# *SUPPORTING REPORT I*

# *INSTITUTIONAL ORGANIZATION*

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### SUPPORTING REPORT I: INSTITUTIONAL ORGANIZATION

# 1. INTRODUCTION

The institutional study aims to propose a plan to strengthen the organization of (1) drainage systems and (2) sewerage and sanitary service management in the State of Pernambuco. The present sewerage system started in 1971 after COMPESA was established by State Law N° 6307, 29th of July 1971. The stormwater drainage systems are stipulated to be managed by the respective municipalities.

In particular, the rapid increase and expansion of urban areas including low income and informal settlements has brought about a shortage of basin infrastructure in these years. This resulted in the degradation of the urban environment of the RMR, in particular in relation to the water quality of its rivers. Thus, urgent projects of sewerage systems were proposed to remedy this situation but they are very ambitious for the existing agencies and organizations to implement. In order to carry out these projects, the present organizations and the basic concepts were studied to propose plans for the State Government to strengthen organizations for sewerage system management in the following areas: (1) organizational restructuring of existing agencies, (2) systems of implementation of projects and (3) reorganization of operating and maintenance entity.

## 2. EXISTING ORGANIZATIONS

### 2.1 Overall Administrative Structure of Pernambuco State

The state government is composed of seventeen (17) secretariats under the governor, (December 1999). Besides these secretariats, there are thirty-seven (37) external organs under the respective secretariats. The organizational diagram of the state is shown in Fig. I2-1. In the figure, agencies and external organizations related to the current study are indicated with broken lines.

The state secretariats are as follows:

| | | |
|---|---|---|
| (1) | **SEPLANDES:** | **State Secretariat of Planning and Social Development** |
| (2) | **SEIN:** | **State Secretariat of Infrastructure** |
| (3) | **SRH:** | **Secretariat of Water Resources** |
| (4) | **SECTMA:** | **Secretariat of Science, Technology and the Environment** |

The external agencies are:

| | | |
|---|---|---|
| (1) | **COMPESA:** | **Sanitation Company of Pernambuco,** |
| (2) | **CONDEPE:** | **Civil Defense Board of Pernambuco** |
| (3) | **FIDEM:** | **RMR Development Foundation** |
| (4) | **ITEP:** | **Technological Institute of Pernambuco** |
| (5) | **CPRH:** | **Environment Company of Pernambuco** |

The functions of these organizations are summarized in Annex at the end of the chapters. The organization diagrams of SEPLANDES, SEIN, SRH and CPRH are shown in Fig. I2-2 to I2-5.

## 3. INSTITUTIONAL FUNCTION

### 3.1 Implementing Organizations of Sewerage Systems

According to the Federal Constitution of 1988, municipalities are responsible for sewerage and sanitary services in their administrative territory (Art. 30). The municipalities are in charge of organizing and providing, directly or by way of concessions or permission, public services including sewerage and sanitary services. Due to the fact that the size and

management of services extrapolates municipal territory, especially in the RMR, these services have normally been delegated to the state authorities in the State of Pernambuco. Therefore, the State Government has been responsible for the regulation, operation and maintenance of sanitation services since their installation.

At present, expansion and investment plans for sewerage systems in the state are usually executed by COMPESA. The State Government, i.e. SEIN as the responsible body, provides the financial sources for the implementation of these plans. In COMPESA, APT (Technical Planning Advisory) is responsible for implementation of these plans. Under APT, GEX (Section of Expansion) manages the implementation of the plans such as preparation of tender documents, supervision of projects and construction works. CPL (Permanent Tendering Commission) is in charge of tenders and contracts with contractors selected for the implementation. These positions of duty are illustrated in Fig. I2-6.

Sewerage and sanitary works are often implemented as a component of comprehensive development projects such as sanitation programs (PASS, PROSANEAR, etc.), tourism development (PRODETUR) and housing programs. These programs are implemented by the municipalities concerned or special agencies for the respective projects. Mostly they are financed by the Federal Government and/or international financing organizations. In these development programs, COMPESA has played a role of sewerage developer as a member or cooperator in the programs. After the completion of the programs, COMPESA receives these facilities that are transferred by the implementing agencies. Thus, the facilities are incorporated into COMPESA's patrimony, although some facilities are not accepted because the sewerage system specifications do not comply with their standards. As a result, there are various types of sewerage systems in the RMR, which were developed by agencies in different programs and which are still managed by COMPESA.

### 3.2 Operating Entity of Sewerage System

In the State of Pernambuco, most of the sewerage systems have been operated by COMPESA since 1971. The State Government owns almost the whole stock of COMPESA. It provided water supply services for 4.9 million people, and sewage sanitary services for 1.1 million people in the state in 1998. In the RMR, COMPESA manages water supply and sanitation services and is also entrusted with the maintenance of other treatment systems by users on request.

For the operation and maintenance of water supply and sewerage systems, COMPESA has 174 municipal branch offices throughout the 185 municipalities in the state. As of July 2000,

COMPESA has around 3,600 workers for water supply and sewerage works. In 1998, the number of workers was around 4,160, so it has decreased by 560 workers over a period of one and half years. In the same manner, outsourcing costs have dropped at the same rate as staff costs. Since the serious drought in 1997, COMPESA is trying to streamline its management to improve its financial situation.

At present, the State Government is examining alternative operating entities for public infrastructure services. The form of privatization of public corporations is also being discussed. However, it will take time for the State Government to put their final decision into effect. Meanwhile, COMPESA is considered to be responsible for the O&M of sewerage systems in the state

## 4. FINANCIAL CONDITIONS

### 4.1 Federal Government

Table I4-1 shows financial statements of the federal government during the four years from 1994 to 1997. In 1997, the government spent around R$ 9.9 billion on capital investment. It accounted for 2.2% of total expenditure and 2.5% of the total fiscal revenue. Of the total investment, R$ 4.2 billion was transferred to local governments and public corporations throughout the country. Meanwhile, the debt service, i.e., interest and principal payments amounted to R$ 249.1 billion, accounting for 58 % of the total expenditure.

### 4.2 State Government

Table I4-2 shows the budgets of the State Government of Pernambuco during the five years from 1995 to 1999. In 1999, the State Government spent around R$ 517 million on capital investment. This accounted for 11.7 % of total expenditure. Meanwhile, the debt service amounted to R$ 597 million, accounting for 13.5 % of the total expenditure.

However, the financial statements of the state government show a performance very different from the budgets (See Table I4-3). The total expenditure recorded considerably smaller amounts than the budgetary expenditures. Their ratios were: 66 % in 1995, 69 % in 1996, 55 % in 1997 and 86 % in 1998. In terms of expenditure for capital investment, the actual amounts were R$ 37 million or 1.7 % of the total expenditure in 1995, R$ 44 million or 1.6 % in 1996, R$ 27 million or 1.3 % in 1997, and R$ 21 million or 0.5 % in 1998. These investments were also only 4 %, 7 %, 5 % and 4 % of the budget amounts, respectively.

The state government prepared the latest 1999 budget, as shown in Table I4-4. The total budget amounted to R$ 5.44 billion. It comprises R$ 4.42 billion or 81% for the government itself and R$ 1.02 billion or 19% for the external organizations. Of the total revenue of R$ 5.44 billion, the current revenue was R$ 4.50 billion or 83 %. Tax revenue accounted for R$ 2.19 billion or 49 % of the current revenue. Transfers from the federal government and others accounted for R$ 1.25 billion or 28 % of the current revenue. Of the total expenses, R$ 0.70 billion was used for capital investment, accounting for 13 % of the total. The debt service accounted for R$ 0.60 billion or 11 % of the total expenses. The expenses per capita for the people in the state was calculated at around R$ 700 (equivalent to US$ 400).

SEIN is the secretariat responsible for infrastructure in the state. Table I4-5 shows its budget for 1999. The total expenditure amounted to R$ 142 million. Of the total expenditure, SEIN allotted the following amount.

- For sewerage systems: R$ 64.8 million or 46 % of the total expenditure
- For stormwater drainage: R$ 2.1 million or 1.5 % of the total expenditure

### 4.3 Municipal Governments

In 1997 the municipalities of the RMR altogether had a surplus of around 2 % of their total income. However, if analyzed separately, it can be seen that only Recife, Cabo and Olinda had a surplus and the other 11 municipalities had deficits, as shown in Table I4-6. The total expenditure of the 14 municipalities accounted for 20 % of the actual state expenditure in 1997.

Over the years, Recife has made an effort to modernize its administration; up-dating property records in terms of building types and uses, as well as adopting measures to reduce defaulting of municipal taxes. The percentage of municipal taxes to the total revenue including transfer payment from both the federal and state governments was raised to 4.5 % in 1996, from 1.7 % only in 1991 as shown in Table I4-7. Significant improvement in income was attained as a result.

### 4.4 Compesa

COMPESA is the public enterprise in charge of sewerage services in the state. Table I4-8 shows its operating performance during the three years from 1995 to 1997. It treated 65million $m^3$ of sewage in 1997, which was collected from 275 thousand units.

Tables I4-9 and I4-10 show the financial statements of COMPESA for the five years from 1995 to 1999. The profit and loss table shows that COMPESA recorded losses, except in 1995 and 1997. However, the statements do not show details of their operating revenues. Therefore it is not clear whether or not their management is sound and efficient. The financial analysis of COMPESA will be more discussed in the supporting report H, "Economic and Financial Evaluation".

The budget of COMPESA in 1999 amounted to R$ 225 million, as shown in Table I4-11. Of the total expenses, sewerage systems accounted for R$ 86 million or 38 % of the total expenditure. Incidentally, in June 1999 the four major sewerage systems in the RMR consumed R$ 2.1 million within the total sewerage expense of R$ 2.6 million.

## 5. ORGANIZATION PLAN

### 5.1 Structure of Existing Organizations

#### (1) From SEIN to ARPE, as Regulatory Organ

At present, SEIN, as a regulatory organ, guides actions to enforce laws and regulations, directs the management of sewerage and ancillary services, and controls agencies concerned with water affairs. It works to collect and provide useful information regarding sewerage services. In effect, SEIN guides and controls COMPESA in the areas of planning and finance.

ARPE is being organized to control all the public services delegated by the State of Pernambuco. In the future, when the privatization of infrastructure management is defined and introduced in the state, ARPE will regulate all the infrastructure services including sewage treatment services, as mentioned before. Thus, ARPE will function as a regulatory organ, in place of SEIN.

Preservation of water resources and their environment is essential for sustainable development. The agencies concerned must make efforts to protect, enhance and restore water quality, and prevent water pollution. In this context, ARPE has to play a leading role in monitoring the activities and conditions of operational entities in state territory in cooperation with agencies such as the CPRH. Monitoring water quality, and observing environment impacts by water users and effluent dischargers are also the responsibility of this regulatory organ. Thus, it is to be desired that ARPE structure its organization to provide the said functions within a corporation framework including the agencies concerned.

#### (2) Deliberative Organs

Until now, water has been provided virtually free to public sector users. Management aspects of water sector issues such as water supply and sanitary services are also decided on by the public sector. There has been no room for the stakeholders to take part in implementation or O&M in this sector. This prevents them from becoming familiar with problems in this area, resulting in insufficient funds being allocated. The revival of democracy has lead to the realization that institutional reorganization, i.e., participation and decentralization, is essential in the water sector. In water resource management, this policy is declared in the statement of the World Bank: "A World Bank Policy Paper, Water Resources Management, September 1993". Sewerage and related services are cited as one of its components.

A deliberative organ should be established to provide sound management of the sewerage system. The deliberative organ could be set up as a board, council or committee. As mentioned before, some deliberative functions are carried out by SEPLANDES. Within SEPLANDES, however, there is no permanent organ taking a deliberative role at present, apart from promoting public participation through public meetings and hearings. If SEPLANDES took a deliberative role in public infrastructure services, it should have a council consisting of several councilors dealing with the respective infrastructure services. Under this council, subcommittees would be established in the respective fields. For example, one of the subcommittees would deliberate on sewerage services in the state. The committee members should be selected from both the public and private sectors. The members from the private sector would be selected from local associations, organizations and communities interested in sewerage services. Thus, the stakeholders in the community would influence policy formulation for sewerage services, alternative designs, investment choice and management decisions. At the same time, they would share in the responsibility for the proposed sewerage systems.

## 5.2 Implementing Organization

### (1) Organizations Concerned with Sewerage Projects

The proposed projects are a large-scale undertaking, which comprise many planning components. For implementation of the project, a leading agency always has to coordinate organizations and agencies concerned with the proposed projects. It also makes arrangement with the federal government and international financing organization in order to procure financial sources for the project.

Thus, the leading agency is formally established as a project management unit (PMU). The PMU would rather be set up under SEPLANDES, since its major function is coordination of agencies concerned. Thus, the PMU has to have a coordination committee including representatives of agencies concerned in addition to the executive secretariat. The committee is composed of representatives from SEIN, SRH, COMPESA, CONDEPE, FIDEM, ITEP and CPRH as well as SEPLANDES.

After completion of the feasibility study, the PMU has to be created as a preparation agency by the time of commencement of the proposed projects. In order to procure from international or local financial organizations, the PMU has to ask the Federal Senate to authorize a permission of finance. After that, the state government gets an approval from the competent agency of foreign loans in the federal government, i.e., External Financial Commission (COFIEX or Comissão de Financiamentos Externos) under Ministry of Planning, Budget and Management (MP or Ministério do Planejamento, Orçamento e Gestão).

Besides, the permission from the Federal Senate is prerequisite for the project entity to procure international loans through the President of the Federal (PR), under consideration of allowance of debt services. The detail procedure of finance procurement from international financing agencies is figured out in Fig. I5-1.

In terms of environment assessment, the PMU has to get licenses from the competent agency at the respective implementation stages. The proposed projects are located in state territory, so the CPRH is competent to issue licenses from the state standpoint, referring to the National Policy of Water Resources (Federal Law No.9443m 18th of January 1997). The PMU might conduct environmental studies under guidance of the CPRH.

### (2) Implementing Organ

For implementation of the project, an umbrella agency always has to coordinate the organizations and agencies mentioned above. The PMU plays a role of coordination and management with the Federal Government and international financing organizations to procure financial sources for the projects. 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 Gestão do Programa) under "PROMETROPOLE". In this project, SEPLANDES played a leading role in the implementation. Fig. I5-2 shows a structure of the PMU with agencies concerned, and a management flow diagram of PROMETROPOLE, as a reference. In the same manner, SEPLANDES should take a leading role in formulating the PMU of the proposed projects in this feasibility study. SEPLANDES should first set up a preparation committee of the PMU. This committee would include representatives of agencies concerned in addition to the executive secretariat. The committee would be composed of representatives from agencies concerned as mentioned in the previous Section.

### (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. I5-3.

### 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 (From 2002 to 2003)

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

1) to win the approval of international finance and to secure a pledge of assistance from international financing organizations;

2) 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);

3) to prepare for construction works such as land acquisition for plant sites, detailed design documents and public tender for selection of contractors; and

4) 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 (From 2004 to 2007)

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 (From 2007 to 2010)

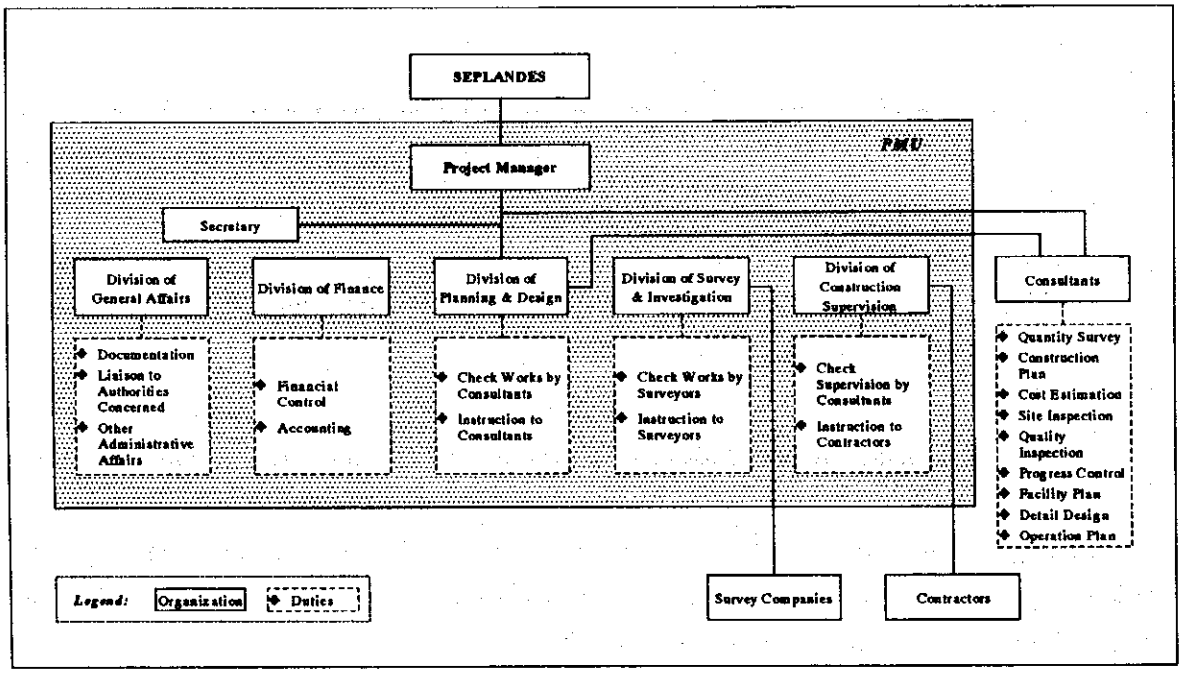
In this stage, the respective plants will be inaugurated after the completion of main plants and trunk sewer pipelines. Without interrupting services, lateral pipelines will be constructed for expanding service areas covered by the sewerage systems. The PMU will complete the proposed projects by the 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.

## 5.3 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.

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. Taking into account of these conditions, the following organization will be recommended for the implementation.




## 5.4 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.

-1 Training for every split business hierarchy, which is classified for sake of convenience into the classes of executive, supervisor, usual staff and recruited staff.

-2 Training for practical subjects, which include the fields of general affairs, accounting, planning, sewerage technology, construction, etc.

-3 Training by dispatching or sending the sewerage system's staff to other institutions or by invitation of trainers.

-4 Supporting for self-education.

## 5.5 Operating Entity

### 5.5.1 Management Components

Sewerage and sanitary services are prescribed as a duty of municipal government. The services act on the principle of "profit and loss responsibility" i.e., coverage of all costs by revenue from services. In this context, the operating entity is a business organization managing sewerage systems. In order to be managed independently, the entity must have a management policy of long-term financial sustainability. The managing entity carries out a policy of full recovery of costs and financial autonomy. In general, management is always assessed in its three specific aspects: efficiency, soundness and profitability. These aspects are useful to diagnose the management situation as a whole. The present operating agency, COMPESA, is diagnosed in terms of these indicators in the financial analysis in Supporting Report H.

On the other hand, the managing entity consists of many parts, such as departments, sections, divisions, etc. A business organization is composed of several functional components. They are (a) executive management, (b) financial management, (c) labor management, (d) sales management, and (e) operation management. In the respective management fields, performance should always be assessed from the point of view of efficiency, soundness and profitability. The results of the assessment are fed back to reorganize their structure.

An overall management diagnosis based on the financial statements of COMPESA highlights four major management problems. They are (a) streamlining of staff allocation, (b) outsourcing and restructuring, (c) tariff control and (d) sewerage management restructuring.

### 5.5.2 Improvement of Management Efficiency

#### (1) Streamlining of staff allocation

It will be inevitable for every staff member to become aware of his labor cost within the total expenses of the company, in order to achieve high management efficiency. Streamlining of staff allocation and raising the motivation of employees is common in the management of private businesses. COMPESA should introduce the management revolution prevailing in private firms.

COMPESA have to establish annual objectives of sales, profit and tasks to achieve their objectives. Each department, section and division should allocate tasks to achieve specified norms and objectives with indicators to measure their attainment. Wages and promotion of each member of staff would preferably be determined by degree of contribution to the achievement of the norms or objectives. Although COMPESA has reformed its management structure on occasions, the necessity of the introduction of objective management seems to have been overlooked.

In response to the expansion of operations resulting from the proposed projects, some administrative staff should be moved to operational sections and the efficiency of administrative sections should be enhanced. The total number of employees would remain stable.

One management cost saving measure would be to increase intervals of meter-reading from monthly to bi-monthly. Monthly bills would continue to be issued, based on half the bi-monthly value.

#### (2) Outsourcing and restructuring

Outsourcing of some parts of the business is an effective way to introduce competition in a monopolized sector like COMPESA when tendering is open to all private sectors. Restructuring of the present sections, which carry out the tasks, should be introduced to enjoy the benefit of the competitive principle.

Outsourcing of operations in COMPESA's professional areas, such as operation of treatment plants, may similarly improve management efficiency. However, this outsourcing has to be carefully introduced, in consideration of the following points. When these points are clear, outsourcing is recommended.

1) Possibility of success in restructuring: outsourcing always involves restructuring, which may include the dismissal or retraining of some employees.

2) Costs of quality control: contracted private companies may operate with lower costs but with lower quality services. This may adversely affect services as a whole. Costs for inspection and quality control will tend to increase.

3) Capability of own efforts for efficiency: COMPESA has expertise in managing sewerage systems. COMPESA itself could be the best competitor among all private firms in the state, if it gave full scope to its ability with incentives for efficient operation. In this case, outsourcing is the second alternative.

### (3) Appropriate tariff system

Tariffs should be set to reflect costs of sewage collection, sewage treatment and other activities for sanitary services. These sewerage system costs are considered to comprise three parts: user cost, fixed cost and variable cost. They contain the following expenses.

1) User cost: meter-reading, tariff collection, etc.
2) Fixed cost: capital cost, standing charge for electricity, basic wage rates, etc.
3) Variable cost: electric power, chemical materials, etc.

A knowledge of the actual costs above is a prerequisite to set the correct tariff. Thus, another management measure will be to streamline the accounting system with enhanced cost analysis.

The basic principle of tariff setting is based on "long-run marginal cost", where users should pay the cost of their marginal services. The tariff for additional service of sewage treatment should be set to cover the additional cost of investment and O&M. The World Bank recommends this tariff principle in the electricity and water sectors.

The current tariff structure for sewerage services is a system of surcharge on water use charge, which is quite popular in many countries. The revenue from sewage treatment services depends on water supply revenue in the service area. On the other hand, the cost structure of sewage treatment is different from that of the water supply system. Thus, it is very important to establish the proper sewage treatment cost to be able to decide a surcharge rate in relation to the water supply cost. Whenever the entity revises the sewerage service charges, the cost information of both sewage treatment and water supply systems must be known to obtain consent from the deliberative organ.

The surcharge system sometimes leads to conflicts between the users and COMPESA. For instance, when a user changes his water source from the water supply system to a private well system, COMPESA does not charge for the water. Consequently, COMPESA is not able to charge for sewage treatment, in spite of the fact that the effluent is still discharged into the sewerage system. This is a defect of the surcharge system. To solve such problems, COMPESA always endeavors to explain to users the importance of sewage sanitation systems and the costs involved. The systems cannot be sustained without the support and understanding of the users. It is important for both COMPESA and users to participate in the maintenance of the systems.

### (4) Sewerage management restructuring

COMPESA business activity services at present include both water supply and sewerage system services. The management of sewage treatment services is a section in the O/M department and does not seem to be functioning well at the moment. The scale of sewerage systems is so small that staff numbers are low compared with water supply services, which tend to receive more attention from top management. For this reason, it is proposed that the management structure for sewerage systems be an independent and autonomous entity within COMPESA, operating in parallel with the water supply division.

# ANNEX

## 1. SEPLANDES (Secretariat of Planning and Social Development)

The Secretariat is responsible for carrying out the basic planning, coordination, monitoring and evaluation of the executive actions promoted by the Government. It also coordinates the administrative affairs among the State Secretariats aiming at the elaboration and consolidation of plans, programs, research, and detailed designs. Furthermore it fosters and coordinates the elaboration of socio-economic development plans for the state, and procures external financial resources. The Secretariat is also in charge of the regulation and coordination of budget preparation, besides carrying out follow-up actions concerning the financial programming process and the execution of the state budget.

### 1.1 FIDEM (RMR Development Foundation)

FIDEM is in charge of the following activities:

#### (1) Metropolitan institutional development

FIDEM promotes the appropriate functioning of the Metropolitan Management System, instituted by the State Complementary Law no. 10 of 1994, as an instrument for the democratization of public management and implementation of the inter-governmental action policy of the RMR. It assures the appropriate functioning of the RMR Development Council – CONDERM, and of the Sectoral Technical Chambers.

#### (2) Implementation of FUNDERM

FIDEM procures the revenue, and manages the Development Fund of the Metropolitan Region – FUNDERM, in order to assure the financing of development actions in the RMR.

#### (3) Coordination and integration of metropolitan planning.

FIDEM provides instruments for metropolitan agencies aiming at metropolitan promotion and management, stimulating the full utilization of potential and the solution of RMR problems.

#### (4) Metropolitan information system

FIDEM complements and renews the metropolitan cartographic system as well as the database which are indispensable to the planning and management of RMR.

### 1.2 CONDEPE (Pernambuco Planning Institute)

CONDEPE is in charge of the following activities:

**(1) Development of information, statistical and documentary systems, as well as research.**

CONDEPE plans, manages and operates information, statistical and documentary systems, besides performing follow-up actions concerning the socio-economic conditions of the state, which support state planning.

**(2) Support to strategic planning**

CONDEPE strategically analyzes the future of the state, and carries out studies and research to guide the actions to be implemented, aiming at overcoming constraints to the sustainable development of Pernambuco. It gives technical support to SEPLANDES and carries out cartographic studies.

### 2. SECTMA (Secretariat of Science, Technology and the Environment)

This Secretariat is responsible for formulating, fostering and executing actions connected with state policy for scientific and technological development. It is also responsible for planning and executing state policy for environment protection and water resources and forestry management and promoting and financing actions and activities to promote science and scientific research. Concerning water resources management, the Secretariat also aims at implementing the Integrated State System of Water Resources Management, promoting actions to optimize the supply and demand of water in terms of quantity and quality, as well as monitoring the weather and forecasting weather for the whole State. This Secretariat is also a shareholder of the CPRH.

### 2.1 CPRH (Environment Company of Pernambuco)

The CPRH is in charge of the following activities:

(1) Execution of the Northeast Tourism Development Program – PRODETUR/PE.

(2) Promotion of environmental education.

(3) Environmental and water resources management. Within this activity, the following actions are performed:

- Monitoring water quality of river basins;

- Monitoring groundwater quality of the RMR;
- Monitoring public water supply reservoirs within the state;
- Survey of water resources potential through the survey of the state water quality;
- Classification of waters according to CONAMA Resolution no. 20 of 1986;
- Implementation of a data bank; and
- Support to the State Plan of Water Resources.

(4) Elaboration of specific projects for pollution control.

(5) Development of actions for environmental control, preservation and restoration.

### 2.2 FERH (Water Resources State Fund)

This fund was created in January 1997 through Law No. 11426. Its main objective is to give financial support to the State Policy for Water Resources and to the actions of the component bodies of the Integrated System of Water Resources Management.

### 2.3 ITEP (Technological Institute of Pernambuco)

ITEP is responsible for assimilating, developing, improving and publicizing scientific and technological methods and knowledge. It also formulates and executes technological projects, research and studies. Furthermore, it provides technological services to industry, public or private companies and to the general public.

## 3. SEIN (State Secretariat of Infrastructure)

SEIN is responsible for coordinating the formulation and execution of governmental policies related to transport, energy, communication, housing and sanitation. In terms of sanitation, the secretariat is responsible for executing policies aimed at the enlargement, rationalization and improvement of the water supply and sewerage system, examining economical and technological alternatives. It is also responsible for meeting public demand for water, giving priority to low-income communities and to programs for developing the hinterland. In the area of housing, SEIN is responsible for the coordination and execution of state housing policy, prioritizing those programs oriented to families with an income of up to five minimum wages. It is also responsible for the promotion of basic infrastructure for rural settlements (landless farmers) and for the urbanization of slums. Another important role is to plan and execute public projects and civil works, besides the promotion of the integrated development of the hydrographic basins.

In the area of water resources and sanitation, the main activities in 1999 are as follows;

(1) **Increasing its stock in COMPESA.**

The investment directed towards: increase of water supply of and extension of water and sewerage services; the optimization and/or recuperation of these services; realization of the operational and institutional development actions; approval of the projects withiin the Zona da Mata Sustainable Development Program – PROMATA; at Social Action Program in Sanitation – PASS; and the Basic Sanitation Improvement Program in the state of Pernambuco.

(2) **Planning and follow-up activities of the sanitation projects in the State.**

(3) **Development of water resource projects in the State.**

(4) **Implementation of the flood control system in the Capibaribe River.**

The main objective of this action is to implement a system of prevention and control of floods in the RMR. The main goals of this action are to execute: at the Tapacurá Dam, the renovatoin of the dam structure, re-opening of drains and renovation of sewers and dike; at the Carpina and Goitá Dams, the indemnification of constructions in the river basin areas; in the Capibaribe, bed, alteration of course, widening and compulsory purchase of land in the urban areas of Recife.

### 3.1 COMPESA (Sanitation Company of Pernambuco)

COMPESA is responsible for executing the governmental policy of water supply and sewerage as well as for preserving and utilizing State water resources for public purposes.

The main objectives of COMPESA are as follows;

(1) **Execution of projects of the Northeast Tourism Development Program – PRODETUR-PE.**

In this program, the execution of works and services for expansion of the water supply and sewerage systems of the bairro do Recife, district of Recife is expected.

(2) **Expansion of water supply systems.**

(3) **Improvement of water supply services.**

(4) **Optimization and/or rehabilitation of water supply systems.**

(5) **Execution of projects within the Program for the Sustainable Development of the Zona da Mata (forest zone) – PROMATA.**

(6) **Operational and institutional development.**

(7) **Sanitation Program for Low Income Populations – PROSANEAR**

This Program provides for the extension of water supply and sewerage systems for low-income communities aiming at the improvement of their health conditions.

(8) **Program of Social Action in Sanitation – PASS**

This Program also provides for the extension of water supply and sewerage systems for the destitute population.

(9) **Program of basic sanitation improvement in the state of Pernambuco (KFW)**

This Program provides for the improvement of the sanitary conditions of rural area municipalities with populations between 5,000 and 40,000.

(10) **Expansion of sewerage systems.**

(11) **Improvement of sewerage services.**

(12) **Optimization and/or rehabilitation of sewerage systems.**

**4. SRH (Secretariat of Water Resources)**

The SRH was created under the new administration that started in 1999. It was based on State Law No.11426, 17th of January 1997. Thus, it was not provided for in the 1999 state budget. It took over some of the functions of SEIN. It is expected to fulfill the following functions as described in "State Policy of Water Resources"

(1) To promote rational use and sustainable development of water

(2) To formulate policies and instructions for the state's water resources management

(3) To coordinate, to supervise and to plan activities concerning to water resources

(4) To function as an executive secretariat of the state council of water resources, and to give necessary administrative and technical support

(5) To promote engineering and economic studies of water resources

(6) To develop and to maintain a state information system of water resources

(7) To analyze applications and to grant water use rights on the basis of regulation of the law

(8) To analyze projects and to permit technical licenses for water facilities in case of no environment problems

(9) To make research aiming to settle criteria and standards for granting water usage right, charging system to users and arranging rational use of water resources, and to collect water tariff

## Table I.4-1 Financial Statement of Federal Government: 1994 to 1997

(Unit: Million Reals)

| Description | 1994 | 1995 | 1996 | 1997 |
|---|---|---|---|---|
| **Revenue** | | | | |
| Current Revenue | 72,610 | 119,691 | 177,537 | - |
| 1. Tax Revenue | 28497 | 42,663 | 65,722 | 60,669 |
| a. Import Tax | 1499 | 3,290 | 6,760 | 10 |
| b. Export Tax | 0 | 1 | 7 | 202 |
| c. Other Taxes | 26,997 | 39,372 | 58,955 | 60,457 |
| 2. Revenue from Social Charge | 34031 | 62,916 | 92,652 | - |
| 3. Patrimony Revenue | 4460 | 2,791 | 4,776 | - |
| 4. Revenue from Public Enterp | 3941 | 7,517 | 8,507 | - |
| 5. Current Transfers | 456 | 845 | 2,398 | - |
| 6. Other Revenue | 1225 | 2,959 | 3,482 | - |
| Capital Revenue | 142217 | 200,466 | 139,113 | - |
| 1. Credit Operations | 93177 | 187,108 | 126,830 | - |
| 2. Other Capital Revenues | 49,041 | 13,358 | 12,283 | - |
| Total Revenue | 214,827 | 320,158 | 316,650 | 383,450 |
| **Expenditure** | | | | |
| Current Expenses | 72,829 | 134,992 | 173,993 | 183,521 |
| 1. Personnel Expenses | 17,135 | 31,207 | 41,348 | 45,061 |
| 2. Interest on Internal Debt | 7,751 | 17,677 | 16,199 | 19,874 |
| 3. Interest on External Debt | 3,431 | 8,451 | 6,064 | 5,379 |
| 4. Other Current Expenses | 44,512 | 77,657 | 110,383 | 113,207 |
| Capital Expenses | 140,863 | 183,442 | 135,986 | 245,343 |
| 1. Investments | 6,052 | 11,892 | 9,530 | 9,917 |
| Transfers | 1,962 | 3,138 | 3,898 | 4,227 |
| Direct Investment | 4,090 | 8,754 | 5,632 | 5,690 |
| 2. Financial Investment | 44,802 | 12,535 | 12,343 | 11,519 |
| 3. Amortization of Internal Det | 87,024 | 154,538 | 108,850 | 212,642 |
| 4. Amortization of External De | 2,861 | 4,088 | 4,913 | 11,164 |
| 5. Other Capital Expenses | 125 | 389 | 349 | 101 |
| Contingency Reserve | 1,114 | 1,744 | 3,035 | 2,729 |
| Total Expenditure | 214,807 | 320,178 | 313,014 | 431,593 |
| **Balance** | 20 | -20 | 3,636 | -48,144 |

Source: Anuario Estatistico do Brasil 1994 to 1998, IBGE

## Table I.4-2 Budgets of Pernambuco State Government: 1995 to 1999

(Unit: R$ Million)

| Description | 1995 | 1996 | 1997 | 1998 | 1999 |
|---|---|---|---|---|---|
| **Revenue** | **3,253** | **3,954** | **3,823** | **4,686** | **4,420** |
| Current Revenue | 2,442 | 3,444 | 3,215 | 3,853 | 3,599 |
| Tax Revenue | 1,256 | 2,054 | 2,052 | 2,149 | 2,151 |
| Contribution | 0 | 0 | 0 | - | 0 |
| Patrimony Revenue | 60 | 12 | 16 | 45 | 83 |
| Service Revenue | 28 | 32 | 2 | 6 | 39 |
| Cash Transfers | 1,006 | 1,195 | 1,040 | 1,299 | 1,138 |
| Other Cash Revenue | 92 | 151 | 106 | 353 | 188 |
| Capital Revenue | 811 | 511 | 608 | 834 | 822 |
| Credit Operations | 372 | 287 | 459 | 703 | 680 |
| Sale of Property | 46 | - | - | 12 | 1 |
| Transfer of Capital | 393 | 223 | 148 | 119 | 141 |
| Other Capital Revenue | 0 | - | 1 | - | - |
| **Expenditure** | **3,253** | **3,954** | **3,823** | **4,686** | **4,420** |
| Current Expenses | 1,895 | 2,974 | 2,960 | 3,384 | 3,373 |
| Personnel Expenses | 1,046 | 1,668 | 1,666 | 1,709 | 1,857 |
| Interest on Debts | 76 | 103 | 124 | 122 | 190 |
| Interest on Internal Debt | 66 | 91 | 115 | 115 | 180 |
| Interest on External Debt | 10 | 11 | 9 | 7 | 10 |
| Other Current Expenses | 773 | 1,203 | 1,170 | 1,553 | 1,326 |
| Capital Expenses | 1,358 | 980 | 863 | 1,303 | 1,047 |
| Investments | 935 | 649 | 576 | 506 | 517 |
| Financial Investment | 362 | 243 | 138 | 636 | 124 |
| Amortization of Public Debt | 61 | 88 | 149 | 160 | 407 |
| Amortization of Internal Debts | 29 | 56 | 108 | 153 | 399 |
| Amortization of External Debts | 32 | 33 | 41 | 8 | 8 |

Source: Lei Orcamentaria Annual, 1995 to 1999, GEP

## Table I.4-3 Financial Statements of Pernambuco State Government: 1995 to 1998

(Unit: R$ Million)

| | 1995 | 1996 | 1997 | 1998 | 1999 |
|---|---|---|---|---|---|
| **Revenue** | **1,996** | **3,046** | **2,205** | **3,797** | - |
| Current Revenue | 1,941 | 2,386 | 2,175 | 2,487 | - |
| Revenue from State Taxes | 1,231 | 1,524 | - | - | - |
| ICMS | 1,181 | 1,450 | 1,307 | 1,423 | - |
| Others | 50 | 74 | - | - | - |
| Transfer from Federal Taxes | 609 | 697 | - | - | - |
| FPE | 533 | 603 | 559 | 635 | - |
| Others | 76 | 94 | - | - | - |
| Other Current Revenue | 101 | 165 | 308 | 429 | - |
| Capital Revenue | 55 | 660 | 30 | 1,310 | - |
| **Expenditure** | **2,163** | **2,747** | **2,119** | **4,017** | - |
| Current Expenditure | 1,953 | 2,422 | 1,986 | 2,352 | - |
| Personnel Expenses | 1,358 | 1,554 | 1,249 | 1,351 | - |
| Interest of Internal & External Debt | 69 | 107 | 73 | 95 | - |
| Transfer to Municipalities | 319 | 409 | 359 | 395 | - |
| Transfer to Others | 79 | 114 | - | - | - |
| Other Current Expenses | 127 | 237 | 305 | 511 | - |
| Capital Expenditure | 210 | 325 | 133 | 1,666 | - |
| Investments | 37 | 44 | 27 | 21 | - |
| Financial Investment | 21 | 13 | - | - | - |
| Amortization of Public Debt | 63 | 87 | 54 | 295 | - |
| Capital Transfer | 89 | 182 | - | - | - |
| Others | - | - | 53 | 1,350 | - |
| **Balance** | **-167** | **298** | **85** | **-220** | - |

Source: (1) PQA, Documento Estrategico de Investimentos, Sept. 1999, SEPLANDES
(2) Relatorio da Acao do Governo 1995-1998, Dec. 1998, GEP

# Table I.4-4 State Budget: 1999

(Unit: R$ Million)

| Item | Source | | |
|---|---|---|---|
| | Government | Others | Total |
| **Revenue** | | | |
| **Current Revenue** | **3,599** | **901** | **4,500** |
| Tributary Revenue | 2,151 | 35 | 2,187 |
| Revenue from Contributions | 0 | 309 | 309 |
| Patrimonial Revenue | 83 | 10 | 93 |
| Agricultural Revenue | 0 | 0 | 0 |
| Industrial Revenue | 0 | 24 | 24 |
| Revenue from Services | 39 | 330 | 369 |
| Current Transferences | 1,138 | 116 | 1,254 |
| Other Current Revenue | 188 | 76 | 264 |
| **Capital Revenue** | **822** | **123** | **945** |
| Credit Operations | 680 | 4 | 684 |
| Transference of Assets | 1 | 1 | 2 |
| Amortization of Loans | 0 | 2 | 2 |
| Transference of Capital | 141 | 107 | 247 |
| Other Capital Revenue | 0 | 9 | 9 |
| **Total** | **4,420** | **1,024** | **5,444** |
| **Expenditure** | | | |
| **Current Expenses** | **3,373** | **836** | **4,209** |
| Personnel | 1,857 | 384 | 2,240 |
| Interests of Internal Debt | 180 | 4 | 184 |
| Interests of External Debt | 10 | 0 | 10 |
| Other Current Expenses | 1,326 | 449 | 1,775 |
| **Capital Expenses** | **1,047** | **188** | **1,235** |
| Investiment | 517 | 181 | 698 |
| Financial Investment | 124 | 7 | 130 |
| Amortization of Internal Debt | 399 | 0 | 399 |
| Amortization of External Debt | 8 | 0 | 8 |
| **Total** | **4,420** | **1,024** | **5,444** |

Source: Lei Orcamentaria Annual 1999, GEPE

## Table I.4-5 Budget of SEIN: 1999 (1/2)

(Unit: R$ 1000)

| Activity | Amount | % of Total |
|---|---|---|
| **Administration and Planning** | **21,183** | **14.9** |
| 1. Administration | 18,956 | 13.3 |
| 1.1 Supervision and Coordination of Secretariat Policy | 2,215 | 1.6 |
| Personnel | 1,954 | 1.4 |
| Other Expenses | 230 | 0.2 |
| Investment | 31 | 0.0 |
| 1.2 General Administration | 8,171 | 5.8 |
| 1.2.1 Management of the Pro-Sanitation and Pro-Housing State Commission | 8 | 0.0 |
| Other Expenses | 3 | 0.0 |
| Investment | 6 | 0.0 |
| 1.2.2 Management of the Secretariat | 8,163 | 5.7 |
| Personnel | 1,103 | 0.8 |
| Other Expenses (1) | 3,111 | 2.2 |
| Other Expenses (2) | 1,655 | 1.2 |
| Investment (1) | 1,094 | 0.8 |
| Investment (2) | 1,200 | 0.8 |
| 1.3 Public Buildings (Construction and maintenance of government buildings, construction of housing estates). | 8,570 | 6.0 |
| Investment (1) | 7,400 | 5.2 |
| Investment (2) | 1,170 | 0.8 |
| 2. Governmental Planning | 1,084 | 0.8 |
| 2.1 Formulation, Planning and Follow-up actions of Housing, Infrastructure and Civil works related activities | 1,084 | 0.8 |
| 3. Integrated Programs | 526 | 0.4 |
| 3.1 Infrastructure Actions Promotion | 526 | 0.4 |
| Investment (1) | 514 | 0.4 |
| Investment (2) | 12 | 0.0 |
| 4. Welfare | 617 | 0.4 |
| Meals subsidy | 533 | 0.4 |
| Transportation subsidy | 84 | 0.1 |
| **Communications** | 680 | **0.5** |
| 1. Telecommunications (implementation of the official State telecommunication system) | 680 | 0.5 |
| Investment (1) | 450 | 0.3 |
| Investment (2) | 230 | 0.2 |
| **Energy and Mineral Resources** | 29,455 | **20.7** |
| 1. Shareholding in the Electricity Company of Pernambuco-CELPE | 29,051 | 20.5 |
| 2. Governmental Planning (planning of the State Electricity grid) | 100 | 0.1 |
| 3. Generation of Non-conventional Electricity | 304 | 0.2 |
| **Housing and Urbanism** | 7,941 | **5.6** |
| 1. Shareholding in the Pernambuco State Housing Company (COHAB) | 7,941 | 5.6 |
| **Health and Sanitation** | 72,070 | **50.7** |
| 1. Shareholding in the Pernambuco State Sanitation Company (COMPESA) | 64,843 | 45.7 |
| *Company (COMPESA)* | | |
| *Financial investment (1)* | 25,166 | 17.7 |
| *Financial investment (2)* | 15,782 | 11.1 |
| *Financial investment (3)* | 23,895 | 16.8 |

(To be continued)

## Table I4 - 5 Budget of SEIN: 1999 (2/2)

(Continuation)

| Activity | Amount | % of Total |
|---|---|---|
| 2. Governmental Planning (Budgetary Planning) | 514 | 0.4 |
| Other expenses | 514 | 0.4 |
| 3. Water Resources (Hydrological Studies and Research) | 4,600 | 3.2 |
| Investment (1) | 4,000 | 2.8 |
| Investment (2) | 600 | 0.4 |
| *4. Environmental Protection* | 2,113 | 1.5 |
| *4.1 Flood prevention measures (implementation of the flood control system of the Capibaribe river)* | 2,113 | 1.5 |
| *Investment (1)* | 13 | 0.0 |
| *Investment (2)* | 2,100 | 1.5 |
| **Welfare and Retirement Plan** | 1,374 | **1.0** |
| 1. Expenses with Non Active and Retired Workers | 1,374 | 1.0 |
| Personnel | 1,324 | 0.9 |
| Other Expenses | 50 | 0.0 |
| **Transportation** | 9,333 | **6.6** |
| 1. Shareholding in the Pernambuco State Metropolitan Trains Company - COPERTRENS | 600 | 0.4 |
| Financial investment | 600 | 0.4 |
| 2. Governmental Planning | 667 | 0.5 |
| 2.1 Planning and Evaluation of the Urban, Suburban and Regional Road System in Pernambuco State | 243 | 0.2 |
| 2.2 Planning, Coordination and Implementation of the State Tranportation System | 424 | 0.3 |
| 3. Air Transportation | 7,596 | 5.3 |
| 3.1 Studies and Elaboration of Projects for the Air Transportation Sector | 440 | 0.3 |
| 3.2 Airport infrastrucutre | 7,156 | 5.0 |
| 3.2.1 Construction, Paving and Restoration of Airports | 6,748 | 4.8 |
| Investment | 1,061 | 0.7 |
| Investment | 5,688 | 4.0 |
| 3.2.2 Airport maintenance | 407 | 0.3 |
| 4. Waterway Transportation | 471 | 0.3 |
| 4.1 Ports and Fluvial and Lacustrine Terminals | | |
| 4.1.1 Expansion, Restoration and Remodelling of Petrolina Port | 149 | 0.1 |
| Investment (1) | 79 | 0.1 |
| Investment (2) | 69 | 0.0 |
| 4.1.2 Operation & Maintenance of Petrolina Port | 183 | 0.1 |
| Personnel | 4 | 0.0 |
| Other Expenses (1) | 63 | 0.0 |
| Other Expenses (2) | 51 | 0.0 |
| Investment | 65 | 0.0 |
| 4.1.3 Maritime Ports and Terminals (Study for the definition of a Ports related Policy for the State) - Investment | 79 | 0.1 |
| 4.1.4 Waterways (Technical Feasibility Study for the São Francisco river waterway) - Investment | 60 | 0.0 |
| **TOTAL** | 142,035 | 100.0 |

Source: Lei Orcamentaria Annual 1999, GEPE

## Table I.4-6 Financial Situation of Municipalities in RMR: 1997

(Unit: 1000 Reals)

| Municipality | Revenue | Expenditure | Balance |
|---|---|---|---|
| 1. Abreu e Lima | 9,519 | 11,089 | -1,570 |
| 2. Araçoiaba | 1,974 | 2,413 | -439 |
| 3. Cabo | 40,801 | 39,096 | 1,705 |
| 4. Camaragibe | 13,912 | 15,154 | -1,242 |
| 5. Igarassu | 88,750 | 96,071 | -7,321 |
| 6. Ipojuca | 13,575 | 18,852 | -5,276 |
| 7. Itamaracá | 4,314 | 5,524 | -1,210 |
| 8. Itapissuma | 18,100 | 19,699 | -1,599 |
| 9. Jaboatão | 7,381 | 7,417 | -36 |
| 10. Moreno | 6,325 | 6,429 | -104 |
| 11. Olinda | 63,099 | 62,432 | 667 |
| 12. Paulista | 45,577 | 45,876 | -299 |
| 13. Recife | 498,532 | 465,193 | 33,339 |
| 14. São Lourenço | 10,902 | 11,487 | -585 |
| **RMR** | 822,760 | 806,730 | 16,030 |

Source: PQA Documento Estategico de Investimentos, Sept. 1999, SEPLANDES

## Table I.4-7 Municipal Tax Revenue as Proportion of Total Municipal Revenue in 13 Municipalities*1 in RMR: 1991

(Unit: Cr$ Million)

| Municipality | Total Revenue | Tax Revenue | Local tax revenue / total revenue (%) |
|---|---|---|---|
| 1. Abreu e Lima | 20.73 | 0.15 | 0.7 |
| 2. Cabo | 31.42 | 0.35 | 1.1 |
| 3. Camaragibe | 28.04 | 0.15 | 0.5 |
| 4. Igarassu | 16.28 | 0.35 | 2.2 |
| 5. Ipojuca | 7.10 | 0.28 | 4.0 |
| 6. Itamaracá | 3.53 | 0.17 | 4.7 |
| 7. Itapissuma | 2.63 | 0.09 | 3.2 |
| 8. Jaboatão | 217.72 | 2.47 | 1.1 |
| 9. Moreno | 8.83 | 0.04 | 0.5 |
| 10. Olinda | 183.70 | 1.74 | 0.9 |
| 11. Paulista | 98.20 | 0.61 | 0.6 |
| 12. Recife | 980.23 | 16.56 | 1.7 |
| 13. São Lourenço | 19.75 | 0.17 | 0.8 |
| RMR | 1,618.15 | 23.13 | 1.4 |

Source: PQA Documento Estategico de Investimentos, Sept. 1999, SEPLANDES

Note: :1 Araçoiaba Municipality was included in Igarassu Municipality.

## Table I.4-8 Business Performance of COMPESA: 1995 to 1997

| Item | Water Supply | | | Sewerage Services | | |
|---|---|---|---|---|---|---|
| | 1995 | 1996 | 1997 | 1995 | 1996 | 1997 |
| **Number of Connections** | | | | | | |
| Residential | 926,321 | 941,175 | 956,299 | 132,975 | 137,918 | 157,943 |
| Comercial | 40,556 | 40,148 | 40,953 | 11,256 | 11,085 | 13,940 |
| Industrial | 3,410 | 3,356 | 3,414 | 672 | 624 | 754 |
| Public | 8,130 | 8,187 | 8,449 | 901 | 909 | 1,023 |
| **Total** | 978,417 | 992,866 | 1,009,115 | 145,804 | 150,536 | 173,660 |
| **Number of Consumption Units** | | | | | | |
| Residential | 1,103,699 | 1,114,524 | 1,126,390 | 224,368 | 224,183 | 243,131 |
| Comercial | 62,285 | 62,276 | 64,140 | 24,725 | 25,342 | 30,153 |
| Industrial | 3,866 | 3,803 | 3,861 | 770 | 717 | 864 |
| Public | 8,568 | 8,621 | 8,898 | 941 | 952 | 1,093 |
| **Total** | 1,178,418 | 1,189,224 | 1,203,289 | 250,804 | 251,194 | 275,241 |
| **Average Number of Consumption Units per Connection** | | | | | | |
| Residential | 1.2 | 1.2 | 1.2 | 1.7 | 1.6 | 1.5 |
| Comercial | 1.5 | 1.6 | 1.6 | 2.2 | 2.3 | 2.2 |
| Industrial | 1.1 | 1.1 | 1.1 | 1.1 | 1.1 | 1.1 |
| Public | 1.1 | 1.1 | 1.1 | 1.0 | 1.0 | 1.1 |
| **Total** | 1.2 | 1.2 | 1.2 | 1.7 | 1.7 | 1.6 |
| **Volume Processed (1000 $m^3$ per year)** | | | | | | |
| Residential | 184,039 | 188,268 | 199,036 | 47,965 | 48,617 | 52,224 |
| Comercial | 16,959 | 17,329 | 16,338 | 8,033 | 8,352 | 8,525 |
| Industrial | 3,868 | 4,427 | 4,645 | 790 | 714 | 649 |
| Public | 9,823 | 10,034 | 10,384 | 3,545 | 3,329 | 3,496 |
| **Total** | 214,689 | 220,058 | 230,403 | 60,333 | 61,012 | 64,894 |
| **Average Volume per Consumption Unit ($m^3$ per unit per month)** | | | | | | |
| Residential | 13.9 | 14.1 | 14.7 | 17.8 | 18.1 | 17.9 |
| Comercial | 22.7 | 23.2 | 21.2 | 27.1 | 27.5 | 23.6 |
| Industrial | 83.4 | 97.0 | 100.3 | 85.5 | 83.0 | 62.6 |
| Public | 95.5 | 97.0 | 97.2 | 314.0 | 291.4 | 266.5 |
| **Total** | 15.2 | 15.4 | 16.0 | 20.0 | 20.2 | 19.6 |

Source: PQA, Documento Estrategico de Investimentos, 1999, SEPLANDES

## Table I.4-9 Profit and Loss Table of COMPESA: 1995 to 1999

(Unit: R$ Million)

| Item | 1995 | 1996 | 1997 | 1998 | 1999 |
|---|---|---|---|---|---|
| **1. Operating Revenue** | 155.5 | 207.8 | 254.1 | 242.9 | 183.0 |
| (1) Water Supply Services | - | - | - | 198.9 | 143.6 |
| (2) Sewage Sanitation Services | - | - | - | 44.0 | 39.3 |
| **2. Expenses of Direct Divisional Costs** | 107.4 | 137.1 | 148.4 | 190.7 | 178.0 |
| (1) Expenses of O&M | 107.4 | 137.1 | 148.4 | 190.7 | 178.0 |
| 1) Staff | 48.1 | 56.7 | 56.6 | 73.9 | 81.1 |
| 2) Material | 10.8 | 14.6 | 13.3 | 19.2 | 10.1 |
| 3) Outsourcing Work | 38.9 | 54.6 | 67.4 | 83.0 | 73.6 |
| 4) General | 0.8 | 1.2 | 1.0 | 1.2 | 0.8 |
| 5) Depreciation, Provisions and Amortization | 8.7 | 9.9 | 10.0 | 13.3 | 12.4 |
| **3. Gross Balance** | 48.1 | 70.7 | 105.7 | 52.3 | 5.0 |
| **4. Expenses of Indirect Divisional Costs** | 41.7 | 74.5 | 109.1 | 83.6 | 77.1 |
| (1) Expenses of Commercial Dept. | 6.3 | 12.4 | 28.3 | 19.2 | 11.1 |
| 1) Staff | 2.9 | 8.6 | 10.3 | 5.0 | 5.7 |
| 2) Material | 0.0 | 0.0 | 0.1 | 0.1 | 0.1 |
| 3) Outsourcing Work | 0.5 | 0.4 | 0.6 | 0.9 | 3.9 |
| 4) General | 2.0 | 3.1 | 3.2 | 3.4 | 0.8 |
| 5) Depreciation, Provisions and Amortization | 0.9 | 0.4 | 14.2 | 9.7 | 0.7 |
| (2) Expenses of Administrative Dept. | 31.8 | 36.0 | 43.1 | 32.6 | 20.8 |
| 1) Staff | 22.7 | 26.6 | 32.6 | 19.3 | 15.6 |
| 2) Material | 0.6 | 0.0 | 0.8 | 0.6 | 0.4 |
| 3) Outsourcing Work | 5.4 | 5.5 | 6.1 | 8.9 | 1.7 |
| 4) General | 0.5 | 1.1 | 0.9 | 1.1 | 0.3 |
| 5) Depreciation, Provisions and Amortization | 2.6 | 2.9 | 2.6 | 2.6 | 2.7 |
| (3) Expenses of Taxes | 0.3 | 0.8 | 1.0 | 9.3 | 7.0 |
| (4) Financial Charges | 3.3 | 25.3 | 36.6 | 22.6 | 38.2 |
| **4. Operating Balance** | 6.4 | -3.8 | -3.4 | -31.4 | -72.1 |
| **5. Non-operational Balance** | 16.3 | 2.7 | 4.4 | 4.4 | -4.2 |
| (1) Non-operation Revenue | 20.0 | 10.8 | 15.0 | 16.7 | 9.1 |
| 1) Financial Revenue | 16.7 | 0.4 | 0.3 | 0.2 | 0.3 |
| 2) Other Revenues | 3.4 | 10.4 | 14.7 | 16.5 | 8.8 |
| (2) Non-Operational Expenditure | 3.8 | 8.1 | 10.6 | 12.3 | 13.0 |
| **6. Current Balance** | 22.7 | -1.1 | 1.0 | -27.0 | -76.2 |
| **7. Reconciliation** | -8.5 | - | - | - | - |
| **8. Net Profit(Loss) of Period** | 14.1 | -1.1 | 1.0 | -27.0 | -76.2 |

Source: (1) PQA, Documento Estrategico de Investimentos, 1999, SEPLANDES
(2) Balance Patrimonial em 31 de dezembro e 30 de novembro de 1998
(3) Balance Patrimonial em 31 de dezembro e 30 de novembro de 1999

## Table I.4-10 Balance Sheet of COMPESA: 1995-1999

(Unit: R$ Million)

| Item | 1995 | 1996 | 1997 | 1998 | 1999 |
|---|---|---|---|---|---|
| **I. Assets** | **641.50** | **698.45** | **744.56** | **841.26** | **871.40** |
| **1. Current Assets** | 68.77 | 104.08 | 126.62 | 152.55 | 160.62 |
| (1) Liquid Account | 4.24 | 5.54 | 6.36 | 3.77 | 4.35 |
| 1) Cash | 0.82 | 0.62 | 1.10 | 0.95 | 0.61 |
| 2) Saving Deposit | 0.76 | 1.71 | 3.35 | 1.09 | 0.69 |
| 3) Linked Bank Deposit | 2.44 | 1.69 | 1.84 | 1.71 | 1.25 |
| 4) Term Deposit | 0.22 | 1.52 | 0.07 | 0.01 | 1.80 |
| (2) Other Short-term Assets | 64.31 | 98.28 | 119.96 | 148.44 | 155.87 |
| 1) Sales Receivable | 55.26 | 87.18 | 107.70 | 124.41 | 136.20 |
| 2) Credits Receivable | 3.05 | 5.42 | 6.95 | 9.55 | 10.76 |
| 3) Prepaid Accounts | 1.72 | 1.53 | - | 8.82 | 0.16 |
| 4) Stock for Maintenance | 3.38 | 3.77 | 4.80 | 5.30 | 4.64 |
| 5) Prepaid Expenses | 0.90 | 0.39 | 0.50 | 0.36 | 4.11 |
| (3) Other Accounts | 0.22 | 0.26 | 0.30 | 0.34 | 0.40 |
| **2. Fixed Assets** | 572.73 | 594.37 | 617.94 | 688.71 | 710.78 |
| (1) Investment | 0.42 | 0.43 | 0.43 | 3.64 | 3.64 |
| (2) Physical Fixed Assets | 353.28 | 345.24 | 336.93 | 514.85 | 520.01 |
| 1) Water Supply Facilities | 318.87 | 320.55 | 322.16 | 499.57 | 516.12 |
| 2) Sewerage Facilities | 147.08 | 147.10 | 147.16 | 159.42 | 162.63 |
| 3) General Properties | 46.09 | 47.55 | 49.48 | 53.13 | 54.08 |
| 4) Depreciation | 158.77 | 169.95 | 181.86 | 197.26 | 212.83 |
| (3) Works in Progress | 213.22 | 244.51 | 278.28 | 169.83 | 187.07 |
| 1) Water Supply Facilities | 196.51 | 222.34 | 251.10 | 147.08 | 163.70 |
| 2) Sewerage Facilities | 15.14 | 20.38 | 25.32 | 22.24 | 22.85 |
| 3) General Properties | 1.56 | 1.79 | 1.86 | 0.51 | 0.51 |
| (4) Deferred Assets | 5.82 | 4.19 | 2.30 | 0.38 | 0.07 |
| 1) Amortizable Expenses | 10.03 | 10.04 | 9.80 | 9.95 | 9.95 |
| 2) Accumulated Amortizations | 4.21 | 5.84 | 7.50 | 9.57 | 9.88 |
| **II. Liability and Capital** | **641.50** | **698.45** | **744.66** | **841.26** | **871.43** |
| **1. Short-term Liability** | 50.34 | 77.74 | 91.43 | 158.57 | 338.97 |
| (1) Accounts Payable | 24.15 | 56.65 | 67.89 | 136.89 | 307.40 |
| (2) Provisions | 23.95 | 20.91 | 22.91 | 17.30 | 23.85 |
| (3) Interest Payable | 0.00 | 0.00 | 0.00 | 1.25 | 1.08 |
| (4) Loan Amortizations | 2.15 | 0.06 | 0.07 | 0.13 | 2.35 |
| (5) Other Liabilities | 0.09 | 0.12 | 0.57 | 3.00 | 4.28 |
| **2. Long-term Debt** | 393.51 | 212.20 | 229.89 | 221.06 | 146.71 |
| (1) Accounts Payable (Electricity Charges) | 102.58 | 136.00 | 152.15 | 156.94 | 22.78 |
| (2) Credits for Capital Increase | 270.53 | 75.14 | 73.98 | 26.47 | 78.21 |
| (3) Provisions | 18.98 | - | - | - | - |
| (4) Outstandings of Loans | 1.43 | 1.07 | 3.75 | 37.65 | 45.71 |
| 1) Internal Loans | 3.58 | 1.07 | 3.82 | - | - |
| 2) Repayment of Loan | 2.15 | - | 0.07 | - | - |
| **3. Capital** | 197.65 | 408.51 | 423.34 | 461.63 | 385.75 |
| (1) Capital Stock | 348.49 | 636.08 | 652.65 | 716.16 | 719.04 |
| 1) Capital Underwitten | 348.49 | 636.08 | 652.65 | 716.16 | 719.04 |
| (2) Capital Reserves | 79.47 | 3.85 | 1.10 | 2.87 | 0.36 |
| (3) Surplus/Loss Accumulated | -230.31 | -231.41 | -230.41 | -257.40 | -333.64 |

Source: (1) PQA, Documento Estrategico de Investimentos, Sept. 1999, SEPLANDES
(2) Balance Patrimonial em 31 de dezembro e 30 de novembro de 1998
(3) Balance Patrimonial em 31 de dezembro e 30 de novembro de 1999

# Table I.4-11 Budget of COMPESA: 1999

(Unit: R$ Million)

| Activity | Amount | % of Total |
|---|---|---|
| **1. Actions related to PRODETUR/PE** | **14.4** | **6.4** |
| **2. Sanitation and Health** | **210.8** | **93.6** |
| 2.1 Water Supply | 53.8 | 23.9 |
| 2.1.1 Extension of Water Supply Services | 36.0 | 16.0 |
| 2.1.2 Expansion of Water Supply Services | 3.0 | 1.3 |
| 2.1.3 Optimization and/or Rehabilitation of Water Supply Systems | 14.8 | 6.6 |
| 2.5 General Sanitation | 70.9 | 31.5 |
| 2.5.1 Actions related to PROMATA | 12.6 | 5.6 |
| 2.5.2 Operational and Institutional Development | 23.6 | 10.5 |
| 2.5.3 Sanitation Program for Low Income Population | 15.8 | 7.0 |
| 2.5.4 COMPESA | 13.6 | 6.0 |
| 2.5.5 Program for the Improvement of Basic Sanitation in Pernambuco State | 5.3 | 2.3 |
| 2.6 Sewerage Systems | 86.1 | 38.2 |
| 2.6.1 Extension of Sewerage System Services | 84.0 | 37.3 |
| 2.6.2 Expansion of Sewerage System Services | 1.0 | 0.5 |
| 2.6.3 Optimization and/or Rehabilitation of Sewerage Systems | 1.1 | 0.5 |
| **Total** | **225.3** | **100.0** |

| Sources of Funds | Amount | % of Total |
|---|---|---|
| 1. Own resources / Other long term resources | 32.8 | 14.6 |
| 2. Resources for increase of own capital - from Government | 64.8 | 28.8 |
| 3. Long term Credit Operations - Internal | 127.6 | 56.6 |
| **Total** | **225.3** | **100.0** |

Source: Lei Orcamentaria Annual 1999, GEPE

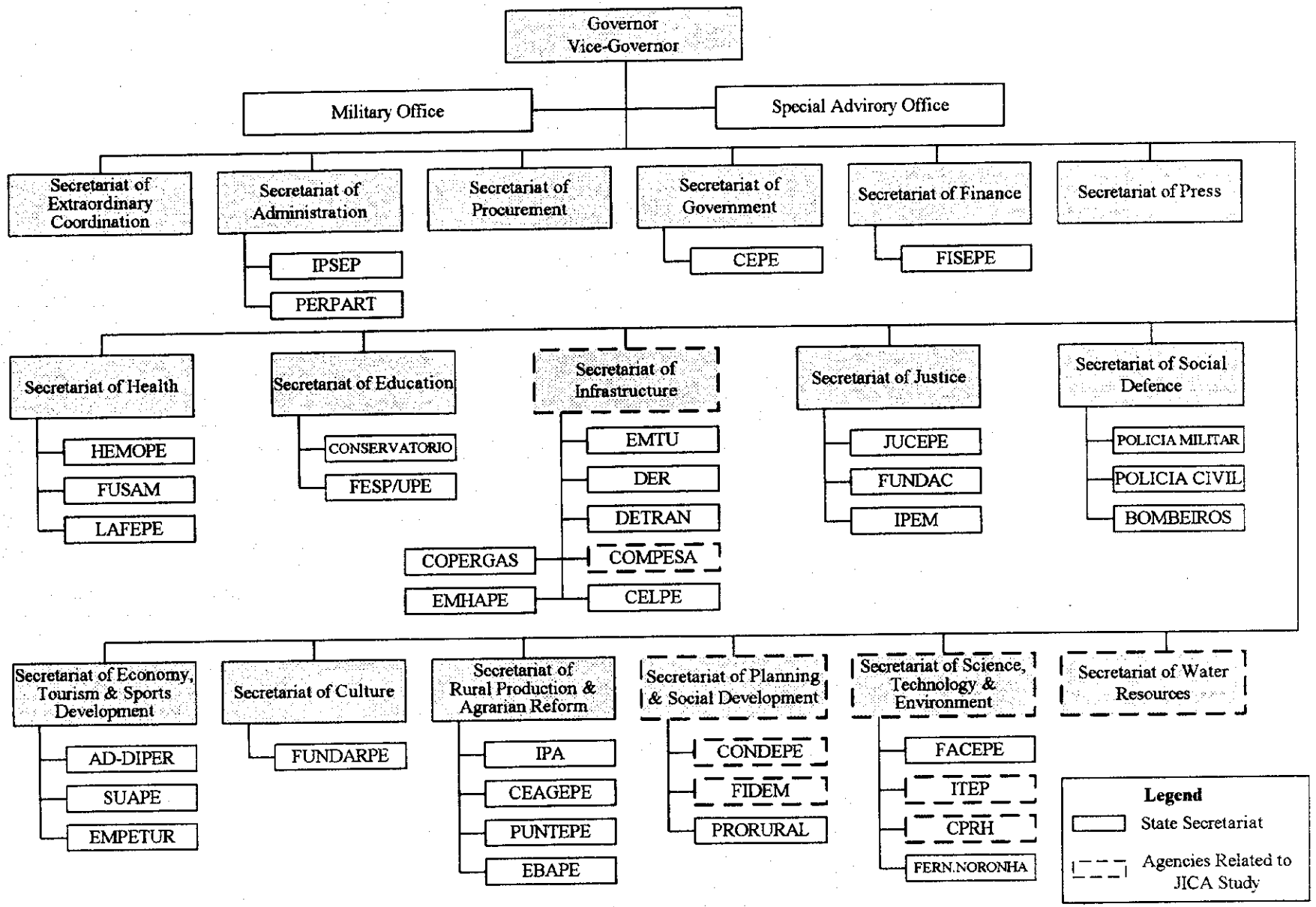



**Fig. I2-1 Organizational Diagram of Pernambuco State Government**

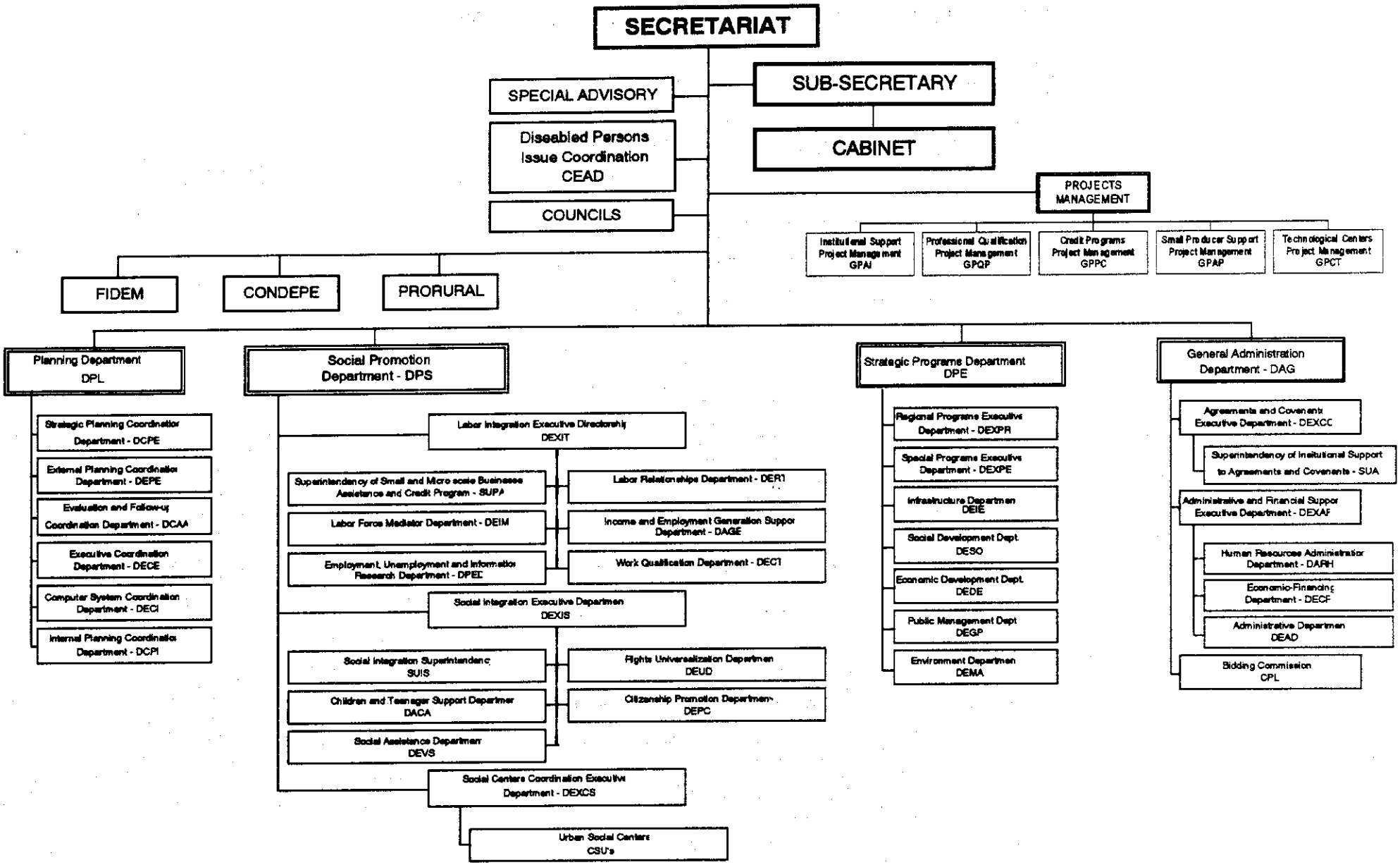



**Fig. I.2-2 Organizational Diagram of SEPLANDES**

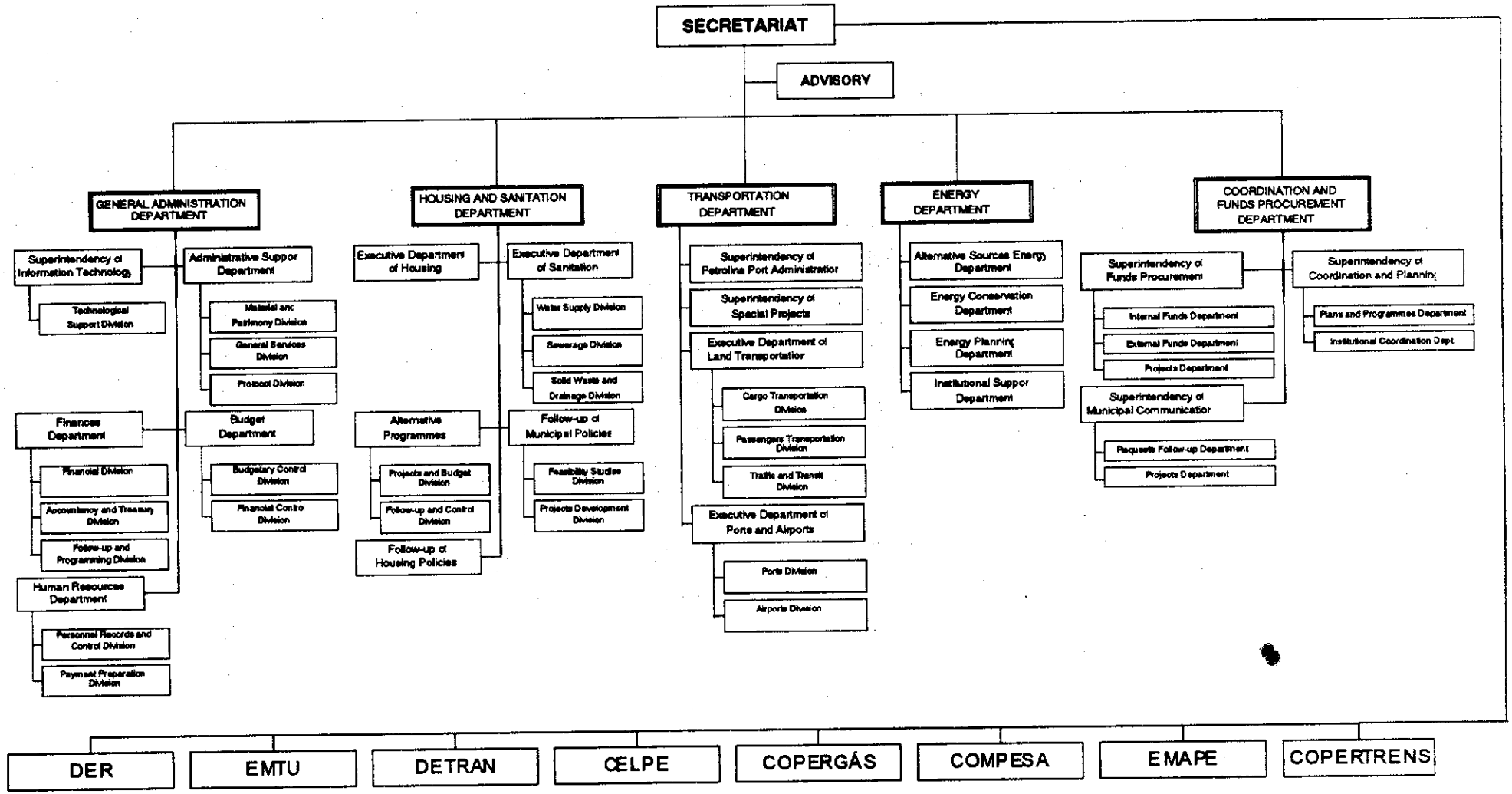



**Fig. I.2-3 Organizational Diagram of SEIN**

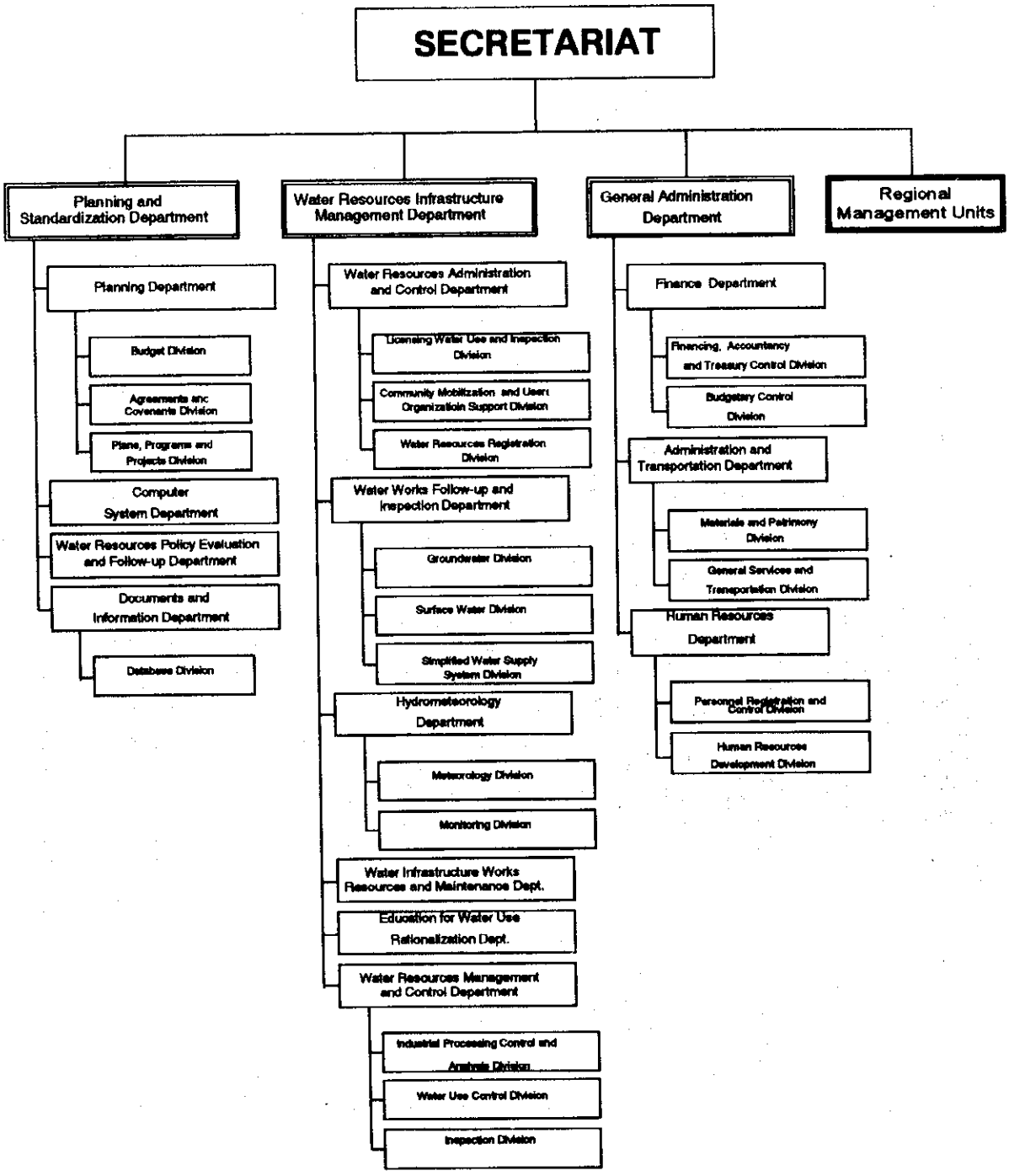



**Fig. I.2-4 Organizational Diagram of SRH**

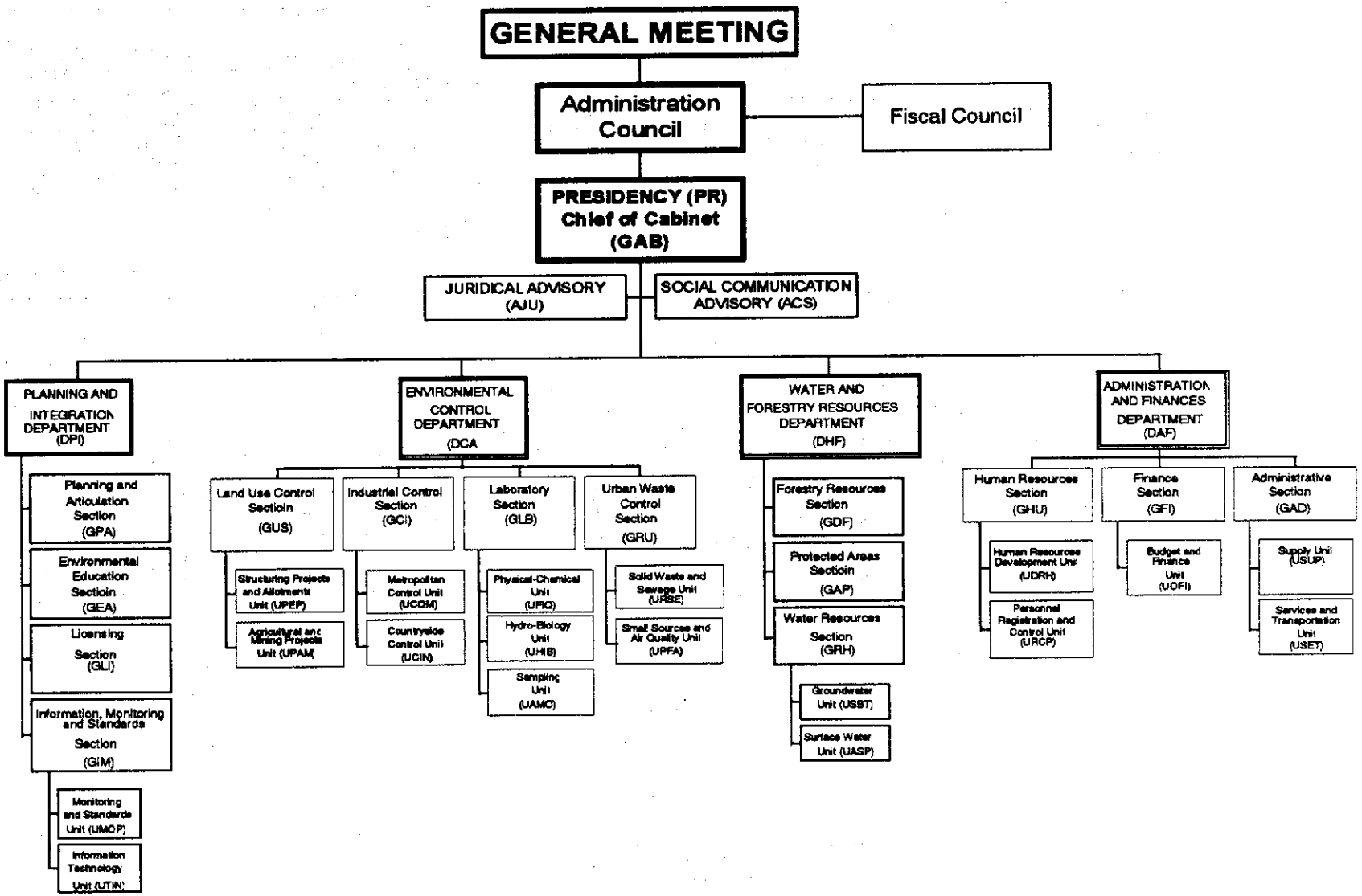



**Fig. I.2-5 Organizational Diagram of CPRH**

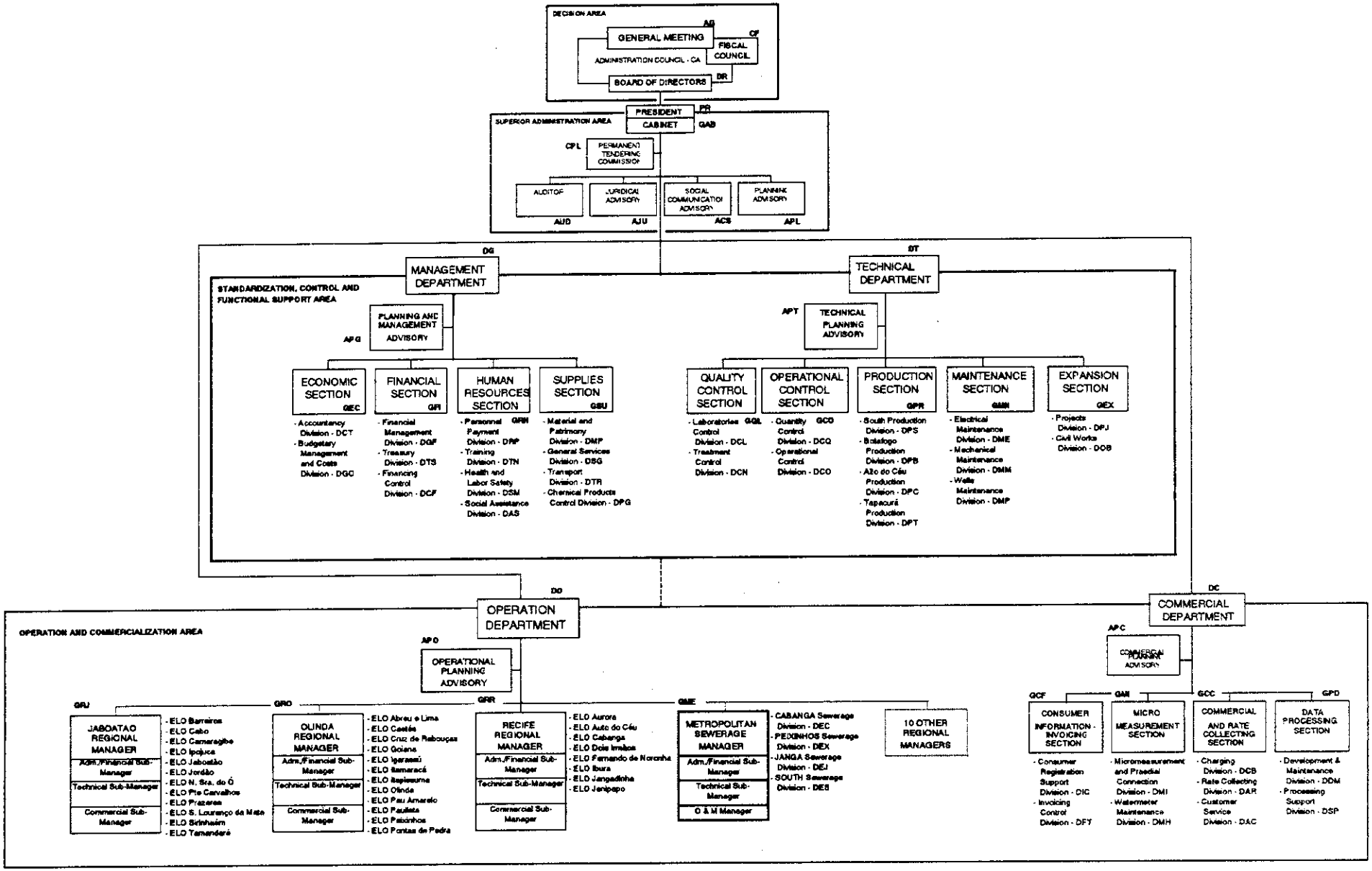



**Fig. I.2-6 Organizational Diagram of COMPESA**

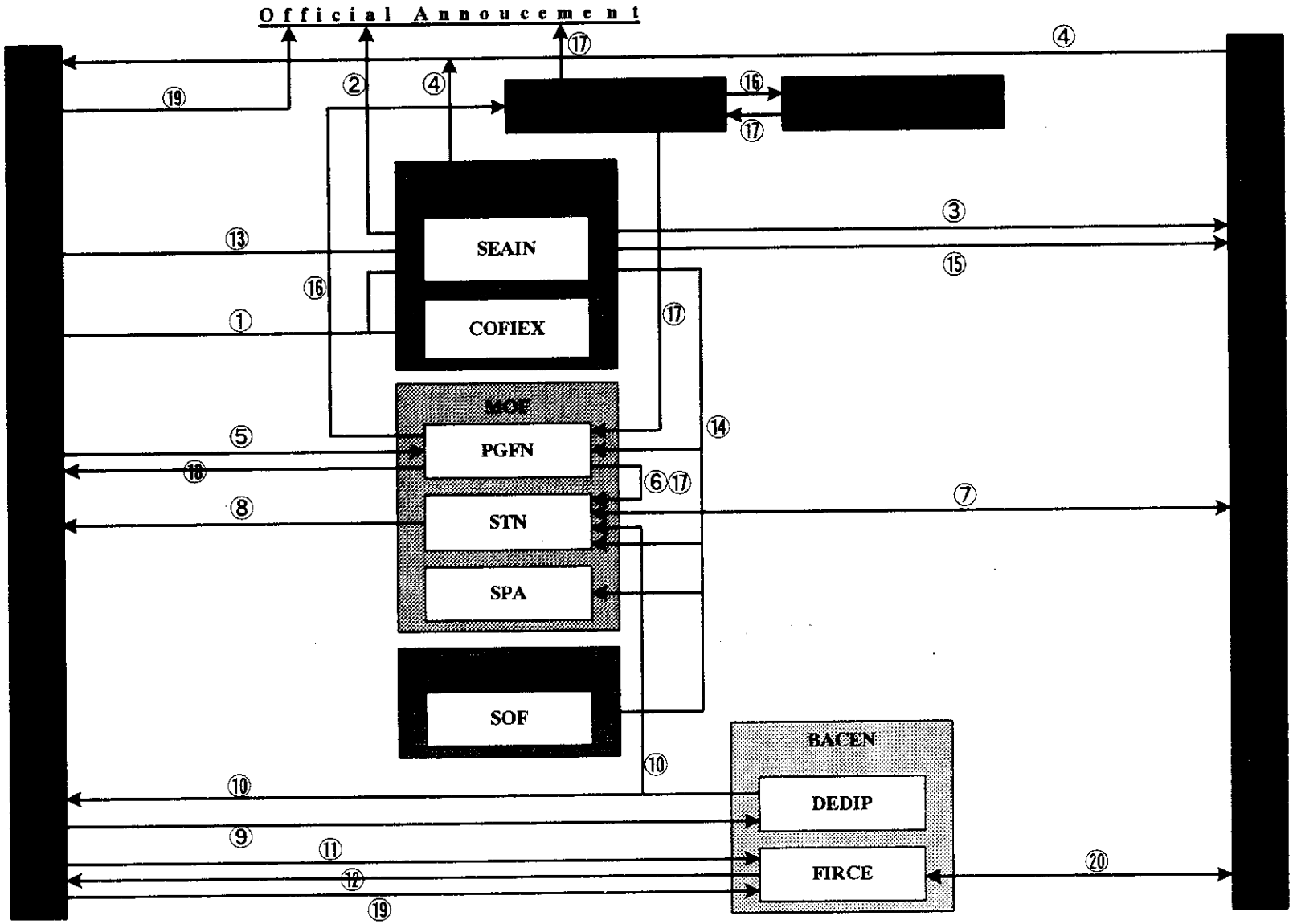



**Fig. I.5-1 Procedure of Finance Procurement from International or Foreign Financing Agency**

ABBREVIATION LIST

| | | |
|---|---|---|
| PR | President of the Federal | Presidente da República |
| SEAIN | Secretary of Foreign Affair | Secretaria de Assuntos Internacionais |
| COFIEX | Foreign Financing Commission | Comissão de Financiamentos Externos |
| MP | Ministry of Planning, Budget and Management | Ministério deo Ploanejamento Orçamento e Gestão |
| MOF | Ministry of Finance | Ministro da Fazenda |
| PGFN | General Attorneys of National Finance | Procuradoria Geral da Fazenda Nacional |
| STN | National Treasury Secretariat | Secretaria do Tesouro Nacional |
| SPA | Secretariat of Planning and Evaluation | Secretaria de Planejamento e Avaliação |
| SOF | Secretariat of Federal Budget | Secretaria de Orçamento Federal |
| BACEN | Central Bank of Brazil | Banco Central do Brasil |
| BACEN/DEDIP | Department of Public Debt and Special Operations | Departamento da Dívida Pública e Operações Especiais |
| BACEN/FIRCE | Department of Foreign Capital | Departamento de Capitais Estrangeiros |

ACTIVITIES

① The State Government (SG) present a Consultation Letter to COFIEX Executive Secretariat, and to SEAIN.
② After evaluating the Letter, COFIEX recommends to MP. The Minister publishes the results and sends it to SEAIN.
③ SEAIN sends the information to a Financing Agency (for example, JBIC)
④ The Financing Agency sends a technical mission to manifest the project. SEAIN takes a role of intermediary.
⑤ The SG requests the concession of National Treasury guarantee and/or authorization to contract foreign credit operation to MOF and to PGFN.
⑥ PGFN creates a process file, and then sends the file to STN.
⑦ STN analysis and evaluate the documents as Brazilian Delegation. STN issues the final decision after negotiation with the Financing Agency.
⑧ The SG receives the final decision from the MOF.
⑨ The SG requests to DEDIP the inclusion of foreign credit operation within the debt limits determined by Federal Senate.
⑩ DEDIP manifest the referred inclusion. If not, the SG can request to raise the limit to Federal Senate through DEDIP.
⑪ The SG requests to FIRCE credentials and required documents (financiering agent commitment statement and copy of preliminary STN evaluation report.
⑫ FIRCE gives the credentials to the SG to start formal negotiations with the Financing Agency within the financial conditions.
⑬ The SG submits the contract draft document to SEAIN.
⑭ SEAIN distributes a copy the documents above to PGFN, STN, SPA and SOF.
⑮ SEAIN with PGFN and STN defines the date and place for the contract negotiations with the Financing Agency.
⑯ PGFN makes a Motif Note of MOF to PR, requesting the transmittal of a message to Federal Senate.
⑰ Federal Senate authorizes the contracting of foreign credit operation and guarantee concession. PGFN sends the file to STN.
⑱ Minster of Finance signs the document. The SG is allowed to makes the contract in force.
⑲ The SG requests the registration of foreign credit operation to FIRCE. The SG publishes a summary of foreign loan contract.
⑳ FIRCE makes an agreement with the Financing Agency.

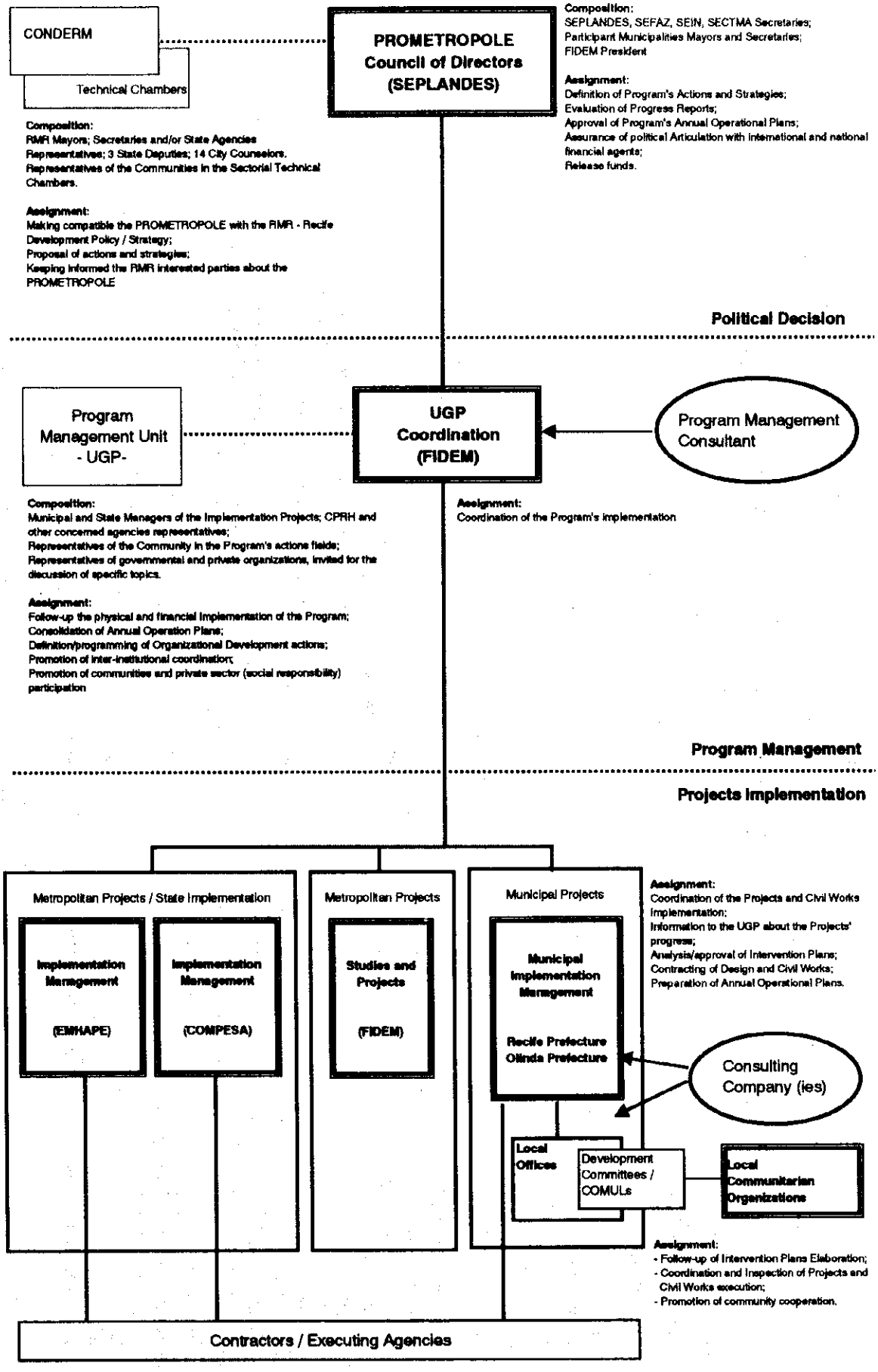



**Fig. I.5-2 Management Structure of PROMETROPOLE**

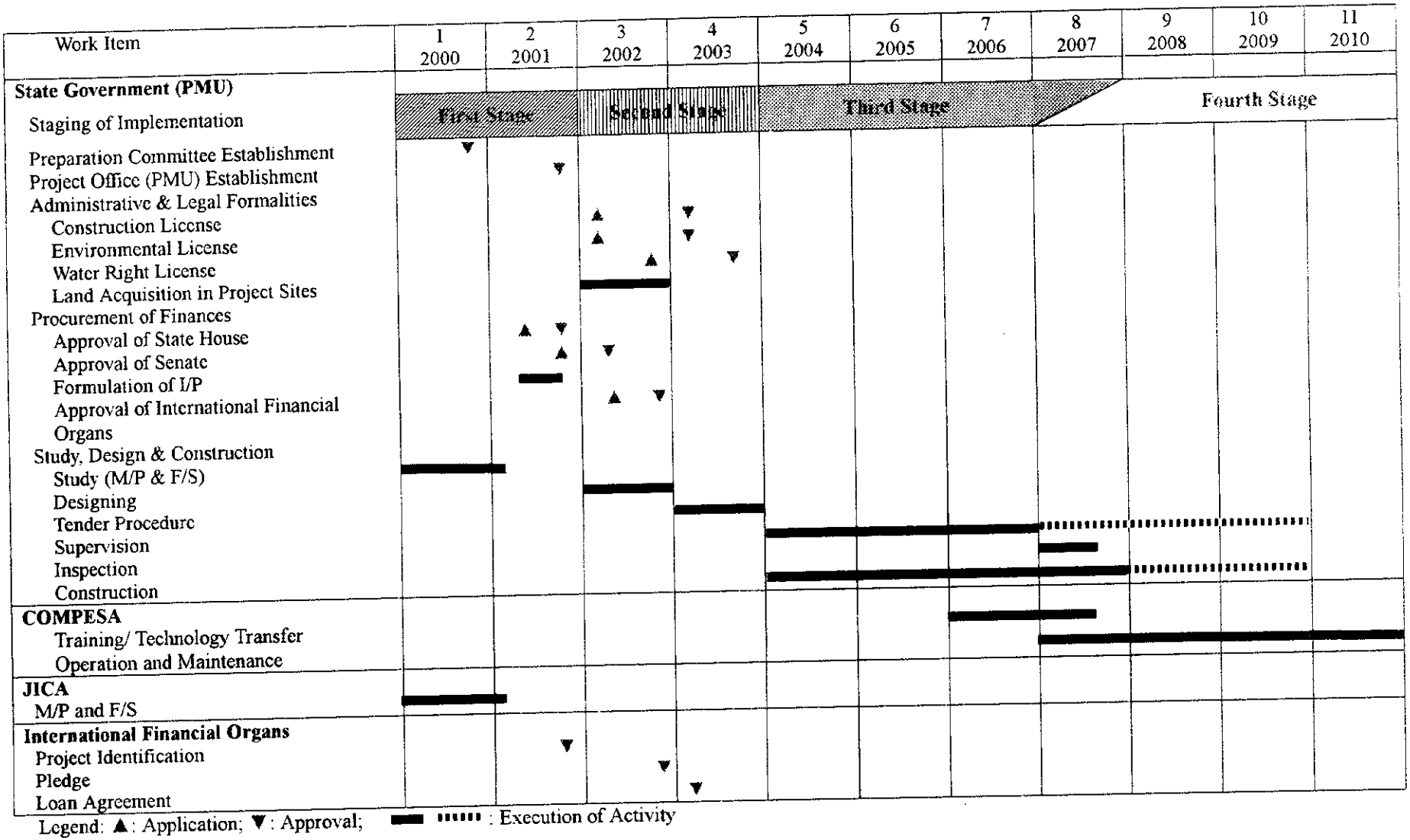



**Fig. I5-3 Timetable of Implementation of Urgent Projects**

# *SUPPORTING REPORT J*

# *CONDOMINAL SEWERAGE SYSTEM*

## TABLE OF CONTENTS

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**SUPPORTING REPORT J: CONDOMINAL SEWERAGE SYSTEM**

# 1. QUESTIONNARIE USED IN THE SURVEY ABOUT CONDOMINIAL SEWERAGE SYSTEMS

## QUESTIONNAIRE ABOUT THE CONDOMINIAL SEWERAGE SYSTEM

### Information about the Interviewee and his/her family

About the Interviewee:

1. Address in the Community: _____
2. Gender: [ 1 ] Male [ 2 ] Female
3. Age: _____ years
4. Position in the family: [ 1 ] Chief [ 2 ] House Wife

About the Family:

5. Time of residence in the community: _____ years
6. Number of members: _____ persons (____ adults + ____ minors)
7. Monthly family income: R$_____ / month (approximately)

### Information about the Condominial Sewerage System

8. Before the implementation of the system, which were the main problems faced by the community (List 3 problems starting with the most serious one).

   [ 1 ] _____

   [ 2 ] _____

   [ 3 ] _____

   [ 4 ] Others_____

### Implementation

9. Did the interviewee reside in the Community when the condominial system was implemented?

   [ 1 ] Yes [ 2 ] No

10. If the previous answer was "Yes", in which way do you participate (or someone in your family) in the system's implementation:

    [ 1 ] Participate in the meetings to discuss the project.

    [ 2 ] Participate in the construction works.

    [ 3 ] Besides the meetings, you also participate in the construction works.

    [ 4 ] Did not participate neither in the meetings nor in the construction works.

    Why? _____

11. If the answer to the question 10 was "No", did someone from the community explained you how to proceed to the maintenance of the condominial system?

    [ 1 ] Yes [ 2 ] No

12. Besides the participation mentioned in the previous question, did you contribute financially with the system's implementation? [ 1 ] Yes [ 2 ] No.

13. If the previous answer was "Yes", with how much? R$ _____

14. In your opinion, which were the main problems occurred during the implementation of the condominial system (list 3 starting with the most serious one).

    [ 1 ] _____

    [ 2 ] _____

    [ 3 ] _____

    [ 4 ] Others _____

## Operation and Maintenance

15. What is the type of collection sewer in your residence?

    [ 1 ] Back yard [ 2 ] Front yard [ 3 ] Sidewalk [ 4 ] Don't know

16. Did you receive any type of training by the implementation team about the maintenance of the collection sewer within your lot? [ 1 ] Yes [ 2 ] No.

17. If the previous answer was "Yes", what type of training? _____

    _____

18. Is your block organized into a "condominium"? [ 1 ] Yes [ 2 ] No

19. If the previous answer was "Yes", is there an elected responsible for the block ("condominium") who organizes the maintenance works? [ 1 ] Yes [ 2 ] No

20. When there is any problem or blockage in the collection sewer, what measure do you take?

    [ 1 ] Organizes with neighbors to clean up the blockage.

    [ 2 ] Call de community leader in order to help solving the problem.

    [ 3 ] Call COMPESA to solve the problem.

    [ 4 ] Try to solve the problem alone.

    [ 5 ] Hires someone to do the job. How much do you expend with this? R$_____/year

    [ 6 ] If you don't find a solution for the problem, give up of the collection sewer and re-start to use the cesspit or the drainage ditch to get rid of the sewage from your house.

    [ 7 ] Others. Which? _____

21. What is the frequency of problems/blockages in the sewer?

    [ 1 ] Never [ 2 ] 1 to 3 times a year [ 3 ] 4 to 6 times a year [ 4 ] more than 6 times a year.

22. After the installation of the collection sewer, did you make any enlargement in your house?

    [ 1 ] Yes [ 2 ] No

23. If the previous answer was "Yes", what did you do with the collection sewer?

    [ 1 ] Constructed over the sewer

    [ 2 ] Avoided to construct over the sewer

[ 3 ] Displaced the sewer

[ 4 ] Others. What? _____

24. Did you connect the storm water to the sewer? [ 1 ] Yes [ 2 ] No

25. Do you think the residents of the community dump solid waste in the sewerage system?

[ 1 ] Yes [ 2 ] No

26. Do you do that (for instance, inside the collection box)? [ 1 ] Yes [ 2 ] No

27. What are the main maintenance problems that occur in the collection sewer to which your residence is connected (list 3 starting with the most serious one).

[ 1 ] _____

[ 2 ] _____

[ 3 ] _____

## Final Comments

28. Are you satisfied with the condominial system to which your residence is connected?

[ 1 ] Yes [ 2 ] No

29. If the previous answer was "No", what do you suggest to improve its maintenance or the sewerage system itself (list 3 starting with the most important one).

[ 1 ] _____

[ 2 ] _____

[ 3 ] _____

30. Do you pay the sewerage charge? [ 1 ] Yes [ 2 ] No

31. If the answer for the previous question was "Yes", how much do you pay? R$_____

32. Do you consider the sewerage charge fair? [ 1 ] Yes [ 2 ] No

33. Even if you had to pay more for the sewerage charge, if possible, would you change the location of the collection sewer (to the sidewalk instead of inside of your lot)?

[ 1 ] Yes [ 2 ] No

34. Disregarding the answer given to the question 29, do you think the implementation of the condominial system improved the life conditions of your family? [ 1 ] Yes [ 2 ] No

35. In which way? _____

**END OF THE INTERVIEW**

## 2. ANALYSIS OF THE "INTERVIEW WITH RESIDENTS" CARRIED OUT WITHIN THE STUDY ABOUT 10 CONDOMINIAL SEWERAGE SYSTEMS

### 2.1 Introduction

The "Interview with Residents" was carried out in 10 Communities in which a Condominial Sewerage System was implemented. The sampling was elaborated according to information supplied by the executing agencies as presented in the following TABLE 1.1.

**TABLE 1.1 Sample for "Interview with Residents" Survey**

| Community | Executing Agency | Population Served | No. of Residences | Sample (1%) | Final Enlarged Sample |
|---|---|---|---|---|---|
| 1 Cannã / Bela Vista | COMPESA | 6,816 | 1,363 | 14 | 14 |
| 2 João de Barros | URB-Recife | 1,700 | 340 | 3 | 10 |
| 3 Jorge Pimenta | URB-Recife | 2,600 | 520 | 5 | 10 |
| 4 Mangueira | URB-Recife | 20,000 | 4,000 | 40 | 40 |
| 5 Mustardinha | URB-Recife | 14,000 | 2,800 | 28 | 28 |
| 6 Tamarineira | URB-Recife | 600 | 120 | 1 | 10 |
| 7 Vila Arraes | COMPESA | 1,780 | 356 | 4 | 10 |
| 8 Vila dos Milagres | COMPESA | 4,965 | 993 | 10 | 10 |
| 9 Poço da Panela | URB-Recife | 730 | 146 | 1 | 10 |
| 10 Rua do Rio / Beirinha | URB-Recife | 4,230 | 846 | 8 | 10 |
| TOTAL | | 57,421 | 11,484 | 115 | 152 |

Source: URB-Recife, DO-DOS (Sanitation Works Division). COMPESA, APT (Technical Planning Advisory Division). 2000

Note: The number of residences was calculated by dividing the served population by 5.

As observed in the above TABLE, 7 out of 10 systems were implemented by URB-Recife that is a public owned company subject to the government of the Recife City. The other 3 systems were implemented by COMPESA, subject to the Government of Pernambuco State. All the systems are located in the City of Recife. The interviews were carried out in July/2000.

### 2.2 Basic Information of the Interviewee and his/her Family

Most of the interviewees were women (73.0%). The majority of the interviewed families were settled in the communities for more than 10 years (69.1%) with a considerable number of them living there for more than 30 years (30.9%) (TABLE 2.1). Almost half of the families (48.0%) were composed of 3 to 4 members. However, a considerable number of them were composed of 5 members or more (40.1%) (TABLE 2.2). The majority of the interviewees declared a monthly family income of up to 3 Minimum Wages[1] (74.3%). If we sum up those who declared "no income" with those who declared "income up to 1 MW" we also have a

[1] The Brazilian Minimum Wage (MW) is R$ 151, as for July/2000. Considering an exchange rate of US$ = R$ 1.9, the MW represents approximately US$ 80.

significant figure of 61.2%. Three Minimum Wages is approximately the same as US$ 240 for a family monthly income (TABLE 2.3).

**TABLE 2.1 Time of Residence in the Community**

| COMMUNITY | TIME OF RESIDENCE IN THE COMMUNITY (years) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | > 1 up to 5 | > 5 up to 10 | > 10 up to 20 | > 20 up to 30 | > 30 up to 40 | > 40 up to 50 | > 50 | TOTAL |
| 1 CANÃA | 1 | 4 | 1 | 1 | | | | 7 |
| 2 BELA VISTA | 2 | 5 | | | | | | 7 |
| 3 JOÃO DE BARROS | | 2 | 2 | 3 | 3 | | | 10 |
| 4 JORGE PIMENTA | | | | 5 | 5 | | | 10 |
| 5 MANGUEIRA | 4 | 11 | 6 | 7 | 6 | 3 | 3 | 40 |
| 6 MUSTARDINHA | 2 | 3 | 6 | 1 | 5 | 9 | 2 | 28 |
| 7 TAMARINEIRA | | 2 | 2 | 2 | 2 | 2 | | 10 |
| 8 VILA ARRAES | | 4 | 6 | | | | | 10 |
| 9 VILA DOS MILAGRES | 1 | 2 | 7 | | | | | 10 |
| 10 POÇO DA PANELA | | | 2 | 2 | 3 | 3 | | 10 |
| 11 RUA DO RIO | 2 | 1 | 1 | | | | 1 | 5 |
| 12 BEIRINHA | 1 | | 3 | 1 | | | | 5 |
| TOTAL | 13 | 34 | 36 | 22 | 24 | 17 | 6 | 152 |
| % | 8.6% | 22.4% | 23.7% | 14.5% | 15.8% | 11.2% | 3.9% | 100.0% |
| | 30.9% | | 69.1% | | | | | 100.0% |

**TABLE 2.2 Number of Family Members**

| COMMUNITY | NUMBER OF FAMILY MEMBERS | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | >7 | TOTAL |
| 1 CANÃA | | 2 | | 2 | 1 | | 1 | 1 | 7 |
| 2 BELA VISTA | | | 1 | 5 | | | 1 | | 7 |
| 3 JOÃO DE BARROS | | 1 | 3 | 3 | 2 | | | 1 | 10 |
| 4 JORGE PIMENTA | | | 3 | 4 | 2 | 1 | | | 10 |
| 5 MANGUEIRA | | 4 | 11 | 10 | 7 | 3 | 1 | 4 | 40 |
| 6 MUSTARDINHA | | 2 | 2 | 8 | 7 | 1 | 4 | 4 | 28 |
| 7 TAMARINEIRA | 2 | | 2 | 4 | 1 | | | 1 | 10 |
| 8 VILA ARRAES | | 1 | 1 | 4 | 1 | 2 | 1 | | 10 |
| 9 VILA DOS MILAGRES | | 4 | | 2 | 3 | | | 1 | 10 |
| 10 POÇO DA PANELA | | | 2 | 3 | 2 | 1 | 2 | | 10 |
| 11 RUA DO RIO | 1 | 1 | 1 | 1 | | 1 | | | 5 |
| 12 BEIRINHA | | | | 1 | 1 | 1 | | 2 | 5 |
| TOTAL | 3 | 15 | 26 | 47 | 27 | 10 | 10 | 14 | 152 |
| % | 2.0% | 9.9% | 17.1% | 30.9% | 17.8% | 6.6% | 6.6% | 9.2% | 100.0% |
| | 11.8% | | 48.0% | | 40.1% | | | | 100.0% |

**TABLE 2.3 Family Monthly Income**

| COMMUNITY | FAMILY INCOME (Minimum Wage - MW) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | no income | up to 1 | > 1 up to 2 | > 2 up to 3 | > 3 up to 4 | > 4 up to 5 | > 5 | no answer | TOTAL |
| 1 CANÂA | | 3 | 4 | | | | | | 7 |
| 2 BELA VISTA | 1 | 2 | 3 | 1 | | | | | 7 |
| 3 JOÃO DE BARROS | 3 | 5 | | | | | | 2 | 10 |
| 4 JORGE PIMENTA | | 3 | 3 | | | | | 4 | 10 |
| 5 MANGUEIRA | 5 | 26 | 7 | | 1 | | | 1 | 40 |
| 6 MUSTARDINHA | 4 | 12 | 5 | 2 | 1 | 1 | 1 | 2 | 28 |
| 7 TAMARINEIRA | | 2 | 8 | | | | | | 10 |
| 8 VILA ARRAES | 4 | 3 | 3 | | | | | | 10 |
| 9 VILA DOS MILAGRES | 1 | 5 | 3 | | | | | 1 | 10 |
| 10 POÇO DA PANELA | 2 | 4 | 2 | | 1 | | 1 | | 10 |
| 11 RUA DO RIO | 2 | 2 | 1 | | | | | | 5 |
| 12 BEIRINHA | | 4 | | | | | 1 | | 5 |
| TOTAL | 22 | 71 | 39 | 3 | 3 | 1 | 3 | 10 | 152 |
| % | 14.5% | 46.7% | 25.7% | 2.0% | 2.0% | 0.7% | 2.0% | 6.6% | 100.0% |
| | 14.5% | 74.3% | | | 4.6% | | | 6.6% | 100.0% |

## 2.3 Condominial Sewerage System

The interviewees were asked to mention the three main problems faced at the community regarding to sewage before the implementation of the Condominial Sewerage System. The answers given pointed out that actually the interviewees had a strong perception of the consequences of the lack of a sewerage system together with other problems in the surrounding environment rather than considering the lack of the sewerage system itself as the main problem. The answers "mud and litter on the streets, lack of paving, floods, bad smell" were by far the number one for most of the interviewees (45.4%). Those who answered "sewage discharged in open, or into a nearby stream (problems with high tide), lack of sanitation" as the main problem represented 30.9% of the sample (TABLE 3.1).

## TABLE 3.1 Main Problems before the Implementation

| COMMUNITY | Main Problems before the Implementation of the Condominial Sewerage System | | | | | | | | | | | | | | | | | | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Mud and litter on the streets, lack of paving, floods, bad smell | | | Sewage discharged in open, or into a nearby water body (problems with high tide), lack of sanitation | | | Diseases and the presence of rodents and insects | | | Lack of toilet, cesspit was clogged | | | No major problems | | | No answer | | | |
| | 1st | 2nd | 3rd | 1st | 2nd | 3rd | 1st | 2nd | 3rd | 1st | 2nd | 3rd | 1st | 2nd | 3rd | 1st | 2nd | 3rd | |
| 1 CANÁA | 2 | 2 | 2 | 2 | 2 | 0 | 1 | 1 | 0 | 1 | | | 1 | | 1 | | 2 | 4 | 7 |
| 2 BELA VISTA | 1 | 3 | 3 | 5 | 1 | 0 | 0 | 1 | 1 | | | | 1 | 1 | | | 1 | 3 | 7 |
| 3 JOÃO DE BARROS | 2 | 4 | 2 | 6 | 4 | 0 | 0 | 1 | 3 | 1 | | | | 1 | | 1 | | 5 | 10 |
| 4 JORGE PIMENTA | 4 | 3 | | 6 | 3 | 0 | 0 | 0 | 1 | | 1 | 2 | | | | | 3 | 7 | 10 |
| 5 MANGUEIRA | 25 | 29 | 22 | 6 | 0 | 0 | 5 | 10 | 3 | 3 | | | 1 | | | | 1 | 15 | 40 |
| 6 MUSTARDINHA | 13 | 18 | 11 | 3 | 1 | 1 | 7 | 8 | 5 | 5 | 1 | | | | | | | 11 | 28 |
| 7 TAMARINEIRA | 2 | 6 | | 7 | 2 | 0 | 0 | 0 | 0 | 1 | | | | | 1 | | 2 | 9 | 10 |
| 8 VILA ARRAES | 9 | 6 | 6 | 0 | 0 | 2 | 1 | 4 | 2 | | | | | | | | | | 10 |
| 9 VILA DOS MILAGRES | 6 | 7 | 4 | 1 | 0 | 0 | 0 | 0 | 3 | | | | 3 | | | | 3 | 3 | 10 |
| 10 POÇO DA PANELA | 4 | 6 | 4 | 4 | 0 | 0 | 1 | 4 | 2 | 1 | | | | | | | | 4 | 10 |
| 11 RUA DO RIO | 1 | 1 | 3 | 4 | 1 | 0 | 0 | 1 | 0 | | 1 | | | | | | 1 | 2 | 5 |
| 12 BEIRINHA | | 1 | 1 | 3 | 0 | 0 | 0 | 1 | 0 | | 1 | | 2 | | | | 2 | 4 | 5 |
| TOTAL | 69 | 86 | 58 | 47 | 14 | 3 | 15 | 31 | 20 | 12 | 4 | 2 | 8 | 2 | 2 | 1 | 15 | 67 | 152 |
| % | 45.4% | 56.6% | 38.2% | 30.9% | 9.2% | 2.0% | 9.9% | 20.4% | 13.2% | 7.9% | 2.6% | 1.3% | 5.3% | 1.3% | 1.3% | 0.7% | 9.9% | 44.1% | 100.0% |

### 2.3.1 Implementation Phase

Almost all the interviewees were residing in the respective Community during the Condominial Sewerage System implementation phase (98.7%). For them, it was asked if the interviewee him/herself or someone from the family had participated in the system implementation. The majority answered "Yes", i.e., they participated (67.1%). However, 58.6% declared to have participated only on the discussions about the plan. For those whose answer was "No" (32.9%), the main reason for not participating was lack of time (14.5%). The figures for the participation on the implementation phase can be seen in the TABLE 3.2.

## TABLE 3.2 Participation in the Implementation Phase

| COMMUNITY | PARTICIPATION IN THE PROJECT IMPLEMENTATION PHASE | | | | | | | | | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|
| | YES | | | NO | | | | | | |
| | Discussions only | Construction only | Both | Not called | Not important | No time | Health Problems | Dislike Association | No answer | |
| 1 CANÃA | 4 | | 1 | | | 2 | | | | 7 |
| 2 BELA VISTA | 5 | 1 | | | | 1 | | | | 7 |
| 3 JOÃO DE BARROS | 8 | | | | 1 | 1 | | | | 10 |
| 4 JORGE PIMENTA | 2 | 2 | | 2 | 1 | 2 | | | 1 | 10 |
| 5 MANGUEIRA | 25 | | | 4 | 2 | 8 | 1 | | | 40 |
| 6 MUSTARDINHA | 18 | | 1 | 3 | | 5 | 1 | | | 28 |
| 7 TAMARINEIRA | 6 | | 4 | | | | | | | 10 |
| 8 VILA ARRAES | 3 | | 2 | | | 3 | 1 | | 1 | 10 |
| 9 VILA DOS MILAGRES | 7 | | | 1 | 1 | | | | 1 | 10 |
| 10 POÇO DA PANELA | 6 | | 1 | 1 | 1 | | | | 1 | 10 |
| 11 RUA DO RIO | 2 | | | 1 | | | | 2 | | 5 |
| 12 BEIRINHA | 3 | | 1 | 1 | | | | | | 5 |
| TOTAL | 89 | 3 | 10 | 13 | 6 | 22 | 3 | 2 | 4 | 152 |
| % | 58.6% | 2.0% | 6.6% | 8.6% | 3.9% | 14.5% | 2.0% | 1.3% | 2.6% | 100.0% |
| | 67.1% | | | 32.9% | | | | | | 100.0% |

It was also asked if, besides the participation in the implementation phase as presented in the previous TABLE, the interviewee or his/her family had also financially contributed to the construction works. The majority answered "No" (78.3%). However, among those who contributed (18.4% or 28 interviewees), excluding those who did not answer, 17 or 60.7% said to have contributed with less than ½ MW.

The interviewees were asked to mention the three main problems faced at the community during the implementation phase. However, also in this question, only the first main problem was emphasized. The first main problem mentioned was "problems on the streets: holes, sand, gravels, gargabe and debris" for 36.8% of the interviewees. On the other hand, 22.4% of the interviewees responded that there were no problems while 12.5% said that the main problem is that "the work remained unfinished: pipes, walls and sidewalks were not repaired. Some houses are still not connected or are illegally connected". As the second main problem, there was a high percentage of the answer "mud, flood and bad smell" (36.2%) with a significant percentage of "no answer"(44.1%) (TABLE 3.3).

## TABLE 3.3 Main Problems during the Implementation

| COMMUNITY | MAIN PROBLEMS DURING THE PROJECT IMPLEMENTATION | | | | | | | | | | | | | | | | | | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | No problems | | | Problems on the streets: holes, sand, gravels, gargabe and debris | | | Mud, flood and bad smell | | | The work remained unfinished: pipes, walls and sidewalks were not repaired. Some houses are still not connected or are illegaly connected | | | Others | | | No answer | | | |
| | 1st | 2nd | 3rd | 1st | 2nd | 3rd | 1st | 2nd | 3rd | 1st | 2nd | 3rd | 1st | 2nd | 3rd | 1st | 2nd | 3rd | |
| 1 CANÃA | 4 | | | | | | | | | 1 | | | 2 | | | | 7 | 7 | 7 |
| 2 BELA VISTA | 6 | | | | | | | | | | | | | | | 1 | 7 | 7 | 7 |
| 3 JOÃO DE BARROS | 5 | | | | | | | | | 1 | | | | 1 | | 4 | 9 | 10 | 10 |
| 4 JORGE PIMENTA | | | | 2 | 1 | | 2 | 1 | | 4 | 1 | 1 | 1 | | | 1 | 7 | 9 | 10 |
| 5 MANGUEIRA | 5 | | | 18 | 2 | 1 | 2 | 21 | 1 | 5 | | | | 1 | 2 | 10 | 16 | 36 | 40 |
| 6 MUSTARDINHA | | | | 22 | 7 | 5 | 3 | 15 | 6 | 1 | 1 | | 1 | 3 | 6 | 1 | 2 | 11 | 28 |
| 7 TAMARINEIRA | 6 | | | | | | | 1 | | 2 | | | 1 | 1 | | 1 | 8 | 10 | 10 |
| 8 VILA ARRAES | | | | 3 | 6 | 1 | 6 | 4 | | | | | 1 | | 3 | | | 6 | 10 |
| 9 VILA DOS MILAGRES | 1 | | | 5 | 1 | 1 | 1 | 7 | | 2 | | | 1 | 1 | 1 | | 1 | 8 | 10 |
| 10 POÇO DA PANELA | 3 | | | 6 | 1 | 1 | 1 | 5 | 1 | | 1 | 3 | | | | | 3 | 5 | 10 |
| 11 RUA DO RIO | 3 | | | | | | | 1 | | | | 1 | 1 | | | 1 | 4 | 4 | 5 |
| 12 BEIRINHA | 1 | | | | | | | | | 3 | 1 | | 1 | 1 | | | 3 | 5 | 5 |
| TOTAL | 34 | 0 | 0 | 56 | 18 | 9 | 15 | 55 | 8 | 19 | 4 | 5 | 9 | 8 | 12 | 19 | 67 | 118 | 152 |
| % | 22.4% | 0.0% | 0.0% | 36.8% | 11.8% | 5.9% | 9.9% | 36.2% | 5.3% | 12.5% | 2.6% | 3.3% | 5.9% | 5.3% | 7.9% | 12.5% | 44.1% | 77.6% | 100.0% |

### 2.3.2 Operation and Maintenance Phase

During the Operation and Maintenance phase, it is very important for the resident to know where the collector route and the collection box of his/her residence are located considering that in most of the cases this resident is the responsible for their maintenance. Thus, it was asked for them the type (location) of his/her collector. The majority could answer the question (93.5%) which is a good sign of the awareness of the resident about this service. As expected, most of the collectors are inside the resident's land: 44.1% on the backyard, 30.3% on the front yard, and 4.6% on the lateral corridor (78.9% in total). Only 13.8% are on the sidewalk and 0.7% (corresponding to one interviewee) is inside the house (TABLE 3.4).

TABLE 3.4 Type (Location) of the Condominial Collector

| COMMUNITY | TYPE OF CONDOMINIAL COLLECTOR | | | | | | |
|---|---|---|---|---|---|---|---|
| | back yard | front yard | lateral corridor | sidewalk | inside the house | no answer | TOTAL |
| 1 CANÃA | 4 | 3 | | | | | 7 |
| 2 BELA VISTA | 5 | 2 | | | | | 7 |
| 3 JOÃO DE BARROS | 6 | 3 | | 1 | | | 10 |
| 4 JORGE PIMENTA | 3 | 4 | | 2 | | 1 | 10 |
| 5 MANGUEIRA | 13 | 12 | | 12 | 1 | 2 | 40 |
| 6 MUSTARDINHA | 4 | 15 | | 3 | | 6 | 28 |
| 7 TAMARINEIRA | 8 | 2 | | | | | 10 |
| 8 VILA ARRAES | 7 | | 3 | | | | 10 |
| 9 VILA DOS MILAGRES | 2 | 2 | 3 | 2 | | 1 | 10 |
| 10 POÇO DA PANELA | 7 | 1 | 1 | 1 | | | 10 |
| 11 RUA DO RIO | 3 | 2 | | | | | 5 |
| 12 BEIRINHA | 5 | | | | | | 5 |
| TOTAL | 67 | 46 | 7 | 21 | 1 | 10 | 152 |
| % | 78.9% | | | 13.8% | 0.7% | 6.6% | 100.0% |
| | 44.1% | 30.3% | 4.6% | | | | |

An important aspect of the Condominial Sewerage System is that the residents shall participate in all phases of the process, particularly in the operation and maintenance phase. For this purpose, it is supposed that all the residents should take part in training activities in order to qualify them for at least the maintenance of the condominial collector. Concerning to this issue, the survey showed that 63.2% of the interviewees did not participate in any training activities. Among those who said to have participated in activities of the type, only 2.0% said to have had instructions in how to "make household connections and maintenance". The other answers were that they received instructions about "not to throw paper on toilet fitting" (15.8%) and "general instructions" (15.1%) (TABLE 3.5).

## TABLE 3.5 Participation in Training Activities

| COMMUNITY | PARTICIPATION IN TRAINING ACTIVITIES | | | | | |
|---|---|---|---|---|---|---|
| | NO | YES | | | | TOTAL |
| | | leaflets / manuals | not throw paper on toilet fitting | make household connection and maintenance | general instructions | |
| 1 CANÃA | 2 | | | | 5 | 7 |
| 2 BELA VISTA | 1 | 2 | | | 4 | 7 |
| 3 JOÃO DE BARROS | 3 | | 3 | | 4 | 10 |
| 4 JORGE PIMENTA | 10 | | | | | 10 |
| 5 MANGUEIRA | 27 | 3 | 8 | 1 | 1 | 40 |
| 6 MUSTARDINHA | 19 | | 8 | | 1 | 28 |
| 7 TAMARINEIRA | 4 | | | | 6 | 10 |
| 8 VILA ARRAES | 8 | | 1 | 1 | | 10 |
| 9 VILA DOS MILAGRES | 8 | | 1 | 1 | | 10 |
| 10 POÇO DA PANELA | 6 | 1 | 3 | | | 10 |
| 11 RUA DO RIO | 3 | | | | 2 | 5 |
| 12 BEIRINHA | 5 | | | | | 5 |
| TOTAL | 96 | 6 | 24 | 3 | 23 | 152 |
| % | 63.2% | 3.9% | 15.8% | 2.0% | 15.1% | 100.0% |
| | 63.2% | 36.8% | | | | 100.0% |

## TABLE 3.6 Block Organization into a "Condominium"

| COMMUNITY | IS YOUR BLOCK ORGANIZED INTO A "CONDOMINIUM"? | | | | |
|---|---|---|---|---|---|
| | NO | YES (Is there an elected representative for the "condominium"?) | | | TOTAL |
| | | Yes | No | Sub-total | |
| 1 CANÃA | 3 | 3 | 1 | 4 | 7 |
| 2 BELA VISTA | 1 | 4 | 2 | 6 | 7 |
| 3 JOÃO DE BARROS | 6 | 0 | 4 | 4 | 10 |
| 4 JORGE PIMENTA | 10 | | | 0 | 10 |
| 5 MANGUEIRA | 7 | 4 | 29 | 33 | 40 |
| 6 MUSTARDINHA | 10 | 2 | 16 | 18 | 28 |
| 7 TAMARINEIRA | 0 | 5 | 5 | 10 | 10 |
| 8 VILA ARRAES | 7 | 0 | 3 | 3 | 10 |
| 9 VILA DOS MILAGRES | 6 | 0 | 4 | 4 | 10 |
| 10 POÇO DA PANELA | 3 | 0 | 7 | 7 | 10 |
| 11 RUA DO RIO | 1 | 2 | 2 | 4 | 5 |
| 12 BEIRINHA | 5 | | | 0 | 5 |
| TOTAL | 59 | 20 | 73 | 93 | 152 |
| % | 38.8% | 21.5% | 78.5% | 100.0% | 100.0% |
| | | 61.2% | | | |

Another important feature of the Condominial Sewerage System is that the block should be organized into a "Condominium" (like in an apartment building) and each condominium should have a representative to organize the maintenance works. 61.2% of the interviewees said that their residences were part of a condominium. However, within these positive answers the majority said that there was no elected representative for the condominium (78.5%) (TABLE 3.6)

Considering that for most of the interviewed residents, their blocks do not have an elected representative to organize the maintenance work, the following answers about how they proceed when there is an obstruction in the collector is clarifying. As expected, only 15.1% said to "jointly with the neighbors try to unclog the collector. As much as 65.2% take individual measures to have the problem solved: call the Community Leader or Association President (8.6%), call COMPESA (17.1%), try to solve by him/herself (29.6%), hires someone to do the work (7.9%), or even give up of the collector using again the old cesspit or the stormwater drainage system to drain sewage (2.0%) (TABLE 3.7).

**TABLE 3.7 Procedures when the Collector is Clogged**

| COMMUNITY | WHAT IS THE PROCEDURE WHEN THE COLLECTOR IS CLOGGED | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Jointly with the neighbors try to unclog the collector | Look for the Community Leader or Association President to ask for help | Call COMPESA | Try to solve the problem by your own | Hires someone to do the work | If you don't find a solution, give up of the collector and start to use the cesspit or stormwater drainage system | There was no clogging until now | No answer | TOTAL |
| 1 CANÃA | 2 | 0 | 2 | 1 | 0 | 0 | 2 | 0 | 7 |
| 2 BELA VISTA | 2 | 0 | 1 | 3 | 0 | 0 | 1 | 0 | 7 |
| 3 JOÃO DE BARROS | 1 | 3 | 1 | 2 | 1 | 0 | 2 | 0 | 10 |
| 4 JORGE PIMENTA | 4 | 0 | 1 | 0 | 5 | 0 | 0 | 0 | 10 |
| 5 MANGUEIRA | 3 | 1 | 2 | 15 | 3 | 0 | 16 | 0 | 40 |
| 6 MUSTARDINHA | 4 | 2 | 1 | 15 | 3 | 1 | 2 | 0 | 28 |
| 7 TAMARINEIRA | 3 | 1 | 3 | 1 | 0 | 0 | 2 | 0 | 10 |
| 8 VILA ARRAES | 2 | 0 | 4 | 2 | 0 | 1 | 1 | 0 | 10 |
| 9 VILA DOS MILAGRES | 1 | 1 | 5 | 1 | 0 | 1 | 1 | 0 | 10 |
| 10 POÇO DA PANELA | 0 | 2 | 6 | 2 | 0 | 0 | 0 | 0 | 10 |
| 11 RUA DO RIO | 1 | 1 | 0 | 1 | 0 | 0 | 2 | 0 | 5 |
| 12 BEIRINHA | 0 | 2 | 0 | 2 | 0 | 0 | 0 | 1 | 5 |
| TOTAL | 23 | 13 | 26 | 45 | 12 | 3 | 29 | 1 | 152 |
| % | 15.1% | 8.6% | 17.1% | 29.6% | 7.9% | 2.0% | 19.1% | 0.7% | 100.0% |

When asked about the frequency of clogging occurrences, the answers showed a predominance of occurrences "more than 6 times a year" (34.9%) which is very high. The other answers were "1 – 3 times a year" (29.6%) and "never" (27.6%) (TABLE 3.8).

**TABLE 3.8 Frequency of Clogging Occurrences**

| COMMUNITY | WHAT IS THE FREQUENCY OF CLOGGING IN THE SYSTEM | | | | |
|---|---|---|---|---|---|
| | Never | 1 to 3 times a year | 4 to 6 times a year | more than 6 times a year | TOTAL |
| 1 CANÂA | 4 | 1 | 1 | 1 | 7 |
| 2 BELA VISTA | 1 | 3 | 1 | 2 | 7 |
| 3 JOÃO DE BARROS | 2 | 3 | 2 | 3 | 10 |
| 4 JORGE PIMENTA | | 1 | 2 | 7 | 10 |
| 5 MANGUEIRA | 19 | 8 | 2 | 11 | 40 |
| 6 MUSTARDINHA | 4 | 12 | 2 | 10 | 28 |
| 7 TAMARINEIRA | 4 | 5 | 1 | 0 | 10 |
| 8 VILA ARRAES | 0 | 1 | 1 | 8 | 10 |
| 9 VILA DOS MILAGRES | 2 | 5 | 0 | 3 | 10 |
| 10 POÇO DA PANELA | 0 | 5 | 0 | 5 | 10 |
| 11 RUA DO RIO | 3 | 1 | 0 | 1 | 5 |
| 12 BEIRINHA | 3 | 0 | 0 | 2 | 5 |
| TOTAL | 42 | 45 | 12 | 53 | 152 |
| % | 27.6% | 29.6% | 7.9% | 34.9% | 100.0% |

Another important aspect to consider in this survey is if the interviewee has made any new construction after the implementation of the condominial collector. According to the survey, 86.2% of them assured they did not make any expansion of the house. The majority of the remaining who did make new construction tried to avoid constructing over the collector (61.9%). Some assumed to have constructed over the collector (33.3%) while only 1 interviewee (4.8%) said to have moved the collector to another place (TABLE 3.9).

## TABLE 3.9 Existence of New Construction after Implementation

| COMMUNITY | DID YOU MAKE AN EXPANSION OF YOUR HOUSE? | | | | | |
|---|---|---|---|---|---|---|
| | NO | YES | | | | TOTAL |
| | | Contructed over the collector | Avoided to contruct over the collector | Changed the collector route | Sub-total | |
| 1 CANÃA | 5 | 2 | 0 | 0 | 2 | 7 |
| 2 BELA VISTA | 6 | | 1 | 0 | 1 | 7 |
| 3 JOÃO DE BARROS | 9 | | 1 | 0 | 1 | 10 |
| 4 JORGE PIMENTA | 7 | 1 | 2 | 0 | 3 | 10 |
| 5 MANGUEIRA | 37 | 2 | 1 | 0 | 3 | 40 |
| 6 MUSTARDINHA | 24 | 1 | 2 | 1 | 4 | 28 |
| 7 TAMARINEIRA | 10 | | | | 0 | 10 |
| 8 VILA ARRAES | 9 | | 1 | 0 | 1 | 10 |
| 9 VILA DOS MILAGRES | 10 | | | | 0 | 10 |
| 10 POÇO DA PANELA | 6 | | 4 | 0 | 4 | 10 |
| 11 RUA DO RIO | 3 | 1 | 1 | 0 | 2 | 5 |
| 12 BEIRINHA | 5 | | | | 0 | 5 |
| TOTAL | 131 | 7 | 13 | 1 | 21 | 152 |
| % | 86.2% | 33.3% | 61.9% | 4.8% | 100.0% | 100.0% |
| | | 13.8% | | | | |

Concerning to the misuse of the system, it was asked to the interviewees if they use to drain the stormwater through the sewerage system. As much as 75.0% of the interviewees assured they do not make this use while 25.0% said "Yes", they use the system to drain the stormwater (TABLE 3.10). Another matter of concern is about littering on the system. When asking if the interviewee him/herself use to throw solid waste in his/her house collection box almost all except one answered "No". It is understandable that no one would like to assume such a practice. However, when asking if they think their neighbors use do to that, the majority answered "Yes" (63.2%), the neighbors use to throw solid waste on the sewerage system (TABLE 3.11).

**TABLE 3.10 Stormwater Drainage through the Sewerage System**

| COMMUNITY | DO YOU DRAIN THE STORMWATER THROUGH THE SEWERAGE SYSTEM | | |
|---|---|---|---|
| | YES | NO | TOTAL |
| 1 CANÁA | 0 | 7 | 7 |
| 2 BELA VISTA | 1 | 6 | 7 |
| 3 JOÃO DE BARROS | 0 | 10 | 10 |
| 4 JORGE PIMENTA | 6 | 4 | 10 |
| 5 MANGUEIRA | 7 | 33 | 40 |
| 6 MUSTARDINHA | 10 | 18 | 28 |
| 7 TAMARINEIRA | 6 | 4 | 10 |
| 8 VILA ARRAES | 1 | 9 | 10 |
| 9 VILA DOS MILAGRES | 1 | 9 | 10 |
| 10 POÇO DA PANELA | 4 | 6 | 10 |
| 11 RUA DO RIO | 1 | 4 | 5 |
| 12 BEIRINHA | 1 | 4 | 5 |
| TOTAL | 38 | 114 | 152 |
| % | 25.0% | 75.0% | 100.0% |

**TABLE 3.11 Littering on the Sewerage System**

| COMMUNITY | DO YOU THINK YOUR NEIGHBOURS THROW SOLID WASTE INTO THE SEWEREAGE SYSTEM? | | | |
|---|---|---|---|---|
| | YES | NO | DON'T KNOW | TOTAL |
| 1 CANÃA | 4 | 3 | 0 | 7 |
| 2 BELA VISTA | 7 | 0 | 0 | 7 |
| 3 JOÃO DE BARROS | 9 | 1 | 0 | 10 |
| 4 JORGE PIMENTA | 7 | 3 | 0 | 10 |
| 5 MANGUEIRA | 19 | 21 | 0 | 40 |
| 6 MUSTARDINHA | 18 | 10 | 0 | 28 |
| 7 TAMARINEIRA | 4 | 4 | 2 | 10 |
| 8 VILA ARRAES | 9 | 1 | 0 | 10 |
| 9 VILA DOS MILAGRES | 9 | 1 | 0 | 10 |
| 10 POÇO DA PANELA | 6 | 4 | 0 | 10 |
| 11 RUA DO RIO | 1 | 4 | 0 | 5 |
| 12 BEIRINHA | 3 | 2 | 0 | 5 |
| TOTAL | 96 | 54 | 2 | 152 |
| % | 63.2% | 35.5% | 1.3% | 100.0% |

To conclude with the features of the Operation and Maintenance phase, it was asked to the interviewees which were the three main maintenance problems in their opinion. Again here, only one answer instead of three was emphasized. The majority said that the main problem is "frequent clogging with solid waste (garbage, plastic bottles)" (55.9%). The other answers can be seen in TABLE 3.12.

## TABLE 3.12 Main Maintenance Problems

| COMMUNITY | MAIN MAINTENANCE PROBLEMS | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | No major problems | | | Mud, flood on the street, bad smell | | | Great amount of dead rodents threatening the residents' health | | | Frequent clogging with solid waste (garbage, plastic bottles) | | | Unfinished work. Sand, gravels and holes on the streets | | |
| | 1st | 2nd | 3rd | 1st | 2nd | 3rd | 1st | 2nd | 3rd | 1st | 2nd | 3rd | 1st | 2nd | 3rd |
| 1 CANÃA | 1 | | | | 1 | 0 | | 0 | 0 | 5 | 0 | 0 | | 0 | 0 |
| 2 BELA VISTA | 0 | | | 1 | 2 | 0 | | 0 | 1 | 6 | 0 | 0 | | 0 | 0 |
| 3 JOÃO DE BARROS | 2 | | | 0 | 2 | 2 | | 0 | 0 | 6 | 1 | 0 | | 0 | 0 |
| 4 JORGE PIMENTA | 0 | | | 0 | 4 | 1 | 0 | 0 | 0 | 9 | 2 | 0 | 0 | 0 | 1 |
| 5 MANGUEIRA | 6 | | | | 9 | 3 | 1 | 1 | 0 | 18 | 2 | 0 | 3 | 4 | 3 |
| 6 MUSTARDINHA | 0 | | | 1 | 4 | 3 | 2 | 1 | 0 | 15 | 5 | 3 | 6 | 10 | 2 |
| 7 TAMARINEIRA | 5 | | | | 1 | 0 | | 0 | 0 | 3 | 0 | 0 | | 0 | 0 |
| 8 VILA ARRAES | 0 | | | 1 | 0 | 0 | | 1 | 1 | 5 | 3 | 1 | 2 | 2 | 2 |
| 9 VILA DOS MILAGRES | 2 | | | 1 | 1 | 0 | | 0 | 0 | 6 | 0 | 0 | 1 | 5 | 0 |
| 10 POÇO DA PANELA | 0 | | | 1 | 1 | 0 | | 0 | 0 | 5 | 2 | 1 | 3 | 5 | 0 |
| 11 RUA DO RIO | 1 | | | | 1 | 0 | | 0 | 0 | 3 | 0 | 0 | | 0 | 0 |
| 12 BEIRINHA | 1 | | | 0 | 1 | 1 | | 0 | 0 | 4 | 0 | 0 | | 0 | 0 |
| TOTAL | 18 | 0 | 0 | 5 | 27 | 10 | 3 | 3 | 2 | 85 | 15 | 5 | 15 | 26 | 8 |
| % | 11.8% | 0.0% | 0.0% | 3.3% | 17.8% | 6.6% | 2.0% | 2.0% | 1.3% | 55.9% | 9.9% | 3.3% | 9.9% | 17.1% | 5.3% |

| COMMUNITY | MAIN MAINTENANCE PROBLEMS | | | | | | | | | | | | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Back flow of the sewage, faulty construction (collection boxes misplaced, broken lids, and others) | | | The system has no maintenance | | | The Community is no organized | | | No answer | | | |
| | 1st | 2nd | 3rd | 1st | 2nd | 3rd | 1st | 2nd | 3rd | 1st | 2nd | 3rd | |
| 1 CANÃA | 1 | 1 | | | 1 | | | 0 | | | 4 | 7 | 7 |
| 2 BELA VISTA | | 2 | | | 0 | | | 0 | | | 3 | 6 | 7 |
| 3 JOÃO DE BARROS | 1 | 0 | | | 0 | | | 0 | | 1 | 7 | 8 | 10 |
| 4 JORGE PIMENTA | 1 | 1 | | 0 | 0 | | | 0 | | 0 | 3 | 8 | 10 |
| 5 MANGUEIRA | | 0 | | 1 | 0 | | | 0 | | 11 | 24 | 34 | 40 |
| 6 MUSTARDINHA | | 0 | | 4 | 0 | | | 0 | | | 8 | 20 | 28 |
| 7 TAMARINEIRA | 1 | 1 | | | 0 | | | 0 | | 1 | 8 | 10 | 10 |
| 8 VILA ARRAES | 1 | 1 | | 1 | 1 | | | 1 | | | 1 | 6 | 10 |
| 9 VILA DOS MILAGRES | | 0 | | | 0 | | | 0 | | | 4 | 10 | 10 |
| 10 POÇO DA PANELA | | 1 | | 1 | 0 | | | 0 | | | 1 | 9 | 10 |
| 11 RUA DO RIO | 1 | 1 | | | 0 | | | 0 | | | 3 | 5 | 5 |
| 12 BEIRINHA | | 1 | | | 0 | | | 0 | | | 3 | 4 | 5 |
| TOTAL | 6 | 9 | 0 | 7 | 2 | 0 | 0 | 1 | 0 | 13 | 69 | 127 | 152 |
| % | 3.9% | 5.9% | 0.0% | 4.6% | 1.3% | 0.0% | 0.0% | 0.7% | 0.0% | 8.6% | 45.4% | 83.6% | 100.0% |

### 2.3.3 Final Comments

To finalize the survey, the interviewees were asked if they were satisfied with the Condominial Sewerage System implemented in their communities. The majority, i.e. 61.8% of the interviewees said "Yes", they are satisfied with the Condominial Sewerage System. Among those who said "No", the first suggestion given for the system improvement was the "repair of the system, replacement of pipes for a larger diameter" (41.4%). Another suggestion highly voted was "maintenance of pipelines and collection boxes" with 27.6% of

the answers for first suggestion. As second suggestion, this last answer was also the best chosen (29.3%) followed by "organization and awareness of the Community, training, avoid littering on the canals" with 20.7% of the answers for the second suggestion (TABLE 3.13).

## TABLE 3.13 Satisfaction with the Condominial Sewerage System

| COMMUNITY | SATISFACTION WITH THE CONDOMINIAL SEWERAGE SYSTEM | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | YES | NO (Suggestions to improve the system) | | | | | | | | | | | | | | | |
| | | Complete the system construction connecting all the houses to it | | | Organization and awareness of the Community. Training. Avoid throwing litter on the canals | | | Maintenance of the pipelines and the collection boxes | | | Repair of the system. Replacement of pipes for a larger diameter | | | Paving the streets, cover the drainage ditches and drainage inlets with lids | | |
| | | 1st | 2nd | 3rd | 1st | 2nd | 3rd | 1st | 2nd | 3rd | 1st | 2nd | 3rd | 1st | 2nd | 3rd |
| 1 CANÁA | 5 | | | | | 1 | | 1 | | | | 1 | 1 | | | |
| 2 BELA VISTA | 4 | | | | | | | | | | 2 | 1 | | | | |
| 3 JOÃO DE BARROS | 8 | 1 | | | | | | | 1 | | | | | | | |
| 4 JORGE PIMENTA | 3 | 6 | 1 | | | | 2 | | 2 | | | 2 | | 1 | | |
| 5 MANGUEIRA | 30 | | | | | 1 | 1 | 5 | 3 | | 5 | 3 | | | | |
| 6 MUSTARDINHA | 15 | 1 | 2 | 2 | 1 | 1 | 6 | 4 | 7 | | 6 | 2 | | | | |
| 7 TAMARINEIRA | 8 | | | | | 1 | | | | | 2 | | | | | |
| 8 VILA ARRAES | 0 | | | | 1 | 4 | 5 | 2 | 3 | | 5 | | 0 | | | 0 |
| 9 VILA DOS MILAGRES | 5 | | | | 1 | 3 | 1 | 4 | | | | 2 | 1 | | | |
| 10 POÇO DA PANELA | 8 | | | | | 1 | 1 | | 1 | 1 | 2 | | | | | |
| 11 RUA DO RIO | 5 | | | | | | | | | | | | | | | |
| 12 BEIRINHA | 3 | | | | | | | | | | 2 | | 1 | | 2 | |
| TOTAL | 94 | 8 | 3 | 2 | 3 | 12 | 16 | 16 | 17 | 1 | 24 | 11 | 3 | 1 | 2 | 0 |
| % | | 13.8% | 5.2% | 3.4% | 5.2% | 20.7% | 27.6% | 27.6% | 29.3% | 1.7% | 41.4% | 19.0% | 5.2% | 1.7% | 3.4% | 0.0% |
| % in relation to all interviews | 61.8% | 38.2% | | | | | | | | | | | | | | | |

| COMMUNITY | SATISFACTION WITH THE CONDOMINIAL SEWERAGE SYSTEM | | | | | | | | | | | | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | NO (Suggestions to improve the system) (continuation) | | | | | | | | | | | | |
| | Change all the system for cesspits | | | More interest and agility from the governmental organizations. Inspection | | | Connect the pipelines to the COMPESA pumping station | | | No answer | | | |
| | 1st | 2nd | 3rd | 1st | 2nd | 3rd | 1st | 2nd | 3rd | 1st | 2nd | 3rd | |
| 1 CANÁA | | | | | | | 1 | | | | | 1 | 2 |
| 2 BELA VISTA | | | | 1 | | | | 2 | 1 | | | 2 | 3 |
| 3 JOÃO DE BARROS | | | | 1 | 1 | | | | | | | 2 | 2 |
| 4 JORGE PIMENTA | | | 1 | | | | | | 1 | | 2 | 3 | 7 |
| 5 MANGUEIRA | | | | | 3 | 5 | | | | | | 4 | 10 |
| 6 MUSTARDINHA | | | | | | 4 | | | | 1 | 1 | 1 | 13 |
| 7 TAMARINEIRA | | | | | | | | | | | 1 | 2 | 2 |
| 8 VILA ARRAES | 2 | 1 | 1 | | 1 | 1 | | | 0 | | 1 | 3 | 10 |
| 9 VILA DOS MILAGRES | | | | | | | | | | | | 3 | 5 |
| 10 POÇO DA PANELA | | | | | | | | | | | | | 2 |
| 11 RUA DO RIO | | | | | | | | | | | | | 0 |
| 12 BEIRINHA | | | | | | | | | | | | 1 | 2 |
| TOTAL | 2 | 1 | 2 | 2 | 5 | 10 | 1 | 2 | 2 | 1 | 5 | 22 | 58 |
| % | 3.4% | 1.7% | 3.4% | 3.4% | 8.6% | 17.2% | 1.7% | 3.4% | 3.4% | 1.7% | 8.6% | 37.9% | 100.0% |
| % in relation to all interviews | 38.2% | | | | | | | | | | | | |

The interviewees were asked if they were paying for sewerage charge and how much. Forty four (44) interviewees are paying the sewerage charge, only representing 28.9% of the total interviewed residents. Among those who are paying the sewerage charge, the majority of 75.0% are paying up to R$5 that is approximately the minimum charge (R$ 4.60) (TABLE 3.14).

**TABLE 3.14 Payment of Sewerage Charge**

| COMMUNITY | SEWERAGE CHARGE | | | | | | |
|---|---|---|---|---|---|---|---|
| | NO | YES | | | | | TOTAL |
| | | > R$1 up to R$ 5 | > R$ 5 up to R$ 10 | > R$ 10 | no answer | Sub-Total | |
| 1 CANÁA | 1 | 6 | 0 | 0 | 0 | 6 | 7 |
| 2 BELA VISTA | 1 | 6 | 0 | 0 | 0 | 6 | 7 |
| 3 JOÃO DE BARROS | 3 | 5 | 2 | 0 | 0 | 7 | 10 |
| 4 JORGE PIMENTA | 10 | 0 | 0 | 0 | 0 | 0 | 10 |
| 5 MANGUEIRA | 29 | 6 | 0 | 1 | 4 | 11 | 40 |
| 6 MUSTARDINHA | 27 | 0 | 0 | 0 | 1 | 1 | 28 |
| 7 TAMARINEIRA | 6 | 3 | 1 | 0 | 0 | 4 | 10 |
| 8 VILA ARRAES | 10 | 0 | 0 | 0 | 0 | 0 | 10 |
| 9 VILA DOS MILAGRES | 10 | 0 | 0 | 0 | 0 | 0 | 10 |
| 10 POÇO DA PANELA | 1 | 7 | 1 | 1 | 0 | 9 | 10 |
| 11 RUA DO RIO | 5 | 0 | 0 | 0 | 0 | 0 | 5 |
| 12 BEIRINHA | 5 | 0 | 0 | 0 | 0 | 0 | 5 |
| TOTAL | 108 | 33 | 4 | 2 | 5 | 44 | 152 |
| % | 71.1% | 75.0% | 9.1% | 4.5% | 11.4% | 100.0% | 100.0% |
| | | 28.9% | | | | | 100.0% |

For those who said they are paying for sewerage charge it was asked whether they think the sewerage charge is fair. Among these, 36 believe the sewerage charge is fair (78.7%) (TABLE 3.15).

## TABLE 3.15 Fairness of the Sewerage Charge

| COMMUNITY | DO YOU THINK THE SEWERAGE CHARGE IS FAIR? | | |
|---|---|---|---|
| | YES | NO | TOTAL |
| 1 CANÃA | 6 | 0 | 6 |
| 2 BELA VISTA | 6 | 0 | 6 |
| 3 JOÃO DE BARROS | 7 | 0 | 7 |
| 4 JORGE PIMENTA | 0 | 0 | 0 |
| 5 MANGUEIRA | 5 | 6 | 11 |
| 6 MUSTARDINHA | 0 | 1 | 1 |
| 7 TAMARINEIRA | 3 | 1 | 4 |
| 8 VILA ARRAES | 0 | 0 | 0 |
| 9 VILA DOS MILAGRES | 0 | 0 | 0 |
| 10 POÇO DA PANELA | 9 | 0 | 9 |
| 11 RUA DO RIO | 0 | 0 | 0 |
| 12 BEIRINHA | 0 | 0 | 0 |
| TOTAL | 36 | 8 | 44 |
| % | 81.8% | 18.2% | 100.0% |

Independently of the question about payment of sewerage charge, it was asked for all the interviewees if they would be willing to pay more for sewerage charge in order to have the collector placed on the sidewalk and thus relieved from the responsibility of maintaining the collector. The majority said "No", they would not be willing to pay more, with 67.8% of the answers. For this question, 17.8% did not respond while 14.5% answered "Yes" (TABLE 3.16).

## TABLE 3.16 Willingness to Change the Collector Location

| COMMUNITY | EVEN IF YOU HAD TO PAY MORE, WOULD YOU BE WILLING TO CHANGE YOUR COLLECTOR TO THE SIDEWALK? | | | |
|---|---|---|---|---|
| | YES | NO | NO ANSWER | TOTAL |
| 1 CANÃA | 0 | 7 | 0 | 7 |
| 2 BELA VISTA | 0 | 7 | 0 | 7 |
| 3 JOÃO DE BARROS | 1 | 6 | 3 | 10 |
| 4 JORGE PIMENTA | 0 | 0 | 10 | 10 |
| 5 MANGUEIRA | 7 | 33 | 0 | 40 |
| 6 MUSTARDINHA | 6 | 22 | 0 | 28 |
| 7 TAMARINEIRA | 0 | 4 | 6 | 10 |
| 8 VILA ARRAES | 4 | 6 | 0 | 10 |
| 9 VILA DOS MILAGRES | 1 | 9 | 0 | 10 |
| 10 POÇO DA PANELA | 3 | 7 | 0 | 10 |
| 11 RUA DO RIO | 0 | 0 | 5 | 5 |
| 12 BEIRINHA | 0 | 2 | 3 | 5 |
| TOTAL | 22 | 103 | 27 | 152 |
| % | 14.5% | 67.8% | 17.8% | 100.0% |

At last, when was asked if the implementation of the Condominial Sewerage Charge has improved the interviewee and his/her family lives, the majority answered "Yes" (60.5%), although a large number responded "No" (39.5%). Among those who answered "Yes", the main reason for the improvement was "more cleanness, improvement of sanitation conditions, valorization of the street" with 48.9% of the positive answers (TABLE 3.17).

**TABLE 3.17 How did the System Implementation Improved the Families' Lives**

| COMMUNITY | DO YOU THINK YOUR AND YOUR FAMILY LIVES IMPROVED AFTER THE SYSTEM IMPLEMENTATION? | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | NO | YES (How did it improved?) | | | | | | | | TOTAL |
| | | More cleanness, improvement of sanitation conditions, valorization of the street | Less diseases | Less rodents and insects | Less standing water on the streets / less floods | Widening of streets and alleys, paving of sidewalks, installation of sanitary fittings | Less bad smell | Others | Sub-total | |
| 1 CANÁA | 1 | 4 | | 1 | | | 1 | | 6 | 7 |
| 2 BELA VISTA´ | 3 | 2 | | | 1 | | 1 | | 4 | 7 |
| 3 JOÃO DE BARROS | 2 | 4 | 2 | | 1 | 1 | | | 8 | 10 |
| 4 JORGE PIMENTA | 8 | | | | | 1 | | 1 | 2 | 10 |
| 5 MANGUEIRA | 13 | 16 | 1 | 3 | 5 | | 1 | 1 | 27 | 40 |
| 6 MUSTARDINHA | 13 | 5 | 1 | 4 | 4 | | 1 | | 15 | 28 |
| 7 TAMARINEIRA | 1 | 5 | | | 3 | 1 | | | 9 | 10 |
| 8 VILA ARRAES | 10 | | | | | | | | 0 | 10 |
| 9 VILA DOS MILAGRES | 4 | | 1 | 5 | | | | | 6 | 10 |
| 10 POÇO DA PANELA | 2 | 4 | 1 | 2 | 1 | | | | 8 | 10 |
| 11 RUA DO RIO | 1 | 2 | | | 1 | 1 | | | 4 | 5 |
| 12 BEIRINHA | 2 | 3 | | | | | | | 3 | 5 |
| TOTAL | 60 | 45 | 6 | 15 | 16 | 4 | 4 | 2 | 92 | 152 |
| % of "Yes" | | 48.9% | 6.5% | 16.3% | 17.4% | 4.3% | 4.3% | 2.2% | 100.0% | |
| % of Total | 39.5% | 60.5% | | | | | | | | 100.0% |

## 2.4 Conclusions

- The communities in which the Condominial Sewerage Systems were implemented are quite consolidated considering that most of the interviewees are living there for more than 10 years. Some are even living there for more than 50 years.
- Most of the families get a monthly income of up to 3 Minimum Wages (around US$ 240). Within these families, the majority gets only up to 1 Minimum Wage (around US$ 80).
- Before the implementation of the Condominial Sewerage System, the residents used to suffer with the overall surrounding environment conditions: mud and litter on unpaved streets, resulting from floods with the consequent bad smell. These conditions were the outcome of the lack of basic sanitation and stormwater drainage facilities.

- Perhaps because of the long term of the communities establishment, almost all the interviewees were already living there when the sewerage system was implemented. Most said someone in the family participated in the system implementation, at least in the discussions about the plan. Even for those who did not participate, the main reason for the absence was merely lack of time and not lack of interest. Only a few contributed in financial terms with the system implementation, most with less than ½ MW.
- The main problem during the system implementation was the conditions of the streets (holes, sand, gravels, garbage, and sand) followed by "mud, flood and bad smell". It must be pointed out that this last problem was usual even before the system implementation.
- The majority of the interviewees are aware of their respective collector and collection box location. There is a predominance of collectors within the land lot (backyard, front yard, and lateral corridor).
- As for the Operation & Maintenance phase, the survey shows that most of the interviewees did not participate in training activities to carry out the collector maintenance. Even among those who participated, only a small number was trained in practical things such as how to make a household connection and the maintenance of the collector.
- Although the majority said that the block in which his/her residence is located was organized into a "condominium", most of the blocks does not have an elected representative to organize the maintenance activities. Consequently, most of the interviewees use to take individual measures when there is an obstruction in the collector. These obstructions are quite frequent with a high number of cases occurring more than 6 times a year.
- The survey also shows that the misuse of the Condominial Sewerage Systems takes place either by their use to drain the stormwater, a practice assumed by 25% of the interviewees, and/or by littering in it which was not assumed by anyone although most have accused the neighbors of doing so. Consequently, the interviewees considered the frequent obstruction of the system with solid waste as the main maintenance problem.
- Despite all the problems in the systems' Operation & Maintenance, the majority of the interviewees are satisfied with them. Among those who are not satisfied, the main suggestion for their improvement was the repair of the system with the replacement of pipes with a larger diameter. In second place, it was requested the maintenance of pipelines and collection boxes.
- Regarding the sewerage charge, only a minority is charged by COMPESA for it. Among those who is charged, the majority pays up to R$ 5, what is approximately the value of the minimum charge (R$ 4.60). The majority of those who is paying consider the charge fair.

- Considering the difficulties in maintaining the collector, it was asked if the interviewee would pay more for sewerage charge just to have the collector outside the land lot and thus becoming released from the responsibility of maintaining it. The majority answered "No" to this question.
- At last, the survey shows that for most of the interviewees, the Condominial Sewerage System implementation improved their families lives mainly providing more cleannes, better sanitation conditions, and the valorization of the street. However, a large number (39.5%) answered "No" to this question, which shows that the systems' operation and maintenance is not being carried out smoothly in some communities.

# *SUPPORTING REPORT K*

# *TECHNICAL SPECIFICATIONS FOR FIELD SURVEYS*

## TABLE OF CONTENTS

# A. TECHNICAL SPECIFICATIONS ON WATER QUALITY SEDIMENT QUALITY SURVEY

## 1. GENERAL

### 1.1 Background of the Project

In compliance with the Contract for " The Study on Stormwater Drainage and Sewerage Management Plan for Recife Metropolitan Area", which was agreed upon between the Japan International Cooperation Agency and Pacific Consultants International (the Consultants) on September 30, 1999, the Consultants has launched a study.

For the purpose of the Study, a number of input data are required, e.g.

- Pollution loads to the rivers and river water/sediment qualities
- Wastewater and treated water conditions

Availability of data collected so far for the Study Area might not meet these requirements taking into account the quite complicated structure for water pollution control planning. Therefore, a water quality and sediment quality survey is deemed necessary to be conducted.

### 1.2 Objectives of the Survey

The objectives of the Water Quality and Sediment Quality Survey are as follows;

- To use the results of the survey for the water quality management planning
- To supplement the data not obtained by the Consultants
- To know the characteristics of municipal and industrial wastewater quality and sediment quality

### 1.3 Scope of the Survey

The survey area is within the Recife Metropolitan Area (2,766 $km^2$). The Water Quality and Sediment Quality Survey covers the analysis for the following seven (7) items:

(1) Water quality of the four (4) rivers in the dry season

(2) Sediment quality of the four (4) rivers in the dry season

(3) Water quality of the four (4) wastewater treatment plants for before and after the treatment in the dry season. The sampling is conducted three times a day for each site considering the fluctuation of discharge.

(4) Sludge quality of the existing three (3) wastewater treatment plants in the dry season.

(5) Domestic wastewater quality for three (3) categories in the dry season, three (3) sites for each category.

(6) Industrial wastewater quality for seven (7) industrial categories in the dry season, three (3) sites for each category.

(7) Sediment quality at the industrial wastewater outlets for three (3) industrial categories in the dry season

Number of samples and of determinants and testing items are described in section 2 " Survey contents and method ".

### 1.4 Unit to be Used

Metric system shall be adopted for the Water Quality and Sediment Quality Survey.

### 1.5 Language

English shall be used for reports, maps, tables and figures.

### 1.6 Documentation

The reports and documents shall be principally in A-4 size. The Surveyor shall submit the following reports. The reports shall be made by using Microsoft Word and Excel and other graphic software.

- Survey Report 2 sets

Two copies of Survey Report shall be submitted by the 30th of December 1999. The Survey Reports shall contain the following items.

(1) summary of analyses result
(2) sampling method and condition
(3) location and date of sampling
(4) analysis method
(5) raw data of laboratory analysis

Final Survey Reports shall also be submitted in one set of floppy disk(s) for the raw data, results of field measurement and laboratory testing for the water quality and the sediment quality.

## 1.7 Equipment, Materials and Labor

The Surveyor shall provide all equipment, materials and labour necessary for the Water Quality and Sediment Quality Survey.

## 1.8 Transportation

The Surveyor shall arrange all transportation required for conducting the Survey.

# 2. SURVEY CONTENTS AND METHOD

## 2.1 Water Quality Survey

**Sampling medium:**

River water, wastewater from treatment plants, wastewater from households and wastewater from factories.

**Sampling locations and sampling number:**

Rivers:
In the sections with a large tidal influence, sampling will be done twice (for high tide and low tide).

| Site | Sampling | Total |
|---|---|---|
| Tidal section near river mouth | 4 rivers x 1 sites x twice( high and low tides) x once (dry season) | 8 samples |
| Up and down stream of polluted area | 4 rivers x 2 sites(up and downstream) x once (dry season) | 8 samples |

Existing treatment plants:
Discharge and inflow at a site will be sampled at three existing treatment plants and one new plant.

| Site | Sampling | total |
|---|---|---|
| Existing treatment plants | 4 plants x 3 times x 2 points (in & out) | 24 samples |

Houses:

Domestic wastewater will be sampled from each of the three typical residential areas that are categorized in accordance with their living standard.

| Site | Sampling | total |
|---|---|---|
| Areas of three categories | 3 categories x 3 sites x once | 9 samples |

Factories:

Wastewater from the factories that are considered to have a large pollution load will be sampled.

| Site | Sampling | total |
|---|---|---|
| Factories of various industries | 7 categories x 3 factories x once | 21 samples |

Discharges, except the rivers, shall be measured to estimate the pollution loads at the inlets and outlets.

**Sampling locations**: To be decided through discussions with the Consultants

**Sampling period**: The dry season. Different sampling locations need not be sampled simultaneously.

**Sampling and analytical procedure**: In accordance with the Brazilian standards

**Format of results**:

All results should be provided in spreadsheet format. The following information shall be provided:

- Locations and date of sampling for each sample
- Results of laboratory testing and their analyses
- A brief report in English describing the fieldwork and laboratory experiments carried out, including problems encountered and how they were handled, and including any deviations from the suggested procedure.

## 2.2 Sediment Quality Survey

The deposit at wastewater outlets of treatment plants/factories and the bed material of riverbeds shall be sampled and analyzed to assess the degree of pollution. Sampling shall be made from the surfaces of the channel-bed

Sampling locations and sampling number:

Rivers:

| Site | Sampling | Total |
|---|---|---|
| Tidal sections of near river mouth | 4 rivers x 1 site x once ( dry season ) | 4 samples |
| Up and downstream of polluted area | 4 rivers x 2 sites ( up and down stream ) x once (dry season ) | 8 samples |

Existing treatment plant:

| Site | Sampling | Total |
|---|---|---|
| Effluent of wastewater | 3 plants x 3 times x once(dry season) | 9 samples |

Factories:

The outlets of three factories that are supposed to produce a large amount of wastewater with high heavy metal contents will be sampled and analyzed.

| Site | Sampling | Total |
|---|---|---|
| Effluent of wastewater | 3 factories x once(dry season) | 3 samples |

**Sampling locations:** To be decided through discussions with the Consultants

**Sampling and analytical procedure**: Standard procedure applied in Brazil.

**Format of results**: All data are to be provided in MS Windows-based spreadsheet.

## 2.3 Items of Laboratory Analysis

The analysis items are shown in the following table

| | Water quality | Sediment quality (dissolved substances from the sediment) |
|---|---|---|
| 1 | PH | Cadmium |
| 2 | BOD | Total cyanide |
| 3 | COD | Organic phosphorous |
| 4 | SS(suspended sediment) | Lead |
| 5 | DO | Chromium (hexavalent) |
| 6 | E-coli | Arsenic |
| 7 | Total Nitrogen | Total mercury |
| 8 | Total Phosphorous | Alkyl Mercury |
| 9 | n-Hexane extract( oil & grease) | PCB( polychlorinated bipheyle ) |
| 10 | Chlorine | Total nitrogen |
| 11 | | Total phosphorous |
| 12 | | Ignition loss |

## 2.4 Survey Team(s)

Sufficient number of survey team(s) shall be established for conducting the field work including samplings and field measurements of the water quality survey for all sampling points within two or three days for each sampling period. Each survey team shall be composed of one engineer or experienced staff with supporting staff.

## B. Technical Specifications FOR THE PEOPLE'S AWARENESS SURVEY

### 1. INTRODUCTION

The work specified in this document (hereinafter referred to as the Work) is a part of the JICA Study on the STORMWATER DRAINAGE AND SEWERAGE MANAGEMENT PLAN FOR RECIFE METROPOLITAN AREA IN THE FEDERATIVE REPUBLIC OF BRAZIL (hereinafter referred to as the Study).

**The Work aims**

(1) to estimate economic and financial benefits resulting from the projects proposed in the Study

(2) to obtain firsthand information on the people's living environment in terms of sewerage connection and wastewater disposal.

The Work will be conducted using the questionnaire forms prepared by the Consultants after necessary alteration. The questionnaire forms are attached in Appendix D

### 2. GENERAL REQUIREMENT

- The Surveyor shall provide all survey equipment, personnel, transportation, reporting and others required to complete the Work.
- All correspondences between both parties are in English. The Surveyor shall translate or interpret between English and Portuguese, if it is necessary to complete the Work.
- The cost of all accommodation and other expenses shall be born by the Surveyor.
- The Surveyor shall keep the answer sheets used in the Work for 2 months after the completion date specified hereinafter, for the Consultants' inspection.
- Other conditions not specified herein shall be settled by mutual written agreement of the two parties.
- The Surveyor shall keep the results of the Work confidential and shall not disclose them to any party without the written approval of the Consultants.

### 3. SCOPE OF WORK

#### (1) Preparation of the Instruction Manual for the interviewer

Before commencement of the interview survey, the Consultants will submit draft questionnaire forms. The both sides will discuss the contents and make revisions if

necessary. Then the Surveyor shall prepare an instruction manual for interviewers and submit it to the Consultants for approval.

### (2) Sampling

The number of samples

About five hundred (500) samples in total from each of the fourteen (14) cities of RMR ; Araçoiaba, Itapissuma, Itamaraca, Igarassu, Abreu e Lima, Paulista, São Lourenço da Mata, Camaragibe, Olinda, Recife, Moreno, Jaboatão dos Guararapes, Cabo de Santo Agostinho, Ipojuca.

Sampling unit and target

It should be noted that the unit of sampling is a household. The sampling is targeted to all types of households in RMR including illegal inhabitants of the slum areas.

Sampling method

Sampling shall be based on random selection. The detail of the sampling method is as follows.

- Classify the residents according to their living environment
- Allocate the total sampling number of about 500 to all the 14 cities in proportion to their populations.
- Within each city, disperse the allocated number of samples among the residents of different categories classified according to the living environment

The Surveyor will present the sampling points and explain the strategy to the Consultants before the commencement of the interview survey.

### (3) Interview Survey

Interview survey shall be conducted using the questionnaire approved by the Consultants. The Surveyor will instruct interviewers to follow the instruction manual prepared by the Surveyor. The interviewer will visit the selected sample households one at a time and ask questions with the questionnaire and record the answers.

### (4) Summing up and Analysis of Data

Based on the results of interviews, the Surveyor shall conduct the following data analysis.

- Availability of samples
- Distribution of respondents' attributes
- The mean value and the median of respondents' willingness to pay (WTP).

The other data shall be simply summed up for easier analysis by the Consultants

### (5) Reporting and Data Submission

The survey results shall be complied in a report written in English. The report shall include the method of sampling, daily log of interview surveys, and results of the data analysis. Two copies shall be submitted to the Consultants.

Results of interviews shall be recorded and the data shall be saved as both Microsoft EXCEL 97 worksheet files and text files, with the media and format specified by the Consultants. The files shall be submitted to the Consultants by means of floppy disk or e-mail.

## 4. Survey Period and COMPLETION DATE

The study shall be carried out in accordance with the following schedule. All survey should be completed within 7 weeks after the commencement of the survey.

| Work item | 1st Week | 2nd Week | 3rd Week | 4th Week | 5th Week | 6th Week | 7th Week |
|---|---|---|---|---|---|---|---|
| Preparation of the Instruction Manual for Surveyors | | | | | | | |
| Sampling | | | | | | | |
| Interview survey | | | | | | | |
| Summing up and Analysis of Data | | | | | | | |
| Reporting and Data Submission | | | | | | | |

# C. TECHNICAL SPECIFICATIONS ON ENVIRONMENTAL IMPACT ASSESSMENT

## 1. INTRODUCTION

In response to the request of the Government of Pernambuco State, the Government of Japan has decided to conduct "The Study on Stormwater Drainage and Sewerage Management Plan for Recife Metropolitan Area in the Federative Republic of Brazil" (hereinafter referred to as the Study) in accordance with the relevant environmental laws and regulations in force in Brazil.

Accordingly, the Japan International Cooperation Agency (hereinafter referred to as JICA), the official agency responsible for the implementation of the co-operation programs of Japan will undertake the study in close co-operation with the authorities concerned of the Government of Pernambuco.

The JICA Study Team has formulated a master plan and selected seven sewerage systems for the feasibility study. This Environmental Impact Assessment will be applied for the feasibility study.

## 2. OBJECTIVES OF THE STUDY

The objectives of this study are:

(1) To undertake an Environmental Impact Assessment (EIA) study for the proposed project to improve the seven sewerage systems, including preparation of the Environmental Management Plan (EMP) for mitigating the negative impacts;

(2) To prepare EIA and an EIA report (RIMA) that includes information on the existing condition of environment and evaluation of the environmental impacts caused by the implementation of the project.

The EIA study is expected to conduct concurrently with the technical study so that the EIA findings can be integrated in the technical study recommendations.

## 3. SCOPE OF WORK

The field studies should be conducted and report shall be prepared according to the principles and processes contained in the Environmental Guidelines by CPRH. The environmental parameters for the field studies should be extracted based on Initial Environmental Evaluation (IEE) study that was carried out by the Consultants.

The EIA study should be in conformity with the Government of Pernambuco requirements for EIA/RIMA for the project and should be in conformity with different the latest laws and regulations as they are amended from time to time.

### 3.1 ENVIRONMENTAL IMPACT ASSESSMENT

The output of the assignment is to prepare detailed report on EIA and RIMA for the Project. The report should include project description, existing environmental conditions, impact assessment, Environmental Management Plan (EMP), monitoring plan.

**Study Area for EIA:** The study area for EIA will include not only the sites of construction but also impact influence areas. The Project Area is the proposed sewerage systems for the feasibility study as shown in the attached figure. The served area and population of each sewerage system are shown in the table below.

**Sewerage Systems for F/S**

| River Basin | Name of Sewerage System | Served Area (ha) | Served Population in 2000 |
|---|---|---|---|
| Capibaribe | Cabanga | 2,260 | 304,394 |
| | Cordeiro | 675 | 100,048 |
| Jaboatao | Prazeres | 1,548 | 233,403 |
| | Curcurana | 910 | 123,636 |
| Tejipio | Boa Viagem | 1,281 | 159,314 |
| Timbo | Janga | 2,879 | 316,075 |
| | Concecao | 710 | 62,445 |
| Total | | 10,263 | 1,299,315 |

#### 3.1.1 Task 1: Description of the Proposed Project

A brief description of the proposed project should be provided using maps at appropriate scale. The descriptions will include information on pre-construction and construction activities, schedule for implementation, workforce and support facilities and services, operation and maintenance activities.

### 3.1.2 Task 2: Secondary Data Collection and Analysis

The relevant data which has already been published and available from other environmental studies and statistics should be collected and compiled. The items for data collection are shown in Table 1.

**Items for data collection.**

| Data Category | Data Items | Period |
|---|---|---|
| Climate | Wind rose, Max/Min/Mean annual Temp. Frequency of inversion, Frequency of cyclones/tornadoes/cloud burst | Last 5 years |
| Air Quality | Ambient air Quality (SPM, RPM, CO, $NO_x$, HC, Pb) | Last 5 years |
| Water Quality | River Water, Ground Water (pH, DO, BOD, COD, SS) | Last 5 years |
| Hydrology and Geology | River Flow, flood, silting, landslide, soil maps, geological maps, soil erosion | Last 10 years |
| Soil | Soil characteristics should be studied. | Present |
| Fauna & Flora | Vegetation map, precious species, endangered species, etc. | Present |
| Environmental Characteristics | a) National Park,<br>b) Recreation areas,<br>c) Wildlife sanctuary,<br>d) Natural reserves,<br>e) Mangrove forests,<br>f) Swamp lands and wetlands,<br>g) Agricultural lands,<br>h) Industrial areas,<br>i) Residential areas,<br>j) Commercial areas,<br>k) Historical and cultural sites and monuments | Present |
| Socio-economic | 1) Data on conditions of health and sanitation by communities,<br>2) Characteristics of habitations, villages and towns,<br>Value and quality of various land uses | Present |

### 3.1.3 Task 3: Existing Environment and Baseline Conditions Data Collection

The latest information on the existing conditions on the following three items which are considered to be important should be collected and compiled. Actual measurements and analyses should be conducted if necessary.

Water Quality:

Quality of water should be studied with the use of collected data and primary data from this study.

Hydrological Situation:

River flow and shape of rivers where there is a discharge point of wastewater treatment stations should be studied.

Biological Environment:

Field surveys should be conducted to determine existing status of terrestrial and aquatic flora and fauna and to identify sensitive areas. An inventory of terrestrial and aquatic flora and fauna, sensitive habitats and endangered species, if any, should be prepared. Data from secondary sources also to be compiled.

### 3.1.4 Task 4: Environmental Impacts

Environmental Impact Assessment (EIA):

Positive and negative impacts on the environment that are likely to result from the implementation of the project during the construction and after construction should be identified.

Wherever possible the impacts should be described in quantitative terms. Standard methods should be used to predict the impacts. The extent and quality of available data, key data gaps and uncertainties associated with predictions should be described. The environmental items for prediction will be as follows:

- Physical Resources etc.
  - ✓ Hydrology
  - ✓ Surface Water Quality
  - ✓ Air Quality
  - ✓ Soils
  - ✓ Offensive odor

- Ecological Resources
  - ✓ Fauna and Flora
- Quality of Life Values
  - ✓ Socio-Economy
  - ✓ Public Health
  - ✓ Aesthetics

Any impact that are irreversible and/or cannot be avoided or mitigated should be identified. The hazard/risk associated with movement of hazardous cargo should be identified. Necessary precautions/mitigation measures, if applicable, should be indicated.

Qualitative description of impacts should be provided for other environmental attributes covering all project activities during construction and operation phase.

The Environmental Impact Assessment (EIA) is to be followed by preparation of RIMA. An RIMA is a final analysis to an environmental Impact Assessment.

The RIMA should cover the following items:

(1) Aims and justification of the project
(2) Description of the project and its alternatives
(3) Description of the existing environment
(4) Probable impacts of the proposed project
(5) Mitigation, protection and improvement measures
(6) Monitoring Plans
(7) Summary and Conclusions

The EIA/RIMA report must refer to the guidelines prepared by CPRH.

### 3.1.5 Task 5: Environmental Management Plan

Mitigation Plan:

For each significant negative impact, a measure to avoid, mitigate (reduction to acceptable levels) or when unavoidable, compensation for the damage should be recommended and described.

The description of mitigation measures should include:

- an estimate of initial and running costs of mitigation measures;
- the party(ies) responsible for their implementation.

Monitoring Plan:

The types of monitoring needed for potential environmental impacts during construction and operation should be specified.

## 4. Result of the Investigation

The result of the work shall be compiled in the following report and two copies in Portuguese and Five (5) copies of its English translation shall be submitted.

(1) EIA report ( Two Portuguese and Five English )

## D. TECHNICAL SPECIFICATIONS ON SOIL INVESTIGATION

### 1. SCOPE OF WORK

#### 1.1 Introduction

The Soil Investigation is to be conducted in the seven sewage treatment station sites for the Feasibility Study of the study on Stormwater Drainage and Sewerage Management Plan for Recife Metropolitan Area in the Federative Republic of Brazil. The work comprises the following:

Soil Investigation.

(1) Machine Boring
(2) Laboratory Testing
(3) Reporting.

#### 1.2 Definitions

**1.2.1** "the Consultants" means the representative of Pacific Consultants International that shall conduct the Feasibility Study on the Project for the stormwater Drainage and Wastewater Management Plan for the Recife Metropolitan Area.

"the Surveyor" means the representative of the contractor that is able to undertake this Soil Investigation work.

#### 1.3 Machine Boring / Laboratory Testing

#### 1.3.1 Equipment, Materials and Labors

The Surveyor shall provide all equipment, materials and labors necessary for all above-mentioned work.

#### 1.3.2 Transportation

All transportation including local transportation of the Surveyor's staff, labors and equipment to/from the work sites shall be provided by the Surveyor.

#### 1.3.3 Accommodation

All accommodation and other expenses shall be borne by the Surveyor.

### 1.3.4 Work Schedule

All of the above-mentioned work shall be accomplished according to the time schedule which will be prepared by the surveyor and approved by the consultants at the beginning of the work.

### 1.3.5 Other Conditions

Other condition not specified herein shall be settled by mutual agreement between the Consultants and Surveyor.

## 2. SPECIFICATIONS

### 2.1 Investigation

The items of Soil investigation and the estimated work and quantities for each item are shown below:

### 2.1.1 Soil Investigations for Sewage Treatment Plants

**(1) Field Investigation**

**1) General Mobilization**

- Mobilization and Demobilization
  (Including all transportation)
- Setting Boring Machine at the Job Sites
  - On land

**2) Machine Boring Survey, Test and Sampling**

| | Quantity |
|---|---|
| • Machine Boring | |
| - Regardless of type of layer | 300 m in total |
| • Standard Penetration Test | 300 times in total |
| • Undisturbed Sampling (for mechanical test) | 20 samples |

**3) Laboratory Test**

| | Quantity |
|---|---|
| • Physical and Mechanical Test for Undisturbed Samples. | |
| a) Physical Test | |
| - Grain size Analysis (Hydrometer & Sieve) | 20 tests |
| - Natural Water Content | 20 tests |

- Specific Gravity.....20 tests
- Atterberg Test (liquid and plastic limit).....20 tests
- Wet Density (undisturbed sample).....20 tests

• Mechanical Test
- Unconfined Compression Test.....20 tests

4) **Report & Photographs** ..... **3 sets**

**Proposed Borings and Samplings for Sewage Treatment Stations**
**(Tentative)**

| Name of Treatment Station | Area of Land ($m^2$) | Proposed Boring | | Proposed Sampling (No) |
|---|---|---|---|---|
| | | No | Length (m) | |
| Cabanga | - | 2 | 30 and 25 | 3 |
| Cordeiro | 11,930 | 1 | 30 | 3 |
| Prazeres | 20,790 | 2 | 30 and 20 | 3 |
| Curcurana | 15,200 | 1 | 30 | 3 |
| Boa Viagem | 2,100 | 1 | 30 | 2 |
| Janga | - | 2 | 30 and 25 | 3 |
| Concecao | 38,140 | 2 | 30 and 20 | 3 |
| Total | 88,160+ | 11 | 300 | 20 |

The above quantities of boring, sampling and others may be changed according to the conditions of the soil layers. The Consultants shall indicate such changes.

## 2.2 Location of Soil Investigation

The rough locations of machine boring and other survey sites are shown in the attached figure. The Consultants shall direct the exact location of machine boring and other survey sites.

## 2.3 Method of Investigation

### 2.3.1 Machine Boring

(1) A boring machine of rotary type shall be used. The percussion type shall not be used.

(2) The diameter of borehole shall be more than 86 mm for the planned undisturbed sampling at every location.

(3) Casings and slurry shall be used in boring to secure the stability of borehole.

(4) In performing the standard penetration test, a bore hole bottom shall be cleaned and slime shall be removed.

(5) The depth of Machine Boring shall be 20m to 30m per site. If encountered by an obvious bearing stratum (over-30 N-value), drilling should be continued to confirm 3m of the layer.

(6) If soil became hard enough to take a core, core samples shall be taken.

(7) During core sampling, bit pressure and revolution for each 25 cm shall be recorded

### 2.3.2 Standard Penetration Test (SPT)

(1) Standard Penetration Test (SPT) shall be conducted in accordance with the procedure specified under ASTM-D-1586, or JIS A-1219.

(2) SPT shall be performed for each one(1)m depth of soft soil and foundation stratum.

(3) A hammer shall be dropped freely, it shall not be dropped by means of a winch.

(4) As for the soil contained in the tube, soil layer, color, hardness, organic component shall be observed and recorded and the soil sample should be preserved.

### 2.3.3 Undisturbed Sampling

(1) A fixed piston type thin-walled tube sampler shall be used. In case another type of sampler is used, the Surveyor shall obtain the approval from the Consultants.

(2) The type of tube for the sampling shall be subject to the approval of the Consultants

(3) The sampler shall be pushed in at a constant speed without a topping in the course of the sampler push-in.

(4) The sampler shall be sealed with a rubber or paraffin packing immediately after the characteristics of the soil are observed and recorded.

### 2.3.4 Laboratory Testing

The laboratory soil test shall be based on the following standard items.

| | ASTM-. | AASHTO. | JIS A-. |
|---|---|---|---|
| - Specific Gravity Test | D-854. | T-100. | 1202 |
| - Natural Water Content | D-2216. | T-265. | 1203 |
| - Grain Size Analysis | D-422. | T-88. | 1204 |
| - Liquid Limit Test | D-423. | T-89. | 1205 |
| - Plastic Limit Test | D-424. | T-90. | 1206. |
| - Wet Density Test | Calipers method. | Calipers method. | |
| - Unconfined Compression Test | D-2166. | T-208. | 1216. |

Unconfined Compression Test

(1) Two specimens or more shall be tested and each test results shall be reported.

(2) A testing machine of strain control type shall be used.

(3) The standard size of specimen shall be 5-cm diameter and 12.5-cm high.

### 2.3.5 Method of Storing Samples

(1) The sample obtained by the standard penetration test (SPT sample) and core boring shall be put into a polyethylene bag for use in the physical test in such a way that water content dose not change and shall be stored in sampling boxes.

(2) SPT sample shall be put into a plastic container and then stored in the laboratory.

(3) The sample container shall be labeled with the following items:

1) Bore hole number
2) Depth
3) Soil name

(4) A thin-walled tube shall be kept in a dark place and in a place not affected by vibration.

(5) The thin walled tube shall be transported with particular attention to avoid impact and vibration. A box specially designed for the transportation of such samples shall be used.

## 2.4 Result of the Investigation

The result of the investigation shall be compiled in the following two volumes of report and the original and two (2) copies each shall be submitted. The reports should be written in English.

(1) Soil investigation report, with boring log and summary of soil test.

(2) All data sheets and work sheets of soil test. The samples of the form / format is shown by the Consultants.

## 2.5 Daily Report

During investigation, the Surveyor shall submit the daily report of the work. The report shall contain the results of boring and SPT, condition of samples, ground elevation and daily progress.

## 2.6 Supervision

The Consultants shall have a right to access the investigation work at any time to check the activities and to request the revision of investigation manner together with investigation equipment.

## 2.7 Language

All reports and letters from the Surveyor shall be in English.