

Document of
The World Bank

Report No: 42291-ID

PROJECT APPRAISAL DOCUMENT
OF THE
INDONESIA: MAKASSAR LANDFILL METHANE COLLECTION
AND FLARING PROJECT
CARBON FINANCE ASSESSMENT MEMORANDUM
FOR A
NETHERLANDS CLEAN DEVELOPMENT MECHANISM FACILITY EMISSIONS
REDUCTION PURCHASE AGREEMENT
IN THE AMOUNT OF APPROXIMATELY
US\$ 6.0 MILLION
WITH
PT GIKOKO KOGYO INDONESIA (GIKOKO)

September 30, 2008

Rural Development, Natural Resources and Environment Sector Unit
Sustainable Development Department
East Asia and Pacific Region

CURRENCY EQUIVALENTS

Exchange Rate Effective September 30, 2008

Currency Unit = Indonesia Rupiah (IDR)
US\$ 1 = IDR 9,083.00

FISCAL YEAR

January 1 – December 31

ABBREVIATIONS AND ACRONYMS

AAA	Analytical and Advisory Activities
BOO	Build Own and Operate
BP	Bank Policy
Btu	British thermal unit
CDM	Clean Development Mechanism
CERs	Certified Emission Reductions
CFO	Carbon Finance Operation
CH ₄	Methane
CO	Carbon Monoxide
COP	Conference of Parties
CO ₂	Carbon dioxide
CPF	Carbon Partnership Facility
DNA	Designated National Entity
DOE	Designated Operating Entity
EAP	East Asia and Pacific Region
ERPA	Emissions Reduction Purchase Agreement
GDP	Gross Domestic Product
GHG	Greenhouse gas
GWP	Global Warming Potential
EA	Environmental Assessment
EMP	Environment Management Plan
H ₂	Hydrogen
IPCC	Intergovernmental Panel on Climate Change
IRR	Internal rate of return
ISO	International Standards Organization
Km	Kilometer
LoA	Letter of Agreement
LFG	Landfill gas
LoI	Letter of Intent
LULUCF	Land use, land use change, and forestry

m3	Cubic meter
MoA	Memorandum of Agreement
MSWM	Municipal Solid Waste Management
Mg	Milligram
NCDMF	The Netherlands Clean Development Facility
NGO	Non-governmental organization
NPV	Net present value
NOx	Nitrogen Oxides
Nm3	Normal Cubic Meter
O&M	Operating and Maintenance
OP	Operational Policy
PDD	Project Design Document
PT	Perusahaan Terbatas
SWM	Solid Waste Management
RT	Rukun Tetangga (Neighborhood Unit)
RW	Rukun Warga (Community Unit)
tCO2e	Tons of CO2 equivalent
TPA	Tempat Pembuangan Akhir
UK	United Kingdom
UPTD	Unit Pelaksanan Teknis Dinas
UNFCCC	United Nations Framework Conventions on Climate Change

Vice President:	James W. Adams, EAPVP
Country Director:	Joachim von Amsberg ,EAICF
Sector Director:	Christian Delvoie, EASSD
Sector Manager:	Sonia Hammam, EASIS

INDONESIA

MAKASSAR LANDFILL METHANE COLLECTION AND FLARING PROJECT

TABLE OF CONTENTS

A.	STRATEGIC CONTEXT AND RATIONALE	1
1.	Country and Sector Context	1
2.	Rationale for World Bank Involvement and Contribution to Sustainable Development	3
B.	CARBON FINANCE OPERATION	4
1.	Overview	4
2.	Description of the Carbon Finance Operation.....	5
3.	Financial Analysis	7
4.	Institutional	11
5.	Safeguards	13
6.	Environmental Analysis	14
7.	Social Analysis.....	16
8.	Legacy and Reputational Risk Issues.....	19
9.	ERPA Main Terms/Conditions.....	19
	Annex 1: Country and Sector Background.....	21
	Annex 2: Participating Entities in the CDM Project Cycle	26
	Annex 3: Detailed Project Description	28
	Annex 4: Implementation Arrangements.....	34
	Annex 5: Financial Management and Fiduciary Issues	35
	Annex 6: Summary of Memorandum of Agreement between the Project.....	38
	Annex 7: Statement of Loans and Credit	39
	Annex 8: County at a Glance.....	42
	Annex 9: Documents in the Project File	44
	Annex 10: Project Preparation and Supervision	45

MAP IBRD #35910

INDONESIA

MAKASSAR LANDFILL METHANE COLLECTION AND FLARING PROJECT

PROJECT APPRAISAL DOCUMENT

EAST ASIA AND PACIFIC

EASRE

Date: September 30, 2008	Team Leader: James Monday
Country Director: Joachim von Amsberg	Sectors: Solid Waste Management (100%)
Sector Manager/Director: Sonia Hammam/Christian Delvoie	Themes: Climate Change
Project ID: P104022	Environmental Screening Category: B
Lending Instrument: N/A – Carbon Fund	Safeguard Screening Category: B

Project Financing Data			
<input type="checkbox"/> Loan <input type="checkbox"/> Credit <input type="checkbox"/> Grant <input type="checkbox"/> Guarantee <input checked="" type="checkbox"/> Other:			
For Loans/Credits/Others:			
Total Bank financing (US\$m.): N/A			
Proposed terms: In negotiation prices designated in Euros per ton for Certified Emission Reductions (CERs), paid annually			
Financing Plan (US\$m)			
Source	Local	Foreign	Total
BORROWER/RECIPIENT			
IBRD/IDA			
NCDMF		6,720,000	6,720,000
Total:		6,720,000	6,720,000
Borrower:			
N/A. The Bank, as trustee for the Netherlands Clean Development Mechanism Facility, will sign the Purchase Agreement with P.T. Gikoko Kogyo Indonesia			
Responsible Agency: N/A			

FY	9	10	11	12	13		
Annual	1,260,000	1,436,400	1,554,600	1,638,000	840,000		
Cumulative	1,260,000	2,696,400	4,242,000	5,880,000	6,720,000		

Project implementation period: 7 years
Expected effectiveness date: September 30, 2008
Expected closing date: December 31, 2015

Does the project depart from the CAS in content or other significant respects? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
--

Does the project require any exceptions from Bank policies? Have these been approved by Bank management? N/A Is approval for any policy exception sought from the Board? N/A	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> No
Does the project include any critical risks rated “substantial” or “high”?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Does the project meet the Regional criteria for readiness for implementation?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Project development objective. The project development objective is to reduce methane emissions from solid waste disposed in the City of Makassar’s landfill, TPA Tamangapa, through a carbon finance transaction. The key indicator for this objective will be the annual delivery of emission reductions (ERs). Another objective is to generate an income stream from the ERs that can be used to finance improvements in overall solid waste management, including improved collection services.	
Project description. The project objective is to reduce methane emissions from solid waste disposed in the City of Makassar’s landfill, TPA Tamangapa.	
Which safeguard policies are triggered, if any	
Environmental Assessment (OP/BP 4.01)	
Significant, non-standard conditions, if any , for:	
Board presentation: N/A	
Loan/credit effectiveness: N/S	
Covenants applicable to project implementation:	
<ol style="list-style-type: none"> 1. Registration of the Project with the CDM Executive Board 2. Annual certification at ERs, including implementation of the Environmental Management Plan, and Community Development Plan. 	

A. STRATEGIC CONTEXT AND RATIONALE

1. Country and Sector Context

1. A decade after the Asian financial crisis, Indonesia is experiencing strong economic growth that is both robust and stable averaging more than 5 percent per year since 2004. As the economy grows, the investment to GDP ratio has also increased, from 19 percent in 2004 to 24 percent in 2006. Much of this growth has occurred in coastal urban areas where both increasing population and rising incomes have created additional demand for public services and put additional pressure on already fragile ecosystems. For instance, pollution from urbanization, motorization, and industrialization have contributed to significant deterioration of air quality; poor solid waste management (SWM) has degraded not only air, but land and water quality; and all of these factors continue to have a negative effect on human health.

2. In many of Indonesia's rapidly growing cities, larger populations are creating a demand for more and better public services such as SWM. However, service delivery and revenue have not kept pace with increasing quantities of waste that have resulted from population and economic growth. As a result, most landfills in Indonesia follow the practice of controlled open dumping which leads to inadequate waste disposal and many of the growing negative environmental impacts in urban areas.

3. For example, much of the improperly disposed urban solid waste finds its way into drainage channels and contributes to flooding and sustains breeding areas for disease vectors. Furthermore, problems persist at relatively well-maintained landfill sites such as poor leachate management and uncontrolled emissions of methane, a greenhouse gas (GHG) that is generated through the anaerobic degradation of organic matter in landfills and dump sites. Methane has twenty one times the global warming potential (GWP) of carbon dioxide (CO₂), which means it is twenty one times more efficient at trapping heat within the earth's atmosphere than an equivalent ton of CO₂ (tCO₂e).

4. According to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) in 2007,¹ warming of the climate system is "unequivocal" and Indonesia is at the centre of the global climate change debate. The country ranks 15 among the highest emitters of GHGs from energy use in the world and when emissions from land use, land use change, and forestry (LULUCF) are included; Indonesia becomes the third largest GHG emitter in the world.² These impacts may threaten many of Indonesia's development gains of the last several decades. For example, Indonesia is one of the most vulnerable countries to the effects of one meter increase in sea level rise. In addition, the low-lying coastal regions of the archipelago are home to half of Indonesia's population (including

¹ "Climate Change 2007: The Physical Science Basis, Summary for Policymakers," Working Group I Contribution to the Intergovernmental Panel on Climate Change, Fourth Assessment Report, February 2007.

² "Indonesia and Climate Change: Working Paper on Current Status and Policies."
<http://siteresources.worldbank.org/INTINDONESIA/Resources/226271-1170911056314/3428109-1174614780539/PEACEClimateChange.pdf>

many of the urban centers that are driving the country's economic growth) and some of its most productive agricultural areas.

5. Indonesia signed the Kyoto Protocol of the United Nations Framework Conventions on Climate Change (UNFCCC) in 1997 and ratified it in 2004 through Law No. 17/2004. The Kyoto Protocol sets targets for the reduction of six GHGs for Annex I (developed) countries between 2008 and 2012 to stabilize GHG concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. The Kyoto Protocol states that emissions in Annex I countries must be reduced on average 5.2 percent below 1990 levels. In order to reach these goals, the Kyoto Protocol established flexible instruments such as the Clean Development Mechanism (CDM) that provide for the crediting of emission offsets resulting from projects in non-Annex I (developing) countries including Indonesia. Once credited, the offsets are called Certified Emission Reductions (CERs) which can be sold at a price to governments or other entities with obligations under the Kyoto Protocol.

6. The financial incentives from market mechanisms such as the CDM offer Indonesia an opportunity to improve SWM activities while also mitigating global climate change. For example, higher volumes of CERs from landfill gas (LFG) projects are dependent on maximizing the amount of methane collected and destroyed, which in turn is dependent on improved solid waste collection and disposal practices that also reduce air, land, and water pollution in Indonesia's urban areas.

7. Most recently, in December 2007, Indonesia hosted the 13th Conference of Parties (COP) to the UNFCCC on the island of Bali. The Bali meetings set a clear agenda for key issues that will be negotiated up to 2009 including further action on ways to reduce GHGs and how to scale-up the use of climate-friendly technologies in developing countries. The success of COP 13 was essential for providing a "roadmap" for concluding negotiations in 2009 to ensure a seamless transition for a new climate regime to enter into force by 2013 once the first phase of the Kyoto Protocol expires at the end of 2012.

8. This proposed carbon finance operation (CFO) will facilitate the purchase of CERs that result from the construction of a LFG flaring facility that will capture and destroy methane from the TPA Tamangapa Landfill in the City of Makassar, South Sulawesi, Indonesia. The LFG flaring activities will demonstrate the use of a technology that takes into consideration Indonesia's tropical environment and other local factors as well as create a tradable commodity in the form of GHG emission reduction credits which are a financial incentive to improve waste management practices as well as mitigate emissions that contribute to climate change. This CFO will also serve as example that can be replicated at other landfills in Indonesia's rapidly growing urban areas during the remaining years of the Kyoto Protocol's first commitment period and beyond.

2. Rationale for World Bank Involvement and Contribution to Sustainable Development

9. Despite Indonesia's strong economic performance, several regions and sectors in Indonesia are lagging behind, creating pockets of worsening poverty. Today, close to 49 percent of Indonesians live on between US\$1 and US\$2 per day and are thus highly vulnerable to many economic and environmental shocks. As the effects of climate change will have a disproportionate impact on developing countries and the poor, the World Bank's overall mission of reducing poverty and promoting longer-term sustainable development is now inextricably linked to the effects of climate change and efforts to manage the impacts. The potential impacts of climate change jeopardize many of the development gains of recent decades, especially in countries such as Indonesia with its thousands of miles of low lying coastal areas and exposure to extreme weather events.

10. The World Bank supports client countries to address their environmental challenges and has been at the forefront of activities to reduce global atmospheric GHGs and mitigate the effects of climate change. These activities are spread across a wide spectrum of interventions including projects in the energy, urban, transport, and forestry sectors, as well as Analytical and Advisory Activities (AAA) such as the *East Asia and Pacific Region (EAP) Environment Monitor Series*, the annual *State of the Carbon Market Report*, and development of the new *Investment Framework for Clean Energy and Development*. Client countries also benefit from global environmental programs administered by the World Bank such as the Global Environment Facility and carbon revenues through the Carbon Finance program.

11. For over a decade, the World Bank has been a pioneer in the carbon market under the Kyoto Protocol, helping to develop policy, regulatory, fiscal, and financial instruments across sectors and countries to generate incentives to reduce GHGs. The World Bank has also developed and managed 10 Carbon Funds. These Funds do not finance projects, but contract to purchase CERs in a commercial transaction, with annual or periodic payments following verification by a third party auditor. These transactions have provided an additional revenue stream to reduce financial risks, leverage new private and public investment, and promote technology transfer for projects that reduce GHG emissions. Support for client countries to address the objectives of international environmental conventions such as the Kyoto Protocol is an identified priority in the World Bank's Environment Strategy, reaffirmed in the 2005 Environment Strategy for EAP. These Carbon Funds also support the objectives of the second pillar of the World Bank's Investment Framework for Clean Energy and Development by providing incentives to promote low-carbon economies in client countries.

12. In 2002, the World Bank announced an agreement with the Government of The Netherlands to establish The Netherlands Clean Development Mechanism Facility (NCDMF) to purchase emission reduction credits from projects in the following categories: (i) renewable energy technology, such as geothermal, wind, solar, and small-scale hydro-power; (ii) clean, sustainably grown biomass; (iii) energy efficiency improvement; (iv) fossil fuel switch and methane recovery; and (v) sequestration. Since then, the NCDMF has agreed to purchase CERs from LFG flaring activities in several Indonesian cities. The World Bank has also

signed Letters of Intent (LoIs) with Indonesia-based project developers that are developing projects for geothermal energy production as well as LFG recovery at landfills. For Indonesia, these agreements have provided valuable experience in establishing the national carbon market as well as knowledge and technical transfer that are strengthening the country's capacity to participate in the emerging global carbon market.

13. This CFO is fully consistent with the World Bank's mandate to spur the development of the CDM market and is a product of the organization's pioneering role in developing the CDM market in Indonesia. For example, both the host city and the project developer participated in CDM capacity building workshops sponsored by the World Bank. With the prior experience of developing other CFOs in the SWM sector including the Indonesia Pontianak Landfill Gas Recovery Project (P104482) and the Bekasi Landfill Gas Recovery Project (P099679), the World Bank is well positioned to facilitate the purchase of CERs from the Makassar Landfill Gas Recovery Project.

14. The project developer is providing funds from a portion of the CER revenue for improved service provision in the waste sector and social benefits for the communities living near the landfill site that will enhance the sustainability of effective SWM and result in benefits for the local community. These actions are in line with Pillar 2: Improving Services for the Poor, of the World Bank's Indonesia Country Assistance Strategy (2003-2007).

15. Moreover, in line with the catalytic function played by the World Bank in the development of the carbon market thus far, and with a view toward developing and testing new approaches that can help address these important constraints, two carbon finance instruments were approved by the World Bank in September 2007, namely: the Carbon Partnership Facility (CPF) and the Forest Carbon Partnership Facility. Both Facilities aim to assist climate change mitigation, with a particular focus on the post-2012 period.

B. CARBON FINANCE OPERATION

1. Overview

16. This CFO entails a carbon finance transaction to purchase CERs from LFG collection and flaring activities that will take place in the City of Makassar's landfill, TPA Tamangapa, which is located in Kecamatan Manggala, Kelurahan Tamangapa, approximately 15km from the city centre. The city, like many others in Indonesia, suffers from an inability to cope with waste generation and disposal. Municipal solid waste (MSW) generation in 2007 was estimated at around 946 tonnes/day ($0.767 \text{ kg/capita/day}^3$ or $3,152\text{m}^3/\text{day}$ at 0.30^4 tonne/m^3) with collection services in 2007 being approximately 498 tonnes/day⁵ (approximately 53 percent of MSW generated). This low level of collection service has major detrimental impacts on the environment and health within the city.

³ IPCC (2006) default generation rate for Indonesia, Volume 5 -Waste. Table 2.1

⁴ World Bank(1999), What a Waste: Solid Waste Management in Asia pg 38

⁵ 2007 Weighbridge Data, Dinas Keindahan, Kota Makassar

17. The TPA Tamangapa landfill was established in 1993 and is expected to provide the only MSW disposal location for the city until at least 2016. Since opening, TPA Tamangapa has received an estimated 1.68 million tonnes of MSW and is expected to receive an additional 2.17 million tones by 2016.

18. In June 2006, the City of Makassar signed a Letter of Intent (LoI) with the World Bank, as trustee of the NCDMF to sell CERs from the collection and flaring of methane to participants in the NCDMF. As the City of Makassar lacks the capacity to build and operate the LFG flaring facility on its own, it has identified a project developer to build, own, and operate (BOO) the LFG flaring facility. The project developer, PT Gikoko Kogyo Indonesia (Gikoko) was chosen through a competitive and transparent tender process, and a review of this process was undertaken as part of the World Bank's due diligence work. The City of Makassar will continue to own and operate the landfill and maintain waste collection and disposal services, but the project developer will own the LFG collection and flaring facilities and the CERs resulting from the flaring of methane.

19. Under the agreement between Gikoko and the City of Makassar, Gikoko and the City will invest / reinvest into the waste collection systems so as to assist the local government in improving collection services to ensure that collection service increases above Makassar's expected population growth.

2. Description of the Carbon Finance Operation

Project Development Objective and Key Indicators

20. The project development objective is to reduce methane emissions from solid waste disposed in the City of Makassar's landfill, TPA Tamangapa, through a Carbon Finance Transaction. The key indicator for this objective will be the annual delivery of certified emission reductions (CERs).

21. The key performance indicators are: (a) methane flow volume (m³); (b) methane emission reduction (tons); and (c) the CER credits created and traded (tCO₂e).

Project Components:

22. **Component A:** The construction and operation of LFG collection and flaring equipment that will result in CERs. The project developer will construct a system to collect and flare the LFG produced from Makassar's landfill site thus reducing GHG emissions. In order to accomplish this objective, the City of Makassar has engaged a private sector company. Gikoko will be responsible for financing the construction and operation of the LFG extraction and flaring facility while the City of Makassar will continue to own and operate the landfill. The City of Makassar has also signed a Memorandum of Agreement (MoA) with

Gikoko to allocate a portion of the CER revenues to the City of Makassar for activities that may include improved waste collection and disposal.

23. The project feasibility study recommended that the facility should include the following components: (i) a collection system consisting of horizontal and vertical wells and collection pipes to be installed in the area containing waste and expanded over time as further areas are filled; (ii) LFG pumping equipment including a pipeline and blowers; (iii) an LFG treatment and flare system which will remove moisture and combust the gas; and (iv) monitoring and control systems. A detailed technical description of these activities and the subsequent emission reductions are included in the Project Design Document (PDD).

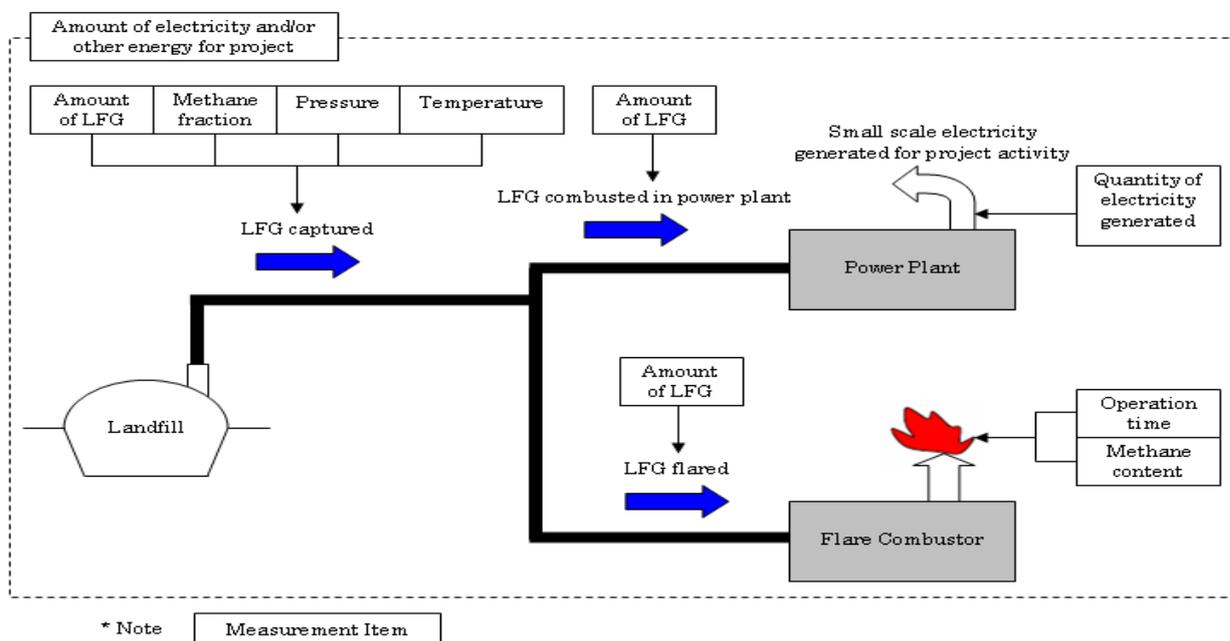
24. **Component B:** A Carbon Finance transaction that will facilitate the purchase of the CERRs. The World Bank-managed NCDMF will finance the purchase of CER credits resulting from the LFG flaring component. The design of the LFG flaring component was significantly influenced by the attempt to optimize the amount of CERs to be delivered and purchased through this transaction.

25. The purchase will be a performance-based contract under which payments are triggered by successful verification of the reduction of methane emissions by an independent and accredited designated operational entity (DOE) under the rules of the Kyoto Protocol.⁶ The quantity of CERs to be contracted, the length of time over which the purchase will be made, and the price paid will be agreed between the World Bank and Gikoko during negotiations of the Emission Reduction Purchase Agreement (ERPA).⁷ In addition, as part of its responsibilities, the NCDMF will ensure registration of the project with the CDM Executive Board as well as the other activities involved with the purchase of the CERs.

⁶ DOE has two functions: 1 validate and certification of emission reduction of a registered CDM project, to certify private and to request the CDB board to issue CERs.

⁷ ERPA negotiations and signature will commence only after project approval by the EAP Vice President.

Figure 1: Schematic Diagram of LFG Collection and Flaring Process



26. Since it is not mandatory in Indonesia to collect and flare methane or to use it for any purpose, Alternatives 2 and 3 can claim additionality and may be eligible for the CDM. Compared with Alternative 2, Alternative 3 requires a higher capital investment, operation, and maintenance costs than Alternative 1. However, current “buy-back rates” for selling electricity to the commercial grid are too low to make this option economically viable given that a feasibility study showed that Alternative 3 would produce far less methane than would be needed to make this option economically viable. Therefore, Alternative 3 was rejected.

27. While Alternative 1 is the least cost option, environmental problems associated with the existing landfill will remain since current revenue sources would not allow the City of Makassar to make additional investments for addressing such problems. Therefore, Alternative 2 was selected where the improvement of landfill management can be undertaken making use of carbon revenues while the associated investment risks are minimal.

3. Financial Analysis

28. Financial analysis was conducted to (a) evaluate Gikoko based on its financial statements and (b) to assess the financial viability of the proposed project.

29. **Due Diligence of the Project Sponsor:** The project developer is an engineering company that designs, manufacturers, and installs power plants for industrial pollution control, waste management, and energy recovery systems in Indonesia. The company was established over 40 years ago in Indonesia and has been manufacturing equipment at its two

International Standards Organization (ISO) 9001 certified plants in metropolitan Jakarta since 1993. Its clients have included multinational automotive, chemical, food, and consumer product manufacturers as well as public utility companies in Indonesia. Gikoko has also participated in several World Bank sponsored CDM capacity building workshops. The company's commitment to CDM is further underscored by its development of two LFG flaring CDM projects in Indonesia, the Pontianak Landfill Gas Recovery Project and the Bekasi Landfill Gas Recovery Project for which ERPAs were signed in June 2007 and February 2008 respectively as well as an umbrella LoI the company signed with the World Bank to develop a series of CDM projects that will deliver 2 million tCO₂e of emission reductions in Indonesia.

30. A fiduciary assessment carried out for this CFO included a due diligence review of the project developer and an assessment of their financial capacity. The assessment has noted that Gikoko is registered as a 100 percent foreign-owned limited liability company in Indonesia and has the required legal registrations to be in business in Indonesia. It was capitalized at IDR 7.7 billion, equivalent to US\$ 850,000 including cumulative capital reserves equivalent to US\$ 390,000.

31. The financial assessment concluded that fiduciary risks may arise from the project developer's weak financial management capacity and also from significant debt exposure. Some risk mitigation measures are suggested, including requiring the project developer to furnish audited financial statements annually to the World Bank during the tenure of the ERPA and for Gikoko to maintain cash reserves equivalent to three months of maintenance and operating cost for each project. Further, it is recommended that the project developer furnish annually to the City of Makassar and the World Bank, an independent audited accountability statement confirming and summarizing the project developer's compliance with its obligations with respect to the City of Makassar (cash transfer of 10 percent after tax revenue) and the provision for their financing of the Community Development Plan (7 percent of after tax revenue).

32. **Project Costs:** The commercial viability of a CDM methane collection and flaring project is dependent on CER revenue as it is the only revenue stream to cover the project costs. Such projects are also heavily reliant upon the techniques employed for improving the collection efficiency. Therefore, increasing the efficiency of gas capture to achieve revenue targets entails the use of appropriate technologies and closure and capping of cells. The analysis in the feasibility study found that greater investments in such landfill improvements could substantially improve the potential emission reductions.⁸

⁸ The feasibility study for developing landfill gas flaring at the Bekasi landfill analyzed the cost and benefits of three LFG collection efficiency rates, 30 percent, 50 percent, and 70 percent. The analysis found that greater investments in landfill improvements could substantially improve the potential emission reductions. The project developer has decided to make the necessary investments to achieve a 50 percent efficiency rate which ensures sufficient methane collection while not taking on the additional financial risk associated with a larger investment to attain a 70 percent collection efficiency.

33. The required investment for the LFG collection and flaring system to achieve a 50 percent efficiency rate is relatively modest and the return on investment is significant so the financial risk is low. Moreover, the LFG system will be manufactured locally in Gikoko's facility, which will cut costs significantly. For this project, Gikoko will incur an aggregate capital investment of about US\$991,000 upon implementation and further investments over the next few years to operate and expand LFG operations to newly closed cells will bring total cost to approximately US\$2.55 million.

34. Fabrication of the LFG equipment is scheduled to begin in September 2008 and be completed in time for construction to start on-site in November 2008. Operation of the LFG facility is planned to commence in December 2008.

35. **Financing Plan:** The World Bank is not financing the construction and/or operation of any part of the activities that will generate CERs. Gikoko plans to use its own equity to finance the required investments based on its analysis and comparison of alternatives. The source of equity will be from the advanced payment that Gikoko will receive from the Pontianak Landfill Gas Project (P104482). Under the terms of the ERPA for that CFO, the Trustee (the NCDMF) shall make available an advanced payment of 730,000 Euros (seven hundred and thirty thousand Euros) to Gikoko as the project entity. The advanced payment will consist of two equal installments. The first payment is due upon registration of the Pontianak Landfill Gas Project by the Executive Board of the UNFCCC. The project was registered on May 30th, 2008. The second installment will be due Gikoko upon completion of construction of the Bekasi Landfill Gas Project (P099679) to the satisfaction of the trustee. As of June 30th 2008, the Bekasi LFG facility was approximately 80% complete. The total value of the advanced payment from the Pontianak Landfill Gas Project is sufficient to cover the costs of design and construction of the Makassar LFG facilities (i.e. this CFO). The operating and maintenance (O&M) costs will be covered by Gikoko's own equity in the first year of operation following registration of the project and subsequently thereafter by the revenue received from the sale of CERs. As discussed in the following section, the internal rate of return (IRR) for the project is significant and will be more than sufficient to cover annual O&M costs.

36. **Financial Analysis of the LFG Component:** Financial analysis for this project indicates an IRR of 32 percent on the investment over a 7 year life, at an assumed methane collection efficiency of 50 percent. At a conservative estimate of 30 percent collection efficiency, the IRR drops to around 15 percent. The project developer considers this as an adequate return on investment and has decided to make the necessary investments to achieve a 50 percent efficiency rate which will ensure sufficient methane collection.

37. The financial assessment provided in Table 1 demonstrates that without a revenue stream generated via the destruction of methane the proposed project is not sustainable. Table 2 demonstrates that with a revenue stream generated via the destruction of methane (at a 50 percent efficiency rate) the proposed project is not only sustainable, but also provides the additional finance required for SWM improvement within the city.

Table 1: Financial Analysis without CER Revenue

Costs	Amount (\$US)	Frequency
Initial Capital Investment	\$991,733	On implementation
Expansion/Extension of LFG collection system over 7 year life of project	\$958,100	On closure of cells
Operation & Maintenance costs (7 year project cycle)	\$601,147	Total of life of project
Total	\$2,550,980	
Financial Indicators		\$US
Total Debt		\$0
Total Equity		\$1,949,833
IRR (#NUM! Denote that the number is a large negative or unable to calculate)	Project	#NUM!
	Asset	#NUM!
NPV	Discount Rate	
	\$US	
	10.00%	-\$2,168,198
	15.00%	-\$2,033,319
	18.00%	-\$1,965,001
	WACC (asset)	-\$2,370,636

Table 2: Financial Analysis CER Revenue

Costs	Amount (\$US)	Frequency
Initial Capital Investment	\$991,733	On implementation
Expansion/Extension of LFG collection system over 7 year life of project	\$958,100	On closure of cells
Operation & Maintenance costs (7 year project cycle)	\$601,147	Total of life of project
Total	\$2,550,980	
Project Revenue	Tonne CO₂e Sold	\$US
CERs Revenue based on ERPA sale of ERs over 7 year period 2008 - 2014 (@ \$12.00 / tonne CO ₂ e)	639,201	\$7,670,415
Financial Indicators		\$US
Total Debt (Upfront finance CDM Development)		\$0
Total Equity		\$1,949,833
IRR	Project	37.70%
	Asset	38.49%
NPV	Discount Rate	\$US
	10.00%	\$1,691,127
	15.00%	\$1,189,896
	18.00%	\$948,064
	WACC (asset)	\$3,285,285

4. Institutional

38. **Letters of Intent and Memorandum of Understanding:** The LoI for the Makassar LFG project was signed between the World Bank and the City of Makassar on June 26, 2006 and first amended on November 18, 2006 to accommodate the city's request for the World Bank to pre-finance the cost of the feasibility study, the Carbon Finance Document, and other appraisal documents to be completed prior to ERPA signing. The LoI was amended a second time on November 16, 2007 to extend the validity period of the LoI to accommodate the completion of the tender and award process for the selection the project developer. After the selection of Gikoko as the project developer, the City of Makassar and the company signed an MoA on December 17th, 2007, transferring the ownership rights of the CERs from the City of Makassar to Gikoko.

39. The MoA also describes a revenue sharing agreement between the two parties and the rights and responsibilities of each party. Since the City of Makassar has transferred ownership rights of the CERs to Gikoko, the ERPA will be between Gikoko and the World Bank. In addition, upon transfer of the ownership rights for the emission reductions to Gikoko, the

original LoI between the City of Makassar and the World Bank was superseded by the umbrella LoI the company (Gikoko) signed in November 2006 with the World Bank to develop a series of CDM projects. The emission reduction credits from this project will count toward the delivery of the 2 million tCO₂e in the umbrella LoI.

40. According to the MoA between the two parties, this CDM project will be implemented under a 15-year BOO commercial agreement. Under the terms of the BOO agreement, the city government will continue to own and operate the landfill; manage waste collection and disposal of new waste in active disposal cells; and be responsible for other issues such as leachate control, storm water drainage, and security of the municipal landfill. Gikoko will be responsible for closing waste disposal cells once full and installing, operating, and owning the LFG extraction and flaring facilities that will produce the CERs from the closed cells.

41. As per the terms of the MoA between Gikoko and the City of Makassar, Gikoko will transfer 10 percent of the after tax CER revenues to Makassar as its share of the revenue. In return, Makassar has agreed to increase the waste collection rates by 5 percent annually. Gikoko will set aside an additional 7 percent of the after tax revenue to fund a community development plan (CDP) for the nearby communities. The CDP will be jointly managed by Gikoko, the City of Makassar, and the local beneficiaries.

42. **Registration and Certification:** The project sponsor submitted the project for approval to the Designated National Authority (DNA) on January 25, 2008 and approval was granted on March 6th, 2008.⁹ The ERPA between the World Bank and Gikoko is expected to be signed before the project is registered with the CDM Executive Board. However, the Validator has submitted the project for registration to the Executive Board of the UNFCCC

43. There are three institutional requirements for clearing a project through the CDM Executive Board: validation (that the project as designed is consistent with approved methodologies, and workable, and may be registered), verification (that the project as implemented is consistent with the approved design) and certification (that CERs have been generated as designed, and may therefore be certified). The DOE contracted for the validation of the project completed its assessment in April 2008. This CDM project meets all the criteria for all the required approvals; therefore, registration of the project with the CDM Executive Board is expected by November 1st, 2008. Verification and certification will follow registration.

44. This project activity is built on the CDM approved methodology ACM0001 - Version 08 "Consolidated baseline methodology for landfill gas project activities." Under this methodology, emission reductions are subject to periodic review and ex post determination, to determine whether the emission reductions have been achieved in compliance with applicable CDM rules and procedures and specific terms of the ERPA. For this, Gikoko must collect and

⁹ DNA – Designated National Authority, a body appointed by a CDM host country to oversee CDM implementation within its jurisdiction. In Indonesia the DNA is located in the Ministry of Environment (KLH).

archive all relevant data necessary for calculating emission reductions from the project activity in accordance with a Monitoring Plan included in the PDD. The Monitoring Plan, established under the ERPA, will provide the methodology and tools for measuring and calculating CERs generated by the project.

45. Gikoko will implement the Monitoring Plan as part of the implementation of the LFG collection and flaring facilities. Gikoko has assembled a CDM team including three environmental staff fully engaged in the CDM business to oversee these activities.

5. Safeguards

46. This project triggers only the Environmental Assessment Operational Policy OP4.01 and was designated a Category B at the concept-stage Safeguards Review Meeting, as the potential adverse environmental impacts due to the installation and operation of LFG collection and flaring facilities are site-specific and manageable with readily available mitigation measures. To ensure compliance with the Safeguards Policy, an Environment Assessment (EA) has been conducted for the LFG collection and flaring system, and an Environmental Management Plan (EMP) established. Adverse environmental impacts such as air pollution and safety due to the installation and operation of the LFG collection and flaring facilities are not deemed significant and can be well managed by planned mitigation measures. The project developer, Gikoko, in cooperation with the owner and operator of the landfill, the City of Makassar will be responsible for the implementation of the EMP. Environmental and social due diligence reports for the project were also prepared and together with the EA report for the LFG component of the project were disclosed in the World Bank's InfoShop on November 5, 2007 and locally on November 23, 2007.

47. Table 3 lists the applicable safeguard policies.

Table 3: Safeguard Policies

Applicable?	Safeguard policy: If applicable, how might it apply?
Applicable?	Safeguard policy: If applicable, how might it apply?
<input checked="" type="checkbox"/>	Environmental Assessment (OP/BP 4.01)
<input type="checkbox"/>	Natural Habitats (OP/BP 4.04)
<input type="checkbox"/>	Pest Management (OP/BP 4.09)
<input type="checkbox"/>	Involuntary Resettlement (OP/BP 4.12)
<input type="checkbox"/>	Indigenous Peoples (OP/BP 4.10)
<input type="checkbox"/>	Forests (OP/BP 4.36)
<input type="checkbox"/>	Safety of Dams (OP/BP 4.37)
<input type="checkbox"/>	Cultural Property (OP/BP 4.11)
<input type="checkbox"/>	Projects in Disputed Areas (OP/BP 7.60)
Note:	

6. Environmental Analysis

48. The project boundary for safeguards compliance includes the LFG extraction and flaring facility including (i) a collection system consisting of horizontal and vertical wells and collection pipes; (ii) LFG pumping equipment including a pipeline and blowers; (iii) LFG treatment and flare system; and (iv) a monitoring and control system. Moreover, the project boundary only includes those areas of the landfill that are directly affected by the CDM project and thus areas that will not contribute LFG to the project during its lifetime, are not considered within the project boundary.

49. In addition to the global benefits through the combustion of methane, the project will bring in significant positive local environmental consequences because: (a) capturing methane at the levels estimated in the feasibility study will require improved management of leachate and capping for closed cells; (b) waste collection rates are expected to increase due to the investment of CER revenues in capacity improvements.

50. At the existing landfill site where the LFG collection and flaring system will be installed, leachate collection and treatment facilities are not working well. As a result, most of the generated leachate is assumed to flow into nearby marsh and groundwater, which may cause negative environmental and health impacts. Therefore, while not within the boundary of this project, an assessment of the entire existing landfill's performance was conducted for due diligence, and priority measures for improving landfill management and operation were recommended. The City of Makassar is now considering how to mobilize financial resources to implement such measures.

51. **Key environmental issues:** The main environmental issues associated with the project include air pollution and safety related to LFG combustion in the operational phase, as well as dust, noise, and workers' safety in the construction phase. Possible environmental, health, and safety risks associated with LFG flaring in the operational phase are summarized below in Table 4 along with the applicable national and international (UK) emission standards for LFG flaring.

Table 4: Emission Risks and Standards for LFG Flaring

Parameter	Risk Generated	Emission Standards	
		National*	UK**
Carbon Monoxide (CO)	Health risk	No Standard	50 mg/Nm ³
Nitrogen Oxides (NO _x)	Health risk	1,000 mg/ Nm ³	150 mg/Nm ³
Methane (CH ₄)	Health & safety risks (fire & explosion)	No Standard	10 mg/Nm ³
Hydrogen (H ₂)	Safety risk (fire & explosion)	No Standard	No Standard

* Indonesia National Emission Standards for Miscellaneous Industries (Kep-13/MENLH/3/1995)

** United Kingdom Emission Standards for Enclosed Landfill Gas Flares

52. **Environmental Management Plan:** The EMP for the project is summarized below for the construction phase in Table 5 and for the operational phase in Table 6. The project developer has the ultimate responsibility in implementing the EMP, with close cooperation with the landfill operator, the City of Makassar.

Table 5: Summary of Construction Phase EMP

Item	Key Mitigation Measures	Implementation Timing and Entity
Air and Noise	- Periodic maintenance of vehicles - Water spraying 2-3 times a day - Planting of proper plants for barrier	During construction phase Project sponsor and Makassar City
Odor and vector	- Cell cover with soil every 1-3 days - Final cell cover with impermeable tarpaulin or geotextile	
Water	- Construction of affluent surface water shifting - Landfill compaction to prevent water infiltration - Final cell cover with impermeable tarpaulin or geotextile	
Safety	- Provision of safety gears to construction workers	

Table 6: Summary of Operational Phase EMP

Item	Key Mitigation Measures	Implementation Timing and Entity
Air and Odor	- Employment of enclosed and low emission flaring system - Installation of odor detector	During operation phase Project sponsor and Makassar City
Water	- Continuous operation of leachate treatment ponds	
Noise	- Routine maintenance of equipment	
Fire, explosion and asphyxia	- Preparation of fire fighting appliances - Proper room ventilation - Placement of danger caution marking	
Safety	- Provision of safety gears to operators - Periodic health check for operators	

53. **Environmental Monitoring Plan:** The environmental monitoring plan has been developed for the construction and operational phases. In accordance with the monitoring plan, the project developer will conduct periodic environmental monitoring for air quality and noise, odor, surface and ground water, and public health.

54. **Public Consultation and Information Disclosure:** Consultation with local communities (including waste pickers), local government officials, and local NGOs was undertaken on June 23, 2007 and again in June 2008 during preparation of the Community Development Plan. About 30 people attended the meeting in June 2007 and participants raised concerns about odor, health, and other impacts, but expected that this project would provide an opportunity to mitigate such problems. At the time of preparation of this document, the reports of the June 2008 consultations were not yet available. These would be made public when they are available.

55. **Existing Landfill Site and Operation:** TPA Tamangapa started its operation in 1993 and is the only available landfill for the City of Makassar. The landfill is located in the Tamangapa area, 15 km from the center of Makassar and covers 14.3 hectares of land. The landfill receives waste from the city, mainly organic waste from residential areas. It also receives waste from commercial areas, markets, offices, public facilities, and industrial areas. No hazardous wastes are allowed to be disposed in the landfill. Recyclables in unloaded waste are collected and sold by scavengers, while all remaining waste is transported to an active disposal cell and compacted with heavy machinery. There is a leachate treatment pond, but aeration equipment is not working well. There are no major water channels around the site so that most of the generated leachate is assumed to flow into nearby marsh and groundwater.

56. **Key Environmental Issues:** The most significant environmental problems associated with the existing landfill are leachate, offensive odors, flies, and smoke due to landfill fires, some of which cause complaints from nearby communities. To mitigate such problems, landfill operations including the location of waste unloading and placement practices have been changed. However, further measures are required to satisfactorily address these issues. Monitoring results indicate that applicable water quality standards are being met at three monitoring wells and there is no indication of impacts on the health of villagers. There have been no cases of landslides or waste collapses at the site.

57. **Recommended Mitigation Measures:** Given the necessity of improved landfill management, the Environmental Due Diligence Report recommended priority measures for the City of Makassar including:

- Rehabilitation and new construction of leachate collection and treatment facilities, and their proper operation and maintenance
- Use of heavy machines for waste placement and compaction, and their proper operation and maintenance
- Construction of a waste sorting facility
- Provision of fencing for safety and avoidance of litter.

58. No concrete financing plan for such improvements has been identified so far, but it is recommended that the City of Makassar explore and mobilize funds such as a Central Government subsidy, a portion of its CER revenues, and the city's own existing funding sources.

7. Social Analysis

59. There are 3 main issues regarding social safeguards; (i) land acquisition; (ii) indigenous peoples; and (iii) the social development plan.

60. **Land Acquisition:** The last land acquisition for the TPA Tamangapa landfill was 3 hectares in 2002 which brought the total area of the landfill to 14.3 hectares which is

sufficient for the operation of the landfill through 2012 and mining of the closed cells could extend the use of this area. The CDM project, including the LFG collection and flaring systems plus ancillary equipment will be within the boundary of the existing landfill's 14.3 hectares. The methane that will be generated and collected as part of these CDM activities will only come from disposal cells within the existing 14.3 hectare site.

61. In the future, the City of Makassar plans to expand the landfill site gradually depending on the availability of the local budget. In 2007, the city allocated budget for 3 more hectares of land acquisition.¹⁰ The land is not used for any commercial practices and there are no inhabitants or buildings located on it. The land to be acquired is considered outside the CDM project boundary as it will not be accepting waste and thus not producing landfill gas during the CER crediting period through 2012 when the NCDMF will be purchasing credits. Therefore, this project does not trigger Involuntary Resettlement Operational Policy OP 4.12.

62. **Indigenous Peoples:** The communities living and working in or around the landfill include the Makasar, Bugis, Javanese, Kalimantan, and Maluku ethnic groups. Through public consultations, focus group discussions, and in-depth interviews with local communities, NGOs, academics, scavengers, and relevant agencies it was confirmed that scavengers and people who are living near the landfill site are migrants from other districts or islands and not indigenous peoples as described in Indigenous Peoples Operational Policy OP. 4.10 as they are: (i) not the original inhabitants of the area; and (ii) not dependent on the natural resources. Therefore, OP. 4.10 is also not triggered by this project.

63. **Social Development Plan:** The scope of the local community plan that will be funded by a portion of the CER revenues includes environmental, health, education, and economic development for the community as well as capacity building for occupational health and safety of communities living near the landfill. As these activities will not involve large-scale infrastructure or land acquisition, no Safeguards are triggered by the Social Development Plan.

64. This area identified to benefit from the Social Development Plan consists of four neighborhood associations, Rukun Tetangga (RTs) in Kampong Bontoa, Kampong Kajengjeng, and Kampong Kasi (see Table 7). The nearest Kampong is located about 0.2 km from the landfill site and the farthest is about 1 km.

¹⁰ Land compensation refers to the Presidential Decree No. 36 of 2005 and 65 of 2006 and the National Land Agency Regulation No. 2 of 2007.

Table 7: Neighboring Settlements around the Landfill Area

Name of settlement	Number of people	Ethnic identity	Any relation to landfill	
			Employees of DKP	Scavengers
Kampong Bontoa (RT04/RW05)	1,256	Makasar, Bugis, Javenese,	2 Families	95 adults and 23 children (<15 years)
Kampong Kajengieng (RT03/RW06)	985	Makasar, Bugis, Javenese, Kalimantan, Maluku, Papua	1 Family	53 adults and 15 children (<15 years)
Kampong Kasi (RT04/RW03)	1,034	Makasar, Bugis, Javenese, Kalimantan, Maluku, Papua	3 Families	57 adults and 10 children (<15 years)
Block D in non-permanent shelter	-	Makasar	-	10 families (37 people)
Outside the landfill	-	Makasar	-	9 people

65. There are 299 scavengers collecting waste at TPA Tamangapa landfill. Most of them are ethnic Makasar (95 percent) and the rest are Bugis (4 percent) or Javenese (1 percent). The average daily income level of the scavengers is approximately IDR 15,000 – IDR 40,000 (see Table 8). For example, scavengers can earn IDR 800/kg for plastic bags, IDR 2,000/kg for cartons, IDR 4,000/kg plastic bottles, IDR 2,400/kg for other plastics, and IDR 100/kg for trash bags. Most children spend the day assisting their parents with waste picking activities.

Table 8: Average Daily Income Level of Scavengers at TPA Tamangapa

Category	Number of people	Income/day (IDR)	Working hours
Children (5-10 years old)	48	15,000	08.00-14.00
Teenager (11-20 years old)	102	25,000	06.00-18.00
Adult (above 21 years old)	149	40,000	06.00-22.00

66. There are 48 children who live and work as scavengers. Only 10 percent of them attend school as the rest have dropped out for economic reasons. A local NGO, Yayasan Pembinaan Kader Bangsa Indonesia (YPKBI) was established in 2002 by local students and

community leaders to provide an informal education for scavengers' children. There are two programs, the first is for religious education and second is for general education and consists of Package A (equivalency program for primary school) and Package B (equivalency program for junior secondary school). Currently, there are no students in Package A. There are 20 students in the Package B program and 40 students in the religious study program. There is a lack of proper facilities including only one 7x8meter room for all classes and a small library with a limited number of books.

67. The City of Makassar provides a community medical center called Puskesmas Pembantu/Pustu that is free of charge for both scavengers and non-scavengers. Pustu is similar to a first aid center for accidents. For major illnesses, residents must use the regional hospital in Makassar which has more complete facilities. The local government's Health Services Department conducts routine spraying to control flies once every 3 months to improve health conditions. However, during the rainy season the fly population increases and the communities would prefer spraying at least once every month.

68. In June 2008, the project developer, PT Gikoko requested the services of the Social Development Specialist working specifically on the Community Development Carbon Fund, the CDCF in ENVCF, to come to Indonesia to share her experiences and to work with them to develop a meaningful and participatory Community Development Plan for this project. This work has led to the close collaboration between ongoing World Bank lending operations in Indonesia such as the UPP and this project whereby opportunities for the CDP for this project to leverage the resources and the expertise of the World Bank funded UPP for the benefit of this project. These details are being worked out and are expected to be finalized after the ERPA is signed.

8. Legacy and Reputational Risk Issues

69. No legacy or reputational risks have been identified with this CFO.

9. ERPA Main Terms/Conditions

70. The fully operational LFG collection and flaring project and subsequent CERs will be the basis for an ERPA to be signed between the project developer, Gikoko and the World Bank, the latter serving as the trustee for the NCDMF. The NCDMF will purchase CER credits resulting from the flaring of the methane collected from the landfill through a performance-based contract under which payments are triggered by successful verification of the reduction of methane emissions by an independent, accredited DOE under the rules of the Kyoto Protocol. The quantity of CERs to be contracted, the length of time over which the purchase will be made, and the price to be paid has been pre-negotiated and agreed between the World Bank and Gikoko. It is expected that once all legal clearances of the negotiated ERPA have been received and after the EAP Vice President has approved the project, the ERPA will be signed.

71. The exact number of CERs transacted will be subject to periodic verification by an independent accredited DOE, and the final project outcome will be the annual amount of delivered CERs which have been certified by the CDM Executive Board. The ERPA payments will therefore be conditioned on performance.

72. As designed, a 7 year crediting period has been chosen for this project. Table 9 shows the estimated amount of emission reductions over 7 years will be 780,188 tCO₂e. At present, the NCDMF intends to purchase the first 400,000 tCO₂e of these emission reductions to be delivered by the end of 2012.

Table 9: Estimated Amount of Emission Reductions

Year	Annual estimation of emission reductions (tCO ₂ e per year)
2008	42,654
2009	100,561
2010	109,695
2011	118,598
2012	127,395
2013	136,195
2014	145,090
Total estimated reductions (tCO₂e)	780,188
Total number of crediting years	7
Annual average over the crediting period of estimated reductions (tCO₂e)	111,455

Annex 1: Country and Sector Background

1. Recent developments at both the national and international levels have provided Indonesia with opportunities to address both climate change and improvements to local solid waste collection and disposal. With a population of 203 million (2000 Census), Indonesia is the fourth most populous country in the world after China, India, and the United States. Despite its large size and geographic and cultural diversity, Indonesia maintained a highly centralized political, administrative, and fiscal system until 2001. The centralized system weakened links between local demands and decisions on local public services, undermined local accountability, and led to ad hoc allocations of fiscal resources across regions. The decentralization of 2001 addressed these shortcomings and allowed citizens and local decision-makers in provinces and local jurisdictions to address these problems. Yet, throughout Indonesia, there continues to be a number of problems associated with public service delivery in sectors such as SWM including technical, financial, environmental, social, and institutional aspects that have not been overcome or resolved.

2. On the global front, Indonesia, recognizing that climate change may have a profound effect on the many islands of the archipelago, signed the Kyoto Protocol of the UNFCCC in 1997 and ratified it in 2004 through Law No. 17/2004. The objective of the Kyoto Protocol is the stabilization of GHG concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system.¹¹ As a non-Annex I signatory of the Kyoto Protocol, Indonesia can participate in the CDM which allows companies or entities in Non-Annex I countries to develop projects leading to reductions of GHG emissions, verify and certify these emission reductions, and transfer the CERs to Annex I entities or governments that have commitments to reduce GHG emissions under the Kyoto Protocol. The CDM offers a market-based incentive to address many of the challenges facing SWM in Indonesia by generating revenue from the capture and destruction of uncontrolled emissions of methane generated through the degradation of organic matter in landfills and dump sites.

3. This Annex provides an overview of the changes in local governance in Indonesia, the implications of decentralization for addressing SWM, the characteristics of solid waste and its management in the country, and the sector's contributions to GHG emissions.

The effects of decentralization on SWM

4. The Regional Governance Law (22/1999) and the Fiscal Balance Law (25/1999) heralded a fundamental change in the way Indonesia is governed and managed. Law 22/1999 devolved most functions of government, to Indonesia's regions, while Law 25/1999 provided the resources to finance the devolved tasks by assigning revenue sources and broad expenditure functions to the regions. In 2004, the Government of Indonesia issued Law (32/2004) and Law (33/2004) to revise Law (22/1999) and Law (25/1999) respectively. The Law (32/2004) strengthened the coordination roles of the provincial governments, while Law (33/2004) changed various regional

¹¹ [Article 2. The United Nations Framework Convention on Climate Change.](http://unfccc.int/resource/docs/convkp/kpeng.html)
<http://unfccc.int/resource/docs/convkp/kpeng.html>

financing mechanisms, in particular *Dana Alokasi Umum* (DAU) (block grants of general allocation funds) and *Dana Alokasi Khusus* (DAK) (special purpose grants) as well as the regional governments' borrowing through bond issue.

5. With these changes, local governments-*kotas* (municipalities) and *kabupatens* (districts), are now controlled by elected local councils known as *Dewan Perwakilan Rakyat Daerah* (DPRDs) and their *Walikotas* (heads of municipalities) and *Bupatis* (heads of districts) are elected by direct vote. Local governments also deliver most public services, including solid waste management and are accountable for their performance. DAU and DAK became the principal mechanisms for fiscal transfers to local governments, ending central control over local financial decision-making. Subject to certain rules and conditions, local governments have also been accorded the power to tax. Greater transparency and public participation in key local government decision-making are now mandated by law. The goals of transferring power and responsibilities to the regions were to bolster local democratic institutions and foster a new culture of governance with greater efficiency, accountability, and transparency. However, the hasty preparation and implementation of decentralization has led to a number of challenges to the efficient functioning of local governments.¹²

6. In theory, decentralization has given the local governments a degree of functional autonomy. In practice, however, most *kotas* and *kabupatens* remain heavily dependent on the center for operating revenues. On the fiscal side, the equalization formula does not adequately consider the expenditure needs for minimal service provision. Disconnects continue to exist between local government revenue and expenditure functions, leading to a situation where many local governments have more expenditure responsibilities than revenue resources. For example, while SWM coverage is relatively high, if uneven, most final disposal sites are inadequate in number and quality and revenues for collection and disposal have not kept pace with increasing demands for these services.

7. Prior to decentralization, responsibilities for SWM were scattered across several departments and ministries including the Ministry of Public Works, Ministry of Home Affairs, Ministry of Health, Agency for Technology Assessment and Development, BAPEDAL, and the Sub-Directorate for Solid Waste Management. This structure resulted in overlapping responsibilities and weak implementation and enforcement of solid waste laws and regulations. With decentralization, local governments have acquired more responsibilities in planning and implementing SWM programs within their locality.

8. Laws and regulations have been developed to properly and efficiently manage solid waste services in Indonesia. With decentralization, municipalities and rural *kabupaten* are entitled to plan and manage environmental services, including SWM. While in the long term decentralization is expected to bring about improvements in the quality of services offered, many goals have yet be achieved.

¹² Project Appraisal Document, Indonesia Urban Sector Development Reform Project, May 2005. p 4.

Solid waste collection and disposal

9. Enforcement of existing laws is generally weak due to a lack of political will, inadequate coordination among various agencies, low technical capability for proving violations, limited access to information, and lack of adequate funding. Accepted sanitary landfill practices are not being followed consistently at landfills in Indonesia. For example, soil cover may be applied once every three months. A lack of financial resources, properly trained and skilled staff, and lack of political support from the local government also contribute to SWM problems in the country. Even though there are some regulations concerning the amounts to be paid by various waste generating sources, the fees actually collected are very low. To improve compliance, the national and local governments are trying to complement existing command-and-control regulations with market-based instruments and public-private partnerships.

10. Since the late 1990s, solid waste generation has increased significantly in Indonesia as the economic situation in the country improves. While data is limited for the country as a whole, the 2003 Indonesia Environment Monitor reported that per capita generation of solid waste in major cities in Indonesia ranged between 0.66 to 0.90 kg per capita per day. Solid waste collection is decentralized and varies across regions, depending on economic prosperity, degree of urbanization, and cultural practices.

11. Local governments have the primary responsibility for garbage collection. While most municipalities carry out these activities themselves, some rely on contractors while residents are personally responsible in other cases. It is estimated that 50 percent of waste is officially collected throughout the country. Larger cities tend to have higher collection rates (up to 75 percent), but poorer areas of the cities and many rural areas are generally underserved or not served at all. Approximately 85 percent of small cities and 53 percent of medium-sized cities officially dispose of their waste in open dumps. There are several cases of small cities that do not have any official dumpsites. As a result, both waste workers and residents use illegal dumpsites as there are often no legal alternatives.

General characteristics of Indonesian municipal solid waste

12. While the composition of waste varies from site to site due to factors such as location, weather, and living standards in individual cities, most waste in Indonesia is considered high in organic content. In addition, the country's tropical environment and poor disposal practices result in a number of negative environmental impacts including leachate and landfill gas.

13. **Waste Characteristics:** Up to 75 percent of Indonesia's municipal waste is biodegradable and includes large amounts of kitchen and market waste. These types of waste are high in moisture and organic content, but low in calorific value so estimates of landfill gas production and collection should take these factors into consideration. The more economically developed cities such as Jakarta and Surabaya display similar composition of MSW as industrialized countries including a higher percentage of paper and plastics and a decrease in the putrescible matter component of solid waste.

14. One positive impact derived from the current SWM systems in Indonesia is the high level of recycling of the non-organic waste. Although the methods employed by waste pickers for sorting and separation of MSW are considered inappropriate for SWM systems as defined by developed countries, these existing methods provide an income stream to the thousands people involved in this unofficial sector and ensure a far greater amount of MSW is recycled. One of the added benefits of recycling is a higher overall organic content of the landfills.

15. **Leachate:** Uncontrolled discharges of the liquid formed in solid waste dumps or landfills, commonly referred to as leachate, contaminate groundwater and contribute to the proliferation of disease-carrying pests and pathogens. Indonesia's tropical climate results in high amounts of rainfall and as water percolates through the solid waste in landfills, it absorbs chemicals and micro-organisms present in the decomposing materials creating high levels of leachate. When properly managed, leachate is captured in a collection system and pumped to a treatment plant where it undergoes treatment prior to discharge. However, most landfill sites in Indonesia do not have such treatment facilities.

16. **Landfill Gas:** Another by-product of waste disposal sites is LFG which is produced during the decomposition of organic matter such as food waste, garden waste, and paper products. LFG is typically 50 percent methane, while the rest is comprised of mainly CO₂ and small traces of volatile organic waste (VOW), hazardous air pollutants (HAP), and odorous compounds. The composition of waste affects the amount, quality, and rate of LFG production. Landfill conditions such as moisture content, cell depth, cover, and compaction are also factors in LFG production.

17. The production of LFG begins as soon as waste is deposited in dumps and landfills and in Indonesia tends to produce gas quickly (completing LFG production within five to 10 years) due to high organic waste material such as food which decomposes rapidly, and results in lower quality gas, e.g., lower Btu content. Landfill gas production generally peaks about a year after the deposit of waste and then gradually declines, over the next 10 - 20 years. In Indonesia, the country's monsoon climate and high annual rainfall contribute to high moisture levels. As a result, waterlogged landfills may not attain optimum temperatures because the bacteria do not generate sufficient heat to raise the temperature of the excess water.

18. LFG in Indonesia can be reduced by using proven technologies applied in other countries. For example, active gas collection systems can remove LFG with a vacuum pump from the landfill or the surrounding soils. Projects in wet tropical environments such as Indonesia often employ both the traditional vertical well collection systems and horizontal well systems. These systems may provide migration control or recover methane for use as energy or flaring. The cost-effectiveness of generating electricity from landfill gas is limited by the price of electricity which can vary depending on local power costs and generating capacity. In the case of Indonesia, the current price from the national electricity utility is not sufficient to make investments in such generating facilities economically viable.

Contributions to Global GHG Emissions

19. Indonesia is one of the three largest emitters of GHGs in the world largely due to the significant release of CO₂ from deforestation which is estimated by the IPCC to release about 2,563 million tCO₂e. Yearly emissions from energy, agriculture, and waste account for a smaller amount of total GHG emissions, approximately 451 million tCO₂e. While non-deforestation contributions are relatively small in absolute and per capita terms, emissions from these sources are growing rapidly. In the waste sector the main contributions of GHGs are from methane and nitrous oxide and estimates for 2000 ranged from 32 – 60 million tCO₂e, ranking Indonesia as the sixth largest emitter in the waste sector (USEPA 2006). Estimates for the future indicate that emissions from the waste sector will grow considerably.

20. As there are no traditional incentives to reduce these emissions at Indonesian landfills, the CDM offers the first such opportunity to do so by offering a revenue stream from CERs. For CDM projects to be successful, improvements to existing landfills must be made to maximize LFG collection thus providing another benefit. In addition, with more government decision-making devolved to local governments, many more municipal governments may explore such CDM opportunities that improve SWM and the environment.

Annex 2: Participating Entities in the CDM Project Cycle¹³

1. In addition to the World Bank project cycle for developing CDM projects, the creation of CERs must also follow specified procedures under the UNFCCC CDM Project Cycle which are outlined in their website (www.unfccc.int). The UNFCCC CDM Project Cycle requires the involvement of a number of different entities. The following outlines the names and functions of the various entities participating in this cycle.

2. **Conference of Parties/Meeting of Parties (COP/MOP)** – This body has authority over, and provides guidance to, the CDM. The COP/MOP makes the final decision on all recommendations made by the Executive Board regarding DOEs and accreditation standards. The COP/MOP is also responsible for reviewing the annual reports of the Executive Board, and the regional distribution of both DOEs and CDM projects. In addition, the COP/MOP assists in the arrangement of CDM funds.

3. **Executive Board** - The CDM Executive Board supervises the CDM and reports directly to the Conference of Parties to the UNFCCC /the Meeting of Parties to the Kyoto Protocol (COP/MOP). The Executive Board is comprised of 10 members from Parties to the Kyoto Protocol, as follows: one member from each of the five United Nations regional groups, two other members from the Parties included in Annex I, two other members from the Parties not included in Annex I, and one representative of the small island developing states.

4. The Executive Board is responsible for:

- Making recommendations to the COP/MOP on amendments as well as on further modalities and procedures for the CDM;
- Approving new methodologies related to baselines, monitoring plans, and project boundaries;
- Reviewing simplified procedures and definitions of small-scale projects and reporting to the COP/MOP;
- Accrediting and suspending operational entities;
- Reviewing accreditation procedures;
- Making publicly available proposed CDM activities and all procedures for developing a CDM project;
- Developing and maintaining a CDM project registry;
- Reviewing project validation and verification reports; and
- Issuing verified CERs.

¹³ The text in this annex is adapted from two publications: ESMAP's publication "Handbook for the Preparation of Landfill Gas to Energy Projects in Latin America and the Caribbean," April 2004
http://imagebank.worldbank.org/servlet/WDSContentServer/IW3P/IB/2005/08/09/000160016_20050809131543/Rendered/PDF/332640handbook.pdf

And UNDP's "Clean Development Mechanism: A Users Guide,"
<http://www.undp.org/energy/docs/cdmchapter2.pdf>

5. **Project Participants** – Private and/or public entities interested in participating in the CDM process are obligated to ensure that the project is consistent with the submitted documentation. They are responsible for choosing an accredited DOE to validate and verify their project activity as part of the CDM project cycle. At the registration of the project, a Project Participant will sign a document indicating the methods of communication to be used with the Executive Board and the allocation of CERs.

6. **Designated Operational Entity (DOE)** – These entities are accountable to the COP/MOP through the Executive Board and must comply with the procedures set out by the Executive Board. They are selected by the Project Participant, certified by the Executive Board, and are responsible for validating proposed CDM project activities and verifying and certifying anthropogenic GHG emission reductions. They are responsible for disclosing any possible conflict of interest arising from a CDM project, as well as maintaining a record of each project for which they have carried out validation, verification, and certification.

7. **Applicant Entity**– This entity is permitted to submit a new methodology for review by the Executive Board. This is permitted assuming that a CDM assessment team has been assigned by the Executive Board to the Applicant Entity, and that the Applicant Entity maintains documentation of the new methodology submitted to the Executive Board.

8. **Designated National Authority (DNA)** - The Marrakech Accords state that in order to participate in the CDM, a country needs to be a Party (signed and ratified) to the Kyoto Protocol. CDM host countries also have to specify a domestic institutional body – a designated national authority or DNA –for approving CDM projects. The host country – via the DNA– must approve each CDM project and ensure that it conforms to their sustainable development criteria.

9. **CDM Secretariat** – The Secretariat is responsible for providing technical and secretarial services to the Executive Board, as well as other CDM sub-committees. This includes the dissemination of information submitted to the Executive Board, such as the PDD and the approved methodology descriptions, through the CDM website and keeping a record of these documents throughout the project life. They also identify promising projects, provide advice, and promote projects to outside investors.

Annex 3: Detailed Project Description

Background

1. The City of Makassar is located in Southwest Sulawesi and with a population of approximately 1.3 million in 2007. In 1993 Makassar established its new final disposal site, TPA Tamangapa. This landfill is currently about 14.3-hectare in size and is located at Tamangapa area, sub district of Manggala, 15km from the center of Makassar City.

2. Since commencing to receive MSW in 1993 the landfill has received approximately 1,240,000 tonnes of organic MSW to the end of 2007. At the current time, MSW generation is estimated at around 3800m³/day, and the city disposes about 458 metric tones/day of this into the TPA Tamangapa, which is around 48% of the total waste generated in the city. This low level of collection service has major detrimental impacts on the environment and health within the city. These include local air pollution from the burning of waste in the streets, ideal breeding conditions for disease vectors, constant flooding from waste blocking drainage and waterways, and emissions of GHGs and other toxic gases.

3. The sustainability of landfill management has been recognized as a problem with previous projects in Indonesia. These issues will be addressed through a public-private partnership and the introduction of a market mechanism (the CDM) that will provide a financial incentive to improve SWM services. This CDM project will be implemented under a BOOT commercial agreement between the project developer, Gikoko, and the City of Makassar that will cover the LFG collection and flaring systems as well as the required budgetary requirements for landfill management and waste collection improvements. This private sector approach to investment in municipal solid waste management will be one of first for Indonesia, demonstrating the potential for removing commercial barriers that have restricted private sector investment into sustainable waste management in Indonesian cities and the associated environmental and social improvements.

4. Indonesian design guidelines¹⁴ and standards¹⁵ for landfill construction and operation require only basic gas venting to be installed but there is no enforcement of even this basic requirement. Environmental regulations are equally limited in their guidelines for reducing the environmental impacts of methane production and emissions from landfills. Without strengthened policies, regulation requirements, and financial capacity the current practice of “controlled open dumping” with little regard to methane gas generation and emissions from landfills will be continued by local governments. Implementation of this proposed CDM project will therefore substantially reduce anthropogenic emissions through the installation of the proposed LFG collection system and the destruction of the methane content of the LFG.

¹⁴ Department Pekerjaan Umum, *Spesifikasi area penimbunan sampah dengan system lahan urug terkendali di TPA Sampah*, Pt S-07-2000-C

¹⁵ Badan Standardisasi Nasional (BSN), *Tata cara teknik operasional pengelolaan sampah perkotaan*, SNI 19-2454-2002, and *Tata cara pemilihan lokasi tempat pembuangan akhir sampah*, SNI 03-3241-1994

5. The organic content in municipal waste disposed in landfills produces methane gas as a bi-product of anaerobic decomposition, a process that will continue for many decades until all available organic content is degraded. The organic waste disposed of during the expected remaining operational lifetime of the landfill will generate and emit methane gas as the available organic carbon resources are degraded. Calculations using the First Order Decay Model, forecast potential emissions during the proposed 21-year project period (2008 – 2014) at approximately $278.641 \times 10^6 \text{ m}^3$ methane, minus that which is oxidized (10 percent) within the landfill leaving potential atmospheric emission of $250.777 \times 10^6 \text{ m}^3$ methane. This is equivalent to approximately **3,774,894** tonne CO₂equivalent.

Project Participants

6. The project developer, Gikoko, under a BOOT agreement with the Municipality of Makassar, will construct and operate an LFG collection and flaring facility that will produce the CER credits. Gikoko is responsible for all financing, construction, and management of the LFG components. The World Bank-managed NCDMF will purchase of CER credits that result from the flaring activities from the project sponsor. Table 10 lists the parties involved in this Carbon Finance Transaction.

Table 10: Carbon Finance Transaction – Parties Involved

Name of Party involved (‘host’ indicates a host Party)	Private and/or public entity(ies) project participants (as applicable)
Indonesia (host)	Gikoko Kogyo Indonesia The Municipal Government of the City of Makassar, South Sulawesi, Indonesia.
The Netherlands	International Bank for Reconstruction and Development (“IBRD”) acting as the trustee of the Netherlands Clean Development Mechanism Facility (“NCDMF”)

Project Components

7. This CDM project consists of two distinct components: (i) Component A: the construction and operation of LFG collection and flaring equipment that will result in the CERs to be purchased; and (ii) Component B: a carbon finance transaction that will facilitate the purchase of CERs.

Component A: LFG Collection and Flaring

8. The installation of a landfill gas collection and flaring system will result in a reduction in methane which constitutes approximately 50 percent of LFG. Methane has a global warming potential 21 times that of CO₂ and combusting it will generate revenue through the sale of CERs. To achieve the objective of creating CERs, the project will employ a proven technology and engineering approach to LFG extraction and flaring with the potential to add an additional small-scale electricity generation component. These systems have been established on many landfills around the world and this will be the third such operation in Indonesia following the development in June 2007 of similar LFG collection and flaring activities in Pontianak, West Kalimantan, Indonesia and in Bekasi, West Java, Indonesia in June 2008. The basic operating principle is the application of a vacuum in the waste mass to extract the gas. The main components of the collection system to be installed are as follows:

- **Collection System:** The project will employ a horizontal LFG collection piping system. The design of this system will employ dropouts within the collection systems to reduce the impacts of excessive leachate and condensation on the extraction system. Horizontal collection piping will be progressively installed during the filling of new cells and designed to ensure protection from damage during filling operations. This system will increase LFG capture during the period of filling, reduce the impact of high leachate levels, and provide improved leachate drainage within the cells. These LFG extraction wells will be connected to a manifold pipe that will carry the LFG to the blower facility. Condensation which forms in the collection system pipe work will be controlled by self-draining condensate traps and manholes fitted with pumps where necessary.
- **Landfill Cell Closure:** The “entombed cell” technique will be used for cell closure to improve LFG efficiency and leachate discharge and reduce rainfall infiltration. This form of closure is recommended for all landfills in western countries so as to limit methane gas emissions and improve gas collection efficiency. The cells will be capped with a synthetic liner which is then covered with a 300mm vegetation layer. As a result, infiltration of rainfall is minimal which reduces leachate levels in the cells and maximizes the LFG capture due to the liner prohibiting LFG surface emissions. As this technique reduces internal moisture content of the cells, moisture content levels of the cells will be monitored and a leachate recycling system will be employed.
- **Leachate Management System:** To maintain low levels of leachate, a leachate management system will be installed to improve LFG recovery efficiency. This system will include the recycling of leachate within the landfill.
- **LFG Pumping Equipment:** A pipeline manifold system and single-stage centrifugal blowers will be installed. A pipeline will convey the LFG from the well system to the LFG treatment unit.

- ***LFG Treatment Unit:*** The treatment units will consist of condensate and flare systems. A knockout vessel will be used to remove gas condensate. The project will utilize an enclosed flare system (also known as ground flare), in which an insulation system will reduce heat losses and enable operation at higher temperatures. An enclosed flare, which meets the United Kingdom Environmental Protection Agency (UK EPA) “Guidance on Landfill Gas Flaring”,¹⁶ or similar standards, will be installed to burn the LFG in a controlled environment so as to maximize the destruction of methane and other harmful constituents before discharging them safely to the atmosphere.
- ***Monitoring and Control Systems:*** The facility’s monitoring and control systems will be linked by telemetry to an off-site supervisory control and data acquisition monitoring location which will allow for real time performance monitoring, systems control, error logging, analysis, and reporting. In addition, monitoring points and valves will be installed at each wellhead to allow for manual measurements and “tuning” of individual wells to ensure optimum performance of the collection system.
- ***LFG Generator, 120 kW output capacity:*** In the future, the project may utilize a small percentage of the collected LFG for the generation of electricity required to meet the needs of the facility. During implementation, studies will be undertaken to evaluate the potential for such electricity generation. There are no plans to provide electricity to the grid or anywhere outside the boundary of the CDM project.

9. An active LFG collection system consists of the mechanical blower described above to a system of gas extraction wells or collection trenches. A pressure gradient is created in the wells or trenches, thereby forcing the removal of gas from the landfill. The gas is then piped to a flare. The effectiveness of an active LFG collection system depends greatly on the design and operation of the system, and on the methane generation capability of the landfill waste. An effective collection system should be designed and configured so as to:

- handle the maximum LFG generation rate;
- effectively collect LFG from all areas of the landfill; and
- provide the capability to monitor and adjust the operation of individual extraction wells and trenches.

10. Air intrusion is a major concern in the design of the active LFG collection system as air intrusion may naturally permeate through the landfill cover and into the refuse. Drainage points must also be incorporated within the connector pipe work to ensure drainage of leachate and condensate. This pipe work must be laid on a gradient so as to ensure drainage and scouring of the pipes.

¹⁶ Environmental Agency, *Guidance on Landfill Gas Flaring*, Environmental Agency & SEPA, Bristol, UK, November 2002, ISBN: 1844320278

11. The collection pipe is designed using horizontal trenches in order to maximize the capturing of landfill gas in the initial two closed cells and will be applied continuously to other cells – after closure – in order to maximize the utilization of the equipment.

Component B: Carbon Finance Transaction

12. The World Bank-managed NCDMF will finance the purchase of CER credits resulting from the flaring of the gas. The purchase will be a performance-based contract under which payments are triggered by successful verification of the reduction of methane emissions by an independent, accredited international entity, DOE, under the rules of the Kyoto Protocol. The quantity of CERs to be contracted, the length of time over which the purchase will be made, and the price paid will be agreed between the World Bank and the project sponsor during ERPA negotiations.

Estimated emission reductions during the crediting period

13. The volume of methane captured and flared from Makassar’s municipal solid waste landfill, TPA Tamangapa is dependant upon the efficiency and effectiveness of a leachate and LFG management design. The project has been designed to achieve a 50 percent efficiency of methane collection. Methane gas composition of 50 percent is typically given for LFG concentrations as per the default given in the IPCC (1996). This default figure was used to estimate emission reductions for the project due to the complex nature of anaerobic decomposition within landfills. The average yearly emission reductions are estimated to be 52,833tCO₂e. Table 11 shows the yearly emission reductions of 357,538 that are expected through 2014.

Table 11: Estimated Project Emission Reductions

Project Years	Methane Reduction (tCO₂e / year)
2008	8,750
2009	48,911
2010	53,617
2011	58,077
2012	62,438
2013	66,801
2014	71,239
Total estimated reductions (tonnes of CO₂e)	369,832
Total number of crediting years	7
Annual average over the crediting period of estimated reductions (tonnes of CO₂e)	52,833

BOO Agreement for the LFG Collection and Flaring Facility

14. The operation of the LFG flaring project will require both financial and technical resources. The project sponsor and the City of Makassar have addressed the lack of public funds available for landfill management, including methane abatement as part of a 15 year BOO commercial agreement where the project sponsor owns the LFG collection and flaring systems to be installed at the project site. As such, the project sponsor will own the emission reductions that result from the flaring of methane. The local government will continue to own the landfill and be responsible for waste collection and disposal.

Annex 4: Implementation Arrangements

1. Monitoring and reporting will be undertaken by a yet to be identified independent consultant contracted for maintenance and testing of the monitoring equipment as well as undertaking the ongoing monitoring of the project. Monitoring points and control systems of the facility will be linked by telemetry to an off-site SCADA monitoring location which will allow for real time performance monitoring, systems control, error logging, analysis and reporting. In addition, monitoring points and valves will be installed at each wellhead to allow for manual measurements and “tuning” of individual wells to ensure optimum performance of the collection system.

2. ISO 10012:2003 standards will be applied. The definition of ISO 10012:2003 specifies generic requirements and provides guidance for the management of measurement processes and metrological confirmation of measuring equipment used to support and demonstrate compliance with metrological requirements. It specifies quality management requirements of a measurement management system that can be used by an organization performing measurements as part of the overall management system, and to ensure metrological requirements are met.

Annex 5: Financial Management and Fiduciary Issues

Summary

Project Developer

1. A fiduciary assessment carried out for this proposed arrangement included a due diligence on the project developer, Gikoko and an assessment of their financial capacity. The assessment has noted that Gikoko is registered as a foreign investment limited liability company in the country and has the required legal registrations to be in business in Indonesia. It is capitalized at Rupiah 7.7 billion, equivalent to US\$ 850,000, including cumulative capital reserves of about Rupiah 3.5 billion. Audited financial statements of the sponsor company for the years 2001 to 2006 have been reviewed as well as an un-audited financial statement for 2007, ended December 31, 2007.
2. The audit reports for the years 2004 and 2005 have a qualified audit opinion, due to the absence of supporting details for the valuation of the year-end inventory, consisting substantially of work in progress. Audited Financial Statements for year ended December 31, 2006 were not available at the time of project appraisal.
3. It was noted that significant amounts are due to and from an affiliated company, including financial accommodation received from its shareholders for raw materials and unsecured loans provided to its shareholders.
4. Fiduciary risks may arise from the weak financial management capacity of the sponsor. Some risk mitigation measures are suggested, including the obligation to furnish audited financial statements annually to the World Bank. Further, it is recommended that the Project Developer furnish to the local government of Bekasi and the World Bank annually an audited statement confirming and summarizing the compliance with its obligations with respect to the cash transfer of 10 percent of after tax revenues to the City of Bekasi and the provision for financing of the Community Development Plan with 7 percent of after tax revenues.
5. The 2007 un-audited financial statement indicated the following:
 - Investment in the Pontianak LFG Project (P104482) amounted to IDR 7,853,908,471 and was financed through current liabilities amounting to IDR 20,956,754,815.
 - The company showed a gross loss of IDR 6,736,585,652 and loss before income tax of IDR 9,102,652,019.
 - The liquidity ratios indicated that current assets of the company were only 47.6 percent of the current liabilities.
 - The debt ratio indicated that 95 percent of the assets are financed through liabilities.

6. In a letter dated May 5th, 2008, Gikoko informed the World Bank that they had secured a loan of US\$800,000 (eight hundred thousand US Dollars) from their commercial lenders Mizuho Bank, and that they would be applying part of this loan, up to a maximum amount of US\$600,000 to the construction of the Bekasi Landfill Gas Project (P099679).

7. On July 1st, 2008, the Minister of Environment of Indonesia in the presence of the Mayor of the City of Bekasi and his staff, officials of the Dutch Embassy in Jakarta, members of the Bank Task team and staff from the World Bank Country Office, numerous members of the press and other invited guests, officially launched and commissioned the fully constructed LFG plant at the Bekasi Landfill site, the TPA Sumur Batu. One of the closed cells was completed covered by then and work was ongoing on other closed cells.

Shareholders of the Project Sponsor Company

8. The Company is owned by foreign investors, as follows:

Name of Foreign Investor	Percentage of Ownership
Giko Corp., Japan	20%
Gie Hing Co., Ltd, Hongkong	20%
Iikoh Co., Ltd, Japan	60%
	100%

City of Makassar

9. According to the MOA between the City of Makassar and Gikoko, the City of Makassar is to receive 10 percent of after tax revenue as a cash transfer into the City's treasury.

Community Risk

10. Gikoko is obliged to provide 7 percent of total net after tax CERs revenue as per the MOA to fund the Community Development Plan (CDP). This 7 percent will be provided annually based on the division between the total amount and ERPA validity term.

11. Accountability reports should be produced annually and made accessible to the public. Specific guidelines should be prepared to ensure that the fund is managed transparently and properly.

Operational Risk

12. Financial audit reports should be produced annually and submitted to the city government and to the World Bank.

13. The purchase of CER credits will be a performance-based contract under which payments are triggered by successful verification of the reduction of methane emissions by an independent, accredited international entity, the DOE under the rules of the Kyoto Protocol.

Commercial Risks

14. The commercial viability of a CDM LFG collection and flaring project is heavily reliant upon the techniques employed for improving the collection efficiency. The use of substandard means of capping of Indonesia landfill cells is a major impediment to efficient collection of LFG. Appropriate cell closure and capping is an investment into collection efficiency and hence return on investment.

15. Poor financial viability would generate commercial risks. A technical and financial feasibility study of this operation has been completed by the project developer and found that at 50 percent methane collection efficiency will result in a project IRR of 32 percent.

Annex 6: Summary of Memorandum of Agreement between the Project

Project Sponsor and the City of Makassar

1. Over the past ten years in Indonesia, waste collection has decreased significantly in proportion to the amount of waste produced. This is largely attributable to the limited funds, the number of appropriate collection vehicles, absence of transfer points, and the lack of enforcement of and compliance with rules and regulations. As the City of Makassar lacks the financial resources to build and operate the LFG flaring facility on its own, it has identified a project developer under a BOOT agreement to develop the LFG flaring facility. The City of Makassar and the project developer, Gikoko signed a Memorandum of Agreement (MoA) on December 17th, 2007, giving Gikoko the right to implement the LFG collection and flaring activities at the Tamangapa landfill and transferred the ownership rights of the CERs from the city to Gikoko.

2. The MoA identifies the rights and responsibilities of both parties including the right of Gikoko to manage non-active cells that will be handed over for the collection of gas and the responsibility, provide all necessary financing for the project implementation, and ensure the registration of the CDM project with the DNA and the EB as well as provide transparent monitoring of data and revenues from the project. The city will assist Gikoko in attaining all necessary registrations and permissions to implement the LFG project. The city will also provide a suitable area for the flaring activities.

3. Although the MoA assigns the CER rights to Gikoko, the company has agreed to allocate 10 percent of after tax CER revenues to the city. Article 6 of the MoA details the city's right to the 10 percent of after-tax revenue and also explains the city's responsibility to increase waste volumes that enter the landfill at a rate of 5 percent per year. This will ensure that collection services increase at the same rate as population growth, estimated at 4.27 percent per year and the delivery of organic waste that will result in increased volumes of LFG that will be flared.

4. The project sponsor and the City of Makassar have also agreed to invest an additional 7 percent of after-tax CER revenues to implement the community development plan (CDP) that will bring direct benefits to the communities in the vicinity of TPA Tamangapa. The MoA states that both parties and the beneficiaries will collaborate on the design of the community development program which will be developed in early 2008.

Annex 7: Statement of Loans and Credit

INDONESIA: Makassar - TPA Tamangapa Landfill Methane Collection and Flaring

Project ID	FY	Purpose	Original Amount in USS Millions				Cancel.	Undisb.	Difference between expected and actual disbursements	
			IBRD	IDA	SF	GEF			Orig.	Frm. Rev'd
P105002	2008	National Program for Community Empower	41.19	190.00	0.00	0.00	0.00	235.27	0.00	0.00
P097104	2008	ID-BERMUTU	24.50	61.50	0.00	0.00	0.00	81.00	-2.81	0.00
P096921	2008	ID - National UPP (PNPM UPP)	52.68	125.00	0.00	0.00	0.00	180.34	0.00	0.00
P083742	2007	ID-Farmer Empower. Agric.Tech.&Info	32.80	60.00	0.00	0.00	0.00	87.42	5.50	0.00
P079906	2007	ID-Strategic Roads Infrastructure	208.00	0.00	0.00	0.00	0.00	197.18	-10.82	-0.82
P089479	2006	ID-Early Childhood Education and Dev	0.00	67.50	0.00	0.00	0.00	67.04	-0.41	0.00
P085375	2006	ID-WSSLIC III (PAMSIMAS)	0.00	137.50	0.00	0.00	0.00	153.56	27.30	0.00
P077175	2006	ID-Domestic Gas Market Development Proj.	80.00	0.00	0.00	0.00	0.00	48.21	13.21	0.00
P071296	2005	ID-USDRP	45.00	0.00	0.00	0.00	0.00	36.50	7.60	0.00
P092019	2005	ID Kecamatan Development Project 3B	80.00	80.00	0.00	0.00	0.00	34.30	-106.51	-18.65
P076174	2005	ID-Initiatives for Local Govern. Reform	14.50	15.00	0.00	0.00	0.00	16.23	10.74	0.00
P085374	2005	ID-HIGHER EDUCATION	50.00	30.00	0.00	0.00	0.00	65.32	28.70	0.00
P085133	2005	Govt Finl Mgt & Revenue Admin Project	55.00	5.00	0.00	0.00	0.00	55.14	43.14	10.49
P084583	2005	ID-UPP3	67.30	71.40	0.00	0.00	0.00	27.61	-43.87	0.00
P078070	2005	ID-Support for Poor and Disadvant Areas	69.00	35.00	0.00	0.00	0.00	92.51	53.21	0.00
P064728	2004	ID-LAND MANAGEMENT &POLICY DEVT	32.80	32.80	0.00	0.00	0.16	34.64	19.71	0.00
P074290	2004	ID-Eastern Indonesia Region Transp. 2	200.00	0.00	0.00	0.00	1.00	136.14	116.14	0.00
P071316	2004	ID - Coral Reef Rehab and Mgmt Prog II	33.20	23.00	0.00	0.00	0.17	37.60	21.77	0.00
P059931	2003	ID-Water Resources & Irr.Sector Mgt Prog	45.00	25.00	0.00	0.00	0.00	54.12	51.00	24.61
P063913	2003	ID-Java-Bali Pwr Sector & Strength	141.00	0.00	0.00	0.00	0.00	79.81	72.76	33.10
P079156	2003	ID-KECAMATAN DEV. 3	204.30	45.50	0.00	0.00	0.00	2.28	0.97	0.00
P076271	2003	ID-PPITA	17.10	0.00	0.00	0.00	0.00	4.52	4.52	4.52
P073772	2003	ID-Health Workforce & Services (PHP 3)	31.10	74.50	0.00	0.00	0.00	65.26	52.94	11.34
P072852	2002	ID-UPP2	29.50	70.50	0.00	0.00	0.00	58.15	-95.56	10.03
P059477	2000	ID-WSSLIC II	0.00	77.40	0.00	0.00	0.00	7.92	-0.34	0.00
Total:			1,553.97	1,226.60	0.00	0.00	1.33	1,858.07	268.89	74.62

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

FY Approval	Company	Committed				Disbursed			
		IFC				IFC			
		Loan	Equity	Quasi	Partic.	Loan	Equity	Quasi	Partic.
2006	Bank Danamon	155.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2004	BonaVista School	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00
2006	Buana Bank	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2006	Centralpertiwi	45.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2004	Medan NP School	1.75	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2002	P.T. Gawi	11.05	0.00	0.00	3.49	4.90	0.00	0.00	3.49
1989	PT Agro Muko	0.00	2.20	0.00	0.00	0.00	2.20	0.00	0.00
1997	PT Alumindo	2.73	0.00	0.00	0.00	2.73	0.00	0.00	0.00
1989	PT Astra	0.00	0.20	0.00	0.00	0.00	0.20	0.00	0.00
1994	PT Astra	0.00	0.19	0.00	0.00	0.00	0.19	0.00	0.00
2003	PT Astra	0.00	0.12	0.00	0.00	0.00	0.12	0.00	0.00
	PT Astra Otopart	0.00	0.70	0.00	0.00	0.00	0.70	0.00	0.00
2005	PT Astra Otopart	24.00	0.00	0.00	0.00	24.00	0.00	0.00	0.00
2000	PT Bank NISP	0.00	2.85	2.86	0.00	0.00	2.85	2.83	0.00
2002	PT Bank NISP	0.00	2.04	0.00	0.00	0.00	2.04	0.00	0.00
2004	PT Bank NISP	35.00	0.00	0.00	0.00	35.00	0.00	0.00	0.00
1997	PT Berlian	0.00	3.35	0.00	0.00	0.00	0.00	0.00	0.00
1993	PT Bina Danatama	0.05	0.00	0.00	0.00	0.05	0.00	0.00	0.00
1996	PT Bina Danatama	0.00	0.00	2.58	4.81	0.00	0.00	2.58	4.81
2004	PT Ecogreen	30.00	0.00	0.00	0.00	30.00	0.00	0.00	0.00
2005	PT Ecogreen	25.00	0.00	0.00	0.00	20.00	0.00	0.00	0.00
	PT Grahawita	0.00	0.00	3.75	0.00	0.00	0.00	3.75	0.00
1991	PT Indo-Rama	0.00	3.82	0.00	0.00	0.00	3.82	0.00	0.00
1995	PT Indo-Rama	0.00	1.57	0.00	0.00	0.00	1.57	0.00	0.00
1999	PT Indo-Rama	0.00	0.81	0.00	0.00	0.00	0.81	0.00	0.00
2001	PT Indo-Rama	20.00	0.00	0.00	0.00	0.33	0.00	0.00	0.00
2004	PT Indo-Rama	48.00	0.00	0.00	0.00	41.00	0.00	0.00	0.00
1992	PT KIA Keramik	0.23	0.00	0.00	2.00	0.23	0.00	0.00	2.00
1996	PT KIA Keramik	1.65	0.00	0.00	53.49	1.65	0.00	0.00	53.49
1995	PT KIA Serpih	4.50	0.00	0.00	49.50	4.50	0.00	0.00	49.50
1997	PT Kalimantan	9.38	0.00	0.00	0.00	9.38	0.00	0.00	0.00
	PT Karunia (KAS)	16.45	0.00	0.00	3.56	16.45	0.00	0.00	3.56
2006	PT Karunia (KAS)	20.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	PT Makro	0.00	2.34	0.00	0.00	0.00	2.34	0.00	0.00
2000	PT Makro	0.00	1.21	0.00	0.00	0.00	0.71	0.00	0.00
2006	PT Makro	0.00	0.66	0.00	0.00	0.00	0.66	0.00	0.00
1998	PT Megaplast	0.00	2.50	0.00	0.00	0.00	2.50	0.00	0.00
1993	PT Nusantara	0.00	0.00	10.16	7.90	0.00	0.00	10.16	7.90
2004	PT Prakars (PAS)	15.36	0.00	0.00	3.20	15.36	0.00	0.00	3.20
1997	PT Sayap	0.83	0.00	0.00	0.00	0.83	0.00	0.00	0.00

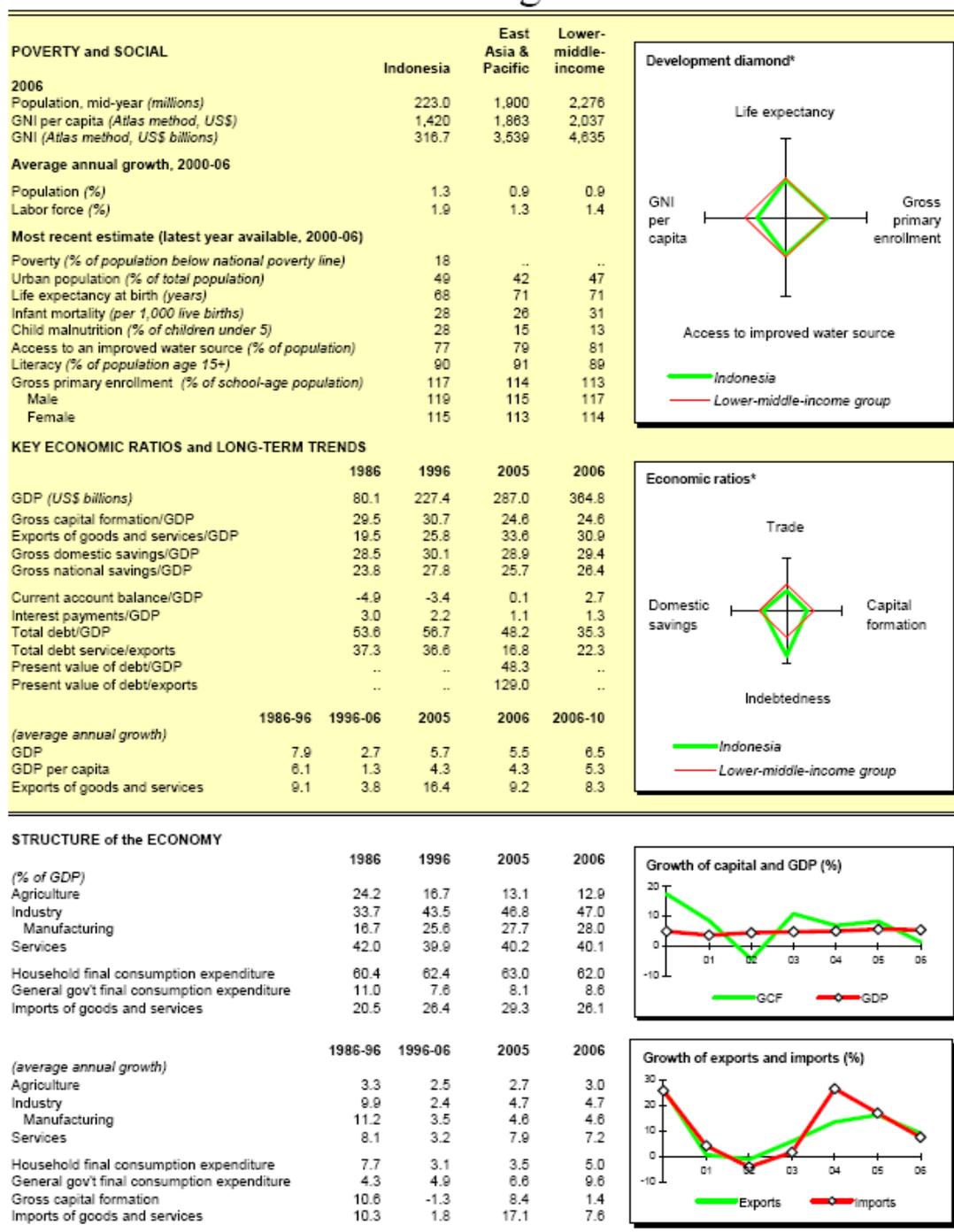
2001	PT Sigma	0.00	1.03	0.00	0.00	0.00	1.03	0.00	0.00
2006	PT TAS	7.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1995	PT Viscose	7.81	0.00	0.00	0.00	7.81	0.00	0.00	0.00
2004	PT Viscose	8.31	0.00	0.00	0.00	8.31	0.00	0.00	0.00
1997	PT Wings	0.72	0.00	0.00	0.00	0.72	0.00	0.00	0.00
2001	Sunson	11.62	0.00	0.00	7.35	11.62	0.00	0.00	7.35
2005	WOM	0.00	15.82	0.00	0.00	0.00	15.74	0.00	0.00
2006	WOM	20.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2004	Wilmar	33.33	0.00	0.00	0.00	33.33	0.00	0.00	0.00
Total portfolio:		560.77	41.41	19.35	135.30	269.20	37.48	19.32	135.30

FY Approval	Company	Approvals Pending Commitment			
		Loan	Equity	Quasi	Partic.
2005	Bank NISP SELF	0.03	0.00	0.00	0.00
2006	Bank NISP Swap	0.00	0.00	0.00	0.00
2006	Orix Indonesia	0.08	0.00	0.00	0.00
Total pending commitment:		0.11	0.00	0.00	0.00

Annex 8: County at a Glance

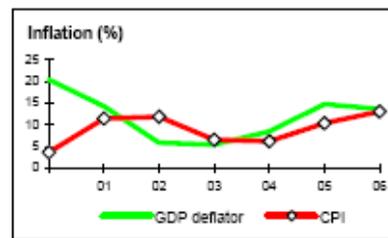
Indonesia at a glance

9/28/07



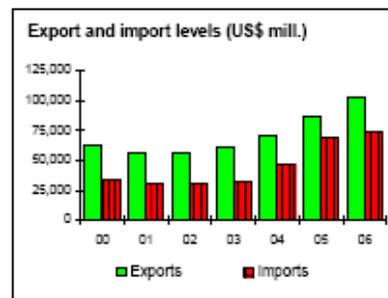
PRICES and GOVERNMENT FINANCE

	1986	1996	2005	2006
Domestic prices				
<i>(% change)</i>				
Consumer prices	5.8	8.0	10.5	13.1
Implicit GDP deflator	-0.1	8.9	14.8	13.6
Government finance				
<i>(% of GDP, includes current grants)</i>				
Current revenue	15.9	16.5	17.8	19.1
Current budget balance	-4.6	8.0	6.2	7.6
Overall surplus/deficit	-3.5	3.0	-0.5	-0.9



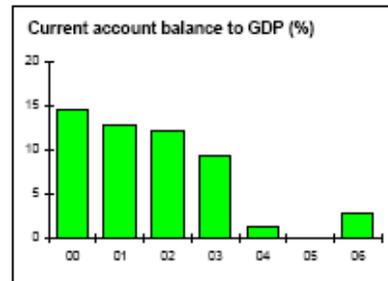
TRADE

	1986	1996	2005	2006
<i>(US\$ millions)</i>				
Total exports (fob)	..	49,815	86,995	103,514
Fuel	..	12,861	23,717	27,619
Estate crop	..	3,998	4,918	5,483
Manufactures	..	10,795	14,402	17,190
Total imports (cif)	..	42,929	69,462	73,868
Food	..	3,931	3,888	4,709
Fuel and energy	..	3,670	17,429	19,028
Capital goods	..	17,497	15,262	4,877
Export price index (2000=100)	..	80	140	167
Import price index (2000=100)	..	128	207	220
Terms of trade (2000=100)	..	63	68	76



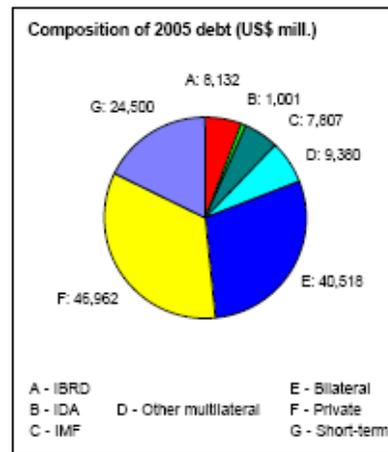
BALANCE of PAYMENTS

	1986	1996	2005	2006
<i>(US\$ millions)</i>				
Exports of goods and services	15,240	56,787	99,760	115,032
Imports of goods and services	16,194	59,379	91,319	95,493
Resource balance	-1,908	-5,184	8,441	19,539
Net income	-6,432	-6,008	-12,927	-14,465
Net current transfers	259	937	4,793	4,863
Current account balance	-3,911	-7,663	307	9,937
Financing items (net)	1,904	16,668	-970	-3,035
Changes in net reserves	2,007	-9,005	663	-6,902
Memo:				
Reserves including gold (US\$ millions)	4,814	19,281	36,181	43,083
Conversion rate (DEC, local/US\$)	1,282.6	2,342.3	9,705.0	9,151.0



EXTERNAL DEBT and RESOURCE FLOWS

	1986	1996	2005	2006
<i>(US\$ millions)</i>				
Total debt outstanding and disbursed	42,916	128,937	138,300	128,917
IBRD	5,058	11,138	8,132	7,423
IDA	857	736	1,001	1,318
Total debt service	5,984	21,543	18,045	27,345
IBRD	636	2,249	1,871	1,827
IDA	12	26	36	37
Composition of net resource flows				
Official grants	136	190	998	..
Official creditors	1,016	-792	-811	..
Private creditors	528	6,869	1,485	..
Foreign direct investment (net inflows)	258	6,194	5,260	..
Portfolio equity (net inflows)	0	1,819	-165	..
World Bank program				
Commitments	982	1,194	1,027	105
Disbursements	828	905	652	1,012
Principal repayments	236	1,429	1,417	1,430
Net flows	592	-523	-765	-418
Interest payments	411	846	489	434
Net transfers	180	-1,370	-1,254	-852



Annex 9: Documents in the Project File

1. Notary deed No. 109 dated 23 January 1993 – PT Giko Indonesia Manufacturing Corporation.
2. Notary deed No. 6 dated 7 May 1998 (Changes of article of association).
3. Notary deed No. 7 dated 24 April 2001 (Changes of shareholders composition).
4. Limited Importer Identification Number (APIT - Angka Pengenal Importir Terbatas).
5. Tax Identification Number.
6. Limited Company Registration.
7. Company Domicile Letter.
8. Permanent Business License.
9. Approval of Foreign Investment Extension.
10. Audit reports for the year 2001, 2002, 2003, 2004 and 2005.
11. The company's financial statement for the year 2006.
12. Detail Work In Process for the year 2006.
13. Detail Account Payable for the year 2006.
14. Environment Due Diligence Report and Environmental Management Plan.
15. Social Due Diligence Report.
16. Stakeholders Meeting Report.

Annex 10: Project Preparation and Supervision

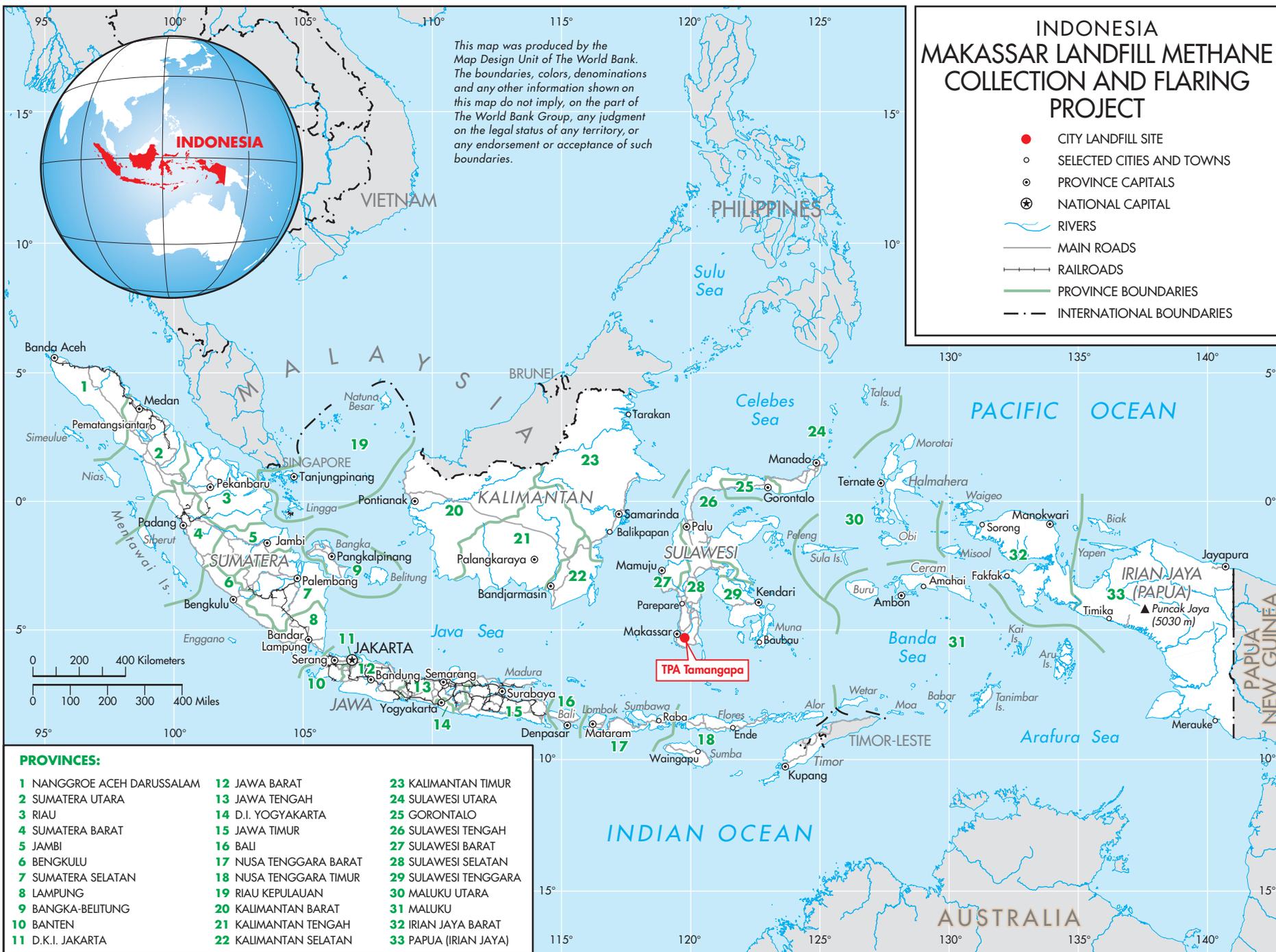
Name	Title	Unit
James Orehmie Monday	Senior Environmental Engineer (Task Team Leader)	EASRE
Ahmed Mostafa	Technical Specialist (Deal Manager)	ENVCF
Josef Lloyd Leitmann	Lead Environment Specialist (Environment Coordinator, Indonesia)	EASIS
Lasse Ringuis	Operations Team Leader	ENVCF
Xueman Wang	Senior Counsel (Project Lawyer)	LEGCF
Novira Asra	Financial Management Specialist	EAPCO
Daniel A. Hoorweg	Sr. Environmental Engineer (Peer Reviewer)	FEU
Charles Peterson	Sr. Environmental Specialist (Peer Reviewer)	FEU
Ina Pranoto	Senior Environmental Engineer	EASIS
Haddy Jatou Sey	Social Development Specialist	ENVCF
Hiroshi Ono	Senior Environmental Engineer	EASRE
Sulistiowati Niannogolan	Social Development Specialist (Consultant)	EASIS
William Nicholas Bowden	Consultant (Technical Specialist)	ENVCF
Benedicta Sembodo	Program Assistant	EACIF
Retno Anna Widiana	Team Assistant	EACIF
Cynthia Dharmajaya	Program Assistant	EASRE
Sukanya Venkataraman	Program Assistant	EASRE

MAP SECTION

INDONESIA MAKASSAR LANDFILL METHANE COLLECTION AND FLARING PROJECT

- CITY LANDFILL SITE
- SELECTED CITIES AND TOWNS
- ⊙ PROVINCE CAPITALS
- ⊕ NATIONAL CAPITAL
- ~ RIVERS
- MAIN ROADS
- +— RAILROADS
- PROVINCE BOUNDARIES
- - - INTERNATIONAL BOUNDARIES

This map was produced by the Map Design Unit of The World Bank. The boundaries, colors, denominations and any other information shown on this map do not imply, on the part of The World Bank Group, any judgment on the legal status of any territory, or any endorsement or acceptance of such boundaries.



PROVINCES:

- | | | |
|----------------------------|------------------------|-----------------------|
| 1 NANGGROE ACEH DARUSSALAM | 12 JAWA BARAT | 23 KALIMANTAN TIMUR |
| 2 SUMATERA UTARA | 13 JAWA TENGAH | 24 SULAWESI UTARA |
| 3 RIAU | 14 D.I. YOGYAKARTA | 25 GORONTALO |
| 4 SUMATERA BARAT | 15 JAWA TIMUR | 26 SULAWESI TENGAH |
| 5 JAMBI | 16 BALI | 27 SULAWESI BARAT |
| 6 BENGKULU | 17 NUSA TENGGARA BARAT | 28 SULAWESI SELATAN |
| 7 SUMATERA SELATAN | 18 NUSA TENGGARA TIMUR | 29 SULAWESI TENGGARA |
| 8 LAMPUNG | 19 RIAU KEPULAUAN | 30 MALUKU UTARA |
| 9 BANGKA-BELITUNG | 20 KALIMANTAN BARAT | 31 MALUKU |
| 10 BANTEN | 21 KALIMANTAN TENGAH | 32 IRIAN JAYA BARAT |
| 11 D.K.I. JAKARTA | 22 KALIMANTAN SELATAN | 33 PAPUA (IRIAN JAYA) |