BRAZIL

BASIC SANITATION PROGRAM FOR THE GUANABARA BAY BASIN
PHASE I

(BR-072)

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Costs of the sewerage subprogram

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CEDAE – income statement

CEDAE – projected income statement

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CEDAE – projected statement of condition

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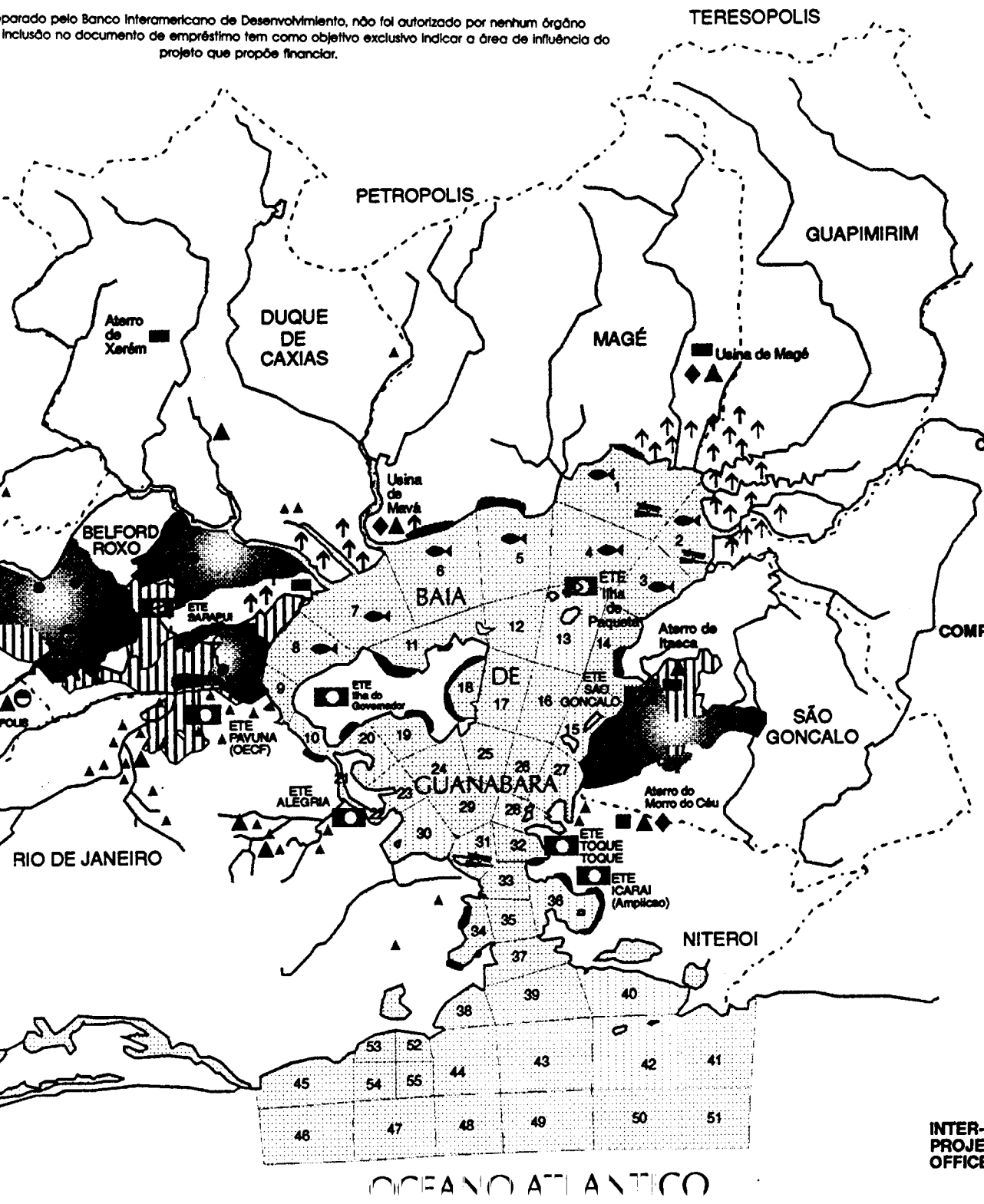
ABBREVIATIONS

CEDAE	Companhia Estadual de Água e Esgoto [State Water and Sewerage Company]
CEF	Caixa Econômica Federal [Federal Savings Bank]
CIDE	Fundação Centro de Informações e Dados do Rio de Janeiro [Rio de Janeiro Information Center Foundation]
CLIN	Companhia Municipal de Limpeza Urbana de Niterói [Niterói Municipal Sanitation Company]
COMLURB	Companhia Municipal de Limpeza Urbana do Município do Rio de Janeiro [Rio de Janeiro Municipal Sanitation Company]
FAE	Fundo de Água e Esgotos [Water and Sewerage Fund]
FEE	Fundação Estadual de Educação [State Education Foundation]
FEEMA	Fundação Estadual de Engenharia do Meio Ambiente [State Environmental Engineering Foundation]
GEROE	Executive Group for Emergency Works
GIS	geographic information system
IEF	Instituto Estadual Florestal [State Forestry Authority]
JICA	Japanese International Cooperation Agency
MRRJ	metropolitan region of Rio de Janeiro
OCEF	Japanese Overseas Economic Cooperation Fund
SEMAN	Secretaria do Meio Ambiente [Department of the Environment]
SERLA	Superintendência Estadual de Rios e Lagoas [State Rivers and Lakes Authority]
SOSP	Secretaria de Obras e Serviços Públicos do Estado [State Department of Public Works and Services]
WSD	water and sewerage districts
WTS	water treatment station
WWTP	wastewater treatment plant

eparado pelo Banco Interamericano de Desenvolvimiento, não foi autorizado por nenhum órgão
inclusão no documento de empréstimo tem como objetivo exclusivo indicar a área de influência do
projeto que propõe financiar.



Programa de Sanea
Básico da Bac
Baía de Guana

LEGENDA

COMPONENTE: RESÍDUOS SOLID

- RECUPERAÇÃO DO
- COLETA E AMPLIAÇ DE TRANSFERENCIA
- MELHORIA DA COLE DESTINO FINAL
- IMPLANTAÇÃO DE U

COMPONENTE: SANEAMENTO-ESG

- ÁREA COM REDE CO PROGRAMADA
- ETE-ESTAÇÃO DE TR DE ESGOTO PROGR
- DISPOSIÇÃO FINAL

COMPONENTE: SANEAMENTO-ABASTE

- SETORES DO SISTE ABASTECIMENTO DE
- RESERVATÓRIO

USOS DA BAIA

- PESCA
- PRAIAS
- OBRAS COMPLEME
- TURISMO ECOLOGI

MANGUEZAL:

- Preservado
- Alterado
- Principais Indústrias Pol

INTER-AMERICAN DEVELOPMENT BANK
PROJECT ANALYSIS DEPARTMENT
OFFICE OF TECHNICAL PROGRAMMING (
10/11/93

BRAZIL

Basic Socio-Economic Data
Statistics and Quantitative Analysis
Economic and Social Development Department

Executive Summary

Social Statistics

Land Area (Km2)	1992	8,456,508
Population (Thousands)	1992	154,105
Population (Average Annual Growth Rate)	1983-1992	2.0
Rural (Percent)	1992	22.7
Density (Population per Km2)	1992	18.2
Vital Statistics		
Crude Birth (Rate per 1,000 Population)	1991	24.0
Infant Mortality (Rate per 1,000 Live Births)	1991	58.0
Crude Death (Rate per 1,000 Population)	1991	7.5
Life Expectancy at Birth (Years)	1991	66.0
Illiteracy (Percent)	1990	18.9
Primary School Enrollment Ratio	1990	108.0

Economic Statistics

Exchange Rate (Cruzeiros/US$)	8-1993	82,740.0
GDP per Capita (Average Annual Growth Rate)	1983-1992	-0.1
Labor Force (Thousands)	1990	55,026
Unemployment Rate (Percent)	1992	5.9
Consumer Prices (Twelve Month Variation)	6-1993	1,633.7
NF Public Sector Operational Balance (% of GDP)	1992	2.4
Domestic Credit (% of GDP)	1992	21.1
Balance of Payments (Millions of US$)		
Current Account Balance	1992	6,300
Trade Balance	1992	15,700
Capital Account Balance	1992	8,800
Change in Reserves (- Increase)	1992	-15,100
Total External Debt (Millions of US$)	1992	120,679
Total Debt Service (Millions of US$)	1992	10,300
Debt to GDP Ratio (Percent)	1992	35.0
Debt Service Ratio (Percent)	1992	25.1

18 October 1993

BRAZIL
Basic Socio-Economic Data

1. Exchange Rates

Cruzeiros/US$, End of Period
Index 1980=100

	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Exchange Rate	0.0	0.0	0.0	0.0	0.1	0.8	11.4	177.1	1068.8	12387.5
Real Effective Index	130.1	134.6	138.6	147.8	147.7	136.9	109.8	93.5	116.5	129.8

2. Prices

Average Annual Growth Rates in Percent

	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Consumer Price Index	142.0	196.7	226.9	145.3	229.7	682.3	1287.0	2938.0	440.8	1000.0
Wholesale Price Index	200.0	233.3	233.3	140.3	206.9	697.1	1284.1	2710.0	401.1	...

3. International Liquidity

Millions of US$

	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Reserves	4562	11996	11609	6761	7458	8116	8729	9176	8764	23268
Reserves minus Gold	4355	11508	10605	5803	6299	6972	7535	7441	8033	22521
Special Drawing Rights (SDRs)	0	1	1	0	0	0	...	11	13	1
Reserve Position in the IMF	...	...	...	...	...	...	...	...	...	...
Foreign Exchange	4355	11507	10604	5803	6299	6971	7535	7430	8020	22520
Gold (National Valuation)	207	488	1004	958	1159	1144	1194	1735	731	747

4. National Accounts

Millions of 1988 US$
1988 US$

	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Gross Domestic Product	267318	281184	302978	326788	337755	337301	348050	332791	335283	331534
GDP Per Capita	2058	2118	2235	2362	2394	2346	2377	2233	2212	2151

Annual Growth Rates in Percent - Constant Prices

	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
GDP Per Capita	-5.6	3.0	5.7	5.5	1.6	-2.0	1.4	-6.1	-0.8	-2.5
GDP by Type of Expenditure (MP)	-3.5	5.2	7.9	7.6	3.6	-0.1	3.3	-4.4	0.9	-0.9
Consumption	-2.9	2.2	2.8	12.5	1.7	-1.4	4.0	-1.9	2.0	-2.3
Gross Domestic Investment	-22.6	3.7	31.1	9.6	-1.3	-4.8	1.2	-8.1	-4.1	-0.7
Exports of Goods and Services	14.3	22.0	7.0	-10.6	19.2	13.1	5.1	-4.9	6.6	5.2
Imports of Goods and Services	-17.4	-2.9	0.0	28.7	-2.9	-1.1	8.9	10.1	10.1	-1.6
GDP by Sector of Origin (FC)										
Agriculture, Forestry and Fishing	-0.6	3.3	10.0	-8.0	15.0	0.8	2.9	-3.7	2.5	6.0
Mining and Quarrying	15.9	30.7	11.5	3.6	-0.9	0.4	3.9	2.9	0.3	-4.1
Manufacturing	-5.8	6.2	8.3	11.3	0.9	-3.4	2.9	-9.5	-0.5	-0.3
Electricity, Gas and Water	7.5	12.4	10.0	8.5	3.2	5.9	1.6	1.8	4.3	1.9
Construction	-13.9	0.8	6.0	18.5	1.0	-2.8	3.2	-8.4	-4.0	-4.4
Wholesale and Retail Trade	-3.9	3.9	7.4	7.8	2.6	-2.6	3.1	-6.4	1.4	-3.2
Transport and Communications	1.0	6.7	9.8	13.8	6.0	6.4	8.7	1.6	6.5	3.2
Financial Services	5.6	7.7	10.0	-1.8	-4.7	0.3	1.3	-3.1	-8.0	-4.6
Government	2.0	1.9	1.9	2.0	1.9	1.9	2.0	1.9	1.9	1.9
Other Services	-55.9	-27.4	-33.0	371.8	62.1	14.0	9.0	6.4	27.6	-9.5

BRAZIL
Basic Socio-Economic Data

4. National Accounts (cont.)

Composition in Percent - Current Prices

	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
GDP by Type of Expenditure (MP)										
Consumption	80.4	77.7	75.7	78.5	74.5	72.1	72.0	76.8	79.1	...
Gross Domestic Investment	17.2	16.5	19.1	19.1	22.2	22.7	24.8	21.5	18.9	...
Exports of Goods and Services	11.7	14.2	12.2	8.8	9.4	10.9	8.2	7.2	8.5	...
Imports of Goods and Services	9.3	8.3	7.1	6.3	6.2	5.7	5.0	5.5	6.5	...
GDP by Sector of Origin (FC)										
Agriculture, Forestry and Fishing	11.9	12.9	11.8	11.5	10.3	10.5	8.9	10.4	10.8	...
Mining and Quarrying	1.9	3.0	3.2	2.7	2.2	1.9	1.6	1.6	1.7	...
Manufacturing	31.6	31.8	33.6	32.9	31.8	31.0	29.6	26.3	25.0	...
Electricity, Gas and Water	2.2	2.4	2.3	2.3	3.3	2.8	2.4	2.8	3.6	...
Construction	6.6	6.2	6.0	7.1	8.4	8.0	9.2	7.8	7.1	...
Wholesale and Retail Trade	10.1	9.4	9.1	8.7	8.0	8.1	7.8	7.3	7.1	...
Transport and Communications	5.8	5.6	5.3	5.1	5.2	5.4	5.5	5.5	5.5	...
Financial Services	9.9	10.2	9.3	10.0	10.6	11.4	11.7	14.2	15.8	...
Government	7.6	6.5	7.6	8.2	8.6	8.7	10.6	11.8	9.9	...
Other Services	12.2	11.9	11.7	11.7	11.5	12.2	12.8	12.2	13.6	...

5. Non-Financial Public Sector

As a Percent of GDP

	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Borrowing Requirements	-21.7	-24.2	-28.5	-11.2	-32.2	-52.8	-82.7	-29.3	-25.8	-42.9
Operational Balance (- Deficit)	-4.4	-2.7	-4.4	-3.6	-5.7	-4.8	-6.8	1.3	-1.3	2.4

6. Monetary Survey

As a Percent of GDP

	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Domestic Credit	40.3	33.9	31.9	33.3	31.3	22.6	13.7	22.5	20.4	21.1
Public Sector	10.5	9.2	9.3	9.4	9.9	6.4	3.9	7.0	6.4	6.0
Private Sector	29.8	24.7	22.6	23.9	21.4	16.2	9.8	15.6	14.0	15.1
Money (M1)	5.1	3.5	3.2	9.1	4.1	2.1	1.2	3.7	2.7	1.4

7. External Trade

Direction in Percent
Index 1980=100

	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Exports of Goods (fob)										
Developed Countries	63.3	64.3	64.4	66.7	65.9	65.2	67.9	68.0	63.4	58.7
Developing Countries	36.7	35.7	35.6	33.3	34.1	34.8	32.1	32.0	36.6	41.3
Latin America	10.3	11.3	9.6	12.3	12.3	11.9	11.8	11.3	16.5	22.2
Imports of Goods (cif)										
Developed Countries	38.4	39.8	45.3	59.2	56.0	57.5	55.8	54.9	59.3	60.2
Developing Countries	61.6	60.2	54.7	40.8	44.0	42.5	44.2	45.1	40.7	39.8
Latin America	14.4	15.6	12.3	13.1	12.1	12.8	18.3	17.1	18.0	16.5
Terms of Trade Index	77.9	85.8	83.5	97.9	87.1	96.8	88.9	83.8	91.7	90.0

BRAZIL
Basic Socio-Economic Data

7. External Trade (cont.)

Composition in Percent

	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Exports of Goods (fob)										
All Food	40.9	39.2	37.2	34.7	32.5	29.6	27.5	28.0	25.2	25.7
Agricultural Raw Materials	4.1	3.1	2.6	2.8	3.6	3.4	3.5	3.5	3.4	3.3
Fuels	5.4	6.8	6.4	3.2	3.6	2.7	2.5	2.2	1.4	1.6
Ores and Metals	17.4	17.2	18.1	19.8	17.9	23.3	25.1	25.3	27.7	23.5
Manufactured Goods	32.3	33.7	35.7	39.5	42.3	41.0	41.4	41.0	42.3	45.9
Chemicals	5.8	6.4	6.6	5.7	6.2	6.5	6.0	6.4	6.3	6.2
Machinery and Transport Equipment	14.0	12.6	15.4	17.4	20.5	19.0	20.1	18.7	18.7	20.8
Other Manufactured Goods	12.5	14.6	13.7	16.4	15.7	15.6	15.3	15.9	17.3	18.8
Imports of Goods (cif)										
Capital Goods	12.2	9.6	11.2	13.9	16.0	17.6	15.6	17.6	...	...
Consumption Goods	4.1	3.0	4.2	11.8	6.7	5.1	10.4	11.4	...	...
Intermediate Goods	83.4	87.2	84.3	74.0	77.3	77.2	73.9	70.7	...	...
Fuels	...	...	...	...	...	...	...	...	...	...
Other	0.4	0.3	0.3	0.2	0.1	...	0.1	0.3	...	...

8. Balance of Payments

Millions of US$

	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Current Account Balance	-6837	42	-273	-5304	-1450	4159	1025	-3788	-1408	6300
Trade Balance	6469	13086	12466	8304	11158	19168	16112	10747	10578	15700
Exports of Goods (fob)	21898	27002	25634	22348	26210	33773	34375	31408	31619	36200
Imports of Goods (fob)	15429	13916	13168	14044	15052	14605	18263	20661	21041	20500
Service Balance	-13414	-13215	-12894	-13695	-12678	-15103	-15331	-15369	-13542	-11400
Freight and Insurance	403	453	514	34	152	235	143	-50	-156	-250
Travel	-392	-153	-375	-509	-184	-588	474	-122	-212	-50
Investment Income	-11008	-11470	-11192	-11127	-10319	-12084	-12547	-11613	-9652	-9135
Other Services	-1109	-832	-972	-1219	-1357	-1369	-1766	-1944	-1965	-1965
Unrequited Transfers	108	171	155	87	70	94	244	834	1556	2000
Private	106	161	139	89	113	107	226	813	1521	...
Official	2	10	16	-2	-43	-13	18	21	35	...
Capital Account Balance	5532	4928	292	2006	4417	-1621	1495	5330	753	8800
Non-Monetary Sector	7760	5331	3528	4960	6194	493	4201	8317	3724	11700
Private Sector	-126	-4010	-2393	-4233	-6840	-6482	-3887	1047	3598	12600
Direct Investment	1373	1556	1267	177	1087	2794	744	236	-42	...
Portfolio Investment	-286	-272	-237	-450	-428	-498	-421	575	3808	...
Other Long-Term	-848	-1391	-2421	-4135	-7471	-7272	-3670	-232	-1077	...
Other Short-Term	-365	-3903	-1002	175	-28	-1506	-540	468	909	...
Government Sector	7886	9341	5921	9193	13034	6975	8088	7270	126	-900
Long-Term	9274	11283	6325	8818	7995	7947	2737	-3584	-3416	...
Short-Term	-1388	-1942	-404	375	5039	-972	5351	10854	3542	...
Monetary Sector	-2228	-403	-3236	-2954	-1777	-2114	-2706	-2987	-2971	-2900
Long-Term	-1519	-1404	-2643	-3647	-2178	-2520	-2415	-1354	-616	...
Short-Term	-709	1001	-593	693	401	406	-291	-1633	-2355	...
Change in Reserves (- Increase)	1891	-5369	511	3232	-2165	-1711	-1701	-1246	-197	-15100
Errors and Omissions	-586	399	-530	66	-802	-827	-819	-296	852	...

BRAZIL
Basic Socio-Economic Data

9. External Debt

Millions of US$
Ratios in Percent

	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Total Debt	98367	105424	106147	113735	123864	115726	111378	116417	116514	120679
Long-Term Debt	81368	90113	91915	99550	106227	101477	90375	90431	95129	97898
Public and Publicly Guaranteed	59856	70809	74738	84909	91793	89963	84368	83760	87476	90070
Bilateral	5021	6859	8176	10542	12867	13028	13354	15469	14779	14761
Multilateral	5122	5622	7358	10027	12311	11413	11088	11386	11068	10343
Bond Holders	2231	1698	1816	1787	1516	1546	2183	2339	9150	11330
Banks	41199	50750	50107	54000	55839	55833	49949	46185	44041	45201
Suppliers	2636	2590	3117	3614	3684	3028	2605	2585	2745	2699
Other Creditors	3647	3290	4164	4939	5576	5115	5189	5796	5693	5736
Private Non-Guaranteed	21512	19304	17177	14641	14434	11514	6007	6671	7653	7828
Use of IMF Credit	2644	4185	4619	4501	3976	3333	2422	1821	1238	1045
Short-Term Debt	14355	11126	9613	9684	13661	10916	18581	24165	20147	21736
Interest Arrears on Debt	151	178	344	398	3431	593	3755	9240	4352	5673
Total Debt Service	13416	13989	11309	11809	12043	17740	13425	8041	10754	10300
Public and Publicly Guaranteed	7528	8026	7042	7568	7889	13059	8752	5577	7603	7306
Bilateral	769	919	684	1122	955	591	1321	1079	1532	1910
Multilateral	708	890	1084	1522	1980	2132	1911	2494	2451	2577
Private Non-Guaranteed	4224	4137	2427	2172	1860	2225	2504	1468	1090	1436
IMF Repurchases and Charges	68	204	402	978	1455	1179	1069	996	717	493
Short-Term Debt (Interest only)	1596	1622	1438	1091	839	1277	1100	0	1344	1065
Debt to GDP Ratio	43	43	37	36	36	34	31	37	34	35
Debt Service Ratio	55	46	39	47	42	48	35	22	30	25

... Not Available
0.0 Indicates that the amount is nil or negligible

BRAZIL
Basic Socio-Economic Data

Sources and Notes

Executive Summary

Social Statistics:

Land Area: Organization of American States (OAS), América en Cifras 1974.

Population: IDB estimates based on data from Latin America Demographic Center (CELADE) and United Nations Population Division.

Vital Statistics:

World Bank, Social Indicators of Development - 1993 Edition and Economic Commission for Latin America and the Caribbean (ECLAC), Statistical Yearbook - 1992 Edition.

Economic Statistics:

Labor Force: World Bank, Social Indicators of Development - 1993 Edition.

Unemployment: Programa Regional del Empleo para América Latina y El Caribe (PREALC).

1. Exchange Rates:

International Monetary Fund (IMF), International Financial Statistics (IFS). Official rate.

Real Effective Index: IDB estimates based on data from the IMF.

2. Prices:

IMF, IFS. Annual figures are expressed as average annual growth rates; monthly figures as a twelve month variation.

3. International Liquidity:

IMF, IFS.

4. National Accounts:

GDP in 1988 US Dollars: IDB estimates.

GDP by Type of Expenditure and Sector of Origin: Fundaçao Instituto Brasileiro de Geografia e Estatística, Departamento de Contas Nacionais. Consumption includes changes in inventories from 1985.

5. Non-Financial Public Sector:

Banco Central do Brasil, Departamento Econômico. Operational Balance excludes monetary and exchange correction on the domestic debt.

6. Monetary Survey:

Domestic Credit: Banco Central do Brasil, Relatório Anual, various issues (geometric mean of year-end stocks).
Money Supply: Ibidem (mid-year observations).

7. External Trade:

Trade by Direction: IMF, Direction of Trade Statistics (magnetic tapes).

Terms of Trade: ECLAC, Balance Preliminar de la Economía de America Latina y el Caribe, 1992.

Export Composition: United Nations Statistical Division (UNSTAT) Commodity Trade (COMTRADE) Data Base; Exports include Re-Exports.

Import Composition: ECLAC. Fuels and Lubricants and Passenger Automobiles are included in Other.

8. Balance of Payments:

Banco Central do Brasil and IMF, Balance of Payments Statistics (magnetic tapes).

9. External Debt:

World Bank, World Debt Tables (magnetic tapes) and estimates.

BRAZIL
OPERATIONS DEPARTMENT
OPS/ITC/IRO

IDB LOANS

APPROVED AS OF SEPTEMBER 30, 1993

	US$Thousand	Percentage
TOTAL APPROVED *	9,388,227	100.0%
DISBURSED	7,102,294	75.7%
CANCELLATIONS	1,145,245	12.2%
UNDISBURSED BALANCE	2,285,933	24.3%
PRINCIPAL COLLECTED	3,700,264	39.4%
APPROVED BY FUND		
ORDINARY CAPITAL	7,783,530	82.9%
FUND FOR SPECIAL OPERATIONS	1,473,176	15.7%
SOCIAL PROGRESS TRUST FUND	61,510	0.7%
VENEZUELAN TRUST FUND	51,721	0.6%
OTHER FUNDS	18,290	0.2%
APPROVED BY SECTOR		
AGRICULTURE AND FISHERY	971,947	10.4%
INDUSTRY AND MINING	1,580,817	16.8%
TOURISM AND MICROENTERPRISE	0	0.0%
ENERGY	1,955,293	20.8%
TRANSPORTATION AND COMMUNICATIONS	2,076,747	22.1%
EDUCATION SCIENCE AND TECHNOLOGY	515,013	5.5%
PUBLIC AND ENVIRONMENTAL HEALTH	1,451,620	15.5%
URBAN DEVELOPMENT	494,210	5.3%
PLANNING AND REFORM	0	0.0%
EXPORT FINANCING	266,477	2.8%
PREINVESTMENT AND OTHER	76,103	0.8%

* Net of cancellations with monetary adjustments and export financing loan collections.

B R A Z I L

Tentative Program for 1993-1994

1993			
No.	Sector	Name	Amount in US$ millions
BR-0072	OS	Guanabara Environmental Program	350
BR-0073	OS	Guaíba Watershed Environmental Program	132
BR-0162	TR	Modernization F. Dias Highway	267
BR-0196	TR	Bahia Transportation	147
BR-0194	VR	Sectoral Debt Reduction	400
		Subtotal	1,296
1994			
BR-0192	OS	Manaus Igarapés Sanitation	98
BR-0204	TU	Northeast Tourism Potential Development	200
BR-0203	OS	Todos os Santos Bay Sanitation	216
BR-0159	OS	São Paulo II Drainage	319
BR-0150	TR	São Paulo-Florianópolis Highway	200
BR-0166	VR	Strengthening of Integration Mechanisms	10
BR-0163	TR	Urban Transportation Metro São Paulo	400
BR-0164	CYT	FINEP II Science and Technology Program	160
		Subtotal	1,603
		GRAND TOTAL	2,899

BASIC SANITATION FOR THE GUANABARA BAY BASIN
PHASE I

(BR-0072)

EXECUTIVE SUMMARY

BORROWER:	State of Rio de Janeiro		
GUARANTOR:	Federal Government of Brazil		
EXECUTING AGENCY:	Companhia Estadual de Água e Esgoto (CEDAE)		
AMOUNT AND SOURCE:		(US$ million)	
	IDB: OC	US$300.0	
	FSO	US$ 50.0	
	Cofinancing (OECF):	US$294.2	
	Local counterpart funding:	US$148.8	
	Total:	US$793.0	
TERMS AND CONDITIONS:		Loan OC	Loan FSO
	Amortization period:	25 years	25 years
	Disbursement period:	5 years	5 years
	Interest rate:	variable	3%
	Inspection and supervision:	1%	1%
	Credit fee:	0.75 p.a.%	-

OBJECTIVES: The project has three interrelated objectives. They are to: (a) clean up the Guanabara Bay and adjacent basin area; (b) improve the quality of life of the 7.3 million residents of the basin; and (c) strengthen those local government institutions whose activities can positively affect the bay. The project is the first phase of what is likely to be a multiphase effort.

DESCRIPTION: This US$793,000,000 first phase, which includes US$294,200,000 in cofinancing from the Japanese Overseas Economic Cooperation Fund (OECF), will finance six subprojects. These subprojects are:

a. Sewage collection and treatment (US$405,900,000). This subproject includes treatment plants, collectors, trunk lines, and connections concentrated in the bay's most heavily populated areas. These works will increase: (i) the number of households with sewer connections from 35% to

50%; and (ii) the amount of sewage entering the bay which receives treatment from 15% to 51%.

b. Potable water (US$120,200,000). This subproject includes water pumping stations, distribution tanks and networks, household connections, and water meters. These works will: (i) provide a reliable water supply to over 1,000,000 residents; (ii) provide water networks and connections to 15 *favelas*, benefitting 52,500 inhabitants; and (iii) increase the percentage of households with water meters in the basin area from 25% to 70%

c. Solid waste collection and disposal (US$14,900,000). This subproject includes: (i) collection of trash in difficult access areas; (ii) rehabilitation of two solid waste transfer stations; (iii) recycling and incineration plants; (iv) improving of dumping sites; and (v) institutional strengthening of municipalities in solid waste collection and disposal and in supervision of private firms. This subproject is intended to increase solid waste collection coverage from 68% to 90%.

d. Canal and river drainage (US$9,300,000). This subproject will: (i) build a series of works to prevent flooding and improve transport in the Acari River region of the bay; and (ii) provide equipment for improved canal maintenance. These works will benefit 150,000 people who reside in one of the basin's most frequently flooded areas.

e. Complementary environmental programs (US$7,700,000). This subproject includes activities to: (i) control industrial contamination; (ii) monitor environmental conditions in the bay; and (iii) provide environmental education for the area population. These activities will reduce the amount of industrial waste entering the bay and create ongoing programs for environmental monitoring and education.

f. Digital mapping and municipal institutional development (US$10,500,000). This subproject will: (i) modernize information systems in the basin's municipalities and improve their planning capability; and (ii) provide up-to-date digital maps of the area and training in the use of this information. These activities will improve local tax collection capacity.

ENVIRONMENTAL CLASSIFICATION: The Environmental Management Committee, at its meeting of August 26, 1991, classified this as a Category III operation. The environmental summary was approved on July 13, 1993.

BENEFITS: Activities to clean up the bay will have a dramatic effect on the bay's water quality and on the quality of life of the 7.3 million residents of the area. Works in sanitation and water supply will directly benefit over 3,000,000 people. At the end of the first phase of the project, the more seriously degraded areas of the bay's water will have improved and 35 of the bay's 53 beaches (which are now closed) will be reopened. Efforts at institutional strengthening will help ensure that progress toward cleaning up the bay area is sustainable.

RISKS: This project, with its six subprojects, requires strong coordination to ensure that all of the activities move forward and the project's impact is maximized. In Rio de Janeiro, past efforts to coordinate multi-agency projects have proven problematic, particularly when coordinating commissions have been responsible for execution. For this project, the responsibility for execution will rest with CEDAE rather than a coordinating commission. Giving the responsibility for project execution to a line agency should enhance the likelihood of project success.

THE BANK'S COUNTRY AND SECTOR STRATEGY: The proposed project fits within the overall strategy developed during the 1993 Programming Mission. During this mission it was agreed that projects for the 1993-1995 operative program would "emphasize social needs through ... programs which increase potable water and sewage coverage" and "actions in support of environmental cleanup and protection, management of natural resources, environmental sanitation, and strengthening of public services which manage the environment." Consistent with this strategy, the proposed project will increase coverage of potable water and sewage services in the Guanabara Basin, will clean up the bay, and will strengthen those institutions involved in the bay's management.

Brazil's federal government has made the solution of environmental problems an important objective and has requested IDB support in this effort. In 1992, the IDB approved sanitation loans for São Paulo-Tietê River in the amount of US$450 million and for sanitation in Fortaleza in the amount of US$200 million. For 1993, a project for environmental management of the Guaíba River basin in the amount of

US$132.3 million was approved and this project is scheduled for approval. In the tentative program for 1994-1995, sanitation projects are proposed for the Todos os Santos Bay, igarapés in Manaus, the States of Rondônia and Goiás, as well as a drainage project for the city of São Paulo.

OTHER ASPECTS: The Bank will recognize as counterpart up to US$7 million of prior expenses incurred by the borrower in project preparation.

I. FRAME OF REFERENCE

A. The setting

1.1 The greater Guanabara Bay basin is an important part of both the State of Rio de Janeiro's and Brazil's economies. With 6,000 industries, a major port, and one of the country's largest oil refineries, the area is responsible for generating 87% of the state's GDP and 10% of the country's.

1.2 Guanabara Bay occupies an area of over 300 square kilometers. The area defined by the region's topography as its basin includes 35 tributary rivers and nearly 4,000 km^2 of land area. In 1991, it was estimated that nearly 7.3 million people inhabited the basin area, which is nearly 70% of Rio's metropolitan area population. As with most urban areas in Brazil, the Guanabara basin experienced rapid population growth. The greater metropolitan area nearly doubled in population size in the decade of the 1960s and growth rates for many of its municipalities exceeded 5% per year well into the late 1970s.

1.3 The Guanabara Bay basin is made up of most of the Municipality of Rio de Janeiro and the Municipalities of Nilópolis, Nova Iguaçu, Belford Roxo, São João de Meriti, and Duque de Caxias, which lie to the west of the bay, and Magé, Guapimirim, Cachoeiras de Macacu, Itaboraí, São Gonçalo and parts of the Municipalities of Rio Bonito and Niterói, all of which lie east of the bay. Rio municipality is the most densely populated with nearly 4,500 inhabitants per square kilometer, followed by those municipalities with easiest access to Rio – Niterói, São Gonçalo, São João de Meriti and Duque de Caxias.

1.4 Statistics on the region's population density are not truly reflective of the high concentration of population in many of the basin's urban areas. This uniquely mountainous urban setting, bordering on the Atlantic Ocean, severely limits available land for urban settlement and has resulted in the establishment of *favelas* on very marginal and often precarious terrain – i.e., mountain sides and along the banks of canals and rivers. Fully 40% of the area's urban population is now estimated to reside in these marginal areas.

1.5 Providing even basic urban sanitary services in Rio's marginal areas has proven to be both technically difficult and costly. This difficulty in providing service has been further exacerbated by Brazil's lingering economic crisis. Since its inception in the early 1980s, few resources have been available each year to maintain and expand water and sanitary facilities to meet the increased demand.

1.6 In the 1960s and 1970s, when Brazil's industrial base was experiencing rapid growth, legislation was developed by the State

of Rio de Janeiro to control effluent wastes generated by its many industries. Enforcement of this legislation through strong state institutions was a priority. As the financial situation of both the state and country begin to deteriorate, so did the capacity and willingness of state institutions to enforce this anti-pollution legislation.

B. Sources of contamination

1.7 Rio's rapid urbanization, its lack of financial resources for expanding sanitary services to meet increased demand, and the weak institutional capacity of state institutions to enforce anti-pollution legislation have contributed to high levels of contamination in the bay area.

1.8 The principal sources of contamination include:

a. 554 tons per day of organic matter (domestic sewage) generated in the bay area. Of this 554 tons, only 15% is treated; 1/

b. 580 tons per day of trash generated in the bay area which, for lack of service, remains uncollected. With frequent rains, a significant portion of this trash is washed into the bay and its tributaries; 2/

c. various dump sites located along the bay and its tributaries including the Rio dump located in Duque de Caxias municipality (Gramacho). This disposal area generates approximately 800 m^3 per day of leachate which produces an organic load of 4 tons per day that seeps into the bay;

d. the country's second largest industrial park, which emits 82 tons of organic material and 0.4 tons of heavy metals per day, nearly all of which enters the bay. About 80% of this pollution is generated by 50 industries which include chemical and petrochemical plants, textiles, metalworks and agricultural processing.

e. two large ports with 16 petroleum terminals, which spill an estimated 0.5 tons of oil into the bay daily;

f. 2,000 gasoline stations and 40 shipyards, which spill more than 1 ton of oil per day into the waters of the bay area; and

g. PETROBRÁS's oil refinery, which in addition to heavy metals and phenol, spills 1.75 tons of oil daily into the bay.

1/ By 1998, it is projected that 604 tons per day will be generated.
2/ Trash which is not washed into the waters of the bay remains to decay in open spaces, empty lots, etc.

1.9 In 1991, total estimates from the above sources for the daily load of contaminants entering the bay were: (a) over 400 tons of untreated sewage; (b) 82 tons of industrial organic material; (c) 4 tons of leachate; (d) 3.2 tons of petroleum products; and (e) 0.4 tons of heavy metals.

C. Consequences of contamination

1.10 Contamination from sources such as those highlighted above has had a tremendous negative impact on the bay's ecosystem and has contributed to a gradual deterioration in quality of life in the area. Consequences of this contamination include:

a. closing of all of the bay's 53 beaches most of the time because the presence of coliforms exceeds levels permitted by Brazilian health standards and pose a significant health hazard;

b. an 83% reduction in tons of fish harvested from the bay in the past 10 years; 3/

c. flooding along the bay's tributaries causing destruction of life and property, particularly in low-income areas, due in large part to trash which prevents adequate drainage;

d. a recent outbreak of cholera in Rio, the first in 30 years; and

e. the destruction of nearly 50% of the bay's mangroves. (These groves serve as an important natural filter for water entering the Guanabara ecosystem and as nurseries for marine life.)

D. Water quality

1.11 Many of the consequences of contamination described above have arisen from the deterioration in water quality of the bay and its 35 tributaries. Recent analyses (1991) of the presence of coliforms and levels of dissolved oxygen in 41 segments of the bay indicate serious deterioration in water quality in those segments which are adjacent to densely populated and/or heavily industrialized areas.

3/ Partially the result of contamination.

1. Presence of coliforms 4/

1.12 In this analysis, coliforms at levels of over 5,000/100 ml were present in 11 of the bay's 40 segments, in areas adjacent to nearly all of the bay's heavily populated areas (Rio, São Gonçalo, Duque de Caxias, Itaipu and Niterói). Additionally, levels of 1,000-5,000/100 ml were found in 13 segments. Acceptable levels were found in 17 segments, principally those areas in the center of the bay which are not adjacent to land and along two of the bay's more sparsely populated areas.

2. Dissolved oxygen 5/

1.13 For dissolved oxygen, five of the segments along the heavily populated areas on the western side of the bay (Rio, Duque de Caxias and Governador Island) had levels of dissolved oxygen well below the acceptable standards of 6 mg/l. Levels were found to be so low in segments adjoining Governador Island (0.2 mg/l) that virtually no aerobic marine life can be supported.

3. Rivers

1.14 While precise water quality data on the bay's 35 tributary rivers are not available, 10 of the bay's rivers (principally those located on the western side of the bay) serve as collecting points for raw sewage and solid waste. Water quality in these rivers is similar to levels found in the western portion of the bay. 6/

E. Infrastructure and urban services - present situation

1. Water supply

1.15 The Companhia Estadual de Água e Esgoto (CEDAE) is responsible for all aspects of water supply for nearly all of the systems in the state's municipalities. Water supply for the municipalities in the

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4/ High levels of coliforms are the result of raw sewage, are associated with diseases in humans, and directly affect the usability of beaches. Total coliform levels of over 5,000/100 ml are considered to be dangerous to humans, those over 1,000/100 ml are unacceptable by international standards. In Brazil, beaches are closed when coliform levels exceed 5,000/100 ml.

5/ The presence of dissolved oxygen and the biochemical oxygen demand are indicators of the capacity of a body of water to support marine life. High levels of dissolved oxygen (above 6 mg/l) and low levels of biochemical oxygen demand (less than 5 mg/l) are indicative of a healthy habitat where organic effluents are sufficiently diluted for sustainable marine life.

6/ The principal rivers of the bay which serve as receptors of raw sewage are: Berquo, Banana Podre, Carioca, Dom Carlos, Ramos, Irajá, Sarapuí, Alameda, São Lourenço, Maruí and Bomba.

basin comes from six systems: an integrated system for Rio and the Baixada Fluminense, which supplies water to Rio, Duque de Caxias, Nilópolis, Nova Iguaçu and São João do Meriti; an integrated system for Niterói and São Gonçalo, which serves these municipalities as well as the district of Itambi in the municipality of Itaboraí; and four separate systems which serve Itaboraí, Magé, Cachoeiras de Macacu and Rio Bonito.

1.16 In the Rio metropolitan area, an average of 80% of households are supplied with water, although services are not equally available throughout the region. In the more urbanized areas such as Rio and Nilópolis, more than 85% of households have water connections. In contrast, fewer than 30% of households in the more remote areas, like Magé, have water connections.

1.17 To meet the rapidly growing demand for urban services in the midst of a lingering economic crisis, CEDAE has devoted most of its resources available for investment during the past two decades to water supply at the expense of investment in sewage disposal and treatment.

1.18 Expansion of the water system was not accompanied by a corresponding increase in metered residences (only 23% of residences with water have meters). Low meter coverage, added to CEDAE's operating costs (larger water consumption per capita), may have contributed to lower revenues and ultimately to limiting CEDAE's capacity for network expansion.

2. Sewage connections and treatment

1.19 CEDAE is also responsible for providing sewage connection and treatment. The distribution of sewer connections is even more skewed than service for water, with 81% of Rio having sewer connections, 70% of Niterói and virtually no service available in the other municipalities.

1.20 With regard to sewage treatment, only 14% of the sewage generated in the bay area is treated. This sewage is treated primarily at three plants on the western side of the bay (Penha, Governador Island and Pavuna) and one station on the eastern side (Niterói South). Untreated sewage enters the bay via canals, the drainage system and the bay's 35 rivers.

3. Solid waste collection and final disposal

a. Collection

1.21 The basin's unique setting and its dense population levels, particularly in *favela* areas, has made solid waste collection exceedingly difficult. The additional problems of a rapid growth rate and fewer resources to finance collection services further contribute to the challenge.

1.22 The coverage of trash collection services in the six largest municipalities around the bay 1/ is in general deficient and rather variable, reflecting the varying degrees of development of the service in each of them. The city of Niterói has the highest coverage (approx. 80%) and has an independent enterprise that handles the service, the Companhia Municipal de Limpeza Urbana de Niterói [Niterói Municipal Sanitation Company] (CLIN). The municipalities of Nilópolis, Duque de Caxias, São Gonçalo and São João de Meriti provide the service through municipal sanitation departments that generally operate under the public works and services departments of the municipal governments, with coverages of 75%, 71%, 67% and 59%, respectively. The lowest coverage is in the municipality of Magé, where 34% of the trash generated is collected.

1.23 It is estimated that these six municipalities generate about 1,800 tons of trash a day, of which about 1,220 tons, i.e. 68%, is collected. The trash that is not collected (some 580 tons) is dumped indiscriminately in open spaces, bodies of water and the drainage systems, resulting in blockages of the latter and flooding with contamination of soil and water.

1.24 Three of the six municipalities mentioned have significant private sector participation through contracts for collection of all or part of the household trash generated and for cleaning of public areas. The municipalities concerned are Niterói, São Gonçalo and Duque de Caxias. In the other three the services are provided exclusively by the respective municipal agency. São João de Meriti and Nilópolis also have solid waste transfer stations, operated by the Rio de Janeiro Municipal Sanitation Company (COMLURB) in the case of Nilópolis, and directly by the municipality in the case of São João de Meriti.

b. Final disposal

1.25 The final disposal of the trash is the phase that presents the greatest difficulties. Besides the trash that is not collected at all, that which is hauled to the municipal landfills or dumps does not receive any technically or environmentally acceptable treatment. In almost all cases, disposal is in the open, without control of runoff or infiltration, or of gas emanation. The most critical case is the Jardim Gramacho landfill, which receives the greater part of the city of Rio's solid waste plus all the trash from four adjoining municipalities (5,000 tons per day). In addition to its sanitary problems, this fill has a remaining useful life of no longer than six years. Moreover, at Jardim Gramacho and also the Niterói and São Gonçalo fills there are people who sort

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1/ The Rio de Janeiro Municipality, which is not included in the project, has a coverage of around 95%.

through the trash looking for recyclable materials, and who work under insanitary conditions with a high risk of accidents.

4. Drainage

1.26 Owing to the largely unplanned urban growth of recent decades, the drainage systems – both natural and manmade – are now inadequate for the task, and in some cases low-income settlements have sprung up alongside them. As a result of this urbanization process large-scale flooding has become a regular occurrence, as in 1971 when an area of 10.5 km^2 was affected, causing damage estimated at US$9 million. The most recent floods of significance were in January 1992, causing damage to housing and impacting the city's economic activities by blocking a number of roads. Both the state, through the State Rivers and Lakes Authority (SERLA), and the Municipality of Rio de Janeiro, through the Rio Urbe scheme, have been endeavoring to improve this situation by means of channeling, straightening, dredging, cross-section improvement at locations or in stretches identified as most critical and also by relocation of families. However, while locally beneficial these actions have been insufficient owing to the size of the urban area.

1.27 The Acari River basin is one of the most important ones in the bay watershed. It covers an area of about 100 km^2 and is mostly built up, with an estimated population of 1.6 million. Around 74% of its area is totally urban. In addition to its considerable population, there are a number of industries located in it and it is also crossed by major roads leading into the city and other roads of regional importance.

5. Control of environmental pollution

1.28 The recent State Constitution declares Guanabara Bay, the mangroves, lakes, lagoons and estuaries to be permanent conservation areas; the bay is also considered of significant ecological interest and any actions aimed at better utilization of it require prior authorization.

1.29 The State of Rio de Janeiro has quite comprehensive environmental control legislation. There is legal oversight and protection concerning planning of use and occupation of the basin and a body of federal, state and municipal legislation providing a basis and framework for environmental control activities. The current legislation, including penalties for enforcing control of industrial pollution, is considered adequate. 8/

1.30 The State Environmental Engineering Foundation [Fundação Estadual de Engenharia do Meio Ambiente] (FEEMA) is the state agency charged with monitoring the quality of the bay's beaches, water and air,

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8/ A description of the legislation is included in Annex I-1.

with enforcing the major legislation regulating pollution generated by existing industries, and with licensing any new activities which impact on the environmental quality of the state. During the 1970s, FEEMA's institutional capacity for monitoring and enforcement was gradually strengthened along with development of an increasingly demanding set of environmental rules, laws and legislation. By the late 1970s FEEMA had both the legal and the institutional tools to monitor and control activities affecting the state's environment. Unfortunately, beginning in the early 1980s and continuing to the present, FEEMA's staff and budget have been repeatedly cut back. Thus, although adequate environmental legislation continues in force, FEEMA's institutional capacity to enforce that legislation has diminished. The result has been little industrial pollution control in the state in recent years, particularly in the highly industrialized bay area.

6. Institutional capacity of the local governments; cadastral mapping, property taxation and land-use planning

1.31 The 13 municipal governments making up the Guanabara watershed play an important role in the environmental control of the area. They are directly responsible for managing the solid waste collection and disposal services and for storm drainage. Indirectly, through their land-use planning functions, they exercise a strong influence on the quality of the urban environment by setting the location and density guidelines for residential, industrial and commercial uses, and determining the size and characteristics of the green and recreational areas within their boundaries.

1.32 However, the findings of a survey made for the program indicate that the local governments suffer from institutional and financial weaknesses that constrain their capacity to contribute effectively to these activities. On the one hand, the cadastral mapping systems of most of the municipalities are out of date, being based on aerial photographs taken between ten and twenty years ago. Although some municipalities have sought to make up for this deficiency by means of partial remapping based on field visits, in general the municipalities' property mapping records have not kept up adequately with the rapid growth that took place over the period.

1.33 In parallel with, and partly as a result of, the foregoing, the tax receipts collected by the region's municipalities are generally low. According to the above-mentioned survey, on average only 20% of total municipal tax revenue is derived from property taxes. With an updated property register and modernized collection and data-processing systems, it is estimated that the tax revenues of the municipalities in the region could be increased by an average of 10%-12% per annum over the next three years. It should be noted that an increase in revenues of this magnitude would be most helpful for ensuring a proper level of operation and maintenance for the storm drainage and urban cleaning services in the region.

1.34 On the other hand, with the exception of the municipalities of Rio de Janeiro, Niterói, Nova Iguaçu and São Gonçalo, most of the municipalities in the area do not possess functional mechanisms for carrying out the urban and environmental planning of their respective territories. In some cases, such as Nilópolis, Duque de Caxias, Rio Bonito and Magé, planning units exist in theory, but carry very little weight, while the others – Cachoeiras de Macacu, São João de Meriti, Itaboraí, Guapimirim and Belford Roxo – do not yet have any such units to perform these functions.

F. Summary – the project, an integrated approach

1.35 The series of problems outlined above are complex and interrelated. The increasing deterioration of the bay area and its consequent negative effects have arisen as the result of rapid urbanization and industrialization, a lack of environmental controls, and the inability of urban services to respond to increased demand. Industrial contaminants enter the bay uncontrolled, raw sewage enters without treatment, and uncollected trash causes serious flooding. The result is that beaches are closed, water quality continues to deteriorate, fishing is virtually eliminated, and disease problems mount.

1.36 The problems are serious, complex, and require a concerted, coordinated, and multi-faceted effort to reverse the deterioration. The State of Rio de Janeiro is proposing a comprehensive and integrated first phase effort which will begin to resolve the problems highlighted in this chapter. This effort, whose details are described in chapter II, contemplates a series of subprojects which will contribute to cleaning up the bay and adjacent areas, improve the quality of life of the 7.3 million inhabitants residing in the Guanabara Bay basin, and strengthen those local government institutions whose activities can positively affect the bay.

G. Bank and country strategy

1.37 The proposed project fits within the overall strategy developed during the 1993 Programming Mission. During this mission it was agreed that projects for the 1993-1995 operative program would "emphasize social needs through ... programs which increase potable water and sewage coverage" and "actions in support of environmental cleanup and protection, management of natural resources, environmental sanitation, and strengthening of public services which manage the environment." The proposed project is fully consistent with this strategy.

1.38 Brazil's federal government has made the solution of environmental problems an important objective and has requested IDB support in this effort. In 1992, the Bank approved sanitation loans for São Paulo-Tietê River in the amount of US$450 million and for Fortaleza in the amount of US$200 million. For 1993, the proposed project is scheduled for approval as well as a project for environmental

management of the Guaíba River basin in the amount of US$132.3 million. In the tentative program for 1994-1995, sanitation projects are proposed for the Todos os Santos Bay, Igarapés in Manaus, the states of Rondônia and Goiás, as well as a drainage project for the city of São Paulo.

H. Experience of the other donors and the Bank

1.39 The World Bank is financing a US$175 million flood reconstruction loan for the State of Rio de Janeiro which was approved in 1988 and is scheduled for completion in 1994. The loan, which finances works for flood control, water supply, and sanitation in low-income areas, was executed by CEDAE and SERLA through the Executive Group for Emergency Works the (GEROE), reporting directly to the Governor of the state. Certain management problems have arisen in the execution of this loan, particularly in the operation of GEROE, which have been taken into account when the executing mechanism for the proposed project was developed.

1.40 The Japanese International Cooperation Agency (JICA) is financing a new mathematical model for measuring water quality in the bay. This activity is scheduled for completion in 1994. Funds from the proposed loan will be used to further develop and calibrate the model so that it will be operational for use in the selection of works for future phases.

1.41 While the Bank has financed over US$1 billion in operations for basic sanitation in Brazil, no recent loans have been approved for Rio de Janeiro. The last loan to CEDAE for sewerage networks, connection and treatment in 1962 was for US$11 million. This loan was completed in a satisfactory manner. In general, the Bank has had positive experience with sanitation and water projects in Brazil. In most cases, executing agencies have proven to be capable and local contractors for both supervision and execution of works experienced and competent. State fiscal situations have occasionally limited the availability of local counterpart, thereby delaying completion of works.

II. THE PROJECT

A. Objectives

2.1 The project has three interrelated objectives. They are to: (i) clean up the Guanabara Bay and adjacent basin area; (ii) improve the quality of life of the 7.3 million inhabitants residing in the Guanabara Bay basin; and (iii) strengthen those local government institutions whose activities can positively affect the bay. The project is the first phase of what is likely to be a multiphase effort. 9/

B. Phasing

2.2 Subprojects in this first phase are detailed below. Future phases will provide secondary treatment in areas where primary treatment is to be financed in this first phase, construct several additional sewage treatment stations for primary treatment, further expand the sewer network and the number of household connections, improve the final disposal of solid waste, and continue enforcement of pollution controls.

C. Subprojects

2.3 This US$793 million first phase (which includes US$294.2 million in cofinancing from Japan's OECF) will finance six subprojects. These subprojects represent an integrated approach to addressing the series of problems outlined in the first chapter and will further the project's objectives of cleaning up the bay, improving the quality of life and strengthening local institutions. The project's six major subprojects are:

a. Sewage collection and treatment (US$405,900,000).
b. Potable water supply (US$120,200,000).
c. Solid waste collection and disposal (US$14,900,000).
d. Canal and river drainage (US$9,300,000).
e. Complementary environmental programs in industrial pollution control, environmental monitoring and education (US$7,700,000).
f. Digital mapping and municipal institutional development (US$10,500,000).

2.4 A map with the locations of all project activities for municipalities is included at the beginning of this project report,

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9/ A separate project for the Municipality of Rio will be presented in late 1994. This project will include solid waste disposal (Gramacho), drainage and digital mapping.

and a chart summarizing subprojects is included at the end of this chapter.

D. Execution

2.5 As detailed in chapters III and IV, CEDAE will take the lead in project coordination through an executing unit which will report directly to its president. The other agencies involved in project execution (the co-executors) will each assign several key technical personnel to CEDAE's executing unit on a full-time basis. A newly established Guanabara Bay Coordinating Commission will deal with major policy and interministerial issues.

2.6 This project will be cofinanced with a US$294.2 million loan from the Japanese Overseas Economic Cooperation Fund (OECF). The OECF will finance three sewage treatment stations with accompanying trunk collectors and networks. Technical specifications for these three stations, which are described in the document, reflect detailed discussions between the IDB, Brazilian Government officials and the OECF. The OECF has exchanged diplomatic notes with the Government of Brazil detailing their support for this project and the Government of Brazil has reviewed and approved a draft loan agreement. The loan has been approved by OECF's internal committees and is scheduled for the OECF Board approval immediately after the IDB loan is approved. 10/

E. Benefits

2.7 Benchmarks for each of the subprojects are discussed below. The project will have a dramatic affect on the bay's water quality and on the quality of life of the 7.3 million residents of the area. Works in sanitation and water supply will directly benefit over 3 million people. At the end of the first phase of the project, the more seriously degraded areas of the bay's waters will have improved, and 35 of the bay's beaches - which are almost always closed - will be reopened. Indirectly, more than 6 million people (this includes most of the 3 million benefiting from the works) will benefit from cleaner beaches.

F. Description of subprojects

2.8 The subprojects - including their benchmarks, locations, executing agencies and works - are described below:

10/ Signature of an agreement between the State of Rio de Janeiro and the OECF is a condition precedent to first disbursement (see Resolution).

1. Sewage collection and treatment subproject (US$405,900,000) 11/

a. Benchmarks

2.9 This subproject, which is the loan's largest, will:

a. increase the number of households in the basin area with sewer connections from 35% to over 50%; and

b. increase the amount of sewage entering the bay and receiving treatment from 15% to 51%.

b. Works

2.10 Levels of treatment and locations and size of treatment plants, which are described below, were determined based on their impact on the quality of water using an updated 1979 model of the bay with cost/benefit analysis to assure maximum benefits from the investments (see chapter V). Treatment plants, collectors, trunk lines and connections are generally located in the bay's most heavily populated and industrialized areas where water quality is most severely degraded. (See map for location of works.)

2.11 This subproject will be executed by CEDAE and comprises the works necessary for the collection, conveyance and treatment of the liquid wastes (household and industrial) from the program area, and final disposal of the sludge produced in the treatment plants.

2.12 Briefly, the activities envisaged in this component are:

a. Sanitation works consisting of: (i) construction of four primary wastewater treatment plants to handle a total flow of 6.6 m^3/s (Alegria, Sarapuí, Pavuna and São Gonçalo plants) 13/; (ii) two secondary-level treatment plants for Governador and Paquetá Islands, 14/ to treat a flow of 0.247 m^3/s including a 2.5-km underwater outflow for Paquetá; (iii) upgrading of the Icaraí and Penha plants to perform secondary-level treatment of 2.23 m^3/s and a 4.7-km land and underwater outfall for Icaraí; (iv) 126 km of collectors, interceptors and outfalls; and (v) 1,000 km of collector systems and 34 pumping stations. A detailed description of the plants is provided in Annex II-1.

11/ For linkage to the problem, see paragraphs 1.8, 1.12, 1.19 and 1.20.

13/ The Alegria, Sarapuí and Pavuna plants would be financed by Japan's OECF.

14/ Toque-Toque was eliminated from the program because of its low rate of return.

b. Installation of approximately 104 km of sewer systems and about 18,400 residential connections in 23 *favelas* on the west side of Guanabara Bay; and installation of 17 km of sewer lines and 2,450 house connections in four *favelas* on the east side of the bay. The sewage collected by these systems will be carried into the existing systems, or ones to be constructed as part of the proposed program, for treatment purposes.

c. For final disposal of the 720 m^3/day of sludge (with 55% solids) produced by the plants in this stage, the intention is to set up a sanitary landfill in Xerém, in Duque de Caxias municipality. Procurement of equipment for transporting the sludge from the plants to the point of final disposal is also planned.

2. Potable water subproject (US$120,200,000) 15/

a. Benchmarks

2.13 This subproject will:

a. provide a reliable water supply to over 1 million people;

b. provide water networks and connections for 15 *favelas*, benefiting 52,500 people;

c. increase the percentage of households with water meters in the basin area from 25% to 70%;

d. reduce the amount of water generated but not accounted for from 48% of the total to 35%; and

e. develop a map of networks, a study of water usage, and short-term training.

2.14 The water-supply works included in this subproject will greatly benefit the people living in the municipalities to the east of Duque de Caxias, Nova Iguaçu and São João de Meriti. They will be executed by CEDAE and will comprise installation of supply lines, distribution tanks, pumping stations, distribution networks and household connections with their respective meters. It is estimated that 710,000 people will benefit, while in São Gonçalo, on the east of the bay, 300,000 residents will benefit. Continuous reliable service, with adequate pressure and good water quality, will be provided; charges will be rational and equitable in accordance with actual consumption.

2.15 Water networks and household connections will also be installed under the program in 12 *favelas* on the west side of the bay,

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15/ For linkage to the problem, see paragraphs 1.15 to 1.18.

benefiting 37,000 residents, and in three *favelas* on the east side, serving 15,500 persons. In all, approximately 9,100 household connections will be installed.

2.16 Since only a small proportion of the residential connections are metered, with 256,000 meters for 959,900 house water connections, around 48% of the water delivered to the metropolitan region of Rio de Janeiro (MRRJ) is not accounted for. The program calls for procurement and installation of 525,000 domestic water meters together with replacement of house connections, procurement of spare meters for various capacities, the equipment needed to modernize the meter shop to enable it to take care of the large number of new units efficiently, and also procurement and installation of master meters and remote control equipment in the Guandu water treatment station and in the most important structures and components of the MRRJ distribution system. More rational use will be made of water resources, the amount of unmetered water will be reduced considerably from the present 48% to about 35% by the end of the program, and it may be possible to extend service to areas that are not presently served.

b. Works

2.17 The potable water subproject includes: (a) mains: 5,560 m of 800-mm and 600-mm steel pipe; (b) supply lines to the eight tanks at Baixada and the two tanks at São Gonçalo: 14,600 m of ductile cast-iron pipe; (c) distribution mains from the tanks: 86,200 m of ductile cast-iron pipe; (d) distribution networks: 330 km of polyvinyl chloride (PVC) pipe; (e) household connections: 33,440 1/2" diameter residential connections with their respective meters; (f) 10 reinforced concrete tanks with a total capacity of 107,500 m^3; and (g) individual and master metering program: (i) procurement and installation of 525,000 meters and spares; (ii) 20-mm PVC or PEAD pipe for house connections and accessories; (iii) equipment and tools to improve and expand the capacity of the meter shop; (iv) equipment, materials, software, civil works, installation and assembly of the systems, calibration and fine-tuning of the Guandu and Rio operations control centers; and (v) procurement of operating and maintenance equipment in two water and sewerage districts (WSDs).

2.18 To assist CEDAE in executing the works, a small training program, a study of water resources and updating of the water and sanitary networks mapping are included as part of this subproject.

3. Solid waste collection and disposal subproject (US$14,900,000)

a. Benchmarks

2.19 The purpose of this subproject will be to: 16/

a. increase coverage of solid waste collection from 68% to close to 90%, thereby reducing the amount not collected from 580 tons to 180 tons;

b. process 800 t/d of trash in three recycling and composting plants to enable reuse of materials with commercial value, reduce the volume of waste to be disposed of and improve the working conditions of 300 sorters currently doing this work;

c. increase the incineration capacity for waste from clinics and hospitals by 800 kg/h, to ensure separation of this waste from household trash and its proper treatment;

d. strengthen the administrative capacity of the six program municipalities and promote private sector participation in provision of the service.

e. evaluate the medium- and long-term solutions for haulage and final disposal of trash from the metropolitan area that is presently being sent to the Gramacho landfill (5,000 t/d).

2.20 These goals will be accomplished gradually, with due adjustment in each case to the local conditions of each of the six main municipalities (Duque de Caxias, Niterói, Nilópolis, São João de Meriti, Magé and São Gonçalo), such as access facilities, population density and capacity of the local sanitation company or authority. To this end, the program will both seek to increase private sector participation in the work and also to strengthen the municipal company or authority responsible for the provision, contracting and supervision of the service. Capacity to expand the service to the low-income neighborhoods will also be improved using appropriate systems, since vehicle access to these neighborhoods is generally more difficult, per capita trash generation is less, and accordingly, private sector interest in participating is lower.

b. Works

2.21 This subproject will be coordinated by the State Department of Public Works and Services (SOSP) and includes the following activities:

16/ For linkage to the problem, see paragraphs 1.8 and 1.21-1.25.

(i) Nonconventional collection

2.22 To strengthen the capacity of the agencies responsible for collection and cleaning in the low-income urban areas that are not readily accessible, procurement of specialized equipment such as mini-tractors, carts, haulage vehicles, stationary dumpsters and receptacles of various types is envisaged. Garages for parking the vehicles, depots for materials and support posts for workers will be built.

(ii) Transfer stations

2.23 The municipal transfer stations in Nilópolis (87 t/d) and São João de Meriti (275 t/d) will be rehabilitated and the vehicles used for hauling the transferred waste will be replaced.

(iii) Recycling plants and incinerators

2.24 Materials-recovery and compost-production plants will be built in the municipalities of Niterói (300 t/d), São Gonçalo (380 t/d) and Magé (125 t/d). In addition, incinerators for medical and hospital waste with capacities ranging from 50 kg/h to 250 kg/h will be built in five municipalities.

(iv) Sanitary landfills

2.25 The Niterói (90 t/d) and São Gonçalo (150 t/d) sanitary landfills will be equipped to receive the nonrecyclable material and a fill of 30 t/d capacity will be constructed in Magé to receive the same type of material. The sites currently used in Magé will be closed.

(v) Institutional strengthening

2.26 The program also includes an institutional strengthening component designed to benefit the municipal companies or agencies responsible for providing the service. This program will be coordinated with the institutional strengthening component of the digital mapping subprogram. Special emphasis will be placed on the contracting and supervising of private enterprises because the object is to significantly expand private sector participation.

(vi) Master plan for final disposal

2.27 Financing will be included for a study intended primarily to evaluate the medium- and long-term alternatives for hauling, treatment and final disposal of solid waste from the Rio de Janeiro metropolitan area. This area consists of the five municipalities on the western part of the bay that currently use the Gramacho landfill for final disposal. The contract for this study will be awarded within three months after the signature of the contract (see Recommendations).

4. Canal and river drainage subproject (US$9,300,000) 17/

a. Benchmarks

2.28 The purpose of this subproject will be to:

a. benefit 150,000 persons living in an area highly prone to the flooding; and

b. improve conditions on the main access routes to the city during floods.

b. Works

2.29 The three drainage works proposed are: (i) restoration of the retaining walls along a 1.27-km section of the Das Pedras River; (ii) construction of a gallery and channelling of a 2.4-km section of the Upper Timbó and Timbó II Rivers; and (iii) channeling of a 1.5-km section of the Piraquara River. This subproject will be executed by SERLA.

2.30 To complement these drainage works, financing is also included for a set of maintenance equipment for canals, river beds and creeks. This equipment will consist mostly of excavators, mechanical shovels, dumptrucks and auxiliary items.

5. Complementary environmental programs subproject (US$7,700,000) 18/

a. Benchmarks

2.31 This subproject will:

a. reduce the amount of organic industrial waste entering the bay from 86 mt/d to less than 12 t;

b. establish an ongoing environmental monitoring system; and

c. establish an environmental education program.

b. Works

(i) Industrial pollution control

2.32 FEEMA will be supported institutionally (with equipment and training) to give continuity to the control actions in 50 industries considered critical and to initiate the process in

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17/ For linkage to the problem, see paragraphs 1.26 and 1.27.
18/ For linkage to the problem, see paragraphs 1.8, 1.12, 1.28 and 1.30.

another 402, so as to bring under control by the end of four years a total of 455 industries that account for 90% of the organic industrial material generated in the basin. The program would also support FEEMA by enhancing its efficiency in handling technological mishaps in the area, including control of pollution by gasoline stations.

2.33 An industry is considered to be under control when FEEMA has taken the following actions: (i) characterization of the industry; (ii) definition of the activities to control the sources of pollution so as to achieve effluent quality patterns consistent with those laid down in current legislation; (iii) negotiation of a plan of action; (iv) analysis of the proposed control measures; (v) monitoring implementation of the measures; and (vi) analysis and follow-up on the self-monitoring program. The project plans to have 50 sources under control in the first year, 150 in the second, 300 by the third and 455 by the fourth year of operation. These targets are in the industrial pollution control plan and will be included in the agreement between FEEMA and the executing agency. The plan will be started in the 50 industries considered critical and which already have treatment systems, followed by those that need to put in such systems and finally by those for which no precise data are available (see Recommendations).

(ii) Environmental monitoring

2.34 Execution is planned of a set of activities coordinated by FEEMA, with the State Forestry Authority (IEF), the State Department of the Environment (SEMAN) and the State Rivers and Lakes Authority (SERLA), to control the quality of river and sea water and of the beaches. Through this component, data will be obtained to feed into the water quality model under preparation by the technical cooperation project with the Japanese International Cooperation Agency (JICA). These activities include evaluation of the program, preparation of a proposal for integrated management of the basin and preparation of the second stage of the decontamination of the bay. Equipment and training will also be provided for institutional strengthening of the above-named agencies.

2.35 To ensure that FEEMA has an adequate staff and budget to carry out the important functions of industrial pollution control and environmental monitoring, the Government of the State of Rio de Janeiro has submitted a plan for revitalization of the Foundation. As a condition precedent to first disbursement for the entire program and at the beginning of each subsequent year, the state will be asked to provide evidence that an adequate budget for industrial pollution control and environmental monitoring functions has been proposed (see Resolution and Recommendations).

(iii) Environmental education

2.36 Considering the importance of education in the change process, the need for community participation in the collection and final disposal of solid waste, and also the large quantities of wastes that are dumped into the rivers and arrive in the bay, the program includes education activities that will complement the actions to be carried out in the sanitation projects and will inform the community regarding the steps taken and the results of the efforts made to control industrial pollution. The public to be educated will include: primary and secondary school pupils, the community at large, nongovernmental organizations (NGOs), public agencies, and public and private-sector leaders. This activity will include: (i) environmental education; (ii) development of environmental management models; and (iii) implementation of a small conservation unit. These activities will be coordinated by FEEMA.

6. Digital mapping and municipal institutional development (US$10,500,000)

a. Benchmarks

2.37 The purpose of this subproject will be to:

a. strengthen the urban and environmental planning capacity of the local governments;

b. increase the property tax revenues collected by these governments by an average of 10% per year, over the first three years following installation of new the cadastral systems;

c. create in the Rio de Janeiro Information Center Foundation (CIDE) capacity for storage, processing and analysis of digitalized geographic information, to be used for advisory purposes in the physical and environmental planning of the bay region.

b. Works

(i) Information systems

2.38 Geoprocessed information systems will be set up in CIDE, which will act as executing agency for the component, and in the 12 area municipalities. These systems will be fed with input from aerial mapping that represents the bulk of the cost of the component (US$9.5 million), covering an area of approximately 640 km^2 that encompasses the main urban zones of the bay region. This mapping will be done on a sufficiently detailed scale (1:2,000) to serve as a database for the municipalities' property rolls for taxation purposes.

2.39 Unlike previous mapping work done in the area, this exercise will be totally digitalized, making it computer usable. This will enable a quicker response in the future when there is a need to correct or update cadastral information in the municipalities. In addition, the computerized geographic data will also enable the municipalities to strengthen their urban planning process by eliminating the costly manual production of maps for specific purposes.

2.40 All the municipalities will be provided with basic graphic geoprocessing stations, while in those with greater institutional capacity the basic station will be expanded with a supplementary station. In the case of CIDE, which will have to function as the central pivot for the information system for the region, besides the basic geoprocessing equipment it will also be provided with GIS (Geographic Information System) equipment and software, which will enable it to create and analyze graphic data banks crossed with alphanumeric data - an important tool for monitoring the physical development of the region. To help with the regional analysis work, the CIDE system will also have additional mapping sources from satellite images covering the entire watershed region but on a smaller scale (1:10,000 and 1:50,000).

(ii) Institutional strengthening

2.41 As well as the above, the mapping subproject includes technical assistance and institutional strengthening, which will be coordinated with the institutional strengthening activity for solid waste for the municipalities and the SOSP, covering three areas: (i) assistance for the municipalities to strengthen their computer and planning systems; (ii) assistance to the municipalities and CIDE in operating and initial coordination of the new information systems; and (iii) institutional strengthening for CIDE in program execution.

G. Total project cost

2.42 The total cost of the project, in accordance with the above description, is estimated at US$793 million equivalent, the breakdown of which by sources of financing and investment categories is presented in the following table, followed by a description of the respective cost components. The methodology and criteria used in preparing the budget shown are considered reasonable.

Total cost and financing plan (US$ millions)						
CATEGORIES	IDB		LOCAL COUNTERPART		TOTAL COST	%
	OC	FSO	OECF	Rio Govt. & CEDAE		
1. Engineering and administration	0	10.3	14.3	23.6	48.2	6.08
1.1 Studies and designs	0	8.3	6.5	7.2	22.0	
1.2 Supervision	0	2.0	7.8	14.3	24.1	
1.3 Administration	0	0.0	0.0	2.1	2.1	
2. Direct costs	257.3	30.0	245.0	36.3	568.5	71.69
2.1 Potable water	104.6	0	0	15.6	120.2	
2.2 Sewerage	148.6	0	245.0	12.0	405.9	
2.3 Drainage	0	9.3	0	0	9.3	
2.4 Solid waste	0	14.9	0	0	14.9	
2.5 Complementary env. programs	0	5.8	0	1.0	7.7	
2.6 Digital mapping	3.8	0	0	6.7	10.5	
3. Associated costs	6.0	3.9	0	10.7	20.6	2.60
3.1 Land and easements	0	0	0	2.0	2.0	
3.2 Training	0	0	0	1.5	1.5	
3.3 Institutional support	6.0	3.9	0	5.7	15.6	
3.4 Solid waste master plan	0	0	0	1.5	1.5	
4. Unallocated	33.7	5.3	34.9	4.1	78.0	9.80
4.1 Contingencies	31.6	5.3	33.0	4.1	74.0	
4.2 Cost escalation	2.1	0	1.9	0	4.0	
5. Finance charges	3.0	0.5	0	74.2	77.7	9.80
5.1 Interest	0	0	0	69.9	69.9	
5.2 Credit fee	0	0	0	4.3	4.3	
5.3 Inspection and supervision	3.0	0.5	0	0	3.5	
Total	300.0	50.0	294.2	148.8	793.0	100.0
Percentage	37.8	6.3	37.1	18.8	100.0	

1. Engineering and administration (US$48,200,000)

2.43 This category comprises the following subcategories:

a. Studies and designs (US$22,000,000)

2.44 The cost of the services of consulting firms hired to make all the studies, engineering designs and technical specifications for the project and for certain studies under the complementary programs subproject that will be financed by FSO resources.

b. Supervision (US$24,100,000)

2.45 This comprises the costs connected with the services of two consulting firms who will handle the management of the project and its general supervision during the execution period. One firm would be hired with local resources in the last quarter of 1993 and the other using OECF funds (after that contract is signed) in the

first half of 1994. The FSO funds will be used for the supervision of the solid waste, mapping and drainage works.

c. Administration (US$2,100,000)

2.46 This represents the personnel costs and other incremental costs attributable to the operation of the executing unit in CEDAE and of the coordination committee that will be responsible for administration of the project.

2. Direct costs (US$568,500,000)

2.47 This category, which represents 71.7% of the total cost of the project, comprises the following subcategories:

a. Potable water subproject (US$120,200,000)

2.48 Expansion and improvement of the water systems, as discussed in section F.2 of this chapter.

b. Sewerage subproject (US$405,900,000)

2.49 Construction of the works described in section F.1 of this chapter.

c. Channeling and drainage subproject (US$9,300,000)

2.50 This includes the drainage works described in section F.4 of this chapter.

d. Solid waste collection and disposal subproject (US$14,900,000)

2.51 This coves the works and institutional strengthening described in section F.3 of this chapter.

e. Complementary environmental programs subproject (US$7,700,000)

2.52 This comprises industrial pollution control, environmental monitoring and environmental education activities described in section F.5 of this chapter.

f. Digital mapping subproject (US$10,500,000)

2.53 This includes geoprocessed information systems in CIDE and in the 12 area municipalities; these systems will receive input from aerial mapping covering 640 km^2, which encompasses the main urban zones in the Guanabara Bay region.

3. Associated costs (US$20,600,000)

2.54 This category represents 2.6% of the total cost of the project and comprises the cost of implementing the following activities:

a. Land and easements (US$2,000,000)

2.55 This item includes the purchase cost of the land where the São Gonçalo, Niterói, and Pavuna wastewater treatment plants will be built, including the pumping stations and water distribution tanks.

b. Training (US$1,500,000)

2.56 This includes the consultancy services for organization of CEDAE's technical library and for training of CEDAE technical personnel, especially in the operation and maintenance of the potable water and sanitary sewerage systems.

c. Institutional support (US$15,600,000)

2.57 This includes the following components:

(i) System mapping (US$3,600,000)

2.58 The cost of updating the maps of all water supply and sewerage system installations in the MRRJ.

(ii) Strengthening of CEDAE's operating and maintenance activities (US$4,100,000)

2.59 Equipment and tools will be procured to strengthen the São Gonçalo and Alcântara water and sewerage districts, on the eastern side of the bay, to enable them to properly perform the operation, maintenance and public service activities in a large part of the MRRJ (see Annex II-1).

(iii) Strengthening of CEDAE's planning activities (US$500,000)

2.60 Consulting services will be hired to develop and implement a planning system for setting guidelines, policies and short-, medium- and long-term strategies together with procedures and methodologies for economic and financial appraisal of projects under analysis by CEDAE, in accordance with the goals and strategies laid down, taking into consideration the MRRJ water and sewerage master plans that are to be updated at least every eight years.

(iv) Strengthening for six municipalities (US$680,000)

2.61 The necessary support will be provided to enable these municipalities to improve the relevant units to enable more

efficient provision of the solid waste collection, haulage and disposal services and to ensure that they charge and collect in a timely fashion a fee or tariff that is sufficient to guarantee the upkeep of the works and equipment.

(v) Procurement of operating and maintenance equipment for drainage works (US$2,400,000)

2.62 The necessary tools and equipment will be procured to enable SERLA to adequately perform the upkeep and maintenance of the works that will be built as part of the project.

(vi) Institutional support to the municipalities included in the digital mapping program (US$1,420,000)

2.63 Equipment and support will be provided for the execution of this component.

(vii) Training and institutional strengthening for FEEMA, SERLA, IEF and SEMAN (US$2,900,000)

2.64 Equipment will be procured and support and advisory services will be provided to these four institutions for the execution of this component.

d. Solid waste master plan (US$1,500,000)

2.65 A study will be financed of the available alternatives for solid waste disposal in the Rio de Janeiro metropolitan area.

4. Unallocated (US$78,000,000)

2.66 This category, which accounts for 9.8% of the total cost, includes: (i) the costs made necessary by any unforeseen circumstances that could not have been anticipated in the designs and specifications of the works, or in the services market or construction industry; and (ii) the price escalation that is expected to occur during the execution period of the works after the date when the basic estimates were prepared.

2.67 The amount allocated to cover contingencies (US$74 million) was determined as the approximate equivalent of 12% of the basic estimated cost. This percentage is considered reasonable, consistent with the project's characteristics and in accordance with the criteria used by the Bank. The sum allocated to cost escalation (US$4 million) was determined in accordance with the factors and inflation indexes applied by the Bank in Brazil.

5. Finance charges (US$77,700,000)

2.68 This category, amounting to 9.8% of the total cost, comprises:

(i) interest falling due during the execution period;

(ii) the relevant credit fee; and

(iii) the cost of Bank inspection and supervision of the project.

6. Financing

a. Bank funds

2.69 The Bank will contribute to the financing 44.1% of the cost of the proposed project, or US$350 million equivalent, of which US$300 million would come from the ordinary capital for disbursement in foreign exchange and the equivalent of US$50 million would come from the Fund for Special Operations for disbursement in local currency.

2.70 It is proposed that the prospective Bank loans be provided on the following terms and conditions:

Terms and Conditions	Foreign exchange (OC)	Local currency (FSO)
Interest rate	variable	3.0%
Credit fee	0.75%	-
Inspection and supervision	1.0%	1.0%
Disbursement	5 years	5 years
Grace period	5 years	5 years
Amortization period	25 years	25 years

b. Local contribution and cofinancing

2.71 The local contribution, totaling US$443 million equivalent (55.9% of the total), will be provided by CEDAE, the Rio de Janeiro State Government and cofinancing from the Japanese OECF of 31,475 million yen, equivalent to US$294.2 million. 19/ The feasibility of on-time provision of these contributions is considered in chapter V of this report.

2.72 The counterpart will be used to cover 100% of the cost of category 1 (engineering and administration); 48.1% of the direct costs; 56.8% of the associated costs; 51.4% of the unallocated costs; and

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19/ The terms and conditions of the OECF loan would be: 5% interest; grace period of 7 years and amortization period of 25 years.

95.5% of the finance charges, comprising the credit fee on the IDB foreign exchange loan and 100% of the interest on the two loans during the execution period.

DESCRIPTION OF THE PROGRAM

SUBPROJECT, EXECUTING AGENCY, AMOUNT	LOCATION	DESCRIPTION
I. CEDAE Sewerage (US$405,900,000)	Alegria OECF	- Execution of the sewage treatment plant, with a first-stage flow of 4 m^3/s, primary treatment level. - Execution of 23.1 km of trunk collectors.
	Pavuna OECF	- Execution of the sewage treatment plant, with a first-stage flow of 1 m^3/s, primary treatment level. - Execution of 374 km of collector systems, 30 km of trunk collectors and 10 pumping stations.
	Sarapuí OECF	- Execution of the sewage treatment plant, with a first-stage flow of 1 m^3/s, primary treatment level. - Execution of 284 km of collector systems, 18 km of trunk collectors and 7 pumping stations.
	São Gonçalo	- Execution of the sewage treatment plant, with a first-stage flow of 0.625 m^3 at primary treatment level. - Execution of 301 km of collector systems, 27 km of trunk collectors and 4 pumping stations.
	Iiha do Governador	- Expansion of the sewage treatment plant from 0.2 to 0.4 m^3/s, 50 km of netwo and 10,100 household connections, at secondary treatment level.
	Paquetá Island	- Sewage treatment plant, 27 l/s, secondary type, 5 pumping stations. 3.1 km collector systems and a 2,500-m x 300-mm underwater outfall.
	Niterói South - Icaraí	- Improvement of sewage treatment plant with 0.63 m^3/s capacity, secondary treatment. - Execution of underwater and land outfalls of 900 mm diameter and 4,600 m in length.
	Penha	- Improvement of Penha station with capacity of 1.6 m^3/s, secondary treatment.
	Sewerage works in favelas	- Installation of 121 km of networks and 20,800 household connections
	Xerém sanitary landfill for disposal of WWTP sludge	- 40-ha site 45 km north of the Alegria WWTP; cells will be constructed with internal dimensions of 50 x 100 m and fitted with waterproofing, drainage systems, lighting, access facilities and protective devices that will ensure sanitary disposal. Capacity to handle approx. 763,000 m^3 by the year 2005.
II. Potable Water CEDAE (US$120,200,000)	Municipalities of Duque de Caxias, Nova Iguaçu and São João de Meriti	- Execution of 168 km of distribution systems, 5.6 km of supply mains, 11.6 km submains, 26.5 km of trunk distribution lines and 8 tanks with a total volum 77,500 m^3.
	São Gonçalo	- Execution of 3 km of submains, 59 km of trunk distribution lines, 99 km of distribution systems and 2 tanks with a total volume of 30,000 m^3.
	Metropolitan Region of Rio de Janeiro	- Procurement and installation of household meters, master meters and remote-control equipment
	Water supply works in favelas	- Installation of 63 km of networks and 9,100 household connections.

SUBPROJECT, EXECUTING AGENCY, AMOUNT	LOCATION	DESCRIPTION
III. SOSP Solid Waste and municipalities (US14,900,000)	Duque de Caxias	- Nonconventional trash collection equipment.
	Niterói municipality	- Improvement of sanitary landfill. - Construction of recycling and composting plant with capacity for 300 tons/da - Incinerators for medical waste. - Nonconventional trash collection equipment.
	Nilópolis municipality	- Improvement of transfer station. - Incinerators for medical waste. - Nonconventional trash collection equipment.
	São João de Meriti municipality	- Improvement of transfer station. - Incinerators for medical waste. - Nonconventional trash collection equipment.
	Magé municipality	- Construction of 1 recycling and composting plant with capacity for 125 t/d. - Incinerators for medical waste. - Construction of a sanitary landfill. - Nonconventional trash collection equipment.
	São Gonçalo municipality	- Construction of 1 recycling and composting plant with capacity for 380 t/d recovery from sanitary landfill. - Nonconventional trash collection equipment.
	Metropolitan Region of RJ, excluding municipality of Rio de Janeiro	- Institutional and organizational support for municipal authorities, excludin the municipality of Rio. - Study of final disposal.
IV. SERLA Macrodrainage (US$9,300,000)	Acari River	- Restoration of retaining walls along 1.27 km, channelling of a further 3.9 k
V. Complementary environmental programs FEEMA, SEMAN/IEF (US$18,100,000)	Guanabara Bay watershed	- Industrial pollution control project. - Environmental monitoring project. - Environmental education project.
VI. Digital mapping CIDE and municipalities (US$10,500,000)	CIDE and the municipalities of the MRRJ, excluding the municipality of RJ.	- Implementation of the digital mapping system in the municipalities outside o Rio de Janeiro. - Institutional strengthening of the municipalities.

III. EXECUTION OF THE PROJECT

A. Borrower, executing agency and co-executing agencies

3.1 The borrower will be the State of Rio de Janeiro and the guarantor will be the Federative Republic of Brazil.

3.2 The decree issued by the State Governor on June 29, 1993, sets the bases for the execution of the program, establishing the Coordination Commission for Execution of the Guanabara Bay Decontamination Program, which is chaired by the State Governor.

3.3 In addition to its chairman, this commission is made up of the Secretary of the Environment and Special Projects, the President of CEDAE and the State Attorney General. The decree specifies, *inter alia*, that the commission's functions will be to: (i) coordinate all actions regarding the services, supplies and works included in the program; (ii) prepare the comprehensive program for environmental development and monitoring in the bay; (iii) plan and coordinate the projects; and (iv) identify sources of funding the projects.

3.4 The decree further specifies that the State Water and Sewerage Company [Companhia Estadual de Água e Esgoto] (CEDAE) will be the primary executing agency for the program.

3.5 Various co-executing institutions will participate in the execution of the project, as follows:

a. The State Department of Public Works and Services [Secretaria de Obras e Serviços Públicos do Estado] (SOSP) will be responsible for execution of the solid waste projects in the municipalities, and for coordination of preparation of the master plan for final disposal of solid waste and implementation of the institutional strengthening. 20/ Once execution of this component is completed, the assets will be turned over to the respective municipalities for operation and maintenance.

b. The Rivers and Lakes Authority [Superintendência Estadual de Rios e Lagoas] (SERLA) will be responsible for drainage works falling within the jurisdiction of the State of Rio de Janeiro, and also for their maintenance and for certain studies connected with environmental monitoring.

c. The Rio de Janeiro Information Center Foundation [Fundação Centro de Informações e Dados do Rio de Janeiro] (CIDE) will be

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20/ COMLURB, the Rio de Janeiro Municipal Sanitation Company, will also participate in the coordination of the master plan.

responsible for the digital mapping component in the municipalities included in the program.

d. The State Environmental Engineering Foundation [Fundação Estadual de Engenharia do Meio Ambiente] (FEEMA) will coordinate the execution of the complementary programs with assistance from the State Forestry Authority [Instituto Estadual Florestal] (IEF), the Department of the Environment [Secretaria do Meio Ambiente] (SEMAN) and SERLA.

B. Executing unit

3.6 For execution of the project, CEDAE will set up an executing unit, which would be the Implementation Advisory Office which reports directly to the company president. This unit will execute the project sanitation component and will be responsible for administering the other components to be handled by the State of Rio de Janeiro.

3.7 The basic organization proposed for the executing unit would have technical and legal advisory offices and a general administration department which report to its manager.

3.8 The technical advisory office will be responsible for the technical aspects of execution of the project, for which purpose the office will be divided into technical units that will handle the execution of each component of the project. Each of the entities participating in the project will assign the technical personnel needed for coordination of the respective component on a full-time basis.

3.9 The executing unit will have to organize its general administration department so as to be able to process all the documentation relating to the financial execution of the project, including the disbursement process and keeping of the project accounting records.

3.10 It is recommended as a condition precedent to the first disbursement that it be demonstrated that: (i) an executing unit reporting directly to the president of CEDAE has been formed; (ii) this unit has an organizational structure acceptable to the Bank; and (iii) the general administration department and the legal advisory office have the necessary personnel to perform their activities (see Resolution).

C. Management firm

3.11 The project execution unit will be supported by a consultant management firm that is to be engaged prior to the first disbursement, in accordance with terms of reference acceptable to the Bank (see Resolution).

3.12 This management firm 21/ will be responsible for the following basic activities during the execution of the project, as laid down in the respective service contracts: (i) physical and financial planning and programming; (ii) review of the studies, engineering designs and technical specifications for the project; (iii) supervision of works and supplies; (iv) general coordination of execution, activities, supervision of works and delivery of equipment and supplies; (v) support in the coordination of participating agencies such as FEEMA, SOSP, SERLA, SEMAN and the municipalities of the MRRJ; (vi) preparation of reports; (vii) monitoring of the physical and financial schedule; and (viii) administrative support.

D. Agreements between the co-executing agencies and CEDAE

3.13 Since there will be various co-executing agencies, agreements will have to be concluded between them and CEDAE to govern the execution and subsequent operation and maintenance of the works executed (see Resolution).

3.14 The agreements for execution and operation of the projects must include the co-executing agencies' commitment to assign the required personnel and to provide the technical support needed for execution of the respective component (see Resolution).

3.15 In addition, these agreements will have to include the following:

a. The agreement between SOSP and the municipalities must include SOSP's commitment to execute the solid waste component and to turn over the works for operation and maintenance, while the respective municipalities will undertake to: (i) operate and maintain the works properly; (ii) when necessary, carry out strengthening and reorganization programs in the solid waste collection and final disposal area; and (iii) ensure that the users of the service pay enough to cover its cost.

b. With FEEMA, CIDE, SEMAN and IEF, these entities' commitment to carry out the activities assigned to them under the program.

c. With SERLA, the agency's obligation to maintain and operate the drainage works financed under the program and to participate as specified in the complementary programs.

3.16 The executing unit will be responsible for maintaining the consolidated project execution records and for submitting the program financial statements for all co-executing agencies. It is recommended that the consolidated project financial statements be submitted to the Bank with the opinion of a reputable firm of

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21/ OECF will use a separate management firm to supervise the works financed.

auditors such as might reasonably be acceptable to the Bank (see Resolution).

E. Execution of the program components

3.17 The contracts for construction of the works and execution of the permanent improvements included in the projects, and for procurement of equipment, goods and materials and consultancy services, will be awarded by means of international public competitive bidding governed by the procedures agreed on by the borrower and the Bank. The consultancy services forming part of the local counterpart will be procured using the procedures laid down by national legislation.

3.18 All the entities involved in execution possess experience and capacity to perform the tasks assigned to them in the program. The capacity of these entities to carry out these responsibilities is analyzed in chapter IV. Annex III-1 details the execution responsibilities of the co-executing agencies.

F. Status of component preparation

1. Sewerage

a. Works

3.19 CEDAE has the technical studies, engineering designs, general and particular construction specifications and other documents necessary for estimating the costs and calling for bids on the sewerage works. The Bank has reviewed these studies and found them suitable.

3.20 CEDAE has begun contracting out the detail engineering. These detail drawings will be provided to the contracting firms that win the respective contracts before work is started. The cost of this detail engineering work, which will be financed by the Bank, is US$4.9 million; this work is programmed to be done in stages, with completion of the São Gonçalo drawings by mid-1995. The cost of the detail engineering to be done with OECF funding is US$6.5 million and this work is expected to be completed, also stage-wise, by the end of 1996.

b. Equipment and supplies

3.21 CEDAE has drawn up the lists of equipment and materials complementary to the works that will be included in the project. The general and particular technical specifications and other documents prepared by CEDAE have been reviewed by the Bank and are also considered satisfactory.

c. Underwater outfalls - Icaraí and Paquetá Island

3.22 CEDAE has prepared the basic design for improving the underwater outfall to dispose of the effluents treated in the Icaraí plant (0.63 m^3/s) at secondary level.

3.23 An underwater outfall will be installed that will carry the effluent (27 l/s) from the Paquetá Island WWTP to be built under the project; this outfall will be 2,500 m long with an inside diameter of 300 mm, with the diffuser located at a depth of around 16 m, which will ensure adequate dilution of the effluents treated at secondary level in the WWTP.

d. Final disposal of sludge

3.24 The executing agency has specified the location of the site where the sanitary landfill for final disposal of the sludge from the seven WWTPs to be built under this project plus the five existing WWTPs will be built. CEDAE has submitted the basic study on disposal of the sludge, which makes it possible to define the components, characteristics and general specifications and to estimate the cost of construction and bringing into service. CEDAE has initiated the bidding process for the detail designs that will be needed for construction of these facilities.

2. Potable water

a. Works

3.25 CEDAE has the technical studies, engineering designs, general and particular technical construction specifications and other documents necessary for making a reliable cost estimate and for calling for bids and awarding the contracts on the main works in accordance with the execution schedule. The Bank has reviewed these studies and found them suitable.

3.26 CEDAE has started the contracting process for detail engineering design for the works, which will be made available to the successful bidders on the construction contracts before the works are started. These detail designs are to be completed before June 1994. The cost of this detail engineering work for the potable water component is US$2.2 million and CEDAE has it scheduled for completion by mid-1994.

b. Equipment and supplies

3.27 CEDAE has drawn up the lists of equipment and materials complementary to the works that will be included in the project. The general and particular technical specifications and other documents prepared by CEDAE have been reviewed by the Bank and have also been found satisfactory. The procurement of this equipment could be started as soon as the potential loan contracts are

signed, especially as regards the household meters, master meters and lines to be installed.

3. Solid waste

3.28 The necessary designs for opening bidding on works connected with the recycling and composting plants and sanitary landfills have been completed. However, to avoid underutilization of these installations, evidence will be required, before calls for bids are issued, that the municipality in question has moved ahead with contracting private enterprises to handle trash collection or else possesses the capacity to perform collection itself (see Recommendations).

3.29 The vehicle and equipment requirements for collection and cleaning in urban areas that are hard to reach and for modernization of the transfer stations in the municipalities of Nilópolis and São João de Meriti have also been determined. However, in the case of these two municipalities and Duque de Caxias, the call for bids on the proposed equipment will have to be made conditional upon the Jardim Gramacho landfill – which receives their wastes – being converted into a technically acceptable landfill, or some other equally acceptable solution being found for the final disposal of the waste (see Recommendations). The study of the urban sanitation master plan for the metropolitan area is to be contracted three months after signature of the contract (see Recommendations).

4. Drainage

3.30 The plans for the drainage works in the Acari River basin have been completed, as have the lists of equipment required for maintenance of the canals and rivers or creeks in the urban area.

5. Digital mapping

3.31 CIDE currently has preliminary terms of reference for the bidding documents that will be used in contracting aerial photography and digital reconstruction services for the digital mapping component, as well as preliminary specifications for the graphic computer equipment to be procured for execution of the program. CIDE will receive advisory services for finalizing the bidding documents and the computer equipment specifications from the international firm responsible for the technical monitoring of the execution of the component.

6. Complementary environmental programs

3.32 This component is sufficiently defined to be included as part of the program; however, before bids are invited for procurement of goods and services for the complementary programs, the borrower will be required to submit the technical documentation in the case of goods and the final terms of reference to the Bank (see Recommendations).

G. Land

3.33 CEDAE has the land needed for execution of the potable water and sewerage works as far as supply lines and water systems are concerned, and for the collection and interception works and also for certain WWTPs (Governador Island, Paquetá Island and Icaraí). It is negotiating with the federal government to obtain the sites for the Alegria and Sarapuí WWTPs and for the final disposal of the dried sludge from the Xerém WWTP under concession. CEDAE is negotiating the acquisition of the other sites for construction of the ten water distribution tanks, the water pumping station, the 36 wastewater pumping stations and the other WWTPs, either by direct purchase or else by expropriation, which is a normal procedure in Brazil.

3.34 Since the drainage works in the Acari River basin are designed to resolve localized problems and are relatively small in size, no land will have to be obtained that is not already owned by the municipality. In the case of the solid waste subprogram, only the works proposed in the municipality of Magé will require the purchase of new land for the recycling plant and the sanitary landfill. This activity has already been started and on the basis of similar experience no difficulties are expected in securing the sites required.

H. Execution period and investment schedule

3.35 The execution period for the project is five years from the effective date of the loan contracts (OC and FSO). This period is compatible with the size of the project, the type of activities envisaged, the institutional capacity of CEDAE and the other co-executing agencies, the capacity for producing the local counterpart and also the requirements of the chief contributor of local resources, the Japanese OECF. Taking a five-year execution period as the basis, the following investment schedule has been prepared:

(US$ thousands or equivalent)

	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	TOTAL
IDB loan (OC)	67,130	83,160	75,680	61,975	12,060	300,000
IDB loan (FSO)	10,545	16,590	15,355	7,515	0	50,000
Local contribution	31,037	97,774	126,428	109,050	78,711	443,000
TOTALS	108,712	197,524	217,463	178,540	90,771	793,000

I. Bidding schedule for the CEDAE drainage and solid waste works

3.36 The IDB's schedule for the procurement of goods and services envisions 13 international bidding competitions for goods and 16 such competitions for construction of water supply and sewerage civil works and for assembling the equipment in the seven WWTPs. This schedule for the water, sewerage and solid waste subproject is set out on the next page.

PROCUREMENT SCHEDULE - IDB

		YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEA
Equipment and Supplies						
Steel, PVC and duct. cast-iron pipe	I	IIISSSSSSSSS				
Meters	I	IIISSSSSSSSS	SSSSSSSSSSSS	SSSSSSSSSSSS		
Master metering and remote-control eqt.		IIIISSS	SSSSSSSSSSS			
PVC pipe		IIII	SSSSSSSSS			
WWTP process eqt.			IIII	SSSSSSSSSS		
Concrete and clay pipe		IIII	SSSSSSSSS			
Steel, duct. cast-iron and PEAD pipe		IIIISSS	SSSSSSSSS			
Pumping eqt.			IIIISSSSSSSS	SS		
Sludge preparation and transp. eqt.			IIII	SSSSSSSS		
PVC pipe			II	IISSSSSS		
Solid waste, eastern municipalities		IIII	SSSSSSSSSSS			
Solid waste, western municipalities			IIIISSSSSSSS	SSSS		
Urban drainage eqt.		IIII	SSSSSSSS			
Works						
Civil works Baixada Flum.		IIIIEE	EEEEEEEEEEE	EEEE		
São Gonçalo		IIIIEE	EEEEEEEEEEE	EEEE		
Meter installation			IIIIEEEEEEEE	EEEEEEEEEEE	EEEEEEEEEEE	EEEE
Systems in *favelas*			IIIIEEE	EEEEEEEEEEE		
São Gonçalo II WWTP				IIII	EEEEEEEEEEE	
S.G. networks, trunk lines, pumping stns.				IIII	EEEEEEEEEEE	EEE
Improvement of Icaraí WWTP						
Outfall			IIIIEEE	EEEEEEEEEEE		
Improvement Governador Island WWTP			IIIIEEEEEEE	EEEE		
Networks, trunk lines, pumping stns.			IIIIEEEEEEE	EEEE		
Paquetá Island WWTP, networks, collect.			IIIIEEEEEEE	EEEE		
Disposal of Xerém sludge			IIIIEEEEEEE	EEEEEEEEEEE	EEEEEE	
Favelas			IIIIEEEEEEE	EEEEEEEEEEE	EEEEEEEEEEE	EEEE
Solid waste, eastern municipalities			EEEEEEEEEE			
Solid waste, western municipalities		IIII	IIIIEEEEEEE	EEEE		
Acari River drainage and channelling			IIIIEEEEEEE	EEEEEEEEEE	EEEEEE	

I = International bidding; S = Supplies; E= Execution

J. Cost recognition

3.37 CEDAE and the other co-executing agencies incurred costs in the preparation of the engineering studies and designs in 1992 and 1993, together with the environmental impact studies, field studies, bathymetric and current research, etc., and are continuing to hire consulting firms to make the detail design drawings for certain works and site and easement acquisition. The Bank has accordingly been requested to recognize expenditures chargeable to the local counterpart of up to US$7 million equivalent, of which US$2.5 million would relate to costs attributable to the works that would be financed with resources from the Japanese OECF. These costs will be accounted for in accordance with the pertinent Bank rules (see Recommendations and Appendix III).

K. Operation and maintenance

1. CEDAE

3.38 CEDAE will be responsible for the administration, operation and maintenance of the water supply and sanitary sewerage works to be executed under the project, for which it possesses the necessary organization, personnel and resources. The bulk of the maintenance work on the MRRJ water and sewer system for which CEDAE is responsible is considered to be satisfactory.

3.39 The equipment necessary for improving and strengthening the maintenance of certain operating units will be procured under the project. This includes some components of the water distribution system, various water and sewerage districts (WSDs), the meter shop, equipment connected with the operation and maintenance of the Guandu water treatment station (WTS) and the Penha and Icaraí WWTPs.

3.40 To ensure greater operating efficiency of the WWTPs that will be built under the project, it is recommended that CEDAE be required to submit a plan defining the participation of private firms in the operation and maintenance of the two plants with a capacity of 1 m^3/s or over that will be financed with program resources (see Appendix IV).

3.41 A training plan has been developed for CEDAE's technical and administrative personnel to enable the company to improve its supervision capability and to equip it to handle temporarily, if need be, the direct responsibility of operating and maintaining any of the seven new WWTPs. A new map will be prepared of the MRRJ water and sewerage systems.

3.42 It is recommended that the loan contract include the obligation for CEDAE to submit annually to the Bank, during a ten-year period starting from the year after the facilities are completed and brought into service, and within the first calendar quarter of each

year, an annual operating and maintenance plan for these facilities, including a report on the previous year which will also record the condition of the systems (see Recommendations).

2. SOSP and the municipalities

3.43 Upon completion of their execution, SOSP will turn the facilities over to the municipalities for operation and maintenance. The purpose of the institutional strengthening discussed earlier is to improve the capacity to contract, supervise and maintain the solid waste facilities of the municipalities involved, since the greater part of the collection and cleaning service will be performed by private companies (see Annex III-1).

3. SERLA

3.44 The maintenance of the drainage works in the Acari River will be performed by SERLA, which will also be responsible for this work in most of the rivers in the state. To improve SERLA's present maintenance capacity, the program includes financing of a set of equipment for this function.

L. Environmental aspects

3.45 At its meeting of August 26, 1991, the Bank's Environmental Management Committee (CMA) classified the project in Category III, in view of the effects it would have on the environment. The CMA's recommendations upon approval of the environmental summary on July 13, 1993, have been taken into account in the design and execution rules of the project. The technical specifications of the works and the bidding documents include measures to control and mitigate the direct impact resulting from execution of the works.

3.46 The current legislation and the agencies charged with environmental aspects in the state of Rio de Janeiro are considered adequate and sufficient for the control and supervision the project will require during the execution period. The project also includes an institutional strengthening component for FEEMA designed to improve control of industrial pollution. In addition, compliance will be required throughout the execution of the project with all rules and requirements concerning licenses, studies and procedures laid down by the pertinent legislation.

3.47 At the São Gonçalo and Niterói sanitary landfills, which are the points of final disposal for solid waste, there are about 300 persons who sort through the trash without proper control. As a condition precedent to issuing bids for the sanitary landfills at São Gonçalo and Niterói, the borrower will be required to submit to the Bank a detailed plan for new employment for these people (see Recommendations).

M. Ex post evaluation

3.48 The borrower has requested an ex post evaluation and CEDAE, the executing agency, has the capacity to perform it. In order to evaluate the socioeconomic impact of the program and the degree to which its objectives are accomplished, the borrower will be required to submit an ex post evaluation report to the Bank that must include an analysis of the program's impact on the coverage and quality of the potable water and sewerage services, and on the pollution levels of rivers and beaches. This analysis will include a comparison of the program's results with the ex ante assumptions used in its preparation. It will also be required to include an analysis of rate levels and of CEDAE's financial position and of the operating efficiency of the potable water, sanitary sewerage and wastewater treatment systems. This report is to be submitted at the end of the second year following the date of the last disbursement of the financing (see Recommendations).

N. Precautions to guard against the effects of natural disasters

3.49 The design standards for the works contain the necessary precautions with regard to flows and maximum water levels to be considered for execution of the works in order to reduce the risk of damages and materials losses in the case of heavy rainfall to the minimum.

IV. BORROWER AND EXECUTING AGENCY

A. Financial considerations

4.1 The local funding for the sanitation component will be met by internal generation of funds by CEDAE and by proceeds from the Japanese cofinancing. CEDAE will be responsible for servicing the debt on its corresponding portion. The State of Rio de Janeiro will be responsible for making the local contribution for the other components.

4.2 The institutional plan (see chapter III) requires, as a condition, that an agreement be concluded between the State of Rio de Janeiro and CEDAE that is to include at least the following points: (i) the state shall undertake to transfer the resources of the Bank loan and of the counterpart funding, except for the sanitation component that will be contributed by CEDAE; and (ii) the resources of the Bank loan earmarked for the sanitation component will be provided by the state to CEDAE on the same financial terms as those of the Bank loan (see Resolution).

B. Financial analysis of the borrower

4.3 The budget performance of the State of Rio de Janeiro over the last three years, expressed in constant values as of December 31, 1992, and converted to US$ at the exchange rate in effect on December 31, 1992, is as follows:

State of Rio de Janeiro Budget revenue and expenditure (in constant US$ millions as of December 31, 1992)			
	1990	1991	1992
REVENUE			
Current			
Tax	2,964	2,732	2,594
Transfers	722	406	400
Equity capital and other	91	620	1,296
Total current revenue	3,777	3,758	4,290
Capital			
Credit operations	407	352	484
TOTAL REVENUE	4,184	4,110	4,775
EXPENDITURE			
Recurrent			
Personnel	2,152	1,526	1,117
Operating supplies	82	52	100
Third-party services	154	81	120
Other costs	3	1	88
Transfers	1,376	1,284	1,630
Finance charges	557	463	657
Total recurrent expenses	4,323	3,494	3,624
Capital			
Investments	144	356	67
Financial inv. and others	126	2	31
Transfers	465	282	892
Debt amortization	65	99	150
Total capital costs	799	738	1,112
TOTAL EXPENDITURES	5,123	4,231	4,736
SURPLUS (DEFICIT)	-939	-121	38

4.4 The state's resources are administered through its annual budget. As the above table shows, to finance its expenditures it has tax resources, transfers from the federal government, returns on its financial investments and the use of credit.

1. Revenues

4.5 The annual revenues of the state during the period examined ranged from a low of US$4,110 million in 1991 to a high of US$4,755 million equivalent in 1992. Current revenue has been the largest category each year and in 1992 amounted to US$4,290 million equivalent, or 90% of total receipts.

4.6 The principal current revenue item has been taxes, although during the period examined this revenue fell slightly because it is expressed in constant values, while the state's economic activity remained the same throughout the period. The tax on the sale of goods and services is the most important tax and in 1992 accounted for the equivalent of US$2.4 billion, or 99% of tax receipts.

4.7 Transfers to the state from the federal government come from the Federal Government Transfer Payment Fund. These resources have been approximately US$400 million in the last two years and the relative share received by the State of Rio de Janeiro is less than in most other Brazilian states.

4.8 The income classified as equity capital comes from short-term offerings of available resources on the financial market.

4.9 The state's capital income in the period came from the use of credit, and in 1992 these funds amounted to US$484 million equivalent, or approximately 10% of total funds raised by the state in that year.

2. Expenditures

4.10 During the period under consideration the state's expenditures for personnel fell substantially, because in 1991 when the government changed hands, a process of staff cutbacks was initiated, and adjustments to salaries were lower than price increases. In 1990 personnel costs were US$2,152 million equivalent, representing 50% of recurrent expenditures, whereas in 1992 they had declined to US$1,117 million equivalent, or 31% of total current costs.

4.11 Transfers have been the largest recurrent cost, amounting to US$1,630 million equivalent in 1992. This item corresponds to funds transferred by the state to the municipal governments and decentralized agencies to finance their activities.

4.12 Capital outlays also increased substantially in 1992 – by 51% over the previous year. Of these capital outlays, the most important item is transfers. They consist mostly of transfers to the DER (Highway Department) for US$276 million for construction of the Vermelha expressway and other roads, and to the FEE (State Education Foundation) for US$555 million for construction of CIEPS (public schools offering special assistance to children from poor families).

3. Budget results

4.13 The results of the state budgets are given below:

State of Rio de Janeiro Results of budget performance (constant US$ millions as of December 31, 1992)			
	1990	1991	1992
Current revenue	3,777	3,758	4,290
Recurrent expenses	4,323	3,494	3,624
Current savings	-546	264	666
Credit operations	407	352	484
Debt amortization	65	99	150
Investments	734	639	962
SURPLUS (DEFICIT)	-939	-121	38

4.14 In 1990 the financial condition of the State of Rio de Janeiro was critical; in that year current revenue fell short of covering recurrent expenditures by US$546 million equivalent. The state did not have its own resources to cover its debt service or to help finance its investment costs. Although during that year funds were obtained by borrowing, the fiscal deficit was US$939 million equivalent, or 22% of total revenues. In 1991 the government launched a financial recovery program, based principally on reducing its recurrent costs. As a result, in 1991 and 1992 there were current savings of US$264 million and US$666 million, respectively. This level of current savings led to a reduction in the fiscal deficit in 1991 to US$121 million equivalent and in 1992 there was a small surplus of US$38 million, even though in that year investment costs rose by 50% to US$962 million equivalent. These results show that during the last two years the state's financial position has improved substantially.

4. Indebtedness

4.15 The debt of the State of Rio de Janeiro has evolved as follows:

US$ millions			
	1990	1991	1992
Internal debt			
Bonds	1,497	1,532	1,860
Contracts	927	956	1,155
External debt	51	52	54
Metro debt	761	665	764
Total debt	3,236	3,205	3,833

4.16 The debt of the State of Rio de Janeiro as of December 31, 1992 was US$3,833 million equivalent, most of which corresponds to the issue of government bonds, with a balance of US$1,860 million equivalent that represents 49% of the total debt. The state is up to date in servicing that debt.

4.17 The internal debt formalized through contracts with banks is next in order of size and, excluding the debt for metro works, which is shown separately, amounts to US$1,155 million equivalent. The state is up to date in servicing this debt. Within this debt there is a balance of US$465 million with the Bank of Brazil on which repayment was renegotiated in 1990 and, accordingly, amortization will begin in 1995. The increase in debt with local banks in 1992 was due principally to financing of the Vermelha expressway.

4.18 Part of the internal debt is accounted for by the debt due to construction of the metro, whose balance as of December 31, 1992, was US$764 million equivalent and which is not being repaid. Regarding this debt, on April 9, 1992, a protocol was signed between the Governor of Rio de Janeiro and the federal government whereby it was agreed that the federal government will take on the debts arising from metro construction, the State of Rio de Janeiro will be responsible for the state's urban train system and the metro will be transferred to the municipal government of Rio de Janeiro.

4.19 However, the Office of the General Counsel of the Treasury Department has not authorized the federal government to take on this debt, since it is of the opinion that a special law must be passed. For that reason, the act decentralizing railway transportation services contains an article that allows the federal government to assume the debt. This proposal has already been approved by the Congress of the Republic. The act stipulates the steps that must be taken for the federal government to take over

the debt. The period for completion of this process cannot be estimated, but this state liability is not considered to be demandable at this time.

4.20 The external debt is with a consortium of banks and is subject to the country's external debt renegotiation. Accordingly, payments are being made pursuant to Central Bank directives.

4.21 Analysis of the debt status indicates that the state is currently making regular debt service payments, except for the debt for metro construction.

C. Institutional analysis of the co-executing agencies

1. State Water and Sewerage Company (CEDAE)

a. Basic organization

4.22 The president is responsible for administration of the company's activities. To perform these functions he is supported by a vice president, advisory bodies and departments. The Superintendent of Implementation reports directly to the president of the company, and is responsible for execution of the Rio environmental program, a program of sanitation works in the state funded by the Federal Savings Bank (CEF), and for the sanitation component of the project under study.

4.23 The breakdown of functions and responsibilities of the company is as follows:

4.24 The Department of Planning and Control is responsible for planning investment activities and monitoring financing contracts. In the area of control, it is responsible basically for the information service and financial economic control.

4.25 The Department of Business and Finance, in order to perform its tasks, has:

a. The Office of the Superintendent of Accounting and Budget Control, which is responsible for keeping the company's accounting records and controlling budget execution.

b. The Office of the Financial Superintendent, which is responsible for funds, control of debt and preparation of payments.

c. The Office of the Business Superintendent, which is responsible for the company's commercial activities, including registration of users, metering and collection of payments for services.

4.26 The Department of Human Resources is responsible for administration of the company's human resources.

4.27 The Department of Projects and Works is responsible for supervision and execution of the company's works, including bidding processes and financing contracts for works.

4.28 The Department of Operation and Maintenance is responsible for operation and maintenance of the company's systems, grouped into activities relating to electrical machinery, water and sewerage. This department has regional offices to perform its duties in the interior of the state.

4.29 The breakdown of functions and responsibilities within the company is deemed appropriate.

b. Personnel

4.30 The company had 11,673 employees as of December 31, 1990 and 11,246 at the end of 1992, which indicates that there was a reduction during this period. The ratio of employees to number of connections is reasonable: 1 employee for each 173 water and sewer connections.

c. Internal control

4.31 The company has established administrative and accounting procedures that ensure the existence of internal control mechanisms. In addition, there is the Internal Auditing Advisory Office, that reports directly to the president of the company. This internal auditing is technically linked to the Office of the State Auditor General that sets forth the technical standards for conducting audits. There are manuals for programming, planning and executing audits. However, the number of staff in this unit has been decreasing and at this time only three professionals remain in addition to the chief, which is insufficient to perform the assigned functions. This unit is scheduled to be strengthened by hiring more staff or contracting private firms to perform audits. For this reason, it is recommended that the prospective loan contract require the presentation of a plan for strengthening the internal auditing office within 12 months of the signature of the loan contract and, within 18 months, evidence that this plan has been implemented (see Recommendation).

d. External control

4.32 The annual financial statements of CEDAE are audited by a firm of public accountants that in recent years has issued formal opinions without qualification. For the project under study, it is recommended that CEDAE present within 120 days of the close of each fiscal year its financial statements duly audited by a firm of independent public accountants acceptable to the Bank.

e. Rates

4.33 The company's rate system is subject to a federal government decree of November 1978, that regulates the rates of sanitation companies in Brazil. Pursuant to that decree, the rates must generate sufficient income to cover: (a) operating costs, including all costs of providing the services, operation and maintenance of the systems, administrative and commercial expenses, depreciation and amortization; and (b) 40% of the annual investment plan.

4.34 Approval of rate adjustments has been the responsibility of the state since 1986.

4.35 The rate structure of the company classifies users into residential, commercial, industrial and public. Within each of these categories the rates are differentiated by level of consumption. The sewer rate is based on water consumption and is 100% of the water service billing.

4.36 CEDAE complies with the country's legal requirements on rates and with Bank policies. As discussed in paragraphs 4.57 to 4.59, the company's income over the last three years has been sufficient to cover its operating costs. In 1992, the rate of return on fixed investment was 10%, which is considered reasonable.

f. Financial analysis of CEDAE

(i) Statements of condition

4.37 CEDAE's statements of condition for the last three years, expressed in US$, are as follows:

CEDAE Statements of condition (US$ thousands) 23/						
	1990		1991		1992	
	US$	%	US$	%	US$	%
ASSETS						
Fixed assets						
Fixed assets in service	949,879	96	1,066,191	100	1,286,293	104
Less: depreciation	182,232	19	200,368	19	236,208	19
	767,647	77	865,823	81	1,050,085	86
Assets under construction	90,320	9	62,496	6	64,368	5
Total fixed assets	857,967	86	928,319	87	1,114,453	91
Current assets	95,397	10	73,217	7	88,300	7
Other assets	38,315	4	63,886	6	26,762	2
TOTAL ASSETS	991,679	100	1,065,422	100	1,229,515	100
NET WORTH AND LIABILITIES						
Net worth	571,818	58	593,003	56	708,901	58
Long-term debt	357,277	36	426,451	40	457,540	37
Current	62,584	6	45,968	4	63,074	5
TOTAL NET WORTH AND LIABILITIES	991,679	100	1,065,422	100	1,229,515	100

4.38 The company's assets at the close of 1992 were US$1,229 million equivalent, and as is usual in this type of company, fixed assets constitute the principal item with a total at that date of US$1,114 million equivalent.

4.39 Fixed assets, before depreciation, rose from US$1,039 million as of December 31, 1990, to US$1,350 million, an increase of US$311 million – or 35% – during the period examined.

23/ Exchange rate: December 31, 1990, 1US$ = CR$177.06
December 31, 1991, 1US$ = CR$1,068.80
December 31, 1992, 1US$ = CR$12,387.00

4.40 Of this amount, US$127 million corresponds to additions, of which US$62 million is accounted for by the Rio environmental program partially financed by the CEF, US$22 million by water and sewerage works and US$35 million by the operational development program.

4.41 The increase in fixed assets is affected by revaluations in addition to the normal adjustments for currency devaluation. In 1991 the special adjustment for currency devaluation was made on the accounting value of the fixed assets as of December 31, 1990, required by Federal Law 8,200 of June 29, 1990. In 1992, the financial statements included the results of a technical valuation of the sewer systems, which increases the value of assets by US$99 million. This valuation has not yet been conducted for the water supply systems.

4.42 Current assets are next in importance within the structure of assets and as of December 31, 1992, were US$88 million equivalent, which represented 7% of the company's assets.

4.43 Within the current assets, accounts receivable were the largest item, with a net balance of US$66.6 million. Analysis of the efficiency of collection indicates that the company has adequately collected for its services. In 1992, 90% of amounts due during the year were collected, which is somewhat higher than the percentage considered by the Bank to be reasonable.

4.44 The other assets currently consist of deferred expenditures that correspond to costs incurred by the company in project preparation.

4.45 The company's long-term liabilities, which as of December 31, 1990, were US$423 million equivalent, as of December 31, 1992, were US$471 million equivalent. The principal creditors are the Federal Savings Bank (CEF) and the Water and Sewerage Fund (FAE). The breakdown of the principal amounts outstanding is as follows:

CEDAE debt (US$ millions)

	1990	1991	1992
CEF	263.8	286.6	306.2
FAE	127.5	116.9	126.3
BANERJ	5.9	3.8	2.9
IDB	4.0	1.6	0.0
Others	22.7	27.7	36.0
Total	423.9	436.6	471.4

4.46 The long-term liabilities of the company are currently with local agencies, since the IDB financing was paid off in 1992. The principal creditor is the CEF with a balance of US$306.6 million equivalent, which represents 65% of the total long-term debt. During 1991 CEDAE was in arrears in servicing its debt with CEF, but this situation was rectified and normal debt service payments have now been resumed.

4.47 The next largest debt is with the FAE, which as of December 31, 1992, was US$126.3 million equivalent. This debt has not been serviced since 1991. In this regard, it should be noted that on April 20, 1993, CEDAE asked the CEF, the financial agency that administers the FAE, to renegotiate this debt, and it agreed to do so. The arrears situation has therefore been restored to normal.

4.48 Based on the financial statements mentioned, the following financial ratios are obtained:

	1990	1991	1992
Current ratio	1.69:1	1.60:1	1.40:1
Debt ratio			
Short-term	0.11:1	0.80:1	0.09:1
Long-term	0.80:1	0.72:1	0.65:1
Total	0.91:1	0.80:1	0.74:1

4.49 The current ratio and debt indexes indicate that the company has maintained an acceptable liquidity and indebtedness position during the period.

(ii) Income statements

4.50 The income statements expressed in US$ for the last three years are summarized below:

CEDAE Income statements (US$ thousands) 24/						
	1990		1991		1992	
	US$	%	US$	%	US$	%
OPERATING INCOME						
Water service	373,774	58	295,252	58	358,406	58
Sewerage service	256,111	40	202,308	40	245,580	40
Other	13,482	2	9,669	2	14,117	2
Total income	643,367	100	507,228	100	618,103	100
OPERATING EXPENDITURE						
Operation and maintenance	374,583	58	313,441	62	388,022	63
Depr. Amort. Reserve for bad debts	26,707	4	25,291	5	51,155	8
Marketing	12,053	2	15,195	3	17,434	3
Overhead and administration	57,483	9	48,489	10	52,983	9
Total operating costs	470,826	73	402,417	79	509,594	82
Net operating income	172,541	27	104,812	21	108,509	18
Other income and expenditure	66,145	10	61,043	12	58,754	9
Finance charges	34,133	5	47,172	9	31,887	5
Income tax	6,952					
NET PROFIT	197,601	31	118,683	23	135,376	22

4.51 The company's operating income for the period examined, which was US$643.3 million equivalent in 1990, fell in 1991 and rose again in 1992. These results reflect the fluctuations in volumes of water sold and also the rate adjustments made. In 1991 the fact that the exchange rate variation was less than the movement in the price indices contributed to the drop in income expressed in US$.

24/ Average exchange rate:
1990 1US$ = CR$68.30
1991 1US$ = CR$406.61
1992 1US$ = CR$4,513.02

4.52 The following are the operating indicators of the company's activity for the period:

CEDAE Operating indicators			
	1990	1991	1992
Water connections (average)			
With meter	320,323	346,249	366,347
Without meter	1,014,224	1,004,651	1,000,321
Total water connections	1,334,547	1,350,900	1,366,668
Sewer connections (average)			
With meter	214,049	225,631	234,775
Without meter	364,834	356,022	351,477
Total sewer connections	578,883	581,653	586,252
Volume billed (m^3 thousands)			
Metered water	420,474	403,184	402,767
Unmetered water	522,438	518,134	517,633
Total volume water billed	942,912	921,318	920,400
Metered water for sewerage	209,850	183,944	183,684
Unmetered water for sewerage	361,014	367,116	366,599
Total water/sewerage	570,864	551,060	550,283
Amount billed (US$ thousands)			
Metered water	166,664	128,822	157,699
Unmetered water	207,110	164,430	200,707
Total water	373,774	295,252	358,406
Metered sewerage	109,470	81,231	98,232
Unmetered sewerage	146,641	122,735	147,348
Total sewerage	256,111	202,308	245,580
Average income (m^3 US$)			
Metered water	.39	.31	.39
Unmetered water	.39	.31	.39
Total water	.39	.31	.39
Metered sewerage	.52	.44	.53
Unmetered sewerage	.40	.33	.40
Total sewerage	.44	.37	.45
Annual volume per connection (m^3)			
Metered water	1,312	1,164	1,099
Unmetered water	520	515	517
Metered sewerage	980	815	782
Unmetered sewerage	989	1,040	1,043

4.53 An analysis of the company's operating data indicates:

a. The number of water connections in the period examined has remained stable, at 1,366,668 connections, of which 27% have meters. The volumes of water billed per year for connections with meters have been decreasing and reached 1,100 m^3 in 1992, whilst average annual sales for connections without a meter were 517 m^3 in 1992. This appears to indicate that the consumption of users without a meter is being underestimated. Hence the importance of conducting a meter installation program.

b. The number of sewer connections has also remained stable and during 1992 was 586,252, which represents 43% of the total water connections.

c. In 1991 there was a substantial decline in average income, because in some months no adjustments were made to offset the

fluctuations in domestic prices. In 1992 income levels recovered and in the first two months of 1993 average income per m^3 for the water supply service was US$0.45 and US$0.47, respectively.

d. In 1991 the volume of water sold dropped as a result of the shutdown of part of the Guandu system.

4.54 The income earned by the company in the last three years has been sufficient to cover its operating costs, although the net income from operations has decreased from US$172 million in 1990 to US$108 million in 1992. In 1990 this result accounted for 27% of operating income, while in 1992 it was 18%. The increased costs of materials, third-party services including electricity, and depreciation charge are affecting the operating results.

4.55 The company obtains significant additional income from offering its disposable assets on the financial market. This income is high because the prevailing inflation means that interest rates are high.

4.56 The net operating income has been sufficient to cover the finance charges in all years analyzed, and therefore the net result in each year has been positive. In 1992 the rate of return on fixed investment was 10%, which is considered reasonable.

(iii) Source and application of funds statement

4.57 Based on the statements of condition and income statements, the statements of source and application of funds for CEDAE were drawn up for the last three years, as follows:

CEDAE Statements of source and funds (US$ thousands)						
	1990		1991		1992	
		%		%		%
SOURCE						
Internal source						
Net operating income	172,542		104,812		108,509	
Other income	66,145		61,043		58,754	
Depreciation, amortization	22,128		21,052		39,467	
Total internal sources	260,816	83	186,907	74	206,730	69
External source						
Loan disbursements	27,964	9	42,865	17	13,180	4
Capital increase advances	22,787	8	23,263	9	26,475	9
Long-term assets					32,668	11
Other	24		6		20,496	7
Total sources	311,590	100	253,044	100	299,549	100
APPLICATION						
Debt service:						
Interest	34,133		47,172		31,887	
Amortization	14,160		9,710		9,266	
Total debt service	48,293	15	56,882	22	41,153	14
Investments in works	130,009	42	32,458	13	95,582	32
Deferred assets	12,035	4	3,061	1		
Working capital	28,550	9	-9,802	-3	1,559	1
Other	17,824	6	25,972	10	7	
Exchange rate diff, and adjustment	74,879	24	144,473	57	161,248	54
Total application	311,590	100	253,044	100	299,549	100

4.58 During the period examined the company's principal source of funds was operations, which in 1992 amounted to US$206 million equivalent.

4.59 Internal generation of funds has varied in line with the company's operating results. "Other income" in 1990 was US$66 million equivalent and in 1992 US$59 million, which represented 29% of total internal generation in that year. These funds primarily consist of interest on offerings of the company's disposable assets on the financial market.

4.60 The use of credit to finance investments during the period analyzed has been relatively small owing to the problems facing the CEF, the company's principal source of financing.

4.61 In terms of the application of the company's funds, investment in works during the period was US$258 million, of which US$84 million was financed using loan resources.

4.62 Debt service is one of the largest uses of funds, and in 1992 accounted for 14% of resources.

4.63 The statement of source and application of funds reflects the major impact of inflation and exchange rate variations. This is shown as an application of funds over the period of US$381 million equivalent and represents 21% of billing for the same period.

4.64 In January 1992, to minimize this loss, the company started to index the balances of the accounts receivable for the services it provides.

2. Co-executing agencies

a. Solid waste in municipalities (excluding Rio de Janeiro)

4.65 The SOSP will be responsible for co-executing this component. For this purpose it plans to set up a superintendency of solid waste which will have the following offices to conduct its activities: (a) planning and administration; and (b) engineering and technology. The State of Rio de Janeiro will be responsible for providing the local counterpart funds for this component.

4.66 Once the works are completed, they will be handed over to the municipal governments for operation and maintenance.

4.67 The municipal governments operate and administer the solid waste service through units that operate within their structure, with the exception of Niterói which has set up a company for this purpose. Evaluation of these units shows that they are weak and in many cases their structure is inappropriate. For this reason, the program includes institutional strengthening for these municipal units, which will be handled by the SOSP. This strengthening

program will reorganize the units and encourage private sector contracts for trash collection.

4.68 The municipalities charge a fixed trash collection rate that is collected along with the urban property tax. In all cases the proceeds of this rate are far below the cost of the service. However, the users of the service are financing this cost through municipal tax payments.

4.69 The municipal governments receive transfers from the state government to finance their activities, that for the most part consist of a share of the tax on the sale of goods and services. The amount received by the municipalities through these transfers is based on an estimate of the proceeds of this tax in the respective municipality. For the reasons cited above, it is felt that the users are meeting the cost of the service through the tax system in each municipality.

4.70 An analysis was conducted of the financial situation of the municipal governments to determine the capacity of each one to cover recurrent costs. To give an idea of the financial capacity of these municipal governments, the following table shows the results of budget performance in 1992.

Results of budget performance 1992 (US$ thousands)

	Duque de Caxias	São Gonçalo	Magé	São Joãs Meriti	Nilópolis	Niterói
Current revenue	81,600	35,376	12,302	17,829	10,665	64,049
Recurrent expenses	67,066	28,657	10,672	15,884	11,066	47,662
Current savings	14,534	6,719	1,630	1,945	-401	16,387
Loans and others	0	0	421	306	975	0
Capital costs	14,523	6,606	2,313	2,307	1,972	17,916
Surplus/deficit	10	113	-262	-56	-1,398	-1,529

4.71 The table shows that, except for Nilópolis, the municipalities have current savings in the performance of their budgets for 1992, and only Magé, São João de Meriti and Nilópolis resorted to the use of credit to help finance their investment expenses.

4.72 The financial projections prepared for each of the municipalities show that the five municipal governments that currently have positive current savings would be able to meet the incremental operating costs stemming from each project. In the case of Nilópolis, the projection indicates that current revenue must be increased in order to cover the additional operating costs. The agreements between the SOSP, the municipal governments and CEDAE

should stipulate that the respective municipality must demonstrate that it has the necessary funds to cover the incremental operating costs due to the project, or that it has taken fiscal and administrative steps to ensure it has funds for this purpose. These agreements should also stipulate the commitment on the part of the municipalities to allocate and provide funds to meet the incremental costs of the project, including part of the additional revenue obtained from execution of the digital mapping program.

4.73 The other co-executing agencies are supported by the state budget. The projects that these agencies will conduct under the program fall within their area of expertise and experience, and the agencies have appropriate personnel, financial administration and accounting controls to adequately carry out the projects assigned to them (see Annex III-1).

V. PROJECT FEASIBILITY

A. Technical feasibility

5.1 The project is deemed to be feasible and fully justified from the technical viewpoint. The principal considerations that support this view are:

a. The project responds to urgent needs to expand and improve the sanitary and environmental infrastructure of the metropolitan region of Rio de Janeiro (MRRJ), and is in line with the priorities assigned by the State of Rio de Janeiro.

b. The basic engineering designs are available for the water, sanitation and solid waste projects and are adequate for cost estimation and preparation of the bidding documents and forms.

c. The cost of the project has been calculated based on real unit costs on the international and national markets, and reasonable provisions have been made for contingencies and escalation.

d. The execution schedule appropriately reflects the time required for all the activities included and therefore the five years proposed for the disbursement period are considered to be realistic and feasible.

e. The grouping of the contracting process into bids on goods, works and assembly for the components to be financed using Bank funds, and bids on goods and works that will be financed using OECF resources, will enable appropriate national and international competition, and afford the opportunity for different types of enterprises to participate.

f. The executing and co-executing agencies of the project will have the necessary number of qualified technical personnel for proper execution of the project and its various components.

g. The operation and maintenance of the water supply and sanitary sewerage systems and the treatment plants will be conducted directly by CEDAE or by specialized private companies hired for that purpose. The training plan for CEDAE staff will enhance its capacity to effectively operate, maintain and supervise these installations.

h. The institutional strengthening of the municipal governments for the digital mapping and solid waste subprojects will enhance their capacity to manage these programs.

B. Institutional feasibility

5.2 CEDAE will be in charge of project execution and for this purpose will set up an executing unit, to be structured with appropriate distribution of functions and responsibilities. The technical unit will comprise subgroups, established on the basis of the nature of the projects to be carried out. Each of the co-executing agencies of the program will provide professional full-time staff for each of the technical subgroups to ensure they have the necessary technical capacity. The administrative accounting area will be organized along lines to be approved by the Bank.

5.3 A management consulting firm will be contracted in order to support the executing unit in technical, administrative and accounting areas.

5.4 The structure approved for the administrative area, with the support of the CEDAE's regular structure and of the management consulting firm, will make for adequate administration of the financial resources allocated to the program.

5.5 The executing agency of the program - CEDAE - is an institution with suitable organization and distribution of functions and responsibilities, that will be able to support the executing unit in this area.

5.6 The administrative and internal control procedures of that company will ensure proper administration of the resources it manages.

C. Financial feasibility

5.7 The State of Rio de Janeiro will be responsible for making the local contribution to the drainage, digital mapping and solid waste components for the smaller municipalities in the metropolitan area, strengthening of FEEMA and the complementary programs. This financial commitment during the period of project execution amounts to US$7.5 million equivalent over five years, which is within the financial capacity of the state. The state's financial position has improved and its investment capacity with its own resources in 1992 was US$330 million. The impact of the portion of debt servicing that must be met by the state once execution of the works is completed is not significant within the state's budget.

5.8 CEDAE will use its own resources to cover most of the local contribution to the program, in the amount of US$131.8 million equivalent, and the finance charges on the OECF loan of US$32 million equivalent, that were not included in the project cost.

5.9 Annex IV-3 gives the financial projections for CEDAE for ten years, together with the bases used for their formulation.

5.10 The projection of results was formulated on the assumption that the company's average income during the period projected would remain unchanged. The rate level attained in January 1993 of US$0.45 or US$0.47 per m^3 of water and sewerage would drop, respectively, by an estimated 15% as a result of losses through price fluctuations. This percentage is lower than in the past because part of this loss will be offset by indexing the accounts receivable for services.

5.11 The projection of results shows that sales of water in the period 1993-1997 will increase by 19%, due to the larger volume of water billed as a result of the installation of 525,000 meters, which confirms the importance of conducting a consumption metering campaign.

5.12 The net operating income would gradually increase in each year projected and in 1993 would be US$71.6 million equivalent and in 2002 US$114 million equivalent. This revenue in each of the years projected is sufficient to cover the finance charges on the company's long-term debt, and there is a positive result in each year, which means the company will have to pay an estimated US$123 million in income tax for the period projected.

5.13 The statement of source and application of funds shows that the internal generation of funds will increase annually from US$115 million in 1993 to US$196 million in 2002.

5.14 The internal generation of funds is sufficient at all times to cover servicing of the entire long-term debt of the company, staying above 1.50:1, a ratio which is acceptable.

5.15 During the project execution period, and after debt service has been paid, the remaining resources are sufficient to cover the local contribution and commitments to projects financed by other institutions.

5.16 The company has a surplus of funds in the period projected, except for 1995, 1999 and 2001, which show slight deficits that can be absorbed by the accumulated surpluses of previous years. At the end of the projected period, there is a surplus of US$68.9 million equivalent.

5.17 The financing plan for this project includes resources from the Japanese Overseas Economic Cooperation Fund in the amount of ¥31,475 million, equivalent to US$294 million. These funds are essential for financing the project and the company's generation of funds could not replace them. It is recommended that conclusion of the loan agreement with OECF be made a condition precedent to the first disbursement (see Resolution).

5.18 The projection shows that after completion of execution of the project under study, CEDAE would be able to spend more than US$50 million per annum of its own resources on its program of works.

5.19 The projection of CEDAE's statements of condition shows that during the period its fixed assets would increase from US$1,114 million equivalent in 1992 to US$1,940 million in 2002. The company would maintain a sound financial standing, with moderate levels of debt, since its debt to equity ratio would never exceed 1.17:1.

5.20 The results of the financial projections are deemed satisfactory, since CEDAE would have positive operating results and would have resources available for normal coverage of all its debt service and its commitments to various projects.

5.21 This situation basically depends on an appropriate rate level. It is therefore recommended that the loan contract stipulate that the borrower and executing agency must take all measures to ensure that the revenue from all the systems operated by CEDAE is sufficient to cover all the company's costs, including operation, maintenance, administration and depreciation of its restated fixed assets in operation and to generate sufficient resources to meet all its obligations, and finance at least 40% of the expansion program (see Recommendations).

D. Economic feasibility

5.22 An economic evaluation was conducted for the sewage treatment, water supply, drainage and solid waste disposal works. The economic analysis of the sanitation and drainage subprojects was based on both cost-benefit and least-cost criteria. For the treatment subproject, a cost-effectiveness model was also developed to analyze the volume of flow to be treated and the type of treatment for the different catchment areas in the bay's drainage system. The principal benefits of the sanitation works stem from expansion of the sewerage and water supply services, and from the reduction in pollution of rivers and beaches. A major benefit of the drainage projects, apart from preventing damages caused to residents in areas subject to flooding, is the elimination of traffic congestion during the flood season on major arteries of the city of Rio de Janeiro. The economic analysis of the solid waste subproject compared the costs of different alternatives for final disposal, including recycling and composting plants. To calculate the economic efficiency prices, conversion factors for consumption, unskilled labor and electric power were used. 25/

1. Sewerage subprogram

5.23 Seventy-one percent of project resources are earmarked for this subprogram, which includes expansion of the sewer system of Sarapuí and São Gonçalo, the construction of sewer mains and treatment plants in the watersheds of Alegria, Sarapuí, Pavuna, Governador and Paquetá Islands and São Gonçalo, and the construction of an

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25/ The following factors were used: unskilled labor – 0.610, standard conversion – 0.887 and electric power – 1.103.

underwater outfall in Niterói South (Icaraí). Except for the plants on Governador and Paquetá Islands, the plants proposed in the subprogram are primary treatment plants.

2. Least-cost analysis

5.24 The master plan drawn up in 1979 by CEDAE was revised based on the results of the 1991 population census, and a new balance between the supply and demand for sewerage and treatment services was calculated in the different drainage areas of the bay. Generally speaking, this analysis showed a reduction in estimated demand for the service and therefore the size of the systems and treatment plants was downscaled to make them compatible.

5.25 In addition, a detailed least-cost analysis was conducted to determine the construction method for the sewer main in Alegria and the sludge disposal method. The following paragraphs summarize the analysis conducted in each case.

a. Sewer main in Alegria

5.26 The choice of the construction method for the sewer mains of the Alegria system was influenced by its location in a highly built-up area, including the heart of the city of Rio de Janeiro. The more conventional open-cut channel method, although less costly, was rejected as it would cause serious problems in terms of traffic congestion, noise and air pollution, and possible damage to building structures and safety concerns caused by deep excavations. For the least-cost analysis two alternative methods of nondestructive or microtunnel construction were considered: the new Austrian tunneling method (NATM) and the shield method. Analysis for a length of 14.4 km and diameters between 1,000 mm and 3,500 mm indicates that the cost of the shield method, at efficiency prices, is US$61,140,000, which is 9.5% less than the cost of NATM.

b. Sludge disposal

5.27 Under the program the number of treatment plants would increase to 14, which would generate 86,700 cubic meters of sludge yearly. Two alternatives were studied for disposal in sanitary landfills and one for ocean disposal 100 km offshore. The landfill disposal alternatives are as follows:

5.28 Alternative 1: Construction of two sanitary landfills, one on the west side of the bay for the disposal of sludge from nine plants and the other on the east side for five plants in Niterói and São Gonçalo.

5.29 Alternative 2: Centralized solution with a sludge drying plant in Alegria and a sanitary landfill on the west side.

5.30 The following table gives the costs of the three alternatives in present value and at economic prices.

COST OF ALTERNATIVES FOR SLUDGE DISPOSAL
(US$ thousands)
Table 1

	Land transport	Sea transport	Sanitary landfill	Drying	Total
Alt. 1	3,347.7		29,864.6		33,212.26
Alt. 2	3,081.8		8,341.4	7,611.0	19,034.3
Ocean alt.	1,363.0	16,619.0			17,982.0

5.31 It can be seen that the present value cost of the centralized alternative with the sludge drying system is 43% less than alternative 1. The drying process reduces the volume of sludge to be disposed of by 3.7 times, which means that the costs of investment and operation of the sanitary landfill are significantly lower. The results also show that the ocean disposal alternative would reduce the cost of final disposal by an additional 5.5% compared with alternative 2. However, owing to the environmental concerns surrounding the disposal in the sea of sludge that could contain toxic metals and organic chemical compounds, adoption of the sanitary landfill solution has been proposed.

c. Efficiency cost of the investments in treatment

5.32 In order to rank the investments in treatment in order of priority, the coverage and stage of treatment in the different drainage areas around the bay was analyzed. A linear programming model was developed that minimizes the water pollution index, subject to the limitation of financial resources and the volume of flow for each drainage area. This analysis complements the cost-benefit evaluation, since it makes the differences in the degree of effectiveness of various works to control pollution at points of interest in the bay less arbitrary, especially when several works share the same benefit. The analysis sought to reflect the program's pollution control objectives, and therefore emphasized the impact of the works on reducing the bacteriological pollution of beaches and increasing the levels of dissolved oxygen (DO) in critical areas.

5.33 The results of the model for four investment levels are shown below in Table 2. It can be seen that the solutions of the model give priority to increasing the flow treated at various points located around the bay, before passing to a secondary treatment stage in the principal watersheds. Only when the amount of funds available for treatment is over US$325 million – more than double the amount of resources included in the program – would treatment of the bulk

of the flow at the secondary stage be justified. Series for lower investment levels than those included in the program confirmed the importance of investments in the outfalls at Icaraí, Governador Island and Paquetá Island. 26/ The principal difference between the results of the model and the program included in this operation arises as a result of the expansion of the sewerage systems of Pavuna and Sarapuí. Expansion of the sewerage service in these densely populated areas has a significant economic benefit that is overlooked in the efficiency cost analysis.

Table 2
FLOW TREATED AND TREATMENT LEVEL FOR DIFFERENT SYSTEMS
(results of the linear programming model)

System	Total flow	US$155 mill. treatment		US$225 mill. treatment		US$325 mill. treatment		US$470 mill. treatment	
		Prim.	Sec.	Prim.	Sec.	Prim.	Sec.	Prim.	Sec.
Magé	0.170	0.170		0.170		0.170			0.170
Sarapuí	2.100			1.600		1.600			2.100
Pavuna	3.300	0.909		0.824		0.823		1.677	1.623
Govern. Island	0.433		0.433		0.433		0.433		0.433
Paquetá Island	0.020		0.020		0.020		0.020		0.020
São Gonçalo S/2	0.625	0.390	0.235		0.625		0.625		0.625
Alegria	4.600	0		3.735	0.865		4.600		4.600
São Gonçalo S/1	0.300	4.600				0.006			0.300
Niterói North	0.500				0.500		0.500		0.500
Icaraí	0.850	0.500	0.850		0.850		0.850		0.850
São Gonçalo 3/4/5	0.800								
Index			101		61		20		12

5.34 To complement the above analysis, cost-efficiency indicators were calculated based on biochemical oxygen demand (BOD) for the most polluted cells. Without the investments included under the program, the levels of BOD in cells 9 and 10 of map 1 would reach values in 1998 of 27.8 mg and 14.6 mg per liter, respectively. For uses that do not involve direct water contact, such as fishing and boating, it is recommended that BOD levels should be less than 10 mg per liter. The levels of dissolved oxygen would be 0.17 for cell 9, indicating that a large part of this cell would be under anaerobic conditions, especially in locations next to the outfalls and in upper surface waters. This further degradation that would

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26/ This analysis did not consider investments in sewerage works and the interception of sewage from the *favelas* (program of complementary works). However, the environmental impact assessment of the program established that the contribution of these relatively small investments would have a significant impact on reducing the total coliform count in various cells close to the coast. Reductions could be obtained ranging from 15% for Icaraí to 75% for beaches on the northern side of Governador Island.

occur without the investments in treatment would worsen the problem of odors currently noticeable on the cities' access roads.

5.35 The following table shows the cost-efficiency indicators for the treatment plants with the greatest influence on cells 9 and 10. These indicators were calculated as the ratio between operating costs and investment in each plant and the reduction in levels of pollution in each cell. It can be seen that the investments in Alegria are more efficient in reducing the levels of pollution in cell 9 and the investments in Pavuna should be selected if the objective is to reduce the BOD levels in cell 10. 27/

Table 3
COST-EFFICIENCY INDICATORS FOR CRITICAL CELLS
(US$ per mg per liter)

PROJECT	CELL 9	CELL 10
Alegria	7,553.03	10,630.2
Pavuna	9,680.70	3,821.3
Sarapuí	184,333.30	15,800.0

E. Cost-benefit evaluation

5.36 This component has five important benefits: (a) expediency, cost saving, and improvement in the sanitary conditions of 1.2 million inhabitants in the 72 systems of Pavuna, Governador Island, Sarapuí and São Gonçalo; (b) improvement in aesthetic conditions and habitability as a result of reduction of the high pollution levels in 10 rivers and canals that flow into the bay and in densely populated areas of the bay; (c) creation of new recreational opportunities at a lower cost for the population residing in urban areas close to the bay and reduction in the current congestion on the oceanside beaches; (d) increased diversity of tourist attractions in the city, which means tourists would stay longer and therefore provide higher revenue for the tourist industry; and (e) partial recovery in the catch of several economically important fish species. The methodology used in estimating each of these benefits is described briefly below.

27/ Although the Alegria plant is farther away from cell 9 than Pavuna, it has a greater impact on that cell. This is because Alegria diverts the sewage from 470,000 people that currently flows into cell 9 to cell 23. Part of this flow was released after treatment at low levels of efficiency in the Penha station. The smaller load that the latter station would receive would also improve the quality of its effluent.

F. Sewerage service

5.37 The benefits of the sewer systems were calculated based on willingness to pay (WTP) determined in contingent valuation surveys for other sanitation projects in Brazil. The values range from US$11.20 per family per month estimated for the expansion of the system in the city of Fortaleza (state of Ceará) to US$26.9 for Guarapiranga in the metropolitan region of São Paulo. 28/ The results of the Fortaleza project were adopted using the selection criterion of the similarity in income levels of the beneficiary population. The WTP for the systems was calculated by adjusting the estimated value for Fortaleza, in accordance with the income levels found in the survey used to estimate the benefits from reducing pollution in the bay. The results for the four projects included in the program are as follows: Sarapuí - US$11.2; São Gonçalo - US$11.70; Pavuna - US$11.87; and Governador Island - US$12.83 per family per month. The calculation of the benefits of the systems assumed 90% connection.

G. River pollution control

5.38 In order to measure the benefits that would result from the construction of sewer mains and the reduction in river pollution, a contingent valuation survey of 500 persons living in the watersheds of the Faria and Timbó Rivers in the Alegria system and the Alameda canal in Niterói was used. The WTP for reclamation of the rivers was estimated at US$7.30 per family per month. To reflect the fact that some projects reduce river pollution only partially, the WTP values were adjusted in proportion to the reduction in discharges. 29/

H. Reclamation of beaches in the bay

5.39 The model described above and the data compiled by FEEMA for 1990 and 1991 show that more than 90% of the beaches in the bay have levels of pollution that for most of the year exceed the state's

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28/ The values found in these studies are as follows:

Survey	Date	Family income (US$/month)	WTP
Osasco	June 1990	697	19.5
Guarapiranga	March 1991	811	26.9
Fortaleza	Nov. 1991	303	11.2

29/ The reductions in discharges of wastewater into the rivers and canals are as follows: Fara, Timbó, Maracanã and Mangue canal in the Alegria system - 93%; Pavuna, São João Meriti and Acari in the Pavuna system - 34%; Sarapuí canal - 20%; Madeira and Imboassu canal - 29% in the São Gonçalo system and Alameda São Boaventura canal - 94% in central/northern Niterói.

standard. 30/ The works included in this program would reduce the levels of pollution of the beaches of Niterói and Governador Island to comply with the state standard and even with the stricter EPA-recommended standard. Pollution of the bathing beaches close to the center of the city of Rio de Janeiro (Flamengo, Botafogo and Urca) would be brought down to the local standard.

5.40 The benefits from reducing the pollution of the beaches were estimated based on a survey of 1,674 families from different districts in the metropolitan region of Rio de Janeiro. The results of the contingent valuation analysis indicate that for all districts, regardless of their income level, the willingness to pay for investments that reclaim the beaches is much higher than for investments that only improve the environmental and general aesthetic condition of the bay. For example, in the case of Niterói, a WTP of US$7.20 per family per month was estimated for investments that reclaim the beaches but just US$0.15 for investments that improve conditions for recreational fishing, sailing and the aesthetic qualities of the bay.

5.41 The survey data also indicate that the number of visits that people would like to make to the beaches of the bay exceeds the saturation levels for the largest beaches. 31/ This result has two important implications: the size of the beaches is a critical factor in determining the benefits of the pollution reduction works, and the WTP values calculated based on contingent valuation probably overestimate the benefits of cleaning up the beaches. In order to make corrections for the congestion and rationing that would exist with the project, the benefits were estimated based on the consumer surplus considering the maximum capacity of the beaches. The estimated values are between 15% and 40% below the WTP estimated by the contingent valuation method.

I. Tourism

5.42 There are tourist excursion projects for Guanabara Bay that could not be carried out owing to the current levels of pollution in the bay. The works at Pavuna, Alegria and Governador island would reduce the high levels of pollution in areas close to the international airport. Paquetá Island is one of the biggest attractions in the excursions planned. Based on information provided by the concession companies, it was determined that 385,000 foreign

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30/ The state's standard is 5,000 total coliforms or 1,000 fecal coliforms per 100 ml. The standard recommended by WHO and the EPA is 1,000 total coliforms or 200 fecal coliforms per 100 ml.

31/ The demand for beaches was obtained based on the travel intentions indicated by the interviewees. The capacity of the beaches was estimated on the basis of available area, seasonal and weekend fluctuations, and a saturation level of 8 square meters per family. Excess demand was also identified by substituting the costs of traveling to beaches in the bay on demand curves for ocean beaches.

tourists visited the city's main tourist attractions. To calculate the benefits from tourism, it was assumed that the program would increase the average stay of 50% of these tourists by one day. Daily spending per stay during the last two years was US$87 and, based on data obtained from other Bank-financed projects, it was estimated that the operating and maintenance costs are approximately 60% of the gross revenue of the tourist industry. 32/

J. Fishing

5.43 Based on information provided by the managers of fishing grounds located in the bay, catches of the principal species of fish and shrimp have declined to levels that are just 17% and 33% of the levels observed 10 years ago. The most important factors contributing to this collapse in catch levels are: pollution by industrial effluent, especially from the petrochemical industry; reduction in mangrove coverage; discharges of raw sewage, which result in low levels of dissolved oxygen in the northern areas of the bay (cells 7, 8, 9 and 10); and overfishing due to the lack of proper fishery resource management.

5.44 The lack of statistics and comprehensive studies of the situation of fishery resources in the bay makes it extremely difficult to estimate the benefits that might be attributed to the project. According to the FEEMA study and information obtained from fishing grounds, current output is estimated at 260 tons per month of fish and 10.3 tons per month of shrimp. At market prices observed during 1992, the present value of the catch is estimated at US$3.6 million, and could increase to US$14.5 million if the environmental conditions and biomass existing 10 years ago were regained. Assuming that the resource recovers over 10 years and the costs are 50% of the value of the catch, at economic prices a total value of US$30.6 million is obtained.

K. Results

5.45 The results of the economic evaluation are shown below in table 4. Owing to the difficulty in separating the impact on water quality, and therefore the benefits, the projects in the Alegria, Sarapuí and Pavuna basins, Governador island south sector and Governador Island north sector were evaluated together. In order to reflect the legal requirements of the state and of the municipal governments, separate internal rates of return were not calculated

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32/ The data on expenses in the tourist industry were obtained based on estimates made for the Huatulco Bay project in Mexico and the sewerage project for the southern coast of Barbados. Owing to the current low occupancy rates and the relatively small impact of the program, the costs of investment in expanding the hotel capacity were not included.

for the treatment component. 33/ Nevertheless, table 4 makes it possible to calculate the net present value of each of the project components. With the exception of São Gonçalo, all works in systems and sewer mains have internal rates of return higher than 20%. There is also a high internal rate of return for the Icaraí outfall, which would reduce pollution of the most important beaches in Niterói.

Table 4
Result
Cost-benefit analysis
Sewerage and treatment component
(US$ millions)

System	Systems			Sewers			Sewer systems		
	Ben.	Cost	IRR	Ben.	Cost	IRR	Ben.	Cost	IRR
Alegria				124.4	62.6	24.0			
Pavuna	66.9	27.0	34.2	34.2	13.6	28.1			
Gov. Isl. - South (favelas)	19.2	13.6	29.8	-	-				
Alegria/Pavuna/Isl.							326.1	204.5	19.4
Sarapuí	55.6	29.4	25.2	36.2	19.5	21.9			
Gov. Isl. North	7.8	3.7	35.5						
Sarapuí/Isl. North							103.3	64.3	20.3
Niterói south							81.1	20.8	43.9
São Gonçalo	37.1	17.9	28.0	20.8	14.5	17.4	62.4	55.2	14.0
Paquetá Isl.	-	-					9.5	2.7	37.8
Favelas downtown	0.8	0.5	21.1						

L. Water supply and metering subprogram

1. Sector program

The sector program would ensure the regular supply of water to 706,337 people in the Baixada Fluminense and 296,987 people in São Gonçalo. The construction of new water tanks and installation of meters in these sectors would enhance the service during times of peak demand, and provide for the installation of 15,297 new connections in the Baixada Fluminense and 9,000 in São Gonçalo. The benefits of this component were estimated based on a survey of 500 families, including families without connection, with regular service and with unsatisfactory service. A summary of the results of the Simop model is shown in table 5.

33/ Article 274 of the State Constitution stipulates that all wastewater discharges on the coast must be treated at least at the primary stage. The same requirement is stipulated in the bylaws of the municipalities of Rio de Janeiro, Niterói and São Gonçalo.

Table 5 COST-BENEFIT RESULT Sector program (US$ thousands)			
PROJECT	BENEFIT	COST	IRR
Baixada Fluminense	79,145	52,195	20.7
São Gonçalo	30,562	26,256	14.6

M. Metering

5.46 This component complements the other investments in sanitation by producing significant savings in the production and distribution costs of drinking water, and in the costs of collection and treatment of wastewater. Based on the results of the survey used in evaluation of the sector program and an average rate of US$0.454 for each service, it was estimated that household metering would lead to reductions in consumption levels on the order of 24%. The incremental long-term cost for water and sewerage was estimated at US$0.53 and US$0.31 per cubic meter, respectively. The reduction in water consumption would save US$160 million (the difference between its opportunity cost and its economic value to consumers), which when compared to costs would yield an internal rate of return of 52%.

N. Drainage

5.47 The stretches where works would be conducted in the Acari River watershed are considered critical and have the largest number of direct beneficiaries in relation to funds invested. The economic evaluation was based on the flood marks recorded in 1971 and 1992 with periods of recurrence of 2 and 200 years, respectively. The benefits of reclamation and canalization were estimated on the basis of direct and indirect damage suffered by the residents of the Piraquara, Pedras and Upper Timbó River subbasins. Table 6 shows that the three projects have internal rates of return higher than 12%. In addition, the quantified benefits do not include the costs associated with traffic congestion and interruption of train service caused by overflowing rivers, affecting a large population in the northern area of the city who do not live in the watersheds of the rivers to be canalized.

Table 6 ECONOMIC EVALUATION Acari River watershed			
RIVER	VPL - COSTS US$ 1000	VPL - BENEFITS US$ 1000	IRR (%)
Upper Timbó	2,693	2,821	14.15
Piraquara	4,612	4,908	14.46
Pedras	2,233	2,545	15.52

O. Solid waste

5.48 The improvement in residential collection service of public-area cleaning would primarily be carried out with private sector participation. The investments in equipment included in the program will only expand direct service to lower-income areas which, due to difficulty of access, require special collection systems. Retaining part of the service in the hands of the municipalities also provides data on costs and alternative means of providing the service to improve the negotiating position of the municipalities with the private sector.

5.49 The program includes investments in final disposal of solid waste in the municipalities of Niterói, São Gonçalo and Magé. There are serious defects in the existing final disposal systems of the three municipalities. It is estimated that the useful life remaining in the Niterói sanitary landfill is less than four years, expansion of the São Gonçalo landfill is destroying the mangroves in an environmental protection area, and in Magé there are small dumps at various sites in the municipality which have serious social and economic repercussions.

5.50 The results of the least-cost analysis shown in table 7 indicate that even for the less built-up municipalities (Magé and São Gonçalo) the recycling and composting plants are less costly than establishing new sanitary landfills. This is due to the fact that in the MRRJ there is a well-developed market for recycled products, and that new sanitary landfills require investments in access roads, basic infrastructure and land preparation that are greater than the costs of investment in recycling plants. In the case of São Gonçalo, the solution of a sanitary landfill also involves a significant increase in transportation costs. 34/

Table 7
COSTS OF ALTERNATIVES FOR FINAL DISPOSAL OF SOLID WASTE
(present value US$ thousands)

	Recycling plant		Sanitary landfill	
	Investment	Operation	Investment	Operation
Magé	1,057.9	-384.3	1,656.2	753.4
São Gonçalo	1,961.6	49.3	2,379.2	1,782.6

P. Distributional impact analysis

5.51 The information obtained in the surveys was used to estimate the percentage of low-income population that would benefit from the

34/ As a result of the least-cost analysis, decentralized solutions involving recycling plants for the municipalities of Magé and Niterói were also rejected.

sanitation program. This percentage ranges from 17.6% to 80% for the different districts surveyed.

5.52 The results summarized in the table shows that the distributional impact coefficient (DIC) for the program is 69%. The sector subproject has the greatest relative impact on low-income groups, with a DIC of 79%.

Table 8
DISTRIBUTIONAL IMPACT OF THE PROGRAM
(US$ millions)

ITEM	PUBLIC SECTOR	PRIVATE SECTOR		SOCIAL PRICES
		Low-income	Other	
1. BENEFITS	-0.4	504.6	302.0	806.4
1.1 Service				
Sewerage		130.6	58.8	189.4
Water supply		83.8	25.9	109.7
House metering	-0.4	49.4	33.0	82.0
1.2 Environmental				
Rivers		141.0	94.0	235
Beaches		99.7	62.2	161.9
Tourism			28.2	28.2
2. RATES	369.6	-221.7	-147.8	0
3. INVESTMENT	-429.8	43.9	0.0	-385.9
Systems	-62.9	8.6		-54.3
Sewers	-112.2	13.3		-98.9
Plants	-121.0	3.9		-117.1
Sector program	-56.7	7.7		-49.0
House metering	-50.4	6.8		-43.6
Household connection	-26.6	3.6		-23.0
4. OPERATION	-159.4	15.8	0.0	-143.6
Systems	-12.5	1.7		-10.8
Sewers	-22.0	2.6		-19.4
Plants	-52.8	1.7		-51.1
Sector program	-34.1	4.6		-29.5
House metering	-38.0	5.2		-32.8
NET BENEFIT	-220.1	342.5	154.2	276.7

$$DIC = \frac{342.5}{342.5 + 154.2} = 69.0\%$$

Q. Risks

5.53 This project, with its six subprojects, requires strong coordination to ensure that all of the activities move forward and the project's impact is maximized. In Rio de Janeiro, past efforts to coordinate multi-agency projects have proven problematic, particularly when coordinating commissions have been responsible for execution. For this project, the responsibility for execution will rest with CEDAE rather than a coordinating commission. Giving the responsibility for project execution to a line agency should enhance the likelihood of project success.

ENVIRONMENTAL LEGISLATION

State Decree 134 of June 16, 1975, legislates environmental protection and pollution control in the State of Rio de Janeiro. Regulations were issued pursuant to the law on December 21, 1977, and complemented by Decree 8,974 of May 15, 1986, that regulates the enforcement of penalties.

The basic instrument for control, applied at the state level by the State Environmental Engineering Foundation (FEEMA), linked to the Department of the Environment (SEMAM), is the licensing system for polluting activities (SLAP). Based on this system, which establishes the procedures for granting permits in three different project phases, FEEMA advises and inspects the installation of new activities in the state. Through this system, environmental impact analysis (EIAs) may be requested in certain cases, as may public hearings, as a requirement prior to granting permits for projects that could potentially harm the environment, directly or indirectly. The State Environmental Control Agency (CECA) is the authority that monitors, enforces sanctions and approves documents, under the SLAP.

Ventures that were already operating before 1977 are linked to the SLAP on the basis of their size and the severity of their environmental impacts. Permits may be required and, in the case of noncompliance, penalties can be enforced, as well as partial or total shutdown of activities.

In addition to the two agencies, FEEMA and CECA, the state's environment system also comprises SEMAM (Department of the Environment and Special Projects) that coordinates environmental policy in Rio de Janeiro, and CONEMA (State Environmental Council) consisting of 16 representatives from the state and federal governments and 16 representatives from civil society.

The State of Rio de Janeiro has extensive and sufficient environmental legislation, supplemented by federal legislation, to ensure that FEEMA's pollution control actions have full legal backing.

BASIC FEATURES OF THE TREATMENT PLANTS

1. Alegria plant

The Alegria plant was designed to treat sewage at the primary stage with an average flow of 4 m^3/s. The treatment process could be brought up to the secondary stage involving activated sludge by incorporating the pertinent units into this process, such as aeration tanks, secondary settling tanks, ventilator buildings, etc. This WWTA will benefit a population of 1,530,000 living in an area covering 8,634 ha. The direct cost of the plant is estimated at US$69.8 million.

2. Sarapuí plant

This plant will also treat sewage at the primary stage but retains the possibility of expansion to the secondary stage. A module of 1 m^3/s, with 2 primary settling tanks of 0.5 m^3/s each, will be built. The principal units of the plant would be: sewage pumping station, square section sand filters, two primary circular settling tanks, a circular thickening tank, one cylindrical primary digester, rectangular sludge drying beds and a thickened sludge pumping station. This plant will benefit a population of 431,000 inhabitants on 4,376 ha. The direct cost of the plant is estimated at US$13.4 million.

3. Pavuna plant

The plant will perform primary treatment with anaerobic digestion of the sewage using the following components: screening to remove coarse solids, sewage pumping station, grit removal, primary sedimentation, sludge thickening, anaerobic digestion of sludge (primary); drying of sludge by centrifugation and auxiliary units. The capacity of this plant will be 1 m^3/s and it will serve a population of 410,000 by the end of the project in 1998. This WWTP will be located in the district of Vigário Geral, on the right bank of the Pavuna-Meriti rivers, 3 kilometers from the point at which those rivers flow into the Guanabara Bay, which will be the final receptor of the effluent from the WWTP. Owing to the characteristics of the subsoil, the foundation structures will be built with prefabricated piles. The direct cost of the plant is estimated at US$17.7 million.

4. São Gonçalo plant

The WWTP will have a final capacity of 832 l/s to be constructed in two stages: the first will have a capacity of 625 l/s and will include only primary treatment with anaerobic digestion of the

sludge; initially the settling tanks and sludge digesters will be built. The WWTP will initially comprise the following units:

Medium rack: 2 units
Aerated sand trap: 2 units
Primary sand trap: 3 units
Primary sludge pumping station: 3
Fine rack: 1 unit
Anaerobic digester: 2 units
Sludge dewatering presses: 2 units
A population of 234,000 inhabitants living in an area covering 2,393 ha would be served.

5. Improvements to the Icaraí WWTP (Niterói south)

This WWTP was reconstructed and expanded to 630 l/s with its current features in 1976. It treats sewage at the secondary stage. Owing to the time the service takes, the sludge is not properly treated or disposed of. The excess sludge is discharged together with the treated effluent into the stream that passes in front of the plant on Ary Parreiras Avenue which then empties into Guanabara Bay at the end of Icaraí beach. The estimated cost of the improvements is US$3.6 million and the improved effluent will be transported by an 800 m land outfall and then an underwater outfall of 3,700 m x 900 mm diameter, considerably improving the quality of the bathing water at the Icaraí beaches.

6. Expansion of the Governador Island plant

The existing treatment process is conventional activated sludge for a flow of 200 l/s. The expansion would increase capacity to 420 l/s using the same process. The WWTP would use digestion and separation of the sludge from the wastewater to obtain a final liquid effluent with nearly no BOD or suspended solids. The component units of the expansion project are:

Aeration tank: 1 unit
Secondary settling tanks: 3 units
Sludge thickeners: 2 units
Sludge drying beds: 2 beds of 2,100 m^2 each
The works would benefit a population of 197,000 living in an area covering 1,770 ha.

7. Paquetá Island plant

The plant is located at Ponta das Pedreiras in the central part of the island and will receive the wastewater from a drainage area of 101 ha, and benefit a population of 12,500. The treatment process is activated sludge, including aeration tanks, sludge thickening

and drying. The flow of the WWTP is 27 l/s and its component units are:

Intake channel with racks and Parshall meter
Sand trap 4.5 m x 4.5 m x 0.80 m
Aeration tank (2 units); useful volume per tank: 1,340 m^3
Sludge thickener (1 unit) with 6.50 m diameter
Mechanical drying with centrifuges (2 units)

8. Improvements to the Penha plant

The WWTP at Penha currently has three GEOSAN press filters to dry the digested sludge. Only one of the three existing units is in operation but is unreliable, and the renovation of the other two units is not deemed feasible. CEDAE prepared a comparative economic study of the use of centrifuges or press filters, to select the most appropriate drying method, and the centrifuges were shown to be the best solution. The solution proposed provides for the installation of a sludge conditioning system by means of four horizontal settling centrifuges with a nominal capacity of 15 m^3/hour each and accessories. The total cost will be equivalent to US$2.3 million. The WWTP improvements will benefit 576,000 people.

SOSP

The SOSP will execute the solid waste subproject through its solid waste bureau. It reports directly to the Under-Secretary of the SOSP, a hierarchical level that enables it to act with the technical and administrative units that must support it.

The principal functions of the bureau are to coordinate and reconcile the programming of investments in the sector; to issue opinions on the technical and economic viability of projects; conduct financial and technical monitoring during project execution; and monitor, control and inspect solid waste projects executed by other state or municipal agencies.

The bureau office has the following units to perform its duties: (i) solid waste; (ii) sector programming; and (iii) monitoring. Each of these units has duly-assigned functions and responsibilities.

This unit would have a staff comprising 12 professionals and technicians during execution of the component.

SERLA

SERLA will be responsible for executing the drainage projects, for a direct cost under the project of US$9.3 million. The president of SERLA is the highest authority and the duties and responsibilities have been distributed among the following departments: (i) studies and projects; (ii) works; (iii) operation and conservation; (iv) plans; and (v) financial administration. The operation and maintenance department has ten regional offices.

This institution has broad experience in executing this type of works, and currently is executing works under a program partially financed by the World Bank for a cost of US$90 million, the São Gonçalo-Niterói program for US$6 million and the complementary Acaraí Bay project for US$4 million.

The cost of the maintenance of the works will be covered with resources transferred by the state to SERLA. The institution has an operation and maintenance department to conduct this activity, as mentioned previously. That department has divisions for: (i) equipment, which is responsible for maintenance and operation of the equipment SERLA has for this activity; and (ii) operation, which is responsible for scheduling the maintenance activities.

FEEMA

As described in chapter II of this document, the program includes components referred to as complementary environmental projects that were

grouped into subcomponents for: (i) environmental pollution control; (ii) environmental monitoring; and (iii) environmental education. FEEMA will be responsible for execution of most of this component. FEEMA prepared a basic document that defines each subcomponent indicating its objectives, strategies, schedules, benefits, expected results and necessary resources. IEF, SERLA and SEMAN will also participate in execution.

In the subcomponent for control of industrial pollution, FEEMA will commence with corrective control in industries that have treatment plants to ensure they are operating properly. The next action will concern industries that need to build plants and have designs approved by FEEMA. Finally, it will monitor industries that require studies to define the necessary control actions. The control planning is reflected in the document mentioned previously.

The environmental monitoring subcomponent will be executed by FEEMA with the help of IEF, SERLA and SEMAN. There will be three activities to monitor water quality in the bay's drainage area and the quality of the beaches.

The environmental education subcomponent will be coordinated by FEEMA and execution is planned through three activities. The environmental education activities will involve education agencies of the state and municipal governments, and also the community. Starting from key issues involving sanitation, drainage, resettlement and solid waste, the community will be encouraged to participate and become involved in the environmental problems of the area. Environmental conservation and management demonstration units will be set up.

Three working groups have been set up within FEEMA to manage these three subcomponents and the technical members of each group (60 in all) have been identified.

Although FEEMA's budget has been insufficient in recent years, it has a competent technical group for execution. With an adequate budget (see Recommendations) and equipment purchased under the project, FEEMA will be able to execute its program component.

CIDE

The Rio de Janeiro Information Center Foundation (CIDE) is responsible for executing the digital mapping component. This is an agency of the Government of the State of Rio de Janeiro created in 1987 to generate and maintain data banks and basic statistics on physical, economic, social and environmental aspects of the state. To manage the component, CIDE will set up an executing unit within its technical department, which will be responsible for coordinating the activities of several divisions and technical and administrative offices that will be involved in execution and operation of the component.

Although CIDE has a good professional staff in the area of statistical processing, and has acquired a serious reputation for the dissemination and analysis of socioeconomic data on the state, the agency does not have prior experience in the management of geographical data systems and digitalized data, nor in the management of investment projects and technical assistance as proposed in this program. Accordingly, the executing unit of CIDE will be advised by three external consultancies on execution of the component: (i) a consultant who is an expert in the assembly and use of digitalized mapping systems who will be contracted for 36 months as national advisor to the executing unit; (ii) a consulting firm specializing in project management to take charge of aspects of programming and physical-financial oversight of the component, supervision of service contracts and equipment, preparation of reports and administrative support; and (iii) an international entity specializing in training and technical assistance for geoprocessing of data and mapping systems, to monitor and control the quality of the component through semiannual technical auditing visits.

PROPOSED RESOLUTION [1]

BRAZIL. LOAN /OC-BR TO THE STATE OF RIO DE JANEIRO
(Basic Sanitation Program for the Guanabara Bay Basin)

The Board of Executive Directors

RESOLVES:

That the President of the Bank, or such representative as he shall designate, is authorized, in the name and on behalf of the Bank, to enter into such contract or contracts as may be necessary with the State of Rio de Janeiro, as Borrower, and the Federative Republic of Brazil, as Guarantor, for the purpose of granting the former financing to cooperate in the execution of a Basic Sanitation Program for the Guanabara Bay Basin, hereinafter referred to as the "Program". This Financing shall be subject substantially to the following conditions:

1. Amount and Currencies: Up to US$300,000,000, or its equivalent in other currencies, except that of the Federative Republic of Brazil, which are part of the ordinary capital resources of the Bank, to pay for goods and services acquired through international competition in the member countries of the Bank and for such other purposes as may be specified in the loan contract. Payments of amortization and interest shall be made in the currency or currencies specified by the Bank, in a quantity equivalent to the corresponding amount owed, calculated in units of account in terms of dollars of the United States of America, in accordance with provisions to be included in the loan contract.

2. Source of Funds: The ordinary capital resources of the Bank.

3. Guarantee: The joint and several guarantee of the Federative Republic of Brazil.

4. Credit Fee: 0.75% per annum on the undisbursed portion of the Financing, commencing to accrue 60 days after the date of the loan contract and payable in dollars of the United States of America on the same dates as the interest.

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[1] The provisions contained in this Appendix I and in Appendices III and IV will be final only when the Board of Executive Directors has approved the loan proposal.

5. Amortization: The Borrower shall amortize the loan in a period of 25 years from the date of the loan contract, by means of semiannual, consecutive, and, insofar as possible, equal installments. The first installment shall be paid on the first interest payment date, six months after the date scheduled for the last disbursement of the Financing.

6. Interest: The Borrower shall pay interest semiannually on the daily outstanding balances of the loan. The first payment shall be made six months after the date of the loan contract. The Bank shall determine the rates of interest to be applied during the life of the loan, in accordance with the lending rate policy of the Bank.

7. Disbursement: The term for disbursement of the Financing shall expire five years after the effective date of the loan contract.

8. Special Conditions:

   (a) The execution of the Program and the utilization of the resources of the loan shall be performed in their entirety by the Borrower, through the Companhia Estadual de Águas e Esgotos do Rio de Janeiro (CEDAE), in coordination with the Coordinating Committee of the Guanabara Bay Sanitation Program.

   (b) The resources of the loan, together with the resources of loan __/SF-BR, shall be used to participate in the execution of a project, the total cost of which is estimated at the equivalent of US$793,000,000. Consequently, the loan and guarantee contracts shall contain the appropriate provisions to ensure that such resources as may be necessary, in addition to those of the two loans, for the complete execution of the Program shall be duly provided, in an amount estimated at the equivalent of US$443,000,000, in accordance with a schedule of investments satisfactory to the Bank, which may include resources from the Overseas Economic Cooperation Fund ("OECF").

   (c) Prior to the first disbursement of the Financing, the Borrower, through the Executing Agency, shall present to the satisfaction of the Bank:

      (i) evidence that: (A) it has created an executing unit, reporting directly to the President of the Executing Agency, with an organizational structure and staff acceptable to the Bank; and (B) the administrative department and the legal advisory office of the Executing Agency have adequate staff to carry out their activities;

(ii) an agreement signed by the Borrower and the Executing Agency whereby the Borrower undertakes to transfer to the Executing Agency the resources necessary to execute the Program, and the Executing Agency undertakes to furnish the counterpart resources for the sanitation works, repay to the State the resources of the Financing expended in sanitation works, execute the Program in keeping with the provisions of the loan contract, and comply with the other obligations deriving from it;

(iii) agreements between the Executing Agency and each of the following entities, establishing the responsibilities and obligations of the respective entity in executing the Program components for which it is responsible, and the responsibilities of the Executing Agency with regard to transferring resources to the entity, in accordance with drafts agreed to in advance with the Bank: Secretaria de Obras e Serviços Públicos ("SOSP"); Fundação Estadual de Engenharia do Meio Ambiente ("FEEMA"); Instituto Estadual de Florestas ("IEF"); Fundação Centro de Informações e Dados do Rio de Janeiro ("CIDE"); Fundação Superintendência de Rios e Lagoas ("SERLA"); and Secretaria de Estado de Meio Ambiente e Projetos Especiais ("SEMAN");

(iv) an agreement between the OECF and the Borrower, whereby the OECF undertakes to finance part of the Program, in keeping with the Program objectives and description;

(v) evidence that a consulting firm has been contracted to assist the Executing Agency in general Program management during the execution period, with respect to that part of the Program financed wholly or partially by the Bank; and

(vi) (A) evidence that the Borrower has included in the budget proposal for 1994 sufficient resources for FEEMA's activities in the areas of industrial pollution control and environmental monitoring; and (B) a plan for implementing FEEMA's Program for Controlling Industrial Pollution with regard to approximately 50 industries that are the heaviest polluters of Guanabara Bay, as specified in that program.

(d) Prior to the first disbursement of the Financing for the solid waste collection and disposal subproject, the Borrower, through the Executing Agency, shall present to

the Bank the separate agreements signed between SOSP and each of the municipalities of Duque de Caxias, São João de Merití, Nilópolis, Magé, São Gonçalo and Niterói.

(e) In the acquisition of machinery, equipment, or other goods for the Program, and in the awarding of construction contracts, the system of public bidding shall be followed in each case in which the value of such acquisitions exceeds the equivalent of US$250,000 or the value of such contracts for the execution of works exceeds the equivalent to US$1,000,000. The bidding shall be subject to the procedures to be attached as an annex to the loan contract. This provision shall not apply to acquisisions made with resources from suppliers' credits or from complementary financing resources.

(f) The Borrower, through the Executing Agency, shall take appropriate measures acceptable to the Bank in order that the rates for all the services provided by the Executing Agency's systems produce revenues sufficient to cover, at a minimum, all the Executing Agency's operating expenses, including those related to administration, operation, maintenance and depreciation of its restated fixed assets in operation. If the application of the foregoing does not generate sufficient resources to cover timely and full service of all the obligations of the Executing Agency and a percentage of the annual investment program for the above-mentioned services, the Executing Agency or the Borrower shall, within their respective spheres of competence, take the necessary measures, which may include rate increases, to obtain the additional resources to achieve that purpose.

(g) The Bank shall establish such inspection procedures as it deems necessary to assure the satisfactory execution of the Program, and the Borrower and the Guarantor shall extend all cooperation which is required for the most effective accomplishment of this purpose. From the amount of the financing the sum of US$3,000,000 shall be allocated for credit to the income accounts of the Bank to meet expenses of general inspection and supervision.

PROPOSED RESOLUTION [1/]

BRAZIL. LOAN /SF-BR TO THE STATE OF RIO DE JANEIRO
(Basic Sanitation Program for the Guanabara Bay Basin)

The Board of Executive Directors

RESOLVES:

That the President of the Bank, or such representative as he shall designate, is authorized, in the name and on behalf of the Bank, to enter into such contract or contracts as may be necessary with the State of Rio de Janeiro, as Borrower, and the Federative Republic of Brazil, as Guarantor, for the purpose of granting the former financing to cooperate in the execution of a Basic Sanitation Program for the Guanabara Bay Basin, hereinafter referred to as the "Program". This Financing shall be subject substantially to the following conditions:

1. Amount and Currencies: Up to US$50,000,000 in cruzeiros reais which are part of the Bank's Fund for Special Operations to cover local expenses and for such other purposes as may be specified in the loan contract. Payments of amortization and interest shall be made in cruzeiros reais.

2. Source of Funds: The Fund for Special Operations.

3. Guarantee: The joint and several guarantee of the Federative Republic of Brazil.

4. Amortization: The Borrower shall amortize the loan in a period of 25 years from the date of the loan contract, by means of semiannual, consecutive, and, insofar as possible, equal installments. The first installment shall be paid on the first interest payment date, six months after the date scheduled for the last disbursement of the Financing.

5. Interest: 3% per annum, payable semiannually on the amounts outstanding. The first payment shall be made six months after the date of the loan contract.

6. Disbursement: The term for disbursement of the Financing shall expire five years after the effective date of the loan contract.

[1/] The provisions contained in this Appendix and in Appendices III and IV will be final only when the Board of Executive Directors has approved the loan proposal.

7. Special Conditions:

(a) The execution of the Program and the utilization of the resources of the loan shall be performed in their entirety by the Borrower, through the Companhia Estadual de Águas e Esgotos do Rio de Janeiro (CEDAE), in coordination with the Coordinating Committee of the Guanabara Bay Sanitation Program.

(b) The resources of the loan, together with the resources of loan __/OC-BR, shall be used to participate in the execution of a project, the total cost of which is estimated at the equivalent of US$793,000,000. Consequently, the loan and guarantee contracts shall contain the appropriate provisions to ensure that such resources as may be necessary, in addition to those of the two loans, for the complete execution of the Program shall be duly provided, in an amount estimated at the equivalent of US$443,000,000, in accordance with a schedule of investments satisfactory to the Bank, which may include resources from the Overseas Economic Cooperation Fund ("OECF").

(c) Prior to the first disbursement of the Financing, the Borrower, through the Executing Agency, shall present to the satisfaction of the Bank:

(i) evidence that: (A) it has created an executing unit, reporting directly to the President of the Executing Agency, with an organizational structure and staff acceptable to the Bank; and (B) the administrative department and the legal advisory office of the Executing Agency have adequate staff to carry out their activities;

(ii) an agreement signed by the Borrower and the Executing Agency whereby the Borrower undertakes to transfer to the Executing Agency the resources necessary to execute the Program, and the Executing Agency undertakes to furnish the counterpart resources for the sanitation works, repay to the State the resources of the Financing expended in sanitation works, execute the Program in keeping with the provisions of the loan contract, and comply with the other obligations deriving from it;

(iii) agreements between the Executing Agency and each of the following entities, establishing the responsibilities and obligations of the respective entity in executing the Program components for which it is responsible, and the responsibilities of the

Executing Agency with regard to transferring resources to the entity, in accordance with drafts agreed to in advance with the Bank: Secretaria de Obras e Serviços Públicos ("SOSP"); Fundação Estadual de Engenharia do Meio Ambiente ("FEEMA"); Instituto Estadual de Florestas ("IEF"); Fundação Centro de Informações e Dados do Rio de Janeiro ("CIDE"); Fundação Superintendência de Rios e Lagoas ("SERLA"); and Secretaria de Estado de Meio Ambiente e Projetos Especiais ("SEMAN");

(iv) an agreement between the OECF and the Borrower, whereby the OECF undertakes to finance part of the Program, in keeping with the Program objectives and description;

(v) evidence that a consulting firm has been contracted to assist the Executing Agency in general Program management during the execution period, with respect to that part of the Program financed wholly or partially by the Bank; and

(vi) (A) evidence that the Borrower has included in the budget for 1994 sufficient resources for FEEMA's activities in the areas of industrial pollution control and environmental monitoring; and (B) a plan for implementing FEEMA's Program for Controlling Industrial Pollution with regard to approximately 50 industries that are the heaviest polluters of Guanabara Bay, as specified in that program.

(d) Prior to the first disbursement of the Financing for the solid waste collection and disposal subproject, the Borrower, through the Executing Agency, shall present to the Bank the separate agreements signed between SOSP and each of the municipalities of Duque de Caxias, São João de Merití, Nilópolis, Magé, São Gonçalo and Niterói.

(e) In the acquisition of machinery, equipment, or other goods for the Program, and in the awarding of construction contracts, the system of public bidding shall be followed in each case in which the value of such acquisitions exceeds the equivalent of US$250,000 or the value of such contracts for the execution of works exceeds the equivalent to US$1,000,000. The bidding shall be subject to the procedures to be attached as an annex to the loan contract. This provision shall not apply to acquisitions made with resources from suppliers' credit or from complementary financing resources.

(f) The Borrower, through the Executing Agency, shall take appropriate measures acceptable to the Bank in order that the rates for all the services provided by the Executing Agency's systems produce revenues sufficient to cover, at a minimum, all the Executing Agency's operating expenses, including those related to administration, operation, maintenance and depreciation of its restated fixed assets in operation. If the application of the foregoing does not generate sufficient resources to cover timely and full service of all the obligations of the Executing Agency and a percentage of the annual investment program for the above-mentioned services, the Executing Agency or the Borrower shall, within their respective spheres of competence, take the necessary measures, which may include rate increases, to obtain the additional resources to achieve that purpose.

(g) The Bank shall establish such inspection procedures as it deems necessary to assure the satisfactory execution of the Program, and the Borrower and the Guarantor shall extend all cooperation which is required for the most effective accomplishment of this purpose. From the amount of the financing the sum of US$500,000 shall be allocated for credit to the income accounts of the Bank to meet expenses of general inspection and supervision.

RECOMMENDATIONS

A. It is recommended that the following conditions, to be met to the Bank's satisfaction, be included in the loan and guarantee contracts, as applicable, in addition to those set forth in the proposed resolutions:

1. Unless the parties agree otherwise, prior to issuing each call for public bids, or if there is no need for public bids, prior to the acquisition of the goods or the initiation of the works, the Borrower shall submit to the Bank:

   (a) the engineering designs, specifications, budgets and other documents needed for the acquisition or construction and, where applicable, the specific requirements and other documents needed for the call for bids;

   (b) in the case of works, evidence that it has legal possession, easements or other rights to the lands required for the construction of the Program works; and

   (c) evidence that FEEMA has analyzed the construction standards and the specifications books prepared by CEDAE, SOSP and SERLA, which will form part of the contracts for construction of the Program works.

2. Prior to issuing calls for bids for the sanitation works in the Alegria basin, the underwater outfall sewer at Niterói South, the sanitary landfill at Xerém, and the macrodrainage works at Acarí, the Borrower, through the Executing Agency, shall submit to the Bank the preliminary license issued by FEEMA.

3. Prior to awarding the contracts for Program works, the Borrower, through the Executing Agency, shall submit to the Bank the installation license issued by FEEMA.

4. Prior to issuing calls for bids for the works related to the construction of recycling or composting plants and sanitary landfills, the Borrower, through the Executing Agency, shall submit evidence that the municipalities which will use these plants or landfills are able to guarantee adequate coverage of the solid waste collection service. This evidence will consist of proof that the municipalities have the capacity to provide the collection service, or that they have prepared and approved all the documentation necessary to contract the solid waste collection service out to private companies.

5. Prior to issuing calls for bids for equipment for waste collection and rehabilitation of solid waste transfer stations

in the municipalities of Nilópolis, São João do Merití or Duque de Caxias, the Borrower, through the Executing Agency, shall submit evidence that a solution acceptable to the Bank has been devised for final waste disposal in these three municipalities.

6. Prior to issuing calls for bids for the works to build or expand sanitary landfills at São Gonçalo and Niterói, the Borrower, through the Executing Agency, shall submit to the Bank a plan for the improvement of working conditions and training for the workers who sort the waste at the landfills; prior to initiating the works, the Borrower, through the Executing Agency, shall demonstrate that the measures proposed in the plan are being implemented.

7. The Bank may recognize as part of the local counterpart resources of the Program expenditures up to the equivalent of US$7,000,000 in cruzeiros reais, for studies and engineering designs for the sanitary sewerage and potable water works, incurred prior to [the date of Resolution DE-], but after [eighteen months prior to the date of the resolution authorizing the loan], provided that requirements substantially similar to those set forth in the resolutions and in the loan contracts have been fulfilled.

8. The Borrower, through the Executing Agency or the co-executing agencies, shall: (a) assure that the works and equipment involved in the Program will be adequately maintained in accordance with generally accepted technical standards; and (b) submit to the Bank, within the first quarter of each calendar year during the ten years following completion of the first of the Program works, a maintenance report for the past year on the works and equipment, and the annual maintenance plan for the current year, in accordance with the provisions set forth in Section VI of Appendix IV. If the inspections conducted by the Bank, or reports it receives, reveal that actual maintenance is below agreed-upon levels, the Borrower, through the Executing Agency or the co-executing agencies, shall take appropriate actions to have the deficiencies fully corrected.

9. Within three months from the signature of the loan contracts, the Borrower, through the Executing Agency, shall submit evidence that it has commissioned a master plan for final disposal of solid waste in the municipalities that currently use the sanitary landfill at Gramacho. The master plan shall be submitted to the Bank within 11 months from the effective date of the loan contracts.

10. Within six months after the first disbursement of the Financing for the complementary programs subproject, the Borrower, through the Executing Agency, shall submit to the Bank: (a) the plan of execution for the informatics component of the complementary environmental activities subproject; (b) the

detailed environmental education project together with evidence that the agreements relating to the project have been signed; and (c) the implementation plan for the Program to Control Industrial Contamination in approximately 450 industries identified under that program.

11. Within the first three months of each year, beginning in the second year from the effective date of the loan contracts, and up to one year after the Program has ended, the Borrower, through the Executing Agency, shall demonstrate to the Bank that FEEMA has verified that the industries identified in the stages established in the Program to Control Industrial Contamination are "under control", in accordance with the definition provided in Section VII of Appendix IV. Each year, beginning in the second year from the effective date of the loan contracts, and until one year after the Program has ended, the Borrower shall publish the results of the Program to Control Industrial Contamination in a widely-circulated local newspaper.

12. Beginning in the second year from the effective date of the loan contracts, and annually during Program execution, the Borrower shall include in the proposed budget for the following year the resources needed to allow FEEMA to perform its duties with regard to controlling industrial contamination and environmental monitoring under the Program.

13. Within 12 months from the effective date of the loan contracts, the Borrower shall submit to the Bank a plan to strengthen the internal auditing of the Executing Agency; and 18 months from the effective date of the loan contracts, it shall submit evidence that the plan has been put into practice.

14. Within two years after the final disbursement of the Financing, the Borrower, through the Executing Agency, shall submit to the Bank for approval an ex post evaluation of the results of the Program, based on the methodology and guidelines indicated in Section X of Appendix IV.

15. The financial statements of the Program, during its execution, shall be presented annually to the Bank audited by a reputable independent public accounting firm reasonably acceptable to the Bank, which will perform the audit under the supervision of the National Department of the Treasury. The financial statements of the Executing Agency shall be presented annually to the Bank during the life of the loan contracts audited by a reputable independent public accounting firm reasonably acceptable to the Bank.

B. The loan contracts shall contain an annex substantially similar to Appendix IV, "The Program", of this document.

THE PROGRAM
(Annex A to the loan contracts)

I. Objective

1.01 The Program has three inter-related objectives: (i) to clean up the Guanabara Bay basin and adjacent area; (ii) to improve the quality of life of the residents of the Guanabara Bay basin; and (iii) to strengthen those local government institutions whose activities can positively affect the Bay.

II. Description

2.01 The following six subprojects have been planned to attain these objectives, which cover a series of integrated actions constituting the first phase of cleaning up Guanabara Bay.

2.02 Sewage collection and treatment subproject

(a) This subproject is the responsibility of CEDAE and includes works, goods and installations for the collection, transport and treatment of liquid waste (domestic and industrial) in the Program area, and final disposal of the sludge produced by the treatment plants.

(b) The activities in this component are summarized as follows:

(i) Sanitation works: (1) construction of four primary wastewater treatment plants to treat a total flow of 6.6 m^3/sec; (2) two secondary treatment plants for Gobernador and Paquetá islands to treat an additional flow of 0.25m^3/sec; (3) improvements to the Icaraí and Penha plants for secondary treatment of 2.23 m^3/sec and a 3.9 km underwater outfall sewer; (4) 126 km of trunk sewers, intercepting sewers and outfalls; and (5) 1,000 km of sewers, 117,700 residential connections and 36 pumping stations. [1/]

(ii) In 23 *favelas* in the western part of Guanabara Bay, selected on the basis of the positive effect that the works will have on water quality on the beaches of the bay, construction of approximately 104 km of sewers and approximately 18,400 residential connections; construction, in four *favelas* on

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1/ Small variations are admissible in the figures for the numbers of connections, total flow, kilometrage, and number of water meters.

the eastern side of the Bay, of 17 km of sewers and 2,450 residential connections. [1/]

(iii) Construction of a sanitary landfill at Xerém, municipality of Duque de Caxias, covering 40 hectares, for sanitary disposal of the sludge produced by the sewage treatment plants; procurement of equipment to transport the sludge from the treatment plants to the final disposal site.

2.03 Potable water subproject to be executed by CEDAE

(a) This subproject includes: (A) 5.6 km of water mains (steel, 800 and 600 mm); (B) 14.6 km of feeder pipes for eight tanks at Baixada and two tanks at São Gonçalo (ductile cast iron, 900 to 400 mm); (C) distribution pipes from the tanks (86 km of ductile cast iron pipes, 700 to 150 mm); (D) distribution systems (292 km of PVC pipes, 50, 75 and 100 mm); (E) 24,300 1/2" residential connections and meters; (F) ten reinforced concrete tanks with a total capacity of 107,500 m^3; and (G) a master metering and household metering program which includes: (i) procurement and installation of approximately 525,000 meters and spare parts; (ii) 20-mm PVC or PEAD pipes for domestic connections and accessories; (iii) equipment and tools to improve and expand the capacity of the meter repair shop; and (iv) equipment, materials, software, civil works, installation and assembly of the systems, calibration and fine-tuning of the operations control centers at Guandú and Rio; (H) strengthening of the operations and maintenance capacity of the water and sewerage districts of São Gonçalo and Alcântara; and (I) installation in 12 *favelas* in western Guanabara Bay of 42 km of potable water systems and approximately 6,000 domestic connections; and construction, in 3 *favelas* on the eastern side of the Bay, of 21 km of potable water systems, and installation of 3,100 residential connections. [1/]

(b) A small training program for CEDAE staff and computerization of CEDAE's network mapping systems.

2.04 Solid waste collection and disposal subproject to be executed by SOSP under agreements with the municipalities involved

(a) Nonconventional collection. To reinforce the capacity of the entities responsible for waste collection and street sweeping in urban areas with difficult access and limited financial resources, specialized equipment will be procured such as mini-tractors, carts, transport vehicles, stationary boxes and containers of different types. Parking garages for the vehicles, depots for materials, and posts for workers will be built.

[1/] Small variations are admissible in the figures for the numbers of connections, total flow, kilometrage, and number of water meters.

(b) Transfer stations

The transfer stations in the municipalities of Nilópolis (87 tons/day) and São João de Merití (275 tons/day) will be rehabilitated and the vehicles used to transport the transferred waste will be replaced.

(c) Recycling and incineration plants

Plants to recycle materials and produce compost will be built in the municipalities of Niterói (300 tons/day), São Gonçalo (380 tons/day) and Magé (125 tons/day). Incinerators for medical and hospital waste with capacities ranging from 50 to 250 kg/h will be installed in five municipalities.

(d) Sanitary landfills

The sanitary landfills at Niterói (90 tons/day) and São Gonçalo (150 tons/day) will be equipped to receive non-recyclable materials and a sanitary landfill will be built at Magé (30 tons/day) for the same types of materials.

(e) Institutional strengthening

Institutional strengthening will be provided for the companies or municipal agencies responsible for providing these services.

2.05 Canal and river drainage subproject to be executed by SERLA

(a) Three drainage works will be built in the Acarí River basin: (i) repair of retaining walls along a 1.27 km section of the Rio das Pedras; (ii) construction of a gallery and channeling of a 2.4 km section of the Timbó Superior and Timbó II rivers; and (iii) channeling of a 1.5 km section of the Piraquara River.

2.06 Complementary programs subproject - control of industrial pollution, environmental monitoring and environmental education - to be executed by FEEMA

(a) Control of environmental contamination

Institutional support will be provided for FEEMA to give continuity to its activities to control industrial pollution and to improve the agency's efficiency in dealing with technical mishaps in the area.

(b) Environmental monitoring

A series of activities will be coordinated by FEEMA, IEF, the Department of the Environment and Special Projects and SERLA to monitor water quality in rivers, the sea, beaches, underwater

outfalls and mangrove forests, including an integrated master management plan for water resources in the affluents of Guanabara Bay.

(c) Environmental education project

Educational activities will be conducted to complement the sanitation projects. The target public includes primary and secondary school pupils, the community, nongovernmental organizations, public agencies, and public and private sector leaders. The activities will include: (i) environmental education and participative communications, including dissemination of the results of the environmental monitoring plan; (ii) development of environmental management models; and (iii) studies and implementation of conservation units.

2.07 Digital mapping and municipal institutional development subproject to be executed by CIDE

(a) Updating the cadastral systems of the local governments in the Program area to improve their financial situation and urban environmental planning capability; creation, within the Rio de Janeiro Information Center Foundation (CIDE), of the capacity to store, process and analyze geographic information on the regional level, to allow CIDE to advise on physical and environmental planning in Guanabara Bay basin.

(b) Specifically, geoprocessed information systems will be set up in CIDE and the 12 municipalities in the area, with input from digital aerial mapping. All the municipalities will be provided with graphic geoprocessing stations. In the case of CIDE, in addition to the basic geoprocessing equipment, a station with Geographic Information System (GIS) equipment and software and additional mapping information from satellite imaging will be provided.

(c) Technical assistance and institutional strengthening to reinforce the tax, information and planning systems of the municipalities and to coordinate the information systems between the municipalities and CIDE.

III. Total cost of the Program and financing plan

3.01 The estimated total cost of the Program is the equivalent of US$793,000,000, in accordance with the following investment categories and sources of financing:

Total Cost and Financing Plan
(US$ Millions)

CATEGORY	IDB RESOURCES		LOCAL COUNTERPART		TOTAL COST	%
	OC	FSO	OECF*	RIO & CEDAE GOV'T		
I. Engineering & Administration	0	10,3	14,3	23,6	48,2	6,08
1.1 Studies and designs	0	8,3	6,5	7,2	22,0	
1.2 Supervision	0	2,0	7,8	14,3	24,1	
1.3 Administration	0	0,0	0,0	2,1	2,1	
2. Direct Costs	257,3	30,0	245,0	36,2	568,5	71,69
2.1 Potable water	104,6	0	0	15,6	120,2	
2.2 Sewerage	148,9	0	245,0	12,0	405,9	
2.3 Drainage	0	9,3	0	0	9,3	
2.4 Solid wates	0	14,9	0	0	14,9	
2.5 Complementary activities	0	5,8	0	1,9	7,7	
2.6 Digital Mapping	3,8	0	0	6,7	10,5	
3. Concurrent Costs	6,0	3,9	0	10,7	20,6	2,60
3.1 Land and rights-of-way	0	0	0	2,0	2,0	
3.2 Training	0	0	0	1,5	1,5	
3.3 Institucional support	6,0	3,9	0	5,7	15,6	
3.4 Solid waste master plan	0	0	0	1,5	1,5	
4. Unallocated	33,7	5,3	34,9	4,1	78,0	9,80
4.1 Contingencies	31,6	5,3	33,0	4,1	74,0	
4.2 Escalation	2,1	0	1,9	0	4,0	
5. Financial Costs	3,0	0,5	0	74,2	77,7	9,80
5.1 Interest	0	0	0	69,9	69,9	
5.2 Credit fee	0	0	0	4,3	4,3	
5.3 Inspection and supervision	3,0	0,5	0	0	3,5	
Total	300,0	50,0	294,2	148,8	793,0	100,0
%	37,8	6,3	37,1	18,8	100,0	%

* Corresponds to OECF cofinancing of 31,475 billion yen. The distribution among investment categories is estimated.

IV. Procurement

4.01 (a) When goods to be procured or services to be contracted for the Program, including those related to transportation or insurance, are to be financed in whole or in part with foreign exchange from the Financing, the procedures and specific requirements for the bidding or other forms of contracting shall permit the unrestricted participation of suppliers of goods and services from member countries of the Bank. Consequently, no conditions that would prevent or restrict the offer of goods or the participation of contractors from such countries shall be established in such procedures or specific requirements.

(b) For the purposes of the provisions set forth in Annex B, "Tender Procedures", Section 3.04, of the loan contracts, the system of prequalification or registry of bidders shall be utilized in tender procedures for the execution of the sanitary landfill works at Xerém and the underwater outfall at Icaraí.

V. Consulting services

5.01 In the selection and contracting of consulting services to be financed in whole or in part with resources from the Financing: (i) the procedures established in Annex C to the loan contract shall apply, and (ii) no conditions or stipulations may be established that would restrict or prevent the participation of consultants from the Bank's member countries.

5.02 With respect to consulting services to be financed with resources of the local counterpart:

(a) Before tendering consulting services that are to be financed with resources of the local counterpart, the Borrower shall reach agreement with the Bank with regard to the terms of reference for the services, and public bidding in accordance with Brazilian legislation shall be used.

(b) Before contracting the services, the Borrower shall inform the Bank of the names and background of the firms selected and the value of the contracts.

This provision does not apply when resources from the complementary financing are used for such contracts.

VI. Maintenance

6.01 The purpose of the maintenance shall be to preserve all the works of the Program in accordance with generally accepted technical standards. For this purpose, at the end of the first year after the loan contract becomes effective, the Borrower, through the Executing Agency, shall submit a plan, defining participation by private firms, for the operation and maintainenance of two treatment plants to be financed with Program resources and having a capacity of 1 m^3/second or greater.

6.02 The first annual maintenance report shall correspond to the fiscal year subsequent to that in which the first of the Program works went into operation.

6.03 The annual maintenance report shall include: (i) details of the organization responsible for maintenance, the personnel involved, and the number, type, and condition of the maintenance equipment; (ii) the location, size, and condition of the repair, storage and maintenance facilities; (iii) information pertaining to the amounts spent on maintenance during the preceding year and in the current year, and the amount to be allocated in the budget the following year; and (iv) a report on the operating efficiency achieved by the maintenance and on the status of maintenance, based on the evaluation system established by the Borrower.

VII. Definition of an industry "under control"

An industry is considered "under control" when FEEMA has performed the following actions:

(i) classification of the industry;

(ii) definition of actions to control sources of contamination to have the effluents conform to the quality standards established in current Brazilian legislation;

(iii) negotiation of a plan of action;

(iv) analysis of the proposed control measures;

(v) monitoring implementation of the measures; and

(vi) analysis of and follow-up on the self-monitoring program.

VIII. Semiannual reports

8.01 The Borrower shall include in the reports required pursuant to Article 7.03 (i) of the General Conditions, information on the progress of the program to control industrial pollution, including, *inter alia*: (a) the results of semiannual meetings with the community, through the State Environmental Control Commission, with support from FEEMA; (b) the number of industries and the average daily organic load discharged per industry into the public sewer system in the rivers and Guanabara Bay; and (c) information on included and excluded industries, classified and unclassified industries, plans requested, plans submitted (approved and under study), wastewater treatment systems (in implementation and cases solved), industries being monitored, and industries that have been fined or otherwise penalized.

IX. Rates of return

9.01 For the purposes of Appendix I, paragraph 8 (f), and Appendix II, paragraph 7 (f), the net internal generation of funds of the Executing Agency shall be sufficient to finance at least 40% of its annual plan of investments. Net internal generation of funds is understood to mean internal generation of funds net of debt service. Internal generation of funds is understood to mean total operating revenues, less operating costs, not including depreciation and amortization costs, financial costs and nonoperating results.

X. Ex post evaluation

For the purposes of evaluating the socioeconomic impact of the Program and the extent to which its objectives have been attained, the Borrower shall submit an ex post evaluation report to the Bank which shall include an analysis of the impact of the Program on the coverage and

quality of potable water and sanitary sewerage services, and pollution levels in rivers and on beaches. This analysis shall include a comparison of the results of the Program with the ex ante assumptions. It shall also include an analysis of rates and the financial situation of CEDAE and the operating efficiency of the potable water, sewerage and wastewater treatment systems. This report shall be submitted at the end of the second year following the final disbursement of the financing.