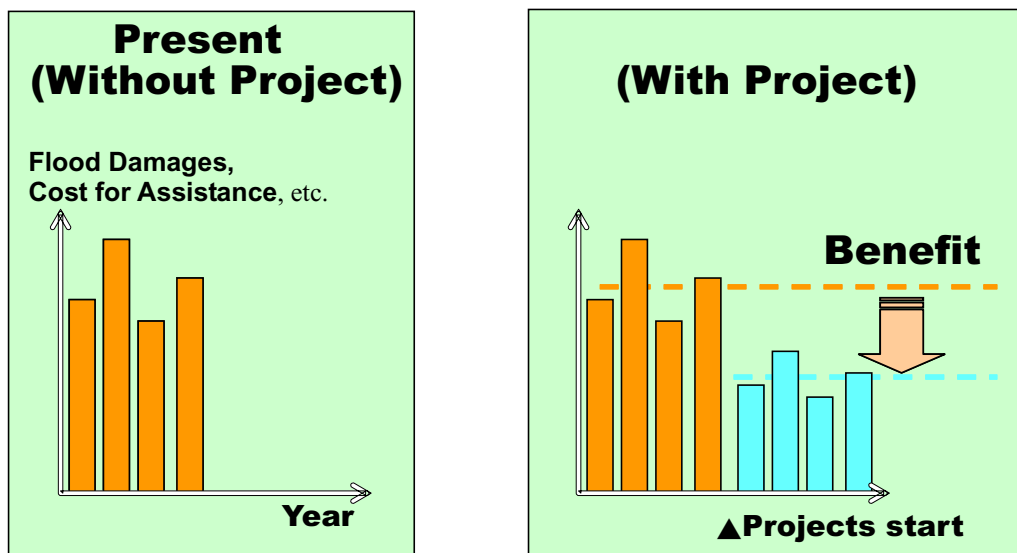


4.10.2 BENEFIT OF THE PROJECT

(1) Structure of Project Benefits

Flood control benefit is generally defined as the reduction of potential flood damage attributed to the proposed and designed works/projects/programs. The flood damages, i.e. the project benefit, are different from the area and depth of inundation. Since it is impossible to predict the timing and magnitude of future floods, analysis of the flood control benefit is undertaken based on deriving and expected annual damage under present socio-economic conditions and indexing this value by way of analyzing the growth rate of annual flood damage to reflect expected future socio-economic change. In this analysis, the prediction of future flood was made to assess the flood risk using the hydrodynamic simulation model. (See details in *Chapter 3.2*) This model generated the expedient inundation area and depth in the study area by floods of 2-year, 3-year, 5-year, 10-year, 20-year, and 30-year return periods, thereby eventually making it possible to draw a risk curve associating probability with damages. Damage rates as numerically defined in correspondence with inundation area, depth, ground slope, etc. in the past reports and guidelines in the Philippines and abroad had been applied in this analysis.

The value of flood control benefit is obtained as the difference between the estimated flood damages under the “with” project and “without” project situations.



Source: The Study Team

Figure 4.10.2 Project Benefit

Correspondingly, the average or expected project benefit would be calculated from the difference between “with” project and “without” project, while considering the expected degree of flood protection from the project.

In addition to these tangible damages, it is apparent that there are other intangible damages both economic and social (effects) associated with those floods. Therefore, the result of this analysis is regarded in a lower, or conservative tier of benefits for the project.

The next item to identify is what kind of flood damage should be adopted for the analysis. In general, flood damage is classified as shown in the following table.

Table 4.10.1 Classification of Flood Damage

Category of Damageable Assets and Activities				Damages Mitigated by Flood Control Project	
Benefit of Flood / Inundation Mitigating	Direct Damages	Primary Damages	General Assets	Building Unit	Damage to residential and business sites and buildings due to inundation
				Household Effects	Damage to Furniture and movables such as automobile, electric appliance
				Depreciable Assets of Business Establishments	Damage to depreciable assets of Business establishments except their sites and buildings
				Inventory Stocks of Business Establishments	Damage to inventory stocks of business establishments due to inundation
				Depreciable Assets for Farming and Fishery	Damage to depreciable assets for farming or fishery or business establishments except their sites and buildings
				Inventory Stocks for Farming and Fishery	Damage to inventory stocks for farming or fishery or business establishments except their sites and buildings
		Agricultural Production			Damage to crop production due to inundation
		Public Infrastructures	Road, Bridge, Railway, River Facility, Sewerage, Water Supply, Electric Power, Gas, Telephone, Irrigation Facility, Medical Facility, Educational Facility, etc.	Damage to infrastructures supporting livelihood, business activities and Public Service Facilities	
		Human Lives			Damage to living space, causing death, injury or illness
		Secondary Damages			Weed growth, etc.
	Indirect Damages	Primary Damages	Trade Loss (Daily Maintenance and Business Activities)	Household Economy	Damage to daily housekeeping tasks and community activities due to inundation
				Industrial Production	Stoppage or decrease of business and production activities, decrease of tourists due to inundation
				Public Services	Stoppage or decrease of public services
		Secondary Damages	Expenses for State of Emergency	Household Economy	After inundation, cleaning and repairing houses damaged by flood/inundation, and extra expenses for state of emergency
				Industrial Production	After inundation, cleaning and repairing buildings and offices damaged by flood/inundation, and extra expenses for state of emergency
Public Services				Expenses for emergency activities to casualties in addition to the works above	
Traffic Disruption			Disruption of traffic systems spreading to surrounding areas		
Lifeline Services Disruption			Water supply, Electric Power, Gas, Telephone, etc.	Disruption of public utility services	
Spreading Effect of Stagnation and Decrease of Daily Activities			Decrease of production due to lack of raw and semi finished materials, Stoppage of public services and utilities.		
Mental shock and inconvenience			Mental Influence due to damages to general assets, business losses, casualties, aftereffects and influence over surrounding areas		
Environmental Quality					
Aesthetic Value	Planting, Historical Building	Decrease of value of Historical buildings/assets, Damage to townscape			
Benefit of Landuse Development				Land appreciation owing to improvement of flood control	

Source: Various sources compiled by the Study Team

Unfortunately, there is no standard method for estimation of flood damages because characteristics of damages depend on geopolitical, socio-economic, and demographical conditions of each country, city and area.

The components of benefit in this analysis were selected considering inventories of existing facilities and data availability in Metropolitan Manila. They are as follows:

Direct Damage

- Building Unit
(Residential Houses and Buildings of Business Establishments, Educational and Health Facilities)
- Assets
(Household Effects, Depreciable Assets of Business Establishments, Inventory Stocks of Business Establishments)
- Public Infrastructure

Indirect Damage

- Trade Loss (Household and Business)
- Public Service Disruption
- Traffic Disruption
- Cleaning at Household & Business

(2) Calculation of Potential Flood Damage

Inundation and floodwater levels calculated for several probable rainfalls or discharges are applied to the relation between water level and flood damage mentioned above. In this analysis, the flooding cases of 2-, 3-, 5-, 10-, 20- and 30-year return periods were applied.

(3) Flood Damage by Return Period

The results of the estimates are summarized in the following tables:

Table 4.10.2 Flood Damage by Return Period (Without Project)

Unit : Php Million

Item	Return Period (Year)					
	2	3	5	10	20	30
A. Direct Damage	10,796	13,651	18,165	25,067	29,816	32,051
1. Residence - House	1,836	2,446	3,304	4,909	5,852	6,336
2. Residence - Household Effects	976	1,311	1,786	2,654	3,210	3,488
3. Business Establishments	5,424	6,658	8,767	11,559	13,684	14,627
3-1 Manufacturing	1,388	1,718	2,299	2,996	3,564	3,815
3-2 Commerce (Wholesale & Retail Trade)	1,524	1,898	2,546	3,429	4,124	4,427
3-3 Hotel and Restaurants	863	1,056	1,375	1,786	2,091	2,231
3-4 Financial / Insurance / Real Estate Business	850	1,024	1,304	1,733	2,020	2,149
3-5 Educational Facilities	190	228	295	380	443	471
3-6 Medical Facilities	609	734	949	1,234	1,441	1,534
4. Infrastructure	2,560	3,237	4,308	5,944	7,070	7,600
B Indirect Damage	5,079	6,478	8,604	11,987	14,255	15,307
5. Loss of Business Opportunity, Cost for Cleaning Activities, Public Service / Utility Service Disruption	3,173	3,962	5,249	7,108	8,439	9,051
6. Traffic Disruption	5	7	9	12	12	13
7. Assistance and Calamity Fund Extended	0	0	0	0	0	0
8. Cost for Alternative Activities	1,901	2,509	3,346	4,866	5,805	6,244
C. Total	15,875	20,129	26,769	37,053	44,071	47,359

Source: The Study Team

Table 4.10.3 Flood Damage by Return Period (With Master Plan)

Unit : Php Million

Item	Return Period (Year)					
	2	3	5	10	20	30
A. Direct Damage	626	937	1,432	2,667	6,500	8,481
1. Residence - House	35	40	138	306	939	1,337
2. Residence - Household Effects	16	19	60	143	424	612
3. Business Establishments	427	656	895	1,586	3,595	4,521
3-1 Manufacturing	122	185	253	436	952	1,191
3-2 Commerce (Wholesale & Retail Trade)	120	184	251	440	987	1,247
3-3 Hotel and Restaurants	65	100	136	244	575	721
3-4 Financial / Insurance / Real Estate Business	56	88	119	223	532	676
3-5 Educational Facilities	16	24	33	59	133	165
3-6 Medical Facilities	49	75	103	184	417	521
4. Infrastructure	149	222	340	632	1,541	2,011
B Indirect Damage	257	376	623	1,170	2,960	3,919
5. Loss of Business Opportunity, Cost for Cleaning Activities, Public Service / Utility Service Disruption	212	322	465	845	1,991	2,556
6. Traffic Disruption	1	1	1	1	1	3
7. Cost for Alternative Activities	45	54	157	324	967	1,360
C. Total	884	1,313	2,055	3,837	9,459	12,400

Source: The Study Team

(4) Effect of Existing Pumping Station and Gate Operation Service

In order to verify the effectiveness of existing pumping stations and flood control gates, the Study Team tried an additional sensitivity analysis as a case of without pumping station and gate operation services under the flood size of 10-year return period. As the results were shown in the following table, when pumping stations and gate control in metropolitan Manila were stopped, the flood damage would increase at 50% compared to the existing conditions. This flood damage is equivalent to the damage of bigger than the flood of 30-year return period. As seen in the example of this simulation result, it is apparent that the pumping stations and flood control gates have great function to prevent Metropolitan Manila from severe flood / inundation damage.

Table 4.10.4 Effect of Pumping Station & Gate

Item	Unit : Php Million					
	Existing Condition		Existing + No Pump Condition		Existing Condition	Existing + No Pump Condition
	North Manila	South Manila	North Manila	South Manila	All Study Area	All Study Area
A. Direct Damage	12,700	12,273	17,020	20,539	25,070	37,551
1. Residence - House	2,033	2,876	2,805	5,068	4,909	7,874
2. Residence - Household Effects	1,091	1,563	1,629	2,833	2,654	4,461
3. Business Establishments	6,636	4,923	8,544	7,768	11,559	16,312
3-1 Manufacturing	1,915	1,081	2,501	1,884	2,996	4,385
3-2 Commerce (Wholesale & Retail Trade)	2,013	1,417	2,614	2,343	3,429	4,956
3-3 Hotel and Restaurants	955	831	1,220	1,263	1,786	2,483
3-4 Financial / Insurance / Real Estate Business	831	902	1,055	1,237	1,733	2,291
3-5 Educational Facilities	222	158	279	239	380	518
3-6 Medical Facilities	699	535	876	801	1,234	1,677
4. Infrastructure	3,034	2,910	4,034	4,870	5,944	8,904
B Indirect Damage	6,148	5,890	8,006	9,986	11,000	18,220
5. Loss of Business Opportunity	3,814	3,295	5,004	5,398	7,108	10,402
6. Traffic Disruption	6	6	6	6	12	12
7. Cost for Alternative Activities	2,328	2,538	3,296	4,412	4,866	7,708
C. Total	18,848	18,163	25,318	30,525	37,830	55,673
Increase of Damage(Adverse Effect by Out of Service of Pump & Gate)			↑ 34%	68%		50% ↑

Note: Existing Condition = Case of Without Project

Existing Condition + No Pump Condition = Case of without pumping service & without gate operation

(5) Estimation of Annual Average Benefit

Based on the estimated potential flood damages for each probable rainfall or discharge, the annual average damage was calculated by the following formula:

$$\begin{aligned} \text{Annual Average Benefit} &= \text{Annual Average Damage} \\ &= \sum_{i=1}^n 1/2 (D(Q_{i-1}) + D(Q_i)) \cdot (P(Q_{i-1}) + P(Q_i)) \end{aligned}$$

Where,

$D(Q_{i-1}), D(Q_i)$: Flood damage caused by the floods with Q_{i-1} and Q_i discharges, respectively

$P(Q_{i-1}), P(Q_i)$: Probabilities of occurrence of Q_{i-1} and Q_i discharges, respectively

n : Number of floods applied

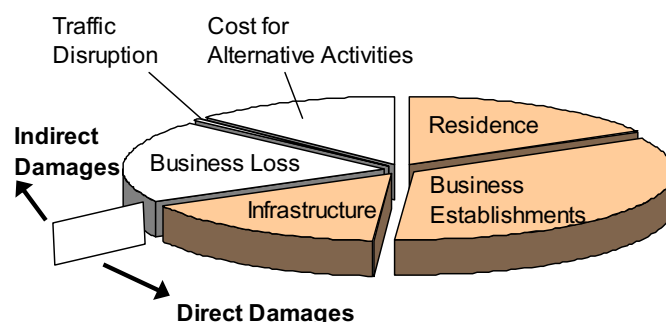
The annual average benefit, defined as the reduction of probable damage under the “with” and “without” project situations was thus estimated for the proposed plan, i.e., Php 14,639 million in total as presented in the table below.

Table 4.10.5 Breakdown of Annual Average Benefit (in Present Condition)

Unit : Php million

Flood Return Preod	Flood Damage		Reduction	Average	Expectation Rate	Benefit by Return
	Without Project	With Project				
2 year	15,875	884	14,991	7,495	0.5000	3,748
3 year	20,129	1,313	18,816	16,903	0.1667	2,817
5 year	26,769	2,055	24,714	21,765	0.1333	2,902
10 year	37,053	3,837	33,216	28,965	0.1000	2,897
20 year	44,071	9,459	34,612	33,914	0.0500	1,696
30 year	47,359	12,400	34,959	34,785	0.0167	580
Total (Annual Average Benefit)						14,639

Source: The Study Team



Source: The Study Team

Figure 4.10.3 Elements of Annual Average Benefit

(6) Socio-Economic Projection

Future Projection on GDP, Population, and Land Use

(GDP Projection)

The long-term projection of GDP is indispensable for formulating the future framework of the socio-economic structure. Annual growth rate of GDPs 2001 - 2006 is estimated at 5.1% (low case) and 5.6 (high case) in the Medium Term Development Plan. The rate in the past year, 2003, was 4.7%. Under these circumstances, GDP is estimated on the following assumptions in this analysis.

- Until 2010, GDP will increase at the same rate in the present situation.
- Between 2010 and 2015, GDP will grow at a half of the above rate.
- Beyond the year 2015, growth of GDP is not considered.

Table 4.10.6 Economic Growth Rate Framework

	Actual Performance* ¹	MTPDP Target* ²	Assumption of this Study		
	2003	2004-2010	2005-2010	2010-2015	After 2015
GDP Annual Growth Rate	+4.7%	High +8.0% Low +4.9%	+4.70%	+2.35%	±0%

Source: *¹ NSCB website, *² NEDA website

(Demographic Projection and Housing Conditions)

National Statistics Office (NSO) provides national population projections, for subdivisions down to municipal level, until 2010, incorporating the results of the 1990 census.

In accordance with the NSO projection, it estimates population decline in Manila and Pasay after 2005 and Makati after 2010. But in the latest 2000 Census, the decline in these three cities has already started.

In this analysis, the future population is projected on the basis of the NSO projection until 2010, and then, after 2010, growth is assumed ±0%. The average number of family members and average floor area per house are assumed to be the same in future.

Table 4.10.7 Population Framework

	Actual Statistics * ¹		Assumption of this Study		
	NSO Projection * ²		2005	2010	After 2010
	1995	2000			
Caloocan	1,023,159	1,177,604	1,383,071	1,608,034	
Manila	1,654,761	1,581,082	1,501,077	1,429,674	
Pasay	408,610	354,908	323,374	278,122	
Quezon	1,989,419	2,173,831	2,406,137	2,464,168	
Makati	484,176	471,379	475,531	471,267	
Taguig	381,350	467,375	589,397	732,741	
5 Cities&1Municipality	5,941,475	6,226,179	6,678,587	6,984,006	6,984,006
5-year growth rate		+4.79%	+7.27%	+4.57%	±0.00%
annual growth rate		+0.94%	+1.41%	+0.90%	±0.00%
NCR	9,454,040	9,932,560	10,505,346	11,074,059	
5-year growth rate		5.06%	5.77%	5.41%	

Source: *¹, NSO

*², NSO, Population and Development in the Philippines, AIM (Asian Institute of Management) Policy Center, 2003

(Land Use Plans)

As mentioned in the *Chapter 2.2*, land use plans have been released by the LGUs. In this economic analysis, the proposed land use plans are supposed to be realized immediately after project commencement in order to keep consistency with hydrodynamic simulation model, although the plans are not guaranteed to be realized within the project period, and the land use is transformed gradually in general.

Future Prospects of Damageable Assets

While the structure of damageable properties remains constant, economic value and distribution of the assets and properties in the flood-prone areas are considered to change in the future. Taking the socio-economic projection into consideration, these changes are derived in the following manner:

- The number of damageable housing units and buildings is computed as constant to keep consistency with hydrodynamic simulation model.
- The average damageable value of household effects and construction cost of housing units are assumed to increase in consideration of GDP per capita and population growth.
- The total values of both depreciable assets and inventory stock basically increase in consideration of the GDP and GDP per capita growth.
- Increase of damageable assets, which will be caused by increment of the number of business establishments in future, is assumed to be absorbed in the increment of the number of damageable assets of individual establishments. Thus, although the assessed values of an individual establishment are considered to have outwardly larger damageable assets than the actual values, the number of establishments could be frozen in the same number as the present one even in future.

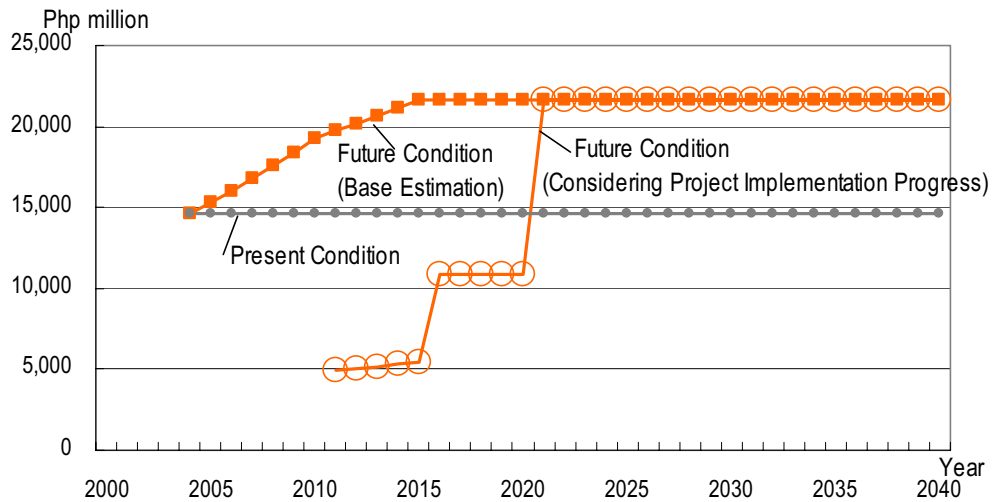
Table 4.10.8 Future Framework for Economic Analysis

	2005-2010	2010-2015	2015-
GDP Annual Growth Rate	4.70%	2.35%	0.00%
Population Annual Growth Rate = No. of Households Annual Growth Rate	0.90%	0.00%	0.00%
GDP per capita Annual Growth Rate	3.77%	2.35%	0.00%

Source: The Study Team's assumption

Adjusted Annual Average Benefit

In accordance with the future framework mentioned above, flood damages in the future conditions are estimated. The annual average benefits in respective years increase as shown in the following figure (Base Estimation). When the progress of the project implementation is considered, the timing of accruing benefit appears to be delayed. The Study Team's assumption is shown in the following figure as well.



Note: At current prices
 According to “Considering Project Implementation Progress”, see section 4.10.4 (1)
 “Timing of Accruing Benefits”

Source: The Study Team

Figure 4.10.4 Annual Average Benefit and Timing of Accruing Benefits (in Future Condition)

(7) Intangible Benefit

As defined in *Chapter 4.10.1*, among the variety of flood reduction benefits, this analysis does not deal with the following intangible flood control benefit

- Direct Damage
 - a. Physical damages to human bodies such as injuries, diseases, deaths
 - b. Mental influences to people affected
- Direct Damage
(Secondary damage because of long time inundation such as weed growth or corrosion)
- Indirect Damage
 - a. Extra Expenses for Emergency Activities
 - b. Degradation of environmental quality such as reverse flow of sediment, solid waste, sewer water,
 - c. Deterioration of hygienic safety such as food poisoning or outbreak of communicable diseases,
 - d. Increase of crimes such as stealing under the disordered situation,
 - e. Deterioration of sophisticated environment such as damage to townscape of street trees or damages to historical buildings, and
 - f. Benefit of Land Use Development

These intangible benefits above represent the adverse social effects of flood and inundation. Although their substantiality, quantification of these intangible benefits are difficult in the absence of detailed surveys which should be carried out over a long period, as such it would be more likely intuitive in so doing. With this in view, and coupled with the preceding analyses undertaken by other international development assistance agencies, no attempt was made to include these items as tangible benefit (or should not be included) to avoid double counting same benefit as separate elements.

4.10.3 COST OF THE PROJECT

(1) Basic Conditions for Economic Analysis

Economic cost differs from financial cost in the sense of value judgment since the former is nominal figures that duly reflect the true economic value of goods and services involved (or also called “opportunity cost”) and the latter is resource value at market prices. All the costs involved in every project have to be measured as economic costs, although this economic cost is used only for the economic evaluation of the project which requires the evaluation from the viewpoint of the national (in some cases, regional) economy. The measurement of economic cost of a commodity depends on how likely it is to be procured – whether by increasing import, decreasing export, expanding domestic production or diverting.

Prior to economic evaluation of the projects, all (financial) costs need to be expressed in terms of economic cost by using conceivable adjustment, i.e.,

$$\begin{array}{l} \text{Financial Cost} \\ \text{(Actual cost in market value)} \end{array} \times \text{Conversion Factors} = \text{Economic Cost}$$

“Sunk Costs” are defined as all those cost incurred on the projects prior to the preparation of the economic analysis. Since these expenses have already been incurred, they are no longer subject to investment decision making. As such, sunk cost should not be included in the analysis.¹

(2) Conversion Factor and Elements for Real Economic Value

The elements of the adjustment are as follows.

Conversion Factor 1: Transfer Payments

Transfer items such as taxes and duties imposed on construction materials and equipment, including government subsidy and contractor’s profit, are to be excluded from the elements of financial cost. Because tax payment is just the change of money in ownership, the change does not produce any added value to national economy. These taxes are transferred to the government which acts on behalf of the society as a whole and are not treated as costs. Conversely, a government subsidy is an expenditure of resources that the economy incurs to operate the project. The parameter of DPWH Guideline is adopted in this analysis:²

$$\text{Economic Cost} = 86\% \text{ of Financial cost}$$

Where the cost for land acquisition is also converted at same rate, in this analysis, it is assumed that the necessary lands for right-of-way and resettlement site would be acquired from private sector.

Conversion Factor 2: Foreign Exchange Shadow Price Rate (or Shadow Exchange Rate, SER)

Since the central bank foreign exchange guiding rate is not reflective of the actual exchange rate due to balance of payments disequilibrium and the projection structure, in this analysis, 1.2 times of the official rate is adopted for Foreign Currency Portion. This rate is based on NEDA guideline.³

Based on these assumptions and conversion factors, financial costs for civil works were converted to economic costs. Land acquisition cost, social cost such as resettlement cost, supporting cost, and non-structural measures' cost are converted only by factor 1 of transfer payments because major items of these costs are domestic costs.

(3) Operations and Maintenance (O/M) Costs

Being subject to the guidance from and discussions with the engineering experts of agencies concerned and the Study Team, annual operation cost is assumed to be 110% of current expenditure of MMDA for 2005 – 2020 to hold the status quo. After project period (year 2020), these cost are excluded from this economic analysis, because these costs are necessary for under both “with” and “without” project situation. After 2020, only the maintenance cost for additional civil works proposed in the Master Plan is considered for 2005 - 2040 in economic analysis.

And also, the project costs for supporting measures are excluded from this economic analysis. Though the costs were identified in the previous chapter, it was excluded from economic analysis because there was not enough information to quantify the effect and benefit derived from the supporting measures.

Table 4.10.9 Project Cost

Item	Unit: Php million	
	Financial Cost	Economic Cost
1. Civil Work	9,703.8	9,430.2
2. VAT	970.4	0.0
3. Resettlement and Compensation Cost	1,590.1	1,367.5
4. Government Administration Cost	291.1	250.3
5. Engineering Services	970.4	942.9
6. Physical Contingency	1,352.6	1,282.6
7. Supporting Measure Cost	488.9	0.0
8. Operation Cost (2005-2020)	0.0	3,316.2
9. Maintenance Cost (2005-2040)	0.0	1,269.4
Total	15,367.3	17,859.1

Source: The Study Team

Note: Cost for Supporting Measures is excluded. Details may not add up to totals due to rounding.

4.10.4 ECONOMIC EVALUATION

(1) Economic Viability

The Master Plan was evaluated from the economic viewpoint by figuring out the economic viability, comparing the economic benefit and the economic cost in terms of economic internal rate of return (EIRR), benefit/cost ratio (B/C), and net present value (NPV = B – C, or Benefit minus Cost).

All the monetary calculations were based on the following parameters either predetermined or using assumptions.

Project Duration

- Project Start-up : 2005
- Project Life Span (Economic Life) :
30 years⁴ after completion of the work in Short-Term
- Project Phase:
The first phase starts in 2005 and continues to 2010. The second phase works are facilitated from 2011 to 2015.
The third phase works are facilitated from 2016 to 2020.
Then, beyond 2020, operation and maintenance works continue to 2040

Timing of Accruing Benefits

- 25% of annual average benefit will appear after the first phase,
- 50% of annual average benefit will appear after the second phase,
- The matured annual average benefit will appear after the third phase, i.e., completion of all phases of civil works.

Price Level

- The valuation of project costs and benefit should be in constant price at the current year's level. Though, cost of civil works was identified as the price at July 2004 (see *Chapter 4.8*), the basic price level in the economic analysis is set at the beginning of 2004 in order to keep consistency among all cost items.

Social Discount Rate (SDR)

- Based on the guideline of NEDA⁵ for basic infrastructure projects, SDR is applied at 15% in this analysis.⁶

Prevailing Exchange Rate

- Php 55 per US\$ and JPY 110 per US\$ at the official rate in market

Depreciation, Financial Charges, Interest and Amortization

- In general, financing of the project is not relevant to the economic evaluation. These financial items are independent of the economic value of the project. To ensure that only feasible projects are financed, investments should be subjected to cost-benefit analysis removed from financing considerations. Only after a project is determined feasible should terms of financing be incorporated to evaluate possible benefits derived from relative, favorable (e.g., concessionary) loan terms.⁷ From these points of view, depreciation (residual value) of waterways and pumping stations, and financial cost or charges are not estimated in this analysis.

The calculations of NPV, B/C, and EIRR were based on the annual cash flow that was prepared from the above-mentioned economic cost and the annual average benefit discussed in

accordance with the implementation schedule or annual disbursement schedule. The economic viability of the optimum plan was thus figured out as follows.

Table 4.10.10 Results of Economic Analysis (Future Condition)

NPV	Php 27,595 million
B/C	5.2
EIRR	42.8%

Source: The Study Team

(2) Sensitivity Analysis

The cost and benefits were estimated at conservative side with discretion in this analysis. In spite of that, some uncertainty still exists in the estimation. In particular, the cases with long implementation period and/or expectation of future growth in Metropolitan Manila have high risks in terms of judgment on project viability. In this context, the sensitivity analysis was tested in the following relevant parameters guided by NEDA⁸ in consideration of sensitive factors for project feasibility.

Assumption I : Increase in projected costs by 10% and 20%

Assumption II : Decrease in benefits by 10% and 20%

Assumption III: Combination of Cases I and II

In addition to the above NEDA guideline, another case that the benefit decreased to 50% of original estimate was also tested for reference.

Assumption IV: Decrease in benefit by 50%

Table 4.10.11 Results of the Sensitivity Analysis 1 (NPV, Future Condition)

		Unit : Php Million			
		Benefit			
		±0%	-10%	-20%	-50%
Cost	±0%	27,595	24,176	20,756	10,497
	+10%	26,935	23,515	20,096	9,837
	+20%	26,275	22,855	19,436	9,176

Source: The Study Team

Table 4.10.12 Results of the Sensitivity Analysis 2 (B/C, Future Condition)

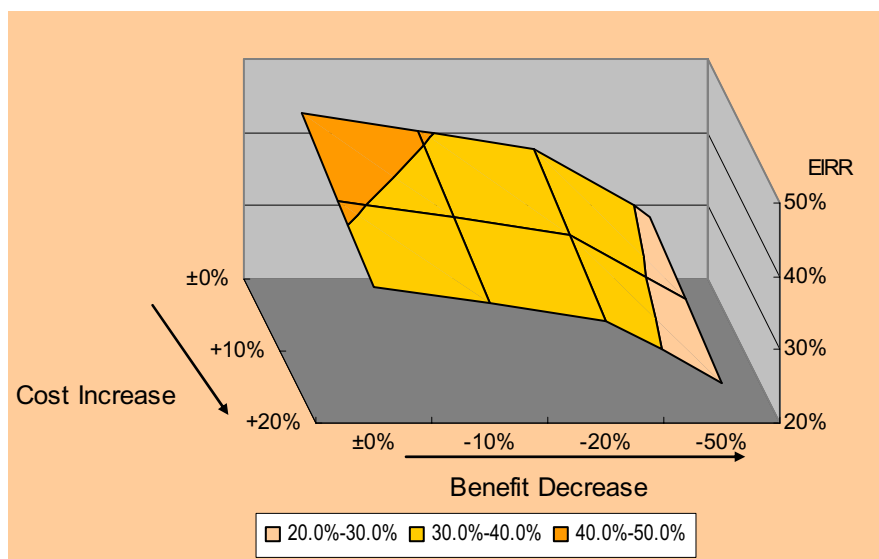
		Benefit			
		±0%	-10%	-20%	-50%
Cost	±0%	5.2	4.7	4.1	2.6
	+10%	4.7	4.2	3.8	2.4
	+20%	4.3	3.9	3.5	2.2

Source: The Study Team

Table 4.10.13 Results of the Sensitivity Analysis 3 (EIRR, Future Condition)

		Benefit			
		±0%	-10%	-20%	-50%
Cost	±0%	42.8%	40.3%	37.8%	28.6%
	+10%	40.6%	38.2%	35.8%	27.0%
	+20%	38.6%	36.4%	34.0%	25.5%

Source: The Study Team



Source: The Study Team

Figure 4.10.5 Results of Sensitivity Analysis (EIRR, Future Condition)

In principle, it is said that the project is feasible when NPV is positive (over 0), B/C is over 1.0, and EIRR is over social discount rate (15% in Philippines). As shown in the tables above, NPV of the all cases were positive, B/C exceeded 1.0, and the lowest EIRR exceeded social discount rate. Thus, the proposed projects are sufficiently feasible from the economic point of view.

Incidentally, in case of excluding socio-economic growth in future, EIRR would still keep the economically feasible level 20.0%, under the assumption of +20% increased cost and -50 % decreased benefit, see *Table 4.10.16*).

Table 4.10.14 Results of the Sensitivity Analysis 4 (NPV, Present Condition)

		Benefit			
		±0%	-10%	-20%	-50%
Cost	±0%	16,823	14,481	12,138	5,111
	+10%	16,163	13,820	11,478	4,450
	+20%	15,503	13,160	10,818	3,790

Unit : Php Million

Source: The Study Team

Table 4.10.15 Results of the Sensitivity Analysis 5 (B/C, Present Condition)

		Benefit			
		±0%	-10%	-20%	-50%
Cost	±0%	3.5	3.2	2.8	1.8
	+10%	3.2	2.9	2.6	1.6
	+20%	3.0	2.7	2.4	1.5

Source: The Study Team

Table 4.10.16 Results of the Sensitivity Analysis 6 (EIRR, Present Condition)

		Benefit			
		±0%	-10%	-20%	-50%
Cost	±0%	35.0%	32.8%	30.6%	22.6%
	+10%	33.0%	31.0%	28.8%	21.2%
	+20%	31.3%	29.4%	27.3%	20.0%

Source: The Study Team

(3) Project Justification

Though social infrastructure projects such as flood control and drainage improvement works are in general put into implementation even at the lower EIRR, compared with other productive projects, the Master Plan shows a very high viability of 42.8% in EIRR (Future Condition), likewise resulting in high values of B/C and NPV for the conceivable reason that socio-economic needs for flood prevention in the study area where the central function of the political and economic activity locates will augment to a maximum degree.

The reason of high viability is easy to see. As mentioned already in the beginning of this report, there are totally 74 km esteros/creeks in length, 35 km drainage mains, and other small drainage network in Metropolitan Manila. In addition, there are high quality pumping stations started in service in 1970s and have been maintained functionally. However, the construction costs of these tremendous investments are not considered in this economic analysis, because these costs shall be excluded as “sunk cost” in conventional economic analysis on public infrastructure project. In other words, taking advantage of these infrastructure heritages, it is possible to output the most effective result with minimum additional investment for these kinds of infrastructure.

In this context, the Master Plan can be justified from the economic viewpoint to take a next step in accordance with the proposed schedule.

4.10.5 CONSIDERATION FOR INVESTMENT PLAN

The purpose of this section is to analyze financial affordability for the master plan. Three resources can be considered to be available.

The first is the source under fiscal disbursement of the national government which is to be allocated to DPWH and MMDA in charge of flood control and drainage works.

The second is the local fund from respective LGUs.

The last source is special funds or schemes such as new allocation to the sector and/or introduction of new ear-marked taxation system in order to enhance financial capability of government.

As for the local fund from LGUs, very scarce budget has been allocated to flood control and drainage works in the past years. Even if fiscal revenue of LGUs through IRA would be expected to grow in near future, investment for this sector would not be expected unless the priority of this sector would become high dramatically.

While, the third option takes time to put in practice without strong political decision, because the introduction of new system is all-time subject of controversy. Therefore, the analysis on the third option must be based on conceptual approach.

(1) Future Framework of National Government Revenue

Growth of the Philippines Economy and GDP

In the last decade (1994-2003), the average of the growth rate of GDP (Gross Domestic Product) was about 4 %, though this includes the recession period of Asian Crisis in and after 1997. If these periods are excluded as singular situation, the performance of Philippines' economy is regarded well than the figure. After the crisis, as is witnessed by the fact that the country's economy recovered and record the following figures;

Table 4.10.17 MTPDP (2001-2004) Targets vs. Actual Performance

	Unit : %			
GDP Growth Rate	2001	2002	2003	2004
MTPDP 2001-2004	3.3	4.0-4.5	5.4-5.9	5.7-6.3
Actual Growth	3.0	4.3	4.7 (1 st semester 4.5)	(1 st semester 6.3)

Source: MTPDP 2004-2010, NEDA

Note: At constant price basis, *As of first semester 2004

The GDP steadily grew and its growth rate has showed upward tendency. The rates of divergence between the actual performance and planned growth rates in the previous MTPDP (Medium Term Philippine Development Plan) were not big.

While, in the new MTPDP 2004-2010, the government set the target of the growth rate as follows;

Table 4.10.18 GDP Targets of MTPDP (2004-2010)

	Unit : %						
	2004	2005	2006	2007	2008	2009	2010
GDP Growth Rate	4.9-5.8	5.3-6.3	6.3-7.3	6.5-7.5	6.9-7.8	7.0-8.0	7.0-8.0

Source: MTPDP 2004-2010, NEDA

Under the conditions where the country's economy was up-trend in recent years and the forecast of the authority was relatively accurate in the previous MTPDP, these new targets of 4.9% to 8.0% might not be impossible, though it seems rather high rates compared to the past performance.

Growth or the National Government's Revenue and Expenditure

Fiscal Revenue is broadly classified into tax and non-tax portion. In Philippines, the major tax portion consists of

- taxes on income and profits,
- taxes on property,
- taxes on domestic goods and services,
- taxes on international trade and transactions, and
- other taxes.

Non-tax revenues refer to all other impositions or collections of the government in exchange for services rendered, assets conveyed, penalties imposed, foreign grants, etc.

In addition, the national budget is financed not only from these fiscal revenues but

- borrowing from both domestic and foreign sources, and
- withdrawals from available cash balances.

Fiscal expenditure is broadly classified into current expenditure and development expenditure. The former, current expenditure is also called as Current Operating Expenditure (COE)⁹. The COE covers;

- personal services (PS) such as salaries, wages, social security contributions, etc., and
- maintenance and other operating expenditures (MOOE) for day-to-day regular operation,

The latter, development expenditure consists of

- Capital Outlays (CO),
- Net Lending referring to net advances to government owned and/or controlled corporations (GOCCs) for servicing of government-guaranteed corporate debt and loan outlays, and
- Debt Service (Debt Amortization) such as the repayment of interest and related costs.

To make an accurate estimate, the forecast of future revenues and expenditures should be analyzed by each item individually based on the elasticity with respective economic growth, then, it should be multiplied. But the financial balance is affected not only by the socio-economic conditions but also by tax policies and other relevant political strategies for structural reform.

In the MTPDP 2004-2010, the government manifested the following targets;

- to balance the budget by 2010,
- to reduce the ratio of Consolidated Public Sector Deficit (CSPD) to GDP from 6.7% in 2004 to 1.0% in 2010, and
- to reduce the ratio of Public Sector Debt¹⁰ to GDP from 136% in 2004 to 90% by 2010 through institutional reforms for a more financial viability.

MTPDP 2004-2010 emphasized the importance of investment for infrastructures such as;

“It will also boost growth by providing the fiscal resources to raise public infrastructure spending from 2.6 percent of GDP in 2003 to 4.2 percent on GDP by 2010.”,

“The government is aiming to achieve its growth targets on account of strong investment spending and exports. Investment spending is targeted to increase to 28 percent by 2010 from around 20 percent in 2003,

In line with these policies, it is considered that the framework of allocations to DPWH and MMDA shall be increased or at least maintained as same as the growth rate of total government investment for public infrastructure in future.

Regional & Sector allocation of DPWH to Metropolitan Manila on Flood Control and Drainage works.

In MTPDP, except the emphasis on the effort for decongestion of intensive traffic in Metropolitan Manila, there is no specific regional strategy for the area. The national government, preferably, put the stress of regional development from the viewpoint of poverty alleviation and uplifting the connectivity throughout the country.

(2) Development Expenditure of Relevant Stakeholders

The current expenditures on flood control and drainage improvement projects of relevant agencies are shown in the following table. When the annualized cost of proposed cost of the Master Plan are compared to the average amount of total expenditure of MMDA and the 6 LGUs for the past 6 years, it is fairly huge and requires almost 1.5 times of annual budget in order to implement the Master Plan.

While, on the assumption that the ODA loan would be appropriated as financial source of the Master Plan, the required share of the Philippine Government is equivalent to around 45% to the present expenditures, and that burden is not a prohibitive level of expenditure from the aspect of the financial status of the relevant authorities.

Table 4.10.19 Comparison of Expenditure on Flood Control

Unit: Php Million

	1999	2000	2001	2002	2003	2004	Average	Proposed Master Plan
National								15 billion for 15 years
(MMDA)	120	955	200	199	200	956 ^{*1}	438	
LGUs								Annualized 1,000 million / year
(Manila)	-	10	29	21	48	-	27	
(Makati)	118	127	73	30	5	212	94	
(Pasay)								
(Caloocan)	5	51	73	22	31	206 ^{*1}	65	
(Taguig)	-	-	-	36	31	116	61	
(Quezon) ^{*2}	1	1	1	1	1	1	1	
Total						6,667	686	
Ratio of Present Average Expenditure to Total of Master Plan							146% (= 1,000/686)	
Ratio of Present Average Expenditure to GOP portion							45% (=311/686)	
							GOP 30%	Loan 70%
							311	727

Source: The Study Team

Note: *1 Proposed, *2 Only for Maintenance

Based on the Study Team's survey to the MMDA and relevant agencies, present allocation is badly short on even recurrent cost for operation and maintenance activities against the required level. Although this Master Plan is proposing the same level of the future budgetary allocation comparing to the present conditions, this amount is regarded as bare minimum but essential level.

Table 4.10.20 Comparison of Budget on Operation & Maintenance of Flood Control

Unit: Php Million

	2003	2004	Proposed Master Plan
Amount for O/M	218	242	241
note	Approved	Proposal	

Source: MMDA

(3) External Resources

External Borrowing and Loan

The total project cost of the Master Plan is estimated at about Php 15 billion. Assuming the project would be implemented with financial support by multilateral lending institutions, the example of general principle guideline of loan conditions are like as follows:

- There are upper limit of loan amount. For example, a limit of one of multilateral institutions shall be 85% of the total project cost or the total foreign exchange cost.
- There are also conditions of non-eligible cost for the loan by type of expenditures.

In accordance with one of institutions' loan conditions, non-eligible costs are considered for the following categories, but they could be included in the total project cost:

- Land acquisition cost
- Compensation for PAP (Project Affected People)
- Taxes and duties as well as government administration cost
- Interest during borrowing period

The total cost of Master Plan is shown in table below. Following the loan conditions, for example, the eligible costs for JBIC loan are civil works and engineering service which amount to Php 10,689 million corresponding to 70% of the total project cost.

Table 4.10.21 Project Costs (Financial Term)

Item	Amount (Php million)	Ratio	Eligible Item for Loan *
1. Civil Works	9,703	63 %	O
2. VAT for (1)	970	6 %	
3. Resettlement & Social Cost	1,590	10 %	
4. Government Administration	291	2 %	
5. Engineering Service	970	6 %	O
6. Physical Contingency	1,353	9 %	
7. Supporting Measure	489	0 %	
Total	15,367	100 %	

Source: The Study Team

Note: Amount excludes present on-going cost for operation / maintenance

Total does not represent the sum of items because of rounding.

* This is an example of loan scheme of JBIC (Japan Bank for International Cooperation).

(4) Other Fund Source (Non-Loan Scheme, Technical Assistance, and Coordination with Other Agencies)

In accordance with the eligibility of loan conditions among multilateral lending institutions, social costs are often not covered by the loan scheme. Meanwhile, bilateral donors and multilateral lending institutions start to put into effect their guidelines on Confirmation of Environmental and Social Considerations which placed a premium on participation by such stakeholders as local community inhabitants who will be affected by the project. They require the project executor to solicit stakeholders' participation from the project planning stage. Therefore, non-eligible costs which must be prepared by the Philippine Government side is required to fulfill the standard of the guideline in terms of technical, social and financial aspects.

As mentioned earlier in the chapter on social issue, however, the Philippine Government side has domestic laws and guidelines which define their own standard on involuntary resettlements affected by infrastructure projects.

In other words, there are some discrepancies between foreign donors/multinational lending agencies and Philippines side, and it can be possible that neither ODA nor national budget does finance some parts of social cost. In order to fill the gap, as the next best policy, technical assistance can be utilized for smooth implementation on relocation and establishment of stable livelihood of PAP.

As referred in *Chapter 2.2 "Economic Conditions"* and *4.12 "Implementation Organization"*,

the stakeholders such as NHA and relevant agencies are closely related to this project from a view point of providing socialized housing, upgrading health/sanitary conditions and social welfare standard in vulnerable communities like the area along the waterways. In order to maximize the effectiveness of the priority projects, especially non-structural measures and supporting measures, well coordination on budgeting from the planning stage or preferably differentiate the roles and budgetary allocations clearly among agencies are indispensable for optimizing the limited government resources.

(5) Financial Feasibility

Comparing to the project cost and the current expenditures and its assumed future available resource on flood control and drainage improvement projects of relevant agencies, i.e. MMDA and the 6 LGUs, the burden of the proposed project is not a prohibitive level of expenditure from the financial aspect.

However, based on the Study Team's survey, present budgetary allocation of relevant agencies is badly short. The current budget levels of these agencies are bare minimum. Assuming to be maintained at proper level of services, future budgetary allocation for flood control and drainage improvement projects are strongly recommended to be raised politically to higher level than the above mentioned forecast which is basically based on the past trend. In the event of these proper budgetary arrangements are considered, the proposed cost of Master Plan are fairly achievable. Regardless of whether the projects would be financed by domestic resources or external resources, in view of the extensive damage of flood and its effect on socio-economic activities, metropolitan function of the country, and view of economically sound result of analysis, it is surely worthwhile for the national government to consider the increase of budgetary allocation to the urban flood control.

¹ ICC Project Evaluation procedures and Guidelines, NEDA

² Technical Standards and Guidelines for Planning and Design, Draft, Volume I : Flood Control, March 2002, DPWH - JICA

³ ICC Project Evaluation procedures and Guidelines, NEDA

⁴ Regarding project life span, 30 years is recommended in the guideline "Economic Analysis for Social Development Study, 13 Flood Control & Sabo", 2002, JICA

⁵ ICC Project Evaluation procedures and Guidelines, NEDA

⁶ In Japan's guideline and several study reports, it is suggested to add a risk premium onto the discount rate as another way to reflect uncertainty in long-term and wide-sector analysis of the project like flood control which reduces the risk by itself. A variation of this is to add a premium to the discount rate for the benefits, and subtract a premium for the costs. Introducing these premiums into the calculations of economic evaluation has the effect of giving less weight to increasingly uncertain costs and benefits in the future. This method, however, must determine an arbitrary risk premium to add to the discount rate.

⁷ ICC Project Evaluation procedures and Guidelines, NEDA

⁸ ditto

⁹ The acronyms with parentheses hereinafter referred are definition by Department of Budget and Management. For details, the following publication is convenient for understanding of the words and basic concept of budgetary system of Philippines, "Frequently Asked Questions – National Government Budget", A joint undertaking of the Budget Advocacy Project, Philippine Governance Forum and the Department of Budget and Management, PH FF 3496 2002 NWB

¹⁰ Among outstanding liabilities of the national government of Philippines in the present situations, the most big issue is adjustment of NPC (National Power Corporation)'s financial loss and its absorption by the government. The burden depends on the appraisal value of the debt and affects the amortization plan of the government in no small way.

4.11 PROJECT EVALUATION

4.11.1 GENERAL

The proposed programs in the Master Plan for drainage improvement of the core area of Metropolitan Manila are evaluated in technological, social, economic and social/environmental terms.

4.11.2 TECHNICAL ASPECT

The supposed reduction of the floods and inundation damages by the project is estimated and evaluated as a part of the impact from technical aspects. Though 87,000 houses and a half of the roads (1,389 km in total) in the core area were affected by the 1999 flood and inundation, the affected population numbers and road networks could be significantly reduced by the project due to the reduction of the depth and duration of the floods and inundation area, and the damages caused by the flood and inundation could be minimized with the completion of the Master Plan.

4.11.3 ECONOMIC ASPECT

The Master Plan shows a very high viability of 42.8% in EIRR (Future Condition), likewise resulting in high values of B/C (5.2) and NPV (Php27,595 million) for the conceivable reason that socio-economic needs for flood prevention in the study area where the central function of the political and economic activity locates will augment to a maximum degree.

The reason of high viability is that the core area of Metropolitan Manila has already been provided with basic drainage channels: totally 74 km esteros/creeks in length, 35 km drainage mains, and other small drainage network. In addition, there are 15 major drainage pumping stations. However, the construction cost of these tremendous investments is not considered in this economic analysis, because these costs shall be excluded as “sunk cost” in conventional economic analysis on public infrastructure project. In other words, taking advantage of these infrastructure heritages, it is possible to output the most effective result with minimum additional investment for these kinds of infrastructure.

In this context, the Master Plan can be justified from the economic aspect to take a next step in accordance with the proposed schedule.

The Master Plan would be effective to mitigate the damages caused by floods and inundation in the capital area and feasible from technical, economic, social/environmental aspects. It is surely worthwhile for the Government of the Philippines to consider increasing budgetary allocation to the floods and drainage improvement in the core area of Metropolitan Manila.

When the annualized cost of proposed cost of Master Plan is compared to the average amount of total expenditure of MMDA and the six LGUs for the past six years, it is fairly huge and requires almost 1.5 times of annual budget in order to implement the Master Plan.

While, on the assumption that the JBIC loan or other resources of ODA would be appropriated to the Master Plan, the required share of the Government of the Philippines is equivalent to around 31% to present expenditures, and it is said that the burden is not prohibitive level of its expenditures from the aspect of the financial status of the relevant authorities.

The Government of the Philippines needs to consider financial arrangement for the

implementing agencies to implement the Master Plan.

4.11.4 SOCIAL/ENVIRONMENTAL ASPECT

Major issues related to social/environmental aspects are as follows:

- The rehabilitation of the drainage channels proposed in the Master Plan requires relocation of informal settlers living in houses/structures on the drainage channels before dredging, until the target year of 2020. The families to be resettled during the Master Plan (from 2005 to 2020) are estimated to be about 5,500. It is proposed that the Government of the Philippines shall arrange and develop resettlement sites based on a Resettlement Action Plan (RAP) prepared according to the guidelines for social framework of resettlement proposed in the Study.
- The rehabilitation works also require dredging/declogging a huge volume of bottom deposits of drainage channels, which is estimated to be about 920,000 m³. It is proposed that the Government of the Philippines shall arrange and develop disposal sites for the dredged materials.

4.12 IMPLEMENTATION ORGANIZATION

4.12.1 IMPLEMENTION ORGANIZATION

For implementation of the proposed Master Plan and Priority Projects various agencies will be involved and the implementing agency shall take the initiative in the implementing activities before and after the commencement of the projects. DPWH has been taking the initiative for the Study as the main counterpart agency.

It is proposed for smooth implementation of the projects to set up a Coordination Committee for the projects. The coordination committee will consist of concerned member agencies: NEDA, DPWH, MMDA, PCUP, PAGASA, HUDCC, NHA, DSWD, MWSS and concerned LGUs. DPWH is assumed to be the Chairman of the committee. *Figure 4.12.1* presents the draft proposed organization chart of project implementation.

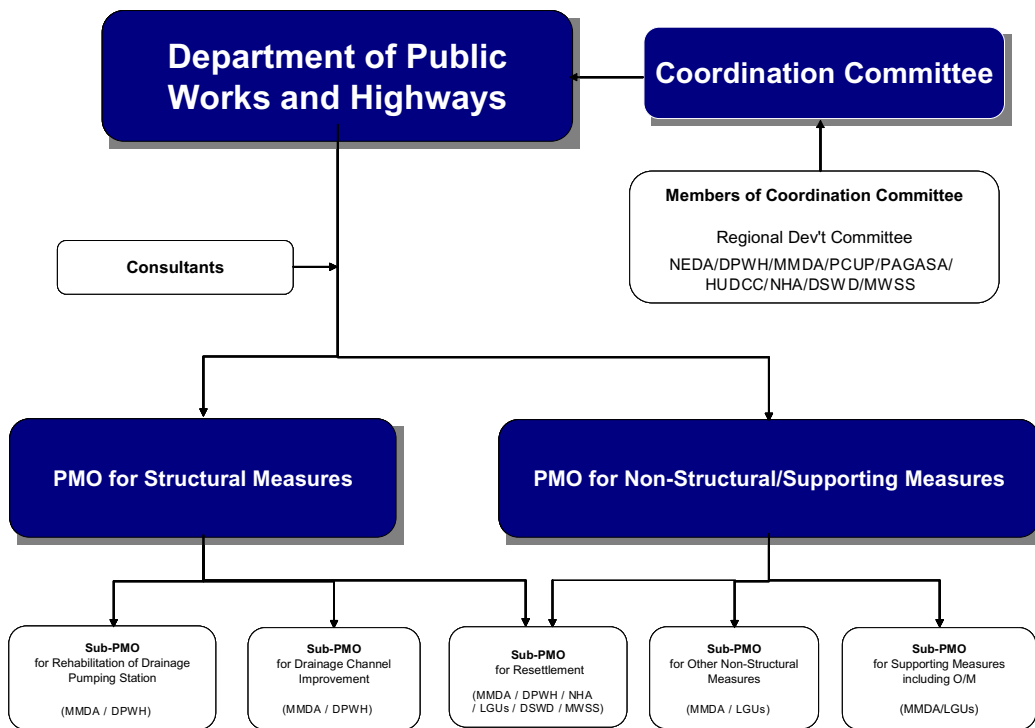


Figure 4.12.1 Project Implementation Organization

4.12.2 RESPONSIBLE AGENCY

It is proposed that the coordination committee be the responsible agency for implementation of the Master Plan and Priority Projects. Under the coordination committee, the Project Management Office (PMO) for the projects will be organized and PMO will directly manage the implementation of projects. Further respective leading agencies for sub projects are proposed as follows.

Structural Measures:

- Rehabilitation and Additional Works for Drainage Channels: MMDA / DPWH
- Rehabilitation and Additional Works for Drainage Pumping Stations: MMDA / DPWH

Non-Structural Measures:

- Countermeasures for Rapid Urbanization: LGUs
- Application of Existing Floodplain Management System: MMDA

Supporting Measures:

- Community-Involved Solid Waste Management: MMDA / LGUs
- Improvement of Operation and Maintenance Organization and Activities: MMDA / LGUs
- Installation of Equipment and Facilities for Effective Operation and Maintenance: MMDA
- Resettlement: MMDA / DPWH / NHA / LGUs / DSWD / MWSS

4.13 SELECTION OF PRIORITY PROJECTS FOR FEASIBILITY STUDY

The projects proposed for the 1st Phase in the Master Plan are selected as the Priority Projects, because the projects selected for the 1st Phase are proposed to improve the inundation conditions (depth and duration) of the severest inundation areas in both North Manila and South Manila. The components of the Priority Projects are as follows.

(1) Structural Measures

1) Rehabilitation Works of Drainage Channels

- Dredging of Esteros/Creeks: 139,000 m³
 - Estero de Sunog Apog/Maypajo (partially)
 - Estero de Tripa de Gallina (partially)
 - PNR Canal (partially)
 - Calatagan Creek I
- Declogging of Drainage Mains (D.M): 20,000 m³
 - Blumentritt Interceptor
 - Buendia Outfall
 - Zobel Roxas D.M.
 - Faraday D.M.
 - Pasong Tamo D.M.
- Related Works:
- Relocation of informal settlers: 825 families (15 % of 5,500 families)

2) Rehabilitation Works of Drainage Pumping Stations

- Rehabilitation: 12 Pumping Stations
(Quiapo, Aviles, Valencia, Binondo, Escolta, Tripa de Gallina, Pandacan, Paco, Sta.Clara, Libertad, Makati, Balete)

3) Additional Works for North Manila

- Additional works for Aviles drainage area
 - Increasing the pump capacity (3 m³/s) at Aviles Pumping Station
- Additional works of Blumentritt Interceptor
 - Remedial works of existing Blumentritt Interceptor
 - Construction of additional Blumentritt Interceptor

4) Additional Works for South Manila

- Additional works for the severe inundation area in South Manila
 - Additional Box Culvert (B.C) along Zobel Roxas D.M.
 - Additional B.C. along Faraday D.M.

(2) Supporting Measures

- 1) Improvement of Operation and Maintenance Organization and Activities and Promotion of Community-Involved Activities
 - Improvement of the existing O & M organization and activities including establishment of Community-Involved O & M
 - Community-Involved Solid Waste Management
- 2) Installation of Additional Hydrological Equipment
- 3) Introduction of Emergency Operation and Maintenance Equipment
- 4) Preparation of Guideline for Resettlement

4.14 EXAMINATION ON NEGATIVE IMPACTS BY IMPLEMENTATION OF THE PRIORITY PROJECTS FOR FEASIBILITY STUDY

The priority projects selected in the Master Plan are aiming to improve the severe inundation area in the core area and consist of recovering drainage capacities of the existing drainage channels by dredging and declogging, rehabilitation of major drainage pumping stations, remedial/additional works of drainage facilities, promotion of public participation at barangays for solid waste collection, and preparation of relocation of informal settlers living in structures in drainage channels.

The dredging work of drainage channels will require relocating the informal settlers before the execution of dredging.

Although identification of the informal house buildings or structures located in the drainage channels are by interpretation of aerial photographs and the number of the informal structures to be removed is found to be about 1,900 for the Master Plan and about 285 for the Phase 1 (or Priority Projects), respectively, the Steering Committee and the counterpart agencies are showing positive responses and have agreed to follow the JICA guideline for environmental and social awareness, and to conduct a series of public consultations.

The possible negative impacts by the Priority Projects and possible responses are summarized as follows:

- The relocation of the informal settlers in the drainage channels shall be considered. And negative impacts owing to this move can be minimized if the Philippine Government draws up a “Resettlement Action Plan” based on the guideline for social awareness, which will be proposed by the Study, and duly implements the resettlement plan.
- The Steering Committee, at the meeting held on July 22, 2004, admitted the importance of the resettlement of the informal settlers in the drainage channels and decided to establish a sub committee under the Steering Committee for the relocation issues. During the Steering Committee meeting, the NHA and other related agencies emphasized the importance of cooperative efforts regarding the relocation issues.

Chapter 5

FEASIBILITY STUDY

CHAPTER 5 FEASIBILITY STUDY

5.1 GENERAL

5.1.1 INTRODUCTION

The Feasibility Study has been conducted on the Priority Projects identified in the Master Plan for drainage improvement in the core area of Metropolitan Manila.

The Government of the Philippines has already constructed fundamental drainage facilities to mitigate the flood and inundation damages in the core area, but the existing drainage facilities require drastic rehabilitation works, and construction of some remedial works and additional facilities to meet the runoff conditions, which have been changed by the current urban development in the core area. Therefore, the Master Plan has proposed the rehabilitation of the existing drainage facilities, the construction of remedial works/additional facilities, the improvement of the O & M organizations/activities, the promotion of public participation through the enhancement of public awareness for drainage improvement/O & M activities.

The Master Plan has selected the Priority Projects in order to reduce the flood and inundation damages from the severe inundation areas in both North Manila and South Manila. In this chapter the feasibility of the Priority Projects is discussed.

5.1.2 COMPONENT OF THE PRIORITY PROJECTS

The component of the projects is as follows:

1) Rehabilitation works for drainage channels

- Dredging of Esteros/Creeks: 139,000 m³
- Declogging of Drainage Mains: 20,000 m³
- Related Works

The dredging works require the relocation of 285 informal house buildings (or structures) and informal settlers (825 families, 15% of 5,500 families, estimated at the Master Plan stage)

2) Rehabilitation works for drainage pumping stations

- Rehabilitation of the 12 Pumping Stations (Quiapo, Aviles, Valencia, Binondo, Escolta, Tripa de Gallina, Pandacan, Paco, Sta.Clara, Libertad, Makati, Balete)

3) Remedial and additional works for North Manila and South Manila

- Additional works for Aviles drainage area
- Additional works of Blumentritt Interceptor
- Additional works for the severe inundation area in South Manila

4) Improvement of O & M organizations and activities and promotion of community-involved activities

- Improvement of the Existing O &M Organization and Activities including Establishment of Community-Involved O & M
- Community-Involved Solid Waste Management

5) Others

- Experiment at pilot Barangays
- Installation of Additional Hydrological Equipment
- Introduction of Emergency Operation and Maintenance Equipment
- Preparation of Guideline for Resettlement

5.2 PRELIMINARY DESIGN OF DRAINAGE CHANNEL FACILITIES

5.2.1 GENERAL

The priority projects consist of 1) rehabilitation and additional works for the selected drainage channel facilities and 2) rehabilitation and additional works for the 12 drainage pumping stations. In this section, results on preliminary design for the drainage channel facilities are discussed.

5.2.2 OBJECTIVE PRIORITY PROJECTS FOR DRAINAGE CHANNEL FACILITIES

The objective priority projects for the drainage channel facilities: esteros/creeks, drainage mains, are as follows.

(1) Rehabilitation and Additional Works of Drainage Channel Facilities in North Manila

Sunog Apog

- Dredging (Clearing)

Blumentritt Interceptor

- Declogging of the existing interceptor and related works
- Construction of remedial works and additional interceptor by box culvert

(2) Rehabilitation and Additional Works of Drainage Channel Facilities in South Manila

Estero de Tripa de Gallina, PNR Canal and Calatagan Creek I

- Dredging (Clearing)

Buendia Outfall

- Declogging and related works

Zobel Roxas Drainage Main

- Declogging and construction of additional box culvert

Pasong Tamo Drainage Main

- Declogging

Faraday Drainage Main

- Declogging and construction of additional box culvert

5.2.3 DESIGN CRITERIA FOR DRAINAGE CHANNEL FACILITIES

A preliminary design is conducted for the objective drainage channel facilities: estero/creek and drainage main. The menus for preliminary design are rehabilitation of drainage channels by dredging/declogging and additional and/or remedial works for the interceptors (or box culverts). Criteria for the preliminary design for the drainage channels are as follows:

(1) Target of Rehabilitation Works and Design Scale of Additional Works

The rehabilitation works for the existing drainage channels are designed to recover the original flow area (or cross-sectional area) of channels and box culverts so as to convey storm water properly. Accordingly, the rehabilitation work is to dredge or declog the bottom deposits in the channels and culverts, including related works like installation of stop log gates and improvement of maintenance holes (or manholes) for enabling proper maintenance activities.

Aside from the above, that of the additional works is to construct new box culverts and remedial works for improvement of the existing drainage conditions. For Blumentritt Interceptor, preliminary design of additional box culvert and remedial works for road surface flow inlets and widening of narrow sections are conducted. The design scale of drainage main shown in *Table 5.2.1* is applied for additional works.

Table 5.2.1 Design Scale for Additional Works

Objective Channel	Design Scale
Secondary Channels (Blumentritt Interceptor, Zobel Roxas D.M., Faraday D.M.)	3-year return period (60 mm/hour)

(2) Basic Data Used

Basic topographic maps and other data used in the preliminary design are the same as those used for the Master Plan as follows:

- 1) Topographic Maps
 - The topographic information is based on the topographic map (1:5,000) prepared by JICA study in 2004, with low-lying areas modified using the results of manhole survey by JICA in 2000.
 - Primary benchmark used for the Study is BM-ML3 located in Quezon City.
 - Elevation above DPWH datum of 10.475 m is equivalent to Mean Sea Level (MSL).
- 2) Channel Cross-Sections and Profiles
 - For rehabilitation works, cross-sections and longitudinal profiles of the channels surveyed in the master plan stage and in SEDLMM (2000) are used as basis to retrieve original channel section.
 - For additional works, cross-sections (ground elevation) at major points (100 m interval) and longitudinal profiles (ground elevation) surveyed in the feasibility stage of 2004 are used as basis in the design of box culvert channel.
- 3) Design High Water Levels at Surroundings
 - Mean Spring High Tide Level (El. 11.34 m) is applied for design high tide level on Manila Bay.
 - Completion of on-going Pasig-Marikina River Improvement Project is assumed. The design high water level along the Pasig River determined by the on-going Pasig-Marikina River Improvement Project is applied.
- 4) Soil Conditions
 - Soil investigation by boring and soil analysis was conducted in the feasibility stage. Major soil data obtained from the above is utilized in the design of additional works and construction method, etc.
- 5) Referred Guidelines and References
 - Design Guidelines, Criteria and Standards for Public Works and Highways, Volume-II (Orange Book) DPWH
 - Technical Standards and Guidelines for Planning and Design, Volume-II, Urban Drainage, DPWH
 - Technical Standard for River and Sabo Works, River Association of Japan, Ministry of Land, Infrastructure and Land (MLIT)

(3) Hydraulic Analysis

Discharge capacities after dredging/declogging of the drainage channels and design discharges for box culverts estimated in the master plan stage are applied.

(4) Basic Line for Dredging and Declogging of Drainage Channels and Related Works

The following are the basic lines for dredging (clearing) and declogging of drainage channels including related works.

- Bottom deposits accumulated in the esteros/creeks is to be removed by dredging/clearing. The channel bed elevation to be dredged is set either by modifying original bed elevation in the previous construction stage or by estimating the original bed level based on the existing observed cross-sectional shape and connections between channels.
- Informal settlers residing within the objective channels are to be relocated by resettlement.
- Bottom deposits accumulated in the box culverts is to be cleared by declogging. In declogging, maintenance holes that are not in proper condition for practical maintenance activities are repaired, if needed.
- Stop log gate is installed at some sections for the purpose of carrying out maintenance works of the culvert in dry or no water condition, especially in Blumentritt Interceptor and Buendia Outfall. These two channels are always occupied by water because of high water level at outlet. The respective channel bed elevations are around E.L.8.5 m to 8.0 m whereas mean tide level is E.L.10.475 m.

Image of rehabilitation works for esteros is illustrated in *Figure 5.2.1*. However, as reference, the river channel and its easement may be recovered eventually in future to reflect the image shown in *Figure 5.2.2*, depending on the progress of resettlement of informal settlers residing in houses constructed within the channels.

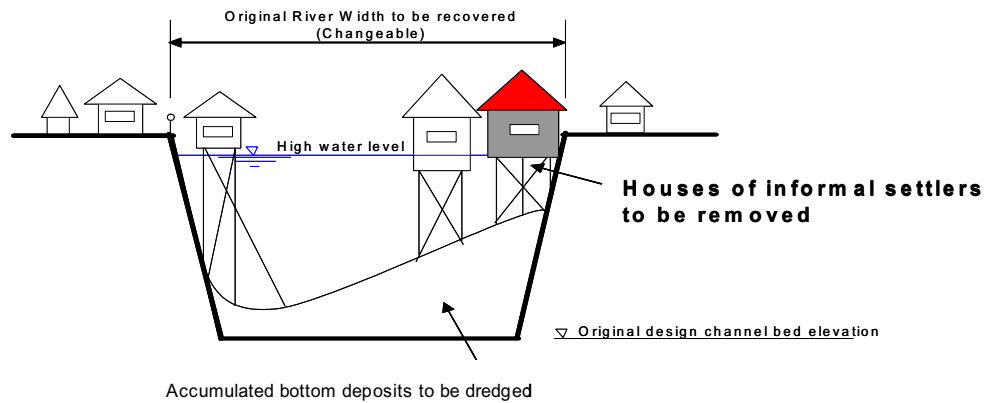


Figure 5.2.1 Image of Rehabilitation of Open Drainage Channel (Estero/Creek/Canal)

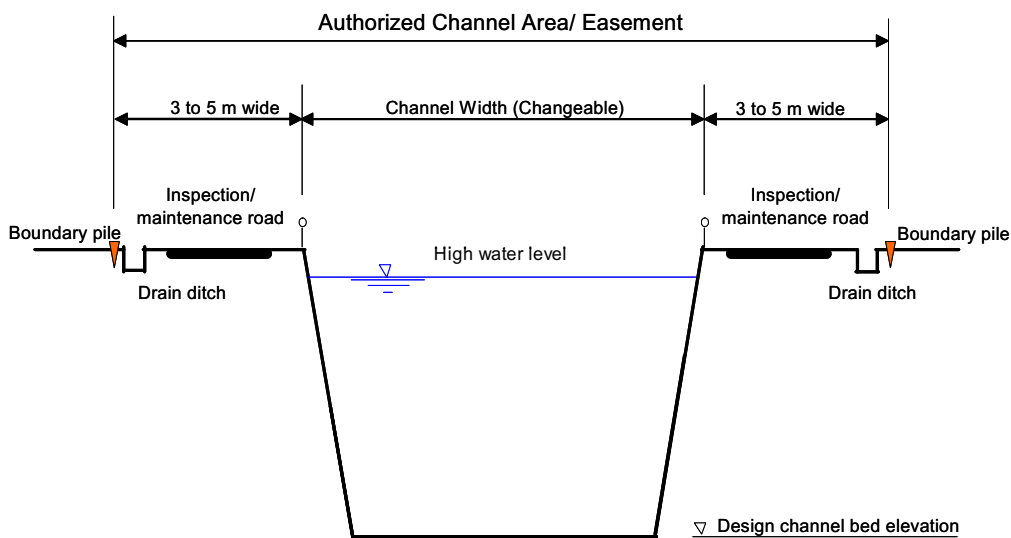


Figure 5.2.2 Ideal Typical Section of Open Channel and Its Easement

(5) Basic Line for Construction of Additional Culverts and Remedial Works

The following are the basic lines for construction of additional box culvert and remedial works.

- Additional box culvert is to be constructed along the existing culvert in question in principle. When there is no space for installation of box culvert, it is aligned in the adjacent street.
- Longitudinal bed slope is set from gentle to steep towards upper end.
- Required box culvert cross-sectional area is estimated based on pressurized condition, i.e. a condition in which storm water in the box culvert does not spout from maintenance hole or manhole.
- Box culvert is constructed by concreting in site in principle.

- 1.0 m is adopted as minimum earth cover in roadway and railway.
- Minimum inner height of box culvert will be 1.2 m considering easy maintenance activities.
- Direct foundation is applied as the foundation structure of box culvert considering soil and geological conditions.
- Street inlet with steel grating is installed at intersection depending on site condition, especially along the proposed Blumentritt Interceptor.
- Maintenance hole is installed at interval of around 50 m or at major intersections, points of changing slopes, depressions, etc., and closed maintenance holes, due to road pavement/embankment, are to be recovered by modification of original holes.
- Stop log gate is to be installed depending on water level at outlet of box culvert. The criteria of installation of stop log gate are as follows.
 - For box culvert discharging through pumping stations: culvert with more than 50 cm water depth when water level of outlet is pump operation stop level
 - For box culvert discharging directly to Manila Bay: all culverts
 - In priority projects, the objective culverts will be Blumentritt Interceptor and Buendia Outfall.
- For construction works of box culvert, some affected house buildings are to be temporarily or permanently relocated due to site conditions.

5.2.4 PRELIMINARY DESIGN OF DRAINAGE CHANNEL FACILITIES IN NORTH MANILA

The objective drainage channel facilities subject to preliminary design in North Manila are summarized below and shown in *Figure 5.2.3*.

Estero de Sunog Apog

- Dredging (Clearing)

Blumentritt Interceptor

- Related works and declogging of existing interceptor
- Construction of additional interceptor by box culvert and remedial works

PRIORITY PROJECTS FOR NORTH MANILA (STRUCTURAL MEASURES)

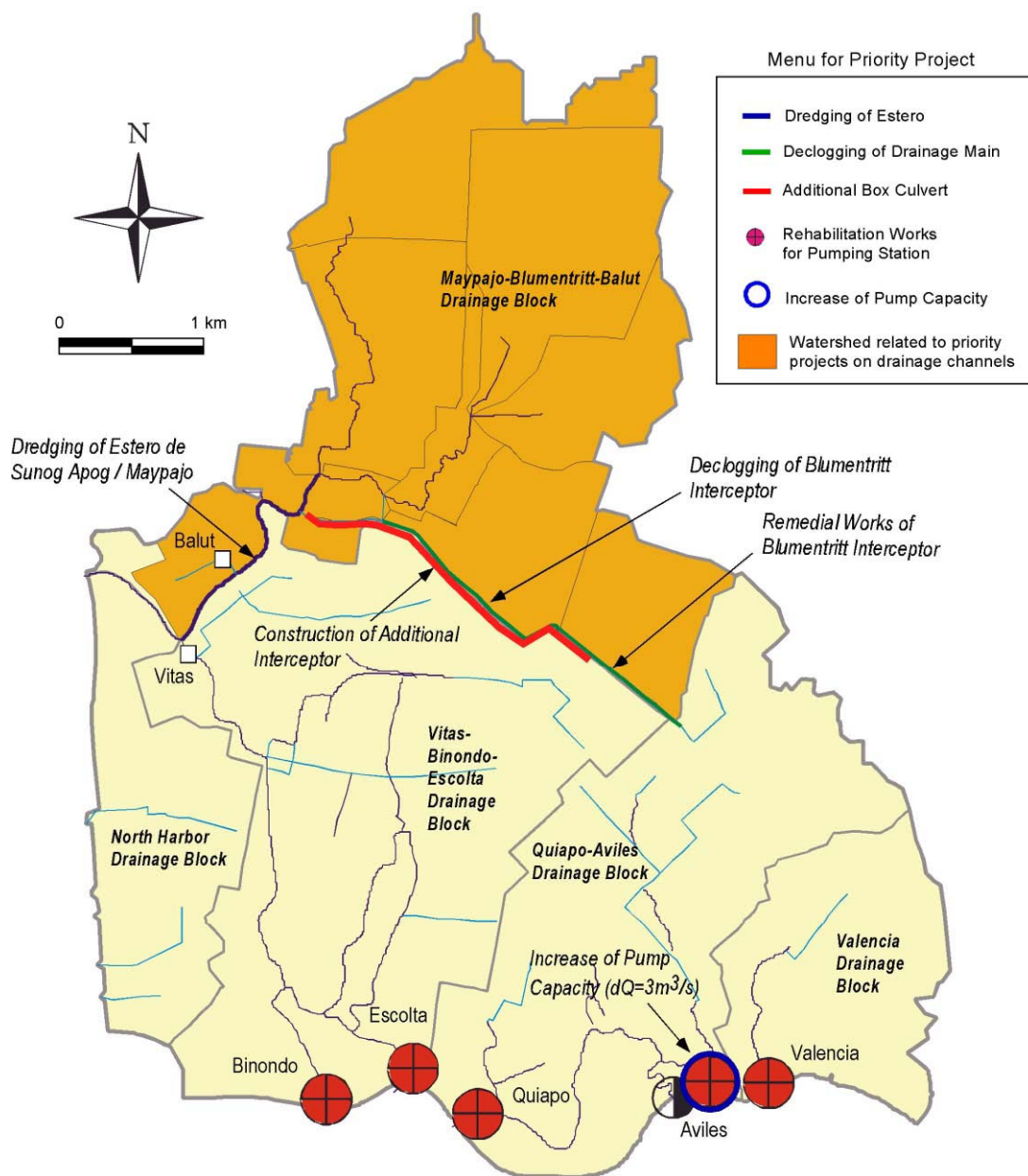


Figure 5.2.3 Locations of Priority projects in North Manila

(1) Dredging (Clearing) of Estero de Sunog Apog

Estero de Sunog Apog is discharging storm water collected in the upper catchments of Casili Creek and Estero de Maypajo including Blumentritt Interceptor to Estero de Vitas as shown in Figure 5.2.4.

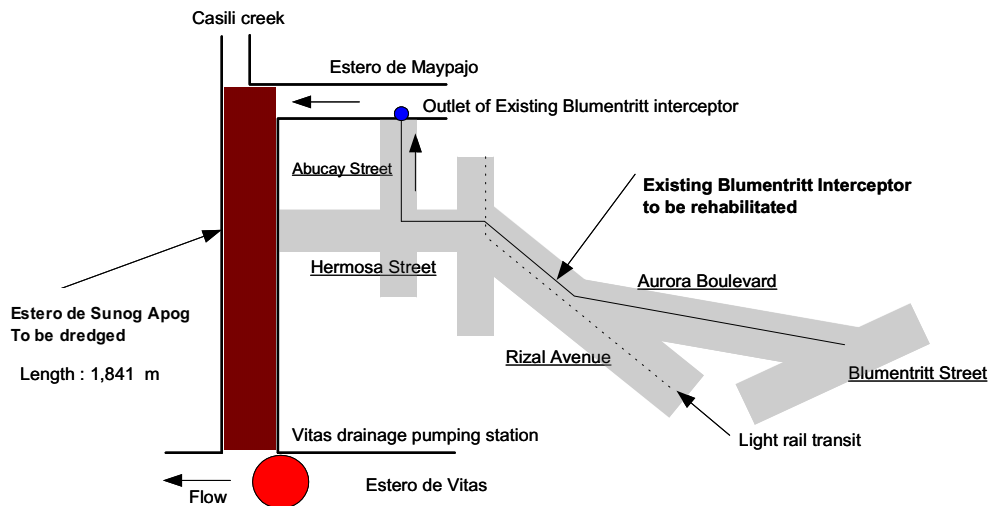


Figure 5.2.4 Schematic Location of Estero de Sunog Apog

The accumulated bottom deposits in Estero de Sunog Apog is cleared so as to recover original cross-sectional area assigned in the previous construction stage. Recovering is made as follows.

- Stretch: Confluence with Estero de Vitas to confluence with Estero de Maypajo (total length: 1,841 m)
- Channel width: within the existing channel's bed width (70 m to 7 m)
- Channel bed elevation: Longitudinal profile proposed in the construction stage of Vitas drainage pumping station in 1997 is modified partially. At the confluence with Estero de Vitas, channel bed elevation is set above the lowest bed elevation of the existing Estero de Vitas.
- Riverbed at the upper end of the stretch to be dredged is excavated with a slope of 1:10 to prevent washing away of riverbed materials
- Clearing volume: 91,600 m³ in total
- Estimated discharge capacity after dredging: 200~90 m³/s
- Relocation of informal settlers: Based on field observation during the feasibility study, it is judged that the existing informal structures in the stretch will not be obstacle for the dredging work. At the feasibility study stage, it is assumed that there is no family who will be resettled.

The dimensions of longitudinal profiles are shown in *Databook II (Drawings)*.

(2) Declogging of Existing Blumentritt Interceptor and Related Works

Figure 5.2.5 shows a schematic route map of the existing Blumentritt Interceptor to be rehabilitated.

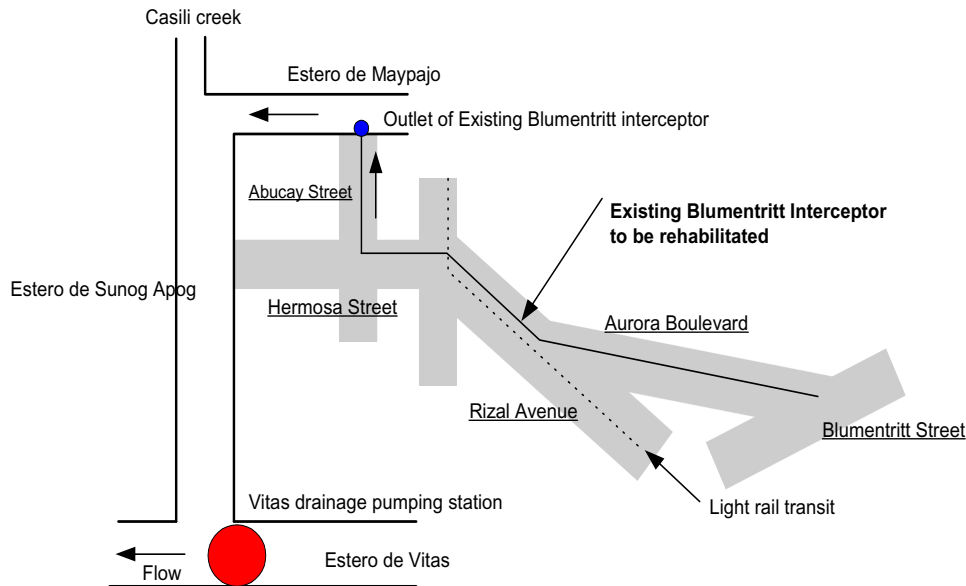


Figure 5.2.5 Route of Existing Blumentritt Interceptor

The existing Blumentritt Interceptor is presently not discharging storm water smoothly because of the accumulated bottom deposits in the culvert, clogging in Estero de Maypajo and partial structural defects with narrow sections. Several existing maintenance holes could not be used because they have been covered by road pavement. To address the above problems, the required works will be 1) related works of modification of maintenance holes and installation of stop log gates for easy operation and maintenance and 2) declogging of existing culvert. The required works are explained as follows.

1) Related Works

The related works consist mainly of modification of maintenance holes covered by road pavement and installation of stop log gates.

Modification/raising of maintenance hole

- Closed maintenance holes by road pavement are modified for easy maintenance activities.
- 20 units of maintenance hole out of 91 holes will be modified by raising of hole cover as shown in *Figure 5.2.6*.

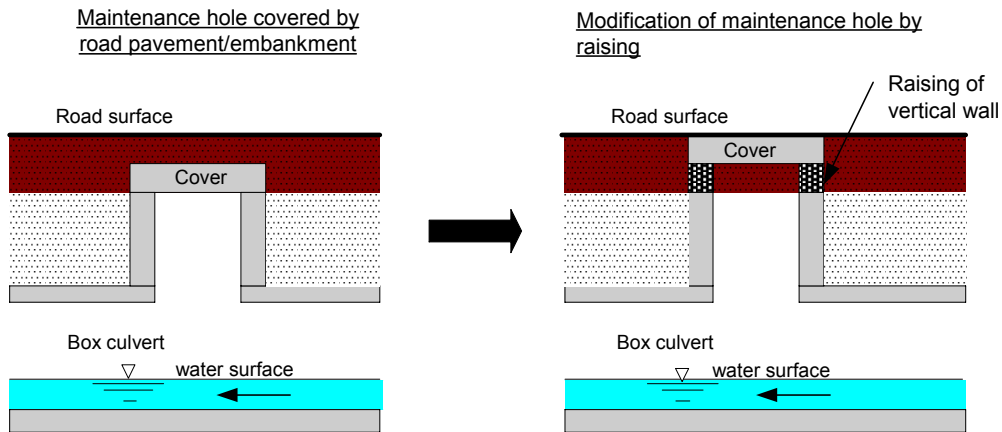


Figure 5.2.6 Image of Modification of Closed Maintenance Hole

Installation of stop log gate for easy maintenance activity

- The existing box culvert/additional new culvert is always submerged due to water backflow from outlet, resulting in difficulty of periodical maintenance activities.
- In view of effective maintenance works in the dry condition of the culvert, the stop log gate is additionally installed at 8 sections jointly (same sections) for the existing and additional culverts with images shown in *Figure 5.2.7*.

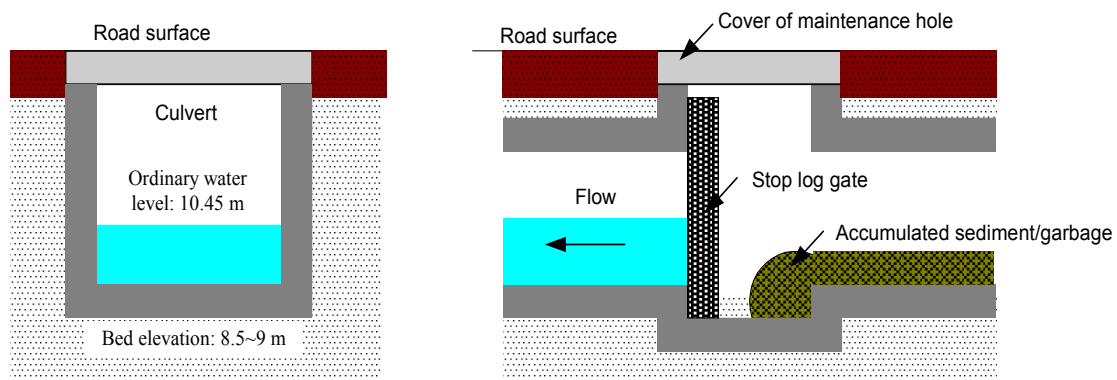


Figure 5.2.7 Cross Section of Stop Log Gate to be Installed

2) Declogging of Existing Blumentritt Interceptor

In parallel with related works of the existing interceptor, declogging for a total length of 2,655 m from the closing section at Hermosa Street to the upper end of the intersection of Dapitan Street will be carried out.

- Stretch: Section to be closed at Hermosa Street to upper end of the intersection of Dapitan Street (total length: 2,655 m)
- Declogging volume: 9,800 m³ in total
- Estimated discharge capacity after declogging: 8 m³/s

The dimensions of longitudinal profiles of the interceptor are presented in *Databook II (Drawings)*.

(3) Construction of Additional Blumentritt Interceptor and Remedial Works

The additional Blumentritt Interceptor with a total length of 2,570 m is newly constructed along the existing interceptor. Also, widening of existing box culvert at narrow sections and construction of inlets for road surface flow will be additionally made as remedial works. The details are presented in *Supporting Report F* and *Databook II (Drawings)*.

1) Proposed Route of Additional Interceptor

The proposed route of the additional interceptor will be as follows.

- A proposed route of the additional interceptor will be as shown in the following *Figure 5.2.8*, mostly along the existing culvert. Total length of new culvert is around 2,570 m.
- As already explained in the master plan stage, the lowermost portion of the existing culvert including outlet is shifted to the Estero de Sunog Apog in connection with construction of new culvert as shown in *Figure 5.2.8*.

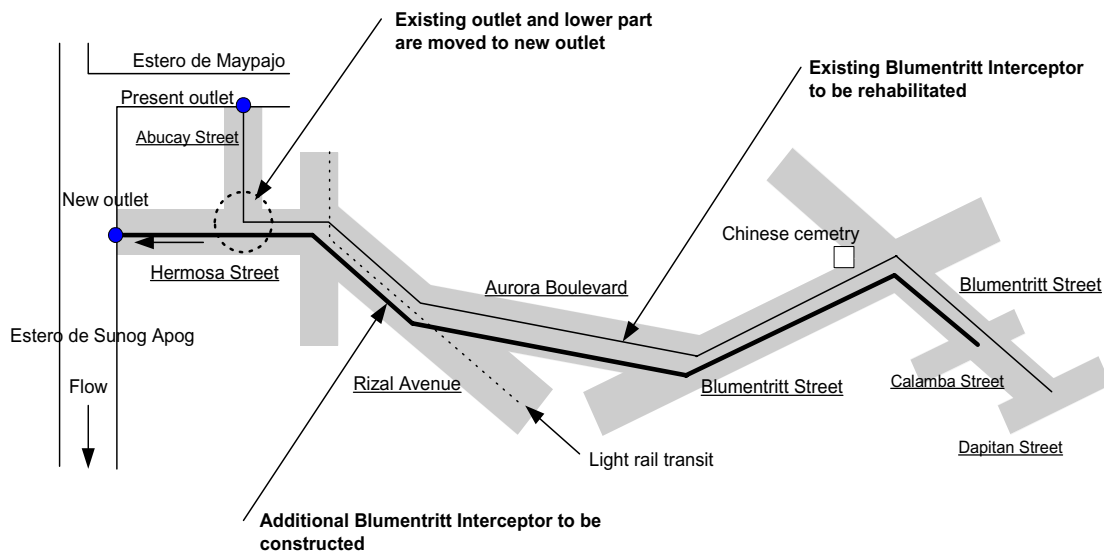


Figure 5.2.8 Proposed Route of Additional Blumentritt Interceptor

2) Design Discharge of Additional Interceptor

The estimated design discharge for additional culvert with a 3-year return period of design scale is presented in *Figure 5.2.9*.

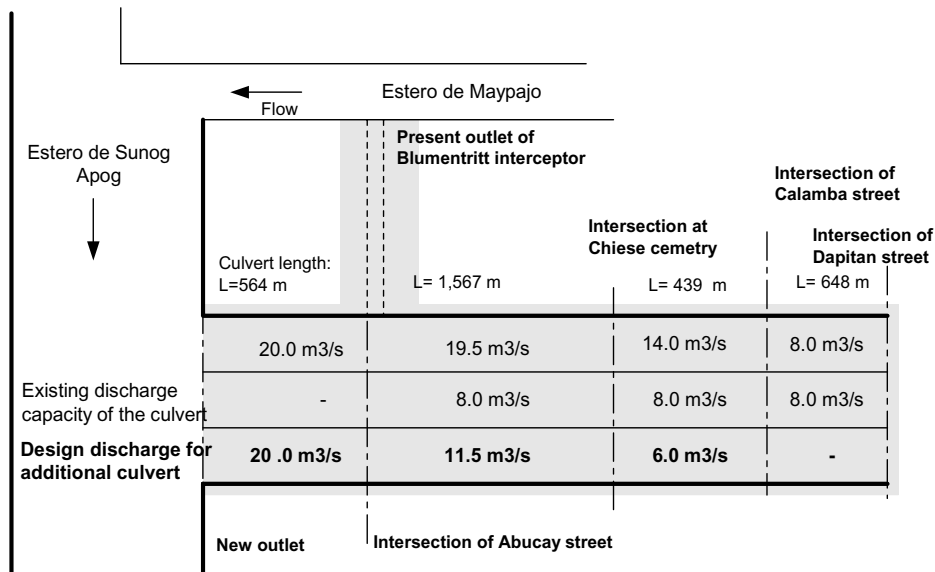


Figure 5.2.9 Design Discharge of Additional Blumentritt Interceptor

3) Preliminary Design of Additional Box Culvert

In accordance with the above section of Rehabilitation and Design Criteria for Drainage Facilities, additional box culvert was designed.

Additional box culvert

- The proposed additional box culvert consists of concrete box culvert with a total length of 2,570 m.
- The additional box culvert is divided into 3 sections or 3 types as indicated in *Table 5.2.2*. An image at section of Rizal Avenue is presented in *Figure 5.2.10*.
- There are some house buildings that will be affected by the construction of the additional box culvert. It is possible that the house buildings around the new outlet and the corner near Chinese cemetery will be required to be tentatively relocated during the construction.

Table 5.2.2 Dimensions of Additional Box Culvert

Stretch	Length	Culvert Dimension
Outlet - Intersection of Abucay Street	564 m	Width 3.4 m × height 2.6 m × 2 lanes
Intersection of Abucay St. - Intersection of Chinese cemetery	1,567 m	W 3.6 m × h 2.7 m × 1 lane
Intersection of Chinese cemetery - Intersection of Calamba St.	439 m	W 2.3 m × h 2.4 m × 1 lane

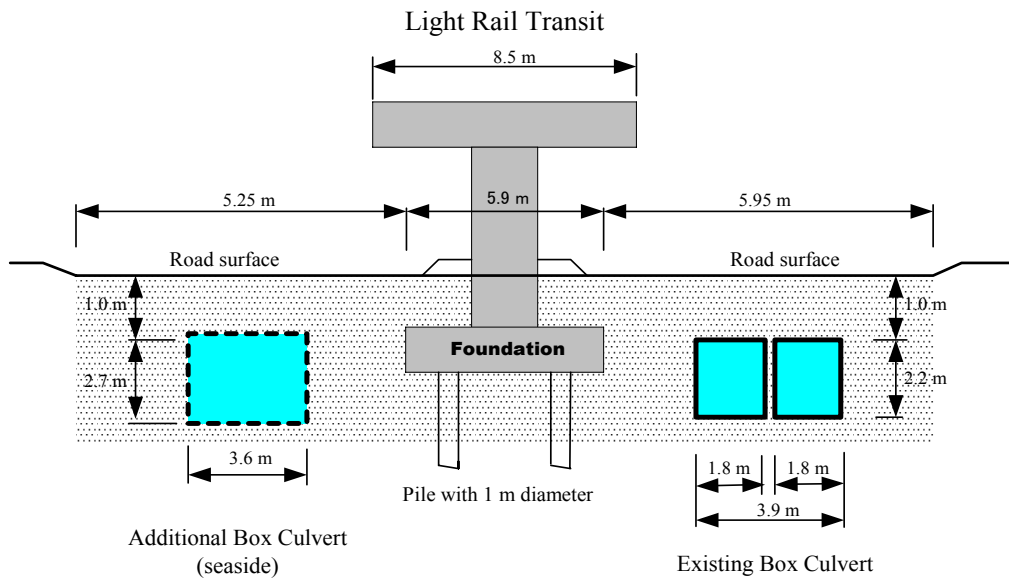


Figure 5.2.10 Image of Additional Box Culvert at Section of Rizal Avenue

Inlet for road surface flow

- In order to drain road surface flow into the box culvert smoothly and effectively, inlets are newly installed at 10 sections which locate at intersections in the upper Blumentritt Street from intersection of Chinese cemetery to Dapitan Street.
- Inlet ditch is installed on the whole carriageway width as shown in *Figure 5.2.11* and covered by steel grating.

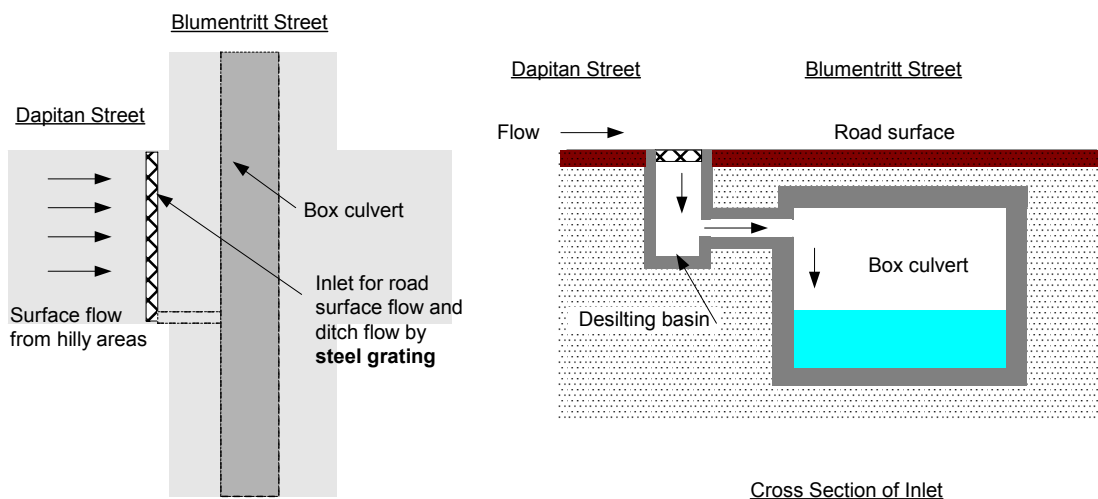


Image Plan of Inlet for Road Surface and Ditch Flow

Figure 5.2.11 Image of Inlet for Road Surface Flow

Maintenance hole

- In order to operate and maintain the new box culvert smoothly and effectively, maintenance holes are installed at an interval of 50 m. The number of maintenance holes will be 51 places.
- Stop log gate will be jointly installed at 8 sections of the proposed maintenance holes.

Widening of existing box culvert at narrow sections

- There exist 2 places of extremely narrow sections in the stretches of Rizal Avenue and Aurora Boulevard with a total length of 200 m, of which locations are shown in *Figure 5.2.12*.
- The narrow sections are to be modified/reconstructed with same section of upper and lower reaches. The details are shown in *Databook II (Drawings)*.

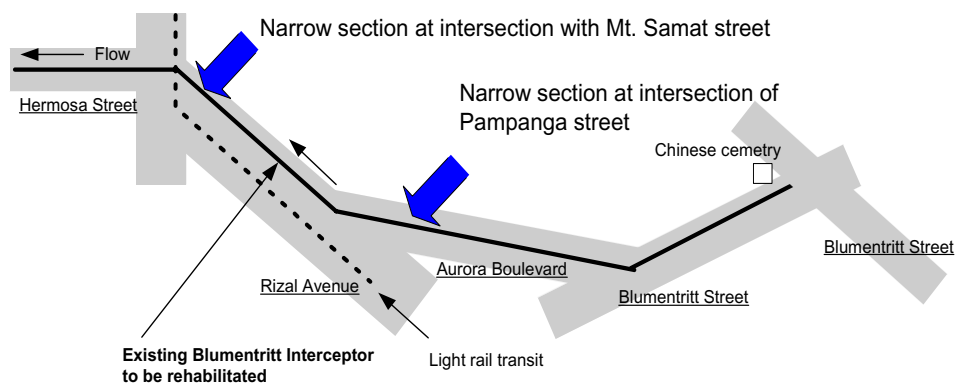


Figure 5.2.12 Locations of Narrow Section of Existing Box Culvert

(4) Summary of Rehabilitation and Additional Works for Drainage Channel Facilities in North Manila

The major proposed works in North Manila are outlined below and detailed work quantities are described in *Supporting Report G*.

Estero de Sunog Apog

- Dredging (Clearing): 91,600 m³ (for a total length of 1,841 m)

Blumentritt Interceptor

- Raising/modification of cover of maintenance holes: 20 holes
- Installation of stop log gate: 8 sections
- Declogging: 9,800 m³ (for a total length of 2,655 m)
- Construction of additional interceptor by box culvert: 2,570 m
- Installation of maintenance hole: 51 places
- Widening of narrow sections of existing box culvert: 2 sections with a total length of 200 m
- Installation of inlet for road surface flow: 10 sections
- Affected buildings by the construction of additional interceptor: Some house buildings

5.2.5 PRELIMINARY DESIGN OF DRAINAGE CHANNEL FACILITIES IN SOUTH MANILA

The objective drainage channel facilities subject to preliminary design in South Manila are summarized below and shown in *Figure 5.2.13*.

Esteros de Tripa de Gallina, PNR Canal and Calatagan Creek I

- Dredging (Clearing)

Buendia Outfall

- Declogging and related works

Zobel Roxas Drainage Main

- Declogging
- Construction of additional box culvert

Pasong Tamo Drainage Main

- Declogging

Faraday Drainage Main

- Declogging
- Construction of additional box culvert

PRIORITY PROJECTS FOR SOUTH MANILA (STRUCTURAL MEASURES)

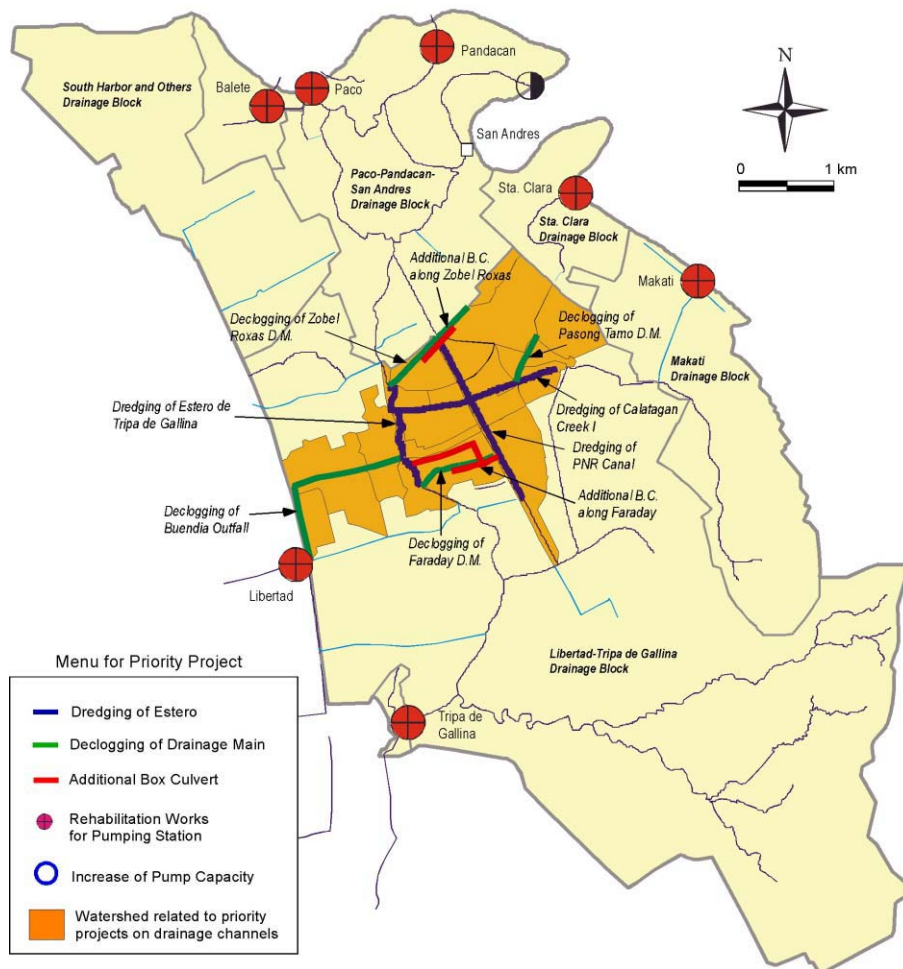


Figure 5.2.13 Location Map of Priority Projects in South Manila

(1) Dredging (Clearing) of Estero de Tripa de Gallina, PNR Canal and Calatagan Creek I

The recovering of cross-sectional areas of Estero de Tripa de Gallina (partial stretch), PNR Canal and Calatagan Creek I is made so as to convey storm water collected in San Isidro, San Antonio and Pio del Pilar area toward Libertad drainage pumping station through Buendia Outfall. *Figure 5.2.14* schematically shows locations of the above objective 3 channels.

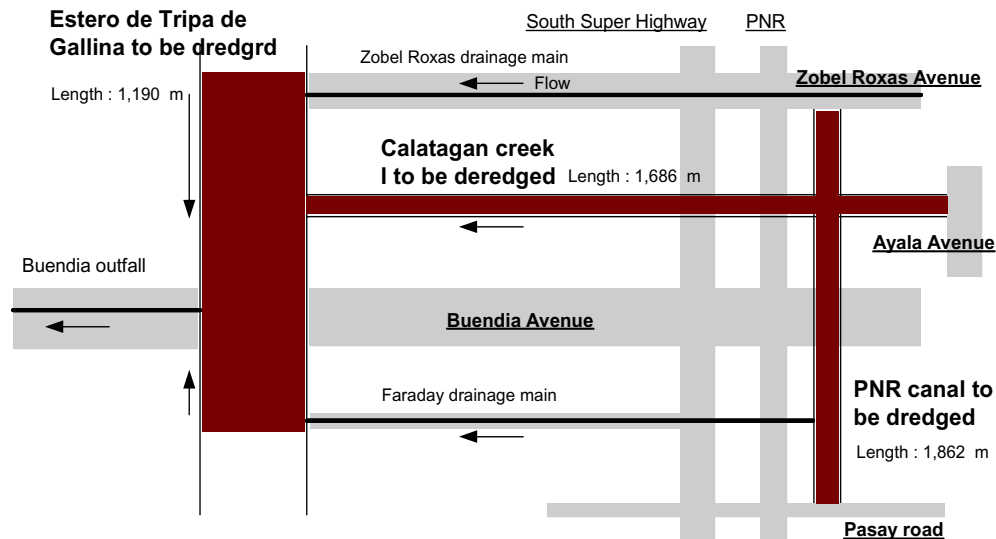


Figure 5.2.14 Schematic Locations of Objective Channels to be Dredged/Cleared

The recovering by dredging/clearing will be made as follows.

Tripa de Gallina

- Stretch: Confluence with Faraday Drainage Main to confluence with Zobel Roxas Drainage Main (total length: 1,190 m)
 - Channel width: within the existing channels bed width (12 m to 6 m)
 - Channel bed elevation: Longitudinal profile proposed in the previous construction stage of Estero de Tripa de Gallina is modified. The dimensions of longitudinal profiles are presented in *Databook II (Drawings)*.
 - At confluence with Calatagan Creek I, a corner of the left bank or Makati City side will be widened with more gentle angle in view of smooth joint with Estero de Tripa de Gallina. Accordingly, resettlement or compensation is required.
 - Riverbed at both ends of the stretch to be dredged is excavated with a slope of 1:10 to prevent washing away of riverbed materials
 - Clearing volume: 28,900 m³ in total
 - Estimated discharge capacity after dredging: 50~30 m³/s
- Relocation of informal settlers: Based on the survey during EIA study, about 700 families are required to resettle prior to the dredging works.

PNR Canal

- Stretch: Confluence with Zobel Roxas drainage main to the bridge across Pasay Road (total length: 1,862 m)
- Channel width: within the existing channel's bed width (12 m to 2 m)
- Channel bed elevation: Bed elevation is set by estimating the original bed level based on the existing observed cross-sectional shape and connections between channels. The dimensions of longitudinal profiles are as presented in *Databook II (Drawings)*.
- Clearing volume: 5,000 m³ in total
- Estimated discharge capacity to be recovered: 10~4 m³/s
- Relocation of informal settlers: Based on the field observation during the feasibility study, it is judged that the existing informal structures in the stretch will not be obstacle for the dredging work. At the feasibility study stage, it is assumed that there is no family who will be resettled.

Calatagan Creek I

- Stretch: Confluence with Estero de Tripa de Gallina to the upper end (total length: 1,686 m)
- Channel width: within the existing channel's bed width (8 m to 3 m)
- Channel bed elevation: Bed elevation is set by estimating the original bed level based on the existing observed cross-sectional shape and connections between channels. The dimensions of longitudinal profiles are as presented in *Databook II (Drawings)*.
- Clearing volume: 13,200 m³ in total
- Estimated discharge capacity after dredging: 20~15 m³/s
- Relocation of informal settlers: Based on the field observation during the feasibility study, it is judged that the existing informal structures in the stretch will not be obstacle for the dredging work. At the feasibility study stage, it is assumed that there is no family who will be resettled.

(2) Declogging of Buendia Outfall and Related Works

Storm water collected in Estero de Tripa de Gallina in the stretch selected in the priority projects is discharged through 2 box culverts of Buendia Outfall into Libertad drainage pumping station as shown in *Figure 5.2.15*. The total length of the existing culvert is around 1,960 m.

The required works for Buendia Outfall consist of 1) related works of modification of covered maintenance holes and installation of stop log gates for easy maintenance activities and 2) declogging of the accumulated bottom deposits in the box culvert. For the above, the following related and declogging works are proposed.

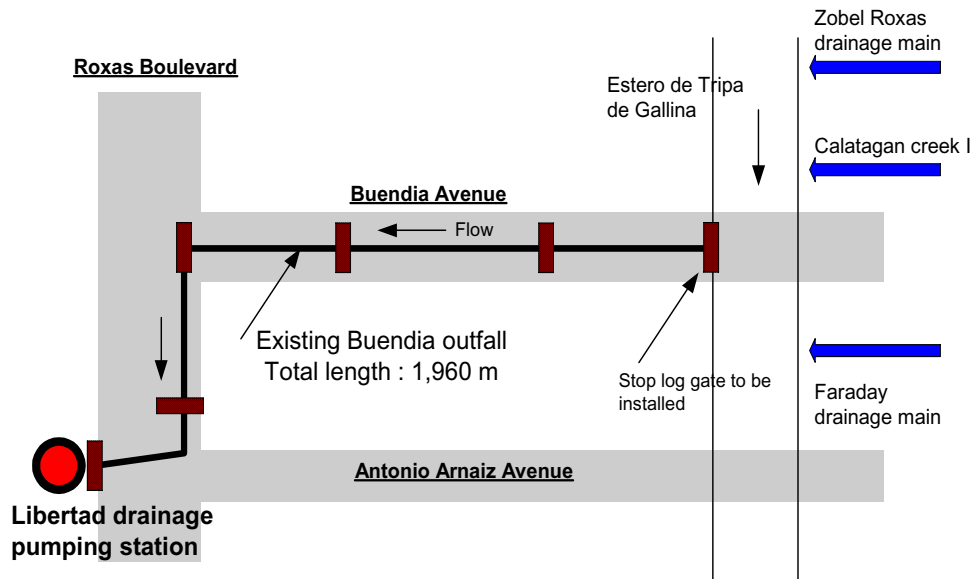


Figure 5.2.15 Schematic Route of Buendia Outfall

1) Related Works

The related works are modification of maintenance holes and installation of stop log gates for easy maintenance activities. Those are outlined below.

Modification of maintenance holes closed by road pavement/embankment

- 22 maintenance holes out of the total 47 holes are presently not functioning due to covering by road pavement/embankment.
- These closed maintenance holes are to be modified for easy maintenance activities (refer to Figure 5.2.6).

Installation of stop log gate

- The existing box culvert/additional new culvert is always submerged due to water backflow from outlet, resulting in difficulty of periodical maintenance activities.
- For this problem, stop log gates are to be installed at 6 sections for the existing 2 culverts (refer to Figure 5.2.7).

2) Declogging Works

The declogging of the existing drainage main is to be carried out as follows.

- Stretch: Outlet to upper end of the confluence with Estero de Tripa de Gallina (total length: 1,960 m)
- Declogging volume: 7,200 m³ in total
- Estimated discharge capacity after declogging: 55 m³/s

The dimensions of longitudinal profiles of the interceptor are as shown in *Databook II (Drawings)*.

(3) Declogging of Zobel Roxas Drainage Main and Construction of Additional Box Culvert

Zobel Roxas Drainage Main is discharging storm water collected along Zobel Roxas Avenue and PNR Canal into Estero de Tripa de Gallina. The drainage main exists under the present Roxas Avenue, which crosses South Superhighway and PNR. The existing box culvert has been clogged by accumulated bottom deposits. An upper part of the existing culvert does not have sufficient flow area against design discharge to be allocated. For Zobel Roxas Drainage Main, major proposed works will be 1) declogging of existing box culvert with related works for modification of covered maintenance holes due to road pavement and 2) construction of additional culvert as shown in *Figure 5.2.16*. The details are presented in *Supporting Report F* and *Databook II (Drawings)*.

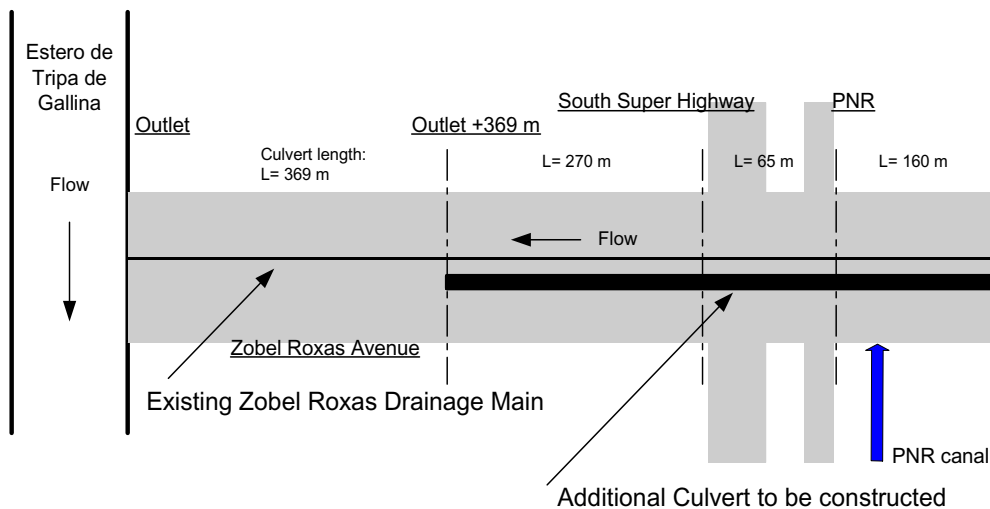


Figure 5.2.16 Existing and Proposed Routes of Zobel Roxas Drainage Main

1) Declogging Works of Existing Zobel Roxas Drainage Main

The declogging and related works of the existing drainage main for a total length of 864 m are to be carried out as follows.

Declogging

- Stretch: Outlet of Zobel Roxas drainage main to 160 m point ahead of PNR Canal (total length: 864 m)
- Declogging volume: 2,200 m³ in total
- Estimated discharge capacity after declogging: 14 m³/s

Modification of maintenance holes covered by road pavement/embankment

- 3 maintenance holes out of the total 17 holes are presently not functioning due to covering by road pavement.
- These closed maintenance holes are to be modified for easy maintenance activities (refer to *Figure 5.2.6*).

2) Construction of Additional Zobel Roxas Drainage Main

In accordance with the above section of Rehabilitation and Design Criteria for Drainage Facilities, additional box culvert was designed and summarized as follows.

Proposed route of additional culvert

- The additional culvert is to be aligned in parallel with the existing one as shown in *Figure 5.2.16*. The total additional culvert length is 495 m.

Design discharge for additional culvert

- The estimated design discharges for additional culvert with a 3-year return period of design scale is shown in *Figure 5.2.17*.

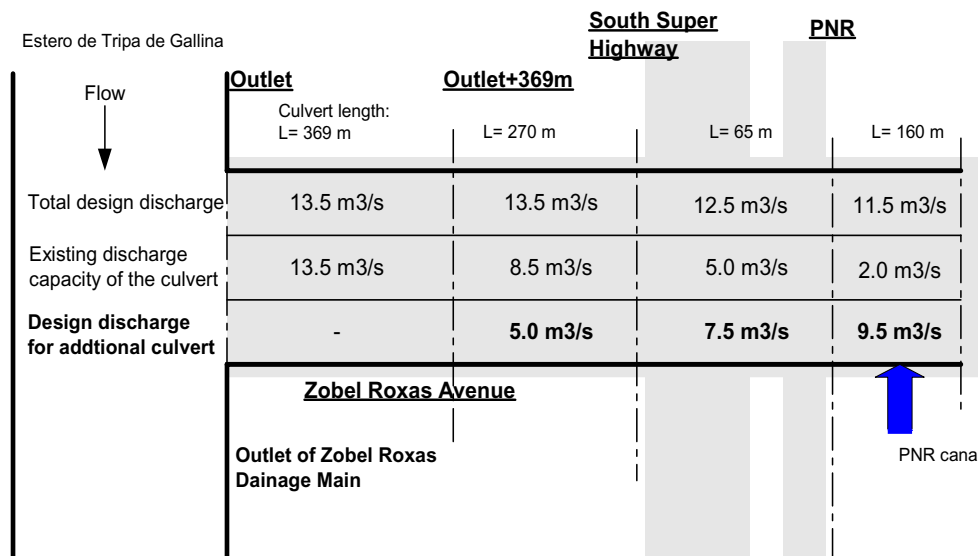


Figure 5.2.17 Design Discharge of Zobel Roxas Drainage Main

Dimensions of additional culvert

- The proposed additional box culvert consists of concrete box culvert with a total length of 495 m.
- The additional box culvert is divided into 3 sections or 3 types as indicated in *Table 5.2.3*.

Table 5.2.3 Dimensions of Additional Box Culvert

Stretch	Length	Culvert Dimension
Outlet+369 m - South Superhighway	270 m	Width 1.7 m × height 1.6 m × 2 lanes
South Superhighway - PNR	65 m	W 1.8 m × h 1.5 m × 2 lanes
PNR – upper end	160 m	W 2.3 m × h 1.5 m × 2 lanes

Maintenance hole

- In order to operate and maintain the box culvert smoothly and effectively, maintenance holes are installed at an interval of 50 m. The number of maintenance holes will be 10 places.

(4) Declogging of Pasong Tamo Drainage Main

Pasong Tamo drainage main with a total length of 550 m connects Calatagan Creek I, as shown in *Figure 5.2.18*.

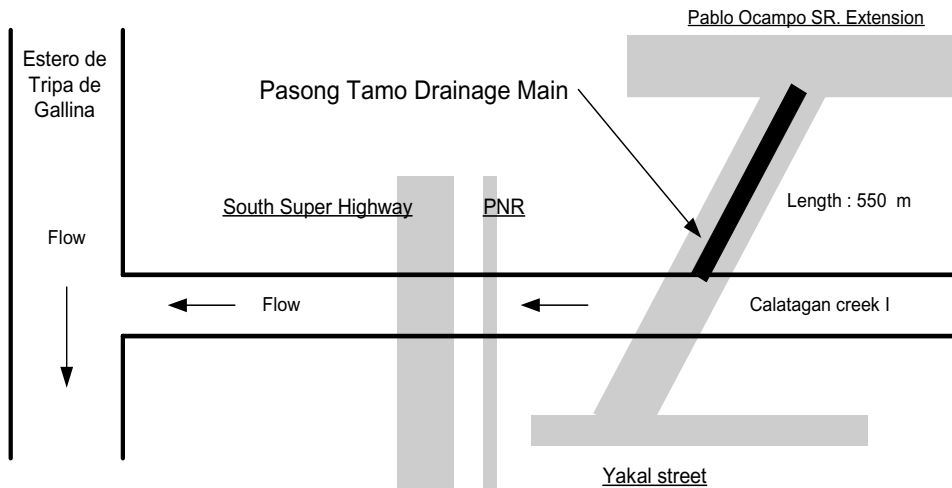


Figure 5.2.18 Schematic Location Map of Pasong Tamo Drainage Main

There exist maintenance holes installed with a 50 m pitching for the whole stretch. Declogging of Pasong Tamo Drainage Main (box culvert) will be made through these maintenance holes with the following conditions.

- Stretch: Confluence with Calatagan Creek I to intersection of Pablo Ocampo Sr. Extension with a total length of 550 m
- Declogging volume: 900 m³ in total
- Estimated discharge capacity after declogging: 12 m³/s

The dimensions of longitudinal profiles of the drainage main are presented in *Databook II (Drawings)*.

(5) Declogging of Faraday Drainage Main and Construction of Additional Box Culvert

The Faraday Drainage Main is running under the Faraday street connecting PNR Canal and Estero de Tripa de Gallina as shown in *Figure 5.2.19*. The carrying capacity of the existing drainage main is small compared with its design discharge assigned. Major works in the Faraday Drainage Main will be 1) declogging of the existing box culvert and 2) construction of additional box culvert as indicated in *Figure 5.2.19*. The details are presented in *Supporting Report F* and *Databook II (Drawings)*.

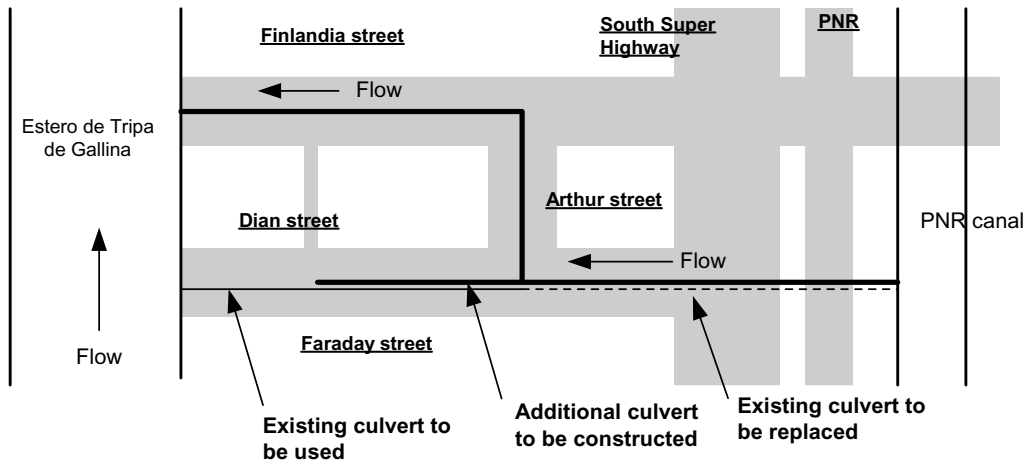


Figure 5.2.19 Existing and Additional Proposed Route of Faraday Drainage Main

1) Declogging Works

The declogging of the existing drainage main is to be carried out as follows.

- Stretch: Confluence with Estero de Tripa de Gallina to proposed diversion point with a total length of 713 m
- Declogging volume: 100 m³ in total
- Estimated discharge capacity after dredging: 5~3.5 m³/s

The dimensions of longitudinal profiles of the drainage main are presented in *Databook II (Drawings)*.

2) Construction of Additional Faraday Drainage Main

In accordance with the above section of Rehabilitation and Design Criteria for Drainage Facilities, additional box culvert was designed and details are summarized as follows.

Proposed route of additional culvert

- An additional box culvert is basically to be constructed along the existing culvert. However, in the lower reach, there is no space for construction of additional one. Accordingly, additional culvert is also to be constructed underneath the streets of Finlandia and Arthur as shown in *Figure 5.2.19*.

Design discharge for additional culvert

- The estimated design discharge for additional culvert with a 3-year return period of design scale as shown in *Figure 5.2.20*.

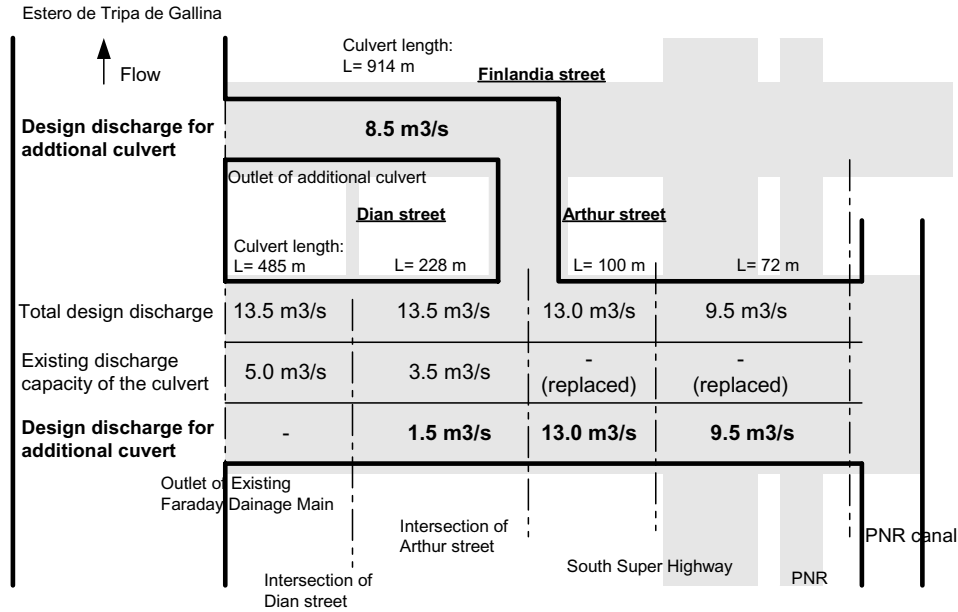


Figure 5.2.20 Design Discharge of Faraday Drainage Main

Dimensions of additional culvert

- The proposed additional box culvert consists of concrete box culvert with a total length of 1,314 m.
- The additional box culvert is divided into 4 types as indicated in *Table 5.2.4*.

Table 5.2.4 Dimensions of Additional Box Culvert

Stretch	Length	Culvert Dimension
Existing Faraday DM route		
Intersection of Dian St. - Intersection of Arthur St. (diversion point)	228 m	Width 1.8 m × h 1.4 m × 1 lane
Intersection of Arthur St. (diversion point) - South Superhighway	100 m	W 2.2 m × h 1.7 m × 2 lanes
South Superhighway - PNR Canal	72 m	W 1.8 m × h 1.4 m × 2 lanes
Finlandia and Arthur streets route		
Outlet in Finlandia St. - diversion point	914 m	W 3.5 m × h 1.7 m × 1 lane

Maintenance hole

- In order to operate and maintain the box culvert smoothly and effectively, maintenance holes are installed at an interval of 50 m. The number of maintenance holes will be 26 places.

Affected House Buildings

- There are some house buildings that will be affected by the construction of the additional box culvert. It is possible that the house buildings around the inlet of Faraday drainage main on PNR canal will be required to tentatively relocate during the construction.

(6) Summary of Quantity for Rehabilitation and Additional Works for Drainage Channel Facilities in South Manila

The proposed works in South Manila are outlined below and detailed work quantities are described in *Supporting Report G*.

Estero de Tripa de Gallina, PNR Canal and Calatagan Creek I

- Dredging (Clearing) of Tripa de Gallina: 28,900 m³ (for a total length of 1,190 m)
- Dredging (Clearing) of PNR Canal: 5,000 m³ (for a total length of 1,862 m)
- Dredging (Clearing) of Calatagan Creek I: 13,200 m³ (for a total length of 1,686 m)
- Resettlement prior to the dredging works: About 700 families

Buendia Outfall

- Raising/modification of cover of maintenance hole: 22 holes
- Installation of stop log gate: 6 sections
- Declogging: 7,200 m³ (for a total length of 1,960 m)

Zobel Roxas Drainage Main

- Raising/modification of maintenance hole: 3 holes
- Declogging: 2,200 m³ (for a total length of 864 m)
- Construction of additional box culvert: 495 m
- Installation of maintenance hole: 10 places

Pasong Tamo Drainage Main

- Declogging: 900 m³ (for a total length of 550 m)

Faraday Drainage Main

- Declogging: 100 m³ (for a total length of 713 m)
- Construction of additional box culvert: 1,314 m
- Installation of maintenance hole: 26 places
- Affected buildings by the construction of additional box culvert: Some house buildings

5.2.6 FURTHER ISSUES FOR NEXT STAGE OF DETAILED DESIGN

Subsequent works for the priority projects will be a detailed design for rehabilitation and additional works of drainage facilities and pumping stations. In order to conduct the detailed design especially for rehabilitation and additional works of drainage channels, a cross-sectional survey of drainage channels is firstly required. It is necessary to clarify the detail of original cross-sectional area of drainage channels. An interval of cross-sections to be surveyed will be minimum 20 m including partial narrow points and sections.

Subsequently, based on the results of surveyed cross-sections and detailed site reconnaissance, the following considerations will be widely made in the coming detailed design stage.

- Clarification of original boundary line of drainage channels
- Clarification of original boundary of easement as maintenance road, if planned
- Clarification of locations of local narrow points/ sections

In line with the above clarification results, required works will be studied to secure original cross-sectional area of drainage channels with considering stability of concerned riverbank structures.

5.3 REHABILITATION OF DRAINAGE PUMPING STATIONS

5.3.1 GENERAL

The rehabilitation works for the 12 pumping stations consist of 2 categories: repair and replacement of pump equipment and appurtenant facilities. Prior to execution of the rehabilitation works, it is necessary to conduct a careful and thorough technical investigation and analysis through overhauling for the 12 pumping stations. Based on the results of investigation and analysis, a detailed rehabilitation program shall be prepared. In this stage, detailed rehabilitation work items are clarified for the 12 drainage pumping stations based on the diagnosis results conducted in the Master Plan and the past studies: the previous reports on Metro Manila Drainage System Rehabilitation Project (Phase II), Sept. 1999, Japan Plant Association, and Follow-Up Service Report on Metro Manila Drainage System Rehabilitation Project (Phase II) Feb. 2002, Japan Plant Association.

5.3.2 REHABILITATION TARGET AND CRITERIA

(1) Objective Drainage Pumping Stations

For the 12 aged drainage pumping stations identified in the Master Plan, a further detailed rehabilitation work items of repair and replacement of pump equipment and apparatus by stations will be examined in this stage. They are listed as follows.

- Aviles
At Aviles station, increase of pump capacity of 3 m³/s is proposed in connection with the rehabilitation works as additional work.
- Quiapo
- Valencia
- Pandacan
- Paco
- Sta. Clara
- Tripa de Gallina
- Libertad
- Makati
- Binondo
- Escolta and Balete

(2) Rehabilitation Target of Drainage Capacities

The capacities of the 12 pumping stations are principally kept by means of repair and/or replacement of pump equipment and appurtenant facilities complying with the extent of mechanical and electrical aging. It should be noted that the capacity should be increased at Aviles station. The existing and proposed drainage capacities of the 12 stations with the respective target scales of 10-year return period applied in the original design are shown in *Table 5.3.1*.

Table 5.3.1 Drainage Capacity of Pumping Stations

Pumping station	Construction Year and (Operation Hours as of June 2004)	Existing discharge capacity (m ³ /s)	Proposed discharge capacity (m ³ /s)	Remarks
Aviles	1976 (14,650)	15.6	18.6	+ 3 m ³ /s
Quiapo	1976 (15,830)	10.8	10.8	No change
Valencia	1976 (10,790)	11.8	11.8	No change
Pandacan	1976 (10,890)	4.4	4.4	No change
Paco	1977 (16,630)	7.6	7.6	No change
Sta. Clara	1977 (7,420)	5.3	5.3	No change
Tripa de Gallina*1	1977 (8,010)	57.0	57.0	No change
Libertad*1	1977 (12,880)	42.0	42.0	No change
Makati	1984 (4,030)	7.0	7.0	No change
Binondo	1985 (8,220)	11.6	11.6	No change
Balete	1988 (140)	3.0	3.0	No change
Escolta	1982 (360)	1.5	1.5	No change

Note: *1 indicates installed pump is horizontal one and others, vertical one.

(3) Basic Lines for Rehabilitation of Drainage Pumping Stations

In rehabilitation works of the drainage pumping stations, the basic lines to be considered are as follows:

- In the implementation stage, a further careful and thorough technical investigation and analysis through overhauling at the 12 drainage pumping stations is to be conducted for formulation of a detailed rehabilitation program. The rehabilitation works are to be made based on the above detailed rehabilitation program consisting of 2 categories of repair and replacement works.
- In principle, no action is considered to the pump houses and other civil works.
- Detailed work items by the above categories for the 12 stations are to be clarified.
- Based on the diagnosis results conducted in the master plan stage, the categorization of detailed work items for repair and replacement of pump equipment and appurtenant facilities is to be made.
- Mean spring high tide level (El. 11.34 m) is applied for design high tide level on Manila Bay.
- On-going Pasig-Marikina River Improvement Project is assumed to be completed. The design high water level along the Pasig River determined by the on-going Pasig-Marikina River Improvement Project is applied.
- Change of present (original) start/stop levels of pump operation as shown in *Table 5.3.2* including other minor adjustment of total working head will be made in the next stage of detailed investigation. The minor adjustment of drainage capacity due to changing of the total working head or increase of drainage capacity (3 m³/s) at Aviles station can be made by means of changing the angle of impeller without installation of additional pump equipment.

Table 5.3.2 Present Pump Start/Stop Levels for Drainage Pumping Station

Pumping station	Pump Start level (EL.m)	Pump Stop Level (EL.m)	Remarks
Aviles	10.5	10.3	+ 3 m ³ /s
Quiapo	10.5	10.2	
Valencia	10.5	10.3	
Pandacan	10.5	10.2	
Paco	10.5	10.2	
Sta. Clara	11.2	11.0	
Tripa de Gallina	9.9	9.6	
Libertad	9.9	9.6	
Makati	11.3	10.9	
Binondo	10.0	9.8	
Balete	10.6	10.5	Pump gate
Escolta	10.0	9.8	Pump gate

- Manual of Rehabilitation of Pump Equipment and Appurtenant Facilities, Ministry of Land, Infrastructure and Transport (MLIT), Japan will be referred to in the rehabilitation works.
- As reference, average working life of pump equipment and electrical parts is summarized from both the aspects of physical and functional in *Table 5.3.3*, which is from the above manual by MLIT, Japan.

Table 5.3.3 Working Life of Pump Equipment and Appurtenant Facilities

System/Part	Equipment/Facilities	Physical Working Life (year) *1	Functional Working Life (year)*2
Main pump equipment	Main pump	40	30
	Main discharge pipe	40	40
	Valve	40	25
Engine	Prime mover for diesel	40	27
	Reduction gear	40	30
Fuel system	Fuel transfer pump	20	20
	Storage tank	30	30
Cooling system	Cooling water pump (vertical/horizontal)	20	18
	Cooling water pump (submergible)	10	10
Air supply system	Air compressor	20	17
Electrical system	Panel	20	18
	Generator	40	18
Trash rake	Trash rake/conveyor/ screen	20	20
Crane	Overhead crane	40	40
Flood gate	Sluice gate	40	40

Note; *1: Working life based on life cycle cost (physical life),

*2: Working life to be replaced by working reliability (functional life)

5.3.3 REHABILITATION OF DRAINAGE PUMPING STATIONS

The proposed rehabilitation works intend to partially improve the system by repairing/renewing it with application of new technology, and to finally recover the capacity of pump facilities to its original condition in line with the results of technical investigation and analysis of pumping stations scheduled ahead of the actual rehabilitation works. In this section, rehabilitation works are discussed, by dividing the 12 pumping stations into 3 groups of: 1) 4 stations of very old and serious conditions, 2) 6 stations of old and marginal service life, and 3) 2 stations with submersible pumps of outdoor type. The detailed work items taken up in the rehabilitation are summarized in *Table 5.3.4* and major work items are discussed below.

(1) Technical Investigation and Analysis of Pumping Station

As already explained, a further careful and thorough technical investigation and analysis through overhauling at the 12 drainage pumping stations are to be conducted for formulation of a detailed rehabilitation program in the next implementation stage. Accordingly, the detailed rehabilitation work items is to be finalized based on the results of the above technical investigation and analysis.

The rehabilitation works of drainage pumping stations consist of 1) repair and replacement works of pump equipment and appurtenant facilities, and 2) supply of spare parts and consumables.

(2) 4 Stations (Aviles, Quiapo, Valencia and Tripa de Gallina)

The contents of rehabilitation works for the aged four stations required for urgent rehabilitation are summarized as follows.

Main pump and discharge valve

- For vertical pumps of Quiapo, Aviles and Valencia, vertical pumps including main pipe are to be repaired based on the results by the prior investigation and analysis.
- For horizontal pumps of Tripa de Gallina, horizontal pumps are to be repaired based on the results by the prior investigation and analysis.
- Discharge valve, shaft, shaft seal, prime detector, submerged bearing and radial/thrust bearing are to be replaced with new ones.

Gear box and engine

- Gear box and diesel engine for the main pump and auxiliary equipment are to be replaced.
- All the existing engines including air starting system, cooling water system, lubrication system, etc., are to be replaced.

Electrical system and generator

- All the existing electrical systems including main electrical panels, local panels, cable/wires trays, etc., are to be replaced.
- Generator equipment including panels is to be repaired.

Automatic trash removal equipment

- Automatic trash rake and screen and horizontal/inclined conveyor are to be repaired. Replacement of some minor parts is to be included.

Water level gauging

- The existing water level gauging facilities are to be replaced by new one of ultrasonic type.

Table 5.3.4 summarizes rehabilitation work items by each part of the four stations and the others.

Table 5.3.4 Tentative Detailed Work Items to be Taken Up in Rehabilitation

No.	Pump Equipment/Appurtenant Facilities	Aviles	Quiapo	Valencia	Pandacan	Paco	Sta. Clara	Tripa de Gallina	Libertad	Makati	Binondo	Balete	Escolta
1	Main Pump	▲○	▲○	▲○	▲○	▲○	▲○	▲○	▲○	▲○	▲○	●	●
2	Reduction Gear	●	●	●	●	●	●	●	●	●	●	NA	NA
3	Butterfly Valve (inclu. replace of actuator)	□/●	□/●	□/●	□/●	□/●	□/●	□/●	□/●	□/●	□/●	NA	NA
4	Flap Valve	○	○	○	○	○	○	○	○	○	○	●	●
5	Diesel Engine for Main Pump	●	●	●	●	●	●	●	●	●	●	NA	NA
6	Generator Panel	●	●	●	●	●	●	●	●	●	●	○	○
7	Diesel Engine for Generator	▲○	▲○	▲○	▲○	▲○	▲○	▲○	▲○	▲○	▲○	▲○	▲○
8	Vacuum Pump (for priming)	NA	NA	NA	NA	NA	NA	●	●	NA	NA	NA	NA
10	Clear Water Pump	●	●	●	●	●	●	●	●	●	●	NA	NA
11	Cooling & Sealing Water Pump	NA	NA	NA	NA	NA	NA	●	●	NA	NA	NA	NA
12	Cooling Water Pump for Gen.	●	●	●	●	●	●	●	●	●	●	NA	NA
13	Fuel Transfer Pump	●	●	●	●	●	●	●	●	●	●	NA	NA
14	Cooling Tower	●	●	●	●	●	●	●	●	●	●	NA	NA
15	Air Compressor	●	●	●	●	●	●	●	●	●	●	NA	NA
16	Air Reservoir Tank	□	□	□	□	□	□	□	□	□	□	NA	NA
17	Ventilating Fan	●	●	●	●	●	●	●	●	●	●	NA	NA
18	Fuel Storage Tank	□	□	□	□	□	□	□	□	□	□	NA	NA
19	Fuel Service Tank	□	□	□	□	□	□	□	□	□	□	NA	NA
20	Cooling Water Tank	□	□	□	□	□	□	□	□	□	□	NA	NA
21	W. L. Gauge at Inlet (ultrasonic type)	●	●	●	●	●	●	●	●	●	●	●	●
22	W. L. Gauge at Outlet (ultrasonic type)	●	●	●	●	●	●	●	●	●	●	●	●
23	Automatic Trash Rake and Screens	▲○	▲○	▲○	▲○	▲○	▲○	▲○	▲○	▲○	▲○	NA	NA
24	Horizontal Conveyor	▲○	▲○	▲○	▲○	▲○	▲○	▲○	▲○	▲○	▲○	NA	NA
25	Inclined Conveyor	▲○	▲○	▲○	▲○	▲○	▲○	▲○	▲○	▲○	▲○	NA	NA
26	Hopper	▲○	▲○	▲○	▲○	▲○	▲○	▲○	▲○	▲○	▲○	NA	NA
27	Conveyor Pit Drain Pump	●	●	●	●	●	●	●	●	●	●	NA	NA
28	Pump Room Drain Pump	●	●	●	●	●	●	●	●	●	●	NA	NA
29	Overhead Crane	□/○	□/○	□/○	□/○	□/○	□/○	□/○	□/○	□/○	□/○	NA	NA
30	Flood Gate/Control Panel	-●	-●	-●	-●	-●	-●	-●	-●	-●	-●	▲	▲
31	Electric Panel	●	●	●	●	●	●	●	●	●	●	●	●

Legend:

- : Inspection
- ▲: Overhaul
- : Repair
- : Replacement
- : No action
- N/A: Not applicable

(3) 6 Stations (Pandacan, Paco, Sta. Clara, Libertad, Makati and Binondo)

The contents of rehabilitation works for the six stations will be mostly the same as that of the aforementioned four stations.

Main pump and discharge valve

- For vertical pumps of Pandacan, Paco, Sta. Clara, Makati and Binondo, vertical pumps are to be repaired based on the results by the prior investigation and analysis.
- For horizontal pumps of Libertad, it is to be repaired based on the results by the prior investigation and analysis.
- Discharge valve, shaft, shaft seal, prime detector, submerged bearing and radial/thrust bearing are to be replaced with new ones.

Gear box and engine

- Gear box and diesel engine for the main pump and auxiliary equipment are to be replaced.
- All the existing engines including air starting system, cooling water system, lubrication system, etc., will be replaced.

Electrical system and generator

- All the existing electrical systems including main electrical panels, local panels, cable/wires trays, etc., are to be replaced.
- Generator equipment including panels is to be repaired.

Automatic trash removal equipment

- Automatic trash rake and screen and horizontal/inclined conveyor are to be repaired. Replacement of some minor parts is to be included.

Water level gauging

- The existing water level gauging is to be replaced by new one of ultrasonic type.

The rehabilitation work items by each part are summarized in *Table 5.3.4*.

(4) 2 Stations of Escolta and Balete

The contents of rehabilitation works for the two stations are outlined as follows.

Main pump

- The existing submergible pumps at the two stations are to be converted into a gate pump type.
- The gate pumps are to be installed in the existing floodgates with due investigation of their mechanical durability.

Electrical system and generator

- All the existing electrical systems including main electrical panels, local panels, cable/wires trays, etc., are to be replaced.
- Generator equipment including panels is to be repaired.

Automatic trash removal equipment

- A small type automatic trash rake and screen and horizontal/inclined conveyor are to be additionally installed, if necessary, based on the technical investigation and analysis in due time.

Water level gauging

- The existing water level gauging facilities are to be replaced by a new one of ultrasonic type.

The rehabilitation work items by each part are summarized in *Table 5.3.4*.

(5) Summary of Quantity for Rehabilitation Works of Drainage Pumping Stations

Work categories and quantities of drainage pumping stations for rehabilitation works are summarized as follows.

- Technical investigation and analysis including overhaul: 12 stations
- Supply of spare part and consumable: 12 stations
- Rehabilitation works of pump equipment and appurtenant facilities: 12 stations

5.3.4 INSTALLATION OF ADDITIONAL HYDROLOGICAL EQUIPMENT

In connection with drainage improvement in the core area of Metropolitan Manila, additional hydrological gauging stations are to be installed in view of strengthening of the O/M activities for drainage facilities and pumping stations and accumulation of necessary data for further drainage improvement. The locations of the additional installation are proposed as shown in *Figure 5.3.1*.

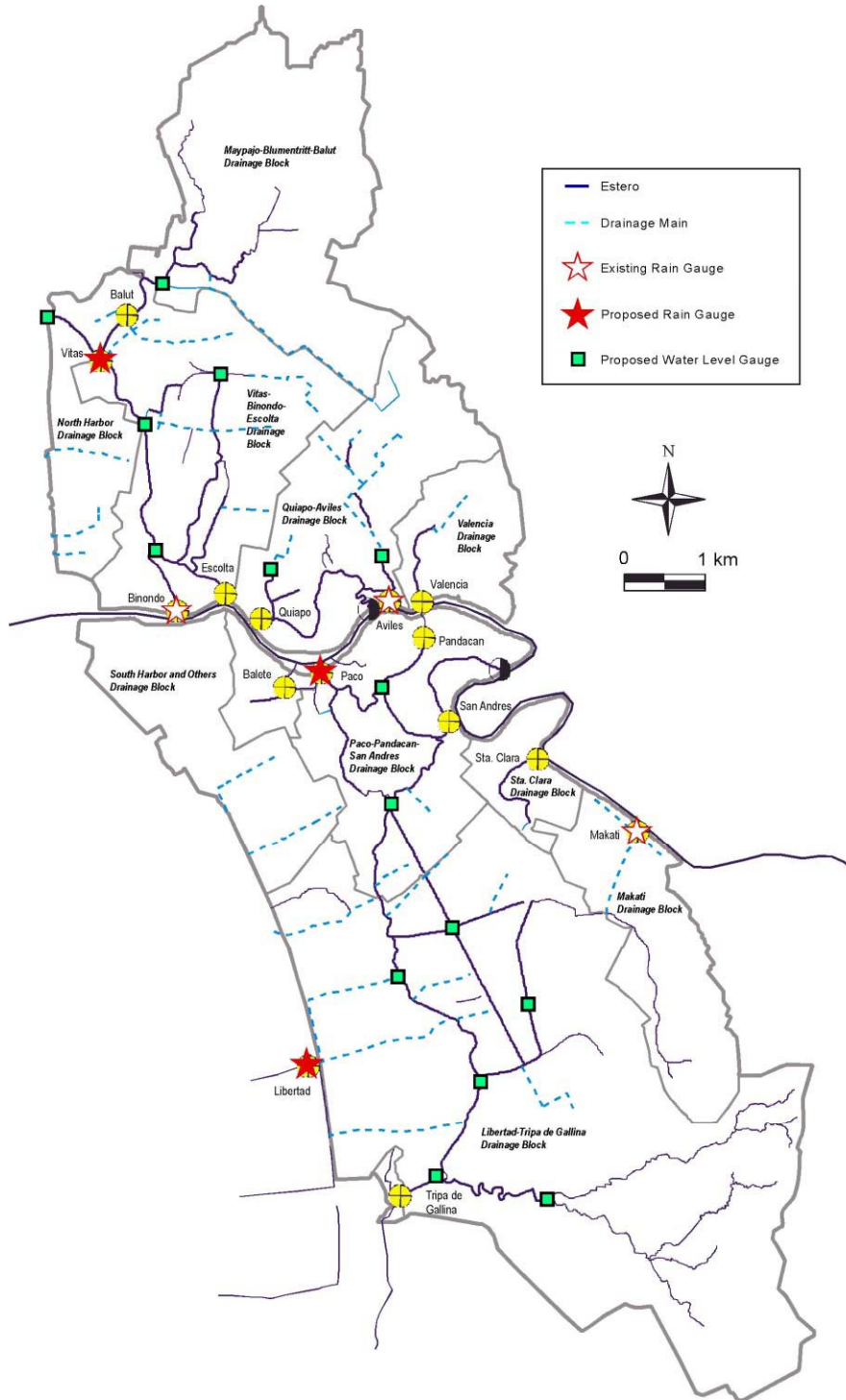


Figure 5.3.1 Locations of Additional Hydrological Equipment

(1) Observatory Network

Within the core area of Metropolitan Manila, available data on rainfall and water level is quite limited to conducting hydrological analysis. Only one station of Port Area is available for rainfall data, while water level data recorded are available at respective 15 drainage pumping stations. However, there exists no water level data in the major esteros. It is considerably important to observe and accumulate such rainfall and water level data for hydrological and hydraulic analysis such as rainfall patterns, total amounts, intensities and flow conditions of channels, in view of further future procedure for drainage improvement in the core area of Metropolitan Manila. In order to supplement such limited data, rainfall stations and water level gauges are to be newly installed. Such accumulated rainfall and water level data highly contribute to necessary procedure for future drainage improvement including effective operation of the present drainage channels and drainage pumping stations.

From this aspect, the additional rainfall observation stations are to be proposed at appropriate locations. Taking into consideration of space distribution of rainfall in the core area, the three stations are proposed at the respective drainage pumping stations of Vitas, Paco and Libertad as shown in *Figure 5.3.1*. The rainfall observatory equipment will be automatic rain gauges.

On the other hand, at 15 drainage pumping stations, water stages are recorded at 2 sides of inlet and outlet of the stations. However, no water stage data is presently available in the esteros in the core area of Metropolitan Manila. In order to supplement water stage data in the esteros, installation of staff-gauges is proposed. The proposed sites of staff-gauges will be 15 sites in the major esteros, which are connected to the drainage pumping stations as shown in *Figure 5.3.1*.

(2) Work Quantity of Rainfall and Water Level Observation Network

The work quantities of the observation network are summarized in *Table 5.3.5*.

Table 5.3.5 Work Quantity of Observation Network

Item	Work Quantity	Remarks
Rainfall gauging station	3 sets	Automatic rain gauge
Water stage gauging station	15 sets	Staff gauge

5.4 IMPROVEMENT OF OPERATION AND MAINTENANCE SYSTEM - COMMUNITY-INVOLVED OPERATION AND MAINTENANCE -

5.4.1 FRAMEWORK OF OPERATION AND MAINTENANCE (O & M)

(1) General

There are two approaches for O & M of drainage system such as structural O & M and non-structural O & M. At present, DPWH and MMDA use the structural O & M approach for not only drainage system but also other infrastructure. However, problems of O & M regarding drainage system are caused by mainly people's activities such as throwing waste and constructing illegal structures on esteros. Although people benefit from drainage system, people affect functions of drainage system at the same time. On the other hand, DPWH and MMDA have limited resources, technical capability and financial capability. In the Master Plan the existing O & M organizations and activities as well as the existing conditions of drainage facilities are studied, and the conclusion reached is that, in order to sustain the drainage system in the core area of Metro Manila, the existing O & M system should be improved and strengthened and the communities at barangay level should be involved for drainage improvement as a part of public participation. It is necessary to share responsibility between government agencies and residents. It is indispensable that residents and community be involved in O & M of drainage system, in order to foster shared responsibility and to get to know their opinions and ideas.

Therefore, community-based O & M should be practiced in order to achieve a safe and healthy barangay, and to create a better living environment of barangay through workable, sustainable and effective O & M for the people and by the people.

According to the results of the experimental research for community participation at the 3 pilot barangays along esteros, barangay people have a great potential of improving their barangays. The barangay people are also mostly positive and cooperative for improvement of their environment, including solid waste collection and cleaning esteros.

It would be practical and effective for improving and sustaining the drainage facilities in the core area to involve barangay communities. In this section, community-involved O & M system and activities are proposed.

(2) Expectations from Community-Involved O & M system

The expectations from the Community-Involved O & M system related to drainage are as follows:

- Institutional system and capability can be strengthened at community level;
- Socially acceptable, sustainable and effective solid waste management can be ensured;
- Prevention of illegal activities to ensure original functions of drainage system; and
- Improvement of people's awareness and manner through increasing people's ownership of system.

5.4.2 APPLICATION OF BARANGAY ENVIRONMENTAL MANAGEMENT ACTIVITIES TO OPERATION AND MAINTENANCE OF DRAINAGE SYSTEM

Based on the results of the experiment at the 3 pilot barangays for community participation described in *Chapter 6*, the barangay environmental management activities that include not only solid waste management but also the other components can be applied to the community-involved O & M. The barangay environmental management consists of the following components.

- Strengthening of Barangay Institutional System
- Community-Involved Solid Waste Management
- Community-Involved Pollution Control
- Beautification
- Information, Education and Communication (IEC) campaign

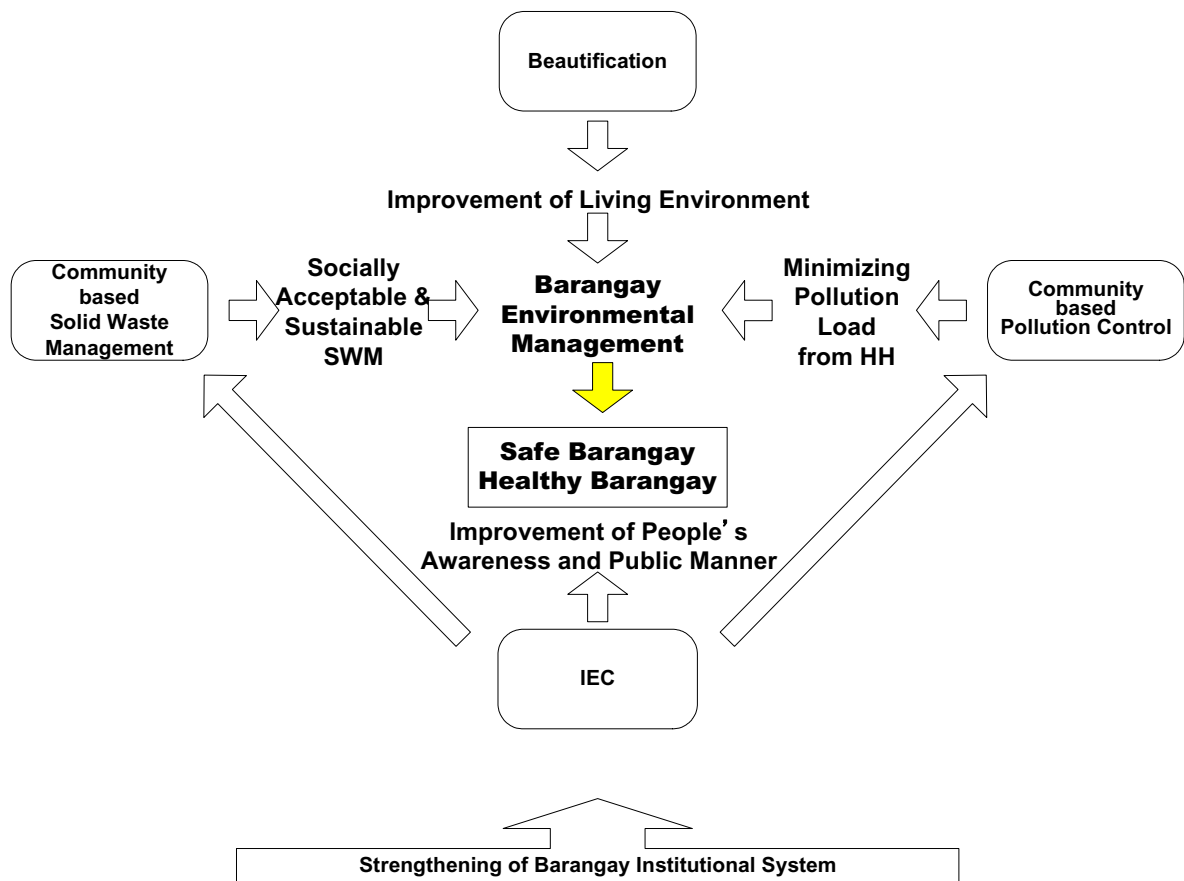


Figure 5.4.1 Structure of Barangay Environmental Management

5.4.3 ESTABLISHMENT OF INSTITUTIONS FOR COMMUNITY-INVOLVED OPERATION AND MAINTENANCE

Concept of barangay institutional system results from the Experimental Research (*see Chapter 6: Experimental Research for Community Participation*). Barangay institutional system provides fundamental framework for living environment and sanitary improvement of barangay through community-based O & M. Barangay institutional system for strengthening of barangay administration was already verified through Experimental Research. Its functions are very wide including living environment improvement, sanitation, public health and others. Proposed barangay institutional system is described in detail in Chapter 6 of Main Report. In this section, the focus is on O & M of drainage system.

(1) Structure of Operation and Maintenance

Administrative structure for O & M of drainage system is shown in *Figure 5.4.2*. O & M is divided mainly into two levels: governmental level and community level. At governmental level, DPWH and MMDA will implement O & M from viewpoint of structural or engineering aspects. Superintendents and Inspectors will be appointed by government agencies. They will monitor drainage system. At community level, on the other hand, mainly BEM and Team ESTERO can be involved in O & M. BEM will collaborate inspection of drainage system with Superintendents and Inspectors. BEM also will rally the involvement of residents for improvement of barangay environment through Community-Involved O & M including Community-Involved Solid Waste Management, Community-Involved Pollution Control, Beautification and IEC.

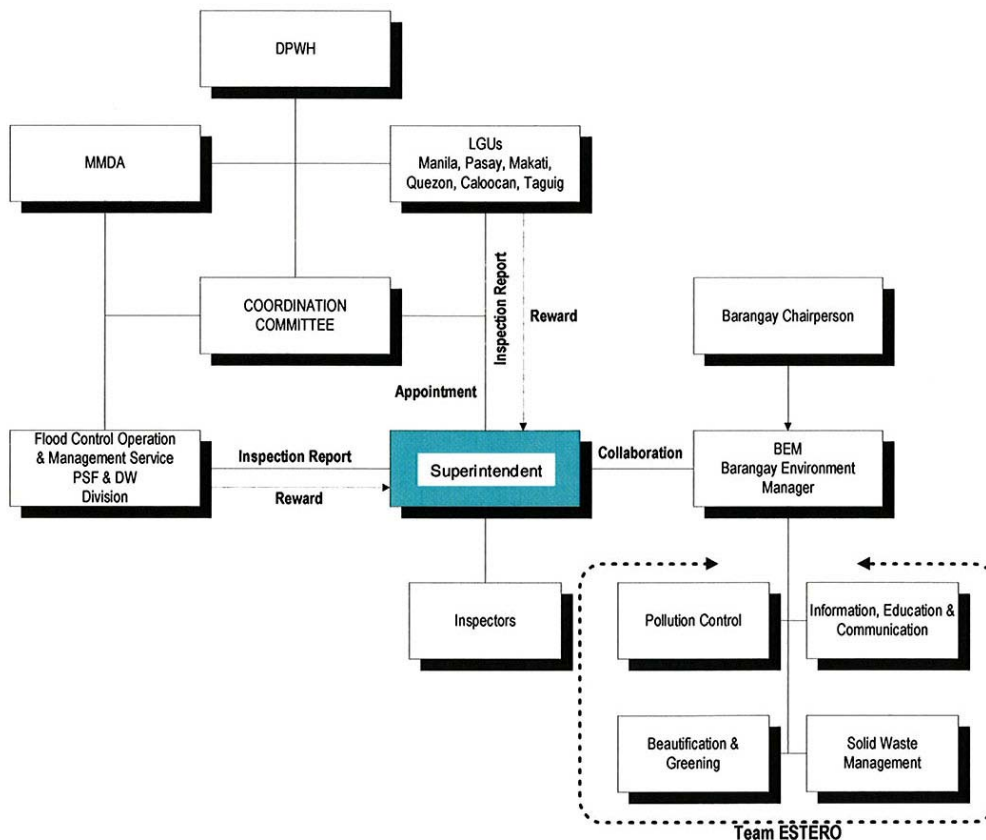


Figure 5.4.2 Administrative Structure of Operation and Maintenance

At Community level, BEM and Team ESTERO appointed by Barangay Chairperson will ease the way for residents to prepare a Barangay Environmental Management Plan. After authorization of Barangay Environmental Management Plan by Barangay Council (*Sungguniang Barangay*), this plan will be implemented by BEM and Team ESTERO with barangay people. *Figure 5.4.3* shows proposed Barangay institutional organization.

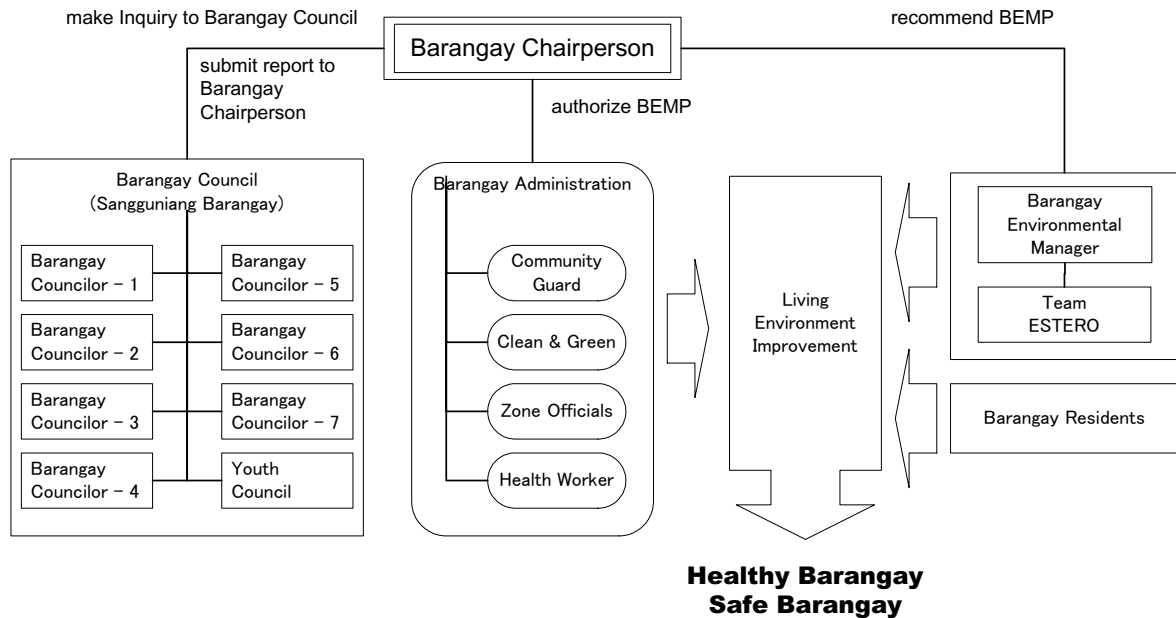


Figure 5.4.3 Proposed Barangay Institutional Organization

(2) Roles of BEM and Team ESTERO

In principle, Barangay Environmental Management aims to improve barangay living environment led by BEM and Team ESTERO. BEM and Team ESTERO have various roles (*see Chapter 6*). For only O & M of drainage system, BEM and Team ESTERO have the following roles:

Table 5.4.1 Roles of BEM and Team ESTERO

Barangay Environmental Manager (BEM)	Team ESTERO
<ul style="list-style-type: none"> - to promote Community-Involved O & M - to assist barangay people for preparation of Community-Involved O & M plan - to coordinate for O & M with superintendents and inspectors - to report conditions of drainage system to superintendent or inspector 	<ul style="list-style-type: none"> - to support BEM for planning of O & M - to assist barangay people for implementation of Community-Involved O & M

(3) Benefit of Barangay Environmental Manager and Team ESTERO

Barangay Health and Nutrition Officers are volunteers appointed by Barangay chairman. Barangay Health and Nutrition Officers disseminate information and educate barangay women in order to improve nutrition conditions and reduce risks of poor nutrition to pregnant women. BEM and Team ESTERO are also volunteers from barangay residents. The same system of Barangay Health and Nutrition Officer can be adopted for barangay administration.

Benefit should be provided to BEMs and Team ESTERO so that work could proceed smoothly, sustainably and effectively. *Table 5.4.2* shows a reasonable share of benefits for BEM and Team ESTERO members.

Table 5.4.2 Sharing of Benefit by BEM and Team ESTERO

	BEM	Per Member of Team ESTERO
From MMDA or DPWH	P 300	P 150
Related City Government	P 300	P 150
Barangay Administration	P 400	P 200
Total	P 1,000	P 500

It is possible that DPWH or MMDA provide financial support to BEM and Team ESTERO if barangay undertakes roles of DPWH and MMDA such as cleaning and monitoring.

(4) Development for BEM and Team ESTERO

There are 1,191 barangays in the study area, i.e. the Core Area. It is required, in the future, that Barangay institutional strengthening be expanded to the whole study area and Metro Manila from viewpoint of urban environment improvement. However, barangays located along esteros should be priority for introduction of the system. There are 376 barangays located along esteros. Therefore, it is required that this institutional system be introduced to 376 barangays until year 2020, phase by phase, as shown in *Tables 5.4.3* and *5.4.4*. This phasing is based on level of seriousness caused by thrown refuse and drainage network system.

Table 5.4.3 No. of Priority Barangays for Introduction of Barangay Environmental Management

Target Year	No. of Barangays for introduction of the System
Short-term 2005 – 2010	137 barangays
Mid-term 2011 to 2015	140 barangays
Long-term 2016 - 2020	99 barangays

Table 5.4.4 Priority Barangays for Introduction of Barangay Environmental Management System

Block_ID	Code	Name	Number of Related Barangays	Short-term 2005-2010	Mid-term 2011-2015	Long-term 2016-2020			
N01	NE01	Estero de Vitas (*1)	12	81		12			
	NE04	Estero dela Reina	23			23			
	NE05	Estero de Binondo	5			5			
	NE06	Estero de Magdalena	5			5			
	NE07	Estero de San Lazaro	16			16			
	NE08	Estero de Kabulusan	6			6			
	NE09	South Antipolo Open Canal	6			6			
	NE10	North Antipolo Open Canal	4			4			
	NE11	Estero de Tutuban	4			4			
	N02	NE12	Estero de Quiapo			8	47		8
		NE13	Estero de San Sebastian			3			3
NE14		Estero de San Miguel / Uli Uli	17	17					
NE15		Estero de Alix	2	2					
NE16		Estero de Aviles	2	2					
NE17		Estero de Sampaloc I	8	8					
NE18		Estero de Sampaloc II	4	4					
NE19		Estero de Calubcob	3	3					
N03	NE20	Estero de Valencia	12	12		12			
N04	NE02	Estero de Sunog Apog / Maypajo	36	50	36				
	NE03	Casili Creek	14				14		
S01	SE09	Estero de Tripa de Gallina (*2)	64	98	64				
	SE11	PNR canal	3				3		
	SE12	Calatagan Creek I	2				2		
	SE13	Calatagan Creek II	1				1		
	SE15	Zanzibar Creek	2				2		
	SE16	Makati Diversion Channel I	2				2		
	SE17	Makati Diversion Channel II	2				2		
	SE18	Dilain Creek / Maricaban Creek I	14				14		
	SE19	Maricaban Creek II	2				2		
	SE20	Estero de San Antonio Abad	5				5		
	SE21	Libertad Channel	1				1		
S02	SE03	Estero de Balete	4	4	4				
S03	SE01	Estero de Provisor	4	70	16	4			
	SE02	Estero de Tanque	1				1		
	SE04	Estero de Santa Banez	3				3		
	SE06	Estero de Paco	16				16		
	SE07	Estero de Concordia	5				5		
	SE08	Estero de Pandacan	36				36		
	SE10	Perlita Creek	5				5		
S04	SE05	Santa Clara Creek	7	7		7			
S05	SE14	Calatagan Creek III	4	4		4			
S06	SE22	Sto Nino Creek	3	3		3			
Total			376		137	140	99		

Source : a: JICA Study Team, b: SEDLMM database (2000)

Note : *1: This is included also in N04. *2: This is included also in S02.

5.4.4 COMMUNITY-INVOLVED SOLID WASTE MANAGEMENT

Community-involved solid waste management plan is described in *Chapter 4.4*.

5.4.5 COMMUNITY-INVOLVED POLLUTION CONTROL

(1) Objectives of Community-Involved Pollution Control

Illegal activities affect functions of drainage system in the core area. There are three serious problems as follows:

- clogging of water flow on esteros caused by thrown solid waste and unidentified substances;
- clogging of water flow caused by illegal structures; and
- water pollution of waterways by discharging of wastewater and suspended solids and deposited waste on esteros.

It is necessary to establish a prevention system against illegal activities in order to minimize pollution load. At present, sewage system and separation facility of rainwater and sewage have not been installed. Therefore, it is expected that pollution load will be minimized at household level in cooperation with people.

Community-involved pollution control aims:

- to prevent illegal activities such as throwing solid waste and constructing illegal structures; and
- to minimize pollution load at household level.

(2) Implementation of Community-Involved Solid Waste Management

One of the reasons for throwing solid waste into esteros is inappropriate solid waste collection system. This matter is dealt with in Community-Involved Solid Waste Management. Implementation of Community-Involved Solid Waste Management is described in *Chapter 4.4*.

(3) Community-Involved Prevention of Illegal Activities

1) Targets of community-involved prevention of illegal activities

Illegal activities targeted are as follows:

- throwing of solid waste by barangay people and other outsiders, and
- construction of illegal buildings/structures.

2) Establishment of watching system

Watching system for illegal activities should be established as shown in *Figure 5.4.4*. Residents should report to BEM and/or Team ESTERO any illegal activities they might have seen. BEM and Team ESTERO will give warning to persons who throw solid waste and construct structures within prohibited areas of those activities; at the same time, BEM will report to Barangay Chairperson. It is important that people recognize what are illegal activities, and hope they understand why these activities are not allowed.

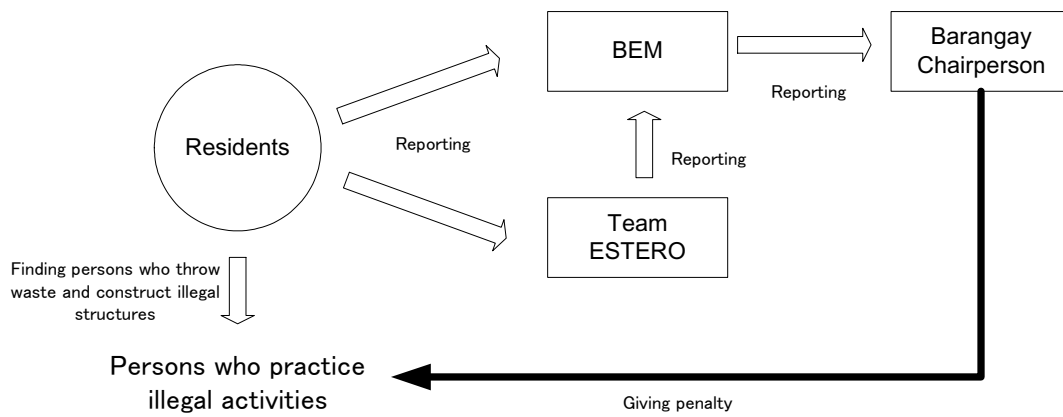


Figure 5.4.4 Watching System Against Illegal Activities

(4) Minimizing Pollution Load at Household

1) Targets of pollution load at household level

This subcomponent aims to minimize water pollution load such as suspended solids and organic matter of wastewater from households.

2) Promotion of community-involved pollution control

It seems that major water pollution sources of drainage channels are wastewater from households due to the absence of sewage treatment system and separation facility of rainwater and wastewater. A sewage treatment facility is very expensive, and so construction of one cannot be expected at present. There is a discharging standard of industrial wastewater though its enforcement is difficult. And it is more difficult to control household wastewater by government. Under this situation, only community participation is most effective way to minimize pollution load at household level.

3) Minimizing pollution load at household

The following are recommended to minimize water pollution load at household level:

Attachment of screen at sink drain

In order to remove suspended solids and organic matter from wastewater, a screen should be set at mouth of sink drain or corner of sink (see Figure 5.4.5). The screen can trap kitchen waste.

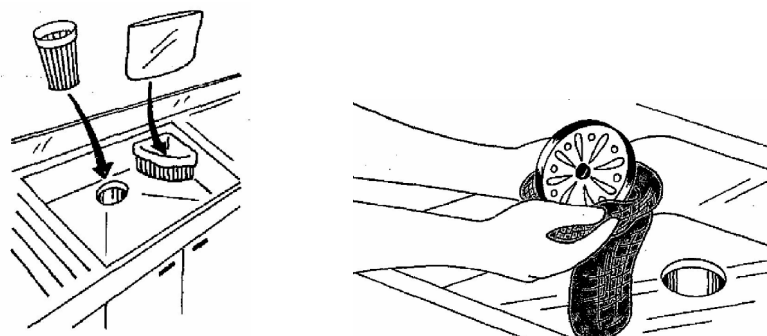


Figure 5.4.5 Setting-up of Screen at Mouth of Sink Drain

Appropriate disposal of kitchen waste

Kitchen waste and trapped kitchen waste by screen at sink drain and leftovers from meals should be collected and disposed of appropriately. It is necessary to promote collection of these kitchen wastes under waste collection system.

Information, Education and Communication (IEC)

IEC is a very important tool commonly found in other components. IEC plan is described in *Chapter 5.4.7*.

5.4.6 BEAUTIFICATION

(1) Objectives of Beautification

Sides of esteros are used for the following:

- area for minimizing the impact caused by human activities to drainage system; and
- area for public use and/or facilities.

In order to increase the value of barangay, area along esteros should be beautified. Beautification of esteros provides places of recreation and relaxation for barangay people. It is expected that beautiful esteros will serve as a deterrent to throwing of solid wastes.

(2) Formulation of Guidelines for Beautification

It is required that the guidelines for beautification be established for along esteros. The guidelines for beautification provide a standard and/or unified land coverage with vicinity areas. Beautification works can be divided into the following:

- cleaning maintenance roads along esteros
- cleaning roads and space by residents
- cleaning ditches by residents
- setting up plant/flower pods
- removing illegal structures and dilapidated things along esteros
- lighting along esteros for increasing amenity and security

The guidelines should include maintenance roads, sidewalks, estero planting and lighting, and signboard.

(3) Roles of BEM and Team ESTERO in beautification

Beautification is part of Barangay Environmental Management so that BEM and Team ESTERO are key players for beautification. BEM and Team ESTERO will act as facilitators of planning and implementation of beautification. However, it is important that BEM coordinate with responsible bodies for O & M of drainage system when BEM and Team ESTERO coordinate with DPWH and MMDA.

5.4.7 INFORMATION, EDUCATION AND COMMUNICATION (IEC)

(1) Objectives of IEC

Objectives of IEC are:

- to enhance people's knowledge of related regulations, function and problems related to drainage system; and
- to deliver to people the necessary information related to drainage issues at certain quality and volume by proper IEC tools.

(2) Targets of IEC

It is expected that IEC will effect changes in barangay people's awareness and behavior. Although mainly BEM and Team ESTERO will formulate and implement IEC plan, they are also one of several targets of IEC as listed below.

- Barangay chairperson
- BEM and Team ESTERO
- local leaders
- residents

(3) Recommended IEC Tools

It is not effective if only one tool will be used for IEC. Several tools for IEC should be used at the same time. Examples of IEC tools are:

- door-to-door communication campaign
- barangay workshop
- notice board and posters
- publication of brochures, primer and others
- other necessary tools

5.4.8 IMMEDIATE ACTION PLAN TO THIS YEAR

It was mentioned that BEM system would be extended to 137 barangays as priority barangays by 2010. It is necessary to implement BEM continuously without pause. DPWH should take the initiative regarding the following immediate Action Plan to this year, 2005, based on the Experimental Research for Community participation.

(1) Expansion to other Barangay

Neighboring barangays of Experimental Research will be designated at first year, year 2005, from viewpoint of effectiveness for improvement of estero's environment. BEM system will be expanded to the following barangays:

Table 5.4.5 Target Barangays of Expansion for This Year, 2005

Areas of Esteros	Barangays	
Estero de Maypajo	Manila	Brgy 199, Brgy 202
Tripa de Gallina	Makati	Brgy San Isidro
	Pasay	Brgy 43, Brgy 51

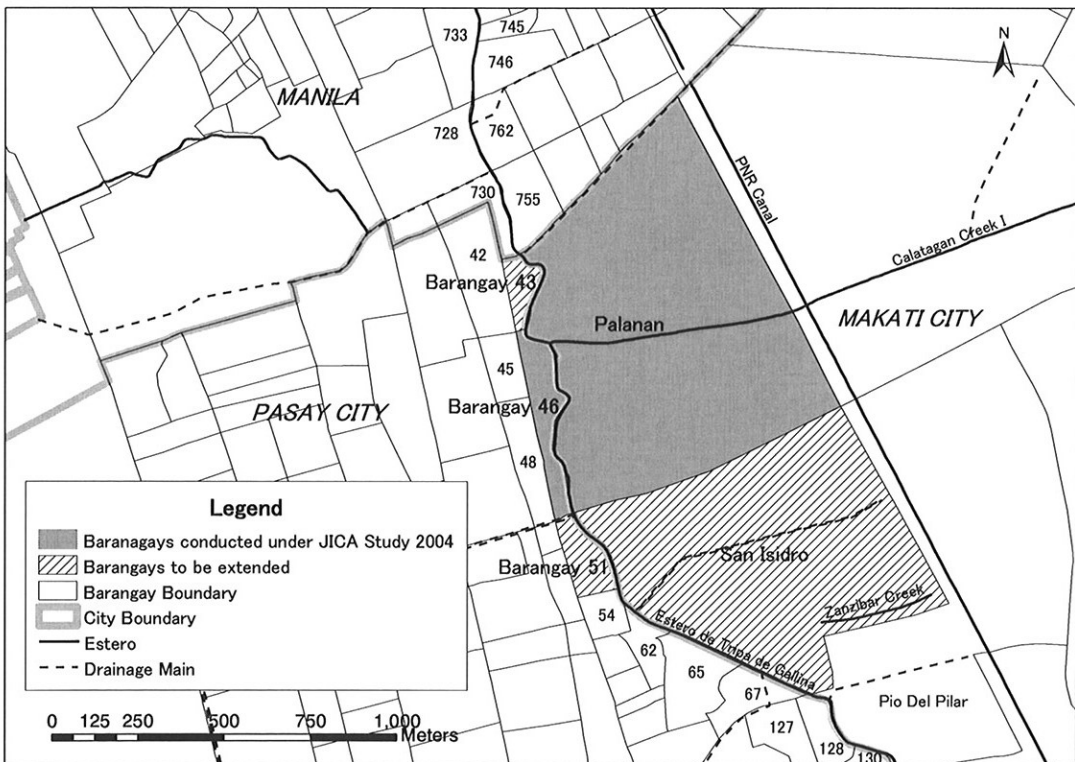
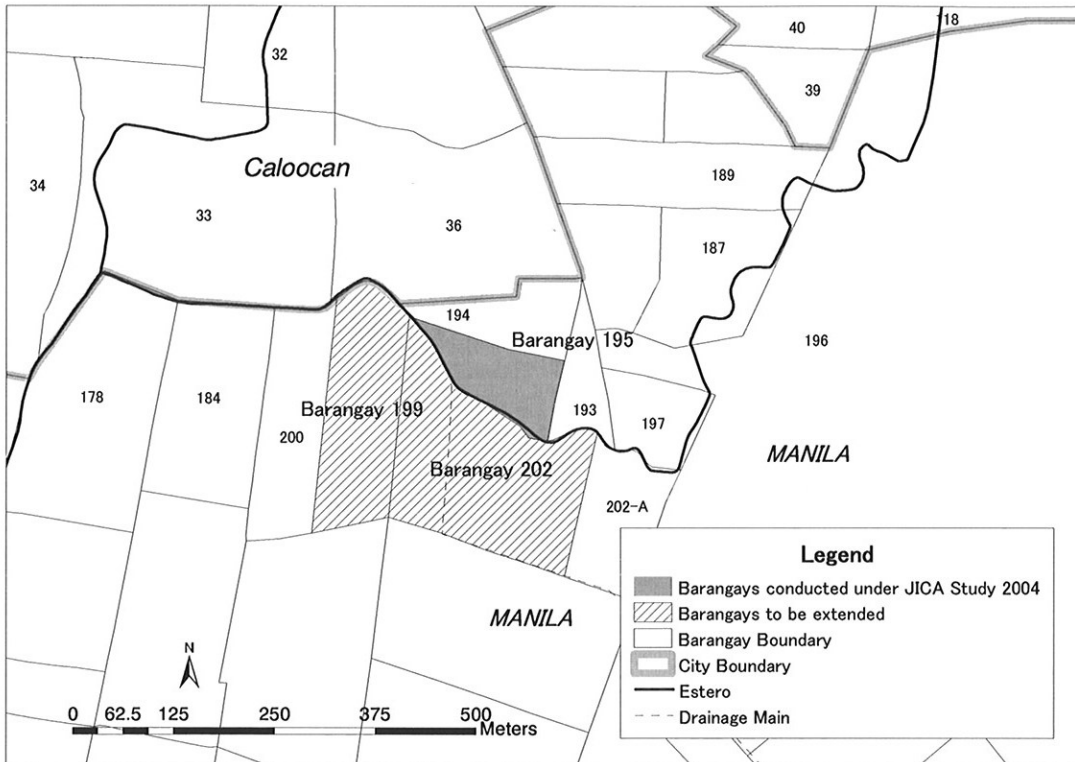


Figure 5.4.6 Location of Target Barangays for Expansion of BEM System in 2005

(2) Roles of related Agencies

DPWH should take the initiative of BEM system expansion because DPWH has know-how of BEM implementation. However, city/municipal governments and other related agencies, such as MMDA ,and Barangay chairpersons are also very important players.

The following related entities have the following roles in order to expand the BEM system:

Table 5.4.6 Roles of Related Entities for Expansion of BEM System, 2005

Related Entities	Roles for BEM System Expansion
DPWH	<ul style="list-style-type: none"> ■ To establish BEM-Team ESTERO Supporting Team under Planning Services, DPWH ■ To formulate Action Plan for BEM-ESTERO Expansion ■ To prepare Guidelines of BEM-ESTERO System ■ To arrange Coordination Meeting among DPWH, MMDA and City/Municipal Governments ■ To provide Training Seminar for BEMs and Team ESTERO members
MMDA	<ul style="list-style-type: none"> ■ To provide technical support for planning, implementation and monitoring of BEM ■ To provide financial support to barangays for O & M of drainage system ■ To implement IEC
City/Municipal Governments	<ul style="list-style-type: none"> ■ To establish Sub-Section which supports BEM-ESTERO regarding BEM ■ To coordinate City/Municipal Seminar of BEM-ESTERO expansion supported by DPWH ■ To assist Barangay Chairpersons and people for promotion of BEM-ESTERO System ■ To provide administrative, technical and financial support to BEM-ESTERO ■ To monitor activities of BEM ■ To implement IEC for the whole city or municipal area
Barangay Chairpersons	<ul style="list-style-type: none"> ■ To appoint BEM ■ To establish and appoint Team ESTERO under Barangay Ordinance ■ To support BEM Planning ■ To implement BEM Plan supported by BEM and Team ESTERO

(3) Process and Schedule of Expansion of BEM System

Process and schedule of BEM system expansion are shown in *Figure 5.4.7*. Expansion of BEM system should be commenced before July 2005. DPWH has already piloted some barangays for implementation of BEM system during the Experimental Research. In order to implement the BEM system smoothly, however, other agencies, such as MMDA, and city/municipal governments should be involved in immediate action plan, especially the governments of Manila, Makati and Pasay.

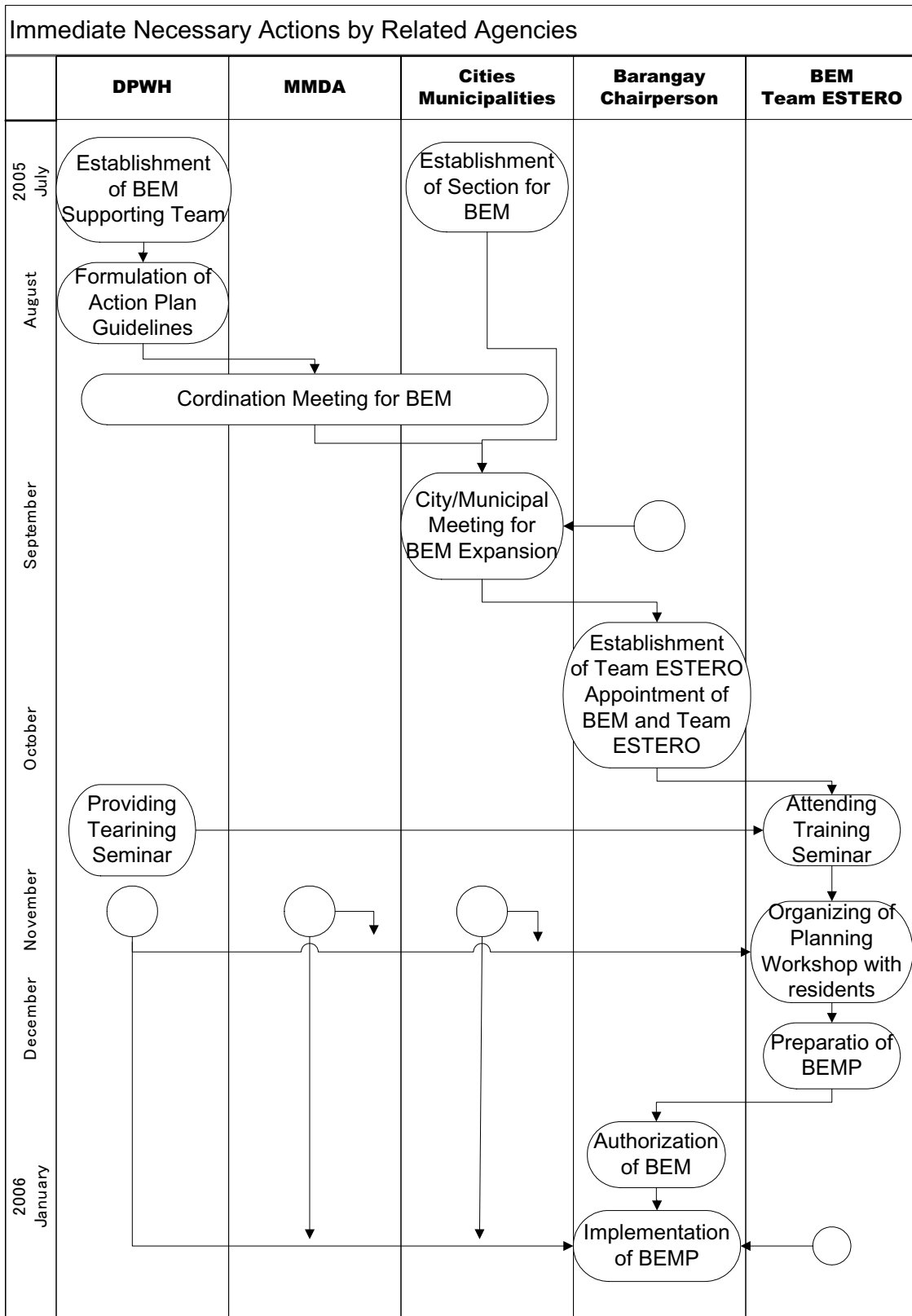


Figure 5.4.7 Process and Schedule of BEM System Expansion

5.5 CONSTRUCTION PLAN

The work items in the Priority Projects are divided into 3 categories: 1) dredging/declogging of open channels and closed channels of concrete box culverts, 2) construction of additional concrete box culverts and 3) repair/replacement of pump equipment and appurtenant facilities in the pumping stations. These works are basically carried out by contractors selected through international and/or local competitive biddings considering those work natures. In this chapter, a construction plan of the priority projects is explained.

5.5.1 OBJECTIVE WORKS OF PRIORITY PROJECTS

(1) Rehabilitation and Additional Works of Drainage Channel Facilities in North Manila

The priority projects in north Manila are summarized below.

Estero de Sunog Apog

- Dredging (Clearing): 91,600 m³

Blumentritt Interceptor

- Declogging of existing interceptor and related works: 9,800 m³
- Construction of additional interceptor by box culvert and remedial works: 2,570 m

(2) Rehabilitation and Additional Works of Drainage Channel Facilities in South Manila

The priority projects in South Manila are summarized below.

Estero de Tripa de Gallina, PNR Canal and Calatagan Creek I

- Dredging (Clearing): 47,000 m³

Buendia Outfall

- Declogging and related works: 7,200 m³

Zobel Roxas Drainage Main

- Declogging: 2,200 m³
- Construction of additional box culvert: 495 m

Pasong Tamo Drainage Main

- Declogging: 900 m³

Faraday Drainage Main

- Declogging: 100 m³
- Construction of additional box culvert: 1,314 m

(3) Rehabilitation and Additional Works of Drainage Pumping Stations

The priority projects for the drainage pumping stations in the core area of Metropolitan Manila are summarized below.

Drainage Pumping Station in North Manila

- Repair/replacement of pump equipment and appurtenant facilities: 5 drainage pumping stations

Drainage Pumping Station in South Manila

- Repair/replacement of pump equipment and appurtenant facilities: 7 drainage pumping stations

5.5.2 BASIC CONDITIONS FOR CONSTRUCTION PLAN

There are various factors and conditions for preparing a construction plan of the project works to be carried out. Such works are much affected by the natural factors, particularly the climate at the work site and availability of construction resources in and around the project area.

The following are the basic conditions adopted to formulate a construction plan and schedule under the contract basis in principle:

- Annual working days are assumed at 210 days for earthworks and 260 days for concrete and other works assuming the number of holidays and suspended days due to rainfall in the wet season.
- Working days and hours are set at 25 days per month and 8 hours per day in principle.
- Locally available construction resources are to be used as much as practicable. The following information was determined from local construction condition survey:
- Skilled and unskilled labors are available in the Philippines.
- The backfill materials will be purchased.
- A ready-mixed concrete factory of 40 m³/hr. production capacity is available.
- Construction equipment rental is available in the Philippines.
- Other construction materials, such as cement, reinforcing bar, and concrete aggregates are available
- Public electrical power is available at all construction sites.
- Water required for construction is also available.
- Construction works are assumed to be executed by competitive bidding.
- Water supply pipes across under the additional Blumentritt interceptor at Juan Luna Street and additional Faraday DM at South Superhighway are replaced with partial modification prior to construction works.
- Special attention should be paid to traffic control during construction works especially in work sites of construction of additional box culverts of Blumentritt interceptor, Zobel Roxas drainage main and Faraday drainage main.
- Dumping site is proposed at KAMANAVA area.

The dumping site is proposed to utilize an old fish pond at Malabon in the ongoing KAMANAVA Project. The dumping site is approximately 5 hectares and around 150,000 m³ in volume. The dumping site is located 15 to 20 km from the project site in the core area. *Figures 5.5.1 and 5.5.2* show the location of proposed dumping site.

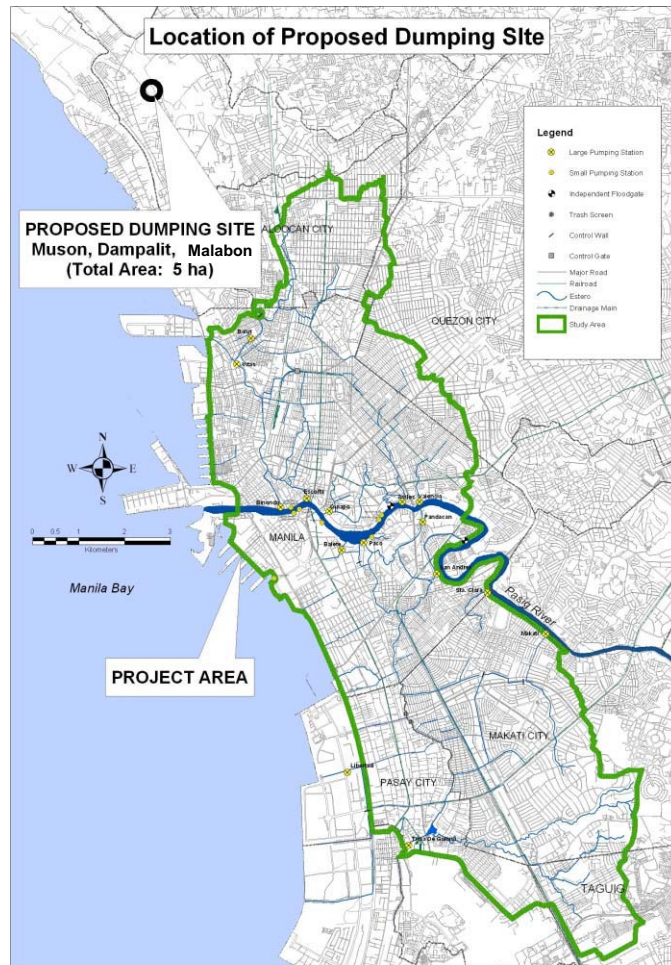


Figure 5.5.1 Location Map of Dumping Site

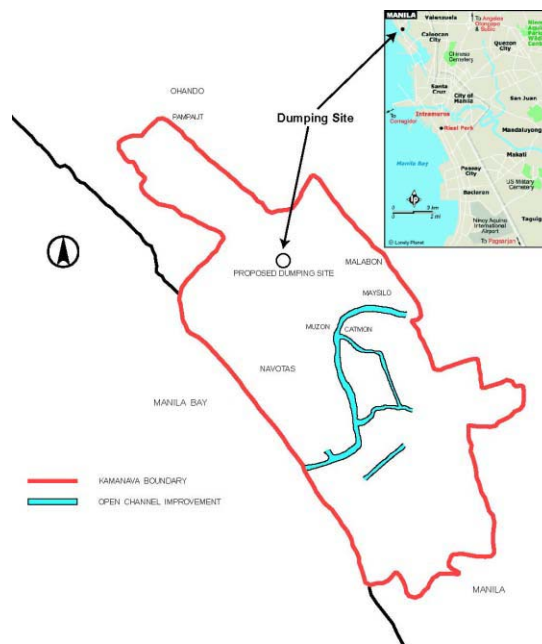


Figure 5.5.2 Detailed Location Map of Dumping Site

5.5.3 CONSTRUCTION METHOD

The rehabilitation and additional works of the drainage facilities are rather conventional consisting of dredging/declogging and construction of sub-surface box culverts. On the other hand, rehabilitation and additional works of pumping stations are highly and technically complicated and require modern technology. Major points for the construction method and plan are discussed below.

(1) Preparatory Works

1) Traffic Control

Since the construction will be conducted in the densely populated urban area of Metro Manila. Traffic control is an important issue and should be carried out duly during the construction in order to carry out the works efficiently and safely. The method of traffic control is closely related with the construction method of excavation, especially in crossing the South Superhighway. The excavation shall be carried out in open cut method for a half width of the road to cross the South Superhighway, as shown in *Figure 5.5.3*. And then, sheet piles should be installed for construction of culvert. After sheet pile installation, deck plates should be installed to make the vehicle passing possible. The excavation should be executed at night, and the road shall be closed at night for the area where the excavation be executed.

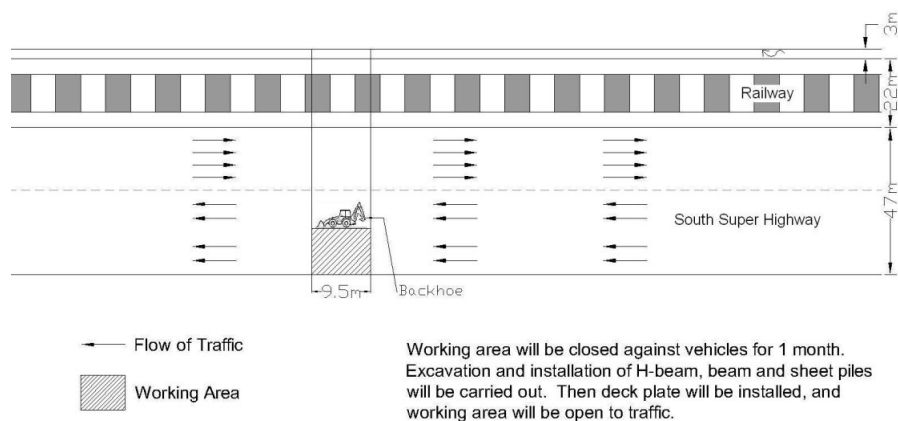


Figure 5.5.3 Traffic Control in South Superhighway

2) Relocation of MWSS Water Supply Pipe

There exist various underground facilities such as drainage pipes, water supply pipes and sewerage pipes. These facilities should be carefully checked when additional box culverts are design and constructed, especially the main water supply still pipe installed underneath the main streets in the core area from north to south. The relocation of water supply steel pipe shall be considered at two crossing points: one for the additional Blumentritt Interceptor and the other for Faraday Drainage Main (box culvert). The size of the water supply steel pipe is 2,200 mm in diameter and 25 mm thickness. The image of relocation of the existing pipe will be as shown in *Figure 5.5.4*.

The works are considered to take one month more or less, and water supply must be stopped several times during the construction... Therefore, further coordination with MWSS should be made during the detailed design and construction stage.

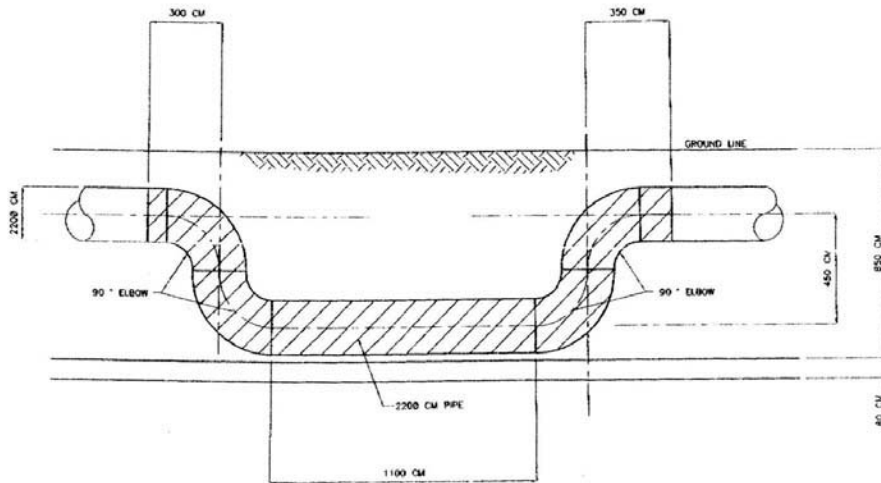


Figure 5.5.4 Image of Relocation of Water Supply Pipe

(2) Dredging Works

The dredging work should be carried out by using clamshell mounted on barge and hopper for a rather big canal such as Estero de Snog Apog. Bottom deposits heaped at the bottom of the canal should be loaded to the bottom door type hopper mounted on barge by a clamshell, and barge should be tugged by the tugboat to the designated point. And then collected material should be transferred to the dump truck by the truck crane. The dredged material should be dumped to Malabon dumping site which is around 15 km from the site. Dumping is basically allowed at night time from 21:00 to 6:00 in the morning.

For a small canal like Estero de Tripa de Gallina, PNR Canal and Calatagan Creek I, the dredging work should be carried out by manpower with a small loading equipment. The loading of bottom deposits should be done by manpower or by a small loading equipment like backhoe to the bottom door type hopper set at the canal bed. And then collected material should be transferred to the dump truck by the truck crane. The dredged material should be dumped to Malabon dumping site.

(3) Declogging Works

The declogging work can be executed without specific traffic control, but working reach of clamshell, approximately 2 m × 2 m, should be kept free.

The declogging work is basically to be executed by manpower using a clamshell. The proposed plan is to carry out the work section by section starting from the lower part. For box culverts with water level being high of a few meters such as Blumentritt Interceptor and Buendia Outfall, the stop log gates are planned to be installed as permanent structure at several points of the maintenance holes having an interval of about 400 m in length, and water in the culvert should be firstly pumped out to the water level of more or less 30 cm. Bottom deposits should be collected by a clamshell positioned at a maintenance hole, and loaded to a dump truck. The collected material should be dumped to Malabon dumping site.

The stop log gate is not required for the other 3 drainage mains of Zobel Roxas, Pasong Tamo and Faraday, since the water levels in the box culverts are as low as 30 cm or so. The declogging work should be carried out in the same manner as that of Blumentritt Interceptor.

(4) Construction of Additional Culvert

Excavation should be carried out in open cut method. Special attention is required to control traffic for construction of additional box culverts of Blumentritt Interceptor for a whole stretch and Faraday Drainage Mains especially at the South Superhighway, as already mentioned in the above (1). Prior arrangement with the concerned agency such as police department is required before the commencement of the work.

Firstly, excavation is made for construction of box culvert, while sheet piles are installed. During the excavation work, the road shall be closed for the half of the road width. After sheet pile installation, deck plates should be installed to make the vehicle passing possible. The excavation work should be continued in the same manner. Following the completion of excavation, concrete works should be commenced. The concrete should be placed in-site by using ready-mixed concrete by a concrete pump.

On the other hand, during the construction of box culvert, only one lane width out of 2 lanes should be secured free for vehicle passing for Zobel Roxas Avenue for construction of additional culvert of Zobel Roxas Drainage Main. The streets of Faraday and Finlandia need to be closed for construction of additional culvert, since the road is narrow and it is not possible to keep enough width free for vehicle passing.

(5) Rehabilitation of 12 Pumping Stations

The pump equipment and appurtenant facilities are repaired and replaced depending on the present functional conditions. For the objective 12 aged drainage pumping stations, the detailed rehabilitation work items of repair and replacement of pump equipment and apparatus by stations have been examined in this stage as mentioned in *Chapter 5.3*. In the next implementation stage, a further careful and thorough technical investigation and analysis including overhaul at 12 drainage pumping stations is to be conducted for formulation of a detailed rehabilitation program.

5.5.4 CONSTRUCTION SCHEDULE

(1) Packaging of Project

With due consideration of the respective work natures of the priority projects, the project works are divided into 3 lots with 11 packages carried out by contractors selected through local competitive biddings (LCB) and/or international competitive biddings (ICB). They are as follows.

1) Rehabilitation and Additional Works of Drainage Channel Facilities in North Manila (Lot I)

- Estero de Sunog Apog I (lower part): LCB
- Estero de Sunog Apog II (remained): LCB
- Blumentritt Interceptor: ICB

2) Rehabilitation and Additional Works of Drainage Channel Facilities in South Manila (Lot II)

- Estero de Tripa de Gallina, PNR Canal and Calatagan Creek I: LCB
- Buendia Outfall: ICB
- Zobel Roxas Drainage Main: ICB
- Pasong Tamo Drainage Main: LCB
- Faraday Drainage Main: ICB

3) Rehabilitation and Additional Works of Drainage Pumping Stations (Lot III)

- First group (Aviles, Quiapo, Valencia and Tripa de Gallina): ICB
- Second group (Pandacan, Paco, Sta. Clara, Libertad, Makati and Binondo): ICB
- Third group (Balete, Escolta): ICB

(2) Construction Schedule

For implementation of the Priority Projects in the core area of Metropolitan Manila, the fund arrangement including loan procedure and establishment of implementation organization of PMOs are firstly needed in the pre-construction stage. Subsequently, a selection of consultant is to be made for conducting detailed design for preparation of tender document and then, contractors are to be selected for carrying out construction works through local and/or international competitive biddings.

Considering such preparatory works, the construction time schedule is proposed as shown in *Figure 5.5.5*. The preparatory works are to be started in early 2005 immediately after completion of the Feasibility Study. The total construction period including the detailed design, procurement of contractors and maintenance period after completion of the respective projects is proposed at 5 years from 2006 to 2010.

As already mentioned, the rehabilitation works of open channel of estero, especially in the dredging of Estero de Sunog Apog, is of simple and conventional works, and that no resettlement of the formal and informal settlers is required in carrying out the object dredging works. In order to mobilize the project smoothly while awaiting fund arrangement including loan procedure, it is proposed to commence the works in early 2005 immediately after finishing the feasibility study through a selection of local contractor or by means of force account system by MMDA. The drawings for dredging works prepared by the Feasibility Study are available and enough for carrying out the dredging works. However, the resettlement of informal settlers is needed for the same nature of works of dredging of Estero de Tripa de Gallina, prior to the commencement of the dredging works.

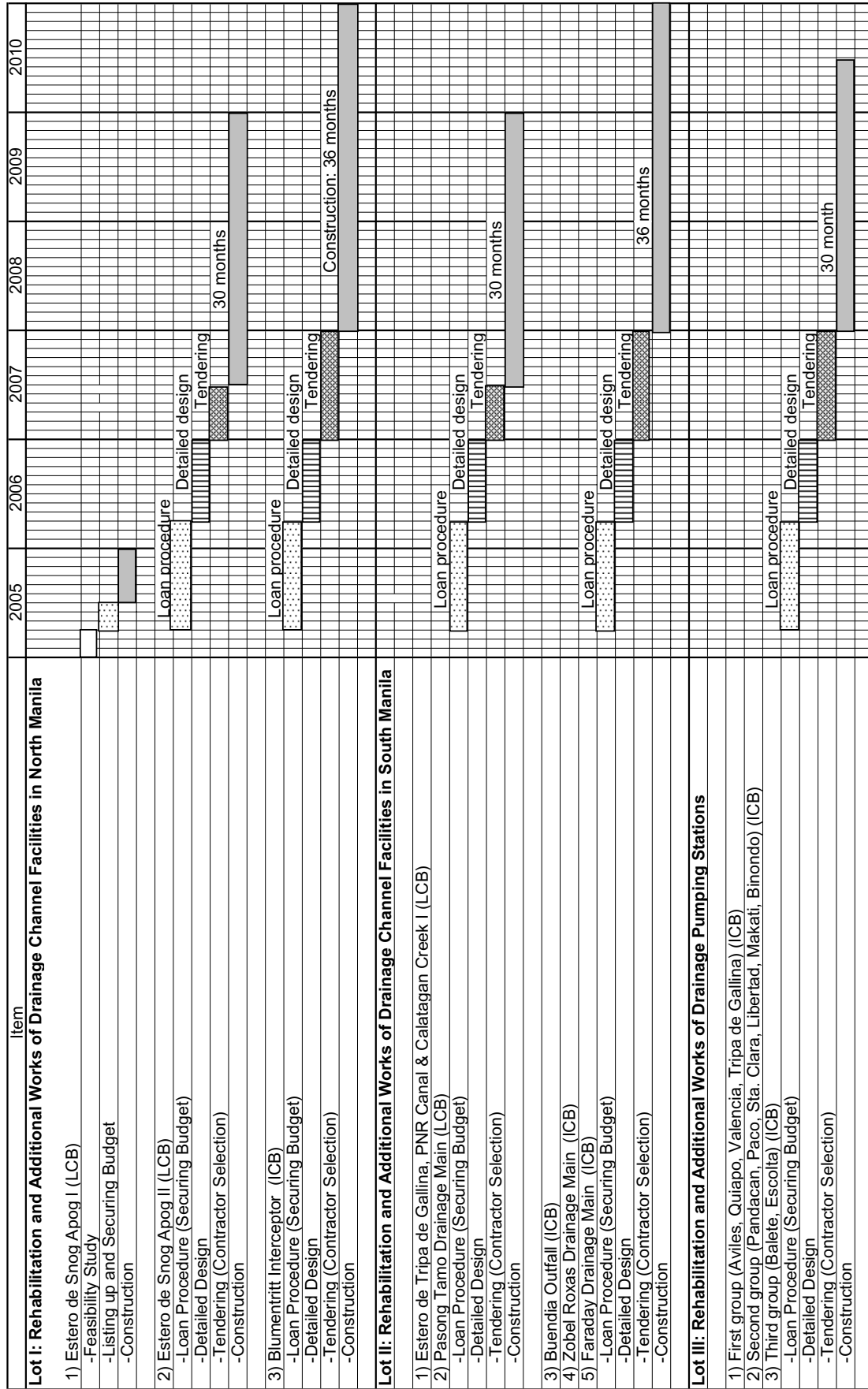


Figure 5.5.5 Construction Time Schedule

5.6 RESETTLEMENT ACTION PLAN GUIDELINE

This guideline is prepared as the base for the formulation of a Resettlement Action Plan (RAP) for the Priority Projects proposed in the Study but not for general use.

5.6.1 REQUIREMENTS BY JBIC

For the purpose of information JBIC's requirement in their "Guidelines for Confirmation of Environmental and Social Considerations" for the preparation of "Resettlement Action Plan", or "Resettlement Implementation Plan" has been referred.

JBIC requires the submission of a "Basic Plan for Resettlement" to confirm the contents of the plan before their appraisal. This basic plan has to be a separate and independent document with financial requirements that cover the items indicated in the Guidelines.

In case the basic plan has not been submitted before the time of appraisal by JBIC, the appraisal shall be postponed until the submission of the basic plan is confirmed.

5.6.2 BASIC PRINCIPLE

Resettlement operation and assistance is totally a combination play that requires good coordination among different government agencies, local governments, NGOs, implementing and executing body and the people who are directly affected by a project, in this particular case, the Priority Projects of "Drainage Improvement in the Core Area of Metropolitan Manila, Republic of the Philippines."

It should be well understood that some parts of the Resettlement Action Plan will have to be formulated on assumption only, especially the part of post-relocation livelihood requirements which needs careful analysis of the survey and good planning, because this part shall be prepared on the basis of socio-economic survey, but not on the basis of thorough, direct and repeated consultations with the Project Affected People (PAP).

The Resettlement Action Plan must be of a concrete and practical one. The type of plans that looks nice and beautiful on paper but not followed in reality should be avoided. If the Plan lacks practicability and clarity the Plan shall end up as simply a plan.

5.6.3 OBJECTIVES OF THE GUIDELINE

The objective of preparing a Resettlement Action Plan should be to clarify the responsibilities of concerned bodies: government agencies, LGUs, NGOs and the implementing (or executing) agency during the operation of resettlement of project affected people who have to move out from their present houses. The mandates of each party in the operation are described by the stipulations of RA 7279, which is presented in Chapter 4.6 *Spportig Bpot I* and the summary of the mandates by agencies shown in *Ab 14.1*, *Esportities forat* *geies.*"

The Plan must, therefore, clearly tell who should do what, when and how for each step of resettlement operation, so that the entire operation may be smoothly carried out at the time of actual relocation and resettlement.

The Plan also must be prepared aimed at maintaining, at least, or improving, if possible, of the present living standards and conditions of the PAP.

One other important objective of preparing the Resettlement Action Plan is to estimate the financial requirements of the resettlement operation. Each step of the operation must have a calculation of estimated cost with the information on expected fund sources.

5.6.4 METHODOLOGY

There are no specific guidelines for the preparation of a Resettlement Action Plan by, for example, a funding agency such as JBIC. Accordingly, the framework and structure of the plan has to be determined by the planner or writer of the Plan.

However, the Resettlement Action Plan should be formulated in accordance with the resettlement procedures stipulated by RA No. 7279, because all the resettlement operation should follow this Act in the Philippines.

The Resettlement Action Plan shall be formulated on the basis of the Social Development Plan, which is prepared in the course of an EIA. Special importance of the Social Development Plan is the part of socio-economic survey that requires 100% coverage of the directly affected families, in this case, whose structures are encroaching into the Estero de Tripa de Gallina and therefore who are required to transfer to elsewhere. The method of the survey should be a house-to-house survey by the use of a questionnaire prepared and tested in advance.

The survey has to be conducted by well-experienced people with the permission of each barangay and, if possible, accompanied and assisted by a barangay official, because some of the areas where those informal settlers reside are dangerous; there might be people who would be suspicious of the survey or would try to interrupt the survey.

5.6.5 RESETTLEMENT ACTION PLAN GUIDELINE

(1) Items and Contents to be Included

The Action Plan may include, at least, the following items and contents:

- Rationale and Objectives
- Project Description that includes its Scope and Schedule
- Scale and Types of Impacts
- Legal Bases
- Resettlement Site
- Socio-Economic Profile of the Affected Families and Communities
- Setting of Cut-Off Date
- Compensation
- Demolition Date
- Public Consultation and Hearing
- Options for Resettlement Assistance
- Post-Relocation Assistance for Reconstruction of Livelihood
- Provision of Social Services
- Grievance and Complaints
- Monitoring

- Funds sources

(2) Considerations Required

Particular considerations are required for the preparation of the Resettlement Action Plan for the following parts. Again, the plan for each operation should tell who is responsible, how the operation shall be done, when it shall be done, who shall and how many people shall be assigned for the task, how the plan should be coordinated and with whom, and importantly how much financial resources shall be required for the operation.

In order to have a clear picture of the Plan, first requirements are to draw:

- a flow chart of the resettlement operation plan by step of tasks;
- a matrix to explain what section of responsible organization(s) will work on each component/step/task and how many staff members shall be assigned;
- what kinds of groups shall be organized at the barangay level and the government level to assist the PAFs (Project Affected Families) on resettlement – Task Force, Inter-Agency Committee and Monitoring Team – and their duties.

(3) Preparation of the Plan

1) Resettlement Site and Preparation of Resettlement Site

The acquisition of a resettlement site to relocate directly affected families who are required to move out from their present houses is a prerequisite condition for the implementation of the subject priority project. Therefore, the first, and one of the most important factors of the Resettlement Action Plan, is to explain the status of land acquisition of resettlement sites.

If a resettlement site has not been found at the time of writing the plan, at least, there must be a candidate site or sites. If not even a candidate site is presented, the priority of loan provision from a funding agency shall be very low.

a. Plan for Land Acquisition

- What agency or body will initiate the search for appropriate land?
- How do the proponent LGUs, recipient LGUs, NHA and project proponent plan to coordinate for acquisition?
- Where are the candidate sites for purchase?
- Who will purchase the land and what shall be the cost of acquisition or compensation, if any, required?
- Will the acquisition involve CMP (Community Mortgage Program)? If so;
 - ◆ What are the necessary preparations for CMP?
 - ◆ Who will facilitate, coordinate or prepare the necessary procedures?
 - ◆ What are the conditions or qualification of PAP for joining the CMP?
- How long will it take to develop the land with basic infrastructure?
- When shall the construction of socialized housing be completed?

b. Description of the Site and Surrounding Environment

- Present the description of the site including physical and social environments

surrounding the site, availability of access roads, market places, schools, clinics or access and transportation to the Metro Manila area.

- And then, explain the plan that will be prepared within the site in addition to the required basic infrastructure. Are amenities such as, multi-purpose hall, a small park, a day-care center/ kindergarten, a church, and a market planned?

c. Plan for Site Development and Basic Infrastructure

- Explain the plan as to who will develop the site and to what degree?
 - ◆ The Plan should include access roads, sewerage system, electricity, water supply, and health clinic etc.
 - ◆ Would the water or electricity reach to each house or only to the primary or secondary level?, and should the tertiary level be borne by each family?
 - ◆ If so, approximately how much shall each family bear?

d. Plan for Preparation of Socialized Housing

- Some of the resettlement sites are prepared only the land and basic infrastructure but not houses. In such cases, the resettlers themselves have to build own structures. However, the policy of RA No. 7279 and of the DPWH is to provide a site and a low-cost socialized housing to the PAP who do not own a house and land.
- For the above reason, the Resettlement Action Plan in this case should include the provision of low-cost socialized housing. A clear and detailed plan has to be prepared as to how the PAFs will acquire the socialized housing.
 - ◆ Qualification and eligibility criteria for awarding the low-cost socialized housing
 - ◆ Description of the house: size, floor plan, housing materials, furnishings, proximity to various establishments and transportation system, etc.
 - ◆ If CMP is involved, clear information must be given to the families joining the program – what is CMP, how the program works, necessary procedures, duration of repayment, terms of repayments, how to prepare a contract, etc.
 - ◆ Various responsibilities of the PAP

e. Acceptance by the PAP

- Invitation of the PAP to the candidate site and explanation to them of the conditions surrounding the area
- Acquisition of the land upon the acceptance of the PAP
- How the acceptance by the PAP shall be assured

f. Acceptance by the Recipient Community

- There must be a plan as to who will be responsible for the task of explaining the coming of informal settlers and ask for their acceptance at the recipient community, at what timing and how to obtain the acceptance of the community.

2) Socio-Economic Profiles of Project Affected Families and Communities

As previously explained, the house-to-house socio-economic survey, which shall be conducted in the course of EIA, is extremely important because the post-relocation livelihood/income increase programs plan shall be derived from the results and analyses of this survey.

a. Overall Existing Conditions of Project Affected Families (PAFs) and Communities

Results of the survey shall be presented first.

- Barangays directly affected by the Priority Projects
- Explain who are the PAP and their numbers
- Classification of informal settlers and their numbers – renters, owners, etc.
- Qualification of PAP who will be recognized as recipients of a socialized housing in a resettlement site and their numbers
- PAFs general profiles
- PAFs family compositions
- PAFs housing conditions
- PAP educational level and occupational skills
- PAFs financial situations and income levels

b. Analyses of the Above Findings

3) Setting of a Cut-Off Date

- When and how the cut-off date is/shall be set
- What is the indication of the cut-off date to be notified to the people

4) Compensation

a. Compensation for Structures

DPWH's Resettlement Policy indicates that, "Owners of structures, including shanty dwellers in urban areas, have no title or tax declaration to the land because it is government land", are entitled "No compensation." But government (NHA) in coordination with LGU and implementing agency shall establish and develop squatter relocation sites in accordance with RA 7279. The concerned LGU shall provide/administer the relocation site".

Accordingly, the compensation for the structures are not paid but socialized housing must be made available.

b. Compensation for Lost Businesses

The Policy, however, does not indicate whether lost businesses that are being carried out in such structures shall be compensated or not. There may be families who are doing business on the public lands and in illegal structures.

- The Plan has to state whether those who are doing business in the informal structures on public land are eligible for compensation or not

- If yes:

- ◆ What agency will be responsible for examining and deciding it
- ◆ Those who are qualified for the compensation and who are not qualified
- ◆ What types of businesses are qualified on what bases
- ◆ How the compensation will be calculated
- ◆ Who will pay the compensation in what manner and when

5) Demolition and Notification

The demolition date has to be notified in advance in accordance with RA No. 7279 to all informal settlers who have to move out, so that all PAP are well aware of their relocation date and are able to prepare for it. The notification has to be clear, easily understandable and accessible by the people.

- Who will be responsible for notifying the PAP of demolition date

- How the notification will be done

6) Plan for Public Consultation and Hearing

A thorough public hearing and consultation with PAP is conducted during the EIA study, but only scoping sessions. However, it should be noted that this process is one of the most essential parts of the resettlement operation. All the PAP must be well informed of the project that they might have to move out, what assistance they can expect from the governments, and what options they are allowed, etc. Similarly, the PAP should be able to have opportunities to express their opinions, agreements or disagreements, and make requests. In the past, lack of this process resulted in the misunderstanding, dissatisfaction or distrust on the side of PAP.

A good social preparation only comes from repeated and careful communication with the PAP.

A careful plan to prepare for communication and information with PAP is needed. (A sufficient number of skilled staff members that are specialized in communicating with people must be assigned).

- Who are the responsible agency(ies)/group(s) that directly come into contact with the PAP:

- ◆ How they will explain the project, need for relocating the PAP, who are PAP, etc.
- ◆ Who, how and where they explain on resettlement; its procedure, the site, available options, government assistance at what stage
- ◆ Solicit PAP's opinions, their requests, and how to come to agreement with them

7) Options for Resettlement Assistance

- Information on the options for resettlement must accompany the plan:

- ◆ Who is responsible for informing the options to the PAP, when it will be done and how
- ◆ People's responsibility when PAFs opted for lump sum money
- ◆ If opted for "back to province", what preparations are required, who will do them and how
- ◆ The method of calculation, who will pay, when and how the disturbance fee will be paid

8) Post-Relocation Assistance for Reconstruction of Livelihood

The importance of the post-relocation arrangements is repeatedly emphasized. Without a good and practical plan for the assistance, resettlement of the PAP cannot be assured.

a. Required and Proposed Skill Training and Programs

- According to the findings of the survey on the existing conditions of the PAP, various plans for required skill training and programs have to be formulated. These plans necessitate great care because the post-relocation livelihood arrangements and implementation of them is the key for the resettled people to stay or not.

The Plan should include at least:

- ◆ What kinds of training and programs are planned and why
- ◆ Who will be responsible for each training/program – what section of what agency
- ◆ How many staff shall be assigned, how and where training shall be given
- ◆ How long they will be continued
- ◆ What will be the budgetary requirement for the program and its source
- ◆ Expected outcomes/how to connect the training to job opportunity/income increase
- ◆ The plan to maintain their present occupations – securing of transportation
- ◆ What are the people's requests for reconstruction of their livelihood
- ◆ The way to conduct job market research and analysis of appropriate and possible industry to induce or to invite

b. Programs and Projects for Improving Living Environment

- What kinds of programs will help to improve their living conditions

- ◆ Who will provide assistance
- ◆ What will be concrete programs and rationality of them
- ◆ How will they be implemented
- ◆ How long will they be continued and why
- ◆ What will be budgetary requirements from where and how

9) Provision of Social Services and Amenity

The provision of social services is generally the responsibility of Recipient LGU by the staffs of regional offices of each department and in some cases DSWD. The social services include:

a. Education

- Explain the availability of schools and proximity – elementary school, secondary school, high school – at the resettlement site and in neighborhood communities
- The plan to provide education of the children of resettled families, construct a new school or incorporate them into existing schools. If newly construct:
 - ◆ Who is responsible for planning the construction
 - ◆ Who will construct it, and when it will be constructed
 - ◆ Who will finance it
- Availability of sports facilities for youth

b. Health Care

- Existing conditions of healthcare facilities in the resettlement site and surroundings
- The plan as to how to provide health care for resettled people – available health and medical facilities already exist, or construct a new clinic
- Availability of day-care center, how the care shall be given to necessary families

c. Amenity and Improvement of Living Environment in Community

- How to maintain market place for daily needs/encourage small businesses
- A church in the neighborhood or construct a new one, and how
- Any plan to form community organizations to improve living environment
- A place like multi-purpose hall for community, a park or a playground

10) Place for Grievance and Complaints

A plan to arrange the place for grievance and complaints for the resettled people needs to be included.

- What organization will be responsible, where it will be established
- How easily available for the people, proximity and open hours, is it free of charge
- What kinds of assistance will be available, what measures will be taken

11) Monitoring (Preferably by a Third Party Organization)

The monitoring of the resettlement operation is preferably conducted by a third party organization so that distrust of the people toward the government, if there is, may be avoided.

In fact, a Multi-partite Monitoring Team (MMT) shall be formed immediately after the issuance of Environmental Compliance Certificate (ECC) by DENR. However, this

MMT will only be organized for the construction phase and will not function throughout the project life. Accordingly, a separate third-party multi-partite monitoring team that can monitor the entire resettlement operation throughout the project life must be established at the initial stage of the project.

- What organization will monitor the resettlement operation, set up of a team
- Method, types and duration of the monitoring
- How the monitoring shall be evaluated
- How to feed back the results of the evaluation
- Monitoring on people's living standards

12) Funds sources

A Resettlement Action Plan is normally required by financing agencies for budget requirements. Because of this, a cost estimation of the resettlement operation is an important element of the plan.

In case the Government of the Philippines (GOP) requests a loan from JBIC, a certain portion of the project cost must be borne by the GOP, in this case, somewhere around 15% to 25%. Some components of the social costs such as land acquisition, and construction of socialized housing or salaries for necessary personnel have to be shared by the GOP. However, some part of the budget requirements,, such as land development and construction of infrastructure, or post-relocation livelihood programs and various sorts of consulting fees may be included in the loan requirement.

Thus, the Plan has to indicate the expected sources of required costs.

- A list of possible sources of funds
- Cost requirements for each component or operation
- Expected fund sources of each operation

5.7 PROJECT COST

5.7.1 GENERAL

The project cost for the priority projects is summarized below. The project cost consists of 1) civil works cost, 2) VAT, 3) resettlement and compensation cost, 4) government administration cost, 5) engineering services cost, 6) physical contingency and 7) supporting measures cost for BEM and Team ESTERO activities and IEC campaign. Aside from the above costs, annual cost for O & M activities for drainage facilities and pumping stations is separately estimated and the results are also shown below.

5.7.2 MAIN CIVIL WORKS COST

The main civil works direct cost of the priority projects including installation cost of equipment and facilities for effective O & M activities is estimated at Php3.25 billion and is broken down as follows (the details are explained in *Supporting Report G*).

- Total main civil works cost: Php3,252.5 million
- Rehabilitation and additional works of drainage channel facilities in North Manila: Php750.3 million
- Rehabilitation and additional works of drainage channel facilities in South Manila: Php458.1 million
- Rehabilitation and additional works of drainage pumping stations: Php2,005.0 million
- Installation of equipment and facilities for effective O & M activities: Php39.1 million

Further details of the respective civil works consisting of 3 lots with 11 packages are shown in *Table 5.7.1*.

Table 5.7.1 Civil Works Costs of Respective Works

Sub Project	Civil Works Cost (million Pesos)	Procurement of Contractor /Equipment
Lot I: Rehabilitation and Additional Works for Drainage Channel Facilities in North Manila		
1. Estero de Sunog Apog I - Dredging	<u>20.4</u> 20.4	LCB
2. Estero de Sunog Apog II - Dredging	<u>166.7</u> 166.7	LCB
3. Blumentritt Interceptor - Declogging of existing Blumentritt Interceptor - Construction of additional Blumentritt Interceptor	<u>563.2</u> 43.6 519.6	ICB
4. Sub total	750.3	
Lot II: Rehabilitation and Additional Works for Drainage Channel Facilities in South Manila		
1. Estero de Tripa de Gallina, PNR Canal and Calatagan Creek I - Dredging	<u>87.5</u> 87.5	LCB
2. Buendia Outfall - Declogging	<u>43.5</u> 43.5	ICB
3. Zobel Roxas Drainage Main - Declogging - Construction of additional box culvert	<u>54.9</u> 7.5 47.4	ICB
4. Pasong Tamo Drainage Main - Declogging	<u>2.9</u> 2.9	LCB
5. Faraday Drainage Main - Declogging - Construction of additional box culvert	<u>269.3</u> 0.3 269.0	ICB
6. Sub total	458.1	
Lot III: Rehabilitation and Additional Works of Pumping Stations		
1. Rehabilitation of 12 Pumping Stations - Group 1 (Aviles, Quiapo, Valencia, Tripa de Gallina) - Group 2 (Pandacan, Paco, Sta. Clara, Libertad, Makati, Binondo) - Group 3 (Escolta and Balete)	<u>2,005.0</u> 1,057.0 880.0 68.0	ICB
2. Sub total	2,005.0	
Installation of Equipment and Facilities for Effective O & M Activities		
1. Emergency O & M equipment	<u>39.1</u> 37.6	ICB
2. Rainfall and water level observation facilities	1.5	
3. Sub total	39.1	
Grand Total	3,252.5	

5.7.3 COST FOR OTHERS

(1) Cost for Resettlement

The required direct cost for the resettlement of the informal settlers residing in the objective channels is estimated at Php192.2 million, assuming that the number of families to be resettled is 700.

- Total resettlement cost:	Php192.2 million
- Resettlement cost excluding land acquisition cost:	Php164.1 million
- Land acquisition cost for relocation site:	Php28.1 million

Note: Considering price increases, unit price of the cost for resettlement, excluding land acquisition costs are assumed to be Php234, 472/ family.

(2) Cost for Compensation for Additional Works

Compensation cost during the construction stage of the additional works is estimated at Php19.1 million and broken down as follows.

- Total compensation cost for additional works:	Php19.1 million
- Land acquisition:	Php2.3 million
- House compensation:	Php16.8 million

(3) Cost for Community-Involved Solid Waste Management

For the sustainability of the drainage system in view of daily operation and maintenance activities, community-involved solid waste management including IEC has been proposed in the Priority Projects. The required cost for this item is Php87.4 million and broken down as follows.

- Total cost for community-involved SWM:	Php87.2 million
- Cost for BEM and Team ESTERO activities:	Php63.3 million
- Cost for IEC:	Php23.9 million

(4) Cost for Installation of Equipment and Facilities for Effective O&M Activities

This direct cost of Php39.1 million is already included in Civil Works Cost. The break down of this item is given below.

- Total cost for installation of equipment and facilities:	Php39.1 million
- Cost for emergency O&M equipment:	Php37.6 million
- Cost for additional hydrological equipment:	Php1.5 million

(5) Annual O & M Cost

The operation and maintenance cost per annum for drainage channel facilities and pumping stations is estimated as follows.

- Annual cost for operation and maintenance activities:	Php241.0 million
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5.7.4 PROJECT COST

The project cost of the priority projects except price contingency is estimated at Php4,952.0 million as shown in *Table 5.7.2*. It should be noted that the above total cost does not include annual costs for annual operation and maintenance. Furthermore, the ratio of preparatory works/temporary works cost for the main works which was estimated multiplying the main works cost by 5% in the master plan stage, was, in this stage, counted in the main works cost with 3% to 10%, considering site conditions and natures of objective works, while the ratio of miscellaneous for the civil works cost was decreased to 5%, considering further study depth in this stage from 10% applied in the master plan stage.

Table 5.7.2 Project Cost

Item	Amount (million Pesos)	Remarks
1. Civil Works cost	3,415.1	
1.1 Main works	3,252.5	incl. preparatory/temporary cost
1.2 Miscellaneous	162.6	5 % of (1.1)
2. VAT	341.5	10 % of (1)
3. Resettlement and Compensation Cost	221.9	
3.1 Resettlement cost	192.2	
3.2 Compensation cost for additional works	19.1	
3.3 Miscellaneous	10.6	5 % of (3.1+3.2)
4. Government administration cost	102.5	3 % of (1)
5. Engineering services cost	341.5	10 % of (1)
6. Physical contingency	442.3	10 % of (1+2+3+4+5)
7. Supporting measures cost	87.2	
7.1 BEM and Team ESTERO	63.3	
7.2 IEC	23.9	
8. Total project cost	4,952.0	

Note: US\$1.0=Php55=JY110 (July 2004)

5.8 ECONOMIC EVALUATION

5.8.1 BACKGROUND OF ECONOMIC EVALUATION

The economic evaluation in this section focuses on the projects dealt by the Feasibility Study, i.e. the priority projects which would be implemented during the 1st phase of the Master Plan.

The basic concept to estimate the benefit derived from the proposed programs/projects is worked out by the same equation referred in the Master Plan.

Explanations of “benefit” and “cost” are found in *Chapter 5.8.2 and 5.8.2*, respectively and then, economic viability of the priority projects dealt by the Feasibility Study is analyzed in *Chapter 5.8.4*.

5.8.2 BENEFIT OF THE PROJECT

(1) Basic Conditions for Analyzing Benefits of Priority Projects

The components of benefit considered in the Feasibility Study were selected as same as analysis of the Master Plan except for traffic disruption*. Correspondingly, same unit values of assets, parameters of damage rate, future socio-economic framework and so on are applied in the Feasibility Study. For details, see *Chapter 4.10*.

** As a result of analysis of Master Plan, the damages caused by traffic disruption was relatively small compared with other direct damages. Therefore, the additional computer modeling on traffic simulation for Priority Projects was not analyzed.*

(2) Flood Damage by Return Period

Flood damage under the “Without” situation, the same estimate as the Master Plan (see *Chapter 4.10*) are employed. The results of the estimates under the “With Feasibility Study Project” are summarized in the following tables:

Table 5.8.1 Flood Damage by Return Period (With Priority Projects : North Manila)

Item	Return Period (Year)					
	2	3	5	10	20	30
A. Direct Damage	5,011.0	5,869.9	7,274.5	8,938.9	11,595.2	13,033.3
1. Residence - House	757.8	901.0	1,054.6	1,253.1	1,833.0	2,113.2
2. Residence - Household Effects	352.9	456.9	589.1	724.7	993.0	1,156.3
3. Business Establishments	2,712.0	3,120.1	3,905.8	4,841.4	6,019.7	6,673.2
3-1 Manufacturing	775.8	898.4	1,129.0	1,403.4	1,740.2	1,925.9
3-2 Commerce (Wholesale & Retail Trade)	772.6	900.1	1,142.7	1,430.1	1,809.2	2,028.1
3-3 Hotel and Restaurants	409.0	467.7	581.7	716.6	876.3	962.8
3-4 Financial / Insurance / Real Estate Business	351.3	400.5	497.6	613.0	757.0	836.0
3-5 Educational Facilities	98.4	110.3	134.3	164.0	202.1	221.7
3-6 Medical Facilities	305.0	343.2	420.4	514.3	635.0	698.7
4. Infrastructure	1,188.3	1,391.9	1,725.0	2,119.7	2,749.5	3,090.6
B. Indirect Damage	2,373.6	2,828.1	3,510.4	4,303.9	5,630.6	6,331.9
5. Loss of Business Opportunity, Cost for Cleaning Activities, Public Service / Utility Service Disruption	1,521.4	1,768.6	2,201.9	2,716.5	3,458.2	3,863.7
6. Cost for Alternative Activities	852.2	1,059.6	1,308.5	1,587.4	2,172.4	2,468.2
C. Total	7,384.7	8,698.0	10,784.9	13,242.8	17,225.7	19,365.2

Source: The Study Team

Table 5.8.2 Flood Damage by Return Period (With Priority Projects : South Manila)

Unit : Php Million

Item	Return Period (Year)					
	2	3	5	10	20	30
A. Direct Damage	1,990.2	3,534.4	5,568.0	8,869.7	11,308.4	12,582.9
1. Residence - House	303.6	690.6	1,173.9	2,039.1	2,625.1	2,882.9
2. Residence - Household Effects	142.4	327.9	552.8	1,044.3	1,434.2	1,606.9
3. Business Establishments	1,072.2	1,677.8	2,521.0	3,683.0	4,567.6	5,109.3
3-1 Manufacturing	257.5	395.9	599.6	873.3	1,065.0	1,197.2
3-2 Commerce (Wholesale & Retail Trade)	297.5	464.0	700.0	1,036.8	1,306.9	1,480.6
3-3 Hotel and Restaurants	183.7	294.7	440.7	634.3	780.8	867.2
3-4 Financial / Insurance / Real Estate Business	177.7	280.8	417.9	616.7	780.0	862.0
3-5 Educational Facilities	36.4	56.4	84.6	121.2	146.2	161.5
3-6 Medical Facilities	119.3	185.9	278.2	400.8	488.7	540.8
4. Infrastructure	471.9	838.1	1,320.3	2,103.3	2,681.6	2,983.8
B. Indirect Damage	908.5	1,637.6	2,584.5	4,268.6	5,458.0	6,052.5
5. Loss of Business Opportunity, Cost for Cleaning Activities, Public Service / Utility Service Disruption	602.3	1,013.2	1,566.0	2,412.5	3,044.2	3,393.8
6. Cost for Alternative Activities	306.2	624.4	1,018.5	1,856.1	2,413.8	2,658.6
C. Total	2,898.6	5,172.1	8,152.5	13,138.3	16,766.4	18,635.3

Source: The Study Team

Table 5.8.3 Flood Damage by Return Period (With Priority Projects : All Study Area)

Unit : Php Million

Item	Return Period (Year)					
	2	3	5	10	20	30
A. Direct Damage	7,001.2	9,404.4	12,842.5	17,808.6	22,903.6	25,616.2
1. Residence - House	1,061.4	1,591.6	2,228.6	3,292.2	4,458.1	4,996.1
2. Residence - Household Effects	495.3	784.8	1,141.9	1,769.0	2,427.1	2,763.2
3. Business Establishments	3,784.3	4,797.9	6,426.7	8,524.5	10,587.3	11,782.5
3-1 Manufacturing	1,033.3	1,294.2	1,728.7	2,276.7	2,805.2	3,123.1
3-2 Commerce (Wholesale & Retail Trade)	1,070.1	1,364.2	1,842.7	2,466.9	3,116.1	3,508.7
3-3 Hotel and Restaurants	592.7	762.5	1,022.4	1,350.9	1,657.1	1,830.0
3-4 Financial / Insurance / Real Estate Business	529.0	681.3	915.4	1,229.7	1,537.0	1,698.0
3-5 Educational Facilities	134.8	166.7	218.9	285.2	348.2	383.2
3-6 Medical Facilities	424.3	529.1	698.6	915.1	1,123.7	1,239.5
4. Infrastructure	1,660.2	2,230.0	3,045.3	4,222.9	5,431.1	6,074.3
B. Indirect Damage	3,282.1	4,465.7	6,094.9	8,572.4	11,088.6	12,384.4
5. Loss of Business Opportunity, Cost for Cleaning Activities, Public Service / Utility Service Disruption	2,123.7	2,781.8	3,767.9	5,129.0	6,502.4	7,257.5
6. Cost for Alternative Activities	1,158.3	1,684.0	2,327.0	3,443.4	4,586.2	5,126.8
C. Total	10,283.3	13,870.1	18,937.4	26,381.1	33,992.2	38,000.6

Source: The Study Team

(3) Estimation of Annual Average Benefit

The annual average benefit, defined as the reduction of probable damage under the “with” and “without” Priority Projects situations was estimated for the proposed plan as presented in the tables below.

**Table 5.8.4 Breakdown of Annual Average Benefit
(Present Condition, Priority Projects, North Manila)**

Unit : Php million

Flood Return Preod	Flood Damage		Reduction	Average	Expectation Rate	Benefit by Return Period
	Without Project	With Project				
				917	0.5000	459
2 year	9,219	7,385	1,834	2,201	0.1667	367
3 year	11,266	8,698	2,568	3,012	0.1333	402
5 year	14,241	10,785	3,456	4,574	0.1000	457
10 year	18,935	13,243	5,693	5,510	0.0500	275
20 year	22,553	17,226	5,327	4,936	0.0167	82
30 year	23,910	19,365	4,545	Total (Annual Average Benefit)		2,042

Source: The Study Team

**Table 5.8.5 Breakdown of Annual Average Benefit
(Present Condition, Priority Projects, South Manila)**

Unit : Php million

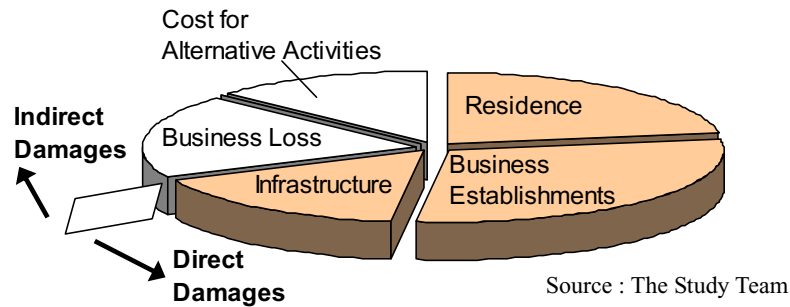
Flood Return Preod	Flood Damage		Reduction	Average	Expectation Rate	Benefit by Return Period
	Without Project	With Project				
				1,876	0.5000	938
2 year	6,651	2,899	3,752	3,718	0.1667	620
3 year	8,856	5,172	3,684	4,026	0.1333	537
5 year	12,520	8,153	4,367	4,667	0.1000	467
10 year	18,106	13,138	4,968	4,854	0.0500	243
20 year	21,506	16,766	4,740	4,770	0.0167	79
30 year	23,436	18,635	4,800	Total (Annual Average Benefit)		2,883

Source: The Study Team

Table 5.8.6 Breakdown of Annual Average Benefit (Present Condition, Priority Projects, All Study Area)

Flood Return Preod	Flood Damage		Reduction	Average	Expectation Rate	Benefit by Return Period
	Without Project	With Project				
				2,793	0.5000	1,397
2 year	15,870	10,283	5,586			
3 year	20,122	13,870	6,252	5,919	0.1667	987
5 year	26,760	18,937	7,823	7,037	0.1333	938
10 year	37,041	26,381	10,660	9,242	0.1000	924
20 year	44,059	33,992	10,067	10,364	0.0500	518
30 year	47,346	38,001	9,345	9,706	0.0167	162
Total (Annual Average Benefit)						4,926

Source: The Study Team

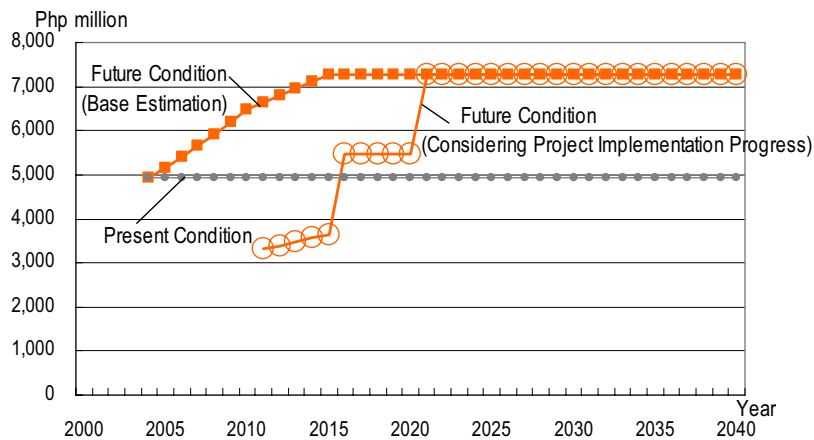


Source : The Study Team

Figure 5.8.1 Elements of Annual Average Benefit (Priority Projects, All Study Area)

(4) Adjusted Annual Average Benefit

In accordance with the future framework, flood damages under the future conditions are estimated. The annual average benefits in respective years are shown in the following figure (Base Estimation). When the progress of the project implementation is considered, the timing of accruing benefit appears to be delayed. It is shown in the following figure as well.



Note: At current prices / Source: The Study Team

Figure 5.8.2 Annual Average Benefit & Timing of Accruing Benefits (Future Condition, Priority Projects, All Study Area)

5.8.3 COST OF THE PROJECT

(1) Basic Conditions for Analyzing Cost for Priority Projects

All financial costs are converted into economic cost by categorizing foreign currency portion and local currency portion. In the analysis of Master Plan, only general two types of share rates of foreign currency portion and local currency portion are used, but in this feasibility study analysis, every project items were identified each distribution of foreign and local currency individually.

Regarding to the conversion factor from financial cost to economic cost, in the analysis of Master Plan, two conversion factors (Transfer payments and Foreign exchange shadow price rate) were applied, but in this feasibility study analysis, Shadow Wage Rate (SWR) is also considered in addition to Transfer payments and Foreign exchange shadow price rate because of the high precision of cost estimates of Priority Projects compared to M/P.

Since most of the labors engaged in a project are from the unskilled urban labor pool, labor cost is adjusted to reflect the estimated opportunity cost of labor. In this analysis, the adjustment is applied based on the NEDA guideline as follows.

SWR of Unskilled Labor : 0.6 times of market wage rate

This adjustment is to be applied only to the unskilled labor component. It is regarded that there is a competitive market of skilled labor, and their wage rate is decided reflecting the balance of demand and supply. Therefore, the SWR of skilled labor is negligible or defined as follows.

SWR of Skilled Labor : 1.0 times of market wage rate.

(2) Operations and Maintenance (O & M) Costs

Cost for O & are assumed as same condition as the Master Plan Analysis (see *Chapter 4.10*). Operation Cost is included for 2005 – 2010. After project implementation period (2011-) are excluded from economic analysis except for the additional maintenance cost to maintain the engineering capacity of the drainage system increased by the additional works proposed in Priority Projects. Maintenance Cost is considered for 2005 – 2040. And also, the project costs for supporting measures were excluded from this economic analysis because of same reason of Master Plan analysis.

Table 5.8.7 Project Cost (Priority Projects)

Work Item	North Manila		South Manila		All Study Area	
	F/C	E/C	F/C	E/C	F/C	E/C
Civil Works	1,685.7	1,627.9	1,729.0	1,685.1	3,415.1	3,313.0
VAT	168.5	0.0	172.9	0.0	341.5	0.0
Resettlement & Compensation	17.8	15.3	204.0	175.4	221.9	190.8
Government Administration	50.6	48.8	51.9	50.6	102.5	99.4
Engineering Services	168.5	162.8	172.9	168.5	341.5	331.3
Physical Contingency	209.1	185.5	233.1	208.0	442.3	393.4
Operation	0.0	649.8	0.0	593.8	0.0	1,243.6
Maintenance	0.0	256.7	0.0	266.1	0.0	522.8
Total	2,300.0	2,946.8	2,564.1	3,147.5	4,864.8	6,094.3

Note : F/C= Financial Cost, E/C= Economic Cost. Cost for Supporting Measures are excluded. Details may not add up to totals due to rounding./ Source: The Study Team

5.8.4 ECONOMIC EVALUATION

(1) Economic Viability

Priority projects are evaluated from the economic viewpoint by figuring out the economic viability, comparing the economic benefit and the economic cost in terms of economic internal rate of return (EIRR), benefit/cost ratio (B/C), and net present value (NPV or $B - C$, i.e. Benefit minus Cost).

All the monetary calculations are based on the following parameters either predetermined or using assumptions.

Project Duration(Economic Life)

- Civil works and collateral works & arrangements for Priority Projects start in FY2005 and complete in FY2010. Then, beyond 2010, operation and maintenance works continue for 30 years¹. i.e.
FY2005 – FY2010 (6 years) : Civil works and collateral works & arrangements including structural and non-structural measures
FY2011 – FY2040 (30 years) : Operation & maintenance as supporting measures

Timing of Accruing Benefits

- Theoretically, the matured annual average benefit will appear after completion of priority project' works, i.e., FY2011. However, considering consistency and make comparison easy to the analysis on Master Plan, the timing of accruing flood reduction benefit is set as follows:
 - 50% of annual average benefit will appear after 2011,
 - 75% of annual average benefit will appear after 2016,
 - The matured annual average benefit will appear after 2021

Price Level

- The valuation of project costs and benefit should be in constant price at the current year's level. Though, cost of civil works was identified as the price at July 2004, the basic price level in the economic analysis is set at the beginning of 2004 in order to keep consistency among all cost items.

Social Discount Rate (SDR)

- SDR is applied at 15%² based on the guideline of NEDA³ for basic infrastructure projects as same as the analysis of Master Plan

Prevailing Exchange Rate

- Php 55 per US\$ and JPY 110 per US\$ at the official rate in market as same as the analysis of Master Plan

Depreciation, Financial Charges, Interest and Amortization

- In general, financing of the project is not relevant to the economic evaluation. For further details, see *Chapter 4.10*. From these points of view, depreciation (residual value) of waterways and pumping stations, and financial cost or charges are not estimated in the economic evaluation.

The calculations of NPV, B/C, and EIRR are based on the annual cash flow that is prepared from the above-mentioned economic cost and the annual average benefit discussed in accordance with the implementation schedule or annual disbursement schedule. The economic viability of the priority projects was thus figured out as follows.

Table 5.8.8 Results of Economic Analysis (Future Condition, Priority Projects)

	North Manila	South Manila	All Study Area
NPV	Php 4,817 mil.	Php 7,374 mil.	Php 12,191 mil.
B/C	3.7	4.8	4.3
EIRR	34.0 %	38.8 %	36.6 %

Source: The Study Team

(2) Sensitivity Analysis

The cost and benefits were estimated at conservative side with discretion in this analysis. In spite of that, some uncertainty still exists in the estimation. In particular, the cases with long implementation period and/or expectation of future growth in Metropolitan Manila have high risks in terms of judgment on project viability. In this context, the sensitivity analysis was tested in the following relevant parameters guided by NEDA⁴ in consideration of sensitive factors for project feasibility.

Assumption I : Increase in projected costs by 10% and 20%

Assumption II : Decrease in benefits by 10% and 20%

Assumption III : Combination of Cases I and II

In addition to the above NEDA assumptions, another case that the benefit decreased to 50% of original estimate was also tested for reference. i.e.,

Assumption IV : Decrease in benefits by 50%

The commencement of project delayed 5 years and 10 years were tested to check the elasticity against time utility. i.e.,

Assumption V : Delay of commencement of project for 5 years and 10 years

While the all of above mentioned analysis are considered the socioeconomic development, another sensitivity without change of socioeconomic development was tested. i.e.,

Assumption VI : Project without socioeconomic development
(= Present Condition)

Result of Assumption I, II, III and IV

As mentioned in *chapter 4.10*, it is said that the project is feasible when NPV is positive (over 0), B/C is over 1.0, and EIRR is over social discount rate (15% in Philippines). As shown in the tables above, NPV of the all cases were positive, B/C exceeded 1.0, and the lowest EIRR exceeded social discount rate. Thus, the proposed projects are sufficiently feasible from the economic point of view.

The results are as follows:

**Table 5.8.9 Results of the Sensitivity Analysis 1
(NPV, Future Condition, Priority Projects)**

		Benefit			
		±0%	-10%	-20%	-50%
Cost	±0%	12,191	10,601	9,012	4,243
	+10%	11,821	10,231	8,641	3,872
	+20%	11,450	9,860	8,271	3,501

Source: The Study Team

**Table 5.8.10 Results of the Sensitivity Analysis 2
(B/C, Future Condition, Priority Projects)**

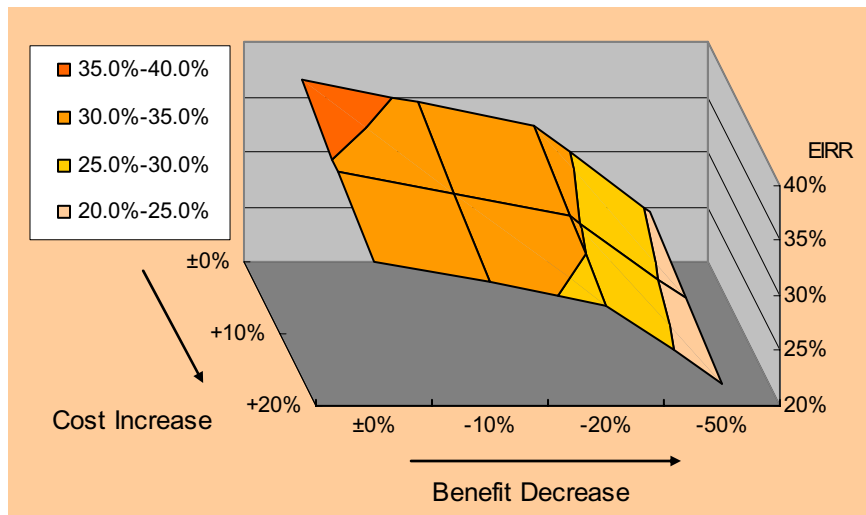
		Benefit			
		±0%	-10%	-20%	-50%
Cost	±0%	4.3	3.9	3.4	2.1
	+10%	3.9	3.5	3.1	1.9
	+20%	3.6	3.2	2.9	1.8

Source: The Study Team

**Table 5.8.11 Results of the Sensitivity Analysis 3
(EIRR, Future Condition, Priority Projects)**

		Benefit			
		±0%	-10%	-20%	-50%
Cost	±0%	36.6%	34.5%	32.3%	24.6%
	+10%	34.7%	32.8%	30.6%	23.2%
	+20%	33.1%	31.2%	29.1%	22.0%

Source: The Study Team



Source: The Study Team

**Figure 5.8.3 Results of Sensitivity Analysis
(EIRR, Future Condition, Priority Projects)**

Result of Assumption V

If the commencement of the project would delay for 5 years or 10 years, each index changes as following table. Because of the socioeconomic development of Metropolitan Manila, B/C and EIRR would slightly improve, but each NPV would drop sharply at 50 % and 75% respectively. In addition, this assumption doesn't consider financial price escalation. If the inflation would be considered, the result would worsen. In view of this time conditions, it is recommended to commence the project as soon as possible.

**Table 5.8.12 Results of the Sensitivity Analysis 4
(Delay of Project Commencement, Future Condition,
Priority Projects, All Study Area)**

	Base Case	Delay of 5 Years	Delay of 10 Years
NPV	Php 12,191 mil.	Php 6,215 mil.	Php 3,090 mil.
B/C	4.3	4.4	4.4
EIRR	36.6 %	37.5 %	37.5 %

Source: The Study Team

Result of Assumption VI

Incidentally, in case of excluding socio-economic growth in future, EIRR would still keep the economically feasible level (17.3%, under the assumption of +20% increased cost and -50 % decreased benefit, see *Table 5.8.15*).

**Table 5.8.13 Results of the Sensitivity Analysis 5
(NPV, Present Condition, Priority Projects)**

Unit : Php Million

		Benefit			
		±0%	-10%	-20%	-50%
Cost	±0%	7,248	6,153	5,057	1,771
	+10%	6,878	5,782	4,687	1,400
	+20%	6,507	5,412	4,316	1,030

Source: The Study Team

**Table 5.8.14 Results of the Sensitivity Analysis 6
(B/C, Present Condition, Priority Projects)**

		Benefit			
		±0%	-10%	-20%	-50%
Cost	±0%	3.0	2.7	2.4	1.5
	+10%	2.7	2.4	2.1	1.3
	+20%	2.5	2.2	2.0	1.2

Source: The Study Team

**Table 5.8.15 Results of the Sensitivity Analysis 7
(EIRR, Present Condition, Priority Projects)**

		Benefit			
		±0%	-10%	-20%	-50%
Cost	±0%	30.0%	28.2%	26.3%	19.6%
	+10%	28.3%	26.6%	24.8%	18.4%
	+20%	26.9%	25.3%	23.5%	17.3%

Source: The Study Team

(3) Project Justification

In line with the same reason as described in *Chapter 4.10 Project Justification for the Master Plan*, the priority projects also can be justified from the economic viewpoint to take a next step in accordance with the proposed schedule. Comparing to the economic viability of the Priority Projects between in North Manila area and South Manila area, to be precise, South Manila portion shows slightly better viability, but roughly speaking, the rates are almost same. It is recommended that all portions of Priority Projects in both North Manila and South Manila is to be implemented simultaneously.

¹ Regarding project life span, 30 years is recommended in the guideline “Economic Analysis for Social Development Study, 13 Flood Control & Sabo”, 2002, JICA

² In Japan’s guideline and several study reports, it is suggested to add a risk premium onto the discount rate as another way to reflect uncertainty in long-term and wide-sector analysis of the project like flood control which reduces the risk by itself. A variation of this is to add a premium to the discount rate for the benefits, and subtract a premium for the costs.

Introducing these premiums into the calculations of economic evaluation has the effect of giving less weight to increasingly uncertain costs and benefits in the future. This method, however, must determine an arbitrary risk premium to add to the discount rate.

³ ICC Project Evaluation procedures and Guidelines, NEDA

⁴ Ditto

5.9 ENVIRONMENTAL IMPACT ASSESSMENT STUDY

5.9.1 BACKGROUND

Initial Environmental Examination (IEE) was conducted during the master plan study. Per DAO No. 2003-30, the Priority Projects proposed in the Master Plan are classified as Environmentally Critical Projects (ECPs), thus Environmental Impact Assessment (Study) is conducted for preparation of the basic materials for the Environmental Impact Statement (EIS), which required full blown environmental impact assessment.

5.9.2 EIA STUDY PROCESS

DPWH as the Project Proponent and the JICA Study Team with assistance from Local Consultant (the EIS Preparer) have diligently followed the methodological approach prescribed in the Procedural Manual of DAO No. 96-37 and DAO No. 2003-30, the most recently issued Implementing Rules and Regulations (IRR) for the Philippine Environmental Impact Statement (EIS) System (PD No. 1586).

Per DAO 96-37 and DAO 2003-30, the project proponent submitted the Project Description and requested the schedule of the First Level Scoping Session. The session was held at the Office of the Director, EMB-NCR, on November 11, 2004.

The objectives of the first level scoping session are:

- To provide early link between EMB, the project proponent and the EIA consultants;
- To ensure that the EIA will address only relevant issues and concerns;
- To establish clear-cut agreement on the scope of environmental studies, issues and alternatives that requires thorough examination; and
- To ensure that results are to be presented in a form consistent with EIA review requirements.

Public participation and stakeholders consultation are major requirements of DAO 96-37 and DAO 2003-30. Under the EIS System, the project stakeholders and project affected community can participate during the second level scoping session. In this study, the second-level and stakeholders' consultation was held on November 28, 2004 at two separate venues, Northern Manila and Southern Manila. The two separate sessions were attended by the municipal and barangay officials, representatives from the project affected people, government agencies, JICA Study Team, DPWH and EIA Consultant.

The objectives of the community-level and stakeholders' consultations were:

- To provide early link between the DENR, the project proponent and the stakeholders;
- To provide venue for the stakeholders to voice out their issues and concerns and ensure that the EIA will adequately address these issues and concerns;
- To address issues and identify the carrying capacity of the environment and the possible constraints and requirements; and
- To agree on the process of dealing with issues related to technical and socio-economic concerns.

During EIA study, the following are carried out:

Table 5.9.1 EIS Process

	Participants and Activities
First Level Scoping Session November 11, 2004	<u>Participants:</u> Representative of EMB, IEE/EIA Review Committee, DPWH, EIA/EIS Consultants, JICA Study Team
Second Level Scoping Session and Stakeholders Consultation for North Manila November 28, 2004	<u>Participants:</u> Municipal and barangay officials, representative from the project affected people, government agencies, DPWH, EIA/EIS Consultants, JICA Study Team
Second Level Scoping Session and Stakeholders Consultation for South Manila November 28, 2004	<u>Participants:</u> Municipal and barangay officials, representative from the project affected people, government agencies, DPWH, EIA/EIS Consultants, JICA Study Team
Project Site investigation by EMB and member of the EIS Review Committee November 29, 2004	<u>Participants:</u> Member of EMB staff, EIA/EIS Review Committee, DPWH, EIA Consultants, JICA Study Team
Primary Data Collection	1) Water quality survey (January 2005) 2) Bottom sediment quality survey (January 2005) 3) Ambient air quality survey (December 2004) 4) Traffic volume survey (December 2004) 5) Perception survey (December 2004 – January 2005)
Secondary data collection	For this EIS, secondary data were gathered from sources available from various government agencies, libraries, professional and academic papers and related literature from the cities of Makati, Pasay, Calocan, Manila and Quezon.
Social Development Planning Workshop January 15, 2005	<u>Participants:</u> Barangay Officials, Community leaders, Multi-sector Representatives, LGUs Department Heads, Identified relocatee's representatives from Barangay Palanan and San Isidro in Makati City, and Barangay 43, 46, 51 and 54 in Pasay City, National Inter-Agency Representatives (TLRC and NHA)

5.9.3 TARGET OF EIA STUDY

(1) Project Components

The proposed drainage improvement project is composed of the following components:

- Improvement and rehabilitation for drainage channels,
- Improvement and rehabilitation for drainage pumping stations,
- Improvement for solid waste management along drainage channels,
- Improvement for O & M organizations and activities,
- Pilot examination, and
- Social framework of resettlement.

As specified in the Feasibility Study, the “Priority Projects” consist of the following improvement works:

1) Rehabilitation Works of Drainage Channels

Dredging of esteros/creeks: 139,000 m³

- Estero de Sunog Apog/ Maypajo (partially)
- Estero de Tripa de Gallina (partially)

- PNR canal (partially)
- Calatagan Creek I

Declogging of drainage mains: 20,000 m³

- Blumetritt interceptor
- Buendia Outfall
- Zobel Roxas D.M.
- Faraday D.M.
- Pasong Tamo D.M.

2) Drainage Improvement of the Severe Inundation Areas

North Manila:

Additional works for Aviles drainage area

- Increasing of pump capacity at Aviles Pumping Station

Additional works of the existing Blumentritt interceptor

- Remedial works of the existing Blumetritt interceptor
- Construction of additional interceptor

South Manila:

Additional works for the severe inundation area in South Manila

- Additional Box Culvert. along Zobel Roxas Drainage Main.
- Additional Box Culvert. along Faraday Drainage Main.

3) Rehabilitation of 12 Major Pumping Stations

- Quiapo
- Aviles
- Valencia
- Tripa de Gallina
- Pandacan
- Paco
- Sta. Clara
- Libertad
- Makati
- Binondo
- Balete
- Escolta

4) Supporting Measures

- Improvement of operation and maintenance organization and activities and promotion of community-involved activities
- Installation of additional hydrological equipment
- Introduction of emergency operation and maintenance equipment

- Preparation of guideline for resettlement

(2) Project Activities

For this EIA document, the project can be divided into three phases, namely:

- Pre-construction phase
- Construction phase
- Operation and Maintenance phase

The undertakings or activities under each phase are described below.

1) Pre-Construction Phase

During the pre-construction phase, the Project Proponent with assistance from local and foreign consultants shall undertake the following activities:

- Consultations and securing of relevant permits, endorsement and clearances from pertinent government agencies;
- Conduct of Initial Environmental Examination (IEE) and full-blown Environmental Impact Assessment (EIA)/ Environmental Impact Statement (EIS) and the subsequent securing of an Environmental Compliance Certificate (ECC) for the Priority Projects project (the subject of this study);
- Resettlement Action Plan;
- Detailed Engineering Design and Tendering Stage;
- IEC Action Program;
- Land and Right-of-Way acquisition
- Resettlement of informal settlers; and
- Procurement of construction contractor services and of facilities.

2) Construction Phase

During construction phase, the following major activities which could potentially impact the existing environment shall be carried out:

- Mobilization/transport of heavy equipment and construction materials;
- Preliminary works which shall include clearing of ROW of drainage lines, staking and layout of drainage lines and fabrication of project sign;
- Displacement of informal and formal settlers and other properties that fall within the alignment of drainage channels (existing and proposed);
- Dredging of esteros/creeks;
- Excavation and dredging/declogging of drainage mains;
- Construction of structures and facilities;
- Rehabilitation of major pumping stations;
- Increase pumps capacities (especially in severely inundated areas);
- Transport/disposal of construction wastes and dredged spoils; and
- Road works/pavement works.

5.9.4 ENVIRONMENTAL IMPACT ASSESSMENT

The impact matrices for this proposed project are presented in *Tables 5.9.4* and *5.9.5*. Results of the assessment showed that some of the impacts especially during construction stage are negative but manageable.

It is possible to predict significant negative environmental impact will be relocation of informal settlers caused by dredging work of Tripa de Gallina. It is estimated that encroached 442 buildings including affected buildings and potentially affected buildings or 663 households will be removed from inside of Tripa de Gallina (see *Table 5.9.2*). It is also necessary to remove the intruding part of 42 formal buildings which are located along Tripa de Gallina. Number of potentially affected buildings will be identified clearly at detail design stage.

Construction of additional drainage mains also will affect 15 buildings including formal and informal buildings (*Table 5.9.3*). During the construction, these buildings should be removed temporarily. Compensation should be made for owner of these buildings, or, if they want, assistance for relocation should be considered as one of options.

Table 5.9.2 Number of Affected Buildings Caused by Dredging of Estero de Tripa de Gallina

Name of Barangays	Buildings			No. of Affected Household	No. of Household to be relocated *
	Affected Buildings	Potentially Affected Buildings	Total		
Informal					
Pasay City					
Barangay 43	71	0	71	97	91
Barangay 46	111	0	111	165	143
Barangay 51	53	0	53	74	71
Barangay 54	20	0	20	32	29
Makati City					
Barangay Palanan	80	27	107	231	214
Barangay San Isidro	80	0	80	122	115
Sub-Total	415	27	442	721	663
Formal					
Barangay Palanan	23	19	42	>50	-
Sub-Total	23	19	42	>50	-
Total	438	46	484	>771	663

Source: JICA Study Team

Note: * Excluding non-residing, absentee house owners.

Table 5.9.3 Number of Affected Buildings Caused by Construction of Drainage Main

Locations	Buildings			No. of Affected Household
	Formal	Informal	Total	
Manila City				
Blumentritt Street	4	0	4	27
Outlet of Blumentritt	2	2	4	2
Makati City				
Faraday	0	7	7	11
Total	6	9	15	40

Source: JICA Study Team

5.9.5 ENVIRONMENTAL MANAGEMENT AND MONITORING PLANS

Under the EIS System, the Project Proponent is required to provide blueprints for environmental and monitoring plans for the various phases of the proposed project. In those plans, the following are presented:

- identification of project impacts and corresponding mitigation and/or enhancement measures;
- cost estimates which may be in the form of a program or equipment purchase;
- the institutional mechanism for implementing the plans; and
- the type of agreements or guarantees that will ensure the realization of the plans.

In view of this, the mitigation measures and the implementation plan are combined to form an environmental management plan. The EMP is presented in *Table 5.9.5*.

A separate monitoring plan is likewise provided to serve as guidance for the Project Proponent. The EMoP is presented in *Table 5.9.6*. Among the components of the monitoring plans are as follows:

- Parameters of the affected environmental conditions to be monitored;
- Location of monitoring activity;
- Frequency of monitoring;
- Cost of monitoring activity; and
- Implementing or responsible group.

In this EIA, the institutional arrangement is also presented. Two aspects of the institutional arrangements are given emphasis: the role of the Environmental Officer (EO) and the responsibility of the Multi-partite Monitoring Team (MMT). The role of EO can be assumed by the City's Environment & Natural Resources Officer (ENRO).

The EO shall be assigned by the Project Proponent to act as the responsible person who will oversee the implementation of the mitigation and monitoring plans in behalf of the Project Proponent.

The MMT, on the other hand, is an independent party comprising members from various sectors of the society. Among the functions of the MMT are as follows:

- Monitor project environmental compliance;
- Gather information if damage occurs or public complaints are raised about the project;
- Prepare and disseminate monitoring reports and submit recommendations to DENR; and,
- Conduct relevant community information and education campaigns regarding the project and its impact to the project.

DENR will provide support to the MMT in the technical aspects or evaluation and policy monitoring. In support for the MMT, an Environmental Monitoring Fund (EMF) is set by the LGU for the proposed project to be sourced from its internal revenue allotment (IRA).

The training needs for the local staff of the Project Proponent are also recommended to ensure that the capability building is given importance to ensure proper implementation of the proposed project.

Table 5.9.4 Matrix for Environmental Impacts During Pre-Construction and Construction Phases Without Mitigation

Impact Area	Potential Impacts	Nature	Magnitude	Probability of Occurrence	Reversibility/Permanence	Impact Duration	Geographic Extent
PRE-CONSTRUCTION PHASE							
	1) Geologic Consideration (Structural Integrity and Stability)	No effect	---	---	---	---	---
	2) Site Clearing	Negative	Nil to Minimal	Low	Reversible/Transient	Short term	Project site
	3) Disturbance of Wildlife	No effect	---	---	---	---	---
	4) Mobilization of Heavy Equipment	Negative	Minimal to Moderate	Low	Reversible/Transient	Short term	Project site
	5) Relocation of Affected Communities	Negative	Significant	High	Permanent	Long term	Project site
	6) Public Acceptance of the Project	No effect	---	---	---	--	---
CONSTRUCTION PHASE							
Physico-Chemical Environment	1) Threat of Environmental Hazards	Negative	Nil to Minimal	Low	Reversible/Transient	Short term	Vicinity of the project site
	2) Effect on Water Quality and Quantity	Negative	Minimal	Low	Reversible/Transient	Short term	Vicinity of the project site
	3) Effect on Surface and Hydrology	Negative	Minimal to Moderate	High	Reversible/Transient	Short term	Vicinity of the project site
	4) Effect on Air Quality and Atmosphere	Negative	Nil to Minimal	High	Reversible/Transient	Short term	Vicinity of the project site
	5) Effect on Noise/ Sonic Environment	Negative	Moderate to Significant	High	Reversible/Transient	Short term	Vicinity of the project site

Table 5.9.4 Matrix for Environmental Impacts During Pre-Construction and Construction Phases Without Mitigation (Cont'd)

Impact Area	Potential Impacts	Nature	Magnitude	Probability of Occurrence	Reversibility/Permanence	Impact Duration	Geographic Extent
CONSTRUCTION PHASE							
Physico-Chemical Environment	6) Solid Waste Generation	Negative	Moderate to Significant	High	Reversible/Transient	Short term	Vicinity of the project site
	7) Offensive Odors	Negative	Moderate to Significant	High	Reversible/Transient	Short term	Vicinity of the project site
	8) Effect on Drainage, Topography and Terrain	No Effect	-	-	-	-	-
	9) Flooding/Inundation in some areas	Negative	Significant	High	Reversible/Transient	Short term	Vicinity of the project site
	10) Effect on Open Space and Recreation	No Effect	-	-	-	-	-
	11) Aesthetic Effect	Negative	Nil to Minimal	Low	Reversible/Transient	Short term	Vicinity of the project site
Biological Environment	1) Effect on Ecological Environment	Negative	Nil to Minimal	Low	Reversible/Transient	Short term	Vicinity of the project area
	1) Population Dynamics	Positive/Negative	Nil	High	Reversible/Transient	Short term	Vicinity of the project area
	2) Employment and Income	Positive	Significant	High	Reversible/Transient	Short term	Vicinity of the project area
	3) Dependency Burden	Positive	Significant	High	Reversible/Transient	Short term	Vicinity of the project area
Socio-Economic Environment	4) Housing Characteristics and Utilities	Positive	Moderate to Nil	High	Reversible/Transient	Short term	Vicinity of the project area

Table 5.9.4 Matrix for Environmental Impacts During Pre-Construction and Construction Phases Without Mitigation (Cont'd)

Impact Area	Potential Impacts	Nature	Magnitude	Probability of Occurrence	Reversibility/Permanence	Impact Duration	Geographic Extent	
Socio-Economic Environment	CONSTRUCTION PHASE							
	5)	Health and Safety of Construction Workers	Positive / Negative	Significant / Minimal	Low	Reversible/Transient	Short term	Vicinity of the project area
	6)	Health and Safety of General Public	Negative	Minimal	Low	Reversible/Transient	Short term	Vicinity of the project area
	7)	Income, the Household, and the Local Economy	Positive	Significant	High	Reversible/Transient	Short term	Vicinity of the project area
	8)	Impact on Traffic and Vehicular/Road Safety	Negative	Significant	High	Reversible/Transient	Short term	Vicinity of the project area
	9)	Women's Welfare	Positive	Moderate	High	Reversible/Transient	Shot term	Vicinity of the project area
	10)	Archeology/ Heritage	No effect	-	-	-	-	-

Table 5.9.5 Matrix for Environmental Impacts During Operation Phase Without Mitigation

Impact Area	Potential Impacts	Nature	Magnitude	Probability of Occurrence	Reversibility/Permanence	Impact Duration	Geographic Extent
Physico-Chemical Environment	1) Threat of Environmental Hazard	No Effect	-	-	-	-	-
	2) Water Quality and Quantity	Positive	Significant	High	Reversible/Permanent	Long term	Vicinity of the project area
	3) Surface and Ground Water Hydrology	Negative/Positive	Moderate to significant	High	Reversible/Permanent	Long term	Vicinity of the project area
	4) Open Space and Recreation	No Effect	-	-	-	-	-
	5) Geological Impact	No Effect	--	--	--	--	--
Biological Environment	1) Effect on Ecological Environment	Positive	Significant	High	Reversible/Permanent	Long term	Vicinity of the project area
Socio-Economic Environment	1) Land Values	Positive	Significant	High	Irreversible/Permanent	Long term	Vicinity of the project area
	2) Management of Vacated Areas	Positive	Significant	High	Irreversible/Permanent	Long term	Vicinity of the project area
	3) Aesthetics	Positive	Significant	High	Reversible/Permanent	Long term	Vicinity of the project area
	4) Public Health and Safety	Positive	Significant	High	Reversible/Permanent	Long term	Vicinity of the project area
	5) Women's Welfare	Positive	Moderate	High	Irreversible/Permanent	Long term	Immediate vicinity of the project area
	6) Employment Opportunities	Positive	Significant	High	Permanent	Long term	Vicinity of the project area
	7) Local Economy	Positive	Significant	High	Reversible/Permanent	Long term	Vicinity of the project area

Table 5.9.6 Environmental Management Plan (EMP)

Project Phases and Area of Concern	Impact Description	Mitigation Program	Cost	Schedule	Institutional Plan	Guarantees
PRE-CONSTRUCTION PHASE						
Geologic consideration (structural integrity and stability)	Project benefits impaired	<ul style="list-style-type: none"> Incorporation of geological considerations in detailed design 	Covered by the contract cost of the Technical Consultant	During planning and detailed engineering design	DPWH/ Technical Consultant	Include in Master Plan, Feasibility Study and Detailed Engineering Design for the project
Vegetation loss during surveying	Loss of natural vegetation;	<ul style="list-style-type: none"> Removal only of epigeal portion (retaining the roots) of vegetation to allow natural regeneration Depends on selected site; minimal since area is relatively developed (only insects /small animals will be displaced) 	Minimal	During surveying and site clearing activities	DPWH/ Technical Consultant/ Contractor	Include in Master Plan and Feasibility Study for the project
Relocation of affected communities	Loss/ damage to properties of affected households	<ul style="list-style-type: none"> Public Consultations and preparation of applicable RAP and SDP for the affected community Just compensation for the affected families 	> to be based on actual cost (estimate is not final)	During Planning Stage and site clearing	DPWH/ LGUs	Public Consultation Reports, Proof of Social Acceptability from Barangays, Homeowners Association and City Hall
Public acceptance of the project	Public participation and cooperation	<ul style="list-style-type: none"> Public hearing and consultations should be conducted to address the concerns of the stakeholders 	Covered by the contract cost of the Technical Consultant	During planning stage or pre-construction phase	DPWH/ Technical Consultant/ LGUs/Other concerned government agencies	Public Consultation Reports, Proof of Social Acceptability from Barangays, Homeowners Association and City Hall

Table 5.9.6 Environmental Management Plan (EMP) (cont'd)

Project Phases and Area of Concern	Impact Description	Mitigation Program	Cost	Institutional Plan	Schedule	Guarantees
CONSTRUCTION PHASE						
1) Threat of environmental hazards	Soil and water pollution	Adherence to RA 6969/Good Housekeeping/ Adherence to sound engineering practices	Covered by the contract cost of the contractor	DPWH/ Contractor	During the entire period of the construction phase	Included in the conditions of civil works contract
2) Disposal of dredged materials from esteros and drainage channels	Soil and water pollution; health hazard	Adherence to RA 6969/Good Housekeeping/ Adherence to sound engineering practices	Covered by the contract cost of the contractor	DPWH/ Contractor	During the entire period of the construction phase	Included in the conditions of civil works contract
3) Effect on water quality and quantity	Surface and groundwater pollution	Provision of Portalets/No direct discharge of domestic wastewater	>200,000	DPWH/ Contractor	During the entire period of the construction phase	Included in the conditions of civil works contract
4) Effect on air quality	Dust generation and emission of gaseous pollutants	Proper maintenance of heavy equipment; regular sprinkling of water to exposed areas (when applicable)	>100,000	DPWH/ Contractor	During the entire period of the construction phase	Included in the conditions of civil works contract
5) Noise/sonic environment	Unavoidable noise increase generated from different construction equipment	Suspend construction activities during nighttime; use of mufflers for heavy equipment and vehicles	>100,000	DPWH/ Contractor	During the entire period of the construction phase	Included in the conditions of civil works contract
6) Disposal of solid waste from esteros and drainage mains	Threat of environmental pollution (soil and water pollution)	Strict adherence to the provisions of RA 9003 or Ecological Solid Waste Management Act	Covered by the contract cost of the contractor	DPWH/ Contractor/ LGUs	During the entire period of the construction and operation phase	Included in the conditions of civil works contract
7) Effect of odors	Air pollution; odor nuisance and irritation to nearby communities	Employ proper construction technique, management of spoils and application of odor reducers	Covered by the contract cost of the contractor	DPWH/ Contractor	During the entire period of the construction and operation phase	Included in the conditions of civil works contract

Table 5.9.6 Environmental Management Plan (EMP) (cont'd)

Project Phases and Area of Concern	Impact Description	Mitigation Program	Cost	Institutional Plan	Schedule	Guarantees
CONSTRUCTION PHASE						
8) Effect on aesthetics	Visual eyesores	Maintenance of the orderliness and cleanliness at the construction site	>1 M	DPWH/ LGUs	During the entire period of the construction and operation phase	Included in the conditions of civil works contract
9) Population Dynamics	Potential increase of population during construction phase	Prioritize local labor; ensure adequate stock of housing units for shelter needs	Covered by the contract cost of the Contractor	DPWH/ Contractor	Prior to construction phase	Site Inspection Report
10) Employment and income opportunities during construction phase	Economic benefits; but may not be fully realized because of imposed bidding conditions	Advanced notice of hiring should be advertised in the community	>100,000	DPWH/ Contractor	Prior to construction phase	Data of hired personnel
11) Occupational health and public safety	Occurrence of work-related accidents	Compliance with DOLE's regulations on Occupational Safety and Health Hazard Standards	>500,000	DPWH/ Contractor	During the entire period of the construction phase	Included in the conditions of civil works contract
12) Vehicular traffic and public safety	Traffic congestion and road accidents	Adopt a comprehensive Traffic Management Plan (TMP); install signages and warning devices at the construction site	>500,000	DPWH/ LGUs	During the entire period of the construction phase	Included in the conditions of civil works contract

Table 5.9.6 Environmental Management Plan (EMP) (cont'd)

Project Phases and Area of Concern	Impact Description	Mitigation Program	Cost	Institutional Plan	Schedule	Guarantees
OPERATION AND MAINTENANCE (O & M) PHASE						
1) Physico-Chemical Related Impacts	Direct disposal of domestic solid wastes and wastewater into rivers and drainage channels, which can cause water pollution, clogging of waterways and affect public health and safety	Concerted efforts among local people, NGOs and concerned government agencies to regulate disposal of domestic solid wastes and wastewaters into the river and drainage channels, (a) to prevent water pollution, (b) to maintain cleanliness and sanitation in the area, (c) prevent clogging of the waterways, and (d) protect public health and safety.	>1,000,000	DPWH/ MMDA/ LGUs	During the entire period of the operation and maintenance (O&M) phase	Include in Master Plan and Feasibility Study for the project; ECC conditionality
2) Public Health and Safety	Project benefits will be impaired	<ul style="list-style-type: none"> The key mitigation measure is the sound and effective operation and maintenance of all the flood control and drainage improvement structures. This may include regular desiltation and/or dredging to increase discharge capacity of esteros and canals. Flood forecasting and warning during rainy or flood season to forewarn people of impending floods (especially in times where there is structural defects in any of the installed flood control and drainage structures). Disaster and flood preparedness program involving multi-agency participation. 	>5,000,000	DPWH/ MMDA/ LGUs	During the entire period of the operation and maintenance (O&M) phase	Include in Master Plan and Feasibility Study for the project; ECC conditionality
3) Local Economy, Labor and Employment,						
4) Land Values, People's Living Condition						
5) Vehicular Traffic						

Table 5.9.7 Environmental Monitoring Plan (EMoP)

Project Phase / Area of Concern	Parameter	Procedure	Location	Frequency	Responsibility	Cost (P)
A. CONSTRUCTION PHASE						
1) Water Quality	6 water samples to be tested for conventional parameters (pH, DO, salinity, BOD, COD, TDS, TSS, pH, color, oil & grease, PO ₄ ³⁻ , Total N, Cr ⁶⁺ , Total Coliform, and Surfactants) based on Class C water	Collection of water samples from Esteros and drainage mains and laboratory analysis	At selected points or sections of esteros and drainage mains	The need for water sampling will be done depending on the physical observation of the surface water bodies (i.e. turbidity, abnormal discoloration) / Quarterly	Project Proponent/ Contractor	>200,000.00 per monitoring
2) Air Quality	Fugitive dust during earthmoving and Suspended Particulate (TSP), offensive odors, and fumes from vehicle emissions-CO ₂ and NO ₂	Statistical data using the Staplex high-volume sampler for STP and using the Air Check Gas Sampler for CO ₂ and SO ₂	At selected observation station in the project site	Twice a year	Project Proponent/ Contractor	>100,000.00 per sampling
3) Sediment Quality and Quantity	Parameters to be analyzed are color, odor, As, Hg, Pb, total CN ⁻ , Cr ⁶⁺ & Cd.	Estero sediment sampling and laboratory analysis	At selected points or sections of esteros and drainage mains	The need for sediment sampling will be done depending on the physical observation of the bottom sediment (i.e. odor, abnormal discoloration)	Project Proponent/ Contractor	P200,000.00 per monitoring

Table 5.9.7 Environmental Monitoring Plan (EMoP) (cont'd)

Project Phase / Area of Concern	Parameter	Procedure	Location	Frequency	Responsibility	Cost (P)
A. CONSTRUCTION PHASE						
4) Solid Waste Generation	Volume of solid wastes from Esteros and the construction workers; Checking on the proper disposal and collection of solid wastes in adherence to RA 9003	Visual observation; Statistical data on solid wastes	Construction site	Daily	Project Proponent/ Contractor	Part of the Contractor's Contract
5) No. of actual relocated project affected people	Houses/shanties built on the estero and within 3 meters on either side of the estero	Statistical data affected families/ households	Estero de Tripa Gallina	Prior to construction	Project Proponent/ Contractor/ LGUs/other concerned agencies	>1M
6) No. of local workers (living in the project area / hired for the project)	Ratio of hired workers (local residents vs migrant workers)	Statistical data on hired workers	Hiring offices	During hiring period	Project Proponent/ Contractor	Part of the Contractor's Contract
7) Occupational Health and Safety	Job related accidents/sickness	Statistical data on job accidents and sickness	Construction site	Daily	Project Proponent/ Contractor	Part of the Contractor's Contract
8) Vehicular Traffic and Public Safety	Traffic volume (all kinds of vehicles); project and traffic-related accidents	Statistical data/ count of passing vehicles per hour and related	Construction site	Daily	Project Proponent/ Contractor/MM DA	Part of the Contractor's Contract

Table 5.9.7 Environmental Monitoring Plan (EMoP) (cont'd)

Project Phase / Area of Concern	Parameter	Procedure	Location	Frequency	Responsibility	Cost (P)
		accidents				
B. OPERATION AND MAINTENANCE (O&M) PHASE						
1) Water Quality	6 water samples to be tested for conventional parameters (pH, DO, salinity, BOD, COD, TDS, TSS, pH, color, oil & grease, PO ₄ ³⁻ , Total N, Cr ⁶⁺ , Total Coliform, and Surfactants) based on Class C water	Estero water sampling and laboratory analysis	Same sampling stations identified during the pre-construction phase	Semi-annual	Monitoring Team collaboration with PMU	P200,000.00 per monitoring
2) Offensive Odor	Foul stinky odor	Physical observation and sense of smell	Along drainage route	As required	Monitoring Team collaboration with PMU/LGUs	Cost should be allocated by DPWH
3) Sediment Quality and Quantity	Parameters to be analyzed are color, odor, As, Hg, Pb, total CN ⁻ , Cr ⁶⁺ & Cd.	Sediment/Sludge sampling and laboratory analysis	Same sampling stations identified during the pre-construction phase; STPs and septic tanks	Semi-annual	Monitoring Team collaboration with PMU	P300,000.00 per monitoring
4) Solid Waste Generation	Volume of solid wastes from esteros; Checking on the proper disposal and collection of solid wastes in adherence to RA 9003	Spot checking / Visual observation	Along the drainage route and its vicinity	As required	Monitoring Team collaboration with PMU/	Part of the regular O&M funds of the LGU,

Table 5.9.7 Environmental Monitoring Plan (EMoP) (cont'd)

Project Phase / Area of Concern	Parameter	Procedure	Location	Frequency	Responsibility	Cost (P)
5) Flooding	Depth of flood	Spot checking/statistical data on depth of flood	Vicinity of the project area	As required	LGUs Monitoring Team collaboration with PMU	in addition to the EMF Part of the regular O&M funds, in addition to the EMF
6) Informal Settlers	Number of shanties/squatters proliferated along drainage line	Statistical data on number of squatters	Along the drainage route and its vicinity	Daily	Monitoring Team collaboration with PMU	Part of the regular O&M funds of DPWH, in addition to the EMF
7) Public Health	Project-related illnesses such as water-borne diseases	Statistical data on water-borne diseases outbreak	Within the vicinity of the Project Area (Workers and nearby residents)	Daily	Monitoring Team collaboration with PMU	Part of the regular O&M funds, in addition to the EMF

5.10 PROJECT EVALUATION

5.10.1 INTRODUCTION

The Priority Projects are evaluated from technical, economic, social and environmental aspects. The technical efficiency is evaluated by reduction of the inundation conditions (depth and duration), the economic efficiency is evaluated by EIRR for which the value higher about 15% considered to be feasible due to the NEDA guideline for basic infrastructure projects or opportunity cost of capital. Improvement of the inundation conditions in the core area evaluates the social and environmental benefit.

The Priority Projects will improve the drainage conditions and enhance the living conditions and feasible as a whole in technical economic, social and environmental as bellows.

5.10.2 TECHNICAL ASPECT

By the implementation of the Master Plan the inundation conditions in the core area will be improved as a whole, but by the implementation of the Priority Projects the inundation conditions in the severest inundation areas in both North Manila and South Manila will be improved.

Though 87,000 houses and a half of the roads (1,389 km) were affected in the 1999 floods and the flood and inundation affecting population numbers and road networks will be significantly reduced in the severe inundation area in both North Manila and South Manila by the implementation of the priority projects due to the reduction of the flood and inundation depth and duration.

The proposed drainage improvement measures are all basic and conventional ones and will be maintained by the implementation agencies and the proposed improvement of O & M system could be effective for the management of drainage system. And the database developed for the Study and transferred to the implementation agencies will support in improving the O & M activities for drainage facilities, and also the promotion of the barangay-involved community activities will improve and sustain the drainage facilities by reducing illegal activities at the barangay level.

5.10.3 ECONOMIC ASPECT

Though the basic social infrastructure projects such as flood control and drainage improvement works shall be implemented in general even at the lower EIRR, compared with other productive projects,

The Priority Projects show a high viability of 36.6% in EIRR (Future Conditions), a higher value of EIRR than the 15%, which is the NEDA guideline for basic infrastructure projects, likewise resulting in high values of B/C (4.3) and NPV (Php12,191 million) for the conceivable reason that socio-economic needs for prevention of the flood and inundation in the core area, where has the central function of the political and economic activity in the country.

The reason of high viability is that there are numerous existing drainage facilities: 15 major drainage pumping stations, 74 km esteros/creeks, 35 km drainage mains/outfalls and other small drainage network which were invested in the past in the core area of Metropolitan Manila. However, the construction cost of these tremendous investments is not considered in this

economic analysis, because these costs shall be excluded as “sunk cost” in conventional economic analysis on public infrastructure project. In other words, taking advantage of these infrastructure heritages, it is possible to output the most effective result with minimum additional investment for these kinds of infrastructure.

5.10.4 FINANCIAL ASPECT

The Master Plan will be effective to mitigate the damages caused by floods and inundation not only in the core area but also in the surrounding area of Metropolitan Manila and feasible from technical, economic, social/environmental aspects. It is surely worthwhile for the Government of the Philippines to consider the increase of budgetary allocation to the floods and drainage improvement in the core area.

When the annualized cost of proposed cost of the priority projects are compared to the average amount of total expenditure of MMDA and 6 LGUs for the past 6 years, it is fairly huge and requires almost 1.2 times of annual budget of relevant agencies in order to implement the project.

While, on the assumption when some portion of F/S projects would be financed by ODA loan or other assistance scheme, the burden of the agencies would be eased. If the costs for civil works which is equivalent to around 70% of total propose costs of F/S project are financed by assistance scheme, the share of the agencies would become 35% of total expenditure of relevant agencies and it is not a prohibitive level from the aspect of the financial status of the authorities.

The project involves various non structural and supporting activities, which are fundamental measure for the drainage improvement and shall be conducted by the local budget, but the measure works of improvement and rehabilitation for the drainage facilities would require the financial assistance by grant or loan for implementation.

5.10.5 SOCIAL AND ENVIRONMENTAL ASPECT

The drainage system is one of the basic social and environmental infrastructures in the core area and the drainage improvement in the core area shall be one of the basic measures for the core area, however major issues related to social/environmental aspects of the project are as follows:

- The rehabilitation of the drainage channels proposed in the Master Plan requires relocating informal settlers occupying inside drainage channels: about 5,500 families and 700 families estimated for the Master Plan and the Priority Projects, respectively. An optimum resettlement action plan for the people shall be prepared according to the guidelines for resettlement action plan prepared in the Study in order to avoid any adverse social impacts. One resettlement site at the city of Rodriguez is proposed for the Priority Projects.
- The rehabilitation works also require dredging of a huge volume of bottom deposits, which was estimated to be 920,000 m³ and 150,000 m³ for the Master Plan and the Priority Projects respectively. The disposal site shall be prepared for the dredged materials and one disposal site at Marabon is proposed for the Priority Projects.
- The various social adverse impacts caused by habitual flood and inundation will be reduced by the implementation of priority projects, reducing the flood and inundation conditions (flood/inundation depth and duration).

5.11 IMPLEMENTATION PROGRAM

5.11.1 GENERAL

The overall coordination for the projects will be provided by the Coordination Committee established, and the execution of the Projects will be the responsibility of the Department of Public Works and Highways (DPWH). The other implementing agencies will be MMDA, NHA and LGUs. NEDA and DENR will be involved in supportive roles for implementation of the projects.

The construction works consist of rehabilitation of drainage channels, rehabilitation of drainage pumping stations, additional works for drainage channels and additional works for drainage pumping stations in the core area. It is assumed that the detailed designs and construction and rehabilitation works proposed for the priority projects will be executed by local and international competitive bidding basis and completed within the 1st Phase (from 2005 to 2010).

The detailed design including tendering procedure will be conducted from 2006 to 2007 and the construction works will be conducted from 2008 to 2010, except the LCB which will be conducted from the mid 2007 to 2009.

The construction works are planned to be composed of 3 lots with 11 packages, which will be carried out by contractors selected through local competitive bidding (LCB) and/or international competitive biddings (ICB) as follows:

Rehabilitation and Additional Works of Drainage Channel Facilities in North Manila (Lot I)

- Estero de Sunog Apog I (lower part): LCB
- Estero de Sunog Apog II (remained part): LCB
- Blumentritt Interceptor: ICB

Rehabilitation and Additional Works of Drainage Channel Facilities in South Manila (Lot II)

- Estero de Tripa de Gallina, PNR Canal and Calatagan Creek I: LCB
- Buendia Outfall: ICB
- Zobel Roxas Drainage Main: ICB
- Pasong Tamo Drainage Main: LCB
- Faraday Drainage Main: ICB

Rehabilitation and Additional Works of Drainage Pumping Stations (Lot III)

- First group (Aviles, Quiapo, Valencia and Tripa de Gallina): ICB
- Second group (Pandacan, Paco, Sta. Clara, Libertad, Makati and Binondo): ICB
- Third group (Balete, Escolta): ICB

It is assumed that the soft components are to be commenced and conducted as soon as possible by the respective agencies of MMDA and LGUs. The proposed soft components are as follows:

- Barangay-involved Solid Waste Management
- Improvement of Operation and Maintenance Organization and Activities
- Installation of Equipment and Facilities for Effective Operation and Maintenance

As for the relocation of the informal settlers in the objective channel of Estero de Tripe de Gallina a Resettlement Action Plan should be prepared and carried out by the implementation agency in collaboration with the respective LGUs. The relocation or resettlement should be carried out in advance of the rehabilitation works for the Estero de Tripe de Gallina.

5.11.2 BASIC CONDITIONS

For preparing an optimum implementation program of the project, the following conditions have been considered for the implementation of projects:

(1) Preparation of Detailed Design

The detail design, including tender documents for the project shall be carried out due to the design concept under the management of international consultants, which are selected through international competitive biddings or through the JICA technical cooperation program, suggested by DPWH.

(2) Mode of Construction

The construction works shall be carried out by contractors selected through local and/or international competitive biddings under supervision of international consultants.

(3) Construction Materials

Local materials shall be used as much as possible.

(4) Implementation of Non-structural and Supporting Measures

The non-structural and supporting measures should be conducted by the concerned national and local governments.

(5) Implementation Organization

The implementation of the projects involves various agencies and require a leading agency for taking the initiative in the activities before and after the commencement of the projects. The implementation agency shall set up a Coordination Committee for smooth implementation of the projects. The coordination Committee will consist of concerned agencies: NEDA, DPWH, MMDA, PCUP, PAGASA, HUDCC, NHA, DSWD, MWSS and concerned LGUs.

5.11.3 IMPLEMENTATION PLAN

(1) Detailed Design

The consulting services for the detailed design of the priority projects are composed of the following:

1) Review of the F/S on the Project

The F/S on the priority projects conducted by the JICA Study and the Resettlement Action Plan prepared by DPWH are to be reviewed and updated.

2) Execution of Detailed Field Surveys and Investigation

Detailed investigation, topographic surveys, geologic investigation and detailed checking drainage pumping stations are to be conducted for the major facilities, i.e., drainage channels (open channels and closed channels), drainage pumping stations and major infrastructure for the resettlement plan.

3) Preparation of a Definitive Plan of the Project

The preparation of a definitive plan of the priority projects (3 lots with 11 packages) and the resettlement plan (social and basic infrastructures).

4) Preparation of Detailed Design and Tender Documents of the Project

The detailed design of the proposed facilities in the definitive plan is to be conducted and the tender documents are to be prepared for the Project.

- Preparation of detailed designs of the proposed drainage facilities and others including construction plans and cost estimate.
- Preparation of tender drawings and tender documents of the Project, including pre-qualified documents, technical specifications and bill of quantities.

5) Technology Transfer

An effective technology transfer to the counterpart personnel on designing of drainage facilities and basic infrastructure for resettlement plan is to be accomplished by means of on-the-job training. Main field of the On-the-job training will be as follows:

- Designing of drainage facilities: drainage cannel and drainage pumping stations,
- Preparation of training program for routine O&M activities,
- Preparation of a GIS database for the drainage system as O&M tools.

(2) Construction Works

It is planned to divide the project works into 3 lots with 11 packages carried out by contractors selected through local and/or international competitive biddings (LCB / ICB) as follows:

1) Rehabilitation and Additional Works of Drainage Channel Facilities in North Manila (Lot I): LCB and ICB

The priority projects in North Manila are summarized below.

- Estero de Sunog Apog: LCB
Dredging (Clearing): 91,600 m³
- Blumentritt Interceptor: ICB
Declogging of existing interceptor and related works: 9,800 m³

Construction of additional interceptor by box culvert and remedial works: 2,570 m

2) Rehabilitation and Additional Works of Drainage Channel Facilities in South Manila (Lot II): LCB and ICB

The priority projects in South Manila are summarized below.

- Estero de Tripa de Gallina, PNR Canal and Calatagan Creek I: LCB
Dredging (Clearing): 47,000 m³
- Buendia Outfall: ICB
Declogging and related works: 7,200 m³
- Zobel Roxas Drainage Main* ICB
Declogging: 2,200 m³
Construction of additional box culvert: 495 m
- Pasong Tamo Drainage Main: LCB
Declogging: 900 m³
- Faraday Drainage Main: ICB
Declogging: 100 m³
Construction of additional box culvert: 1,314 m

3) Rehabilitation and Additional Works of Drainage Pumping Stations (Lot III): ICB

The priority projects for the drainage pumping stations in the core area of Metropolitan Manila are summarized below.

- Drainage Pumping Station in North Manila
Repair/replacement of pump equipment and appurtenant facilities: 5 drainage pumping stations
- Drainage Pumping Station in South Manila
Repair/replacement of pump equipment and appurtenant facilities: 7 drainage pumping stations

(3) Non-structural and Supporting Measures

1) Community-Involved Solid Waste Management

It is planned to spread the BEM and Team ESTERO activities together with IEC Campaign to 137 barangays from 2005 to 2010.

2) Improvement of Operation and Maintenance Organization and Activities

It is recommended that improvement of operation and maintenance organization be implemented as soon as possible.

Establishment of community-involved operation and maintenance would be gradually achieved by target year of the Master Plan, together with the expansion of the Community-Involved Solid Waste Management.

3) Installation of Equipment and Facilities for Effective Operation and Maintenance

Other countermeasures for effective operation and maintenance require installation of equipment and facilities. The followings are proposed for the 1st Phase..

- Installation of Additional Hydrological Equipment
- Introduction of Emergency Operation and Maintenance Equipment

(4) Relocation of Informal Settlers

The relocation of about 700 families will be required for the Phase 1 before the commencement of dredging works.

5.11.4 IMPLEMENTATION SCHEDULE

The priority projects would be implemented following the schedule shown in *Figure 5.11.1*.

5.11.5 DISBURSEMENT SCHEDULE

The disbursement schedule of each project is shown in *Table 5.11.1*.

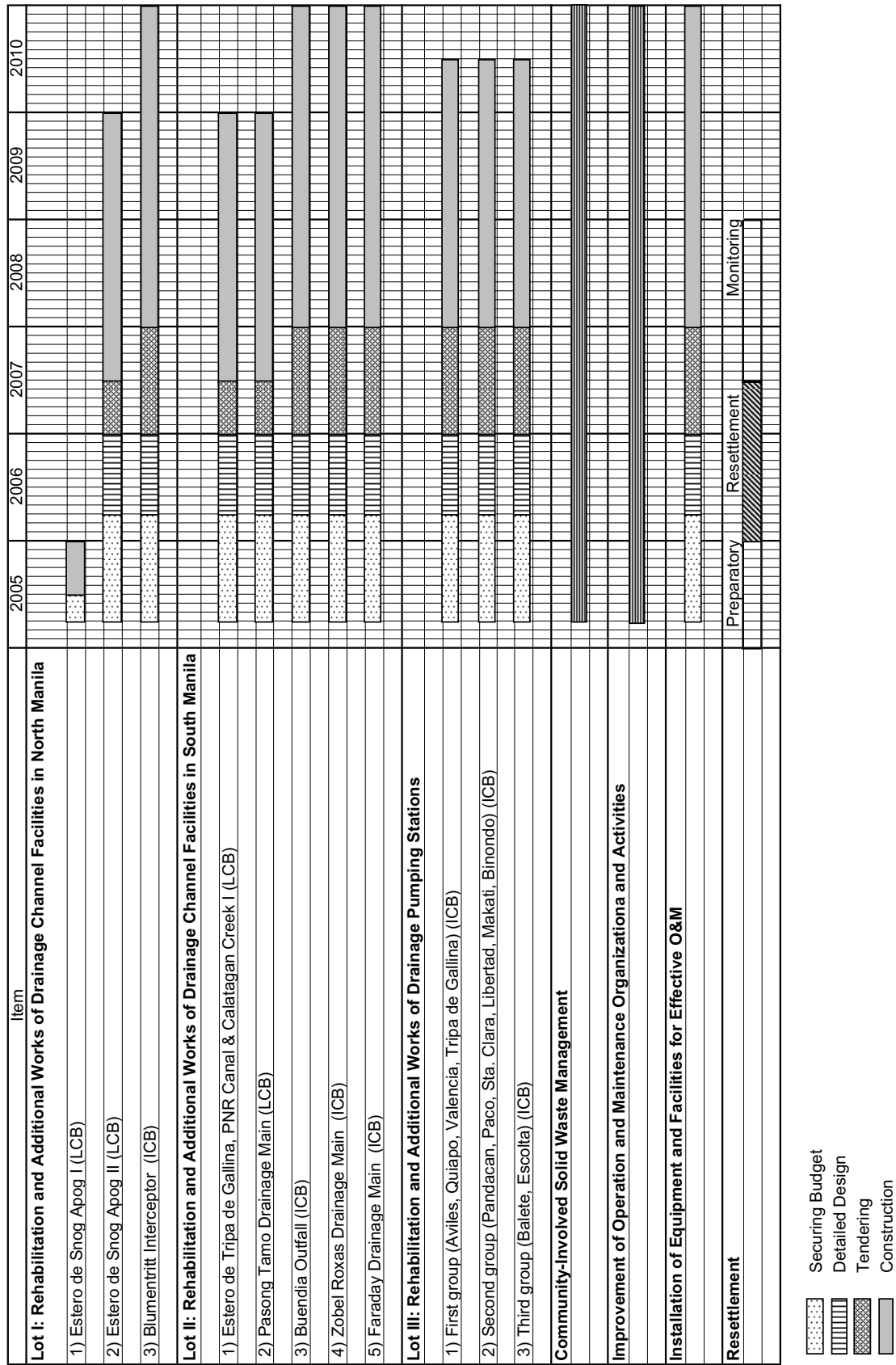


Figure 5.11.1 Implementation Schedule of the Priority Projects

Table 5.11.1 Disbursement Schedule of the Priority Projects

Unit: Million Peso

Work Item	Project Cost	Year						Total
		2005	2006	2007	2008	2009	2010	
Civil Works	3,415.1	21.4	0.0	53.9	2209.6	629.0	501.2	3,415.1
1) Main	3,252.5	20.4	0.0	51.3	2104.4	599.1	477.3	3,252.5
- Rehabilitation and Additional Works for Drainage Channel facilities in North Manila	750.3	20.4	0	33.3	254.5	254.4	187.7	750.3
a) Estero de Sunog Apog I	20.4	20.4	0	0	0	0	0	20.4
b) Estero de Sunog Apog II	166.7	0	0	33.3	66.7	66.7	0	166.7
c) Blumentritt Interceptor	563.2	0	0	0	187.8	187.7	187.7	563.2
- Rehabilitation and Additional Works for Drainage Channel facilities in South Manila	458.1	0	0	18	158.8	158.8	122.5	458.1
a) Estero de Tripa de Gallina, PNR Canal and Calatagan Creek I	87.5	0	0	17.5	35	35		87.5
b) Buendia Outfall	43.5	0	0	0	14.5	14.5	14.5	43.5
c) Zobel Roxas Drainage Main	54.9	0	0	0	18.3	18.3	18.3	54.9
d) Pasong Tamo Drainage Main	2.9	0	0	0.5	1.2	1.2		2.9
e) Faraday Drainage Main	269.3	0	0	0	89.8	89.8	89.7	269.3
- Rehabilitation of Pumping Station	2,005.0	0	0	0	1671	167.1	167.1	2,005.0
a) Group 1	1,057.0	0	0	0	880.8	88.1	88.1	1,057.0
b) Group 2	880.0	0	0	0	733.4	73.3	73.3	880.0
c) Group 3	68.0	0	0	0	56.6	5.7	5.7	68.0
- Installation of Equipment and Facilities	39.1	0	0	0	20.3	18.8	0.0	39.1
2) Miscellaneous	162.6	1	0	2.6	105.2	29.9	23.9	162.6
VAT	341.5	2.1	0.0	5.4	221.0	62.9	50.1	341.5
Resettlement and Compensation Cost	221.9	0	134.5	87.4	0	0	0	221.9
1) Resettlement Cost	192.2	0	128.1	64.1	0	0	0	192.2
2) Compensation cost for additional works	19.1	0	0	19.1	0	0	0	19.1
3) Miscellaneous	10.6	0	6.4	4.2	0	0	0	10.6
Government Administration Cost	102.5	0.6	0	1.6	66.3	18.9	15.1	102.5
Engineering Services	341.5	2.1	0	5.4	221	62.9	50.1	341.5
Physical Contingency	442.3	2.6	13.5	15.4	271.7	77.4	61.7	442.3
Sub-Total		28.8	148.0	169.1	2989.6	851.1	678.2	4,864.8
Supporting Measure Cost	87.2	8.2	9.6	12.4	16.7	18.6	21.7	87.2
1) BEM and Team ESTERO	63.3	3.4	5.9	8.7	12	15.1	18.2	63.3
2) IEC	23.9	4.8	3.7	3.7	4.7	3.5	3.5	23.9
Total		37.0	157.6	181.5	3006.3	869.7	699.9	4,952.0

5.12 GUIDELINE FOR DRAINAGE IMPROVEMENT

During the Study, the guideline for drainage improvement has been prepared as a basic reference aiming at smooth and effective implementation of the proposed projects, and gives more emphasis to the necessary considerations and procedures for further drainage improvement including operation and maintenance activities of the constructed channels and facilities in the core area of Metropolitan Manila.

The composition of the guideline is as follows.

1. Introduction

- 1.1 Background*
- 1.2 Proposed Master Plan and Priority Projects*
- 1.3 Implementation of the Projects*
- 1.4 Objective and Composition of the Guideline*

2. Investigation, Planning and Designing of Drainage Improvement

- 2.1 Overall Work Flow for Drainage Improvement*
- 2.2 Investigation and Study*
- 2.3 Basic Planning Concept of Drainage Improvement*
- 2.4 Proposed Structural Measures for Drainage Channel Facilities of Esteros/Creeks and Box Culverts*
- 2.5 Proposed Structural Measures for Drainage Pumping Stations*
- 2.6 Non-Structural and Supporting Measures*
- 2.7 Designing of Drainage Facilities of Box Culverts in Priority Projects*

3. Construction Management

- 3.1 Basic Conditions of Construction Plan and Method*
- 3.2 Construction Schedule for the Priority Projects*
- 3.3 Construction Management*

4. Operation and Maintenance

- 4.1 General*
- 4.2 Drainage System Inventory and Record*
- 4.3 Operations and Maintenance of Drainage Structures (Waterways)*
- 4.4 Operations and Maintenance of the Pumping Stations*

The guideline is compiled in *Supporting Report M*.

Chapter 6

EXPERIMENTAL RESEARCH FOR COMMUNITY PARTICIPATION

CHAPTER 6 EXPERIMENTAL RESEARCH FOR COMMUNITY PARTICIPATION

6.1 INTRODUCTION

It can be said that the problems of drainage system in the core area of Metro Manila are throwing solid waste and informal settlers in drainage channels. Throwing solid waste into esteros is caused by lack of people's awareness. It is believed that inappropriate solid waste collection is also one of the reasons for throwing solid waste. However, where areas are covered with solid waste collection services, solid waste is still scattered in just about anywhere. Therefore, problems regarding dumping solid waste into drainage channels stem from mainly the lack of people's awareness, so that this aspect should be improved. However, it takes time for improvement of awareness and behavior of individual people. It is required to develop an institutional system at community level for improvement of drainage system in order to support improvement of people's awareness by institutional system at barangay level or community level.

On the other hand, people obtain benefit from improvement of drainage system. Provided that people do not cooperate with O & M of drainage system, drainage system does not work. And then people are affected by increasing flooding risk. Government agencies alone cannot maintain and sustain the drainage facilities well. There has to be community cooperation and so community-involved O & M system for drainage should be established in order to ensure safety of society against flood.

6.2 FRAMEWORK OF EXPERIMENTAL RESEARCH

6.2.1 OBJECTIVES OF EXPERIMENTAL RESEARCH

Objectives of experimental research are:

- to find a workable, sustainable and effective mechanism through an experimental research, and
- to find practical and applicable community participation for the Master Plan through the experimental research.

The Study Team hypothesizes that community participation for O & M of drainage system is an important strategic approach. However, community participation could either succeed or not depending on community situations. The draft model of community participation for operation and maintenance of drainage system by the Study Team should be tested as experimental research to see how things work in the core area of Metro Manila. The result of experimental research is reflected to the Master Plan in order to shape a model for institutional system at community level to be more realistic, applicable, acceptable and replicable.

6.2.2 APPROACHES OF EXPERIMENTAL RESEARCH

Approach to finding a solution to the social problems begins with this:

Problems of drainage system should be improved by establishment of participation at barangay level
--

In order to improve the drainage problems, an institutional system at community level is planned as model. This institutional system aims to check a socially acceptable, workable, sustainable and effective structure at barangay community level.

The proposed institutional system deals with not only issues on the drainage problems but also broader areas of environmental improvement and development at barangay level, and will be extended to other barangay.

6.2.3 METHODOLOGY

(1) Major Activities

During the experimental research, the following activities are undertaken in order to study the applicability of the institutional system:

- Establishment of BEM (Barangay Environmental Manager);
- Establishment of Team ESTERO (Environmental Strategic Task for Estero Renewal Organization);
- Formulation of Barangay Environmental Management Plan (BEMP) by community people facilitated by BEM and Team ESTERO;
- Implementation of selected projects and programs; and
- Monitoring and evaluation by Barangay chairperson, DPWH, MMDA and the Study Team.

(2) Concept of Experimental Research

It is necessary to prepare an institutional arrangement for BEM activities. Barangay office appointed Barangay Environmental Manager (BEM) who is facilitator and interface between barangay residents and DPWH/Study Team. Working Group and Barangay Task Force, named Team Environmental Strategic Task for Estero Renewal Organization (Team ESTERO), were also established.

According to the Local Government Code of 1990, Barangay offices have a responsibility of providing services for good environment of their barangays. The organizations mentioned above shall promote improvement and development of environment in barangays. Experimental research is to give an institutional system at barangay level. However, formation of these organizations is not something new; some of barangay offices of Metro Manila have already established similar organizations like Clean and Green Commission.

BEM and Team ESTERO shall coordinate and facilitate barangay residents for formulation of Barangay Environmental Management Plan supported by DPWH counterpart and the Study Team. It is expected that formulated BEMP will be given authorization by Barangay ordinance. BEMP comprises solid waste management, pollution control, public awareness and beautification. After formulation of BEMP, DPWH and the Study Team will support selected projects and programs.

Through these activities, it is expected there will be various problems ahead. On the other hand, it is also expected that the barangay residents will be able to handle these problems with the support of DPWH and the Study Team. Issues of community participation for drainage improvement can be identified. The Study Team will do its best to identify successful factors and unsuccessful factors in the process of developing an implementable mechanism to more greatly realize the Master Plan.

(3) Process of Experimental Research

Process of experimental research is shown in *Figure 6.2.1*.

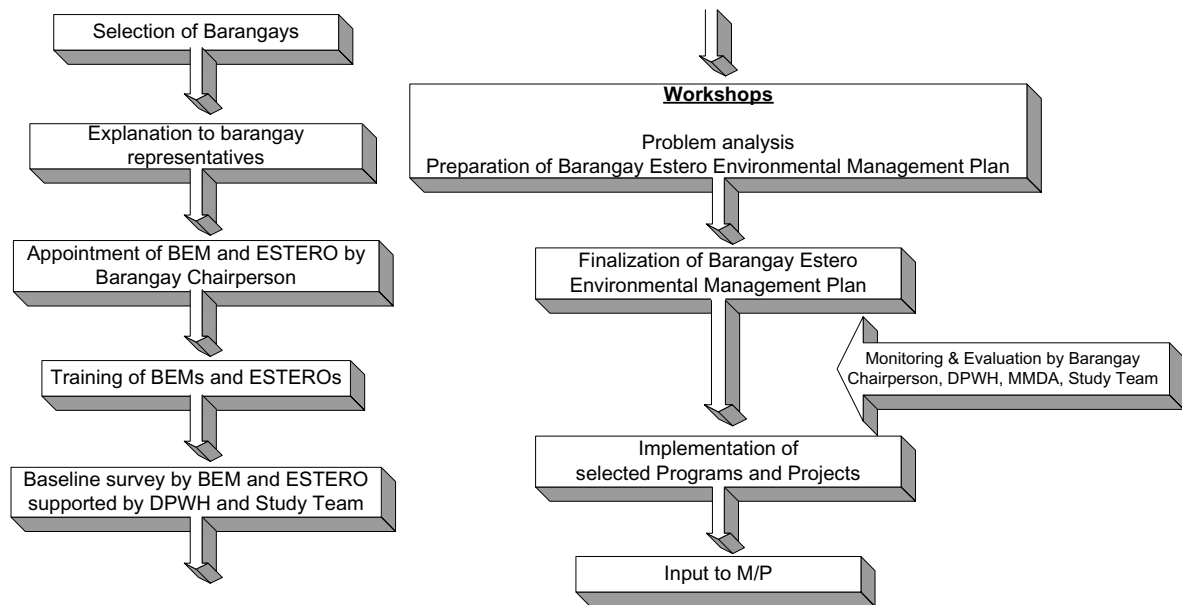


Figure 6.2.1 Process of Experimental Research

6.2.4 SELECTION OF TARGET BARANGAYS

(1) Criteria of Selected Barangays

The experimental research aims to develop a model for barangay institutional system so that target barangay should be typical and/or representative barangay in the core area of Metro Manila. Typical and/or representative barangays may be based on characters of people and types of problems.

It is possible that people's awareness depends on income level mainly. Types of problems are based on land use including road network, density of building and topographic conditions. Income level of people can be roughly converted to land use. It can be said, in general, that the people with the same income level gather at the same places. On the other hand, there is no significant difference of topographic conditions in the core area so that topographic conditions can be ignored.

Other factors of people's awareness such as land use and density of house building are important. However, land use should be considered for selection of target barangays because of the reasons stated above.

Classification of land use along esteros is shown in *Table 6.2.1*. According to land use map, those areas along esteros are mainly categorized as residential area, commercial/business area and industrial area. The areas where people throw garbage into esteros are residential area so

that residential area should be selected from along esteros. Residential area can be divided into several sub-classification based on density of buildings such as slum area, high-density residential area, medium-density residential area and low-density residential area. Intensity of density impacts road conditions, income of people and others. Therefore, it is reasonable that three barangays were selected from two types of barangays such as informal settlement area and high- or middle-density areas.

Table 6.2.1 Classification of Land Use and Selected Barangays

	Slum area	High-/Middle- Density area
Residential area	√	√
Commercial/Business area		
Industrial area		

(2) Profile of Target Barangays

The profile of target communities is shown in *Table 6.2.2*.

Table 6.2.2 Profile of Target Barangays

	Brgy. 195 Manila City	Brgy. 64 Pasay City	Brgy. Palanan Makati City
Location	along Estero de Maypajo Area: 1.24 ha	Along Estero de Tripa de Gallina Area: 3.79 ha	Along Estero de Tripa de Gallina Area: 64.20 ha
Population	Total Population: 1,249 HH population: 1,249 HH population density: 1,007/ha	Total Population: 4,509 HH population: 4,509 HH population density: 1190/ha	Total Population: 16,614 HH population: 16,589 HH population density: 258/ha
Household	No. of HHs: 270 HH density: 217 HH/ha	No. of HHs: 868 HH density: 229 HH/ha	No. of HHs: 4,218 HH density: 66 HH/ha
Land Use	High density area (Slum area)	Informal settler area	High density area
Flood Area	No flooding	Flood depth: 0.5-1 m Flood duration: 0 - 3 hr.	Flood depth: 0.5-1 m Flood duration: 0 - 3 hr.
Solid waste Collection	Before election campaign every day at front of church During election campaign 1 – 2 times//week	every day collection by pushcart	every day collection by collection vehicle

6.2.5 ORGANIZATION

(1) Operational Structure

Organizational chart of experimental research is shown in *Figure 6.2.2*. The functions of each organization are described in the next section.

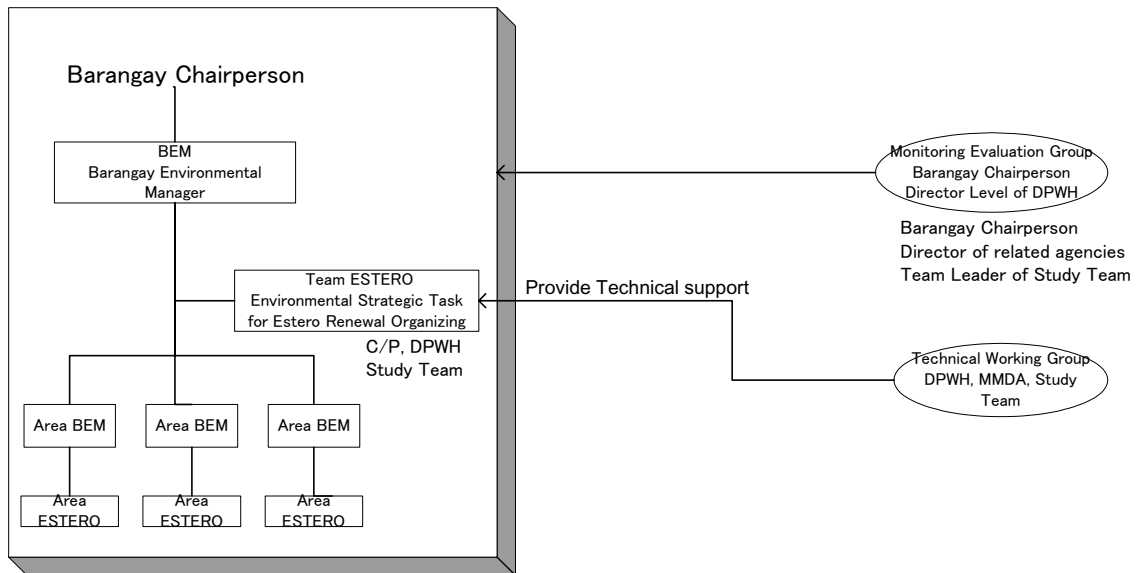


Figure 6.2.2 Organizational Chart of Experimental Research

(2) Functions of Established Organizations

Functions of established organizations for experimental research are as follows:

Barangay Environmental Manager (BEM)

- facilitates formulation and implementation of Barangay Environmental Management Plan
- coordinates between barangay chairperson and barangay residents for formulation and implementation of Barangay Environmental Management
- facilitates and monitors Team ESTERO
- supports Team ESTERO

Team Environmental Strategic Task for Estero Renewal Organization (Team ESTERO)

- supports BEM in order to improve and develop their environment
- organizes barangay residents in order to improve and develop their environment
- facilitates Barangay Environmental Management

(3) Supporting Group

Supporting Group backs up the BEM and Team ESTERO daily for smooth implementation of experimental research. Supporting Group consists of DPWH Counterpart of the JICA Study on Drainage Improvement in the Core Area of Metro Manila, MMDA, LGUs and the Study Team.

Roles

- supports BEM and Team ESTERO in order to improve and develop their environment
- gives technical advice to BEM and Team ESTERO

(4) Monitoring and Assessment Group

Monitoring and Assessment Group ESTERO consists of director level of DPWH, MMDA and city government.

Roles

- monitors activities of experiment research milestone
- assesses activities and performance of experimental research
- gives advice to supporting group

6.2.6 SCHEDULE OF EXPERIMENTAL RESEARCH

Schedule of experimental research is shown in *Figure 6.2.3*.

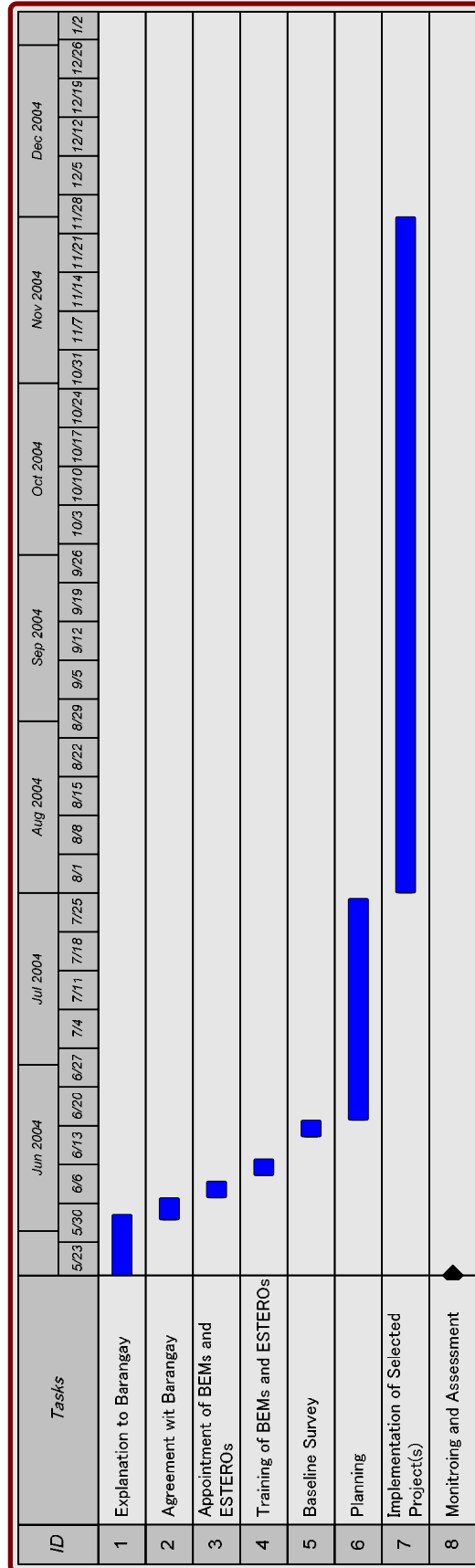


Figure 6.2.3 Schedule of Experimental Research

6.3 FIELD EXPERIMENT

6.3.1 BARANGAY 195, MANILA CITY

(1) Members of Related Organizations

Barangay Environmental Manager (BEM) and members of Team ESTERO are as follows:

Table 6.3.1 Member List of BEM and Team ESTERO

BEM	Team ESTERO
Francisco Cirera	Severino C. Reyes Rosalinda F. Antonio Arlene A. Bautista Flordeliza Isip Joseph H. Bayna Jean M. Rosas Analiza A. Lao

(2) Major Activities

The major activities of Barangay 46 for Experimental Research are shown in Table 6.3.2.

Table 6.3.2 Major Activities of Barangay 195, May – December 2004

Date	Activities	Place
May 26	Explanation of Experimental Research to Manila City Government	Manila City Hall
May 31	Explanation of Experimental Research to Brgy. 195	Brgy. 195 Hall
June 9	Data Gathering - Barangay Profile	Brgy. 195 Hall
June 12-14	Training Program for BEM and Team ESTERO	Great Eastern Hotel and Aberdeen Court, DPWH Central, Tripa de Gallina Pumping Station, Calatagan Creek, Brgy. 24 South Cembo, Estero de Tripa de Gallina, Pier 17 Dumpsite
June 19	Site Inspection	Barangay 195
June 26	Training Workshop for BEM and Team ESTERO	Executive Plaza Hotel, Malate, Manila
July 5	Stakeholder Analysis and SWOT Analysis Demonstration	Barangay 195 Hall, Manila
July 24	Lecture on Waste Segregation and RA. 9003	Jollibee, Abad Santos corner Hermosa Branch, Manila
August 5	Following-up of Program Proposals for each Focal Point (SWM, Beautification and Greening, Pollution Control, and IEC)	Barangay 195 Hall, Manila
August 19	IEC Workshop	Barangay 195 Hall, Manila
September 9	Monitoring	Barangay 195, City of Manila

Date	Activities	Place
October 16	Presentation General Rehearsal	Barangay Palanan Hall, Makati
October 19	Presentation Final Rehearsal	Barangay 195 Hall, Manila
October 22	2 nd Barangay Cluster Workshop	Traders Hotel, Manila
October 27	Site Visit	Barangay 195, Manila
November 4	Surprise Site Inspection	Barangay 195, Manila
December 8	Evaluation Monitoring – Knowledge, Attitude, and Practices Survey for BEM-ESTERO Team	Barangay 195 Hall, Manila

6.3.2 BARANGAY 46, PASAY CITY

(1) Members of Related Organizations

Barangay Environmental Manager (BEM) and members of Team ESTERO are as follows:

Table 6.3.3 Member List of BEM and Team ESTERO

BEM	Team ESTERO
Benjaminb S. Evangelista	Natividad C. Tan Jesus S. Mora Lucio F. de Guzman Antonio M. Tangon Jose H. Pascua Alma M. Managuit Eufemia M. Villanueva

(2) Major Activities

The major activities of Barangay 46 for Experimental Research are shown in *Table 6.3.4*.

Table 6.3.4 Major Activities of Barangay 46, May – December 2004

Date	Activities	Place
May 25	Explanation of Experimental Research to Pasay City Government	
May 29	Explanation of Experimental Research to Brgy. 46	Brgy. 46 Hall
June 9	Data Gathering - Barangay Profile	Brgy. 46 Hall
June 12-14	Training Program for BEM and Team ESTERO	Great Eastern Hotel and Aberdeen Court, DPWH Central, Tripa de Gallina Pumping Station, Calatagan Creek, Brgy. 24 South Cembo, Estero de Tripa de Gallina, Pier 17 Dumpsite
June 19	Site Inspection	Barangay 46
June 25	Training Workshop for BEM and Team ESTERO	Max's Restaurant, Greenbelt, Makati

July 6	Stakeholder Analysis and SWOT Analysis Demonstration	Barangay Chapel
July 25	Lecture on Waste Segregation and RA. 9003	Barangay 46 Hall
August 5	Following-up of Program Proposals for each Focal Point (SWM, Beautification and Greening, Pollution Control, and IEC)	Barangay 46 Hall, Pasay
August 23	IEC Workshop	Barangay 195 Chapel, Pasay
September 8	Monitoring	Barangay 46, Pasay City
October 16	Presentation General Rehearsal	Barangay Palanan Hall, Makati
October 19	Presentation Final Rehearsal	Barangay 46 Hall, Pasay
October 22	2nd Barangay Cluster Workshop	Traders Hotel, Manila
October 28	Site Visit	Barangay 46, Pasay
November 4	Surprise Site Inspection	Barangay 46, Pasay
December 9	Evaluation Monitoring – Knowledge, Attitude, and Practices Survey for BEM-ESTERO Team	Barangay 46 Hall, Pasay

6.3.3 BARANGAY PALANAN, MAKATI CITY

(1) Members of Related Organizations

Barangay Environmental Manager (BEM) and members of Team ESTERO are as follows:

Table 6.3.5 Member List of BEM and Team ESTERO

BEM	Team ESTERO
Roel C. Arevalo	Ma. Lourdes P. Cambosa Ryan C. Amante Emmanuel B. Alivio Gilda N. Garte Renieboy O. Mocoy Alfie Inigo Sonia Mariño

(2) Major Activities

The major activities of Barangay Palanan for Experimental Research are shown in *Table 6.3.6*.

Table 6.3.6 Major Activities of Barangay Palanan, May – December 2004

Date	Activities	Place
May 26	Explanation of Experimental Research to Makati City Government	Makati City Hall
June 3	Explanation of Experimental Research to Barangay Chairman of Brgy. Palanan	Brgy. Palanan Hall
June 9	Data Gathering - Barangay Profile	Brgy. Palanan Hall

June 12-14	Training Program for BEM and Team ESTERO	Great Eastern Hotel and Aberdeen Court, DPWH Central, Tripa de Gallina Pumping Station, Calatagan Creek, Brgy. 24 South Cembo, Estero de Tripa de Gallina, Pier 17 Dumpsite
June 19	Site Inspection	Zobel Roxas and Tramo
June 25	Training Workshop for BEM and Team ESTERO	Max's Restaurant, Greenbelt, Makati
July 3	Stakeholder Analysis and SWOT Analysis Demonstration	Barangay Hall Conference Room
August 5	Following-up of Program Proposals for each Focal Point (SWM, Beautification and Greening, Pollution Control, and IEC)	Barangay Palanan Hall, Makati City
August 24	IEC Workshop	Barangay Palanan Hall, Makati
September 8	Monitoring	Barangay Palanan, Makati City
October 16	Presentation General Rehearsal	Barangay Palanan Hall, Makati City
October 20	Presentation Final Rehearsal	Barangay Palanan Hall, Makati City
October 22	2nd Barangay Cluster Workshop	Traders Hotel, Manila
October 28	Site Visit	Barangay Palanan, Makati City
December 9	Evaluation Monitoring – Knowledge, Attitude, and Practices Survey for BEM-ESTERO Team	Barangay Palanan Hall, Makati City

6.3.4 OUTPUT FROM BARANGAY WORKSHOP

The BEM and Team ESTERO facilitated several Barangay Workshops from May 2004 to February 2005 in order to formulate and implement Barangay Environmental Management. Result of workshops by each selected barangay is presented in *Supporting Report O*.

6.3.5 EVALUATION OF EXPERIMENTAL RESEARCH

A questionnaire survey to barangay people was conducted in order to evaluate the experimental research. Total respondents were 24. Over half (54%) of respondents are female. Majority is in productive age of 31 to 60 years old. Profile of respondents is shown in *Tables 6.3.7 and 6.3.8*.

Most of respondents (41.7%) have gone to High School and College (37.6%). A few are Elementary graduates.

Table 6.3.7 Age Groups of Respondents for Evaluation of Experimental Research

Age	Gender			
	Male		Female	
	No.	%	No.	%
15 –20	1	4.16	2	8.3
21 – 30	1	4.16	-	-
31 - 40	4	16.6	7	29.16
41 – 50	1	4.16	1	4.16
51 - 60	3	12.5	1	4.16
61 - 70	3	12.5	-	-
TOTAL	13	54.03	11	45.83

Table 6.3.8 Educational Attainment for Evaluation of Experimental Research

Education	Number	%
Elementary	5	20.8
High School	10	41.7
College	9	37.5
Vocational	-	-
TOTAL	24	100

(1) Knowledge

There were five questions asked of the participants regarding their knowledge about the BEM-ESTERO. The questions were:

1. What is the meaning of BEM- ESTERO?
2. What are the duties of the BEM?
3. What are the duties of the ESTERO members?
4. What is the importance of the BEM- ESTERO in the Barangay?
5. What are the focal points of the BEM-ESTERO?

All of the participants except two from Barangay 46 answered the five questions. The answers they gave indicated their full knowledge of the experimental study they have learned from the workshop.

(2) Attitude

- The formation of BEM-ESTERO Experimental Study will not contribute to the welfare of the Barangay.

Answer: Almost all (91.1%) agreed with the statement.

- Creation of Barangay Profile is not significant for distinguishing the real situation of the Barangay.

Answer: Almost half disagree with the statement with a few strongly disagreeing.

S.W.O.T. Analysis is of great help in identifying the strengths and weaknesses of the Barangay.

Answer: A great majority (66.7%) strongly agreed with the statement while only some agreed.

- Preparation of Barangay Environmental Management Plan is a necessity for each Barangay.

Answer: A great majority or 70.8% strongly agreed with the statement.

(3) Practice

This section of the evaluation focuses on the behavior of the participants' **Before and After practices** in relation to the Barangay Environment Management Plan focal points.

1) Barangay 195, Manila City

Solid Waste

- How do you dispose of your garbage?

<ul style="list-style-type: none"> • Throw garbage into the estero • Unconcerned and uninformed • Do not know how to clean the surroundings • Throw garbage in the river and anywhere else • Throw everything in the river 	<ul style="list-style-type: none"> • Put all garbage in the plastic bags and brought to the truck • Informed about SWM • Refrained from throwing in the estero • Having appropriate schedule of garbage disposal • Clean Barangay • We now throw our garbage in the truck according to schedule • Throwing in the estero was lessened • Residents became concerned • Income generation from garbage • Implementation of door-to-door garbage collection • Nobody throws garbage in the estero • The Barangay became educated of proper waste disposal
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Information, Education and Communication

- What information, education and communication strategies about the environment were you able to accomplish?

Before BEM-ESTERO	After/During BEM-ESTERO
<ul style="list-style-type: none"> • None • Unconcerned of the effects of improper waste disposal • Everyone does not care • Uneducated and uncooperative 	<ul style="list-style-type: none"> • Households are instructed to bring out their garbage before the truck arrives • Became educated of proper waste disposal to prevent all sorts of diseases through posters and brochures • Residents became more concerned about their environment • Information regarding the environmental management • The surroundings became clean • More concern for the environment

Pollution Control

- What pollution controls have you implemented?

Before BEM-ESTERO	After/During BEM-ESTERO
<ul style="list-style-type: none">• None• Residents care less of pollution, they throw everything anywhere• Vehicle owners park indifferently• The surroundings always stink	<ul style="list-style-type: none">• None• Implementation of the laws on pollution• The burning of garbage was reduced• Prohibition of anybody to burn wires or any other objects that might pose health risks• Segregation of biodegradable and non-biodegradable waste• Absence of unpleasant odor in the surroundings

Beautification and Greening

Before BEM-ESTERO	After/During BEM-ESTERO
<ul style="list-style-type: none">• The area has been beautiful and clean even before but was not sustained• Few streetlights• Few plants around the Barangay	<ul style="list-style-type: none">• Beautifying and nurturing the plants, as well as tidying up the plant pots• Continuous beautification of the environment• Putting up posters about the environment• Beautification enhancement of streets and plants

2) **Barangay 46, Pasay City**

Solid Waste

- How do you dispose your garbage?

Before BEM-ESTERO	After/During BEM-ESTERO
<ul style="list-style-type: none">• Throw garbage in the river• Pile the garbage without segregation	<ul style="list-style-type: none">• Garbage is gathered by the barangay pushcart• Wait for the barangay garbage collector to gather the biodegradable and bring the recyclables to the MRF, which is segregated and sold by the Barangay associations• Segregate the non-biodegradable wastes and bring to the MRF to be sold per kilogram

Information, Education and Communication

- What information, education and communication on environment were you able to accomplish?

Before BEM-ESTERO	After/During BEM-ESTERO
<ul style="list-style-type: none"> • The Barangay Administration notifies the residents on cleanliness, but there is no actual action • Lack of unity among the people on what should be done for cleanliness 	<ul style="list-style-type: none"> • Meetings were organized with the leaders of all organizations in the barangay • Made visits to homeowners and taught them how to properly manage their garbage
<ul style="list-style-type: none"> • Lack of information, and evident or heard actions 	<ul style="list-style-type: none"> • The residents are now aware that the BEM-ESTERO is supported by JICA, making it more credible • People became aware of cleanliness in the surroundings, importance of pollution control and implementation • It enlightened the residents of the fact that this project is significant in making the barangay a better place to live in • News is posted on wall providing the community people with appropriate information • With the help of the BEM-ESTERO, the people learned to give importance on proper management of garbage

Pollution Control

- What pollution controls have you implemented?

Before BEM-ESTERO	After/During BEM-ESTERO
<ul style="list-style-type: none"> • Throwing of burned garbage into the river • None • Burning of garbage on the streets • Unconcerned, ignorance of the law 	<ul style="list-style-type: none"> • Implementation of the City Ordinances on Pollution Control • Burning garbage is prohibited, all the Barangay Garbage are collected • Violators are penalized • Permits are required for any machine operations to prevent possible problems • Implementation of Clean Air Act and Noise Pollution Control • Our Barangay is beautiful and orderly

Beautification and Greening

Before BEM-ESTERO	After/During BEM-ESTERO
<ul style="list-style-type: none"> • None • Dirty streets • Improper parking 	<ul style="list-style-type: none"> • Cleaning the surroundings • Informed everybody to put plants in his/her house, and do the necessary painting work and beautify the Barangay • Formation of Ladies Auxiliary Brigade, associate of the BEM-ESTERO, in the implementation of cleanliness and order

3) Barangay Palanan, Makati City

Solid Waste

- How do you dispose of your garbage?

Before BEM-ESTERO	After/During BEM-ESTERO
<ul style="list-style-type: none"> • Bring out the garbage even if the truck has not yet arrived • Garbage is thrown in the river and scattered everywhere 	<ul style="list-style-type: none"> • Now, garbage are brought out only whenever the truck has arrived • Refrained from throwing garbage on streets and in the river, instead, they throw them in the garbage containers • Segregated garbage are being brought out only whenever the truck is there (biodegradable and non-biodegradable)

Information, Education and Communication

- What information, education and communication on environment were you able to accomplish?

Before BEM-ESTERO	After/During BEM-ESTERO
<ul style="list-style-type: none"> • Inform the residents about the meetings in the Barangay <p>The Barangay holds meetings to inform the residents and posted information on walls</p>	<ul style="list-style-type: none"> • Efforts were doubled in informing the residents about the activities in the Barangay • Give out leaflets & handouts to the people • Put up posters on houses regarding proper waste disposal and its importance • People are informed personally, which makes them understand easier all about order in the environment • Hand out leaflets to the people • Monitoring communication dissemination

Pollution Control

- What pollution controls have you implemented?

Before BEM-ESTERO	After/During BEM-ESTERO
<ul style="list-style-type: none"> • Prohibiting garbage burning alongside of the streets • Garbage thrown on streets are being burned 	<ul style="list-style-type: none"> • Became more strict in prohibiting painting of vehicles alongside of the streets • Cleaner surroundings • Activities causing pollution in the community have been banned • People police their community on violators of the Clean Air Act

Beautification and Greening

Before BEM-ESTERO	After/During BEM-ESTERO
<ul style="list-style-type: none">• Sidewalks and the estero are dirty• Projects on Beautification not implemented	<ul style="list-style-type: none">• Sidewalks are clean, sidewalks are painted, and potted plants are placed• Continued the existing Projects and hired additional cleaners• Organized cleaning of the community

(4) Future Plans

1) Barangay 195, Manila City

“To continue what we have learned for the benefit of our Barangay and for us to be more active in supervising”.

2) Barangay 46, Pasay City

“To sustain the BEM-ESTERO in our Barangay and to teach the other residents the benefit of the project”.

3) Barangay Palanan, Makati City

“We will continue and teach other Barangays to preserve the estero because Barangay Palanan is a Model in entire Makati”.

(5) Conclusion

Almost all of the BEM-ESTERO members displayed a positive attitude towards the process they experienced in the training and implementation of the BEM-ESTERO experimental project. Very influential to this outcome was the manner in which the project was implemented, particularly the different concepts and skills learned in the context of their environment and experiences. Although few had ambivalent attitudes the total impact of the BEM-ESTERO activities to the Barangay made a difference in their lives and particularly their environment.

The whole process of the BEM-ESTERO was experimental and the proponent DPWH have seen how effective it was in making the affected stakeholders actively participate in assuring the sustainability of the structural and non-structural measures in the Operation and Maintenance of the project. Thus, the proposed DICAMM project can be enhanced greatly by the initiatives of the Barangay through the organized effort of a Barangay Environment Management Plan.

6.4 RECOMMENDATION TO DEVELOPMENT OF BARANGAY INSTITUTIONAL SYSTEM

Based on Experimental Research, barangay institutional system is recommended as follows:

6.4.1 ORGANIZATION

It is recommended that BEM and Team ESTERO be established under Barangay Chairperson at each barangay. BEM and members of Team ESTERO are volunteers and/or representatives of barangay people. They are interface between community side and Government side.

At Community level, BEM and Team ESTERO appointed by Barangay Chairperson will ease the way for residents to prepare Barangay Environmental Management Plan. After authorization of Barangay Environmental Management Plan by Barangay Council (*Sungguniang Barangay*), this plan will be implemented by BEM and Team ESTERO with barangay people. *Figure 6.4.1* shows proposed Barangay institutional organization.

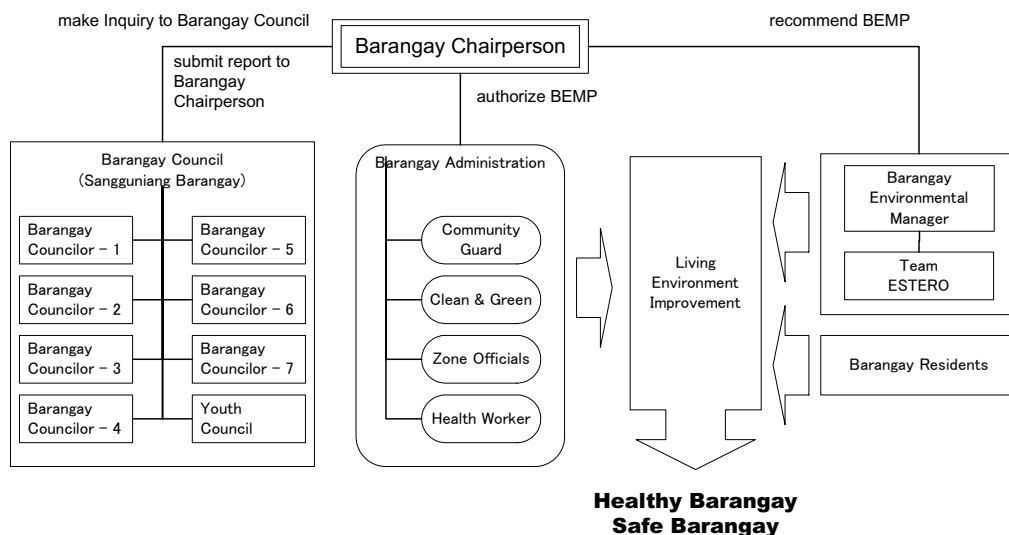


Figure 6.4.1 Proposed Barangay Institutional Organization

6.4.2 ROLES OF BEM AND TEAM ESTERO

1) Barangay Environmental Manager (BEM)

BEM is a volunteer. BEM is appointed as community leader from viewpoint of barangay environment by Barangay Chairperson.

Roles

- facilitates solid waste management, pollution control, improvement of public health and improvement of beautification for his/her barangay
- coordinates between barangay chairperson and barangay residents in order to formulate, implement and monitor Barangay Environmental Management Plan
- facilitates and monitors Team ESTERO
- disseminates information to barangay residents for improvement and development of barangay environment

2) Team Environmental Strategic Task for Estero Renewal Organization (Team ESTERO)

Team ESTERO is also composed of volunteers. Team ESTERO is appointed by Barangay Chairperson. They have roles of barangay environmental improvement and development as a working group and/or taskforce.

Roles

- supports BEM in order to improve and develop their environment
- organizes barangay residents in order to improve and develop their environment
- facilitates pollution control, improvement of public health and improvement of beautification for their barangay

6.4.3 BARANGAY ENVIRONMENTAL MANAGEMENT

Purposes of establishment of BEM and Team ESTERO are to conserve Barangay environment in order to ensure the safety and health of barangay through socially acceptable, sustainable and effective barangay environmental management. Barangay Environmental Management Plan should be formulated and implemented by community participatory method facilitated by BEM and Team ESTERO.

Components of Barangay Environmental Management Plan depend on local situations or local management issues. In general, Barangay Environmental Management Plan consists of five components as follows:

- Strengthening of Barangay Institutional System
- Community-Involved Solid Waste Management
- Community-Involved Pollution Control
- Beautification
- Information, Education and Communication (IEC)

Structure of Barangay Environmental Management is shown in *Figure 6.4.2*. Component of Strengthening of Barangay Institutional System provides a framework for living environment and sanitary improvement of barangay. In other words, development for better environment through drainage improvement is supported by this component fundamentally. This developed barangay institutional system supports other components such as community involvement of Solid Waste Management, Community-Involved Pollution Control, Beautification and IEC.

Solid waste management system should be accepted by community people who generate solid waste and throw solid waste into esteros. Community-Involved Pollution Control prevents illegal activities such as illegal solid waste dumping and minimizes pollution load from households. Furthermore, illegal settlers and structures are handled by Community-Involved Pollution Control. Beautification adds value to barangays. It is possible that people will not cooperate, even though a good system can be formulated. It is indispensable to strengthen Information, Education and Communication (IEC) campaign, in order to increase people's awareness.

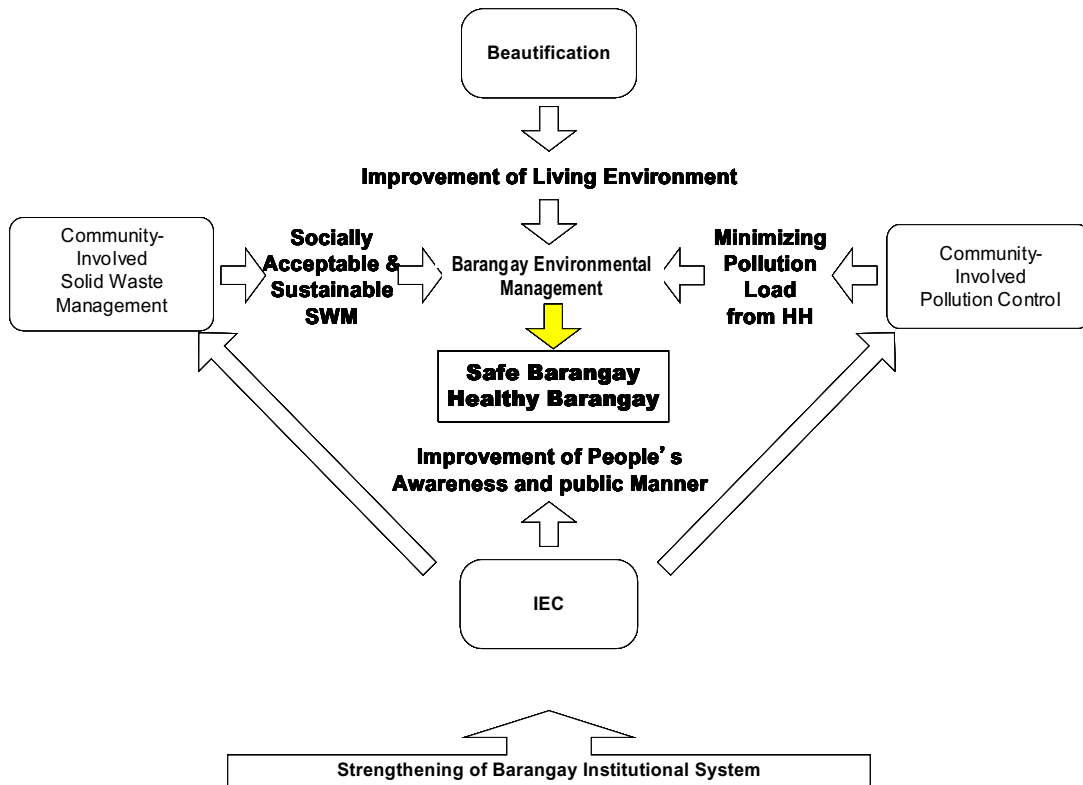


Figure 6.4.2 Structure of Barangay Environmental Management

Chapter 7

CONCLUSION AND RECOMMENDATION

CHAPTER 7 CONCLUSION AND RECOMMENDATION

7.1 CONCLUSION

The drainage facilities in the core area are composed of drainage pumping stations and drainage channels: esteros/creeks, drainage mains/outfalls and laterals. However, major drainage pumping stations have become old and require rehabilitation because they have already been working since the 1970s-1980s, and the drainage channels require improvement because they have mostly lost their original drainage capacities by the heavy deposits of solid waste/silt illegally dumped into drainage channels. Moreover, the encroachment of numerous informal house buildings/structures inside drainage channels are affecting the capacity of drainage channels and disturbing the O & M activities. The solid waste dumped in the drainage channels partly flows into the drainage pumping stations and is affecting the pump equipment.

The Master Plan proposes, as the most effective drainage improvement measures, the recovery and improvement of the original drainage capacities by relocating the informal settlers in the channels and by dredging/declogging of drainage channels together with the improvement by remedial works and additional facilities for the severe inundation areas, and the sustainment of capacities of the major drainage pumping stations. Also, the Master Plan proposes the establishment of proper O & M organizations/activities and the community-involved solid waste collection and O & M activities at the barangay level, in order to sustain the drainage capacities in the core area.

The proposed Master Plan and Priority Projects for the core area are effective in terms of technical, economic, social and environmental aspects for drainage improvement in the core area. By the implementation of the proposed drainage improvement plan, the severe inundation area will significantly be reduced and improved. It is recommended for the Government of the Philippines to take immediate actions for the implementation of the proposed measures, because the core area of Metropolitan Manila is very important economically and socially in the country, but extremely vulnerable to flood and inundation problems. The Study recommends the actions as follows.

7.2 RECOMMENDATION

- (1) The rehabilitation of the existing major drainage facilities: drainage channels and drainage pumping stations, shall be conducted according to the proposed schedule in order to prevent/mitigate the damages caused by floods and inundation in the core area of Metropolitan Manila. The Priority Projects identified in the Master Plan shall require immediate actions, and be conducted duly according to the schedule.
- (2) The relocation of informal settlers living inside the target drainage channels (esteros/creeks) shall be conducted before dredging. The implementing agencies shall select resettlement sites and prepare a “Resettlement Action Plan” for the Priority Projects and the Master Plan through a series of public consultation, based on the resettlement guideline prepared in the Study and the JICA guideline for environmental and social awareness, and shall avoid executing any summary evictions and returnees. Although there are some structures encroaching partly the drainage channel, the detailed number of project affected people for relocation or structure for compensation shall be decided based on the detailed design.
- (3) The O & M organizations shall be improved and barangay-involved O & M shall be established, and those organization shall conduct not only proper O & M activities for drainage facilities but also carry the responsibility for proper solid waste collection management at the barangay level to avoid illegal activities for sustaining the capacity of the drainage facilities after the rehabilitation/improvement of drainage channels.
- (4) The major drainage pumping stations require detailed rehabilitation programs through overhauling and the 12 drainage pumping stations require rehabilitation, but the 4 drainage pumping stations: Quiapo, Aviles, Valencia and Tripe de Gallina, are critical conditions requiring immediate actions for rehabilitation.
- (5) The implementing agency shall be decided and organize a coordination committee for the implementation of the Master Plan and Priority Projects, because the implementation of the Master Plan and Priority Projects shall require various concerned central and local government agencies and stakeholders.
- (6) The barangay environmental management shall be extended to other barangays along esteros/creeks to promote the community participation for improvement of various barangay activities including improvement/sustainment of the drainage capacity. The BEM (Barangay Environmental Manager) and Team ESTERO (Environmental Strategic Task for Estero Renewal Organization) activities conducted at three pilot barangays (Manila: Barangay 195, Pasay: Barangay 46, Makati: Barangay Palanan) as an experiment, would be an effective way for enhancement of public awareness through public education, for promotion of public participation for solid waste collection management as well as for prevention against illegal activities like dumping solid waste into drainage channels and informal settlement in public spaces.
- (7) The database for the Study, which has been developed and transferred to the implementing agency and concerned organizations (DPWH, MMDA and LGUs), shall be utilized and updated periodically for the O & M of drainage facilities and the coordinated activities shall be required among the concerned agencies.
- (8) DPWH as the implementing agency shall take the initiative to continue the preparation for the implementation of Priority Projects as follows:

- Preparation of the Environmental Impact Statement (EIS) based on the Environmental Impact Assessment (EIA) prepared in the Study and get an Environmental Compliance Certificate (ECC) for Priority Projects
- Preparation of a Resettlement Action Plan (RAP) shall be conducted according to the proposed the guideline of social awareness and resettlement, enough consideration of necessary social and basic infrastructures.
- Preparation of Implementation Program (IP) for financial arrangement shall include necessary measures for drainage improvement of the core area of Metropolitan Manila and also necessary measures required for the resettlement plan.
- Preparation for resettlement sites for the Phases 2 and 3 in the Master Plan shall be conducted according to the proposed relocation schedule of project affected people along the drainage channels.
- Preparation for countermeasures for rapid urbanization to lower runoff coefficient shall be conducted in order to establish sustainable drainage system.