Document of
The World Bank

Report No: ICR0000504

IMPLEMENTATION COMPLETION AND RESULTS REPORT
(IBRD-70330)

ON A

LOAN

IN THE AMOUNT OF US$ 2.22 MILLION

TO THE

REPUBLIC OF LATVIA

FOR A

LIEPAJA REGION SOLID WASTE MANAGEMENT PROJECT

DECEMBER 21, 2007

Environmentally and Socially Sustainable Development Unit
Europe and Central Asia Region

CURRENCY EQUIVALENTS

(Exchange Rate Effective October 25, 2007)

Currency Unit = Latvian Lats (LVL)
LVL 1.00 = US$ 2.0284
US$ 1.00 = LVL 0.4930

FISCAL YEAR
January 1 to December 31

ABBREVIATIONS AND ACRONYMS

AMs	Aide-Memoires
CAS	Country Assistance Strategy
CIDA	Canadian International Development Agency
DEPA	Danish Environmental Protection Agency
EA	Environmental Assessment
EL	Energy Law
EMP	Environmental Management Plan
ERPA	Emission Reductions Purchase Agreement
ERR	Economic Rate of Return
EU	European Union
ERs	Emissions Reductions
FIRR	Financial Internal Rate of Return
GHG	Green House Gases
GoL	Government of Latvia
IBRD	International Bank for Reconstruction and Development
ISPA	Instrument for Structural Policies for Pre-Accession
JCI	Japan Consulting Institute
LCC	Liepaja City Council
LEP	Liepaja Environment Project
LFG	Landfill Gas
LoSWM	Law on Solid Waste Management
L-RAS	Liepajas Ras Ltd
LREPB	Liepaja Region Environmental Protection Board
LVL	Latvian Lats
LWWTP	Liepaja Waste Water Treatment Plant
MERs	Minimum Emissions Reductions
MoE	Ministry of Environment, former Ministry of Environmental Protection and Regional Development (MOEPRD)
MoEc	Ministry of Economy
MoF	Ministry of Finance
MVP	Monitoring Verification Protocol
NEPP	National Environmental Policy Plan
NES	National Energy Strategy

NIB	Nordic Investment Bank
NMSWMS	National Municipal Solid Waste Management Strategy
PAD	Project Appraisal Document
PCF	Prototype Carbon Fund
PIU	Project Implementation Unit
RMSWMP	Riga Municipal Solid Waste Management Project
ROP	Reverse Osmosis Plant
SIDA	Swedish International Development Cooperation Agency
TA	Twinning Arrangements
ToR	Terms of Reference
WB	World Bank

Vice President:	Shigeo Katsu
Acting Country Director:	Sergiy V. Kulik
Sector Manager:	Juergen Voegele
Project Team Leader:	Barbara Letachowicz
ICR Team Leader:	Barbara Letachowicz

LATVIA
Liepaja Region Solid Waste Management Project

CONTENTS

A. Basic Information

Country:	Latvia	Project Name:	Liepaja Region Solid Waste Management Project
Project ID:	P058476	L/C/TF Number(s):	IBRD-70330
ICR Date:	12/28/2007	ICR Type:	Core ICR
Lending Instrument:	SIL	Borrower:	GOVERNMENT OF LATVIA
Original Total Commitment:	USD 2.2M	Disbursed Amount:	USD 2.2M

Environmental Category: A

Implementing Agencies:
Liepajas RAS

Cofinanciers and Other External Partners:
Swedish International Development Cooperation Agency (SIDA)
Nordic Investment Bank (NIB)

B. Key Dates

Process	Date	Process	Original Date	Revised / Actual Date(s)
Concept Review:	12/21/1998	Effectiveness:	08/10/2001	08/10/2001
Appraisal:	01/17/2000	Restructuring(s):		
Approval:	09/14/2000	Mid-term Review:		06/14/2004
		Closing:	06/30/2007	06/30/2007

C. Ratings Summary

C.1 Performance Rating by ICR

Outcomes:	Satisfactory
Risk to Development Outcome:	High
Bank Performance:	Highly Satisfactory
Borrower Performance:	Highly Satisfactory

C.2 Detailed Ratings of Bank and Borrower Performance (by ICR)

Bank	Ratings	Borrower	Ratings
Quality at Entry:	Highly Satisfactory	Government:	Highly Satisfactory
Quality of Supervision:	Highly Satisfactory	Implementing Agency/Agencies:	Highly Satisfactory
Overall Bank Performance:	Highly Satisfactory	**Overall Borrower Performance:**	Highly Satisfactory

C.3 Quality at Entry and Implementation Performance Indicators			
Implementation Performance	**Indicators**	**QAG Assessments (if any)**	**Rating**
Potential Problem Project at any time (Yes/No):	No	Quality at Entry (QEA):	None
Problem Project at any time (Yes/No):	No	Quality of Supervision (QSA):	None
DO rating before Closing/Inactive status:	Satisfactory		

D. Sector and Theme Codes

	Original	Actual
Sector Code (as % of total Bank financing)		
Other industry	6	6
Solid waste management	88	88
Sub-national government administration	6	6
Theme Code (Primary/Secondary)		
Administrative and civil service reform	Primary	Primary
Climate change	Primary	Primary
Municipal governance and institution building	Primary	
Pollution management and environmental health	Primary	Primary

E. Bank Staff

Positions	At ICR	At Approval
Vice President:	Shigeo Katsu	Johannes F. Linn
Country Director:	Suman Mehra	Basil G. Kavalsky
Sector Manager:	Motoo Konishi	Kevin M. Cleaver
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ICR Team Leader:	Barbara Letachowicz	
ICR Primary Author:	Anders O. Halldin	
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	Stubenitsky Frank	

F. Results Framework Analysis

Project Development Objectives (from Project Appraisal Document**)**
The purpose of this project is to demonstrate self-sustaining, modern management of municipal solid waste through maximum collection and utilization of landfill gas (LFG) in the city and district of Liepaja. Other objectives include:

a) Demonstrating modern sanitary landfill techniques on a regional basis;
b) Strengthening institutional capacity at the local/regional levels on issues related to municipal solid waste management;
c) Arresting the on-going contamination of groundwater;
d) Reducing environmental disamenities for neighbors of existing disposal sites that would be closed;
e) Facilitating the separation of recyclable material; and
f) Reducing greenhouse gas emissions through an emission reduction agreement with the Prototype Carbon Fund (PCF).

Revised Project Development Objectives (as approved by original approving authority)
Project Development Objectives were not revised.

(a) PDO Indicator(s)

Indicator	Baseline Value	Original Target Values (from approval documents)	Formally Revised Target Values	Actual Value Achieved at Completion or Target Years
Indicator 1 :	Reduction of greenhouse gas emissions			
Value quantitative or Qualitative)	0 tonnes Carbon equivalent	13,000 tonnes Carbon equivalent (in amended version of ERPA)		4,994 tonnes carbon equivalent
Date achieved	05/01/2004	06/30/2007		06/30/2007
Comments (incl. % achievement)	The most recent analyses made by independent experts, as well as some analysis made by the PCF staff resulted in the opinion that MER amount has been oversetimated due to use of Tier 1 model which use resulted in overestimation in other projects as well.			
Indicator 2 :	Reduced environmental disamenities for neighbours through closure and remediation of small dump sites in Liepaja region			
Value quantitative or Qualitative)	0 dump sites in Liepaja region closed	15 dump sites in Liepaja region closed		26 dump sites in Liepaja region closed
Date achieved	08/01/2002	01/31/2007		06/30/2007
Comments (incl. % achievement)				
Indicator 3 :	Facilitating the separation of recyclable material			
Value quantitative or	no separation is taking place	Was not set in numerical values.		Some 263.5 tons of waste were sorted

Qualitative)				out in year 2006 against 1,605 tons in 2005. A total of 125,784 tons of waste werte stored in the energy cells, of which 97,065 tons of household waste and 2,863 tons of garden waste.
Date achieved	05/01/2004	01/31/2007		06/30/2007
Comments (incl. % achievement)				

(b) Intermediate Outcome Indicator(s)

Indicator	Baseline Value	Original Target Values (from approval documents)	Formally Revised Target Values	Actual Value Achieved at Completion or Target Years
Indicator 1 :	Strengthening institutional capacity at the local/regional levels on issues related to municipal solid waste management			
Value (quantitative or Qualitative)	no basic knowledge on functioning of a modern solid waste management system	no numeric values have been set		Public awareness campaign on functioning of modern waste disposal site has been successful. The increase in tariff in late 2005 has not increased illegal dumping. The modern sanitary landfill techniques are implemented in the Liepaja Region.
Date achieved	08/01/2002	07/31/2006		06/30/2007
Comments (incl. % achievement)				

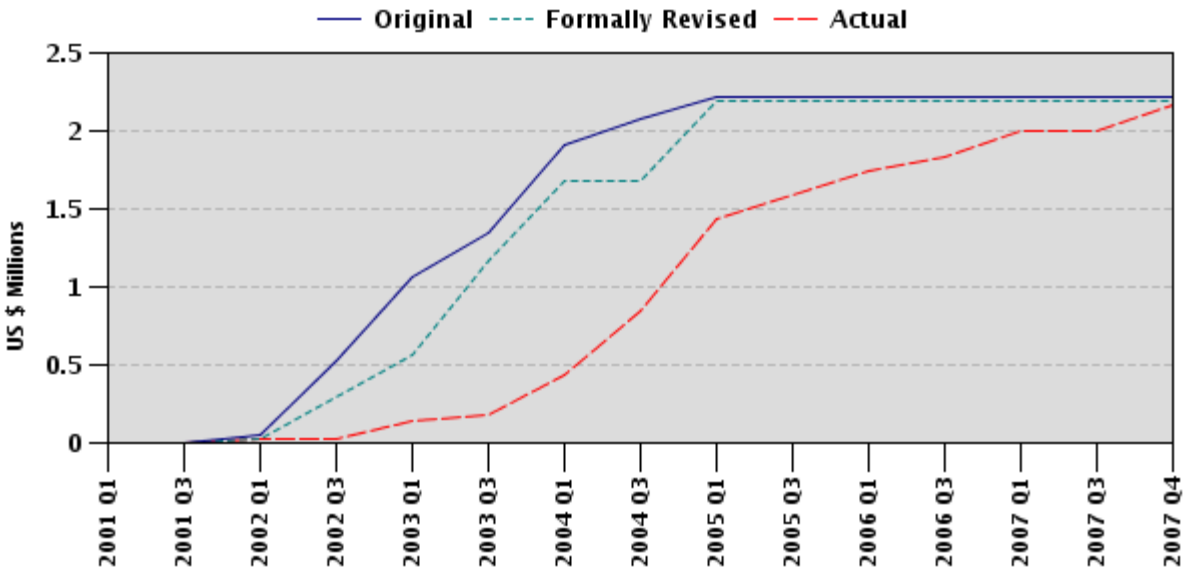
G. Ratings of Project Performance in ISRs

No.	Date ISR Archived	DO	IP	Actual Disbursements (USD millions)
1	11/02/2000	Satisfactory	Satisfactory	0.00
2	11/08/2000	Satisfactory	Satisfactory	0.00
3	04/11/2001	Satisfactory	Satisfactory	0.00
4	07/14/2001	Satisfactory	Satisfactory	0.00
5	12/10/2001	Satisfactory	Satisfactory	0.02
6	06/28/2002	Satisfactory	Satisfactory	0.02
7	12/18/2002	Satisfactory	Satisfactory	0.18
8	04/16/2003	Satisfactory	Satisfactory	0.18
9	09/22/2003	Satisfactory	Satisfactory	0.45
10	12/15/2003	Satisfactory	Satisfactory	0.50
11	03/11/2004	Satisfactory	Satisfactory	0.84
12	07/07/2004	Satisfactory	Satisfactory	0.86
13	12/01/2004	Highly Satisfactory	Satisfactory	1.49
14	06/28/2005	Satisfactory	Satisfactory	1.77
15	06/12/2006	Satisfactory	Satisfactory	1.86
16	08/10/2006	Satisfactory	Satisfactory	1.86
17	02/14/2007	Satisfactory	Satisfactory	2.04

H. Restructuring (if any)

Not Applicable

I. Disbursement Profile



1. Project Context, Development Objectives and Design

The development of institutional capacity at the local and regional levels to manage programs for local infrastructure and environmental clean-up was one of five key areas of World Bank assistance highlighted in the Country Assistance Strategy (CAS)[1] for the Republic of Latvia approved in 1998. Despite the progress made by Latvia until early 1998 in preparing a National Environmental Policy Plan (NEPP) and reaching some reduction in land and water pollution, Latvia's national and local environmental management capacity was below the levels required for European Union accession. The proposed Project was designed to contribute to an improvement of this situation, by strengthening institutional capacity and demonstrating self-sustaining provision of waste management services. The Project was also to respond to the need to extend the World Bank assistance provided to the municipality of Riga to other municipalities that need better delivery of urban services. In addition to directly benefiting the Liepaja region, the Project is expected to spur interest for similar projects in other regions.

The CAS specifically called for an operation to, *inter alia*, promote private sector participation in wastewater and waste management. Even if the operating company Liepajas RAS (L-RAS) is owned by the municipalities in the Liepaja region, it is operating on commercial terms.

1.1 Context at Appraisal

Improved waste management cited in a National Environmental Policy Plan (NEPP) completed by Ministry of Environmental Protection and Regional Development (MOEPRD) in 1995, was one of the top five priorities for Latvia within the time frame up to 2025. Pursuant to the NEPP, the Government of Latvia (GoL) initiated implementation of a program of upgrading or closing all existing waste disposal sites, many of which posed a risk to local groundwater resources. To support this program institutionally, a National Municipal Solid Waste Management Strategy (NMSWMS) [2] has been prepared, supported by the Danish Environmental Protection Agency (DEPA).

The NMSWMS emphasized regional solutions as a key strategic element to improved and cost effective waste management. It was estimated that upon completion of the NMSWMS only 10-12 major sites would remain to serve the waste disposal needs of Latvia. At the same time, the National Energy Strategy (NES)[3] stated that due to the country's few natural resources and the need to import all of its natural gas and oil products and half of its electricity, the use of indigenous energy resources and the diversification of energy sources are of high priority. The Energy Law (EL) was amended in early 2000 to grant a preferential status to electricity produced from landfill gas (LFG). Provisions for LFG capture were also included in the 1996 Law on Solid Waste Management (LoSWM).

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[1] Report No 17706-LV as of 05/19/98

[2] 1997

[3] 1997

Greenhouse gas (GHG) emissions resulting from improper landfill operations are recognized as a serious environmental concern. MOEPRD declared that the reduction and collection of methane from municipal solid waste disposal sites was one of the Government's priorities for the reduction of GHG emissions. Under the proposed Project, the resulting GHG abatement benefits have been shared between the GoL and the Prototype Carbon Fund (PCF) under an Emissions Reduction Purchase Agreement (ERPA) signed in December 2000.

Both the Liepaja City Council (LCC) and the MOEPRD requested the World Bank's support at the end of 1995 in designing and preparing a project for improved waste management in Liepaja City. Due to preparation of the Riga Waste Management project[4] which was ongoing at that time, the World Bank had to delay its positive response to mid-1998. However, the Bank raised several conditions for engaging in a new waste management operation in Latvia: (i) Project compliance with the NMSWMS; (ii) clear consensus among all involved municipalities within the Liepaja region on their participation in Project development and implementation; (iii) active participation of MOEPRD and LCC staff in Project preparation, including staff responsible for providing information to the public and mass media. In addition a request was formulated and addressed to Swedish International Cooperation Development Agency (SIDA) for active participation in Project preparation. When the conditions had been met, Project preparation started in June 1998.

1.2 Original Project Development Objectives (PDO) and Key Indicators (*as approved*)

The purpose of the Project was to demonstrate self-sustaining, modern management of municipal solid waste in the city and region of Liepaja through maximum collection and utilization of LFG. Other objectives included:

a) Demonstrating modern sanitary landfill techniques developed on a regional basis;
b) Strengthening institutional capacity at the local/regional levels on issues related to municipal solid waste management;
c) Arresting the on-going contamination of groundwater;
d) Reducing environmental disamenities for neighbors of existing waste disposal sites;
e) Facilitating the separation of recyclable material; and
f) Reducing GHG emissions through an ERPA with the PCF.

It should be emphasized that at start of the Project preparation the overarching main objective was to establish a modern waste management facility for the Liepaja Region including the capture and destruction of LFG. Based on this main objective the PDOs a) to e) were formulated. During the preparation phase PCF became interested in participate in the financing of the Project by offering the procurement of Emission Reductions (ERs) formalized through the ERPA. Consequently, this agreement resulted in an additional PDO as mentioned under f) above.

The following key outcome indicators were agreed to assess achievement of PDOs:

[4] Municipal Solid Waste Management Project (Loan LV4286)

- The efficiency of waste management: technical performance, consumer satisfaction, amount of recyclable materials,
- Local environmental pollution: water quality, reduced complaints from neighbors,
- Financial sustainability: financial performance of waste management company, tariffs, tariffs as percentage of expenditures,
- Local government capacity: establishment and sustainable operation of regional waste management system and accomplishment of training workshops,
- LFG captured and energy production: volume of gas, energy output,
- Greenhouse gas abatement: decrease in and eventual elimination of methane emissions, amount of fossil fuel based power replaced by LFG.

1.3 Revised PDO (as approved by original approving authority) and Key Indicators, and reasons/justification

The Project objectives were not revised during implementation.

At an early stage of implementation the Bank agreed with the Borrower to aggregate outcome indicators into three PDO indicators and one intermediary outcome indicator. These aggregated indicators were found more relevant and were easy accessible through reports developed by Environmental Board, MOEPRD data and reports, national statistics, audited financial statements, and surveys. At the same time, these indicators were adequate to illustrate achievement of PDOs. The PDO indicators are:

- Reduction of greenhouse gas emissions,
- Reduced environmental disamenities for neighbors through closure and remediation of small dump sites in Liepaja region,
- Facilitating the separation of recyclable material.

For the indicator one and two numerical target values were set to be achieved at the end of the Project implementation, and for all indicators baseline values were defined.

1.4 Main Beneficiaries

The final beneficiary of the Project is the non-profit oriented municipal solid waste management company Liepajas RAS Co Ltd. (L-RAS). The L-RAS was incorporated in early 2000 and it is owned by the City of Liepaja and the municipalities and villages of the Liepaja region jointly associated in a limited liability company RAS-30. The exposure to international expertise through participation in Twinning Arrangements (TA) provided L-RAS management and staff with sound knowledge and understanding of modern solid waste management techniques and management of such municipal service. L-RAS received hands-on training during operation of Skede and Grobina sites. L-RAS was actively involved in search for solution to operational issues through cooperation with local waste management experts, participation in international workshops on waste management and visits to modern waste management facilities outside Latvia.

Moreover, L-RAS benefited from implementation support provided by consultants of ELSE Ltd., a company representing extensive experience acquired under the World Bank co-financed Liepaja Environmental Project (LEP), specifically in areas of procurement

and financial management. ELSE has been contracted by LCC to serve as the Project Implementation Unit (PIU) of the Project. Experience gained by L-RAS during preparation and processing the application to the Instrument for Structural Policies for Pre Accession (ISPA) has a potential to be utilized in further application for EU structural funds, for which L-RAS is eligible.

In addition, the population of the Liepaja region municipalities can be recognized as a multiple beneficiary of the Project. The benefits to this group come first, from the fact of the closure or remediation of the local dump sites being a source of continued pollution of soil, water and air. Second, the activities undertaken by the Project resulted in an improvement of ground water quality. The Liepaja Region population benefited, through participation in a public awareness-raising campaign, and enhanced understanding of modern solid waste management. The effectiveness of the campaign was proved in late 2005, when a substantial increase of disposal tariffs did not result in increased illegal dumping.

1.5 Original Components (*as approved*)

The proposed Project consisted of two components, one investment component for implementing a modern waste management solution for Liepaja Region, and a technical assistance component supporting the Government's efforts to implement its NMSWMS.

Project Component I - US$13.77 million[5]

Remediation of Existing Dump Sites - US$ 2.81 million (World Bank: US$ 1.24 million): Under this subcomponent existing dump sites were to be closed and subsequently remediated. The requirements for remediation were expected to be specified by the Liepaja Region Environmental Protection Board (LREPB). Scope of remediation actions required covering, collection and treatment of leachate, groundwater and surface runoff, etc.

Technical and Operational Improvements - US$ 5.72 million (World Bank: US$ 0.69 million): This activity was designed to establish a state-of-the-art solid waste management system to meet international sanitary landfill standards therefore to strengthening institutional capacity at the local/regional level. It was foreseen to include the establishment of a sorting line for separation of recyclable materials and arranging separate areas for storing of separated material as well as of hazardous waste, which would be transported to another site. The Project considered the site to be covered with thick clay in compliance with EU regulations. All leachate and polluted run-off water would be collected.

Installation of Energy Cells and Landfill Gas Collection System - US $1.07 million. Energy cells were planned to be installed for the enhanced degradation of easily biodegradable waste and the accelerated production of LFG, in line with modern sanitary

[5] Component costs include contingencies and VAT

techniques and to reduce GHG emissions. LFG would be extracted both from energy cells at Grobina and from the remediated dump site in Skede. The resulting GHG emission reductions would be partly sold to the PCF under an ERPA. Emission reductions were to be monitored and subject to periodic verification by a third party.

Installation of a Power Generator - US$ 0.72 million. An energy conversion unit (gas engine) of about 1 MW capacity using LFG was to be installed at Grobina, and one of about 0.3 MW to be installed at Skede. Both units would be connected to the power grid, and the power would be sold to Latvenergo under a power purchase agreement to be negotiated as part of the Project. Most of the energy content in LFG would be utilized for electricity generation, while a small part of the remaining heat energy was to be used for pre-heating the leachate and heating the buildings. Incineration of LFG was to contribute to reduction of GHG emissions.

Vehicles and Waste Collection Points - US$ 0.78 million. This activity was designed to establish a system of waste collection points of recyclable materials to ensure the efficient transport of waste to the regional disposal site. Implementation of this activity was to contribute to meeting the objective of establishment of modern sanitary landfill techniques and to facilitate the separation.

Managerial Support through Twinning Arrangements - US$ 0.48 million. Under this activity a new solid waste management company was to be established being responsible for the management of the landfill, the waste collection points, and the transport of waste between them, therefore to strengthen local capacity on municipal solid waste management. The activity was to finance provision of technical and managerial assistance to the new company through a twinning arrangement, for which SIDA, expressed a strong interest.

Detailed Design - US$ 1.18 million. This activity was intended to provide the detailed design, and all necessary drawings for Project implementation, and to include the necessary construction supervision during Project implementation.

Implementation Support - US$ 0.56 million. This activity would provide services from the PIU in order to handle all procurement and disbursement issues related to the Project, maintain Project accounts and prepare Project progress reports. In addition, this activity would support the continuation of the public information and participation activities, which have been an integral part of the Project since its inception.

Project Component II - US$0.47 million[6]

Technical assistance on the NMSWMS - US$0.47 million. Design of this component involved training and capacity building at the local/regional level for solid waste management utilities, municipal authorities and private sector companies involved in the implementation of the NMSWMS. The activity was expected to be implemented during

[6] Component costs include contingencies and VAT

2001-2002, and would include a number of seminars and workshops demonstrating the use of different managerial systems to better control the handling of solid waste and the operation of the sites. The activity was planned to be financed by the Canadian International Development Agency (CIDA) through a grant.

1.6 Revised Components

Component 1 was not revised, however Component 2, *Technical assistance on the NMSWMS* was dropped. This component was designed to provide training and capacity building at the local/regional level for solid waste management utilities, municipal authorities and private sector companies involved in the implementation of the NMSWMS. Unfortunately, CIDA (the financier of the component) withdrew from their original plans. Dropping this component did not affect achievement of the PDO because training for implementation of the NMSWMS has been carried out by L-RAS with other-than-Project funding. In addition satisfactory achievement of the PDO is confirmed by formal communication from MoE, as of December 17, 2007[7].

1.7 Other significant changes

Under the subcomponents described under section 1.5 (Original Components) the following deviations, not related to the scope of work rather to technical solution, can be noticed.

Technical and Operational Improvements. During the detailed design of the Project it was decided that instead of building a separate biological plant for leachate treatment, the leachate should be trucked to the Liepaja Waste Water Treatment Plant (LWWTP). This solution was in place to September 2004.

The largest contributor to Project financing was the EU through the funds of Instrument for Structural Policies for Pre-Accession (ISPA). At end of 2005, additional funds from ISPA became available to L-RAS, and therefore decision was made to use these proceeds for procurement of a Reverse Osmosis Plant (ROP), which has been in operation since end of 2006, with a very high reduction of pollutants in the leachate. Moreover, the mixer for mixing the waste with sludge was never procured and mixing is done by a bulldozer.

Furthermore, at the stage of detailed design, the shape of the land for implementation was changed and narrowed, resulting in difficulties to meet the logistic requirements for establishing a picking belt for manual waste separation, shredding the waste, and transporting the waste on conveyer belts directly to the energy cells. Therefore these items were consequently dropped, and freed funds for other investments, like the ROP and making up for shortfalls in the Project budget.

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[7] see Annex 7: Borrower's comments on Draft ICR

Installation of Energy Cells and LFG Collection System. Cost for this sub-component includes additional costs for a poly-ethylene liner neither foreseen nor required at appraisal and all the buildings for administration and separation, which actually were included in the operational improvements at appraisal.

Vehicle and Waste Collection Points. The waste collection points were never procured under the Project financing scheme, but implemented by use of other funds.

2. Key Factors Affecting Implementation and Outcomes

2.1 Project Preparation, Design and Quality at Entry

Ownership demonstrated by the local community and the Project stakeholders was recognized indispensable to achieve of the Project outcomes. The first step during the preparation phase was to evaluate five proposed locations in different municipalities, which were all interested to provide land for the location of a regional waste management facility. Quite an unusual situation, as there is normally strong opposition against the creation of disposal sites. Two of the originally chosen sites, Skede and Grobina, were selected for further technical and environmental investigation.

Rationale for Bank intervention was found as the extension of the assistance provided to the city of Riga. The MOEPRD had declared that it wanted to close nearly all existing disposal sites and focus on the development of about 12 regional sites. Therefore the Bank accepted MOEPRDs request to establish another regional site in Latvia besides already ongoing implementation of the Getlini site servicing the Riga region.

Possibility to take advantage of existing learning experience from preparation and implementation of the Riga Municipal Solid Waste Management project (the Riga project) appeared to be indispensable[8]. The Project team responsible for the Project preparation utilized the unique opportunity of learning from experience because of its involvement in the preparation and implementation of the Riga project. Lessons learned during implementation of the Riga project were therefore reflected in the design of the Liepaja Project. For example, the importance of reaching a political consensus was translated into the requirement that all Liepaja region municipalities, future beneficiaries of the Project, were to establish a common regional facility. Such facility has been established to implement the Project and it has been funded through contributions of beneficiary municipalities (pagasts). To secure good publicity regarding the Project, residents of the Liepaja region have been duly and regularly informed, not only about the Liepaja Project developments, but also on modern solid waste management systems. The LCC established a special office to maintain contacts with the public and MoE secured active participation of one of its officials in the preparation.

2.2 Implementation

Proactive and practical approach of the L-RAS to Project implementation demonstrated to utilize all grant funding available to the Project - as mentioned under 1.7 the original

[8] Loan LV4286

plan of treating the leachate in a biological plant was never implemented; instead the leachate was trucked to the municipal waste water treatment plant. This solution was abandoned end of 2006, when a Reverse Osmosis Plant was put in operation, financed by ISPA and L-RAS.

The only problem the Project encountered in its initial phase of implementation is a considerable delay in obtaining ISPA financing due to lengthy procedures. However, thanks to a diversified financing plan it was possible to proceed with activities financed through funding from WB, NIB, PCF, Sida, GOL, LCC, and LRC. As soon as the ISPA grant became fully available the Project picked up speed, and was able to finish within the planned period for implementation without any extension of the closing date.

Actions taken to remedy the shortage of ERs - reducing GHG emissions through ERPA with the PCF has been set as one of the Project objectives. Implementation of ERPA requires achievement of certain amount of emissions reduction, MERs, by the Project within the agreed time frame[9]. These reductions can be achieving through LFG collection and utilization – by flaring or electricity generation. MERs have been estimated based on projections of LFG output. The gas collection at Skede and Grobina is below projections, and the issue has been constantly discussed in Aide-Memoires from all supervision missions during the last years. The team is of the opinion that the installed gas wells are not appropriate; they are too large and too few. The design company has been contacted by L-RAS, but no actions have been taken in order to rectify the problem. Currently, a local consultant team including technical expertise from the Getlini plant is involved, but their report is not expected to be presented until end of December 2007, so its outcome can not be included in this ICR Report. It should immediately be stated that even without expected revenues from sale of electricity generated from the LFG, L-RAS has a solid financial situation. The detailed design of the energy cells and construction of the energy cells was financed by the ISPA grant. During the detailed design phase, the Bank raised its concern in regard to the well design, but the consultant responsible for the detailed design confirmed that the amount of gas would be in line with the volumes calculated in the preliminary design.

2.3 Monitoring and Evaluation (M&E) Design, Implementation and Utilization

M&E Design - Project design covers the set of indicators which was listed in Annex 1 to the PAD. The indicators, which were identified to monitor progress towards achievement of the introduction of modern sanitary landfill techniques at regional level, were selected in a way to allow for rapid evaluation at relatively low cost at each stage of Project implementation. Aggregating the performance indicators into three PDO indicators only, allowed avoiding a trap of proposing a system with too many underutilized indicators, however remained focused on quantifiable information to demonstrate accurately achievement of DO with no compromise on quality of information. Actual result of the separation of recyclable material depends on efficiency of waste management, including establishment and operation of waste collection system. The efficiency of management system can usually benefit from the economy of scale because of its regional dimension,

[9] Until year 2012

and consumers' attitude and satisfaction shaped by information campaigns and tariffs decided by local government decisions, depending on local government capacity. For all such indicators baseline values were available and known. The reduction of GHG emissions indicated how much of emission was avoided through LFG collection and utilization at the Project sites either by flaring or by producing electricity; the number of closed and/or remediated dumpsites reflected reductions of environmental hazards; while amounts of sorted waste showed that separation of recyclable materials has been ongoing. All three indicators together provided L-RAS, MoE, other local Project stakeholders and the Bank with an accurate picture of the results of modern waste management.

M&E Implementation - the indicators illustrating progress of Project implementation have been presented in numerous reports produced by L-RAS, which collected information serving as M&E indicators on a day-to-day basis. Statistics on waste amounts delivered to the site, quantities of separated recyclable materials, control of LFG collection and generation of electricity were collected as part of the regular operational cycle. Monitoring of ground water quality conducted by some of beneficiary municipalities was part of the Environmental Management Plan, the implementation of which was agreed by Project stakeholders during project preparation. Monitoring of leachate amounts and its quality were performed by L-RAS as part of the leachate treatment arrangements. Waste was weighted upon reception at the Grobina site, or after being sorted; ground water analysis was performed by certified laboratories; leachate amounts were measured first upon discharge to the LWWTP and later by treatment through the ROP. Calculations of carbon emission reductions were made in line with MVP using monthly worksheets developed for the two Project sites Grobina and Skede, while the amount of electricity produced, which is subject to a purchase agreement with Latvenergo, resulted in payments to L-RAS.

M&E utilization - the most important issues recognized through the analysis of M&E data were (1) the declining trend in LFG production, and (2) a risk of non-delivery of contractual amount of MERs. L-RAS initiated consultations with a number of specialised companies – starting from a local consultant on biogas and then, the consultant responsible for the detailed Grobina plant design, to investigate the reasons of the reduced gas collection. This investigation was followed by an inventory of corrective measures designed to improve LFG collection and hence the production of electricity. Low LFG output and the shortfall in delivery of contractual MERs led to the following actions: first, L-RAS undertook to clear the legal status of the Grobina site and to apply for a revised operational permit, thus ensuring that all emissions reduction reached by the closing date for ERPA implementation could be recognized by PCF and accounted for. Second, MoE explored the legal and fiscal consequences of non-delivery of MERs in order to negotiate an amendment to ERPA. Lack of ground water monitoring which are to be financed by the beneficiary municipalities mobilized MoE and LREPB into the enforcement of these agreed environmental monitoring activities.

2.4 Safeguard and Fiduciary Compliance

Environment - the environmental assessment (EA) developed at the time of Project preparation evaluated two candidate locations for the regional disposal site. The EA identified a number of endangered species at the Skede location and therefore the final

choice was made to establish energy cells at the Grobina site. Establishment of only one disposal site for the whole region, based on state-of-the-art technology and taking all necessary measures to prohibit groundwater contamination, odor problems, noise and litter around the site resulted in significant environmental benefits. These benefits were achieved through remediation and closure of all existing small local dump sites and discontinued leachate discharge from the Skede site into lake Tosmare. Finally, the selected energy cell technology for waste management resulted in a considerable reduction of GHG emissions.

EMP defined mechanisms to monitor and evaluate the impact of the Project on the environment. A comprehensive monitoring program was developed in order to follow the quality of surface water and groundwater on a regular basis at the Skede and the Grobina sites. In addition, background measurements of ground water quality were made at the small dump sites and monitoring program for these sites was prepared. Results of laboratory tests were envisaged to assess Project impact on the environment and to quantify changes in ground water quality resulting from remediation of dump sites implemented under the Project. Also, a register of received amounts and types of waste was maintained at the Grobina site, as well as of collected gas from the energy cells and the old landfill in Skede.

Social - no social risks due to the Project arose during implementation. No complaints from the public have surfaced during the Project implementation, despite the fact that fee has been increased several times. The team believes that this is a result of extensive information about the Project from its early preparation phase, and the careful implementation of the Action Plan for Public Information, which was prepared during Project preparation and up-dated every year.

Procurement - multiple sources used to finance different Project components forced use of different procurement procedures by the Project, for example: WB procurement guidelines, Swedish Public Procurement Law and procurement procedures observed by the European Union, which was quite challenging for the PIU and L-RAS. The most significant changes into procurement plan originally included in the PAD resulted from ISPA financing. ISPA required limited number of procurement packages, and also that each package should be of a considerable size. Therefore it was necessary to rearrange the original procurement plan in early 2002; the number of procurement packages has been reduced from planned 17 to 9 leading to redistribution of allocated funds from the different financiers. The PIU and L-RAS staff greatly expanded their professional knowledge on project management and including procurement, therefore procurement activities were implemented timely and completed by the PIU prior to Project completion date.

Financial Management - overall financial management rating for the Project was satisfactory after completion of the action plan to strengthen the Project financial management system. The financial statements of the Project and implementing entities were subject to annual audit by independent auditors acceptable to the Bank who issued unqualified audit opinions. Project Financial Monitoring Reports were submitted on

timely basis and were acceptable. During Project implementation financial management supervision missions issued moderately satisfactory ratings.

2.5 Post-completion Operation/Next Phase

The Project is expected to be in operation for at least an additional 30 years, and continue to be operated by L-RAS. L-RAS has already acquired additional land which will guarantee the continued operation even further in the future. Provisions for continued investments are included in the cashflow projections.

L-RAS has currently a well-trained staff, which is regarded as fully competent to maintain and continue the operation. Furthermore, L-RAS has established a very good contact and exchange of technical information with staff at Getlini, which has a longer experience of operating energy cells. The L-RAS management and the GoL seem fully competent and resourced to handle the situation, as well as any future unknown complications.

The ambition of current officials at the GoL is to further enhance the collection of LFG and sale of "green energy", which strongly benefits the Project's financial viability.

3. Assessment of Outcomes

3.1 Relevance of Objectives, Design and Implementation

The NMSWMS emphasizes regional solutions as a key strategic element to improved and cost effective waste management. *One of the main objectives is to demonstrate a modern waste management solution at the regional level and this objective has been reached.* Once the strategy is fully implemented it is estimated that only 10-12 major sites will remain to serve the waste disposal needs of Latvia. The MoE recognized contribution of the Project to establishment of modern system of municipal solid waste management in the Liepaja region, and the Liepaja region could serve as an example to those regions which still lack such a system. In relation to waste management issues, the National Energy Strategy states that due to the country's few natural resources and the need to import all of its natural gas and oil products and half of its electricity, the use of indigenous energy resources and the diversification of energy sources are of high priority. Consequently, the Energy Law has recently been amended to grant a preferential status to electricity produced from LFG which can now be sold at *1.5* times the price of imported electricity. Provisions for LFG capture are also included in the 1996 Law on Solid Waste Management. LFG collection and utilization system implemented at the both Project sites fully meets the current requirements of the Latvian Law harmonized with the EU legislation in the area of municipal waste management. In addition, operation of LFG incineration by electricity generators and the possibility to sell it to national grid makes L-RAS a beneficiary of the most recent amendments to the Energy Law.

Greenhouse gas emissions resulting from improper landfill operations are recognized as a serious environmental concern. MOEPRD has declared that the reduction and collection of methane from solid waste disposal sites is one of the Government's priorities for the

reduction of greenhouse gases. This priority remains valid for MoE nowadays as solid waste disposal on land contributed to total 2004 GHG emissions in Latvia by 5%.[10]

3.2 Achievement of Project Development Objectives

The development of institutional capacity at the local/regional levels to manage programs for local infrastructure and environmental clean-up was one of five key areas of Bank assistance which were highlighted in the CAS. The CAS noted that despite progress in preparing a national environmental policy plan and some reduction in land and water pollution, Latvia's national and local environmental management capacity was below the levels required for EU accession and the country still faced unsatisfactory levels of land, water, and air pollution. The Project contributes to an improvement of this situation, which was included under two of the objectives. It also responded to the need to spread Bank assistance from Riga to other municipalities that need better delivery of urban services. In addition to directly benefiting the Liepaja region, the Project was expected to spur investments for similar projects in other regions.

In 1995, MOEPRD completed a National Environmental Policy Plan (NEPP). Improved waste management is cited in the NEPP as one of the top five priorities for Latvia. Pursuant to the NEPP, the Government started a program of upgrading or closing all existing waste disposal sites, many of which pose a risk to local groundwater resources. To support this program institutionally, a National Solid Waste Management Strategy (NMSWMS) was prepared, supported by the Danish EPA. The Project has through its implementation managed to close 26 old dumps, which was one of the objectives.

Collaboration with the PCF allowed for the implementation of a more modern and efficient waste management system than would otherwise have been possible.

The PCF involvement enabled to complete the design of the waste management system in line with EU requirements for the control of LFG emissions. The design of the Grobina and Skede plants included an installation to collect and utilize LFG through flaring or through electricity generation even before LFG control requirement became binding for Latvia. This design contributed therefore to a reduced negative impact of the both plants on the environment.

The ERPA agreement concluded between Government of Latvia and the PCF for the Liepaja Project was the first such agreement made ever with a EU candidate country; hence there was no experience of implementing such agreements. Implementation of the ERPA agreement was therefore a hands-on testing operation of this innovative approach for GHG emission reduction. In addition, no experience of international emissions trading operations existed and the European Trading Scheme (ETS) for GHG emission allowances was envisaged to be introduced after EU accession. Implementation of this ERPA agreement provided the GoL, L-RAS, the PCF and the Bank with a unique

[10] UNCFF 2006

experience of cooperation which required utmost focus and flexibility within the existing legal framework, in order to address implementation issues.

Therefore it is fair to state that all Project objectives have been met:

a) Demonstrating modern sanitary landfill techniques developed on a regional basis. This objective has been met: the waste processing plant at Grobina, established by the Project, serves not only the Liepaja region as originally planned but also municipalities of Kuldiga and Saldus districts, as well as Skrunda municipality. All leachate at the Grobina plant is collected, controlled and treated in an environmentally sound way, and impact of the waste treatment process run at the Grobina plant on groundwater is controlled on a regular basis in accordance with requirements from the LREPB and following the Environmental Management Plan (EMP).

b) Strengthening institutional capacity at the local/regional levels on issues related to municipal solid waste management through establishment and provision of hands-on training to L-RAS. . This objective has been met. The L-RAS company, operating both Grobina plant and Skede closed dump site has complete control of the amount of waste received and is able to plan for future extension of their activity. The TA provided a management system giving L-RAS the opportunity to use information from the quantity and different types of waste received to calculate both environmental benefits as well as financial income in addition to a lot of training both in Latvia and Sweden.

c) Arresting the on-going contamination of groundwater through implementation of EMP. This objective has been met. Implementation of EMP was a condition for the Liepaja region municipalities to join the Project. As the result of this participation the municipalities benefited because of remediation of local dump sites and because of improvement of ground water quality. During the Project implementation course LREPB strengthened its control activities on ground water monitoring, supported by the Liepaja local authorities. In addition, L-RAS voluntarily contributed through covering the cost of some laboratory analyses of ground water.

d) Reducing environmental disamenities for neighbors of existing waste disposal sites through closure and subsequent remediation of small dump sites. This objective has been met through closure and subsequent remediation of the Skede dump site and 26 other small dump sites in the Liepaja region; evidenced by the results of ground water testing.

e) Facilitating the separation of recyclable material at the Grobina site. This objective has been met; separation of recyclab;le materials has been ongoing and is evidenced by L-RAS.

f) Reducing GHG emissions through an ERPA with the PCF by 4, 994 tonnes Carbon equivalent until the Project closing date. . This objective has not been fully met. The waste is collected and treated with a modern technology resulting in the collection of LFG including Methane. LFG is burned and Methane content is converted into Carbon Dioxide. The collection of LFG is below expectations. The MoE has established a special working group to look further into a solution to increase the collection of LFG, and thereby enable the Project to meet both legal and financial obligations according to

ERPA. In addition, MoE has hired local consultants[11] to develop an assessment of financial and judicial aspects of the Liepaja Regional Waste Management Project. The report is expected by the end of 2007.

3.3 Efficiency

Economic rate of return (details are in Annex 3)

At appraisal the ERR, including PCF disbursements as a proxy for local environmental benefits, was estimated at 10.1%. By adding in the proxy for international environmental benefits -- the disbursement of grants offered by the European Union and Sweden -- this base case ERR increased to 21.2%. These calculations were made over 20 years (5 years implementation and 15 years of operation), with a waste disposal fee that would rise over 5 years to around LVL 4.95/ton and an import parity price for electricity of LVL 14.73/MWh. The benefit stream included, as the major component (around 60%), electricity production to be generated from LFG extraction, both from the old Skede dump site and from the energy cells at the modern waste handling site to be established at Grobina.

The modern landfill has been established as planned, but LFG extraction and electricity sales are lagging far behind appraisal estimates. These problems are now being tackled, but it seems already clear that neither gas extraction, nor the related electricity production and sales will ever reach the projected levels. Under normal circumstances, this negative development would have seriously reduced the financial and economic viability of the Project. However, several external factors not foreseen at appraisal are more than counterbalancing the negative impact of reduced LFG extraction. One factor is the much higher than projected quantity of waste delivered to the site, both from Liepaja city and its region and from two neighbouring regions Saldus and Kuldiga, which are sending some of their waste to the Grobina waste handling facility to save on transportation costs. The second external factor is the very rapid increase in international energy prices, which so far has led to a doubling of the import parity price for electricity.

A third factor is the substantial increase of the waste deposit fee, which has been approved by the local authorities. At appraisal it seemed evident that this fee could not be raised beyond the level that was then proposed, for reasons of affordability: salaries were low and unemployment was high and the waste deposit fee was considered to represent a substantial expense item for an average household. In fact, and no doubt related to the rapid increase in prosperity in Latvia and Liepaja, household incomes have risen to such a degree that the actual waste deposit fee of LVL 10.63/ton – compared to LVL 4.95/ton at appraisal – does not seem to pose a problem. And the latest fee proposal, already approved by City authorities, would lead to a further increase of 54 % to LVL

[11] SIA “Geo Consultants”

16.42 in 2008. This fee would then have increased more than three-fold compared to appraisal estimates.

As a result of these three external developments, the ERR of the completed Project has only marginal decreased from 10.1% estimated at appraisal to 8.91% at present, calculated over 20 years and taking into account only the local environmental benefits. The NPV at 10% shows a negative value of LVL 427,100. When the international environmental benefits are added into the equation, the ERR is at 20.12% almost equal to that estimated at appraisal; the NPV becomes largely positive at LVL 2.2 million.

It now seems that the economic life of the Project will be closer to 25 years rather than the 15 years used at appraisal. On this basis (30 years projection) the ERR would improve further, to 10.97% with local environmental benefits and to 20.96% when international environmental benefits are added in as well. These results indicate that the Project, at present prices, will be as economically viable as estimated at appraisal.
The sensitivity analysis has been carried out solely for the case where all environmental benefits, local and international, are included in the equation. The period for the analysis is 20 years, as at appraisal; extension to 30 years would of course improve the results (details are in Annex 3). The variations used are: an increase in the organic content of waste, from an assumed 16% now to a likely 25%; a complete failure to produce electricity; and a 25% increase in operating and administrative costs. The results are shown in the following table and indicate that the ERR is quite insensitive to the assumed changes in benefits or costs.

Table 1. ERR analysis, over 20 years

	base case	25% organic content	zero electricity	25% increase recurrent costs
base case	20.12%			
25% organic content		20.79%		
zero electricity			18.54%	
25% increase recurrent costs				18.59%

Financial Analysis (details are in Annex 3)

1. The cash flow projection

At appraisal a set of profit and loss projections, as well as the overall cash flow for the company L-RAS were made over 20 years. As a result of the very favourable funding of the Project from grant finance; the electricity sales at subsidized "green" prices; and a doubling of the then quite low waste deposit rates, the financial situation of the company was considered acceptable. There would be a small but positive cash flow and the loan repayment would be assured. However, these results were quite sensitive to decreases of revenues and/or increases of cost.

Seven years later operating costs have indeed increased quite rapidly, in line with the economic development of the country and the very sizeable increases in wages and salaries since 2000. And revenues have decreased due to the difficulties with LFG extraction and thus with production of electricity. These developments would have seriously affected the financial situation of the company and the Project, were it not for

the three external factors already mentioned before: the higher waste quantities, the higher international energy prices and the substantial increases in waste deposit fees.

The projections show that after a small loss in 2007 the company would be profitable throughout and the cash flows after loan repayment would remain largely positive; all the ratios are also favourable throughout. In addition, it would seem that the risks of unfavourable developments have already been largely discounted: electricity sales represent only 25% of revenues, compared to over 60% at appraisal, and any increases in operating costs would not doubt be covered by increases in waste deposit fees.

However, this favourable scenario assumes that a solution will be found with PCF and GoL for the shortfall in delivery of carbon emission units; otherwise the company may have to repay the PCF grant and this would of course put a considerable strain on its finances.

2. The financial internal rate of return (FIRR)

Even if the cash flow of the company appeared acceptable at appraisal, the FIRR for the Project, calculated over 20 years and including the local environmental benefits, showed a very low return of only 3.0%. Normally such a low FIRR would condemn a Project; however, in this case the ERR was considered to give the correct signal for the investment in the protection of the environment of Liepaja City and its region. And an important consideration was the fact that waste disposal as practised at the Skede dump site could not continue to be an acceptable solution in the longer run. A calculation at appraisal where only the loan amounts were included in Project costs, i.e. by including the international environmental benefits, showed in fact a high FIRR of 18.8%.

The FIRR for the completed Project is also calculated over 20 years, using the cash flow projections as a basis and including only the local environmental benefits. This calculation gives a quite acceptable figure of 9.2 %, which compares favourably with the base case FIRR at appraisal of only 3%. An extension of the period to 30 years, which now appears more reasonable that the 20 years assumed at appraisal, increases the FIRR to 11.2%.

The sensitivity analysis with the same parameters as used for the ERR, gives the following results over 20 years.

Table 2. FIRR analysis, over 20 years

	base case	25% organic content	zero electricity	25% increase recurrent costs
base case	9.20%			
25% organic content		10.63%		
zero electricity			5.36%	
25% increase recurrent costs				7.91%

The results show that the increase in electricity sales from a higher organic content of the waste would have a relatively small positive impact on the FIRR. On the contrary, the 25% increase in recurrent costs would reduce the ERR by about 14%, while the case of

"zero electricity sales" would reduce the FIRR substantially to 5.36%; however, this latter event is considered to have a low probability. The extension of the operational period of the Project to 25 years would of course improve all these results.

The foregoing analysis leads to the conclusion that the financial outlook for the company is quite positive; the cash flows and the FIRR are robust and would be negatively affected in a serious way only in the unlikely case that the company does not succeed to re-establish electricity production from the energy cells.

Sustainability

The analysis of the Project's economic and financial prospects shows that the Project is sustainable, even in the event of adverse developments. The technology of modern waste management has been largely acquired by the company, even though improvements, notably in waste separation and management of the energy cells can and should be realised. Overall therefore the outlook for the Project and the company appear to be favourable.

3.4 Justification of Overall Outcome Rating

Rating: *Satisfactory*

The overall outcome rating is based on a combination of the achievement of objectives, relevance and efficiency.

The Project has achieved its objectives since it has contributed to the demonstration of self-sustaining, modern management of municipal solid waste through maximum collection and utilization of LFG in the city and region of Liepaja. The Project has been completed within the foreseen timeframe during which: (i) 26 dump sites in the Liepaja region have been closed, (ii) GHG emissions are being reduced and registered, (iii) ground water quality is being monitored, (iv) separation of recyclable materials has been achieved since early 2006, and (v) modern sanitary landfill techniques have been demonstrated at both project sites – Grobina and Skede.

The company L-RAS has continued to undertake efforts to improve LFG collection. Disposal from additional waste from municipalities of Kuldiga, Saldus districts and Skrunde municipality is expected to have a positive effect on increased LFG output.

It is likely that the Project will not be able to generate the quantity of MERs necessary to satisfy ERPA requirements by the year 2012. In this respect MoE has been actively looking for solutions which could be acceptable to PCF.

3.5 Overarching Themes, Other Outcomes and Impacts

(a) Poverty Impacts, Gender Aspects, and Social Development

These aspects were never addressed in the PAD, and it is unlikely that the Project has had any impact on these aspects, besides that the waste management in the Region has now been much improved, and so reduced the disamenities for inhabitants living close to the now remediated old dump sites.

(b) Institutional Change/Strengthening

The Project has been of large value for the MOE to continue with its ambition to close and remediate old dumps and reorganize Latvian waste management by establishing a limited number of regional waste management facilities. The MoE supported and closely monitored the Project during the entire implementation process. The Project created unique opportunity to test a mechanism available through PCF financing. It also sensitized officials and staff, not only of MoE, but also MoF and the Treasury that implementation of innovative mechanisms like ERPA and projects of a pilot nature require a lot of careful attention, close monitoring and cooperation with project implementing agencies to address implementation issues effectively.

(c) Other Unintended Outcomes and Impacts (positive or negative)

Not applicable

3.6 Summary of Findings of Beneficiary Survey and/or Stakeholder Workshops

Not applicable

4. Assessment of Risk to Development Outcome

Rating: *High*

Risk: Project is unable to deliver contractual ERs within amended ERPA schedules. The ERPA is based on a delivery schedule ending 2012. However, EU has now in its latest directive 1999/31/EC[12] required that all landfills from 2009 onwards should be equipped with a LFG collection system. If that directive would be applied retroactively to Grobina, it is clear that even with LFG generation as projected at appraisal, the Project would not be able deliver ERs in accordance with the ERPA agreement.

However, the directive is referring to landfills, while the Grobina site is a waste management facility, as confirmed by MOE. Therefore, MOE has requested EU to provide clarifications if the Landfill directive also should be applied to the Grobina site.

Current generation of MERs by Grobina and Skede is insufficient to satisfy ERPA requirements within the 2012 horizon. It has been proposed to find a compensation for the amount of MERs, which cannot be delivered up to 2012. This solution, which is fully supported by MOE, is pending a written request to PCF by the GoL and would depend on the reaction of PCF to the proposed solution.

5. Assessment of Bank and Borrower Performance

5.1 Bank Performance

(a) Bank Performance in Ensuring Quality at Entry

Rating: *Highly Satisfactory*

Before even starting the Project the team decided that the following criteria should be fulfilled:

[12] of April 26, 1999

(a) a signed agreement between Liepaja City and municipalities to establish a regional waste management facility; (b) establishment of an office at Liepaja City Council serving as a information center to the public about Project activities; and (c) agreement that the Ministry of Environment should appoint an official to participate in all preparation missions.

The Project was reviewed in regard to Quality at Entry by Mr. John Kendall. In the opinion of June 2, 2001 QER noted that the Project was an excellent demonstration operation that introduced valuable new practices to Latvia to, among other things, reduced groundwater contamination from solid waste deposits and collected and utilized methane from solid waste sites to generate electricity at reasonable cost. In addition, the fruitful efforts of the task team leader to obtain cooperation of several co-financiers to participate in the demonstration project, including Canada's CIDA, the European Union, the Nordic Investment Bank, SIDA and the PCF, were recognized.

(b) Quality of Supervision

Rating: *Highly Satisfactory*

The Bank allocated sufficient budget and staff resources to supervise the Project adequately and monitor closely. The team has put a substantial effort in covering all aspects of the Project, which are fully reflected in the Aide-Memoires (AMs) which were regularly prepared and transmitted. The Project Status Reports (PSRs) and then, Implementation Status Reports (ISRs) realistically rated achievement of development objectives and implementation progress. Whatever problem encountered has been fully reflected in the A-Ms, mitigation measures have been suggested, and actions for both, the Borrower agencies and the Bank have been thoroughly discussed, agreed and set in the exact timeframes. Implementation status of those actions has been followed during periods between subsequent missions and their completion recognized during the following supervision missions and reflected in A-Ms. Representatives of other donors participated in most of supervision missions.

The team has been responsive to justified requests for re-allocation of loan proceeds among different expenditure categories to enable full use of the loan.

Two changes on the position of project task team leader were done smoothly and quality supervision was maintained. The access to the project institutional memory was secured through involvement of the first team leader until closure of the Project.

(c) Justification of Rating for Overall Bank Performance

Rating: *Highly Satisfactory*

As the rating for both Quality at Entry and Quality of Supervision is the same the outcome of the Overall Bank Performance should be as follows:

5.2 Borrower Performance

(a) Government Performance

Rating: *Highly Satisfactory*

The Governmental agencies such as Ministry of Environment (MoE), Ministry of Finance (MoF), and Treasury have been extremely helpful in moving the Project forward, and

taken actions in critical situations to solve bureaucratic problems in record time to the benefit of the Project. In order to deal with ERPA implementation issues GoL established a working group to examine solutions and actions to be taken to satisfy the requirement of emission reductions delivery to the PCF by GoL to compensate possible shortage in MERs delivered by the Project and gathered representatives of MoE, MoF, the State Treasury (ST), L-RAS and the PIU into the group. In addition, MoE supported L-RAS efforts towards improvement of LFG collection systems operation through financing of local consultants.[13]

(b) Implementing Agency or Agencies Performance

Rating: *Highly Satisfactory*

The implementing agency is Liepajas-RAS (L-RAS) supported by the Project Implementation Unit (PIU). Both, L-RAS and PIU worked effectively to satisfy the Bank's requirements on disbursement, procurement and proper maintenance of project records. L-RAS has accomplished all the required actions as recorded in the A-Ms, and provided an excellent documentation for every mission. L-RAS and PIU were proactive during the whole project implementation and initiated several actions to address implementation issues, *inter alia*: requested allocation among expenditure categories, applied for an updated operational permit for the Grobina site to clarify legal status of the site[14] i.e. waste processing plant and inert and actively cooperated with local and international consultants to address problems of LFG collection effectiveness including participation and sharing own experience at municipal solid waste management during international workshops[15]. Moreover, Project implementation benefited from the excellent and continuous support of Liepaja City Council (LCC) and also of RAS-30.

(c) Justification of Rating for Overall Borrower Performance

Rating: *Highly Satisfactory*

As can be seen from above both the Government and the Implementing Agency have performed in an excellent way during Project implementation.

6. Lessons Learned

Implementation of innovative arrangements, like those under the ERPA agreement, requires thorough and closely coordinated project supervision involving all project parties to react/address implementation issues, and dedicated monitoring and support of the project implementing entity by state institutions (MoE, MoF).

EU accession and related harmonization of local legislation with the EU *acquis* required additional efforts of cooperation of all parties involved in project implementation, monitoring and supervision to establish univocal understanding of law changes which may impact on achievement of project outputs.

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[13] Including a contract on assessment of financial and Judicial aspects [of implementation of ERPA] with SIA "Geo Consultants, Latvian consulting company, dated September 28, 2007

[14] Cabinet Regulation No. 15, Adopted 3 on January 2002; Regulations regarding Requirements for Construction of Landfill Sites, as well as Management, Closure and Re-cultivation of Landfill Sites and Dumps and Waste Management Law adopted on December 29, 2000 with amendments

[15] http://www.intranet.worldbank.org/WBSITE/INTRANET/INTCOUNTRIES/INTECA/INT...08/13/2007

Availability of ISPA financing resulted in a considerable delay in project implementation due to lengthy procedure, and required rearrangements of the original procurement plan as well as the redistribution of funds from the different financiers. This lessons shows that all possible project financing sources should be identified at the earliest stage of project preparation in order to coordinate requirements of multiple financiers to reflect them in financing plans and implementation schedules appropriately.

Preparation of LRSWM project benefited from lessons learned under the Riga Solid Waste Management project notably the need for all stake holders to cooperate and the value of a public awareness campaign.

The PIU should be integrated into the management structure of the project rather than operate as a separate unit. In this way its competence will be retained within the project and not lost at the end of contract period.

The Business Plan for the company, drawn up by foreign consultants, proved to be too complicated for management. Establishment of such long-term company strategies would make sense only for already well-established entities, and not for start-up companies as L-RAS. The same comment applies to the technical assistance on the financial models developed by a Swedish consultant.

The language barrier was often a problem in getting ideas across; the project should have included an intensive English language course for key members of management.

7. Comments on Issues Raised by Borrower/Implementing Agencies/Partners

(a) Borrower/implementing agencies

Comments to the draft ICR were submitted by Ministry of Environment on December 17, 2007, and a letter from Ms. Vija Geme, Deputy State Secretary, is included in Annex 7 along with "Project Assessment" developed by the Liepajas RAS Ltd. in October 2007, which is presented in exact wording of L-RAS.

L-RAS commented the draft ICR on December 6, 2007. Neither Ministry of Environment, representing the Borrower, nor L-RAS, the implementing agency, have raised issues on substance. The comments were focused on providing clarifications.

No comments from Ministry of Finance were received by December 21, 2007.

(b) Cofinanciers

Not applicable

(c) Other partners and stakeholders

(e.g. NGOs/private sector/civil society)

Annex 1. Project Costs and Financing

(a) Project Cost by Component (in USD Million equivalent)

Components	Appraisal Estimate (USD millions)	Actual/Latest Estimate (USD millions)	Percentage of Appraisal
REMEDIATION OF EXISTING DISPOSAL SITES	2.18	0.92	42.2
TECHNICAL AND OPERATIONAL IMPROVEMENTS [16]	4.60	2.69	58.5
INSTALLATION OF ENERGY CELLS AND LANDFILL GAS COLLECTION SYSTEM [17]	0.88	8.53	969.3
INSTALLTION OF A POWER GENERATOR	0.59	1.33	225.4
VEHICLE AND WASTE COLLECTION POINTS [18]	0.64		
MANAGERIAL SUPPORT THROUGH TWINNING	0.42	0.51	121.4
DETAILED DESIGN	0.88	0.78	88.6
IMPLEMENTATION SUPPORT	0.47	0.60	127.7
TECHNICAL ASSISTANCE ON THE NMSWMS [19]	0.42		
Total Baseline Cost	11.08	15.39	138.6
Interest during Construction	0.9		
Operation and Maintenance during Implementation	2.04	0.08	3.9
Physical Contingencies	0.53		
Price Contingencies	1.06		
VAT	1.11	1.12	100.9
Total Project Costs	16.72	16.59	99.0
Project Preparation Fund	0.00	0.00	
Front-end fee IBRD	0.03	0.022	.00
Total Financing Required	16.75	16.61	99.0

[16] The need for additional equipment had been developed during the implementation phase, and a major procured using remaining ISPA-funds is the equipment for leachate treatment through investment in a Reverse Osmosis Plant. Installation of a line for waste separation through a picking belt, shredding of the waste and transport of the waste by conveyer belts were excluded already under the detailed design phase. Furthermore, the mixer for mixing the waste with sludge was never procured.

[17] Cost for this sub-component includes additional costs for a poly-ethylene liner neither foreseen nor required at appraisal and all the buildings for administration and separation, which actually were included in the operational improvements at appraisal.

[18] The waste collection points were never procured under the project financing scheme, but implemented by use of other funds.

[19] The technical assistance for training of staff from other municipal waste management companies by use of the CIDA funds, was unfortunately cancelled, as no funds were made available.

The largest contributor to Project financing is the EU through the ISPA funds. At the end of the final procurement planning, EU required to have large packages for its financing which resulted in substantial revisions of the original PAD procurement plan. It is therefore nearly impossible to make a fair comparison between PAD and realization of the costs for different subcomponents, as can be seen above. Furthermore, some of the sub-components were dropped and some other activities included (see comments on section 1.7). The footnotes below Table in Annex 1 subsection (a) provide explanations for the differences.

(b) Financing

Source of Funds	Type of Cofinancing	Appraisal Estimate (USD millions)	Actual/Latest Estimate (USD millions)	Percentage of Appraisal
EC: European Commission	Grant	4.86	5.48	.113
International Bank for Reconstruction and Development	Loan	2.22	2.22	100
Local Govts. (Prov., District, City) of Borrowing Country	Local contribution	3.94	4.53	115
Nordic Investment Bank (NIB)	Loan	1.49	1.49	100
FOREIGN SOURCES (UNIDENTIFIED)	Grant	0.47	0.00	0
SWEDEN: Swedish Intl. Dev. Cooperation Agency (SIDA)	Grant	1.18	1.18	100

Annex 2. Outputs by Component

The outputs described below are related to (a) the investment component for improved waste management on a regional basis, and (b) the technical assistance component.

Investment Component

The Project has resulted in an efficient closure of Skede and 26 other old dump sites, at the benefit of all people living in the small municipalities in Liepaja region, as well as those close the major dump site Skede. Besides the environmental benefits of closing Skede, owners of houses in the neighborhood have realized a clear increase in property value.

The waste is now collected and treated with a modern technology resulting also in the collection of the detrimental green-house gas Methane, which is burned and converted into Carbon Dioxide. However, the collection of LFG is (about 20%) below expectations. One major reason is that the types of gas wells as used in accordance with the detailed design are both too large and too few compared with the initial design. A special working group has been established by the MOEPRD to look further into a solution to increase the collection of LFG, and thereby enable the Project to meet both legal and financial obligations according to ERPA. The report is expected by the end of 2007.

The operating company L-RAS, now has complete control of the amount of waste received and is able to plan for future extension of their activity.

All leachate is controlled and treated in an environmentally sound way, and impact on groundwater is controlled on a regular basis in accordance with requirements from the LREPB following the Environmental Management Plan (EMP) as included in the PAD.

Technical Assistance Component

The SIDA financed TA provided a management system giving L-RAS the opportunity to use information from the quantity and different types of waste received to calculate both environmental benefits as well as financial income. However, the model prepared has not yet been used, despite the fact the L-RAS staff was provided with a lot of training both in Latvia and Sweden. Finally, the model was modified by L-RAS to meet the company needs, and is being used in this modified version.
CIDA was from the beginning of Project preparation interested in providing TA for training of waste management staff at other regional disposal sites. Unfortunately, CIDA withdrew from their original plans, so that part of expected Project outcomes was never accomplished.

Annex 3. Economic and Financial Analysis [20]

Introduction and assumptions

The results of the financial and economic analysis of the LRSWM Project are presented in three sections: in the first section the financial cash flows of the company, Liepajas-RAS (L-RAS) are developed; the financial internal rate of return (FIRR) of the Project is analyzed in the second section; while in the final section the economic rate of return ERR is estimated. Detail of the relevant assumptions is given both in the text below and more concisely in Attachment 1.

The waste management project in Liepaja was carried out without major delays and Project costs were close to appraisal estimates, which are quite positive factors. However, on the production side the achievements are mixed; reduction of greenhouse gases, has not been fully met. While most organic waste is now stored in energy cells, as foreseen under the Project, extraction of LFG and generation of electricity, both from the old landfill site at Skede and from the new energy cells at Grobina are falling far short of appraisal estimates. This situation is possibly linked to errors in the implementation and operation of the Project and this factor risks to compromise both the reduction of carbon emissions as agreed to with PCF and the production of electricity for sale to Latvenergo.

Bank supervision missions, as well as consultants engaged to deal with the problem of low LFG extraction, seem to have identified several factors that could explain this lower than expected extraction rate. One factor is the quality of the waste going to the energy cells, which is not sorted and contains a lot of inert material, which is useless for methane gas production. Another is the height of the energy cells; the presence of water in the gas extraction wells; and finally the pattern and size of extraction wells, basically too few and of a too large diameter. The German consultant company SEF has suggested various corrective measures which would, if successfully implemented, raise LFG extraction and the resulting electricity production, and consequently the revenues to about half of what was calculated at appraisal. The financial and economic projections for the Project are based on the SEF projections, which assume that L-RAS will carry out the corrective measures and that they will have the desired result. These technical factors represent therefore a real risk to the ultimate success of the Project.

The shortfall in electricity production and its negative impact on the company's financial situation is reduced by the very rapid and recent increases in the international energy prices. The latter phenomenon has led to a doubling of import parity prices for electricity and would, according to a recently approved regulation on electricity generation from

[20] Prepared by Frank M Stubenitsky, Consultant : 5 supporting tables are attached

renewable energy sources[21], result in a nearly four-fold increase in the sales price of "green electricity" to Latvenergo compared to appraisal figures.

A further positive external factor is that waste quantities delivered to the site are higher than estimated at appraisal, in spite of a falling population both in the city of Liepaja and in the Liepaja region. It now appears that waste generation per capita is higher than foreseen, a development which is probably linked to the higher prosperity in the city and the region. In addition, waste from parts of two neighboring regions, Saldus and Kuldiga, will in future be transported to the Grobina site; it concerns a total of around 15,000 tons. Last but not least, local authorities have approved substantial increases of the waste deposit fee; as a result, revenues from waste now represent the bulk of the company's income.

The main **assumptions** used in the projections are detailed below (see also Attachment 1). The projections of the PAD were carried out 20 years, which in retrospect appears a too short period. Therefore, the ICR projections have been carried out over a period of 30 years (5 years of implementation and 25 years of operation) and in constant 2007 prices, but the respective 20-year figures are given to allow a correct comparison with the appraisal estimates. The figures for 2001 to 2006 are drawn from the audited accounts of L-RAS; those for 2007 have been estimated on the basis of 9-months company actual and the figures for 2008 are based on the recently approved budget of the company.

Waste quantities. During 2007 some waste from parts of the neighboring Saldus region has being directed to the Grobina landfill; the quantity is estimated at around 5,000 tons/year and partly explains the increase in waste delivered to the site from 61,000 tons in 2006 to an estimated 69,000 tons in 2007. From 2008 neighboring Kuldiga region will also send part of its waste to L-RAS; it concerns an estimated 10,000 tons/year. All this waste is mostly of the degradable type suitable for use in the energy cells and will thus contribute to the production of LFG. This additional waste has been phased in over 2007 to 2009, after which overall deliveries of waste to Grobina are assumed to increase by 1% per year.

Disposal fee. This fee was expressed per m^3 of waste until the change-over by the introduction of a weighbridge in 2004, when it was converted to a fee per ton. It has been increased substantially since appraisal, from the equivalent of around LVL 2.00/m^3 in 2000 and LVL 3.24 at change-over to the weight based system, to LVL 10.63/ton at present. A further raise to LVL 16.42/ton is now before the Public Sector Regulator of Liepaja City, and is expected to be approved for introduction by mid-2008.

Electricity output. Extraction of LFG at the Skede closed landfill and at the energy cells of Grobina was to be converted to electricity for sale to Latvenergo. So far only the Skede site produces electricity, but at far lower quantities than estimated at appraisal. At Grobina several energy cells have been covered and LFG extraction is taking place.

[21] « Regulation on Electricity Generation from Renewable Energy Sources » adopted on July 24, 2007 by the Cabinet of Ministers.

However, the gas quantities are too low and the methane content not high enough to permit production of electricity; the extracted gas is therefore flared. The LFG extraction problem is being addressed by L-RAS management, but it is already clear that appraisal estimates will not be realized. The most recent re-evaluation of likely LFG extraction and related electricity production at Grobina has been produced by consultant company SEF in July 2007[22].

Their projection is conditional on certain improvements to be realized at the energy cells; it uses an organic content of the waste of 16.06% (at appraisal this content was estimated at over 30%) and assumes that 2/3 of all waste coming to the landfill will be stored in energy cells. This SEF calculation is based on a constant stream of waste of 40,000 tons per year going to the energy cells. It has been corrected for waste coming from Saldus and Kuldiga regions and total quantities are assumed to increase annually after 2009 with 1% per year. These quantities are the basis for the recalculated electricity production figures used in the financial analysis. To allow for a certain delay in LFG production following corrective measures, actual electricity output is assumed at 25% of SEF corrected figures for 2008, 50% in 2009 and 75% in 2010, and at the full 100% thereafter.

Organic waste content however, is likely to be higher than the 16% estimated by SEF, which is used in the financial cash flow projections and in the "base case" calculations of the FIRR and the ERR. In the sensitivity analysis an increase of the organic waste content to 25% will be analyzed for its positive impact on the rates of return.

Electricity price. The price at which Latvenergo was to purchase electricity generated from LFG has been set by GoL at a substantial margin over assumed import parity prices in order to stimulate locally based renewable energy production. At appraisal these prices were respectively LVL 22.10/MWh and LVL 14.73/MWh respectively, while the sales price subsequently rose to LVL 34.35/MWh in the early years of Project implementation. The recent regulation approved by the Cabinet of Ministers contains a formula for the calculation of the new subsidized electricity prices[23]: at present import prices for natural gas this new price for supplies from L-RAS is at a level of LVL 88.45/MWh, an increase of over 150% of the previous level. However, the regulation also stipulates that only production of the first 7,000 hours will receive this higher price, with the balance at the much lower price of LVL 34,35/MWh[24]. The assumed import parity price is at present double that taken at appraisal, LVL 29.46/MWh, a figure that will be used in the economic analysis.

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[22] SEF-Energietechnik GmbH, July 13, 2007: report prepared by Dr-Ing. A Seyfert.

[23] The formula for the calculation of the subsidized price for renewable electricity = Tg x k/9,2 x 4,45, where Tg is the import price of natural gas, currently LVL 176,68/'000m3 and k a coefficient linked to the installed power : in the case of L-RAS this coefficient is 1,035. The other numbers are coefficients given in the formula. Source : annex to the government regulation of July 24, 2007.

[24] The theoretical number of operating hours of a turbine is 8,760 per year. However, some 760 hours have been assumed for maintenance, leaving 8,000 hours of effective operation. Of these 8,000 hours some 7,000 will be sold at the high subsidized price of LVL 88,45/MWh, with the remainder sold at the present price of LVL 34,35/MWh.

Operation, maintenance and administration. These costs are based on the 2008 budget and have been kept constant after a modest increase in 2009. Other costs include repayment of NRT, a provision for landfill closure (LVL 30,000 per year) and an annual investment of an assumed LVL 100,000 per year to cover expansion of the site, drilling of wells, increasing leachate treatment capacity, etc.

Loan repayment WB and NIB. These loans have grace periods of 5 years and 10 years, and repayment over 12 years and 15 years respectively for the Bank and for NIB. The calculation has been based on an effective interest rate of 6.55%, using to-days LIBOR plus various mark-ups; details are in Attachment 3.

Write-down of grants. The grants received by the Project from ISPA and SIDA are treated in the accounts on an income-basis and written down in line with the assets they financed. As a result an amount of LVL 245,100 is shown under inflows and this adds to the positive outcome of the analysis.

Residual value. The financial cash flow of the company has been projected on a "going concern" basis. But for the FIRR and ERR calculations a residual value of the Project investment has been added to the benefit stream in year 30; for the ERR this investment is net of VAT. For the calculation over twenty years, the residual value has been added to the costs/benefits in year 2020.

1. The financial cash flow analysis of L-RAS

The calculations are in Attachment 2. Under outflows are operating and administrative costs, depreciation, a provision to cover the cost for closure of the site in 25 years' time and the annual investment in waste treatment facilities of LVL 100,000 per year from 2008 onwards. The table shows that profits after company taxes are negative in 2007 (LVL 42,600); thereafter the situation improves rapidly due to the combined effect of higher waste quantities and the 65% increase of waste disposal fees. The profitability index, after tax profits as a percent of revenues, increases from 37% in 2008 to 48% in 2010 and to an estimated 62% in 2030.

After adding back depreciation and allowing for loan repayment and the annual investment in the waste treatment facilities, the cash flow which is estimated at LVL 377,400 in 2007 remains positive throughout, to reach just over LVL 1.7 m (USD 3.4 m at current exchange rates) in 2030. The cumulative cash flow in year 2030 would then reach LVL 31.1 million (USD 62.2 m). Obviously, with such good profit and cash flow figures all the ratios are very satisfactory from 2008 onwards.

Compared to the PAD, the current financial projections are much more favorable than estimated at the time of appraisal, in spite of the problems with LFG extraction and electricity generation and higher operational and administrative costs. The main factors responsible for this positive outcome are the much higher than expected waste deliveries and the very significantly higher waste deposit fees. The recently approved substantial

increase in electricity tariffs for "green" energy produced by the company also helps to mitigate the effects of reduced electricity production.

Sensitivity analysis The financial outlook is so robust that the company would continue to generate profits even if it did not succeed in re-establishing electricity production from the Grobina energy cells. In fact, electricity revenues are currently estimated to represent only 25% of total revenues, against just over 57% at appraisal. Profits in a zero electricity production scenario would fall by between 40% and 45%, depending on the year; but there would be no losses.

A 25% increase in operating and administrative costs, some LVL 100,000, would have a much lesser impact on profits, varying between 7% and 11% depending on the year. The conclusion from this sensitivity analysis is therefore that L-RAS' financial future appears quite positive and that the financial flows are so robust as to be able to withstand possible negative developments in revenues and costs.

2. The financial internal rate of return (FIRR) of the LRSWM Project

The detailed FIRR calculations, based on the data presented in the cash flow projections, are in Attachment 4. For the costs, the analysis includes the investments in the Project during implementation, post-project investments of LVL 100,000/year and the provision of closure cost of the site in 25 years (LVL 30,000/year). Regarding benefits, in addition to the waste deposit fee and sales of electricity, the sale of carbon emission reduction units to PCF is brought in. The actual PCF disbursements under the Project are taken as a proxy for these sales; the residual value of 15% of total Project investment has been added to benefits in benefits in years 20 and 30 respectively.

The "base case" FIRR calculated with these cost and benefit streams, over 20 years, gives a rate of 9.20%, more than three times the PAD estimates of 3.01%. The NPV at 10% gives a small negative rest value of LVL 365,300, as against a very large negative value at appraisal. The reasons for this much better performance have already been mentioned: higher revenues from the waste management activity due to higher quantities of waste and substantially higher waste deposit fees, which more than compensate for increased operation and administrative costs. The much lower than expected electricity production is more than off-set by the very substantial increases in the price of "green electricity" recently decided by Government.

An extension of the operational period to the year 2030 improves the FIRR to 11.18%, while the NPV gives a positive value of LVL 715,200. As a longer exploitation period appears more realistic, the financial performance of the Project is likely to be much better than that estimated for the twenty year period.

Sensitivity analysis. In order to test the robustness of the FIRR three variations of the "base case" cost and revenue projections have been carried out: the calculations are in Attachment 5.

The first case incorporates the assumption that organic content of waste going to the energy cells is 25%, instead of the 16% on which SEF consultants have based their projection of electricity production. The increase in revenues related to this higher organic content drives the FIRR up by about 15%, from 9.20% to 10.63% over 20 years (from 11.18% to 12.68% over 30 years).

The second variation assumes that L-RAS does not succeed to re-establish normal LFG extraction. The "zero electricity production" scenario would reduce the FIRR by about 40% from the base value of 9.20% to 5.36% over 20 years; the NPV at 10% gives a negative value of LVL 1.8 million. Over 30 years the figures are respectively 7.87% and a negative NPV of LVL 1.1 million.

The third variation scenario assumes a 25% increase in the operating and administrative costs; in this event the FIRR over 20 years would drop by about 14% from 9.20% to 7.91%. An extension of the period to 30 years gives a FIRR of 10.27%.

These scenarios show that the FIRR is more sensitive to a drop in revenues compared to an increase in costs. However, the "zero electricity production" scenario has the worst impact, but the probability of this event materializing appears in fact to be quite low, while the likelihood of improvements of LFG extraction and thus of electricity production over and above the SEF estimates is quite high. The financial outlook for the Project remains therefore largely positive.

Summary of FIRR estimates

	20 years	30 years
Base case	9.20%	11.18%
25% organic content	10.63%	12.68%
zero electricity production	5.36%	7.87%
25% increase recurrent costs	7.91%	10.27%

3. The economic internal rate of return (ERR) of the LRSWM Project

The ERR analysis is also shown in Attachment 4. The "base case" calculation of the ERR uses the cash flow projections of attachment 2, with several adjustments: VAT has been deducted from Project investments and the tax element of recurrent expenditures (social security taxes of 24% on salaries and 18% VAT on purchases) has also been deducted. Benefits include the waste deposit revenues; electricity production at import parity prices; the sale of carbon emission reduction units to PCF as a proxy for local environmental benefits; and a proxy for international environmental benefits in the form of disbursements of the ISPA and SIDA grants.

The resulting ERR when taking account only of local environmental benefits over 20 years is 8.91%, compared to an appraisal estimate of 10.1%. When international environmental benefits are factored in the ERR rises to 20.12%, which is very close to the 21.2% calculated at appraisal. And when the calculation is extended over a 30-year

period the ERR improves to respectively 10.97% (local environmental benefits) and 20.96% (including also international environmental benefits). The NPV at 10% gives a negative value for the worst case, and is largely positive for all other scenarios.

Sensitivity analysis. The same revenue and cost scenarios as used for the FIRR have been applied to the ERR calculation; the analysis over 20 years; respectively 30 years has only been carried out for the case which includes both local and international environmental benefits.

A 25% organic content of waste compared to the 16% assumed by SEF consultants would lead to a 56% increase in electricity production; this would marginally increase the ERR from 20.12% to 20.79% over 20 years (from 20.96% to 21.70% over 30 years). These small increases indicate that electricity revenues at import parity prices are much less important in the overall economic benefit picture than waste deposit revenues. The NPV at 10% remains largely positive.

The second case, zero electricity sales, also underscores this relative unimportance of electricity revenues. The ERR would lose 2.5% from 20.12% to 18.54% over 20 years, with a similar drop over 30 years; these are still very favorable levels.

In the third case, a 25% increase in recurrent costs would have about the same impact on the ERR as the "zero electricity production" scenario.

Summary of ERR estimates (local and international environmental benefits)

	20 years	30 years
Base case	20.12%	20.96%
25% organic content	20.79%	21.70%
zero electricity production	18.54%	19.54%
25% increase recurrent costs	18.59%	19.64%

The results of the sensitivity scenarios are summarized in the table: the figures show that the ERR is quite robust and that the economic justification of the Project would remain at acceptable levels even in the face of unfavorable developments.

4. Conclusion

The waste management project for Liepaja was designed, through the energy cell concept, to pay for modern waste management with the revenues from electricity production. This source of income would then allow the company to keep the waste deposit fees, and thus the individual household collection charges, down to low levels. The affordability of the Project for individual households would thus be guaranteed and this was an important issue at the time of appraisal in view of the low levels of income.

Because of the problems with LFG extraction and electricity production the LCC has had to approve rather large increases in the waste deposit fee in order to guarantee the

financial viability of the company. These increases have been approved based on the fact that the population now can afford them.

The Project will also have a problem in meeting the contractual requirements with PCF relative to emission reduction, but this will hopefully not have any financial consequences for the company. However, the cash-flew calculations clearly indicates, that in case PCF would request repayment for already invested money (pre-payment for MERs) L-RAS would be able repay these amounts, without requesting financial support from its owners LCC and LRC.

Paradoxically, the Project's financial outlook and its economic justification remain solid, thanks to higher than estimated waste quantities; substantially higher waste deposit fees; and much increased electricity prices. The rapid economic development of the country has led to greater prosperity than thought possible at appraisal; as a result, the affordability of modern waste treatment, even at very much higher household charges than foreseen at appraisal, does not appear to pose a significant problem to the inhabitants of Liepaja city and region.

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Financial cashflow analysis based on audited accounts for 2001 to 2006, projections of L-RAS thereafter (in '000 LVL)

Attachment N° 1: assumptions used in the projection.

waste quantities to the landfill site — actuals 2001 to 2004 in '000m3, then in '000tons; 2007 based on 9-months figures. From 2010 assumed growth rate(1% pa) 1.01
waste from parts of Saldus region (estimated at 5,000t/year from 2007 onwards) and Kuldigas region (estimated at 10,000t/year from 2008 onwards) have been added; most of this waste will go to the energy cells. From 2010 onwards 1% growth rate applied

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Bank estimates (in tons)	*76,497*	*88,410*	*108,350*	*72000/18700*	*61,033*	*61,614*	*69,000*	*74,000*	*79,000*	*79,790*	*80,588*	*81,394*	*82,208*
of which energy cells (tons)							*40,000*	*45,000*	*50,000*	*50,500*	*51,005*	*51,515*	*52,030*

disposal fee
9.24 fee level increased from 1,00/m3 in 2001 to 1,65/m3 in 2002; rate fixed at 3,42/ton with change-over to weighbridge in 2004.
10.63 from July 2005 fee increased to 9,24/ton, from 1st March 2007 to 10,63/ton. Proposed increase for 2008 is 16,42/ton, if approved by Public Sector Regulator.
16.42 For 2007: 1/4 at 9,24 and 3/4 at 10,63: for 2008, 50% at 10,63 and 50% at 16,42. Thereafter at 16,42/ton.

natural resource tax - payment and provision from 2007 — rate of LVL 0,25/m3, then 0,75/ton is included in the disposal fee **0.75** Only 40% is paid directly to GOL, with the balance retained until after energy cells are emptied.

electricity production (notes 1 and 2) — start of sales from the Skede site in 2005: Grobina production to start in 2008; ICR estimates are based on calculations of SEF consultants, corrected for higher waste quantities and organic matter content.

		2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
production(MWh)	*SEF estimates, in kWh, on basis of 40,000t*	*na*	*na*	*na*	*na*	*na*	*na*	*na*	*279.2*	*323.0*	*361.0*	*394.2*	*423.0*	*448.1*
	kWh per '000 ton waste to energy cell	*calculation SEF based on fixed 40,000 ton/year to energy cell*					***40***	*na*	*7.0*	*8.1*	*9.0*	*9.9*	*10.6*	*11.2*
	kWh calculated on waste to energy cells	*estimated waste to energy cells*					*na*	*na*	*314.1*	*403.7*	*455.8*	*502.6*	*544.8*	*582.8*
	MWh production @ 7,000 hours	*production based on 7,000 hours*			*0*	*0*	***7,000***	*na*	*2,198.8*	*2,825.8*	*3,190.6*	*3,518.2*	*3,813.3*	*4,079.9*
	MWh production @ 1,000 hours	*production based on 1,000 hours (8,760-7,000-760 for maintenance)*					***1,000***		*314.1*	*403.7*	*455.8*	*502.6*	*544.8*	*582.8*
	total MWh from energy cells	*na*	*na*	*na*	*na*	577	26	490	*2,512.9*	*3,229.5*	*3,646.4*	*4,020.8*	*4,358.1*	*4,662.7*

electricity price
34.35 average sales price of LVL 30,281/MWh, increased to 32,27/MWh as off 1st January 2004, and 34,35 as off 1st January 2005
a further substantial sales price increase of "green energy" to LVL 88,45 has been approved by the Cabinet of Ministers. Sales at
88.45 this price are limited to 7,000 hours of operation; the remaining theoretical 1760 hours are priced at LVL 34,35/MWh.
29.46 average import price was LVL 14,73/MWh, increased to be double at LVL 29,46/MWh in 2007(information from MoE)

operational & maintenance costs — covers Skede and Grobina sites: actuals for 2001 to 2006, estimates of L-RAS thereafter
administration costs — actuals for 2001-2006, estimates thereafter
depreciation — from 2007 amount capped at LVL 500,000/year
provision for landfill closure — total costs were estimated by CarlBro Consultants: LVL 750,000 over 25 years, for annual charge of LVL 30,000/year
interest rate WB and NIB loans — at assumed at 5,5% rate; see sheet 3
repayment — see sheet N° 3 for details: WB loan 5 yrs grace, 12 yrs repament; NIB 10 yrs grace and 15 yrs repayment
annual investments — investment in energy cells, wells, leachate treatment, etc of LVL 100,000/year from 2008
write-down of ISPA and SIDA grants — an annual amount of LVL 245,100 takes account of this write-down
residual value — 15% of project costs, excluding VAT when applied to the ERR

Notes:
(1) SEF consultants projected LFG extraction and electricity production on the basis of 40,000 tons of waste going to the energy cells, with an organic content of only 16% (over 30% estimated at appraisal). Waste to the energy cells will increase with deliveries from Saldus and Kuldiga regions.

(2) Electricity production from Grobina is conditional on L-RAS taking corrective measures to enhace LFG extraction, as suggested by SEF consultants. Assuming these measures will be succesful, it is assumed that electricity production in 2008 will be at 25% of the SEF estimate; at 50% in 2009, 75% in 2010 and at 100% of SEF estimates thereafter.

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2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
83,030	*83,860*	*84,699*	*85,546*	*86,401*	*87,265*	*88,138*	*89,019*	*89,909*	*90,808*	*91,717*	*92,634*	*93,560*	*94,496*	*95,441*	*96,395*	*97,359*
52,551	*53,076*	*53,607*	*54,143*	*54,684*	*55,231*	*55,783*	*56,341*	*56,905*	*57,474*	*58,048*	*58,629*	*59,215*	*59,807*	*60,405*	*61,010*	*61,620*

2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
469.9	*488.9*	*505.4*	*519.8*	*532.4*	*545.2*	*556.5*	*556.5*	*556.5*	*556.5*	*556.5*	*556.5*	*556.5*	*556.5*	*556.5*	*556.5*	*556.5*
11.7	*12.2*	*12.6*	*13.0*	*13.3*	*13.6*	*13.9*	*13.9*	*13.9*	*13.9*	*13.9*	*13.9*	*13.9*	*13.9*	*13.9*	*13.9*	*13.9*
617.4	*648.7*	*677.4*	*703.6*	*727.8*	*752.9*	*776.0*	*783.8*	*791.6*	*799.5*	*807.5*	*815.6*	*823.8*	*832.0*	*840.3*	*848.7*	*857.2*
4,321.5	*4,541.1*	*4,741.6*	*4,925.4*	*5,094.6*	*5,270.0*	*5,432.2*	*5,486.5*	*5,541.4*	*5,596.8*	*5,652.8*	*5,709.3*	*5,766.4*	*5,824.1*	*5,882.3*	*5,941.1*	*6,000.5*
617.4	*648.7*	*677.4*	*703.6*	*727.8*	*752.9*	*776.0*	*783.8*	*791.6*	*799.5*	*807.5*	*815.6*	*823.8*	*832.0*	*840.3*	*848.7*	*857.2*
4,938.8	*5,189.9*	*5,419.0*	*5,629.0*	*5,822.3*	*6,022.8*	*6,208.2*	*6,270.3*	*6,333.0*	*6,396.4*	*6,460.3*	*6,524.9*	*6,590.2*	*6,656.1*	*6,722.6*	*6,789.9*	*6,857.8*

LATVIA - LIEPAJA REGION SOLID WASTE MANAGEMENT PROJECT **ICR - Annex 3, attachment 2 (page 1/2)**

Financial cashflow analysis based on audited accounts for 2001 to 2006, projections of L-RAS thereafter (in '000 LVL) in constant 2007 prices

Attachment N° 2, calculations

		actuals	actuals	actuals	actuals	actuals	actuals		>> estimates	>>>>>>>>>						
Profit & Loss Statement	description	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
revenues	*waste, '000 m3 until sept 2004 , then in '000 ton*	*76.50*	*88.41*	*108.35*	*72/18,7*	*61.0*	*61.6*	*69.0*	*74.0*	*79.0*	*79.8*	*80.6*	*81.4*	*82.2*	*83.0*	*83.9*	*84.7*
Reception of waste at the site	at disposal fee, excluding NRT	75.0	92.0	126.3	143.8	337.2	499.4	550.1	1,000.9	1,297.2	1,310.2	1,323.3	1,336.5	1,349.9	1,363.3	1,377.0	1,390.8
Receipts of natural resource tax (NRT)	0,25/m3 and 0,75/ton	15.3	16.8	25.4	25.5	21.4	26.3	51.8	55.5	59.3	59.8	60.4	61.0	61.7	62.3	62.9	63.5
Sale of electricity to Latvenergo	*7,000 hours at LVL 88,45/MWh*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*48.6*	*125.0*	*211.7*	*311.2*	*385.5*	*412.4*	*436.8*	*459.0*	*479.3*
	1,000 hours at LVL 34,35/MWh	*0.0*	*0.0*	*0.0*	*0.0*	19.8	0.9	16.8	*10.8*	*13.9*	*15.7*	*17.3*	*18.7*	*20.0*	*21.2*	*22.3*	*23.3*
Total electricity sales		0.0	0.0	0.0	0.0	19.8	0.9	16.8	59.4	138.8	227.3	328.5	404.2	432.4	458.0	481.3	502.6
total revenues		**90.3**	**108.8**	**151.7**	**169.3**	**378.4**	**526.5**	**618.7**	**1,115.8**	**1,495.3**	**1,597.3**	**1,712.1**	**1,801.7**	**1,843.9**	**1,883.7**	**1,921.2**	**1,956.9**
costs																	
Operation & maintenance		27.9	36.7	39.3	68.5	124.7	249.9	250.0	265.0	265.0	265.0	265.0	265.0	265.0	265.0	265.0	265.0
Administration		39.4	46.8	55.7	72.6	106.0	91.6	115.0	135.0	135.0	135.0	135.0	135.0	135.0	135.0	135.0	135.0
NRT, direct payments	40% waste to landfill; balance in provision	15.3	16.8	25.4	25.5	21.4	26.3	20.7	55.5	59.3	59.8	60.4	61.0	61.7	62.3	62.9	63.5
total costs, incl NRT		**82.6**	**100.3**	**120.5**	**166.7**	**252.1**	**367.9**	**385.7**	**455.5**	**459.3**	**459.8**	**460.4**	**461.0**	**461.7**	**462.3**	**462.9**	**463.5**
Gross operating margin	*revenues minus costs*	*7.7*	*8.5*	*31.2*	*2.6*	*126.3*	*158.6*	*233.0*	*660.3*	*1,036.0*	*1,137.5*	*1,251.7*	*1,340.7*	*1,382.3*	*1,421.4*	*1,458.3*	*1,493.3*
Depreciation		-3.3	-4.4	-10.0	-31.0	-129.5	-474.4	-500.0	-500.0	-500.0	-500.0	-500.0	-500.0	-500.0	-500.0	-500.0	-500.0
Provision for landfill closure		0.0	0.0	0.0	0.0	0.0	0.0	-30.0	-30.0	-30.0	-30.0	-30.0	-30.0	-30.0	-30.0	-30.0	-30.0
Net operating margin		*4.4*	*4.1*	*21.3*	*-28.4*	*-3.2*	*-315.7*	*-297.0*	*130.3*	*506.0*	*607.5*	*721.7*	*810.7*	*852.3*	*891.4*	*928.3*	*963.3*
Interest:IBRD/NIB and other loans		-26.0	-12.6	-14.4	-21.9	-64.9	-83.4	-124.6	-119.5	-114.1	-108.2	-102.1	-93.2	-83.8	-73.8	-63.1	-51.8
Foreign exchange losses/profits		-0.1	-12.4	-3.0	20.8	-212.8	186.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other operating income/expenditures	incl write-down of grants until 2030	0.1	12.9	2.9	11.3	95.4	271.1	245.1	245.1	245.1	245.1	245.1	245.1	245.1	245.1	245.1	245.1
Profits/losses before taxation		-21.6	-8.0	6.8	-18.1	-185.4	58.4	-176.6	255.8	637.1	744.3	864.8	962.5	1,013.6	1,062.7	1,110.3	1,156.7
Company taxes 15%	from 2009 after write-down losses	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-95.6	-111.6	-129.7	-144.4	-152.0	-159.4	-166.5	-173.5
Profits/losses	**base case**	**-21.6**	**-8.0**	**6.8**	**-18.1**	**-185.4**	**58.4**	**-176.6**	**255.8**	**541.5**	**632.7**	**735.0**	**818.2**	**861.5**	**903.3**	**943.7**	**983.2**
profits/losses	*without electricity sales*	*na*	*na*	*na*	*na*	*na*	*na*	*na*	*167.0*	*423.5*	*439.5*	*455.9*	*474.6*	*494.0*	*513.9*	*534.6*	*556.0*
profits/losses	*with 25% higher operation and administration costs*	*na*	*na*	*na*	*na*	*na*	*na*	*na*	*132.5*	*456.5*	*547.7*	*650.0*	*733.2*	*776.5*	*818.3*	*858.7*	*898.2*
Cash flow adjustments																	
Depreciation	see above	3.3	4.4	10.0	31.0	129.5	474.4	500.0	500.0	500.0	500.0	500.0	500.0	500.0	500.0	500.0	500.0
Cash flow before loan repayment	after tax profit + depreciation	-18.3	-3.6	16.7	12.9	-55.9	532.8	323.4	755.8	1,041.5	1,132.7	1,235.0	1,318.2	1,361.5	1,403.3	1,443.7	1,483.2
Repayment WB/NIB loans	after 6, resp 10 yrs grace period, see sheet 3	0.0	0.0	0.0	0.0	-52.2	-201.1	-80.0	-78.2	-83.3	-88.8	-128.5	-134.7	-143.5	-152.9	-162.9	-173.6
Cash flow after loan repayment		-18.3	-3.6	16.7	12.9	-108.1	331.7	243.4	677.6	958.2	1,043.9	1,106.5	1,183.5	1,218.0	1,250.4	1,280.8	1,309.5
Annual investment in facilities	100,000 per year, from 2008 onwards	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-100.0	-100.0	-100.0	-100.0	-100.0	-100.0	-100.0	-100.0	-100.0
Cash flow, overall		**-18.3**	**-3.6**	**16.7**	**12.9**	**-108.1**	**331.7**	**243.4**	**577.6**	**858.2**	**943.9**	**1,006.5**	**1,083.5**	**1,118.0**	**1,150.4**	**1,180.8**	**1,209.5**
cash flow overall	*without electricity sales*	*na*	*na*	*na*	*na*	*na*	*na*	*na*	*488.7*	*740.1*	*750.7*	*727.4*	*739.9*	*750.4*	*761.0*	*771.7*	*782.4*
cash flow overall	*with 25% higher operation and administration costs*	*na*	*na*	*na*	*na*	*na*	*na*	*na*	*454.2*	*773.2*	*858.9*	*921.5*	*998.5*	*1,033.0*	*1,065.4*	*1,095.8*	*1,124.5*
Cumulative cash flow	**after loan repayment and annual investment**	**-18.3**	**-21.9**	**-5.1**	**7.8**	**-100.3**	**231.4**	**474.8**	**1,052.5**	**1,910.6**	**2,854.5**	**3,861.0**	**4,944.5**	**6,062.5**	**7,212.8**	**8,393.6**	**9,603.2**

Ratios na = not applicable

profitability ratio																
after tax profits/losses, as percent of revenues	-23.89%	-7.33%	4.46%	-10.67%	-49.00%	11.09%	-28.54%	22.93%	36.21%	39.61%	42.93%	45.41%	46.72%	47.95%	49.12%	50.24%
cash flow indicators																
cash flow before loan repayment, as percent of revenues	neg	neg	11.03%	7.63%	neg	101.20%	52.28%	67.74%	69.65%	70.91%	72.13%	73.16%	73.84%	74.50%	75.15%	75.79%
cash flow after loan repayment, as percent of revenues	neg	neg	11.03%	7.63%	neg	63.00%	39.34%	60.73%	64.08%	65.35%	64.63%	65.69%	66.05%	66.38%	66.67%	66.92%
depreciation as percent of cash flow before loan repayment	neg	neg	59.52%	239.71%	neg	89.04%	154.60%	66.15%	48.01%	44.14%	40.48%	37.93%	36.72%	35.63%	34.63%	33.71%
debt service indicators																
* debt service coverage ratio (gross operating margin over total debt service payments)	na	na	na	na	2.42	0.79	2.91	8.44	12.43	12.81	9.74	9.95	9.63	9.29	8.95	8.60
** interest payment as percent of cash flow, before debt service payments	neg	neg	85.83%	169.13%	neg	15.65%	38.54%	15.81%	10.95%	9.56%	8.26%	7.07%	6.16%	5.26%	4.37%	3.49%
*** loan repayment as percent of cash flow, before debt service payments	na	na	na	na	neg	37.74%	24.74%	10.35%	8.00%	7.84%	10.40%	10.22%	10.54%	10.90%	11.29%	11.71%
efficiency indicators																
break-even ratio (revenues/operating costs+debt service-depreciation)	1.12	1.43	1.59	1.41	1.55	0.47	0.57	0.97	1.29	1.38	1.44	1.52	1.55	1.58	1.62	1.65
gross margin as percent of revenues	8.52%	7.78%	20.59%	0.0	33.38%	30.13%	37.65%	59.18%	69.29%	71.21%	73.11%	74.41%	74.96%	75.46%	75.91%	76.31%
working ratio (operating costs as percent of revenues)	30.91%	33.74%	25.93%	0.4	32.95%	47.47%	40.41%	23.75%	17.72%	16.59%	15.48%	14.71%	14.37%	14.07%	13.79%	13.54%
operating ratio (operating costs+depreciation+interest as percent of revenues)	63.33%	49.32%	41.96%	71.69%	84.32%	153.40%	141.38%	79.28%	58.79%	54.67%	50.64%	47.63%	46.03%	44.53%	43.11%	41.74%

ICR - Annex 3, attachment 2 (page 2/2)

2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	description
85.5	*86.4*	*87.3*	*88.1*	*89.0*	*89.9*	*90.8*	*91.7*	*92.6*	*93.6*	*94.5*	*95.4*	*96.4*	*97.4*	*waste collected*
1,404.7	1,418.7	1,432.9	1,447.2	1,461.7	1,476.3	1,491.1	1,506.0	1,521.0	1,536.3	1,551.6	1,567.1	1,582.8	1,598.6	waste disposal fee, net
64.2	64.8	65.4	66.1	66.8	67.4	68.1	68.8	69.5	70.2	70.9	71.6	72.3	73.0	NRT
497.9	*515.0*	*532.7*	*549.1*	*554.6*	*560.2*	*565.8*	*571.4*	*577.1*	*582.9*	*588.7*	*594.6*	*600.6*	*606.6*	*electricity sales revenues*
24.2	*25.0*	*25.9*	*26.7*	*26.9*	*27.2*	*27.5*	*27.7*	*28.0*	*28.3*	*28.6*	*28.9*	*29.2*	*29.4*	*electricity sales revenues*
522.1	540.0	558.6	575.8	581.5	587.3	593.2	599.2	605.1	611.2	617.3	623.5	629.7	636.0	total electricity sales
1,990.9	**2,023.5**	**2,056.9**	**2,089.1**	**2,110.0**	**2,131.1**	**2,152.4**	**2,173.9**	**2,195.7**	**2,217.6**	**2,239.8**	**2,262.2**	**2,284.8**	**2,307.7**	**total revenues**
265.0	265.0	265.0	265.0	265.0	265.0	265.0	265.0	265.0	265.0	265.0	265.0	265.0	265.0	operational and maintenance
135.0	135.0	135.0	135.0	135.0	135.0	135.0	135.0	135.0	135.0	135.0	135.0	135.0	135.0	administrative costs
64.2	64.8	65.4	66.1	66.8	67.4	68.1	68.8	69.5	70.2	70.9	71.6	72.3	73.0	NRT payments
464.2	**464.8**	**465.4**	**466.1**	**466.8**	**467.4**	**468.1**	**468.8**	**469.5**	**470.2**	**470.9**	**471.6**	**472.3**	**473.0**	**total costs**
1,526.7	*1,558.7*	*1,591.5*	*1,623.0*	*1,643.2*	*1,663.7*	*1,684.3*	*1,705.1*	*1,726.2*	*1,747.5*	*1,768.9*	*1,790.6*	*1,812.5*	*1,834.6*	*gross margin*
-500.0	-500.0	-500.0	-500.0	-500.0	-500.0	-500.0	-500.0	-500.0	-500.0	-500.0	-500.0	-500.0	-500.0	depreciation
-30.0	-30.0	-30.0	-30.0	-30.0	-30.0	-30.0	-30.0	-30.0	-30.0	-30.0	-30.0	-30.0	-30.0	provision landfill closure
996.7	*1,028.7*	*1,061.5*	*1,093.0*	*1,113.2*	*1,133.7*	*1,154.3*	*1,175.1*	*1,196.2*	*1,217.5*	*1,238.9*	*1,260.6*	*1,282.5*	*1,304.6*	*net margin*
-42.6	-35.0	-31.5	-27.8	-23.9	-19.7	-15.2	-10.5	-5.4	0.0	0.0	0.0	0.0	0.0	interest payments World Bank+NIB loans
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	foreign exchange losses/profits
245.1	245.1	245.1	245.1	245.1	245.1	245.1	245.1	245.1	245.1	245.1	245.1	245.1	245.1	write-down grants
1,199.2	1,238.8	1,275.1	1,310.3	1,334.5	1,359.1	1,384.2	1,409.8	1,435.9	1,462.6	1,484.0	1,505.7	1,527.6	1,549.7	profits/losses before taxation
-179.9	-185.8	-191.3	-196.5	-200.2	-203.9	-207.6	-211.5	-215.4	-219.4	-222.6	-225.9	-229.1	-232.5	company taxes
1,019.3	**1,053.0**	**1,083.8**	**1,113.7**	**1,134.3**	**1,155.2**	**1,176.5**	**1,198.3**	**1,220.5**	**1,243.2**	**1,261.4**	**1,279.9**	**1,298.5**	**1,317.3**	**profits/losses**
575.6	*594.0*	*609.0*	*624.3*	*640.0*	*656.0*	*672.3*	*689.0*	*706.1*	*723.7*	*736.7*	*749.9*	*763.2*	*776.7*	*profits/losses, without electricity sales*
934.3	*968.0*	*998.8*	*1,028.7*	*1,049.3*	*1,070.2*	*1,091.5*	*1,113.3*	*1,135.5*	*1,158.2*	*1,176.4*	*1,194.9*	*1,213.5*	*1,232.3*	*profits/losses, with 25% higher costs*
500.0	500.0	500.0	500.0	500.0	500.0	500.0	500.0	500.0	500.0	500.0	500.0	500.0	500.0	depreciation
1,519.3	1,553.0	1,583.8	1,613.7	1,634.3	1,655.2	1,676.5	1,698.3	1,720.5	1,743.2	1,761.4	1,779.9	1,798.5	1,817.3	cash flow before loan repayment
-139.5	-116.6	-52.8	-56.3	-60.0	-63.9	-68.1	-72.6	-77.3	-82.4	0.0	0.0	0.0	0.0	World Bank+NIB loan repayment
1,379.8	1,436.4	1,531.0	1,557.4	1,574.3	1,591.3	1,608.4	1,625.7	1,643.2	1,660.8	1,761.4	1,779.9	1,798.5	1,817.3	net cash flow after loan repayment
-100.0	-100.0	-100.0	-100.0	-100.0	-100.0	-100.0	-100.0	-100.0	-100.0	-100.0	-100.0	-100.0	-100.0	periodic investment
1,279.8	**1,336.4**	**1,431.0**	**1,457.4**	**1,474.3**	**1,491.3**	**1,508.4**	**1,525.7**	**1,543.2**	**1,560.8**	**1,661.4**	**1,679.9**	**1,698.5**	**1,717.3**	**cash flow, overall**
836.0	*877.4*	*956.2*	*968.0*	*980.0*	*992.0*	*1,004.2*	*1,016.4*	*1,028.8*	*1,041.3*	*1,136.7*	*1,149.9*	*1,163.2*	*1,176.7*	*cash flow overall, without electricity sales*
1,194.8	*1,251.4*	*1,346.0*	*1,372.4*	*1,389.3*	*1,406.3*	*1,423.4*	*1,440.7*	*1,458.2*	*1,475.8*	*1,576.4*	*1,594.9*	*1,613.5*	*1,632.3*	*cash flow overall, with 25% higher costs*
10,883.0	**12,219.4**	**13,650.3**	**15,107.8**	**16,582.1**	**18,073.4**	**19,581.8**	**21,107.5**	**22,650.7**	**24,211.5**	**25,872.9**	**27,552.8**	**29,251.2**	**30,968.5**	**cumulative net cash flow after loan repayment**
51.20%	52.04%	52.69%	53.31%	53.76%	54.21%	54.66%	55.12%	55.59%	56.06%	56.32%	56.58%	56.83%	57.08%	after tax profits/revenues, as a percentage
76.31%	76.75%	77.00%	77.25%	77.45%	77.67%	77.89%	78.12%	78.36%	78.61%	78.64%	78.68%	78.71%	78.75%	cash flow as percent of revenues
69.30%	70.99%	74.43%	74.55%	74.61%	74.67%	74.73%	74.78%	74.84%	74.89%	78.64%	78.68%	78.71%	78.75%	cash flow after loan repayment, as % of revenues
32.91%	32.20%	31.57%	30.98%	30.59%	30.21%	29.82%	29.44%	29.06%	28.68%	28.39%	28.09%	27.80%	27.51%	depreciation as % cash flow, before loan repayment
														debt service ratios
10.94	13.37	30.12	28.83	27.39	26.03	24.73	na	na	na	na	na	na	na	* ratio of gom over total debt service payments
2.81%	2.25%	1.99%	1.72%	1.46%	1.19%	0.91%	na	na	na	na	na	na	na	** interest % of cash flow, before debt service
9.18%	7.51%	3.34%	3.49%	3.67%	3.86%	4.06%	na	na	na	na	na	na	na	*** loan repayment over cash flow, before debt service
1.74	1.81	1.96	1.99	2.01	2.03	2.05	2.07	2.09	2.11	2.31	2.33	2.35	2.37	break-even ratio
76.69%	77.03%	77.37%	77.69%	77.88%	78.07%	78.25%	78.44%	78.62%	78.80%	78.98%	79.15%	79.33%	79.50%	gross margin as percent of revenues
13.31%	13.10%	12.88%	12.68%	12.56%	12.43%	12.31%	12.19%	12.07%	11.95%	11.83%	11.71%	11.60%	11.48%	working ratio (operating costs as percent of evenues)
40.57%	39.53%	38.72%	37.95%	37.39%	36.82%	36.25%	35.67%	35.09%	34.50%	34.15%	33.82%	33.48%	33.15%	op ratio (op costs+depr+interest as % of revenues)

LATVIA - LIEPAJA REGION SOLID WASTE MANAGEMENT PROJECT ICR - Annex 3, attachment 3 (page 1/2)

Financial cashflow analysis

Attachment N° 3: loan repayment **Details on payment of commitment fees and interest, WB and NIB loans**

		7.80% rate at appraisal	6.55% rate assumed ICR	difference	
interest rate, both loans	Front-end fee of 1% paid in 2001 7,80% based on LIBOR of 6,25% appraisal 6,55% ICR estimate, LIBOR one year 4,9875% (oct 2007)				
WB, 5 years grace, 12 years repayment: fixed annuity of LVL 144,044, based on loan of LVL 1,212,000		-159,163.75 F	-148,954.36 F	-10,209.39 F	amounts is LVL
NIB, 10 years grace, 15 years repayment: fixed annuity of LVL 83,764, based on loan of LVL 823,000		-94,979.74 F	-87,809.70 F	-7,170.04 F	amounts is LVL

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
WB loan													
disbursement schedule, PIU of November 2005	98	176	608	241	89								
commitment fee at 0,25% on undisbursed	3	2	1	0									
total disbursed and outstanding, at 7,8%	98	274	882	1,123	1,160	1,092	1,018	939	853	760	661	553	437
interest at 7,8% on net outstanding	4	15	45	78	91	85	79	73	67	59	52	43	34
payment of annuity					159	159	159	159	159	159	159	159	159
repayment of principal				52	68	74	80	86	92	100	107	116	125
total disbursed and outstanding, at 6,55%	98	274	882	1,123	1,160	1,080	1,002	918	830	735	634	527	412
interest at 6,55% on net outstanding	3	10	32	56	62	71	66	60	54	48	42	35	27
payment of annuity	0	0	0	0	149	149	149	149	149	149	149	149	149
repayment of principal				52	80	78	83	89	95	101	107	114	122
NIB loan													
disbursement schedule, PIU of July 2005	0	0	562	261									
commitment fee at 0,25% on undisbursed	0	1	1										
total disbursed and outstanding, at 7,8%	0	0	562	823	823	823	823	823	823	823	792	759	723
interest at 7,8% on net outstanding	0	0	44	64	64	64	64	64	64	64	62	59	56
payment of annuity									95	95	95	95	95
repayment of principal									31	31	33	36	39
total disbursed and outstanding, at 6,55%	0	0	562	823	823	823	823	823	823	823	789	753	715
interest at 6,55% on net outstanding	0	0	16	46	46	54	54	54	54	54	52	49	47
payment of annuity	0	0	0	0	0	0	0	0	88	88	88	88	88
repayment of principal	0	0	0	0	0	0	0	0	34	34	36	38	41
totals													
commitment fees	3	4	1	0	0	0	0	0	0	0	0	0	0
interest charges at 7,8%	4	15	89	142	155	149	144	137	131	124	113	102	91
loan repayment at 7,8%	0	0	0	52	68	74	80	86	123	130	141	152	163
interest charges at 6,55%	3	10	48	101	108	125	120	114	108	102	93	84	74
loan repayment at 6,55%	0	0	0	52	80	78	83	89	129	135	144	153	163

Note: the projection has been carried out on loans expressed in LVL: however, the contractual amounts are in USD and annual payments in LVL may differ due to exchange rate fluctuations.

2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
313	178	33								
24	14	3								
159	159	36								
135	145	33								
290	160	67								
19	11	4								
149	149	71								
130	93	67								
685	643	598	550	498	442	381	316	246	170	88
53	50	47	43	39	34	30	25	19	13	7
95	95	95	95	95	95	95	95	95	95	95
42	45	48	52	56	61	65	70	76	82	88
674	630	583	534	481	425	365	301	233	160	83
44	41	38	35	31	28	24	20	15	10	5
88	88	88	88	88	88	88	88	88	88	88
44	47	50	53	56	60	64	68	73	77	82
0	0	0	0	0	0	0	0	0	0	0
78	64	49	43	39	34	30	25	19	13	7
176	190	82	52	56	61	65	70	76	82	88
63	52	43	35	31	28	24	20	15	10	5
174	140	117	53	56	60	64	68	73	77	82

LATVIA - LIEPAJA REGION SOLID WASTE MANAGEMENT PROJECT **ICR - Annex 3, attachment 4 (page 1/2)**

Attachment N° 4: FIRR and ERR calculations **base cases**

FIRR calculation (in '000 LVL) 30 years and in 2007 constant prices		2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
COSTS																
project investments	from ICR cost table (total = 9,183,700)	201.9	814.9	1,118.5	3,280.1	2,837.3	931.0									
post-project investments	estimated amounts								100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
operation and maintenance costs	from cash flow table	27.9	36.7	39.3	68.5	124.7	249.9	250.0	265.0	265.0	265.0	265.0	265.0	265.0	265.0	265.0
administrative costs	from cash flow table	39.4	46.8	55.7	72.6	106.0	91.6	115.0	135.0	135.0	135.0	135.0	135.0	135.0	135.0	135.0
provision landfill closure	CarlBro estimate							30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0
total financial costs		269.2	898.4	1,213.6	3,421.3	3,068.0	1,272.6	365.0	500.0	500.0	500.0	500.0	500.0	500.0	500.0	500.0
BENEFITS																
waste deposit fee, net	from cash flow table	75.0	92.0	126.3	143.8	337.2	499.4	550.1	1,000.9	1,297.2	1,310.2	1,323.3	1,336.5	1,349.9	1,363.3	1,377.0
sales of electricity	from cash flow table	0.0	0.0	0.0	0.0	19.8	0.9	16.8	59.4	138.8	227.3	328.5	404.2	432.4	458.0	481.3
sale of carbon emission units	PCF disbursements as proxy (1)	351.0	0.0	0.0	525.0	230.7	50.8									
residual value of the investment (15%)	9,183,700															
total financial benefits		426.0	92.0	126.3	668.8	587.8	551.0	566.9	1,060.3	1,436.0	1,537.5	1,651.7	1,740.7	1,782.3	1,821.4	1,858.3
Net financial costs/benefits per year		**156.8**	**-806.4**	**-1,087.2**	**-2,752.5**	**-2,480.2**	**-721.5**	**201.9**	**560.3**	**936.0**	**1,037.5**	**1,151.7**	**1,240.7**	**1,282.3**	**1,321.4**	**1,358.3**
Cumulative financial costs/benefits		156.8	-649.6	-1,736.9	-4,489.4	-6,969.6	-7,691.1	-7,489.2	-6,928.9	-5,992.9	-4,955.5	-3,803.8	-2,563.1	-1,280.8	40.6	1,398.9
	30 years **FIRR**		**11.18%**	20 years	**9.20%**											
(1) from amendment ERPA dated May 31, 2004	**NPV at 10%**		**715.2**		**-365.3**											

ERR calculation (in '000 LVL) 30 years and in constant prices		2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
COSTS																
total financial costs	from FIRR calculation	269.2	898.4	1,213.6	3,421.3	3,068.0	1,272.6	365.0	500.0	500.0	500.0	500.0	500.0	500.0	500.0	500.0
VAT on project costs	from ICR project cost table	-7.9	-64.7	-49.5	-95.2	-342.2	-60.8									
taxes on recurrent costs	average of 21%	-14.1	-17.5	-20.0	-29.6	-48.4	-71.7	-76.7	-84.0	-84.0	-84.0	-84.0	-84.0	-84.0	-84.0	-84.0
total economic costs	net of taxes	247.1	816.2	1,144.1	3,296.4	2,677.3	1,140.0	288.4	416.0	416.0	416.0	416.0	416.0	416.0	416.0	416.0
BENEFITS	only local environmental benefits															
financial benefits, excl electricity	from FIRR calculation	426.0	92.0	126.3	668.8	567.9	550.2	550.1	1,000.9	1,297.2	1,310.2	1,323.3	1,336.5	1,349.9	1,363.3	1,377.0
electricity sales at import parity price (2)		0	0	0	0	9.2	0.4	9.8	18.5	47.6	80.6	118.5	128.4	137.4	145.5	152.9
residual value of the investment, net of VAT:15%	8,563,400															
total economic benefits	only local environmental benefits	426.0	92.0	126.3	668.8	577.2	550.6	559.9	1,019.4	1,344.8	1,390.7	1,441.7	1,464.9	1,487.2	1,508.8	1,529.9
Net economic costs/benefits	**only local environmental benefits**	**178.8**	**-724.2**	**-1,017.8**	**-2,627.6**	**-2,100.2**	**-589.5**	**271.6**	**603.4**	**928.8**	**974.7**	**1,025.7**	**1,048.9**	**1,071.2**	**1,092.8**	**1,113.9**
	30 years **ERR**		**10.97%**	20 years	**8.91%**											
	NPV at 10%		**512.8**		**-427.1**											
BENEFITS	local and international economic benefits															
financial benefits, excl electricity	from FIRR calculation	426.0	92.0	126.3	668.8	567.9	550.2	550.1	1,000.9	1,297.2	1,310.2	1,323.3	1,336.5	1,349.9	1,363.3	1,377.0
electricity sales at import parity price (2)		0	0	0	0	9.2	0.4	9.8	18.5	47.6	80.6	118.5	128.4	137.4	145.5	152.9
proxy for environmental benefits	ISPA and SIDA grant disbursements (3)	60.0	384.0	613.0	1,145.0	1,150.0	657.0									
residual value of the investment, net of VAT	8,563,400															
total economic benefits	local and international economic benefits	486.0	476.0	739.3	1,813.8	1,727.2	1,207.6	559.9	1,019.4	1,344.8	1,390.7	1,441.7	1,464.9	1,487.2	1,508.8	1,529.9
Net economic costs/benefits per year	**local and international economic benefits**	**238.8**	**-340.2**	**-404.8**	**-1,482.6**	**-950.2**	**67.5**	**271.6**	**603.4**	**928.8**	**974.7**	**1,025.7**	**1,048.9**	**1,071.2**	**1,092.8**	**1,113.9**
	30 years **ERR**		**20.96%**	20 years	**20.12%**											
	NPV at 10%		**3,212.3**		**2,272.4**											

(2) - import parity prices: for 2005 and 2006 at LVL 16/MWh; at LVL 20/MWh in 2007 and at LVL 29,46/MWh from 2008 onwards
(3) - PIU disbursement table
(4) - figures in italics in year 2020 are net costs/benefits including the residual value of 15% used in the rate of return calculations over 20 years

2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
265.0	265.0	265.0	265.0	265.0	265.0	265.0	265.0	265.0	265.0	265.0	265.0	265.0	265.0	265.0
135.0	135.0	135.0	135.0	135.0	135.0	135.0	135.0	135.0	135.0	135.0	135.0	135.0	135.0	135.0
30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0
500.0	500.0	500.0	500.0	500.0	500.0	500.0	500.0	500.0	500.0	500.0	500.0	500.0	500.0	500.0
1,390.8	1,404.7	1,418.7	1,432.9	1,447.2	1,461.7	1,476.3	1,491.1	1,506.0	1,521.0	1,536.3	1,551.6	1,567.1	1,582.8	1,598.6
502.6	522.1	540.0	558.6	575.8	581.5	587.3	593.2	599.2	605.1	611.2	617.3	623.5	629.7	636.0
				1,377.6										1,377.6
1,893.3	1,926.7	1,958.7	1,991.5	2,023.0	2,043.2	2,063.7	2,084.3	2,105.1	2,126.2	2,147.5	2,168.9	2,190.6	2,212.5	3,612.2
1,393.3	**1,426.7**	**1,458.7**	**1,491.5**	**1,523.0**	**1,543.2**	**1,563.7**	**1,584.3**	**1,605.1**	**1,626.2**	**1,647.5**	**1,668.9**	**1,690.6**	**1,712.5**	**3,112.2**
				3,546.0										
2,792.2	4,219.0	5,677.6	7,169.1	8,692.1	10,235.3	11,799.0	13,383.3	14,988.4	16,614.6	18,262.1	19,931.0	21,621.6	23,334.2	26,446.4

2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
500.0	500.0	500.0	500.0	500.0	500.0	500.0	500.0	500.0	500.0	500.0	500.0	500.0	500.0	500.0
-84.0	-84.0	-84.0	-84.0	-84.0	-84.0	-84.0	-84.0	-84.0	-84.0	-84.0	-84.0	-84.0	-84.0	-84.0
416.0	416.0	416.0	416.0	416.0	416.0	416.0	416.0	416.0	416.0	416.0	416.0	416.0	416.0	416.0
1,390.8	1,404.7	1,418.7	1,432.9	1,447.2	1,461.7	1,476.3	1,491.1	1,506.0	1,521.0	1,536.3	1,551.6	1,567.1	1,582.8	2,976.2
159.6	165.8	171.5	177.4	182.9	184.7	186.6	188.4	190.3	192.2	194.1	196.1	198.0	200.0	202.0
				1,284.5										1,284.5
1,550.4	1,570.5	1,590.2	1,610.3	1,630.1	1,646.4	1,662.9	1,679.5	1,696.3	1,713.3	1,730.4	1,747.7	1,765.2	1,782.8	4,462.7
1,134.4	**1,154.5**	**1,174.2**	**1,194.3**	**1,214.1**	**1,230.4**	**1,246.9**	**1,263.5**	**1,280.3**	**1,297.3**	**1,314.4**	**1,331.7**	**1,349.2**	**1,366.8**	**4,046.7**
				2,914.6										

1,390.8	1,404.7	1,418.7	1,432.9	1,447.2	1,461.7	1,476.3	1,491.1	1,506.0	1,521.0	1,536.3	1,551.6	1,567.1	1,582.8	2,976.2
159.6	165.8	171.5	177.4	182.9	184.7	186.6	188.4	190.3	192.2	194.1	196.1	198.0	200.0	202.0
				1,284.5										1,284.5
1,550.4	1,570.5	1,590.2	1,610.3	1,630.1	1,646.4	1,662.9	1,679.5	1,696.3	1,713.3	1,730.4	1,747.7	1,765.2	1,782.8	4,462.7
1,134.4	**1,154.5**	**1,174.2**	**1,194.3**	**1,214.1**	**1,230.4**	**1,246.9**	**1,263.5**	**1,280.3**	**1,297.3**	**1,314.4**	**1,331.7**	**1,349.2**	**1,366.8**	**4,046.7**
				2,914.6										

Attachment N° 5: FIRR and ERR analysis **sensitivity analysis**

FIRR calculation (in '000 LVL) 30 years and in 2007 constant prices		2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Net financial costs/benefits per year	**from base case (sheet 4)**	**156.8**	**-806.4**	**-1,087.2**	**-2,752.5**	**-2,480.2**	**-721.5**	**201.9**	**560.3**	**936.0**	**1,037.5**	**1,151.7**	**1,240.7**	**1,282.3**
sensitivity case 1														
electricity sales at 25% organic waste content	increase base sales by factor 9/16 (1)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	33.4	78.1	127.9	184.8	227.4	243.2
net financial costs/benefits	higher organic waste content, 25%	156.8	-806.4	-1,087.2	-2,752.5	-2,480.2	-721.5	201.9	593.7	1,014.1	1,165.3	1,336.5	1,468.0	1,525.5
	FIRR - 30 years	**12.68%**	20 years	**10.63%**										
	NPV @ 10%	**1,737.46**		**303.31**										
sensitivity case 2														
no electricity sales		0.0	0.0	0.0	0.0	0.0	0.0	0.0	-59.4	-138.8	-227.3	-328.5	-404.2	-432.4
net financial costs/benefits	zero electricity sales after 2008	156.8	-806.4	-1,087.2	-2,752.5	-2,480.2	-721.5	201.9	500.9	797.2	810.2	823.3	836.5	849.9
	FIRR - 30 years	**7.87%**	20 years	**5.36%**										
	NPV @ 10%	**-1,102.18**		**-1,796.30**										
sensitivity case 3														
operating and administrative costs, + 25%			0.0	0.0	0.0	0.0	0.0	0.0	-91.3	-125.0	-125.0	-125.0	-125.0	-125.0
net financial costs/benefits	25% higher financial costs	156.8	-806.4	-1,087.2	-2,752.5	-2,480.2	-721.5	201.9	469.0	811.0	912.5	1,026.7	1,115.7	1,157.3
	FIRR - 30 years	**10.27%**	20 years	**7.91%**										
	NPV @ 10%	**161.12**		**-909.34**										

ERR calculation (in '000 LVL) 30 years and in constant prices		0	0	0	0	0	0	0	0	0	0	0	0	0
Net economic costs/benefits per year	**from base case (sheet 4)**	**238.8**	**-340.2**	**-404.8**	**-1,482.6**	**-950.2**	**67.5**	**271.6**	**603.4**	**928.8**	**974.7**	**1,025.7**	**1,048.9**	**1,071.2**
sensitivity case 1														
electricity sales at 25% organic waste content	increase base sales by factor 9/16	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.4	26.8	45.3	66.6	72.2	77.3
net economic costs/benefits	higher organic waste content, 25%	238.8	-340.2	-404.8	-1,482.6	-950.2	67.5	271.6	613.8	955.5	1,020.0	1,092.3	1,121.1	1,148.5
	ERR - 30 years	**21.70%**	20 years	**20.79%**										
	NPV @ 10%	**3,542.32**		**2,461.57**										
sensitivity case 2														
no electricity sales		0.0	0.0	0.0	0.0	0.0	0.0	0.0	-18.5	-47.6	-80.6	-118.5	-128.4	-137.4
net economic costs/benefits	zero electricity sales after 2008	238.8	-340.2	-404.8	-1,482.6	-950.2	67.5	271.6	584.9	881.2	894.2	907.3	920.5	933.9
	ERR - 30 years	**19.54%**	20 years	**18.54%**										
	NPV @ 10%	**2,625.50**		**1,779.82**										
sensitivity case 3														
operating and administrative costs, + 25%		0.0	0.0	0.0	0.0	0.0	0.0	0.0	-72.1	-104.0	-104.0	-104.0	-104.0	-104.0
net economic costs/benefits	25% higher financial costs	238.8	-340.2	-404.8	-1,482.6	-950.2	67.5	271.6	531.3	824.8	870.7	921.7	944.9	967.2
	ERR - 30 years	**19.64%**	20 years	**18.59%**										
	NPV @ 10%	**2,753.07**		**1,837.88**										

Note (1): increased organic content at 25% will add a factor of 9/16 to the LFG extraction and thus to electricity production compared to the base case at 16% organic content.

(2) figures in italics in year 2020 are net cost/benefits including the 15% residual value used in the rate of return calculations over twenty years

ICR, Annex 3, attachment 5 (page 2/2)

2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	
1,321.4	**1,358.3**	**1,393.3**	**1,426.7**	**1,458.7**	**1,491.5**	**1,523.0**	**1,543.2**	**1,563.7**	**1,584.3**	**1,605.1**	**1,626.2**	**1,647.5**	**1,668.9**	**1,690.6**	**1,712.5**	**3,112.2**	
257.6	270.7	282.7	293.7	303.7	314.2	323.9	327.1	330.4	333.7	337.0	340.4	343.8	347.2	350.7	354.2	357.8	organic content of 25%, not 16%
1,579.0	1,629.1	1,676.0	1,720.4	1,762.4	1,805.7	1,846.9	1,870.3	1,894.0	1,918.0	1,942.2	1,966.6	1,991.3	2,016.2	2,041.3	2,066.7	3,470.0	
						3,224.4											
-458.0	-481.3	-502.6	-522.1	-540.0	-558.6	-575.8	-581.5	-587.3	-593.2	-599.2	-605.1	-611.2	-617.3	-623.5	-629.7	-636.0	zero electricity sales
863.3	877.0	890.8	904.7	918.7	932.9	947.2	961.7	976.3	991.1	1,006.0	1,021.0	1,036.3	1,051.6	1,067.1	1,082.8	2,476.2	
						2,324.8											
-125.0	-125.0	-125.0	-125.0	-125.0	-125.0	-125.0	-125.0	-125.0	-125.0	-125.0	-125.0	-125.0	-125.0	-125.0	-125.0	-125.0	25% higher financial costs
1,196.4	1,233.3	1,268.3	1,301.7	1,333.7	1,366.5	1,398.0	1,418.2	1,438.7	1,459.3	1,480.1	1,501.2	1,522.5	1,543.9	1,565.6	1,587.5	2,987.2	
						2,775.6											
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
1,092.8	**1,113.9**	**1,134.4**	**1,154.5**	**1,174.2**	**1,194.3**	**1,214.1**	**1,230.4**	**1,246.9**	**1,263.5**	**1,280.3**	**1,297.3**	**1,314.4**	**1,331.7**	**1,349.2**	**1,366.8**	**4,046.7**	
81.8	86.0	89.8	93.3	96.5	99.8	102.9	103.9	104.9	106.0	107.1	108.1	109.2	110.3	111.4	112.5	113.6	organic content of 25%, not 16%
1,174.7	1,199.9	1,224.2	1,247.8	1,270.7	1,294.1	1,317.0	1,334.3	1,351.8	1,369.5	1,387.4	1,405.4	1,423.6	1,442.0	1,460.6	1,479.4	4,160.4	
						2,601.5											
-145.5	-152.9	-159.6	-165.8	-171.5	-177.4	-182.9	-184.7	-186.6	-188.4	-190.3	-192.2	-194.1	-196.1	-198.0	-200.0	-202.0	zero electricity sales
947.3	961.0	974.8	988.7	1,002.7	1,016.9	1,031.2	1,045.7	1,060.3	1,075.1	1,090.0	1,105.0	1,120.3	1,135.6	1,151.1	1,166.8	3,844.7	
						2,315.7											
-104.0	-104.0	-104.0	-104.0	-104.0	-104.0	-104.0	-104.0	-104.0	-104.0	-104.0	-104.0	-104.0	-104.0	-104.0	-104.0	-104.0	25% higher financial costs
988.8	1,009.9	1,030.4	1,050.5	1,070.2	1,090.3	1,110.1	1,126.4	1,142.9	1,159.5	1,176.3	1,193.3	1,210.4	1,227.7	1,245.2	1,262.8	3,942.7	
						2,394.6											

Annex 4. Bank Lending and Implementation Support/Supervision Processes

(a) Task Team members

Names	Title	Unit	Responsibility/ Specialty
Lending			
Anders O. Halldin	Sr. Environmental Specialist	ECSSD	Task Manager
Kari Johansson	Municipal Services Specialist	ECSSD	Participating from the Riga office
Samuel Fankhauser	Economist	ENV	Economic Calculations
Chandra Sheckar Sinha	Economist	ENV	Economic Calculations
Junko Funahashi	Counselor	LEGEC	Legal Documents
Nicholay Cistayakov	Disbursement Officer	LOAG1	Disbursement Issues
David Freese	Disbursement Officer	LOAG1	Disbursement Issues
Jose Martinez	Procurement Specialist	ECSSD	Procurement Issues
Frank M. Stubenitsky	Consultant	ECSSD	Financial Analyst
Alan Hancock	Consultant	ECSSD	Social Issues Specialist
Supervision/ICR			
Anders O. Halldin	Sr. Environmental Spec./Consultant	ECSSD	Task Manager up to Dec 2004
Dina Grube	Operations Officer	ECCU7	Task Manager from Dec 2004 to Jun 2006
Barbara Letachowicz	Environmental Specialist	ECSSD	Task Manager from July 2006 to Dec 2007
Kari Johansson	Municipal Services Specialist	ECSSD	Participating from the Riga office
Chandra Sheckar Sinha	Economist	ENV	Economic Calculations
Naushad Khan	Sr. Procurement Specialist	ECSSD	Procurement Issues
Jose Martinez	Procurement Specialist	ECSSD	Procurement Issues
Elzbieta Sieminska	Procurement Specialist	ECCU9	Procurement Issues
Salim Benouniche	Sr. Procurement Spec.	ECSPS	Procurement Issues
Junko Funahashi	Counselor	LEGEC	Legal Documents
Nightingale Rukuba-Ngaiza	Counselor	LEGEC	Legal Documents
David Freese	Disbursement Officer	LOAG1	Disbursement Issues
Iwona Warzecha	Sr. Financial Management Spec.	ECSPS	Financial Management
Frank M. Stubenitsky	Consultant	ECSSD	Financial Analyst
Alan Hancock	Consultant	ECSSD	Social Issues Specialist

Note: Table below doesn't reflect the actual time spent in preparation and supervision of the Project

(b) Staff Time and Cost

Stage of Project Cycle	Staff Time and Cost (Bank Budget Only)	
	No. of staff weeks	USD Thousands (including travel and consultant costs)
Lending		
FY98		15.25
FY99		27.35
FY00	13	35.59
FY01	5	17.38
Total:	18	95.57
Supervision/ICR		
FY01	4	25.75
FY02	4	48.50
FY03	1	34.58
FY04	5	39.56
FY05	4	31.80
FY06	6	38.40
FY07	7	34.05
Total:	31	252.64

Annex 5. Beneficiary Survey Results

Not applicable

The beneficiaries of the Project are the population in Liepaja Region, and the operating company Liepajas-RAS. No specific survey was made, but it became clear during the frequent contacts through the action plan for public information, that the implementation of the Project was highly appreciated. In particular this was the case in regard to closure of 26 old dumps in the region and the old Liepaja city dump at Skede including the major site at Skede.

Annex 6. Stakeholder Workshop Report and Results
Not applicable

No workshop was held

Annex 7. Summary of Borrower's ICR and/or Comments on Draft ICR

LATVIJAS REPUBLIKAS VIDES MINISTRIJA
MINISTRY OF THE ENVIRONMENT
OF THE REPUBLIC OF LATVIA

Peldu iela 25, Rīga, LV-1494, Latvija, tālrunis 371 7026470, 371 7026500, fakss 371 7820442, e-pasts: pasts@vidm.gov.lv
Peldu iela 25, Riga, LV-1494, Latvia, phone 371 7026470, 371 7026500, fax 371 7820442, e-mail: pasts@vidm.gov.lv

Rīgā, 17.12.2007. Nr. 4.2.3-07/10686

Mrs. Barbara Letachowicz
The World Bank
International Bank for Reconstruction and Development

Operations Officier

Poland, Warsaw Office
Warsaw Financial Center, 9th Floor
53 Emilii Plater Str., 00-113 Warsaw, Poland

RE: Latvia: Liepaja Region Solid Waste Management Project (Loan LV 7033-LV)

Dear Mrs.Letachowicz,

Thank you for your letter dated November 28 and draft Implementation Completion Report regarding Liepaja Region Solid Waste Management Project (furthermore - Project).

The implementation of the Project leads to establishment of modern system of municipal solid waste management in Liepaja city and Liepaja region.

Creation of regional waste management system was one of the top-priorities stated in Waste Management Plan for Latvia. The main Project activities implemented:

- disposal sites non-compliant with legislation are remediated,
- treatment of the leachate according legislative requirements,
- landfill gas capture, energy production;
- emission reduction trade (started);
- sorting line and arranging for storage of separated municipal solid waste and hazardous waste established.

The Ministry of Environment supported the Project during the all implementation process and the outcome is to be considered as satisfactory performance.

Regarding the Completion and Results Report, please, find attached some technical comments from the Ministry of Environment for this Draft document.

Finally let me thank the World Bank's officials for provision of the in-depth Project review and supervision during whole designing and implementation process. The World Bank`s officials during Project period have shown themselves as pragmatic, co-operative, constructively critical and well experienced experts.

Attachments: Comments on Draft Implementation Completion and Results Report on 1 page.

Sincerely yours,

Vija Gēme
Deputy-State Secretary

RE: Latvia: Liepaja Region Solid Waste Management Project (Loan LV 7033-LV)

Comments of MoE
on draft Implementation Completion and Results Report

1. page 1 The name of strategic document is National Environmental Policy Plan or National Energy Strategy, like in page 13. Please select the right one.

2. page 2 The name of strategic document is National Municipal Solid Waste Management Strategy. Please, change the abbreviation as well.

3. page 2 Please, add....*Greenhouse gas (GHG) emissions resulting from improper landfill operations are recognized as a serious environmental concern. MEPRD declared that the reduction and collection of methane from municipal* ***solid*** *waste disposal sites was...*

4. Table 1. Outcome indicators Please, in place of ***closed***, use ***remediated***. Also Annex 2.

5. page 4 ....*The final beneficiary of the project is the non-profit oriented* ***municipal*** *solid waste management company Liepajas RAS...*

6. page 5 .....*Under this subcomponent existing dump sites were to be* ***closed and subsequently remediated***.

7. page 6 and page 11, page 14, page 16 and Annex 3 Please, replace the ***landfills*** with ***dumps*** where appropriate.

8. page 17 .... *continuing to undertake efforts to improve LFG collection. Disposal from additional waste from municipalities of Kuldiga, Saldus* ***districts*** *and Skrunda* ***municipality*** *is expected to have...*

9. page 18 *The Project has been of large value for the MoE to continue with its ambition to close* ***and remediate*** *old dumps and reorganize Latvian waste management by establishing a limited number of regional waste management facilities.*

10. Annex 3 ... *those for 2007 have been estimated on the basis of 9-****months*** *company actual and the figures for 2008 are...*

2007.12.17.

The text below is Project assessment of the Liepajas RAS Ltd., the Project implementing agency, in exact wording of L-RAS.

October 2007

To The World Bank

From Liepajas RAS Ltd

Project overall assessment

Historically there were dump sites of various sizes both in the City of Liepaja and the Region polluting the environment - ground, water and air.

The Project objectives include arresting the contamination and reducing the environmental disamenities. Under the Project the ways were found how to continue waste management and disposal meeting the environmental protection requirements. Moreover, sustainable landfill development was secured with the energy cell technology and effective LFG use was applied.

During the Project implementation, the main deviation from the initial schedule concerned the implementation time schedule due to the EU ISPA time consuming requirements. The deviation impacted timeliness of MERs delivery to the PCF.

Alongside with the Project implementation, the community's perception of waste disposal and management changed – a fruitful cooperation of municipalities, hauling companies and the landfill operator is in place.

Lessons learned

One of the Project aims was to establish a new waste management company owned by all the municipalities involved in the Project. The newly established company Liepajas RAS Ltd had a limited staff with no technical experience. The consulting companies contracted for the detailed design, institutional strengthening, construction supervision and others differed in opinions, and for Liepajas RAS Ltd it was difficult to properly assess recommendations to undertake the most appropriate decisions to the benefit of project implementation. A better result could have been achieved with strong technical in-house experience.

The Project total preparation and implementation period, starting from 1998 when the Feasibility Study was initiated, to the end of the full completion of the Project components in 2007, was too long - such a Project should have been scheduled in a shorter time span to be able to rely on the initial basic data further on in the implementation stages of the Project. For example, the waste composition, which is a basic parameter for LFG calculations, has changed considerably over a 10 year period.

Assessment of the operation's objective, design, implementation, and operational experience

The following activities were addressed and completed under the Project:

Investment Component

a) **Remediation**. All disposal sites were closed by the Liepaja Region Environment Board (the LREB) and remediated under the Project. At the Skede site, which was in operation for nearly 40 years, the landfill gas (LFG) is being collected and used for electricity generation.

Assessment:

- The remediation of the small dumps was carried out stepwise, according to the schedule and requirements by the LREB, and within the estimated budget.
- Monitoring of the ground water quality demonstrated that the remediation contributed to the improved environmental conditions.
- To quantify the improvement of the environmental conditions, the ground water testing will be continued according to the Latvian legislation.
- The LFG collection at the Skede site is lower than estimated.

b) **Technical and Operational Improvements**. A state-of-the-art solid waste management system, which meets international sanitary landfill standards, has been established. It includes a new disposal site in accordance with EU requirements, establishment of a line for reception of waste already partly separated at the household level and arranging separate areas for the storing of separated material as well as hazardous waste, which is being transported to another site. The tip face is protected by regular (once in 6 months) coverage of soil, and other measures are occasionally undertaken in order to prevent birds from feeding from the newly disposed and fresh garbage. Equipment enabling the utilization of sludge from the Liepaja Waste Water Treatment Plant (as an additional gas generation source), has also been included.

Assessment:

- All the equipment and machinery required for the operation of a waste processing plant with energy cell technology has been procured and is in place and is being used to secure the proper operation of the facility.
- The leachate treatment is ensured with reverse osmosis method. The reverse osmosis plant has been procured in addition to the original design. The reverse osmosis equipment has been included to improve overall results of the treatment, and to protect heavy metal contents release to the environment.
- The leachate treatment is independent of third parties.
- The waste accepted at the new disposal site (Grobina Poligons) will become more homogeneous after waste separation at the household level is fully introduced.
- The coverage of the tip face is only possible when an energy cell is fully completed.

c) **Installation of Energy Cells and a Landfill Gas Collection System**. Energy cells have been installed for the enhanced degradation of easily biodegradable waste and the accelerated production of landfill gas, containing about 50% methane. The resulting greenhouse gas emission reductions reached through flaring or electricity production are sold to the PCF under an emission reduction agreement. Emission reductions are monitored and subject to periodic verification by a third party.

Assessment:

- The energy cell is small in size and vulnerable to weather conditions.
- The waste amount in one energy cell is too small for efficient LFG collection.
- The LFG collection from energy cells is lower than estimated.

- The existing energy cell technology requires further improvements, such as enlargement in size, leachate recirculation, moisture content.

d) **Installation of Power Generators**. Two energy conversion units (gas engines) of 0.52 MW capacity each and which run on landfill gas have been installed at Grobina, and one of 0.45 MW has been installed at Skede. The units at both sites are connected to the power grid, and power is sold using "green energy" price to Latvenergo under a power purchase agreement negotiated as part of the Project.

Assessment:

- The CHP unit at Skede is oversized and cannot be run on continuous basis.
- The CH4 content in the LFG at Skede is lower than estimated.
- The CHP units at Grobina are oversized and cannot be run with the waste volume disposed less than 200 000 t.
- LFG production requires careful monitoring to estimate and measure the actual amount of LFG being produced. Besides day-to-day operation of the Project facilities, L-RAS will continue its active approach to improve operation of the LFG collection and utilization, and look for solutions in- and outside the country.

e) **Establishment of Waste Collection Points**. A system of waste collection (for areas with small waste volumes) has been established to ensure the efficient transport of waste to the regional disposal site. The system is operated by private waste transportation companies contracted by each municipality individually. The transportation companies gradually introduce collection points equipped with separate containers for different types of recyclable materials.

Assessment:

- The waste collection and transportation system fully meets the needs of the waste producers.
- The private waste transportation companies initiate and further develop collection of separated waste alongside with the development of the market for recyclables.
- The private waste transportation companies service the municipalities and private/individual waste producers on contractual basis with no need for further development of special collection points.

f) **Managerial Support through Twinning**. The Project established a new waste management company that is responsible for the management of the landfill. This activity has provided technical and managerial assistance to the new company through a twinning arrangement.

Assessment:

- The twinning arrangement contributed to institutional development of the new waste management company established in February 2000.

g) **Detailed Design.** This activity provided the detailed design, technical specifications, bill of quantities and all necessary drawings for project implementation.

Assessment:

- The detailed design was fully compliant with the preliminary design concept, such as capacity of one energy cell, sizes of the CHP units, leachate transportation to the municipal waste water treatment plant.
- The detailed design confirmed the LFG volume to be captured and delivered under the PCF agreement; however the actual amount of LFG being collected is lower than the detail design estimates which were based on and fully in line with the Feasibility Study.

h) **Implementation Support**. This activity financed the PIU in order to handle all procurement and disbursement issues related to the Project, maintain Project accounts and prepare Project Progress Reports. In addition, the PIU also coordinated the continuation of public information and participation activities, which have been an integral part of the project since its inception.

Assessment:

- The PIU handled all the procurements needed for the implementation of the Project in accordance with the requirements of the various financiers. The contracts signed in the result of the procurements are presented in the Project Financial Report.
- The PIU provided assistance in contract supervision and administration.
- The disbursement requests were prepared in accordance with the contract conditions and submitted to the financiers for payment.
- The overall financial management was provided.
- The public awareness program was implemented as advised by the consultants contracted by the World Bank.

Technical Assistance Component

i) **Technical Assistance on the National Solid Waste Management Strategy**. This activity should have involved training and capacity building at the local/regional level for waste management utilities, municipal authorities and private sector companies involved in the implementation of the NMSWMS.

Assessment:

- This activity has not been implemented due to lack of funding from CIDA as originally assumed in the PAD.
- Training for implementation of the NMSWMS has been carried out by L-RAS with other-than-Project funding.

***

Evaluation of Implementing Agency / Liepajas RAS Ltd (LRAS) own performance

1. Overall

The Implementing Agency / Liepajas RAS Ltd (LRAS) played a very positive role throughout the whole Project with an extensive support from the PIU with sufficient experience from the previous international projects, including the World Bank Liepaja Environment Project, the implementation of which was assessed highly satisfactory.

2. During the Project preparation

The performance of LRAS during the Project preparation stage was limited to the few staff members and the lack of experience. However, LRAS was always willing to discuss and understand the Project issues in order to start the Project implementation immediately upon signing the financing agreements. LRAS was supported by the PIU on procurement, financial and contract management issues, as well as in the public awareness program; all activities were in accordance with, but not limited to, the Terms of Reference drawn by the Bank.

The performance of LRAS was highly satisfactory as none of the Project preparation documents was delayed due to LRAS ignorance.

3. During the Project implementation

During the Project implementation stage, LRAS got extensive support from the consultants contracted under the Twinning Arrangement, for the Detailed Design development, for the Civil Works supervision and for the PIU activities. With all the external support, LRAS had sufficient expertise to implement all the original Project components and also some additional activities, such as, for example, the installation of the on-site leachate treatment plant with reverse osmosis method.

Facing a situation of LFG amounts being lower than estimated, L-RAS has undertaken an active approach to address this issue, and cooperates with MoE and external consultants to identify the ways how to improve the LFG production. L-RAS will continue this approach in order to increase the collected amount of LFG.

The performance of LRAS was highly satisfactory as the project physical scope was extended and was implemented within the Project budget, with all the Project objectives reached, regardless the complicated Project financing scheme with differing requirements by each of the financiers.

Evaluation of the performance of the Bank and other partners

The performance of the Bank and other partners is evaluated highly satisfactory by Liepajas RAS Ltd (LRAS) due to the following considerations:

1. Overall

The Bank and other partners were very supportive throughout the whole Project with deep understanding of the problematic situations and highly flexible in joint decision making. The Bank team consisted of experienced experts with perfect cooperation abilities.

2. During the Project preparation

The Bank and other partners got effectively involved in the Feasibility Study stage and were highly cooperative during the preparation of the financing agreements. The Project financing scheme was successfully approved only with a slight delay due to the new experience in purchasing emission reduction units to be produced under a waste management project.

Lesson Learned
It was very important that a newly established company (LRAS) was supported by experienced experts from the financiers' side.

3. During the Project implementation

The Bank and other partners gave a great contribution for the Project implementation on time, namely before the Project closing date and within the budget. This was possible to achieve thanks to the short response time to the issues addressed, the flexibility to the extent it was needed, the full understanding of the local situation.

***

NOTE: No comments were received from the Ministry of Finance of the Republic of Latvia and from other co-financiers: Swedish International Development Cooperation Agency (SIDA) and Nordic Investment Bank (NIB) until the date of December 17, 2007.

Annex 8. Comments of Cofinanciers and Other Partners/Stakeholders

Not applicable

Annex 9. List of Supporting Documents

Project Appraisal Document, Report No. No: 20718-LV, August 18, 2000 based on the following documents prepared during preparation of the Project:

Siting study including five selected locations for a Regional Disposal Facility

Feasibility Study for a Regional Disposal Facility in the Liepaja Region

Environmental Assessment

Study of the Possibility to mix in saw dust with the received waste
Business Plan for Development of the operating company Liepajas-RAS

Aide-Memoires

Prototype Carbon Fund Emission Reductions Purchase Agreement (Liepaja Solid Waste Management Project) (TF02104) by and between Republic of Latvia and International Bank for Reconstruction and Development, as a trustee of the Prototype Carbon Fund, December 19, 2000;

Amendment to Emission Reductions Purchase Agreement (Liepaja Solid Waste Management Project) (TF02104) (31.05.2005);

The Prototype Carbon Fund Baseline Study for the Greenhouse Gas Component of the Liepaja Regional Solid Waste Management Project Revision May 15, 2000;

Liepaja Regional Solid Waste Management Project Monitoring and Verification Protocol. Final Project Document. Prepared by ICF Consulting, May 2000;

Subsidiary Agreement Nr. 130–A001 Prototype Carbon Fund Emission Reductions Purchase Agreement between Ministry of Finance of the Republic of Latvia and Liepājas RAS Ltd. (01.08.2001);

Project Audits