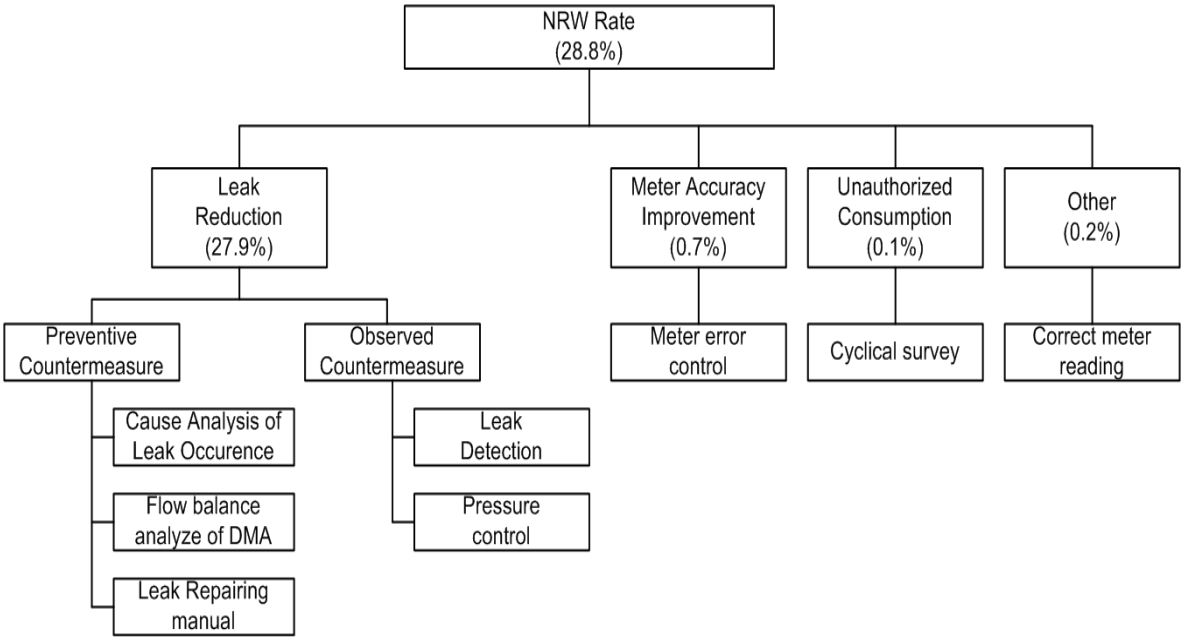
III-3 Requirements in Managerial Improvement

III-3.1 NRW Reduction

(1) Planning Concept

Currently, the rate of NRW has a share of 28.8% in total production. Based on the water balance performed in 2008, leakage itself, is at 27.9% of total production (i.e. leakage makes up 96.8% of total NRW). Water meter error was 0.7% (2.4% of total NRW), and others were about 0.3% (1% of total NRW). It is clear that the reduction of leakage is critically important to reduce NRW effectively.

Therefore, it is the most important subject to reduce the leakage and this should be raised as the action plan. Countermeasures of leakage reduction are made up of two components as shown in Figure III-32, preventive and re-active countermeasures, respectively.



Source: NRW rate is based on operational highlight of 2008, MCWD.

Figure III-32 Objective Tree Analysis

(2) Action Plan

Leakage amount has been recurred as the same amount of leakage reduction according to fluctuation of NRW rate since 2006. Work cycle of leak detection and pipe repair within entire pipeline system was estimated at 2-years using record until 2008.

Therefore, effect of leakage reduction can be improved by control on the recurring rate of leakage reduction when the cycle of working period can be reduced. Current cycle of field work is 2-years. Accordingly, 75% of leak reduction would be effective since the fieldwork cycle can be reduced to 6-months (25% of current cycle: 25% of recurring rate).

Based on the analysis on leakage detection survey in the study period, it can be judged that 2.5% of NRW reduction would be achieved during the first 6-months period. Target of 25% reduction in following 6-months period can be anticipated. Finally, NRW rate will be reduced at 19.8% in 2015 as shown in Table III-52.

Table III-52 NRW Reduction Plan in Short Term

Year	NRW Rate	Progress Point	Reduced Volume (m^3/day)
Dec-2009	29.4%	Not Applicable	Not Applicable
Jul-2010	26.9%	2.5%	1,223
Jan-2011	25.0%	1.9%	917
Jul-2011	23.6%	1.4%	688
Jan-2012	22.5%	1.0%	516
Jul-2012	21.8%	0.8%	387
Jan-2013	21.2%	0.6%	290
Jul-2013	20.7%	0.4%	218
Jan-2014	20.4%	0.3%	163
Jul-2014	20.1%	0.2%	122
Jan-2015	19.9%	0.2%	92
Jul-2015	19.8%	0.1%	69
Total			4,686

< Preventive Countermeasure >

A preventive countermeasure does not directly contribute to the reduction of latent leaks. Rather it contributes to prevent the leak from recurring by properly repairing existing leakage points. This will significantly reduce the volume of leakage. The preventive countermeasures include preparation of a leak repairing manual, analysis of the leak cause and water balance analysis of DMA.

* Leak Repairing Manual
  Repairing work must be performed properly, in order to prevent the recurrence of the leak. This manual must be prepared covering clear topics such as external construction standards of road excavation and restoration in consultation with the Road Works Office (or similar).

* Analysis of Flow Balance of DMA
  Water balance data including night flow shall be collected. These data categories of DMA shall be included for improvement of analytical precision. Accurate analysis results will be obtained if DMA's are set up in whole area and the collected data has a high reliability.

* Analysis of the Cause of Leak Occurrence
  Following repair data is statistically necessary to determine the cause of leak occurrence.
  - ✓ Address of occurrence leak point (GIS information, distribution block, DMA, etc.)
  - ✓ Pipe info. (diameter, material, laying depth, backfill materials, completion year, etc.)
  - ✓ Leak condition (estimated leak amount, leaking portion, etc.)
  - ✓ Repairing condition (method, used material, backfill materials, etc.)

< Re-active Countermeasure >

Re-active countermeasures reduce the leak volume directly by (a) the repair of existing leaks, and (b) the intentional control of water pressure. Since these countermeasures are of high priority over others, an action plan shall deal with these matters preparing periodically.

* Objection and Target
  At present, it takes two years to complete a full round of leakage detection in the entire area. The NRW rate has remained unchanged at about 30%. Following are considerable reasons why there has been no effect on NRW since 2006, despite performing leakage surveys.
  - ✓ The repeatability period of leaks is short, and leaks often re-occur within two years. Round period of leak investigation and restoration period of leak have been getting equal.

- ✓ Many small-scale leaks are not detected and latent. To cope with this cause and to increase the effectiveness of the leakage detection work.
- ✓ Select day time works area that high density tapping area (Table III-53 and Figure III-33).
- ✓ Day-time-surveys must be done, with detailed inspection of the facilities by the visual observation. Night-time-survey must be done to detect the underground leaks by listening on the road surface.

Table III-53 High Density Connection Area

Area No.	Primary Information			Density (No./km)	
	Connection (No.)	Tapping (No.)	Pipe Length (km)	Connection	Tapping
1	1,780	332	3.2	555	103
2	1,031	351	6.8	152	52
3	5,329	1,190	15.2	352	79
4	2,244	953	5.4	418	177
5	1,007	260	4.2	241	62
6	698	278	2.3	298	119
7	1,120	341	3.6	309	94
8	827	201	2.7	311	76
9	1,015	330	4.0	253	82
10	3,399	866	9.0	379	97
11	1,610	313	4.3	379	74
12	846	332	4.0	209	82
13	1,360	235	6.9	197	34
14	566	131	1.6	352	81
15	583	176	2.2	267	81
16	484	83	1.7	288	49
17	792	252	3.1	255	81
18	605	350	1.8	334	193
19	420	118	1.7	255	72
Total	25,716	7,092	83.5	307	85

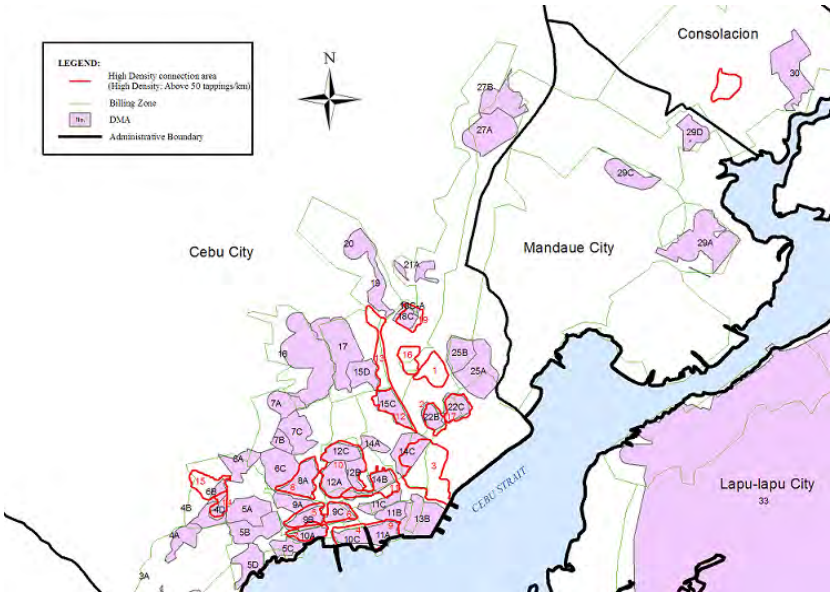


Figure III-33 Map of High Density Connection Areas

The leakage detection work must combine these two types of surveys. Moreover, the balance of the reduction volume and recurrence leak volume is reduced by shortening the leak detection period in the whole area from the current two-years, down to six-months. This will have a real effect on NRW reduction.

* Re-organization of Leak Detection Team

The round period is set at six months to patrol the whole area. For this purpose, five teams need to be reorganized from present organization, and each one team is composed of four members. Two teams carried out the day time survey on the high density area of service connection. Other two teams carried out the night time survey on the low density area of service connection. Another team must promptly identify the leak point when they receive the leak information from the plumber and the inhabitants.

* Pressure Control

Figure III-34 indicates that the average of highest pressure in midnight (00:00 to 05:00) is 36 psi according to MCWD survey. A reduction of 0.62% in NRW is brought when the midnight pressure was decreased for 2 hours to 20 psi, the planning distribution pressure. If it is done for 3 hours, 1% of the improvement can be expected (see Table III-54). Because the midnight pressure reduction is acceptable for the customers. This is an effective countermeasure which can be undertaken immediately. Especially, the suspended direct injection would be considered.

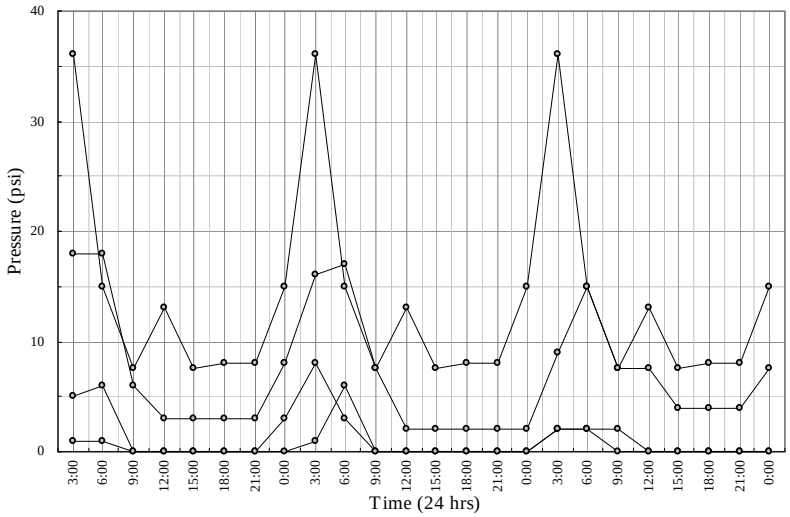


Figure III-34 Typical Records on Pressure Measurement

Table III-54 Expected Effects by Midnight Pressure Control

Month	Production Volume m^3/month	Production Volume m^3/day	Monthly NRW	Average Water-loss/hr	Conversion of Pressure	Reduction Volume (2 hrs)	Reduction Rate
	a	a'	b	c =a×b÷(31×24)	d =c√20 / 36.27	e =c-d×2	f =e/a'
Jan	5,367,626	173,149	31.81%	2,295.19	1,704.35	1,181.67	0.68%
Feb	5,120,984	182,892	31.33%	2,156.53	1,601.39	1,110.28	0.61%
Mar	4,630,311	149,365	26.72%	1,663.00	1,234.90	856.19	0.57%
Apr	4,930,308	164,344	28.65%	1,898.64	1,409.88	977.51	0.59%
May	4,909,896	158,384	26.63%	1,757.44	1,305.03	904.81	0.57%
Jun	4,944,438	164,815	29.05%	1,930.52	1,433.56	993.92	0.60%
Jul	5,171,595	166,826	29.44%	2,046.74	1,519.86	1,053.76	0.63%
Aug	5,192,146	167,489	27.96%	1,951.02	1,448.78	1,004.48	0.60%
Sep	5,116,623	170,554	31.50%	2,166.45	1,608.75	1,115.39	0.65%
Oct	5,372,596	173,310	29.76%	2,149.34	1,596.05	1,106.58	0.64%
Nov	5,019,232	167/308	30.16%	2,034.80	1,510.99	1,047.61	0.63%
Des	5,132,831	165,575	29.24%	2,034.80	1,497.90	1,038.53	0.63%
Total	60,908,585		29.36%			12,390.74	0.62%

Note: Conversion formula is Q = Qo*√P/Po, 36.27psi is average max. and 20psi means planed distribution pressure.

* DMA System and Survey Block

Leak detection team establishes the working block based on the working volume of one day. Basically, a data arrangement shall be made in the analysis of the restoration rate and the

statistics on the leak point, however there is no relation between working-block and DMA though it is put together in every DMA. While each DMA was being subdivided, it is desirable in the working block to set it up. An example is shown in the case of set up the working Block in the DMA-12A (see Figure III-35).

Figure III-35 DMA-12A and Working Block

* Input Required

Recommend the under follow for carried out the NRW rate reduction plan.

✓ Number of pipe leak repair (based on the past record)

Large scale	121 sites
Small scale	1,089 sites
	1,210 sites in total

✓ Leak detection team organization

Engineer	1×5
Detector	2×5
Driver	1×5
	Totally 20 members for five teams

✓ Equipments for Leak Detection

Leak detector	10 units
Listening rod	10 peaces
Metal pipe locater	5 units
Metal locator	5 units
Vehicle	5 cars

✓ Preventive Countermeasure staff

Engineer	1 head
Staff	3 heads

(3) Long Term Plan

After the rate of NRW is reduced to 20% in 2015, it needs to be improved gradually, and as a long-term plan. The NRW rate of 18.4% will be achieved in 2030 as shown in Figure III-36 with refraining from the new investment and maintaining the desired value achieved in 2015.

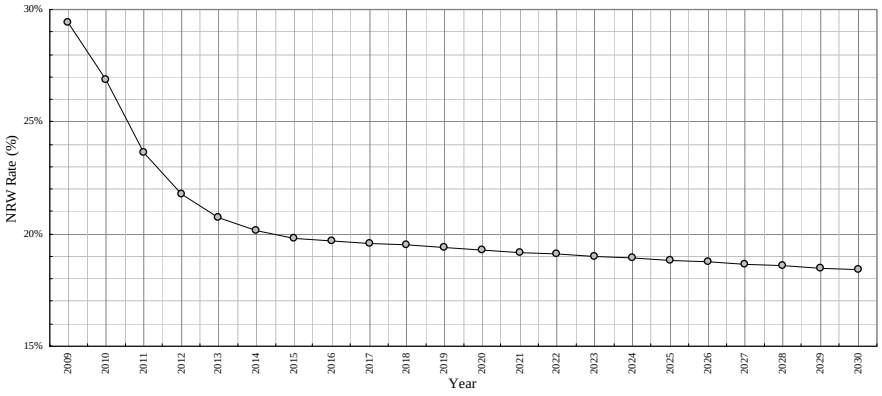


Figure III-36 NRW Reduction in Long Term Plan

III-3.2 Water Saving Measures

(1) Outline

In the Metropolitan Cebu, there are many problems in developing new water resource. Such problems include acquisition of the water rights and the production cost, and the execution of the water-saving countermeasure is necessary for the continuation of the steady water supply for MCWD to catch up with the future population growth and increase in the water demand.

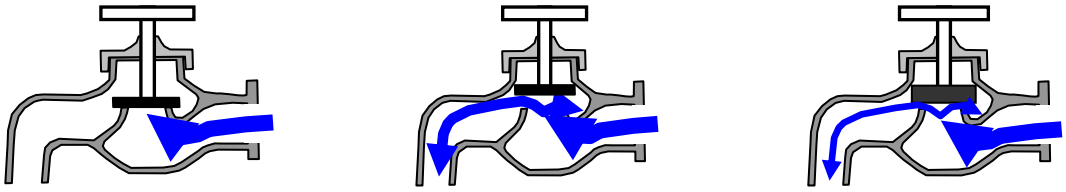
In Los Angels, US, "Green Building Program" was legislated in July 2009. This program restricts the private rights on water use and put the citizens under an objection to introduce water saving type products to the new houses building.

(2) Water-saving Equipment

Even many Japanese waterworks authorities encourage adoption of the water-saving type product. For example the effect on saving water by the water-saving utensils is;

- In a rest room of toilet bowl 16 to 10 litter/ flash
- In a rest room of urinal 10 to 5 litter/ flash

The faucet and shower of water-saving type are shown in Figures III-37 and III-38. In opening the 90 degrees of the water-saving faucet compared to full open, 6 litters/min can be reduced (the water pressure 0.1 Mpa).



Close the faucet Normal type faucet Water save type faucet

Figure III-37 Water Saving Type Faucet

Exchange to silky faucet from the general faucet: saving of 6 litters/ head/ day
(Silky faucet make soft expel that a like silk feel)

Figure III-38 General Type Faucet and Silky Type Faucet

III-3.3 Poverty Stratum Measures

(1) Definition of Poverty

Currently, there is no available data on the poverty situation and income level for specific cities and municipalities. Nonetheless, the situation in the study area is shown in Table III-55.

The annual food threshold in Cebu is 9,917 PHP/capita for urban areas and 8,825 PHP/capita for rural areas. This means that a HH of 5.9 members, which is resulted from the Socioeconomic Survey, in Metro Cebu needs 4,876 PHP/month to be able to eat decent meals three times a day. Therefore, in this section, poor HH is defined as one's monthly income is below 5,000 PHP/HH based on the Socioeconomic Survey, such poverty stratum shares 23.1%.

Table III-55 Poverty Situation in the Study Area

Items		Figure
Annual per Capita Poverty Threshold in 2006	Urban Areas of Cebu	14,467 PHP
	Rural Area of Cebu	12,107 PHP
Annual per Capita Food Threshold in 2006	Urban Areas of Cebu	9,917 PHP
	Rural Area of Cebu	8,825 PHP
Poverty Incidence in the Philippine	In 2006	32.9%
	In 2003	30 %
Number of Poor Families in the Philippine	In 2006	26.9%
	In 2003	24.4%
Number of Poor Families in Cebu Province	In 2006	33 %
	In 2003	29.4%

Source: National Statistical Coordination Board

(2) Water Usage of Poor Households

< Water Consumption and Cost >

In terms of unit price for usage, the most expensive one (0.061 peso/litter) is the one for households below 5,000 pesos of their monthly household income (see Table III-56). This shows that the poorest households use the most expensive water.

Table III-56 Water Consumption and Expense by Income Range

HH Income (PHP/ month)				Ave. Consumption		Ave. Monthly Cost			Unit Price (PHP/L)
Range	Average	No.	%	HH (L/ month)	Lpcd	HH (PHP)	Capita (PHP)	Ratio over HH Income	
Refuse to Ans.	-	52	7.0%	21,010	121	566	94	-	-
< 5,000	3,040	172	23.1%	6,104	42	372	66	12.3 %	0.061
5,000≦ to <10,000	7,347	284	38.1%	10,046	59	468	75	6.4 %	0.047
10,000≦ to <15,000	12,764	131	17.6%	11,864	58	566	79	4.4 %	0.048
15,000≦ to <20,000	17,286	42	5.6%	14,005	71	580	84	3.4 %	0.041
20,000≦ to <25,000	22,490	22	3.0%	15,980	73	655	82	2.9 %	0.041
25,000≦ to <30,000	28,692	13	1.7%	24,426	136	582	97	2.0 %	0.024
30,000≦	44,299	30	4.0%	24,554	110	769	103	1.7 %	0.031
Totality	10,381	746	100.0%	11,435	65	499	78	4.8 %	0.044

While regarding average daily consumption per person, poor households daily consume only

41.7 litters per person, which is a half or one third of richer households.

In terms of unit price of each water source as shown in Table III-57, the unit price of communal faucet water (B3) is 5.7 times of one of MCWD individual faucet water (B1). While the unit price of MCWD water buy from neighbor is 10 times of one of MCWD individual faucet water (B1).

Table III-57 Average unit Price per Litter and Average Monthly Cost: Q-4 Unit Price

Water source	Average unit price (peso/litter)	Average monthly cost per HH (in pesos)	Average monthly cost per person (in pesos)
B1	0.03	479.3	77.1
B3	0.17	435.5	77.3
B4	0.30	308.5	53.5

As a result, poor household, that have monthly income blow 5,000 pesos, have to spend 12.3% of monthly income for water, which is equivalent to 372.45 peso. It is almost two (2) times or more of households in richer ranges.

< Communal Faucet >

As shown in Table III-58, many (72.7%) of B3 users are using other source and spend more (109.3 peso/person/month) than these of B3 users only. While average daily consumption per person is almost similar (21.1 and 25.4 liter/person) between B3 users only and B3 users with other source. This shows difficulty and/or inconvenience in using communal faucet water because of distance, waiting time and so on. Usually one communal faucet is used by more than 30 households. Therefore many of them have to depend on other source.

Table III-58 Water Consumption and Expense of Communal Faucet Users

Water users	No.	%	A	B	C	D	E	F
All B3 users	11	1.5%	7,163.64	4,065.45	24.0	547.09	97.1	7.6%
B3 users only	3	0.4%	5,833.33	4,000.00	21.1	440.00	69.5	7.5%
B3 users with other sources	8	1.1%	7,662.50	4,090.00	25.4	587.25	109.3	7.7%
Non-B3 users	735	98.5%	10,432.47	11,545.18	65.5	498.23	77.6	4.8%
Total	746	100.0%	10,380.66	11,434.74	64.9	499.01	77.9	4.8%

Note: A; average HH income (PHP/ month), B; average HH consumption (L/ month), C; average per capita daily consumption (Lpcd), D/ E; average costs (PHP/HH-month, PHP/ capita month), F; water cost over income (%)

< Water Drawing >

Drawing water from outside the house is likely in poorer households than in richer ones (see Table III-59). Very poor households (87.8%), those with a monthly income of less than P5,000 fetch water more than in households that earn more than P30,000 a month (36.7%). Likewise, there are more households in the P5,000 to P10,000 monthly income bracket (70.8%) that draw water from neighboring areas than in households whose income ranges from among P25,001 to P30,000 (38.5%).

The households that fetch water use 1) B3: communal water, 2) B4: water by from neighbor, 3) A: bottled/ distilled water. Regarding A: bottled/ distilled water, some households go to shop by car/ motorbike/ tricycle and some ask shops for delivery.

Table III-59 Drawing Water Outside the House by Income Range: Q-6.1

Monthly Household Income	Gets/brings/takes water outside the house							
	Yes		No		No answer		Total	
	No. HH	%	No. HH	%	No. HH	%	Total HH	%
Refused	28	53.8%	24	46.2%	0	0	52	100.0%
Below P 5,000	151	87.8%	21	12.2%	0	0	172	100.0%
P 5,000 to P 10,000	201	70.8%	83	29.2%	0	0	284	100.0%
P 10,001 to P 15,000	91	69.5%	39	29.8%	1	0.8%	131	100.0%
P 15,001 to P 20,000	19	45.2%	23	54.8%	0	0	42	100.0%
P 20,001 to P 25,000	9	40.9%	13	59.1%	0	0	22	100.0%
P 25,001 to P 30,000	5	38.5%	8	61.5%	0	0	13	100.0%
Above P 30,000	11	36.7%	19	63.3%	0	0	30	100.0%
Total	515	69.0%	230	30.8%	1	0.1%	746	100.0%

But fetching water is not considered as a major problem. More than half of the respondents claimed that they travel less than 11m to fetch water from outside the house. In fact, most of the respondents travel less than 11m to get water from neighboring areas (see Table III-60). Putting all house location types, the average distance to fetch water is 127.6 meters since there are households that use motorized vehicles to get it, especially bottled/ distilled water.

As a result, though water drawing work is not a problem, expensive water for poor is a problem. Even communal faucet is provided to poor, the actual price is high and many of poor households have to depend on other source due to inconvenient of communal faucet water.

Table III-60 Distance from House in meters: Q-6.2

Distance from House in meters	No.	%
Less than 5 meters	82	15.9%
5 - 10 meters	176	34.1%
11 - 20 meters	106	20.5%
21 - 30 meters	45	8.7%
31 - 40 meters	8	1.6%
41 - 50 meters	24	4.7%
51 - 100 meters	28	5.4%
101 - 500 meters	19	3.7%
Above 500 meters	27	5.2%
Total	515	100.0%

(3) MCWD's Approach to Poor

< History of Communal Water Supply >

The Communal Water Supply (CWS) was started by MCWD in 1975 as a Level II Water Program intended to give opportunity to low income families within its service area to have access to safe, clean and affordable water. It is an expression of MCWD's corporate social responsibility to help families who cannot afford to have their own water connection.

To avail of the Level II Water Program, interested families were required to submit a formal application to MCWD expressing their desire to put up a communal faucet system. An evaluation was conducted by MCWD to determine the actual economic status of the families, their population, and the water pressure required to meet the needs of the area. If the application passed MCWD's evaluation, the families underwent an orientation to discuss the ways on

how to operate and maintain a Communal Water Association (CWA). MCWD served as the regulatory body in the formation and operation of the CWA, an informal community group composed of not less than 30 but not more than 60 low income households.

The CWA concept was considered a feat in MCWD's attempt to provide water to the poor. Revolving around the idea of community development, the management of the communal faucet was deemed simple and the collection of water payments easy because water was purchased on cash basis. Despite these positive attributes, MCWD encountered several problems while implementing the CWA. In fact, several of the CWAs encountered major conflicts, which included poor management of finances, inappropriate community development projects, limited updates of annual financial reports, and untimely payment of water bills or payment defaults.

MCWD started the CWS approach in October 2008. MCWD Board Resolution No. 072-2008 dated July 21, 2008 approved the revised Implementing Rules on Communal Water System and the Communal Service Contract.

< Previous and New Policies >

1. Who may apply
   - Previous Communal Water Associations (CWA) only
   - New Anybody
2. Qualifications
   - Previous Poor families belonging to the low income class. No clear-cut definition as to who are poor families.
   - New The communal service connection must be located in the depressed areas as determined by MCWD.
3. Requirements for Application
   - Previous Formal petition only
   - New Consent of the owner of the lot where the communal service connection will be installed. Board resolution for NGO and Cooperative. Articles of incorporation for NGO and Cooperative. Resolution authorizing the organization's representative to transact with MCWD.
4. Membership Requirement
   - Previous At least 30 members per communal association
   - New None
5. Number of Communal Faucets
   - Previous Maximum of 3 faucets per CWA (regardless of the number of members)
   - New Maximum of 2 faucets (1 faucet per 15 members)
6. Communal Water Management
   - Previous CWA elects the following officers to operate the communal faucet but with close and direct supervision by MCWD. CWA funds in excess of MCWD payments shall be spent for projects.
     - President: responsible for the management of the CWA
     - Secretary: keeps the minutes of all CWA meetings
     - Treasurer: takes charge of the CWA funds and prepares the financial statement of the CWA
     - Auditor: audits all financial transactions of the CWA
   - New The undertaking shall be that of franchising; franchisor-franchisee relation-

ship between MCWD and NGO, Cooperative, and private contractor. Communal water management is completely delegated to the franchisee. Subcontracting of the management and operation of the communal water system is totally prohibited. MCWD shall act as a regulatory body in the creation and overall management of the communal water system. Projects out of the communal water funds are no longer required.

7. Selling Prices of Communal Water
   - Previous The following standard selling prices are set but not compulsory:
     2 gallon (about 7.5 litters) PHP 0.25
     1 kerosene (about 20 litters) PHP 0.65
     1 container (about 22 litters) PHP 0.75
   - New The following ceiling prices are set for strict compliance (selling prices shall be posted on the communal faucets as notice to the communal consumers):
     1 gallon (about 3.8 litters) PHP 0.25
     1 pail (about 8.5 litters) PHP 0.75
     1 container (about 22 litters) PHP 1.50
8. Income Statement and Audit
   - Previous The CWA's are required to submit their income statement to MCWD. The CWA and its funds may be subject to audit by MCWD.
   - New MCWD shall conduct a spot audit of franchisee's operations and finances.
9. Penalty Clause
   - Previous Disconnection or cancellation of the CWA status in case of non-compliance with any or all of the implementing rules.
   - New Application of regular water rates in case of non-compliance with any or all of the revised implementing rules.
10. Communal Water Rates
    - Previous None.
    - New Existing communal water rates shall be adjusted to break-even.

< Case Study >

Due to several problems/ issues encountered by MCWD on the communal water system, case studies have been conducted to:

1. Look into the background of communal water associations/ systems with a brief description of the barangays that host them, including the CWA/ CWS histories and the rationale behind their formation,
2. Assess the current status of CWA/ CWS operations in line with the MCWD requirements for communal faucets,
3. Identify problems and concerns that pose as major challenges affecting CWA/ CWS operations, and
4. Ascertain CWA/ CWS future plans that will significantly make impact on their management directions.

At the time of the case studies as of April 2009, MCWD listed 192 communal water associations/ systems with 87 already under the franchise system in its service area. The case studies selected three (3) typical cases, which are;

(i) existing CWA,
(ii) non-operational CWA, and
(iii) converted in to a franchise system.

As of September 2009, all CWAs have been converted into franchised CWS. The case studies were conducted for the following CWA/ CWS as shown in Table III-61.

Table III-61 CWA/ CWS for Case Study

Status	Name of CWA/ CWS	LGU
Existing CWA	The Communal Water Associations in San Vicente, Lilo-an – the Sitios Ibabao and Tabaylawom CWAs	Mandaue City
	The Communal Water Associations in Catarman, Cordova particularly the Catarman II B CWA	Cordova
	The Villamanga Communal Water Association in Opao, Mandaue City	Mandaue City
Non-operational	The Non-Existing Communal Water Associations in Guizo, Mandaue City	Mandaue City
	ATU Carbon Market Multi-Purpose Cooperative in Cebu City	Cebu City
Converted into a franchise system	Saac Seaside Community Association, Inc. in Mactan, Lapu-lapu City	Lapu-lapu City
	Alvin Flores/ Cantila Communal Water System 4 in Poblacion Occidental, Consolacion	Consolacion

A non-operational CWA is one that has failed to pay for two (2) months prompting MCWD to disconnect the communal water supply. Further, any resident can assume (purchase) the communal faucet by paying an installation fee of PHP4,950 to MCWD including arrears. This person can own the regular/individual faucet converted from communal water. As of September 2009, all CWA have been converted into CWS. The updated status is shown in Table III-63.

Table III-62 Status of CWA/ CWS

Status	No.
Active CWA/CWS	153
Closed and Inactive CWA/CWS	107
Converted to Residential	6
Total Installation	266

< Issues to be addressed >

The summary of the case studies' results is as follows:

1. Selection of CWA/ CWS beneficiaries
   No clear cut definition of "low income families." No definite cut-off point when an economic status is no longer considered "low income" that merits the dissolution of a CWA/ CWS. Presence of beneficiaries is not limited to families but vendors.

2. Institutional support
   Absence of support activities that strengthen the institutional capability of associations/ organizations. Inability of MCWD to provide institutional support due to the nature of the program and the limited number staff assigned to communal water systems; Absence of mechanisms to thwart conflicting interests; Effectively managed associations (e.g., Saac Seaside Community Association, Inc. in Mactan, Lapu-lapu City) have better communal water supply management; they were provided with institutional support by government agencies and NGOs

3. Water prices
   Differences in water prices due to limited monitoring; It is unclear whether consumers are being interviewed regarding how much they pay for water or monitored regarding their knowledge on and satisfaction of the water rates; CWA/ CWS lacks the knowledge and skills in calculating system loss

4. Salaries of watchers
   Differences in the salary/ honorarium of watchers from one CWS/ CWA to another; Absence of policy with regard to salary/ honorarium of watchers; Inequality of salary rates could be a potential irritant between watchers and CWAs/ franchisees

5. Direct connection from main communal faucet and pilferage
   Revised Implementing Rules on CWS dated July 21, 2008 is silent about the direct water connection issue; No mechanism in place that protects the franchisee from being the victim of pilferage

6. Use of income for CWA projects
   Different interpretations of use of income for CWA projects from one CWA to another; the clause that "income should be used to improve the social condition of members" is subject to many interpretations; Absence of specific guidelines on the utilization of income/ savings resulting in the "abuse" of income leading to conflict within the association

7. CWA conversion to franchise system
   Advent of the franchise system, as approved through MCWD Resolution No. 072-2008, has created anxiety among existing CWAs; NGOs or cooperatives of good standing are the preferred franchisees of the CWS but several CWAs have not been prepared to take on the role of a cooperative in good standing; there is not enough time or support provided to CWAs to prepare themselves for the eventual conversion

8. Income sharing in the CWS franchise
   Anxiety over income sharing in the franchise system; there may be no problem if the franchisee is the NGO or cooperative since income can be shared among or plowed back through projects to its members; if the franchised CWS happens to be a transition from CWA, income sharing could be a volatile source of conflict

< Conclusion in the Action Plan >

It is proposed that MCWD should facilitate to install communal faucets under the franchise system and monitor their operation at the same time. Based on the monitoring data, the franchise system should be reviewed at the appropriate timing.

III-3.4 Institutional Strengthening

As shown in Table III-63, the number of job order employees in 2009 fluctuated from 14 to 115. Job order employees provide the additional labor requirement for a specific job. The 4.63 ratio of staff (regular and casual categories only accounting for 64% of total employees) per 1,000 connections as of yearend is better than in previous years, an indication of increasing work force productivity.

Table III-63 MCWD Personnel Complement, Year 2009

Month	Employees				Total
	Regular	Casual	Contractual	Job Order	
January	492	79	277	29	877
February	492	78	279	14	863
March	497	79	274	49	899
April	499	80	275	57	911
May	501	80	274	115	970
June	502	80	273	114	969
July	503	81	269	94	947
August	504	82	272	69	927
September	506	81	272	15	874
October	505	80	272	19	876
November	506	80	274	33	893
December	509	79	277	57	922

Source: MCWD, Corporate Planning Department

The overall MCWD corporate performance from 2005 to 2009 has been good as evidenced by it accomplishments in the monitored key result areas for water utility as shown in Table III-64.

Table III-64 MCWD Key Result Areas, 2005 – 2009

Key Result Area	2005[1]	2006[1]	2007[1]	2008[1]	2009[2]
1. Systems Recovery Rate[2] (%)	72.57	72.15	70.66	70.78	70.10
Non-Revenue Water[2] in (%[3])	27.73	29.04	29.55	29.40	30.30
2. Water Production (000 m³)	53,009	56,564	59,178	60,739	62,647
3. Water Sales (000 m³)	38,179	39,912	41,626	43,003	43,591
4. Net Revenue (PHP'000)	806,941	955,386	1,052,652	1,090,400	1,092,003
5. Collections (PHP'000)	750,822	890,062	985,607	1,007,874	1,025,776
6. Collection Ratio (%)	93	93	94	92	94
7. On-time Collection Efficiency (%)	66	65	63	55	60
8. Service Connections Installed	6,945	5,758	7,455	5,445	6,514
9. Total No. of Service Connections	105,532	110,361	116,417	120,390	126,935
10. Service Connection Repair	18,146	18,155	18,956	18,395	14,010
SCR Reaction Time (hour)	6.87	7.28	7.65	5.50	5.10
11. Mainline Repairs (site)	491	602	535	530	502
MR Reaction Time (hour)	10.47	8.63	9.40	6.78	7.10
12. Service Conn. Reactive Rehabilitation	8,150	9,099	9,940	5,272	6,381
13. Corrective Meter Job Orders	13,768	10,898	9,564	10,616	not applicable
14. Manpower Level (Regular/ Casual)	582	568	572	568	588
15. Employee per '000 Service Connection	5.75	5.31	4.98	4.72	4.63
16. Water Sales per Employee (PHP'000)	146.16	131.17	199.87	206.27	205.19

Source[1]: MCWD Annual Report for the year, Note[2]: SRR and NRW both include the amount of unbilled but accounted for (free) water, Source[3]: Corporate Planning Department, MCWD

However, the on-time collection efficiency (item 7 in Table III-54) has declined over the same time period. More importantly and a cause of great concern was the deterioration of NRW. Thus, the need to take a closer look at the whole organization to find ways and means to keep the NRW level to at most 20% by 2015.

(1) Rationalization and Reorganization Efforts

MCWD is, on its own, currently undertaking a thorough review of its present organization to address the key issues of improving customer service and business efficiency. This means having an organizational structure tailored fit to provide more efficient delivery of services to customers,

deal with an expanding customer base, and improve the financial performance of the business.

In 2008, earnest efforts to address improvements in MCWD's operation and water contamination were started and resulted to the identification of the following areas for improvement.

- Water Resource Management: securing supplies other than groundwater
- Distribution System Performance: aiming to optimize across a complex system, ensuring acceptable pressures and supply continuity is achieved and eliminating groundwater contamination;
- Reducing NRW, getting NRW embedded at a strategic, organizational and individual level and calculating infrastructure leakage index;
- Achieving set water quality standards on an on-going basis;
- Data Management: greater use of GIS (linking leaks to system assets for improved NRW management), i.e., causal analysis of reported or repeated leaks. Recording sufficient information to facilitate evidence based decision making;
- Updating customer databases and classification;
- Demand management to capture both customers demand and those who are not connected in the system;
- MIS: looking at methods to present information differently and ensure operational departments take a greater role in compiling their own key indicators (KIs);
- Streamlining the organization to facilitate coordination and communications between groups that are heavily dependent on one another.

As a result, the reorganization of MCWD was put forward guided by the following principles:

- To streamline functions of various units and group the same mind-sets within the organization
- To establish/ institutionalize as regular functions important tasks currently carried out by ad-hoc bodies/ committees, e.g. NRW reduction and consumer marketing
- To consider outsourcing of non-core activities/ processes
- To equally distribute workloads among groups, departments and divisions
- To, at most, maintain the same number of groups and departments under the proposed organizational structure

A thorough review of MCWD operational procedures and flow of work was spearheaded by the Corporate Planning Department (CPD). Core and non-core functions as well as gaps in business functions and possible areas for outsourcing were identified as shown in Tables III-65 and III-66. A proposed organizational structure was based on analysis done by the CPD.

The CPD-proposed MCWD organization has the same numbers of Groups and Departments, but reduced the total number of divisions as shown in Figure III-39. Group names were changed to reflect the core functions. To a certain extent, the following changes were likewise made: names of departments and divisions; and creation of new, abolition, upgrading or downgrading of existing levels. The plan is to "pilot" the formation and operation of the Customer Services Group as soon as possible (in 2010) as the first phase of MCWD's reorganization.

The outsourcing strategy as good management practice is acceptable; however the following observations and suggestions are put forward.

- First, the suggestion to outsource the right of way, lot acquisition, legal processes, recruitment and training should be revisited to define more clearly what aspect and parts of the

processes can effectively and cost efficiently be outsourced. The planning and scheduling of human resource development should remain a major responsibility of HRD.

- Second, payroll processing should be transferred to HRD where all personnel records are lodged and maintained, e.g., employment and salary history, attendance records and leave credits, list of benefit entitlements, etc.
- Lastly, the meter reading function may be considered for outsourcing in addition to the bill delivery activity.

The reorganization plan was approved by the Board of Directors (BOD) who has been fully informed and updated on the progress of the reorganization efforts. The plan is to be implemented in 3-phases starting in 2010. First phase will focus on financial and customer services functions.

Table III-65 MCWD Core and Non-Core Functions

Core / In-House	Non-Core (For Outsourcing)
• Corporate planning	-
• Management Information Services: ✓ Preventive and corrective maintenance of computers	✓ Systems development
• Internal audit	-
• Legal	✓ Litigation ✓ ROW, lot acquisition, legal processes
• Billing: ✓ Meter reading ✓ Billing analysis	✓ Bill distribution
• Financial Management: ✓ Financial planning	✓ Collections
• Accounting: ✓ Accounting ✓ Payroll processing	-
• Public Affairs:	✓ Customer service
• Human Resources: ✓ Personnel administration ✓ Library services	✓ Recruitment ✓ Training ✓ Dental and medical examination
• Materials Management: ✓ Procurement ✓ Warehouse management/inventory control	✓ General services
• Production and distribution	-
• Service Connection Installation: ✓ Water service processing ✓ Installation of new Service Connections	✓ Disconnection ✓ Reopening of Service Connection
• Maintenance and Support Services: ✓ Meter maintenance ✓ Pump maintenance	✓ Fabrication
• Environment and Water Resource Knowledge Center: ✓ Development and utilization of water sources ✓ Well rehabilitation and monitoring ✓ Management of watershed project areas	-
• Engineering: ✓ Planning ✓ Design	-
• Construction: ✓ Project management	✓ Building construction and assets ✓ Pipe laying
• Pipelines Maintenance: ✓ Repair and maintenance of distribution lines ✓ Massive rehabilitation	✓ Leak repair ✓ Road restoration ✓ Mainlines rehabilitation

Source: MCWD Corporate Planning Department

Table III-66 MCWD Identified Gaps in Major Functions and Areas for Outsourcing

Corporate Function	Identified Gaps	Business Process Outsourcing
Development of Strategies and Business Plan	✓ Key stakeholders management ✓ Marketing Plan	
Water Source	✓ Network Modeling ✓ Infrastructure Planning ✓ Demand Management	
Installation and Sustaining MCWD Infrastructure	✓ Asset Management	✓ Construction of buildings ✓ Construction of hydraulic assets
System Operation and Maintenance	✓ Condition Monitoring Implementation ✓ Asset Performance Data Collection	✓ Leak repairs ✓ Road restoration ✓ Fabrication of fittings
Customer Servicing	✓ Top 50 Customers ✓ Marketing Plan Implementation	✓ Bill distribution ✓ Collections
Organizational Support	✓ Occupational Health and Safety	✓ System development ✓ Litigation, land and right-of-way acquisitions ✓ Buildings maintenance ✓ Fleet maintenance ✓ Carpentry works ✓ Dental and medical examinations

Source: MCWD Corporate Planning Department

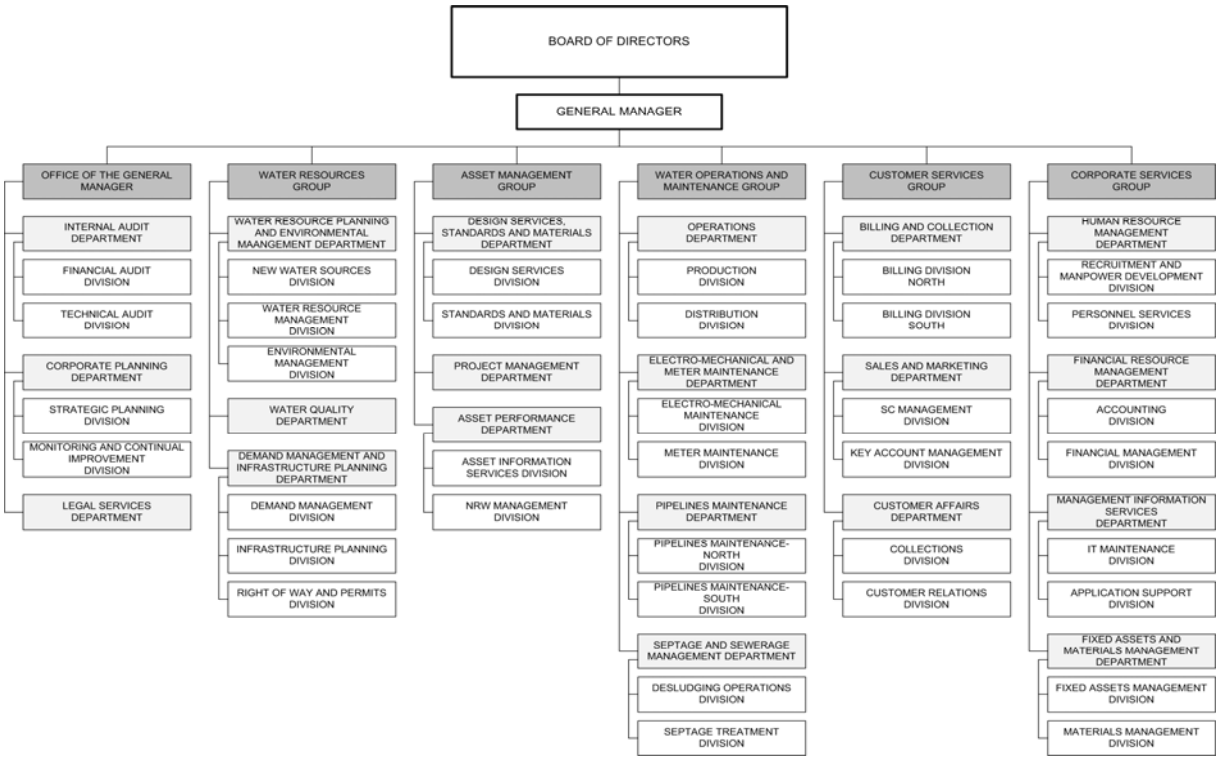


Figure III-39 MCWD CPD-Proposed Organizational Structure

(2) Legal Bases and Reorganization Constraints

The reorganization of MCWD is bound by the provisions of Executive Order No.366 (EO-No.366) as well as related rules and regulations issued by the Department of Budget and Management (DBM) and the Civil Service Commission (CSC). As a local water district (LWD), MCWD organizational structure should likewise be consistent with the LWUA organizational and institutional criteria set in the LWD Manual in accordance with Sec.62 of Presidential Decree

No.198. The manual prescribes the criteria for functional groupings and staffing pattern of LWDs, staff productivity index of 1 position for every 100 service connections and the maximum allowable positions and level of classifications.

While EO-No.366 covers all executive branches of government implementation of the law with original charter like MCWD is not in the priority list of the DBM. Nonetheless, MCWD reorganization/ rationalization is not exempt from the provisions of EO-No.366. As such, it has to abide by the directives of EO-No.366 as presented in Table III-67. The CSC approval should likewise be sought since there will be changes in position titles/ nomenclatures.

Table III-67 EO-No.366 as Applied to MCWD Reorganization/ Rationalization

Directive	Particulars
Coverage	All Departments of the Executive Branch and their component units/ bureaus, including all corporations… attached to or under the administrative supervision of a Department.
Framework And Objectives	The rationalization and service delivery improvement framework shall be as follows: • Focusing government efforts on its vital/ core functions and the priority programs and projects under the 10-Point Agenda of the Administration, and achieving the poverty-reduction targets under the Millennium Development Goals; • Improving the quality and efficiency of government services by eliminating/ minimizing overlaps and duplication, and by rationalizing delivery and support systems, organizational structures and staffing; • Improving agency accountability for performance and results; and • Implementing programs and projects of government within allowable resources.
Actions on Functions/ Programs/ Projects/ Activities	The possible actions on the functions/ programs/ activities/ projects of MCWD are as follows: • Scaling Down: a reduction in the intensity or magnitude of a function, program, activity or project either by eliminating selected components, reducing the geographical, demographic or clientele coverage, the types of services rendered, or the level of outputs. • Phasing Out: the gradual elimination or discontinuance of a function, program, activity or project through the sequential or selective abolition of its component parts, until such time that said function, program, activity or project ceases to exist. • Abolition: the elimination or discontinuance of a function, program, activity or project. • Strengthening: the act of increasing the targets of a core function, or its expected goods/ services and the desired impact of these, or widening its clientele/ geographical coverage by infusing additional physical, financial and other resources to it.
Creation of the Change Management Team (CMT)	In the case of MCWD, a CMT shall be created by the GM to conduct the strategic review of its operation and organization. It shall have at least one (1) representative of the MCWD-accredited union sitting in as member. Sub-CMT for different organizational levels or areas of concern may be created. Each sub-CMT should likewise have at least one (1) union or rank and file representative sitting in as member.
Functions of the CMT	The CMT shall perform the following functions: • Conduct a strategic review of the operations and organization of all component units of MCWD. • Identify MCWD core functions, programs, activities and projects; • Identify the functions, programs, activities and projects which can either be scaled down, phased out or abolished; or can be strengthened and where more resources need to be channeled; • Prepare a Rationalization Plan for the review and endorsement of the DBM to, and subsequent approval by, the President; • Conduct consultation meetings with the affected personnel and other stakeholders on the effort; Oversee the actual implementation of the Rationalization Plan; • Mitigate the impact of the rationalization effort; and • Coordinate and consolidate the processes and outputs of the sub-change management teams.
Contents of the Rationalization Plan	The Rationalization Plan shall contain the intended shifts in the functions, programs, projects, activities, organizational units, staffing and personnel of MCWD
Approvals	The Plan shall be endorsed by all members of the CMT and approved by the GM and the BODs prior to submission to the DBM for evaluation and approval/ endorsement to the President for final approval.

The first phase of the reorganization is planned for implementation in 2010 and will affect the financial and customer services functions only. However, this may not be feasible since, the rationalization law calls for specific processes like the creation of change management team/s and substantial consultations which apparently had not been followed in the case of MCWD. Furthermore, EO-No.366 calls for the full implementation of reorganizations. As such, the issuance of an EO to authorize MCWD to undertake a phased implementation would be necessary.

At this point in time, the creation of the MCWD-CMT to handle the rationalization and reorganization process is imperative. This will ensure the general acceptance of the workforce to the need for change, maximum participation and substantive inputs based on actual work experiences, smoother transition from the old system to the new and rationalized one and therefore a greater chance for success.

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III-4 Initial Environmental Examination

III-4.1 Preliminary Scoping of Environmental and Social Impact

(1) Alternatives Study

< Water Source Development >

Following three alternatives for water source development were identified and examined from the viewpoint of environmental and social consideration.

- surface water: dam at the river basins of Mananga, Lusaran, Kot-kot and Luyang,
- groundwater: deep well at the well fields in Consolacion, Mandaue and Cebu, and
- seawater: desalination at Mactan Island.

To examine the advantages and disadvantages for each alternative, necessity of land acquisition and or land alternation, that is considered to be related to the impact on involuntary resettlement, land use, landscape, etc., and existence of protected areas, that is considered to be related to the impact on flora, fauna and biodiversity, landscape, etc., were examined. Besides, other conceivable major environmental and social impacts were identified qualitatively. Table III-68 shows the comparison of major conceivable environmental and social impacts for each alternative as well as life-cycle cost (LCC) and benefit cost ration (BCR). Figure III-40 shows location of water source development site.

Table III-68 Comparison of Major Conceivable Environmental and Social Impacts

Alternatives	Surface Water (dam)	Groundwater (well)	Seawater (desalination)
Land Acquisition or Conversion	Mananga Dam: 69 km^2 Lusaran Dam: 55 km^2 Kot-kot Dam: 33 km^2 Luyang Dam: 37 km^2 Resettlement is necessary.	12,600 m^2 in total[*1] No settlement is required.	6,050 m^2 No settlement is required.
	Negative	Positive	Positive
Protected Area	Candidate sites are located in CCPL except for Luyang dam.	None.	None.
	Negative	Positive	Positive
Conceivable Major Environmental and Social Impacts	Land conversion by the project will affect on terrestrial ecosystem in and around project site. Water quality such as SS, BOD, and DO will be deteriorated, and change of water temperature will be caused by the project, and ecosystem in river will be affected.	Drawing groundwater from constructed wells will cause decline of groundwater level and salt water intrusion.	Intake of seawater and discharge of concentrated seawater by the project will affect on marine ecosystem and will cause water pollution.
LCC	2.9~13.1 PHP/m^3	2.8 PHP/m^3	34.8~36.6 PHP/m^3
BCR	0.6~3.2	2.7~2.8	0.2

Note: LCC and BCR were referred to Chapter III-1. Remark*[1]: Land area is estimated by 63 wells times 200 m^2/well in average. Source: Water Remind Project and JICA Study Team

As for groundwater development, the locations of new wells were positioned at aquifer of limestone in hilly area. It was reflected that many MCWD wells in alluvial area had been abandoned due to aggravated saltwater intrusion. It is considered the targeted location of new wells will be desirable as it will contribute to avoid and mitigate environmental and social impacts such as involuntary resettlement.

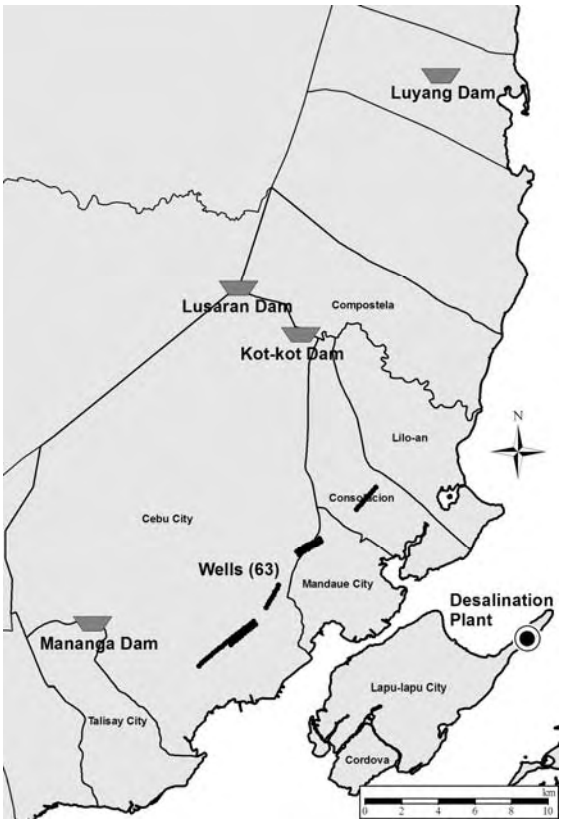

Figure III-40 Map of Water Source Development Sites

As for seawater development, the candidate location was positioned at the northern edge of Mactan Island, which is considered favorable to intake seawater with better quality and to install intake facility nearby the plant and the sea. Besides, there is no settlement in the candidate site at present and it is assumed that involuntary resettlement will not be caused by the project.

Hence, it is judged the proposed projects for water source development will be the optimum options and the environmental and social impacts were preliminary avoided and mitigated as much as possible.

< Water Supply System/ Facility Improvement >

The improvement plan consists of the following major components except water source development:

- reservoir: additional installation near to the existing reservoir;
- pipeline: new line installation, replacement and parallel installation; and
- maintenance: NRW reduction by leak detection and repairing.

The proposed reservoirs shall be installed neighboring the existing reservoirs by considering their favorable location in terms of altitude. Besides, it was confirmed that there is no resident in the proposed locations at present. The pipelines shall be installed under the existing roads. On the other hand, the NRW reduction project shall not require significant infrastructure development.

Hence, it is judged the proposed projects for water supply system/ facility improvement will be the optimum options and the environmental and social impacts were preliminary avoided and mitigated as much as possible.

(2) Preliminary Scoping of Environmental and Social Impact

In order to assess likely significant environmental and social impacts, the conceivable adverse environmental and social impacts by the proposed action plan were preliminary identified. The impacts of social environment, natural environment and pollution/ contamination were classified as following rating in accordance with JICA Guidelines for Environmental and Social Considerations (2004).

- A: Serious impact is expected,
- B: Some impact is expected,
- C: Extent of impact is unknown,
- D: No impact is expected. IEE/EIA is not necessary.

The conceivable environmental and social impacts by the proposed "well development," "desalination plant" and "system/ facility improvement" were preliminary examined. The preliminary scoping matrixes for the said schemes were presented in Tables III-69, III-70 and III-71 respectively. The draft scoping shall be revised and updated in feasibility study stage by referring to detailed projects' descriptions.

(3) Adverse Environmental and Social Impacts Identified

< Water Source Development >

As discussed in Tables III-69 and III-70, the main causes of environmental and social impacts by the proposed deep well project can be identified as follows:

Well Development

- Land Acquisition:
  Land area 13,600 m^2 in total will be required for the project and it would affect on land use, flora and fauna to a certain extent. Although it is considered that involuntary resettlement will be avoided, the livelihood of land owners may be affected.
- Groundwater Extraction:
  The project will cause decline of groundwater level and aggravation of saltwater intrusion and may affect on groundwater usage in the surrounding area.
- Construction Work:
  Typical solid waste such as residual soil, and noise and vibration will be discharged and accident may occur in construction phase.

Desalination Plant

- Land acquisition:
  Approximately 6,050 m^2 of the land will be required for the project and it would affect on land use, flora and fauna to a certain extent. Although it is considered that involuntary resettlement will be avoided, the livelihood of land owners may be affected.
- Seawater Intake and High Chloride Water Drainage:
  The project will affect on local resource usage i.e. fishery, coastal environment and/ or marine ecosystem, and water pollution will be caused by the drainage of high chloride water.
- Construction Work:
  Typical air pollutants such as NO_2, PM10, solid waste such as residual soil, and noise and vibration will be discharged and accident may occur in construction phase.

Table III-69 Conceivable Adverse Environmental and Social Impacts by Proposed Well Development (1/2)

		Item	Rating	Reasons
Social Environment	1	Involuntary Resettlement	D	The candidate sites are located in hilly areas and it is anticipated that the sites will be selected so as to avoid residential area. Therefore, it is assumed that involuntary resettlement will not occur though the exact locations of proposed wells are not designated.
	2	Local Economy such as Employment and Livelihood, etc.	B	The livelihood of land owners of the candidate sites may be affected as the sites will be private land. However the impact will be limited as the land acquisition for each well will be quite small.
	3	Land Use and Utilization of Local Resources	B	It is assumed that the impact on land use and local resource usage will be insignificant as the land conversion by the project is small (13,600 m^2).
			B	Drawing groundwater from constructed wells will affect on groundwater usage by residents (if any) nearby project area.
	4	Social Institutions such as regional severance	D	The project will not cause impact on social institution such as regional severance.
	5	Existing Social Infrastructures and Services	D	The project will not affect on existing social infrastructure. The project is expected to improve water supply service in the study area.
	6	The Poor, Indigenous and Ethnic people	C	Extent of impact is unknown at this stage. Further survey is necessary to confirm the existence of poor, indigenous and ethnic people in the candidate sites.
	7	Misdistribution of Benefit and Damage	C	Inequality between beneficiaries and project-affected peoples by the project may occur.
	8	Cultural heritage	C	Extent of impact is unknown at this stage. However, it is anticipated that the project sites will be selected so as to avoid cultural heritage as necessary.
	9	Local Conflicts of Interest	C	Conflicts of interests related to the project may occur among beneficiaries and project-affected peoples.
	10	Water Usage or Water Rights and Communal Rights	B	The amount of water taken from groundwater will increase but it will not exceed the permitted amount by NWRB. (NWRB permit MCWD to take 177,894 m^3/day from groundwater.) However, the project would affect on current groundwater usage in the surrounding area.
	11	Sanitation	D	The project will not cause negative impact on sanitation. The project is expected to bring positive impact on sanitation by supplying safe water.
	12	Hazards (risk) Infectious Diseases such as HIV/ AIDS	D	The project will not cause negative impact on hazards and diseases. The project is expected to bring positive impact on infectious disease by supplying safe water.
	13	Accident	C	Accident during construction phase may happen.

Source: JICA Study Team

Table III-69 Conceivable Adverse Environmental and Social Impacts by Proposed Well Development (2/2)

	Item		Rating	Reasons
Natural Environment	14	Topography and Geographical Features	D	The project will not cause any large scale land conversion which will affect on topography and geographical features.
	15	Soil Erosion	D	The project will not cause soil erosion.
	16	Groundwater	B	Groundwater extraction from wells will cause decline of groundwater level and saltwater intrusion.
	17	Hydrological Situation	D	The project will not affect on hydrological situation such as flow regime of rivers.
	18	Coastal zone	D	The project will not affect on coastal zone.
	19	Flora, Fauna and Biodiversity	B	It is assumed that the impact on terrestrial ecosystem will be insignificant as the land conversion by the project is small (13,600 m^2) and the candidate sites are not located in protected area (CCPL).
	20	Meteorology	D	The project itself will not affect on climate.
	21	Landscape	D	The project will not construct any large scale structures which will affect on landscape.
	22	Global Warming	B	Greenhouse gas will be discharged during construction phase due to construction machineries and vehicles.
Pollution/ Contamination	23	Air Pollution	B	Air pollutant such as SO_2, CO, NO_2, PM10, TSP will temporary discharged during construction phase due to construction machineries and vehicles.
	24	Water Pollution	B	Drawing groundwater from constructed wells will cause saltwater intrusion.
	25	Soil Contamination	D	The project will not cause soil contamination.
	26	Waste	B	Construction residue soil and waste will be discharged in construction phase, though the volume of waste will be limited.
	27	Noise and Vibration	B	Noise and vibration level will temporary increase during construction phase due to construction machineries and vehicles.
	28	Ground Subsidence	D	Ground subsidence will not occur because groundwater development will be implemented in limestone formation
	29	Offensive Odor	D	The project will not cause offensive odor.
	30	Bottom Sediment	D	The project will not affect on bottom sediment.

Source: JICA Study Team

Table III-70 Conceivable Adverse Environmental and Social Impacts by Proposed Desalination Plant (1/2)

		Item	Rating	Reasons
Social Environment	1	Involuntary Resettlement	D	There is no settlement in the candidate site at present and it is assumed that involuntary resettlement will not occur.
	2	Local Economy such as Employment and Livelihood, etc.	B	The livelihood of land owners of the candidate site may be affected as the site is private land.
	3	Land Use and Utilization of Local Resources	B	It is assumed that the impact on land use and local resource usage will be insignificant as the land conversion by the project is small (6,050 m^2).
			B	Intake of seawater and discharge of concentrated seawater will affect on fishery.
	4	Social Institutions such as regional severance	D	The project will not cause negative impact on social institution such as regional severance.
	5	Existing Social Infrastructures and Services	D	The project will not affect on existing social infrastructure. The project is expected to improve water supply service in the study area.
	6	The Poor, Indigenous and Ethnic people	D	It is assumed there are no poor, indigenous and ethnic people in the candidate site.
	7	Misdistribution of Benefit and Damage	C	Inequality between beneficiaries and project-affected peoples by the project may occur.
	8	Cultural heritage	D	It is assumed there is no cultural heritage in the candidate site.
	9	Local Conflicts of Interest	C	Conflicts of interests related to the project may occur among beneficiaries and project-affected peoples.
	10	Water Usage or Water Rights and Communal Rights	C	Extent of impact is unknown at this stage. Further survey is necessary to confirm the current status of water usage and water right.
	11	Sanitation	D	The project will not cause negative impact on sanitation. The project is expected to bring positive impact on sanitation by supplying safe water.
	12	Hazards (risk) Infectious Diseases such as HIV/AIDS	D	The project will not cause negative impact on hazards and diseases. The project is expected to bring positive impact on infectious disease by supplying safe water.
	13	Accident	C	Accident during construction and operation phase may happen.

Source: JICA Study Team

Table III-70 Conceivable Adverse Environmental and Social Impacts by Proposed Desalination Plant (2/2)

	Item		Rating	Reasons
Natural Environment	14	Topography and Geographical Features	D	The project will not cause large scale land conversion which will affect on topography and geographical features.
	15	Soil Erosion	D	The project will not cause soil erosion.
	16	Groundwater	D	The project will not affect on groundwater. The project is expected to mitigate salt water intrusion which will be caused by excessive dependence on groundwater.
	17	Hydrological Situation	D	The project will not affect on hydrological situation such as flow regime of rivers.
	18	Coastal zone	B	Drainage of high chloride water by the project will affect on coastal zone environment.
	19	Flora, Fauna and Biodiversity	B	It is assumed that the impact on terrestrial ecosystem will be insignificant as the land conversion by the project is small (6,050 m^2) and the candidate site is not located in protected area (CCPL).
			B	Drainage of high chloride water by the project will affect on marine ecosystem.
	20	Meteorology	D	The project itself will not affect on climate.
	21	Landscape	D	The project will not construct any large scale structures which will affect on landscape.
	22	Global Warming	B	Greenhouse gas will be discharged during construction phase due to construction machineries and vehicles.
Pollution/Contamination	23	Air Pollution	B	Air pollutant such as SO_2, CO, NO_2, PM10, TSP will temporary discharged during construction phase due to construction machineries and vehicles.
	24	Water Pollution	B	Discharge of concentrated seawater will cause water pollution.
	25	Soil Contamination	D	The project will not cause soil contamination.
	26	Waste	B	Construction residual soil and waste will be discharged in construction phase, though the volume of waste will be limited.
	27	Noise and Vibration	B	Noise and vibration level will temporary increase during construction phase due to construction machineries and vehicles. Noise will be generated by desalination plant, though its impact will be limited.
	28	Ground Subsidence	D	The project will not cause ground subsidence.
	29	Offensive Odor	D	The project will not cause offensive odor.
	30	Bottom Sediment	C	Intake of seawater and discharge of concentrated seawater by the project may affect on bottom sediment.

Source: JICA Study Team

Table III-71 Conceivable Adverse Environmental and Social Impacts by Proposed System/ Facility Improvement (1/2)

		Item	Rating	Reasons
Social Environment	1	Involuntary Resettlement	D	There is no settlement in the candidate sites at present and it is assumed that involuntary resettlement will not occur.
	2	Local Economy such as Employment and Livelihood, etc.	B	The livelihood of land owners of the candidate sites may be affected as the sites are private land.
	3	Land Use and Utilization of Local Resources	B	It is assumed that the impact on land use and local resource usage will be insignificant as the land conversion by the project is small (358 m^2).
	4	Social Institutions such as regional severance	D	The project will not cause impact on social institution such as regional severance.
	5	Existing Social Infrastructures and Services	D	The project will not affect on existing social infrastructure. The project is expected to improve water supply service in the study area.
	6	The Poor, Indigenous and Ethnic people	C	Extent of impact is unknown at this stage. Further survey is necessary to confirm the existence of poor, indigenous and ethnic people in the candidate sites.
	7	Misdistribution of Benefit and Damage	C	Inequality between beneficiaries and project-affected peoples by the project may occur.
	8	Cultural heritage	D	It is assumed there is no cultural heritage in the candidate site.
	9	Local Conflicts of Interest	C	Conflicts of interests related to the project may occur among beneficiaries and project-affected peoples.
	10	Water Usage or Water Rights and Communal Rights	D	The project itself will not affect on water usage, water rights or communal rights.
	11	Sanitation	D	The project will not cause negative impact on sanitation. The project is expected to bring positive impact on sanitation by supplying safe water.
	12	Hazards (risk) Infectious Diseases such as HIV/ AIDS	D	The project will not cause negative impact on hazards and diseases. The project is expected to bring positive impact on infectious disease by supplying potable water.
	13	Accident	C	Accident during construction phase may happen.

Source: JICA Study Team

Table III-71 Conceivable Adverse Environmental and Social Impacts by Proposed System/ Facility Improvement (2/2)

		Item	Rating	Reasons
Natural Environment	14	Topography and Geographical Features	D	The project will not cause any large scale land conversion which will affect on topography and geographical features.
	15	Soil Erosion	D	The project will not cause significant soil erosion.
	16	Groundwater	D	The project itself will not cause significant impact on groundwater.
	17	Hydrological Situation	D	The project will not cause significant impact on hydrological situation such as flow regime of rivers.
	18	Coastal zone	D	The project will not affect on coastal zone.
	19	Flora, Fauna and Biodiversity	B	It is assumed that the impact on terrestrial ecosystem will be insignificant as the land conversion by the project is small (358 m^2) and the candidate sites are not located in protected area (CCPL).
	20	Meteorology	D	The project itself will not affect on climate.
	21	Landscape	B	Construction of reservoirs may affect on landscape to a certain extent.
	22	Global Warming	B	Greenhouse gas will be n machineries and vehicles and during operation phase due to pumps.
Pollution/Contamination	23	Air Pollution	B	Air pollutant such as SO_2, CO, NO_2, PM10, TSP will temporary discharged during construction phase due to construction machineries and vehicles.
	24	Water Pollution	D	The project itself will not cause significant water pollution.
	25	Soil Contamination	D	The project will not cause soil contamination.
	26	Waste	B	Construction residue soil and waste will be discharged in construction phase, though the volume of waste will be limited.
	27	Noise and Vibration	B	Noise and vibration level will temporary increase during construction phase due to construction machineries and vehicles.
	28	Ground Subsidence	D	The project will not cause ground subsidence.
	29	Offensive Odor	D	The project will not cause offensive odor.
	30	Bottom Sediment	D	The project will not affect on bottom sediment.

Source: JICA Study Team

< Water supply system/ facility improvement >

As discussed in Table III-72, the main causes of environmental and social impacts by the proposed system/ facility improvement project can be identified as follows:

* Land acquisition:
  Approximately 358 m^2 of the land will be required for the project and it would affect on land use, flora and fauna to a certain extent. Although it is considered that involuntary resettlement will be avoided, the livelihood of land owners may be affected.

* Existence of reservoirs:
  Landscape may be affected by the existence of reservoirs although their impact will be limited.

* Construction Work:
  Typical air pollutants such as NO_2, PM10, solid waste such as residual soil, and noise and vibration will be discharged and accident may occur in construction phase.

III-4.2 Requirements to the IEE Activities

Bases on the expected impact according to the project implementation, following measures, monitoring and reporting are required for risk reduction or avoidance.

(1) Mitigation Measures for Major Environmental and Social Impacts

- Land Acquisition [Common to all projects]

  Although it is considered that all the candidate sites for proposed projects will not cause involuntary resettlement, the sites will be mostly located in private lands and compensation for lands and other assets in fair and appropriate manner will be necessary. Therefore, a land acquisition and resettlement action plan (LARAP) will be required to prepared in feasibility study stage, with strict compliance with related legislations such as RA-7279 (1992), RA-8974 (2000) etc.

- Environmental Pollution in Construction Phase [Common to all projects]

  The typical environmental pollution such as air pollution, solid waste, noise and vibration, and accident will be temporally caused by construction of the projects. Environmental and safety measures should be required to both client and contractor, such as appropriate operation of construction machineries/ vehicles, training of workers, etc.

- Saltwater Intrusion [Well Development]

  There are two orders related to water quality:

  * Philippines National Standard for Drinking Water 2007 (PNSDW-07) by DOH, and
  * Groundwater Regulation 2007 by NWRB

  The former standard provides supplied water that maximum desirable concentration of chloride ion shall not exceed 250 mg/L. On the other hand, the later regulation decided on intake water that salinity level shall not exceed 250 mg/L, otherwise the well shall be closed immediately.

  On the above mentioned condition, well development scheme was simulated within salinity level of 200 mg/L using flow model. No artificial protection measures using underground fence or well injection were considered in the modeling because of non-cost effectiveness. As the result, it was concluded that the groundwater potential in MCWD franchise area is 175,840 m^3/day (cf. Volume III: Supporting Report; Part-B Water Source Management).

  The volume of groundwater extracted by the proposed project will be 158,000 m^3/day, which satisfy the predicted groundwater potential. Hence, it is judged that the saltwater intrusion caused by the proposed project was preliminary avoided and mitigated as much as possible in planning stage. At the same time, it shall be noted that the groundwater potential should be reconsidered in accordance with the revision of concerned legislations.

The developer (MCWD) will be required to examine the impact on salt intrusion and groundwater level in detail in the course of environmental impact assessment which will be conducted in parallel with feasibility study. Especially, impact on current groundwater usage in the surrounding area such as decline of groundwater level or saltwater intrusion should be examined.

- Drainage of high chloride water [Desalination Plant]

  The impact on fishery, marine ecosystem and water pollution in detail in the course of environmental impact assessment will be required to examine in parallel with feasibility study. Marine environment such as seawater quality, tidal current condition, distribution of coral reef, marine flora and fauna shall be studied and the locations of drainage facilities as well as quality and quantity of high chloride water should be examined so as to avoid and mitigate impact on marine ecosystem as much as possible.

- Impact on Landscape [System/ Facility Improvement (reservoir)]

  It is desirable the proponent (MCWD) shall assess impact on landscape caused by the project in the course of environmental impact assessment, and take mitigation measures considering the shape and color of reservoir as well as size and height.

(2) Monitoring Plan for Environmental and Social Impacts

- Land acquisition [Common to all projects]

  The proponent (MCWD) will be required to monitor the livelihood of project-affected peoples of which contents and detail shall be examined in land acquisition and resettlement action plan (LARAP) prepared in feasibility study stage.

- Environmental Pollution in Construction Phase [Common to all projects]

  The proponent will be required to supervise the contractor and conduct environmental monitoring of which contents and detail shall be examined in environmental management plan (EMP) prepared in feasibility study stage.

- Saltwater Intrusion [Well development]

  The proponent (MCWD) should conduct periodical monitoring on groundwater quality and level from now on. Mitigation measures such as reducing volume of extraction and or closing wells shall be taken if the groundwater quality was found not to comply with groundwater regulation 2007.

- Drainage of high chloride water [Desalination Plant]

  The proponent (MCWD) should conduct periodical monitoring on quality of discharged concentrated seawater as well as its impact on fishery and marine ecosystem. Further mitigation measures should be examined and implemented if any impacts by the project will be identified.

(3) Required Procedures for Proposed Projects by the Philippine EIA System

According to "Revised Procedural Manual for DENR AO No.2003-30 (Second Edition January 2008)," project grouping matrix for determination of EIA report types concerning proposed projects are defined as shown in Table III-72. Also, it is mentioned that "all unclassified projects shall submit a project description as an interim documentary requirement. Unclassified projects may be covered or non-covered by the EIA system subject to DENR-EMB review of a project description.

The outcome of review shall be a recommendation on the final EIA report type to be submitted as basis for issuing a CNC or ECC.

Table III-72 Project Grouping Matrix for Determination of EIA Report Types (Extract)

Project Description		Report Requirements			
Type	Parameter	ECP	Non-ECP in ECA		
		EIS	EIS	IEE	PD
Complete System	Number of Well Construction	NA	> 6 wells and other systems (e.g. infiltration gallery, etc.)	≤ 6 wells	NA
Distribution only	Service Level*	NA	NA	Level III	Level II/ I
Pipeline	Total Length	NA	≥ 50 km	< 50 km	NA
Wastewater (TP)	Capacity of Plant	NA	≥ 5,000 m^3/year	< 5,000 m^3/year	< 30 m^3/year

Note: Service L-III: HH connection, L-II: communal faucet and L-I: point source, defined by LWUA

Source: Revised Procedural Manual for DENR AO No.2003-30 (Second Edition January 2008)

As mentioned in Chapter II-4.4 (2) of this Main Report, EMB Region 7 regards all project sites in its jurisdiction as ECA. Therefore, the required report types for the proposed projects can be summarized as shown in Table III-73.

In feasibility study stage, the project owner (MCWD) had better consult with DENR Region 7 on the required EIA report types as well as the distribution of ECA in Metro Cebu in detail. Besides, it is assumed that the project owner (MCWD) can apply single EIA report for the consolidated proposed projects.

Table III-73 Proposed Projects and their Required EIA Report Types

Proposed Categories		Quantity	Required EIA Report
Well Development		63 wells	EIS
Desalination Plant		1 desalination plant	Unclassified. Subject to DENR-EMB review of project description.
System/ Facility	Reservoir	4 reservoirs	
	Pipeline	130 km pipelines in total	EIS

Source: JICA Study Team

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III-5 Project Implementation

Execution of the project should provide significant benefits for both of users and MCWD. These benefits are solutions to acquisition limits of new customers, suspended water supply and low water supply pressure, and also that should be connected to MCWD financial sustainability. Workflow of project implementation indicates in Figure III-41.

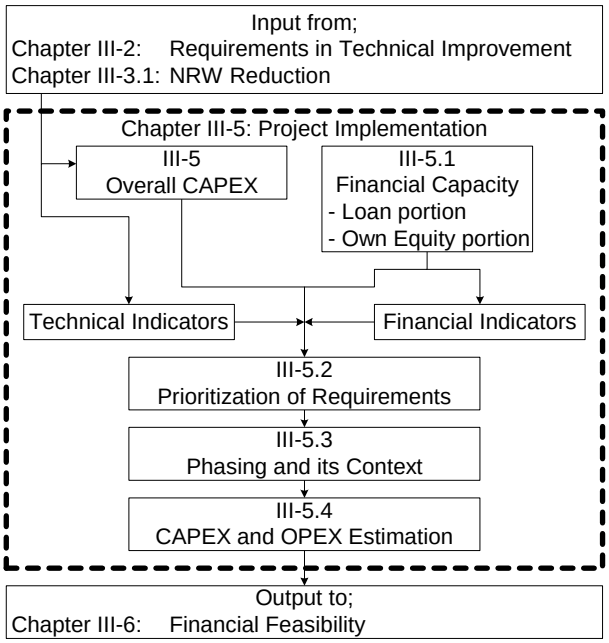

Figure III-41 Workflow of Project Implementation

At the first, Table III-74 shows the overall CAPEX cost of technical requirements including NRW reduction. Detailed conditions of the said cost estimation are referred to Chapter III-5.4.

Table III-74 Overall CAPEX Estimation (million PHP)

Category		2011	2012	2013	2014	2015	Sum	Remarks
A	Construction	636	599	841	511	1,081	3,668	
B	Procurement	11	0	0	0	0	11	
C	Land Acquisition	91	150	0	0	0	241	
D	Engineering Services (D/D)	124	84	51	108	0	367	A × 10 %
E	Engineering Services (S/V)	32	30	42	26	54	183	A × 5 %
F	Government's Formality	16	15	21	13	27	92	A × 2.5 %
G	Physical Contingency	45	44	48	33	58	228	(ΣA to F) × 5 %
H	Price Contingency	143	138	150	103	183	718	(ΣA to F) × 15.73 %
I	Value Added Tax	109	105	115	79	139	547	(ΣA to F) × 12 %
Total of Annual Disbursement		1,207	1,166	1,268	872	1,542	6,055	> 250 million PHP/year
Breakdown Portion		Available from Loan					4,428	A + A × (G + H)
		Should be Self-financing					1,626	Others

Note: Rate of H; Price Contingency was assumed at 15.73 % with annually 6 % and base year of 2013.

According to annual investments of MCWD from 2008 (actual) up to 2015 (plan), it can be seen that the minimum 100 (actual in 2008) and the maximum 541 (actual in 2009) million PHP have been invested, respectively. Average investment including plan was estimated at 250 million PHP annually. Based on the financial analysis, it was found that the case with implementation of the all improvement projects is not feasible due to the predicted shortage of the funds surplus, even under an assumption

about the water rate increase (referred to Chapter III-6.1). Table III-75 shows the projected financial conditions of MCWD, assuming that the all projects are implemented by 2015. In this regard, improvement project should be screened with priority according to conceptual criteria.

Table III-75 Net Income and Cash Flows: All Projects (million PHP)

Financial Indicator		Projection					
		2010	2011	2012	2013	2014	2015
Case-I:	Net Income	251	196	148	53	**-1**	**-103**
without	Funds Surplus	194	**-319**	**-382**	**-236**	**-389**	**-329**
water rate increase	Balance	936	617	236	**-8**	**-389**	**-718**
Case-II:	Net Income	251	315	274	184	134	91
10% water rate increase	Funds Surplus	194	**-199**	**-256**	**-105**	**-255**	**-135**
in 2011	Balance	936	737	481	376	122	**-14**

Note: Total annual cash flow amount of cash and cash equivalent, and temporary investments is used in this study.

III-5.1 Financing Capacity

(1) Objectives and Methodology

The aim of this study is to estimate the financing capacity of MCWD, which will be ascertained as project cost limitation.

For this purpose mentioned above, gross profitability (GP) of the investment in each DB is estimated and compared using the indicator of the gross return on the investment cost. It is noted that overall project cost was divided into the DB with due basic consideration of following.

- purposeful breakdown costs (water source with conveyance pipeline, water treatment/ desalination plant, reservoir and distribution pipeline) were fallen on the DB where the subject water is used, and
- common breakdown costs (transmission pipeline) were allotted to the DB according to the rate of water volume to be supplied.

For example, almost costs of transmission pipelines were fallen on the Mactan DB because transmitted water is used for water supply in the Mactan DB.

(2) Finance Institutions

The Development Bank of the Philippines (DBP) and LWUA provide long-term loans to water supply service providers. In the case of DBP, loans are provided through Philippine Water Revolving Fund (PWRF); in the case of LWUA, loans are provided either from its own funds or as a joint funding together with international cooperation agencies (ADB, WB or JICA). DBP is the current creditor of the MCWD for 1,000 million PHP of long-term loans.

The loan scheme, terms and conditions of PWRF administered by DBP and LWUA are provided below.

< PWRF administered by DBP >

PWRF is a lending facility designed to provide innovative financing solutions to water supply and sanitation projects in the Philippines. Eligible borrowers are LGUs, WDs, private water service providers, etc. The financing is eligible for most expenditure of water supply and sanitation projects; however, indirect expenditures such as land acquisition, taxes, etc. are not eligible.

Figure III-42 indicates the financing flow and lending conditions are;

Lending Rate: The interest rate will be market based. The current rate is around 9.3% (0.5% lower for sanitation projects).

Loan Repayment/ Terms: The loan tenor will depend on the cash flow of the project and can be up to 20 years inclusive of maximum 3 years grace period.

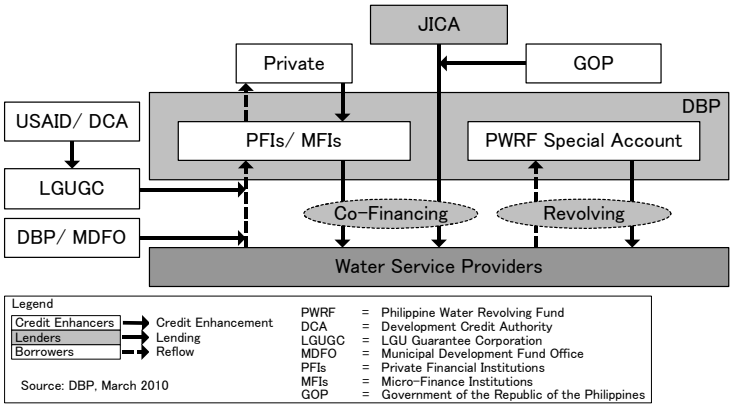

Figure III- 42 Financing Structure of PWRF

Other requirements are:

- The borrow records positive net income
- Debt Service Coverage Ratio (cash flow before debt service/ debt service) of the borrower is 1.5 or above.
- The borrower is able to provide collateral that covers the loan amount.
- Single Borrower's Limit (SBL) of DBP is approximately 5,000 million PHP (SBL equals 5% of the DBPs net worth)
- Preferable profitability of the subject water project is around 12 to above of financial internal rate of return (FIRR).

< LWUA >

For the water supply with service level-III, eligible projects include start-up of existing eater supply system, repair/ rehabilitation of existing system, immediate impact development of new/ existing system and comprehensive development. The financing is eligible for 50% to 100% of project cost.

"Repayment period = Interest rates" are:

- 10 years maximum = 9.2 %
- 20 years maximum = 9.5 %
- 30 years maximum = 9.8 %
- 40 years maximum = 10.2 %

(3) Financing Capacity

Financing capacity of MCWD is evaluated by the portions of loan and self-financing.

< Loan Financing Capacity >

Solvency and financial stability of MCWD have been comparatively low for the past several years due to a large amount of the outstanding loans; however, MCWD has been getting stronger as a result of the financial measures aimed at decreasing of its loan balances and con-

tinuing its activity with a high profitability.

Under the loan terms and conditions of PWRF, current financing capacity of MCWD for additional loans is considered to be about 1,100 million PHP. In calculation of this capable loan amount, 1.5 of the Debt Service Coverage Ratio was used, which is one of the requirements for applying for the financing from the PWRF administrated by the DBP.

Considering the size of the investment required for the projects and the supposed profitability of the project water facilities, certain financial improvements are needed. This study therefore further analyzes the debt service capacity under the assumption that the effective water rate (the average water rate calculated as the water sales revenue/ the water sales volume) will be increased by 10% from 2011. Under this assumption, the financing capacity increases up to 1,500 million PHP.

Table III-76 shows the relation between the financial indicators used for analysis and the financing capacity of MCWD.

Table III-76 Indicators and Loan Capacity during the Project period (million PHP)

Indicator	Current Water Rate	Water Rate Increase
Average Net Income	217	282
Average Annual Debt Service Capacity	120	163
Loan Financing Capacity during the Project period	1,100	1,500

Note: Basis of calculation;

- Average Net Income and Debt Service Capacity are calculated based on the projections from 2010 to 2015, with the consideration of actual figures from 2007 to 2009.
- Loan Terms assumed are 20 years to maturity and 9.3% of the annual interest rate using DBP conditions.
- The Effective Water Rate is 26.0 PHP/m^3 at current and 28.6 PHP/m^3 after the 10% increase in 2011.

< Self-financing Capacity >

Current operation of MCWD is steady, and as the results of the history of annual positive net income, it accumulates the funds surplus.

The current amount of the funds surplus (the total amount of Cash and cash equivalents and Temporary investments is used in this study as the funds surplus definition) is 740 million PHP, and the projected amount in 2015 is 1,800 million PHP under the assumption that no major water facility projects will be implemented during the period. In the case of a 10% water rate increase, the projected amount in 2015 increases up to 2,400 million PHP.

Table III-77 summarizes the financing capacity of MCWD from 2010 through to 2015, both at the current water rate and at the increased water rate. The self-financing capacity below shows the amount of the funds surplus less the debt service, supposing that the corresponding loan amount is outstanding. The financing capacity varies depending on the timing of disbursements made by MCWD.

Table III-77 Financing Capacity of MCWD (million PHP)

Financing Category	Current Water Rate	Water Rate Increase
Loan financing	1,100	1,500
Self-financing	610 to 1,200	610 to 1,560
Total	1,710 to 2,300	2,110 to 3,060

Note: The Self-financing amounts for each case were calculated under the assumption that the loans are made in 2011, and payments for the annual due amounts (principal and interest) and commission fees are excluded from the self-financing amounts.

III-5.2 Prioritization of Requirements

As described for implementation concept, execution of the improvement project should provide significant benefits for both of MCWD as sustainable operation and users as social service. The proposed improvement projects include achievement of water supply services in terms of water quality and supply quantity. However, water quality improvement is related to the Tisa WTP rehabilitation and that has not large impact to the present situation. Therefore, the project priority shall be given to the quantitative improvement.

On the viewpoints mentioned above, following criteria are conceptualized to select the priority projects comprehensively.

< For MCWD Benefit: Financial Indicator >

- Financing Capacity as project cost limitation
- Profitability in the DB (GP based on the Overall Projects excluding Tisa WTP rehabilitation)

< For Users Benefits: Service Indicators (basic human needs and service sustainability) >

- Additional Demand (2015 - 2007) and Demand Growth Rate (2015/ 2007) by the DB
- Node Rate and Demand Rate of Low Water Supply Pressure in 2015 by the DB

(1) Estimation of Indicators

< MCWD Financial Indicators >

Financing capacity of MCWD was estimated at minimum 2,060 and maximum 2,900 million PHP as shown in Table III-04 (previous page) when water rate can be increased. Among this MCWD financing capacity, loan portion was calculated at 1,500 million PHP.

Table III-78 summarizes the relation between the cost (5,676 million PHP excluding Tisa WTP rehabilitation) and gross profitability of each DB. Lagtang DB has very high profitability comparing to others because small input and almost full output in 2015. In the cost estimation for project evaluation, common cost was allotted for subject distribution blocks according to the demand ratio among the concerned distribution blocks. In this regard, it is noted that independent and evaluation costs for each distribution block have different meanings and values.

Table III-78 Gross Profitability of the Projects in Distribution Block (million PHP)

DB	Cost of All Projects (w/o Tisa)	GP of All Projects (w/o Tisa)	
CLC	361	13 %	Middle
Casili	645	20 %	
Talamban	865	11 %	
Tisa	606	15 %	
Lagtang	36	79 %	High
Mactan	3,162	3 %	Low
Total	5,676	10 %	

Note: Bases of the calculation of gross profitability are;

- The GP indicates the gross return on the investment cost (i.e., incremental O/M expenses are not included in this calculation).
- The loan terms used for the calculation are 20 years to maturity and 9.3% of the annual interest rate.
- No water rate increase is included in this calculation.

< Users Service Indicators >

Additional demand and demand growth rate are indicated in Table III-79. Additional demands in the DBs of Casili and Mactan indicate larger figures compared to the others, while demands grow rates in the DBs of Lagtang and Mactan are far better than those in the others.

Table III-79 Water Demand and Indicator in Distribution Block

DB	Demand (m^3/day)		Indicator		
	2007: A	2015: B	B - A (m^3/day),	Occupancy %	B/ A (%)
CLC	9,384	15,409	6,025	8 %	164 %
Casili	16,682	32,258	15,577	22 %	193 %
Talamban	35,449	46,538	11,090	15 %	131 %
Tisa	36,491	48,765	12,274	17 %	134 %
Lagtang	6,256	14,641	8,385	12 %	234 %
Mactan	11,904	30,509	18,605	26 %	256 %
Total	116,165	188,120	71,955	100 %	162 %

Note: NRW (30% in 2007 and 20% in 2015) is not included into the water demand.

Regarding the water supply pressure improvement, rates of low-pressure node (pipe connection) and demand in 2015 were compared within the DBs as shown in Table III-80. In both rates, the DBs of Talamban and Tisa will be worse of service level.

Table III-80 Low Water Supply Pressure in 2015 without Improvement Projects

DB	Pressure* (psi)	Low-pressure Node		Low-pressure Demand* (incl. NRW)	
		No.	Rate (%)	m^3/day	Rate (%)
CLC	≤ 10	51	57 %	27,287	64 %
	all	89		42,381	
Casili	≤ 10	88	26 %	30,501	34 %
	all	345		88,691	
Talamban	≤ 10	865	90 %	115,512	90 %
	all	966		127,989	
Tisa	≤ 10	879	94 %	129,129	96 %
	all	931		134,072	
Lagtang	≤ 10	7	5 %	5,245	13 %
	all	141		40,300	
Mactan	≤ 10	103	50 %	41,102	49 %
	all	208		83,897	
MCWD	≤ 10	1,993	74 %	348,776	67 %
	all	2,680		517,330	

Note: Pressure* and demand* without project in 2015 mentioned above were simulated by the WaterCAD model.

(2) Comparison of Indicators

Indicators with their impact according to the conceptual criteria are shown in Table III-81.

(3) Selection of Priority Project

Initially, Lagtang DB with small investment (36 million PHP) and Mactan DB with huge investment (3,162 million PHP) were selected as priority projects. Since financing capacity of MCWD was estimated at 2,060 up to 2,900 million PHP, unwillingly the entire Mactan DB project has no choice to be given up. It means that water importation from Cebu main island to Mactan island should be considered when the remaining project is proceeded or the scheme of surface water development comes true. Therefore, desalination plant with its transmission pipeline was selected as priority in 2015.

Table III-81 Screening Indicators in the DBs

DB	Financial	Service			Impact
	GP: %	Rate (B-A): %	Growth B/A: %	L-P Demand: %	(scoring)
CLC	(M) 13	(L) 8	(M) 164	(M) 64	H×0+M×3+L×1
Casili	(M) 20	(H) 22	(M) 193	(L) 34	H×1+M×2+L×1
Talamban	(M) 11	(M) 15	(L) 131	(H) 90	H×1+M×2+L×1
Tisa	(M) 15	(M) 17	(L) 134	(H) 96	H×1+M×2+L×1
Lagtang	(H) 79	(M) 12	(H) 234	(L) 13	H×2+M×1+L×1
Mactan	(L) 3	(H) 26	(H) 256	(M) 49	H×2+M×1+L×1
MCWD	10	100	162	67	

Note: Tisa WTP rehabilitation is not included. H; high, M; medium and L; low comparatively.

Secondary, priority projects will be nominated among the DBs of Casili, Talamban and Tisa. MCWD needs financial source for continuous project of service improvement using funds surplus and or loan. The Casili DB would have a priority because of the higher gross IRR, larger additional demand and demand growth.

Finally, the last choice is given to the Tisa DBs with due consideration of indicator values comparing to Talamban DB.

(4) Contents of Priority Projects

Table III-82 shows the CAPEX and GP of proposed projects. It is noted that Tisa WTP rehabilitation is included in the other remaining projects.

Table III-82 CAPEX (million PHP) **and GP** (%) **of the Priority Projects**

DB		CAPEX	GP	Project Contents
Casili		1,020	14 %	All improvement items
Tisa		606	15 %	Excluding Tisa WTP rehabilitation
Lagtang		36	79 %	All improvement items
Mactan		863	6 %	Desalination plant with its transmission
Total		2,525	14 %	-
Breakdown Cost*	Loan	1,791	Remarks*: Available loan was estimated at 1,500 million PHP, while MCWD funds surplus becomes 1,025 million PHP.	
	Own Equity	734		

Note: GP indicates return on the investment cost. This indicator differs from FIRR, as it does not include incremental OPEX in its calculation. Loan Terms used for the calculation are 20 years of tenor and 9.3% of annual interest rate. No water rate increase is included in its calculation.

Table III-83 indicates the BOQ of priority projects.

Table III-83 BOQ of the Priority Projects

Description		Distribution Block				Total
		Casili	Tisa	Lagtang	Mactan	
Intake	Well: new	26 wells				26 wells
	Well: rehabilitation	6 wells	22 wells	7 wells		35 wells
	Jaclupan		1 site			1 site
	Desalination				1 plant	1 plant
Reservoir	Site	5,000 m^3 × 1	10,000 m^3 × 1			2 sites
Pipeline	Raw Water	17.7 km				17.7 km
	Transmission	5.2 km			8.9 km	14.1 km
	Distribution Main	3.1 km	4.2 km			7.3 km
	Distribution Secondary	8.2 km	4.0 km	2.0 km		14.2 km
	Flow Meter	1 site	1 site	1 site		3 sites
NRW	Reduction	1 LS	1 LS	1 LS		3 lots

III-5.3 Phasing and its Context

(1) Phasing

Priority projects were divided into 3-phases from commencement in 2011 and for work completion by 2015, which are;

Phase-1 Preparatory Work including planning review, detailed design and contract
Phase-2 Construction including construction supervision
Phase-3 Operation and Maintenance including turnover inspection within warranty period

The contract packaging may have several options in terms of construction period and work category. Later grouping would be better arrangement in the proposed projects, because several investigation/ survey and land acquisition are required before the contract. Major considerations for contract packaging are;

* Well construction and rehabilitation will be grouped with plural year contract,
* Jaclupan rehabilitation will be contracted out after detailed hydrogeological survey,
* Desalination plant will be constructed by one plant maker,
* Pipeline including raw water, transmission and distribution will be packaged with plural year contract, and
* NRW reduction shall be worked by MCWD.

(2) Construction Schedule

The construction priority shall be given to new water intake facility. Well construction is related to design of raw water pipeline. Existing well shall be rehabilitated after new water source is connected to the reservoir. Jaclupan and desalination plant can be commenced independently.

On these relations, construction schedule is referred to Table III-84.

Table III-84 Construction Schedule

Description			2011	2012	2013	2014	2015
Water Source	1-1	Well: Construction					
	1-2	Well: Rehabilitation					
	1-3	Jaclupan: Rehabilitation					
	1-4	Desalination: Construction					
Reservoir	2-1	Tisa: Construction					
	2-2	Casili: Construction					
Pipeline	3-1	Raw Water: Installation					
	3-2	Transmission: Installation					
	3-3	Main Distribution: Installation					
	3-4	Secondary Distribution: Installation					
	3-5	Flow Meter: Installation					
Others	4-1	NRW Reduction: Pipe Repairing					

Legend:
Phase-1: Preparatory Work
Phase-2: Construction
Phase-3: Operation and Maintenance

III-5.4 CAPEX and OPEX Estimation

Capital expenditure (CAPEX) of the priority projects and operating expenditure (OPEX) upon completion of the priority projects were estimated. Following descriptions include detailed estimation methods and conditions. The data CD contains the estimation results in details.

(1) CAPEX Estimation

Composition of CAPEX was referred to the LWUA standard for cost estimation, which is shown in Figure III-43.

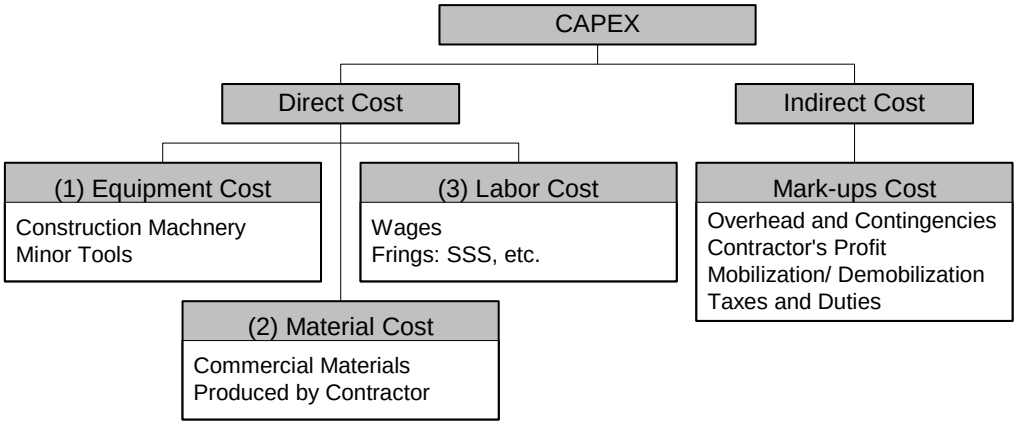

Figure II-43 LWUA Component of CAPEX Estimation

< Direct Cost >

- Equipment Cost: Standard construction hours per concrete volume and operated rental rates per hour were adopted. Cost of minor tools was merely percentage (5% to 20%) of the labor cost.
- Material Cost: Commercial materials were quotation basis including delivery and unloading at Cebu city. Cost for contractor's production was estimated unit basis (length, volume, weight, etc).
- Labor Cost: Philippines labor's cost standard was adopted.

< Indirect Cost >

- Overhead and Contingencies include following;
  - ✓ Engineering and administrative supervision,
  - ✓ Transportation allowance,
  - ✓ Office expenses,
  - ✓ Contractor's insurance, and
  - ✓ Miscellaneous expenses (laboratory testing, etc).
- Existing cost estimation policies in the Philippines are;
  - ✓ VAT = 12% of direct and indirect costs,
  - ✓ Overhead, contingencies and miscellaneous costs < 10% direct cost
  - ✓ Contractor's profit margin < 12% of direct cost, and
  - ✓ Mobilization and demobilization cost < 1% of direct cost

Basically, CAPEX was estimated by: (1) quotations, (2) past price schedules from MCWD contract or (3) past MCWD contract price. According to IMF, annual percentage change of gross domestic product was issued at 6.4%-2004, 4.9%-2005, 5.4%-2006, 6.3%-2007, 5.8%-2008 and average 5.8%. Therefore, merely 6% is given to this study.

CAPEX composition was re-classified into following categories to understand the portions of loan and self-financing. Table III-85 indicates cost of the priority projects.

- Construction: direct cost + mobi./ demobi. + contractor' profit and insurance
- Procurement: independent item
- Land Acquisition: independent item
- Engineering: D/D + S/V costs
- Government: Law formality fees
- Contingencies: Physical and price escalation
- VAT: Taxes

Table III-85 CAPEX Estimation of the Priority Projects (million PHP)

Category		2011	2012	2013	2014	2015	Sum		Remarks
A	**Construction**	477	159	256	271	320	1,483	58.8 %	
B	Procurement	6	0	0	0	0	6	0.2 %	
C	Land Acquisition	91	62	0	0	0	153	6.1 %	MCWD estimation
D	Engineering Services (D/D)	64	26	27	32	0	149	5.9 %	A × 10 %
E	Engineering Services (S/V)	24	8	13	14	16	75	3.0 %	A × 5 %
F	Government's Formality	12	4	6	7	8	37	1.5 %	A × 2.5 %
G	**Physical Contingency**	34	13	15	16	17	95	3.8 %	(ΣA to F) × 5 %
H	**Price Contingency**	106	41	48	51	54	300	11.9 %	(ΣA to F) × 15.73 %
I	Value Added Tax	81	31	36	39	41	228	9.0 %	(ΣA to F) × 12 %
Total of Annual Disbursement		894	344	402	429	456	2,525	100.0 %	
Breakdown Portion		Available from Loan					1,791	71.0 %	A + A × (G + H)
		Should be Self-financing					734	29.0 %	Others

Note: Rate of H; Price Contingency was assumed at 15.73 % with annually 6 % and base year of 2013.

(2) OPEX Estimation

Composition of OPEX was also based on the LWUA standard for cost estimation. Categories of OPEX are;

- Personnel expenses: salary, casual labors, etc. (with price escalation)
- Chemical expenses: treatment chemicals (price escalation) and disinfection (production volume and price escalation)
- Energy expenses: mainly electric power cost (+ wells and desalination)
- O/M expenses: estimated by percentage
- Other expenses: operating fee for offices, warehouse, vehicles, etc.

MCWD past data for OPEX has the same categories, however breakdown quantity and utility was not maintained properly. In this regard, estimated OPEX was estimated merely additional cost to present OPEX or percentage of total OPEX.

It is noted that energy expenses mainly composed of electric power consumption (12.1 % of total OPEX) in past record were quite low comparing to other water districts in the Philippines. In the small scale water districts (< 5,000 HHs connections), about 30 % to 35 % of OPEX was fallen on the energy cost (electric) or rate of energy expenses versus human expenses was analyzed at 60 %. On the other hand, this occupancy rate and comparison rate of energy expenses have a trend of increase when water supply scale becomes larger.

According to past payment bill, MCWD and VECO (Visayas Electric Co. Ltd.) have a contract of large transaction (normally 6.7 PHP/kWH, MCWD 2.6 PHP/kWH) since long years back.

Table III-86 indicates summary of OPEX.

Table III-86 OPEX Estimation after the Priority Projects (million PHP)

Category		2007		2015		Remarks*
A	Human Cost	323	64.8 %	450	40.7 %	+ NRW staffs
B	Chemical Cost	5	1.1 %	12	1.1 %	+ chloride for new wells
C	Power Cost	60	12.1 %	133	12.1 %	+ desalination plant and wells
D	O/M Cost	28	5.7 %	75	6.8 %	+ NRW works
E	Other Cost	82	16.4 %	253	22.8 %	Training Cost, etc
Total		499		923		

Note: Comments on remarks are described other than price escalation.

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III-6 Financial Feasibility

III-6.1 Financial Improvement

In providing adequate water service to its customers, every WD needs to receive sufficient total revenue to ensure proper operation and maintenance, development and perpetuation of the system, and maintain the utility's financial integrity according to LWUA manual. In this study, water rate increase is assumed as the prerequisite condition for implementing the prioritized projects. In relation to this assumption, analysis for water rate increase in MCWD is made from the viewpoints of (1) rational basis for water rate increase from the financial viewpoint and (2) its financial effect.

(1) Rational Basis for Water Rate Increase from the Financial Viewpoint

As it is shown in water tariff structure; Section II-3.2 (4), under the current water rate structure of MCWD, the minimum monthly charge and the commodity monthly charge up to 30 m^3 are set lower than the WDs' average (about 17% less). Meanwhile, the commodity monthly charge in excess of 31 m^3 is set much higher than the WDs' average (about 90% higher).

Table III-87 shows the calculated average monthly sales volume per connection, for domestic, commercial and industrial (and other usage). The average monthly sales volume of 27 m^3 for domestic users falls within the lower-rate bracket of below 30 m^3, whereas that of commercial and industrial (and other usage) is far above this lower-rate bracket. In other words, the cost coverage for the 81% water usage is comparatively low, whereas that for the rest of water usage is rather high.

Table III-87 Average of Monthly Sales Volume per Connection

Category	No. of Connections		Sales Volume ('000 m^3)		Average of Monthly Sales Volume/ Connection (m^3)
Domestic	115,252	97%	3,075	81%	27
Commercial and Industrial	3,315	2%	514	14%	155
Others	422	1%	192	5%	454
Total	118,989	100%	3,781	100%	31

Note: Analysis data was obtained as of December 2008.

In MCWD, discussion about the water rate restructuring is underway, considering current situation of imposing excess burden on part of the users. Under the situation, an implementable measure of water rate increase is considered to address the prerequisite condition of prioritized projects, together with the restructuring of water rate. One approach for this revision is to reduce the gap of the cost coverage between the large-volume users and the small-volume users by referring the WDs' average water rate. As the effect, the water sales revenue would increase as a whole.

(2) Effect of Water Rate Increase

In implementation of the suggested projects, an increase of the water rate is a necessary condition, in terms of both the financing capacity for the project cost and the financial feasibility of the project operation. As a result of the financial projection of the prioritized projects provided in the following sections, water rate is increase is the necessary element for the prioritized projects to be financial feasible, whereas without such water rate increase the financial conditions are expected to worsen and financial improvements need to be taken simultaneously in implementation of the major water projects.

In this study, an analysis of the financial feasibility of the projects is made under the current water rate and at the increased water rate assumptions. In the financial projection under "water rate increase", the average (or "effective") water rate is assumed to be increased by 10% from 2011, the year of the project commencement. Table III-88 shows the expected effect of the water rate increase in the suggested cases.

Table III-88 Effect of Water Rate Increase on Operating Income (million PHP/ year)

Category	Projection					
	2010	2011	2012	2013	2014	2015
Baseline	1,116	1,116	1,116	1,116	1,116	1,116
- Without Projects	1,116	1,228	1,228	1,228	1,228	1,228
- Prioritized Projects	1,149	1,293	1,332	1,352	1,364	1,744

Note: It is the case with "after 10 % water rate increase in 2011."

III-6.2 Cost Recovery

In this section, financial feasibility of the prioritized projects is analyzed based on the projected financial status of MCWD, for the case of the current water rate and the increased water rate (assuming 10% increase in 2011).

Results of the financial analysis indicate that implementation of the prioritized projects is not feasible unless it is accompanied with a sufficient level of water rate increase. Assumptions for the financial analysis are:

- period of analysis is from 2010 until 2015,
- effect of in-house water facility projects is not included in the financial analysis,
- water sales volume of the baseline is assumed at the same level of 2009,
- purchase volume of the bulk water is assumed at the same level of 2009,
- loan amount is assumed to be 1,500 million PHP,
- loan terms are 20 years to maturity and 9.3% of annual interest rate,
- SRR increases from 2010 in the distribution blocks where the projects are implemented (see III-3.1 NRW Reduction), and
- targeted completion and commencement of the operation of new facilities in 2015.

(1) Revenue Increase by the Projects

< Baseline (without project and water rate increase) >

Trends of the sales volume and the operating income during the last three years and the projections for 2015 without projects are shown in Table III-89.

Table III-89 Projection of the Sales Volume and Revenue: Baseline (without Project)

Description	Actual			Projection
	2007	2008	2009	2015
Sales Volume ('000 m^3)	41,626	43,003	43,591	44,261
Operating Income (million PHP/ year)	1,076	1,109	1,106	1,116

< Prioritized Projects (without water rate increase) >

Comparison of the sales volume and the operating income between the actual amount in 2007 and the projections for 2015 with the projects are shown in Table III-90.

Table III-90 Projection of the Sales Volume and Revenue: Prioritized Projects

Description	Actual 2007	Projection 2015	Change (increasing amount and ratio)	
Sales Volume ('000 m^3)	41,626	60,706	19,080	46%
Operating Income (PHP million)	1,076	1,586	510	47%

Effects of the revenue increase consist of two elements: increase in production volume and increase in SRR. Table III-91 shows effects of these elements in sales volume and operating income, respectively.

Table III-91 Breakdown of the Projects' Impact

Description	Effect of Production Volume		Effect of SRR Increase	
	Amount	%	Amount	%
Sales Volume ('000 m^3)	12,687	31%	6,393	15%
Operating Income (million PHP/ year)	343	31%	167	16%

(2) Project Costs

The supposed timing and disbursement amounts for the prioritize projects allocated during the project period is provided in Table III-06. A part of the construction cost is supposed to be financed by a loan, up to the capable loan amount of 1,500 million PHP.

Table III-92 Projection for Loan Amount: Prioritized Projects (million PHP)

Project Cost:	Projection					
	2011	2012	2013	2014	2015	Total
Loan Portion	576	160	315	315	424	1,791
Own Equity Portion	315	146	92	104	77	734
Total	891	307	407	419	501	2,525
Loan Amount	482	134	264	264	356	1,500

(3) Operation and Maintenance Expenses

< Baseline >

Trends of the baseline operating expenses for the last three years and projections for the project period are shown in Table III-93.

Table III-93 Operating Expenses: Baseline (million PHP/ year)

Operating Expenses	Actual			Projection					
	2007	2008	2009	2010	2011	2012	2013	2014	2015
Operation expenses	587	609	654	657	670	682	694	707	720
Maintenance expenses	157	167	147	164	165	167	169	170	172
Total	744	776	801	821	835	849	863	877	892

Note: Actual operating expenses are obtained from the Annual Report.

< Prioritized Projects >

Table III-94 shows projected operating expenses and interest expense for new loans.

Table III-94 Operating Expenses and Interest Expense: Prioritized Projects (million PHP)

Operating Expenses	Projection					
	2010	2011	2012	2013	2014	2015
Operation expenses	663	679	697	712	727	1,025
Maintenance expenses	164	166	167	169	171	211
Total	827	845	864	881	898	1,237
Interest Expense for new loans	0	44	56	79	102	132

(4) Net Income and Cash Flow

< Baseline >

Trends of the baseline net income and cash flows during the last three years and projections for the project period are shown in Table III-95.

Table III-95 Net Income and Cash Flows: Baseline (million PHP)

Net Income and Cash Flow		Actual			Projection					
		2007	2008	2009	2010	2011	2012	2013	2014	2015
Baseline	Net Income	229	245	220	220	216	211	207	203	199
	Increase in Funds Surplus	153	190	202	195	189	183	176	169	162
	Balance of Funds Surplus	350	540	742	937	1,126	1,309	1,485	1,654	1,816
Water Rate Increase	Net Income	229	245	220	220	328	326	324	323	322
	Increase in Funds Surplus	153	190	202	195	302	298	293	289	284
	Balance of Funds Surplus	350	540	742	937	1,239	1,537	1,830	2,119	2,403

Note: Water rate increase is scheduled in 2011.

< Prioritized Projects >

Projected net income and cash flows in the case of projects' implementation are shown in Table III-96. It is observed that without the water rate increase net income and cash flows are considered to decrease gradually as the projects proceed. In contrast, if the water rate increase accompanies implementation of the projects, the investment costs seem to be covered by the increased profitability of the projects and the water rate increase. As the effect, the financial stability would be considered to stabilize after 2015 if the water rate is increased.

Table III-96 Net Income and Cash Flows: Prioritized Projects (million PHP)

Net Income and Cash Flow		Projection					
		2010	2011	2012	2013	2014	2015
Baseline	Net Income	248	217	225	209	189	173
	Increase in Funds Surplus	191	**-262**	**-21**	**-17**	**-59**	40
	Balance of Funds Surplus	933	670	649	632	574	614
Water Rate Increase	Net Income	248	336	350	339	322	344
	Increase in Funds Surplus	191	**-144**	104	113	75	211
	Balance of Funds Surplus	933	789	893	1,005	1,080	1,291

Note: Water rate increase is 2011.

(5) Financial Ratio Analysis

Financial ratios for the baseline and the prioritized projects with/without water rate increase are

also analyzed. As it was indicated above, profitability of MCWD would be largely impaired if the projects are implemented without an accompanying water rate increase, which would then negatively affect the solvency and financial stability of the entity.

Tables III-97 and III-98 show the financial ratios in baseline and with priority projects. Defined formulas on financial ration are;

< Solvency >
- Debt Equity Ratio = Long-term Debt ÷ Total Equity

< Financial Stability >
- Ratio of Net Worth to Total Assets = Total Equity ÷ Total Assets

< Profitability >
- Net Income Ratio = Net Income ÷ Total Operating Revenues

Table III-97 Financial Ratios: Baseline (without Project)

Financial Ratios	Actual			Projection for 2015	
	2007	2008	2009	Without water rate increase	After 10% water rate increase
Solvency	1.09	0.86	0.73	0.24	0.19
Financial Stability	0.39	0.45	0.48	0.70	0.75
Profitability	0.21	0.22	0.20	0.18	0.26

Table III-98 Financial Ratios: Prioritized Projects

Financial Ratios		Projection					
		2010	2011	2012	2013	2014	2015
Without water rate increase:	Solvency	0.59	0.74	0.69	0.70	0.71	0.75
	Financial Stability	0.53	0.50	0.52	0.53	0.53	0.52
	Profitability	0.22	0.18	0.19	0.17	0.15	0.11
After 10% water rate increase:	Solvency	0.59	0.75	0.73	0.68	0.64	0.60
	Financial Stability	0.53	0.50	0.52	0.54	0.56	0.58
	Profitability	0.22	0.26	0.26	0.25	0.24	0.20

(6) Simulation of Implementing Rest of the All Projects

In addition to the analysis of the prioritized projects, financial feasibility of the rest of all projects is also examined. Tables III-99 and III-100 show the results of projected financial conditions, under the assumption that those projects which were not included in the list of the prioritized projects are to be implemented upon completion of the prioritized projects in 2015. The simulation was made for two project periods; for 5 years from 2016 through to 2020, and for 10 years from 2016 through to 2025.

Results of the simulation indicate that implantation of the rest of projects would worsen financial condition of MCWD due to the burden of debt service. Even if the water rate increase accompanies the projects, the increased expenses such as depreciation and interest lower the net income. Based on the financial projection at the present, the longer project period of 10 years is considered better between these two cases. In the implementation of the rest of all projects, drawing up of an action plan with a new target after 2015 should be considered.

Assumptions for the financial analysis are;

* All construction costs for the rest of the all projects are assumed to be financed by a loan, under the same loan terms as assumed in the analysis of the prioritized projects.
* Water demand for the added project periods is assumed to be the same as at 2015; the sales volume is therefore unchanged from the 2015 level.
* Other assumptions for this analysis are the same as in the analysis of the prioritized projects.

Table III- 99 Implementation of the Remaining Projects within 5 years (million PHP)

Net Income and Cash Flow		Prioritized 2015	Rest of the All Projects				
			2017	2019	2021	2023	2025
Without water rate increase:	Net Income	173	85	**-16**	**-121**	**-221**	**-367**
	Increase in Funds Surplus	40	**-118**	**-264**	43	**-54**	**-253**
	Balance of Funds Surplus	614	449	**-5**	**-151**	**-191**	**-567**
After 10% water rate increase:	Net Income	344	265	170	93	1	**-136**
	Increase in Funds Surplus	211	62	**-78**	257	168	**-23**
	Balance of Funds Surplus	1,291	1,482	1,396	1,677	2,078	2,158

Table III- 100 Implementation of the Remaining Projects within 10 years (million PHP)

Net Income and Cash Flow		Prioritized 2015	Rest of the All Projects				
			2017	2019	2021	2023	2025
Without water rate increase:	Net Income	173	138	90	44	**-17**	**-116**
	Increase in Funds Surplus	40	35	**-46**	**-10**	**-51**	**-16**
	Balance of Funds Surplus	614	724	673	577	515	406
After 10% water rate increase:	Net Income	344	317	276	238	183	112
	Increase in Funds Surplus	211	215	140	183	149	212
	Balance of Funds Surplus	1,291	1,756	2,074	2,361	2,696	3,019

III-6.3 Project Evaluation

Feasibility of the prioritized projects is evaluated using the Financial Internal Rate of Return (FIRR). In the preceding sections, financial feasibility was analyzed for the cases of with/ without the water rate increase.

(1) Base Case

The FIRR of the prioritized projects is comparatively low as shown in Table III-101. This is considered to happen because, the investment cost is large compared to the expected gross return from the investment, in its nature the projects, as shown in Section III-5.1 Financing Capacity. Incremental O/M expenses further lower the profitability, such as the material power cost required for operation of the desalination plant.

Table III-101 FIRR of the Prioritized Projects

Base Case	Without water rate increase	After 10% water rate increase
	8.6 %	14.7 %

Note: Basis of calculation are;

- ✓ Project life is 25 years.
- ✓ Constriction period is from 2011 through to 2015.
- ✓ Revenue increases from 2015 and it continues throughout the project life.

(2) Sensitivity Analysis

Table III-102 shows the relation between the conceivable risk factors of the projects and their effects on the FIRR.

Table III-102 Sensitivity Analysis of the FIRR

Description	Without water rate increase	After 10 % water rate increase
Delay in completions of projects facilities -- 1 year	8.0 %	13.7 %
Delay in completions of projects facilities -- 2 years	7.2 %	12.2 %
Decrease in revenue due to competition with -- 1% decrease	7.9 %	14.1 %
Decrease in revenue due to competition with -- 2% decrease	7.2 %	13.5 %

Risk factors:

< Delay in completion of the Projects >

In water projects in the Philippines, delays in construction are observed due to delay in acquisition of land etc. Delay in completion of the projects would reduce the revenue during the originally supposed period until 2039, during the construction period by 2014 and project life of 25 years starting from 2015.

< Decrease in revenue due to competition >

Competition with other water suppliers could reduce water supply of MCWD, which might then cause decrease in its revenue.

(3) Prerequisite for Implementation of the Prioritized Projects

As it is indicated in the preceding analysis, financial feasibility of the prioritized projects assumes that the water rate increase accompanies with their implementation. Not only for securing the loan financing capacity, the prioritized projects are not considered financially feasible unless a sufficient increase in the water rate is made at an appropriate timing.

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Chapter-IV
Basic Plan on Urban Sanitation

IV-1 Needs Assessment

IV-1.1 Impacts of Current Situation

It is apparent that there are major problems with sanitation relating to;

- Limited infrastructure and access to services outside special economic zones and industrial areas,
- Low priority in the financing of the sector rendering unlikely achieving both national and international targets in the current scenario,
- Gaps in the planning and execution of strategies to increase coverage, and
- Overlapping of roles and responsibilities and weak sector coordination capacity to promote, implement and monitor sustainable solutions.

This has resulted in;

- Environmental Impacts related to degradation of water resources above and below ground level
- Health Impacts related to proliferation of water related diseases
- Socio-Economic Impacts

(1) Environmental Impacts

< Pollution of Receiving Water Bodies >

The main problem in the area is that contractors have not in general constructed septic tanks based on best practice design specifications. Most septic tanks are not twin chamber tanks but only have one settling tank, and no drainage fields are provided. In addition they are poorly maintained. These conditions greatly reduce the treatment efficiency of the septic tank system.

The lack of a centralized sewerage system, bad septic tank design and gaps in legislation means that the partially treated effluent from septic tanks, which has a high domestic pollutant load (BOD), is usually discharged either directly or through subsurface drains, into adjacent rivers and creaks. Entry of solid sewage into the system is also possible through bad design of tanks and connections, and illegal dumping of septage in the streams or drains.

The rapid urbanization of Cebu City and some other urban locations has resulted in the establishment of informal settlements by the most economically deprived parts of the population. Parts of these settlements represent approximately 20% of households without toilets discharging waste directly into adjacent streams, rivers the sea or fields. Finally grey water (sinks, baths, etc.) also high in organic loads (grease, oils, etc.) and often cross contaminated with black water is also discharged in drains or directly in streams.

A crude approximation based on the above analysis, indicates that the domestic pollution load (BOD) accounts for at least 50% of pollution into receiving watercourses and in highly urbanized locations probably much more. The rest is made up of pollutants transferred through

surface runoff and industrial wastewater as well as other unidentified point sources.

The assimilative capacity of existing receiving waters to carry out natural purification has not been established for the area. It is well known that natural purification mechanism of rivers can reduce BOD. Existing information and observation indicates that at the downstream end of the catchment the natural purification capacity of rivers is reduced due to low flows (dry weather) and increased load generated by the densely populated areas.

< Contamination of Groundwater Sources >

There are two health concerns when drinking water with high levels of nitrates or nitrites: (i) blue baby syndrome affecting infants and (ii) the formation of chemicals called nitrosamines in the digestive tract. Nitrosamines are being studied for long-term links to cancer. Boiling water does not treat water but is actually increasing concentration especially when the same water is boiled more than once.

There is a strong indication that nitrate contamination could be the result of poor sanitation practices mainly due to unlined septic tanks and lack of observation of well protection zones in association with poor soil conditions. The worst affected areas have experienced a high level of residential development in the last few years that could potentially have exacerbated the problem. In this case drinking water should also be tested for bacterial contamination and affected areas targeted as priority for sanitation improvements.

(2) Health Impacts

Based on the fact that the majority of population has access to apparently safe water supplies, the data is a strong indication that lack of sanitation resulting in water pollution and cross contamination is the main contributing factor. Cross contamination occurs in the area by the use of polluted river water for washing and cleaning, proximity to and contact with polluted water and poor hygiene practices, bad design of septic tanks allowing seepage of leachate into the aquifers etc. Addressing sanitation conditions will address the issue at the source and counteract the negative health effects.

(3) Socio-Economic Impacts

The potential key socio-economic impacts relevant to the area are identified below. These are closely related to the health and environmental impacts already identified.

- Losses in tourism income (e.g. unsightly algae is present at stretches of beaches deterring tourists)
- Losses in commercial activities such as fisheries due to potential effect of pollution on aquatic life
- Work and school days lost to illness
- Health bill expenses (Study survey showed that the yearly medical bill for WRDs can be up to 10-25% of the monthly household income)

It is very difficult to quantify in monetary terms the financial and wider economic losses attributed to poor sanitation. This is mainly due to lack of monitoring data in the sector and the complexity of multiple contributing factors. Nevertheless the previous analysis has shown that the correlation of socio-economic impacts and poor sanitation is strong.

IV-1.2 On-going Program

USAID through the Philippine Revolving Water Fund Support Program facilitated the development of the Metro CEBU Septage Management Project Feasibility study. Currently this is the only document relevant to sanitation services issues.

The objective of the report is to provide septage de-sludging services and treatment within the MCWD franchise area. The scope includes a full technical, financial and economic feasibility study for a septage management project and future business strategies for sustainable operations. The out come of the study was a recommendation for the construction of one central Septage Treatment Plant (SpTP) in North Reclamation Project STP and two satellite SpTpS in Cordova and Lilo-an, including de-sludging services, in a phased approach.

The future for the implementation of this study is still uncertain due to resistance from some LGUs. The reasons for this resistance are not clear but evidence indicates that land availability, low political commitment, unwillingness to host treatment facilities are some of the contentious issues. Without the support of the LGUs and the provision of relevant ordinances implementation will not be possible by MCWD.

The municipality of Cordova is one LGU that has been receptive to the program probably due to the criticality of sanitation issues exacerbated by its restrictive geography. Implementation of Phase 1 of the proposed solution comprising of a pilot project in Cordova has been initiated and MCWD are currently coordinating with Cordova and Lapu-lapu regarding local legislative requirements.

It should be noted that the study is not a “Sanitation Plan” and alternative sanitation options such as sewerage or other decentralized services are outside its scope. As such it partially addresses raw water quality issues (Refer to Option 4) and it was proposed that it should be used as complimentary to any future sanitation plans and development of options.

Finally the existing Cebu city Drainage Plan developed by DEPW should be considered as reference material during development of Sanitation Options. The plan focuses only on flows associated with storm water runoff but existing conditions indicated that the drains are used as combined sewers. The potential of improving existing capacity complimented with water quality improvement programs could be a viable option but further studies are required.

IV-1.3 Sectoral Assessment

The resulting environmental, health and socio-economic impacts indicate that there is an urgent need for change in the provision of sanitation services and the sector.

In order to identify the requirements for achieving change, a needs assessment was carried out. The assessment was split into two distinct but interrelated parts to ensure a holistic approach to change across all levels of intervention.

- The Service Provision and System Performance
- The Institutional Framework Arrangements and Capacity

A Gap Analysis methodology was employed to identify the weaknesses or gaps related to the current situation, what has been achieved so far and actions required to bridge the residual gap.

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IV-2 Basic Improvement Plan

In line with the needs assessment methodology two basic improvement plans will be developed.

1. Facility Improvement Plan: In this plan, it will be examined that available urban sanitation technologies and develop options customized for the local needs for consideration, feasibility and future implementation.
2. Institutional Improvement plan: In this plan, a new institutional framework will be proposed which can effectively deliver sanitation services of any nature. The roles and responsibilities of the main sector stakeholders, and the required sector activities and outputs shall be defined.

IV-2.1 Facility Improvement

The methodology for development of any sanitation options should follow basic 6-stages:

Stage 1: Information gathering/ surveys of current situation including systems and services
Stage 2: Consultation and needs assessment
Stage 3: Identifying available technologies
Stage 4: Development of basic options
Stage 5: Prioritizing and reaching consensus on preferred options
Stage 6: Develop detailed costed options

(1) Stage 1: Information Gathering/ Surveys of Current Situation including Systems & Services

This Stage was covered in detailed in Sections II-2 and IV-1.

(2) Stage 2: Needs Assessment

A detailed gap analysis and needs assessment was carried out for existing Service Provision and System Performance.

(3) Stage 3: Identifying Available Sanitation Technologies

The scope of this Stage is to identify the most appropriate technologies for the project area. The analysis is based on presenting the main types of technology available, and using a logical sequence chart to eliminate those that are not viable based on the information gathered and the recommendations made in the previous two stages.

The most basic classification of sanitation technologies begins at the very start of the sanitation cycle at the toilet facility. All sanitation technologies at this point can be classified as wet or dry. Wet technologies require water to flush solids (faeces). Most urban sanitation in the area is wet involving some form of flush toilet connected to a septic tank or a leach pit.

The use of wet or dry toilet facilities will affect the choice of the sanitation system downstream and the configuration of its components. As shown in Figure IV-01, sanitation systems can be broadly categorized into the following with a general rule;

- On-site, retaining wastes in the vicinity of the toilet in a pit, tank or vault.
  This option is most appropriate in areas of low-density housing (typically less than 40 housing units per hectare), relatively low water consumption, and ground conditions that allow the absorption of wastewater without harm to an aquifer.
- Off-site, removing wastes from the vicinity of the toilet for disposal elsewhere.
  This option is most appropriate where housing density is high (>40 houses per hectare), there

is a reliable water supply on or nearby the plot and sufficient gradient can be provided to transport solids through the sewer without pumping.

- Hybrid, retaining solids close to the latrine but removing liquids for off-site disposal elsewhere.

  This system may be appropriate in medium- to high-density areas with a flat topography, particularly where the water table is high.

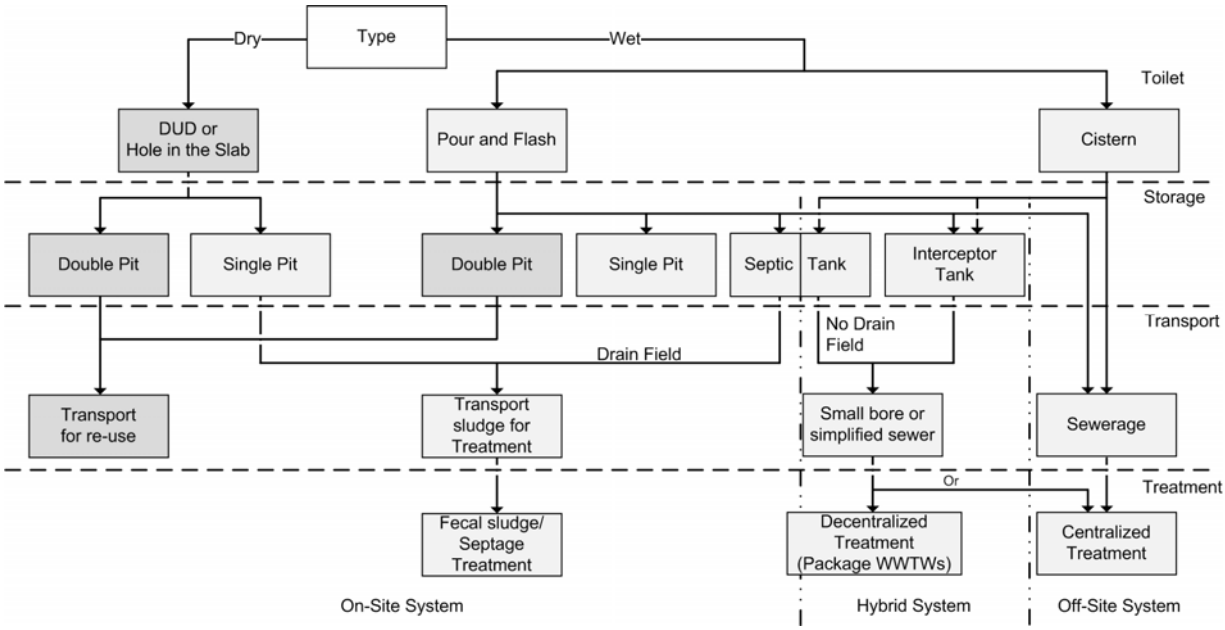

Figure IV-01 Sanitation Facilities

(4) Stage 4: Development of Basic Options

The needs assessment carried out through this study identified that the proposed infrastructure options should focus on the following critical indicators:

- Highly urbanized locations and informal settlements to increase coverage and improve standard of living.
- Highly polluted watercourses and coastal areas to address environmental (BOD, DO, TSS), health (Water Related Diseases) and economic (Tourism) impacts.
- Water supply sources affected by high nitrate concentrations and other pollutants attributed to poor sanitation.
- Existing service provision (none exist apart from commercial zones).

A criticality map was developed as shown in Figure IV-02, by dividing the project area based on vulnerability against the critical indicators. Moreover LGU boundaries were included in delineating critical areas to help facilitate implementation. It is recommended that options development should focus on locations that have the highest concentration of critical indicators. These are in order of priority:

Area-1 Cebu City (North)
Area-2 Areas adjacent to High Nitrate water supply
Area-3 Mactan Island (Lapu-lapu City)
Area-4 Cebu City (South)
Area-5 Mandaue City
Area-6 Low population density towns and peri-urban areas (all LGUs)

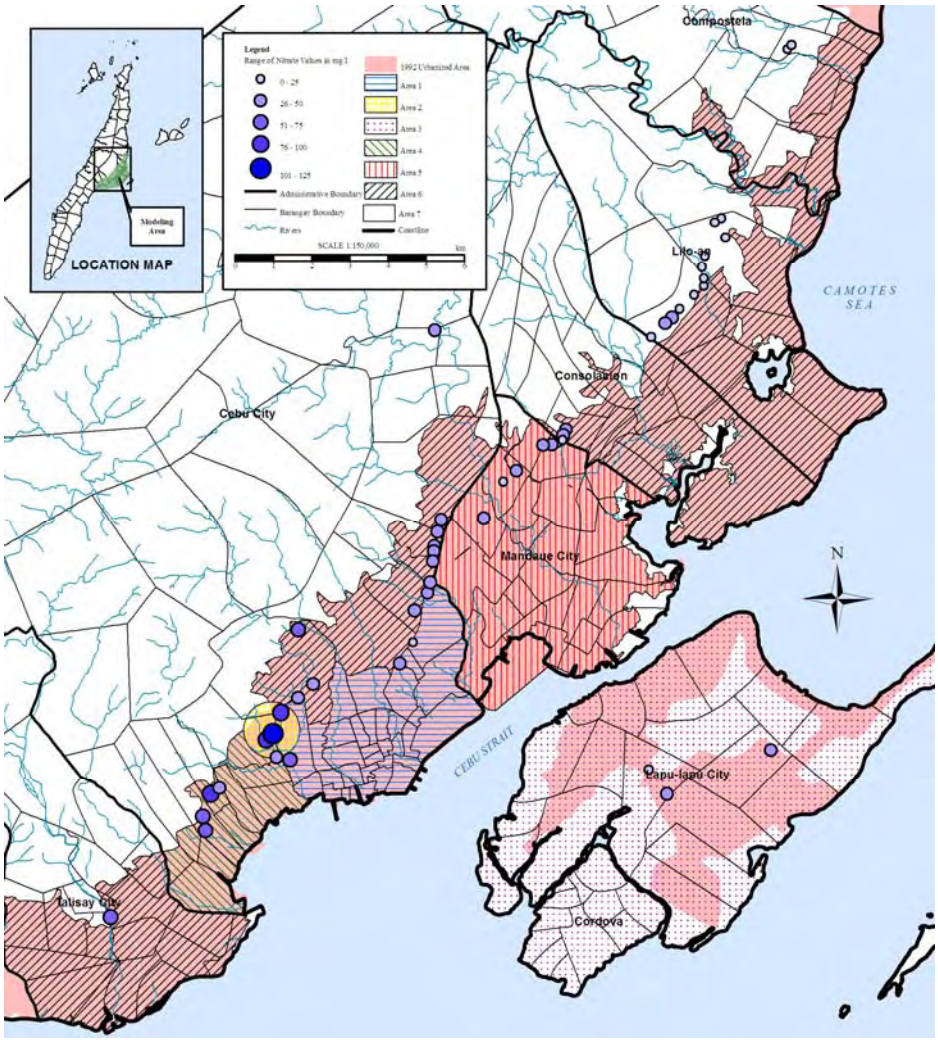

Figure IV-02 Sanitation Services Critical Map

Area 3 was given high priority due to its restrictive geography as a small, flat island. Within the rest of the areas, variations in housing type, density and settlement layout; poverty status; and access to networked services (especially water supply) mean that different solutions may be needed in different parts of the city or even within the same neighborhood. Rarely is a single option (for example, sewerage) viable for an entire town. Based on the analysis carried out through out this study, the sanitation options (see Table IV-01) for further consideration and assessment are proposed.

Table IV-01 Proposed Options

Options	Proposed Intervention	Target Location
Option-1: Septage Management	Implement Septage collection, transfer and treatment service	Areas 1, 3, 4, 5 and 6
Option-2: Septage Management and Environmental Improvements	As Option 2 plus improve raw water quality by: (a) On site systems	Areas 1,2,3,4,5 and 6
	(b) Hybrid systems	Areas 1,3,4,5 and 6
Option-3: Centralized Sewerage System and Treatment Facilities	Install centralized sewerage system and treatment facility	Area 1 (Possibility for expansion to other areas 3, 4 and 5 in future)

The option without any action should be considered to confirm or otherwise the need for sanitation. The following questions need to be considered:

1. Why do we need Sanitation?
2. What is the effect of doing nothing for the present and future of the area?
3. Who, what and in what way, will be affected if nothing is done?
4. Can this option be justified within the existing legal framework?

The assessment so far indicates that this option is not a viable one for the project area. Environmental, health, socio-economic and legal factors demand an intervention. All options presented below can be implemented in a sequential mode at different planning horizons to provide increasingly higher levels of service.

< Option-1: Septage Management >

Under option-1, it is proposed that provision of de-sludging, transport and treatment of sludge is implemented within the target areas. Possible sludge treatment options include;

- Solids-liquid separation in batch-operated settling-thickening tanks;
- Primary sedimentation/anaerobic stabilization ponds;
- Sludge drying beds (unplanted; planted);
- Combined composting with organic solid waste (composting); and
- Anaerobic digestion (potentially with biogas utilization).

Treated sludge can be reused as fertilizer. The program will consist of the following key activities:

1. Public awareness campaigns and user consultation
2. Development of relevant ordinances by the LGUs
3. Identify coverage levels and transport requirements
4. Development of treatment options
5. Development of a cost recovery mechanism

A septage management feasibility study has already been prepared by USAID through the PWRF for the project area. A pilot project is planned in Cordova. Currently preliminary meetings are held between MCWD and the LGUs of Cordova and Lapu-lapu city, the two areas of operation for phase-1, for the formulation of a local ordinance and planning of public awareness campaigns. The key lesson to be learned from this initiative is the importance of local legislation and political commitment. It is recommended that the study is reviewed and further consultations with the public and local officials are organized to promote the plan and overcome any difficulties.

< Option-2: Septage Management and Environmental Improvements >

A septage management program alone does not fully address environmental impacts (i.e. water pollution) caused by the effluent discharges from septic tanks. The implementation of regular de-sludging will effectively increase the efficiency of septic tanks and reduce the domestic pollution load (BOD). The rate and degree of reduction though depends also on acceptable design of septic tanks.

It should be established that most tanks within the project area have been poorly designed thus dramatically reducing their treatment capacity. Even with improved maintenance effluent still contains 70% of sewage pathogens. As a result highly pathogenic effluent is discharged into receiving watercourses with already reduced capacity of purification.

It is proposed under Option-2 to combine a Septage Management program with a Wastewater

Management plan. Two sub-options are considered here based on a decentralized approach and available technology for treating domestic effluent discharges.

< Option-2(a): On Site Systems >

Previous Figure IV-02 shows the range of available on-site systems. In this case, the majority of existing facilities are septic tanks therefore septic tank improvements shall be considered as priority. The other type of systems can be considered where facilities do not exist or for new developments (also most applicable for rural areas not covered in these options).

A septic tank improvement program will be implemented in targeted areas. The program will consist of the following key activities:

1. Survey of existing facilities
2. Development of septic tank design criteria and upgrading guidelines (based on existing codes) such as fully lined tanks, provisions of leach pit or soak-away for effluent treatment etc. The Sanitation Code guidelines should also be reviewed and updated.
3. Development of ordinances including implementation timelines and penalties for non compliance

It can be envisaged that the cost will be borne by the septic tank owners and ordinances enforced through the septage collection service. Essentially owners that do not comply will be penalized through the cost recovery mechanism either by disconnection for connected customers or financial penalties for non-connected.

This option is highly recommended for Area-2 with ground water pollution. Particularly lining of septic tanks in these areas should be a priority. The challenges in implementation are:

a) political commitment for the development of ordinances,
b) public awareness regarding user responsibilities, and
c) land availability issues for the provision of drain fields where soil conditions allow.

Land availability and soil conditions could potentially prove prohibitive factors for implementing option-2(a) in some areas, especially regarding provision of drain-fields for effluent treatment. An alternative to option-2(a) that could address this issue and ensure effluent treatment is incorporated and is a Septage management program with hybrid systems, under option-2(b).

< Option-2(b): Hybrid Systems >

These systems still require land for wastewater treatment but areas can be grouped together and decentralized plants can be built at available spaces. There are two main types of hybrid systems. Detail information on local conditions and user capacity, and preferences will determine the choice of options-2(a) and 2(b).

i. Small-Bore Sewerage; Otherwise known as Septic Tank Effluent Disposal Scheme (STEDS) or Sewered Interceptor Tank Systems (SITS)

This is a hybrid system, comprising interceptor tanks connected to small-diameter sewers for drainage of domestic wastewater. Removal of solids in the interceptor tanks means that sewers carry only liquid and so can be of smaller diameter, and laid to flatter gradients, than conventional sewerage thus reducing costs.

They are appropriate where wastewater production is at least 25 Lpcd. Lower gradients result in reduced excavation depths where topography is flat. So, small-bore sewerage may be a

good option in flat areas, particularly where the water table is near the surface. It can provide a cost-effective way to upgrade septic tanks to a level of service comparable with conventional sewers. It can be used where effluent from pour flush toilets and household sludge cannot be disposed of on-site due to soil and/ or groundwater conditions, but there is insufficient water to allow for operation of conventional sewerage or the latter is not a preferred option.

The effluent from interceptor tanks transported through small-bore sewerage can be discharged into conventional sewerage or treated locally in a decentralized wastewater treatment plant such as an anaerobic baffle reactor, a rotating baffle reactor, activated sludge and other package treatment plants depending on land availability.

ii. Shallow Sewerage

These systems are developed for use in residential areas and can be used both as off-site and hybrid systems; these sewers can be laid at relatively shallow depths due to the absence of heavy traffic. A simplified design and layout is used with inspection chambers instead of manholes and interceptor tanks at cluster locations receiving waste from several households. The sludge from the interceptor tanks requires evacuation and treatment while the effluent can be either treated in a decentralized facility serving one or several clusters or connected to a centralized sewer system.

This reduces construction costs, facilitates cleaning, and makes it easier and cheaper to connect households to the system. They are particularly appropriate for dense informal settlements where laying sewer lines is often problematic due to the unplanned, irregular layout of buildings and streets. They have low capital costs but do require regular maintenance and a wastewater treatment facility (that could be de-centralized).

< Option-3: Centralized Sewerage System and Treatment Facilities >

Centralized Sewerage Systems or conventional sewerage consists of a closed system of pipes, manholes, and pumping stations in flat areas, which takes domestic waste (solids, black and grey water) from residential, commercial, and industrial areas to a centralized treatment facility.

Conventional sewerage is used extensively in urban areas where water consumption is high and a centralized system is in most cases a viable solution. They provide usually a high level of treatment and deal collectively with all domestic waste relieving owners from the responsibility of sanitation. As a result they are viewed as a highly desirable solution.

The technologies include Waste Stabilization Ponds, Activated Sludge Processing for solids with a combination of wastewater treatment plants such as Rotating Biological Contactor, Anaerobic Baffled Reactor, Reed Beds, Fluidized Aerated Bed (FAB) Reactor, Biological Trickling Filter, Up-flow Anaerobic Sludge Blanket (UASB), followed by disinfection and discharge to receiving water courses.

Shallow sewerage can be utilized locally under this option to reduce costs. The shallow sewers can then be connected to secondary or primary conventional sewer lines. Also the possibility of utilizing the existing drainage system as a combined system should be explored.

(5) Planning Horizon

The planning horizon is a critical factor in the prioritization of options. Following options based on two planning phases are recommended.

1. Sort Term-2015 to develop and implement pilot studies and small-scale interventions. Also

to allow for the institutional plan to be implemented and feasibility studies to be identified for the next phase

2. Long Term-2030 to carry out detailed surveys and develop detailed designs for long-term options.

IV-2.2 Institutional Improvement

Best practice dictates that institutional arrangements should provide a comprehensive solution for the long-term future of the sector and should facilitate the implementation of any system options. This prevents expensive and time consuming restructuring activities every time a new program is implemented, and is conducive to further development.

(1) Organizational Framework.

Modern best practice seeks to differentiate between the roles of (i) policy and legislation maker (ii) Service provider and iii) Regulator. It is important that separation of roles is established within the existing institutional framework to provide an effective arrangement for sanitation provision.

< Policy and Legislation Maker >

In 1991 the Local Government Law devolved significant functions, powers, and responsibilities to the thousands of local governments in the country that have long been operating under a highly centralized regime. LGUs have the legislative power to translate national policy at local level and create, through ordinances, the legal and regulatory framework for the set up and operation of sanitation facilities. It is evident that LGUs are fully mandated to fulfill the role of legislation maker and policy promoter within the local sanitation sector but coordination at local and national level should be strengthened.

< Service Provider >

The fact that LGUs have the final responsibility for urban sanitation services, and the importance of local political support, recommends that LGUs retain overall control of their local services. Based on the principle that wastewater should not be separated from potable water (cause and effect), MCWD is an obvious candidate to undertake responsibility of Service Provision for Sanitation.

The role is supported partly by existing national legislation and policy, namely the Local Water Districts Law PD 198 and also the Clean Water Act 2004. Nevertheless existing legislation is still unclear and subject to interpretation leading to overlapping of activities and sector fragmentation. Another important prerequisite for MCWD to fulfill this role will be effective organizational restructuring and sufficient capacity building.

< Regulator >

Regulatory activities should cover two distinct areas;

1. Environmental Regulation including raw and potable water quality standards and monitoring, specifications and standards for waste treatment, and issuance of permits and licenses for sanitation operations. These duties are currently shared by DENR, DOH and LGUs. A clear delineation of responsibilities must be established between the organizations and monitoring activities strengthened at regional but especially at local level. All LGUs should ensure that an organic position for an Environmental and/ or Reinforcement Officer is

filled and monitoring activities are coordinated between all stakeholders through an inter-agency committee.

2. Service Provision Regulation including the development of sanitation performance indicators. Currently there is no regulator for service provision and an initial assessment indicates that LWUA could possibly take on this role under its current capacity as a water supply services regulator.

(2) Strategy Framework

One of the key requirements for improved sanitation services is the need for a strategy to translate policy into programs and projects and meet long-term objectives. The three key elements in that strategy is the need for:

(i) a coordinating body;
(ii) a competent service provider and
(iii) Master Plans that will address the "how" for providing sanitation services.

< Coordinating Body >

The needs assessment carried out under this study identified a lack of coordination and common strategy between the stakeholders and the absence of an institutional "home" for sanitation and service provision. It is proposed that an Integrated Sanitation Development Agency (ISDA, referred to Figure IV-03) or Board is formed based on the Integrated Water Resource Management to ensure a clustering of LGUs for a holistic approach to septage and wastewater management.

< Competent Service Provider >

At section 4 below recommendations are provided on the required organizational changes so that MCWD is fully capable of fulfilling its role of a competent Sanitation Service Provider. Specific technical assistance programs are also identified at Section IV-3 to support the organizational changes.

< Master Plan >

The objective of a Master Plan is to provide a utility with a strategic plan for the water and sanitation development within its area of responsibility, over a defined design horizon taking account of financial, social, demographic and environmental considerations. It is essential that the Master Plans are developed on a bottom up approach based on needs identified at local level and then prioritized at franchise area level and reviewed and approved based on river basin management principles in line with national policies and plans.

(3) Sustainability Framework

The long term success of an Institutional Improvement Plan will heavily depend on the sustainability of the operations. There are two key factors governing sustainability;

< Financing and Cost Recovery >

A financing strategy must address both the need for initial capital investment and sustained cost recovery mechanisms. Best practice indicates that tariff structures must be based on the full cost recovery principle including capital and operational expenditure. Initial capital investment for project implementation will be high and alternative sources of financing such as low cost loans or private public joint ventures should be fully explored.

< Public Awareness Campaigns and Community Participation >

One of the major reasons for the lack of sanitation provision has been lack of customer demand for alternatives to septic tanks. This is partly due to the cost of the service but also due to a general lack of awareness concerning public health and sanitation. International best practice indicates that community participation and public awareness campaigns are critical to;

a) Choice of appropriate technology;
b) Willingness to connect and pay and
c) Operational and financial sustainability of schemes.

National and international experience has shown that substantial upfront investment should be made at the planning stages of any sanitation program to raise awareness and ensure customer and political commitment. NGOs have substantial capacity in grass roots interventions and their experience on community participation programs should be utilized when available. It is important that pro poor strategies and community participation are an integral part of any sanitation strategy and MCWD should build sufficient capacity to be able to provide services to all.

(4) The Proposed Institutional Framework

Proposed plan on the institutional development is represented in a flow chart of Figure IV-03 showing the key stages of project implementation along with the roles and responsibilities and the relationships between key stakeholders. The aim of the plan is to act as a framework that will provide guidance on how to implement the changes and aid identification of specific assistance programs to ensure sufficient capacity is developed for success and sustainability.

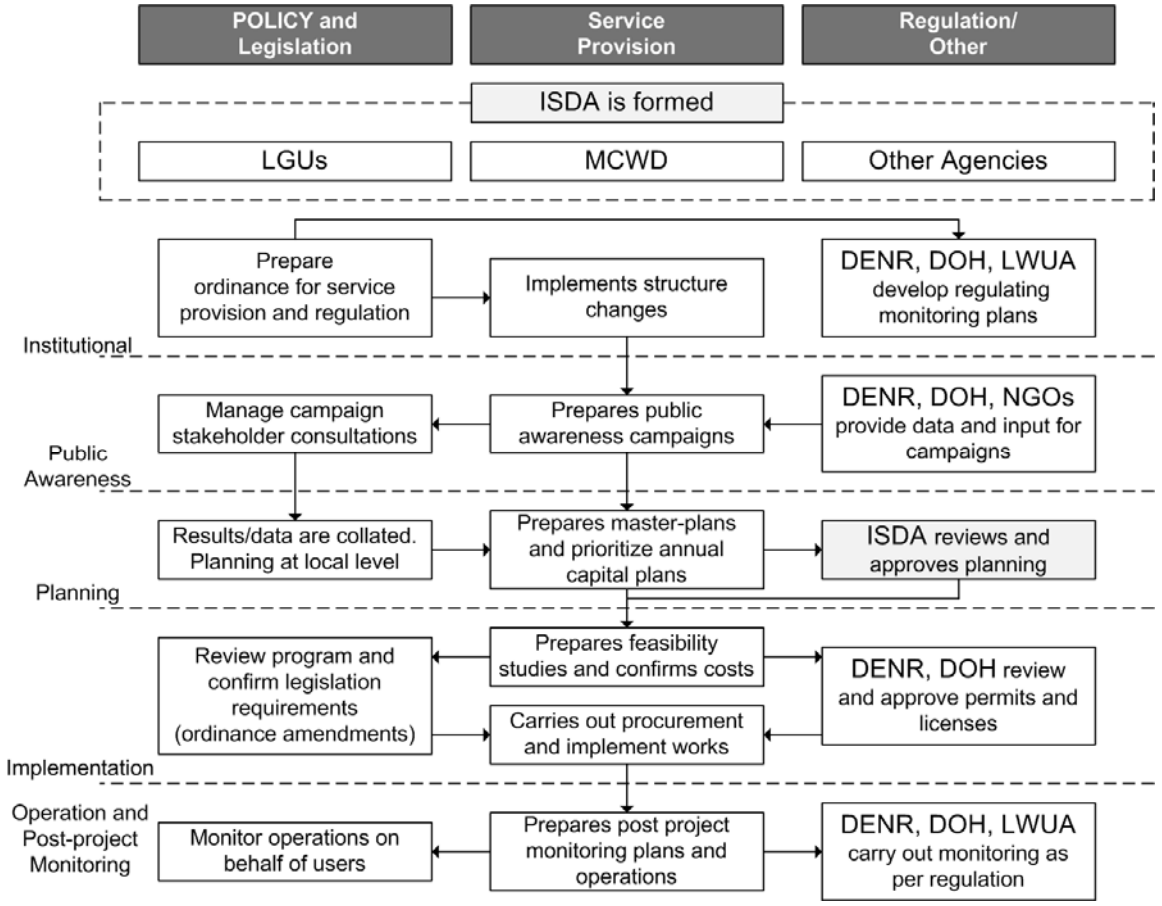

Figure IV-03 Institutional Framework Flowchart

< MCWD Organizational Structure >

It is proposed that MCWD should emphasize its commitment to the new role by renaming its Water Operations group to WATSAN Operations and create the new Department of Wastewater and Septage Management with a Collection and Transfer Division and a Treatment Division as shown in Figure IV-04. Any proposed improvements to the overall restructuring do not alter the position of the new department under the Operations Group.

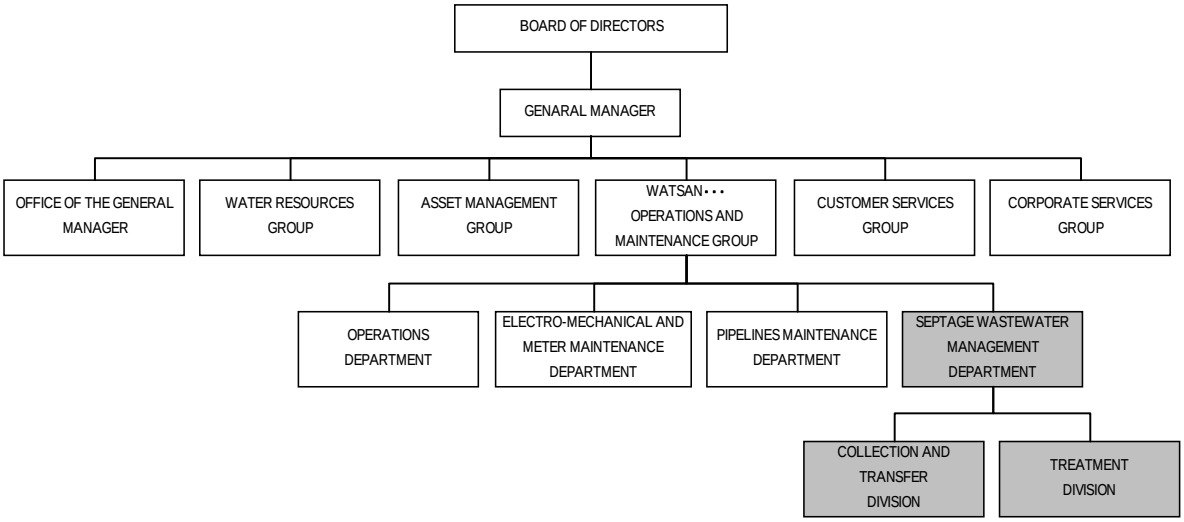

Figure IV-04 New Septage and Wastewater Management Department in MCWD

To be able to carry out the new role as proposed in the Institutional Framework above further resources should be assigned to functional areas of the organization that are critical to the provision of the new service. Table IV-02 indicates initial requirement of resources and their prime functions for each of the target areas.

Table IV-02 Proposed Initial Resource Requirements

Critical Functional Area	Resource Requirement	Prime Functions
Corporate Planning	Planning Engineers (2)	Management of Master Plan preparation; Review of LGU proposals submitted;
Design Services	Engineers (2)	Preparation of Manuals and Guidelines etc. Review and control of consultants designs Capital works programming
Project Management	Procurement (1)	Preparation and management of works, service and materials supplier contracts; Contract and supplier financial management.
	Engineers (2)	Site staff to oversee consultant supervision engineers.
Environmental Management	Environmental Scientist/ Engineers (1)	Monitoring Standards Monitoring and Evaluation Systems
Wastewater and Septage Management Dep.	Department Head (1) Engineer (1)	Monitoring performance of “as built” schemes against objectives; Monitoring performance indicators Reporting and publicizing performance
Collection and Transfer Div and Treatment Div.	Septage Management personnel (Ref. Feasibility study)	Provide de-sludging Services, operate and maintain de-sludging equipment Operate and maintain STP

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IV-3 Prioritization on the Sanitation Projects

In line with the methodology, following two components have been identified.

- Zonal Project Requirements
- Institutional Capacity Developments

IV-3.1 Zonal Project Requirements

A combination of projects relevant to all options will be identified and prioritized, and the need of the area to address mainly domestic and any untreated commercial loads. The following two subcomponents were identified.

- Wastewater Management
- Septage Management

Critical factors such as land availability, restricted access to capital investment, flat topography favors decentralized solutions in the short term to address critical environmental and health issues as soon as possible. Centralized solutions are considered as a long term approach to increase levels of service to the highly urbanized areas, subject to full feasibility studies and full integration with the decentralized system approach in the planning process.

The following projects were prioritized under the two components divided into short term and long term design horizons. Investments under these projects will enable MCWD to gain technical experience in construction and management of sewerage systems in areas with septic tanks. Moreover, the project will demonstrate to the public and to local government the viability of different types of wastewater management.

(1) Wastewater Management

< Wastewater Collection and Treatment: short term (2015) >

Among the wide variety of decentralized treatment systems, it has focused in secondary and tertiary treatment components that are complementary to primary treatment provided by septic tanks. The choice of technology to be tested is based on the following governing factors:

1. Restricted land availability: Decentralized options such as underground facilities to make maximum use of space
2. The composition of wastewater to be treated: As most industrial effluents are treated and monitored the focus is mainly on domestic or other non treated highly organic loads (i.e markets, slaughter houses etc).
3. Climate and topography: Technologies conducive to a flat location with high water table and low infiltration and hot humid climate with dry and wet season
4. Low capital investment: Small scale intervention with low per capita investment
5. Low O/M financial and technical requirements: Focus on low/non-mechanized options with minimum maintenance requirements
6. Public acceptance and awareness: Focus on a highly visible highly accessible option.

Based on the above requirements it was identified that the following arrangement would be an appropriate option for a wastewater treatment pilot project. A decentralized collection and treatment system comprising of a separate sewer collection system (shallow/ small bore system) followed by an anaerobic baffle reactor and anaerobic filter providing secondary treatment and a constructed wetland for tertiary treatment. The following table presents the advantages

and disadvantages of the system and its compatibility with the local requirements as identified above:

Table IV-03 ABR-AF-CW Specifications

Description	ABR Anaerobic Baffle Reactor	AF Anaerobic Filter	CW Constructed Wetlands
Treatment Processes	Anaerobic	Anaerobic	Facultative-anaerobic Aerobic Pathogen removal
Treatment Step	secondary treatment	secondary treatment	secondary/tertiary treatment
Wastewater Type	Pretreated domestic and industrial wastewater	Pretreated domestic and industrial wastewater	Domestic and weakly polluted industrial wastewater after removal of settle-able and colloidal solids by pretreatment
Advantages	Simple and durable with high treatment efficiency Little permanent space required due to underground construction Low capital and O/M	Simple and durable if wastewater has been properly pretreated Little permanent space required due to underground construction	High treatment efficiency No odor nuisance Pleasant landscaping possible
Disadvantages	Requires larger footprint during construction Less efficient with weak wastewater Longer start-up phase than anaerobic filter	Blockage of filter possible	Higher permanent space required Costly if filter material not locally available Technical construction and maintenance required

Decentralized systems based on ABR + AF + CW technologies, may replace centralized piped systems in urban areas where network accessibility is complex and costs must be kept low. Due to its simple structure and operation and the fact that it can treat all type of soluble wastewater from low to high strength (very good dealing with shock loads) it is good for treating municipal wastewater of tropical areas in developing countries.

An outline plan of the proposed pilot project is presented in Figure IV-05:

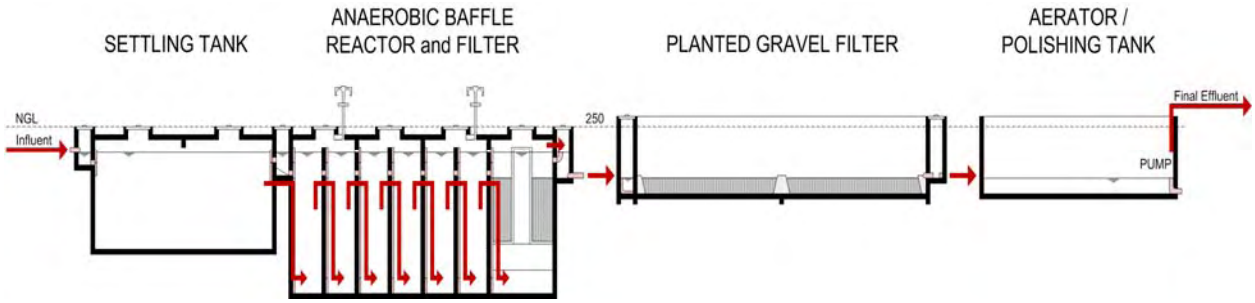

Figure IV-05 Proposed Wastewater Treatment Process

The pilot project if successful can be adjusted and replicated to other locations within the franchise area. It was identified that city or municipal markets would be ideal target areas for the implementation of a pilot. They are major polluters, with discharges high in organic loads which are appropriate for ABR treatment. The Carbon Market (downtown in the Cebu city) is an obvious candidate for implementation. It is currently too fragmented and detailed survey of the area to identify available land must be carried out. A smaller market is more appropriate as a starting point and this is why the Consolacion Market was prioritized. Nevertheless the proposal is flexible enough to be implemented in any market with available land if current conditions change.

< Interceptor Sewers and Centralized WWTP: long term (2030) >

These are high capital and high operating cost options that should be carefully considered as part of a long term strategy that integrates both centralized and decentralized solutions. Critical Area 1with a focus in downtown Cebu city and possibly Mandaue is the most appropriate location for a centralized option. The area is highly urbanized (Cebu), industrialized (Mandaue) and highly polluted. The proposed project is split into two phases due to the high capital investment required.

Phase-1: It includes feasibility study, detailed design and construction of interceptor sewers to collect DWF from the outfalls along the downstream end of the main rivers in Areas-1 and -5 and transmission of effluent, through a deep interceptor along the coast, for treatment to a centralized WWTP. This phase will address environmental and health issues as a critical priority but will not increase levels of service. Septage management is still required. The option offers reduced capital cost as most houses are already connected to the drain.

Phase-2: It includes expansion of sewer systems across the city and connection to interceptors which will act as mains. The aim is to gradually close off drain connections working towards a fully separate system. The phased approach will address environmental issues as priority and provide increased coverage and level of service in a long term approach to wastewater management.

An integrated initiative to upgrade the dumpsite and direct leachate to the proposed treatment plant will achieve increased environmental benefits for the Cebu Strait and socio-economic benefits for the area. This option should be carefully considered in close cooperation with the planning department of Mandaue city and in line with future development plans for the location.

(2) Septage Management

< Septage Collection and Treatment: short term (2015) >

Under this project, it is proposed to continue with existing Septage Management program phase-1 that includes the construction of a STP in Cordova and provision of de-sludging services for Cordova and Lapu-lapu City. The project is already underway and addresses the lack of sanitation service provision and partially environmental issues in Mactan Island (critical Area-3). Additionally it is recommended that a septic tank improvement program should be included to complement the septage management and improve water quality of the septic tank effluent (referred to Option 2(a) and 2(b)).

< Groundwater with high NO_3: short term (2015) >

High nitrate concentrations in groundwater resources, is a serious problem in the majority of the project area and critical in Area-2. A solution is required to address;

i) Environmental Impacts by protecting Water Sources,
ii) Health Impacts by eliminating Waterborne and Acute chronic Diseases, and
iii) Economic Impacts by achieving lower treatment and clean up costs.

The following activities in Area-2 are proposed under the project.

- Survey of the sanitation facilities and practices in affected area including design, condition,

operation and maintenance to assist in identifying sources of pollution.

- Public Consultation to assess awareness of the problem, public perception of its criticality, willingness to participate in proposed solutions.
- Identify options based on value engineering principles. As a minimum the options should consider i) provision of on-site tertiary treatment were possible or installation of shallow sewerage to collect and convey effluent away from the critical area as a priority, ii) safe septage transfer and storage, and finally iii) options for containment of other sources of pollution if identified.
- Prepare and sign local ordinances, procure the works and implement
- Post project monitoring and contingency plan

< Septage Management Program Review: long term (2030) >

The feasibility study requirements for phase-2 of the Septage Management program in line with Wastewater Management plans should be reviewed to adjust strategy for maximum benefit. Figure IV-06 shows the locations of the proposed facility projects.

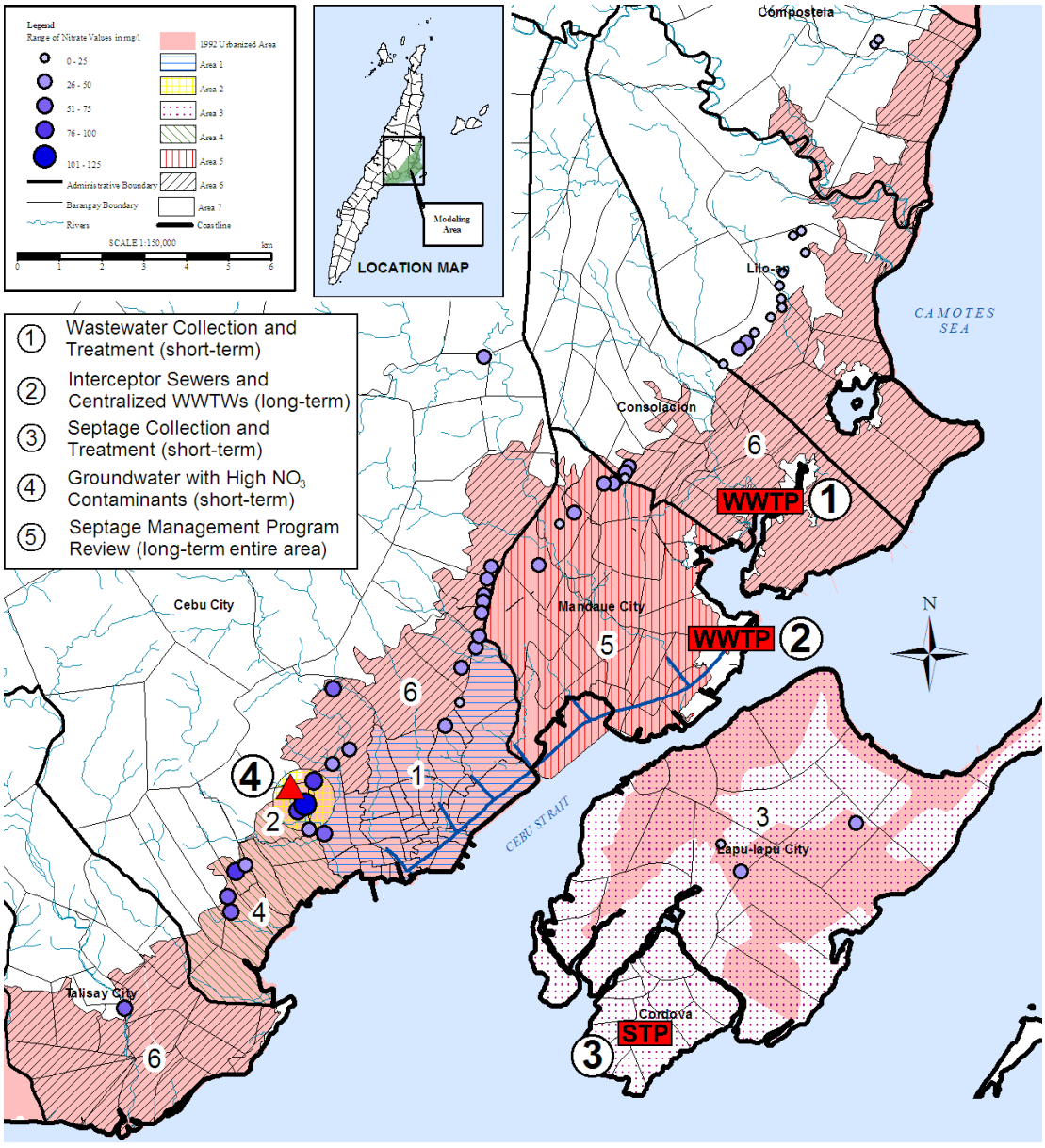

Figure IV-06 Facility Improvement Priority Projects

(3) Environmental and Social Considerations

According to the basic plan for sanitation improvement, pilot projects for sanitation facility improvement were proposed as follows:

- Decentralized wastewater treatment facility;
- Septage treatment facility; and
- Improvement of septic tanks operation.

The common environmental and social impacts by sanitation improvement can be assumed as follows:

- Land acquisition and resettlement
  Land acquisition for project sites will be required to some extent, and it may cause impact on livelihood of land owners. Involuntary resettlement will be avoided as it is expected that project sites will be selected in no settlement area.
- Sanitation and infectious diseases:
  The sanitation improvement projects originally aims to improve sanitary condition in Metropolitan Cebu and it will contribute to improve the peoples' health. However, it is assumed that there is possibility inadequate operation of sanitary facilities may cause sanitation and health problem among the peoples in surrounding and downstream area of project sites.
- Water pollution and offensive odor:
  The sanitation improvement projects originally aims to improve the water pollution and offensive odor which is quite common in drainages and rivers in Metropolitan Cebu. However, it is assumed that there is possibility inadequate operation of sanitary facilities may cause water pollution and offensive odor in surrounding and downstream area of project sites. Consequently, it may contaminate groundwater, soil, and bottom sediment as well.

Therefore, land acquisition and resettlement action plan (LARAP) and/ or Environmental Impact Assessment (EIA) must be prepared/ implemented in parallel with feasibility study. Mitigation measures and monitoring plan shall be prepared simultaneously.

IV-3.2 Institutional Capacity Developments

The recommendations under this section aim to improve capacity at critical areas in the sector. The following subcomponents were identified

- Technical assistance in institutional capacity building for the preparation of follow-up programs for wastewater and sanitation improvements
- Carrying out public information campaigns on the benefits of sewerage and sanitation services, and on the best practices of proper disposal of sewage

It is recommended that all projects identified under the institutional development plan are implemented within the short term design horizon as they are critical to the development of the sector and the successful implementation and operation of the infrastructure projects.

(1) Technical Assistance for Capacity Development

This component is split into MCWD specific and Sector Wide. The proposed projects are prioritized assuming the Basic Institutional Improvement Plan is accepted and adopted by the stakeholders in Metropolitan Cebu. Technical assistance will be delivered in the form of consultancy services by national and international experts.

< Sector Wide Capacity Development >

Policy and Strategy

Institutionalize the National Sewerage and Septage Management Plan (NSSMP) at local level when completed. The plan is at final draft stages and should be reviewed and incorporated in the planning process.

Legislation and Regulation

- Review and streamline the legislative framework to support clear demarcation of roles and responsibilities especially between WDs and LGUs. Advise on the implementation of the Clean water Act 2004 at local level by aligning national laws such as PD 198 the Provincial Water Utilities Act of 1973, the Local Government Code and others to identify the most competent service providers.
- Review and update regulatory requirements for environment, health and service provision including Environmental standards on raw water quality and effluent discharges (DENR), EIA requirements for Sanitation projects, service performance indicators and others.
- Review and update the Philippine Sanitation Code with particular attention to technical specifications and design standards.

Manuals and Guidelines

- For planning standards; population projections; demand forecasting; design criteria; typical designs and drawings etc.
- For the integration of decentralized sanitation solutions within the city/ municipality planning process.
- For the drawing up of comprehensive ordinances including technical financial and legal arrangements.
- For tariff calculation for sanitation services.
- For O/M manuals.
- For M&E of implementation and service activities.

Pro-poor Sanitation Services (Capacity Development of LGUs and MCWD in;)

- Comprehensive research on best available technology and previous and ongoing pilot sanitation schemes in low-income areas, and lessons to be drawn from such schemes;
- Incorporate pro-poor strategies into wastewater master planning;
- Preparing proposals on future investment requirements in accordance with the strategy and identify finance sources;
- Recording underserved settlements data into the geographic information system database; and
- Piloting alternative and unconventional on-site sanitation in selected low-income areas.

< MCWD Organizational Capacity Improvement >

Organizational Restructuring

Support MCWD to implement the required organizational restructuring as proposed in section IV-2.2. Draw up change management plans and detailed resourcing and training programs.

Planning and Asset Management

- Undertake extensive information gathering on existing drainage systems and outfalls within the project area. Sampling and analysis of wastewater and groundwater quality
- Prepare an Asset Management system with priority on development of GIS to support the recording of spatial data base (e.g. location of sewer lines, manholes, pumping stations etc.) and attribute data base (e.g. characteristics of sewer line - diameter, pipe material, depth, year of construction, current condition etc) and prepare for asset map digitization.
- Prepare technical standard manuals including specifications, standard designs and drawings
- Prepare Wastewater Master Plan to reflect recent urbanization trend and future urban development plan from city/municipality, along with the vision and strategy for the next 30 years i.e. up to 2040. Ensure plan development is based on multi-criteria such as increased coverage and levels of service and environmental impacts and pro poor strategies.
- Support MCWD to get formal sanction of Wastewater Master Plan 2040 from competent authorities.
- Undertake feasibility studies for further development of sanitation/ wastewater management services.
- Develop procurement, project and construction management capacity.

Business Financial and Accounting (support MCWD to)

- Develop tariff strategy for the provision of sanitation services
- Establish proper systems for accounting and financial management of septage and wastewater management units.
- Prepare for 'ring-fencing' of revenues and expenditures for septage and wastewater management services.
- Ensure sufficient financial allocation every year for Q&M.
- Develop Business Plan objectives and capital programs in line with Master Plan strategies.
- Develop standard performance indicators for sanitation linked to infrastructure condition, operating efficiency and financial performance, quality of service, tariff levels etc. and establish a monitoring system.

Training

An initial outline of training requirements is presented in the Table IV-04 (next page).

(2) Public Awareness Campaigns

The strategy will aim to improve public awareness on;

(i) the environment and public health in relation to sanitation;
(ii) the operational costs needed to provide a service and associated service charges;
(iii) links between water consumption and wastewater generation; and
(iv) the consequences of solid waste disposal into open canals or maintenance holes.

The campaign will also provide an opportunity to disseminate information relating to customer inquiries and customer support. The campaigns should be run at local level, facilitated by NGOs, LGUs and their Barangays but supported and coordinated with MCWD and other agencies e.g. DENR, DOH.

Table IV-04 Training Requirements

Training Topics	Delivered to:
Implementing change in MCWD; Developing a Decision-Making Process; External fund requirements; Principles of customer service – internal and external; Overview of: a. Technologies for urban sanitation; b. Production of Master Plans, capital programming and investment plans; c. Public awareness campaigns and public participation in decision making; d. Financial Planning, Management and budget setting and monitoring; e. Working within a performance related regime;	Senior managers within the MCWD
Project management, Government policies, strategies and objectives, Anti-corruption safeguards, Report writing, Customer service, etc	All staff
Asset management; Urban Wastewater Management Planning – principals, selection of options, Value Engineering; Project Appraisal – to ensure efficiency in capital spending; Performance indicator determination and performance reporting; Detailed external fund requirements: technical, financial, procurement and contract; Care for the environment and Environmental Assessment; Tender dossier and contract preparation; Tender evaluation	Capital planning, design and engineering staff within MCWD
As for capital engineering staff, plus; Contract requirements; Site supervision and monitoring; Performance monitoring and reporting; Technical audits; Site Health and Safety;	Site supervision and monitoring staff
Procurement of services and works; Financial management and budget control; Tariff setting; Tender evaluation; Capital investment planning; Financial audits;	Financial staff

These objectives can be achieved by:

- Water-quality testing of raw water and private supplies with presentation of the results to increase awareness of pollution, nitrate, nitrite, and ammonium concentration levels in the water supplies;
- Presentation of improved cost-efficient sanitation systems and improvement projects;
- Organization of a public awareness campaign at:
  - Barangay level through public meetings and debates covering health and hygiene issues;
  - Presentations to schools and other institutions;
  - Information provided in health centers;
  - Mass media and public awareness campaign.

Utilize NGOs to prepare training programs for the sector on community participatory methods such as:

- Focus group discussions and consultations
- Stakeholder and Activity mapping exercises
- Field friendly manuals or information posters
- Capacity building/training sessions targeted at required needs
- Others

IV-3.3 Monitoring Framework

Implementation of the proposed priority projects must be carefully monitored and evaluated to ensure that not only the project outputs i.e the physical works/programs have been completed but also the desired outcomes/ benefits have been achieved and the projects have a long lasting positive impact by improving the lives of the beneficiaries. Indicators must be established at the planning stages of any intervention to measure the value achieved and confirm alignment with the project objectives.

Table IV-05 presents an outline monitoring framework highlighting the short and long term benefits that can be facilitated by the proposed priority projects.

Table IV-05 Monitoring Framework

Input/ Priority Project			Outputs	Outcomes	Impact
Zonal Project Requirements	Wastewater Management	Pilot Project; Wastewater Collection and Treatment	Facilities designed, constructed and operated Indicators: 1) No of WWTPs built 2) Achieving acceptable treated effluent standards in all new WWTPs 3) Km of conventional and shallow sewers installed and/or drains rehabilitated	Increased access to sanitation infrastructure and coverage levels for MC, Indicators: 1) % increase of population serviced 2) No of HHs connected to treatment facility 3) % increase of sanitation capital investment	
		Interceptor Sewers and centralized WWTP			
	Septage Management	Septage Collection and Treatment			
		Improve groundwater quality in locations with high NO_3 concentrations			
		Septage Management Program Review	Long-term Septage Management program updated in line with wastewater management plans	Implementation of reviewed strategy	
Institutional Development	Technical Assistance	Institutional Strengthening (Sector Wide)	Efficient, effective urban sanitation sector developed. Indicators: 1) Restructuring completed by Dec 20XX 2) All capacity building activities proposed under project achieved by Dec 20XX	Improved, affordable and sustainable sanitation services in MC Indicators: 1) % reduction in annualized cost/HH 2) Sustainable and socially acceptable tariff levels and collection mechanisms(set standards) 3) No of new connections per year 4) % improvement in operational performance.	1) % Reduction in BOD in receiving watercourses and Nitrate concentration in groundwater resources 2) Reduction in WRDs 3) No of low-income underserved settlements reduced
		Institutional and organizational capacity development-MCWD	Governance, institutional and operational capacity strengthened for MCWD Indicators: 1) Detailed sector capacity development program and assessment of training needs completed by Dec 20XX 2) All activities proposed under project completed by Dec 20XX		
	Public Awareness	Public Awareness Campaigns	Improved awareness of health and sanitation and increased willingness to connect Indicators: 1) Septage Management campaign completed and household survey results confirm output 2) Long-term strategy developed by Dec 20XX 3) CPM detailed training assessment completed by Dec 20XX		
		Training on Community Participatory Methods (CPM)			

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IV-4 Introduction of Progressive Activities by LGUs

Two case studies of Septage and Wastewater Management Service Provision were reviewed for introduction to the stakeholders;

- Dumaguete LGU and WD: Septage Management Project, and
- MWSS and MWCI: The Metropolitan Manila (MM) Experience.

Institutional and implementation arrangements, and identify lessons learned could be applicable to future projects in Metropolitan Cebu.

IV-4.1 Dumaguete LGU and WD

The Dumaguete Septage Management Project includes the following three components:

1. Pilot Project: Treatment of Public Market Effluent (Anaerobic Baffle Reactor/Gravel Bed)
2. Septage Management Program: Treatment Facility (Stabilization Ponds and Oxidation Ponds) and Desludging Services
3. Septic Tank Improvement Program.

(1) Background

Dumaguete is located in the west side of Cebu and it is the provincial capital of Negros Oriental with a population of 116,392. The city's sanitation needs are mainly served by septic tanks but there is no septage treatment facility and bad design of the tanks results in the majority of the pollution load entering the drains and discharged directly into the sea.

In 2003 USAID, under the Local Initiatives for Affordable Wastewater Treatment Project, provided technical assistance to the City of Dumaguete to address wastewater management issues. The project identified the Public Market in Dumaguete as one of the major polluters. The market was discharging effluent high in organic load, directly to the seafront, along the much revered Dumaguete promenade. A pilot project was implemented to provide treatment of the Public Market effluent.

Following the success of the project, in 2005-06 under the Philippine Sanitation Alliance a continuation of the project, the next phase of addressing the sanitation needs of the whole city began. Different options were considered and it was decided that a Septage Management Project was the right solution for Dumaguete. At the time of the visit construction of the facility had started and planned to be completed by early 2010.

(2) Implementation Arrangements

The project was implemented through a joint venture between LGU and DCWD. An MOA was signed between the two parties delineating the roles and responsibilities based on the Clean Water Act 2004. It was agreed that LGU will assume the role of owner and operator of the septage treatment facilities while the WD will facilitate the provision of de-sludging and transfer services and collection of fees, taking advantage of its existing water supply collection system.

The feasibility study was undertaken by the LGU with support from USAID. The design involves the construction of septage treatment facility with stabilization and oxidation ponds, the procurement of evacuation trucks for provision of de-sludging services and also technical specifications on the septic tank improvement program to be carried out by the private owners.

In line with the MOA the financial arrangements for implementation are based on a 50/50 split of capital cost and revenue sharing. Sustainability of the operations was ensured with appropriate tariff levels set as % of the water bill.

Implementation was legally supported at local level by the formulation of a Septage Management Ordinance encompassing all technical, financial and regulatory requirements. The septic tank specification improvement program is an integral part of the scheme and technical guidelines and specifications along with monitoring have been clearly stated in the ordinance. Monitoring of fee collection and associated penalties are also part of the document.

(3) Lessons Learned

The Project is currently at construction stage and there is still substantial work to be completed prior to commencing operation. Nevertheless there are valuable lessons to be learned.

< Legislation >

National legislation is not sufficient, as it is not practically enforceable under devolution and decentralization of powers. Local legislation such as ordinances show commitment and set out clearly the responsibilities of the parties, reducing risk and safeguarding sustainability. The ordinance process though is time consuming and fraught with difficulties. In the Dumaguete experience it took the project implementers 3 years of intensive lobbying of the local government in order to raise the profile of the project and finally secure approval. Sanitation projects are perceived as a high cost low return investment without much political cachet. This coupled with limited understanding of the far reaching consequences of neglecting wastewater management issues it is not surprising that there is a reluctance to support them.

< Public Awareness >

Similar difficulties are faced when dealing with the public. Lack of awareness of sanitation issues influences public consensus on key decisions and affects willingness to pay. It took over 6 years and over 50 public hearings, the implementation of a successful pilot project and tireless campaigning and it is not over.

The team is currently carrying out a septage promotion campaign related to costs and fees in preparation of entering the operation phase. It was reported that regardless of the 6 years of raising public awareness there is still resistance and the efforts must continue post project implementation. Raising public awareness along with securing political commitment are the two most crucial steps into successful implementation.

< Comprehensive Technical Solutions >

Finally a comprehensive technical solution was incorporated to address both septage management and raw water quality improvements (Pilot, Septage treatment and Septic Tank improvement).

The Dumaguete experience showcases a number of important lessons for future initiatives in Metropolitan Cebu especially regarding the role of national and local legislation, the importance of public awareness campaigns and political commitment, and the value of innovative and holistic design strategy (one size doesn't fit all). Also taking advantage of synergies between LGUs and WDs and exploring alternative financial and institutional arrangements such as JVs.

It is important to note though that local conditions between Dumaguete and the study area differ considerably. The main difference is that the first covers one LGU and one WD, while the latter 8 LGUs and 1 WD. The clustering of LGUs means that unclear roles and responsibilities and weak legislation could make the formation of JVs complicated. Additionally the area of operations and the needs of the latter are also much greater, demanding more complex solutions and increased technical capacity.

IV-4.2 MWSS and MWCI

(1) Background

The Metropolitan Waterworks and Sewerage System (MWSS) is mandated by law to provide water and sanitation services. The Water Crisis Act 1995 provided the legal framework for privatization of services and MWSS entered into a public private partnership in 1997 and divided the service area into two concessions. The key features of the two concession agreements were;

i) 25 year concession agreements with Manila Water (MWCI) covering the east and Maynilad Water (MWSI) covering the west,
ii) the operators took on the responsibility of O/M and investment while MWSS retained asset ownership and
iii) service coverage targets and regulatory standards were set by the contract with clear delineation of responsibilities between DENR (environmental standards), DOH (drinking water quality) and MWSS (service performance including prices).

(2) Service Provision

The existing sanitation conditions in Manila in 1997, prior to the concession, were very similar to the current situation in Metropolitan Cebu. Less than 3% of the population was connected to a sewerage facility. Around 85% had septic tanks, the majority of which were constructed without adequate leaching fields and were rarely maintained or de-sludged.

The Manila Third Sewerage Project (MTSP) which is still ongoing (2006-2012) will support the long term strategy to achieve 100% coverage through a combination of sewer and septage management projects. The strategic targets are 30% sewer coverage and 70% septage management coverage by 2012 (end of MTSP) and by 2022 (end of concession) 67% sewer coverage and 33% septage management coverage providing increased levels of service and environmental benefits.

(3) Lessons Learned

Metropolitan Cebu is a scale down version of MM in 1997 prior to privatization. There are a lot of opportunities for knowledge transfer from the MWSS/ MWCI experiences and lessons learned are summarized below under critical areas of interest.

< Legislation and Institutional Arrangements >

MWSS was fully supported legislatively to provide sanitation services prior to privatization. There was no ambiguity in the separation of roles or responsibilities and its position was not contested by other entities. The concession agreement supported by the Water Crisis Act further cemented the institutional arrangements with the separation of regulation, service provision and asset ownership between MWSS and the two concessionaires. This has provided an enabling framework for MWSS and MWCI to coordinate with LGUs and other stakeholders.

For example project implementation is rarely contested by LGUs. On the contrary it is sup-

ported by providing available land. In return the service provider will support the LGUs through technical assistance or added value projects such as municipal basketball courts on top of underground WWTPs.

This highlights the need for similar legislative support for WDs or the most competent service provider outside Manila. The Clean Water Act must be supported by further legislation to provide clarity in roles and responsibilities and strengthen the mandate of Service Providers. Strengthening of the coordination and relationship between the stakeholders is critical.

< Regulation>

The role of effective regulation through a framework comprising clear delineation of service performance, environmental and health standards was defined by the concession agreement and is supported by an effective monitoring program through an interagency committee.

< Planning>

Master Plans with long term horizon and inbuilt flexibility to changing conditions provide a clear direction and aid capital planning and implementation. In the MWCI example the master plans clearly reflect the goals of increased levels of service for specific design horizons (2012 and 2022). The plan is supported by capital investment that will be delivered through the MTSP to achieve 30% sewerage coverage and 70% septage coverage by 2012.

< Financing and Cost Recovery>

Access to low cost investment for example the World Bank funded MSSP and MTSP in the case of MWCI, intelligent financial arrangements (public private, pain-gain etc), cross subsidization and a clear tariff structure aligned with strategic planning goals contribute to the financial viability of sewerage services. It must be noted that the environmental fee in Manila was already established by MWSS prior to the concession, setting the precedence of the “polluter pays” principle. The challenge in Metropolitan Cebu would be to balance the need to pay for sanitation while providing satisfactory levels of service especially at the early stages of implementation when capital investment is high.

< Public Awareness and Community Participation >

During the 12 year service provision under the concession, MWCI with the help of LGUs and other stakeholders implemented a sustained public awareness campaign. Additionally it increased visibility and exposure through initiatives such as the publishing of a sustainability report and a comprehensive pro poor strategy. The latter actually helped in increasing operational efficiencies by reducing illegal connections and raising awareness. Continuous investment in raising awareness is key to the future of the business.

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Chapter-V Recommendations

V-1 Sectoral and Administrative Improvement

V-1.1 Legal and Regulation

(1) Water Code

More than 3 decades has passed since the enactment of PD 1067 otherwise known as the Water Code of the Philippine of 1976 and the issuance of its IRR. Other water-related laws were also passed over the years. NWRB has been continuously updating implementation policies and procedures, through Board resolutions, to ensure their relevance to current times. But these have not been consolidated and integrated into the IRR. Nevertheless, the basic laws including some existing water policies are still relevant and adequate, others need to be amended.

Inadequate implementation of and/ or enforcement of existing laws and the need to update the IRR of the Water Code have created difficulties in the resolution of problems and issues brought about by increasing water demand and current pressures on water and related land resources.

The recently passed Clean Water Act was an attempt to provide for an integrated, holistic, decentralized and participatory approach to abating, preventing and controlling water pollution in the country. It is regarded as the first attempt to consolidate different and fragmented laws, provide a unified direction and focus to fight water pollution. But water pollution is just one area of concern within the whole water sector.

There is a need to conduct a comprehensive review of all existing water-related laws/ legal issuances for the purpose of updating the IRR or amending the Water Code. The former could be done through an Executive Order while the latter will need an act of Congress. Should the latter option be adopted, the creation of an apex body that will serve as a strong regulatory body for integrated water resources management (IWRM) should already be incorporated therein.

(2) Island Water Resources Management

Groundwater-related operation in Metropolitan Cebu is complicated by the number and types of stakeholders, e.g. groups and individuals with varying interests and concerns. There is a need to unify the development and regulatory functions over groundwater into one single local apex body to optimize development and water conservation in a critical area like Metropolitan Cebu. This body should likewise be responsible for monitoring and evaluation of the groundwater environment.

The Sangguniang Panlalawigan of Cebu created “the Provincial Water Resources Authority of the Province of Cebu (PWRA)” through the enactment of Ordinance No. 2006-12 in November 2006. Among the objectives of PWRA are to process, endorse or oppose application for water rights as designated agent of NWRB and to harmonize the Provincial Water Resource Development Plan with the Water Code of the Philippines and the Clean Water Act.

Functioning as the Metropolitan Cebu level counterpart of NWRB, the proposed local apex body

should have as wide representations as possible from identified stakeholders of groundwater. The latter includes: national government agencies like DOH, LWUA, DENR, NWRB, DPWH, DTI, NIA, etc.; provincial, city and municipal LGUs; MCWD and other water providers; sub-division developers and homeowners; business and industries; service providers to the water and sanitation sector; academe; and, NGOs and NPOs.

With the amendment in its composition and activities based on wide consultations with stakeholders, the PWRA may be considered a good candidate to serve as the local apex body. For the PWRA to function effectively as local apex body, it should have financial, personnel and other logistical support for its operations. These may come from regular appropriations from Cebu provincial government and contributions from cooperating LGUs and other stakeholders.

It is recommended zealously that groundwater development outside of MCWD franchise area shall be promoted to meet the projected demand as a most feasible choice. Stakeholders including developers and regulators are anticipated to make decisions urgently for the creation of the system of Island Water Resources Management. It will be the first case in the Philippines, when improvement of groundwater resources management in a water crisis area is achieved well.

V-1.2 Proposed Institutional Framework

The Philippine government is pursuing the IWRM which is at present a worldwide recognized process of promoting coordinated development and management of water, land and related resources in river basins, to maximize the economic benefits and social welfare in an equitable manner without compromising the sustainability of vital ecosystems.

It is a long-term process that needs sustained commitment by all stakeholders in the river basin and its implementation needs an enabling environment. At the national level, this includes an effective water policy, updated legislation, and conducive financing and incentive structures. At the river basin level, the following are needed;

- a capable river basin organization,
- clear institutional roles and participation, and
- river basin planning and monitoring system involving all the stakeholders.

An institutional structure with the capacity – legal, technical and administrative, to effectively address important water issues for sustainable water utility management such as (a) cost sharing and recovery; (b) water use rights; and, (c) clear definition of responsibilities would be necessary. It should have the competence to implement IWRM as planned under the Medium-Term Philippine Development Plan (MTPDP).

(1) NWRB

It is proposed that a national water apex body with the following functions be created:

- Preparation of the Master Plan on IWRM consistent with and in support of the MTPDP,
- Formulation and adoption of corresponding policies and guidelines as well as enforcement of rules and regulations to implement the Master Plan,
- Regulation and coordination of all water development activities in the country,
- Coordination and monitoring of water-related functions, plans, programs, projects and activities of government agencies including local water district to ensure consistency with the Master Plan,
- Collection of water data and maintenance of the National Water Information System, and

* Arbitration and resolution of conflicts in the water sector.

The national apex body should be sufficiently clothed with clear legal regulatory authority and the supporting organizational structure, manpower and financial and other logistics to perform its functions, implement policies and enforce rules and regulations in the water sector.

< Short Term Actions >

NWRB may be considered as the most logical candidate to be the national water apex body invoking its mandate as "the government coordinating and regulating body for all water resources related development." Immediate actions would be possible with only the use of the administrative power and prerogative of the DENR Secretary.

The prescribed Water Resources Regional Councils and the Water Operations Offices (WAOs) should immediately be established in all DENR regional offices utilizing the existing manpower complement and resources of DENR. This is provided for by EO-123 Sec.5. The WAOs shall serve as NWRB regional units. Trainings and capability building of these regional units should immediately follow for the decentralization of NWRB regulatory functions, (including regulation of water tariffs of water districts), to pursue IWRM.

< Medium and Long Term Actions >

Further study will be needed to effectively transform NWRB into the national water apex body (or create an entirely new organization). What is important is to give this apex body the stature and authority to enjoin cooperation from the various water stakeholders. A new law would have to be passed consolidating into one body the fragmented functions, authorities and responsibilities on water management and development while at the same time updating the provisions of the old ones.

The following recommendations are specifically addressed to NWRB.

- ✓ Institutional Strengthening of NWRB
  There is a need to rationalize and strengthen the organizational structure of NWRB. Its manpower resources must be upgraded both in terms of numbers and technical capacity. This should include the creation and operationalization of Water Resources Regional Councils (WRRCs) and Water Area Operations (WAOs) to coordinate the efforts of all water related agencies towards sustainable water development all over the country.

- ✓ Revision/ Amendment of the Philippine Water Code of 1976 and its IRR
  NWRB should spearhead the updating of RA 1067 and/ or its IRR to reflect the current demands of the times and to resolve the problems of institutional fragmentation, overlapping mandates, inadequate implementation of the laws and lack of coordination, among others. In relation to this, the conduct of a comprehensive review of all existing water-related laws/ legal issuances would be necessary. The amendment of the law will need an act of Congress while the latter could be done through an Executive Order. Should the former option be adopted, the creation of an apex body that will serve as a strong regulatory body for IWRM may be considered for incorporation therein.

- ✓ Raw water pricing should be pursued to effect efficient allocation and conservation of water and in recognition of water as an economic resource.

- ✓ Promotion of public private partnership (PPP) that will allow the private sector to operate and maintain part of local water district's facilities by utilizing private funds and efficient private sector business know-how.

(2) DENR

DENR should take immediate actions to immediately address the issue of coordination by using the administrative powers and prerogatives of the DENR Secretary to designate NWRB as the lead agency in the water sector since the IRR of the Clean Water Act was issued by the DENR Secretary and NWRB is administratively under its supervision.

DENR, in the short term, may be able to assist in improving NWRB capabilities by giving it full support in utilizing existing DENR structures, facilities and technical personnel and resources as mandated under Sec.5(c) of EO-123. This will enable NWRB to function as the apex body in the interim. Likewise, DENR should extend substantive assistance to NWRB in the review of existing laws and crafting of the amendments or new Bill to streamline the water sector.

V-1.3 Groundwater Conservation Plan

The most dissolved ingredients in raw water excluding some organic matters can not be removed by the general treatment process of slow or rapid sand filtration. Accordingly, the normal treated water with dissolved substances is supplied to users directly, notwithstanding its effects on human health. Therefore, it is imperative to conserve potable water sources should advanced treatment process is not feasible to apply.

From this point of view, security and conservation of safe water resources are required as important responsibility of the water utility company. The following major issues for groundwater conservation are identified.

- Water Quality: Contamination/ Pollution
- Water Quantity: Saltwater Intrusion (subsidence is unknown because of none observation)

(1) Water Quality Issue

Contamination and pollution control are parts of "Urban Sanitation" study. The most critical contaminant is nitrate originating from human waste from mainly sub-division development area in hilly side of the Cebu city and the entire Mactan Island. Geology in the said areas is composed of karstic limestone. Therefore, the function of purification during the flow period within porous media can not be anticipated.

As a stop-gap measure of user side, the following design standard of well structures is proposed.

- ✓ protection seal using permanent conductor pipes with cement milk around well point shall be installed, and
- ✓ well screen portion shall be located below sea level.

(2) Water Quantity Issue

The promotion of inlet (recharge) and the control of outlet (extraction) will be examined. For the extraction control, they are divided into technical requirements and institutional operation. Following are proposed technical measures.

< Promotion of Groundwater Recharge >

Effective measures to increase recharge rate are:

- ✓ Re-forestation
- ✓ Permeable Paving
- ✓ Infiltration Box

For these activities, core management organizations shall be LGUs and the province of Cebu including regional DENR and DPWH.

< Control of Groundwater Extraction >

The aim of the groundwater regulation is to maintain the groundwater environment with recovery of aggravated saltwater intrusion. Subject of regulation shall be limited to the mass of well intake for industrial users even though with or without water rights, because location of such wells can not be removed easily.

On the other hand, groundwater use of water supply providers including MCWD shall be regulated its extraction with due consideration of groundwater environment using the Cebu-GWM-09 model and of water supply responsibility to industrial users.

Private well users for domestic purpose are not included in the subject regulation. Complicated formalities may be repealed. Instead of this process change, regulation operator places users or constrictors under obligation to submit the initial reporting (need penalty).

Administration and regulator shall improve the present institutions with detailed IRR. The action plan shall be prepared with participation of stakeholders related to this problem.

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V-2 MCWD Technical Improvement

V-2.1 Comprehensive Measures for Sustainable Water Supply

(1) Gravity Water Supply System

Presently, about 38% of water sources volume has been fed to the distribution pipeline directory. One of system improvement concepts is to convert the gravity water supply system. Essentially, gravity water supply system with reservoir has following roles among the entire system. Upon completion of the requirements in this improvement plan, the volume ratio of direct feeding water becomes 22%.

- water buffer from the daily supply fluctuation, and
- reduce the risk of suspended water supply when power source is cut-off.

Several advantages can be expected when gravity system is applied.

- the water supply pressure at any terminal can be maintained within designed range,
- the contamination risk in distribution can be reduced because of non-negative pressure,
- the life of pipeline will longer because of non-pressure fluctuation, and
- the calcium incrustation can be reduced because of slow flow velocity in the distribution.

Since direct feeding well pump makes the difficulties of flow and pressure controls, they should be abolished or converted to reservoir feeding well as soon as alternative water source is secures.

(2) Distribution Block Supply System

Presently, complex water supply system disturbs the operating of water utility. Most serious problem is none availability of water balance, especially flow information for NRW reduction. DMAs are established currently. However such system does not cover the entire service area and vales and meters for the said system become the factor of flow obstruction. Flow measurement in each DMA can be done when NRW reduction work is planned.

Initially, water balance shall be monitored by each distribution block. Inflow volume into each network block can be measured using the flow meter to be installed at the outlet point of the main reservoirs and direct-feeding pump outlet points for the meantime. Proposed block boundary is almost the same to administrative boundaries except for Cebu city and each LGU area is divided into the billing zones.

In the future, water intake, transmission, storage, distribution, meter reading, billing and tariff collecting should be the same line of water quantity within the same basic unit for GIS and MIS establishment. For the sector monitoring and planning purposes, LGUs boundaries shall be used for the distribution block supply system because the population statistics are available.

(3) SCADA System

As to the data control, mini-SCADA system is on going between groundwater abstraction wells and feeding reservoirs at Lagtang and Tisa site. After enlarging this system to the entire 5 reservoir sites (Lagtang, Tisa, Talamban, Casili and Mactan) which are called as the local control center (LCC). These data is to be transmitted to the central control center (CCC) at Talamban site. Additionally, the information of water quality from laboratory and maintenance record from repair work is easily accessible. Figure V-01 shows the basic concept of flow control.

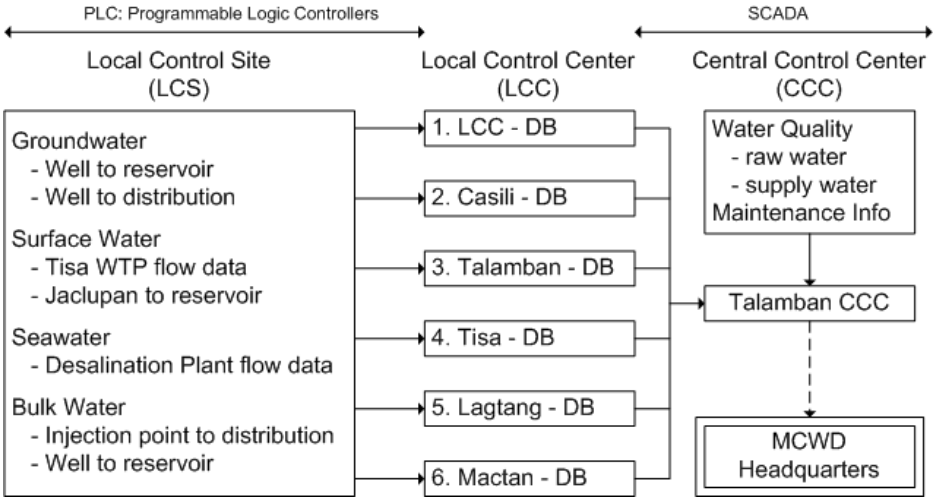


Figure V-01 Data Acquisition Flow

(4) NRW Reduction Work using DMA

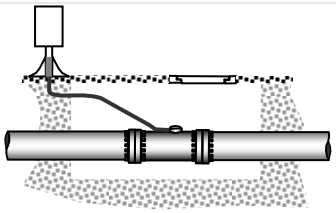
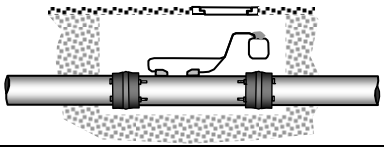
Main issues of the existing DMA are as follows.

- Construction of entire DMA system is too costly. Especially electro magnetic flow meter is expensive.
- Closed valve to make DMA or to convert to leaf system may be the obstacles to interrupt water pressure equalization.
- Covering area of one DMA is small and many DMAs are left to be constructed.

For the future development, cheaper and simpler DMA is required. One proposal is the development of temporal DMA with only chambers at inflow and outflow point of one DMA, in which pipe is exposed to be measured its flow with portable ultrasonic flow meter at convenience occasion without any fixed meter installation.

Although total flow in accordance with consumed volume for one month of billing period is not measured, daily fluctuation is surveyed for the detection and estimation of leakage volume. Table V-01 indicates their advantage and disadvantage.

Table V-01 Comparison of DMA System

Items	On-going Leaf System	Proposed System
Outline	Fixed System: Fixed flow meter (electro magnetic) at inlet point and stop valve at end point.	Loose System: Only the chamber is installed at the inlet and outlet point of the DMA, where flow is measured anytime necessary with portable meter (ultrasonic).
		
Advantage and Disadvantage	• Not only daily fluctuation but monthly and yearly accumulative flow can be measured. NRW can be estimated easily. • Initial cost is expensive.	• Leakage volume can be estimated by measuring only nighttime flow. • Due to the number of staff and portable meter, number of DMA to be measured is limited.

V-2.2 Technical Guideline for Groundwater Development

The guideline for groundwater development should be composed of technical and institutional portions. However, this guideline is concentrated to technical portion and contains following parts.

- Water Balance in Well Field: (1) site selection and (2) facility operation
- Performance Indicator: (1) well efficiency and (2) sand contents
- Monitoring and Evaluation: (1) water balance and (2) performance indicator

Management of groundwater abstraction in the well field is described in "Water Balance in Well Field," while management of individual well is guided in "Performance Indicator."

(1) Water Balance in Well Field

Indispensable condition of groundwater potential study is to regulate Non-MCWD well abstraction definitely. Assumptions of optimal well are positioning and abstraction rate.

< Site Selection >

Optimal well arrangement for groundwater potential study was concluded in the model depending on the location as shown in Table V-02. Site selection priority shall be given to the elevation of 70 masl and intake portion of 0 to 50 mbsl.

Table V-02 Input Criteria on Optimal Wells in the Cebu-GWM-09

Island	Particularity (well field)	Interval (m)	Elevation (masl)	SWL (masl)	Intake Portion (mbsl)
Cebu	Well fields are formed by two rows lineally along hilly side.	200	70	30 to 35 (Sep-09)	0 to 50
Mactan	Well field is located in the central portion of island (southern part of Mactan International Airport).	200 to 500	10	3 to 5 (Jun-09)	0 to 3

< Facility Operation >

Following operation standards are guided for adequate groundwater development.

* Cebu Island: water level at 20 masl or higher (10 m drawdown)

There are two feedback notices for abstraction control. First one is interference between individual wells, while the other one is gross volume limitation within well field as shown in Table V-03.

Table V-03 Feedback Notices from Groundwater Modeling

Feedback Items	Notice
Control of Well Interference	Groundwater level including well interference shall be controlled above 20 masl, even though longer or shorter well intervals. In this regard, it shall be required to conduct periodical step drawdown test and to maintain the observation well in the said well field. This consideration is related to Non-MCWD wells also.
Abstraction Limit within Well Field	Well field potential was estimated by it extent distance based on the model. Of course, gross potential by well field may be changed according to gross abstraction from the Non-MCWD wells as shown in Table V-04.

Table V-04 Well Field Potential

Location		Potential Indicator			Remarks
Island	Well Field	Gross m^3/day	Width km	Density m^3/day/km	
Cebu	Compostela	14,800	3.7	4,000	LGU clearance is not issued.
	Lilo-an	3,000	1.0	3,000	Present gross abstraction exceeds the potential volume.
	Cansaga North	3,700	3.7	1,000	
	Cansaga South	11,100	3.7	3,000	Many Non-MCWD wells may exist.
	Butuanon North	17,000	1.7	10,000	
	Butuanon South	13,600	1.7	8,000	Surplus abstraction is not allowed.
	Cebu North	7,200	1.2	6,000	There is surplus potential but permeability of this limestone has slightly smaller than that in northern model district.
	Cebu River	24,000	2.0	12,000	
	Cebu South	48,000	8.0	6,000	
	Mananga	12,000	1.2	10,000	Hydrogeological investigation in limestone aquifer will be required.
	Talisay	18,200	1.4	13,000	
	Cebu Sub-total	172,600	-	-	Depending on the regulatory operation.
Mactan	Mactan	3,240	-	-	Potential was studied by planed well.
MCWD Grand Total		175,840	-	-	-

(2) Performance Indicator

Functional diagnosis has been conducted mostly for deterioration of well yield. Safety yield shall be evaluated by following three viewpoints.

- Drawdown shall be controlled at maximum 10m with due consideration of less incrustation.
- Inlet velocity from well screen shall not exceed 1 cm/sec because of filtration design.
- Intake amount shall not affect hydraulic balance for avoidance of groundwater level depreciation.

Following performance indicators shall be monitored periodically to judge the rehabilitation plan. Normally, testing at every 5 year is recommended for wells penetrating the limestone aquifer.

< Well Efficiency >

Loss coefficients shall be analyzed by the results of step drawdown test ($sw = BQ + CQ^2$). Test Specifications are:

- ✓ Pre-test: at least 8 hours on leave before testing,
- ✓ Step: at least 4 steps and maximum 8 steps,
- ✓ Duration: at least 1 hour and maximum 2 hours each,
- ✓ Discharge Rate: at even interval logarithmically (range: 50% to 150%)
- ✓ Water Level: at every 10 min. interval

Following solutions of simultaneous equations are well coefficients B and C.

- ✓ $\Sigma(sw) = B\Sigma(Q) + C\Sigma(Q^2)$
- ✓ $\Sigma(sw/Q) = B\Sigma(N) + C\Sigma(Q)$

< Sand Contents >

Excessive sand contents make the life of well and pump shorter. But it is impossible to make zero while groundwater pumping from the tube well. This test will normally be conducted

every 5 years. Design criteria on the solid contents are:

- ✓ Permissive: 50 mg/L pump damage limitation
- ✓ Allowable: 5 mg/L pump abrasion limitation

(3) Monitoring and Evaluation

Groundwater monitoring shall be referred to groundwater regulatory operation. In this section, water balance and performance indicators are the subjects.

< Water Balance >

Monitoring results of MCWD wells will be used for groundwater development and conservation. Water sources availability of MCWD still depends on groundwater development. Therefore, observation records in Table V-05 shall be accumulated and analyzed annually.

< Individual Well >

PIs at individual wells will be accumulated from now on. Following are judgment criteria on planning of well rehabilitation.

- ✓ Well Efficiency < 50 %
- ✓ Sand Contents > 50 mg/L

Table V-05 Monitoring Well and Parameters

Description		Monitoring or Stand-by Wells	Production Well
Location		∗ CLC: E-4, SV-12 ∗ Casili: K-2.1 ∗ Talamban: W-1.3b, W-4.5 ∗ Tisa: MC-9, MC-18b ∗ Lagtang: W-1.1, E-3 ∗ Mactan: ObW-6, ObW-7	∗ All Production Well
Parameter	Monthly	∗ SWL (atmospheric pressure) by elevation	∗ Water Quality Cl, NO_3, Ca by pumping water sampling ∗ Discharge Record (monthly average, daily maximum) ∗ PWL (atmospheric pressure) by elevation
	Quarterly	∗ Water Quality EC, Cl, NO_3, TDS/ TH (interface of freshwater and saltwater) by different depths	∗ SWL (atmospheric pressure) by elevation: it shall be measured after 8 hours pump stopped
	Annually	∗ Water Quality NO_3 (Mactan only) by depth	∗ none

Note: Monitoring plan shall be reviewed every 5 years.

V-2.3 The Cebu-GWM-09 Improvement Plan

Following limitation and weak points were observed during modeling period of the Cebu-GWM-09.

- Limitation of the Soft-ware

  A soft-ware is the V-MODFLOW by FDM; therefore un-confined groundwater flow can not be simulated. In the Cebu-GWM-09, unsaturated zones were adopted as passing layer of recharging from the surface.

- Weak Points of the Cebu-GWM-09

  Following data are still uncertain information while the Cebu-GWM-09 was built. These weak

points can be categorized into two groups; (1) parameters can be measured in the field and (2) parameters would be assumed using actual data.

< Data to be investigated >

* Non-MCWD well information
* fluid density with high TDS groundwater
* geological boundary in deeper portion
* conduit flow belts
* confining layer in coastal alluvial
* verification of observed data (SWL-PWL, Interface Depth)

< Data to be assumed >

* water balance from Water Remind
* water budgets zoning and its allocation
* non-verification area
* interaction between modeling districts

Reconsideration of modeling conceptualization may be needed when the Cebu-GWM-09 is improved, for example;

- Expansion of model domain to both northern coast and southern coast sides,
- Deduction of Mactan district (renunciation of groundwater development by MCWD), etc.

Implementing period of the action plan until 2015 should be significantly utilized for the modeling data collection. Following data accumulation and model improvement are recommended.

(1) Data Accumulation

Three activities are proposed; namely

* Non-MCWD Well Inventory
* MCWD Well Monitoring
* Hydrogeological Investigation

< Non-MCWD Well Inventory >

The aims of inventory survey are shown below. Therefore, study area is not subject to MCWD franchise LGUs.

* to prepare the database on abstraction and water quality from Non-MCWD wells, and
* to acquire the hydrogeological information in outside of MCWD franchise area.

< MCWD Well Monitoring >

Proposed monitoring wells are nominated in the technical guideline and listed below.

* CLC: E-4, SV-12
* Casili: K-2.1
* Talamban: W-1.3b, W-4.5
* Tisa: MC-9, MC-18b
* Lagtang: W-1.1, E-3
* Mactan: ObW-6, ObW-7

Monitoring items are two parameters of water quality and water level with following important notices.

* Water Quality: Cl, NO_3, EC, TDS, Ca and interface depth freshwater and saltwater
* Water Level: SWL or PWL

< Hydrogeological Investigation >

The aim of proposed hydrogeological investigation is to acquire following information for reflection to the Cebu-GWM-09. Among these requirements mentioned above, three investigation schemes are proposed as shown in Table V-06.

Table V-06 Lacking Information and its Investigation Scheme

Lacking Information	Investigation Scheme
• fluid density with high TDS groundwater	MCWD (laboratory) or USC (contract out)
• geological boundary in deeper portion • confining layer in coastal alluvial	MCWD Hydrogeologist with procured instrument
• conduit flow belts	Contracted Out

For this purpose, following instruments are proposed to procure and investigation is contracted out.

* Procurement: Fluid Density Meter and Borehole Logger (gamma probe)
* Investigation: Seismic Prospecting (10 sounding sites)

(2) Model Improvement

Parameters shown in Table V-07 will be replaced for re-calibration of the Cebu-GWM-09.

Table V-07 Comparison of Input Data

Initial Model			Improved Model
Parameter of Weak Points		Applied Method	
Amount of abstraction from Non-MCWD Wells		Assumed 400,000 m^3/day was deducted from the recharge. Portion from water remind project was transient, while remaining portion was constant.	Amount and position of extraction from Non-MCWD wells could be identified. When MCWD becomes the unified organization of the water provider, model can be calibrated much easier.
Fluid Density		Assumed densities of freshwater and seawater are 1.000 g/cm^3 and 1.035 g/cm^3, respectively.	Actual densities could be given to fluid assignments with transient conditions, because TDS will be increased according to the contact time between freshwater and limestone with its elution.
Aquifer Assignment	Geological Boundary	Massive limestone was merely supposed with its dips.	Truth boundaries of geological boundary and confining layers will be investigated with data accumulation of gamma logging at existing wells when it is possible.
	Confining Layer	Aquitard was supposed to distribute below 20 mbsl in alluvial.	
	Conduit Flow	It was considered as porous media with constant value.	Fracture zone can be identified with different assignment values.
Observation Data	SWL-PWL	They were not verified yet.	Monitoring data shall have pumping rate.
	Interface Depth	Entire Mactan and coastal line in Cebu were reflected.	Interface depth will be reflected in Butuanon and Cebu river plains. Seasonal variation would be calibrated.
	Chloride	Trend in fixed well was reflected.	

MCWD maintains the available data from MCWD wells. Using logging instrument, MCWD can accumulate some data from Non-MCWD wells. Additionally, well inventory survey will provide very helpful information which is on-going activities in the city of Lapu-lapu.

In this study, regional model was divided into 4 districts. This was because of time saving in trial and error operation during the calibration period. Problem of sub-division is to create lacking of consistency near the district boundary. Regional model (would be combined by the sub-regional models) may have following validities.

* reduction of non-verification area
* dissolution of interaction between modeling districts

Parameters obtaining from the Water Remind Project would be confirmed using results of actual inputs mentioned above. In this period, following items shall be considered.

* water balance from Water Remind
* application of infiltration capacity test done by JICA study
* water budgets zoning and its allocation

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V-3 MCWD Managerial Improvement

V-3.1 Rationalization and Reorganization

(1) Process

It is recommended that MCWD follows the rationalization parameters and processes prescribed by EO-366. It should start with the creation of the change management team (CMT) who will be responsible for the change management within the organization. The engagement of a change management expert to guide and advise the CMT should also be considered.

Change management is "the people side of change." It is a structured approach to transitioning individuals, teams and organizations from a current state to a future state to achieve a desired outcome. This is in recognition of the fact that organizations are comprised of people, and the outputs of an organization are determined by the behaviors of people.

Change management entails thoughtful planning and sensitive implementation with the most important and critical aspect being the consultation with, and involvement of, the people affected by the changes. Involving and informing people create opportunities for others to participate in planning and implementing the changes and build-up a sense of ownership and familiarity among those affected.

An agreement to a more sensible time-frame to implement the MCWD reorganization has to be forged among all the stakeholders of the change. Quick change may prevent proper consultation and involvement and may eventually lead to difficulties that take time to resolve. Consultations will give both management and staff better understanding of the implications and feasibility of the proposed reorganization.

(2) Proposed Organizational Structure

The proposed MCWD organizational structure is shown in Figure V-02. The suggested functions are presented in Table V-08.

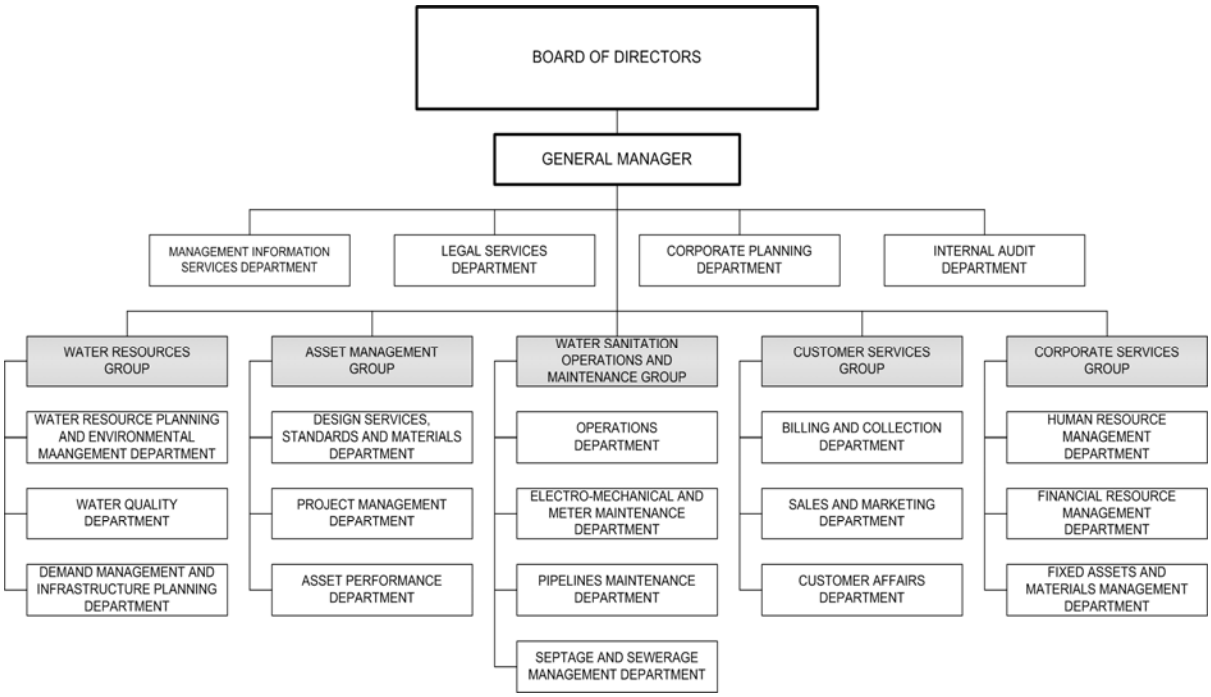

Figure V-02 Proposed MCWD Organizational Structure

Table V-08 Proposed Functions of MCWD Groups

GROUP/ Departments	Group Functions
OFFICE OF THE GENERAL MANAGER • Corporate Planning • Internal Audit • Legal Services • Management Information Services	Responsible for (a) providing the strategic direction and overall management guidance in the preparation and implementation of corporate strategic and marketing plans and programs; (b) monitoring and evaluation of overall corporate performance and those of individual groups/units with the use of KRAs and KPIs; (c) planning and implementation of IT applications support plans and data base maintenance to meet the needs for automation of the different units within and MCWD as a whole; (d) ensuring the adequacy and effectiveness of internal controls and quality of performance of the organization; (e) providing the legal support needs of MCWD and its various units.
WATER RESOURCES • Water Resource Planning and Environmental Mgt. • Water Quality • Demand Management and Infrastructure Planning	Responsibilities include: (a) identification, exploration and development of new ground and surface water sources including management of stakeholders; (b) monitoring, evaluation and protection from degradation of ground and surface water sources and MCWD wells; (c) purchase and monitoring of bulk water supply and contracts; (d) establishment of hydrometric and hydrologic data and monitoring systems for Central Cebu; (e) setting evaluation criteria and issuance of permit for private well drilling; (f) implementation of Philippine environmental laws; (g) assurance of MCWD water quality; (h) demand management and corresponding infrastructure planning.
ASSET MANAGEMENT • Design Services Standards and Materials • Project Management • Asset Performance	Responsible for (a) the development of detailed project/systems design and evaluation criteria, (b) technical standards for materials and equipment, (c) contracting out or actual construction/project implementation, (d) technical supervision and technical evaluation of finished projects, (e) development and maintenance of asset database and GIS, and (f) preparation and monitoring of the MCWD asset renewal program.
WATER OPERATIONS AND MAINTENANCE • Operations • Electro-Mechanical and Meter Maintenance • Pipelines Maintenance • Septage and Sewerage Management	Responsible for (a) preparation, implementation and monitoring of the production and distribution plans and strategies; (b) preventive and corrective maintenance and repairs of pumps and production facilities/equipment, meters and fire hydrants; (c) meter testing and monitoring of meter accuracy; (d) leak detection and repairs (e) road restoration; (f) fabrication of fittings; (g) preparation, implementation and monitoring of MCWD plans, policies and strategies for its septage and sewerage service operation which includes septic tank desludging and septage treatment design and operation.
CUSTOMER SERVICES • Billing and Collection • Sales and Marketing • Customer Affairs	Responsible for the implementation of (a) billing and collection policies (meter reading, billing - preparation, distribution, collection analysis and adjustments); (b) maintenance of customer database; (c) planning, implementation and monitoring of sales, marketing and retention strategies for MCWD consumers; and, (d) customer relations – customer queries, complaints and customer surveys for feedbacks
CORPORATE SERVICES • Human Resource Mgt. • Financial Resource Mgt. • Fixed Assets and Materials Management	Responsible for: (a) recruitment, manpower development and attendant personnel services including the implementation of OHSAS (occupational health and safety advisory services) and payroll processing; (b) overall financial management - treasury, budgeting, cash/investment management, fund sourcing, expenses/disbursements control , accounting and financial reporting; and (c) fixed assets and materials management including assets database and inventory control, maintenance and physical security.

The recommendation is generally in line with the CPD-proposal but with certain suggested modifications. It likewise features a more streamlined functions and loads of various units and

groups, addresses NRW reduction concern and gives due importance to the function of consumer marketing. Additionally, it considers the possibility of business outsourcing as earlier discussed in Section III.4. The highlights are discussed below.

The existing 4 staff departments with the Office of the General Manager will be retained but with modified functions and activities: Corporate Planning, Management Information Services, Legal Services and Internal Audit.

< Corporate Planning (CP) >

Under the new structure, CP will have 2 divisions; the proposed Strategic Planning and the Monitoring and Continual Improvement divisions. However, it is recommended that the NRW planning, monitoring and evaluation be included in the functions of CP in as much as NRW performance is a corporate key result area (KRA) and the overall responsibility of the General Manager. Setting up a separate division for this function may be considered.

< Management Information Services (MIS) >

The MIS shall provide the timely and accurate information/ data requirements for performance monitoring in addition to its regular functions of servicing the computerized system and processing needs of the whole organization. What is important is for the users of information to define their specific needs and for the MIS to enhance its in-house capability to adequately address these needs.

< Internal Audit (IA) >

The IA functions should be in accordance with the provisions of Administrative Order No.278 (see Table V-09).

Table V-09 Salient Provisions of Administrative Order No.278 (1/2)

Article	Particulars
Internal Audit Service	Integral part of the organization to – •assist management in the effective discharge of its responsibilities •manner of assistance should not encroach on or be adversarial with the auditors of the Commission on Audit.
Functions	Staff functions in accordance with the provisions of RA 3456 as amended by RA 4177
Responsibilities	Primary responsibilities encompass the examination and evaluation of – •the adequacy and effectiveness of Internal control and •the quality of performance
Regular Activities	Internal Audit activities shall include the following: •Ascertaining the reliability and integrity of financial and operational information and the means used to identify, measure, classify and report such information; •Ascertaining the extent of compliance and reviewing the systems established to ensure compliance with government policies, plans and procedures, laws and regulations which have impact on operations; •Ascertaining the extent to which the assets and other resources of the institutions are accounted for and safeguarded from losses of all kinds; •Reviewing and evaluating the soundness, adequacy and application of accounting, financial and other operating controls and promoting the most effective control at reasonable cost; •Reviewing operations or programs to ascertain whether or not results are consistent with established objectives and goals and whether or not such programs are being carried out as planned; •Evaluating the quality of performance of groups/individuals in carrying out their assigned responsibilities; and •Recommending corrective actions on operational deficiencies observed.

Table V-09 Salient Provisions of Administrative Order No.278 (2/2)

Article	Particulars
Additional Duties	•May be called upon to perform special assignments by the Head of the Agency
Functional Limitations	IAS shall not be responsible for or required to participate – •in procedures which are essentially a part of regular operating activities or •in operations which are the primary responsibility of another unit in the organization •IAS shall be detached from all functions of routine operating character, such as the following: •Pre-audit of vouchers and counter-signature of checks; •Inspection of deliveries, although the internal auditor may, as part of his examination, observe inspection; •Preparation of treasury and bank reconciliation statements; •Development and installation of systems and procedures, however, in exceptional cases, IAS may assist by way of giving suggestions; •Taking physical inventories; however, IAS may review the plans in advance and observe and test-check the accuracy of counting, costing and summarizing; •Maintaining property records; and •All other activities related to operations.

It shall assist MCWD management achieve an efficient and effective fiscal administration and performance of agency affairs and functions. It shall perform staff functions encompassing the examination and evaluation of the adequacy and effectiveness of internal controls and the quality of performance. The scope of internal audit work shall include the review of risk management procedures, internal control systems, information systems and governance processes.

With regards to the regrouping/ rationalization of the 5 non-staff departments, the general groupings of departments are considered adequate to meet the present needs of MCWD. The delivery of sewerage services which should be one of the major functions of MCWD and the need to institutionalize Geographic Information System (GIS) as an important management tool to a more efficient operation should be given due attention and consideration in the design of the new organizational structure.

In view of the recommendation for MCWD to follow strictly the change management process discussed above, the consultations in particular, the final detailed composition of each group and department will still evolve. Nonetheless, the following are proposed:

* Inclusion of a full personnel complement for a Septage and Sewerage Department in the proposal for the creation of new positions. Request for additional positions after the approval of the reorganization plan may be more difficult.
* Regular rotation or shuffling of meter readers' geographic assignments to prevent any possible collusion with customers as the former becomes too familiar with the latter. Or, consider the operational and financial feasibility of outsourcing this particular activity.
* Assurance that check and balance will be present in the assignment of functions/ tasks to various units to minimize the incidence of internal collusion and manipulation of performance measurement results.

The corresponding updating of MCWD Operational Manuals and Standards responsive to the needs of the new organizational structure and defined processes should follow immediately. The training and capability building of personnel on the new regime is imperative.

<Public-Private Partnership (PPP)>

Outsourcing some of MCWD's non-core functions and the maintenance and operation of part of MCWD's facilities is an encouraging move towards the development of PPP. This will allow MCWD to utilize private funds and efficient private sector business know-how in a symbiotic manner beneficial to both parties.

V-3.2 Management Information System (MIS)

Reliable and adequate data are needed to improve the decision maker's or water manager's decision making. Data needs for water resources management range from monitoring and assessment of a water resource to modeling and simulation activities. Water related data are enormous - climate, physical system, hydrology, operation and maintenance, etc. so much so that computers and MIS are important tools for efficient data processing, management, analysis and modeling. The crucial need of MCWD for reliable, adequate and timely information both for strategic and operational decision making purposes cannot be over-emphasized.

In this connection, the following are recommended:

(1) Data Base

Data base is the set of data available for use of the organization. Typical data base usually consists of a central data file and distributed data files. MCWD should evaluate and decide on the approach to MCWD data base design. It can be by "function" or by "organization" or other classification system it deems to be most suitable for its needs. Table V-10 shows some of the information parameters needed by function while Table V-11 shows databases using the "inputs" and "outputs" classification. Similar database are also needed for information systems for wastewater management.

Table V-10 Data Base: By Function

Acquisition	Treatment	Delivery	Support
Water Balances	Operations Records	System Flow and Pressure	Financial Records
Water Quality	Reporting Records	Water Quality	Engineering Records
Water Sales	Maintenance Records	System Inventory and Maintenance	Administrative Records
Facility Inventory			
Maintenance Records			

Table V-11 Data Base: By Input - Output

Input	Water Supply System	Output
• Supply location • Supply timing • Supply quality	• Facilities data ✓ Inventory ✓ Capacity ✓ Condition ✓ Maintenance history • Operational data ✓ Flows ✓ Pressures ✓ Water quality	• Demands by ✓ Classes ✓ Location ✓ Time ✓ Amount

(2) Deliverable

MIS is the system of using the data base. It is the linkage that can help managers in different parts of an organization communicate. It is recommended for MCWD to determine and agree

on who needs the information (user), the kind of information (what) s/he needs to make decisions, how should the information be presented (report format) and how often (frequency of reporting).

The MIS should be designed in such a way that it will be able to screen out the best of all information available and present the most useful information to decision makers. The criteria on usefulness includes: accuracy, form, origin, comprehensiveness, frequency, and timeliness. Figure V-03 presents the activities and results needed in an effective MIS.

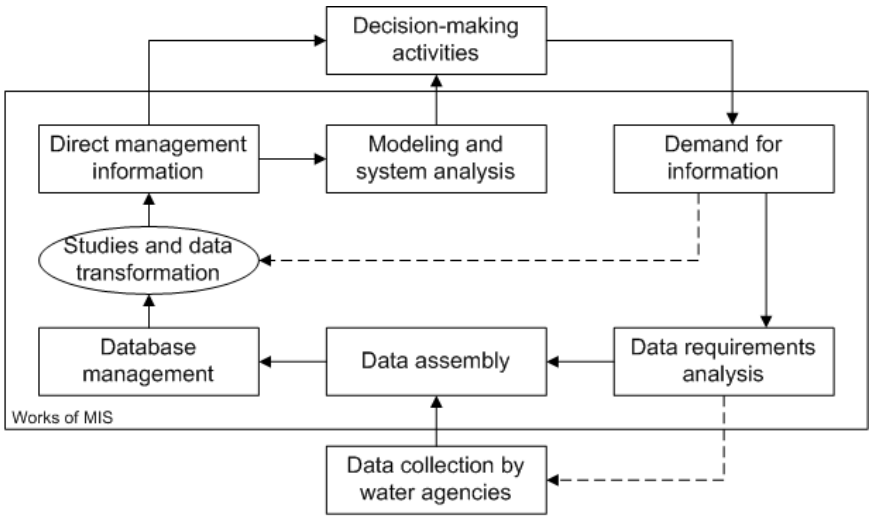

Figure V-03 Activities and Results in an Effective MIS

The framework and extensive use of Geographic Information System (GIS) for water supply and sanitation asset maintenance and management should be facilitated. Technical assistance for this should be explored.

The outsourcing or subcontracting of some technical services such as systems software development and/ or customization as well as the corresponding application trainings should be considered. This is in the light of MCWD losing highly trained MIS technical personnel to private businesses who can afford to offer much better compensation package and benefits than those allowed under the government's salary standardization law.

(3) Performance Indicators

The use of Performance Indicators (PI) in identifying problems and setting targets, and achieving better management is recommended. PIs will enable MCWD to objectively understand the actual status of and changes in its own operations and compare it with other waterworks. This will help determine needed future improvements in operation like upgrading service standards, increasing operational efficiency and strengthening management systems. PI-based evaluation should be started and institutionalized in the organization.

MCWD has already come up with a suite of PIs for the various aspects and units of the organization. It may be a good idea to benchmark or compare these PIs with the "Guidelines for Waterworks (JWWA Q100)" developed by Japan as their domestic standards. There are about 137 items included in the JWWA guidelines.

(4) Benchmarking

MCWD should continue to use benchmarking as a useful tool in measuring its performance vis-à-vis other LWDs. As a member of the South East Asian Water Utilities Network (SEAWUN), it has access to the benchmark data base for 7 water utilities in South East Asia. In ad-

dition, MCWD management and the MCWD Employees Union forged a partnership among MCWD, Alliance of Government Workers in the Water Sector, Visayas State University, and Public Services International – Research Unit for a program to enhance appreciation and capacities of managers and workers on performance benchmarking for water districts.

V-3.3 Continued Provision of Safe Water Supply to the Poor

As of the end of December 2009, a total of 266 communal connections were established by MCWD. Of this total, 149 are active, 111 inactive and 6 converted to residential scheme after October 2008, as shown in Figure V-04. About 80% (or 116) of currently active CWS are located in the cities of Cebu and Mandaue. All the inactive CWA/CWS were closed by December, 2009.

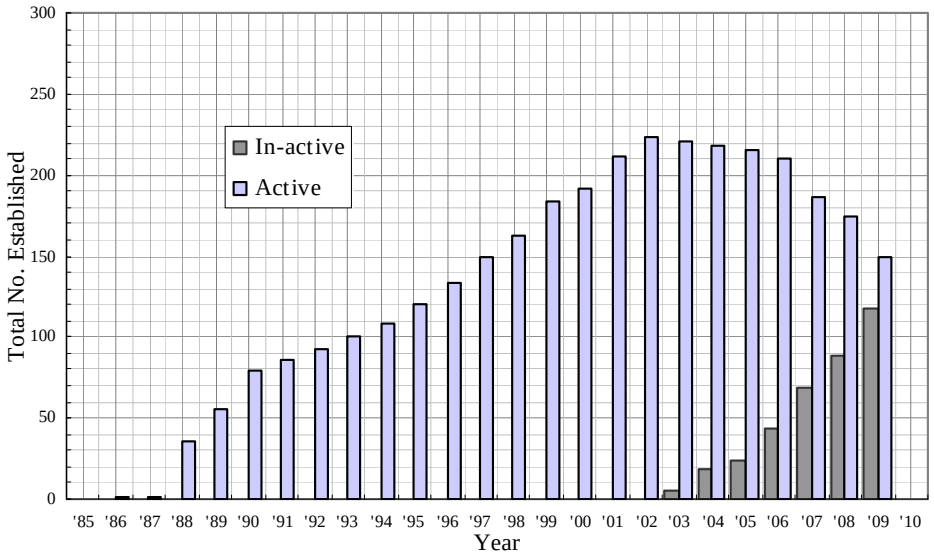

Figure V-04 CWA/CWS Established as of Dec-2009

MCWD classified into 5 groups the reasons for closing CWS: (1) delinquency, (2) violation (3) requested (4) burned/ destroyed, (5) unidentified and of MCWD policies. Delinquency, violation of MCWD policies and unidentified were the most common reasons registering 34%, 32% and 26% of total, respectively as shown in Figure V-05.

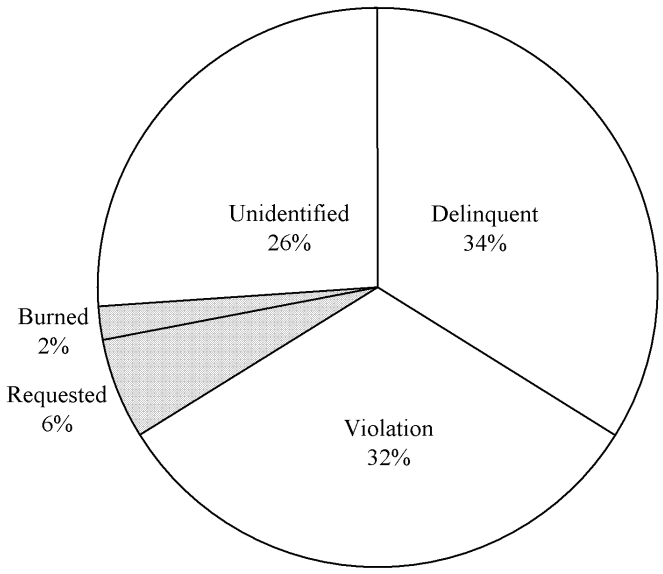

Figure V-05 Share Rate of Various Reasons for Closing Inactive CWS

Incidences of delinquency, violations and other unidentified reasons increased in the last 5 years as shown in Figure V-06. Dates of CWA closures coincided with water tariff escalation of CWA. As mentioned in Chapter III, CWA may increase its selling prices by more than MCWD's prescribed price escalation rate.

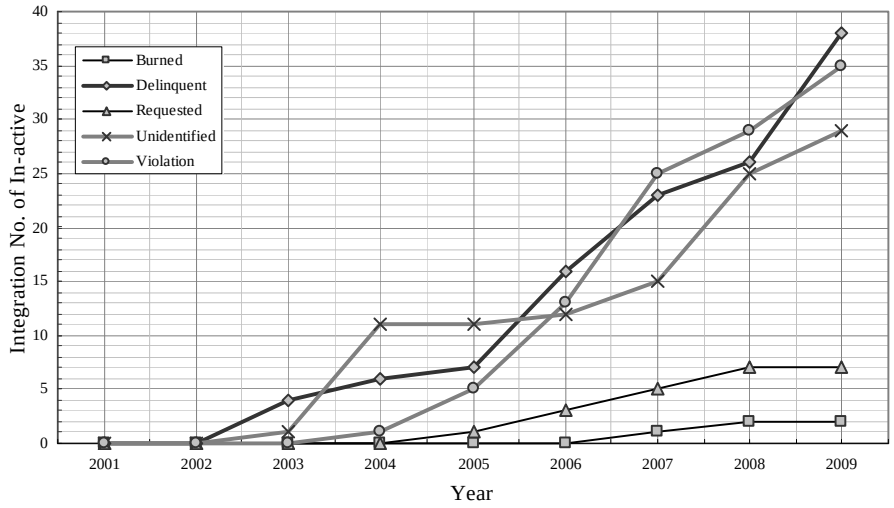

Figure V-06 Annual Transition of Closed CWS by Reasons until Dec-2009

Most of the issues identified in the April 2009 case studies conducted were related to the CWA's operation of communal faucets. All CWAs were converted into franchised CWS as of 15 September 2009 as part of the new policy started in October 2008. As a result, most of the issues may already have been settled. In this context, the following measures based on the new policy are recommended to enable MCWD to continue providing water services to the poor without prejudice to its corporate financial viability.

(1) Institutional Measures

MCWD should design and implement an institutional development program to get LGUs concerned assume an active role is assuring the availability of safe water to the communities within its territorial jurisdiction as part of its mandate under the Local Government Code. A partnership program between MCWD and LGUs should be forged.

LGU will take care of the following aspects, among others:

(a) provision of mechanisms for conflict resolution and promoting equity within CWS;
(b) provision of sustainable livelihoods for the community – to facilitate water users' "graduation" to higher water service level;
(c) assisting MCWD come up with the proper definition of the "poor" who should benefit from CWS service;
(d) provision of logistical support for the CWS' coverage expansion;
(e) assisting MCWD in the conduct of community trainings; and
(f) assisting MCWD in monitoring prices to consumer as well as pilferages.

MCWD should design and conduct trainings:

(a) for its CWS franchisees on MCWD policies and procedures, monitoring and preventing water pilferage and possible remedial measures, including legal actions; and
(b) for the CWS subscribers on MCWD policies and procedures, the benefits and corresponding responsibilities of connecting to the communal water system.

(2) Operational Measures

- Regular monitoring of water prices through interviews with consumers and/ or consultation with the LGU to ensure that the MCWD prescribed selling prices are complied with. MCWD's "Pulong-pulong sa barangay" (meetings at the barangay level to solicit feedback from customers) may be a good monitoring mechanism.
- Provision of training to CWS on the prevention, calculation and pricing of system loss or NRW
- Installation of appropriate and enough number of faucets in terms of distance and number of households covered
- Regular monitoring of selling prices, water users, situation of usage and convenience and CWS operation status
- Evaluation of the new CWS system after one or two years
- Regular monitoring to determine illegal direct connection from main communal faucet and development of appropriate systems for warnings and penalizing offenders in accordance with the provisions of the law on water theft, i.e. RA 8041, The National Water Crisis Act of 1995 which includes anti-pilferage sanctions of fines and imprisonment
- Provision of specific guidelines to protect the franchisee from pilferage
- Training of franchisees on monitoring and preventing water pilferage and legal actions to be taken by the franchisee in case of such event
- Training of communities to create a receptive environment and take collective action for the adoption of improved water and sanitation practices.

V-3.4 Water Saving

MCWD is doing public relations (PR) activities on saving water by regularly distributing leaflets and printing the water saving news to the customers. But, the impact of these efforts is not apparent or negligible because a concrete water-saving countermeasure is not enforced.

It is recommended to begin the countermeasure which can get user's understanding and cooperation to enable them to cope with increased demand in the near future. The water-saving countermeasure of Los Angeles City was taken up as an example in Chapter-III. The sufficient understanding between the administration and the people is necessary for the introduction because this legislation is taken as "the intervention to the individual right of the administration" as well.

But, even if the measures are imposed on the user, the latter is also benefited (reducing the water tariff and reducing water consumption), and save-packing and silky-shower are often accepted.

< Active Correspondence by MCWD >

MCWD needs to promote a water-saving countermeasure carefully assessing the interests or benefits of customers. It must enrich public relations to provide water users information on available water-saving instruments/ devices.

< Active Correspondence by LGUs and Residents >

Apart from a compulsory water-saving countermeasure through regulations like in the Los Angeles case, a community participatory approach, guided by the administration, seems more sustainable to enrich the water saving consciousness citizens.

MCWD and LGUs should cooperate, and work for the formation of the water-saving society, which will encourage the people's voluntary water-saving behaviors.

Guidance in the education sector is considered as a measure. Even Japan adopts water-saving guidance in school education. Children will be guided to recognize the importance of the saving water. Administrative leadership on building the water saving society will change the citizens' activities into the voluntary water saving behaviors, and such policies should be promoted continuously.

V-3.5 Introduction of JWWA-PIs System (Q-100)

(1) Background

Technical working committee 224 (TC-224) in ISO was established in September 2001 for guideline preparation on WATSAN services in terms of suitable cost, sustainable supply and potable water quality with due consideration of future world-wide water crises. Japan has been a participating member of ISO/ TC-224 for standardization activities. International standards composed of; (1) consumer services; ISP-24510, (2) waste water services; ISO-24511 and (3) water supply services; ISO-24512 were adopted and published at the general meeting in Tokyo on the 1st day of December 2007.

During the same period, Japan Water Works Association (JWWA) prepared "Guideline for the management and assessment of a drinking water supply service (JWWA Q-100)" in January 2005 based on the working trend in ISO/ TC-224. This guideline has 137 items of performance indicators (PIs). The ISO/ TC-224 showed deep interest and high valuation on "JWWA Q-100".

(2) Effectiveness of PIs Analysis and Evaluation

Management standard for water supply service was recognized as ISO standard in Dec-2007. It is important that the water supply utility shall be analyzed and evaluated using the PIs that had been objectively defined and authorized based on ISO standards.

To date, the funding agency or the water supply utility have been using the PIs developed according to their own scale or criteria. Although common scale and criteria were created, they were only qualitative PIs. Presently, the water supply utility will be given international water works recognition only when it uses the ISO-24512 PIs. The following are the expected benefits of "PIs Analysis and Evaluation".

< Numerical Definition of Issues >

Numerical accuracy and reliance are basis of PIs evaluation and analysis. During this study period, characteristics of exchanged primary data have been discussed frequently. Additionally, it becomes possible to explain the issues clearly using PIs.

< Common Understanding among the Stakeholders using PIs>

Appraisal works of PIs may provide the background situation of primary information. Therefore, discussions during the appraisal works are very helpful to have common understanding of PIs meanings.

< Establishment of Tendency Analysis and Target using Definite Values >

It is a basic concept in this study that the past tendency analysis would be contributed for setting up of future target. Basic fundamentals were set up through limited discussions on the past trend using latest information and data including typical PIs. Maintenance of basic database and careful data management are needed.

< Verifiable Evaluation and Analysis of Project Progress >

Numerical PIs can be common target of the project among the stakeholders. PIs can be used for pre and post project evaluation to determine how the project performed.

(3) Viewpoints of PIs System

PIs analysis using JWWA Q-100 are to define the viewpoints as shown in Table V-12. Brief descriptions are as following.

Table V-12 Viewpoints for PIs Analysis

Category	Viewpoints
(1) Reliability	Supply of safe and comfortable water for every user? Water Resources Conservation, Water Quality Control, etc.
(2) Stability	Stable supply of water at anytime anywhere? Water Supply Hours/ Pressure, Facility Preservation, Risk Management, etc.
(3) Sustainability	Sustainable and stable supply of safe water? Financial Foundation, Technical Succession/ Evolution, Service Level, etc.
(4) Environment	Contribute to environmental protection? Energy Consumption, Efficiently Use, etc.
(5) Management	Appropriate O&M of drinking water supply system? Enterprise Management, Facility O&M

Note: Above categories do not include the category of "International Corporation" according to JWWA Q-100.

< (1) Reliability: Supply of safe and comfortable water for every user? >

One of key PIs on "Reliability" is to control water supply quality. MCWD manages the parameters of residual chlorine, nitrate, calcium hardness and chloride ion. However, parameter of boron was not monitored yet that is related to de-salination water quality. In this regard, MCWD is required to improve the current monitoring system for PIs estimation. Additionally, the measure' manual based on PIs shall be maintained.

< (2) Stability: Stable supply of water at anytime anywhere? >

It is important to maintain the sufficient volume of water sources for stable water supply. In MCWD, distribution volumes of daily maximum and daily average are almost the same. It means that the water supply system does not keep surplus water sources. Accordingly, increasing the number of connections without additional distribution water causes the restriction of water supply to certain hours.

Background of this situation is lacking for risk management because of system ideology without maximum, average, surplus, etc. Typical countermeasures are to maintain the guidelines of; (1) planning and designing standard, (2) operating and maintenance, and (3) enterprise management with numerical indicators or targets such as PIs.

< (3) Sustainability: Sustainable and stable supply of safe water? >

Operating fundamentals shall be required for sustainable water supply. In particular, reduction of NRW is a very important measure for this purpose. Following desirable cycle shall be maintained as a sustainable measure.

* Secure enough investment for NRW reduction,
* Prevention of illegal water (illegal connection becomes customer and increasing of secondary water source),
* Increasing of new connection using surplus water sources,

- Increasing of enterprise benefits, and
- Secure enough investment for NRW reduction...to be connected to the first measure...

From the viewpoint of NRW reduction and capacity building, corporate management shall work under the strategic system/ organization for sustainable operation.

< (4) Environment: Contribute to environmental protection? >

Typical PIs are:

(1) electric power consumption per 1 m^3 transmission input,
(2) energy consumption per1 m^3 transmission input, and
(3) underground water ratio.

Electric or energy consumptions shall be considered with its locality such as lift-up water because of topographic features, additional water treatment because of deteriorated raw water quality, etc. Therefore, these PIs can not be compared without local features but they can be compared its variation.

"Underground Water Ratio" was defined as "sound water cycle". This PIs will be examined together with surface water development, groundwater quality, seawater intrusion, subsidence possibility, etc.

< (5) Management: Appropriate O&M of drinking water supply system? >

This group includes PIs of "inspection criteria", "working license", "safe keeping standard", etc. Additionally, accuracy and reliability of leakage or connection number shall be confirmed for estimation of "leakage rate per connection". Accordingly, PI parameters shall be screened and added with due consideration of the real state in MCWD.

(4) Consideration of PIs System Establishment

MCWD should consider the following improvement points for creation of new PIs system.

< Selection of suitable PIs for Evaluation >

Following works will be required if PIs are based on JWWA Q-100.

- Suitable Screening Methodology for MCWD Management
- Consideration of PI Option according to MCWD Operating Form

< Considerable Viewpoints for PI Evaluation Methodology >

Major methodologies of PI evaluation are:

- PIs Grouping and Combination
- Setting of PI Targets according the Scale

PIs can be classified into two; individual and complex evaluations. Generally, scale merit is related to technical efficiency and financial tolerance. Different target shall be set up according to past data analysis.

< Additional PI or Change Definition of PI according to Institutional Background >

JWWA Q-100 was prepared with due consideration of Japan Law, Regulation, etc. For application of JWWA PIs to MCWD, primary data for PIs and estimate method of PIs shall be re-defined.

(5) MIS with PIs

MIS is not only to estimate PIs (Performance Indicators) but also to manage and control the primary data with definition, accuracy and reliability. Therefore, MIS with PIs would strengthen the relationships of internal MCWD organizations. Additionally, the PIs are very useful to communicate between the contractor such as WTP operation, meter reading, etc. without misunderstanding.

Initially, MCWD shall study the PIs system which will be required for utility management including technical and financial information. The PIs system of SEAWUN (Southeast Water Utility Network) can be obtained via website for MCWD references. After that, primary data will be set up with clear definitions. Preparation of operating guidelines for the PIs system would also be required for better and smooth management.

About 15 years back, MWSS started to study the PIs System for promotion of the PPP (public-private partnership) contract. Now, the regulatory office in MWSS has created its KPI (key performance indicator) to be used as common PIs for the concessionaire contract.

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