstanding the redefinition of the legal framework for municipal solid waste management in Peru,[12] and in metropolitan Lima,[13] progress implementing the *Sistema Metropolitano de Gestión de los Residuos Sólidos* (Metropolitan System of Solid Waste Management) has been slow, and in many areas non-existent.

In 2002, about 2.35 million of Lima's population (35%), most of who live in the marginal settlements of the poorest district municipalities (MDs), did not have regular refuse collection services.[14] In the settlements that lack this basic environmental service, garbage piles up around homes and in the streets, or are burned in the open, and vermin and disease vectors proliferate. Open dumping is the most common solid waste disposal method in many urban areas of Peru. However, open dumping contributes to serious health and safety problems in affected communities, has a negative impact on property values and has been linked to the contamination of aquifers and surface waters. 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 and maintained.

[12] *Ley No. 27314 Ley General de Residuos Sólidos*, 2 July 2000.
[13] *Ordenanza No. 295* creating the *Sistema de Gestión de los Residuos Sólidos en Lima Metropolitana*, 27 Oct 2000. The corresponding *Reglamento* was promulgated by *Decreto de Alcaldía No. 147*, 6 Jan 2002 and subsequently modified by *Decreto de Alcaldía No. 093*, 2 Mar 2003.
[14] MML/DMSC, *Plan de Emergencia Ambiental, para el Manejo de los Residuos Sólidos, a Nivel Provincial*, Lima, 31 Jan 2002.

The challenges of municipal solid waste management are growing in Peru due to: (i) population growth and the high rate of rural migration to urban settings; (ii) changes in consumption patterns associated with economic growth in urban centers.

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. Up 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. Furthermore, 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.[15] This 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.

At the moment there are two main landfills operating under private management and serving the district municipalities of Lima. One of them is Huaycoloro –where this project is expected to take place. The second main landfill –Portillo Grande—is owned by the central MD of Lima and operated under a concession agreement by a private company. This landfill has also good potential for a LFG project as it receives 1700 tons of municipal waste daily and has an accumulated capacity of about 4.2 million tons of waste and could continue operations for another 30 years. FONAM has also identified the MSWM operations in the landfill of Cuzco as another urban area where LFG projects would be feasible, mainly due to the high organic content of the solid waste. Other cities which due to their population and increasing activities could use LFG projects to improve the management of MSW are: Arequipa, Trujillo, Lambayeque, Iquitos, Pucalpa and Chimbote. The actual potential in each of these places varies and the introduction of LFG operations in some of these cities will likely have to include the development either of new concession agreements for MSWM, or the improvement of environmental and operational performance of the actual facilities.

Nevertheless, as indicated by the Huaycoloro project, the potential for an additional income stream implementing CDM projects under the Kyoto Protocol is very good and could provide an important incremental incentive to improve MSWM operations. The World Bank has been coordinating with FONAM, which has been active in promoting CDM activities in Peru, to identify further opportunities and enter in preliminary agreements with various municipalities to develop and promote the concept of LFG operations and MSW. The lack of a concrete example in the country however is creating an information and perception barrier, which the Huaycoloro project is seeking to address.

[15] Article 46 of Ley No. 27314 requires the establishment of a municipal *cuenta especial intangible*.

Annex 2: Major Related Projects Financed by the Bank and/or other Agencies

PERU: Huaycoloro Landfill Gas Recovery

Project Name	ID	Product Line	Country	Status	Approved
Methane Gas Capture and Use at a Landfill - Demonstration Project	P063463	Global Environment Facility – Grant	Mexico	Active (Highly Satisfactory)	15-May-2001
Olavarria Methane Capture Project	P088934	Carbon Offset	Argentina	Active	07-Dec-2004
Nova Gerar Landfill Rio de Janeiro	P079182	Carbon Offset	Brazil	Lending	04-Nov-2005
Waste Management and Carbon Offset Project	P088546	Carbon Offset	Mexico	Lending	18-Mar-2005
Poechos Hydropower	P081954	Carbon Offset	Peru	Lending	03-Dec -2004
Santa Rosa Hydro	P092834	Carbon Offset	Peru	Lending	11-May-2005
Liepaja Solid Waste Management	P058477	Carbon Offset	Latvia	Lending	19-Dec-2000

Annex 3: Results Framework and Monitoring

PERU: Huaycoloro Landfill Gas Recovery

Results Framework

PDO	Project Outcome Indicators	Use of Project Outcome Information
The project aims to promote private sector investment in the collection and use of landfill gas to reduce greenhouse gases and create Certified Emissions Reductions (CERs) that can create significant additional income for well-managed municipal solid waste operations.	Creation of CERs through the collection and burning of methane	Emissions Reductions Purchase Agreement payments

Arrangements for results monitoring

		Target Values					Data Collection and Reporting		
Project Outcome Indicators	Baseline	YR1	YR2	YR3	YR4	YR5	Frequency and Reports	Data Collection Instruments	Responsibility for Data Collection
CERs (tCO2e) created	0	160,000	183,000	204,000	225,000	246,000	Semi-annual	Designated Operational Entity Reports	Designated Operational Entity

Annex 4: Detailed Project Description

PERU: Huaycoloro Landfill Gas Recovery

The project would generally consist of the installation of a landfill gas collection system to extract and collect LFG and flare it. The revenues for the project would come from the sale of Certified Emissions Reductions (CER) of greenhouse gases. The CERs are created by the combustion of methane, which makes up approximately 50 percent of LFG. Methane has a global warming potential about 21 times that of carbon dioxide (CO_2).

A pumping test was conducted in the Huaycoloro landfill during the pre-feasibility study period. This investigation has provided additional information regarding the available LFG volume and quality at the landfill, along with other physical information such as buried waste characteristics and leachate levels within the waste mass.

The following is a summary of the relevant project information:

- The Landfill opened in 1994 and is anticipated to remain open until about 2040, with a total capacity of approximately 40 million metric tons (tonnes) of municipal solid waste (MSW).

- The Landfill is currently filling at a rate of approximately 2,200 tonnes per day, and presently has about 5.5 million tonnes of waste in place.

- The site comprises a total of about 1,575 hectares (ha), of which about 240 ha are planned for landfilling.

- The Landfill is not lined; groundwater is located approximately 120 meters below the ground surface. Upon completion, maximum waste thickness is anticipated to be about 20 meters.

- The Landfill does not have an existing active landfill gas collection and control system, but does have a series of existing passive vents.

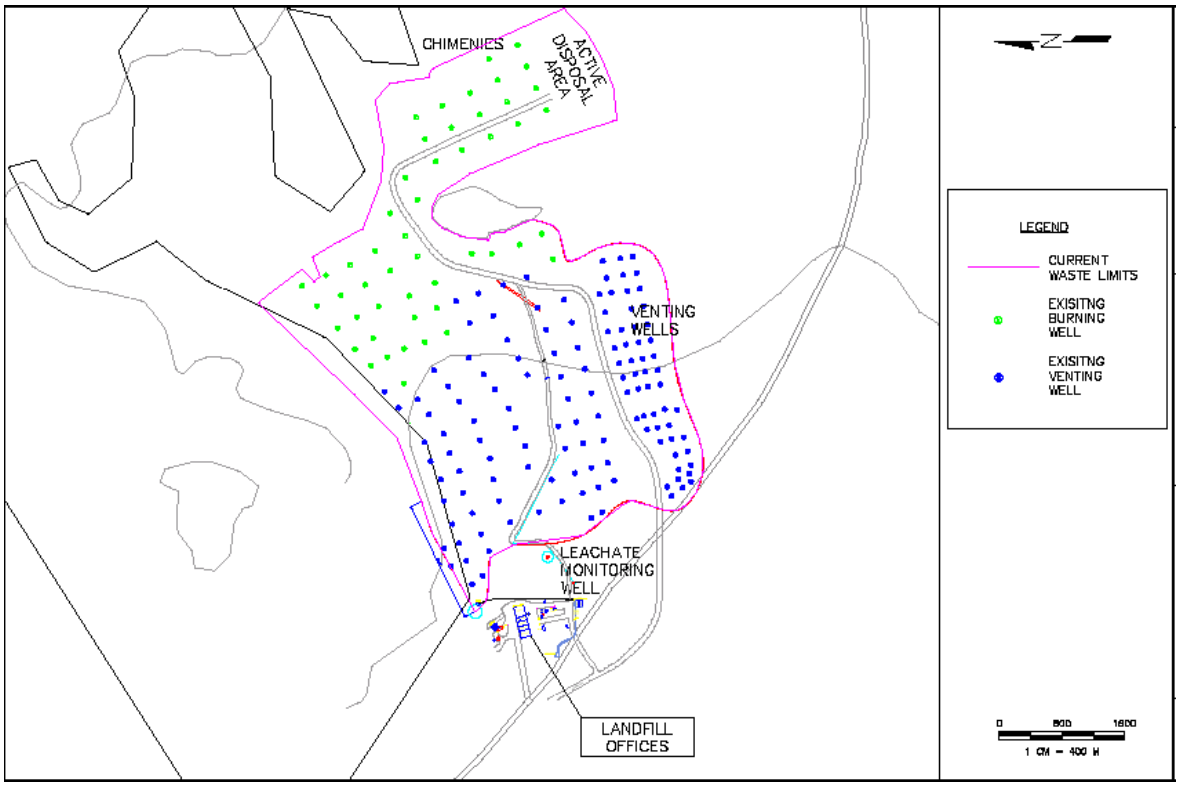
- There are several uncertainties regarding the potential impact Federal and Local legislation might have regarding developing a project per the CDM. The National Law 27.314 sets minimum installation and operating conditions for landfills, including landfill gas control. However, this legislation does not set specific requirements for the collection and combustion of LFG. Municipal Ordinance 295 of Lima includes specifications for the collection of landfill gas in wells and the treatment of collected landfill gas. However, this legislation does not explicitly state that LFG must be collected and treated.

- Gas Recovery Projections:

– Projected gas recovery in 2006 is estimated to be approximately 3,665 m3/hr. The recovery rate is expected to increase steadily to approximately 5,300 m3/hr in 2012, and to approximately 6,800 m3/hr in 2019. Gas recovery is expected to increase thereafter as well, until landfill closure in 2040.

- Baseline:
  - There are several uncertainties regarding the potential impact of Federal and Local legislation might have regarding developing a project per the CDM. The National Law 27.314 sets minimum installation and operating conditions for landfills, including landfill gas control. However, this legislation does not set specific requirements for the collection and combustion of LFG. Municipal Ordinance 295 of Lima includes specifications for the collection of landfill gas in wells and the treatment of collected landfill gas. However, this legislation also does not explicitly state that LFG must be collected and treated.
  - The Landfill has existing passive flares, and additional vents that will be converted to flares as the landfill reaches final grade. The passive flares are manually ignited, do not continually burn, and have to be relit several times a day due to unstable flame conditions and normally windy conditions. Based on the existing practice of capture and flaring of LFG in a limited manner, the baseline for the Huaycoloro Landfill is about 3.3% of the potential gas recovery.

– **Figure 4-1: The Project Site.**



Source: SCS Engineers, 2005, project pre-feasibility study

LFG Modeling results

For the pre-feasibility of the project study pump tests were conducted at the landfill and the LFG recovery potential at the landfill and the expected LFG recovery rates were estimated . The study estimates that the LFG recovery potential for the landfill in 2005 is 4,449 m3/hr (2,619 cfm), and will increase to 9,143 m3/hr (5,382 cfm) in 2019 during the evaluation period as filling progresses. Under the mid-range scenario, actual LFG recovery is projected to be 2,224 m3/hr (1,309 cfm) in 2005, increasing to 5,326 m3/hr (3,135 cfm) in 2012, and reaching a maximum rate during the project period of 6,858 m3/hr (4,036 cfm) in 2019.

Assuming that 100 percent of the amount of LFG recovered is available for use for electrical generation (i.e., not accounting for available engine capacities or parasitic loads), a 6.1 MW power plant could be supported from 2006 through 2019, and a 8.0 MW plant could be supported from 2011 through 2019. Table 4-1 presents a summary of the projected potential LFG recovery rates, actual LFG recovery rates under the mid-range scenario, and corresponding power plant sizes for the evaluation period.

TABLE 4-1. SUMMARY OF LFG MODELING RESULTS – MID-RANGE RECOVERY SCENARIO

Year	Potential LFG Recovery Rate (m^3/hr)	Estimated System Coverage (%)	Projected Actual LFG Recovery Rate (m^3/hr)	Projected Project Capacity (MW)
2006	4,887	75%	3,665	6.1
2007	5,302	75%	3,976	6.6
2008	5,695	75%	4,272	7.1
2009	6,070	75%	4,553	7.5
2010	6,429	75%	4,821	8.0
2011	6,772	75%	5,079	8.4
2012	7,102	75%	5,326	8.8
2013	7,419	75%	5,565	9.2
2014	7,727	75%	5,795	9.6
2015	8,025	75%	6,018	10.0
2016	8,314	75%	6,236	10.3
2017	8,597	75%	6,448	10.7
2018	8,873	75%	6,655	11.0
2019	9,143	75%	6,858	11.3

Landfill Gas Collection and Control System Design

The landfill does not currently have an active landfill gas collection system. The existing venting wells are not constructed in a manner conducive to an active system. Modifications to the vents may be attempted to seal them from air intrusion when a vacuum is applied. The success of such modifications is unknown. Therefore, for the cost analysis, an active LFG collection system including new wells was assumed to be installed.

The pre-feasibility study includes the following general recommendations for the LFG collection system:

- Installation of approximately 135 vertical extraction wells. In general, extraction wells should only be installed in areas at final or intermediate grade and to which the piping connection will have a minimal impact on current filling operations. It is assumed that extraction wells will be raised as waste filling progresses, as opposed to re-drilling wells once final grade has been reached. Once available, operational data can be used to evaluate the well spacing by assessing flow rates from individual wells and the range of vacuum influence exerted by the wells.

  As a general industry guideline, extraction wells normally have a "radius of influence (ROI)" approximately equal to between 1.25 and 2.5 times its depth, depending on the ratio of blank to slotted pipe length, refuse permeability, and other factors. To minimize gaps in collection system coverage, some degree of overlap in wells' ROIs is required, resulting in a well spacing of between 2 and 4 times well depth.

  The pump test data indicated that the ROI of the extraction wells at the Montevideo Landfill is approximately 40 meters, or approximately 2.7 times well depth.

- Installation of approximately 9,700 meters of HDPE piping to connect the extraction wells with the flare station and LFG control plant. This piping includes main gas header piping designed to accommodate greater gas flow rates, and smaller lateral gas piping designed to connect the main header piping to the extraction wells.

  For budgetary purposes, it is assumed that the header piping will be 350 mm in diameter, and the lateral piping will be 110 mm in diameter.

  Installation of a condensate management system. Condensate, which forms in the LFG piping network as the warm gas cools, can cause significant operational problems if not managed properly. The LFG collection system must be designed to accommodate the formation of condensate. This will be accomplished through a series of self-draining condensate traps located within the waste footprint. A total of 5 self-draining condensate traps and 2 condensate manholes with pumps will be required.

- Installation of a blower and flaring station. It is anticipated that a significant fraction of LFG will be combusted in a control device. The flaring system will be an enclosed-type flare so that exhaust components can be tested and quantified for CER registration (exhaust testing is not possible on candlestick-type open flares).

For budgetary purposes, it is assumed that the initial system construction would include installing approximately 7,000 m3/hour (4,000 cfm) of gas flaring capacity and blower equipment. This capacity is sufficient to approximately handle the maximum projected LFG recovery rate under the mid-range (no expansion) scenario through 2019.

Collection System Expansion and Maintenance

In order to maintain a high level of efficiency for the LFG collection system, and thus maximize LFG recovery rates and CERs, it will be necessary to expand the collection system, and to implement a regular program of operation and maintenance of the gas collection system equipment. As noted previously, it is expected that disposal operations will be expanded into new landfill cells in the future. It is assumed that future wellfield expansions to collect LFG from new disposal areas will require approximately 5 new wells each year of operation.

Following system start-up, operational data should be reviewed with respect to the system design criteria, and adjustments made during future system expansions as appropriate. Adjustments to the wellfield layout that are indicated by operating data may include the following:

- Wells that are unproductive or are damaged will need to be repaired or replaced.
- Areas of the landfill where monitoring data indicate a surplus of LFG may yield higher recovery rates if additional wells are installed.
- Ongoing monitoring of leachate levels in wells will indicate whether or not additional leachate pumps are required.

Figure 4-2 Plan view of the conceptual gas collection system.

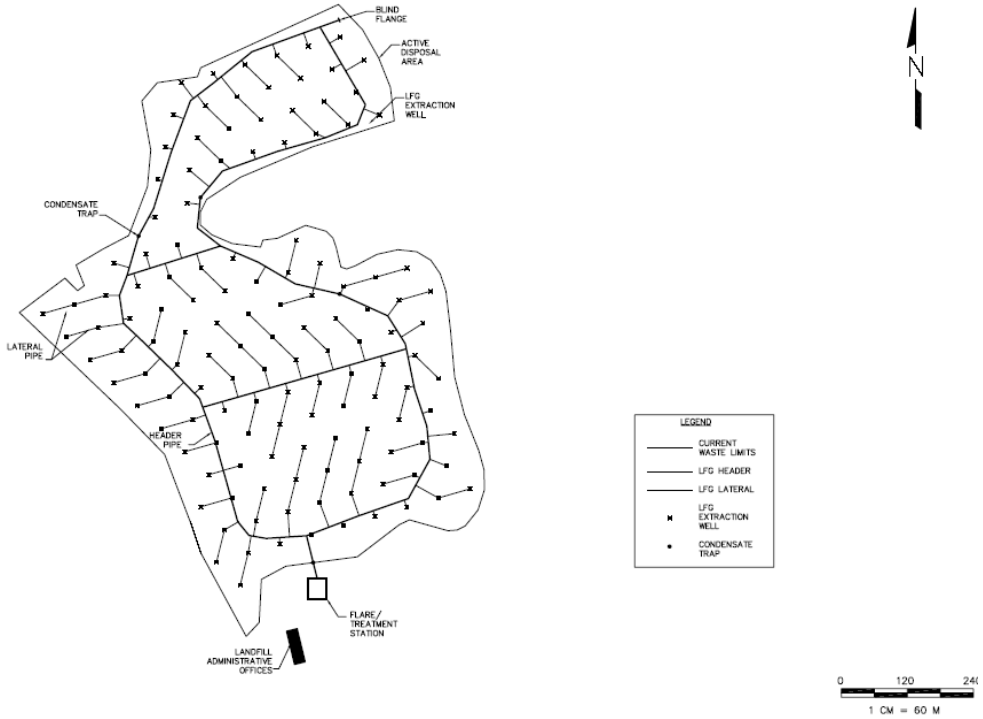
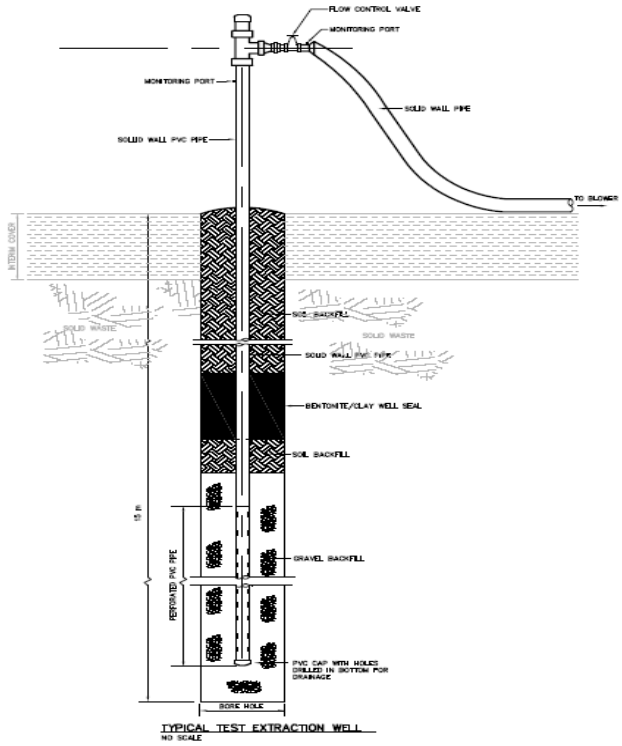


Figure 4-3 Typical Test Extraction Well



Baseline Estimate

The project is estimated to reduce 1,990,328 tCO_2e for the duration of the initial 7-year crediting period; 7,976,845 tCO2e over the 21-year crediting period.

To calculate the project total GHG emission reductions (ERs) two baseline methodologies will be used: The approved consolidated baseline methodology for landfill gas project activities ACM0001, to compute ERs achieved from the methane destroyed by the project and the simplified baseline methodology for selected small scale CDM project activities AMS-ID, to compute ERs achieved from CO2 displacement by the project, when it provides renewable electricity to the national interconnected electric grid.

ACM0001 is applicable to the project because the baseline is the partial or total atmospheric release of the gas and the project falls into situation (c) of the approved consolidated baseline methodology ACM0001; which refers to LFG captured and used to produce energy. The methodology states that in situation (c), ERs can be claimed for displacing or avoiding energy generation from other sources and that an approved baseline methodology for electricity displacement shall be used. ACM0001 adds that if the installed capacity of the electricity generated is less than 15 MW, small-scale methodologies can be used. For the project the applicable small scale methodology was AMS-ID; as the installed electricity generating capacity will be 5.74 MW.

AMS-ID is applicable to the project because it is a power plant of less than 15 MW of installed capacity that will supply renewable electricity to a grid that is supplied by at least one fossil fuel generation unit, such grid will be the *SEIN*[16]. The chosen baseline calculation for the CO2 displacement following AMS-ID was the average of the "approximate operating margin" and the "build margin", the baseline calculation chosen was deemed to be superior on its compliance with the Marrakech Accords ("MA")'s baseline definition[17], than the weighted average emissions of the current generation mix for two reasons: a) The project is more likely to mitigate fossil fuel-based electricity generation than hydro electricity generation given the *SEIN* dispatch characteristics[18]; this operational fact of the *SEIN*, would have been completely ignored if the weighted average emissions (in KgCO2/KWh) of the current generation mix had been considered the project's baseline but it is taken into account (with a weight of 50%) in the baseline chosen as the approximate operating margin excludes hydro sources[19]; b) The build margin is a more dynamic component for the baseline than the weighted average emissions (in KgCO2/KWh) of the current generation mix, since the build margin covers a larger period of time[20] and at the same time both are similar in the fact of both being weighted average emissions (in KgCO2/KWh) of a generation mix that do not excludes any type of electricity generation technology. In summary, it was deemed that this 50%-50% combination of both margins (approximate operating margin and build margin) explained better what would happen in the

[16] Fossil fuel based electricity supplied to the *SEIN* in 2003 was 14% out of *SEIN's* total.
[17] The definition for baseline of the Marrakech Accords ("MA"), is: "The baseline for a CDM project activity is the scenario that reasonably represents the anthropogenic emissions by sources of greenhouse gases that would occur in the absence of the proposed project activity".
[18] Which assigns less dispatch merit order to fossil fuel-based generation than to hydropower plant generation (the project's technology).
[19] Geothermal, wind, low-cost biomass, nuclear and solar generation are inexistent in the *SEIN*.
[20] The latest capacity addition's generation in the *SEIN* up to 20% of the *SEIN* generation takes new units added even from 1997

absence of the project activity than the weighted average emissions (in KgCO2/KWh) of the current generation mix.

The Huaycoloro Landfill has existing passive flares and additional vents that will be converted to flares as the landfill reaches final grade. The passive flares are manually ignited and have to be relit several times a day due to unstable flame conditions and normally windy conditions. No flow measurement data for the passive flares is available.

The pump test conducted for the pre-feasibility used three extraction wells consisting of a 30 cm diameter boring with stone backfill and perforated piping to extract the gas. The passive flares have stone backfill with no piping, but are constructed with a chimney made of steel. Under passive conditions, the flow rate in the three extraction wells was an average of 4 cfm (6.8 m^3/hr) per well. Under active extraction conditions at steady state, the average flow was approximately 60 cfm per well. Therefore, the ratio of passive to active conditions is 4/60 or 6.67%.

In order to quantify the baseline, additional consideration was made to adjust for the fact that the passive flares are not continuously burning. For example, during the night no attempt is made to relight flares that have extinguished. Moreover, during the life of the landfill (which is expected to be until 2040) there will be some fraction of the vents that are not converted to flares. In other words, the passive vents generally are not converted to passive flares until final grade is attained.

Conversely, the proposed gas collection system will employ active extraction wells in areas of the landfill at both final and interim grade. The pre-feasibility report estimates the combined impact of these two factors to reduce the baseline by one half. Therefore, the recommended baseline for Huaycoloro Landfill is 3.3% of the potential gas recovery.

Annex 5: Project Costs

PERU: Huaycoloro Landfill Gas Recovery

Budgetary Costs for Initial LFG Collection and Control System

Table 1: Estimated Project Cost	
Item	Total Estimated Cost (U.S. $)
Mobilization and project management	$23,500
Vertical extraction wells and wellheads	$635,000
Main gas header collection piping (assume about 3,500 meters of 350 mm diameter)	$252,000
Lateral piping (assume about 5,100 m of 110 mm diameter)	$133,000
Condensate management	$79,000
Blower and flaring equipment (enclosed flare)(1)	$446,000
Engineering/Contingency, and Up-Front (Pre-Operational) CDM Costs(2)	$140,000
Taxes	$113,900
Administrative Costs	$75,900
Total Estimated Cost	$1,898,300

NOTES:

(1) Blower and flaring equipment includes: blower and flare, construction and site work, LFG measurement and recording equipment, flare start-up costs, and emissions testing.

(2) Pre-operational CDM costs include: preparation of PDD, registration, validation, and legal fees.

Annex 6: Implementation Arrangements

PERU: Huaycoloro Landfill Gas Recovery

Institutional and Implementation Project Arrangements

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 project sponsor is Petramas S.A., a 100% private company, registered in Peru, with core business activities in municipal solid waste management.

The Netherlands Clean Development Mechanism Facility (NCDMF) was established in may 2002 between the IBRD and the State of the Netherlands as a facility to purchase GHG ER credits. The Agreement, signed with the Netherlands' Ministry of Environment (VROM), supports projects in developing countries in exchange for ER credits under the CDM as established by the Kyoto Protocol. The NCDMF is managed by the World Bank as a trustee on behalf of the Government of the Netherlands.

NCDMF purchases high quality GHG ER which could be registered with the UNFCCC for the purposes of the Kyoto Protocol. NCDMF enters into Emissions Reduction Purchase Agreements (ERPA) with 'project sponsors', defining the quantity, price and other delivery conditions of ER to be purchased by NCDF, including the monitoring and verification protocols to enable quantification, verification and certification of ER actually achieved. To increase the likelihood that the ER will be recognized by the Parties to the UNFCCC, independent experts from the engineering and economic consulting industry and the global certification and audit industry provide baseline validation and verification/certification services for ER transactions that respond to UJNFCCC rules as they develop.

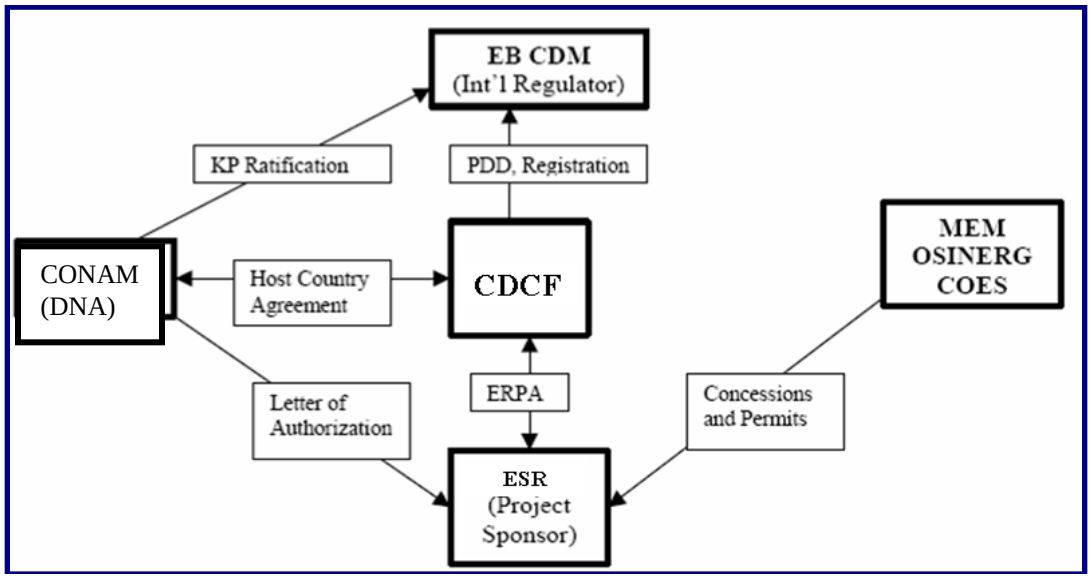
The NCDF has a target of placing up to 70 million Euros in projects leading to emission reductions of approximately 16 million metric tons of C02 equivalent until the end of 2012. The NCDF has entered into purchase agreements to purchase ER credits from renewable energy, energy efficiency, and fuel switching CDM project activities.

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 (MEM, OSINERG, COES) as described in Annex 16.

General Institutional Arrangements for CF Projects



The monitoring of the emissions reductions will be carried out by an accredited Designated Operational Entity (DOE), as required by the CDM rules. The DOE is an independent entity accountable to the supervising bodies of the CDM and will be responsible for validating the project activities and verifying and certifying anthropogenic GHG emissions reductions. In addition, the DOE will be responsible for disclosing any potential conflict of interest arising from the project, as well as maintaining records for the validation, verification and certification. This would be part of the normal validation and verification process of the emissions reductions as required by the CDM project cycle[21]. Using actual recorded data for the measured flows and characterization of the LFG that is collected and flared, as well as the flaring equipment, the DOE will monitor the creation of CERs. The monitoring process essentially uses direct reading instrumentation with straight line calculations to present the emission reductions associated with the combustion of the LFG.

[21] See also sections 6.2 -6.5 in the "Handbook for the Preparation of Landfill Gas to Energy Projects in Latin America and the Caribbean", ESMAP, January 2004,

Annex 7: Financial Management and Disbursement Arrangements

PERU: Huaycoloro Landfill Gas Recovery

[This annex is not required for CF projects as they do not follow procurement and disbursement guidelines required under World Bank lending operations]

Annex 8: Procurement Arrangements

PERU: Huaycoloro Landfill Gas Recovery

[This annex is not required for CF projects as they do not follow procurement and disbursement guidelines required for World Bank lending operations]

Annex 9: Economic and Financial Analysis

PERU: Huaycoloro Landfill Gas Recovery

The analysis considers the following main costs and benefits: (i) investment costs for LFG recovery and flaring; (ii) operation and maintenance costs; (iii) economic value of emissions reductions.

Capital expenditures are based on feasibility study estimates for the equipment installed, including assembling and testing, covering the flaring equipment, gas plant, generation system, and its connection to the grid. Capital costs for the LFG recovery and combustion operation are assumed to be about USD 1.9 million.

It should be noted that both for the financial and the economic analysis of the project the economic value of CERs was assumed to be at the price proposed in the NCDMF ERPA. However, there is significant uncertainty on the actual marginal cost of CO2 emissions, with a number of scholar studies pointing at significantly higher levels. As a result, the estimated economic rates of return (EIRR) are likely to be conservative.

The LFG recovery and combustion project has been analyzed to estimate the financial returns of the project for the project sponsor Petramas. The project has been treated for tax purposes as a marginal cost to the operations of Petramas subject to the full corporate tax rate, and assuming a 10% depreciation rate for project investments. Using the assumptions as above, assuming an operation fully financed on equity, and taking into account the taxes to be paid by the project the project's financial internal rate of return (FIRR) is estimated at about 45% (to 2012). The project's financial NPV, for the period of the project, at a discount rate of 18% (benchmark equity return for private investors in Peru) is about USD 4.2 million.

Based on the above assumptions, the EIRR for the LFG recovery and combustion for the project period (to year 2012) is estimated at 64%, while for the project's lifetime (to year 2026) it is about 67%. The estimated economic Net Present Value (NPV) of the project calculated at a 10% discount rate is about USD 4.2 million during the project's lifetime.

The tables below present: (i) the key base-case assumptions of the analysis (table 9-1); and (ii) the spreadsheet analysis for the base case scenario (table 9-2).

Table 9-1: Key Assumptions for Economic and Financial Analysis

Certified Emissions Reduction	
Transaction Costs of CERs (Initial)	150,000
Anual Transaction Costs CERs	15,000
Price CER's (USD)	6.6
Price CER's (Euros)	5.5
Participation fee to Executive Board	2%
Exchange Rate 1 Euro = (USD)	1.2

Year	Emission reduction TCO_2/year
1	160,447
2	182,498
3	204,112
4	225,299
5	246,065
6	266,421
7	286,373
8	305,931
9	325,101
10	343,891
11	362,310
12	380,364
13	398,060
14	415,406
15	432,408
16	449,074
17	465,410
18	481,422
19	497,117
20	512,501
21	527,581
Total	**7,467,791**

INVESTMENTS	
Engineer and Investment for system to recovery	1,898,397
Year Investments for sytem to recovery	30,000

Financial Assumptions for cahs flow	
% of the investment povided by Petramas	100.0%
% of the investment povided by loan	0.0%
Loan interes rate	10.0%
Discount rate (cost of oportunity for the investors)	10.0%
Taxes	30%

Expenses	
Technical assistance	25,000
Operation and maintenance	30,000

Table 9-2: Financial Analysis

FINANCIAL EVALUATION
Landfill Gas Recovery project
Project Developer PETRAMAS

Cash Flow (dólares)

Years	0	1	2	3	4	5	6	7
	2005	2006	2007	2008	2009	2010	2011	2012
Income	**0**	**1,058,951**	**1,204,487**	**1,347,141**	**1,486,970**	**1,624,031**	**1,758,378**	**1,890,064**
1. Income CER's		1,058,951	1,204,487	1,347,141	1,486,970	1,624,031	1,758,378	1,890,064
Expenses	**0**	**-434,019**	**-289,929**	**-295,783**	**-301,579**	**-282,320**	**-288,007**	**-293,641**
1, Participation fee to Executive Board	0	21,179	24,090	26,943	29,739	32,481	35,168	37,801
2, Transaction Costs of CERs (Initial)		150,000						
3, Anual Transaction Costs CERs		15,000	15,000	15,000	15,000	15,000	15,000	15,000
4, Technical Assistance		25,000	25,000	25,000	25,000			
5, Operation and maintenance		30,000	30,000	30,000	30,000	30,000	30,000	30,000
6, Depreciation	0	192,840	195,840	198,840	201,840	204,840	207,840	210,840
Earning before interest and taxes	**0**	**624,932**	**914,557**	**1,051,358**	**1,185,391**	**1,341,711**	**1,470,370**	**1,596,423**
7. Taxes	0	187,480	274,367	315,407	355,617	402,513	441,111	478,927
Net income	**0**	**437,452**	**640,190**	**735,951**	**829,774**	**939,197**	**1,029,259**	**1,117,496**

Cash Flow								
Net income	0	437,452	640,190	735,951	829,774	939,197	1,029,259	1,117,496
(+) Depreciation	0	192,840	195,840	198,840	201,840	204,840	207,840	210,840
Cash flow Operative	**0**	**630,292**	**836,030**	**934,791**	**1,031,614**	**1,144,037**	**1,237,099**	**1,328,336**
Investments	-1,898,397	-30,000	-30,000	-30,000	-30,000	-30,000	-30,000	-30,000

Cash Flow	-1,898,397	600,292	806,030	904,791	1,001,614	1,114,037	1,207,099	1,298,336
Present Value of Cash flows	-1,898,397	545,720	666,140	679,783	684,116	691,729	681,376	666,252

TIR al 2012	45.60%
TIR al 2026	46.45%
Net Present Value	9,357,219

8	9	10	11	12	13	14	15	16	17	18	19	20	21
2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
2,019,143	**2,145,666**	**2,269,683**	**2,391,245**	**2,510,400**	**2,627,195**	**2,741,678**	**2,853,894**	**2,963,888**	**3,071,703**	**3,177,384**	**3,280,972**	**3,382,509**	**3,482,036**
2,019,143	2,145,666	2,269,683	2,391,245	2,510,400	2,627,195	2,741,678	2,853,894	2,963,888	3,071,703	3,177,384	3,280,972	3,382,509	3,482,036
-299,223	**-304,753**	**-310,233**	**-122,825**	**-125,208**	**-127,544**	**-129,834**	**-132,078**	**-134,278**	**-136,434**	**-138,548**	**-140,619**	**-142,650**	**-144,641**
40,383	42,913	45,394	47,825	50,208	52,544	54,834	57,078	59,278	61,434	63,548	65,619	67,650	69,641
15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000
30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000
213,840	216,840	219,840	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000
1,719,920	**1,840,913**	**1,959,450**	**2,268,420**	**2,385,192**	**2,499,652**	**2,611,845**	**2,721,816**	**2,829,610**	**2,935,269**	**3,038,837**	**3,140,353**	**3,239,859**	**3,337,395**
515,976	552,274	587,835	680,526	715,558	749,895	783,553	816,545	848,883	880,581	911,651	942,106	971,958	1,001,219
1,203,944	**1,288,639**	**1,371,615**	**1,587,894**	**1,669,634**	**1,749,756**	**1,828,291**	**1,905,271**	**1,980,727**	**2,054,689**	**2,127,186**	**2,198,247**	**2,267,901**	**2,336,177**

1,203,944	1,288,639	1,371,615	1,587,894	1,669,634	1,749,756	1,828,291	1,905,271	1,980,727	2,054,689	2,127,186	2,198,247	2,267,901	2,336,177
213,840	216,840	219,840	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000
1,417,784	**1,505,479**	**1,591,455**	**1,617,894**	**1,699,634**	**1,779,756**	**1,858,291**	**1,935,271**	**2,010,727**	**2,084,689**	**2,157,186**	**2,228,247**	**2,297,901**	**2,366,177**
-30,000	-30,000	-30,000	-30,000	-30,000	-30,000	-30,000	-30,000	-30,000	-30,000	-30,000	-30,000	-30,000	-30,000

1,387,784	1,475,479	1,561,455	1,587,894	1,669,634	1,749,756	1,828,291	1,905,271	1,980,727	2,054,689	2,127,186	2,198,247	2,267,901	2,336,177
647,411	625,747	602,008	556,547	531,997	506,842	481,446	456,107	431,064	406,509	382,593	359,431	337,109	315,689

Alternative scenarios were examined to evaluate the economic returns of the project beyond the period of this project –assuming that payments for emissions reductions will remain at the same price levels—and the Net Present Value of the project was calculated for higher discount rates. A summary of the results is presented below:

Table 9-3: Summary of Economic Evaluation Results

Economic Results	
ERR (life time)	67%
ERR (2012)	64%
NPV (LifeTime) @ 10%	$12,779,604
NPV (2012) @ 10%	$4,248,379
NPV (LifeTime) @ 14%	$8,462,067
NPV (2012) @ 14%	$3,359,594

For the assumptions stated above, it appears that development of a CDM project at the landfill is economically positive under a number of different scenarios. For the purposes of the economic analysis of the project taxes are not treated as costs –this is the main reason for the increase in the economic rate of return for the project compared to the financial rates of return.

The Sponsor's Financial Capacity

The financial statements for the years 2002, 2003 and 2004 have also been reviewed, as provided by the sponsor. Petramas financial figures present a company that has been growing rapidly and steadily improving its financial position for the period examined. At the end of 2004 the company had total assets of about USD 3.3 million compared to about USD 1.1 million in 2002. In the end of 2004 the company's balance sheet records a total accumulated equity of about USD 1.7 million.

While the company has experienced strong growth and appears to be in good financial standing, a comparison of the size of the initial investment required and the financial strength of the company indicates that Petramas could face difficulties in fully financing the LFG recovery project on its balance sheet. However, in discussions with the project team the sponsor has indicated that the financial returns of the project are very attractive for the company itself and would proceed with the investment. As shown in the analysis above, the project's FIRR would be attractive for commercial banks in Peru and the sponsor, as well as the project team, considers that the existence of a signed ERPA, combined with an initial equity commitment from the sponsor, would facilitate financial closure for the project. Petramas is also considering the use of leasing schemes for the equipment of the LFG recovery Facility that would likely provide additional tax benefits to the company's LFG operation.

In conclusion, the project's ERR indicates that the LFG operation at the present level of CERs is highly beneficial from an economic point of view. In terms of financial returns the project is also highly profitable, and is expected that the sponsor will be able to proceed with the investment once the ERPA is in place either by using a considerable percentage of its accumulated equity, or by a combination of equity and balance sheet loan and/or a lease scheme for the equipment through a commercial bank.

Annex 10: Safeguards Policy Issues

PERU: Huaycoloro Landfill Gas Recovery

LANDFILL BACKGROUND

The Huaycoloro Landfill is a municipal solid waste (MSW) landfill located in the Huaycoloro Valley in the San Antonio District, City of Chacalla, state of Lima, Peru. The site operations are managed by PETRAMAS, and are generally considered the most modern of landfill operations in Peru.

The 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 tonnes per day (over 700,000 tonnes per year). To date, over 5.5 million tonnes (Mg) 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 tonnes. A Site Plan showing the existing landfill configuration and facilities is presented in Appendix A. Maximum waste thickness is expected to be about 20 meters (m).

The bottom of the landfill was not lined with geomembrane clay liner. The groundwater table is located approximately 120 m below the existing grade. The collected leachate is directed to an infiltration well located off the waste limits south of the main access road.

The soils in the area are generally very porous, and contain a significant fraction of fragmented rock. Although the region commonly experiences moisture in the form of fog, rainfall totals are among the lowest in the world, with average annual precipitation at only about 1 cm per year.

Key Safeguards issues

Due to the unique physical characteristics (low groundwater table and negligible rainfall) and good management, the existing landfill has no environmental or social issues of concern. No one lives close to the landfill, and it is secured. No habitats or otherwise environmentally important areas are nearby. The landfill is well managed and a long-term environmental management plan is being implemented for the landfill operations (see annex 12, document reviewed by the environmental consultant specialist and is available in project files).

The project will reduce 2 million tons of CO_2 equivalent emissions reductions for the period 2005 through 2012, enough to generate a minimum 5.3 MW power plant, with the potential of 7.1 MW by 2012.

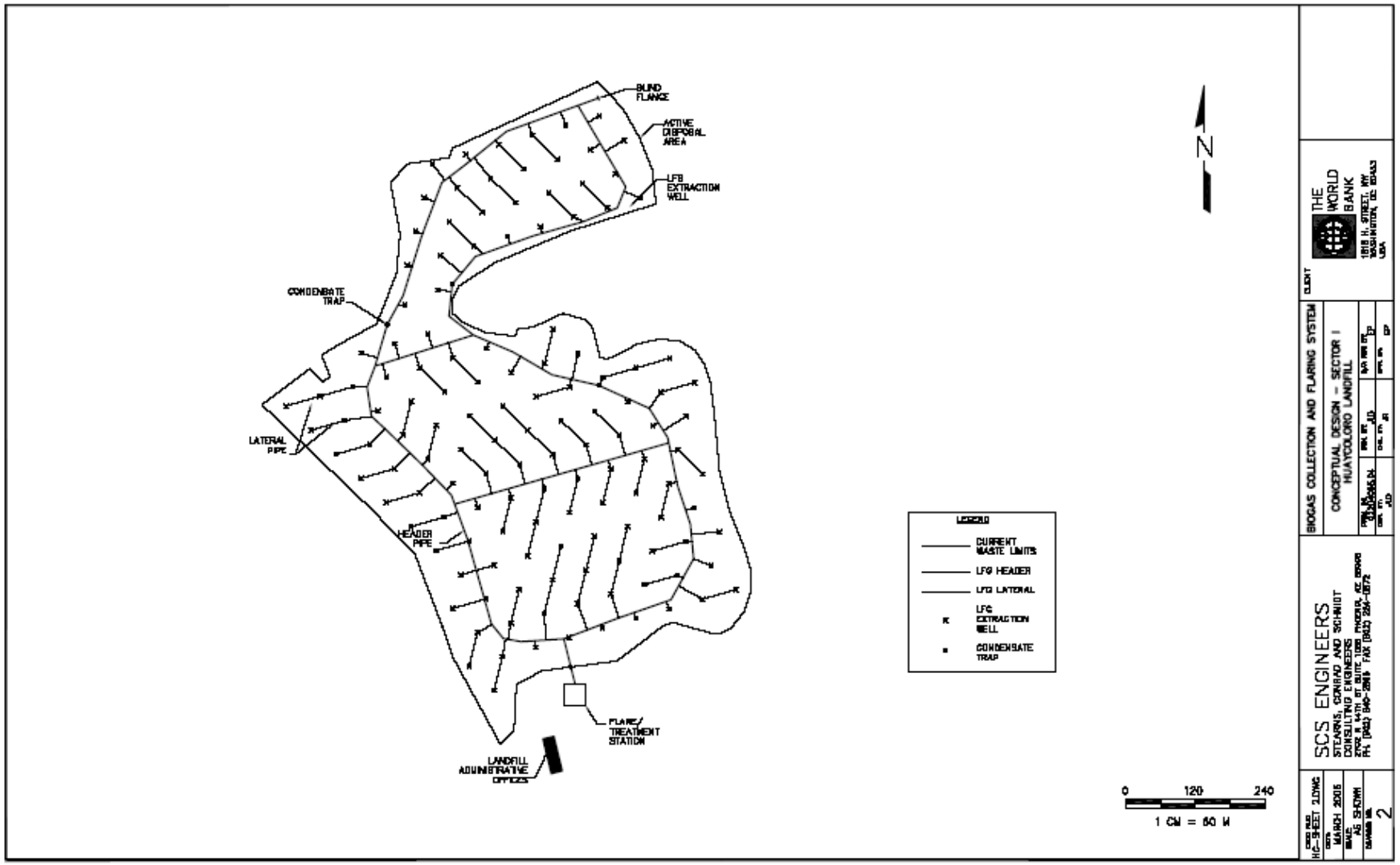
The project only triggers *O.P. 4.01* (Environmental Assessment). No other policies are triggered by this project.

To comply with the requirements of O.P. 4.01, the project sponsor prepared a special annex to their environmental management plan (EMP) for the proposed biogas plant. 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 example: (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. The relevant sections of the EMP and monitoring plan are included in Appendix B.

Public disclosure

The EMP will be posted on the Bank website, and on the website of a local group (such as FONAM) before appraisal. Again, no people would be 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.



Extracted from: "Relleno Sanitario Huaycoloro – Programa de Adecuación y Manejo Ambiental; Anexo Complementario: Proyector de captura del gas metano en el marco del mecanismo de desarrollo limpio" Marzo 2005

Annex 11: Project Preparation and Supervision

PERU: Huaycoloro Landfill Gas Recovery

	Planned	Actual
PCN review	N/A	N/A
Initial PID to PIC		
Initial ISDS to PIC		
Appraisal	October 24, 2005	
Negotiations	October 26, 2005	
Board/RVP approval	November 15, 2005	
Planned date of effectiveness	June 2006	May 18, 2006
Planned date of mid-term review		
Planned closing date	December 31, 2012	December 31, 2012

Key institutions responsible for preparation of the project: PETRAMAS S.A.C., the project's private sponsor.

Bank staff and consultants who worked on the project included:

Name	Title	Unit
Dan Hoornweg	Senior Environmental Engineer – Task Manager	LCSFW
Demetrios Papathanasiou	Energy Economist – Task Manager	LCSFE
Horacio Cristian Terazza	Senior Environmental Specialist	LCSEN
John T. Buckman	Senior Financial Specialist	ENVCF
Xueman Wang	Senior Counsel	LEGCF
Kirsten Oleson	Consultant	
Francisco Fernandez-Asin	Consultant (Deal Manager until June 2005)	

Bank funds expended to date on project preparation:

1. Bank resources: US$ 45,000
2. Trust funds:
3. Total: US$ 45,000

Estimated Approval and Supervision costs:

1. Remaining costs to approval: US$ 65,000
2. Estimated annual supervision cost: US$ 30,000

Annex 12: Documents in the Project File

PERU: Huaycoloro Landfill Gas Recovery

- 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)
- Copies of Financial Statements of Petramas S.A.C. (2004, 2003, 2002).
- 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
- Programa de Adecuación y Manejo Ambiental P.A.M.A. Infraestructura para la Disposición Final de Residuos Sólidos Urbanos Relleno Sanitario "Huaycoloro". PETRAMAS S.A.C. Octubre de 2002.

Annex 13: Statement of Loans and Credits

PERU: Huaycoloro Landfill Gas Recovery

			Original Amount in US$ Millions						Difference between expected and actual disbursements	
Project ID	FY	Purpose	IBRD	IDA	SF	GEF	Cancel.	Undisb.	Orig.	Frm. Rev'd
P088809	2005	PE Inst. Capacity for Decent. TAL	8.80	0.00	0.00	0.00	0.00	8.64	0.43	0.00
P082625	2005	PE Vilcanota Valley Rehab & Mgmt Project	4.98	0.00	0.00	0.00	0.00	4.98	0.05	0.00
P082588	2005	PE (APL2)Agric Research and Extension	25.00	0.00	0.00	0.00	0.00	25.00	0.00	0.00
P078953	2005	PE-(CRL1)ACCOUNT. F/ DECENT. SOC.SCTR	7.80	0.00	0.00	0.00	0.00	6.22	-1.58	-0.01
P074021	2004	PE LIMA TRANSPORT PROJECT	0.00	0.00	0.00	7.93	0.00	7.32	8.23	0.00
P073438	2004	PE Justice Services Improvement	12.00	0.00	0.00	0.00	0.00	11.94	8.14	0.00
P035740	2004	PE LIMA TRANSPORT PROJECT	45.00	0.00	0.00	0.00	0.00	42.65	42.65	0.00
P068250	2003	GEF PE PARTICIPATORY MGMT PROT AREAS	0.00	0.00	0.00	14.80	0.00	10.39	2.53	0.00
P065256	2003	PE NATIONAL RURAL WATER SUPPLY AND	50.00	0.00	0.00	0.00	0.00	47.07	19.73	0.00
P077788	2003	PE Trade Facil. and Prod. Improv. T. A.	20.00	0.00	0.00	0.00	0.00	18.97	10.63	0.00
P081834	2003	PE Lima Water Rehab Add'l Financing	20.00	0.00	0.00	0.00	0.00	19.30	10.17	0.00
P055232	2003	PE- Rural Education	52.50	0.00	0.00	0.00	0.00	48.49	5.93	0.76
P065200	2001	GEF PE Indigenous Management Prot. Areas	0.00	0.00	0.00	10.00	0.00	4.46	1.45	0.00
P044601	2001	PE SECOND RURAL ROADS PROJECT	50.00	0.00	0.00	0.00	0.00	18.51	15.58	0.00
P062932	2000	PE-HEALTH REFORM PROGRAM	80.00	0.00	0.00	0.00	0.00	7.70	-19.30	2.28
		Total:	376.08	0.00	0.00	32.73	0.00	281.64	104.64	3.03

PERU
STATEMENT OF IFC's
Held and Disbursed Portfolio
In Millions of US Dollars

		Committed				**Disbursed**			
		IFC				**IFC**			
FY Approval	Company	Loan	Equity	Quasi	Partic.	Loan	Equity	Quasi	Partic.
2000	Agrokasa	3.00	0.00	0.00	0.00	3.00	0.00	0.00	0.00
1999	Alicorp	0.00	0.00	20.00	0.00	0.00	0.00	20.00	0.00
2005	Corp. Drokasa	7.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2004	EDYFICAR	3.00	0.00	0.00	0.00	1.50	0.00	0.00	0.00
2002	FTSA	7.50	0.00	1.50	0.00	7.50	0.00	1.50	0.00
2003	Global MEF	0.00	0.00	4.00	0.00	0.00	0.00	0.50	0.00
2002	Gloria	25.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2002/03	ISA Peru, SA	0.20	0.00	0.00	0.00	0.12	0.00	0.00	0.00
2001	Inka Terra	5.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00
2004	Interbank-Peru	40.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

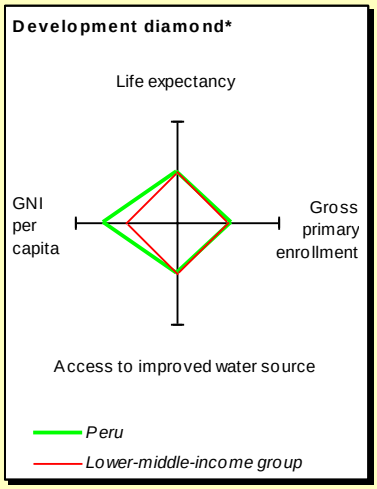
2002/03/05	Interseguro	0.00	0.60	0.00	0.00	0.00	0.00	0.00	0.00
2000/04	Laredo	0.30	0.00	0.00	0.00	0.08	0.00	0.00	0.00
1998	Latino Leasing	1.99	0.00	0.00	0.00	1.99	0.00	0.00	0.00
2002	MIBANCO	1.33	0.00	0.00	0.00	1.33	0.00	0.00	0.00
1999	Milkito	5.50	0.00	3.50	0.00	3.50	0.00	3.50	0.00
2005	Miraflores	10.00	0.00	0.00	0.00	10.00	0.00	0.00	0.00
2003	Norvial S.A.	18.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1998	Paramonga	13.01	0.00	0.00	10.98	13.01	0.00	0.00	10.98
2001	Peru OEH	5.80	0.00	3.60	0.00	1.80	0.00	3.60	0.00
1994	Peru Prvtzn Fund	0.00	4.41	0.00	0.00	0.00	4.41	0.00	0.00
1993/96/00/01	Quellaveco	0.00	0.57	0.00	0.00	0.00	0.54	0.00	0.00
1999	RANSA	5.63	0.00	0.00	0.00	5.63	0.00	0.00	0.00
2003	TIM Peru	70.00	0.00	0.00	0.00	70.00	0.00	0.00	0.00
2001	Tecnofil S.A.	4.05	2.00	0.00	0.00	4.05	2.00	0.00	0.00
2005	USMP	9.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1993/99	Yanacocha	10.00	0.00	0.00	20.00	10.00	0.00	0.00	20.00
	Total portfilio:	245.81	7.58	32.60	30.98	138.51	6.95	29.10	30.98

		Approvals Pending Commitment			
FY Approval	Company	Loan	Equity	Quasi	Partic.
2004	CMAC Arequipa	0.01	0.00	0.00	0.00
2005	Drokasa PCG	0.00	0.00	0.00	0.00
2004	EDYFICAR	0.00	0.00	0.00	0.00
2005	Ransa-Expansion	0.01	0.00	0.00	0.00
2004	UPC II	0.00	0.00	0.00	0.00
	Total pending committment:	0.02	0.00	0.00	0.00

Annex 14: Country at a Glance

PERU: Huaycoloro Landfill Gas Recovery

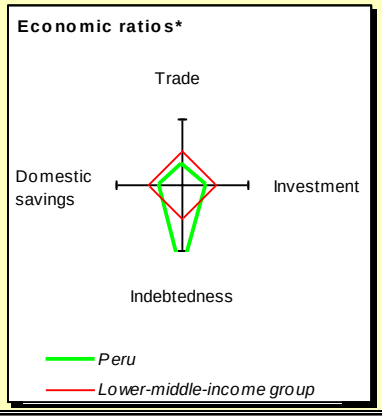
POVERTY and SOCIAL	Peru	Latin America & Carib.	Lower-middle-income
2003			
Population, mid-year *(millions)*	27.1	534	2,655
GNI per capita *(Atlas method, US$)*	2,140	3,260	1,480
GNI *(Atlas method, US$ billions)*	58.2	1,741	3,934
Average annual growth, 1997-03			
Population *(%)*	1.5	1.5	0.9
Labor force *(%)*	2.8	2.1	1.2
Most recent estimate (latest year available, 1997-03)			
Poverty *(% of population below national poverty line)*	49	..	..
Urban population *(% of total population)*	74	77	50
Life expectancy at birth *(years)*	70	71	69
Infant mortality *(per 1,000 live births)*	30	28	32
Child malnutrition *(% of children under 5)*	7	..	11
Access to an improved water source *(% of population)*	80	86	81
Illiteracy *(% of population age 15+)*	15	11	10
Gross primary enrollment *(% of school-age population)*	121	129	112
Male	122	131	113
Female	121	126	111



KEY ECONOMIC RATIOS and LONG-TERM TRENDS

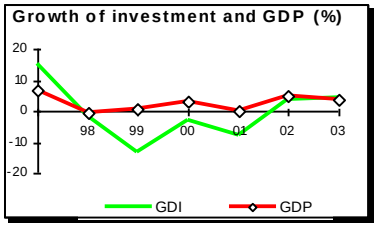
	1983	1993	2002	2003
GDP *(US$ billions)*	19.1	34.8	56.5	60.6
Gross domestic investment/GDP	24.3	19.3	18.8	18.8
Exports of goods and services/GDP	19.7	12.5	16.5	17.7
Gross domestic savings/GDP	24.5	15.4	18.0	18.9
Gross national savings/GDP	..	12.9	17.2	17.5
Current account balance/GDP	-6.8	-6.6	-2.0	-1.8
Interest payments/GDP	2.4	2.2	2.0	2.1
Total debt/GDP	59.3	67.7	49.8	49.3
Total debt service/exports	34.0	59.4	32.5	23.8
Present value of debt/GDP	..	..	52.7	..
Present value of debt/exports	..	..	286.4	..

	1983-93	1993-03	2002	2003	2003-07
(average annual growth)					
GDP	-0.7	3.4	4.9	3.8	4.4
GDP per capita	-2.7	1.6	3.2	2.2	2.8

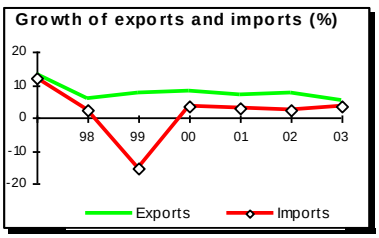


STRUCTURE of the ECONOMY

	1983	1993	2002	2003
(% of GDP)				
Agriculture	8.6	8.2	9.5	9.3
Industry	35.2	25.3	26.0	26.5
Manufacturing	30.3	16.2	14.8	14.6
Services	40.1	57.3	54.9	54.6
Private consumption	64.3	76.5	71.7	71.0
General government consumption	11.2	8.0	10.3	10.1
Imports of goods and services	19.5	16.3	17.3	17.6

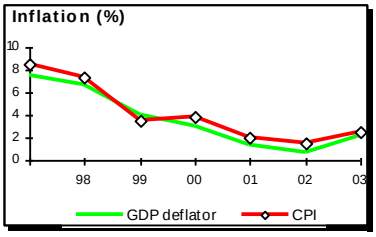


	1983-93	1993-03	2002	2003
(average annual growth)				
Agriculture	1.4	5.2	6.0	1.5
Industry	0.3	2.6	6.6	5.4
Manufacturing	-0.3	2.6	4.0	2.1
Services	-1.5	3.5	4.0	3.1
Private consumption	-0.8	3.0	4.7	3.1
General government consumption	-1.6	3.8	-0.8	2.9
Gross domestic investment	1.5	1.0	3.5	4.5
Imports of goods and services	2.6	3.7	2.3	3.3



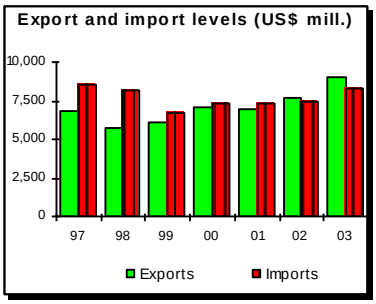
PRICES and GOVERNMENT FINANCE

	1983	1993	2002	2003
Domestic prices				
(% change)				
Consumer prices	110.8	48.6	1.5	2.5
Implicit GDP deflator	104.0	47.1	0.7	2.2
Government finance				
(% of GDP, includes current grants)				
Current revenue	..	13.6	14.4	15.0
Current budget balance	..	0.1	-0.3	0.0
Overall surplus/deficit	..	-3.6	-2.1	-1.8



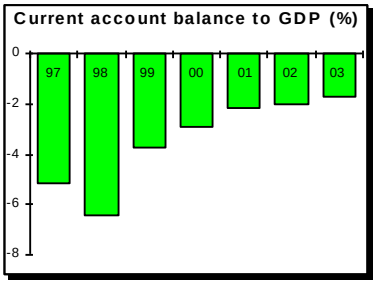
TRADE

	1983	1993	2002	2003
(US$ millions)				
Total exports (fob)	..	3,516	7,723	8,986
Copper	..	658	1,187	1,261
Fishmeal	..	542	823	742
Manufactures	..	1,007	2,256	2,602
Total imports (cif)	..	4,123	7,417	8,255
Food	..	476	546	564
Fuel and energy	..	321	975	1,377
Capital goods	..	1,143	1,842	1,984
Export price index *(1995=100)*	..	79	82	88
Import price index *(1995=100)*	..	88	99	104
Terms of trade *(1995=100)*	..	89	83	84



BALANCE of PAYMENTS

	1983	1993	2002	2003
(US$ millions)				
Exports of goods and services	3,726	4,353	9,267	10,664
Imports of goods and services	3,687	5,535	9,947	10,864
Resource balance	39	-1,182	-680	-200
Net income	-1,130	-1,619	-1,491	-2,082
Net current transfers	-219	508	1,043	1,221
Current account balance	-1,310	-2,293	-1,127	-1,061
Financing items (net)	1,276	2,702	2,112	1,657
Changes in net reserves	34	-409	-985	-596
Memo:				
Reserves including gold *(US$ millions)*	0	3,842	9,989	10,662
Conversion rate *(DEC, local/US$)*	1.63E-6	2.0	3.5	3.5



EXTERNAL DEBT and RESOURCE FLOWS

	1983	1993	2002	2003
(US$ millions)				
Total debt outstanding and disbursed	11,342	23,578	28,105	29,847
IBRD	527	1,369	2,609	2,789
IDA	0	0	0	0
Total debt service	1,307	2,758	3,379	2,547
IBRD	68	1,057	304	278
IDA	0	0	0	0
Composition of net resource flows				
Official grants	95	236	164	..
Official creditors	400	668	273	-7
Private creditors	913	178	749	1,184
Foreign direct investment	38	759	2,156	1,317
Portfolio equity	0	1,226	-9	..
World Bank program				
Commitments	211	392	100	474
Disbursements	77	975	146	344
Principal repayments	28	574	163	163