

4.7.5 Monitoring Program Required for the Project

Effluent Water Quality monitoring during operation is proposed as follows,

Items		Sampling Frequency
Water quality parameters	pH, BOD, SS, and Total & Fecal Coliforms	Once every week
Harmful substances	Heavy metals* Organic materials*	Once every month

* Items should be selected based on Conama Resolution 20-Article 21, 1986

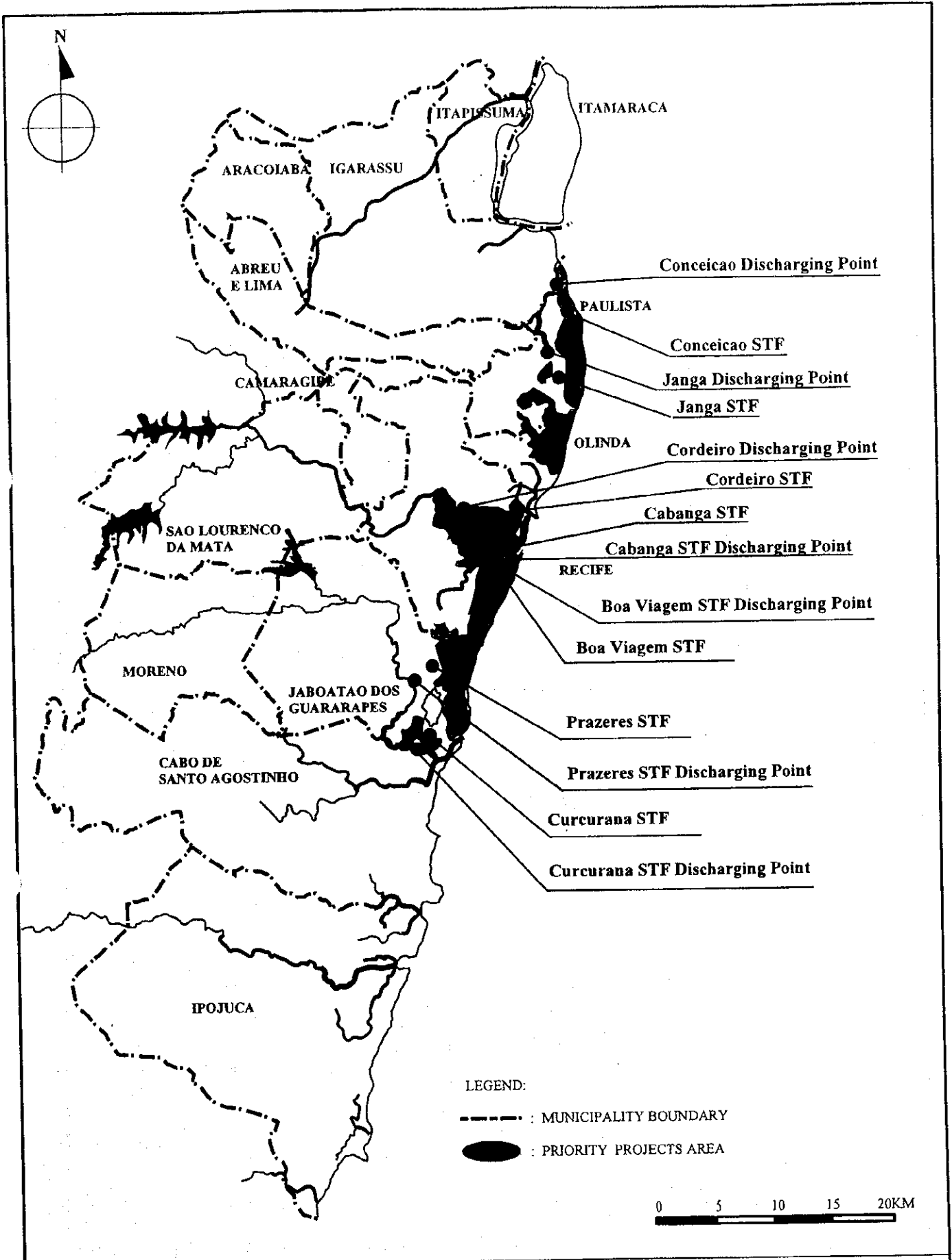


Figure 4.7-1

Location of Sewage Treatment Facility and Effluent Discharging Point

THE STUDY ON STORMWATER DRAINAGE AND SEWERAGE MANAGEMENT PLAN FOR RMR

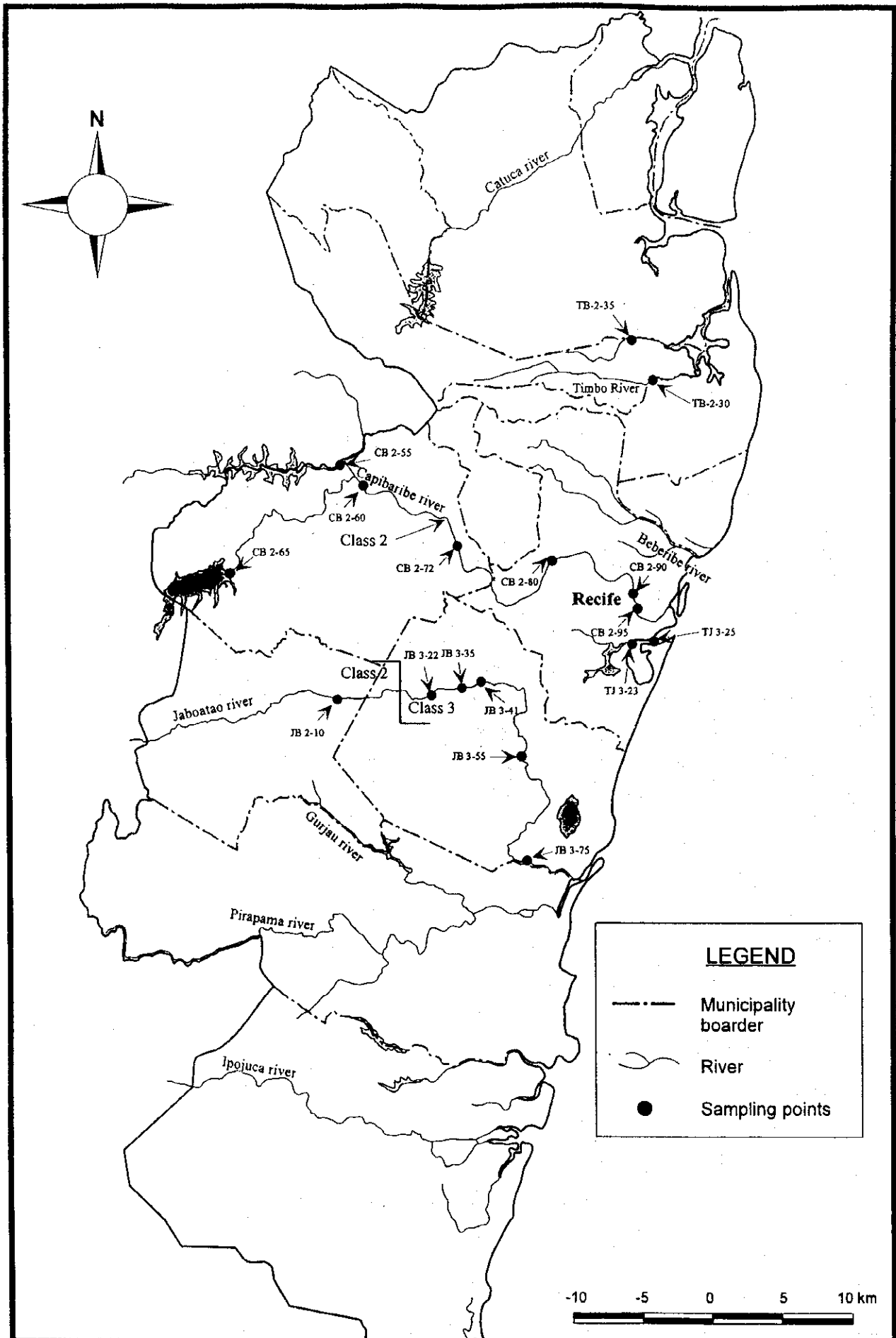


Figure 4.7-2 Monitoring Stations by CPRH (Timbo, Capibaribe, Tejipio, Jaboatao rivers)

THE STUDY ON STORMWATER DRAINAGE AND WASTEWATER MANAGEMENT PLAN FOR RMR

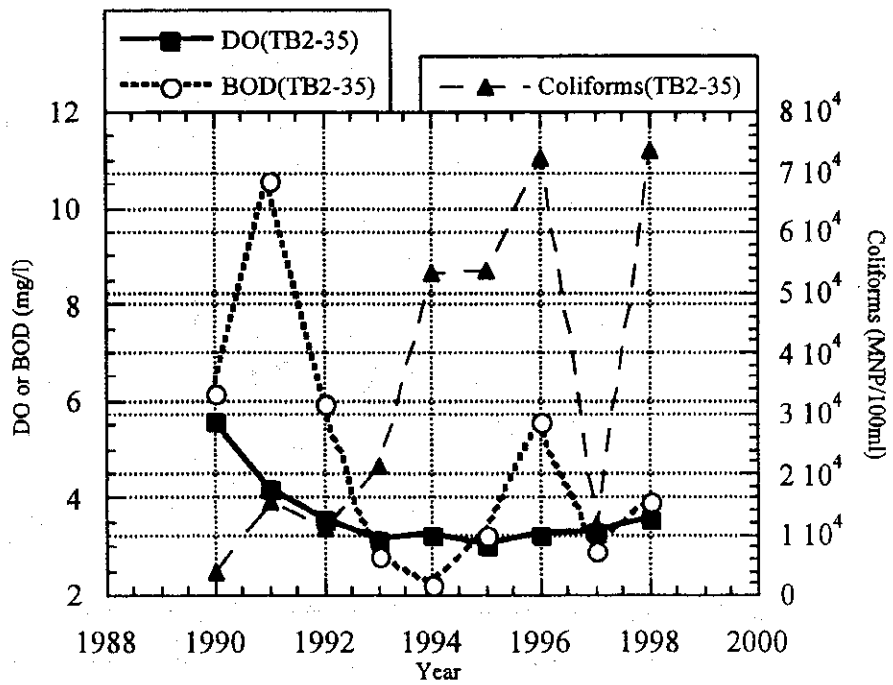
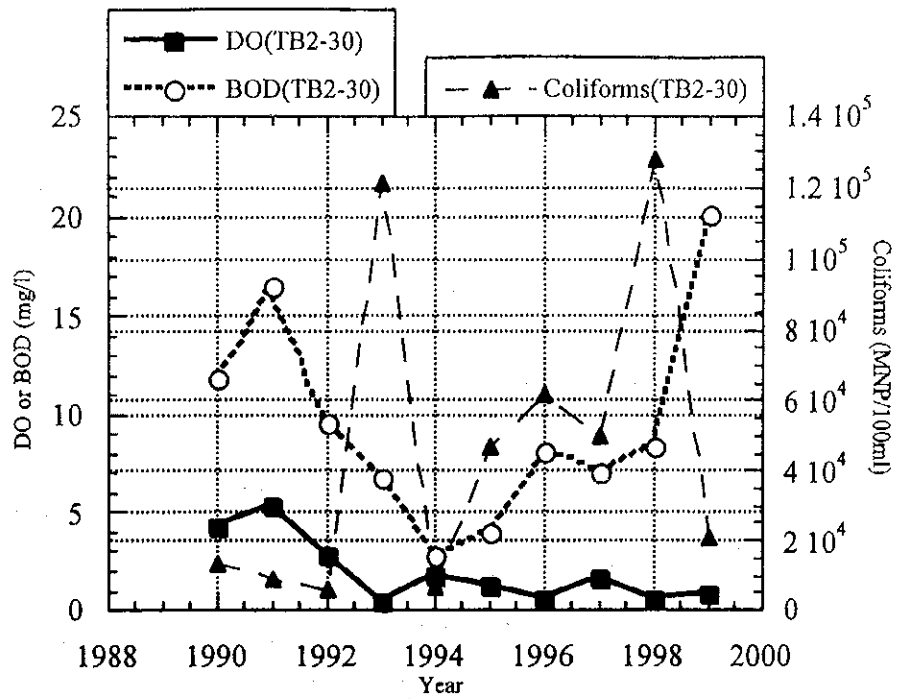


Figure 4.7-3 The Results of Timbo River Water Quality Monitoring, CPRH (1990 - 1999)

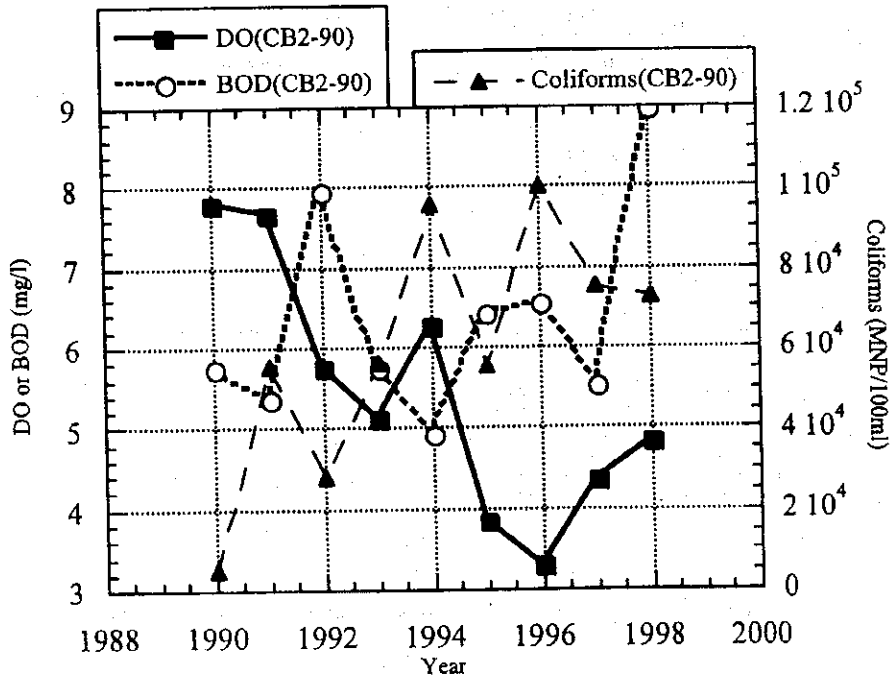
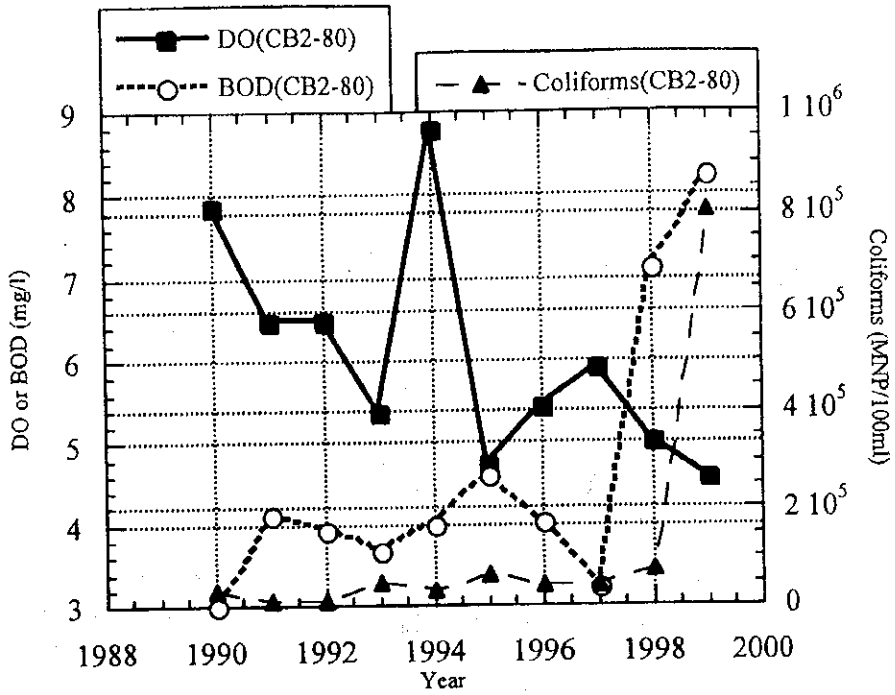


Figure 4.7-4 The Results of Capibaribe River Water Quality Monitoring, CPRH (1990 - 1999)

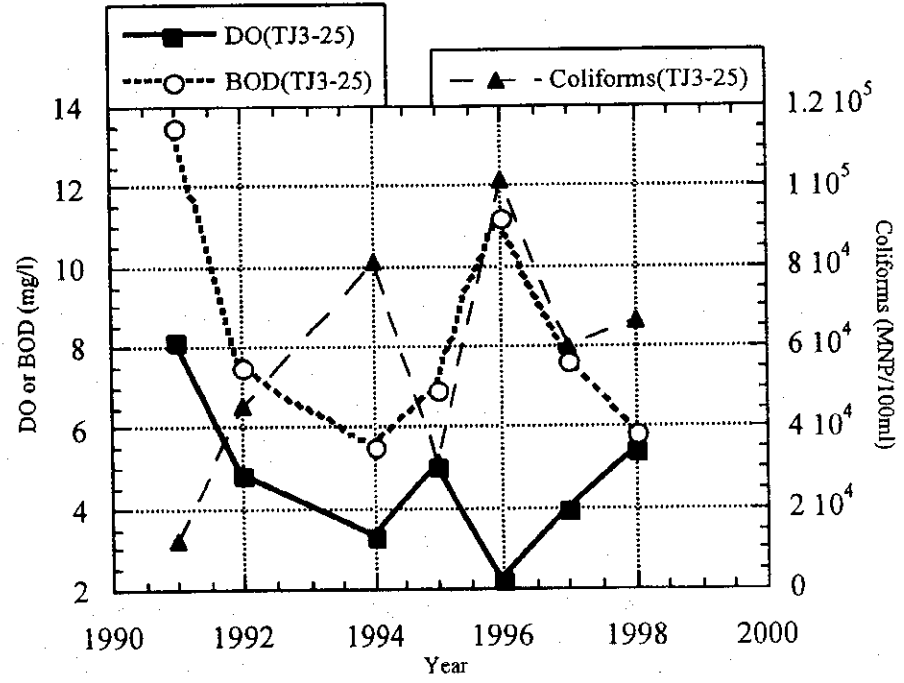
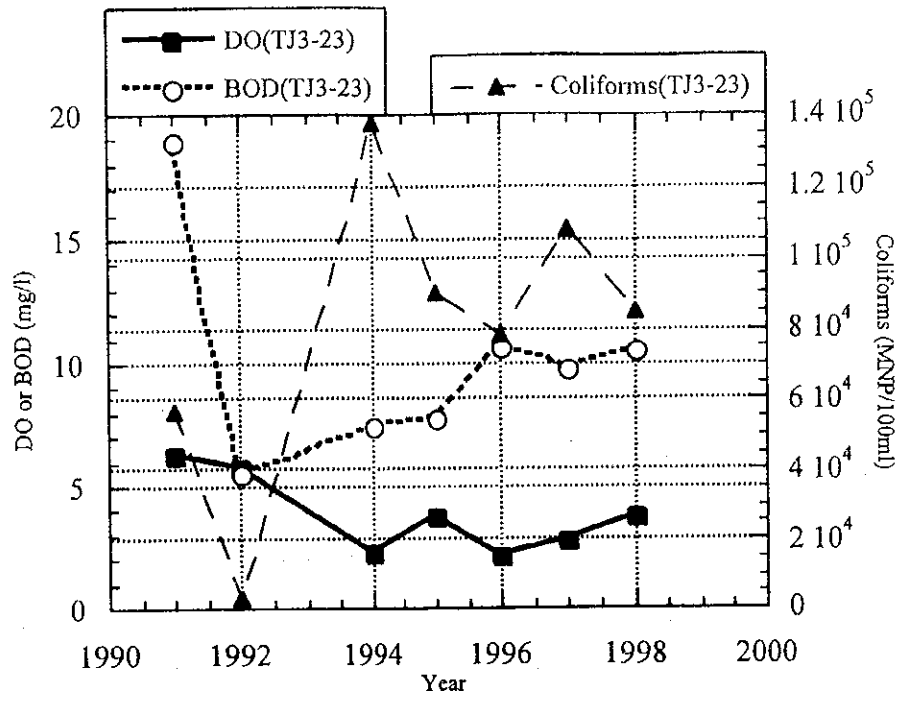


Figure 4.7-5 The Results of Tejipto River Water Quality Monitoring, CPRH (1991 - 1998)

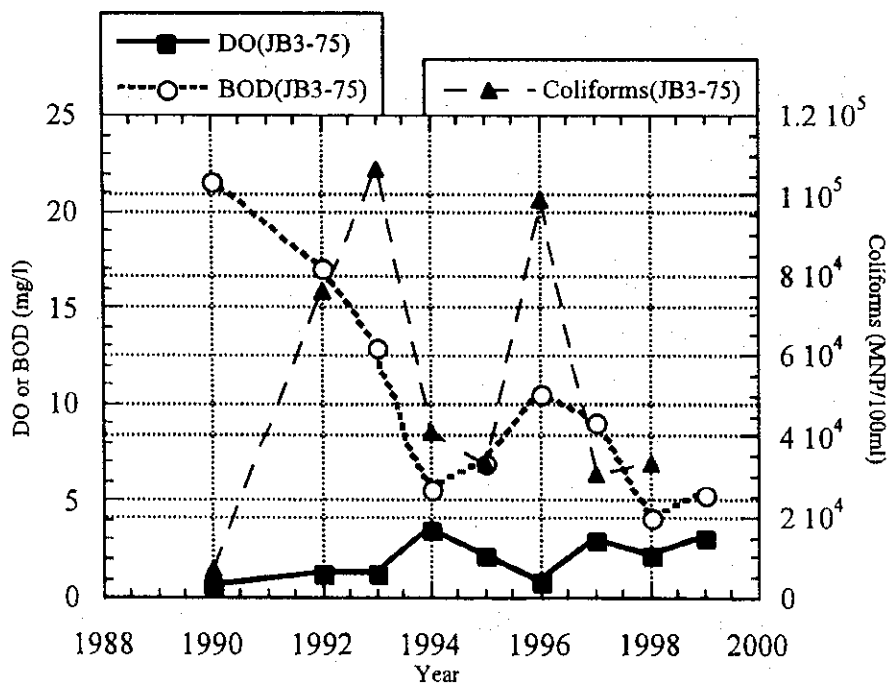
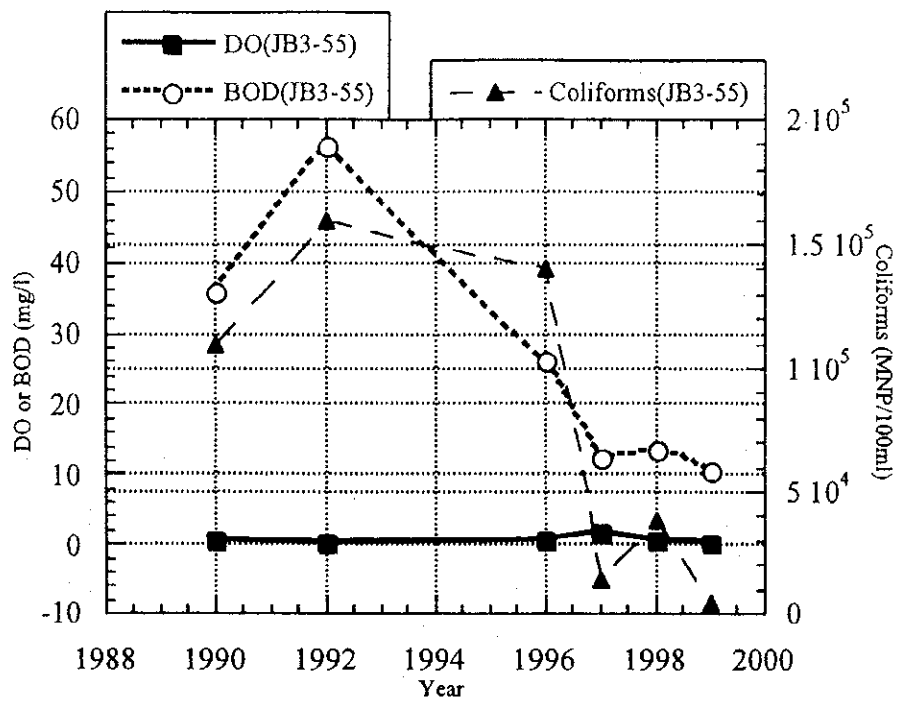


Figure 4.7-6 The Results of Jaboatao River Water Quality Monitoring, CPRH (1990 - 1999)

4.8 PROJECT EVALUATION

4.8.1 General

In this Chapter the proposed projects are discussed from the financial and economic point of view, and also their technical, social and environmental effects are assessed as in the Master Plan. In the financial analysis, project management is discussed from the viewpoint of financial management through financial simulation of the projects.

The proposed projects are inspected to see whether or not they are viable from the socio-economic viewpoint. The economic evaluation examines the viability of the proposed project in terms of social investment in the national economy. The financial evaluation tests the earning capacity and fund management of the project. The financial simulation of the proposed project is presented in the financial analysis section. In addition, aspects of management are discussed in this section.

4.8.2 Financial Analysis

(1) Overview of Financial Analysis

The projects proposed in this feasibility study are urgent schemes, which were formulated as the first stage of the sewage treatment systems in the master plan. In this section, they are evaluated from the financial point of view. After that, financial analysis, employing simulation techniques aims to establish a financial plan for the proposed projects. The analysis is based on the following preconditions.

- 1) The tariff structure approved in 1997 by COMPESA is in effect, although COMPESA is applying to revise its tariffs so as to fully recover the costs of sewage treatment services.
- 2) The proposed projects in this feasibility study are expected to have long-term financial sustainability.
- 3) The organizational restructuring for the operation and maintenance of sewage treatment services will ensure the long-term financial viability of the managing entity by ensuring full cost recovery.
- 4) The management proposed in this study will improve performance efficiency by the reduction of ground infiltration, revised commercial practices and the provision of staff incentives.
- 5) The management body is assumed to be a new organization, which manages only the projects proposed in this study, although they are still under the aegis of COMPESA.
- 6) Construction work of the proposed projects is planned to start in 2002 and operations are

due to start in 2007. The operations of existing plants will continue without interruption.

The financial simulation is based on a financial projection model utilizing various financial conditions and assumptions. Through this simulation, the model suggests the relation between the sewage service tariff and the financial management conditions that were adopted by this feasibility study. In order to assess the financial implications and long-term viability, critical elements of the proposed projects will be elucidated and countermeasures proposed.

(2) Financial Viability of Proposed Projects

The proposed projects in the feasibility study will be evaluated in the same manner as in the master plan. The financial viability is examined by means of a financial indicator - "FIRR". If viability is doubtful from the financial point of view, constraints are identified and analyzed, and some countermeasures are discussed in this analysis.

In the evaluation procedure of the feasibility study, however, there are two preconditions, which differ from those of the master plan. They are: (1) the construction costs are estimated more precisely and disbursed in accordance with the scales of investment during the respective construction schedules from 2002 to 2010; (2) the sewage treatment volume during the construction period is assumed to increase in proportion to the investment made during piping construction schedules from 2004 to 2010.

The revenue of the proposed project accrues from payments for sewage services by new users. COMPESA lays down the sewage service tariff as a surcharge on water consumption in their service areas. Charging rates are set on the basis of the type of sewage collection system, such as conventional or condominiumal systems.

The sales amount from water supply services is calculated as a product of the unit rates settled in the tariff and the water volume consumed. The sales amount of sewage treatment services is based on the water sales amount. The surcharge rates to water charges are applied to users whether or not they have water meters. Applying these charging rates, the monthly financial results of water supply and sewerage services are summarized from July 1999 onwards on the basis of COMPESA's financial records. The average charging rate of sewage treatment services was calculated at R\$0.84 per m³, as analysed in the master plan. In the feasibility study, this rate will be applied to estimate the revenue from sewage treatment services.

The charged volume is calculated at 392 thousand m³/day or 68 million m³/year in 2010, the target year of the feasibility study. Then, the total revenue of the proposed projects is calculated at R\$57 million per year, applying the average unit rate of R\$0.84 per m³. These figures have

been broken down for each sewerage system as shown in the table below.

Revenue of the Proposed Project: 2010

Sewerage System Proposed	Annual Sewage Treatment Volume (1000 m ³ per Year)	Annual Revenue from Sewage Treatment Services (R\$ 1000 per Year)
1. Conceição	3,449	2,897
2. Janga	17,694	14,863
3. Cabanga	16,733	14,055
4. Boa Viagem	7,991	6,712
5. Cordeiro	5,386	4,524
6. Prazeres	9,452	7,939
7. Curcurana	7,221	6,066
Total	67,925	57,057

The financial construction costs of the proposed projects are estimated in Section 4.6. The total costs of the seven systems were R\$345 million. The costs of the respective systems are shown in the table below.

Financial Costs by Sewerage Treatment System

Sewerage System Proposed	Construction Cost (R\$ Million)	O&M Cost in 2010 (R\$ 1000 per Year)
1. Conceição	24.9	995
2. Janga	77.0	3,358
3. Cabanga	52.9	2,450
4. Boa Viagem	61.2	1,715
5. Cordeiro	29.4	1,282
6. Prazeres	63.1	2,159
7. Curcurana	35.9	1,626
Total	344.5	13,585

The construction costs are assumed to be disbursed in accordance with the construction schedule from 2002 to 2006 or 2007. The operation and maintenance (O&M) cost is required annually during the economic life of the proposed projects. The O&M costs of the proposed systems were estimated at around 6% of the direct construction cost. It is estimated at R\$13.6 million in 2010. The unit cost of O&M is calculated at R\$0.19 per m³ of sewer volume.

The financial evaluation indices calculated on the basis of financial expenditure and revenue during the evaluation period are summarized as follows.

Evaluation Indices

Description	FIRR	B/C ^{*1}	NPV ^{*1} (R\$ Million)
1. Conceição	3.1%	0.47	-11.4
2. Janga	9.9%	0.85	-9.2
3. Cabanga	15.0%	1.22	9.6
4. Boa Viagem	4.1%	0.46	-27.3
5. Cordeiro	6.6%	0.66	-8.7
6. Prazeres	4.9%	0.52	-24.8
7. Curcurana	7.2%	0.68	-9.9
Entire Systems	7.9%	0.71	-81.5

Note: *1 Discounted at 12%.

The evaluation indices of the entire projects are calculated at 7.9% for FIRR, 0.71 for B/C and minus R\$82 million for NPV. The latter two values are the results applying the discount rate of 12%. From the financial point of view, accordingly, the proposed project is not said to be viable, because the FIRRs are lower than the decisive factor of 12%. However, the FIRR of the entire project indicates that the projects could be manageable, if they procure financial sources with an interest rate of less than 7.9%.

If it is desired to have the FIRR of more than 12% only through a revenue increase, the charging rates for all consumers would have to be increased by 40% over present rates. It might not be acceptable for the beneficiaries to be charged the higher rates of sewerage treatment services in the present economic situation. In the future, however, the beneficiaries might accept the higher charge after their living conditions are improved owing to economic development.

On the other hand, it would be possible to make the projects viable if some subsidies for the investment costs were available. The analysis indicates that the projects would be made viable by the covering almost 36% of the capital investment cost with a subsidy.

(3) Financial Conditions of COMPESA

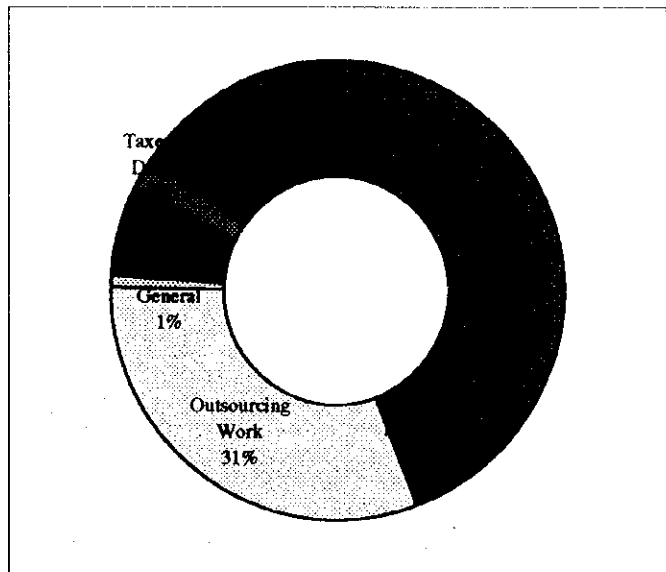
This section shows the present financial situation of COMPESA. According to COMPESA's financial statement and related documents for 1999, it employs an average of 3,844 workers for the services of water supply and sewage sanitation. Services covered water supply to 1.28 million "economias" (consumption units) and sewage sanitation to 0.29 million economias. At present, COMPESA is a state-owned company (a so-called "mixed-economy society"), with more than 99% of shares being held by the State Government.

Table 4.8-1 shows the profit and loss (P/L) table of COMPESA for the five years from 1995 to 1999. The table shows that COMPESA recorded the largest net loss of R\$76 million in 1999. The loss accounts for 42% of the gross revenue (R\$183 million) and 30% of operating expenses (R\$255 million). In 1999, the state suffered a serious drought, so that COMPESA's services were significantly impaired. This is probably the main reason for the large deficit.

The total expenses for operating and maintenance amounted to R\$255 million in 1999. This was distributed as follows: R\$102 million for personnel expenses; R\$11 million for material; R\$79 million for outsourcing works; R\$2 million for general expenses; R\$16 million for depreciation; R\$7 million for taxes and duties; and R\$38 for financial charges. The largest three expenses are for (1) personnel, (2) outsourcing works and (3) financial charges. They accounted for 40%, 31% and 15% of total expenses, respectively. These percentage shares are

illustrated in the figure below. For reference purposes, in Japan, the largest three expenses of public sewage treatment systems in 1992 were (1) 44% of the total expenses for financial charges, (2) 24% for depreciation and (3) 10% for personnel.

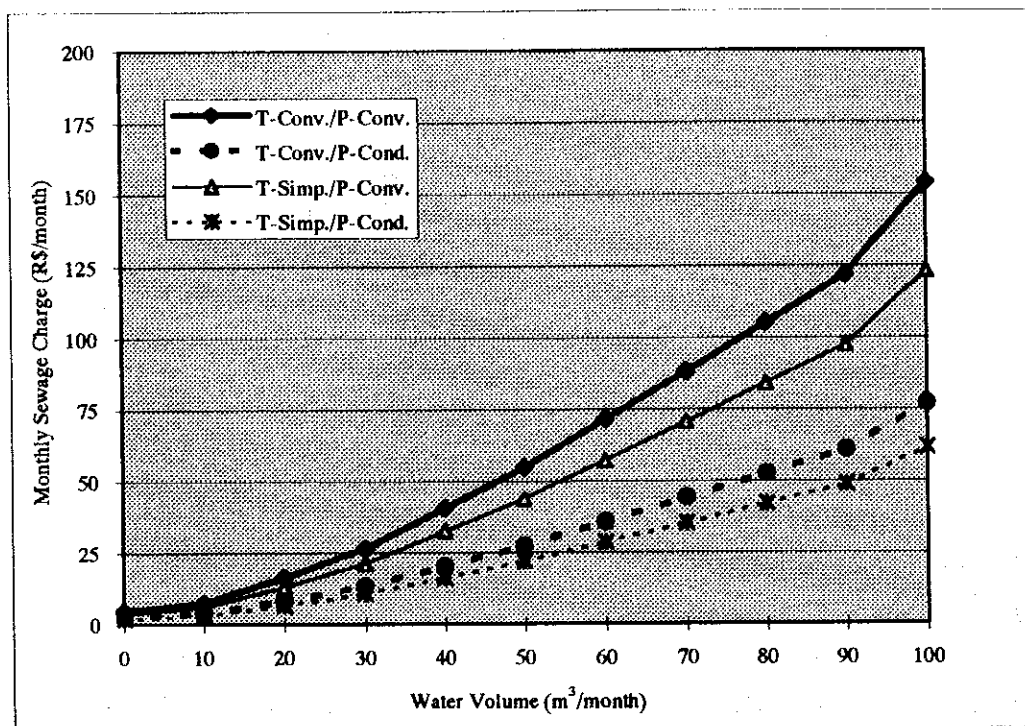
The departmental shares of the total expenses in 1999 are distributed as R\$178 million or 70% of the total for the O&M department, R\$21 million or 8% for the administrative department and R\$11 million or 4% for the commercial department. Total expenses increased from 1995 to 1998 although departmental expenses reduced yearly. In 1999,



they were down 10% on the previous year. This was because management endeavored to cope with income reductions due to the three-year drought.

A current tariff structure of water supply and sewage treatment services is given in Table 2.7-5. As stated previously, sewage treatment service charges are set as a surcharge on water supply charges. The surcharge rates are based on the types of systems of collection and treatment. Their rates range from 100% to 40%, as shown in the tariff table. The sewage treatment charges for residences can be found from the figure below in the next page.

For example, where sewage is treated by COMPESA's conventional treatment systems, households are charged an average of R\$11.90 per month for sewage treatment services, based on a monthly water consumption of 15m³. In the case of simplified treatment systems, the average charge is R\$9.50 per month. On the other hand, if sewage is collected through a condominial system, the charge is R\$5.90 per month using COMPESA's conventional treatment systems and R\$4.70 per month with simplified treatment systems.



The balance sheets of COMPESA for the five years from 1995 to 1999 are shown in Table 4.8-2. The accumulated loss was R\$334 million in 1999, as shown in the table. Over this five years, the loss increased by 45% in relation to the 1995 figure (R\$230 million).

At the end of 1999, COMPESA had fixed assets of R\$520 million for existing facilities after depreciation and R\$187 million for facilities under construction. Among the assets, sewerage systems were assessed at R\$163 million for existing facilities before depreciation and R\$23 million for facilities under construction.

At the end of 1999, COMPESA's receivable sales amounted to R\$136 million, which include not only uncollected charges in 1999 but also those carried forward from previous years. This accounted for 74% of the annual revenue of that year. Although some uncollectible charges were written off as deductible accounts, many uncollected charges have accumulated in this account. Thus, it is not clear how large an item unpaid bills is. Some say that unpaid bills may constitute nearly 20% of total annual revenue. As a matter of fact, the receivable sales figure has increased considerably (R\$12 million to R\$32 million) since 1995. The annual increase of receivable sales was calculated as 15% in 1996, 8% in 1997, 7% in 1998 and 6% in 1999.

Management indicators are useful to diagnose what is wrong in the management of a firm. Indicators are calculated on the basis of financial statements of the firm. The following table shows major management indicators of COMPESA.

Indicator	1995	1996	1997	1998	1999	Ref.* ¹
1 Annual Turnover Ratio of Working Capital	2.26	2.00	2.01	1.59	1.14	2.47
2 Current Ratio	1.37	1.34	1.38	0.96	0.47	2.79
3 Capital Adequacy Ratio	0.31	0.58	0.57	0.55	0.44	0.41
4 Fixed Ratio	290%	145%	146%	149%	184%	218%
5 Ratio of Fixed Assets to Long-term Capital	97%	96%	95%	101%	133%	93%
6 Return on Revenues	9.1%	-0.5%	0.4%	-11.1%	-41.7%	7.8%
7 Return on Assets	2.5%	-0.2%	0.2%	-3.9%	-10.7%	19.8%
8 Return on Equity	7.1%	-0.3%	0.2%	-5.8%	-19.8%	43.9%
9 Labor Productivity	2.1	2.3	2.6	2.5	1.8	4.1**

Note: *1 Indicators of Waterworks in Japan, which serve large-scale towns (more than 300,000 population). The information is quoted from "Management Indicators of Waterworks Business, 1991, Japan Society of Waterworks".

*2 Labor productivity of public sewage treatment systems was reported as 10.0 in 1992.

The current ratio indicates potential liquidity of a firm's current assets. It is to be desired that the ratio be kept more than 1.0 in general. According to the indicators, liquidity (liquid funds such as cash and savings accounts), has been diminishing annually.

A fixed ratio is coverage of fixed assets by equity. It is said that the ratio should be less than 100%. Even if the ratio is more than 100%, at least the ratio of fixed assets to long-term capital (a total of equity and long-term liability) should be less than 100%. In 1998 and 1999, the ratios of fixed assets to long-term capital exceeded 100%. This was mainly caused by the rapid increase of accumulated deficit in 1998 and 1999. This situation could not be improved unless the accumulated loss was canceled.

Return on revenue, return on assets and return on equity are ratios of net profit (loss) to the respective monetary items. According to state decree N° 19251 of December 1994, the return on revenue is expected to be 12% annually (Art. 54). As shown in the table above, however, the return on revenue was smaller than 12% since 1995. In Japan, it is nearly 8% as shown in the table.

Labor productivity seems to be poor in comparison with Japan. In COMPESA, the labor cost yields total revenue of only 1.8 times of the labor cost. These figures in the table are smaller than the Japanese case of 4.1 times. In sewage sanitation entities in Japan, furthermore, the labor productivity was 10.0 in 1992. This either means that COMPESA has too large a labor force for its business activities, or that COMPESA's revenue is too small in comparison with its labor costs. In addition, COMPESA has spent a lot of money on outsourcing. Most of this cost is used to complement the insufficient labor force resulting from a workforce reduction policy. This outsourcing cost, in any case, is included in labor expenses. It can be concluded that labor

productivity is the most serious issue for the management.

(4) Financial Simulation

This section presents the financial simulation of sewage sanitation works of the proposed projects. The financial simulation is based on information on the "existing financial system of sewage treatment services" and "financial conditions of the water sector". We apply an integrated financial simulation model for this analysis. This analysis will indicate the financial problems of the proposed projects and fund requirements for the sewage sanitation works.

The financial model follows conventional accounting principles and standards currently used by commercial enterprises. The accounting for the proposed projects is treated on an accrual basis, and standard commercial procedures are utilized for the accounting of revenue and expense as well as fixed assets and debt obligations. The financial conditions of the existing COMPESA systems are not included in the simulation model, because the JICA study team has little information about water supply and the sewage treatment systems outside the study areas.

1) Conditions and Assumptions for Financial Simulation

In financial simulation, the revenues from the sewage treatment services and the expenditures for operation and maintenance as well as capital investment are estimated on the basis of the proposed sewage sanitation systems. The cost estimators provided these basic estimates. Besides these financial data, the following conditions and assumptions are set-up for the simulation.

1) Projection period: 30 years from 2002 through 2032. The projects start in 2002. In 2007, the sewerage treatment services start and continue through 2032 during their economic life.

2) Price and cost inflation: Projections of both revenues and expenditures were made without inflation to simplify the simulation.

3) Finance for Implementation: Finance for the financial plans are set as follows.

Financial Source	Amount (% of Total Amount)
	Financial Plan
1. Loan (International Agency)	60%
2. Local Government	
1) Capital Investment	40%
2) Other Expenses	
a. Land Acquisition	100%
b. Administration Costs	100%
c. Interests for construction period	100%

* Terms of loan by international agency are as follows: 7.7% annual interest rate, and 20 years repayment period with 6 years (construction period) grace period.

Note: Shortage of Finance during the simulation period is assumed to be provided for by the State Government as is the case with COMPESA.

The interests during construction period are estimated to aggregate to around R\$ 35 million during six years from 2002 to 2007.

4) Sewage treatment service tariff: The tariff is set up by COMPESA, as discussed before. The average unit rate is assumed as R\$0.84 per m³, which was estimated in the master plan. Consequently, the revenue from sewage treatment services is calculated as a product of sewage volume collected and the average rate of R\$0.84 per m³.

5) Business Taxes: Taxes on infrastructure business such as sewage sanitation services in the State of Pernambuco are listed in the table below. As shown in the table, it is assumed that a municipal tax on services is not levied on sewage sanitation services in this simulation.

	Name of Tax	Rate (%)
1.	Corporate Social Contribution on Bills (COFINS)	3.00
2.	Corporate Social Contribution to Social Integration Program (PIS)	0.65
3.	Corporate Income Tax on Profit	25.00
4.	Corporate Social Contribution on Profit	9.00
5.	State Tax on Services and Merchandize Transfers	Exempt
6.	Municipal Tax on Services	Exempt*

*Although sewage sanitation services are not exempt from this tax officially, no service entity has ever paid this tax to its Municipal Government.

The sewage sanitation entity can carry forward its deficit. When it comes into surplus, it can offset the deficit accumulated in the previous years, although the amount for offset is 30% of the surplus annually, at the most.

6) Sewerage connection of users: Within service areas of sewage sanitation covered by COMPESA, every user without any exceptions connects to the sewerage system after 2010. Until 2010, the connections are assumed to increase linearly after the inauguration of the sewerage treatment systems.

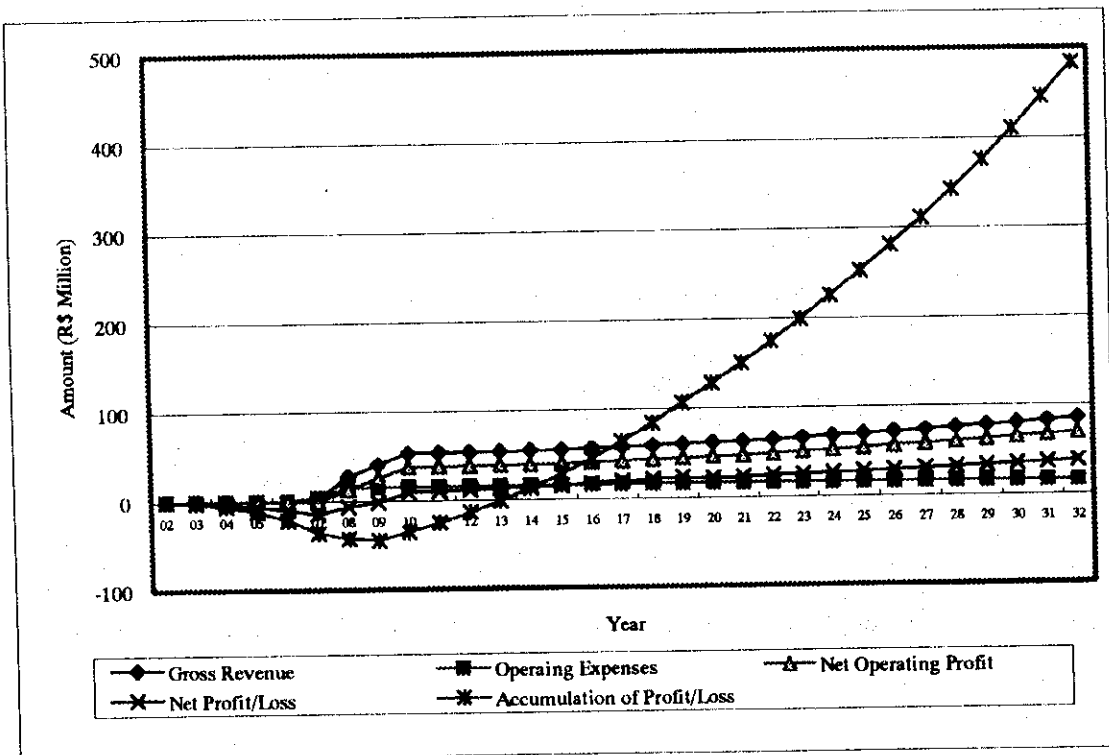
7) Depreciation: Fixed assets such as sewage treatment plants and distribution piping networks are depreciated arithmetically over 25 years after they are placed in service. Engineering services are also set to depreciate arithmetically over 15 years.

2) Analysis of Financial Simulation

The following figure gives the results of trends of income statements in the financial simulation. The figure includes the following information: (a) revenue from sewage treatment service revenue, and interest of savings deposits; (b) expenditure on operation and maintenance; (c) net operating profit, i.e., the difference between revenue and expenditure; (d) annual net profit, i.e., net operating profit minus depreciation and interest on loans; and (e) accumulation of profit

(loss).

The figure indicates that the net loss continues until 2009, and moves towards surplus after 2010. The accumulation of losses continues until 2012 and moves into the black after 2013. The accumulated profit increases rapidly after 2013. It hopefully reaches the amount required for investing in the reconstruction of the facilities by the end of their economic life. It will aggregate to around R\$500 million by the year 2032. As can be seen in this figure, the profit and loss situation of the firm is serious for the first 9 years.



The sewerage treatment works will continue a net loss for the first nine years, although their operating results record net gains except the first year of operation, 2007. In the first year 2008 after the completion of the whole projects, the total revenue is expected to be R\$27.5 million. On the other hand, the operating expenses amount to R\$14.6 million in the same year. Then the net operating profit becomes R\$12.9 million. However, the depreciation and the interest of the loan are estimated at R\$3.5 million and R\$15.9 million, so the income before tax results in a deficit of R\$6.5 million. The largest accumulated deficit aggregated to R\$44.5 million in 2009. Because of these deficits, the works require the cash loan from the local government for covering these deficits from 2007 to 2013. The maximum amount of this loan will reach to R\$30.6 million in 2009. However, the works will finish and repay all the cash loans by 2014.

As mentioned in the preconditions, the simulation does not consider inflation in both revenue and operation costs. In practical situation, the inflation is indispensable in management

circumstance. Thus, the tariff increase will be necessary in consideration of increase of operation costs to cover deficit due to inflation.

4.8.3 ECONOMIC EVALUATION

(1) Overview of Economic Evaluation

The methodology of economic evaluation is the same as in the master plan. In the feasibility study, the respective experts estimate the costs more precisely than those in the master plan. This resulted in a more reliable evaluation of the proposed project. In spite of this, some uncertainty still exists in the estimation. In particular, a case with a long implementation period and a growth in future sewage treatment demand has involves risks when evaluating project viability. In this context, certain aspects of the sensitivity test are applied.

(2) Assumptions for Economic Evaluation

In the feasibility study, preconditions and assumptions for economic evaluation are almost the same as those established in the master plan. The costs and benefits are estimated on the basis of economic values instead of the market values, which were applied for financial analysis. The economic values are converted from the financial values by applying conversion factors. For the economic evaluation, the following criteria and assumptions are applied to calculate economic values and evaluation indicators. Conversion factors and shadow wages were set referring to those of the BNB (Banco do Nordeste do Brasil) and BID (Banco Interamericano de Desenvolvimento). Other basic conditions and assumptions are also set in the same manner as presented in the master plan.

Item	Set Conditions and Assumptions
(a) Base Year:	The year 2002
(b) Construction Period:	Five to six years of actual construction from 2002 through 2006 or 2007
(c) Economic Life and Evaluation Period:	25 years after completion
(d) Timing of Accruing Benefits:	After the completion of the project. The matured benefit is attained in 2010, the target year of the projects. Even after 2010, the full capacity of the plant is utilized for the beneficiaries in the service area. The benefits will increase in proportion to population increase until the target year of the master plan, 2020.
(e) Price Level:	Cost and benefit of the project are set at July 2000.
(f) Prevailing Exchange Rates:	R\$1.80 per US\$1.00 and J¥110 per US\$1.00
(g) Opportunity Cost of Capital:	12% per annum

(h) Conversion Factor	Domestic materials: 0.94 Imported materials: 1.00
(l) Shadow Wage	Skilled worker: 79% of legislated wage Unskilled worker: 48% of legislated wage
(j) Value of Land for Plant	No value in economic terms

(3) Economic Viability of Proposed Projects

As discussed in the master plan, economic benefits are composed of the following three components as tangible direct benefits.

No.	Benefit Component	Quantification
1.	Sewage treatment saving benefits for inhabitants	Elimination of installation and O&M costs of other treatment systems and septic tanks outside the existing sewerage collection service areas
2.	Decrease of medical expenses and losses due to absence from work	Cost reduction of medical expenses for waterborne diseases, and Reduction of losses from absence from work due to waterborne diseases
3.	Elimination of tourism recession owing to maintenance of tourism resources	Maintaining tourist attractions and promotion of regional industries related to tourism in the RMR

In the feasibility study, the proposed projects do not cover whole territories in the respective river basin areas. Thus, the benefits of the respective components above are assumed to accrue in proportion to the population coverage of sewage sanitation services by the proposed projects in terms of components (1) and (2). In terms of component (3), an index for distribution of benefit is based on the removal rates of expected pollution loads in the respective river basins against the total reduction of pollution load in the RMR.

The total benefits were calculated as the sum of the benefits mentioned above. The total economic benefits were estimated at R\$50.0 million in 2010. The benefits of the respective sewerage systems are summarized in the following table.

Total Economic Benefits in 2010

(Unit: R\$1000)

Sewerage System	Sewage Treatment Saving	Medical Benefits	Tourism Recession Elimination	Total
1. Conceição	136	91	3,198	3,425
2. Janga	492	502	11,281	12,275
3. Cabanga	305	500	9,669	10,474
4. Boa Viagem	218	251	4,864	5,334
5. Cordeiro	150	178	3,502	3,831
6. Prazeres	1,355	355	7,573	9,282
7. Curcurana	288	226	4,877	5,391

Entire Systems	2,944	2,103	44,963	50,012
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The cost estimate of the proposed projects was described in Section 4.6. This estimate, however, was enumerated in market prices. In economic evaluation, the financial value has to be converted into economic value applying the conversion factors. The total economic cost of the proposed projects was calculated at R\$257.3 million. The costs for the respective systems are broken down in the table below.

Economic Costs per Sewerage System

(Unit: R\$ Million)

Sewerage System	Direct Cost	Compensation Cost	Engineering Services	Administration Cost	Contingency Cost	Total
1. Conceição	13.8	0.0	1.6	0.6	2.3	18.3
2. Janga	50.2	0.0	5.9	2.3	8.3	66.7
3. Cabanga	34.0	0.0	4.0	1.6	5.6	45.2
4. Boa Viagem	23.9	0.0	2.8	1.1	3.9	31.7
5. Cordeiro	18.2	0.0	2.1	0.8	3.0	23.7
6. Prazeres	31.2	0.0	3.7	1.4	5.1	41.5
7. Curcurana	22.6	0.0	2.6	1.0	3.7	30.0
Entire Systems	193.8	0.0	22.6	8.9	31.9	257.3

The investment costs are disbursed in accordance with the construction schedule. The O&M cost is required annually during the economic life of the proposed project. The annual O&M costs were calculated at around 6% of direct construction costs, which were specifically estimated in Section 4.6. The total annual O&M costs of the respective systems are converted to R\$9.1 million in economic terms after the systems are fully operated.

The economic evaluation indices calculated on the basis of economic cost and benefit during the evaluation period are summarized as follows.

Evaluation Indices

Sewerage System	EIRR	B/C ^{*1}	NPV ^{*1} (R\$ Million)
1. Conceição	12.6%	1.06	0.87
2. Janga	12.8%	1.07	3.67
3. Cabanga	15.5%	1.34	12.07
4. Boa Viagem	11.7%	0.97	-0.70
5. Cordeiro	10.8%	0.90	-1.98
6. Prazeres	14.1%	1.24	7.40
7. Curcurana	14.6%	1.25	4.90
Entire Systems	13.1%	1.10	21.30

Note: ^{*1} Discounted at 12%.

As shown in the table above, the EIRR of the entire systems was 13.1%, so the projects proposed are viable from the economic point of view, because it is higher than the opportunity cost of capital, 12%. In particular, the five projects, i.e., Cabanga, Prazeres, Curcurana, Janga and Conceição, have favorable rates of more than 12%, so these projects are feasible and should

be promoted from the economic point of view. On the other hand, the EIRRs of the two systems, i.e., Boa Viagem and Cordeiro were less than 12%. However, even the Boa Viagem System has a value approximating the opportunity cost of capital. At any rate, the EIRR of the entire projects considerably exceeds 12%, so the proposed projects could be viable economically at a whole.

Yet, the economic analyses were based on a lot of assumptions as mentioned in the respective sections. Accordingly, these indices should be considered to be a reference for project promotion. This standpoint is essential in projects for environmental purposes.

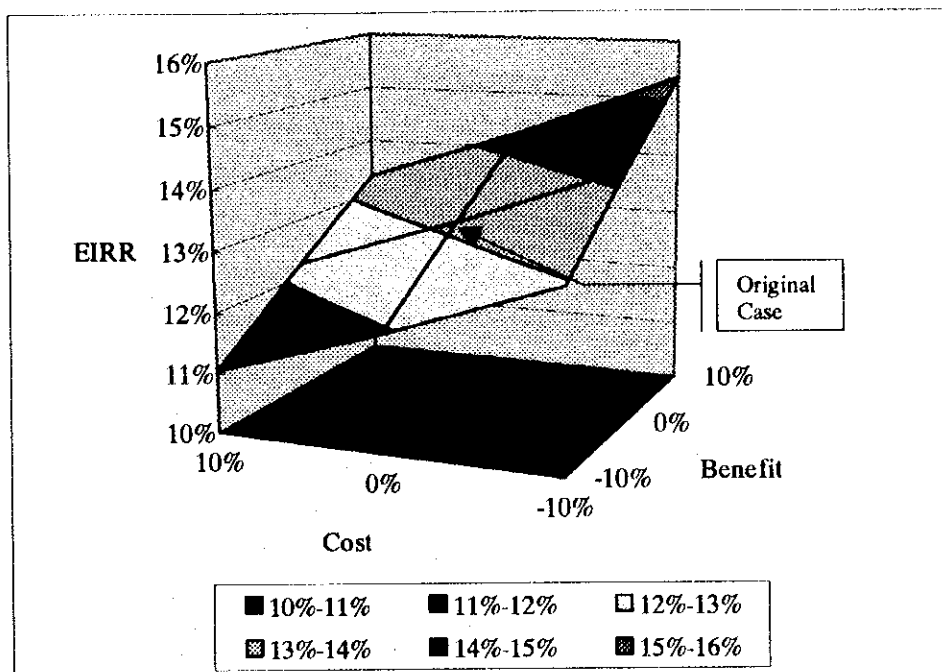
(4) Sensitivity Test

As mentioned in Section 4.8.3(1), the sensitivity test is commenced in this section. A case with long implementation period and increment of future sewage discharge growth has risks in terms of judgment on project viability. It is customary, therefore, to test the results of economic analysis for sensitivity to variations in certain important inputs. The test is made for the variations in $\pm 10\%$ of the cost and benefit with respect to evaluation factors of the proposed project. Then, there are nine cases under these variations. The results are given in the following table.

Results of Sensitivity Test

	Cost	Benefit	IRR (%)	B/C	NPV (R\$ Million)
1.	Original Case	-	13.1	1.1	21.3
2.	-	10% Decrease	11.9	1.0	-1.2
3.	-	10% Increase	14.3	1.2	43.8
4.	10% Increase	-	12.2	1.0	4.4
5.	-	10% Decrease	11.0	0.9	-18.1
6.	-	10% Increase	13.3	1.1	26.9
7.	10% Decrease	-	14.2	1.2	38.2
8.	-	10% Decrease	12.9	1.1	15.7
9.	-	10% Increase	15.4	1.3	60.7

The cases, which the EIRR are less than 12%, were the following only two conditions among the nine cases, that is, (1) 10% increase of cost and 10% decrease of benefit and (2) 10% decrease of benefit. While, all other cases were more than 12% of EIRR. The following figure shows the project viable range of cost and benefit variation from the original estimate. From this point of view, accordingly, the estimates of cost and benefit should be reconsidered with prudence at the implementation stage.



4.8.4 Overall Project Evaluation

The project evaluation in each sewerage system was made based on urgency (total pollution loads in the basin), technical evaluation (reduction in amount of BOD (kg/day). financial/economic evaluation (values of FIRR/EIRR for the projects), social /environmental impact (total served population, and the served population in poverty areas)

The results of the project evaluation in each sewerage system are shown in Table 4.8-3. The seven sewerage systems are evaluated as feasible on the whole. By the implementation of sewerage systems the priority projects are expected to produce the following positive effects:

- It will expand the sewerage service area from 8,516 ha to 12,464 ha in 2010 and increase the sewage treatment level from no more than 20 % of the urban population to about 37 %. By the expansion of sewerage service areas, living and sanitary conditions in the RMR will be improved.
- The FIRR is estimated at 7.9%, which is lower than the 12% decisive factor. However, the projects could be manageable, if the state government procures financial sources with an interest rate of less than 7.9%. The financial condition of the operational body will be further improved by increasing tariffs and by a subsidy by the governmental.

- The EIRR is estimated at 13.1%, so the projects could be viable from the economic point of view. Although the economic analyses were based on a lot of assumptions, these indices should be considered as a reference for project promotion.
- It will improve the sanitary conditions of the poverty areas by developing the sewerage system to provide for some 324,000 inhabitants in these areas.

The result of the comprehensive evaluation by the seven systems are tabulated as follows:

Sewerage Systems	Evaluation	
Conceição	Effective	B-
Janga:	Very effective	A
Cabanga	Very effective	A
Boa Viagem	Effective	B+
Cordeiro	Effective	B+
Prazeres	Very effective	A-
Curcurana	Very effective	A-

Table 4.8-3 Overall Evaluation of Priority Projects

System	River Basin	Generated BOD Load in the River Basin (kg/day)	Basic Conditions				Urgency		Technical Evaluation		Economic Evaluation		Financial Evaluation		Social Environmental impact		Impacts by Construction		Evaluation as a whole	
		(Ratio (%) of the total pollution load in the RMR)	Area (ha)	Population in 2020.	BOD load (kg/day)	Construction cost (1000R\$)	Based on the river basin and location.		Based on the reduction amount of BOD load (kg/day), and reduction rate (%) of the total BOD load from the basin.		Based on the value of EIRR for the Sewerage System.		Based on the value of FIRR for the Sewerage System.		Based on the number of serviced population, and the served population in the poverty areas.					
Conceição	Timbo	25,874 (13.1%)	853	62,440	3,372	16,135	Urgent	B	Reduction amount of BOD: 3,035 kg/day, Reduction rate:11.7%	C	12.6%	A	3.1%	B	Served population: 62,445 Served population in poverty area: No data.	C	Impacts unknown, but no significant impacts expected	B	Effective	B
Janga	Timbo	25,874 (13.1%)	3,954	322,450	17,423	58,683	Very urgent	A	Reduction amount of BOD: 15,681 kg/day, Reduction rate: 60.6%	A	12.6%	A	9.9%	A	Served population: 322,450 Served population in poverty area: No data.	A	No significant impacts expected.	A	Very effective	A
Cabanga	Capibaribe	43,839 (22.2%)	2,671	306,690	17,443	39,765	Very urgent	A	Reduction amount of BOD: 15,699 kg/day, Reduction rate: 35.8%	A	15.5%	A	15.0%	A	Served population: 306,690, Served population in poverty areas: 72,869 (24%)	A	No significant impacts expected.	A	Very effective	A
Boa Viagem	Tejipio	30,366 (15.4%)	1,203	157,010	8,525	27,919	Very urgent	A	Reduction amount of BOD: 7,673 kg/day, Reduction rate:25.2%	B	11.7%	B	4.1%	B	Served population: 157,010, Served population in poverty area:34,008 (22%)	A	Some impacts to the housing area nearby.	C	Effective	B+
Cordeiro	Capibaribe	43,839 (22.2%)	1,054	109,230	5,898	21,056	Urgent	B	Reduction amount of BOD: 5,508 kg/day, Reduction rate: 12.1%	C	10.8%	B	6.6%	A	Served population: 109,230 Served population in poverty areas: 29,215 (29%)	B+	Some impacts to the surrounding poverty area nearby.	C	Effective	B+
Prazeres	Jaboatao	35,139 (17.8%)	1,570	233,400	12,604	36,500	Very Urgent	A	Reduction amount of BOD: 11,344 kg/day, Reduction rate: 32.3%	A	14.1%	A	4.9%	B	Served population: 233,403, Served population in poverty areas:138,204 (60%)	A	Impacts Unknown, but no significant impacts expected	B	Very effective	A
Curcurana	Jaboatao	35,139 (17.8%)	1,160	150,160	8,108	26,362	Urgent	B	Reduction amount of BOD: 7,297 kg/day, Reduction rate:20.8%	B	14.5%	A	7.2%	A	Served population: 150,160, Served population in poverty area:48,011 (32%)	B-	No significant impacts expected.	A	Very effective	A-

Evaluation Criteria

Evaluation Item	A	B	C
Technical evaluation (Reduction amount of BOD)	Above 10,000 kg/day	10,000~5,000 kg/day	Below 5,000 kg/
Economic evaluation	Above 12.0 %	12.0 %~10.0%	Below 10.0 %
Financial evaluation	Above 5.0 %	5.0 %~2.0 %	Below 2.0 %
Social environmental evaluation	Very high	High	Low

4.9 Implementation Organization

4.9.1 Organizations Concerned with Sewerage Projects

As pointed out in the master plan, the proposed projects are large-scale undertakings, which comprise many planning and environmental components. Regarding implementation of the projects, many agencies are involved. They are SEIN, SRH, COMPESA, CONDEPE, FIDEM, ITEP, CPRH as well as SEPLANDES. As an operating agency, COMPESA is responsible for operating the facilities. SEPLANDES has the role of coordinating these agencies. Besides the state agencies, the Federal Government will take part in these projects as a financial agent for international financial sources.

4.9.2 Implementing Organ

For implementation of the project, an umbrella agency always has to coordinate the organizations and agencies mentioned above. It also makes arrangements with the Federal Government and international financing organizations to procure financial sources for the projects. Thus, this leading organ should be established formally as a project management unit (PMU). The PMU should be set up under SEPLANDES, since its major function is the coordination of agencies concerned.

The State Government has an experience of establishing a PMU - Program Management Unit (UGP or Unidade de Gestao do Programa) under "PROMETROPOLE". In this project, SEPLANDES played a leading role in the implementation. In the same manner, SEPLANDES should take a leading role in formulating the PMU of the proposed projects. However, it might be difficult to establish the PMU at the outset, so SEPLANDES should first set up a preparation committee. This committee would include representatives of agencies concerned in addition to the executive secretariat. The committee would be composed of representatives from SEIN, SRH, COMPESA, CONDEPE, FIDEM, ITEP and CPRH as well as SEPLANDES. After this, with the consent of the committee, the PMU would be established as an implementing organ of the proposed projects.

4.9.3 Tasks of Implementing Organ

To implement the projects, it is necessary to negotiate with administrative organizations in the state as well as the appropriate federal agencies such as the External Finance Commission (COFIEX or Comissão de Financiamentos Externos) under the Ministry of Planning, Budget and Management (MP or Ministério do Planejamento, Orçamento e Gestão) and international and/or foreign financing organizations. Therefore, the PMU has to carry out the following successive activities to ensure the sound implementation of the projects. These activities and the timetable of implementation of the projects are illustrated in Fig. 4.9-1.

(1) First Stage (Preparation Stage)

The preparation committee is established by SEPLANDES just after the JICA feasibility study is submitted to the Brazilian Government. The committee prepares applications for approval by the state to procure international finance. For that purpose the committee or SEPLANDES formulated an implementation program (IP) along with the application for financial approval.

Furthermore, the preparation committee discusses duties and the composition of the PMU. SEPLANDES formulates the PMU in pursuance of the recommendation of the committee just after the approval of financial procurement from the state house. Subsequently, the PMU and SEPLANDES start to obtain the approval of international finance from the Federal Government, because permission from the Senate is a prerequisite to procure international loans, considering allowances for debt services.

(2) Second Stage

The PMU is established and starts full-scale implementation. There are four major tasks:

- (a) to win the approval of international finance and to secure a pledge of assistance from international financing organizations;
- (b) to discuss with and inform the federal, state and municipal agencies concerned of construction works such as sewerage treatment plants and sewer piping networks, and to apply for and obtain environment licenses from the CPRH and permission for effluent discharge from the SRH (not in operation as yet);
- (c) to prepare for construction works such as land acquisition for plant sites, detailed design documents and public tender for selection of contractors; and
- (d) to start training and to transfer technology for the PMU staff and the future O&M workforce.

The PMU prepares tender documents in cooperation with engineering consultants and selects general contractors for the respective major schemes on the basis of tenders received. Simultaneously, the PMU makes contracts with supervising consultants for overseeing construction work. These activities in this implementation stage are the most complex in terms of coordinating the agencies involved.

(3) Third Stage

In this stage, the PMU has two major tasks, (a) to construct major portions of the proposed projects and (b) to establish O&M workforce. The construction works of the sewerage system plants and major trunk sewer pipelines. They need about three years to complete these facilities. Up to the time of completion of the construction works, the PMU trains O&M workforce for the

respective sewerage systems through training and technology transfer by international engineering experts.

(4) Fourth Stage

In this stage, the respective plants will be inaugurated after the completion of main plants and trunk sewer pipelines. Without interrupting services, lateral pipelines will be constructed for expanding service areas covered by the sewerage systems. The PMU will complete the proposed projects by the end of 2009. If the second phase works are to follow, the PMU has to carry out the above-mentioned activities, before the completion of the first phase works.

4.9.4 Organization Plan of Implementing Organ

In implementation stage, major tasks are (i) land acquisition, (ii) designing and (iii) construction and its supervision. Item (i) should be carried out in accordance with relevant laws and regulations such as Decree-Law No.21 June 1941 and its amendments, with juridical support of the state government. Some involvement of the PMU is necessary for investigations and negotiations for the land acquisition.

As for (ii) and (iii), the PMU has to hire consultants and to contract with contractors. Bidding procedure must be placed under the inspection of international financing institutes, federal organs in charge and the state agencies concerned. Actual tendering, tender evaluation, negotiations and contract awarding should proceed with the initiative of the PMU. Although the consultants and contractors will undertake most of the engineering works and construction works, some responsibilities will still remain to the project office. Check of the results of the works by consultants and contractors is necessary to be done by the PMU. During the construction works, much administrative permission may be required. Liaison to relevant authorities, such as police, will be necessary. In addition, the PMU establish O&M workforce to manage the sewerage systems properly. For the sake of that, the PMU trains the workforce in corporation with COMPESA, as mentioned above.

The organization to implement the tasks above includes various sections to deal with their duties without delay. The contents and volume of each section will vary in accordance with the development schedule of the project implementation. Each section has a core staff responsible for the duties assigned to the section, and furthermore short-term assistance may be acquired from relevant sections of the state government and state companies.

4.9.5 Training Plan

The vocational training is essential to improve the employee's capability and eventually the performance of the organization. The ways having been applied in the sewerage and sanitation sector are an on-the-job (OJT) training. Although the OJT is still one of the considerably efficient methods and therefore it has been applied in every field widely, it will be necessary that the training be carried out with more systematic and premeditated planning. In addition to the OJT, workshops and seminar programs may be useful for new workers in the field of sewerage and sanitation management to get necessary technical knowledge.

Furthermore, the PMU has to create a training program to bring up new workers for operating and maintaining the new plans and pipelines. COMPESA already has a history of sewerage and sanitation management since 1971. Some of engineers of COMPESA have technical experience and know-how on sewerage and sanitation system. Taking consideration of the information from them and education courses of advanced programs in the industrialized countries, the following training courses will be integrated in the training program.

- (a) Training for every split business hierarchy, which is classified for sake of convenience into the classes of executive, supervisor, usual staff and recruited staff.
- (b) Training for practical subjects, which include the fields of general affairs, accounting, planning, sewerage technology, construction, etc.
- (c) Training by dispatching or sending the sewerage system's staff to other institutions or by invitation of trainers.
- (d) Supporting for self-education.

Work Item	1 2000	2 2001	3 2002	4 2003	5 2004	6 2005	7 2006	8 2007	9 2008	10 2009	11 2010
State Government (PMU)	<div style="display: flex; justify-content: space-between; width: 100%;"> First Stage Second Stage Third Stage Fourth Stage </div>										
Staging of Implementation											
Preparation Committee Establishment											
Approval of State House											
Formulation of I/P											
Project Office (PMU) Establishment											
Administrative & Legal Formalities											
Construction License											
Environmental License											
Water Right License											
Land Acquisition in Project Sites											
Procurement of Finances											
Approval of Senate											
Approval of International Finance											
Study, Design & Construction											
Study (M/P & F/S)											
Designing											
Tender Procedure											
Land Acquisition											
Supervision											
Inspection											
Construction											
Training/ Technology Transfer											
COMPESA											
Operation and Maintenance											
JICA											
M/P and F/S											
International Financial Organs											
Project Identification											
Pledge											
Loan Agreement											

Legend: : Application; : Approval; ■ : Execution of Activity

Fig. 4.9-1 Timetable of Implementation of Proposed Projects

4.10 Implementation Plan

4.10.1 General

The proposed project comprises seven sewerage systems. In the Master Plan it was proposed that an umbrella agency is required for implementation of the projects to coordinate the organizations and agencies concerned and SEPLANDES is proposed to be this umbrella agency. A Project Management Unit (PMU), which is to consist of representatives of the agencies concerned in addition to the executive secretariat, is to be established under SEPLANDES for the implementation of the project.

The Priority Projects seven sewerage systems, are to be implemented as a part of the projects proposed in Phase 1 of the Master Plan.

4.10.2 Project Component

The seven sewerage systems are composed of the following construction works. The construction works of each sewerage system will be divided into first priority and second priority components as follows:

The structural measures:

1) Conceicao;

- Construction of sewer networks,
- Construction of secondary sewer networks,
- Construction of sewage treatment plants,
- Other related works.

2) Janga;

- Construction of sewer networks,
- Construction of sewage treatment plants,
- Rehabilitation of the existing sewer networks,
- Rehabilitation of sewage treatment plants,
- Other related works.

3) Cabanga;

- Construction of sewer networks,
- Construction of sewage treatment plants,
- Rehabilitation of the existing sewer networks,
- Rehabilitation of sewage treatment plants,
- Other related works.

4) Boa Viagem;

- Construction of sewer networks,
- Construction of sewage treatment plants,
- Other related works.

5) Cordeiro;

- Construction of sewer networks,
- Construction of sewage treatment plants,
- Rehabilitation of the existing sewer networks,
- Other related works.

6) Prazeres;

- Construction of sewer networks,
- Construction of sewage treatment plants,
- Rehabilitation of the existing sewer networks,
- Other related works.

7) Curcurana;

- Construction of sewer networks,
- Construction of sewage treatment plants,
- Rehabilitation of the existing sewer networks,
- Other related works.

The non-structural measures for the project are listed as follows:

- To conduct regular monitoring of river water quality,
- To control the wastewater discharge from industries into the water bodies,
- To conduct river basin management, including protection of reservoirs,
- To promote public participation and environmental awareness.

4.10.3 Implementation Agency

For the implementation of the proposed projects, the State Government of Pernambuco should improve existing organizations in terms of functioning and manpower during the progress of the project. SEPLANDES as the leading implementation agency should take the necessary action for the smooth implementation of the project and establish a PMU for execution of the projects and organized a committee by the representatives from SEPLANDES, SEIN, SRH,

COMPESA, CONDEPE, FIDEM, ITEP and CPRH. The necessary staff for the PMU shall be procured from the related organization due to the progress of the project.

4.10.4 Implementation Period and Tasks

The implementation period will be 10 years and divided into the following stages:

- Preparation Stage: 2001
- Stage -1: 2002 to 2005
- Stage-2: 2006 to 2010

The major tasks for each stage are proposed as follows:

(1) Preparation Stage

Immediately after the Study it is recommended that the State Government set up a Preparation Committee for the project under SEPLANDES. The State Government has to organize financial sources for the project and make necessary arrangements with the Federative Government and international financing agencies in order to procure financial sources for the project. External loans would be required to cover a sizable portion of the capital investment.

Immediately after the sources of finance are arranged, the State Government should establish the PMU and start the activities necessary for the project.

(2) Stage 1

The tasks required for the implementation of projects are the following:

- To procure a team of consultants for the preparation of the detailed engineering design, tender documents and supervision of the project. International tenders would be sought according to the guidelines of the financing agency and the State Government.
- To prepare the detailed engineering design and tender documents based on the schedule of construction works for the project, in compliance with the guidelines of the financial agency and the State Government,
- To obtain environmental and construction licences for the projects,
- To procure contractors through international and local tenderings following the guidelines of the financial agency and the State Government,

- To prepare an O&M manual, data base and training program for the project,
- To supervise the construction works,
- To initiate human resources development program,
- To establish an O&M organization.

(3) Stage-2

- To supervise the construction works,
- To conduct routine O&M activities after completion of the projects,

4.10.5 Implementation Schedule

The construction works of the seven sewerage systems are planned to be executed in stage 1 and stage 2 as mentioned above. The first priority components are to be constructed or commenced in stage 1 from year 2002 to 2005 and the second priority components are to be completed in stage 2 from year 2006 to 2010.

The implementation schedules of the structural measures are prepared and shown in Table 4.10.1.

4.10.6 Disbursement Schedule

The disbursement schedule of the project is prepared on the basis of the construction schedule and shown in Table 4.10.2..

Table 4.10-1 Implementation Plan for Priority Projects

Sewerage System	Work Item	Phase 1									
		2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Conceicao	Preparation/Arrangement	█	█								
	Designing and Tender		█	█							
	Construction and Supervision				█	█	█				
	Operation and Maintenance							█	█	█	█
Janga	Preparation/Arrangement	█	█								
	Designing and Tender		█	█							
	Construction and Supervision				█	█	█	█			
	Operation and Maintenance	▨	▨	▨	▨	▨	▨	▨	█	█	█
Cabanga	Preparation/Arrangement	█	█								
	Designing and Tender		█	█							
	Construction and Supervision				█	█	█	█			
	Operation and Maintenance	▨	▨	▨	▨	▨	▨	▨	█	█	█
Boa Viagem	Preparation/Arrangement	█	█								
	Designing and Tender		█	█							
	Construction and Supervision				█	█	█	█			
	Operation and Maintenance								█	█	█
Cordeiro	Preparation/Arrangement	█	█								
	Designing and Tender		█	█							
	Construction and Supervision				█	█	█				
	Operation and Maintenance							█	█	█	█
Prazeres	Preparation/Arrangement	█	█								
	Designing and Tender		█	█							
	Construction and Supervision				█	█	█	█			
	Operation and Maintenance								█	█	█
Curcurana	Preparation/Arrangement	█	█								
	Designing and Tender		█	█							
	Construction and Supervision				█	█	█				
	Operation and Maintenance							█	█	█	█

Table 4.10-2 Disbursement Schedule of the Project

(Unit: R\$1000)

System	Project Cost	Period					
		2002	2003	2004	2005	2006	2007
Conceicao	24,921	3,344	2,294	4,500	8,167	6,616	
Janger	77,046	5,796	1,980	11,639	20,807	20,807	16,017
Cabanga	52,886	4,152	1,566	9,037	9,037	16,401	12,693
Boa Viagem	61,195	14,872	13,055	5,537	9,900	9,900	7,931
Cordeiro	29,449	2,924	1,555	5,874	10,659	8,437	
Prazeres	63,098	11,092	8,716	7,240	12,941	12,941	10,168
Curcurana	35,943	3,277	1,566	7,354	13,346	10,400	
Total	344,538	45,457	30,732	51,181	84,857	85,502	46,809

CHAPTER 5
CONCLUSION AND RECOMMENDATION

CHAPTER 5. CONCLUSION AND RECOMMENDATION

5.1 Conclusion and Recommendation

In the RMR the water quality of the rivers and drainage channels has been polluted and the water environment is deteriorated. The restoration of the river environmental conditions, especially water quality, is an urgent measure for the RMR to meet.

The existing sewerage management system has a sewage treatment capacity of less than 20 % of the households in the urban area. The Master Plan has proposed to increase the sewage treatment capacity to 90 % of the households in the urban area of 2020 by phased expansion of the sewerage facilities of the RMR. The seven sewerage systems have been selected as priority projects for the RMR to improve the water quality of the major river basins by improving the existing sewerage facilities and developing the new sewerage facilities.

The proposed Master Plan for Stormwater Drainage and Sewerage Management for the RMR and also the Priority Projects are feasible in technical, economic, financial, social and environmental terms. By implementation of the proposed projects, the water quality in the RMR will be improved and the water environment will be restored.

It is recommended for the State Government of Pernambuco to take immediate actions for implementation of the following:

- (1) For early restoration of the urban environment of the RMR, it is very important for the State Government to take immediate actions to implement the seven sewerage systems identified as priority projects and the other sewerage systems proposed for the phase 1 in the Master Plan.
- (2) Also it is important to take necessary actions to implement the stormwater drainage facilities proposed in the PQA from technical aspects.
- (3) For smooth implementation of the Master Plan and the Priority Projects, it is necessary for the State Government and SEPLANDES to organize a preparation committee for PMU immediately after the Study and to establish a PMU before the detailed design stage. Also SEPLANDES is to take necessary actions to develop the human resources to strengthen the related organizations.
- (4) For strengthening the O&M activities COMPESA shall prepare basic data of the existing sewerage facilities and their conditions, including the examination of the existing sewer networks.

- (5) For implementation of successful condominial sewerage systems the State Government should support COMPESA to take systematic and continuous actions to guide the communities through all the stages (planning, implementation and O&M stages).
- (6) For preparation of optimum measures for stormwater drainage and flood control of the RMR in future, it is necessary for the RMR to install automatic rain gauges in the urban area, at least at Olinda, Recife and Jaboatao dos Guararapes, in order to collect rainfall data of short duration, and it is also necessary to conduct river surveys for the major rivers to prepare optimum flood control measures.

- (5) For implementation of successful condominal sewerage systems the State Government should support COMPESA to take systematic and continuous actions to guide the communities through all the stages (planning, implementation and O&M stages).

- (6) For preparation of optimum measures for stormwater drainage and flood control of the RMR in future, it is necessary for the RMR to install automatic rain gauges in the urban area, at least at Olinda, Recife and Jaboatao dos Guararapes, in order to collect rainfall data of short duration, and it is also necessary to conduct river surveys for the major rivers to prepare optimum flood control measures.

APPENDIX

SCOPE OF WORK

M/M ON THE SCOPE OF WORK

M/M ON INCEPTION REPORT

M/M ON PROGRESS REPORT (1)

M/M ON INTERIM REPORT


M/M ON PROGRESS REPORT (2)

M/M ON DRAFT FINAL REPORT

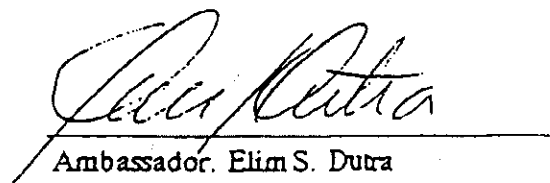
SCOPE OF WORK
FOR
THE STUDY
ON
STORMWATER DRAINAGE AND SEWERAGE MANAGEMENT PLAN
FOR RECIFE METROPOLITAN AREA
IN
THE FEDERATIVE REPUBLIC OF BRAZIL

AGREED UPON BETWEEN
STATE SECRETARIAT OF PLANNING AND SOCIAL DEVELOPMENT
THE STATE OF PERNAMBUCO,
BRAZILIAN COOPERATION AGENCY
AND
JAPAN INTERNATIONAL COOPERATION AGENCY

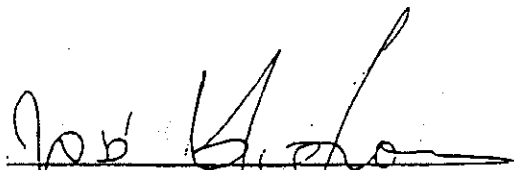
Recife, March 3, 1999



Mr. Shin'ichiro UCHIDA
Leader of Preparatory Study Team
Japan International Cooperation
Agency (JICA)



Ambassador. Elin S. Dutra
General Director,
Brazilian Cooperation Agency(ABC)



Sr. Jose Arlindo Soares
Secretary,
State Secretariat of Planning and Social
Development, State of Pernambuco
(SEPLANDES)

I. INTRODUCTION

In response to the request of the Government of the Federative Republic of Brazil (hereinafter referred to as "the Government of Brazil"), the Government of Japan has decided to conduct the Study on Stormwater Drainage and Sewerage Management Plan for Recife Metropolitan Area (hereinafter referred to as "the Study") together with the Government of Brazil, in accordance with the Basic Agreement on Technical Cooperation between the Government of Japan and the Government of Brazil, signed in Brazil on September 22, 1970 (hereinafter referred to as "the Basic Agreement").

Accordingly, the Japan International Cooperation Agency (hereinafter referred to as "JICA"), the official agency responsible for official implementation of technical cooperation programs of the Government of Japan, Agencia Brasileira de Cooperacao (hereinafter referred to as "ABC") as legal intervention agency on behalf of the Government of Brazil and the Secretaria de Planejamento e Desenvolvimento Social Governo do Estado de Pernambuco (hereinafter referred to as "SEPLANDES"), the executing agency responsible for the implementation of the technical cooperation for the Study, will undertake the Study in close cooperation with the other Brazilian authorities concerned.

The present document sets forth the scope of work with regard to the Study.

II. OBJECTIVES OF THE STUDY

The objectives of the Study are:

1. to formulate a master plan for Stormwater Drainage and Sewerage Management Plan in Recife Metropolitan Area in order to improve the urban environment;
2. to conduct a feasibility study on the urgent and / or priority project(s) which will be selected from the master plan; and
3. to carry out technology transfer to the counterpart personnel in the course of the Study.

III. STUDY AREA

The study area shall cover the Recife Metropolitan Area that is shown in Appendix 1 attached.

IV. SCOPE OF THE STUDY

To achieve the above objectives, the Study will cover the following items:

Phase I : Formulation of Master Plan for Stormwater Drainage and Sewerage Management

1. Basic Study

- (1) Collection and review of existing data and information
- (2) Review for the study of existing / relevant Stormwater Drainage and Sewerage Management;
- (3) Field reconnaissance;

- (4) Field survey:
 - (a) Hydrological analysis;
 - (b) Water quality ;
 - (c) Stormwater Drainage system; and
 - (d) Sewerage system.

(5) Socio economic framework;

(6) Pollutant load analysis;

2. Formulation of Master Plan for Stormwater Drainage and Sewerage Management

(1) Basic policy for Stormwater Drainage and Sewerage plan;

(2) Establishment of planning framework;

(3) Preliminary facility(ies) plan;

(4) Initial environmental examination (IEE);

(5) Operation and maintenance plan;

(6) Preliminary cost estimates and financial plan;

(7) Evaluation;

- (a) Economic evaluation;
- (b) Financial evaluation; and
- (c) Social impact evaluation.

(8) Selection of priority project(s).

Phase II : Feasibility study on the urgent and/or priority project(s) selected from the master plan

(1) Planning framework ;

(2) Facility(ies) plan / preliminary design;

(3) Operation and maintenance plan;

(4) Cost estimation and financial plan ;

(5) Evaluation;

- (a) Environment impact assessment (EIA);
- (b) Social impact evaluation including land acquisition and resettlement;
- (c) Economic analysis; and
- (d) Financial analysis.

(6) Implementation plan.

V. SCHEDULE OF THE STUDY

The tentative schedule of the Study is shown in Appendix 2. attached.

VI. REPORTS

JICA shall prepare and submit the following reports in English to the Government of Brazil.

1. Inception Report:
Thirty(30) copies at the beginning of the work in Brazil.
2. Progress Report (1):
Thirty(30) copies at the end of the first work period in Brazil.
3. Interim Report:
Thirty(30) copies at the end of Phase I. This report will contain the results of the Phase I study and outline of the Phase II study program
4. Progress Report (2):
Thirty(30) copies at the end of second work period in Brazil.
5. Draft Final Report:
Thirty(30) copies at the beginning of the third field survey
The Government of Brazil shall submit its comments within one (1) month after the receipt of the Draft Final Report.
6. Final Report:
Sixty(60) copies within one(1) month after receipt of the comments on the Draft Final Report.

VII. UNDERTAKINGS OF BRAZILIAN SIDE

1. To facilitate smooth implementation of the Study, the Government of Brazil shall take necessary measures:
 - (1) to secure the safety of the Japanese Study Team,
 - (2) to permit the members of the Study Team to enter, leave and sojourn in Brazil for the duration of their assignment therein, and to exempt them from foreign registration requirements and consular fees,
 - (3) to exempt the members of the Study Team from taxes, duties and any other charges on equipment, machinery and other materials brought into and out of Brazil for the implementation of the Study,
 - (4) to exempt the members of the Study Team from income tax and charges of any kind imposed on or in connection with any emoluments or allowances paid to the members of the Study Team for their services in connection with the implementation of the Study,
 - (5) to provide necessary facilities to the Study Team for remittance as well as utilization of funds introduced into Brazil from Japan in connection with the implementation of the Study,
 - (6) to ensure permission for entry into relevant areas for the implementation of the Study within the laws and regulations in force in the Republic of Brazil,
 - (7) to ensure permission for the Study Team to take all data and documents (including photographs and maps) related to the Study out of Brazil to Japan, and
 - (8) to provide medical services as needed. Its expenses will be chargeable on the members of the Study Team.
2. The Government of Brazil shall bear claims, if any arises, against the members of the Study Team resulting from, occurring in the course of, or otherwise connected with, the discharge of their duties in the implementation of the Study, except when such claims arise from gross negligence or willful misconduct on the part of the members of the Study Team.
3. SEPLANDES shall act as a counterpart agency to the Study Team and shall also act as a coordinating body in relation with other governmental and non-governmental organizations concerned for the smooth implementation of the Study.
4. SEPLANDES shall, at its own expense, provide the Study Team with the followings, in cooperation with other organizations concerned:
 - (1) available data (including photographs and maps) and information related to the Study,
 - (2) counterpart personnel,
 - (3) suitable office space with necessary equipment and furniture in Recife, and
 - (4) credentials or identification cards.

- (5) an appropriate number of vehicles with drivers

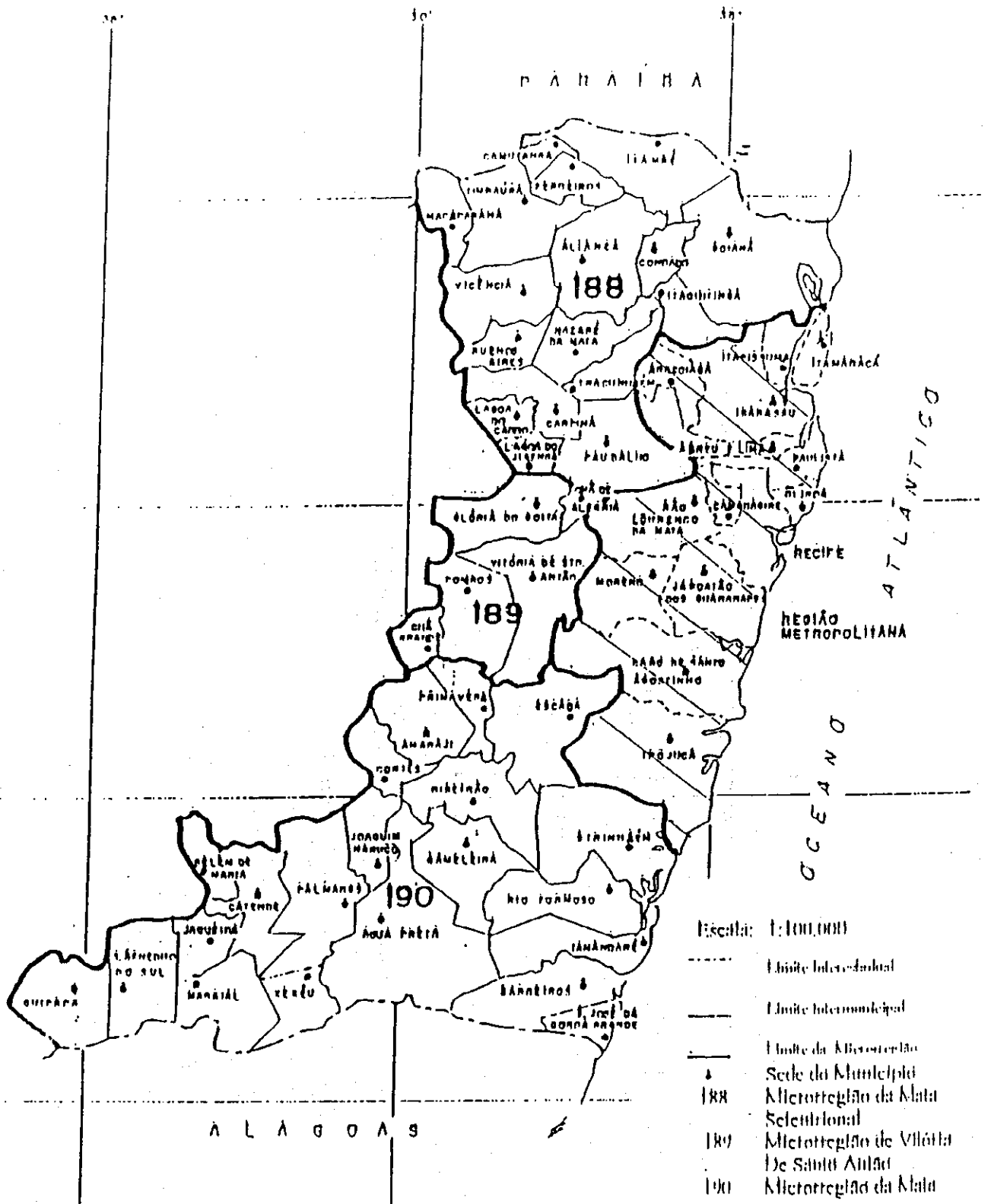
VIII. UNDERTAKINGS OF JAPANESE SIDE

For the implementation of the Study, JICA shall take the following measures:

1. to dispatch, at its own expense, the Study Team to Brazil, and
2. to pursue technology transfer to the Brazil counterpart personnel in the course of the Study.

IX. CONSULTATION

JICA and SEPLANDES shall consult with each other in respect of any matter that may arise from or in connection with the Study.



TENTATIVE STUDY SCHEDULE

APPENDIX2

MONTH	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21		
WORK BRAZIL																							
WORK JAPAN																							
REPORT PRESENTATION	△ IC/R					△ P/R(1)				△ IT/R					△ P/R(2)			△ DF/R			△ F/R		

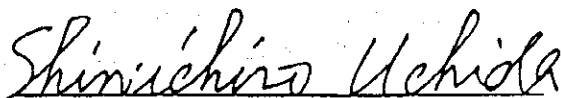
- IC/R : Inception Report
- P/R(1) : Progress Report(1)
- IT/R : Interim Report
- P/R(2) : Progress Report(2)
- DF/R : Draft Final Report
- F/R : Final Report



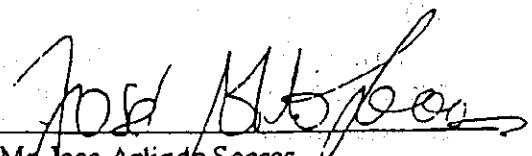
MINUTES OF MEETING
ON
THE SCOPE OF WORK
FOR
THE STUDY
ON
STORMWATER DRAINAGE AND SEWERAGE MANAGEMENT PLAN
FOR RECIFE METROPOLITAN AREA
IN
THE FEDERATIVE REPUBLIC OF BRAZIL

AGREED UPON BETWEEN
STATE SECRETARIAT OF PLANNING AND SOCIAL DEVELOPMENT
THE STATE OF PERNAMBUCO
AND
JAPAN INTERNATIONAL COOPERATION AGENCY

Recife, March 3, 1999



Mr. Shin'ichiro UCHIDA
Leader of Preparatory Study Team
Japan International Cooperation
Agency (JICA)



Mr. Jose Artindo Soares
Secretary,
State Secretariat of Planning and Social
Development, State of Pernambuco
(SEPLANDES)

In response to the request of the Government of the Federative Republic of Brazil (hereinafter referred to as "the Government of Brazil"), the Japanese Preparatory Study Team (hereinafter referred to as "the Team") was sent by Japan International Cooperation Agency (hereinafter referred to as "JICA") to discuss, with the State Secretariat of Planning and Social Development, the State of Pernambuco (hereinafter referred to as "SEPLANDES"), the Scope of Work (S/W) for the Study on Stormwater Drainage and Sewerage Management Plan for Recife Metropolitan Area (hereinafter referred to as "the Study")

The Team carried out the field reconnaissance on the study area and had a series of discussions with the officials of the SEPLANDES and the other organizations concerned. The meetings were held from February 26 to March 3 at the offices of the SEPLANDES. The participants and attendees to the meetings are listed in the attached Appendix.

As a result of the discussions, the Team and SEPLANDES agree to the S/W and the following:

(1) Both sides agree to decide the title of this project, study area and target year as follows:

- i) The title of the Study is "Study on Stormwater Drainage and Sewerage Management Plan for Recife Metropolitan Area";
- ii) Study area is Recife Metropolitan Area as shown in Appendix I on the S/W;
- iii) Target year for the M/P is 2020; and
- iv) The Study is going to be implemented along with M/P (Water Quality Program: PQA).

(2) The Study will be conducted in accordance with JICA's basic policy for Development Study and will be undertaken as follows:

- i) SEPLANDES will serve as the main counterpart for the coordination of the Study and it will assign the main counterpart for implementation of the study;
- ii) JICA, working with the cooperation of other concerned counterpart organizations, will provide technical assistance for the formulation of the Master Plan (hereinafter referred to as "M/P") and the performance of Feasibility Study (hereinafter referred to as "F/S");
- iii) The members of the JICA Study team will, during the course of formulating the M/P and performing the F/S, transfer technology to the Brazilian counterpart personnel in order to provide the said counterparts with the capacity to implement the M/P that is formulated and perform the F/S.

(3) SEPLANDES requested that the following items be included in the Study, and the Team agreed to convey these requests to the JICA Headquarters.

- i) To transfer technology to counterpart personnel, during the course of the study, hold a seminar once a each field study and workshop three times a year,

ii) To conduct field reconnaissance, investigate danger area where the bad drainage system which would be collapsed;

iii) To determine social economic framework taking into consideration of a disparity in economic situation among 14 municipalities of Recife Metropolitan area; and

iv) To summarize Each report on this study in Portuguese, however, SEPLANDES recognize to be written in English basically.

- (4) The team requested SEPLANDES to coordinate with other related organization to get maximum cooperation to secure smooth implementation of the study. The team also suggested to establish a committee such as steering committee to achieve well coordination, and SEPLANDES agree to coordinate for the assignment of the necessary counterpart personnel to work alongside the JICA Study Team including representation from organizations such as PLANEJAMENTO DESENVOLV. SOCIAL (CONDEPE, FIDEM), INFRAESTRUTURA (COMPESA), CIENCIA, TECNOLOGIA E MEIO AMBIENTE (ITEP, CPRH), RECURSOS HIDRICOS.
- (5) SEPLANDES requested that JICA provide counterpart training in-Japan, The team agree to convey this request to JICA Headquarters for further consideration.
- (6) It was confirmed that JICA will make arrangements for necessary equipment to secure the study schedule.
- (7) SEPLANDES agrees to make its best efforts to accommodate the JICA request for appropriate and sufficient office space for the Study Team and counterpart personnel.
- (8) SEPLANDES approves that Final Report on this project will be opened to the public

ATTENDANCE LIST

{ Brazilian Side }

[SEPLANDES]

Sr. Jose Arlindo Soares	Secretary of SEPLANDES
Sra. Berta Levina Soares Maia	Director of Development Strategy Program
Sr. Roberto Salomao do Amaral e Melo	Executive Director
Sra. Luciene Maria Pereira de Lima	Manager of Environmental Department

[FIDEM]

Sr. Francisco Roberto Rocha Aguiar	Architect
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[CONDEPE]

Sra. Sheila Pincosvsky	Director of Information System
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[CPRH]

Sra. Berenice V. de Andrade Lima	Director of Planning
Sra. Joana Teresa Aureliano Maia	Engineer

[ITEP]

Sra. Fatima Brayner	Engineer of Chemistry
Sra. Marcia Lira	Engineer of Chemistry

[SEIN]

Sr. Jaime Vita	Supervisor of Resources
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[COMPESA]

Sr. Guilherme Tavares	Chief of Planning and Technology
Sra. Maria Edith Pinheiro da Costa	Engineer
Sra. Ieda Kozmbiowsky	Engineer

[SECRETARIA DE RECURSOS HIDRICOS]

Sra. Ligia Maria Souza B. Oliverira	Engineer
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{ Japanese Side }

[Preparatory Study Team]

Mr. Shin'ichiro UCHIDA	Leader / Urban drainage System
Mr. Makoto SHIRASAKI	Sewerage Planning
Mr. Akihiro MIYAZAKI	Study Planning
Mr. Hiroshi SUMIKAWA	Water Environment / Environmental Consideration
Mr. Hajime SAKURAI	Sewerage and Drainage Facility
Mrs. Saeko HYODO	Interpreter

[Consulate general at Recife]

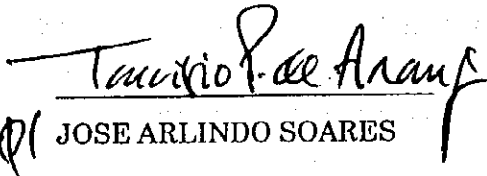
Mr. Tokuji IKEDA	Consul General
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[JICA Brazil Office]

Mr. Kazuyoshi SHINOYAMA	Staff of JICA Brazil Office
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MINUTES OF MEETING
ON
INCEPTION REPORT
FOR
THE STUDY ON STORMWATER DRAINAGE AND SEWERAGE MANAGEMENT
PLAN FOR RECIFE METROPOLITAN AREA
IN
THE FEDERATIVE REPUBLIC OF BRAZIL

RECIFE, OCTOBER 21, 1999


JOSE ARLINDO SOARES

SECRETARY,
STATE SECRETARIAT OF PLANNING
AND SOCIAL DEVELOPMENT,
STATE OF PERNAMBUCO
(SEPLANDES)


HAJIME TANAKA

TEAM LEADER,
STUDY TEAM OF JAPAN
INTERNATIONAL COOPERATION
AGENCY (JICA)


SHIN'ICHIRO UCHIDA

CHAIRMAN,
ADVISORY COMMITTEE OF
JAPAN INTERNATIONAL COOPERATION
AGENCY (JICA)

The Study Team of Japan International Cooperation Agency (JICA) arrived in Brasilia on October 14, 1999 and submitted the Inception Report (October 1999) for the captioned project to the Secretary of Urban Development of the Presidential Office and the Brazilian Cooperation Agency (ABC) on October 15, 1999. The Study Team presented a brief explanation on the basic concept and outline of the Study prepared in the Report to the officials concerned and they showed their satisfaction to the basic concept of the Report.

The Study Team arrived in Recife on October 15, and conducted field trips together with the counterpart team, four sewerage treatment plants i.e., Cabanga, Mangueira, Peixinhos and Janga, on October 16 and the Capibaribe river basin and the major part of Recife Metropolitan Area by helicopter on October 17, 1999.

The Study Team submitted thirty (30) copies of the Report to the State Secretariat of Planning and Social Development, State of Pernambuco (SEPLANDES) on October 18, according to the Scope of Work agreed upon between SEPLANDES and JICA on March 3, 1999.

The Study Team held a meeting with SEPLANDES on October 18, 1999. Sr. Roberto Salomao, Director of Strategy Program of SEPLANDES, chaired the meeting and introduced members the counterpart team and the steering committee proposed for the Study. The Study Team presented the basic concept and outline of the Study prepared in the Report, including the proposed technical transfer program during the Study to the attendants.

The Advisory Team of JICA, visited Recife from October 18 to 22. The Study Team and the Advisory Team held meetings with SEPLANDES and the counterpart team on October 19, 1999. The authority of SEPLANDES expressed its satisfaction to the Report. During the meetings the points agreed by the attendants were as follows:

1. SEPLANDES accepted the Inception Report without fundamental changes.
2. The Study Team accepted the steering committee proposed for the Study by SEPLANDES.

The list of participants, members of the counterpart team and the steering committee are shown in the following Annexes:

- Annex-1: List of the Participants,
- Annex-2: Member of the Counterpart Team
- Annex-3: Member of the Steering Committee

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PROGRAMA DE MELHORIA DA QUALIDADE URBANA DA
REGIÃO METROPOLITANA DO RECIFE - RMR
ACORDO DE COOPERAÇÃO TÉCNICA BRASIL / JAPÃO

SECRETARIA DE PLANEJAMENTO E
DESENVOLVIMENTO SOCIAL

**Anexo 1 - RELAÇÃO DOS PARTICIPANTES (GOVERNO DE PERNAMBUCO) DAS
REUNIÕES REALIZADAS NA SEMANA DE 18 A 22 DE OUTUBRO DE 1999**

NOME	ORGÃO
1. Roberto Salomão do A. Melo	SEPLANDES
2. Luciene Maria P. de Lima	SEPLANDES
3. Thereza Regina P. da Mata	SEPLANDES
4. Zenilson de Carvalho	FIDEM
5. Aldir Pimentel	CPRH
6. Joana Teresa Aureliano Maia	CPRH
7. Lígia Maria S. Barros de Oliveira	SRH
8. Ângela Sotero Bacelar	COMPESA
9. Guilherme Tavares	COMPESA
10. Ieda Kozmhiwsky Alves	COMPESA
11. Maria Edite Pinheiro da Costa	COMPESA
12. Dilene Aguiar Souto Maior	SEIN
13. Nilce Helena Gondim	SEIN
14. MAJOR P.M. HELDER	CODECIPE
15. Cleber Rolim Milet	CODECIPE

Secretaria de Planejamento e Desenvolvimento Social - SEPLANDES / Fundação de Desenvolvimento Municipal - FIDEM / Instituto de Desenvolvimento de Pernambuco - CONDEPE / Companhia Pernambucana de Meio Ambiente - CPRH / Instituto Tecnológico de Pernambuco - ITEP / Secretaria de Recursos Hídricos - SRH / Secretaria de Infra-estrutura - SEIN / Companhia Pernambucana de Saneamento - COMPESA / Coordenadoria de Defesa Civil de Pernambuco - CODECIPE



PROGRAMA DE MELHORIA DA QUALIDADE URBANA DA
REGIÃO METROPOLITANA DO RECIFE – RMR
ACORDO DE COOPERAÇÃO TÉCNICA BRASIL / JAPÃO

SECRETARIA DE PLANEJAMENTO E
DESENVOLVIMENTO SOCIAL

Anexo 2 - EQUIPE DE CONTRAPARTE DO GOVERNO DE PERNAMBUCO

ÓRGÃO	TÉCNICO	FORMAÇÃO
SEPLANDES	1. Berta Levina Soares Maia	Arquiteta
	2. Roberto Salomão do A. Melo	Arquiteto
	3. Luciene Maria P. de Lima	Geógrafa
	4. Thereza Regina P. da Mata	Engenheira Civil
	5. Sandra Domingos	Apoio Logístico
FIDEM	6. Francisco Roberto R. Aguiar	Arquiteto
	7. Zenilson de Carvalho	Engenheiro Civil
CONDEPE	8. Sheila Pincovski	Economista / Demógrafa
	9. Valdeci Monteiro	Economista
CPRH	10. Aldir Pimentel	Engenheiro Sanitarista
	11. Joana Teresa Aureliano Maia	Engenheiro Civil
ITEP	12. Cláudia Cunha	Engenheira Química
	13. Cláudia Neves	Engenheira Química
	14. Fátima Brayner	Engenheira Química
	15. Márcia Lira	Engenheira Química
SRH	16. Lígia Maria S. Barros de Oliveira	Engenheira Civil
COMPESA	17. Ângela Sotero Bacelar	Engenheira Química
	18. Guilherme Tavares	Engenheiro Civil
	19. Ieda Kozmhiwsky Alves	Engenheira Química
	20. Maria Edite Pinheiro da Costa	Engenheiro Civil
SEIN	21. Dilene Aguiar Souto Maior	Engenheira
	22. Nilce Helena Gondim	Engenheira
CODECIPE	23. MAJOR P.M. HELDER	Oficial Bombeiro
	24. Cleber Rolim Milet	Engenheiro Civil / Geólogo

Secretaria de Planejamento e Desenvolvimento Social - SEPLANDES / Fundação de Desenvolvimento Municipal - FIDEM / Instituto de Desenvolvimento de Pernambuco - CONDEPE / Companhia Pernambucana de Meio Ambiente - CPRH / Instituto Tecnológico de Pernambuco - ITEP / Secretaria de Recursos Hídricos - SRH / Secretaria de Infra-estrutura - SEIN / Companhia Pernambucana de Saneamento - COMPESA / Coordenadoria de Defesa Civil de Pernambuco - CODECIPE



SECRETARIA DE PLANEJAMENTO E DESENVOLVIMENTO SOCIAL
DIRETORIA DE PROGRAMAS ESTRATÉGICOS DE DESENVOLVIMENTO
ACORDO DE COOPERAÇÃO TÉCNICA BRASIL/JAPÃO

LADO JAPONÊS

MEMBROS DA EQUIPE DE ESTUDO (PCI)

TÉCNICO		ESPECIALIDADE
	Sr. Hajime TANAKA	Líder da Equipe
	Sr. Katuhisa WATANAKA	Tratamento de Águas Residuárias
	Sr. Hiroyuki SHIRAIWA	Drenagem de Águas Pluviais
	Sr. Naoki YASUDA	Secretário / Apoio Lojístico

MEMBROS DA EQUIPE DE SUPERVISÃO (JICA)

TÉCNICO		ESPECIALIDADE
01	Sr. Shin'ichiro UCHIDA	Conselheiro Executivo / Agência Japonesa de Saneamento
02	Sr. Makoto KITANAKA	Diretor Adjunto / JICA



PROGRAMA DE MELHORIA DA QUALIDADE URBANA DA
REGIÃO METROPOLITANA DO RECIFE – RMR
ACORDO DE COOPERAÇÃO TÉCNICA BRASIL / JAPÃO

SECRETARIA DE PLANEJAMENTO E
DESENVOLVIMENTO SOCIAL


Anexo 3 – COMITÊ EXECUTIVO

ORGÃO	NOME	FORMAÇÃO
SEPLANDES	1. Berta Levina Soares Maia	Arquiteta
	2. Roberto Salomão do A. Melo	Arquiteto
	3. Luciene Maria P. de Lima	Geógrafa
	4. Thereza Regina P. da Mata	Engenheira Civil
FIDEM	5. Francisco Roberto R. Aguiar	Arquiteto
CONDEPE	6. Sheila Pincovski	Economista / Demógrafa
CPRH	7. Aldir Pimentel	Engenheiro Sanitarista
ITEP	8. Cláudia Cunha	Engenheira Química
SRH	9. Lígia Maria S. Barros de Oliveira	Engenheira Civil
COMPESA	10. Guilherme Tavares	Engenheiro Civil
SEIN	11. Nilce Helena Gondim	Engenheira
CODECIPE	12. Cleber Rolim Milet	Engenheiro Civil / Geólogo

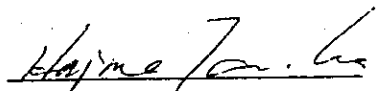
Secretaria de Planejamento e Desenvolvimento Social - **SEPLANDES** / Fundação de Desenvolvimento Municipal - **FIDEM** / Instituto de Desenvolvimento de Pernambuco – **CONDEPE** / Companhia Pernambucana de Meio Ambiente – **CPRH** / Instituto Tecnológico de Pernambuco – **ITEP** / Secretaria de Recursos Hídricos – **SRH** / Secretaria de Infra-estrutura – **SEIN** / Companhia Pernambucana de Saneamento – **COMPESA** / Coordenadoria de Defesa Civil de Pernambuco - **CODECIPE**

**MINUTES OF MEETING
ON
PROGRESS REPORT (1)
FOR
THE STUDY ON STORMWATER DRAINAGE AND SEWERAGE MANAGEMENT
PLAN FOR RECIFE METROPOLITAN AREA
IN
THE FEDERATIVE REPUBLIC OF BRAZIL**

RECIFE, JANUARY 26, 2000



JOSE ARINDO SOARES
SECRETARY.
STATE SECRETARIAT OF PLANNING
AND SOCIAL DEVELOPMENT,
STATE OF PERNAMBUCO
(SEPLANDES)



HAJIME TANAKA
TEAM LEADER,
STUDY TEAM OF JAPAN
INTERNATIONAL COOPERATION
AGENCY (JICA)

The Study Team of Japan International Cooperation Agency (JICA) commenced the Study in the middle of October 1999 and conducted the fieldwork for about three months after explanation of the Inception Report (October 1999). The Study Team issued the Progress Report (1) (January 2000) that presents the results of the field study in the Recife Metropolitan Area from mid-October 1999 to January 2000.

The Study Team submitted thirty (30) copies of the Progress Report-1 (in English) and fifteen (15) copies of the Summary Report (in Portuguese) to the State Secretariat of Planning and Social Development, State of Pernambuco (SEPLANDES) on January 21, 2000, according to the Scope of Work agreed upon between SEPLANDES and JICA on March 3, 1999.

SEPLANDES and the Study Team held a meeting on the report with staff concerned from SEPLANDES, COMPESA and CPRH at the conference room of SEPLANDES on January 25, 2000. The Study Team presented the major findings during the Study and the basic concept for the Master Plan and the priority projects for F/S. During the meeting the opinions and comments raised by the attendants on the report were discussed.

At the end of the meeting the Study Team requested SEPLANDES to collect comments and opinions, if any, on the report from the staff concerned and send to the Study Team within three weeks in order to incorporate them into the Interim Report. Brazilian side and the Study Team agreed as follows:

1. SEPLANDES accepted the Progress Report (1) in principle without special comments.
2. SEPLANDES recommended Janga and Conceicao sewerage subsystems of the Timbo river basin to be included in the list of candidates for the priority projects for F/S proposed in the report. The Study Team agreed to evaluate them together with the other five sewerage subsystems proposed for the priority projects in the report.
3. SEPLANDES agreed to collect comments, if any, on the report from the counterparts, other personnel and related organizations and send them to the Study Team within three weeks.

The list of participants in the meeting on January 25 is shown in Annex-1.



PROGRAMA DE MELHORIA DA QUALIDADE URBANA
DA REGIÃO METROPOLITANA DO RECIFE – RMR
ACORDO DE COOPERAÇÃO TÉCNICA BRASIL / JAPÃO

**SECRETARIA DE PLANEJAMENTO E
DESENVOLVIMENTO SOCIAL**

Annex 1

JICA PROJECT / PERNAMBUCO

EVENT: Presentation / Progress Report Discussion (1) Executive Summary

DATE: January 25, 2000

TIME: 2:30 pm

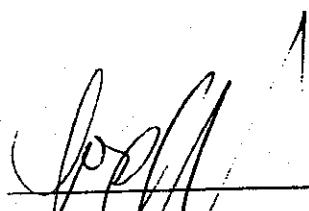
PLACE: Meeting Room / Edf. Rua da Moeda 3F / SEPLANDES

MEMBERS

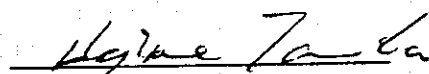
INSTITUTION	NAME	POSITION
SEPLANDES	Berta Maia	DPE's Director
SEPLANDES	Roberto Salomão	Executive Director
SEPLANDES	Luciene Lima	Department Manager
CPRH	Edrise Aires Fragoso	President Director
COMPESA	Guilherme Tavares	Civil Engineer (Technician)
COMPESA	Júlio B. Cavalcanti	Civil Engineer (Technician)
STUDY TEAM	Hajime TANAKA	Team Leader
STUDY TEAM	Katsuhisa WATANABE	Wastewater Treatment Planning
STUDY TEAM	Hiroyuki SHIRAIWA	Stormwater Drainage Planning
STUDY TEAM	Tadashi SHOJI	Facility Planning
STUDY TEAM	Takeshi ARAKAKI	Environment / Water Quality
STUDY TEAM	Naoki YASUDA	Coordinator
STUDY TEAM	Keiko MITSUNAGA	Interpreter
STUDY TEAM	Cesar I. MATONO	Interpreter

MINUTES OF MEETING
ON
INTERIM REPORT
FOR
THE STUDY ON STORMWATER DRAINAGE AND SEWERAGE MANAGEMENT
PLAN FOR RECIFE METROPOLITAN AREA
IN
THE FEDERATIVE REPUBLIC OF BRAZIL

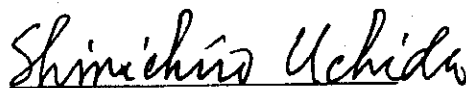
RECIFE, MAY 25, 2000



JOSE ABLINDO SOARES
SECRETARY.
STATE SECRETARIAT OF PLANNING
AND SOCIAL DEVELOPMENT,
STATE OF PERNAMBUCO
(SEPLANDES)



HAJIME TANAKA
TEAM LEADER,
STUDY TEAM OF JAPAN
INTERNATIONAL COOPERATION
AGENCY (JICA)



SHIN'ICHIRO UCHIDA
CHAIRMAN,
ADVISORY COMMITTEE OF
JAPAN INTERNATIONAL COOPERATION
AGENCY (JICA)

The Study Team of Japan International Cooperation Agency (JICA) issued the Interim Report (March 2000) that presents a master plan for Stormwater Drainage and Sewerage Management in Recife Metropolitan Region (RMR) and the priority projects proposed for F/S, according to the Scope of Work agreed upon between SEPLANDES and JICA on March 3, 1999. Two copies of the report were sent to the State Secretariat of Planning and Social Development, State of Pernambuco (SEPLANDES) in April 2000.

The Study Team arrived at Brasilia on May 15, 2000 and gave a brief explanation on the master plan and the priority projects proposed in the report to the Secretariat of International Affaires, Ministry of Planning, Budget and Management on May 16, 2000 and arrived in Recife on May 16.

The Study Team submitted thirty (30) copies of the Interim Report (in English) and thirty (30) copies of the Summary Report (in Portuguese) to SEPLANDES on May 17, 2000. SEPLANDES and the Study Team held a meeting on the report with staff concerned from SEPLANDES, SEIN, SECTMA, FIDEM, COMPESA and CPRH at the conference room of SEPLANDES on May 18, 2000. Roberto Salomao do A. Melo, Executive Director of Regional Programs of Strategy Program Directory of SEPLANDES, chaired the meeting. The Study Team explained the master plan and the priority projects for F/S. and, at the end of the meeting, requested SEPLANDES to collect opinions and comments, if any, on the report in written form from the staff concerned in order to incorporate them into the next report.

The Advisory Team of JICA, arrived in Recife on May 19 and conducted a field trip for the priority projects together with the Study Team and counterparts from COMPESA on May 20.

SEPLANDES, the Study Team and the Advisory Team held a meeting with the staff concerned from SEPLANDES and COMPESA, and discussed on the opinions and comments on the report raised by the attendants on May 22, 2000. The authority of

SEPLANDES expressed its satisfaction to both the Study and the Report. During the meeting the points agreed with the participants were as follows:

1. SEPLANDES accepted the Interim Report and the proposed priority projects for F/S in principle without any special comments.
2. SEPLANDES agreed to collect opinions and comments on the report in written form from the counterparts, other personnel and related organizations and send them to the Study Team by June 9, 2000.

The list of participants in the meeting on May 18 and 22 is shown in Annex-1 and Annex-2.

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**SECRETARIA DE PLANEJAMENTO E
DESENVOLVIMENTO SOCIAL**

ANNEX-2

JICA PROJECT /PERNAMBUCO

EVENT: Meeting - Interim Report debate
DATE: 22/05/2000
TIME: 14:30h
VENUE: SEPLANDES

MEMBERS (Brazilian Side)

INSTITUTION	NAME	Position
SEPLANDES	Roberto Salomão	Executive Director
SEPLANDES	Thereza da Mata	Department Manager
COMPESA	Angela Sotero Bacelar	Assistant Director
COMPESA	Guilherme Tavares	Technical Director

MEMBERS (Japanese Side)

INSTITUTION	NAME	Position
JICA STUDY TEAM	Hajime TANAKA	Team Leader
JICA STUDY TEAM	Hiroyuki SHIRAIWA	Stormwater Drainage Planning
JICA STUDY TEAM	Katsuhisa WATANABE	Sewerage Planning
JICA STUDY TEAM	Tadashi SHOJI	Facility Planning
JICA STUDY TEAM	Shimao HIDAHA	Facility Planning
JICA STUDY TEAM	Naoki YASUDA	Coordinator
JICA STUDY TEAM	Cesar Itiro MATONO	Interpreter
JICA Advisory Committee	Shinichiro UCHIDA	Chairman
JICA (Tokyo HQ)	Takafumi YASUMOTO	Task Manager
JICA (Brasil)	Satoshi YOSHIDA	Coordinator
JICA (Brasil)	Marina M. NAKAGAWA	Coordinator

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**SECRETARIA DE PLANEJAMENTO E
DESENVOLVIMENTO SOCIAL**

ANNEX-1

JICA PROJECT /PERNAMBUCO

EVENT: Meeting – Interim Report Presentation
SPEAKER: Jica team
DATE: 18/05/2000
TIME: 14:30h
VENUE: SEPLANDES

MEMBERS(Brazilian Side)

INSTITUTION	NAME	Position
SEPLANDES	Roberto Salomão	Executive Director
SEPLANDES	Thereza da Mata	Department Manager
SEPLANDES	Ségio David Farias	Department Manager
COMPESA	Angela Sotero Bacelar	Chemical Engineer
COMPESA	Ieda Kozmhinsky Alves	Chemical Engineer
FIDEM	Carlos André Cavalcanti	Consultant
CPRH	Joana Aureliano	Civil Engineer
CPRH	Aldir Pitt	Sanitary Engineer
SEIN	Dilene Aguiar Souto Maior	Engineer
SEIN	Nilce Helena Gondim	Engineer
SECTMA	Ronaldo C. Cavalcanti	Director of Environment

MEMBERS(Japanese Side)

INSTITUTION	NAME	Position
JICA STUDY TEAM	Hajime TANAKA	Team Leader
JICA STUDY TEAM	Hiroyuki SHIRAIWA	Stormwater Drainage Planning
JICA STUDY TEAM	Katsuhisa WATANABE	Sewerage Planning
JICA STUDY TEAM	Tadashi SHOJI	Facility Planning
JICA STUDY TEAM	Shimao HIDAKA	Facility Planning
JICA STUDY TEAM	Naoki YASUDA	Coordinator
JICA STUDY TEAM	Cesar Itiro MATONO	Interpreter

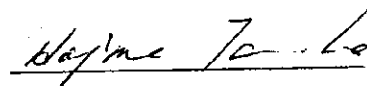
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**MINUTES OF MEETING
ON
PROGRESS REPORT (2)
FOR
THE STUDY ON STORMWATER DRAINAGE AND SEWERAGE MANAGEMENT
PLAN FOR RECIFE METROPOLITAN AREA
IN
THE FEDERATIVE REPUBLIC OF BRAZIL**

RECIFE, SEPTEMBER 5, 2000



JOSE ARLINDO SOARES
SECRETARY.
STATE SECRETARIAT OF PLANNING
AND SOCIAL DEVELOPMENT,
STATE OF PERNAMBUCO
(SEPLANDES)



HAJIME TANAKA
TEAM LEADER,
STUDY TEAM OF JAPAN
INTERNATIONAL COOPERATION
AGENCY (JICA)

The Study Team of the Japan International Cooperation Agency (JICA) has conducted the second field study after signing the Minutes between the State Secretariat of Planning and Social Development, State of Pernambuco (SEPLANDES) and the Study Team on May 25, 2000. The meeting dealt with the Interim Report (March 2000), which proposed the Master Plan and the priority projects for F/S.

The Study Team prepared Progress Report 2 in August 2000 to present the results of the field study from May through August 2000 and submitted thirty copies in English and thirty copies of the Summary Report in Portuguese to SEPLANDES on August 31, 2000, in accordance with the Scope of Work agreed upon between SEPLANDES and JICA on March 3, 1999.

The Study Team held a meeting on Progress Report 2 with the staff concerned from SEPLANDES and COMPESA in the meeting room of SEPLANDES on September 4, 2000. The Study Team explained the major findings and issues on the seven sewerage systems selected as the priority projects and discussed with those present the opinions and comments raised in the meeting. At the end of the discussion the Study Team asked SEPLANDES to collect comments and opinions, if any, on the report from the staff and organizations concerned and send them to the Study Team in order to be incorporated into the Draft Final Report.

On closing the meeting, SEPLANDES expressed its satisfaction with the presentation of the report and the field study.

During the meeting the points agreed by the participants were as follows:

1. Progress Report 2 is accepted in principle without any special comments.
2. SEPLANDES agreed to collect comments and opinions, if any, on the report from the counterparts, other personnel and related organizations and send them to the Study Team within three weeks.
3. SEPLANDES proposed to maintain contacts between the Study Team and the counterpart team during the work in Japan. The Study Team agreed to keep in touch with the counterpart team on a regular basis by e-mail.

4. The Study Team urged SEPLANDES that the counterpart team should cooperate with the Study Team until the end of the Study. SEPLANDES agreed to make every effort to this end.

The list of participants in the meeting on September 4 is shown in Annex-1.



**SECRETARIA DE PLANEJAMENTO E
DESENVOLVIMENTO SOCIAL**

ANNEX-1

JICA PROJECT / PERNAMBUCO

EVENT: PRESENTATION AND DISCUSSION ON PROGRESS REPORT (2)
SPEAKER: JICA STUDY TEAM
DATE: 04/09/2000
TIME: From 14:30 to 17:00
VENUE: SEPLANDES

PARTICIPANTS:

1 Brazilian Side

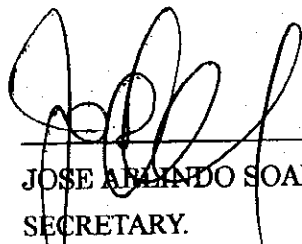
INSTITUTION	NAME	POSITION
SEPLANDES	Roberto Salomão do A. Melo	Executive Director of Regional Program
SEPLANDES	Thereza Regina F. Pereira G. da Mata	Department Manager
SEPLANDES	Sérgio David Farias	Department Manager
COMPESA	Guilherme Tavares	Chief Executive Director
COMPESA	Ângela Bacelar	Director Advisor

2 Japanese Side

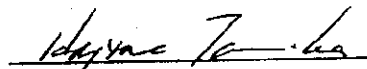
INSTITUTION	NAME	POSITION
JICA STUDY TEAM	Hajime Tanaka	Team Leader
JICA STUDY TEAM	Tadashi Shoji	Facility Planning
JICA STUDY TEAM	Masaru Ohno	Construction Planning and Cost Estimate
JICA STUDY TEAM	Keiko Mitsunaga	Interpreter
JICA STUDY TEAM	César Itiro Matono	Interpreter

**MINUTES OF MEETING
ON
DRAFT FINAL REPORT
FOR
THE STUDY ON STORMWATER DRAINAGE AND SEWERAGE MANAGEMENT
PLAN FOR RECIFE METROPOLITAN AREA
IN
THE FEDERATIVE REPUBLIC OF BRAZIL**

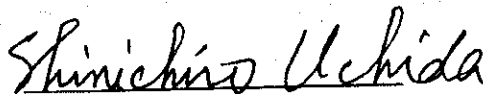
RECIFE, DECEMBER 6, 2000



**JOSE ABANDO SOARES
SECRETARY.
STATE SECRETARIAT OF PLANNING
AND SOCIAL DEVELOPMENT,
STATE OF PERNAMBUCO
(SEPLANDES)**



**HAJIME TANAKA
TEAM LEADER,
STUDY TEAM OF
JAPAN INTERNATIONAL
COOPERATION AGENCY (JICA)**



**SHIN'ICHIRO UCHIDA
CHAIRMAN,
ADVISORY COMMITTEE OF
JAPAN INTERNATIONAL
COOPERATION AGENCY (JICA)**

The Study Team of Japan International Cooperation Agency (JICA) has conducted the Study on the captioned project since October 1999 and prepared the Draft Final Report (November 2000) in accordance with the Scope of Work agreed upon between SEPLANDES and JICA on March 3, 1999. The report presents a Master Plan for stormwater drainage and sewerage management in Recife Metropolitan Region (RMR) and the results of a feasibility study on the seven sewerage systems as priority projects identified in the Master Plan.

The Study Team arrived in Recife on November 27, 2000 and submitted thirty (30) copies (Summary Report, Main Report and Supporting Report) in English, five (5) copies (Data Book) in English and thirty (30) copies of the Summary Report in Portuguese to SEPLANDES on November 28, 2000.

SEPLANDES and the Study Team held a series of meetings on Draft Final Report with the staff concerned from SEPLANDES and COMPESA at SEPLANDES on November 29, 2000, at COMPESA on November 30, 2000 and at SEPLANDES on December 1, 2000. The Study Team explained the results of the Study and discussed with those present on the comments and opinions raised during the meetings.

During the discussion the Study Team asked SEPLANDES to collect comments and opinions, if any, on the report in written form from the staff and organizations concerned and send them to the Study Team through JICA Brazil before the end of December, 2000 in order to be incorporated into the Final Report, which is to be finalized in January 2001.

Roberto Salomao do A. Melo, Executive Director of Regional Programs of Strategy Program Directory of SEPLANDES, and Guilherme Tavares, Chief Executive Director of COMPESA, chaired the meeting at SEPLANDES and at COMPESA respectively.

The Chairman of JICA Advisory Committee, Shinichiro Uchida, arrived in Recife on December 3, 2000.

The Study Team and the Advisory Committee held a meeting with SEPLANDES on

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December 6, and discussed on the major comments and opinions on the report raised by the attendants from SEPLANDES and COMPESA during the meetings. After discussion the authority of SEPLANDES expressed its satisfaction to both the Study and the Report, and also its appreciation of the technology transfer seminar held on December 5 and the donation of the equipment procured by JICA for the Study.

During the meetings the points agreed by the participants were as follows:

1. Draft Final Report is accepted in principle without any special comments.
2. SEPLANDES agreed to collect comments and opinions, if any, on the report in written form from the counterparts, other personnel and related organizations and send them to the Study Team through JICA Brazil Office by the end of December 2000.
3. The Study Team urged SEPLANDES to organized a team (or committee) immediately after the Study to prepare for accomplishment of the results of the Study.
4. The Study Team urged SEPLANDES to conduct proper management of the equipment, which has been donated by JICA to SEPLANDES and transferred from the Study Team to SEPLANDES in accordance with the letter from JICA Brazil to SEPLANDES on November 27, 2000.

The lists of participants in the meetings on November 30, December 1 and December 6 are shown in Annexe-1, -2, and -3 and the lists of equipment transferred are attached.





**SECRETARIA DE PLANEJAMENTO E
DESENVOLVIMENTO SOCIAL**

ANNEX-1

JICA PROJECT / PERNAMBUCO

EVENT: DISCUSSION ON DRAFT FINAL REPORT
SPEAKER: JICA STUDY TEAM
DATE: 29/11/2000
TIME: From 14:30 to 16:00
VENUE: SEPLANDES

PARTICIPANTS:

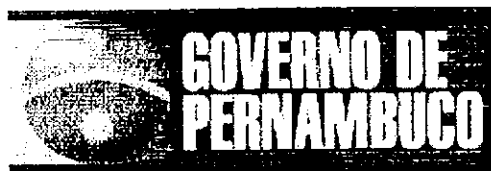
1 Brazilian Side

SEPLANDES	Roberto Salomão do A. Melo	Executive Director of Regional Program
SEPLANDES	Thereza Regina F. Pereira G. da Mata	Department Manager
SEPLANDES	Sérgio David Farias	Department Manager
COMPESA	Guilherme Tavares	Chief Executive Director
COMPESA	Ângela Bacelar	Director Advisor

2 Japanese Side

JICA Studt Team	Hajime Tanaka	Team Leader
JICA Study Team	Katsuhisa Watanabe	Wastewater treatment Planning
JICA Study Team	Shimao Hidaka	Facility Planning
JICA Study Team	César Itiro Matono	Interpreter

5.4



**SECRETARIA DE PLANEJAMENTO E
DESENVOLVIMENTO SOCIAL**

ANNEX-2

JICA PROJECT / PERNAMBUCO

EVENT: EXPLANATION AND DISCUSSION ON DRAFT FINAL REPORT
SPEAKER: JICA STUDY TEAM
DATE: 30/11/2000
TIME: From 9:30 to 12:00
VENUE: COMPESA

PARTICIPANTS:

1 Brazilian Side

COMPESA	Guilherme Tavares	Chief Executive Director
COMPESA	Ángela Bacelar	Director Advisor
COMPESA	Sergio Tavares Do Rego Barros	Chief of Division of Projects- DJP/DT
COMPESA	Artur Dias Medeiros	Engineer of DJP/DT
COMPESA	Julio Sergio Maia Da Costa	Gerente Da of GME?DO
COMPESA	Ieda Kozmhinski Alves	Director Advisor of Sewerage South Division
SEPLANDES	Thereza Regina F. Pereira G. Da Mata	Gerente Do Departament de Infraestrutura

2 Japanese Side

JICA Study Team	Hajime Tanaka	Team Leader
JICA Study Team	Katsuhisa Watanabe	Wastewater treatment Planning
JICA Study Team	Shimao Hidaka	Facility Planning
JICA Study Team	César Itiro Matono	Interpreter



**SECRETARIA DE PLANEJAMENTO E
DESENVOLVIMENTO SOCIAL**

ANNEX-3

JICA PROJECT / PERNAMBUCO

EVENT: DISCUSSION ON MINUTES OF MEETINGS ON DRAFT FINAL REPORT
SPEAKER: JICA STUDY TEAM
DATE: 06/12/2000
TIME: From 11:00 to 12:00
VENUE: SEPLANDES

PARTICIPANTS:

1 Brazilian Side

SEPLANDES	Roberto Salomão do A. Melo	Executive Director of Regional Program
SEPLANDES	Thereza Regina F. Pereira G. da Mata	Department Manager
SEPLANDES	Sérgio David Farias	Department Manager

2 Japanese Side

JICA Study Team	Hajime Tanaka	Team Leader
JICA Study Team	César Itiro Matono	Interpreter
JICA Advisory Committee	Shinichiro Uchida	Chairman
JICA Brazil	Kazuyoshi Shinoyama	Coordinator

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EQUIPMENT LIST

Water Analyzer

	Description of goods	Model	Quantity	Box number
1	Rapid water analyzer with manual	Hach DR/2010	1 set	Box 1
2	Carrying case		1 set	Box 1
3	Rechargeable battery	No. 45185-00	1 set	Box 1
4	AC adapter		1 set	Box 1
5	Portable pH meter with standard pH solution	UK-2030	1set	Box 2

Reagents for the Water Analyzer

	Description of goods	Model	Quantity	Box number
1	Spare reagent for Cadmium analysis	12616	1 pack	Box 3
2	Spare reagent for Chromium analysis	2044	1 pack	Box 3
3	Spare reagent for Chromium analysis	2126	1 pack	Box 3
4	Spare reagent for Chromium analysis	2043	1 pack	Box 3
5	Spare reagent for Chromium analysis	12066	1 pack	Box 3
6	Spare reagent for Chromium hexa analysis	12710	1 pack	Box 3
7	Spare reagent for Chlorine analysis	14064	1 pack	Box 3
8	Spare reagent for Cyanide analysis	21070	1 pack	Box 3
9	Spare reagent for Cyanide analysis	21068	1 pack	Box 3
10	Spare reagent for Cyanide analysis	21069	1 pack	Box 3
11	Spare reagent for Nitrate analysis	14034	1 pack	Box 3
12	Spare reagent for Nitrate analysis	21071	1 pack	Box 3
13	Spare reagent for Ammonium analysis	26531	1 pack	Box 3
14	Spare reagent for Ammonium analysis	26532	1 pack	Box 3
15	Spare reagent for Iron analysis	21057	1 pack	Box 3
16	Spare reagent for Nickel analysis	7005	1 pack	Box 3
17	Spare reagent for phenol analysis	1836	1 pack	Box 3
18	Spare reagent for phenol analysis	872	1 pack	Box 3
19	Spare reagent for Manganese analysis	21076	1 pack	Box 3
20	Spare reagent for Manganese analysis	21077	1 pack	Box 3
21	Spare reagent for Phosphorous analysis	21060	1 pack	Box 3
22	Spare reagent for DO analysis	25150	2 pack	Box 3
23	Spare reagent for Detergent analysis	1008	1 pack	Box 3
24	Spare reagent for Detergent analysis	452	1 pack	Box 3
25	Phthalate-Phosphate Reagent	26151	1 pack	Box 3
26	Buffer powder pillow	14202	2 pack	Box 3
27	Buffer solutions	424	1 pack	Box 3
28	Glassware (liquid separator)		5 pieces	Box 2(1) & 3(4)
29	Rubber & Hollow plug	2118, 1448001	2 pack	Box 3
30	E-coli detection paper		1 set	Box 2

5.4

EQUIPMENT LIST

Portable Digital Flow Meter

	Description of goods	Model	Quantity	Box number
1	Digital Current Meter Hiroi Type	2081	2 sets	Box 5 & 6
2	Sensor for the Current meter	2082	2 sets	Box 4
3	Metal Handle for the flow meter		2 pieces	

Office Equipment

	Description of goods	Model	Quantity	Box number
1	Copier Machine	Xerox 5818 n. T9Y048493	1 set	
2	Voltage Regulator	Xerox do Brasil 10570309-REV. C Serir 3019	1 set	
3	Phone/Fax Machine	Panasonic KX-FJ 34	1 set	
4	Personal Computer (complete)	Waytec K6 II-350 HD 6 GB, e Monitor 17"	2 sets	
5	Printer	Hewlett Packard Laser Jet 1100	1 set	
6	Printer	OKI Data Okipage 4W	1 set	

Handwritten signature and initials: *[Signature]* SL

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