PROPOSAL FOR REVIEW

Project Title:	Latvia: Landfill Gas Recovery Project
GEF Focal Area:	Climate Change
Country Eligibility:	Latvia ratified the UNFCCC on March 23, 1995 IBRD Eligible (1995 GNP/capita of $2420)
Total Project Costs:	$25 million
GEF Financing:	$5.12 million
Riga City Counterpart Financing of GEF Component	$6 million
Cofinancing/ Parallel Financing:	IBRD US $8.8 million Government of Sweden US $1.5 million Operating Company Getlini US $3.58
Associated Project:	Municipal Solid Waste Management Project
GEF Implementing Agency:	World Bank
Executing Agency:	World Bank
Local Counterpart Agency:	Ministry of Environmental Protection and Regional Development Riga City Council
Estimated Starting Date:	July 1, 1997
Project Duration:	5 years
GEF Preparation Costs:	Funded by PHRD grants and the Swedish International Development Cooperation Agency (SIDA)

4. The proposed project would be the first sanitary landfill in the Baltic States, and the first project in the Baltic States where landfill gas is captured and utilized as fuel for energy production. Experience with district heating systems for heat supply in some East European countries and the FSU indicates that future utilization of waste management technologies which maximize landfill gas collection, is both economically attractive and technologically feasible. The project serving the Riga City is based on a population of about 850,000 inhabitants. International experience suggests that landfill gas collection and gas utilization for disposal sites may be technically feasible for communities with 25,000-50,000 inhabitants, thus making this project replicable in small communities throughout the country. Available data, including information regarding actual waste composition and disposed volumes of municipal waste generated in Riga City show that the landfill gas is sufficient to feed a 20 MW boiler, or a 6 MW gas engine for electricity generation with methane captured under the project. Clearly, the project could serve as a pilot for replication in the region and worldwide. The final use of the gas would be dependent on the local conditions and needs.

5. **Bank Strategy**. The Bank's overall strategy in Latvia is to support the country's efforts to accelerate structural reforms leading to a full transition to a market-based economy and, at the same time, to support efficient investments in high priority sectors to encourage economic growth. The recently completed Public Expenditure Review, jointly prepared by the GOL and the Bank, highlights the need to support priority investments in energy, transport and urban environmental services. Given fiscal constraints, the central government lacks sufficient reserves to fund major investments in these sectors from its state budget. The need for external financing to support public infrastructure services and municipal governments has been determined to be a priority in both the Government's Public Investment Program (1996) and the Bank's Country Assistance Strategy (1994). The Government requested World Bank assistance to prepare this initiative in 1995. It has recently declared this project a national priority since it will provide a solution to nearly 50% of the municipal waste generated in Latvia and will have a positive impact on the country's effort to reduce energy imports. Bank preparation was supported by a grant from the Swedish International Development Agency.

PROJECT OBJECTIVES

6. The project objective is to demonstrate financially self-sustaining modern waste management of municipal solid waste through maximum collection of generated methane, thereby reducing greenhouse gas. Other objectives include: (a) to simplify the separation of recyclable material; (b) to reduce environmental disamenities for neighbors of a disposal site; and (c) to demonstrate how outdated and obsolete disposal sites can be remediated and converted into sanitary landfills to enable continued operation. The project would demonstrate the feasibility of developing the indigenous Latvian landfill gas as an energy resource, thereby utilizing an otherwise constant emission of methane into the atmosphere and decreasing the dependence on imported fossil fuel for electricity generation and/or heating purposes.

ensure that the generated landfill gas is not ventilated into the atmosphere but rather collected via the gas collection system.

JUSTIFICATION OF TECHNOLOGY CHOICE

12. During the preparation of the project, several alternatives to upgrade the existing disposal site have been evaluated and considered, including options to: (a) meet minimal sanitary landfill standards ongoing separation of recyclable materials and will provide the means to receive and temporarily store hazardous waste to ensure that it is not mixed with ordinary waste.in regard to environmental protection; (b) same as (a) and introduce modern waste management in regard to technical and operational issues; (c) same as (b) and introduce collection of landfill gas and utilization of energy cells to generate either (i) heat; or (ii) electricity. The first alternative, with remediation and upgrading of the disposal site to meet minimum sanitary landfill requirements in accordance with the foreseen National Waste Management Strategy represents the Baseline Scenario.

13. The second alternative, resulting in an upgrading of the site to meet modern international sanitary landfill standards in regard to environment, operational and hygienic conditions, separation of waste and management does not meet the country's development objectives nor affordability criteria.

14. The third alternative including remediation, upgrading, and improved waste separation, as well as establishing energy cells for maximum methane gas collection and utilization of the captured landfill gas for electricity generation is the scenario which best meets the domestic and global environmental objectives.

15. In the assessment of investment options, it is important to note that besides the global benefits resulting from the proposed energy cell technology, this option yields a higher economic return than the alternative option (b) which represents a modern western sanitary landfill. This indicates that when future decisions are made regarding remediation and/or establishment of sanitary landfills, inclusion of additional investments for gas collection and gas utilization should be considered.

16. Finally, when choosing between heat production or electricity generation, the electricity generation alternative is preferred by the most likely purchaser, Latvenergo, which supplies all electricity in the country and approximately 50% of the heat. In Latvia, there is a high demand for electricity as well as a desire to decrease consumption of energy imports, hence the preference for domestic electricity production. Furthermore, the electricity generation alternative would reduce future problems with distribution of the gas in a separate pipeline. As well, it is anticipated that the heat plant or even a combined heat/power plant would be shut down for approximately 1.5 months every year for maintenance and perhaps for longer periods for major repair jobs. Consequently, the Government decided that the preferred alternative should be generation of electricity at the site, and direct delivery to the national power grid.

PROJECT BENEFITS

20. Implementation of the proposed Project would demonstrate a number of environmental benefits: (a) remediation of the existing disposal site would help eliminate ongoing groundwater pollution and enable a continued operation of the site, thereby postponing the establishment of a new site located at a four times longer hauling distance; (b) collection of landfill gas from already disposed waste thereby reducing methane emissions; (c) collection of landfill gas from new waste in specially designed energy cells, likewise reducing methane emissions; (d) recirculation of leachate thereby reducing treatment costs; and (e) demonstration of a technology which makes it possible to utilize other by-products from the decomposition of the waste. The Project also will result in the cost-effective utilization of an indigenous energy resource and savings in foreign exchange used to import electricity or fossil fuel for heating purposes.

21. Based upon conservative, technologically sound assumptions, the Project will lead to an average yearly reduction of about 31.2 million m^3 gas containing 50% methane (CH_4), equivalent to 11,140 tons of CH_4. The total reduction of landfill gas over the lifetime of the Project, 25 years, is 781 million m^3, of which 179 million m^3 will be captured from the existing landfill and 602 million m^3 will come from the new energy cells. The methane content is 0.357 kg/m^3 resulting in a total amount of captured methane equal to 278,820 tons. Given the fact that on a mass basis methane absorbs 21 times more energy than carbon dioxide, CO_2 (IPCC, 1995), the equivalent amount of CO_2 reduced by the capturing of the CH_4 is 5.86 million tons (278,820 ton x 21). The equivalent amount of carbon (C) Is 1.60 million ton (5.86 : 44 x 12). This is a conservative estimate, as it does not include important carbon savings which arise because power generated from the landfill gas would displace power that would otherwise be generated in all likelihood using a fossil fuel. Based on the estimated incremental cost, US $5.12 million, the greenhouse abatement cost is US $3.41/ton carbon (C).

RATIONALE FOR BANK AND GEF INVOLVEMENT

22. The involvement of the Bank/GEF in the proposed Project provides an opportunity to support Latvian efforts to improve solid waste management, reduce dependence on imported energy, and improve global environmental quality through the reduction of greenhouse gases. In the absence of Bank involvement, it is unlikely that the country would be able to mobilize the technical assistance and financial resources required to implement a demonstration project of this nature.

23. The Project is consistent with the guidance for access to the Climate Change short-term window of the Operational Strategy in that: (a) it is technically, environmentally, and socially sustainable; (b) it is a national priority in the National Climate Change Mitigation Plan (1995) as well as in the Environmental National Policy Plan, and has, furthermore, been declared as a National Priority project by the GOL, as it would provide an affordable solution to nearly 50% of the generated municipal waste in Latvia; (c) it provides the means of abating GHG at a cost of US $3.41 per ton of carbon, which is below the maximum acceptable US $10 per ton carbon; (d) it includes an essential transfer of technology through twinning arrangements and managerial assistance during project

LESSONS FROM PREVIOUS BANK INVOLVEMENT AND TECHNICAL REVIEW

28. This is the first Bank project in the waste management sector in Latvia. It incorporates the lessons learned from Bank experience and specifically, the Operational Evaluation Department analyses of sanitation projects. These point to the need to develop managerially and financially autonomous and decentralized public utilities as a basis for sector reform, efficient operations, and investment. A similar project based on sequestering of the generated landfill gas from energy cells is currently under preparation/ implementation in Pakistan, after being stalled for over two years. The principal reason for the delay in Pakistan is the difficulty in finding an institutional counterpart with necessary implementation and operational skills. Thus, for this project, project implementation support and operational private sector participation was regarded as an essential component for the project. Furthermore, responding to the difficulties faced in Pakistan, the proposed Project will be supported by Twinning Arrangements and Managerial Assistance during the implementation (see para 24).

29. The project was reviewed by a waste management expert selected from the STAP roster in November, 1996 (see attached). His comments were highly supportive of the Project and specific suggestions have been incorporated in the proposal .

PROJECT FINANCING AND BUDGET

30. The total project cost is estimated at US $25 million including recurrent costs during implementation, physical and price contingencies, and interest during construction. An $8.8 million World Bank loan would finance a portion of the non-incremental costs. A GEF grant for US $5.12 million to cover the incremental cost is requested. The Swedish Government will provide grant financing for approximately $1.5 million. The remaining 28% of total project costs would be covered by the Riga City Council ($6 m), and by the new operating company, $3.58 m equivalent). More detailed information about investment costs and operational costs are presented in attachments to Annex 1. During appraisal, a full project budget and a disbursement plan will identify the specific sub-components to be financed by the GEF grant.

INCREMENTAL COST

31. The calculation of the incremental cost is described in Annex 1. The alternative used for calculation of the baseline cost would result in a remediation and upgrading of the existing site to meet environmental requirements to eliminate ongoing contamination of groundwater and surface water, and thereby also enable the continued operation of the site. However, the baseline alternative does not include further technical and operational improvements to fulfill requirements for a western-style sanitary landfill. The baseline scenario cost is estimated at US $3.13m with annual recurrent costs of US $0.25 million. The GEF alternative cost is the investment cost for remediation, technical and operational improvements to meet normal standards for a sanitary landfill to enable continued operation of the site, capturing of the landfill gas utilizing enhanced decomposition of easily biodegradable material in energy cells, and equipment for generation of electricity, estimated at US

ANNEX 1

LATVIA: SOLID WASTE MANAGEMENT AND LANDFILL GAS RECOVERY PROJECT

CALCULATION OF THE INCREMENTAL COST

BROAD DEVELOPMENT GOALS AND THE BASELINE

1. The Government of Latvia (GOL) seeks to protect groundwater resources, critical for the nation's drinking water supply; improved solid waste management is essential for safeguarding these resources. The GOL has therefore started a program focusing on existing disposal sites, and to support this program institutionally, the GOL has initiated an overall National Solid Waste Management Strategy. The minimum requirement for upgrading existing disposal sites is likely to be to implement mitigation measures to fulfill the environmental requirements for sanitary landfills without requiring all necessary arrangements for waste separation and recycling of different materials.

2. The solid waste management in Latvia is currently based on common disposal technology, without waste separation and any particular precautions in regard to surface and groundwater contamination. It should be expected that Latvia has a considerable investment program ahead to deal with remediation actions at the existing disposal sites and an additional investment program in establishing safe sanitary landfills. It is expected that the minimum requirement for existing sites, would be remediation measures to fulfill environmental requirements aiming to safeguard groundwater and surface water resources, and provide facilities for an acceptable treatment of generated leachate. Further technical and operational improvements to reach the sanitary landfill standard are expected to be required and implemented, if and when these improvements are regarded as affordable to the population.

3. The disposal site Getlini has been in operation since 1970. Due to no protection measures against groundwater pollution, and results from groundwater investigations indicating that the essential aquifers Plavinas and Amata were contaminated, the site was assessed to be closed and remediated several years ago, and a new site to be identified and established. The search for a new site resulted finally in a location at a four times larger hauling distance. The investment cost for that project without any arrangements for gas collection and gas utilization was estimated at over US $30 million. Regardless to the increased transportation cost, the capital costs and recurrent cost would require a disposal fee above US $25/ton, which under no circumstances would be affordable to the inhabitants.

4. One year ago, the results from the earlier groundwater investigations were reassessed, and it was believed that the groundwater contamination was not as severe as indicated and that the groundwater problem could be managed to an acceptable cost. The feasibility study, which has included extensive groundwater investigations, has completely confirmed that the aquifers Plavinas and Amata are still uncontaminated. These aquifers are the second and third aquifers underlying the site and are regarded as important resources for supplying potable water to the surrounding municipalities

degradation. The waste will be stacked in cells, equal to about one-third to one-half of the yearly waste volume. During the creation of the horizontal cells, they will be continuously covered and capped with a thick layer of clay to minimize infiltration of rain water and intrusion of air. The activity in the cell will be very low during the filling period, and will not start until the recirculation of leachate takes place. Therefore, the loss of landfill gas during the filling period is regarded as very low, and estimated to about 2-3%.

9. After finished filling, leachate from the cell will be collected and recycled to the cell to maintain the right humidity and temperature inside the cell, thereby creating a favorable environment for an enhanced decomposition of the waste. During late fall, winter, and early spring, the leachate might be preheated to guarantee a temperature inside the cell of about 40°C. This energy will be supplied from the cooling system for the electricity generation unit. As the decomposition of the waste and generation of methane, CH_4, is hydrogen consuming, there is a need for addition of water. As the amount of leachate would not be sufficient to maintain the moisture content and simultaneously support the generation of methane it provides a possibility to also get rid of part of the extracted groundwater and polluted run-off water. The quality of the recycled water will be monitored to assure that it would not contain to high levels of contaminants, which could have a negative impact on the anaerobic bacteria involved in the decomposition process. Experiences from similar energy cells indicate that there should not be any problems in recycling the water. The cell will be under constant under pressure, regulated in such a way that air is not sucked into the cell. The collection of gas will correspond to about 90% of the available gas production. During the five year period about 74% of the potential gas production will be collected. If in the future, the cells would be operated during 10 years instead of 5 years, the collection of landfill gas would correspond to about 85% of the potential volume. However, this decision will be made, when experience of the actual energy cells would be gathered.

10. A continued contamination of the groundwater is regarded as very unlikely after implementation of planned remediation measures and sealing of the whole area. However, to make sure that no future contamination would threaten the important aquifers Plavinas and Amata, the most shallow aquifer, Quatenary, which already is contaminated but of no real value, will be controlled by establishing wells, and, via those wells, extract groundwater from the Quaternary aquifer to such an extent that eventual contamination of the aquifers Plavinas and Amata can be controlled. The extracted water will be disposed off or treated in a way acceptable to the environmental authorities.

Landfill Gas Generation

11. The generation of LFG depends on a number of factors, which for the moment are not totally known, but have been assessed based on the experience form similar sites and projects. The most important of these factors are: (a) level of capturing the LFG; (b) energy content in the LFG expressed in percentage of methane; (c) content of easily decomposable organic waste; and (d) amount of disposed municipal waste. These factors might vary as follows:

16. Based on the difference in investment costs, US $13.23 million and the difference in operational costs US $1.45 million over a lifetime of 25 years, the incremental cost for achieving a substantial reduction in methane emission has been calculated at US $5.12 million. Calculation of the IRR and NPV_{10} for the incremental cost is shown in Attachments 1.A and 1.B. This table also shows the investment costs and recurrent costs for the proposed investment and the alternative base case. The incremental costs for the different steps or components of the project: (a) remediation; (b) technical and operational improvements; and (c) energy cells, gas collection and electricity generation; are shown in Attachments 2.A - 2.D. A table summarizing the findings in Attachment 2 is presented in Attachment 3. Attachment 4 presents the Incremental Cost Matrix.

PROCESS OF AGREEMENT

Agreement on the framework and parameters for the estimation of the incremental cost has been reached in the course of project preparation and appraisal. This agreement is expected to be confirmed at the time of project appraisal, and formalized at project negotiations.

Attachment 1.A

GEF Increment

Electricity Pricing		Lats/kWh	US$/kWh
Import Price		0.0182	0.0337
Corr. Fact. [1]	1.05		
Sales Price		0.01911	0.035389

[1] Price is adjusted with a factor, due to less losses in the grid

Efficiency	
Gas Engine	30

	With Project	Without Project	Increm. Cost
IRR	-1%		4%
NPV	($9,901)	($4,782)	($5,120)

Waste Disposal	
Tons/year	210,000
US $/ton	0
Revenue	0

	Investment Costs			Recurrent Expenditures			Revenues			Net Revenues			Net Rev. Incl. Glob. Env. Ben.		
	Gas-Electr.	Remediation	Increment	Gas-Electr.	Remediation	Increment	Waste Sep.	Electr. Gen.	Total	Gas-Electr.	Remediation	Increment	Gas-Electr.	Remediation	Increment
1997	737	139	598	122	0	122	0		0	-859	-139	-720	-859	-139	-720
1998	9631	2938	6693	766	35	731	0		0	-10397	-2973	-7424	-10397	-2973	-7424
1999	3176	48	3128	1283	187	1096	100	1219	1319	-3140	-235	-2905	-1966	-235	-1731
2000	1282		1282	1372	193	1179	150	1776	1926	-728	-193	-535	982	-193	1175
2001	1538		1538	1490	253	1237	200	2091	2291	-737	-253	-484	1277	-253	1530
2002				2023	253	1770	200	2276	2476	453	-253	706	2644	-253	2897
2003				1860	253	1607	200	2387	2587	727	-253	980	3026	-253	3279
2004				1701	253	1448	200	2455	2655	954	-253	1207	3319	-253	3572
2005				1701	253	1448	200	2386	2586	885	-253	1138	3183	-253	3436
2006				1701	253	1448	200	2325	2525	824	-253	1077	3064	-253	3317
2007				1701	253	1448	200	2272	2472	771	-253	1024	2960	-253	3213
2008				1701	253	1448	200	2225	2425	724	-253	977	2868	-253	3121
2009				1701	253	1448	200	2184	2384	683	-253	936	2787	-253	3040
2010				1701	253	1448	200	2147	2347	646	-253	899	2715	-253	2968
2011				1701	253	1448	200	2115	2315	614	-253	867	2651	-253	2904
2012				1701	253	1448	200	2086	2286	585	-253	838	2594	-253	2847
2013				1701	253	1448	200	2060	2260	559	-253	812	2543	-253	2796
2014				1701	253	1448	200	2036	2236	535	-253	788	2497	-253	2750
2015				1701	253	1448	200	2016	2216	515	-253	768	2456	-253	2709
2016				1701	253	1448	200	1997	2197	496	-253	749	2419	-253	2672
2017				1701	253	1448	200	1980	2180	479	-253	732	2386	-253	2639
2018				1701	253	1448	200	1964	2164	463	-253	716	2355	-253	2608
2019				1701	253	1448	200	1776	1976	275	-253	528	1986	-253	2239
2020				1701	253	1448	200	1776	1976	275	-253	528	1986	-253	2239
2021				1701	253	1448	200	1776	1976	275	-253	528	1986	-253	2239
Res. Value	2455	469	1986							2455	469	1986	2455	469	1986
Total Invest.	16364	3125	13239				IRR		IRR	-1%		4%	15%		21%
							NPV 10	$16,622	NPV 10	($9,901)	($4,782)	($5,120)	$6,104	($4,782)	$10,885

Attachment 2.A

Environmental Remediation

	Unit	Unit Cost	1997	1998	1999	2000	2001	Total
			Totals Including Contingencies ('000)					
I. Investment Costs								
A. Soil Material								
Material, incl. Transport Clay and Sand	m3	8	-	1,623	-	-	-	1,623
B. Earth Works								
Covering of Landfill	m2	4	-	183	-	-	-	183
Excavation and prep. for leachate pond	m2	5	-	189	-	-	-	189
Ditches for surface run-off water	m	4	-	16	-	-	-	16
Dams and Ponds /a	Lumpsum		-	272	-	-	-	272
Subtotal Earth Works			-	660	-	-	-	660
C. Buildings								
Machinery equipment building /b	m2	290	-	87	-	-	-	87
D. Construction								
Groundwater Control/pumps	Number	16,100	-	39	-	-	-	39
Groundwater Control/wells	Number	14,700	-	35	-	-	-	35
Groundwater Control/pipes	m	17	-	40	-	-	-	40
Groundwater Control/Textile	m	4	-	11	-	-	-	11
Groundwater Control/Soil	m3	4	-	10	-	-	-	10
Groundwater Control/Regulation	Lumpsum		-	16	-	-	-	16
Groundwater Control/Installation Wells	Number	3,300	-	8	-	-	-	8
Subtotal Construction			-	159	-	-	-	159
E. Equipment								
Transmission of Surface Water/wells	Number	7,300	-	-	16	-	-	16
Transmission of Surface Water/pipes	m	4	-	-	2	-	-	2
Transmission of Surface Water/Installation	Number	7,300	-	-	16	-	-	16
Transmission of Surface Water/pumps	Number	6,700	-	-	15	-	-	15
Heating of leachate water for treatment	lumpsum		-	177	-	-	-	177
SBR Aeration /c	Number	22,100	-	48	-	-	-	48
SBR Blowing Equip.	Number	14,700	-	48	-	-	-	48
SBR Decant Equip.	Lumpsum		-	24	-	-	-	24
SBR Instrument Equip.	Lumpsum		-	24	-	-	-	24
SBR Dosing Equip./Chemicals	Lumpsum		-	24	-	-	-	24
SBR Motor valves	Lumpsum		-	36	-	-	-	36
SBR Shutters	Lumpsum		-	36	-	-	-	36
Electricity/Regulation /d	Lumpsum		-	129	-	-	-	129
Heating, Water and Sanitation /e	Lumpsum		-	40	-	-	-	40
Transmission pumps /f	Number	7,400	-	40	-	-	-	40
Compacted area /g	m2	15	-	8	-	-	-	8
Installation well /h	Lumpsum		-	16	-	-	-	16
Installation well /i	Lumpsum		-	8	-	-	-	8
Groundwater Monitoring Well	Number	700	-	5	-	-	-	5
Groundwater Monitoring Equipment	Lumpsum		-	9	-	-	-	9
Subtotal Equipment			-	673	49	-	-	722
F. Design								
Detailed Design	lumpsum		141	-	-	-	-	141
Total Investment Costs			141	3,201	49	-	-	3,391
II. Recurrent Costs								
A. Salaries								
Incremental Salaries	12 per month	550/per month	-	15	16	17	18	67
B. Operation and Maintenance								
Maintenance Site Works	0.5% of Investment		-	25	43	49	54	171
Maintenance Equipment	5% of Investment		-	-	40	45	47	133
Electricity Consumption /j	Lumpsum		-	-	124	129	134	386
Total Recurrent Costs			-	41	223	240	253	757
			141	3,242	273	240	253	4,149

\a for existing landfill
\b Leachate Treatment
\c SBR: Sequence Batch Reactor
\d Leachate Treatment
\e Leachate Treatment
\f Leachate Treatment
\g Leachate Treatment
\h Leachate Treatment
\i Leachate Treatment
\i Leachate Treatment
\j 50% of total electricity

Attachment 2.C

Gas Generation and Energy Production

	Unit	Unit Cost	Totals Including Contingencies ('000)					
			1997	1998	1999	2000	2001	Total
A. Earth Works								
Excavation and Prep. of Energy Cells	m2	5	-	139	148	157	165	609
Redistribution of filling material	Lumpsum		-	9	-	-	-	9
Soil Covering Energy Cells	m2	2	-	-	85	90	94	269
Subtotal Earth Works			-	148	234	246	259	886
B. Civil Works								
Gas extraction piping energy cells	lumpsum		-	33	-	-	-	33
Leachate injection water piping	m	10	-	7	-	-	-	7
Leachate water main drainage pipe	m	15	-	11	-	-	-	11
Leachate water perforated pipe	m	18	-	-	8	8	8	24
Manufacture and install gas wells, landfill	Number	882	-	211	-	-	-	211
Gas extraction piping, landfill	m	47	-	186	-	-	-	186
Establishment of energy cell gas wells	m2	6	-	-	222	232	242	696
Establishment of injection wells, energy cells	m2	2	-	-	56	59	61	177
Subtotal Civil Works			-	447	286	299	311	1,344
C. Equipment								
Regulation station	No.	25,000	-	83	-	-	-	83
Junction manholes	Number	1,470	-	-	5	-	-	5
Collector well with pump and heating coil	Lumpsum		-	-	33	-	-	33
Gas pumping station	Lumpsum		-	-	322	-	108	431
Gas boiler with heat exchanger	Lumpsum		-	-	187	-	-	187
Electricity Generation Facility /a	lumpsum		-	2,117	658	680	702	4,157
Subtotal Equipment			-	2,200	1,205	680	810	4,896
D. Design								
Detailed Design /b	lumpsum		157	-	-	-	-	157
			157	2,795	1,725	1,225	1,380	7,283
A. Salaries								
Incremental Salaries	12 per month	550/per month	-	23	41	44	46	153
B. Operation and Maintenance								
Maintenance Site Works	0.5% of Investment		-	-	7	11	14	32
Maintenance Equipment	Lumpsum		-	-	28	29	31	88
Maintenance Electricity Generation	8% of Investment		-	-	189	255	326	770
Fuel /c	lumpsum		-	192	201	208	216	817
Electric Power /d	Lumpsum		-	-	124	129	134	386
			-	215	590	676	767	2,247
Total			157	3,010	2,315	1,901	2,147	9,530

\a Turn-key, including detailed design
\b Excluding Design for Electricity Generation Facility
\c 50% of fuel consumption
\d 50% of Electric Power Consumption

Attachment 3

Table 2: Project Components by Year - Totals Including Contingencies

Financial Costs
Gas for Electricity

	Totals Including Contingencies					
	1997	1998	1999	2000	2001	Total
1. Environmental Remediation	141	3,242	273	240	253	4,149
2. Technical/Operational Improvements	339	4,520	2,124	766	1,022	8,772
3. Gas Generation and Energy Production	157	3,010	2,315	1,901	2,147	9,530
4. Managerial Improvements	210	373	442	249	266	1,539
	847	11,145	5,154	3,156	3,688	23,990

LETTER OF COUNTRY ENDORSEMENT BY DESIGNATED OPERATIONAL FOCAL POINT

MINISTRY OF ENVIRONMENTAL PROTECTION AND REGIONAL DEVELOPMENT
OF THE REPUBLIC OF LATVIA

Charles Feinstein
World Bank
ENVGC Division
1818 H Street, N.W.
Washington D.C. 20433

June 3, 1996

:: *Latvia: Greenhouse gases, priorities for emission reduction*

Dear Sir,

In the beginning of 1995 Latvia ratified the UN Framework Convection on Climate Change. The Government of Latvia has declared its readiness to meet the requirements under the Convention.

Several documents reflect the Government of Latvia's attitude towards the problem of GHG.

In 1995 the National Communication of the Republic of Latvia under UN Framework Convention on Climate Change (UNFCCC) was prepared. The document presents an overview of the existing situation within this field, characterises a set of policies and activities to reduce GHG emissions and gives a forecast of the situation by the year 2000. Among other issues the document says that Latvia's waste disposal sites are one of the sources of methane emissions that have to be considered.

The National Environmental Policy Plan, which was adopted by the Parliament in 1995, declares the emission reduction of GHG (including methane) as one of the national environmental protection priorities. Further, in more details this issue is elaborated in the National Environmental Action Programme which is currently under elaboration.

The Ministry of Environmental Protection and Regional Development of the Republic of Latvia considers the reduction and collection of methane form the solid waste disposal sites as one of the government's priorities for reduction of GHG. Therefore we support the Solid Waste Management Project, which envisages also installation of equipment for collection of landfill gas for the Riga Landfill. The project will serve not only as a pilot project for sound waste management, but also as a pilot project for possibilities of methane collection from landfills. This way the project will serve as one step to fulfil our obligations under UNFCCC.

Indulis Emsis
State Minister of Environment

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TECHNICAL REVIEW
LATVIA: MUNICIPAL SOLID WASTE MANAGEMENT PROJECT

November 27, 1996

To: Anders Haldin @ 202-522-3075

Subj: Second review of Latvia Solid Waste Management GEF project proposal

The revised proposal which you faxed me yesterday addresses all of the major concerns I expressed in my first review in July. There has clearly been a substantial amount of work done in putting together this version. The project looks really solid now, and it appears to satisfy most if not all of the criteria for GEF support under the short-term window (≤$10/tC) or possibly as a barrier removal project for promoting a renewable energy source. In the interests of getting my review back to you before Thanksgiving, I have rushed a bit in preparing this memo. With this in mind, if anything is unclear, I will be available for discussion anytime next week.

My questions/comments are aimed primarily at clarifying some issues in the proposal. I don't believe that any of my comments require any qualitative changes to the project.

1. ¶4 suggests that LFG utilization is financially unviable at sites below a certain size. Can this threshold size be quantified (at least approximately) to make it clear that the site size in the proposed project far exceeds the threshold?

2. ¶5 states that half of Latvia's waste goes to Getlini, while ¶2 indicates that there are 600 existing disposal sites in Latvia. Given these facts, the vast majority of the 600 sites must be rather small in size. How financially viable will be LFG utilization at the majority of these sites? (see comment #1 above). The proposal mentions the importance of the Getlini project as a demonstration for the Baltic region (¶4). This is an important point, since it seems that there will probably be relatively few replications of the technology in Latvia proper.

3. The calculation of avoided carbon emissions in ¶11 (which was not included in the previous version of the proposal) slightly underestimates the saved carbon. Important carbon savings arise from not emitting methane to the atmosphere, but additional carbon savings arise because the power generated from the landfill gas (a renewable resource—no net CO_2 emissions) would displace power that would otherwise be generated (at a central station power plant) in all likelihood using a fossil fuel. If coal is the fossil fuel, saved carbon emissions would be approximately 0.24 tC/MWh_e ($0.024\ tC/GJ_{coal} \times 10\ GJ_{coal}/MWh_e$ heat rate). If oil is the fossil fuel, saved carbon emissions might be 0.20 tC/MWh_e ($0.020\ tC/GJ_{oil} \times 10\ GJ_{oil}/MWh_e$). If natural gas is the fossil fuel, saved carbon emissions would be in the range of 0.11 tC/MWh_e ($0.014\ tC/GJ_{ngas} \times 8\ GJ_{ngas}/MWh_e$). In Attachment 1 to the proposal, annual revenues from sale of electricity are in the range of $1.3 to $1.9 million. Assuming a sale price of $0.034/kWh, this corresponds to 38 to 56 million kWh generated annually. Displacing oil-derived power then would mean an annual

11. The relevance of mentioning the "extensive district heating systems" in the Baltic region and other successor states to the Soviet Union is not clear.

12. What is "OED" mentioned in ¶31?

13. It is good to see (in ¶31) that lessons learned from a similar project in Pakistan are being taken to heart.

14. In ¶34 it would be useful to clarify that improved waste separation is an integral part of an effective LFG recovery system. (I understand that this is the case from the discussion in ¶6 of Annex 1.) Otherwise it appears that there is only a domestic benefit arising from this improvement (and hence GEF support for this part of the project would not be justified).

15. Also in ¶34, an investment cost of $20 million is indicated, but $18.15 million is indicated as being used in the incremental cost calculation (also in ¶12 of Annex 1).

16. The incremental cost calculation methodology (¶34) appears reasonable. However, it is not clear why a discount rate of 10% is used to actually calculate the incremental cost. Why not 5% or 15%? Some discussion is needed. Finally, it would be helpful to state explicitly that the calculated incremental cost is the difference in NPV between the baseline case (Alternative #1 in Table 1) and the power generation case (Alternative #4 in Table 1).

17. With reference to ¶7 in Annex 1: if "extracted groundwater and polluted run-off water" are continuously added to the energy cells (to maintain CH_4 production), could there be a buildup of pollutants in the cell that might be toxic to the bacteria producing the CH_4?

18. The meaning of the second-to-last sentence in ¶8 of Annex 1 is not clear, though the point being made may not be directly relevant for GEF consideration.

19. In ¶10 of Annex 1, mention is made of the "import price for electricity". What does this term mean?