optimization similar to Vila Medeiros Water Pumping Station and São José Booster Pump Station.

Therefore, the result of implantation of Electric Power Optimization Program will be useful for future plans of many facilities.

(4) The energy efficiency program is a major activity program in Sabesp and should be implanted actively. In the future, its proportion is expected to increase. In addition, Sabesp intends to work actively for carbon (CO_2) reduction program, through a small biogas-fueled thermal power plant and a small hydroelectric power plant. Although still negligible, cases for electric power rationing have accumulated, which will certainly provide a satisfactory saving result.

We hope that Sabesp will achieve goods results in its similar projects, by exploring many cases similar to those under study.

Chapter 11 Cost Estimate and Borrowing Plan for the Corporate Water Loss Reduction and Energy Efficiency Program

11-1 Cost Estimate for JICA Stage

11-1-1 Basic Cost Estimate Guideline

n September 2008, a cost estimate was prepared for the PROGRAM (2009-2010), and in May 2009, due to partial changes to quantities, the PROGRAM cost was recalculated, as shown in Tables below – Table 11-1 "Breakdown of Sabesp PROGRAM Cost During JICA Stage" and Table 11-2 "Breakdown of PROGRAM Cost (M & R) During JICA Stage".

For that estimate, Sabesp price database of October 2007 was adopted. Sabesp division in charge of price database is TEV – Project Evaluation Department, which is provided with 25 employees and is responsible for setting the price of inputs (services, use of equipment, material, etc.) comprising the cost of works and materials. That department reports to the Division of Technology, Projects and Environment, and set, through a 10-year experience in procurements, the unit prices of works with a high reliability level. As such, for the PROGRAM cost estimate, the unit price of works was adopted, based on Sabesp standard unit price prevailing in October 2007, applicable to all 16 Business Units.

Currency used - Real The exchange rate prevailing in October 2008 is shown below:
US$ 1.00= R$ 1.801 (Banco Central do Brasil – Average TTB Rate in October 2008)
US$ 1.00= ¥116.81 (Bank of Tokyo-Mitsubishi UFJ – Average TTS Rate in October/2008)

Table 11-1 – Breakdown of PROGRAM cost During JICA Stage (General) (Currency: R$ 1.00)

No.	Action	Unit	2011	2012	2013	TOTAL
A 1-1	Branch line replacement	Physical (unit)	366,318	362,372	358,047	1,086,737
		Financial (R$)	78,020,191	77,197,445	76,319,922	231,537,557
A 1.2	Replacement of networks/branch lines	Physical Network (km)	323	351	368	1,042
		Physical Branch Lines (unit)	35,072	40,456	41,770	117,299
		Financial (R$)	54,797,311	58,832,299	62,243,790	175,873,400
A 1.3	Branch Line Replacement – Leakage Survey	Physical (unit)	35,408	35,408	35,406	106,222
		Financial (R$)	7,133,836	7,133,577	7,133,560	21,400,973
A 1 -	Total Infrastructure renewal	Physical Network (km)	323	351	368	1,042
		Physical Branch Lines (unit)	436,799	438,236	435,223	1,310,258
		Financial (R$)	139,951,338	143,163,321	145,697,272	428,811,930
A 2 -	Leakage Survey	Physical (km)	43,793	43,792	43,791	131,376
		Financial (R$)	9,580,037	9,579,823	9,579,808	28,739,668
A 3.1	Visible Leakage Repair in Network	Physical (unit)	46,183	45,721	45,264	137,168
		Financial (R$)	23,319,220	23,086,028	22,855,167	69,260,415
A 3.2	Non-Visible Leakage Repair (Network)	Physical (unit)	4,618	4,618	4,618	13,854
		Financial (R$)	2,297,720	2,297,680	2,297,678	6,893,079
A 3 -	Total Repair	Physical (unit)	50,801	50,339	49,882	151,022
		Financial (R$)	25,616,940	25,383,708	25,152,846	76,153,494
A 4.1	Sectorization (Implantation of Pressure Zones)	Physical-project (unit)	19	11	5	34
		Physical-work (unit)	19	47	47	113
		Financial (R$)	60,861,396	59,301,746	26,726,047	146,889,189
A 4.2	VRP	Physical (unit)	94	56	55	205
		Financial (R$)	7,845,751	4,765,000	4,619,750	17,230,500
A 4.3	DMC (Measurement Control Districts)	Physical (unit)	210	189	177	576
		Financial (R$)	8,407,185	7,546,105	7,085,310	23,038,600
A 4.4	Booster	Physical (unit)	30	26	17	73
		Financial (R$)	5,192,500	2,047,572	869,300	8,109,372
A 4.5	Closing of primary rings in slums	Physical (unit)	1	1	0	3
		Financial (R$)	770,000	720,000	0	1,490,000
A 4 -	Total Sectorization	Physical (unit)	354	319	296	970
		Financial (R$)	83,076,832	74,380,422	39,300,407	196,757,662
A 5 -	Equipment	Physical (unit)	443	393	325	1,161
		Financial (R$)	5,583,000	4,285,200	3,426,250	13,294,450
Total Real Loss		**Financial (R$)**	**263,808,147**	**256,792,473**	**223,156,583**	**743,757,203**

No.	Action	Unit	2011	2012	2013	TOTAL
B 1.1	Replacement of High-Capacity Water Meters	Physical (unit)	13,366	13,425	13,425	40,216
		Financial (R$)	3,168,278	3,075,625	3,075,625	9,319,528
B 1.2	Replacement of Low-Capacity Water Meters	Physical (unit)	781,771	781,771	781,771	2,345,313
		Financial (R$)	45,053,370	45,053,370	45,053,370	135,160,110
B 1 -	Total Replacement of Water Meters	Physical (unit)	795,137	795,196	795,196	2,385,529
		Financial (R$)	48,221,648	48,128,995	48,128,995	144,479,638
B 2.1 -	Inactive inspections	Physical (unit)	468,618	468,618	468,618	1,405,854
		Financial (R$)	6,621,572	6,621,572	6,621,572	19,864,717
B 2.2.1-	Irregularity Control - Inspection	Physical (unit)	131,811	131,825	131,803	395,440
		Financial (R$)	4,857,240	4,840,660	4,856,955	14,554,855
B2.2.2-	UMA installation	Physical (unit)	21,349	21,350	21,352	64,050
		Financial (R$)	8,197,874	8,198,258	8,199,026	24,595,159
B 2.3 -	Slum regularization	Physical (unit)	17,329	17,375	17,598	52,301
		Financial (R$)	7,027,143	7,027,030	7,117,550	21,171,724
B 2 -	Total Irregularity Control	Physical (unit)	617,758	617,818	618,019	1,853,595
		Physical UMA (unit)	21,349	21,350	21,352	64,050
		Financial (R$)	26,703,830	26,687,521	26,795,103	80,186,455
B 3 -	Record Update	Physical (unit)	805,812	805,812	805,812	2,429,436
		Financial (R$)	3,634,212	3,634,214	3,634,211	10,902,637
Total of Apparent Losses		**Financial (R$)**	**78,559,690**	**78,450,730**	**78,558,310**	**235,568,729**
C 1 -	Installation / Adequacy of Macrometers	Physical (unit)	129	89	64	282
		Financial (R$)	5,990,200	4,546,740	4,608,050	15,144,990
C 2 -	Macrometer Calibration	Physical (unit)	905	907	909	2,722
		Financial (R$)	2,549,900	2,553,728	2,557,556	7,661,183
C 3 -	Capacity Building	Physical (unit)	1,346	516	1,219	3,080
		Financial (R$)	718,119	545,190	645,268	1,908,576
C 4 -	Socioeducative Actions	Financial (R$)	1,227,273	1,227,273	1,227,273	3,681,818
C 5 -	Demand from Technology and Environment Division (Management)	Financial (R$)	10,000,000	10,000,000	10,000,000	30,000,000
Total Management		**Financial (R$)**	**20,485,491**	**18,872,930**	**19,038,146**	**58,396,567**
Energy Efficiency		**Financial (R$)**	**15,000,000**	**14,000,000**	**-**	**29,000,000**
Grand Total		**Financial (R$)**	**377,853,328**	**368,116,133**	**320,753,039**	**1,066,722,500**

Table 11-2 – Breakdown of PROGRAM Cost (M & R) During JICA Stage (Currency: R$ 1.00)

No.	Action	Unit	Total M				Total R			
			2011	2012	2013	SUBTOTAL	2011	2012	2013	SUBTOTAL
A 1.1	Branch line replacement	Physical (unit)	235,383	233,029	230,699	699,110	130,936	129,343	127,348	387,627
		Financial (R$)	58,333,469	57,750,134	57,172,632	173,256,235	19,686,722	19,447,311	19,147,289	58,281,323
A 1.2	Replacement of networks and branch lines	Physical Network (km)	218	239	252	708	105	112	116	333
		Physical Branch Lines (unit)	25,125	30,402	31,115	86,641	9,948	10,054	10,656	30,658
		Financial (R$)	42,367,327	45,942,153	48,943,962	137,253,443	12,429,984	12,890,145	13,299,828	38,619,957
A 1.3	Branch Line Replacement – Leakage Survey	Physical (unit)	18,571	18,571	18,570	55,712	16,836	16,836	16,836	50,508
		Financial (R$)	4,602,462	4,602,204	4,602,187	13,806,853	2,531,373	2,531,373	2,531,373	7,594,120
A 1 -	Total Infrastructure renewal	Physical Network (km)	218	239	252	708	105	112	116	333
		Physical Branch Lines (unit)	279,079	282,002	280,383	841,464	157,720	156,234	154,840	468,794
		Financial (R$)	105,303,258	108,294,491	110,718,781	324,316,530	34,648,079	34,868,830	34,978,491	104,495,400
A 2 -	Leakage Survey	Physical (km)	22,460	22,459	22,459	67,378	21,333	21,333	21,333	63,998
		Financial (R$)	5,313,514	5,313,299	5,313,284	15,940,097	4,266,524	4,266,524	4,266,524	12,799,571
A 3.1	Visible Leakage Repair in Network	Physical (unit)	20,408	20,204	20,002	60,613	25,775	25,517	25,262	76,554
		Financial (R$)	10,602,246	10,496,224	10,391,262	31,489,732	12,716,973	12,589,804	12,463,906	37,770,683
A 3.2	Non-Visible Leakage Repair (Network)	Physical (unit)	1,494	1,494	1,494	4,482	3,124	3,124	3,124	9,371
		Financial (R$)	776,346	776,306	776,304	2,328,955	1,521,375	1,521,375	1,521,375	4,564,124
A 3 -	Total Repair	Physical (unit)	21,902	21,698	21,496	65,096	28,899	28,641	28,386	85,926
		Financial (R$)	11,378,592	11,272,530	11,167,565	33,818,687	14,238,348	14,111,178	13,985,280	42,334,806
A 4.1	Sectorization (Implantation of Pressure Zones)	Physical-project (unit)	7	7	0	13	12	5	5	21
		Physical-work (unit)	5	6	14	25	13	42	33	88
		Financial (R$)	32,301,244	28,656,186	20,672,362	81,629,792	28,560,152	30,645,560	6,053,685	65,259,397
A 4.2	VRP	Physical (unit)	65	38	34	137	29	18	20	68
		Financial (R$)	5,523,250	3,240,000	2,917,250	11,680,500	2,322,500	1,525,000	1,702,500	5,550,000
A 4.3	DMC - Measurement and Control District	Physical (unit)	158	126	109	393	52	63	68	183
		Financial (R$)	6,317,380	5,043,696	4,366,196	15,727,272	2,089,805	2,502,409	2,719,114	7,311,329
A 4.4	Booster	Physical (unit)	26	16	12	54	4	9	5	19
		Financial (R$)	4,917,500	1,647,572	549,300	7,114,372	275,000	400,000	320,000	995,000
A 4.5	Closing of rings in slums	Physical (unit)	0.9	0.9	0.0	1.8	0.5	0.5	0	1
		Financial (R$)	520,000	470,000	0	990,000	250,000	250,000	0	500,000
A 4 -	Total Sectorization	Physical (unit)	255	187	170	611	99	133	127	358
		Financial (R$)	49,579,375	39,057,453	28,505,108	117,141,936	33,497,458	35,322,969	10,795,299	79,615,725
A 5 -	Equipment	Physical (unit)	335	297	270	902	108	96	55	259
		Financial (R$)	4,176,600	3,485,850	2,636,250	10,298,700	1,406,400	799,350	790,000	2,995,750
Total Real Loss		**Financial (R$)**	**175,751,339**	**167,423,623**	**158,340,989**	**501,515,950**	**88,056,809**	**89,368,851**	**64,815,594**	**242,241,253**

No.	Action	Unit	Total M				Total R			
			2011	2012	2013	SUBTOTAL	2011	2012	2013	SUBTOTAL
B 1.1	Replacement of High-Capacity Water Meters	Physical (unit)	11,267	11,288	11,288	33,842	2,099	2,138	2,138	6,374
		Financial (R$)	2,677,680	2,585,209	2,585,209	7,848,097	490,598	490,416	490,416	1,471,431
B 1.2	Replacement of Low-Capacity Water Meters	Physical (unit)	455,328	455,328	455,328	1,365,983	326,443	326,443	326,443	979,330
		Financial (R$)	27,260,461	27,260,461	27,260,461	81,781,384	17,792,909	17,792,909	17,792,909	53,378,726
B 1 -	Total Replacement of Water Meters	Physical (unit)	466,594	466,615	466,615	1,399,825	328,543	328,581	328,581	985,705
		Financial (R$)	29,938,141	29,845,670	29,845,670	89,629,481	18,283,507	18,283,325	18,283,325	54,850,157
B 2. 1 -	Inactive inspections	Physical (unit)	285,437	285,437	285,437	856,311	183,181	183,181	183,181	549,543
		Financial (R$)	4,033,225	4,033,225	4,033,225	12,099,674	2,588,348	2,588,348	2,588,348	7,765,043
B 2.2.1	Irregularity Control - Inspection	Physical (unit)	80,072	80,072	80,072	240,216	51,739	51,753	51,731	155,224
		Financial (R$)	2,950,650	2,950,650	2,950,650	8,851,949	1,906,590	1,890,010	1,906,305	5,702,905
B2-2.2	UMA Installation	Physical (unit)	13,395	13,395	13,395	40,184	7,954	7,955	7,957	23,866
		Financial (R$)	5,143,593	5,143,593	5,143,593	15,430,779	3,054,281	3,054,665	3,055,433	9,164,380
B 2.3 -	Slum regularization	Physical (unit)	17,329	16,639	16,862	50,829	0	736	736	1,472
		Financial (R$)	7,027,143	6,747,350	6,837,870	20,612,364	0	279,680	279,680	559,360
B 2 -	Total Irregularity Control	Physical (unit)	382,838	382,148	382,371	1,147,356	234,920	235,670	235,648	706,239
		Physical UMA (unit)	13,395	13,395	13,395	40,184	7,954	7,955	7,957	23,866
		Financial (R$)	19,154,611	18,874,818	18,965,338	56,994,767	7,549,219	7,812,703	7,829,766	23,191,688
B 3 -	Record Update	Physical (unit)	505,721	505,721	505,721	1,518,770	300,091	300,091	300,091	910,666
		Financial (R$)	2,280,803	2,280,803	2,280,803	6,842,409	1,353,409	1,353,411	1,353,408	4,060,228
Total of Apparent Losses		**Financial (R$)**	**51,373,555**	**51,001,290**	**51,091,810**	**153,466,656**	**27,186,135**	**27,449,439**	**27,466,499**	**82,102,074**
C 1 -	Installation / Adequacy of Macrometers	Physical (unit)	24	19	17	60	105	69	47	222
		Financial (R$)	2,212,000	2,046,540	2,864,340	7,122,880	3,778,200	2,500,200	1,743,710	8,022,110
C 2 -	Macrometer Calibration	Physical (unit)	359	361	363	1,083	546	546	546	1,638
		Financial (R$)	1,742,680	1,746,508	1,750,336	5,239,524	807,220	807,220	807,220	2,421,659
C 3 -	Capacity Building	Physical (unit)	1,157	345	1,053	2,555	189	170	166	525
		Financial (R$)	329,807	166,007	306,085	801,899	388,312	379,183	339,183	1,106,677
C 4 -	Socioeducative Actions	Financial (R$)	1,227,273	1,227,273	1,227,273	3,681,818	0	0	0	0
C 5 -	Demand from Technology and Environment Division (Management)	Financial (R$)								
Total Management		**Financial (R$)**	**5,511,760**	**5,186,328**	**6,148,034**	**16,846,121**	**4,973,731**	**3,686,602**	**2,890,113**	**11,550,446**
Energy Efficiency		**Financial (R$)**								
Grand Total		**Financial (R$)**	**232,636,653**	**223,611,240**	**215,580,833**	**671,828,727**	**120,216,675**	**120,504,892**	**95,172,205**	**335,893,773**

11-1-2 Sabesp Standard Unit Price

Standard unit prices are based on the apparent stage (primary cost) and are given a number according go the type of work. They are the types of standard unit prices that are selected according the difficulty level.

A=X	X is Sabesp baseline unit price	(Works with high difficulty level)
B=X−	(Y%) Average unit price	(Works with medium difficulty level)
C=X−	(Z%) Lowest unit price	(Works with low difficulty level)

PROGRAM cost calculation was based on Sabesp baseline unit prices.

Standard unit prices include charges, taxes and general overhead expenses.
BDI (Indirect Benefits and Expenses) is usually calculated by the formula indicated below (Source: CREA – Engineering, Architecture and Agronomy Council).

$$BDI = \left\{ \left\{ \frac{(1+AC+CF+MI)}{1-(T+MC)} \right\} - 1 \right\} x100$$

With respect to that price, Sabesp issued an internal circular letter (0415/99) containing the following Board's deliberation establishing the BDI value for each type of agreement:

* Engineering services and works 33 %
* Acquisition of material: pipes, parts and electrical equipment, etc. 20 %

Below, we list the prices of components for BDI calculation for engineering works and services, where:

AC: Overhead expenses: 9.00%
CF: Interest rate: 2.68% (interest of 2.0%/month; 40-day cash flow.
MI: Work risk: 0.50%
T: Taxes: 7.65%
MC: Social charges and Profits: 8.00%
Resulting in a BDI of 33%.

11-1-3 Quantity and Unit Price of PROGRAM components (main works)

The Supporting Report provides the list of unit prices applied, as well as the basis for quantity calculation per PROGRAM component, to allow a comparison per Business Unit.
We provide below a summary of main PROGRAM components.

(1) Calculation of Quantities

Calculated for each Business Unit, based on the following data: number of occurrences of leakages, number of branch lines, network length, etc. After iteration and adjustment with the Technology,

Project and Environment Department (T), the following quantity schedule for the project has been condenses.

Table 11-3 – Calculation Base per PROGRAM component

Component	Unit	Calculation Base for Quantity
A1.1. Branch Line Replacement		
Corrective replacement of branch lines	unit	Applied to 15 M and R Business Units according to the history of leakages in branch lines repaired in the respective UN, ranging from 35% to 95%.
Preventive replacement of branch lines.	unit	Complementing the corrective replacement, it was applied in MC to some 4.3%, and in RN to some 1.7% of cost of active connections, per year.
A1.2. Replacement of networks;	km	Network length to be replaced per year corresponds to 0.5% - 1,33% of total distribution network length in priority systems in each UN.
- Branch line replacement	unit	Branch line replacement associated with network replacement was determined on the basis of network extension to be replaced and branch line density in each system.
A1.3. Branch Line Replacement – Leakage Survey	unit	Determination of number of branch lines with leakages in non-visible leakage survey was based on length of network to be surveyed, the rate of leakages found per surveyed km, and percentage of leakages in repaired branch lines of UN. Leakage rate per km ranges from 0.7 to 1.1.
A2. Leakage Survey	km	Length of network to be surveyed corresponds to 75% of total network length in M and T UNs, except RT, where the percentage is 65%.
A3.2. Non-Visible Leakage Repair (Network)	unit	Determination of number of network leakages in non-visible leakage survey was based on length of network to be surveyed, the rate of leakages found per surveyed km, and percentage of leakages in repaired branch lines of UN. Rate of leakages peer km found ranges from 0.7 to 1.1, and the percentage of leakages in repaired networks ranges from 5% to 20%.
B1.1. Replacement of High-Capacity Water Meters	unit	Annual replacement of 1/3 of high-capacity mater meters, taking into account the vegetative growth of each system.
B1.2. Replacement of Low-Capacity Water Meters	unit	Annual replacement of 1/8 of low-capacity mater meters, taking into account the vegetative growth of each system.
B2.1. Inactive inspections	unit	Quantity calculation was based on one inspection per year of inactive connections.
B2.2.1. Irregularity Control - Inspection	unit	Quantity calculation was based on the number of active connections and percentage of connections to be inspected, ranging from 0.5% to 3.5%.
B2.2.2. Installation of UMA in Irregular Connections	unit	Quantity calculation was based on the number of existing active connections and percentage of connections to be inspected, ranging from 0.5% to 3.5%, and percentage of irregularities confirmed by inspections, ranging from 4 to 30%.
B.3. Record Update	unit	Quantity calculation was based on the number of active connections and percentage of record updates to take place every year, ranging from 5% to 20%.

(2) Determination of unit price

Sabesp reference unit price were calculated by their classification into material cost and labor cost. According to the differences of PROGRAM implantation sites, we could roughly find 3 configurations to determine unit prices: number of VRPs, Boosters and DMCs, ring closing, equipment, etc.

1. MA	Equipment installed in area controlled by MA is large, as it comprise structures for water pipelines of large diameters. PROGRAM components estimated for MA include: performance of non-visible leakage survey in pipelines, installation/adequacy and calibration of macrometers.
2. Metropolitan Division - M Excluding MA	Metropolitan Division sectors experience some difficulties to implant some PROGRAM components, especially those for infrastructure. This way, branch line replacements by non-destructive method, without excavation, has been provided for.
3. Regional System Division - R	Located in the State inland, it does not have great restriction for work implantation (all executed by destructive method). Rate of work execution on sidewalks is higher than M rate.

Table 11-4 – Setting of Unit Price

Component	Unit	Item	Description of adopted unit price
A1.1- Branch line replacement	unit	Material	
	unit	Work	At M, execution by non-destructive method was considered, and at R, execution by conventional (with excavation) method was considered.
A1.2 - Replacement of networks	km	Material	Differences of percentages of PVC and ductile iron pipes used in each Business Unit.
	km	Work	Unit price comprising pipe laying and paving. At M, RM, RS and RV, 100% pavement replacement was considered; in other R Business Units, 30% of street pavement replacement and 70% sidewalk replacement were considered.
	km	Project	
Branch line replacement	unit	Material	The same as item A1.1.
	unit	Work	
A1.3. Branch Line Replacement – Leakage Survey	unit	Material	The same as item A1.1.
	unit	Work	
A2. Leakage Survey	km	Work	Except MA, which considers the leakage survey of pipelines, price is the same for all M and R UNs.
A3.1. Visible Leakage Repair in Network	unit	Material	Unit price composed by execution of repairs in ND 50 to 100-mm PVC pipes and ND 50 to 100-mm ductile iron pipes.
		Work	Except for RG, the same unit price was used for all UNs. At RG, work will be financed by own resources. Unit price considers pipe laying and pavement replacement on street and sidewalk.
A3.2. Non-Visible Leakage Repair in Network	unit	Material	The same as item A3.1.
	unit	Work	
A4.1. Sectorization (Implantation of Pressure Zones)	sector	Material and Work	Works involved in each sectorization, as well as sectorization sizes are different from one another. This way, different unit prices have been established.
A4.2. VRP (Pressure Reduction Valve)	unit	M and O	
A4.3. DMC (Measurement and Control District	district	M and O	
A4.4. Booster	unit	M and O	Works comprising each Booster implantation and the differences between motor-pump assemblies used in each sector are different from one another. This way, different unit prices have been established.
A4.5. Closing of rings in slums	unit	M and O	Applicable only to ML, MN and RS. Project and work prices were established for each Business Unit, as each closing covers different numbers of connections.
A5. Equipment	unit	Material	Unit prices were considered for 10 types of material, and each Business Unit determined its need.

Component	Unit	Item	Description of adopted unit price
B1.1. Replacement of High-Capacity Water Meters	unit	Material	Price composition considers the installation of 15% of 15-m^3/h water meters and 85% of 5-m^3/h water meters. Similar unit prices were considered for M and R.
	unit	Work	Similar unit prices were considered for M and R.
	unit	Rack adequacy	Similar unit prices were considered for M and R.
B1.2. Replacement of Low-Capacity Water Meters	unit	Material	Except for RS, all other Business Units adopted the same unit price. RS has a work shop for eater meter recovery.
	unit	Work	Similar unit prices were considered for M and R.
B2.1. Inspection of Inactive Connections	unit		Similar unit prices were considered for M and R.
B2.2. Control or irregular connections (frauds)	unit		Similar unit prices were considered for M and R.
Inspection of irregular connections	unit		Similar unit prices were considered for M and R.
UMA (Water Measurement Unit) installation in irregular connections	unit	M and O	Similar unit prices were considered for M and R.
B2.3. Regularization of connections in slums	unit	M and O	Similar unit prices were considered for M and R. At R, it was applied only to RS.
B3. Record Update	unit	Work	Similar unit prices were considered for M and R.
C1. Installation / Adequacy of Macrometers	unit	M and O	Except for MA, whose scheduled micrometers have diameters above 400 mm (installation in pipelines), similar unit prices were considered for M and R.
C2. Macrometer Calibration	unit	Work	Except for MA, whose scheduled macrometers to be calibrated have larger diameters, similar unit prices were considered for M and R.
C3. Capacity Building	unit		Each Business Unit established the training necessary for loss teams. This way, different unit prices have been established.
C4. Socioeducative and environmental actions in low-income settlements.	Settle-ment		Applied only to MO and MS.

Unit price of material is the price for delivery to the indicated place and includes product transportation and packing costs. This price is adjusted on a yearly basis, according to the financial indices established in the contract.

Labor unit price includes indirect expenses of material used in works, overhead expenses in Work Site and general overhead expenses.

11-1-4 Analysis Result

Through the analysis, adherence of each Business Unit to the estimate price was confirmed.

11-2 Borrowing Plan

Given the need of a great volume of funds to be invested in expansion and improvement of facilities, Sabesp has raising funds from financing by local and foreign public funds to implement the several projects.

Since Sabesp constitution, the PROGRAM is its first long-term project (11 years) to fight water losses. In this sense, negotiations have been made with JICA for a Yen (¥) loan adequate to the scope of a

program like that, as it offers an interest rate and term consistent with a long-term program. However, the Yen loan may only be applied to finance investment in facilities, without covering the costs of expropriations, operations and maintenance of facilities.

As previously established, funds were analyzed against the cost of each project. Usually, the cost estimate breaks down the components of internal and external debt. However, as Sabesp is a mixed company where the Government of the State of São Paulo owns 50.28% of its capital stock, and is managed according to the Corporation Law, the loan granted by the Japan's Official Development Assistance – ODA will be considered as Sabesp revenue and external debt. In addition, debt will be paid out according to the Brazilian laws related to income and labor taxes.

As mentioned previously, the result of shown in Table 11-5. To raise funds for the PROGRAM, Sabesp requested from JICA a loan corresponding to 85% of the PROGRAM price, the remaining funds (15%) to be financed by own resources (Government's counterpart) Total investment of JICA loan converted into Yens will amount approximately to ¥ 48,000,000,000 (October 2008, COFIEX Consultation Letter. US$ 1=R$ 1.85=¥100).
Calculation of estimated cost shown in Table 11-5 is based on Sabesp standard unit cost prevailing in October 2007.

This study has been completed on the basis of physical quantities and costs estimated by Sabesp in its Corporate Water Loss Reduction Program.

We emphasize that the base date of costs considered for PROGRAM actions is October 2007. In addition, at the preparation of the consultation letter, the exchange rate considered for local currency conversion (R$) into Yens (¥) refers to October 2008.

Assuming that the expected implantation of actions and respective financial execution will be based on average prices of 2011, 2012 and 2013, it will be necessary to update the estimated variations of such amounts for the application period.

In this sense, amounts (absolute and relative) related to physical contingency reserve and price variation will be established at the "Appraisal Mission", based on estimated to be provided by Sabesp.

Table 11-5 - Cost Estimate for JICA Stage (Unit: R$1,000)

PROGRAM Breakdown	Total Cost (R$)
Cost of construction	1,007,722.00
Consultancy	30,000.00
Energy Efficiency Program	29,000.00
Total	**1,066,722.00**

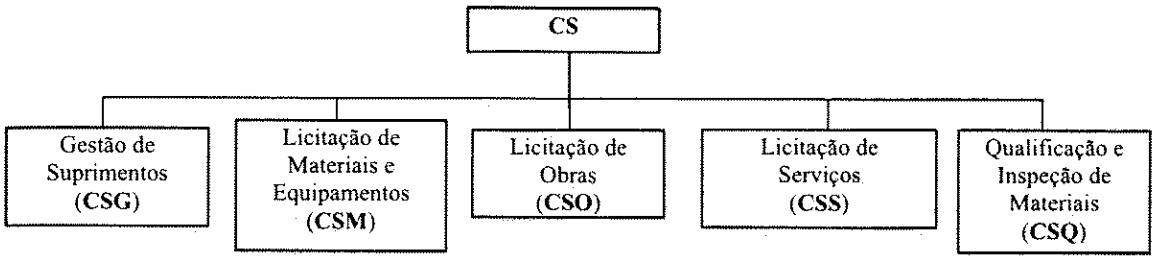
Source: Prepared by F/S JICA Mission.

Chapter 12 Plan for Supply/Purchase of Plant, Equipment and other Materials, and Work Execution Plan

12-1 Supply/Purchase of Plant, Equipment and Other Materials

12-1-1 Organization

Usually, volume and quantity of material uses by Sabesp are very great. This way, they are mostly controlled by the Superintendence of Supply and Strategic Contracting (CS) subordinated to the Corporative Management Division (C).



CSG 34 employees CSM 28 employees CSO 10 employees
CSS 13 employees CSQ 50 employees

With respect to material, plant and equipment, employees assigned to each department are entrusted with making procurements, selecting the suppliers, checking and confirming the quality of materials for delivery to each Business Unit.

12-1-2 Supply/Purchase Methods

In general, 2 purchase procedures are followed:

(1) Shopping

Material and equipment, such as polyethylene pipes, cast iron pipes, water meters, etc. acquired under procurements, are supplied by several companies, given the difficulty of a single supplier to meet the required demand on schedule and at the unit price specified in the bidding documents over the period of 1 year.

To purchase those materials, Sabesp adopts the Shopping procurement method, which is a special procurement method provided in federal laws 8,666/93, as amended, and 10,520/02, the objective of which is to quote the prices of consumption goods selected by electronic bidding for future contracts.

The Superintendence for Supply and Strategic Contracts (CS) shall coordinate and carry out the bidding process using the method referred to above, including the preparation of bidding documents, conduction of bidding, selection of suppliers, contracting and quality inspection.

(2) Usual Supply/Purchase Methods

For low-demand material, such as pressure reducing valves and booster pumps, orders are sent to suppliers quoting the lowest price in the bidding process.

In principle, this supply will also be controlled by CS, but if quantity is reduced, the relevant Business Unit may make the bidding and the purchase.

Regarding the booster pump, supply/purchase is made though the purchase of the complete equipment, but it may occur that CS will purchase the component parts and contract assembly services for them.

In any of supply/purchase procedures mentioned above, transportation costs will be included in contract prices. For service units in remote locations, equipment or material may bee stored in Sabesp warehouse and then transported to the Business Units by Sabesp itself.

12-1-3 Bidding Process

Sabesp classifies the bidding process into 4 categories, according to the purchase price:

Bidding Process	Construction Work	Materials and Services	Notes
A. Waived	Less than R$ 30,000.00	Less than R$ 16,000.00	Bidding is usually waived.
B. Invitation	Less than R$ 150,000.00	Less than R$ 80,000.00	
C. Shopping	Less than R$ 1,500,000.00	Less than R$ 650,000.00	
D. Competitive Bidding	More than R$ 1,500,000.00	More than R$ 650,000.00	International Competitive Bidding, if applicable

In case of waive of bidding, at least three (3) firms must participate, according to Law 8666/93, which governs procurement process in Brazil There is also an internal restriction of Sabesp, which establishes that each Business Unit may only make a bidding process until Class C.

12-1-4 Quality Inspection

CS shall also check the quality of equipment and material supplied.

After procurements according to technical specifications established by the Division of Technology, Projects and Environment, equipment and material are acquired and their manufacture process as followed up in the factory by Sabesp employees, followed by a quality inspection by Sabesp employees at the time of their delivery.

12-1-5 Acquisition of material and equipment during JICA Stage

It will be based on the acquisition method adopted by Sabesp.

12-2 Work Execution Plan

12-2-1 Studies of work execution method

Contractors hired by Sabesp shall honor their contracts by applying all available means, such as labor, material, machinery, resources and work execution method.

Parts related to execution techniques, such as material, machinery, execution method, etc. have been considered.

Works, pipe laying and handling of asbestos cement piping in public ways will be addressed in Chapter 16 – Preliminary Environmental Study.

12-2-2 Studies related to work execution technique according to components (actions)

There are several PROGRAM components, but we will investigate the most significant of them such as:

(a) piping replacement works;
(b) branch line replacement works;
(c) pressure management components (sectorization, Booster installation, VRP/DMC installation);
(d) water meter replacement.

(1) Piping renewal works

a) Method

Works carried out by Sabesp in São Paulo public ways are subject to restrictions to use of destructive methods. Depending on the case, the use of non-destructive –MND methods is obligatory. This way, for replacement of facilities, the "Pipebursting Method" is recommended (replacement method by dynamic bursting) – a type of MND method. Material is polyethylene, and whenever gauge is not increased, this method is widely used. However, other methods may be used, such as replacement by insertion ("Splining") and directional boring, among others, being at Sabesp discretion the selection of the best practice to be implemented at the execution of works.

Table 12-1 – Types of methods

DESTRUCTIVE METHOD – "MD"	Replacement Method by Destructive Method (cast iron and Double PVC Network)
NON-DESTRUCTIVE METHOD – "MND"	Replacement by Dynamic Bursting (Pipebursting Method)

b) Material

We will not provide details on the polyethylene specifications, as they are already included in the company's standards published in 2006 – NTS 194 (Polyethylene pipes for distribution network,

pipelines or pressurized sewerage networks)

Material is high-density polyethylene recognized under code PE100, external insertion method regulated by ISO/TR9080. This material is known as "Higher Performance Polyethylene" "HPPE", for high qualitative performance and good balance, which does not pose problems.. It is a material whose factor of deterioration by *"carbon black"* additive has been solved.

c) Method

Polyethylene pipes for water distribution networks are made in bars of variable lengths depending of their diameter. However, the junction of such bars is the critical factor for the development of this activity and should be made according to the best practices to ensure quality and minimize as much as possible the need of intervention (maintenance).

The process was inspected on site, when it was noted that it is it being carried out in good conditions by "Heat Fusion" system, and basically there are no problems.

Like the water flow test, pressure and leakage test are also required. It is being tried, deliberated and determined in pilot-area of Eficaz Project to establish the standard procedures. It is desirable that pipe elongation for water flow test shall not exceed 500 m.

Junção por fusão

Deslocamento e transporte de tubos alongados

Deslocamento e transporte de tubos alongados

Table 12-2 – Example of specification of water flow test in pipe

Items		Standard Value	Note
Hydraulic pressure test	Pressure value	0.75 MPa	
	Expected pressure time	More than 5 min	
	New pressure	0.75 MPa	
	Pressure reduction:	0.50 MPa	
Evaluation criteria	Time	1 hour	Vacuum maintenance time
	Pressure at evaluation time.	0.40 MPa	Pressure reduction: less than 20%

Note: Below 0.40 MPa, a new evaluation is made after 24 hours. At 0.30 MPa, it shall be rejected.

(2) Branch Line renewal works

a) Method

In São Paulo, in principle, as provided in the municipal law, work should be carried out by non-destructive method. Non-destructive (MND) methods are not subject to certain trademarks or restrictions. Even in case of a different method, a non-destructive method recognized by Sabesp will be accepted. In the city of São Paulo, there are several restrictions to the use of destructive methods, especially for services and works in public ways. A specific law regulated that activity.

For branch line replacement, Sabesp uses, in some 80% of cases, a non-destructive method – MND, mostly directional drilling (Directional Boring).

b) Material

Polyethylene pipes are indicated by 2006 internal standard – NTS 048 (Polyethylene pipes for water branch lines in buildings) and are manufactured according to ABNT NBR 15561 – Systems for water distribution and conveyance and pressure sewage transportation; and ABNT NBR 8417 – Systems for water branch lines, and the following NTS.

With respect to standards, material characteristics and specifications comply with the following NTS:

- NTS 049 (Polyethylene – Density determination by displacement);
- NTS 050 (Polyethylene – Determination of oxidation induction time (OIT));
- NTS 051 (Polyethylene Pipes – Determination of dimensions);
- NTS 052 (Polyethylene Pipes – Determination of tensile strength);
- NTS 053 (Polyethylene Pipes – Determination of resistance to internal hydrostatic pressure);
- NTS 054 (Polyethylene Pipes – Determination of circumferential retraction;
- NTS 055 (Polyethylene Pipes – Determination of crushing strength);
- NTS 056 (Polyethylene Pipes – Determination of dimensional stability);
- NTS 057 (Polyethylene Compound PE – Determination of pigment dispersion);
- NTS 058 (Polyethylene Compound PE – Determination of lampblack content);
- NTS 059 (Requirements for welders, installers and supervisors of works using polyethylene pipes and polyethylene or polypropylene fittings);
- NTS 060 (Welding on polyethylene pipes and fittings by thermofusion (fusion welding))).

(3) Sectorization

a) Sectorization: DMC – Measurement and Control Districts

The Operational Development Program of Metropolitan Division has a subprogram titled "Implantation of Operation Districts and Measurement and Control Districts". This guide provides the implantation and monitoring concepts and techniques, as well as descriptions of studies, planning, operations and maintenances, based on which relevant activities are planned and performed.

b) Main aspects of sectorization implantation plans: installation of pressure reducing valve – VRP,

Booster installation and DMC implantation.

As the objective of this component is to control water distribution and manage the pressure, the installation of a pressure reducing valve, booster and DMC after the preparation of the sectorization plan or simultaneously would be desirable.

DMCs will be implanted when the sectorization issue is resolved, what also applies to VRP and Booster implantation. Booster implantation may also meet the specific demand of distribution system.

c) Delimitation of areas (slum rings)

Delimitation of areas (rings) should be clearly established on the basis of the hydraulic analysis. However, in some areas or distribution networks, its functions are not well established and some maladjustments may occur. This way, an area delimitation plan (rings) with targets established by hydraulic analysis is necessary, which could correct any maladjustments and offer a greater accuracy and field collection of updated data and their organization.

d) Evaluation of sectorization activities

Evaluating a sectorization requires the collection of pressure, quality and water volume data. Based on such data, the operation of a sectorized area must be evaluated through a checklist. Results obtained should be analyzed by comparison with pre-sectorization data.

(4) Replacement of water meters

a) Quality plan for water meters to be replaced

Between 2011 and 2013, it is schedule the replacement of 40,216 high-capacity water meters and 2,345,313 low-capacity water meters. Since there are enough water meter suppliers in Brazil so it will be possible to ensure the planned quantity of water meters, either by increasing the number of suppliers, or by adjusting (increasing) its production. As compared to the average of 500,000 replacements occurred in 2008, that quantity is not expected to cause any problem.

b) Water meter specification

The PROGRAM provides for the use of Class-B water meters, in conformity with specifications of ISO 4064-1 2004, ISO 4064-2 2004, ISO 4064-3 standards (general specifications for water meter and hot water meter), which will not represent any problem.

c) Water meter replacement services

Water meter replacement is usually made in the form of customer service or commercial activity. It is a routine activity that will bring no problem if performed in the form of outsourced service. Under Japanese methodology, in addition to water meter replacement a survey is made to update the records, destination of water use, occurrence of leakages in the real estate, and instantaneous pressure

measurement on the rack to improve the quality of service provided to consumers of users. Adoption of this methodology by Sabesp will require the capacity building of professionals.

12-2-3 Plan for each component and notes on execution

(1) Outsourcing

For water loss reduction activities formally started in 2004, many companies use outsourced services: from piping renewal and rehabilitation works to survey of non-visible leakages, water distribution control, water meter installation, inspection and replacement services, etc. Even from the view of full control of work quality, which will be explained in item 14-1, many technicians need share their responsibility.

Actions included in JICA Stage will focus predominantly on works to be supervised by Sabesp. Companies qualified to execute the works, in São Paulo Metropolitan Region, inland and coastal areas of the State of São Paulo, have been listed and evaluated by this JICA Mission.

Another fact that was observed is that there no problem with respect to the number of contractors available to execute the planned volume of works.

(2) Estimate of number of workers and supervisors for JICA Stage activities

JICA F/S Mission considered the number of workers required according to each component activity and its grouping according to the classification. Table 12-3 shows an estimate of number of required workers and supervisors, who will be engaged in the work of replacement of Metropolitan M networks.

Table 12-3 – Projection of number of workers for Metropolitan M Works

General Lines of Components					Total required personnel per month						
					M	Group		Volume of Work	Number of Supervisors		
No.	Component	JICA Stage		Type of service	Number of staff	Number of teams	No. of persons per team	Daily productivity per team	Number of supervisors	Number of supervisors per team	
A1-1	Branch line replacement	390.736	unit	Works	871,4	79,8	10,9	14.0 units	79,8	1	All activities
A1-2	Network replacement (km)	477	km	Works	296,0	11,3	26,2	100.0 m	22,6	2	All activities
A1-3	Branch Line Replacement – Leakage Survey	39.095	unit	Works	101,3	9,3	10,9	9.6 units	9,3	1	All activities
A3-1	Leakage Repair in Network	45.334	unit	Works	86,6	10,8	8,1	9.0 units	10,8	1	All activities
A3-2	Non-Visible Leakage Repair (Network)	5.434	unit	Works	6,4	0,8	8,1	9.0 units	0,8	1	All activities
									123.3		persons

To manage Metropolitan M work sector, 123 fixed persons will be required. Whether management is direct or outsourced, the importation aspect is the capacity of adequate control at execution of works.

Work planning is not only that made by the contractor responsible for the execution of works. With Sabesp strict control of the whole work process, numeric control and planning capacity, PROGRAM during JICA Stage will become an undertaking worth of its valorization.

Chapter 13 PROGRAM Implementation Schedule

History of loan application to date is shown below.

Time	Description
August 2008	The Government of the State of São Paulo, Mr. José Serra mentioned the application for a loan for the Program during his trip to Japan.
September 2008	Trip of Mr. Marcelo Salles, Director, Technology, Projects and Environment of Sabesp to Japan, when the first official application was made.
December 2008	Visit to Brazil by JICA Preparatory Survey Group.
April 2009	Approval of Loan Application by the Legislative Assembly of the State of São Paulo.
April 2009	Approval of consultation letter by COFIEX.
April-June 2009	Preliminary JICA Cooperation Study (Feasibility Study)

Figure 13-1 shows the implementation schedule after the Feasibility Study.

After surveys carried out under this Feasibility Study (F/S), we present in Table 13-1 the Implementation Schedule during JICA Stage.

It can be clearly noted that it is extremely difficult that said schedule is implemented in the beginning of 2011. Sabesp requested the visit of JICA Approval Mission to occur only in the beginning of 2010, especially for issuance of "Pledge" as soon as possible, to allow the procedures required for the following stage to speed up: Exchange of Notes (E/N), approval by the Brazilian Senate (Congress), and signing of the Loan Agreement (L/A).. Also, with the "Pledge", it will be possible to speed up the selection of Management Consultant and the companies that will participate in the PROGRAM. Assuming that 2010 is an election year in Brazil, several factors will influence administratively. To allow the execution of JICA Stage works to start in the beginning of 2011, it is necessary to better evaluate and confirm beforehand the implementation of schedule mutually by JICA and Sabesp.

For the specific case of Management Consultancy, it is possible to advance further the selection of firms through prequalification (P/Q) under Sabesp responsibility, regardless of "Pledge". However, only after obtaining the "Pledge", JICA will issue its "No-Objection" to the procurement for selection of consulting firms. If the L/A is not signed, the effect of "No Objective" will become null and void. The related agreement will be signed only after L/A signing.

Selection of contractors, given to the fact that Sabesp will make simultaneously the qualification and commercial proposal, will only be possible after the "Pledge", given the required approval by JICA. All information and data necessary for execution of works will be described in detail in the Bidding Documents.

We declare that the determination of an execution period of 3 years is feasible given the results obtained by Sabesp in the past.

We will refer to the Supply Agreement package that will make the PROGRAM implementation possible in an efficient manner in Chapter 14 – Organizational Framework.

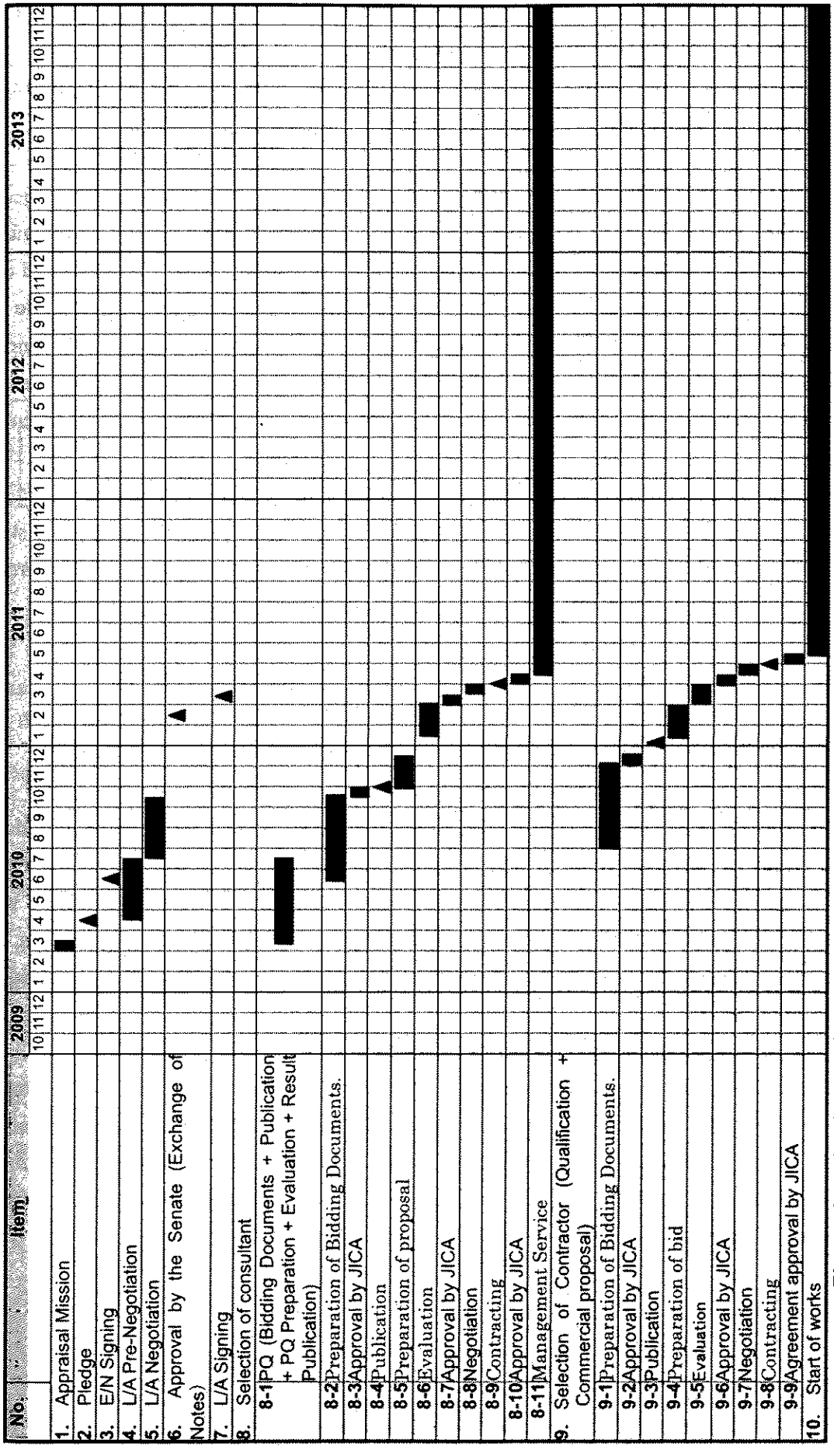


Figure 13-1 – Implementation Schedule During JICA Stage (Assuming that the Approval Mission visit will occur in 03/2010)

Chapter 14 Organizational Framework

14-1 Organization and Framework

At SABESP, the organization framework in charge of management of basic sanitation service is divided into Metropolitan Division (M), responsible for the Greater São Paulo Region, and Regional System Division (R), responsible for all other regions. The Metropolitan Division is constituted of 5 Business Units, in addition to the Metropolitan Water Production Business Unit (MA), while the Regional System Division (R) is constituted of 10 Business Units. Each business Unit has autonomy to do business. To adjust to that situation, SABESP organizational framework is at transition stage, changing from a management system decentralized into Business Units to a regionalized management system.

Given the organizational structure for implementation of this PROGRAM, a comparative study between the PROGRAM implantation according to JICA guidelines and its implementation according to SABESP policies will be developed.

(1) Relevant Bodies
JICA Stage aims to cover all SABESP Business Units, i.e., 15 Business Units comprising 366 municipalities.

For a project financed by a Yen loan, it is desirable that a single body be responsible for all procedures associated with its implementation, from procurement and evaluation stage to contracting, management of works in progress, control of results, management of resources, and contacts with JICA to obtain its approval, etc. To implement another Sabesp program financed by a Yen loan, the Environmental Improvement Program for the Coastal Area of the State of São Paulo, a specific agency was established.

For this PROGRAM, because the existence of several Business Units, it is desirable that a Project Management Unit-PMU be established (hereinafter referred to as PMU or UGP). That agency shall be responsible for the PROGRAM implementation and the only liaison between Sabesp and JICA for matters related to this PROGRAM and the Loan Agreement to be signed. Sabesp intends that UGP is a structure within the Superintendence for Operational Development - TO.

UGP shall be responsible for:

- Development of Standard Bidding Documents for contracting;
- Budget control;
- Follow-up of progress of Contracts and schedule control;

- Request for JICA approval of all related documentation.

Figure 14-1 below shows the structure of the Organizational Plan envisaged by Sabesp.

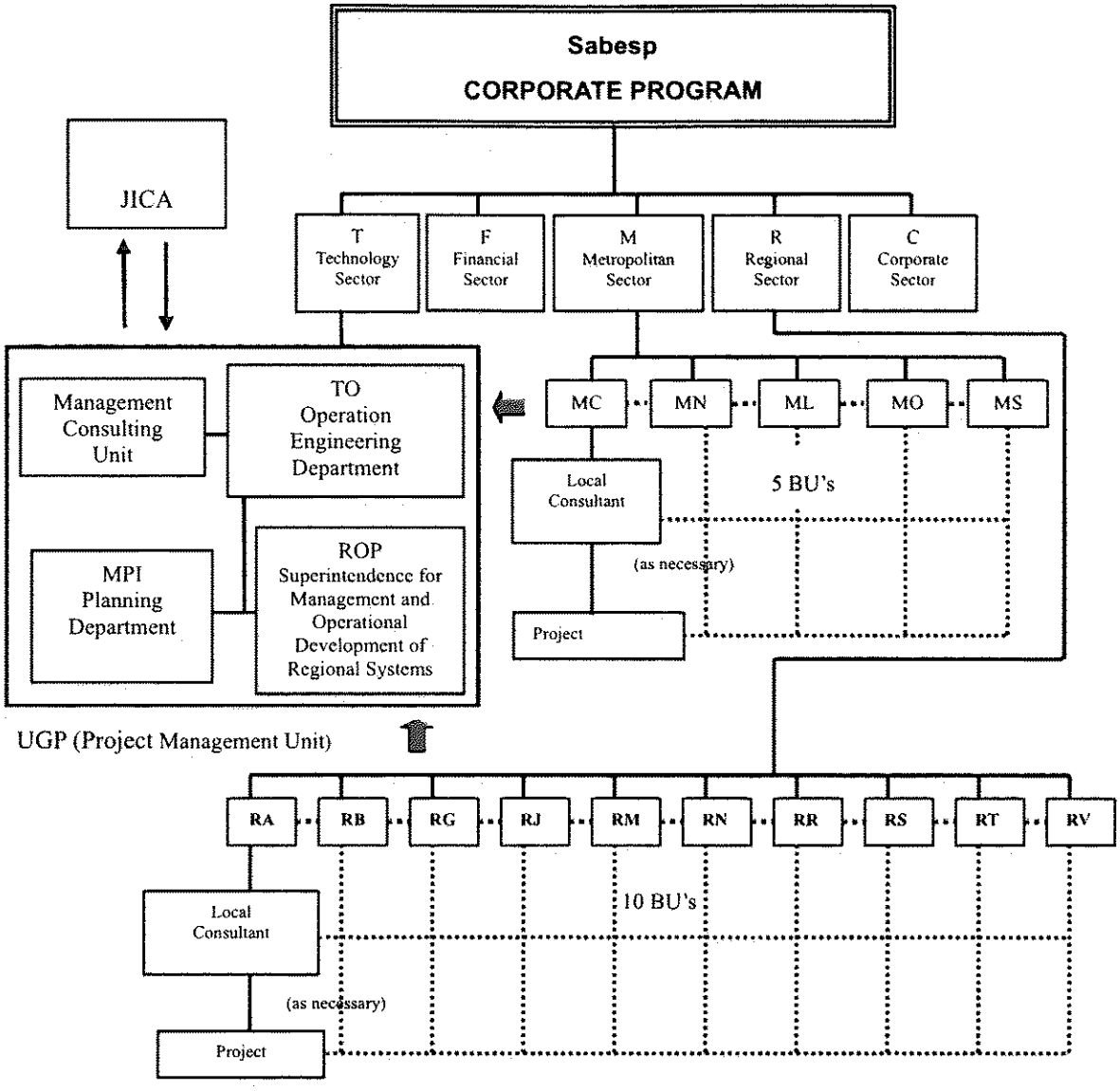


Figure 14-1 – Structure for PROGRAM Implementation

(2) Procurement

JICA guidelines consider that procurement unification under UGP is desirable. Sabesp, however, manages a vast area equivalent to 2/3 of the Japanese territory and, as mentioned above, relies on 15 Business Units that have a high management autonomy level. Procurements are conducted at Division level. Procurement levels are classified into Commercial Sector (replacement of water meters, organization of databases, actions against theft of irregular connections, etc.), and Engineering Sector (replacement of networks and branch lines, detection of leakages, etc; The PROGRAM anticipates a greater, more specific number of procurements. In light of that situation, it is being planned that procurement package determination and execution be entrusted to each Business Unit, at the same time that it is being planned that procurements be managed at Business Level, rather than Division level.

With respect to UGP position in relation to each Business Unit, UGP shall prepare the Bidding Documents, while each Business Unit will conduct the bidding process, its evaluation, negotiation and contracting. Notwithstanding the procurement is conducted by the Business Unit, UGP shall be responsible for all coordination and submission of request to JICA for approval.

(3) Procurement Method

According to JICA guidelines, procurement shall be in principle conducted by international competitive bidding. At Sabesp, however, most purchases of material and equipment is made by Shopping conducted by the Superintendence of Supply and Strategic Contracting (CS). The international competitive bidding is also included in that category. This PROGRAM provides that procurements be made by that method. If the procurement is made by the Business Unit, Sabesp expects it to be at national level (NCB), taking into account the size and number of procurements.

(4) Determination of the Maximum Bidding Price Limit

JICA guidelines do not agreement with the disclosure of estimated price prior to bidding process. Nevertheless, although it does not recommend, JICA shall not make any objection if the borrower shall wish to disclose the estimated price, as provided in the "Guidelines for Procurement Supply under Japanese ODA Loans", as follows:

> *"7 – To emphasize free competition among bidders, JICA has not agreed to the idea to disclose the estimated price for the contract before the bidding. However, some Borrowers and International Financial Institutions have recently come to require the disclosure of the estimated price in view of valuing maximum transparency in the process. Although JICA does not encourage the disclosure, if the Borrower wishes to disclose the estimated price before the bidding, JICA may not oppose the Borrower's position".*

In spite of adopting the "minimum price" principle to select the successful bidder, it prefers that the

estimated price (maximum ceiling) be disclosed. In theory, this affects the conditions of fair competition, but in Brazil, by establishing the maximum price limit, it has the effect of avoiding a contract closing at an unexpected price.

(5) Consultant's Role

The organizational framework provides that management consultant should report directly to UGP. The management consultant will support UGP for the management and control of progress of works and management of funds in each Business Unit. With respect to execution of project in each Business Unit, that is, contract management, execution of works and effects of water loss reduction, each Business Unit will assume its control and will be responsible for related results.

For projects financed by Yen loans, it is recommended that the consultant participate in the preparation of the "Bidding Documents" and "Evaluation". Sabesp, however, may request support for the preparation of the bidding documents, but will not allow the consultant's involvement in "evaluation", given the need to "maintain the confidentiality" and "the responsibility to report to the Government of the State of São Paulo".

(6) Payment Methods

There are the following methods for payments under Yen loans.

(a) payments for reimbursement,

(b) transfer, or

(c) through Special Account.

For this PROGRAM, taking into account that many agreements will be entered into, the most recommendable for of payment will be through Special Account.

14-2 Inspection

14-2-1 Status of Sabesp Inspection

Control of Sabesp water distribution activities is managed by the 15 Business Unit (366 municipalities), each of which operates as an autonomous unit.

Services are inspected by sampling, in such a way that this sampling will represent statistically the view of the whole group. For example, the quality of performance of branch line and pavement replacement services is checked. Inspection of works during JICA Stage will be established as follows:

(1) Detection of non-visible leakages

Sabesp will make a sampled survey in areas allocated to outsourced service providers, to detect one or more leakages (this detection is restricted to Sabesp), followed by a comparison after the completion

of survey by the contracted firm. In case of any difference in results, a punitive action provided in contract will be taken, ranging from a new survey without any cost to Sabesp to the reduction of any amount payable for services provided.

(2) Replacement of branch lines

In case of replacement of branch lines and pavement rehabilitation works, sampling inspection is made by Sabesp as provided in the "technical control" clause of contract.

t will be checked whether services have been fully completed in the respective site. With respect to replacement of branch lines and pavement rehabilitation, Sabesp personnel should be present to the respective sites. According to sampling technique, the "technical control" clause is also included in the service agreement.

Items to be checked for "technical evaluation" include:

- If they comply with NTS "Sabesp Procedure for Execution and Technical Specification";
- If the municipal regulations are being complied with.

On a monthly basis, a contractor's evaluation report will be submitted to Sabesp, based on technical indicators (TI) prepared by Sabesp representative or the supervisor of contracted works.

Such "technical indicators" include:

a: Analysis of sample of earth and sand used to fill excavations; analysis of soil of repaving components.

b: Inspections of services in progress. If they are being properly performed from technical standpoint. Checking if the safety standards for activities are being satisfactorily followed.

c: Inspections of services after completion. If services have been performed technically in accordance with specifications, and if results have been fully accepted.

d: On-site inspection of contractor's facilities (material yard, warehouse, office, dining room, etc.)

e: Examination of employment relationship of contractor's workers.

f: Examination of qualification certificates of contractor's workers.

g: Inspection of work uniforms and safety equipment (if the standards for "Individual Protection Equipment" (IPE) are being complied with.

h: Evaluation of contractor's vehicles and equipment assigned to the works.

(3) Qualification of Inspector

Inspection should be predominantly by randomized sampling. At result stage, the presence of a Sabesp employee will be required. During JICA Stage, inspections will be made in a similar manner. Inspection will be made by a Sabesp employee or a hired firm.

To perform inspector's duties, the Sabesp employee should have completed the obligatory training and performed related activities for at least 6 months. Training content is established by Sabesp.

A certificate of qualification issued by public entities approved by Sabesp', such as SENAI (backhoe operations, network works, etc.) shall be required from contractors' employees. In addition, Sabesp has praised ISO 9001 and ISO 14001 certifications. With respect to contractors' safety control, a periodic inspection will be carried out according to OHSAS 18001 standard.

14-2-2 Inspection under the PROGRAM

No Business Unit has plans to modify its current inspection framework or procedures.

Sabesp is structuring a capacity-building program, which will include capacity building for inspection services. As such, inspection procedure should be reviewed, as well as its framework, as necessary. Such updates are expected to be implemented during the execution of the PROGRAM.

14-2-3 Future Issues and Respective Actions

(1) Future Issues

As far as we know from Eficaz Project with respect to inspection of branch line replacements, it is possible to note the following improvement items:

- Most severe inspection of excavation size;
- Most effective inspection of connections (most effective control of pipe laying);
- Use of coating to protect the pipe, given the excess of rubbish in buried piping environment;
- Review or current tightness test procedure;
- Review of disposal of excess earth and filling material (earth, sand and other material from excavations);
- Inspection of earth filling process (method of surface compaction);
- Inspector's duties;
- Review of form of preparation of *"As Built"* drawing and update of records.

(2) Interactions with Eficaz Project.

With respect to the PROGRAM, issues of greatest concern for Eficaz Project Team and the Feasibility Study Mission may be summarized into:

a) how to implement the PROGRAM without reducing quality, and in a way to increase quality;
b) ensuring an appropriate inspection by Sabesp.

As already pointed out by Sabesp, the major causes for leakages are:

a) poor quality material,
b) poor quality of performance of services,

c) inspection constraints.

Regarding cause a), Sabesp has already implanted material improvements and standardization. At the implementation of PROGRAM, material recommended by Sabesp standards will be used. With respect to issues indicated in b) and c), strengthening of capacity building currently applied to Eficaz Project is confirmed.

Business Units are fully aware of the need of "standardization of methods for execution of services, works and inspection.

Structuring a capacity building system focused on performance of professional services is part of Eficaz Project scope. Methodology currently adopted includes the cross-participation of the company's representatives, in addition to contribution from Japanese experience. In addition to training to improve the quality of performance of services, capacity-building courses for inspectors will also be offered.

One of Eficaz Project commitments for up to July 2010 is the implantation of at least ten capacity building courses, provided that, at least courses for standardization of methods for replacement of branch lines and inspection shall have been offered to employees responsible for the performance of such activities, whether Sabesp own personnel or outsourced personnel, by the start of JICA Stage.

It has already been identified that a critical aspect for the PROGRAM is to ensure that the contents of Sabesp procedures and guidelines are applied to fieldwork. Although ABEND classification examinations are excessively rigorous, the market is ready to meet the demand generated by Sabesp for non-visible leakage survey services.

There is also the assumption that Sabesp employees will make the inspection. However, the company has reduced its staff for the purposes of administrative rationalization, and hiring new technicians for PROGRAM inspection is discarded.

Inspection outsourcing would require its supervision. By considering such issues, the Eficaz project will continue to establish a training framework for "inspection".

14-2-4 Recommendations from the Feasibility Study Mission

(1) Inspection Framework

Assuming that under the PROGRAM services and works will be carried out by outsourced labor and with the objective of establishing the standards for execution of such services and works, structuring the inspection becomes a necessary factor, regardless of the volume of activities or works.

Under the PROGRAM, tests will be introduced to check tightness, methodology for recording the work in the form of photos, which had not been implemented though provided in NTS. For understanding, identification and sharing of the relation between those two aspects, items that need to be controlled at executive level will be described.

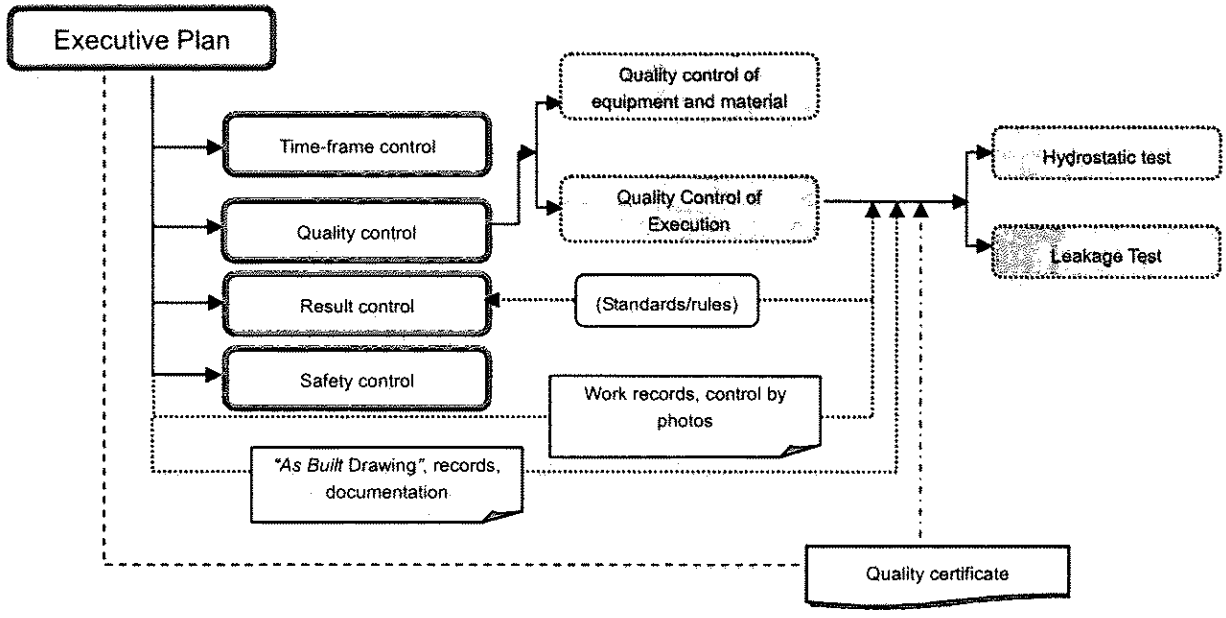


Figure 14-2 – Relationship in executive control plan

(2) Reference specification for Hydrostatic Test and Leakage Test for Execution Quality Control

In general, regarding the quality control, the following five items can be mentioned:

c.1) Criteria for piping material quality,

c.2) Criteria for cement and concrete material,

c.3) Criteria for foundation and stake material,

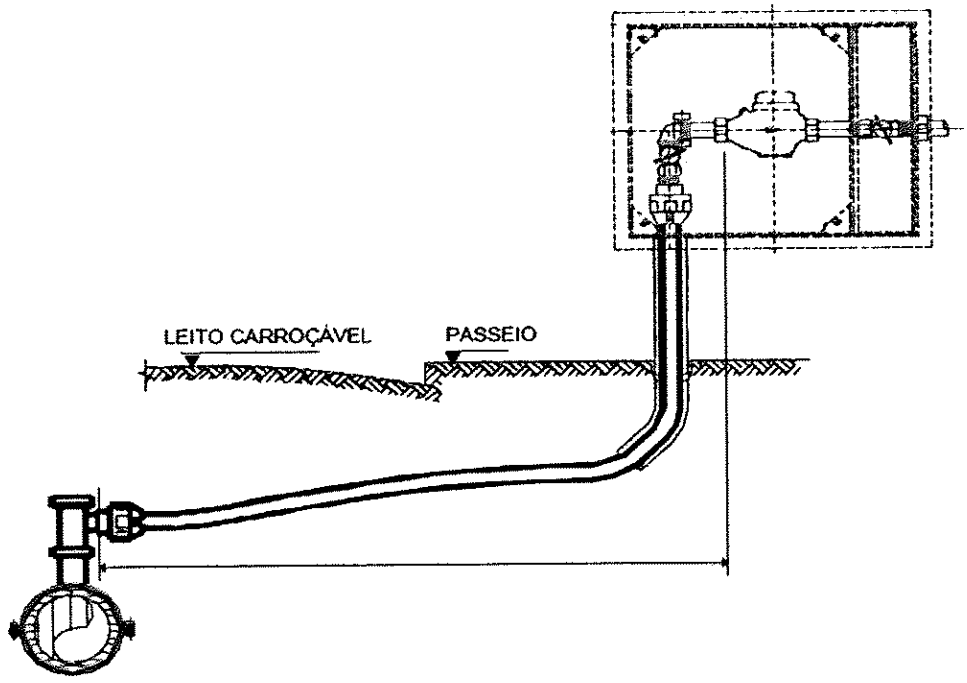
c.4) Inspection of joint, welding, painting and coating quality, and

c.5) Hydrostatic test and water quality test.

A) Hydrostatic or Tightness Test:

This item addresses the hydrostatic test and the hydrostatic test included in water quality test. Hydrostatic test is like a water flow test, which is performed in lieu of test by maximum dynamic water pressure. The description adopts the branch line as an example. Recommendations are contained in training teaching material of Eficaz Project.

Test is made in the section between the water meter installation point and network water intake (1).



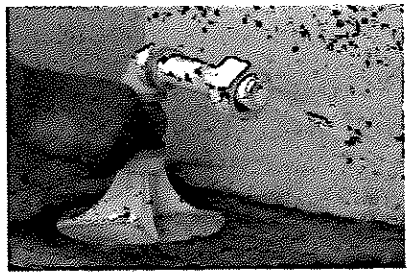
(1)

As a general rule, the branch line should be submitted to a pressure of 0.75 MPa (~75 mca) in a pressure test pump, a value that should be exceeded to avoid damaging the piping. This pressure should be maintained for at least five minutes.

Procedure:

1st Step: *Water discharge for cleaning*

Upon completing the installation/replacement of branch line, discharge water for cleaning and removal of air from piping by opening the water intake valve and draining the water with the water meter disconnected (2).

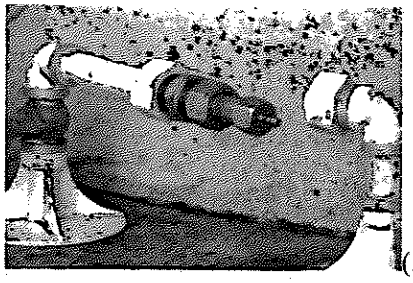


(2)

Volume of water to be drained will depend on piping length and diameter. Allow water to run off for 10 seconds or until water becomes limpid.

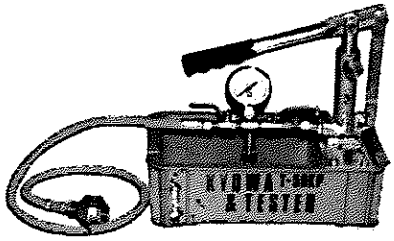
2nd Step: *Test at network pressure (prior test)*

Install the adapter to the end of pipe.



(3)

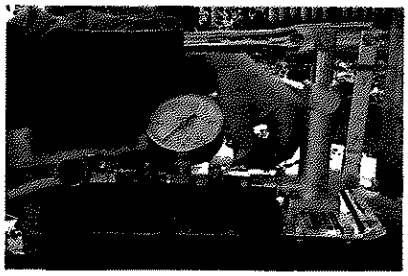
Connect the pressure test equipment (4) to installed adapter (5).



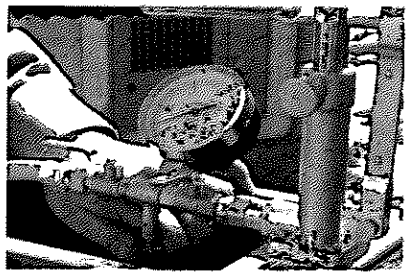
(4)

(5)

Close the water discharge valve in the equipment (6), open the water intake valve in the network and drain the air by opening the valve located below the pressure gauge (7).

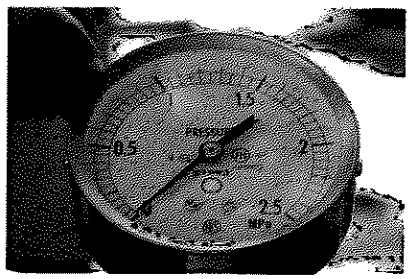


(6)



(7)

Check the pressure. Close the water intake in network. Observe pressure variation in the pressure gauge (8).



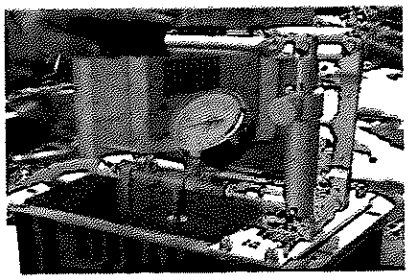
(8)

Check, through this test, the occurrence of leakages in branch line or fittings.

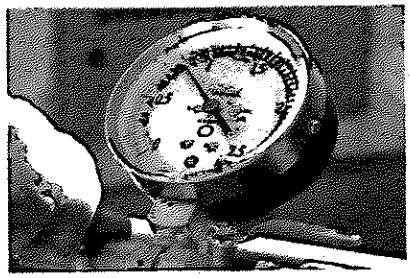
3rd Step: *Test at a determined pressure*

Drain the air again (7) and keep the network water inlet closed. Increase the pressure gradually by

driving successively the equipment lever (9) until the pressure reaches 0.75 MPa (10).



(9)



(10)

It is possible that pressure will decrease quickly initially. In such a case, move again the lever until the pressure returns to 0.75 MPa. Repeat this procedure until the pressure stabilizes at that value.

If, after several stabilization attempts, the pressure shall fail to stabilize at 0.75 MPa, it is possible that air is entering (air bubbles) the system, or the network water intake has not been fully closed, or some leakage is occurring at equipment - branch line connection. In such a case, new tests should be performed.

Consider the time when pressure stabilizes as the actual start of test. Observe the pressure variation at a minimum interval of 5 minutes.

Note:

Polyethylene pipe is flexible. For that reason, it has the characteristics of expanding in case of pressure increased. As such, pressure may decrease during the test, even if there is no leakage; Pressure variation will depend on the composition of pipe material, local temperature, diameter and length of piping.

Decision on acceptance of branch line installation:

Item		Criterion	Acceptance
PRESSURE TEST	pressure	0.75 MPa	**During the observation period, pressure may not reach levels below 0.60 MPa (drop of up to 20% of test pressure)**
	time	5 min.	

Note: Pressure of 0.75 MPa should be avoided during tests, as it could damage connection joints.

(3) Reference specification for result control criteria (criteria for photo control in work)

The main aspect of result control is checking and recording data, such as measurements and laying position, i.e., checking whether the work was executed according to project documents and established criteria. This item will address the control of results of branch line installation service.

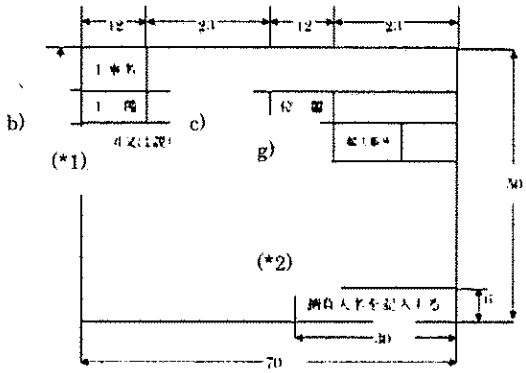
a) Confirmation at a meeting the quantity and position of work photos.

b) Classification of work photos.

Work photos should be classified as follows:

Work Photos	①	Photos before the start and after completion of work
	②	Photos during execution period
	③	Result Control Photos
	④	Photos for inspection of work material
	⑤	Quality Control Photos
	⑥	Safety Control Photos

c) Items to be placed on the small worktable
- a) Name of work
- b) Type of work
- c) Position (measurement points)
- d) Project measurements
- e) Real measurements
- f) Schematic drawing (format)
- g) Number of work.



(*1) Fill with schematic drawing or explanatory notes.
(*2) Fill with the contractor's name.

(4) Contents per photographed item

① Photos before the start and after completion of work

Blackboard item	Photo position	Time	Number of photos
Before the start of work	General view	Before the start of work	1
After completion of work	General view	After completion of work	1

Note: Before the start of work means before excavation; after the completion of works means after pavement restoration.

② Photos during execution period

Blackboard item	Photo position	Time	Number of photos
Pavement cutting and removal	Status	After pavement cutting	1
Situation after excavation	Status	After excavation	1
Work for watershed setting	Status	After setting	1
Work progress ion branch lines	Status	Progress status	1
Installation of branch lines	Status	After installation	1

Note: Photos taken during the execution are photos showing the status before execution.

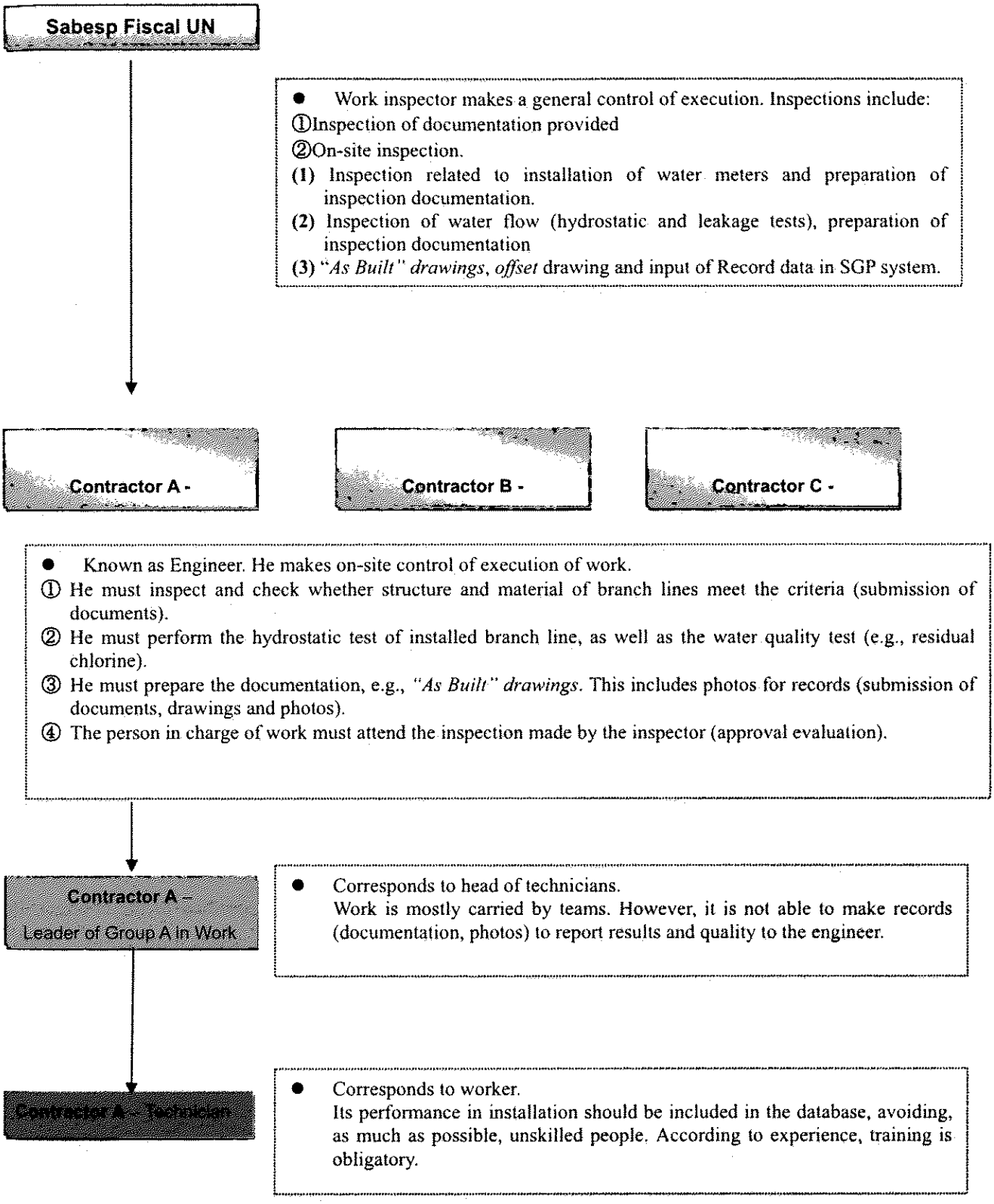
③ Result Control Photos

Blackboard item	Photo position	Time	Number of photos
Pavement cutting and bursting	Length and width measurements	After cutting	1
Excavation	Length, width and depth	After excavation	1
Work progress in branch lines	Depth at initial upstream point, and depth at final downstream point	Initial point and final point after completion of work	2
Removal of photo references	Position of photo references	Before and after services or works	2
Pavement restoration	Length and width	After restoration	1

Note: Photos of result control are photos that allow execution measurements and actual execution to be checked.

Hydrostatic and leakage tests at installation of networks and branch lines are being carried out on an experimental basis in Eficaz Project pilot-areas. The same occurs with recording methodology through photos to control the work result. Its implementation is expected to take place after the several improvement opportunities during the Eficaz Project period.

(5) Structure of execution control and supervising engineer's duties



14-3 Others

14-3-1 Safety Actions

Requirements for Individual Protection Equipment (IPE) should be considered, as defined in safety standards. Use of IPEs should be checked by the Internal Accident Prevention Committee – CIPA. The contractor's practices related to safety should be periodically checked through the Contractor Evaluation Form - FAC.

14-3-2 Obtaining Authorization for Occupation of Public Ways

In case of need of obtaining authorization to occupy public ways, Sabesp shall be the entity responsible for preparing all prior documents to request the authorization.

14-3-3 Work Completion and Delivery

After sampling inspection, activities occurred during branch line replacement should be reported in the Field Sheet – FC, according go the form, for approval of the person in charge and further submission to Sabesp. Activities will be considered completed upon the presentation of FC.

Regarding network replacement, the inspector should go to the site and inspect the work technically. Inspection will take place according to items requested in technical specifications and project. Result control should be made on a monthly basis by issuing an evaluation sheet through the Contractor Evaluation Form – FAC, and Supplier Performance Evaluation – ADF.

For large PROGRAM works, such as network replacement services, approval should be given by a work delivery commission. This commission will check the schedule controls and the work quality. Inspection notification should be made upon 15-day prior notice. Until the completion of works, a field-attended inspection should be made. After inspection, the commission will prepare the technical report. This reports aims to check whether works have been executed according to the contract. In addition, support should be given to the preparation of the Contractor Evaluation Form – FAC. Besides, an execution evaluation should be made under the PROGRAM, through a tightness test. In case of operation, commissioning should be attended to check for its compliance with the project. After the commission inspection, a technical inspection report should be issued. Then, work delivery and contract finalization will take place.

In case of nonperformance of contract provisions, the contract coordinator may require formally the due corrections through several actions.

Regarding the preparation of drawings, changes, additions and exclusions related to executed works will be recorded in a technical book according to Sabesp standards. With regard to network replacement, delivery form should be prepared according to piping diameter. For networks with

diameter smaller than 400 mm, a study notebook called "log book" will be provided, which is intended to records the details of executed works (in A4 pages). For replacement of networks with diameter above 400 mm, submission of "*As Built*" drawing is required. Drawings of plans and cuts of replace networks should be provided (in A4 pages). After Logbook and "*As Built*" drawing approval, they will be recorded and stores in SIGNOS database, in case of Metropolitan (M). Drawings should also be indexed. The person in charge of Sabesp technical notebook will issue an acceptance certificate for the Contract Coordinator.

Chapter 15 Organizational Operation and Maintenance Framework

15-1 Control concept sharing for maintenance and management of piping network

Most of PROGRAM funds will be applied to infrastructure renewal, including during JICA Stage, what will lead to Management optimization. In Japan, water system network assets are estimated in some 40 trillion Yens, corresponding to more than 70%. Sabesp reality is similar to Japan's, and may even exceed that percentage.

15-2 Situation of maintenance and management system in each Sabesp Business Unit

Data on the organization framework of each Business Unit have been collected, including human resources, training system, and availability of maintenance and management equipment.

Based on such data, we plotted a diagram of interaction of operation and maintenance activities and organizational framework, as shown in Figure 15.1, taking the Metropolitan Division - M as an example. Studies included maintenance sufficiency and controls of PROGRAM facilities, as well as scheduled rectifications and expansions.

(1) Study of water loss management system (M Division)

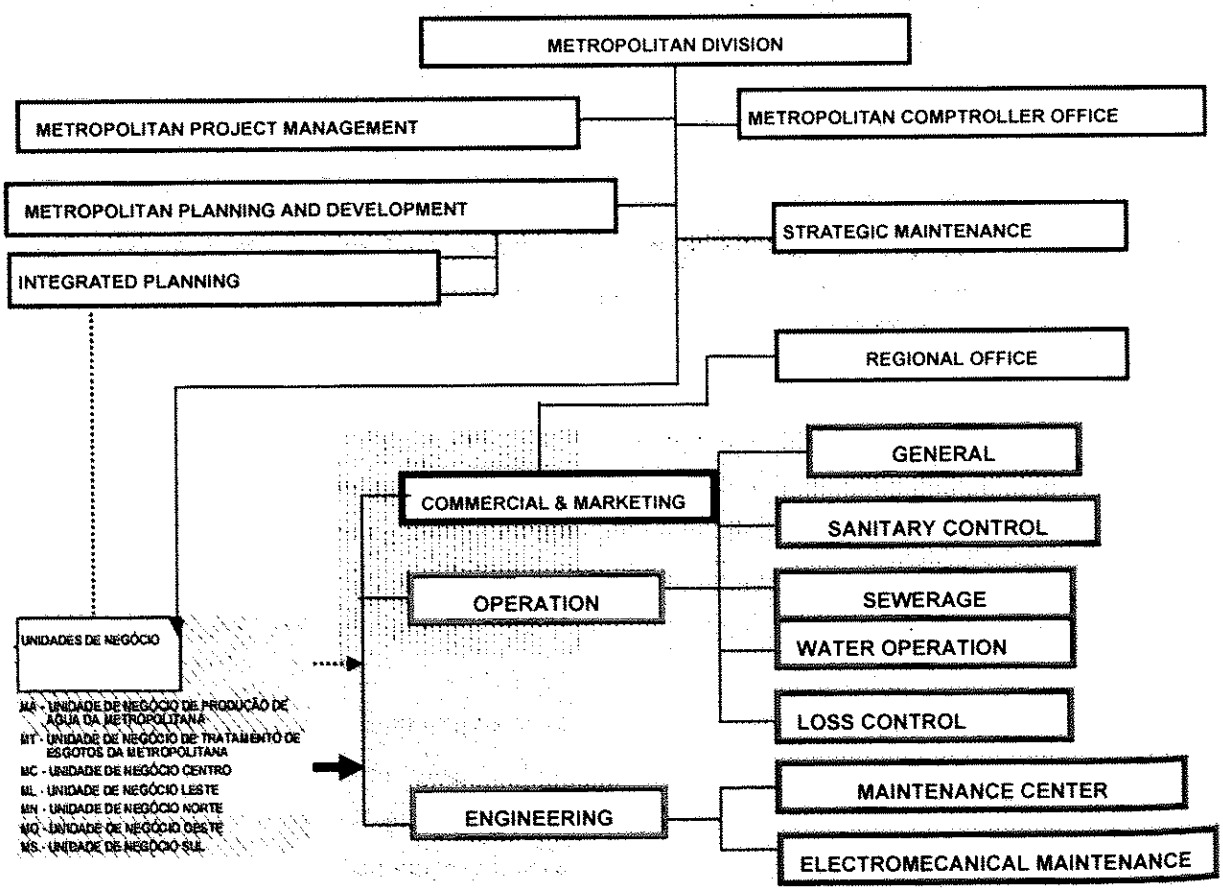


Figure 15-1 Example General Organizational of M Division

(2) Study of water loss management system (R Division)

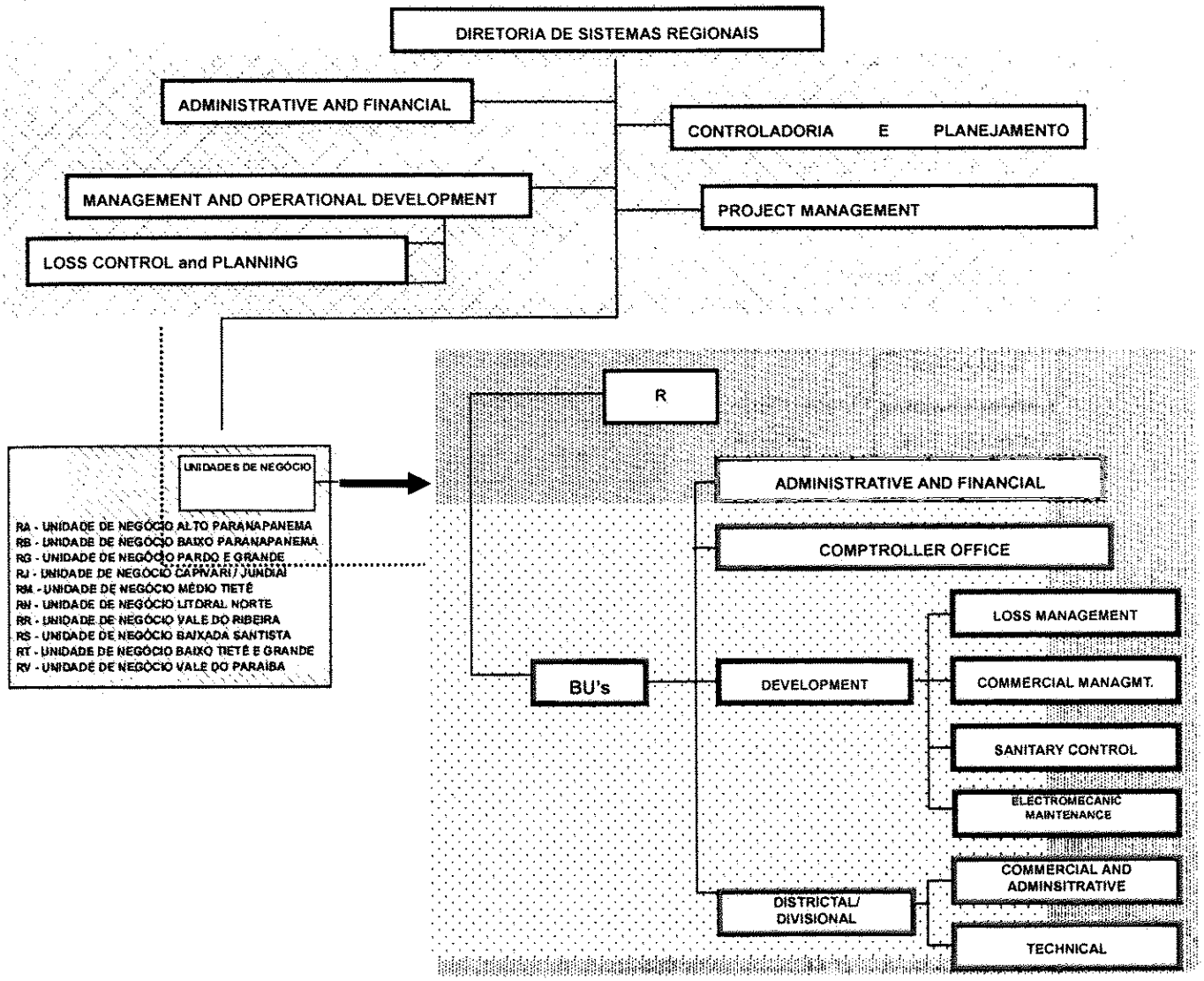


Figure 15-2 - Example Organization of R Division

(3) Number of employees and investment in Sabesp maintenance and management

In 2008, Sabesp achieved an IPR of 27.7%, which practically corresponds to the same loss level 20 years ago of 3 Japanese metropolis taken as reference. As in Japan water meter reading work is practically outsourced, that comparison is not so accurate.

Currently, a strong outsourcing of Sabesp operational services is noted, and it is important to point out that this form of operation requires a very active inspection of service execution, It is important that the entity in charge of inspection have autonomy to act, which is a significant factor that might compromise the PROGRAM success.

Even in regional water services in Japan, the number of employees is too reduced in relation to the

number of water meters, as well as to the great number of extensions of water distribution network per employee.

15-3 Recommendations on Sabesp management and maintenance system

It is important that Sabesp should make investment in technical capacity building of professionals (own or outsourced) that provide this type of service.

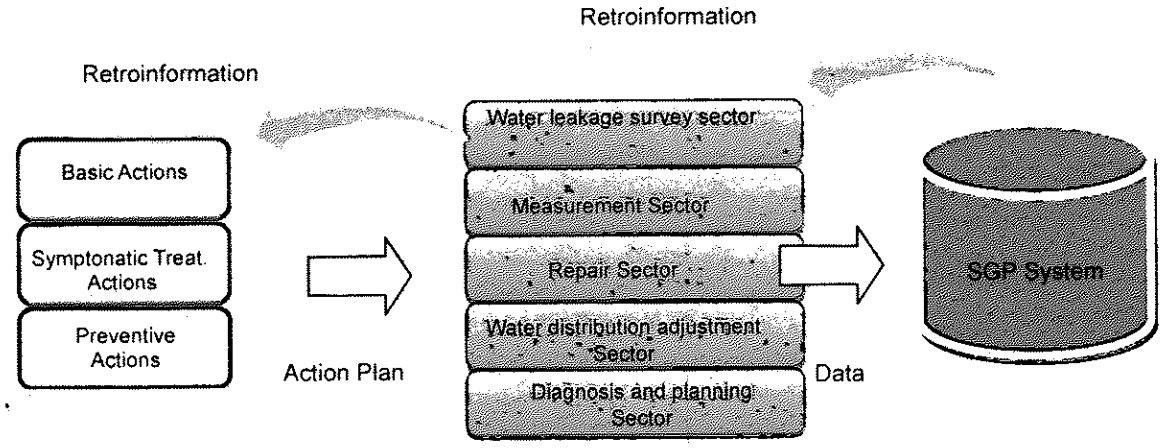


Figure 15-3 – Position of areas subject to countermeasures and functions

In water distribution systems in constantly changing cities like São Paulo, a periodic evaluation and diagnoses of the distribution system is necessary. By observing the organizational structure involved in that task, there is some concern with the small number of workers in relation to the size of the respective facility.

15-3-1 Organizational Maintenance Framework Strengthening

System of supply networks that convey water safely is not an exclusive Sabesp property; it is also an asset of all customers (citizens) that equally enjoy the benefit. By identifying correctly the conditions of supply network facilities where functions are reduced, it is possible to consider an efficient renewal plan. Among the aforementioned recommendations, the requirements for "Strengthening the maintenance system, control and training of inspection and execution staff" will be analyzed. Figure 4 shows a flowchart of Sabesp maintenance and control improvement cycle, including the items likely to contribute to improve the level of Sabesp professionals.

15-3-2 Strengthening of Organizational Framework and Inspection Capacity Building.

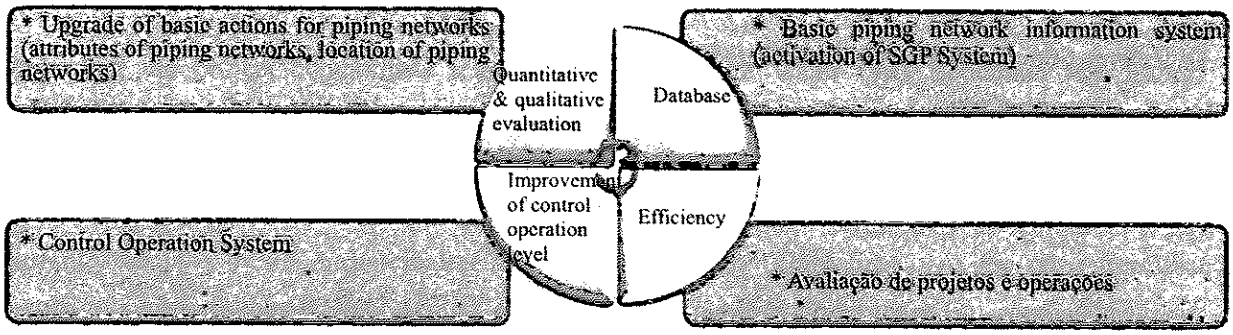


Figure 15-4 Flowchart of Maintenance and Control Improvement Cycle

(1) Upgrade of Basic Distribution Network Actions (water pressure, water quality, information on water volume, organization and improvement of distribution network information).

The chart above shows the cycle structure and basic distribution network actions, which are absolute requirements for actions against facility obsolescence. Attributes of distribution networks (year of installation, type of pipes, installation position, etc.) are indispensable items in the Renewal Plan. In addition, it is also important to consider the distribution network functions (water pressure, water quality, discharge). The level of deterioration of distribution networks (remaining lifespan, closing level) is also an important information. Besides, the Plan should not be restricted to physical evaluation, but also to the need of considering the several causes as circumstantial information. Of course, information on water discharge in PDCA basic cycle and the analysis of distributed water discharge (water distribution system, sector, DMC) is also included.

(2) Operational Management System (improvement of professionals' skills)

The operational management system is a basic requirement for improvement of professionals' skills. Upgrade of several types of measurement and survey equipment, as well as the current situation, are requirements to improve the level related to employees and external technicians training, organization of manuals and accessory texts, increase of skilled staff and active employees. The main objective of Eficaz Project is to standardize the several operational manuals used by Sabesp

(3) Basic Piping Network Information System

The Basic Piping Network Information System is efficient as a system that enables the objective and simple use of data obtained from diagnosis (survey, evaluation and measurement, etc.).

(4) Evaluation Procedures for Project-Related Services

This consists of evaluating the maintenance actions not only during JICA Stage, but also during subsequent stages of PROGRAM.

Objectives of evaluation of project-related services include:

- Outsourcing;
- Routine services.

Services should always be evaluated for time, quality and estimated cost.

Chapter 16 - Preliminary Environmental Studies

16-1 Introduction

Regarding the project components related to the Corporate Water Loss Reduction and Energy Efficiency Program, hereinafter referred to as Corporate Program, and those in JICA Stage as established by Sabesp, technical support has been given to Sabesp to make a screening and check the environmental requirements, according to socioenvironmental guidelines established by JBIC and currently adopted by JICA (hereinafter referred to merely as "Guidelines". At the same time that results of such activities were presented, a screening was made at Preliminary Environmental Impact Assessment (PEIA) level. Whenever a possibility of occurrence of adverse socioenvironmental impact was identified, actions to mitigate the related effects were determined. Activities scheduled for Program components are listed below.

Table 16-1 - Program Components

Number and Item			Activity Items
A. Real Loss (Actions to control real loss volumes)	A1- Renewal of Infra-structure	A 1.1	Branch line replacement
		A 1.2	Networks and branch line replacement
		A 1.3	Branch Line Replacement – Leakage Survey
	A2 - Survey of non-visible leakages		
	A3- Repair	A 3.1	Visible Leakage Repair in Network
		A 3.2	Non-Visible Leakage Repair (Network)
	A4- Sectorization	A 4.1	Sectorization[1] (Implantation of Pressure Zones)
		A 4.2	VRP (pressure reduction valves)
		A 4.3	DMC (Measurement and Control District)[2]
		A 4.4	Booster
		A 4.5	Slum Closing[3]
	A5 - Equipment		
B. Apparent Losses (Actions to control apparent water losses)	B1 - Replacement of water meters	B 1.1	Replacement of High-Capacity Water Meters
		B 1.2	Replacement of Low-Capacity Water Meters
	B2 - Irregularity control	B 2.1	Inspections in Inactive Connections
		B 2.2.1	Inspection in Active Connections
		B 2.2.2	UMA[4] installation in Irregular Connections
		B 2.3	Regularization of connections in Slum areas
	B.3 - Record Update		
C. Management (Water loss control and management)	C1 – Installation / Adequacy of Macrometers		
	C1 - Macrometer Calibration		
	C3 - Capacity Building		
	C4 - Socioeducative Actions		
	C5 - Demand from Technology and Environment Division (Management)		
D. Energy Efficiency (energy saving in pumps and motors already existing in facilities.			

[1] Sectorization aims to divide areas of water distribution in sectors in order to adjust the water pressure as well as the networks, to facilitate the control of water pressure also enable the reduction of water losses through leakage.
[2] Its purpose is to separate the areas into districts (blocks) of control and it was based on the measurement that directly affects the management and control system of water supply.
[3] To get the idea of the volume of water used in the slum areas compared pressure reduction in slum areas with illegal connections to networks and branches to reduce the loss by leakage are urged flowmeters.
[4] Water Measurement Unit: water meter built in wall.

16-2 Screening Results

Results of screening developed by Sabesp are described below, according to methods established by old JBIC guidelines related to socioenvironmental concerns.

Screening Presentation

Project Name: Corporate Water Loss Reduction and Energy Efficiency Program

Name of Project Execution Organization: Cia. de Saneamento Básico do Estado de São Paulo - Sabesp

Name of Borrower: Cia. de Saneamento Básico do Estado de São Paulo - Sabesp

Insert the name, department, position and contact details of person responsible for filling this form.

Name: **Eric Cerqueira Carozzi**

Department and position: **Superintendent, Operational Development**

Name of Company or Organization: **Cia. de Saneamento Básico do Estado de São Paulo - Sabesp**

Telephone: **0 15 11 3388-8895**

Fax: **0 15 11 3388-8596**

E-mail: **ericcarozzi@sabesp.com.br**

Date: **August 18, 2009**

Signature:

Questions

P1. Insert the address of project site.

Address of Project Site: 366 municipalities in the State of São Paulo.

Note: There is a total of 645 municipalities.

P2. Make a brief explanation of project.

The State of São Paulo has currently a population of 42 million inhabitants, equivalent to approximately 22% of total Brazilian population, a demographic density of 135 inhabitants/km^2, three large metropolitan areas, and the most complex urban network in Latin America., The State is expected to reach 47 million inhabitants by 2020. Within a radius of 150 km from the center of the city of São Paulo, demographic density exceeds 500 inhabitants/km^2, well above that of such countries as Germany, Japan, England and Italy. Water resources are limited and correspond approximately to 1.65% of total water resources available in the country. Sabesp operation area covers some 59% of the urban population of the State of São Paulo.

Sabesp prepared an 11-year program titled "Corporate Water Loss Reduction and Energy Efficiency Program" covering the period of 2009 to 2019.

The program was prepared to establish a series of actions to control and reduce real and apparent water losses, in addition to management actions, which would be implemented to enable a gradual loss reduction over the program implantation period, and improve the system by strengthening the management of actions and resources applied. The program aims to reduce, over the period of 11 years, the rate of Sabesp total water losses per branch line (IPDt) from the current 467 liters/branch line/day (Dec 2007) to 211 liters/branch line/day, and the rate of revenue loss from 29.5% (Dec/2007) to 13.0%.

P3. Will JICA loan be applied to a new project or to an ongoing project? If to an ongoing project, please inform the occurrence of great complaints by local residents.

□ New Project □ Ongoing Project (with Complaints)
□ ✓ Ongoing Project (no Complaints) □ Others (Specify)

P4. In case of this Project, will an Environmental Impact Assessment (EIA) be required according to laws or regulations? If yes, inform the EIA progress.

□ Required (Completed) □ Required (At execution of planning stage)
□ ✓ Not Required □ Other (Specify:)

P5. If EIA is already completed, inform whether it has been approved based on environmental assessment system or not. If EIA report has already been approved, inform the date and name of approval authorities.

- ☐ Approved (unconditionally)
- ☐ Approved (conditionally)
- ☐ Under approval process
- ☐ ✓Other (Specify: Not Required)

Date of Approval

Name of Authorities:

P6. If environmental licenses other than EIA are required, inform the name of required license(s). Have you obtained the required license(s)?

- ☐ Obtained
- ☐ Required, but remains to be obtained
- ☐ ✓Not required
- ☐ Other (Specify:)

Name of required license(s):

P7. Will the loan be used for a Project that cannot be specified at this stage (such as export or lease of machinery unrelated to the specific project, or a Two-Stage Project, which cannot specify the Project at the loan agreement time)?

☐ Yes ☐✓No

If "Yes", do not answer the following questions.
If "No", please answer the following questions.

P8. Is there any environmentally sensitive area in or around the project site?

☐ Yes ☐✓No

If "Yes", select and check the applicable items and answer to the following questions.
If "No", answer question 9 *et seq.*

- ☐ (1) National parks, protected areas designated by the government (coastal areas, swamps, habitats of minorities or indigenous populations, heritage areas, etc.).
- ☐ (2) Virgin forests, natural rainforests.
- ☐ (3) Ecologically important ecosystems (coral reefs, mangroves, floodplains, etc.)

☐ (4) Ecosystems of endangered species, whose protection is required by local laws and international agreements.

☐ (5) Areas at risk of substantial increase of salinity or soil erosion.

☐ (6) Desertification areas.

☐ (7) Areas of special values from archeological, historical and/or cultural standpoint.

☐ (8) Habitats of minorities, indigenous people, nomad people with traditional lifestyle, or areas of special social value.

P9. Does the Project involve the following components?

□ Yes ☑ No

If "Yes", describe the number of applicable components and answer questions 10 *et seq.*
If "No", answer questions 11 *et seq.*

☐ (1) Involuntary Resettlement (Number of resettled persons)

☐ (2) Groundwater pumping (Volume: ton/year)

☐ (3) Land reclamation and/or development (Area: ha)

☐ (4) Deforestation (Area: ha)

P10. Answer this question only if the Project involves any of components (1) - (4) above. In the country where the Project is planned, are there rules about the size of items included in question 9? If the country has such rules, inform whether the Project complies with them or not.

□ Rule is applicable (□ complied □ not complied) □ No rule

□ Other (Specify:)

Please answer questions 11 *et seq.*

P11. Will JICA participation in Project exceed 5% of Project cost, or will JICA total loan amount exceed SDR 10 million?

□ Yes ☑ No

If "Yes", do not answer the following questions.
If "No", answer questions 12 *et seq.*

P12. Does the Project relate to any sector whose impact on the environment is considered irrelevant or is not expected under normal conditions (e.g., maintenance of existing facilities, non-expanding renewal Project, acquisition of rights or interests without additional investment in machinery)?

☑ Yes ☐ No

If "Yes", do not answer the following questions.

If "No", answer questions 13 *et seq.*

P13. Does the Project relate to any of the following sectors?

☐ Yes ☐ No

If "Yes", specify the sector by checking it and answer questions 14 *et seq.*

If "No", do not answer the following questions.

- ☐ (1) Hydroelectric plant, Dam or Reservoir
- ☐ (2) Thermoelectric plant
- ☐ (3) Mines
- ☐ (4) Oil and gas development
- ☐ (5) Oil pipeline
- ☐ (6) Steel industry (with large furnace)
- ☐ (7) Non-ferrous material refinement
- ☐ (8) Petrochemical industry (including manufacture of raw material and petrochemical complex)
- ☐ (9) Oil, gas and chemicals terminal
- ☐ (10) Oil refinery
- ☐ (11) Paper and pulp
- ☐ (12) Manufacture and/or transportation of hazardous substances (specified by international agreements)
- ☐ (13) Roadway, railway or bridge
- ☐ (14) Airport
- ☐ (15) Port
- ☐ (16) Waste processing or treatment
- ☐ (17) Sewage and/or wastewater treatment, including hazardous substances or performed in environmentally sensitive area
- ☐ (18) Power transmission and/or transmission lines (including substantial involuntary resettlement or deforestation, or submarine cable)
- ☐ (19) Tourism (Construction of hotel, etc.)
- ☐ (20) Forestry or tree plantation
- ☐ (21) Agriculture (large project and/or Project including irrigation)

P14. Provide information on the project (project, factory and building surface areas, production capacity, power generation volumes, etc.). Then, explain whether an EIA will be necessary in light of the great size of project in the country where it will be implanted.

16-3 Environmental Checklist (Water Supply)

Results of environmental study performed by Sabesp, based on methods indicated by JICA old guidelines on socioenvironmental concerns, are transcribed below.

Category	Environmental item	Main Checking Items	Confirmation of Environmental Aspects Final Sabesp Opinion
1. Licenses and Explanation	1) EIA and Environmental Licenses	) Have EIA reports been officially completed?	EIA reports have not been prepared. They are not required for this Program, according to rules and procedures for EIA and environmental license described in the respective laws and regulations of the Brazilian federal government and São Paulo State Government.
		2) Have EIA reports been approved by the governmental authorities of the host country?	
		3) Have EIA reports been approved unconditionally? If any conditions have been imposed for EIA report approval, have such conditions been met?	
		4) In addition to approvals above, have other environmental licenses been obtained from respective regulatory authorities of the host country's government?	
	(2) Explanation to the public	1) Are program contents and their potential impacts properly explained to the public, based on appropriate procedures, including information disclosure? Is public understanding obtained?	Major program components are focused on infrastructure renewal, and include network, branch line and water meter replacements, among others. As this Program includes no new construction of infrastructure or large facilities, such as water treatment plants, dams, water catchment and pipeline laying, there will be no significant impact on the public living in several areas to be affected. When it is assumed that implementation of construction works and/or provision of services will make some impact to neighboring residents, SABESP gives notice of start of construction works beforehand to such residents in accordance with SABESP's rule of communication plan.
		2) Are appropriate replies given to public and regulatory authorities' comments	As mentioned above, it is not necessary to give any explanations or disclose information to the public at the Program planning stage. Therefore, this item is not applicable.
2. Mitigatory actions	(1) Air quality	1) Is there any possibility that chlorine in deposits and facilities for chlorine injection would pollute the air? Are chlorine concentrations in workplaces in compliance with the country's occupational health and safety regulations?	There is no component in this Program, such as new construction or recovery of chlorine deposits and chlorine injection facilities. Therefore, no air pollution will be caused by chlorine in this Program.
	(2) Water quality	1) Are pollutants, such as SS, BOD, COD, contained in effluents from the facility operations in accordance with the country's effluent standards?	Major program components are focused on infrastructure renewal, and include network, branch line and water meter replacements, among others. There is no Program component likely to affect water quality.

Category	Environmental Item	Main Checking Items	Confirmation of Environmental Aspects Final Sabesp Opinion
2. Mitigatory actions	(3) Waste	1) Is waste, such as sludge generated by the facility operations, properly treated and disposed of according to the country's regulations?	As mentioned above, the major component of this Program is the renewal of infrastructure used for drinking water distribution, and there are no components for new construction or recovery of water or sewage treatment plant. Therefore, this Program will not produce waste, such as sludge.
	(4) Noise and vibration	1) Are noise and vibrations generated by facilities like pumping stations in compliance with the country's regulations?	Actions focused on infrastructure renewal, such as network, branch line and water meter replacement, installation of boosters, among others, are expected to produce some noise and vibration, although at tolerable levels and within the parameters established by the current municipal, state and federal laws. Booster operation will cause no significant inconveniences to neighboring residents, as Sabesp will comply with the provisions of CONAMA Resolution no. 01, of 03.08.90.
	(5) Drawdown	1) In case of extraction of high groundwater volumes, is there any possibility of water table drawdown?	This Program does not include any groundwater extraction. Therefore, there are no risks of soil subsidence.
3. Natural Environment	(1) Protected Areas	1) Is the Program site located in protected areas designated by local laws or international treaties or conventions? Is there any possibility of the Program affecting the protected areas?	The major component of this Program is the replacement of existing infrastructure and installation of equipment that will enable control and management of distribution systems. Implementation of aforementioned actions will occur predominantly in urban areas already served by Sabesp. That said, there is no work in the area of environmental protection, however if there is such need, Sabesp will take action according to the terms of the current Brazilian legislations.
	(2) Ecosystem	1) Does the Program site include virgin forests, rainforests, and ecologically important ecosystems (such as coral reefs, mangroves or floodplains)?	There are no virgin forests, rainforests, or ecologically important ecosystems or protected ecosystems of endangered species in the Program area.
		2) Does the Program site include protected ecosystems of endangered species designated by local laws or international treaties or conventions?	
		3) If significant ecological impacts are expected, will adequate protection actions be taken to reduce impacts on the ecosystem?	
		4) Is there any possibility that the volume of water (e.g., surface water and groundwater) used by the Program will affect adversely the aquatic environment, such as rivers? Will adequate measures be taken to reduce impacts on the aquatic environment, such as aquatic bodies?	This Program does not include the development of water resources and, therefore, it will not affect the aquatic environment.

Category	Environmental Item	Main Checking Items	Confirmation of Environmental Aspects Final Sabesp Opinion
4. Social Environment	(1) Resettlement	1) Will the Program implementation cause any involuntary resettlement? In case of involuntary resettlement, will efforts be made to minimize resettlement impacts?	The major component of this Program is the replacement of existing infrastructure and installation of equipment that will enable control and management of distribution systems. Water supply pipes are installed under public space (public road) and there is not necessity to acquire land newly. Installation sites of booster pumps are land where Sabesp has right to use. Population resettlement is not Sabesp responsibility. Besides, no resettlement will be generated at the time of implementation of this Program.
		2) Is any adequate explanation on displacement and compensation given to affected people before resettlement?	
		3) Is the resettlement plan and the respective compensation, restoration of livelihood and life standards developed on the basis of socioeconomic studies on resettlement?	
		4) Does the resettlement plan give a particular attention to vulnerable groups or persons, including women and children, persons below the poverty baseline, ethnic minorities and indigenous people?	
		5) Are agreements made with affected people before resettlement?	
		6) Is the organizational framework established to properly implement the resettlement? Are capacity and funds assured for plan implementation?	
		7) Is a plan developed to monitor impacts from resettlement?	
	(2) Life and Livelihood	1) Is there any possibility that the Program will affect adversely the population's life? Are adequate actions considered to reduce any impacts, as necessary?	There is no possibility that this Program will affect adversely the life conditions of those living in the Program area.
		2) Is there any possibility that the water volume (e.g., surface water and groundwater) used by the Program will affect adversely the water uses and other uses of existing water sources?	The Program does not include any construction or rehabilitation of water production facilities in operation. Program actions will not imply any increase of production volume, but rather the optimization of distributed volumes. This way, there will be no damage to uses of water and existing water sources (hydraulic areas.
	(3) Heritage	1) Is there any possibility that the Program will damage any local archeological, historical, cultural and religious heritage areas? Are adequate actions considered to protect such areas according to the country's laws?	The major component of this Program is the replacement of existing infrastructure and installation of equipment that will enable control and management of distribution systems. Implementation of aforementioned actions will occur predominantly in urban areas already served by Sabesp.
	(4) Landscape	1) Is there any possibility that the Program will affect adversely the local landscape? Are the required actions taken?	
	(5) Indigenous people	1) Is the Program in line with the local laws on indigenous people's rights? 22) Have actions been considered to reduce any impacts on indigenous people's culture and lifestyle?	Indigenous people's areas are extremely delimited by the Law. The Program will mostly involve properly consolidated urban areas. This way, actions included in the Program are quire unlikely to affect the indigenous populations. Should that need be identified, Sabesp will comply with the applicable law.

Category	Environmental Item	Main Checking Items	Confirmation of Environmental Aspects Final Sabesp Opinion
5. Others	(1) Impacts during Construction	1) Are adequate measures considered to reduce impacts during construction (e.g., noise, vibrations, turbid water, dust, exhaust gases, and wastes)?	Noise and vibration generated during the construction of replacement of distribution networks are small-scale and temporal ones. Measures to reduce the impact on noise and vibration are applied in accordance with Sabesp's operation policy.
		2) If construction activities adversely affect the natural environment (ecosystem), are adequate measures considered to reduce impacts?	The main component of this program is replacement of existing infrastructure and installation of equipment that will allow the control and management of water distribution systems. These works do not have a significant impact on the natural environment.
		3) If construction activities adversely affect the social environment, are adequate measures considered to reduce impacts?	As the Período JICA do not include new construction of infrastructures or large-scale facilities such as water purification plants, dams, intake facilities and water conducting pipelines. There will be no significant negative impact on the social environment.
		4) If necessary, is health and safety education (e.g., traffic safety, public health) provided for project personnel, including workers?	Sabesp, the implementing company responsible for the program, has guidelines regarding instructions, procedures and standards on traffic safety and working conditions, which are followed by employees and by contractors. These guidelines will be followed for implementation of Período JICA.
	(2) Monitoring	1) Does the proponent develop and implement monitoring program for the environmental items that are considered to have potential impacts?	Items, which are necessary to be monitored, will be monitored and managed in the frame work of construction works supervision activities which are carried out regularly. Regarding noise and vibration which will be occurred during construction period, monitoring activities will be conducted in accordance with a monitoring plan which described in article 16-5. In addition, monitoring of noise of booster pump, which may occurred after its installation, also be carried out in accordance with a monitoring plan which described in article 16-5.
		2) Are the items, methods and frequencies included in the monitoring program judged to be appropriate?	It is considered as appropriate.
		3) Does the proponent establish an adequate monitoring framework (organization, personnel, equipment, and adequate budget to sustain the monitoring framework)?	It will be established.
		4) Are any regulatory requirements pertaining to the monitoring report system identified, such as the format and frequency of reports from the proponent to the regulatory authorities?	Environmental approval is not required for this program. Therefore, way of reporting and its frequency is not ruled.
6. Note	Note on Using Environmental Checklist	1) If necessary, the impacts to transboundary or global issues should be confirmed (e.g., the project includes factors that may cause problems, such as transboundary waste treatment, acid rain, destruction of the ozone layer, or global warming).	Not applicable

1) With respect to the term "Country's Regulations" mentioned in the table above, if the environmental regulations of the country where the Program is located shall deviate significantly from international regulations, adequate environmental investigations will be carried out, as necessary.
In cases when local environmental regulations are still to be established in some areas, considerations should be made on the basis of comparisons with appropriate regulations of other countries (including the Japanese experience).
2) The environmental checklist provides general environmental aspects to be checked. It may be necessary to add or exclude any item, taking into consideration the Program characteristics and the specific circumstances of the country and the municipality where the Program is located.

16-4 Environmental Requirements Set by the Local Government

16-4-1 Environmental Control System of Local Government

In Brazil, the National Environmental Policy Law was enacted in 1981. Based on that law, SISNAMA was created to determine the policy related to environmental issues and establish rules to enforce that law. SISNAMA is a system constituted of CONAMA, IBAMA and other municipal and state environment-related bodies, with the objective of enforcing the National Environmental Program (PNMA), through cooperation or reciprocal complementation,.

The National Environmental Policy Law was then reflected in the Federal Constitution enacted in 1988, which included a comprehensive number of environment-related aspects, including the institution of environmental law, right to environmental health, and ecosystem preservation.

In Brazil, there are several environmental laws and regulations established at federal, state and municipal levels. In the federal sphere, it is incumbent on the Ministry for the Environment to plan the environmental policy, while CONAMA reviews and establishes the environmental policy and deliberates on laws related to the improvement of the environment, and IBAMA is entrusted with the examination and certification of environmental assessments. At state administration level, in addition to Secretariat for the Environment (SMA), there are bodies entrusted with environmental management and environmental licensing within the same state secretariat or reporting to it. In the State of São Paulo, there is the Secretariat for the Environment and Companhia Ambiental of the State of São Paulo (Environmental Company of the State of São Paulo (CETESP). The power to issue environmental licenses for implantation of projects or performance of activities in the State has been transferred to the relevant body in each State. In the State of São Paulo, CETESP has competence and power to decide on the need of environmental license and decide on the required procedures to obtain a license.

16-4-2 Environmental Licensing and Environmental Impact Assessment System

Article 1 of CONAMA Resolution 01/86 define environmental impact as "any change to physical, chemical or biological environmental properties caused by any form of matter or energy derived from human activities that, directly or indirectly, affect the population's health, safety and welfare, social and economic activities, biota, aesthetic and sanitary environmental conditions and the quality of environmental recourses." Environmental licensing is defined as a system that requires a license to be obtained from the government before implanting any project likely to change the biological, physical or chemical environmental aspect.

In Brazilian law related to EIA (Environmental Impact Assessment) system, Article 255 of the Federal Constitution, Article 9 of the National Environmental Polity Law, Article 48 of the Federal Decree 88,351/83 and CONAMA Resolution 01/86 stand out. Among them, CONAMA Resolution 01/86 provides for details on procedures to obtain the environmental license.

16-4-3 License required for implantation of this Project

We present initially the conclusion that, in the State of São Paulo, in piped water area, a Water Treatment Plant project will require an EIA and environmental license. With respect to work/project for household water distribution (networks and branch lines), which is the main component of this project, it is classified by a Resolution of the Secretariat for the Environment of the State of São Paulo as a work/project that does not require an environmental license. For JICA Stage project components, EIA and environmental license shall not be required.

The process that led to that conclusion is described below.

In Brazil, not always there is a unified rule related to the types of required studies (EIA/RIMA, AR, AS, etc.), and therefore each licensing body most frequently should decide on that. It should be noted, however, that Article 10 of CONAMA Resolution 237/97 reads that the eventual need of EIA may be determined by the relevant body with the participation of the project owner. Likewise, projects not included in CONAMA Resolution may also require an EIA if the relevant environmental body shall consider it necessary.

In addition, according to the same Resolution, in pipe water supply area both EIA and the environmental license are required only in cases of water treatment plant projects. With respect to JICA Stage components, EIA is not required.

The website of the Secretariat for the Environment of the State of São Paulo specifies the projects that require an environmental license. Like in CONAMA Resolution, an environmental license will be required in case of water treatment plants. The case of this Program, the major component of which includes execution works and activities related to networks and branch lines for household water distribution, is classified in the category of projects that do not require an environmental license, according to Resolution 54/2007 of the Secretariat for the Environment of the State of São Paulo (dated of 12/19/2007). As an example, article 1 of that Resolution requires an environmental license for projects including conveyance pipes with diameter above 1 m, and article 6 requires a license for networks and branch lines for household water distribution (by the way, JICA Stage does not include the replacement of pipes with diameter above 1 m).

Sabesp, in turn, has implanting works related to water loss reduction since 1995 and has never been required an environmental license by the relevant environment authorities. According to statements by employees from Sabesp environment department, environmental licensing shall not be required. As such, JICA Stage shall not be required to make an EIA or obtain an environmental license.

16-5 Possible Effects of Socioenvironmental Impact, Mitigatory Actions and a Monitoring Plan

Some Program components may lead us to assume the occurrence of momentary generation of noises and vibrations during the network replacement works; replacement of water meter works and after installation of booster pump. On the other hand, the implantation of works will require a license from the relevant governmental authorities for use of streets and public places. Upon proceeding adequately to take the necessary steps, it will be possible to minimize the social impact related to great disturbances to local population with respect to local traffic. When existing networks are made of fiber cement, they should be left in place. There is no regulation which prohibits to be leaved fiber cement in place which was used as water supply facility. WHO (World Health Organization) concludes that there is no necessity to make guideline on fiber cement for drinking water, therefore there is no criteria on fiber cement in the WHO Guidelines for drinking-water quality. Regarding information on location of fiber cement pipes, Sabesp has provided this information to the organization in charge of construction on gas pipes etc. in order not to destroy water distribution networks including fiver cement pipes accidentally. This kind of information sharing will be done for implementation of this program.

(1) Mitigation actions

In order to prevent influence of noise and vibration become significant, following mitigation measures will be applied.

<During the construction works>

- Use of construction vehicles and machinery which do not produce large noise and vibration
- Appropriate operation and maintenance of construction vehicles and machinery
- Use of noise walls/ barriers for particular sound-sensitive places (during construction works)
- Guidance and education to labors who operate construction machinery for not to make large noise
- Appropriate parking of construction vehicles and installation of tools at sites of works in order to not to prevent transit of vehicles and walkers.

<After installation of booster pump>

- Conduct regular maintenance in order not to produce large noise and vibration

(2) Monitoring plan on noise and vibration

Monitoring plan on noise and vibration which will be occurred during the execution of works and services during priodo JICA (2011-2013) will be carried out along with the following points.

1) Objectives of monitoring

Check levels of noise and vibration which will be emitted during the execution of works on

replacement of networks and water meters during período JICA (2011-2013), and also check level of noise from booster pumps in operation after its installation.

2) Sampling locations

A location where replacement works of networks and water meters are carried out will be selected during construction period. Regarding booster pump which will be installed by período JICA, noise and vibration levels of booster pump will be checked after their operation whether their levels are within their standards.

3) Sampling parameter and frequency

The measurement is performed at the place where previously selected according to the criteria mentioned above "2)", and will be carried out every six months.

4) Responsible party

Detailed monitoring plan should be developed by the company that assigned for the program management for período JICA.

5) Reference standards

- Noise: NBR 10151
- Noise: NBR 10152
- Vibration: NBR 9653

The following table is a monitoring form on noise and vibration.

Monitoring Form

The following monitoring on noise and vibration will be carried out for período JICA. Detailed monitoring plan should be developed by the company that assigned for the program management for período JICA.

< Noise/ Vibration >

Item and Unit	Measured Value (Mean)	Measured Value (Max.)	Country's Standards	Rederred International Standards	Remarks (measurement point, frequency, method, etc.)
Noise level (dB)			NBR 10151 & NBR 10152	---	A location or more where replacement works of networks and water meters are carried out will be selected during construction period. Regarding booster pump which will be installed by período JICA, noise and vibration levels of booster pump will be checked after their operation whether their levels are within their standards. (Remark 1)
Vibration level (mm/s)			NBR 9653	---	

(Remark 1: Although, selection of measurement points will be done in the detailed monitoring plan, noise sensitive places such as school, hospital and church will be considered as priority point. Consideration for selection will be also made for points where large construction works will be done.)
(Remark 2: Detailed information on country's standards will be described at the preparation of the detailed monitoring plan.)
(Remark 3: Frequency will be examined at the preparation of the detailed monitoring plan.)

16-6 Screening Results at Preliminary Environmental Impact Study (PEIA) level)

According to JBIC guidelines on socioenvironmental concerns, the project may be classified into 4 categories:

Category A: Projects likely to cause serious undesirable impacts to the environment. They require an Environmental Impact Assessment (EIA).

Category B: Projects whose undesirable environmental impact may be lower as compared to Category A projects. EIA is not required, but an environmental review will be made based on information on the project.

Category C: Projects considered without or the minimum undesirable environmental impact. EIA is not required nor will an environmental review be made after screening.

Category F1: Category F refers to the case where JBIC loan is granted to a financial agent and after financing is authorized, the financial agent of another third party make the selection of analysis of a subproject, or before the financing authorization (or Project analysis) the subproject has not been defined, or this subproject is likely to cause environmental impact. The adequate action will be determined with respect to the socioenvironmental impact.

Taking into consideration the results of screening work, according to old JBIC guidelines on environmental concerns, results of environmental assessment, Brazilian environmental laws, and the Brazilian environmental management system, it can be concluded that the components of this Program will most unlikely cause serious impacts to the physical environment or to the social environment. In terms of classification referred to above, this Program may be classified as Category B, because it is judged that this program does not included in the sector which make significant effects to environment in above mentioned old JBIC guidelines on and there no areas negatively affected by this program, and also this program will not produce significant negative impact on environment.

Chapter 17 PROGRAM Evaluation

17-1 Financial Evaluation

17-1-1 Effect of Water Loss Reduction Program Actions

The implantation of PROGRAM components will determine significantly the reduction of water loss volume. The reduced water loss volume referred to as recovered water is shown in Figure 7.1, as well as the evolution of lost volume and recovered volume in 2010-2019 with and without the PROGRAM implantation (2009-2019), and in JICA Stage (20100-2013). Calculation Base: Refer to the Supporting Report.

As limited to JICA Stage, recovered volume will be gradually reduced as from 2014, after the end of that stage. Actually, there will be the continuity of PROGRAM implementation and the continuous increase or recovered volume until 2019. This Figure shows the need of continuity of both the water loss reduction actions and the PROGRAM, even after 2014.

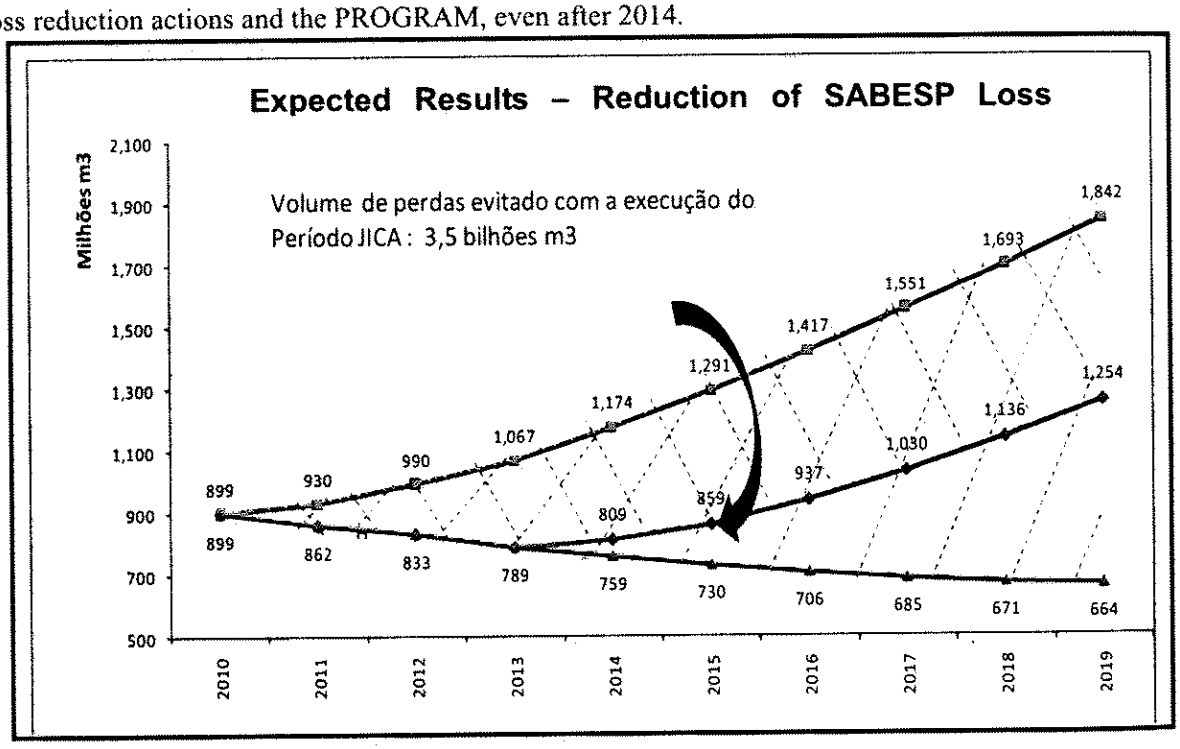


Figure 17-1 – Loss Volume and Recovered Volume

Figures 17-2 and 17-3 show the evolution of Loss Rates (IPF, IPDt) resulting from water loss reduction actions. 2010 indicators were based on indices projected by Sabesp. After the termination of JICA Stage, IPF rates of 19.1% and IPDt rate of 299 l/(connection x day) are expected in 2013.

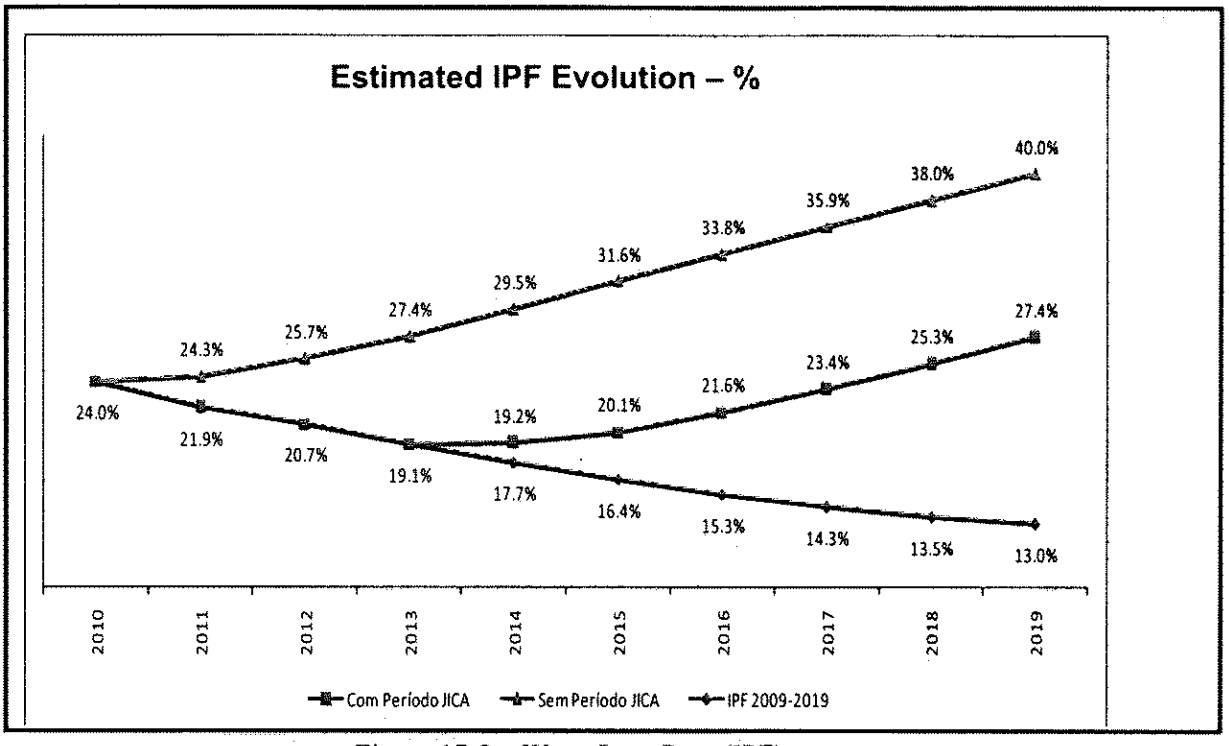


Figure 17-2 – Water Loss Rate (IPF)

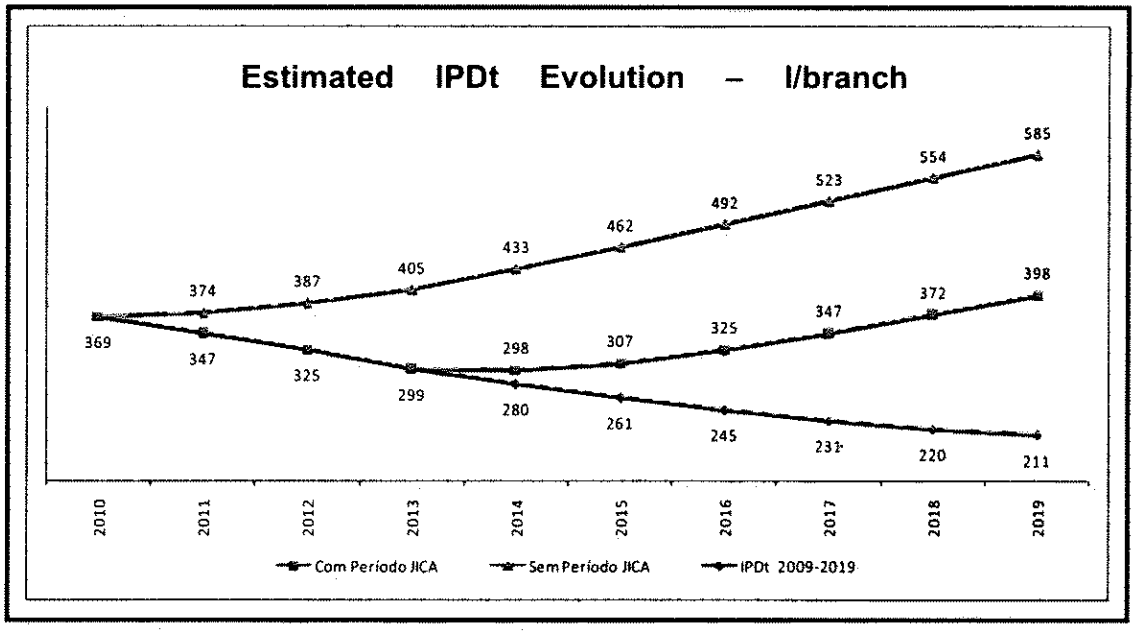


Figure 17-3 – Water Loss Rate (IPDt)

JICA F/S Mission calculated the cash flow, considering the recovered volume as "benefit" and PROGRAM costs as "costs". Based on the previous calculation, the Net Present Value (NPV) and Financial Internal Rate of Return (FIRR) for JICA Stage were calculated. This procedure is shown in Figure 17-4. Figures shown on the upper left corner of cells indicate the report chapters. Action means the Program component (Actions against real losses, apparent losses and for loss control) during JICA Stage, and recovered volume means the volume of water leakage prevented by actions against losses.

Conditions for financial evaluation analysis:

- Evaluation object: "Corporate Water Loss Reduction and Energy Efficiency Program", excluding the component "Energy Efficiency".
- Unit calculation base: Per project components and per Business Unit of Regional System Division (R) and Metropolitan Division (M).
- Calculation period: 50 years, 2001-2060.
- Discount rate applied: 12%

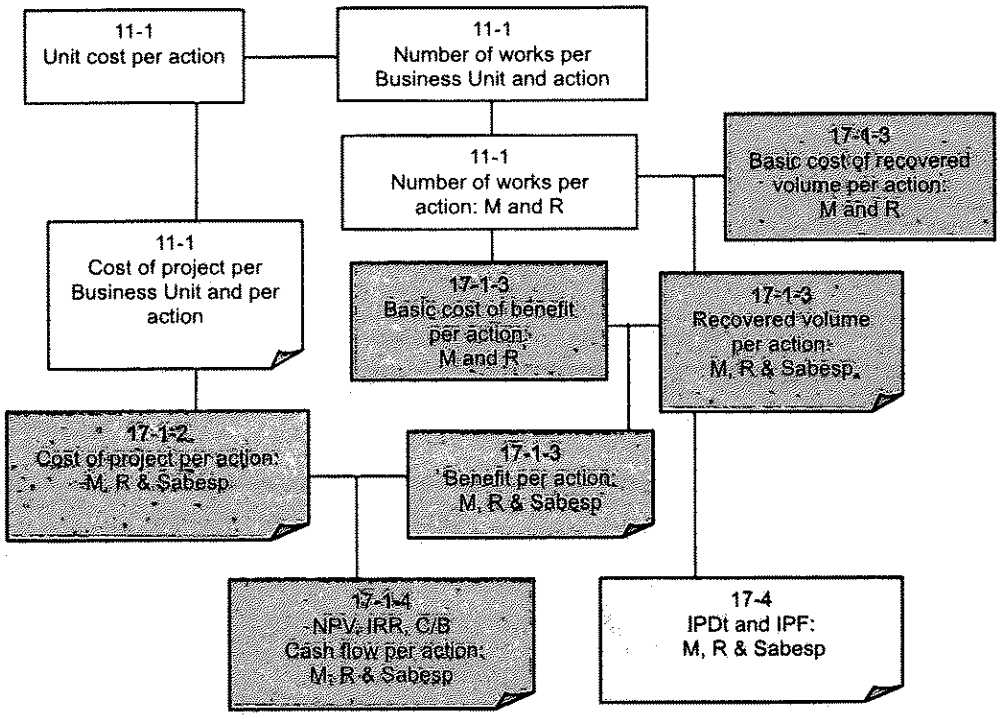


Figure 17-4 – Financial Evaluation Process

17-1-2 Cost of JICA Stage

Data on JICA Stage cost were obtained from estimated calculations shown in Table 11-1.

(1) Cost of Project per Business Unit

As shown in Table 17-1, 64.7% of costs refer to the Metropolitan Division, and 32.4% to the Regional System Division.

Table 17-1 – Cost of JICA Stage per Business Unit (R$ 1,000)

Business Unit	2011	2012	2013	Total	Percentage (%)
MA	3,507	3,518	4,685	11,710	1.1
MC	41,223	41,862	40,274	123,358	11.9
ML	51,164	41,526	49,629	142,319	13.7
MN	40,196	42,794	40,699	123,689	11.9
MO	37,024	37,388	37,755	112,167	10.8
MS	59,523	56,523	42,540	158586	15.3
TOTAL M	**232,637**	**223,611**	**215,581**	**671,829**	**64.7**
RA	11,866	11,111	10,376	33,353	3.2
RB	10,252	9,413	8,790	28,455	2.7
RG	7,371	7,762	7,794	22,927	2.2
RJ	11,118	8,331	7,770	27,220	2.6
RM	12,215	12,079	12,342	36,635	3.5
RN	4,799	4,526	4,870	14,195	1.4
RR	3,675	3,650	3,498	10,823	1.0
RS	37,402	41,336	17,722	96,461	9.3
RT	4,884	4,996	4,753	14,633	1.4
RV	16,636	17,300	17,258	51,193	4.9
TOTAL R	**120,217**	**120,505**	**95,172**	**335,894**	**32.4**
TOTAL T	**10,000**	**10,000**	**10,000**	**30,000**	**2.9**
TOTAL Sabesp	**362,853**	**354,116**	**320,753**	**1,037,723**	**100.0**
Energy Efficiency	15,000	14,000	-	29,000	
Total Program	**377,853**	**368,116**	**320,753**	**1,066,723**	

(2) Cost of Project per component

Table 17-2 shows price compositions during JICA Period, being: A-72% Real loss control actions; B – 22% Apparent loss control actions; and C – 6% Management and control of losses and leakages (including consulting expenses under the control of the Technology and Planning Department – T).

Table 17-2 Cost of JICA Stage per Action

No.	Component	2011 - 2013 (R$ x 1000 ; %)					
		M		R		Total	
A1.1	Branch line replacement	173,256	25.8	58,281	17.4	231,538	22.3
A1.2	Networks and branch line replacement	137,253	20.4	38,620	11.5	175,873	16.9
A1.3	Branch Line Replacement – Leakage Survey	13,807	2.1	7,594	2.3	21,401	2.1
A1	Total Infrastructure renewal	324,317	48.3	104,495	31.1	428,812	41.3
A2	Leakage Survey	15,940	2.4	12,800	3.8	28,740	2.8
A3.1	Visible Leakage Repair in Network	31,490	4.7	37,771	11.2	69,260	6.7
A3.2	Non-Visible Leakage Repair (Network)	2,329	0.3	4,564	1.4	6,893	0.7
A3	Total Repair	33,819	5.0	42,335	12.6	76,153	7.3
A4.1	Sectorization (Implantation of Pressure Zones)	81,630	12.2	65,259	19.4	146,889	14.2
A4.2	VRP	11,681	1.7	5,550	1.7	17,231	1.7
A4.3	DMC (Measurement Control Districts)	15,727	2.3	7,311	2.2	23,039	2.2
A4.4	Booster	7,114	1.1	995	0.3	8,109	0.8
A4.5	Slum Closing	990	0.1	500	0.1	1,490	0.1
A4	Total Sectorization	117,142	17.4	79,616	23.7	196,758	19.0
A5	Equipment	10,299	1.5	2,996	0.9	13,294	1.3
A	**Total Real Loss**	**501,516**	**74.6**	**242,241**	**72.1**	**743,757**	**71.7**

No.	Component	2011 ~2013 (R$ x 1000, %)					
		M		R		Total	
B1.1	Replacement of High-Capacity Water Meters	7,848	1.2	1,471	0.4	9,320	0.9
B1.2	Replacement of Low-Capacity Water Meters	81,781	12.2	53,379	15.9	135,160	13.0
B1	Total Replacement of Water Meters	89,629	13.3	54,850	16.3	144,480	13.9
B2.1	Inactive inspections	12,100	1.8	7,765	2.3	19,865	1.9
B2.2	Irregularity Control - Inspection	8,852	1.3	5,703	1.7	14,555	1.4
B2.2	Installation of UMA	15,431	2.3	9,164	2.7	24,595	2.4
B2.3	Slum regularization	20,612	3.1	559	0.2	21,172	2.0
B2	Total Irregularity Control	56,995	8.5	23,192	6.9	80,186	7.7
B3	Record Update	101,890	15.2	38,618	11.5	140,508	13.5
B	**Total Apparent Losses**	**153,467**	**22.8**	**82,102**	**24.4**	**235,569**	**22.7**
C1	Installation/Adequacy of Macrometers	7,123	1.1	8,022	2.4	15,145	1.5
C2	Macrometer Calibration	5,240	0.8	2,422	0.7	7,661	0.7
C3	Capacity Building	802	0.1	1,107	0.3	1,909	0.2
C4	Socioeducative Actions	3,682	0.5	0	0.0	3,682	0.4
C5	Demand from Technology and Environment Division (Management)	0	0.0	0	0.0	30,000	2.9
C	**Total Management**	**16,846**	**2.5**	**11,550**	**3.4**	**58,397**	**5.6**
	Grand Total	**671,829**	**100.0**	**335,894**	**100.0**	**1,037,722**	**100.0**

Source: Sabesp-Corporativo, May 2009

17-1-3 Benefits

17-1-3-1 Benefits from PROGRAM

JICA F/S Mission has converted financially all six (6) items of benefits from PROGRAM effect. Recovered water volume may be distributed to other consumers.

The term "possibility of sale" is given to the proportion of recovered water volume that can be sold to new consumers. The possibility of sale will be subject to variation according to demand, even though 60% of possibility has been established as a standard example. The portion of the recovered volume that will not be sold will enable the reduction of produced volume. Benefit includes the reduction of costs of repairs derived from branch line and network replacement under the PROGRAM.

(1) Increase of water revenues: income per recovered volume with possibility of sale.
(2) Increase of sewerage revenues.
(3) Reduction of costs of electric power: water production cost, except the marketable portion of recovered volume.
(4) Reduction of costs of chemicals for water treatment: water production cost, except the marketable portion of recovered volume.
(5) Reduction of costs of network repairs: reduction of cost of repairs by reducing the number of repairs per leakage followed by network replacement.
(6) Reduction of costs of branch line repairs: reduction of cost of repairs by reducing the number of repairs per leakage followed by branch line replacement

Chapter 5 provided the calculation of the cost benefits of PROGRAM. The calculation of PROGRAM benefits in this Chapter 17 was similar to that of Chapter 5. Refer to Table 5-10 (Chapter 5) for the formula of calculation of benefits peer PROGRAM components.

17-1-3-2 Calculation of Recovered Water Volume

Table 5-11 of Chapter 5 provides the formulas used for calculation of recovered water volume in each project action.

Calculation coefficient for recovered water volume was established by the person in charge of Sabesp loss program, based on data from a study performed by an external survey firm.

Duration of benefits from loss control actions

Starting from the year the investment is made, water volume recovery will occur continuously, but the recovery effect will decrease over the time for deterioration of facilities, etc. Taking into consideration the lifespan of facilities, a curve of gradual reduction by PROGRAM action was plotted and considered in the calculation of recovered water volume.

Table 17-3 shows the recovered water volume during JICA Stage.

Table 17-3 - Estimated recovered volume during JICA Stage (2011-2013) (m^3/year)

Year	A. Action against Real Loss	B. Action against Apparent Loss	Total recovered volume
2011	21,906,167	23,911,118	45,817,285
2012	45,087,553	41,578,775	86,666,328
2013	65,603,329	49,357,610	114,960,938
2014	51,036,303	28,068,750	79,105,053
2015	35,553,147	21,479,844	57,032,991
2016	22,427,930	14,489,128	36,917,059
2017	19,609,059	8,995,299	28,604,359
2018	17,447,907	4,027,763	21,475,670
2019	15,713,367	1,777,071	17,490,438
2020	14,275,187	476,862	14,752,049

Source: Prepared by JICA survey team, based on data provided by Sabesp.

17-1-4 Financial Evaluation

Costs and benefits have been estimated for a period of 50 years, by calculating the real cash flows to obtain the Net Present Value (NPV) at a 12% discount rate and Internal Rate of Return (IRR). Based on standard possibility of sale of 60% of recovered water volume, IRR will be 7.89% in M, 13.46% in R, and 10.58% in Sabesp. This rate is higher than Sabesp average borrowing cost (9%), indicating that the PROGRAM during JICA Stage is economically adequate.

Sensitivity Analysis

By adopting a possibility of sale of 50%, Sabesp IRR will amount to 5.05% (less than 9%), and by adopting a possibility of sale of 70%. IRR will be 18.10%, almost the double. The possibility of sale is directly related to water demand increase, which is, therefore, one of risk factors.

Table 17-4 – Financial Indices during JICA Stage

Possibility of Sale	IRR (%)			NPV (R$ x 1000)		
	M	R	/ Sabesp	M	R	/ Sabesp
50%	3.22	7.35	5.05	-105.071	-22.679	-113.393
60%	7.89	13.46	10.58	-44.954	6.580	-21.144
70%	13.52	23.58	18.10	15.164	45.628	80.893

Note: Prepared by JICA survey team, based on data provided by Sabesp.

As a reference, Table 17-5 provides the expected effects from 11 years of implantation of the Corporate Water Loss Reduction Program in Sabesp in 2009-2019. However, there are some deviations from the figures indicated in the Interim Report, because a rate of 65% was used as possibility of sale, and the result of in-depth study was reformulated under the preliminary conditions for the Feasibility Study.

Table 17-5 – Financial indices of the Corporate Water Loss Reduction Program (2009—2019)

Possibility of Sale	IRR (%)			NPV (R$ x 1000)		
	M	R	/ Sabesp	M	R	/ Sabesp
50%	0.81	2.17	0.47	-353.147	-110.075	-503.688
60%	5.20	9.01	5.33	-191.189	-29.021	-255.160
70%	10.82	18.21	11.80	-29.232	52.034	-6.632

Source: Prepared by JICA survey team, based on data provided by Sabesp.

17-2 Economic Evaluation

For financial evaluation, an analysis was made from the PROGRAM standpoint, but for the economic evaluation, we have expanded the view to socioeconomic level.

Water demand in Sabesp operation areas increases year after year. A project is underway for exploration of new resources to meet the increasing water demand that could not be met by the current production volume. The reduction of production volume and the satisfaction of new demands are expected from the use of recovered water volume under the Corporate Water Loss Reduction Program. As a result, investment in exploration of new water resources may be delayed until a future time. Assuming the effect of postponed investment in exploration of new water resources as an economic benefit, the Internal Rate of Return (IRR) was calculated.

The updated value of benefit from investment postponement is estimated in R$ 71,564 million. IRR calculation is based on the sum of this financial benefit plus the financial benefit. IRR (when 60% of recovered volume is sold)) is 17.87%. This IRR is higher than the opportunity cost prevailing in Brazil[1], what also makes this project be considered economically feasible.

[1] The long-term financial interest rate prevailing in Brazil at the range of 13% in 2008 has been falling markedly since January 2009, influenced by the world financial crisis started in September 2008. Interest of 13% prevailing in 2008 as Standard long-term interest was used in this economic evaluation. On July 23, 2009, after COPOM meeting, Banco Central do Brasil announced a 0.5% decrease in Selic to 8.75%. There were 5 interest rate decreases since the beginning of 2009, totaling 5%. Stagnation of internal economy and inflation decline trend are behind that interest rate decrease.

17-3 Social Evaluation

Articles on financial and economic evaluation analyzed the measurable benefits; however, this article will analyze those benefits that are difficult to be measured. Figure 17-4 shows the influence of the Corporate Water Loss Reduction Program effect, according to the general relation diagram below:

The impact caused by the PROGRAM on the population is indicated in the 4 following items:

- Consumers' increased satisfaction with improved service level;
- Contribution to service standardization;
- Contribution to saving of resources and energy; and
- Influence on other water projects in Brazil and abroad.

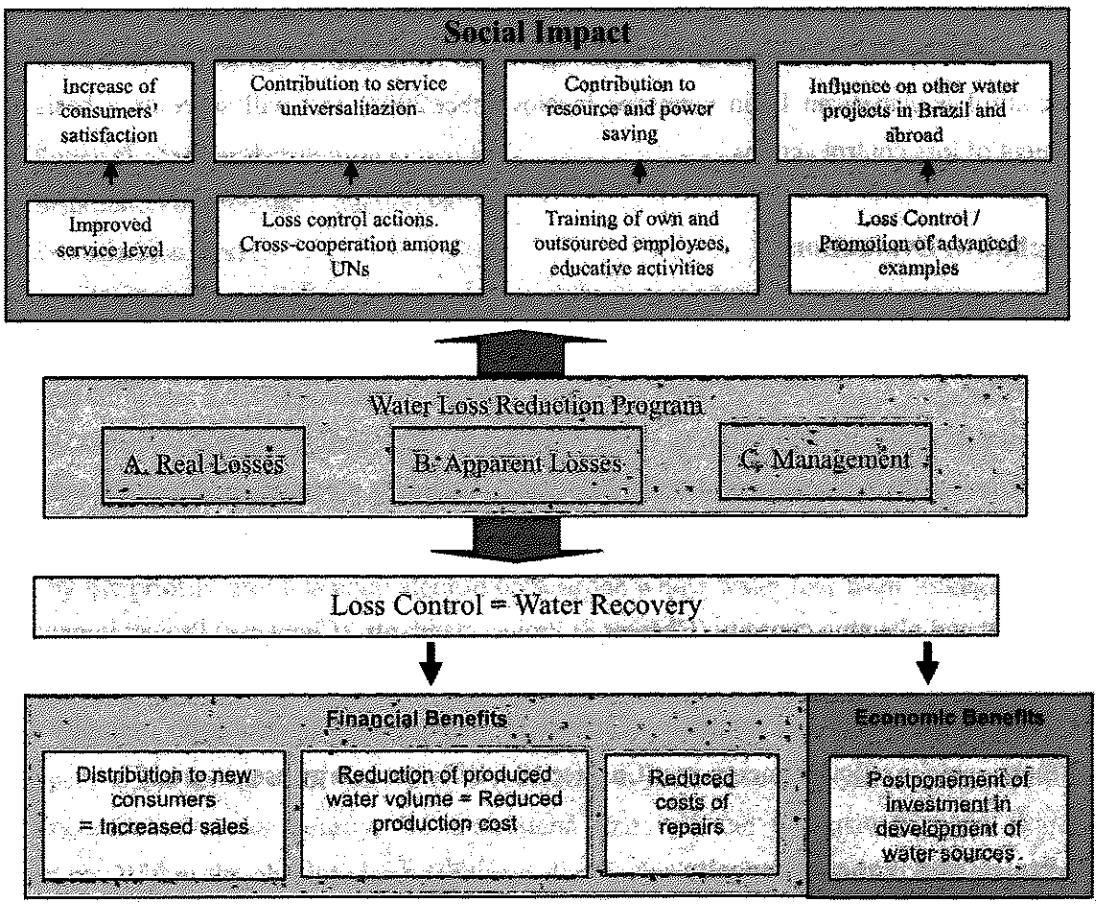


Figure 17-5 General list of influence of Loss Control Project Effects

(1) Increased consumers' satisfaction with improved water service:

Through the Corporate Water Loss Reduction Program and loss control system structuring, water service productivity will increase. It expected that, among the consumers served by Sabesp, effects of leakage reduction would increase their satisfaction with services provided.

(2) Contribution to service standardization

This PROGRAM covers the whole Sabesp by interlinking all 16 Business Units through loss control

actions. By applying successful loss control experience gained by Business Units to Sabesp in general, it will be possible to universalize the services in any region served by Sabesp.

(3) Contribution to resource and energy saving

By avoiding water losses, Sabesp will be able to reduce the volume of produced water and save energy, thus contributing to solve the worldwide problem of efficient use of limited energy resources.

In addition, it will contribute to promote the population's awareness of preservation of water resources, through information and education of employees, contractors and consumers.

(4) Influence on other water projects in Brazil and abroad

Implementation of PROGRAM by Sabesp, the leading water and sewerage service company in Brazil, has been watched by similar companies in Brazil and Latin American countries (Seminar on water and sewage control in American Latin countries in November/2008) and will serve as a basis for the development of loss control actions.

17-4 Technical Evaluation

From the technical standpoint, we estimate that the requested loan for the PROGRAM during JICA Stage is feasible.

We evaluate below JICA Stage from 4 technical views. As this is a summary of matters addressed in previous chapters, the related chapters are mentioned.

1) Project and planning capacity (Chapter 8) Project standards, (Chapter 9) Project in general).
2) Execution capacity (Chapter 12), Execution plan (Chapter 14 PROGRAM execution system).
3) Capacity for operational continuity (Chapter 15 – Operational Control and Continuity System).
4) Technique for efficient energy use (Chapter 10 – Efficient energy use program)

17-4-1 Project and planning capacity

Based on Chapters 8 and 9 we may say that:

1) Water loss reduction method is emphasized by improved infrastructure and pressure control in distribution networks. In general, we can mention the following actions to reduce loss volume:

Loss PROGRAM includes all such 3 actions, with emphasis on actions to improve infrastructure (replacement of branch lines and networks).

a) Detection and repair of leakages in water distribution network;

b) Replacement of networks and branch lines with high possibility of expansion; and

c) Control of distribution network pressure.

In the PROGRAM, the most important action in that indicated in c).

(2) Planned centralization with the implantation and selection of priority group is appropriate from the technical view.

Among more than 500 water supply systems in M and R Divisions (there is annual variations due to concession agreement), 158 priority systems have been established, which are those with greatest losses per water connection (IPDt) and are responsible for 80% of water volume lost by Sabesp. In priority systems, all actions included in PROGRAM will be implemented during JICA Stage. For all other systems, all actions will be implemented but the 4 actions listed below:

a) Renewal of water distribution networks;
b) Installation of pressure reduction valves;
c) Sectorization; and
d) Installation of Boosters.

The Report of Water Loss Reduction Activities started in 2004 by M Division indicated that out of some 900,000 cases of water leakages, 93.5% of them occur in water distribution branch lines. As all 158 priority systems based on IPDt account for 80% of water leakage volume, we may say that 93.5% of such 80% occur in water distribution networks of 158 priority systems, and the water loss to be covered by the priority group is equivalent to 65% of the whole water loss from leakages, which is a valid indicator for the selection of the object of water loss reduction plan (in the specific case of M Division).

With respect to the indicator of loss volume reduction in the whole network, in light of differences caused by supplied water density, we understand that it is an adequate indicator for system prioritization. Within the absolute time for water distribution and supply, 75% of total volume is in 158 sectors. We understand that, with respect to selected systems, if we want to confirm the status of its occurrence, the fact of taking IPDt as the indicator of choice is within the tolerance limit.

(3) We find that it is technically adequate to anticipate PROGRAM common actions for the whole company to plan water loss reduction at global level. To select the Priority System Group, the Daily Loss-per-Connection Rate (IPDt) was taken as a reference, and among the 300 existing systems (number that changes every year, depending on the concession agreement at M and R Superintendence), 158 systems were selected, where, in addition to physical and apparent water loss control actions to be applied to all Sabesp systems, pressure management actions (sectorization,

installation of VRP and Booster) and infrastructure management actions (network replacement, including branch lines) will also be implemented. In addition to the selection of actions for the Priority System Group, actions for all other water distribution systems have also been established, having that group been given the name of Whole Group, which includes more than 500 existing systems. In that group, actions to control loss reduction can be seen everywhere, such as basic actions, corrective actions, preventive actions, water distribution control actions, and socioeconomic actions.

For priority systems, all actions included in PROGRAM will be implemented. For all other systems, the same actions will be implemented, except network replacement, sectorization, implantation of pressure reduction valves and Boosters.

Scope of PROGRAM components is comprehensive and constituted of basic, corrective, preventive actions for distribution and social adjustment.

(4) Although there is some variation in Business Unit execution capacity, we estimate that their capacity is appropriate to PROGRAM implantation.

In Sabesp, water loss reduction activities started in 1981, but became more effective in 2004. Loss reduction action plan is formulated taking into consideration the physical characteristics of each Business Unit, and is monitored by indicators related to water losses. Allocation of funds for water loss reduction is based on diagnoses that take into consideration:

- Age of piping;
- Quantitative history of water leakages;
- Insufficient pressure (identified by users' complaints and network pressure monitoring);
- Adequate leveling according to geographic landmarks with the purpose to obtain a stable water distribution;
- Implementation of management and maintenance of sustainable water distribution in control.

17-4-2 Execution capacity

The PROGRAM execution plan during JICA Stage is technically adequate.

(1) Basically, there are no problems with action implementation techniques.

There are several PROGRAM actions, but their implementation techniques have been analyzed against more significant quantities, such as:

a) Works for renewal of water distribution networks;
b) Works for replacement of branch lines;
c) Actions to control network pressures (sectorization, installation of boosters, VRP and DMC (Measurement and Control Districts); and
d) replacement of water meters.

(2) With respect to inspection of execution of works, it is possible to increase capacity until the PROGRAM starts;

For water loss reduction activities, contractors' activities include, in addition to renewal and rehabilitation of supply networks and replacement of branch lines, such services as surveys of water leakages, outsourced water distribution adjustment, installation and inspection of measurement equipment, and replacement of water meters. From the view of strict execution of quality control of works referred to in item 14-2 'Inspection of execution of works", several technicians should be involved and the responsibilities shared.

Regarding the "Standardization of methods of execution of works" and "Inspection of execution of works", each Business Unit is aware of its needs and has plans focused on the implantation of training courses. Under Eficaz Project, there has been exchange or experience between areas with the objective of structuring and implanting a training center aimed at standardizing the method of implementation of actions.

(3) It is possible to increase the capacity of work execution inspection in each Business Unit until the start of activities under the PROGRAM.

Sabesp is divided into 17 Business Units, for 16 of which there are actions included in the PROGRAM. Each of such units is managed by an independent facility. Each Business Unit is responsible for the inspection of execution of works, apparent loss actions (water meter replacement, record update, control of irregularities, etc.) and for real loss actions (renewal of networks and branch lines, sectorization, survey of non-visible leakages, etc.)

Sabesp is provided with Execution Procedures, Manual of Inspection and Technical Standards, but each Business Unit has additionally its Technical Manual. The preparation of a Technical Manual common to the whole company is at planning stage.

Agreements with contractors, starting in 2009, provides for the inclusion of the "Inspection Manual" organized jointly by MP, RO and Eficaz Project.

In addition, under Eficaz Project 10 training courses are at planning stage. At PROGRAM implantation, it is necessary to cause contractors and professionals assigned to work execution inspection to complete, at least, the "Standardization of Method of Execution of Works" and the "Execution Control" by the start of works. Under Eficaz Project, the standardization of methods of execution, execution control and training contents is at preparation stage.

(4) Even with respect to quality control of execution of works, is possible to increase capacity until the start of PROGRAM.

Regarding the quality control, in general we may highlight the following items:

(a) quality standards for piping material;
(b) quality standards for cement and concrete;
(c) quality standards for base material and piles;
(d) quality inspection of joints, welding and coating; and
(e) water pressure test and water quality test.

Under the PROGRAM, during JICA Stage, water pressure tests and water leakage tests (tightness tests) will be introduced, which although mentioned in NTS, for example, have not been performed, in addition to the method for recording work photos.

17-4-3 Management and Maintenance Capacity

Management and maintenance of operational continuity control of PROGRAM during JICA stage is technically feasible.

(1) The organization framework for Water Loss Control in each Business Unit is generally consistent.

Water Loss Control Management in each Business Unit is responsible for planning and execution of loss-related activities, either using its own resources or outsourced services.

(2) Management and maintenance based on SGP – Loss Management System will be established.

Use of Loss Management System will allow completed actions to be monitored, and program management to be clearly and objectively performed.

17-4-4 Technique for efficient use of energy

Program for efficient use of energy, which is one of JICA Stage components, includes a technically pertinent project.

(1) Quantity control of pump rotations is a valid method for energy saving.

To deal with pressure variations in water distribution pipes, which are due to water use variations, controlling the quantity of rotations of water discharge pump is valid (Vila Medeiros Pumping Station and São José Pumping Station). This method has also been used in Japan for many years with the objective of saving energy and as a method to prevent excessive pressure, eliminate pressure reduction valves and prevent water leakages.

(2) In terms of the whole company, it is possible to expand energy saving activities.

In this study, there are some limitations in items under consideration, but there are sites in Sabesp that use electric power, like the huge pump plan (there is a total of approximately 5,000 sites of which 11 receive high-voltage 88-kV power, approximately 1,000 sites receive an average 13.8-kV power, and others receive 220-V power), and we understand that there several sites that could become more efficient, like Vila Medeiros Pumping Station and São José Pumping Station (medium voltage, each).

Chapter 18 Conclusion

(1) General Evaluation

Feasibility study of JICA Stage was conducted according to the presentation above, and the general conclusion is the feasibility of activities.

Its evaluation was based on financial, economic and social aspects. Among the aspects addressed in the general evaluation, we highlight in particular the following three items considered of the utmost importance:

(2) For manifestation of sustainability effects

It is currently underway in Sabesp the "Corporate Water Loss Reduction and Energy Efficiency Program" (a.k.a. "PROGRAM", covering a period of 11 years, from 2009 to 2019. Traditionally in Sabesp, long-term programs are 5-year programs, being therefore this long-term 11-year program its first trial of the kind. In Sabesp, 15 Business Units and one Water Production Unit (MA) and Sewage Treatment Plant (MT) manage water and sewerage, each in its respective jurisdiction. Units are extremely independent structures, each of which used to adopt its own methodology, even in connection with water loss reduction activities. Under the Corporate PROGRAM, Sabesp is planning, discussing and implementing interrelated activities in the organization, which are aimed to reduce losses. There is no doubt that, under the view of corporate governance, it will be a PROGRAM of high significance for the establishment of future long-term programs in Sabesp.

JICA Stage consists of activities financed over a period of three of 11 years of PROGRAM. To allow the sustainability effect to appear, it is believed that continued support is necessary, in the form of follow-up, technological aspects and know-how related to sustainable operation and maintenance during and after the PROGRAM implementation.

With respect to results from the PROGRAM, there are many unknown aspects. It is extremely important the cyclic process of making evaluations and reviews of actions after measurements and monitoring of completed actions and their results, as well as the effective reduction of loss rates every fiscal year.

(3) Connection with Eficaz Project.

Sabesp conducts its business in a vertical and extremely independent manner among its units, resulting in few cross-activities in the organization. However, it is possible to note information sharing in the PROGRAM, a practice that has been encouraged by Eficaz Project, as well the dissemination of the concept that water loss reduction is the result of an integrated management, strongly emphasized by Eficaz Project.

Eficaz Project workshop held in August 2009 was attended by several Business Units, each of which shared its experience through many presentations. We also noted an interaction among UNs in sessions of questions and answers about Eficaz Project activities and water loss reduction activities in each Business Unit. It is possible to note in the PROGRAM some advances achieved with the support of Eficaz Project. The company recognizes the importance of Eficaz Project, JICA Feasibility Study Mission, and the improved "qualify of execution of works" and inspection of services and works by Sabesp employees.

The main Eficaz Project activities that are contributing to the PROGRAM include:

- Development of procedures for application of Tightness Test in water connections.
- Standardization of criteria for preparation of Loss Program in Operational Divisions (M and R).
- Development of Capacity Building Framework for execution of services and works, including the development of 10 training modules, a structure to allow the participation of UNs, Training Center project, and course implementation.
- Improvement of "Manual of Water Connection Replacement", taking into consideration the revised language to be adopted to facilitate the understanding of the theme by operational staff. We assume that that training courses will be implemented by the start of JICA Stage.
- Development of a Standard Inspection Procedure in Sabesp with the contribution from all Operational Divisions and their current procedures.

(4) Expectations as the Leading South American Company

Water and sewerage sector has been the greatest focus of attention over the last years in Central America, South America and Caribbean Region, and a sector with great achievements in yen loans granted by Japan. Guarantee of operation and maintenance after application of funds is indispensable to allow the development effects to appear. However, we cannot say that the capacity or structure of countries is sufficient as far as operation and maintenance are concerned. Water loss reduction activities are still incipient in South American countries, where nothing is consolidated at this moment. Upon the PROGRAM implementation, Sabesp is expected to play a vanguard role in such activities and become the Leading Company in South America. Through the changes made to its articles of incorporation, Sabesp is today authorized to perform its activities out of the State of São Paulo. Much is expected from the dissemination of concept and technology related to waster loss reduction, through knowledge and experience offered by Sabesp.