

Sanitation Company of the State of São Paulo  
(Sabesp)

**The Preparatory Survey**  
**on**  
**Water Loss Control and Reduction,**  
**and Energy Efficiency Program**  
**in**  
**the State of São Paulo**  
**in**  
**the Federative Republic of Brazil**

**Final Report**  
**Main Report**

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February 2010

JAPAN INTERNATIONAL COOPERATION AGENCY

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**Chuo Kaihatsu Corporation**

Exchange rate

Currency adopted - Real.

The Exchange rate prevailing in October 2007 is shown below.

US\$ 1.00= R\$ 1.801 (Banco Central do Brasil TTB Average Rate Oct/2007)

US\$ 1.00= ¥ 116.81 (Bank of Tokyo-Mitsubishi UFJ TTS Average Rate Oct /2007)



1229009 [4]

## PREFACE

In response to a request from the Government of Federative Republic of Brazil, the Government of Japan decided to conduct “The Preparatory Survey on Water Loss Control and Reduction, and Energy Efficiency Program in the State of São Paulo in the Federative Republic of Brazil” and entrusted to the study to the Japan International Cooperation Agency (JICA).

JICA selected and dispatched a study team headed by Mr. Shigeru Ueda of Chuo Kaihatsu Corporation between April and October 2009.

The study team held discussions with the officials concerned of the Government of Federative Republic of Brazil, and conducted field surveys at the study area. Upon returning to Japan, the study team conducted further studies and prepared this final report.

I hope that this report will contribute to the promotion of this project and to the enhancement of friendly relationship between two countries.

Finally, I wish to express my sincere appreciation to the officials concerned of the Government of Federative Republic of Brazil for their close cooperation extended to the study.

February 2010

Izumi Takashima  
Vice-President  
Japan International Cooperation Agency

LETTER OF TRANSMITTAL

February 2010

Mr. Izumi Takashima  
Vice-President  
Japan International Cooperation Agency

Dear Sir

We are pleased to submit herewith the final report on “The Preparatory Survey on Water Loss Control and Reduction, and Energy Efficiency Program in the State of São Paulo in the Federative Republic of Brazil”.

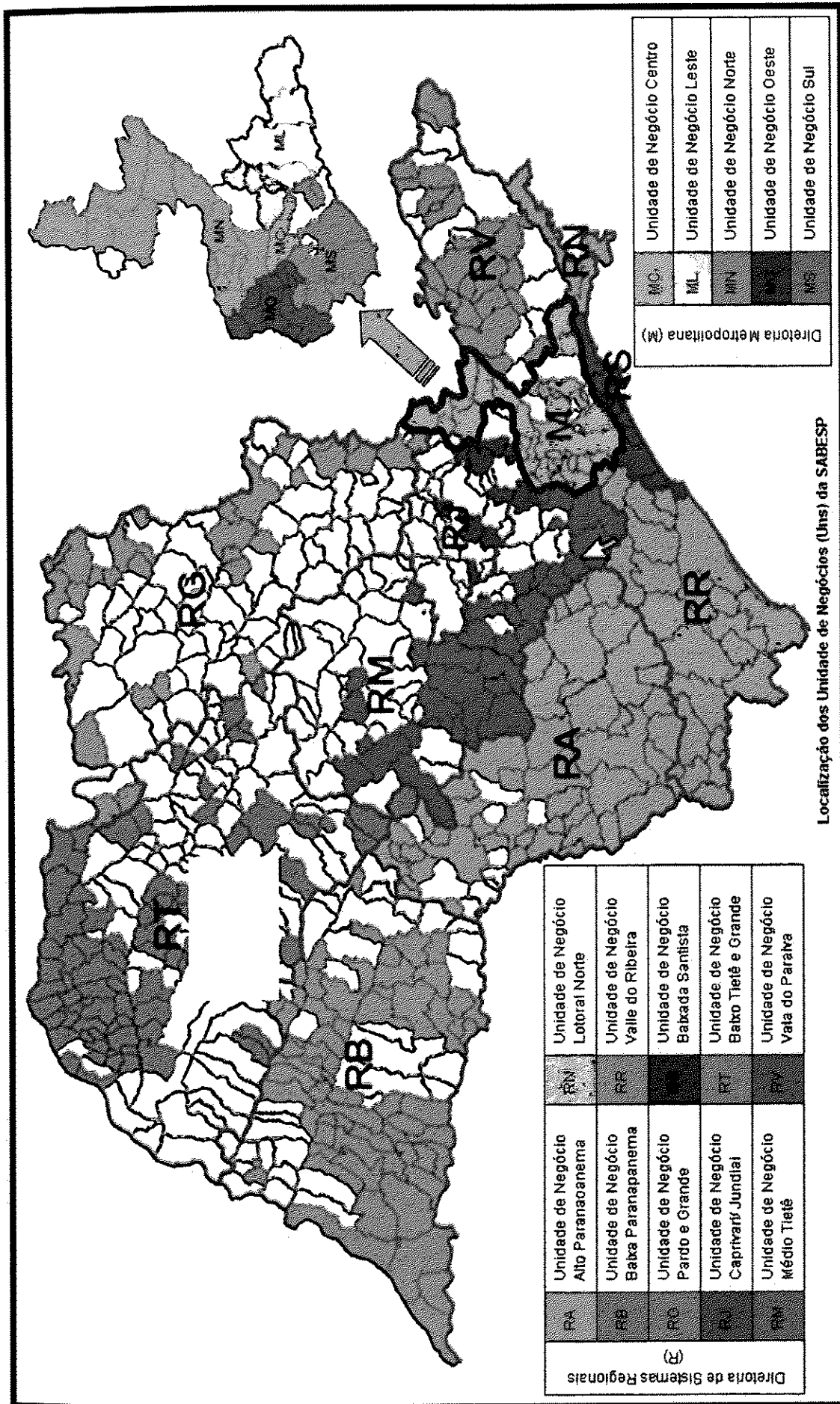
A study team of Chuo Kaihatsu Corporation, in line with the contract entered into with Japan International Cooperation Agency (JICA), carried out the subject study from April to October 2009 in the Federative Republic of Brazil.

This preparatory study has objectives to review the second stage of “the Corporate Water Loss Reduction and Energy Efficiency Program” which was planned by Sabesp, also to improve and optimize its contents according to necessity, and to prepare a feasibility study with preliminary design for the replacement of water pipe networks etc. of the second stage of the program. We are convinced that this study report will contribute to water loss reduction and improvement of energy efficiency in the state of São Paulo.

I wish to express my sincere gratitude to the Government of the Government of Federative Republic of Brazil, State Government of São Paulo, and other authorities concerned for their kind cooperation, assistance, and hospitality to the study team. I also would like to express my sincere gratitude to the JICA headquarters, JICA office in Brazil, and Japanese Embassy in Brazil for their various kinds of support.

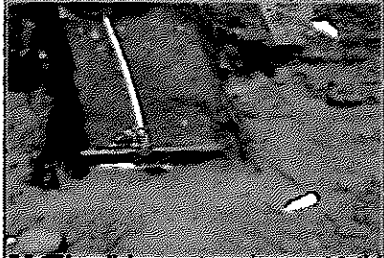
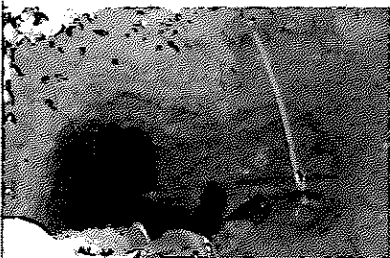
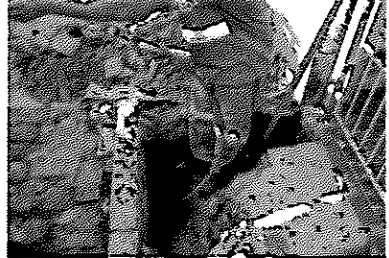
Very truly yours,

Shigeru Ueda .  
Team Leader,  
The Preparatory Survey on Water Loss Control and Reduction,  
and Energy Efficiency Program in the State of São Paulo in the  
Federative Republic of Brazil


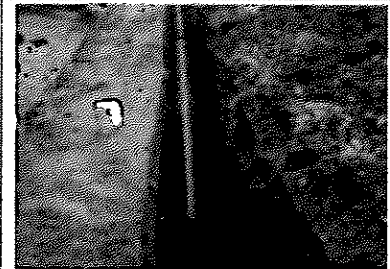
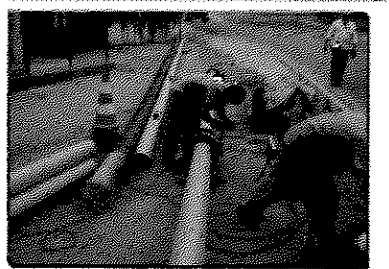


**Photos of actions related to the Water Loss Reduction Program**




**A-1-1 Replacement of Branch Lines**

		
Works of replacement of branch lines by MD	Water connection by MND	Water connection by MND (customer's side)




**A-1-2 Replacement of Branch Lines**

		
Work of pipeline laying by MD	Work of cast iron pipeline laying by MD	Welding by junction electrofusion in PEAD pipes for MND

**A-1-3 Replacement of Branch Lines – Leakage survey**

		
Pavement opening for branch line repair	Leakage from PEAD pipe cracking (black)	Leakage repair by branch line replacement

**A-2 Survey of non-visible leakages**

		
Leakage survey by Sabesp employee (sidewalk)	Leakage survey by Sabesp employee (sidewalk)	Installation for tests by Sabest technicians and outsourced workers


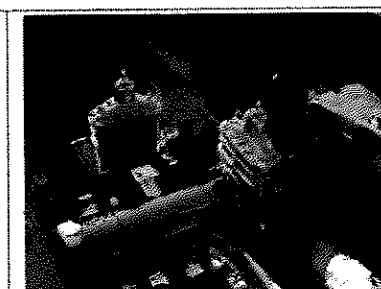
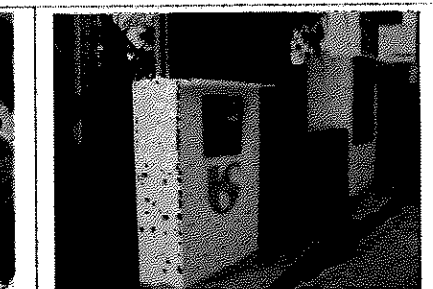
### A-3-1 Leakage Repair in Network

		
<p>Type of leakage in networks</p>	<p>Opening for visible leakage repair</p>	<p>Visible leakage in high pressure water area</p>

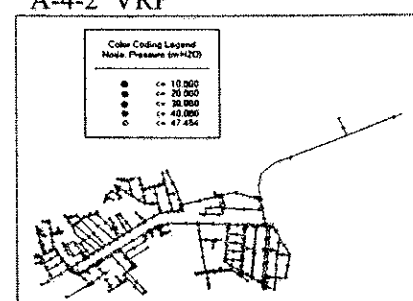
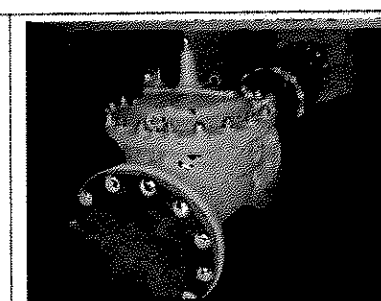
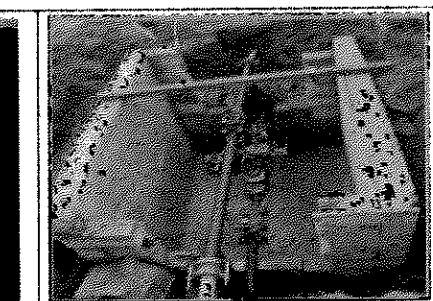
### A-3-2 Repair of Non-Visible Leakages (Network)

		
<p>Usual type of non-visible leakage in network</p>	<p>Leakage repair in 75-mm network in the 1970s</p>	<p>Network leakage (ring rupture)</p>

### A-4-1 Sectorization


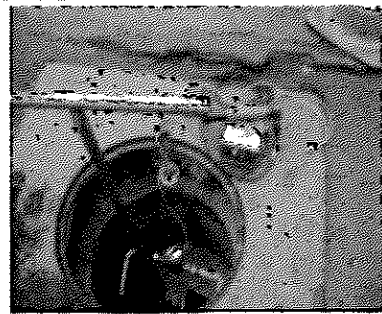
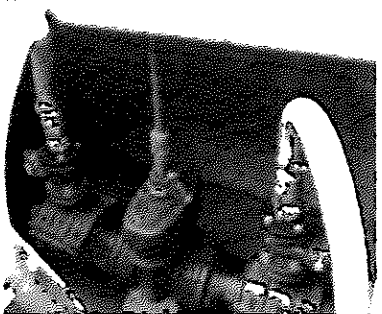
		
<p>Installation of 300-mm valve for sectorization</p>	<p>Installation of high-capacity valve</p>	<p>Installation of water volume meter in the sector</p>

### A-4-2 VRP

		
<p>Hydraulic simulation of VRP installation</p>	<p>Installation of high-capacity VRP</p>	<p>Installation of low-capacity VRP and construction of VRP chamber</p>



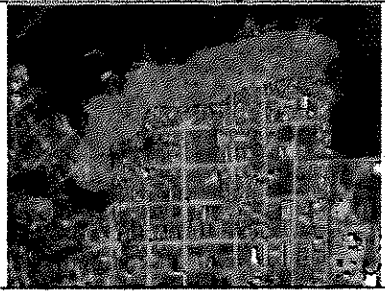


A-4-3 DMC

		
Inatallation of valve for DMC implantation	Flow volume and pressure measurement in bypass pipe at DMC inlet	Installation of DMC measurement equipment



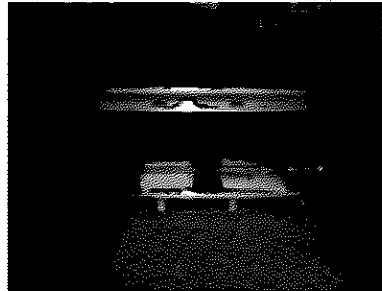
A-4-4 Booster

		
Booster maintenance operation	Booster maintenance operation	2 Boosters

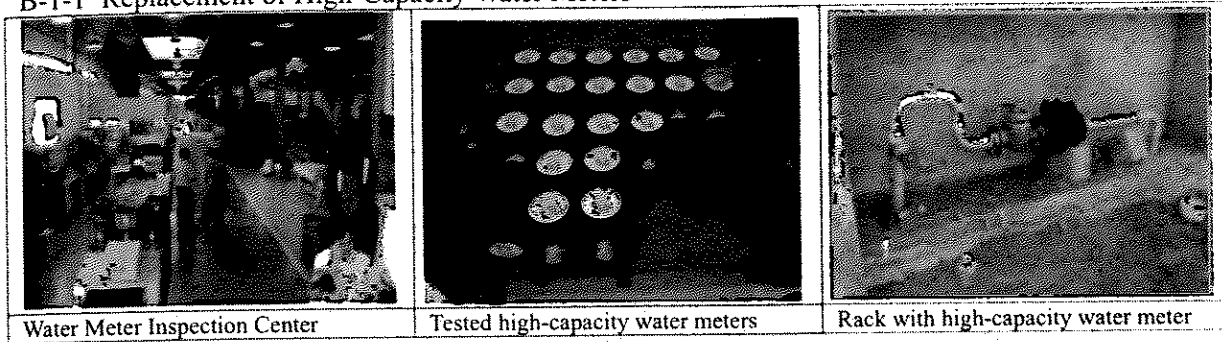
A-4-5 Slum closing

		
Slum area located near the hill	Slum entrance	Measurement of flow volume to slum area

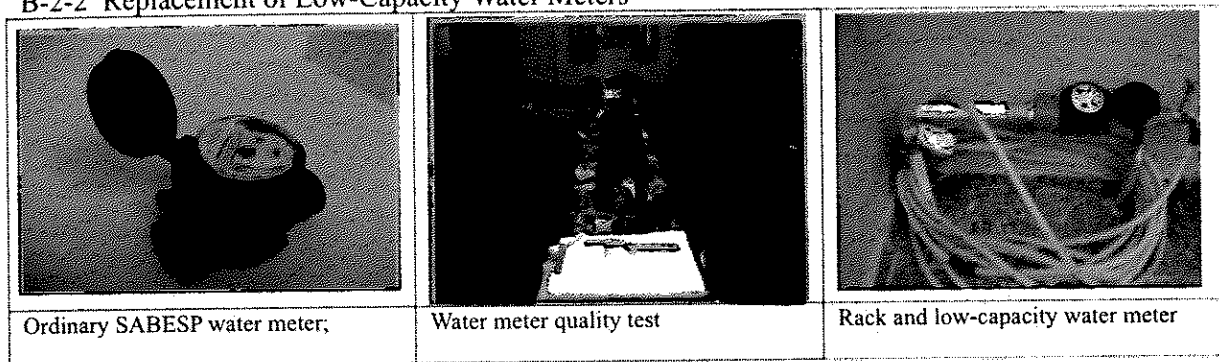
A-5 Equipment

		
RG Maintenance and Operation Equipment	Ultrasonic macrometer for DMC water volume measurement	Built-in electromagnetic macrometer

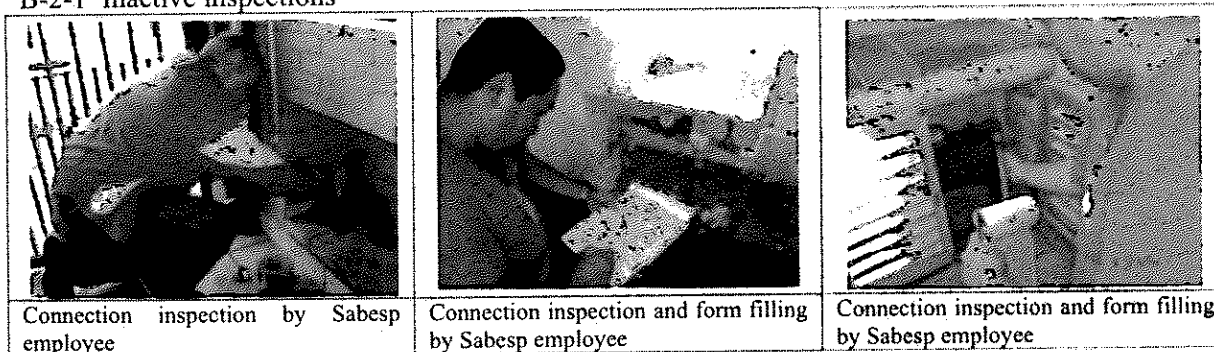
### B-1-1 Replacement of High-Capacity Water Meters



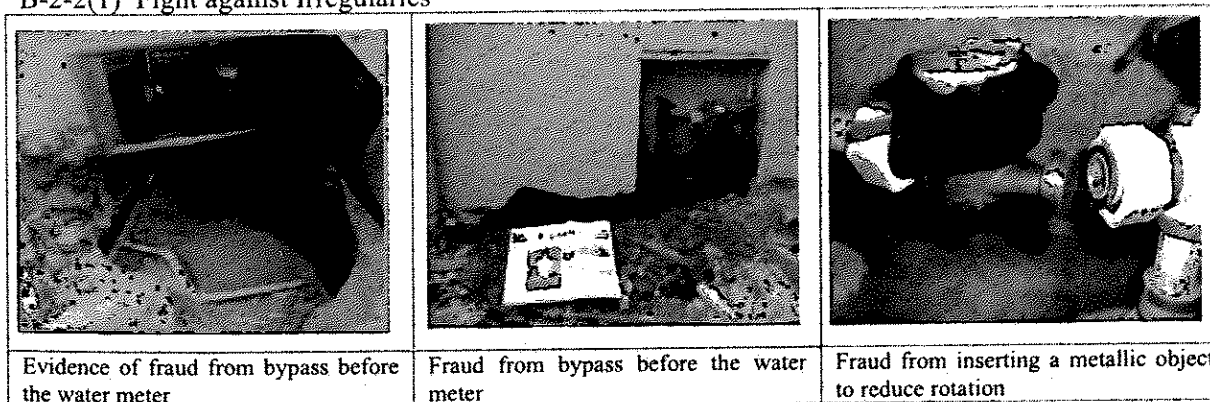
### B-2-2 Replacement of Low-Capacity Water Meters



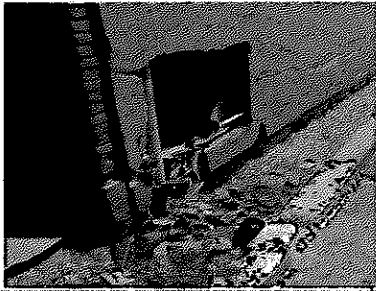
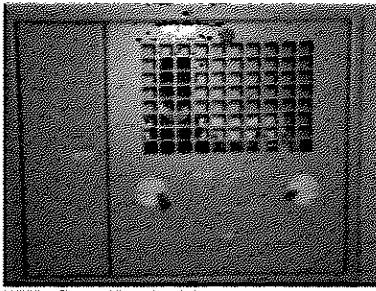
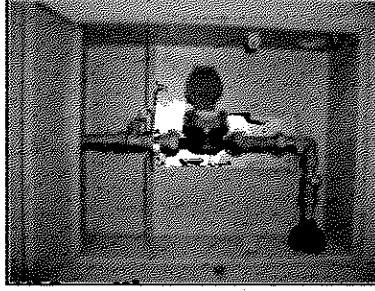
### B-2-1 Inactive inspections



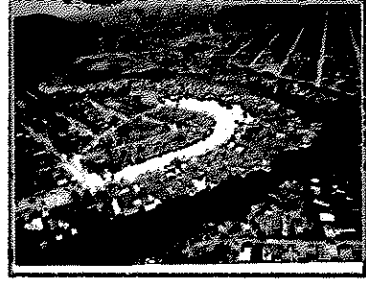


### B-2-2(1) Fight against Irregularities




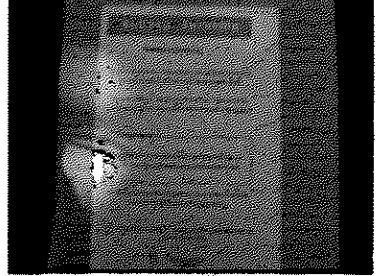

**B-2-2(1) Installation of Irregular UMA**

		
UMA installation work	UMA door	UMA internal side


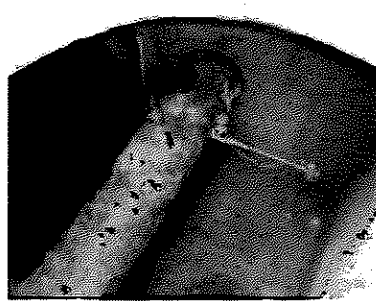

**B-2-3 Slum regularization**

		
Urban area in the municipality São Vicente – State of São Paulo coastal region	Slum settled from the entrance to half of the hill	Irregular branch line connection in slum (squatted area) – São Paulo




**B-3 Personal Record Update**

		
Survey for record update by Sabesp employee	Form for record update survey	Record update form filling

**C-1 Installation/Adequacy of Macrometers**

		
Electromagnetic macrometer for 800-mm pipeline	Built-in electromagnetic macrometer for 400-mm network	250-mm electromagnetic macrometer at DMC inlet

### C-2 Macrometer Calibration

		
Inspection of electric and automation equipment	Electric panel and IHM – electromagnetic outflow meter	Inspection of DMC data transmission equipment

### C-3 Capacity Building

		
International Seminar (Latin America) sponsored by Sabesp	Workshop organized by Eficaz group	Workshop organized by Eficaz group

## **Contents**

Preface	
Transmission Letter	
Study Area	
Photos	
Table of Contents	
List of tables and figures	
Acronyms	
Glossary	

### **“The Preparatory Survey on Water Loss Control and Reduction, and Energy Efficiency Program in the State of São Paulo in the Federative Republic of Brazil”**

#### **Part 1:**

<b>1. General Study Guidelines</b> -----	<b>1-1</b>
1-1 Context of Study -----	1-1
1-2. Results of Study -----	1-2
<b>2. Analysis of Current Water Loss Situation in Sabesp</b> -----	<b>1-4</b>
2-1 Water Loss Management Indicators -----	1-4
2-2 Water Loss Reduction Activities in 2004-2008 -----	1-7
2-3 PROGRAM Actions to Be Implemented -----	1-12
<b>3. Analysis of Related Policies and Higher Management’s Plans</b> -----	<b>1-15</b>
3-1 Federal and State Policies for Water Sector -----	1-15
3-2 Water Sector Programs -----	1-18
3-3 Water-Related Projects Supported by Foreign Financing-----	1-18
<b>4. Analysis of Sabesp Long-Term Program</b> -----	<b>1-20</b>
4-1 Administrative Analysis of Sabesp -----	1-20
4-2 Sabesp Long-Term Plan -----	1-27
4-3 Sabesp Long-Term Financial Plan -----	1-29
<b>5. Analysis of the “Corporate Water Loss Reduction and Energy Efficiency Program” --</b>	<b>1-32</b>
5-1 Background of PROGRAM Preparation-----	1-32
5-2 Targets and Results -----	1-32
5-3 Confirmation of PROGRAM Actions -----	1-34
5-4 Technical Evaluation-----	1-40

5-5 Financial Evaluation -----	1-42
<b>6. Analysis of Stage Financed by JICA -----</b>	<b>1-53</b>
6-1 Evaluation of Components of Actions -----	1-53
6-2 Evaluation under the 5 Criteria for Yen Loans -----	1-58
<b>7. Recommendation for Stage Financed by JICA -----</b>	<b>1-63</b>
7-1 Implantation of Loss Management System - LMS -----	1-63
7-2 Integration with Eficaz Project -----	1-65
7-3 Sustainable Maintenance Improvement -----	1-67
 <b>Part 2:</b>	
<b>8. Preliminary Project Guidelines -----</b>	<b>2-1</b>
8-1 Preliminary Project Guidelines for JICA Stage -----	2-1
8-2 Sabesp Internal Standard Project Guidelines -----	2-1
8-3 Project Concept for the Whole Group -----	2-3
8-4 Methodology for PROGRAM Structuring -----	2-5
8-5 Map Handling -----	2-7
<b>9. Preliminary Project -----</b>	<b>2-9</b>
9-1 Situation of Business Unit Losses -----	2-9
9-2 Characteristics and Problems in each UN -----	2-12
9-3 General Considerations on JICA Stage Actions -----	2-21
9-4 Loss Reduction Program for Business Units (2011 – 2013) -----	2-22
9-5 Drawings -----	2-40
<b>10. Energy Optimization Program -----</b>	<b>2-41</b>
10-1 Introduction -----	2-41
10-2 Optimization Plan for Facilities under Study -----	2-41
10-3 Optimization Study Results -----	2-43
10-4 Comments and Suggestions -----	2-45
<b>11. Cost Estimate and Borrowing Plan for the Corporate Water Loss Reduction and Energy Efficiency Program -----</b>	<b>2-47</b>
11-1 Cost Estimate for JICA Stage -----	2-47
11-2 Borrowing Plan -----	2-55

<b>12. Plan for Supply/Purchase of Plant, Equipment and other Materials, and Work Execution</b>	
<b>Plan</b> -----	<b>2-57</b>
12-1 Supply/Purchase of Plant, Equipment and Other Materials-----	2-57
12-2 Work Execution Plan-----	2-59
<b>13. PROGRAM Implementation Schedule;</b> -----	<b>2-65</b>
<b>14. Organizational Framework</b> -----	<b>2-68</b>
14-1 Organization and Framework -----	2-68
14-2 Inspection -----	2-71
14-3 Others -----	2-82
<b>15. Organizational Operation and Maintenance Framework</b> -----	<b>2-84</b>
15-1 Control concept sharing for maintenance and management of piping network .....	2-84
15-2 Situation of maintenance and management system in each Sabesp Business Unit ----	2-84
15-3 Recommendations on Sabesp management and maintenance system-----	2-86
<b>16. Preliminary Environmental Studies</b> -----	<b>2-89</b>
16-1 Introduction-----	2-89
16-2 Screening Results-----	2-90
16-3 Environmental Checklist (Water Supply) -----	2-95
16-4 Environmental Requirements Set by the Local Government -----	2-99
16-5 Possible Effects of Socio-environmental Impact and Mitigatory Actions -----	2-101
16-6 Screening Results at Preliminary Environmental Impact Study (EIEE) level)-----	2-103
<b>17. PROGRAM Evaluation</b> -----	<b>2-104</b>
17-1 Financial Evaluation -----	2-104
17-2 Economic Evaluation -----	2-110
17-3 Social Evaluation -----	2-111
17-4 Technical Evaluation -----	2-112
<b>18. Conclusion</b> -----	<b>2-118</b>

## LIST OF TABLES AND FIGURES

### (1) List of tables

Table 2-1	Water Losses occurred in 1999-2008 period - Sabesp -----	1-4
Table 2-2	Sabesp Water Balance – 2008 (unit: million m <sup>3</sup> )-----	1-5
Table 2-3	Result of Activities of SPMR 2004-2008 Loss Reduction Plan -----	1-8
Table 2-4	Planned and Completed Loss Reduction Actions – Metropolitan Division -----	1-11
Table 3-1	General Table of International Agents -----	1-19
Table 4-1	Evolution of Management Indicators (2003 – 2008)-----	1-21
Table 4-2	Sabesp tariff adjustment rates (%)-----	1-22
Table 4-3	Economic and Financial Performance Indicators-----	1-24
Table 4-4	Results of borrowing (2004 - 2008) -----	1-25
Table 4-5	Sabesp Programs Completed or under Execution -----	1-26
Table 4-6	Programs Planned by Sabesp (funds under negotiation) -----	1-26
Table 4-7	Basic data on Sabesp business -----	1-27
Table 4-8	Annual Billed Volume (water + sewerage) (million m <sup>3</sup> ) -----	1-28
Table 4-9	IPDt – Total Water Losses per Connection (liters / connection x day) -----	1-28
Table 4-10	IPF – Billing Loss Rate (%) -----	1-28
Table 4-11	Plan for Renewal of Agreements with Municipalities -----	1-29
Table 4-12	Forecast of repayment of loans (R\$ million)-----	1-30
Table 4-13	Sabesp forecast for 2008-2013 (R\$ million) -----	1-30
Table 4-14	Investment Plan (R\$ million)-----	1-31
Table 4-15	Funding Plan (2009-2015) (R\$ million) -----	1-31
Table 5-1	Actions against Real losses-----	1-34
Table 5-2	Actions against Apparent losses -----	1-35
Table 5-3	Control and Management of Water Loss and Leakages -----	1-36
Table 5-4	Energy Efficiency Program Actions-----	1-37
Table 5-5	General PROGRAM Plan -----	1-38
Table 5-6	Actions for the Priority Group -----	1-40
Table 5-7	Components (actions) for the WHOLE Group-----	1-41
Table 5-8	Water Loss Control Indicators -----	1-42
Table 5-9	Cost of PROGRAM peer Action (in R\$ million)-----	1-43
Table 5-10	Formula for calculation the cost per component of PROGRAM-----	1-44
Table 5-11	Formulas for recovered water volume calculation -----	1-46
Table 5-12	Financial Analysis Assumption (1/2)-----	1-47
Table 5-13	Financial Analysis Assumption (2/2)-----	1-48
Table 5-14	Financial Internal Rate of Return - FIRR-----	1-50
Table 5-15	Budget Cash Flow - 2008-2013 (analytic)-----	1-51



Table 6-1	Age of M Division Network-----	1-53
Table 6-2	Length per pipe type and diameter -----	1-54
Table 6-3	Length per pipe type and diameter -----	1-54
Table 6-4	Comparison of replacement extension in JICA Stage and total PROGRAM-----	1-54
Table 6-5	Sabesp rehabilitation method-----	1-55
Table 6-6	Network replacement in 2008-----	1-55
Table 6-7	Executive rehabilitation and renewal methods-----	1-55
Table 6-8	Water meter specifications-----	1-56
Table 6-9	Volume Recovered by Water Meter Replacements-----	1-57
Table 6-10	Undermeasurement Rate-----	1-57
Table 6-11	Sabesp Technical Standards (examples) -----	1-58
Table 8-1	List of NTS related to networks and branch lines -----	2-2
Table 8-2	Actions for the Whole Group (Part 1)-----	2-3
Table 8-3	Actions for the Whole Group (Part 2)-----	2-4
Table 8-4	Actions for the Whole Group (Part 3)-----	2-4
Table 8-5	Figures of Priority System Group and Whole Group -----	2-6
Table 8-6	PROGRAM Components for the Priority Group-----	2-7
Table 8-7	Preliminary map structure -----	2-8
Table 9-1	Business Unit -----	2-9
Table 9-2	Indices of water supply in Business Units (2009)-----	2-11
Table 9-3	IPDt Variation in each Business Unit -----	2-12
Table 10-1	Facilities and Optimization Plan -----	2-41
Table 10-2	Results of Optimization Program Studies -----	2-45
Table 11-1	Breakdown of PROGRAM cost During JICA Stage (General)-----	2-48
Table 11-2	Breakdown of PROGRAM Cost (M & R) During JICA Stage -----	2-50
Table 11-3	Calculation Base per PROGRAM component -----	2-53
Table 11-4	Setting of Unit Price -----	2-54
Table 11-5	Cost Estimate for JICA Stage -----	2-56
Table 12-1	Types of methods -----	2-59
Table 12-2	Example of specification of water flow test in pipe-----	2-60
Table 12-3	Projection of number of workers for Metropolitan M Works -----	2-64
Table 16-1	Program Components -----	2-89
Table 17-1	Cost of JICA Stage per Business Unit-----	2-107
Table 17-2	Cost of JICA Stage per Action -----	2-107
Table 17-3	Estimated recovered volume during JICA Stage (2011-2013)-----	2-109
Table 17-4	Financial Indices during JICA Stage -----	2-110
Table 17-5	Financial indices of the Corporate Water Loss Reduction Program (2009-2019)-	2-110

(2) List of figures

Figure 1-1	Change to Execution Schedule-----	1-3
Figure 2-1	Evolution of water loss volume-----	1-6
Figure 2-2	Evolution of water loss control indicators-----	1-7
Figure 3-1	Sabesp and the organization chart of the State Government-----	1-17
Figure 4-1	Sabesp tariff adjustment rate-----	1-22
Figure 4-2	Percentage of loan balance by currency-----	1-25
Figure 5-1	Targets for Sabesp Water Loss Reduction-----	1-32
Figure 5-2	Water demand increase and water resource development plan-----	1-33
Figure 7-1	Sabesp Information Management System-----	1-65
Figure 7-2	Illustrative drawing of sector relation between network and DMC-----	1-68
Figure 7-3	Image of computer-based network monitoring-----	1-68
Figure 7-4	Action plan reconstruction by monitoring the reduction rate and volume-----	1-68
Figure 7-5	Network prior to analysis (left) and display of pressure analysis (right)-----	1-70
Figure 10-1	Site Map of Facilities-----	2-42
Figure 13-1	Implementation Schedule During JICA Stage (Assuming that the Approval Mission visit will occur in 03/2010)-----	2-67
Figure 14-1	Structure for PROGRAM Implementation-----	2-69
Figure 14-2	Relationship in executive control plan-----	2-75
Figure 15-1	Example General Organizational of M Division-----	2-84
Figure 15-2	Example Organization of R Division-----	2-85
Figure 15-3	Position of areas subject to countermeasures and functions-----	2-86
Figure 15-4	Flowchart of Maintenance and Control Improvement Cycle-----	2-87
Figure 17-1	Loss Volume and Recovered Volume-----	2-104
Figure 17-2	Water Loss Rate (IPF)-----	2-105
Figure 17-3	Water Loss Rate (IPDt)-----	2-105
Figure 17-4	Financial Evaluation Process-----	2-106
Figure 17-5	General list of influence of Loss Control Project Effects-----	2-111

## ACRONYMS

Acronym	Full Name
ABENDI	Brazilian Non-Destructive Essay and Inspection Association
ABNT	Brazilian Association of Technical Standards
ANA	National Water Agency
ARSESP	Sanitation and Energy Regulatory Agency in the State of São Paulo
BEI	European Investment Bank
BID	Inter-American Development Bank
BIRD	The World Bank
BNDES	Banco Nacional de Desenvolvimento Econômico e Social
BOVESPA	São Paulo Stock Exchange
BU	Business Unit
CAF	Andean Development Corporation
CEF	Caixa Econômica Federal
CEQ	Qualification Examination Center
CETESB	Companhia de Tecnologia de Saneamento Ambiental
CJI	Inter-American Investment Corporation
ConCidades	City Council
COFIEX	Foreign Financing Commission
CREA	Regional Engineering, Architecture and Agronomy Council
CS	Superintendence for Strategic Supply and Contracting
ETA	Water Treatment Plant
ETE	Sewage Treatment Plant
FIDA	International Fund for Agricultural Development
FoFo	Cast Iron
FONPLATA	Fund for Development of Plata River Basin
FUMIN	Multilateral Investment Fund
GEF	Global Environment Facility
GESP	Government of the State of São Paulo
IPDI	Water Loss Rates
IPT	Technological Research Institute
IWA	International Water Association
JBIC	Japan Bank for International Cooperation
JICA	Japan International Cooperation Agency
KFW	Kreditanstalt FrWiederaufbau
M	Metropolitan Division
MA	Metropolitan Water Production Business Unit
MC	Central Business Unit
ML	East Business Unit
MN	North Business Unit
MS	South Business Unit
MO	West Business Unit
MOE	West Operation Engineering Department
MOET	West Loss Control Division
Mca	Water column meter
MP	Superintendence for Subway Planning and Development
MPI	Integrated Subway Planning Department
ODA	Official Development Assistance
PAC	Growth Acceleration Program
PCH	Small Hydroelectric Plant
PLANAB	National Environmental Sanitation Plan
PLANASA	National Sanitation Plan
Pmédia	Average Pressure
RMSP	São Paulo Metropolitan Region
R	Regional System Division
RA	Alto Paranapanema Region Business Unit

<b>Acronym</b>	<b>Full Name</b>
RB	Baixo Paranapanema Region Business Unit
RG	Pardo and Grande Region Business Unit
RJ	Capivari / Jundiá District Department
RM	Médio Tietê Region Business Unit
RN	North Coast Region Business Unit
RR	Vale do Ribeira Region Business Unit
RS	Baixada Santista Region Business Unit
RT	Baixo Tietê and Grande Region Business Unit
RV	Vale do Paraíba Region Business Unit
RO	Superintendence for Management and Operational Development of Regional Systems
ROP	Loss Control and Operational Planning Department
SABESP	Companhia de Saneamento Básico do Estado de São Paulo
SCORPION	Operation Control, Problem Resolution and Information System
SENAI	National Industrial Learning Service
SGH	Water Meter Management System
SIGAO	Service Management System
SIGNOS	Sanitation Geographic Information System
T	Technology, Undertaking and Environment Department
TO	Superintendence for Operational Development
TOE	Engineering and Operation Department
UGP	Project Management Unit
UN	Business Unit
UMA	Water Measurement Unit
Vaz.	Leakage
VRP	Pressure Reduction Valve
ZA	High Zone
ZB	Low Zone
ZM	Middle Zone

## GLOSSARY

Term	Description
Water balance	Scenario, based on the model proposed by IWA, which seeks to show, based on data obtained from measurements and estimates, the annual water volume supplied to UN, the annual volume of distributed water use and the annual water loss volume, in addition to include the several water loss components in the evaluation of the technical feasibility of such data collection.
Authorized consumption	Volume of treated water consumed by active connections.
Unattended authorized consumption	Authorized consumption volume related to own use, operational use, and special use volumes.
Economy	Sanitation service consumption units; it may be residential, industrial, commercial or public; for buildings with several floors and some condominiums, a single connection serves more than one economy.
Loss Reduction Task-Force - IWA	Water Loss Task Force – work group constituted in IWA to disseminate and develop studies leading to “best water operation practices”, focused on loss reduction actions.
Distribution Infrastructure	It comprises the equipment necessary for treated water distribution to consumers, reservoirs, piping, valves, connections and pumps, which constitute the water distribution network and connections
Active connection	Water connection in operation, which contributes to the Company's revenues in the respective period.
Water connection	Water distribution system device that allows the connection between the distribution network and the consumer's real estate; it comprises the branch line, the rack and the water meter.
Inactive connection	Water connection recorded as disabled in SABESP commercial system, without contributing to the Company's revenues in the respective period.
Macromasurement	A system integrating Measurement Points, the volumes of which are measured (by water meters = macrometers), or estimated /calculated; this system controls the volumes flowing through water treated pipeline system, volumes collected and produced by ETAs, as well as volumes exported, transferred and delivered to UNs and concessionaires.
Micromasurement	Flow meter system (water meters) that control the volumes supplied to SABESP consumers (residential, commercial, industrial and public)
Model for simulation of effects of loss reduction and control actions	Computer-based model used as a tool to give priority to low reduction and control actions by simulating the effects of such actions.
Number of economies	Number of houses/facilities supplied by SABESP.
Number of connections	Number of connections between the distribution network and consumers' facilities.
Apparent losses	Formerly known as non-physical losses, they are also know as commercial losses; they represent the consumed water portion that was not charged to the consumer (due to: commercial system deficiencies; water meter undermeasurements; illegal connections/unauthorized consumption
Real losses	Formerly known as physical losses, they represent the water losses in water supply system due to leakages in distribution infrastructure and/or reservoir overflows.
Total losses	Difference between the total volume supplied to UNs (integrated system + single system) and the authorized consumption volume.
Branch line	Part of water connection between the distribution network and the rack.
Network rehabilitation	Set of measures aimed to make the distribution network recover its use capacity; any physical intervention extending the distribution network life and involving a change to its condition or specification (IWA).
Infrastructure renewal	Replacement of networks and branch lines under the PROGRAM.
Supply Sector	Area of water distribution network that is confined by watertight and permanent limits and is fed by one or more water inlets.

Term	Description
Sectorization	Interventions in water distribution network aimed to close, through the installation of piping sections and valves, a specific network section, to form a supply sector.
Pipeline system	Set of pipes (pipelines) and special parts (valves, connections and pumps) intended to convey water produced in treatment plants to distribution reservoirs.
Undermeasurement	Volume not recorded by water meters by virtue of flows lower than the minimum flow for water meter reading accuracy (it is mostly caused by use of water tanks or water meter design inconsistent with the customer's consumption profile)
Network replacement	Replacement of an existing network for a new one with the purpose of restoring or increasing its discharge capacity or repair structural piping problems (fissure; corrosion; etc.)
Average repair time	Average interval between the receipt of requested leakage repair and its exclusion after the completion of service.
Calibration Test	Essay performed in flow meters to keep the measurement system in an adequate accuracy standard.
Emergency Uses	Water consumption during fire training and fight operations and through water tanks for emergency supply.
Special Uses	Authorized non-charged water consumption, including social, operations, emergency and public uses (street wash, draining systems, etc.)
Operational Uses	Water consumption for special operations in the supply system, such as reservoir wash, network disinfection, and sewage network wash.
Social Uses	Consumption in deprived areas (shantytowns, squatted areas and slums)
Pressure Reduction Valve	Equipment installed at the entrance of a certain distribution network section with the objective of regulating the pressure in that network section.
Inherent leakage	Non-visible leakage unlikely to be detected by the currently known technology.
Non-visible leakage	Leakage that has not appeared yet and can only be detected by leakage acoustic detection equipment.
Visible leakage	Leakage that is already visible, as reported by the population or Sabesp teams.
Effectively consumed volume	The same as effective consumption = real treated water volume consumed by the customer.
Volume delivered or supplied for distribution	Volume supplied by the pipeline system to UN distribution systems (for reservoirs or direct tapping supply)
Average volume	Consumption volume recorded by water meters
Pressure Zone	Watertight distribution network section with permanent limits and subject to specific pressures from the main supply sources in the sector (reservoir or pipeline), which generally is given the name of Low Zone, High Zone, Middle Zone or zone supplied by direct pipeline tapping (tapping supply).

Notes:

- a) Source – Sabesp – Action Plan for Loss Reduction in the Metropolitan Business Unit – Summary and Analyses – (2008 – 2012) – Dec. 2007.
- b) Not all terms mentioned above are included in the Interim Report. However, such terms are helpful for a better understanding of several Sabesp reference documents.

## **Chapter 1 General Study Guidelines**

### **1-1 Context of Study**

#### **(1) Introduction**

The State of São Paulo is the most populous Brazilian State accounting for 20% of the country's population. However, its water resources are limited and account for 1.6% of national volume, a fact that makes the efficient exploration and preservation of water resources imperative. Companhia de Saneamento Básico do Estado de São Paulo – Sabesp supplies drinking water to 366 municipalities in the State, which are populated together by 26 million inhabitants (corresponding to 60% of the State's inhabitants), what makes it a world's leading water companies with 17.3 thousand employees (of which approximately 10,000 are engaged in water services) and revenues of 3.2 billion dollars (2008).

However, the water loss rate, which represents the unattended distributed water is as high as 40% and poses as a great challenge to the management. Since 2004, Sabesp has been intensifying the actions to improve the operational efficiency of water supply system, in particular the minimization of leakages in distribution networks. In spite of such efforts, the loss rate recorded in December 2007 was as high as 42%.

Under such circumstances, JICA Technical Cooperation Project titled "Water Loss Control Project" (Eficaz Project) is under implementation stage at Sabesp request, over the period of July 2007 through July 2010).

In September 2008, Sabesp prepared the Corporate Water Loss Reduction and Energy Efficiency Program (hereinafter referred to as PROGRAM) covering a period of 11 years, from 2009 to 2019, based on all knowledge acquired hitherto and results from water loss reduction actions.

The PROGRAM aims, through the improved water loss rates, explore efficiently the limited water resources and at the same time mitigate the damages to the environment caused by the exploration of new water resources, thus reducing investments in facilities to meet future water demands, the company's improved profitability and stable water supply in urban areas. These guidelines are in line with the cooperation given by Japan and JICA to Brazil. In addition, its contents are strongly linked to JICA Technical Cooperation Project through Eficaz Project, thus allowing synergy between them.

The PROGRAM includes a period of 3 years (2011-2013) corresponding to the Yen Loan Program (hereinafter referred to as JICA Period). Before the Yen loan approval, JICA sent a "Preliminary Mission to Identify Measures against Water Loss in the State of São Paulo" (hereinafter referred to as JICA Feasibility Study Mission) to evaluate the PROGRAM.

At the preparation of the PROGRAM, Sabesp established the 1<sup>st</sup> stage including the years of 2009-

2010 (BNDES period), and the 2<sup>nd</sup> stage including the years of 2011-2013.

However, because of the credit crisis occurred in Brazil, derived from the worldwide financial crisis, Sabesp had to review its strategy for the PROGRAM. It was first established that the PROGRAM 11-year lifetime should not be changed, but, in light of the difficult funding in the country, the 2009-2010 period was changed to "Transition Phase", with the implementation of activities to support the Program Management, such as the development of Corporate Loss Management System, standardization of work execution procedures, training and others. Additionally, there was a gradual increase of amount of funds historically applied to Sabesp water loss fight actions, although lower than that originally estimated at the PROGRAM design stage.

As the loan request to JICA had already been approved by COFIEX (Foreign Financing Commission), it was not possible to make any change to reflect the changes proposed at the current Transition Stage, and therefore such changes have been reflected in the current 2<sup>nd</sup> and 3<sup>rd</sup> stages (2014-2019), while the 1<sup>st</sup> Stage (2011-2013 – JICA Period) shall remain unchanged).

## **(2) Scope of the Study**

Three items comprise the scope of the study:

- ① To analyze the 2<sup>nd</sup> Stage of the Water Loss Reduction and Energy Efficiency Program) (hereinafter referred to as "PROGRAM") prepared by Sabesp, to determine whether its contents is effective to achieve the expected objectives. In parallel, to make changes to the contents as necessary, to optimize that stage.
- ② To design a preliminary project for actions included in the 2nd stage of the PROGRAM, such as piping rehabilitation and others, and prepare the feasibility study.
- ③ To transfer the technology to Brazilian counterparties through the activities described above.

## **1-2 Results of Study**

Originally, the PROGRAM provided for the implementation in 4 stages. 1<sup>st</sup> Stage (2 years, 2009-2010) financed by Banco Nacional de Desenvolvimento Econômico e Social – BNDES, and the 2<sup>nd</sup> Stage (3 years, 2011-2013) financed by Yens requested to the Japanese government.

However, BNDES funds for the 1<sup>st</sup> stage have become difficult in light of the financial crisis escalation. As a result, the following changes have been proposed by Sabesp: to give the original 1<sup>st</sup> Stage the name of "Transition Stage" where preparatory activities will be implemented; postpone the actual start of works to 2011; and allocate the Yen loan to the stage starting in 2011, which will become the "new "1<sup>st</sup> Stage. According to Sabesp, the volume of loss fight actions scheduled for 2009-2010 period will be smaller, and the remaining actions will be financed by its own funds (and a possible financing).



The Superintendence for Operational Development – TO, the PROGRAM Coordinating Unit in Sabesp, has decided that the period financed by JICA (2011-2013) and the financing amount would not be changed; Nevertheless, from the view that the PROGRAM implementation would start with high-priority components, part of scope of 2009-2010 actions will be incorporated to the stage financed by JICA (New 1<sup>st</sup> Stage). This way, and according to the decision of maintaining the financing amount unchanged, there was the need to adjust the PROGRAM, while postpone part of components originally scheduled for JICA period to subsequent stages. Necessary adjustments have been made by the business units.

The adjusted PROGRAM was delivered by the business units on May 25, 2009. It should be pointed out that this interim feasibility study report analyzes the PROGRAM as a whole, rather than each Business Unit program individually. UN programs shall be object of a more accurate analysis at the preliminary project stage.

Another changed proposed by Sabesp was the exclusion of electric power generation plants, 2 PCHs in Cantareira System and 1 biogas-powered PCT in Barueri ETE, the execution of which would be financed by JICA, but will be executed earlier with Sabesp own funds. Therefore, such works will be excluded from the original group of components. With respect to energy saving in existing pumping stations, studies and projects will be financed by Sabesp funds, but the works will remain as components of JICA stage, according to the original request.

Changes referred to above were agreed by JICA Monitoring Mission from Japan in May 13-28, 2009.

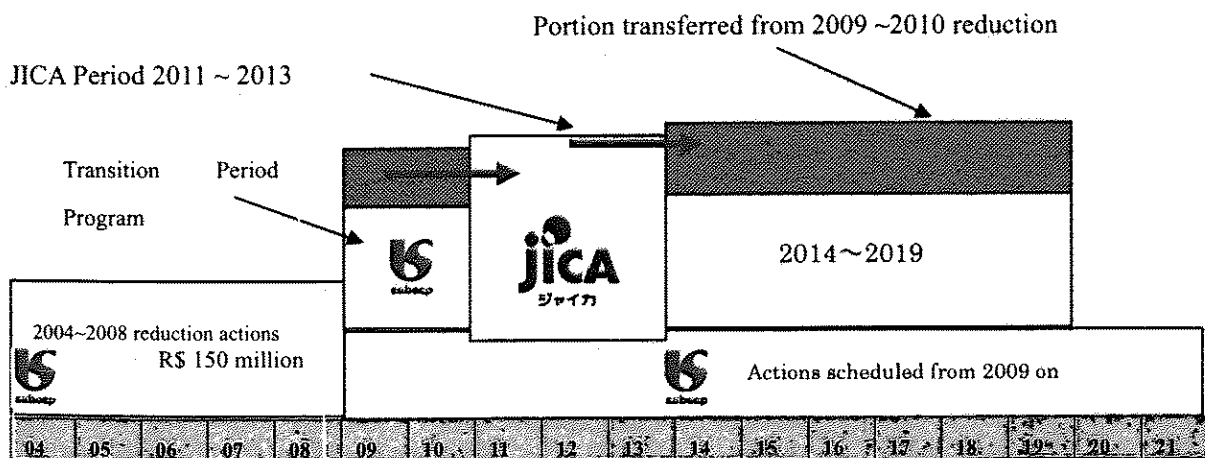


Figure 1-1 - Change to Execution Schedule

Quantity reduced in 2009-2010 will be delayed and executed as from 2014

## Chapter 2. Analysis of Current Water Loss Situation in Sabesp

### 2-1 Water Loss Management Indicators

Table 2-1 shows the quantity executed in 1999-2008 period, produced volume of water, micromeasured volume of water, billed volume of water, water volume for operational, emergency and social uses, number of connections, and water loss management indicators. Sabesp adopts definitions for such indicators, which are based on the definitions of the International Water Association (IWA).

**Volume of Losses – Micromeasured (VPM):** Produced Volume (Vp) – Micromeasured Volume (Vm) – Operational, Emergency and Social Uses (U)

**Volume of Losses – Billing (VPF):** Produced Volume (Vp) – Billed Volume (Vf) – Operational, Emergency and Social Uses (U)

**Volume of Total Losses (unattended water) Produced Volume (p) – Micromeasured Volume (Vm)**

**Loss Rate (IPF):** Volume of Losses (F) – Produced Volume (Vp)

**Loss Rate (IPM):** Volume of Losses (M') – Produced Volume (Vp)

**Loss Rate per Connection (IPDt):** Volume of Losses (M) – (Number of Connections (N) x day) (l / (connection·day))

Table 2-1 Water Losses occurred in 1999-2008 period - Sabesp

Year	V <sub>p</sub>	V <sub>m</sub>	V <sub>f</sub>	U	N	(V <sub>p</sub> -V <sub>m</sub> )/V <sub>p</sub>	(V <sub>p</sub> -V <sub>f</sub> -U)/V <sub>p</sub>	(V <sub>p</sub> -V <sub>m</sub> -U)/(N×365)
	Produced volume	Micro-measured volume	Billed volume	Operational, Emergency and Social Uses	Number of connections	IPM	IPF	IPDt
	Million m <sup>3</sup>	Million m <sup>3</sup>	Million m <sup>3</sup>	Million m <sup>3</sup>	Million connections	Loss Rate (Micro-measured) %	Loss Rate (Billed) %	Loss Rate per Connection l/(conn. x day)
1999	2,664.9	1,628.5	1,782.1	66.1	4,715	38.9	30.6	564
2000	2,679.1	1,562.7	1,729.7	109.1	4,977	41.7	31.4	554
2001	2,650.1	1,532.2	1,697.6	119.9	5,085	42.2	31.4	538
2002	2,778.3	1,609.3	1,770.0	127.4	5,228	42.1	31.7	546
2003	2,819.6	1,592.5	1,764.8	125.2	5,364	43.5	33.0	563
2004	2,770.5	1,499.8	1,692.4	135.8	5,667	45.9	34.0	549
2005	2,830.0	1,571.8	1,755.1	157.2	5,798	44.5	32.4	520
2006	2,886.8	1,625.1	1,806.4	160.0	5,908	43.7	31.9	511
2007	2,873.7	1,666.6	1,846.5	178.7	6,028	42.0	29.5	467
2008	2,852.6	1,693.2	1,877.7	183.4	6,168	40.6	27.7	434
<b>Average Growth (1999-2008)</b>	<b>0.85%</b>	<b>0.49%</b>	<b>0.66%</b>	<b>13.60%</b>	<b>3.42%</b>	<b>0.55%</b>	<b>-1.24%</b>	<b>-0.23%</b>

Source: Table prepared by JICA F/S Mission base don data provided by Sabesp.

#### Evidences:

- Produced Volume (Vp) had remained practically stable since at the level of 2.66 billion m<sup>3</sup> and

increased in 2008 to 2.85 billion m<sup>3</sup> (between 1999 and 2008 there was an average annual increase of 0.85%).

- Micromeasured Volume (Vm), which had practically followed the Produced Volume Variation, increased from 1.63 million m<sup>3</sup> in 1999 to 1.69 billion m<sup>3</sup> in 2008 (average annual increase of 0.49% between 1999 and 2008).
- Billed Volume (Vf) is approximately 9% higher than the micromeasured volume and increased from 1.78 million m<sup>3</sup> in 1999 to 1.88 billion m<sup>3</sup> in 2008 (average annual increase of 0.66% between 1999 and 2008).
- Number of Connections (N), which was 4.72 million in 1999 increased to 6.17 million in 2008 (average annual increase of 3.42% between 1999 and 2008).
- Volume of Operational, Emergency and Social Uses (U): it refers to the total volume estimated for each Business Unit. It increased from 66 million m<sup>3</sup> in 1999 to 183 million m<sup>3</sup> in 2008 (average annual increase of 6.4% between 1999 and 2008).
- Volume of Losses (M): increased from 970 million m<sup>3</sup> in 1999 to 1.13 billion m<sup>3</sup> in 2004, and then fell until reaching 980 million m<sup>3</sup> in 2008.
- Volume of Losses (M'): in 1999, it was 1.044 billion m<sup>3</sup>, increased to 1.27 billion m<sup>3</sup> until 2004, and fell to 1.166 billion m<sup>3</sup> in 2008.
- Loss Rate (IPM): increased from 39.9% in 1999 to as high as 45.9% in 2004, and then fell to 40.6% in 2008;
- Loss Rate (IPF) increased from 30.6% in 1999 to 34.6% in 2004 and then fell to achieve 27.7% in 2008.
- Loss Rate per Connection (IPDt), which was 564 l/water connection x day in 1999, remain approximately at the level of 563 l/conn. x day until 2003, and then was reduced to 434 l/conn. x day in 2008.

The following Water Balance (Table 2.2) was based on Table 2 – 1.

Table 2-2 – Sabesp Water Balance – 2008 (unit: million m<sup>3</sup>)

Distributed Volume 2,853 100%	Authorized Volume 1,877 66%	Micro-measured volume 1,694 59%	Billed Water 1,694 59%
		Operational, Emergency and Social Uses 183 6.4%	Non-billed Water 1,159 41%
	Unauthorized Volume (Loss Volume) 976 34%	Apparent losses Losses other than leakages) 344 12.1%	
		Real Losses (Leakages) 633 22%	

Source : Table prepared by JICA Study Mission, base don data provided by Sabesp.

Figure 2-1 below shows graphically the values of Produced Volume (Vp), Micromeasured Volume (Vm) and Billed Volume (Vf).

The chart shows the evolution of the Loss Volume (VPM), which is the difference between the Produced Volume (Vp) and the Micromeasured Volume (Vm), as well as the evolution of the Lost Volume (VPF), which is the difference between the Produced Volume (Vp) and the Billed Volume (Vf).

Figure 2-2 shows the evolution of Loss Rates (IPF) and Loss Rate per Connection (IPDt) in form of a chart.

It is believed that the reduction of water loss indicators resulted from loss reduction activities started in 2004.

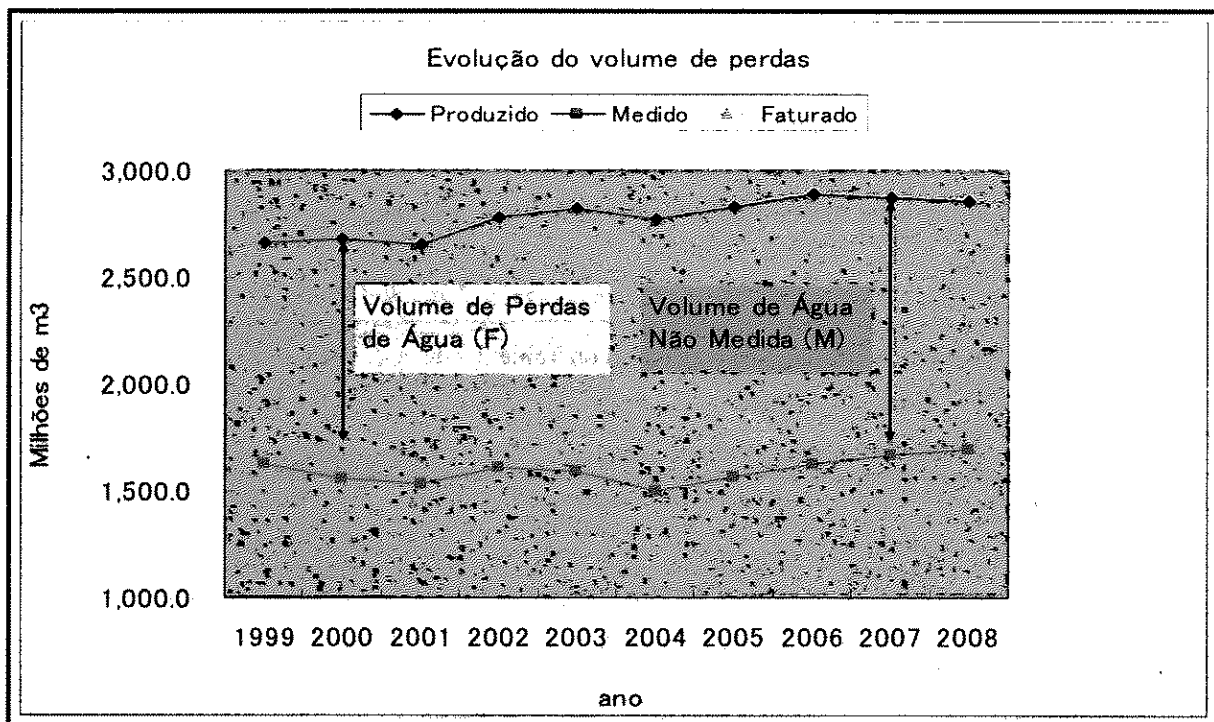


Figure 2-1 Evolution of water loss volume

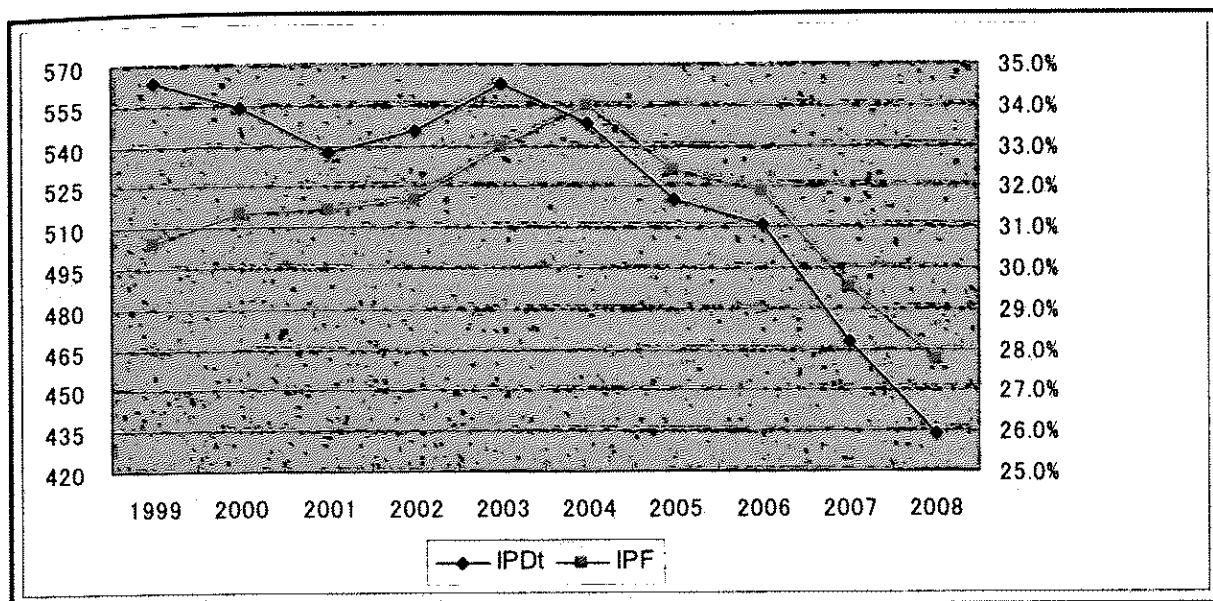


Figure 2-2 Evolution of water loss control indicators

## 2-2 Water Loss Reduction Activities in 2004-2008

With the objective of reducing water losses, Sabesp Operational Divisions (M and R) planned and implemented over 2004-2008 period actions focused on fighting and reducing the losses, based on countermeasures against leakages and other lost waters.

We have evaluated the actions taken by the Metropolitan Division in the period referred to above, based on the following documents:

- Pluriannual plan for Water Loss Reduction Actions; Rehabilitation of Water Networks in Metropolitan/2008;
- Action Plan for Loss Reduction/2008-2012.

### Status of implementation of planned activities

2004-2008 Water Loss Reduction Plan lists the actions under three major topics: “Leakages”, “Losses Other than by Leakages” and “Loss Management”. This is a program under which different conceivable actions would be implanted, which could be called “Trawling Operation”. As shown in Table 2-3, the number of activities includes 95 items, being: 61 “Executed or Under Execution”, 30 “Not Started” and 4 “Canceled”.

Table 2-3 – Result of Activities of SPMR 2004-2008 Loss Reduction Plan

Theme	COMPONENT	No.	ACTION
REAL LOSSES	INFRA-STRUCTURE MANAGEMENT	1	Evaluation and Review of Material and Equipment Specifications
		2	Improvement of Material and Equipment Inspection System
		3	Evaluation and Review of Material and Equipment Transportation and Storage Specifications
		4	Evaluation and Review of Network and Reservoir Project Criteria
		5	Evaluation and Review of Specifications of Linear Works and Civil and Electromechanical Installations
		6	Development and Application of New Material and Equipment in the Distribution Network
		7	Improvement of Technical Network and Equipment Records
		8	Rearrangement of Distribution Networks and Replacement of Building Branch Lines
		9	Network Cleaning and Coating
		10	Preventive and Corrective Maintenance of Distribution Network Operation Valves
		11	Installation and Maintenance (Corrective and Preventive) of Distribution Network Vents
		12	Review of Guidelines and Criteria for Water Network Acceptance in New Settlements
		13	Performance of Tightness Essays at the Receipt of New Networks and Reservoirs
		14	Follow up of Results of Global Sourcing/Materials
		15	Follow up of Results of Global Sourcing/New Connections
		16	Development and Implantation of Distribution Network Failure Records (Pipelines and Line Equipment)
		17	Implantation of New Measurement Units
	PRESSURE CONTROL	18	Installation of Automatic VRPs in Distribution Network
		19	VRP Operation, Follow-up, Evaluation, Control and Maintenance
		20	Booster Operation, Follow-up, Evaluation, Control and Maintenance
		21	Operation Optimization in VRP Area of Influence
		22	Re-sectorization and Elimination of Bypasses in Pipeline Spots
		23	Evaluation and Review of Pressure Control Project Criteria
	ACTIVE LEAKAGE CONTROL	24	Survey of Non-Visible Leakages in Distribution Network and Pipelines
		25	Optimization of Non-Visible Leakage Survey
		26	Project and Implantation of Pitometric Districts (Out of Areas of Influence of VRPs and Boosters)
		27	Measurements of Minimum Night Outflows
		28	Survey of Parameters for Real Loss Determination (Inherent Leakages, Inevitable Losses, Average Pressures, etc.)
		29	Control of Overflows in Sector-Based Reservoirs
		30	Capacity Building of Own and Outsourced Personnel – CETRE/ABENDE
		31	Qualification and Certification of Own and Outsourced Personnel – CETRE/ABENDE
	QUICKNESS AND QUALITY OF LEAKAGE REPAIR	32	Network and Pipeline Repair
		33	Building Branch Line Repair
		34	Rack Repair
		35	Non-Visible Leakage Repair in Networks and Pipelines
		36	Leakage Repair in Pumps and Network Components
		37	Leakage Repair in Reservoirs and Aqueducts
		38	Follow-up of Quality of Global Sourcing Repairs

Theme	COMPONENT	No.	ACTION
APPARENT LOSSES	MICRO-MEASUREMENT MANAGEMENT	39	Corrective Replacement of Ordinary Water Meters
		40	Corrective Replacement of Special Customer Water Meters
		41	Optimized Preventive Replacement of Ordinary Water Meters
		42	Optimized Preventive Replacement of Special Customer Water Meters
		43	Resolution of Water Meter Inclination Problem
		44	Development and Application of 1.2-m <sup>3</sup> /h Water Meters
	MACRO-MEASUREMENT MANAGEMENT	45	Preparation of the Loss Control Plan for the Metropolitan Pipeline System
		46	Acquisition, Implantation and Operation of Macrometers in Integrated System
		47	Acquisition, Implantation and Operation of Macrometers in Single System
		48	Acquisition, Implantation and Operation of Macrometers in High Zones of Supply Sectors
		49	Adequacy of Measurement Points to Reduce Uncertainties
		50	Performance of Standard Essays (IPT Methodology) in ETAs, SAM Delivery Points and Other Measurement Points
		51	Installation and/or Activation of Macrometers in Sector Bordering Points by Relevant UNs
		52	Review of Formulas for Sector/Municipality/UN Closing
	FIGHT TO FRAUDS AND ILLEGAL CONNECTIONS	53	Promotion of Population Awareness on Fraud and Illegal Connection Problem
		54	Analysis of Water Consumption Behavior in Connections (SAHIDRO)
		55	Inspections for Identification of Frauds and Illegal Connections and their Regularization
	IMPROVEMENT OF COMMERCIAL RECORDS AND CONSUMPTION EVALUATION PROCESS	56	Elimination of Fixed Rate Connections
57		Systematization of Processes to Ensure Connection Recording	
58		Inspections and Regularization of Inactive Connections	
COMPLEMENTARY ACTIONS	CSI	59	Inclusion of CSI in Field Related to Slanting Water Meters
		60	Compatibility with SIGAO
	SIGAO	61	Compatibility with CSI
		62	Institution of "Loss Management" SIGAO
		63	Adequacy of SIGAO Base for Correct Leakage Detection to the Customer (195)
		64	Identification of Visible and Non-Visible Leakages at SIGAO
		65	Definition and Production of SIGAO Managerial Reports for Loss Control
	SIGPERDAS	66	Implementation and Improvement of SIGPERDAS
	SGH	67	Implementation of SGH (Hydrometry Management System)
	SIM / SCOA	68	SIM/SCOA Modernization
	GIS	69	Implementation of Loss Control in GIS
	ECONOMIC-FINANCIAL APPROACH	70	Implantation of the PROGRAM Average Cost Database
		71	Systematization of Cost-Benefit Analysis of PROGRAM Actions
		72	Preparation of Studies to Establish the Economic Loss Rate

Theme	COMPONENT	No.	ACTION
	MANAGEMENT	73	Systematic Follow-up of Limits and Physical Isolation of Supply Sectors
		74	Implantation of Telemetric Supply Management System Applicable to Loss Control
		75	Implantation of Hydraulic Modeling for Supply and Loss Management in Tune with GIS System
		76	Improvements and Documentation of Model for Simulation of Loss Reduction Action Results
		77	Management of Distribution Network Infrastructure and Leakage Repair (GIS)
		78	Integrated Loss Reduction Management in Supply Sectors–Risk Contract (Itapevi Model)
		79	Introduction of Quality Tools in Action Result Management
	INDICATORS	80	Preparation of Loss Diagnosis for Supply Sectors and M UNs
		81	Preparation of Water Balance Matrix for Supply Sectors and UNs
		82	Standardization of Criteria and Parameters for Social, Emergency and Operational Volume Appropriation
		83	Evaluation/Review of Loss Indicators in Tune with IWA, PMSS and PNQ
		84	Preparation of Studies for Determination of Inevitable Apparent Losses
	SLUMS AND SQUATTED AREAS	85	Proposal Development and Regularization of Connections in Slums and Squatted Areas
		86	Proposal Development and Implantation of Pressure Reduction in Slums and Squatted Areas
	QUALIFICATION AND CERTIFICATION OF PROFESSIONALS	87	Preparation of Procedures for Execution of Operational Services (Material Inspection, Service Inspection, Leakage Repair)
		88	Preparation of Manuals and Professional Capacity Building Courses
		89	Personnel Capacity Building
		90	Development and Application of Staff Qualification and Certification System
	DISCLOSURE AND ENGAGEMENT	91	Preparation of Loss PROGRAM Disclosure Material by all M and R Operational Areas
		92	Improvement of loss website at "M online" for Disclosure and Follow-up of PROGRAM Results
93		Promotion of events for Loss PROGRAM Awareness in M and R	
94		Preparation of Personnel (Own and Outsourced) Training Program on General Concepts of PROGRAM	
95		Benchmarking in Companies (or Sabesp Areas) with Successful Experience in Loss Reduction Progress	

Status of actions (Nov/2007)

 Completed or underway
  Not Started
  Eliminated

Source: M Division – Action Plan for Loss Reduction /2008-2012



(2) Projects and Results of Actions

Table 2-4 – Planned and Completed Loss Reduction Actions – Metropolitan Division

	2004	2005	2006	2007	2008	
<b>CONTROL OF REAL LOSSES</b>	<b>Network replacement Length (km)</b>					
	Planned	3	86,5	101,5	101,5	98,0
	Completed	0	66,0	51,0	41,0	42,1
	Execution Plan (%)	0%	76%	50%	40%	43%
	<b>[Branch Line Replacement (Quantity)]</b>					
	Planned	52.890	14.472	123.112	123.112	143.113
	Completed	0	71.899	99.670	121.002	155.142
	Execution Plan (%)	0%	497%	81%	98%	108%
	<b>[Leakage Survey] Surveyed length (km)</b>					
	Planned	15.040	21.300	21.800	20.400	22.694
	Completed	16.121	16.950	24.885	30.449	42.378
	Execution Plan (%)	107%	80%	114%	149%	187%
<b>VRP: Pressure Reduction Valve (Quantity)</b>						
Planned	87	101	77	62	72	
Completed	76	17	69	104	47	
Execution Plan (%)	87%	17%	90%	168%	65%	
<b>CONTROL OF APPARENT LOSSES</b>	<b>Inspection of Inactive Connections (Quantity)</b>					
	Planned	195.840	100.722	184.379	150.745	243.885
	Completed	172.819	194.512	284.861	898.495	500.218
	Execution Plan (%)	88%	193%	154%	596%	205%
	<b>Control of Irregularities – Inspection (Quantity)</b>					
	Planned	27.320	26.467	35.000	36.949	106.004
	Completed	32.759	34.498	48.735	118.466	159.605
	Execution Plan (%)	120%	130%	139%	321%	151%
	<b>Replacement of Low-Capacity Water Meters (Quantity)</b>					
	Planned	204.190	128.245	356.234	456.662	454.377
	Completed	120.686	315.281	388.402	424.073	530.021
	Execution Plan (%)	59%	246%	109%	93%	117%
<b>Replacement of High-Capacity Water Meters (Quantity)</b>						
Planned	-	1.373	2.703	8.071	5.418	
Completed	1.786	1.628	6.307	5.930	6.399	
Execution Plan (%)	-	119%	233%	73%	118%	
<b>IPD t</b>	<b>Loss Rate (IPDt):</b>					
	Planned	560	530	490	460	448
	Completed	603	546	543	493	452

Source: For years 2004-2007, Operational Development Program: Rehabilitation of Water Networks in Metropolitan Area/2008. For 2008, Loss Reduction Action Plan/2008-2012.

## **2-3 PROGRAM Actions to Be Implemented**

As a conclusion of M analysis of Water Loss Reduction Plan results in 2004-2008, the following themes were mentioned:

### **(1) Sufficient investment of funds**

We could say that funds invested in the Water Loss Reduction Plan (2004-2008) prevented the natural increase of unattended water volume. However, they were not sufficient to reduce substantially that volume.

### **(2) Continuous efforts**

The importance of maintaining continuous actions focused on loss control has shown good results at our evaluation of regions (systems) that succeeded in that activity. The continuity of such actions will certainly improve the structural conditions, both in terms of diagnosis and control of unattended water volume in such regions.

### **(3) Efficient water loss reduction and monitoring plan**

To achieve the best results and minimize costs, the importance and scope of activities should be considered and planned based on standards, such as the assurance of funds to allow unattended water volume to be reduced. Assurance of funds allocated to the PROGRAM should be clearly established, including the evaluation of its costs and benefits. During PDCA cycle, the plan needs to be reviewed in a yearly basis.

### **(4) Introduction of new techniques.**

Introduction of new techniques and improvement of activities and control. If the technical progress is included in PDCA planning stage, the best results will be obtained (for example, use of polyethylene pipes with welded seams).

### **(5) Analysis of causes of invalid water volume**

Investigation and elimination of the original cause of leakage and invalid waters other than leakage waters. For example, supply infrastructure in many M systems (piping networks) is in poor conditions and requires urgent renewal of pipes.

### **(6) Standardization of quantitative criteria for indicators and figures.**

It is necessary to standardize specific indicators and consumptions related to water loss in M and R and in each business unit.

### **(7) Capacity strengthening**

Topics would include: quality of material, improved staff skills, and method adequacy. Training is important to strengthen Sabesp and private sector employees' technical skills with respect to the

PROGRAM. Figures related to maintenance repairs in M distribution network are impressive, and this aspect should be seriously considered in the program of works for distribution piping renewal.

### **(8) DMC Implantation**

The exact analysis of water distribution status will allow the better application of investment in activities focused on water loss reduction. Dividing the distribution network into areas called Measurement and Control Districts – DMC is an emergency matter.

A best form of loss control in water distribution network may be achieved by subdividing the supply sectors and attaching to them the information included in the database (number of connections, type of network, leakage mapping, etc.) together with the confirmation of the position geographically determined (for example, using SIGNOS). The size of areas will range from not less than 500 connections to not more than 3.000 connections, which is the limit to identify outflow changes in occurrences of leakage water volume. In particular, when the infrastructure is of poor quality, the smaller the area the greater is the possibility of water leakage control.

We will list below significant items for an adequate control, based on the introduction of DMCs:

- Better management of distribution network with greater emphasis on leakage monitoring for an easier determination of volume lost as a result of that occurrence.
- Implantation of a database containing the historic record of maintenance in DMC delimited area.
- Possibility of determination of water volume to be considered upon the occurrence of leakage (volume lost for leakage in the distribution network).
- Notwithstanding Sabesp is provided with a Failure Tracking System – SRF, its technical records lack managerial information, such as: correct description of applied material (network and branch lines) and date of installation of hydraulic structure comprising the distribution network, among others).
- Systematic evaluation of conditions of measurements by water meters and macrometers.
- Analysis of trends of supervision activities with respect to periodic or continuous measurement of water flow and pressure in the control area.
- Development and usual application of performance analysis strategy (for example, SCORPION) and quality of water meters (for example, SGH – Water Meter Management System), optimization of activity schedule and results (transformation into model).

### **(9) Construction of Water Loss Information Control System**

Data from results of actions against water loss, accumulated into such tools as the Service Management System – SIGAO (database used for metropolitan area system control), are indispensable for water loss control. Currently, information control is not perfect, and the topics focused on the following stages include:

- Recording in a database all materials applied to recovery and/or renewal of infrastructure

(networks).

- Investigation and record of data on events occurred in 2002-2006, such as water leakages, water quality pollution, water pressure reduction, etc.
- Analysis of recorded data and organization of number of occurrences of problems,
- Selection of the region of concentration of occurrences of problems as a target area.
- Investigations and evaluation of areas adjacent to the target area by the technical department of each business unit.
- Indication in the map of each business unit the problems in the target area, such as, for example, problems in the water distribution network.
- In M, by using the data indicated in thematic maps as a standard, the most significant problems are identified, except the relevant actions focused on the elimination of such problems.
- Follow-up of the project progress, periodical renewal of information with new diagnoses, and selection of target area

## **Chapter 3 Analysis of Related Policies and Higher Management's Plans**

### **3-1 Federal and State Policies for Water Sector**

This chapter presents the history of Sabesp constitution, its position in the Government of the State of São Paulo and its relationship with the State Secretariat for the Environment and the State Secretariat for Sanitation and Energy. It also shows Sabesp relationship with the newly-created Sanitation and Energy Regulatory Agency of the State of São Paulo – ARSESP (12/07/2007). ARSESP is a special autonomous public entity reporting to the State Secretariat for Sanitation and Energy. It finally shows the Sabesp and the Government of the State of São Paulo relationship with the Federal Government, specifically with the Ministry of Cities and the National Basic Sanitation Plan – PLANSAB.

#### **3-1-1 Laws and Decrees on Sabesp Constitution**

Law no. 119, of June 29, 1973

Authorizes the constitution of a corporation with the name of Companhia de Saneamento Básico do Estado de São Paulo – Sabesp and provides for related matters:

**Article 1** - The Executive Board is hereby authorized to constitute a partnership through shares, under the name of Companhia de Saneamento Básico do Estado de São Paulo - SABESP (Basic Sanitation Company of the State of São Paulo), with the purpose of planning, executing and operating all basic sanitation services in all of the State of São Paulo, respecting each city's autonomy.

§ 5 - Assured, as a priority the correct and adequate conditions of operation and efficient administration of sanitary services within the State of São Paulo - SABESP may perform, in Brazil and abroad, the services described in the "caput" of this article (Complementary Law no. 1,025, of 12/07/2007).

§ 8 – Sabesp and its subsidiaries are hereby authorized to enter into joint ventures with local or foreign companies, including other state of municipal basic sanitation companies, in the capacity of leader of the joint venture or not, with the objective of expanding its activities, obtain technologies and increase the investments in basic sanitation services (Complementary Law no. 1,025, of 12/07/2007).

#### **3-1-2 Sabesp Relationship with the Government of the State of São Paulo and Federal Government**

The Federal Government, jointly with the City Counsel – ConCidades) prepared the National Basic Sanitation Plan – PLANSAB under the coordination of the National Secretariat for Environmental Sanitation of the Ministry of Cities, as provided in Law no. 11,445/2007 and ConCidades Recommend Resolution no. 33, of 3/1/2007.

PLANSAB, when approved, will constitute the core of the federal basic sanitation policy by

promoting the national integration of the country's bodies for implementation of guidelines of Law no. 11,445/07. It will be a critical instrument for the State to resume its guidance capacity to conduct the public basic sanitation policy, and consequently to determine governmental targets and strategies for the sector over the next twenty years, aimed at the universal access to basic sanitation as a social right.

### **3-1-3 Position occupied by Sabesp in the Government of the State of São Paulo**

The Government of São Paulo relies upon a qualified organizational framework that, under the direct coordination of the State Governor, is responsible for policies related to different sectors of the State public administration. It includes 26 State Secretariats, 18 Companies, 25 Autonomous Public Entities and 17 Foundations. There is a total of 26 Secretariats integrating the Government of the State of São Paulo, which are responsible for health, education, transports, public security, finances, social development, environment, and others matters.

Sabesp is one of the 18 Companies of the Government of São Paulo, reporting directly to the State Secretariat for Sanitation and Energy and the State Secretariat for the Environment.

- 1) The duties of the State Secretariat for Sanitation and Energy are established by Law no. 11,364, of March 28, 2003, and Decree no. 51,536, of February 1, 2007, which include the planning and enforcement of the state basic sanitation policies all over the State of São Paulo.
- 2) The State Secretariat for the Environment has built a structure to manage the environmental reality in the State of São Paulo. For each environmental issue, the State Secretariat for the Environment has an adequate response to that specific reality.
- 3) Among the 645 municipalities of the State of São Paulo, Sabesp provided, under concession agreements, basic sanitation services for 366 municipalities. In the State of São Paulo, the legal basic sanitation sector authority is the State Secretariat for Sanitation and Energy

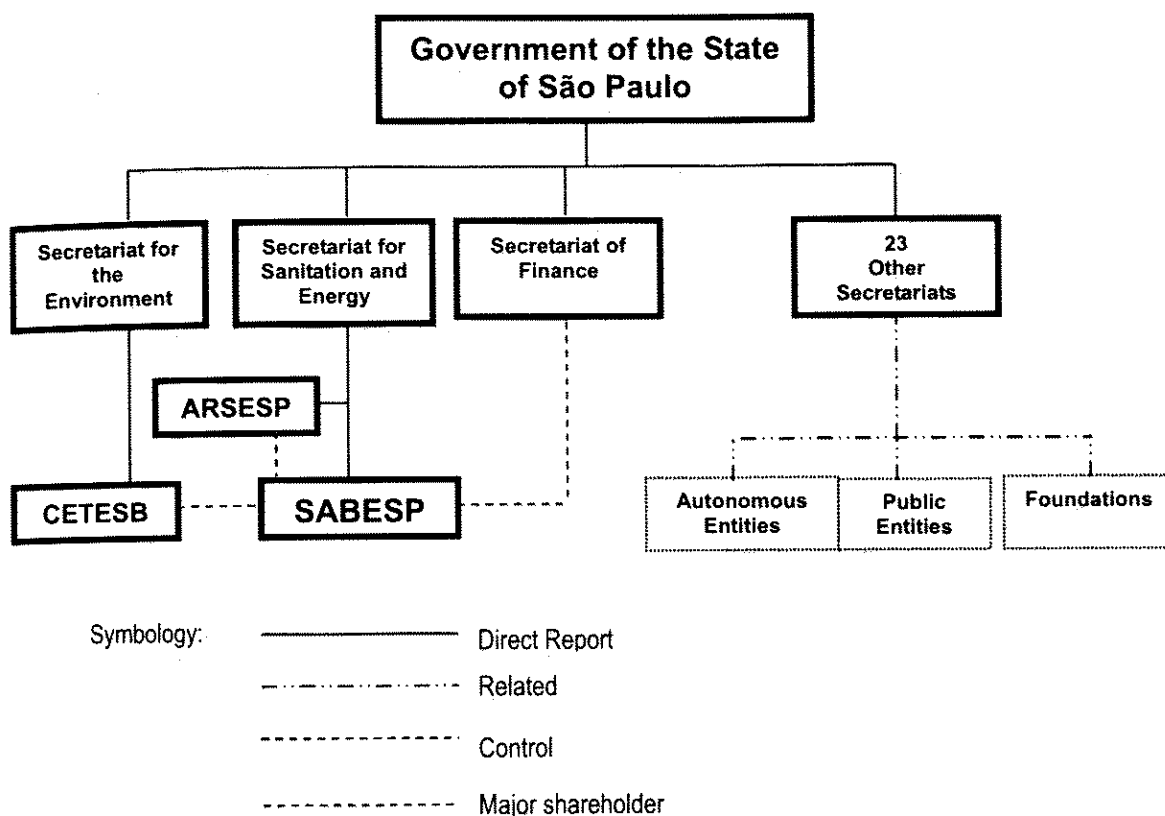


Figure 3-1 – Sabesp and the organization chart of the State Government

### 3-1-4 Constitution of Sanitation and Energy Regulatory Agency of the State of São Paulo - ARSESP

#### DECREE No. 53,192, of July 1, 2008

Provides for the provision of public basic sanitation services in the State of São Paulo and amends Decree no. 50,470, of January 13, 2006 and Decree no. 52,020, of July 30, 2007, and related matters.

§ 1 – Public basic sanitation services in the State shall be subject to the inspection, control and regulation, including tariffs, of the Sanitation and Energy Regulatory Agency of the State of São Paulo – ARSESP, pursuant to the State Complementary Law no. 1,025, of December 7, 2007.

§ 2º - State service planning shall comply with the provisions of federal and state laws related to basic sanitation, and submitted to deliberation of the Deliberative Board in the respective metropolitan region.

**Article 2** – Powers to regulate, including tariffs, and supervise municipal basic sanitation services, which are vested to the State of São Paulo, shall be exercised by the Sanitation and Energy Regulatory Agency of the State of São Paulo – ARSESP, provided that their assignment, for any reason, to Companhia de Saneamento Básico do Estado de São Paulo – Sabesp shall not be allowed.

### **3-2 Water Sector Programs**

Water supply and distribution in the State of São Paulo is divided into two different groups: municipalities under Sabesp control (59%) and municipalities under their own control, or managed by a private company. Notwithstanding the awareness of the problematic Water Loss issue, application of actions to minimize that fact will depend basically on resources and operator skills. In light of its strong organizational framework, Sabesp has a greater facility in obtaining financing, what does not apply to municipalities out of its control.

The Federal Government, through its Ministry of Cities and PMSS – Sanitation Sector Modernization Program, has tried to support such municipalities. However, as funds are insufficient, the government intends to improve that situation through the Growth Acceleration program – PAC.

#### **3-2-1 Basic Sanitation Works under the Growth Acceleration Program – PAC**

According to the National Secretariat for Environmental Sanitation of the Ministry of Cities, starting in 2011 PAC investments are expected to promote a marked improvement in basic sanitation sector in most Brazilian municipalities. This statement is based on the average investments in the sector between 2001 and 2007 and the funds allocated to works in progress. Such funds increased from R\$ 3.9 billion to R\$ 4.8 billion. PAC basic sanitation projects amounting to R\$ 40 billion will be financed by funds from the National Secretariat for Environmental Sanitation, National Health Foundation, Ministry of National Integration, and the Federal Budget that earmarked R\$ 21.8 billion of the estimated total. Currently, 76% of sanitation works provided in PAC are underway, 80% of which are expected to be completed by the end of the next year, comprising 1,620 works in 852 municipalities.

The Ministry of Cities published the 13<sup>th</sup> edition of the Diagnosis of Water and Sewerage Services in 2007, which shows that 94% of urban population benefited of piped water that year. According to that document, 50% of that total is served by sewerage system, where 32% of collected sewage is delivered to treatment plants. The sanitation sector will benefit of the creation of the landmark and institution of the National Sanitation Plan, which is under discussion in technical areas and is expected to be approved this year.

### **3-3 Water-Related Projects Supported by Foreign Financing**

The major international development agents with which Brazil maintains global projects are listed below.



Table 3-1 – General Table of International Agents

IBRD	The World Bank
GEF	Global Environment Facility
IDB	Inter-American Development Bank
FUMIN	Multilateral Investment Fund
CII	Inter-American Investment Corporation
JBIC	Japan Bank For International Cooperation
BEI	European Investment Bank
CAF	Andean Development Corporation
FIDA	Inter-American Fund for Agricultural Development
FONPLATA	Plata River Basin Development Fund
KFW	Kreditanstalt Fr Wiederaufbau

### Project in Federal Sphere

In 2008, 78 projects co-financed by Multilateral and Bilateral Credit Bodies were underway:

Body	Number of Projects
IBRD	21
IDB	17
JBIC	1
FUMIN	4
GEF	14
PPG-7	7
European Community	4
Others	10
<b>Total</b>	<b>78</b>

Such projects above amounts to an investment of US\$ 7.3 billion, which together with the Brazilian counterpart of US\$ 2.4 billion, amount to a total of US\$ 9.7 billion.

### Projects in State and Municipal Areas

124 projects were at execution stage with the support of international bodies, including loans and donations, distributed as follows:

Body	Number of Projects
IBRD	35
IDB	49
KFW	5
FIDA	2
FONPLATA	7
JBIC	5
GEF	1
Others	13
<b>Total</b>	<b>124</b>

Such projects amount to an investment of US\$ 7.9 billion, which together with the Brazilian counterpart of US\$ 7.0 billion amount to a total of US\$ 14.9 billion. Currently, in addition to projects under execution, there are 243 other projects in Brazil at negotiation stage or pending of contract signing to start.

## **Chapter 4 Analysis of Sabesp Long-Term Program**

### **4-1 Administrative Analysis of Sabesp**

Sabesp, a world leading basic sanitation company, earned in 2008 net operating revenues of R\$ 6,352 million (317.6 million yens), including sewerage services.

At the analysis, Sabesp was evaluated as a financially healthy company. Characteristics of such a good management may be summarized into: (1) Form of corporate constitution, (2) Results of a stable management, (3) Tariff adjustment system, (4) Efforts to reduce the costs, (5) Results of funding, and (6) Results of project. Such characteristics justify that evaluation.

#### **(1) Form of corporate constitution**

The first characteristic of Sabesp management is that it is a mixed corporation. The major shareholder is the State of São Paulo, which holds 50.28% of all shares, in addition to 25.52% of shares negotiated in New York Stock Exchange and Brazilian stock exchanges, respectively. Under the Brazilian corporate laws and the State of São Paulo laws, the major shareholder is required to hold at all times at least more than 51% of shares, but in 2004, the Government of the State of São Paulo negotiated its shares, which were reduced to 50.28%. Entering in New York Stock Exchange and Brazilian stock exchanges requires top-level corporate governance.

**Remarks:**

Sabesp is the only Brazilian basic sanitation company that raises funds in the international financial market. In 1985, an executive named Ariovaldo Carmignani was appointed chief executive officer to the company, who gave it worldwide recognition. When he was the chief executive officer, the amount of annual investment reached 1 billion dollars. He modernized the control system and transformed the unprofitable company into a profitable company. Although it is difficult to manage a public utility in Brazil, Sabesp shares are listed in New York Stock Exchange and have been purchased by investors from the world's major entities.

Source: Inter-American Development Bank, Private Sector Performance Contracting in the Water Sector, The Case of Sabesp, Nov/2004.

#### **(2) Results of a stable management**

Table 4-1 shows a comparison between the operating results and administrative indicators, and the performance evolution in 2003-2008 period. Operating income increased satisfactorily in line with the increase of water-supplied population from 21.32 million inhabitants in 2003 to 23.16 million in 2008, and reached the amount of R\$ 6.4 billion reais. Although there has been some variation in net profit index, it has been kept above 10%. Operating profit (EBITDA - profit before interest, tax, depreciation and amortization) has continuously increased to reach R\$ 2.8 billion in 2008. Loans have been kept at an adequate level; long-term loans correspond to approximately 80%.

Table 4-1 – Evolution of Management Indicators (2003 – 2008)

	Unit	2003	2004	2005	2006	2007	2008	2003-2008 average (%)
<b>Customers</b>								
Population supplied with water	1,000 people	21,324	22,335	22,570	22,700	22,959	23,159	1.7
Population served by sewerage system	1,000 people	17,030	18,014	18,326	18,519	18,881	19,198	2.4
<b>Operational</b>								
No. water connections	1,000 connect.	6,044	6,358	6,489	6,609	6,767	6,945	2.8
No. sewerage connect.	1,000 connect.	4,462	4,747	4,878	5,002	5,167	5,336	3.6
Water loss rate	%	33.0	34.0	32.4	31.9	29.5	27.7	-3.4
Water volume produced	Million m <sup>3</sup>	2,820	2,770	2,830	2,887	2,874	2,853	0.2
Water volume-wholesale	Million m <sup>3</sup>	346	251	259	263	274	285	-3.8
Water volume - retail	Million m <sup>3</sup>	1,419	1,441	1,500	1,544	1,573	1,596	2.4
Charged sewage volume	Million m <sup>3</sup>	1,110	1,141	1,198	1,246	1,300	1,330	3.7
Number of Employees	People	18,546	17,735	17,448	16,978	16,850	16,649	-2.1
Employees' Productivity	cnm/people	566	626	651	684	708	738	5.5
<b>Financial</b>								
Operating Income	R\$ million	4.110	4.397	4.953	5.527	5.971	6.352	9.1
Operating profit (EBITDA)	R\$ million	2.077	1.927	2.286	2.446	2.699	2.840	6.5
Net result	R\$ million	833	513	866	779	1.049	1.008	3.9
Total Assets	R\$ million	16.590	16.784	17.431	18.000	18.663	20.523	4.3
Total Loans	R\$ million	7.264	7.051	6.664	6.327	5.685	6.865	-1.1
Short-term Loans	R\$ million	997	1.497	759	853	742	1.449	7.8
Long-term Loans	R\$ million	6.267	5.554	5.905	5.474	4.943	5.416	-2.9
Loans in foreign currency	R\$ million	3.013	2.691	1.576	1.472	1.242	2.281	-5.4
Capital Stock	R\$ million	7.577	7.952	6.483	9.019	9.784	10.492	6.7
Investments	R\$ million	594	601	678	905	921	1.708	23.5
<b>Financial Indicators</b>								
Operating Income Index	%	50.5	43.8	46.1	44.3	45.2	44.7	
Net Profit Index	%	20.3	11.7	17.5	14.1	17.6	15.9	
Long-term Loan Index	%	86.3	78.8	88.6	86.5	86.9	78.9	
Loan Index	%	43.8	42.0	38.2	35.1	30.5	33.5	
Employ./Capital Index	%	96.0	89.0	103.0	70.0	58.0	65.0	

Source: Prepared by JICA Research Group based on Sabesp 2008 Financial Report

EBITDA: Earning Before Interest, Tax, Depreciation, and Amortization.]

Remarks:		
Rating of corporate risks		
The Brazilian rating company Fitch Ratings rated the loans in foreign currency as BB, while the international rating agency Standard & Poor's rated them as BB-.		
Table: Risk Rating		
Rating	Standard & Poor's	Fitch Ratings
Global Level	BB-	BB
Issuances in Foreign Currencies	BB-	BB
Local Level	brA+	A+(bra)
Local Issuances	brA+	A+(bra)
Outlook	Positive	Positive

### (3) Tariff Adjustment System

Sabesp stable management is the result of a longstanding management and its control system. Tariff adjustment system may be the result of learning in high inflation times, in the early 1990s, but it a basic control system (facility) for a stable management.

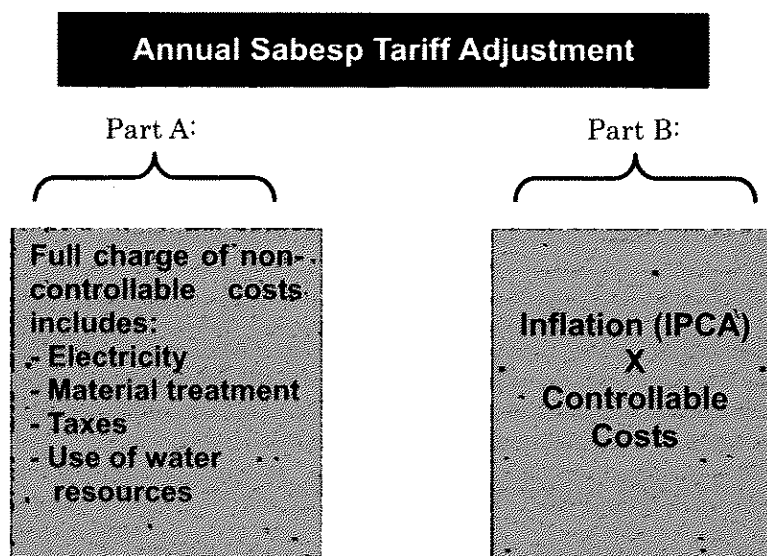
Until 2007, tariff adjustments were based on Sabesp calculations. For the year of 2008, ARSESP established the adjustment rate based on Sabesp calculation until then.

Tariff policy is based on Decree no. 41,446/96. Factors to be considered for tariff adjustments include: cost of service, reserve fund for unforeseen expenses, amortizations, climate and environmental conditions, consumption volume, economic conditions of consumers, etc. Tariffs are adjusted on a yearly basis to conciliate the social aspects with the economic possibilities of basic sanitation business.

Table 4-2 – Sabesp tariff adjustment rates (%)

	2001	2002	2003	2004	2005	2006	2007	2008
Tariff Adjustment (%)	13.10	8.20	18.90	6.80	9.00	6.71	4.12	5.10
Inflation rate*	7.70	12.50	9.30	7.60	5.69	3.14	4.46	5.90
GDP growth rate	1.31	2.70	1.10	5.70	2.90	3.70	5.40	5.10

Source: Sabesp for tariff adjustment rate, and IMF and OECD for inflation rate and GDP growth rate, \*Inflation rate: IPCA – Broad National Consumer Price Index (compared to the previous month)



Source : Sabesp 2008 Financial Report, page 1, and Results of 2008, March 2009

Figure 4-1 – Sabesp tariff adjustment rate

#### (4) Efforts for cost reduction

Income and expense evolution data over the last 12 years, from 1997 to 2008, show the following facts:

- a) personnel costs, corresponding to the highest percentage of expenses, decreased in 2008 to 18% as compared to 25% in 1997.

We believe that the main causes for the reduction of personnel cost percentage were the improved productivity and the increased outsourcing.

- b) Outsourcing cost increased from 8% in 1997 to 10% in 2008.

- c) the 2<sup>nd</sup> highest item of expenses refers to costs of electricity, which increase from 4% in 1997 to 9% in 2004 and then decreased to reach the level of 7% in 2008.
- d) Fiscal charges had a sudden increase from 3% in 1997 to 8% in 2008.
- e) Amortization (depreciation) expenses ranged between 10% and 20%.  
Interest rates were high in 2002 and 2003, 22% and 21% respectively, but then became stable at the level of 10%. The rate of 4% in 2008 was perhaps the result of the efforts to reduce interest on borrowing
- f) The operating profit (total income – total expenses) in 1997-2000 was at the level of 20%, fell in 2002 to 11%, but then recovered to 22% in 2006. Its best result was at 28% in 2008.

Table 4-3 – Economic and Financial Performance Indicators

		R\$ Million															
		1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008				
	Operating income																
A	Expenses	2,976.7	3,184.0	3,334.3	3,458.0	3,543.5	3,962.4	4,307.5	4,642.5	5,356.3	5,984.0	6,446.2	6,838.8				
B	Personnel expenses	1,281.5	1,347.4	1,298.2	1,271.1	1,589.1	1,898.8	2,076.3	2,375.6	2,734.9	3,014.8	3,334.2	3,553.9				
B-1	Material expenses	736.2	770.6	716.1	623.1	726.1	805.7	916.0	956.1	1,029.7	1,147.3	1,173.9	1,245.4				
B-2	Outsourcing expenses	76.0	81.9	84.8	103.4	126.1	154.5	174.6	185.5	214.8	232.2	244.2	279.7				
B-3	Electricity expenses	224.5	231.4	203.4	281.6	329.5	361.7	329.6	422.2	474.0	486.3	539.0	688.0				
B-4	Miscellaneous expenses	109.0	119.8	131.5	181.3	197.7	266.1	322.9	398.6	423.5	448.9	474.5	459.6				
B-5	Charges	48.5	46.8	49.1	58.9	84.2	92.3	130.0	142.0	160.5	210.2	381.7	345.0				
B-6	Amort.(deprec)/expenses.	87.3	96.9	113.2	122.7	129.5	218.5	203.2	271.1	432.3	490.1	520.9	535.7				
C	Interest	590.5	544.8	597.0	647.4	631.1	682.0	602.1	840.5	851.3	960.3	622.5	954.1				
D	Cost of services	344.8	402.2	608.8	564.6	673.7	857.7	901.6	643.3	711.1	598.8	679.9	268.8				
E=B+C+D	Profit before interest	2,216.8	2,294.4	2,504.0	2,583.1	2,893.9	3,438.5	3,580.0	3,859.4	4,297.3	4,573.9	4,630.6	4,776.8				
F=A-B-C	Work control expenses	1,104.7	1,291.8	1,439.1	1,439.5	1,323.3	1,381.6	1,629.1	1,426.4	1,770.1	2,008.9	2,491.5	2,330.8				
G	Total expenses	107.5	129.9	111.6	94.1	94.4	97.9	89.4	88.3	92.9	111.8	103.9	137.2				
H=E+G	Operating profit	2,324.3	2,424.3	2,615.6	2,677.2	2,988.3	3,536.4	3,669.4	3,947.7	4,390.2	4,685.7	4,734.5	4,914.0				
FA	Evolution of comparison with operating profit rate	59.7	59.7	718.7	780.8	555.2	426.0	638.1	694.8	966.1	1,298.3	1,713.7	1,924.8	%	%		
	Operating income																
A	Expenses	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%				
B	Personnel expenses	4.3%	4.2%	3.9%	4.0%	4.5%	4.8%	4.8%	5.1%	5.1%	5.0%	5.2%	5.2%				
B-1	Material expenses	2.5%	2.4%	2.1%	1.8%	2.0%	2.0%	2.1%	2.1%	1.9%	1.9%	1.8%	1.8%				
B-2	Outsourcing expenses	3%	3%	3%	3%	4%	4%	4%	4%	4%	4%	4%	4%				
B-3	Electricity expenses	8%	7%	6%	8%	9%	9%	8%	9%	9%	8%	8%	10%				
B-4	Miscellaneous expenses	4%	4%	4%	5%	6%	7%	7%	9%	8%	8%	7%	7%				
B-5	Charges	2%	1%	1%	2%	2%	2%	3%	3%	3%	4%	6%	5%				
B-6	Amort.(deprec)/expenses.	3%	3%	3%	4%	4%	6%	5%	6%	8%	8%	8%	8%				
C	Interest	2.0%	1.7%	1.8%	1.9%	1.8%	1.7%	1.4%	1.8%	1.6%	1.6%	1.0%	1.4%				
D	Cost of services	1.2%	1.3%	1.8%	1.6%	1.9%	2.2%	2.1%	1.4%	1.3%	1.0%	1.0%	4%				
E=B+C+D	Profit before interest	7.4%	7.2%	7.5%	7.5%	8.2%	8.7%	8.3%	8.3%	8.0%	7.6%	7.2%	7.0%				
F=A-B-C	Work control expenses	3.7%	4.1%	4.5%	4.2%	3.7%	3.5%	3.8%	3.1%	3.3%	3.4%	3.9%	3.4%				
G	Total expenses	4%	4%	3%	3%	3%	2%	2%	2%	2%	2%	2%	2%				
H=E+G	Operating profit	7.8%	7.6%	7.8%	7.7%	8.4%	8.9%	8.5%	8.5%	8.2%	7.8%	7.3%	7.2%				
FA-H		2.2%	2.4%	2.2%	2.3%	1.6%	1.1%	1.5%	1.5%	1.8%	2.2%	2.7%	2.8%				

Source Prepared by JICA study mission base don SABESP Business Management Report, page 10

## (5) Funding Result

Funding has developed gradually through operating income and external investments.

Table 4.4 shows the evolution of external borrowing. By observing the loan/operating profit index, we note that it fell from 3.6 times in 2004 to 2.2 times in 2008. Loan/net worth index remains in the range of 0.5 to 0.9.

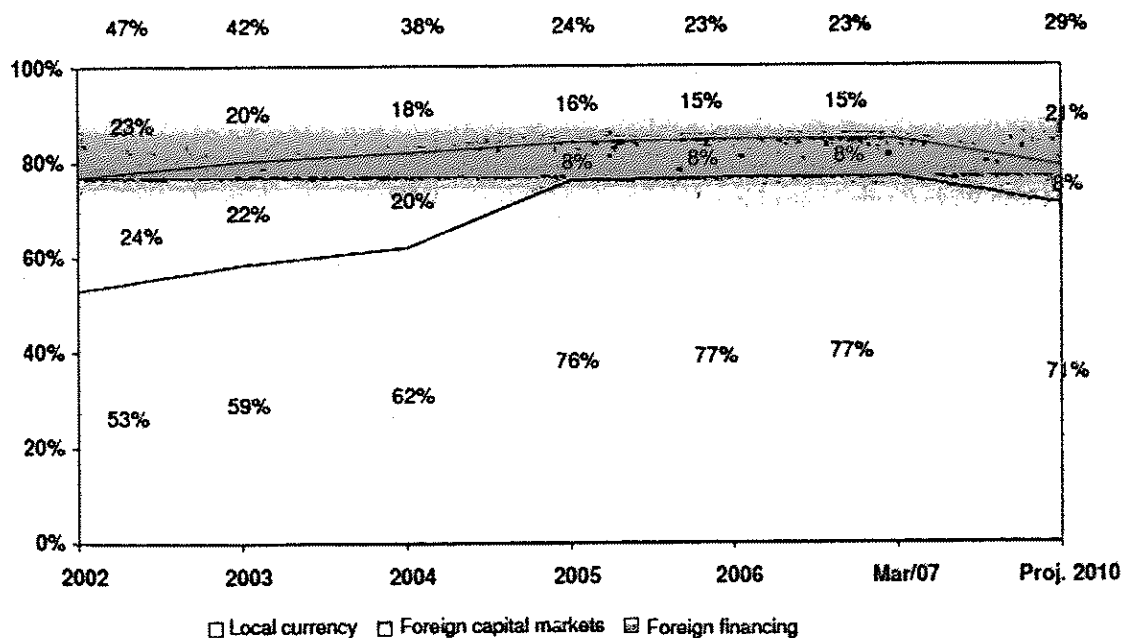
Table 4-4 – Results of borrowing (2004 - 2008) (R\$ million)

	2004	2005	2006	2007	2008
Loan balance	6,945	6,384	5,999	5,220	6,242
Operating profit	1,927	2,286	2,446	2,699	2,840
New loans	911	1,153	706	222	1,050
Paid out amount	1,018	1,290	1,022	735	630
Net Worth	7,952	8,483	9,018	9,784	10,492
Loan balance / operating profit	3.6	2.8	2.5	1.9	2.2
Loan balance / net worth	0.9	0.8	0.7	0.5	0.6

Source: Sabesp "Results 200"

Loans in foreign currency accounted for 47% in 2002, and then fell to 23% in 2007.

## Debt by Currency



Source: "2007-2010 Target and Investment Program" (June 2007), page 13

Figure 4-2 - Percentage of loan balance by currency

## (6) Programs implemented by Sabesp

Water resources available in the State of São Paulo are basically used to meet three basic needs: power generation, irrigation and basic sanitation. The portion allocated to basic sanitation includes the following programs (completed, under execution and planned):

### Main Programs Completed and under Execution:

Application of funds (own funds or from external sources) include:

Table 4-5 - Sabesp Programs Completed or under Execution

Program	Source of Funds	Amount of Loan (US\$ million)	Execution Period
Tietê Project – Phase I (Decontamination of Tietê River – Phase I)	IDB	400	1992-1996
Tietê Project – Phase I (Decontamination of Tietê River – Phase I)	IDB	50	1997-2003
Sewage in São Paulo Metropolitan Region	IDB	163	2001-2007
Tietê Project – Phase II (Decontamination of Tietê River – Phase II)	IDB	200	2000-2008
Water and Sewerage	IBRD	280	7 years
Sewerage - Guarapiranga	IBRD	42.5	5 years
Sewerage – Barueri and ABC	Soc. Generale	24.4	6 years
Sewerage – Barueri and ABC	Soc. Generale	24.6	7 years
Environmental Recovery of Baixada Santista Metropolitan Region	JBIC	190.2	7 years
Metropolitan Water	PPP (Public Private Participation)	1,350	2006-2014
Clean Wave (Onda Limpa)	JBIC / BNDES	600	2008-2011
North Shore Clean Wave (Onda Limpa Litoral Norte)	BNDES	130	2008-2015

Notes: US\$ 1 = R\$ 2.00. Source: Sabesp – Notes to the Financial Statements

Table 4-6 - Programs Planned by Sabesp (funds under negotiation):

Program	Source of Funds	Amount of Loan * US\$ million	Execution Period
Decrease in Water Loss Water Loss Reduction and Energy Efficiency	JICA / Sabesp	565	2011-2013
Tietê Project – Phase III (Decontamination of Tietê River. Phase 3:	IADB / BNDES / Sabesp	800	2010-2015
Pro-Billings Program	JICA / Sabesp	123	2010 -
Coastal Water (Águas do Litoral)	/ Sabesp	550	2009-2013
Clean Stream (Córrego Limpo)	Sabesp/ State Gov. and Municipality of SP	220,5	10 years
Vida Nova (Billings and Guarapiranga Reservoirs)	IBRD /Federal Gov./State Gov./Sabesp	600	To be defined

Notes: US\$ 1 = R\$ 2.00. Source: Sabesp – Notes to the Financial Statements  
Source: Sabesp – 2008 financial newsletter



## 4-2 Sabesp Long-Term Plan

Sabesp has announced its 5-10-year long-term plan. Besides, it is listed in New York Stock Exchange and there are several financial statements in English, which also include a long-term plan.

The current JICA Mission analyzed Sabesp long-term plan, using the material listed below as reference:

2008-2012 Business Target Plan, April 2008.

2009-2018 Sabesp Strategic Plan – Book of Business Targets, March 2009.

2007-2010 Target and Investment Program, June 2007.

Financial Report for the 4<sup>th</sup> Quarter 2009.

Financial Report for the year of 2008.

2008-2013 Sabesp cash flow.

### 4-2-1 Basic Guidelines

In March 2009, Sabesp prepared its 10-year long –term plan, the “2009-2018 Sabesp Strategic Plan – Book of Business Targets”. The main items of that long-term plan are summarized as follows:

In the State of São Paulo, Sabesp is responsible for water supply to 26.3 million inhabitants, which account for 59% of the State’s total population of 42 million inhabitants. Taking into account that scenario, the following basic guidelines have been established to offer high quality services.

(“2009-2018 Sabesp Strategic Plan – Book of Business Targets”)

- Competitiveness strengthening and maintenance of the sustainable environment;
- Implementation of public services and efficient and fair transactions;
- Ethical relationship with customers, based on competition principles;
- Social and environmental responsibility;
- Sanitation sector safety.

Table 4-7 – Basic data on Sabesp business

Item	Quantity
Surface area of the State of São Paulo	248,809 km <sup>2</sup>
Population of the State of São Paulo	42.0 million inhabit.
Water resources available in the State of São Paulo	1,65 %
Number of municipalities operated by Sabesp (59%)	366 units
Population supplied with Sabesp water	26.2 million inhabit.
Sabesp water service rate	100 %
Length of Sabesp water distribution network	62,300 km
Billed water volume (Sabesp)	1.847 billion m <sup>3</sup>

Source: Consultation Letter – COFIEX – Volume I – October 2009

#### 4-2-2 Sabesp Strategic Guidelines

Based on its basic guidelines, Sabesp established the following strategic guidelines:

- Company growth;
- Quality public services;
- Safe drinking water supply;
- Sustainability (social, economic and environmental);
- Enhancement of external relationships.

#### 4-2-3 Long-Term Indicators and Targets

Based on its strategic guidelines, Sabesp established annual priority targets for the next 10 years. (“2009-2018 Sabesp Strategic Plan – Book of Business Targets”)

- Service to customers: offer of services satisfactory to water users and expansion of new activities.
- Sabesp internal strategy: Operational and business efficiency.
- Improvement and expansion: To make the company competitive and innovating through intensive training and integration of operational managers and service providers.

##### a) Increase of Billed Volume

Table 4-8 – Annual Billed Volume (water + sewerage) (million m<sup>3</sup>)

2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
3210	3282	3392	3497	3582	3659					

##### b) Reduction of Loss Rate

Table 4-9 - IPDt – Total Water Losses per Connection (liters / connection x day)

2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
432	397	369	347	325	300	281	264	251	237	221

##### c) Reduction of Billing Loss Rate

Table 4-10 - IPF – Billing Loss Rate (%)

2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
27,7	26,0	24,0	22,0	21,4	19,6	18,6	17,6	16,9	15,9	14,8

#### (1) Renewal of agreement with municipalities

Sabesp operates water supply under a concession agreement with 366 municipalities, and now it is time to renew such agreements, which have an average term of 30 years, 107 of which were renewed in 2007. The following table shows the planned number of agreement renewals.

Table 4-11 – Plan for Renewal of Agreements with Municipalities

2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	After 2018
53	89	74	5	-	-	-	2	2	3	29

### 4.3 Sabesp Long-Term Financial Plan

The Financial Plan was analyzed in the context of the Long-Term Plan, focused on financial perspectives and planning.

#### 4-3-1 Financial Policy

The financial guidelines are included in “2009-2018 Sabesp Strategic Plan – Book of Long-Term Business Targets”. Value creation maximization is mentioned as a strategic target, and the following 5 actions are scheduled:

- 1) Tariff system review.
- 2) Reduction of tariff payment default.
- 3) Rationalization of energy and chemicals costs.
- 4) Capital management (includes optimization of the company’s assets).
- 5) Other operational actions.

#### 4-3-2 Outlook of long-term cash flow (2008—2013)

The Study Mission obtained from Sabesp F Division the outlook of long-term cash flow (2008-2013) (Table 4-21).

According to that cash flow table, the following aspects may be evidenced:

- Cash flow from business activities shows an annual positive balance of R\$ 1.2 – 2.4 billion, while investment activities show a negative balance of US\$ 1.3 – 1.8 billion. Because it is a company focused on facilities, it has a structure to allocate the annual operating profit to investments in equipment.
- Financial activities are intended to adjust business activities to investments activities and have shown variations in the range between R\$ 0.5 billion of positive balance and R\$ 0.6 billion of negative balance.
- The network has an annual variation of some R\$ 0.5 billion of positive balance to R\$ 0.4 billion of negative balance; however, as there is a previous balance, in any of the years the perspective is R\$ 0.1 – 0.5 billion of positive balance.
- Among the financial activities, the expected repayment of debentures and loans will be R\$ 1.3 billion in 2009, R\$ 0.9 billion in 2010, R\$ 1.4 billion in 2011, R\$ 0.7 billion in 2012, and R\$ 0.9 billion in 2013.

There is also information of the expected repayment of debts, according to Table 4-12.

Table 4-12 – Forecast of repayment of loans (R\$ million)

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020+
Local loans	1,343	843	920	500	538	190	69	27	27	28	30	70
Foreign loans	106	86	152	163	163	163	163	490	157	101	86	450
<b>Total</b>	<b>1,449</b>	<b>929</b>	<b>1,072</b>	<b>663</b>	<b>701</b>	<b>353</b>	<b>232</b>	<b>517</b>	<b>184</b>	<b>129</b>	<b>116</b>	<b>520</b>

Source: Sabesp Financial Report for 2008.

Table 4-13 – Sabesp forecast for 2008-2013 (R\$ million)

Operational Activities		2008	2009	2010	2011	2012	2013
(+)	Received from customers	6.919	7.273	7.865	8.478	9.114	9.738
(-)	Payment to suppliers	259	272	310	336	362	394
(-)	Payment to employees	1.503	1.519	1.55	1.601	1.669	1,74
(-)	Interest paid on loans	534	616	692	728	660	666
(-)	Income tax and social charges	554	765	818	901	1.028	1,142
(-)	Payment of contingencies	362	494	85	108	107	111
(+)	Income from insurance reimbursement	-	-	-	-	-	-
(±)	Other net income (payments)	-1.992	-2.432	-2.657	-2.907	-3.049	-3,302
<b>Total of Operational Activities (A)</b>		<b>1.715</b>	<b>1.176</b>	<b>1.754</b>	<b>1.897</b>	<b>2.238</b>	<b>2.384</b>
Investment Activities		2008	2009	2010	2011	2012	2013
(-)	Purchase of fixed assets	1.276	1.761	1.861	1.823	1.818	1.795
(-)	Purchase of shares/quotas	4	-	-	-	-	-
(+)	Income from sales of permanent assets	17	181	21	-	-	-
	In the year	17	181	21	-	-	-
	In previous years	-	-	-	-	-	-
(+)	Income from dividends/interest on own capital	-	-	-	-	-	-
<b>Total Investment Activities (B)</b>		<b>-1.263</b>	<b>-1.58</b>	<b>-1.84</b>	<b>-1.823</b>	<b>-1.818</b>	<b>-1.795</b>
Financing Activities		2008	2009	2010	2011	2012	2013
(±)	Paying-up of self-owned shares	-	-	-	-	-	-
(-)	Payments: dividends/interest on own capital	707	251	313	376	353	410
(+)	Long-term borrowing	809	1,481	1,72	856	827	785
(+)	Income from: placement of debentures and similar	220	246	-	450	-	-
(-)	Payment of loans/debentures	626	1.316	938	1,379	712	973
<b>Total Financing Activities (C)</b>		<b>-304</b>	<b>161</b>	<b>469</b>	<b>-449</b>	<b>-239</b>	<b>-598</b>
<b>Grand Total (A+B+C)</b>		<b>148</b>	<b>-244</b>	<b>384</b>	<b>-375</b>	<b>181</b>	<b>-10</b>
<b>Cash and banks – start of period</b>		<b>195</b>	<b>344</b>	<b>100</b>	<b>484</b>	<b>109</b>	<b>290</b>
<b>Cash and banks – end of period</b>		<b>344</b>	<b>100</b>	<b>484</b>	<b>109</b>	<b>290</b>	<b>281</b>

Source: Sabesp ESP cash flow in 2008-2013, 2009. 5.4

#### 4-3-3 Investment Plans

The investment plan (CAPEX) FOR 2009-2013, includes investments in the amount of R\$ 577- R\$ 668 million (¥ 23.8-33.4 billion) for basic sanitation activities.

The Corporate Water Loss Reduction and Energy Efficiency Program includes investments in the amounts of R\$ 378 million in 2011, R\$ 368 million in 2012, and R\$ 321 million in 2013. Such figures are equivalent to 57% in 2011, 56% in 2012 and 48% in 2013 of all investment in water, and indicate that the program is a major Sabesp investment.

Table 4-14 – Investment Plan (R\$ million)

	2009	2010	2011	2012	2013
Water activities	577	590	664	653	668
Sewerage activities	860	948	835	867	827
Others	214	213	254	228	231
Total	1,651	1,751	1,753	1,748	1,726
<b>PROGRAM</b>	<b>231</b>	<b>255</b>	<b>378</b>	<b>368</b>	<b>321</b>
<b>PROGRAM / Water Activities</b>	<b>40%</b>	<b>43%</b>	<b>57%</b>	<b>56%</b>	<b>48%</b>

Source: Table prepared by JICA Study Mission, based Sabesp Financial Report for 2008, and Corporate Water Loss Reduction and Energy Efficiency Program (revised version of May 2009).

#### 4-3-4 Funding Plan

Because it is listed in New York Stock Exchange, Sabesp officially discloses its Long-Term Funding Plan and clearly mentions the name of such financial entities as The World Bank, IDB, JICA, etc. However, as loans under negotiation or mentioned in the plan are also included, care is required for interpretation.

Table 4-15 – Funding Plan (2009-2015) (R\$ million)

Financial Institution	2009	2010	2011	2012	2013	2014	2015	Total	Total
							& Onward		(%)
<b>Local Market</b>									
Banco do Brasil	264	287	312	340	370	97.5	-	1,669.5	24.3%
Caixa Economica Federal	68.8	74.0	80.1	86.6	87.3	48.3	190.9	636.0	9.3%
Debentures	790	353	459	32.9	72.7	39.8	39.8	1,787.4	26.0%
FIDC- Sabesp I	55.6	55.6	13.8	-	-	-	-	125.0	1.8%
BNDES	42.8	42.8	42.8	36.9	4.2	-	-	169.5	2.5%
BNDES BX SANTISTA	-	-	-	4.0	4.0	4.0	20.1	32.1	0.5%
Others	2.8	7.2	6.4	-	-	-	-	16.4	0.2%
Interest and charges	119	23.4	5.9	-	-	-	-	148.2	2.2%
<b>Total</b>	<b>1343</b>	<b>843</b>	<b>920</b>	<b>500</b>	<b>538</b>	<b>190</b>	<b>250.8</b>	<b>4,584.1</b>	<b>66.8%</b>
<b>International financial market</b>									
IDB	86.4	86.4	86.4	86.4	86.4	86.5	445.0	963.5	14.0%
Eurobonds	-	-	-	-	-	-	327.2	327.2	4.8%
JBIC	-	-	10.5	21.1	21.1	21.1	316.2	390.0	5.7%
IDB 1983AB	-	-	55.1	55.6	55.6	55.6	358.6	580.5	8.5%
Interest and charges	19.8	-	-	-	-	-	-	19.8	0.3%
<b>Total</b>	<b>106</b>	<b>86.4</b>	<b>152</b>	<b>163</b>	<b>163</b>	<b>163</b>	<b>1447</b>	<b>2,281.0</b>	<b>33.2%</b>
<b>Grand Total</b>	<b>1449</b>	<b>929</b>	<b>1072</b>	<b>663</b>	<b>701</b>	<b>353</b>	<b>1697.8</b>	<b>6,865.1</b>	<b>100.0%</b>

Source: / Sabesp announces its 4Q/2008 results.