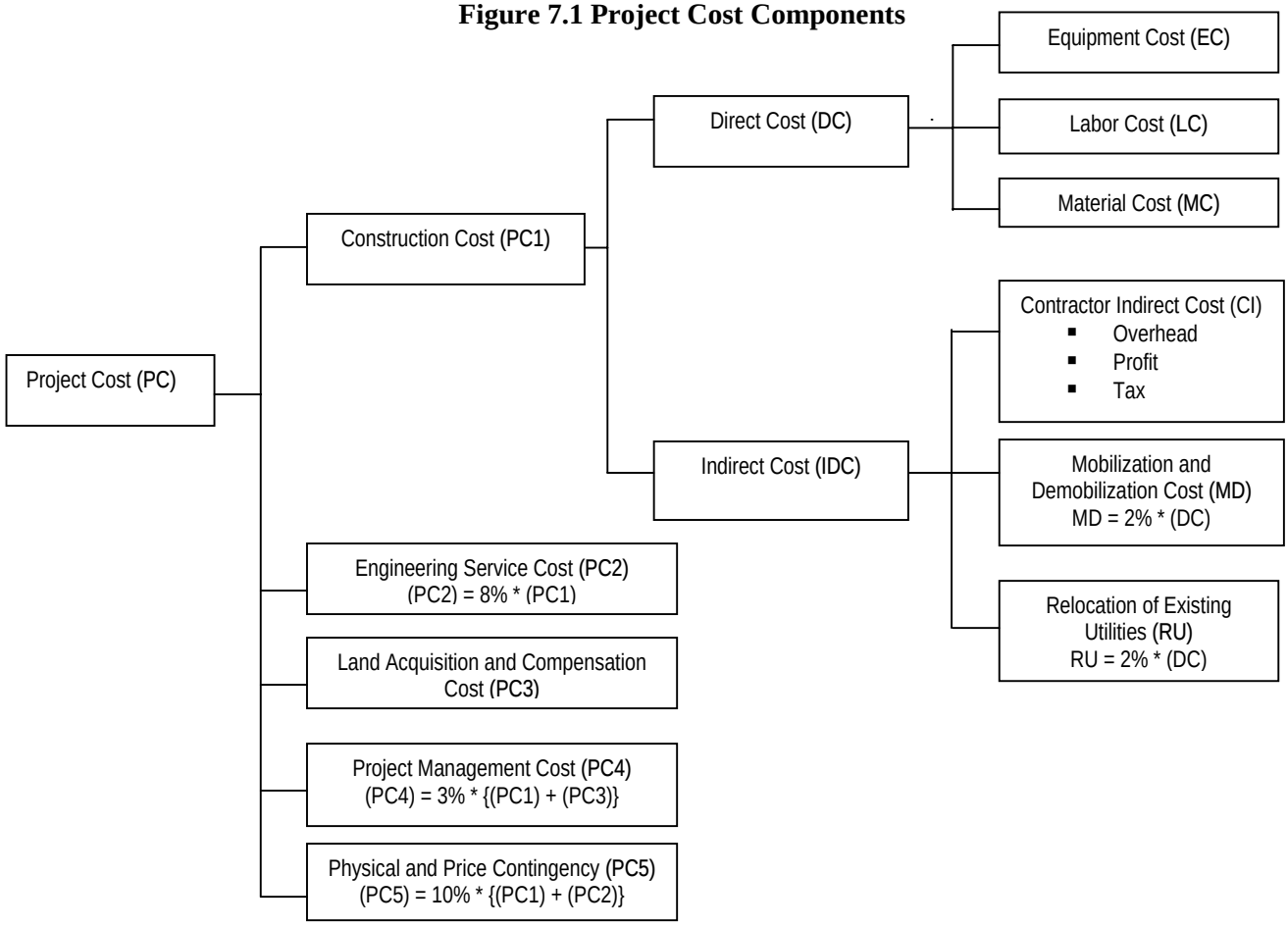
7 COST ESTIMATION, INVESTMENT SCHEDULE AND ECONOMIC ANALYSIS

7.1 Composition of Project Cost

As illustrated in Figure 7.1, the following are the Project Cost (PC) components: Construction Cost (PC1), Engineering Service Cost (PC2), Land Acquisition and Compensation Cost (PC3), Administration Cost (PC4), and Contingency (PC5).

Figure 7.1 Project Cost Components



(1) Construction Cost (PC1)

The Construction Cost is consisted of Direct Cost (DC) and Indirect Cost (IDC), with the Direct Cost comprised of Equipment Costs, Material Costs and Labor Costs. Indirect Costs are basically classified as Contractor Indirect Cost (CI), Mobilization and Demobilization Cost (MD), and Relocation of Existing Facilities (RU). The Contractor Indirect Cost, consisting of overhead, profit and tax, will be included in the Direct Cost for this estimation. These indirect costs are calculated as percentages of the calculated Direct Cost (DC). The following are the respective formulas to derive the indirect cost components based on the usual practice in DPWH road projects:

MD = 2 % of DC RU = 2% of DC

(2) Engineering Service Cost (PC2)

The cost for Engineering Service at the design stage is estimated at up to 6 % of the total Construction Cost. In the implementation stage, it is estimated at up to 10% of the total Construction Cost. This brings Engineering Service Cost to an average if up to 8%of the total Construction Cost for both stages.

(3) Land Acquisition and Compensation Cost (PC3)

This is estimated on the basis of the prevailing government expropriation cost for the land and residential properties. For purposes of this Study, this cost was estimated based on present value of land, property and replacement costs in the Study Area. Funding for this cost is accounted as government counterpart. Table 7.1 shows the land acquisition and compensation cost for each section of the busway corridor.

Table 7.1 Land Acquisition and Compensation Cost (in million pesos)

Segment	ROW Cost*	Compensation for Informal Dwellers
Bacoor, Segment 1	661.0	60.7
Imus, Segment 1	744.0	None
Imus, Segment 2	931.0	None
Dasmariñas, Segment 1	669.0	None
Dasmariñas, Segment 2	779.0	12.0
TOTAL	3,784.0	72.7

*ROW cost includes costs of land acquisition and compensation for formal settlers.

(4) Project Management Cost (PC 4)

This cost is calculated at 3 % of the sum of estimated construction cost and the land acquisition and compensation cost.

(5) Physical and Price Contingencies (PC 5)

Contingencies refer to both physical and price contingency. Physical contingency is provided to address cost changes that may be brought up by unforeseen developments from the time of this Study to the actual project implementation. Price contingency is estimated by applying the inflation rate of 1.1% per annum for the foreign currency component and 4.3 % per annum for the local currency component of the Construction Cost and the Engineering Service Cost. Contingency costs are assumed to be 10 % of Construction Cost.

7.2 Unit Cost Analysis

Information and data on equipment costs, material costs and labor costs were collected and calculated for major work items. Equipment costs are based mainly on the Equipment Rental Rates (ACEL); material costs are applied based on market prices and prices which were used for similar projects. Labor costs are based on the wages which are calculated by the formula of the GOP.

Data collected in the preliminary investigation are as follows:

(1) Equipment Cost

The rental rates (per hour or day) of construction equipment adopted for this Study are based on the "Equipment Rental Rates as of November 1998" by the Associated Construction Equipment Lessors (ACEL). Inc.

The equipment's unit cost already includes other costs such as fuel, lubricant, repair and/or maintenance, and operator. The Equipment Rental Costs are given in Table 7.2.

(2) Labor Costs

Taking into consideration the existing laws, rules and regulations governing setting of wages, total labor cost is estimated as shown in Table 7.3. Overtime pay is not considered in the computation of unit cost of labor. The summary of labor cost is shown in Table 7.4.

(3) Material Costs

Material costs include the costs of procuring the materials, processing, stockpiling, loading, hauling, storage, handling, waste and/or losses, and other miscellaneous costs. Table 7.5 presents the costs of major materials.

Table 7.2 Hourly Rental Rate of Main Equipment

No.	Equipment Description	Capacity	Unit Price	Currency Components (%)		
			P/hr.	Foreign(Peso)	Local(Peso)	Taxes(Peso)
	Plant and Heavy Equipment			68(%)	10(%)	22(%)
1	Aggregate Crushing plant	100~120 tons/hr	2,513	1708.8	251.3	552.9
2	Asphalt Plant	60 tons/hr	1,005	683.4	100.5	221.1
3	Concrete Batch Plant	60 cu.m/hr	1,554	1,056.7	155.4	341.9
4	Mobile Washing and Screening Plant		836	568.5	83.6	183.9
5	Bakhoe Crawler Mounted	0.3 cu.m, 66HP	764	519.5	76.4	168.1
6	Backhoe Crawler Mounted	0.70 cu.m	951	646.7	95.1	209.2
7	Backhoe Crawler with Hydraulic Breaker		951	646.7	95.1	209.2
8	Bulldozer	15 ton class, 140 HP	1,223	832.5	122.2	268.3
9	Bulldozer	21 ton class, 200 HP	1,603	1090	160.3	352.7
10	Clamshell bucket with Base machine	0.8 cu.m	150	102.0	15.0	33.0
11	Reverse Circulation drill with accessories		1,250	850.0	125.0	275.0
12	Crawler Crane	21~25 tons, 145 HP	1,258	855.4	125.8	276.8
13	Crawler Crane	40 tons, 155 HP	1,505	1,023.3	150.5	331.2
14	Crawler Crane	80 tons, 275 HP	2,296	1,561.3	229.6	505.1
15	Crawler Crane	100~120 tons, 295 HP	4,107	2,792.8	410.7	903.5
16	Loader Wheel Type	1.53 cu.m, 102 HP	721	490.2	72.1	158.6
17	Loader Wheel Type	3.1~3.2 cu.m, 212 HP	887	603.2	88.7	195.1
18	Motor Grader	3.1~3.4 m, 125 HP	796	541.3	79.6	175.1
19	Truck Mounted Crane	4.8~4.9 tons, 162HP	471	320.3	47.1	103.6
20	Truck Mounted Crane	16~20 tons, 180 HP	938	637.8	93.8	206.4
21	Truck Mounted Crane	21~25 tons, 200 HP	1,162	790.2	116.2	255.6
22	Truck Mounted Crane	40~45 tons, 338 HP	2,645	1,798.6	264.5	581.9
23	Truck Mounted Crane	120 tons, 380 HP	4,683	3,184.4	468.3	1,030.3
	Light Equipment			65(%)	15(%)	20(%)
24	Asphalt Distributor	5 tons	851	553.2	127.6	170.2
25	Asphalt Finisher	110HP	2,980	1,937.0	447.0	596.0
26	Asphalt Paver/ Finisher	2.4~6.5 m width, 110 HP	2,356	1602.1	235.6	518.3
27	Concrete Paver/Finisher	120 HP	1,308	850.2	196.2	261.6
28	Concrete Pump Car	76 cu.m	1,327	902.4	132.7	291.9
29	Concrete Pump Car	90~110 cu.m	1,439	935.4	215.8	287.8
30	Concrete Vibrator 60 mm. Diameter		83	54.0	12.5	16.5
31	Generator Set	201~250 kW	700	454.7	105.3	140.0
32	Generator Set	50~100 kW	328	213.1	49.2	65.7
33	Grout Mixer	200 liter	95	61.75	14.25	19
34	Grout Pump	15~30 lit./min.	270	175.5	40.5	54
35	Jack and Pump	195 tons cable stressing	235	152.7	35.3	47
36	Mobile Air Compressor	456~500 cfm.	876	569.4	131.4	175.2
37	Mobile Air Compressor	501~600 cfm.	1,182	768.3	177.3	236.4
38	Pneumatic Tired Roller	up to 15 tons	558	362.7	83.7	111.6
39	Road Roller, Macadum Type	9~11 tons	1295	841.8	194.3	258.9
40	Transit Mixer	3.0~3.2 cu.m	877	570.1	131.6	175.3
41	Transit Mixer	6.0~6.2 cu.m	1486	965.9	222.9	297.2
42	Vibratory Plate Compactor	12 HP	206	133.9	30.9	41.2
	Truck			65(%)	15(%)	20(%)
43	Cargo Truck	9~10 tons	918	596.7	137.7	183.6
44	Dump Trucks	6~8 cu.m, 220 HP	807	524.55	121.05	161.4
45	Dump Trucks	9 cu.m, 275 HP	1,004	652.6	150.6	200.8
46	Water Tank Truck with Pump	1,000~3,000 gals	1,341	871.65	201.15	268.2

Source: ACEL

Table 7.3 Labor Cost in Cavite (Area 4)

(as of July 2002)

Category	Labor Cost Index	Basic Daily Wage	Basic Monthly Wage	Leave	Monthly Bonus	BENEFITS				Total Rate per Month	Rate per Day	Rate per Hour
						SSS	Medicare	Employee Contrib.	Pag-ibig			
Foreman	1.49	353.13	8,828.25	735.69	735.69	456.00	93.75	10.00	100.00	10,959.38	438.38	54.80
Assistant Foreman	1.42	336.54	8,413.50	701.13	701.13	430.70	93.75	10.00	100.00	10,450.21	418.01	52.25
Heavy Eqpt. Operator	1.36	322.32	8,058.00	671.50	671.50	405.30	93.75	10.00	100.00	10,010.05	400.40	50.05
Light Eqpt. Operator	1.18	279.66	6,991.50	582.63	582.63	354.70	93.75	10.00	100.00	8,715.21	348.61	43.58
Driver	1.24	293.88	7,347.00	612.25	612.25	380.00	93.75	10.00	100.00	9,155.25	366.21	45.78
Skilled laborer	1.29	305.73	7,643.25	636.94	636.94	380.00	93.75	10.00	100.00	9,500.88	380.04	47.50
Semi-Skilled Laborer	1.14	270.18	6,754.50	562.88	562.88	354.70	93.75	10.00	100.00	8,438.71	337.55	42.19
Unskilled Laborer	1.00	237.00	5,925.00	493.75	493.75	304.00	93.75	10.00	100.00	7,420.25	296.81	37.10

a) Monthly Wage — are based per month, eight(8) hours per day
b) Leave — basic monthly pay/12- representing vacation sick leave benefits
c) Bonus — basic monthly pay/12-representing 13 th month pay
d) SSS — amount representing employer's contribution, graduated scale
e) Medicare — amount representing employer's contribution, graduated scale
f) Employee's Comp — amount representing employer's contribution, graduated scale
g) Pag-ibig — amount representing employer's contribution (2% of basic monthly pay or Ps 100.00 max.)
h) Rate per day — total monthly pay/ 25

Table 7.4 Summary of Labor Cost in Cavite

Designation	Labor Index	Wage P/Hr.	Currency Components (%)		
			Foreign(0)	Local(90)	Taxes(10)
a) Foreman	1.49	54.80	0	49.32	5.48
b) Assistant Foreman	1.42	52.25	0	47.03	5.23
c) Heavy Equipment Operator	1.36	50.05	0	45.05	5.01
d) Light Equipment Operator	1.18	43.58	0	39.22	4.36
e) Driver	1.24	45.78	0	41.20	4.58
f) Skilled Laborer	1.29	47.50	0	42.75	4.75
g) Semi-Skilled Laborer	1.14	42.19	0	37.97	4.22
h) Unskilled Laborer	1.00	37.10	0	33.39	3.71

Table 7.5 Costs of Major Materials

Item of Material	Unit	Unit Price (Pesos)	Currency Components		
			Foreign	Local	Taxes
a) Reinforcement steel bar grade	kg	25.00	54%	35%	11%
b) Reinforcement steel bar grade	kg	27.00	54%	35%	11%
c) Pre stressing steel cable	kg	100.00	65	5%	30%
d) Portland Cement	kg	135.00	40%	45%	15%
e) Structure steel	kg	35.00	85%	4%	11%
f) Asphalt cement (penetration 60/70)	kg	25,600.00	76%	2%	22%
g) Asphalt cement (penetration 85/100)	kg	25,600.00	76%	2%	22%
h) Asphalt Mixture	kg	1,800.00	53%	37%	10%
i) Crushed aggregate	kg	860.00	52%	22%	26%
j) Coarse aggregate for cement concrete	kg	863.00	35%	55%	10%
k) Fine aggregate for cement concrete	kg	253.00	52%	22%	26%
l) Plywood (marine 12 x 120 x 240)	kg	720.00	33%	57%	10%
m) Plywood (ordinary 12 x 120 x 240)	kg	650.00	33%	57%	10%
n) Lumber (apitong or equivalent)	kg	32.00	33%	57%	10%
o) Diesel fuel	kg	14.50	60%	13%	27%
p) Gasoline (regular)	kg	17.00	60%	13%	27%
q) Lubricant	kg	120.00	60%	13%	27%

7.3 Project Cost Estimation

The total estimated project cost is the sum of the Construction Cost, Engineering Service Cost, Land Acquisition and Compensation Cost, Administration Cost, and Contingency.

(1) Construction Cost

The Construction Cost in this Project was estimated at ₱3,955 million consisting of a Foreign Component of ₱2,325 million (59%) and a Local Component of ₱1,630 million (41%).

(2) Estimated Project Cost

By adding up item costs PC1, PC2, PC3, PC4, and PC5, the Project Cost was estimated at ₱8,715 million (¥20 billion) as shown in Table 7.6.

Table 7.6 Total Project Cost

Unit: Peso x 1000; Yen x 1000

Description			Service Road			Bus Way			Total		
			F/C (M Peso)	L/C (M Peso)	Total (M Peso)	F/C (M Peso)	L/C (M Peso)	Total (M Peso)	F/C (M Peso)	L/C (M Peso)	Total (M Peso)
Construction Cost (PC1)	A-1	Earth Work	83.5	194.8	278.2	0.0	0.0	0.0	83.5	194.8	278.2
	A-2	Pavements	502.5	319.6	822.1	387.7	217.7	605.4	890.3	537.3	1,427.5
	A-3	Drainage	121.6	161.3	282.9	0.0	0.0	0.0	121.6	161.3	282.9
	A-4	Structure	219.8	134.7	354.5	372.9	211.3	584.2	592.7	346.0	938.7
	A-5	Cross Road Improvement	60.2	34.7	94.9	0.0	0.0	0.0	60.2	34.7	94.9
	A-6	Road Safety Facilities	37.0	36.4	73.4	0.0	0.0	0.0	37.0	36.4	73.4
	A-7	Terminals and Off-road Facilities	0.0	0.0	0.0	39.9	30.5	70.4	39.9	30.5	70.4
	A-8	Bus Stop within ROW	0.0	0.0	0.0	116.5	45.5	162.0	116.5	45.5	162.0
	A-9	Bus Depot	0.0	0.0	0.0	83.6	51.4	135.0	83.6	51.4	135.0
	A-10	Miscellaneous of other Facilities	114.4	76.2	190.6	93.4	62.3	155.7	207.8	138.5	346.3
	A-11	Mobilization and Demob.	29.4	12.6	41.9	24.0	10.3	34.3	53.3	22.9	76.2
	A-12	Relocation of Existing Utilities	21.0	17.2	38.1	17.1	14.0	31.1	38.1	31.2	69.3
	Total of Construction Cost (A)		1,189.4	987.4	2,176.8	1,135.2	642.9	1,778.1	2,324.6	1,630.3	3,954.8
Indirect cost	PC2	Engineering Services (8% of PC1)	139.3	34.8	174.1	113.8	28.4	142.2	253.1	63.3	316.4
	PC3	Land Acquisition and Compensation	0.0	2,648.8	2,648.8	0.0	1,135.2	1,135.2	0.0	3,784.0	3,784.0
	PC4	Project Management Cost (3%of (PC1+PC3))	113.8	48.8	162.5	48.8	20.9	69.6	162.5	69.6	232.2
	PC5	Physical and Price Contingencies (10% of (PC1+PC2))	132.9	102.2	235.1	124.9	67.1	192.0	257.8	169.4	427.1
	Total of Indirect Cost		385.9	2,834.6	3,220.6	287.4	1,251.7	1,539.1	673.4	4,086.3	4,759.7
Grand Total			1,575.3	3,822.0	5,397.3	1,422.6	1,894.6	3,317.2	2,998.0	5,716.5	8,714.5

Table 7.7 Busway Project Cost by Section (Municipality Boundary)

Unit: Peso x 1000; Yen x 1000

Description			Section I (Sta.0+000~Sta.6+843) Bacoor			Section II (Sta.6+843~Sta.12+577) Imus			Section III (Sta.12.577~Sta.21+000) Dasmarinas			Grand	Equivarent
			Foreign Currency	Local Currency	Total (Peso)	Foreign Currency	Local Currency	Total (Peso)	Foreign Currency	Local Currency	Total (Peso)	Total (Peso)	Total (Yen)
Construction Cost (PC1)	A-1	Earth Work	10,217	23,839	34,056	36,567	85,323	121,890	36,689	85,607	122,295	278,241	651,085
	A-2	Pavements	244,336	159,589	403,924	286,377	169,187	455,565	359,554	208,496	568,050	1,427,539	3,340,441
	A-3	Drainage	37,320	45,614	82,934	38,788	47,407	86,195	45,523	68,285	113,808	282,937	662,073
	A-4	Structure	126,047	67,871	193,918	226,152	138,609	364,761	240,529	139,523	380,051	938,730	2,196,629
	A-5	Cross Road Improvement	51,362	28,767	80,129	4,137	2,782	6,919	4,731	3,102	7,833	94,881	222,021
	A-6	Road Safety Facilities	16511	16380	32891	8,530	8,177	16,707	11,963	11,848	23,812	73,410	171,778
	A-7	Terminals and Off-road Facilities	9,031	7,159	16,190	7,735	5,777	13,512	23,151	17,530	40,681	70,384	164,698
	A-8	Bus Stop within ROW	33,806	8,077	41,884	27,700	13,255	40,955	54,967	24,157	79,124	161,962	378,991
	A-9	Bus Depot				48,200	30,000	78,200	35,440	21,360	56,800	135,000	315,900
	A-10	Miscellaneous of other Facilities	53,156	35,437	88,593	71,082	47,388	118,470	83,547	55,698	139,245	346,308	810,362
	A-11	Mobilization and Demob.	13,643	5,847	19,490	18,244	7,819	26,063	21,444	9,190	30,634	76,188	178,280
	A-12	Relocation of Existing Utilities	9,745	7,973	17,719	13,032	10,662	23,694	15,317	12,532	27,849	69,262	162,072
	Total of Construction Cost (A)		605,174	406,553	1,011,727	786,544	566,387	1,352,932	932,855	657,328	1,590,183	3,954,842	9,254,330
Indirect cost	PC2	Engineering Services (8% of PC1)	64,751	16,188	80,938	86,588	21,647	108,235	101,772	25,443	127,215	316,387	740,346
	PC3	Land Acquisition and Compensation		661	661		1,675	1,675		1,448	1,448	3,784,000	8,854,560
	PC4	Project Management Cost (3%of (PC1+PC3))	21,260	9,111	30,372	28,447	12,191	40,638	33,424	14,325	47,749	232,165	543,267
	PC5	Physical and Price Contingencies (10% of (PC1+PC2))	60,097	49,170	109,267	80,364	65,752	146,117	94,457	77,283	171,740	427,123	999,468
	Total of Indirect Cost		146,107	75,130	221,237	195,399	101,266	296,664	229,653	118,498	348,151	4,759,676	11,137,641
Grand Total			751,281	481,684	1,232,965	981,943	667,653	1,649,596	1,162,508	775,826	1,938,334	8,714,517	20,391,971

Table 7.8 Project Cost for Coastal Road Access

Description			F/C (M Peso)	L/C (M Peso)	Total (M Peso)
Construction Cost (PCI)			284.6	189.7	474.4
Indirect cost	PC2	Engineering Services (8% of PC1)	22.8	15.2	37.9
	PC3	Land Acquisition and Compensation		432.4	432.4
	PC4	Project Management Cost (3%of (PC1+PC3))	8.5	18.7	27.2
	PC5	Physical and Price Contingencies (10% of (PC1+PC2))	30.7	20.5	51.2
	Indirect Cost		62.0	486.7	548.8
Total			346.7	676.5	1,023.1

Exchange Rate : US$ 1= Yen120 = Ps 51.2; Ps 1= Yen 2.34 (Aug. 2002)

7.4 Investment Schedule

(1) Initial Investment

Investment schedule for the Cavite Busway is hereunder planned, assuming that necessary land shall be acquired in 2003 – 2004, detail design shall be conducted in 2005 –2006 and construction work shall be completed in three years starting from 2005 to 2007. Accordingly, the busway will start its operation on the first day of 2008. The ratios of annual investment amount are assumed as shown in Table 7.9.

Table 7.9 Investment Schedule and Annual Composition of Amount

Cost Item		2003	2004	2005	2006	2007	2008
ROW	Annual Invest (%)	40	60				
D/D	Annual Invest (%)		50	50			
Construction	Annual Invest (%)			20	40	40	

Following the said schedule, total project cost of ₱ 9,737.6million is distributed over the implementation period of 2003 – 2007, as shown in Table 7.10. The maximum need for fund raising will occur in the second year due to high cost of land acquisition.

Table 7.10 Annual Investment Amount by Project Component

(Million Pesos)

Component/ Cost Item		Total Cost	Year				
			2003	2004	2005	2006	2007
Busway	ROW	**1135.2**	454.1	681.1	0.0	0.0	0.0
	D/D	71.1	0.0	35.6	35.6	0.0	0.0
	Const.	2110.9	0.0	0.0	422.2	844.3	844.3
	Total	3317.2	454.1	716.7	457.7	844.3	844.3
Service Road	ROW	2648.8	1059.5	1589.3	0.0	0.0	0.0
	D/D	87.1	0.0	43.5	43.5	0.0	0.0
	Const.	2661.5	0.0	0.0	532.3	1064.6	1064.6
	Total	5397.3	1059.5	1632.8	575.8	1064.6	1064.6
Coastal Access	ROW	432.4	173.0	259.4	0.0	0.0	0.0
	D/D	19.0	0.0	9.5	9.5	0.0	0.0
	Const.	571.7	0.0	0.0	114.3	228.7	228.7
	Total	1023.1	173.0	268.9	123.8	228.7	228.7
All Components	ROW	4216.4	1686.6	2529.8	0.0	0.0	0.0
	D/D	177.2	0.0	88.6	88.6	0.0	0.0
	Const.	5344.0	0.0	0.0	1068.8	2137.6	2137.6
	Total	9737.6	1686.6	2618.4	1157.4	2137.6	2137.6

(2) Maintenance Cost

As shown in Table 7.11, maintenance cost of the Busway Project inclusive of service road is estimated for the first ten years after operation starts. Annual cost for routine maintenance is estimated at about ₱1.5 million, covering cleaning and light repair of road facilities and traffic signs.

Due to a heavy traffic forecasted on the busway as well as service road, the road surface will need a periodic treatment by overlay for every five years. One-time overlay for 663,000 m^2 will cost ₱863 million, assuming ₱1,300 per one square meter. Funds for this maintenance should be properly raised to keep a high level of bus service.

Table 7.11 Maintenance Cost of Busway Project

(Million Pesos)

Cost Item	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Routine Maintenance	**1.46**	**1.46**	**1.46**	**1.46**	**1.46**	**1.46**	**1.46**	**1.46**	**1.46**	**1.46**
Vegitation Control	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71
Clearing and Repair of Culvert	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23
Replace, Clean and Repair Traffic Signs	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14
Cleaning Side Ditch	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38
Periodic Maintenance	**0.00**	**0.00**	**0.00**	**0.00**	**863.33**	**0.00**	**0.00**	**0.00**	**0.00**	**863.33**
Overlay of Pavement	0.00	0.00	0.00	0.00	863.23	0.00	0.00	0.00	0.00	863.23
Repair of Cracks/Joints	0.00	0.00	0.00	0.00	0.10	0.00	0.00	0.00	0.00	0.10
Total Maintenance Cost	**1.46**	**1.46**	**1.46**	**1.46**	**864.79**	**1.46**	**1.46**	**1.46**	**1.46**	**864.79**

7.5 Economic Analysis

(1) Methodology and Assumptions

The Project is evaluated from the economic perspective, following a prevailing method of the cost-benefit analysis, in which the project cost and benefit are measured in economic price and compared through the project life. Economic cost is the initial investment cost and maintenance cost of the Project.

Economic benefit of the Project is defined as the savings in VOC and TTC attributable to the project. This benefit is the most direct one and comparatively easy to quantify. The benefit is estimated through "with-and without" comparison of traffic assignment on the network.

The project would generate other economic benefits such as decrease of traffic accidents, improvement in passengers' comfortability and contribution to regional development in the long run. However, these benefits are difficult to measure and

tend to be an arbitrary estimate, even they can be measured. For this reason, economic benefit is limited to the most direct ones to make the analysis safer.

Durable life of a transportation project is usually very long, that is, 50 to 60 years if it is properly maintained. On the other hand, economic project life is considered much shorter than the physical life, that is, 25 to 35 years because the facility soon becomes outdated and uneconomical due to rapid innovation. This busway project, in particular, is planned as a measure for a transitional period from bus to rail-transit. Therefore, its life is defined as a short period of 13 years after commencement of operations, namely, 2008 to 2020, assuming that an LRT system would replace the busway in 2020.

It is still uncertain whether the LRT will run at grade on the busway or on an elevated structure along the busway. Hence, the residual value of the busway and its land is neglected. Only the land acquired for busway is regarded as the residual after the project life.

The CBS is consisted of three segments from Bacoor to Dasmariñas for the busway corridor. An additional segment in the north, the coastal road access which connects Talaba Terminal and the Coastal Expressway. But for purposes of economic analysis, this segment was not included and the economic analysis only focused on the busway corridor itself.

(2) Economic Cost

Economic cost is defined as a net consumption of goods and service for implementation of the project. In order to estimate this economic cost of the Project, the initial cost and the maintenance cost stated in the previous section, which are measured in financial cost, need to be converted to costs in economic price. According to various feasibility studies conducted in the Philippines, NEDA has seemingly suggested two different methods for this conversion, namely:

Method A: Application of Standard Conversion Factor (SCF)

Economic cost is simply estimated by multiplying SCF to financial cost. The MMUTIS, which was conducted in 1997 – 1998, adopted this method using 0.83 as the value of SDF.

Method B: Application of Shadow Rate

Financial cost is divided into two categories of foreign currency and local currency portion. To the former, a shadow exchange rate of 1.2 is applied and to the latter, a shadow wage rate of 0.6 is applied.

Method B seems to have been applicable only in the old era in the Philippines. Because Philippine pesos is now a hard currency, it is now freely exchangeable to foreign currencies. Therefore, the method A is applied in this study to all the cost components except land cost.

Table 7.12 shows the financial and economic cost by project component and cost element. Total economic cost is ₱8,820.6 million, or 90.6% of the financial cost.

Table 7.12 Financial and Economic Cost by Project Component

(1) Financial Cost (Million Pesos)

Project Component	DD Cost (Foreign C.)	Construction			ROW Cost (Local C.)	Total Cost		
		Foreign/C.	Local/C.	Total		Foreign/C.	Local/C.	Total
Busway	71.1	1332.2	778.6	2110.9	1135.2	1403.4	1913.8	3317.2
Service Road	87.1	1484.7	1176.8	2661.5	2648.8	1571.8	3825.6	5397.3
Coastal Access	19.0	354.7	217.0	571.7	432.4	373.7	649.4	1023.1
Total	177.2	3171.6	2172.4	5344.0	4216.4	3348.8	6388.8	9737.6

(2) Economic Cost (Million Pesos)

Project Component	DD Cost (Foreign C.)	Construction			ROW Cost (Local C.)	Total Cost		
		Foreign/C.	Local/C.	Total		Foreign/C.	Local/C.	Total
Busway	59.0	1109.8	648.0	1757.8	1135.2	1168.8	1783.2	2952.0
Service Road	72.3	1241.8	980.8	2222.5	2648.8	1314.0	3629.6	4943.6
Coastal Access	15.7	279.8	197.0	476.8	432.4	295.5	629.4	924.9
Total	147.0	2631.3	1825.8	4457.1	4216.4	2778.4	6042.2	8820.6

In the same manner, maintenance cost was converted into economic price: annual routine maintenance cost of ₱1.46 million is ₱1.34 million and periodic maintenance cost of ₱864.8 million is ₱796.5 million, respectively after conversion.

(3) Economic Benefit

The unit VOC and TTC used in MMUTIS were updated as shown in Table 7.13 and 7.14, using overall inflation rates during 1997 – 2001. The public mode comprises bus and jeepney and the private mode includes car, taxi and truck. The unit costs shown in the tables are weighted averages. The unit VOC is expressed as the function of travel speed.

Table 7.13 Unit VOC by Public and Private Mode as of 2002

Velocity	Public Mode		Private Mode	
(km/hour)	Peso/1000km	Peso/hour	Peso/1000km	Peso/hour
10	6127.6	58.8	4160.9	34.6
20	5720.1	69.6	3855.1	39.5
30	5446.4	74.2	3626.8	39.4
40	5302.9	76.1	3473.5	37.9
50	5397.5	77.1	3420.3	36.1
60	5609.0	77.6	3434.5	34.3
70	5990.7	78.3	3536.1	32.7
80	6655.6	79.6	3741.7	31.3
90	7794.9	82.2	4096.2	30.2

Table 7.14 Unit TTC by Public and Private Mode as of 2002

(Peso/Hour/Vehicle)

Mode	1997*	1997	2005	2010	2015
Public Mode	432.3	631.1	858.4	948.3	1047.7
Private Mode	60.4	88.2	120.0	132.5	146.4

* 1997 price(Others are at 2002 Price)

By applying above unit costs to assigned traffic volume and summing VOC and TTC on each link, aggregate transportation cost was estimated as shown in Table 7.15. Economic benefit is the difference of the aggregate costs between "without project" case and "with project" case, which will expectedly amount to ₱6.0 billion (as annual total) in 2010 and ₱6.7 billion in 2015.

In 2010, about 60% of economic benefit will accrue from congestion mitigation of public mode and 40% from private mode while in 2015, the 80% of benefit will be cost savings in public mode traffic. This is because many road projects are assumed to complete in the project area by 2015 and then relative importance of the Busway Project will be less significant. As a result, high speed service to bus passengers provided by the Project will become relatively remarkable.

Table 7.15 Economic Benefit in Benchmark Years

(1) Busway + Service Road (Million Peso/Year)

Year	Case	Cost Item	Public Mode	Private Mode	Total
2005	Without Case	VOC	35123.8	57489.7	92613.5
		TTC	111468.9	42160.7	153629.6
		Total	146592.7	99650.4	246243.1
	With Case	VOC	34652.3	56696.1	91348.4
		TTC	108890.2	41166.8	150057.0
		Total	143542.5	97862.9	241405.4
	Benefit	VOC	471.5	793.6	1265.1
		TTC	2578.7	993.9	3572.6
		Total	3050.2	1787.5	4837.7
2010	Without Case	VOC	34816.7	81572.2	116388.9
		TTC	118376.9	64505.4	182882.3
		Total	153193.6	146077.6	299271.2
	With Case	VOC	34283.4	80506.9	114790.3
		TTC	115447.2	63051.6	178498.8
		Total	149730.6	143558.5	293289.1
	Benefit	VOC	533.3	1065.3	1598.6
		TTC	2929.7	1453.8	4383.5
		Total	3463.0	2519.1	5982.1
2015	Without Case	VOC	43937.7	113412.8	157350.5
		TTC	158379.3	99657.8	258037.1
		Total	202317.0	213070.6	415387.6
	With Case	VOC	43161.4	112878.7	156040.1
		TTC	153864.4	98790.5	252654.9
		Total	197025.8	211669.2	408695.0
	Benefit	VOC	776.3	534.1	1310.4
		TTC	4514.9	867.3	5382.2
		Total	5291.2	1401.4	6692.6

(2) Busway Only (Million Peso/Year)

Year	Case	Cost Item	Public Mode	Private Mode	Total
2005	Without Case	VOC	34666.6	56971.9	91638.5
		TTC	108991.4	41598.4	150589.8
		Total	143658.0	98570.3	242228.3
	With Case	VOC	34652.3	56696.1	91348.4
		TTC	108871.1	41166.8	150037.9
		Total	143523.4	97862.9	241386.3
	Benefit	VOC	14.3	275.8	290.1
		TTC	120.3	431.6	551.9
		Total	134.6	707.4	842.0
2010	Without Case	VOC	34319.4	80506.9	114826.3
		TTC	115711.5	63051.6	178763.1
		Total	150030.9	143558.5	293589.4
	With Case	VOC	34283.4	80316.7	114600.1
		TTC	115426.7	62670.5	178097.2
		Total	149710.1	142987.2	292697.3
	Benefit	VOC	36.0	190.2	226.2
		TTC	284.8	381.1	665.9
		Total	320.8	571.3	892.1
2015	Without Case	VOC	43187.1	112891.2	156078.3
		TTC	154019.7	98740.7	252760.4
		Total	197206.8	211631.9	408838.7
	With Case	VOC	43061.4	112778.7	155840.1
		TTC	153544.6	98390.5	251935.1
		Total	196606.0	211169.2	407775.2
	Benefit	VOC	125.7	112.5	238.2
		TTC	475.1	350.2	825.3
		Total	600.8	462.7	1063.5

Note: Figures in 2005 is shown hypothetically, because Year 2005 is one of the benchmark years for demand forecast. In cash flow analysis, benefits since the opening year (2008) are estimated by interpolation.

(4) Cost-Benefit Flow and EIRR

Table 7.16 shows the economic cash flow over the project period for calculating economic internal rate of return (EIRR). The entire project including two exclusive bus lanes and four lanes of service road will have a high EIRR of 35.9%. According to NEDA's criteria, the threshold value to judge the economic feasibility of a project is 15% in the Philippine. Although this analysis is still preliminary, the high EIRR would hardly drop below 15%.

In order to evaluate the bus lanes separately from service roads in both sides, the service roads were assumed to be non-existent in both of " with" and "without" case. The resultant EIRR was 20.5%, which also proved to be highly feasible from the economic viewpoint.

Table 7.16 Cash Flow of Economic Cost and Benefit

(1) Busway + Service Road

(Million Pesos)

Year	Project Cost	Mainte. Cost	Economic Benefit	Net Cash Flow
2003	1513.6			-1513.6
2004	2336.1			-2336.1
2005	861.7			-861.7
2006	1592.1			-1592.1
2007	1592.1			-1592.1
2008		1.3	5495.0	5493.7
2009		1.3	5733.4	5732.1
2010		1.3	5982.1	5980.8
2011		1.3	6117.9	6116.5
2012		796.5	6256.8	5460.3
2013		1.3	6398.8	6397.4
2014		1.3	6544.1	6542.7
2015		1.3	6692.6	6691.3
2016		1.3	6844.5	6843.2
2017		796.5	6999.9	6203.4
2018		1.3	7158.8	7157.4
2019		1.3	7321.3	7319.9
2020		1.3	7487.5	8621.3
2021		1.3	7657.5	7656.1
2022	-1135.2	1.3	7831.3	8965.1

EIRR	(%)	35.9
NPV	Million P	13546.1
B/C	-	3.12

(2) Busway Only

(Million Pesos)

Year	Project Cost	Mainte. Cost	Economic Benefit	Net Cash Flow
2003	454.1			-454.1
2004	710.6			-710.6
2005	381.1			-381.1
2006	703.1			-703.1
2007	703.1			-703.1
2008		0.4	871.7	871.3
2009		0.4	881.8	881.4
2010		0.4	892.1	891.7
2011		0.4	924.0	923.6
2012		374.3	957.1	582.7
2013		0.4	991.3	990.9
2014		0.4	1026.8	1026.4
2015		0.4	1063.5	1063.1
2016		0.4	1101.5	1101.1
2017		374.3	1141.0	766.6
2018		0.4	1181.8	1181.4
2019		0.4	1224.0	1223.6
2020		0.4	1267.8	1267.4
2021		0.4	1313.2	1312.8
2022	-1135.2	0.4	1360.2	2495.0

EIRR	(%)	20.5
NPV	Million P	843.3
B/C	-	1.37

(5) Sensitivity Analysis

1) Change in Cost and Benefit

Sensitivity analysis was made by changing the initial/maintenance cost upward and economic benefit downward. The result is shown in Table 7.17. The entire project will remain economically feasible unless the cost increases over 1.5 times and the benefit drops less tan half at the same time. In case of evaluation of busway alone, the economic IRR will be less than 15% if the cost increases by more than 30% or the benefit decreases by more than 30%.

2) Road Development after 2010

In this analysis, it was assumed that the road network will be developed according to the MMUTIS proposal only until 2010 and no further development was assumed. If the MMUTIS network is developed completely, the Busway Project will be affected negatively. In this case, EIRR of entire Project is 26.8% and EIRR of busway alone is 18.2%.

Table 7.17 Sensitivity Analysis by Changing Cost and Benefit

(1) Busway + Service Road (%)

Change in Cost and Benefit		Cost Increase			
		0% up	20% up	40% up	60% up
Benefit Decrease	0% dwn	35.9	32.1	29.1	26.6
	20% dwn	31.3	27.8	25.0	22.7
	40% dwn	25.9	22.7	20.2	18.1
	60% dun	19.1	16.3	14.1	12.3

(2) Busway Only (%)

Change in Cost and Benefit		Cost Increase			
		0% up	10% up	20% up	30% up
Benefit Decrease	0% dwn	20.5	19.0	17.7	16.5
	10% dwn	18.9	17.4	16.1	15.0
	20% dwn	17.1	15.7	14.5	13.4
	30% dun	15.1	13.8	12.7	11.6

3) If road is not used as busway

In this project, six-lane road is newly constructed with the central two lanes dedicated exclusively for the busway and the 4 outer lanes (two lanes in each side) are used as service roads. If all the six lanes are used as ordinary road instead of exclusive use, EIRR of the general 6-lane road becomes higher at 48.7%. This means the exclusive use of two lanes for bus service will sacrifice some part of benefit accruing to private car users, in order to provide higher service of public transport.

8 BUS OPERATION PLANNING

8.1 Framework of Busway Operation

8.1.1 Bus Operation

(1) Types of Bus Operation

Five types are considered in the Study. The 1st type of operation is to provide bus service exclusively in a closed busway corridor. Passengers using this service, with the exclusion of those coming from/going to a walking distance origin/destination, must transfer to feeder services.

The 2nd type of operation is to have a closed end at the Northern Terminal but to allow buses to proceed elsewhere through the Southern Terminal (open end).

The 3rd type of operation is a modification of the 2nd type, where the Northern Terminal will have a closed end but will be open in the Southern Terminal and the major intermediate bus stops (e.g. One Asia in Imus). This type of operation may ease congestion at the busy stops and at the Southern Terminal.

The 4th type of operation is to have a busway operation open at the Northern Terminal but closed at the Southern Terminal. This type of operation may, however, compete with that of the LRT Line 1 extension.

The 5th type of operation is to have open ends at both Northern and Southern terminals, as well as at the major intermediate stops and shall provide the exclusive toll road lanes for buses. This may, however, evolve into the mixed use of buses and passenger cars and degrade service levels along the busway.

(2) Operational Controllability

Operational Controllability is discussed here in terms of the following:

a) Punctuality
b) Transportable Volume

Punctuality is assured by the departure schedule and constant running speed of buses. In cases where the bus route crosses the roads with normal traffic, congestion in these roads may badly influence the exact departure of buses at the terminals.

Transportable volume is the product of speed, frequency and capacity of a bus. Speed in the busway is assured in any operation pattern. Frequency is influenced by the road condition (but magnitude of influence is not so big) and transfer passengers who

come to busway stops as well. For capacity of buses, the Study Team assumes that the busway operator will use standard buses (i.e., of the same size as those normally used) because they are easy to buy, maintain, repair, and sell.

Difference of capacity therefore comes from feasibility of convoy operation. Many of the cities in Brazil use the 3rd type of operation discussed above and have tried convoy operation. But most of them failed because the convoy is consisted of buses coming from different routes. The 1st type of operation, on the other hand, has buses on uniform route. This makes it easier for bus station employees to control and monitor a convoy even if several companies are operating on the same busway.

(3) Congestion at the Terminals/Stops

Table 8.1 shows the number of boarding/alighting passengers at each station under two scenarios: with "through bus" and "without" (i.e., type 1 operation). There is a difference in the number of transfer passengers between "with" and "without" cases of the "through bus". It was assumed that 50% of bus/jeepney passengers use the "through bus".

The largest difference of transfer between both cases is seen at the Southern Terminal which registers 19,960 passengers/day in 2008, 23,826 in 2010 and 34,994 in 2015. Assuming a peak hour ratio at 12% (based on MMUTIS), the peak hour transfer volume of "no through bus" case becomes 2,395 passengers/hour in 2008, 2,859 in 2010 and 4,199 in 2015. These volumes can be handled without much difficulty if transfer facilities are efficiently designed.

Table 8.1 Difference of Number of Transfer whether "Through Bus" or not

Station/Type of Feeder	LRT	Other Public Transport	Walking & Tricycle	Total	Transfer Passengers (w/ Through bus)	Transfer Passengers (w/o Through bus)	Difference of w/ and w/o (Pax)
2008							
Talaba (N.Terminal)	39,448	16,370	3,674	59,492	47,633	55,819	8,185
Ligas		2,102	1,864	3,966	1,051	2,102	1,051
Bayanan		12,567	3,296	15,863	6,284	12,567	6,284
Molino		4,907	4,366	9,274	2,454	4,907	2,454
Anabu		9,239	8,288	17,528	4,620	9,239	4,620
One Asia, Imus		8,623	7,621	16,245	4,312	8,623	4,312
Daang-Hari		18,405	3,940	22,345	9,203	18,405	9,203
Orchard		1,274	1,132	2,406	637	1,274	637
Salitran		12,903	3,426	16,329	6,452	12,903	6,452
Burol		178	158	336	89	178	89
Congressional		7,670	6,830	14,500	3,835	7,670	3,835
San Agustin		12,453	2,126	14,579	6,227	12,453	6,227
Pala-pala		4,701	894	5,595	2,351	4,701	2,351
Southern Terminal		39,920	10,422	50,342	19,960	39,920	19,960
2010							
Talaba (N. Terminal)	35,759	18,192	3,898	57,849	44,855	53,951	9,096
Ligas		2,037	1,820	3,857	1,019	2,037	1,019
Bayanan		12,101	3,324	15,425	6,051	12,101	6,051
Molino		6,219	5,557	11,776	3,110	6,219	3,110
Anabu		10,829	9,642	20,471	5,415	10,829	5,415
One Asia, Imus		10,825	9,711	20,536	5,413	10,825	5,413
Daang-Hari		22,549	5,014	27,563	11,275	22,549	11,275
Orchard		1,417	1,267	2,684	709	1,417	709
Salitran		14,807	4,068	18,875	7,404	14,807	7,404
Burol		199	178	377	100	199	100
Congressional		10,293	9,199	19,492	5,147	10,293	5,147
San Agustin		14,923	2,649	17,572	7,462	14,923	7,462
Pala-pala		5,549	1,104	6,653	2,775	5,549	2,775
Southern Terminal		47,652	12,798	60,450	23,826	47,652	23,826
2015							
Talaba (N. Terminal)	93,661	27,531	7,688	128,880	107,427	121,192	13,765
Ligas		4,521	4,071	8,592	2,261	4,521	2,261
Bayanan		26,856	7,512	34,368	13,428	26,856	13,428
Molino		10,333	9,302	19,635	5,167	10,333	5,167
Anabu		14,142	12,601	26,743	7,071	14,142	7,071
One Asia, Imus		18,021	16,393	34,414	9,011	18,021	9,011
Daang-Hari		32,722	7,406	40,128	16,361	32,722	16,361
Orchard		1,807	1,627	3,434	904	1,807	904
Salitran		19,944	5,579	25,523	9,972	19,944	9,972
Burol		2,002	1,802	3,804	1,001	2,002	1,001
Congressional		14,629	13,171	27,800	7,315	14,629	7,315
San Agustin		21,879	4,002	25,881	10,940	21,879	10,940
Pala-pala		8,104	1,845	9,949	4,052	8,104	4,052
Southern Terminal		69,987	19,422	89,409	34,994	69,987	34,994

(4) Traffic Administration

In the case of the 1st type of bus operation, the number of operators can be limited and enforced quite easily. But in the other types of operation, a multiplicity of operators can be expected because of their differing franchises. Thus, from a traffic administration point of view, the 1st type operation is recommended.

(5) Financial Soundness

If a concession is tendered, the 1st type operation would be preferred by prospective operators as it affords exclusivity in a Greenfield service. In other cases, however, various operators may use the busway and Compete directly and indirectly. This would result in smaller scale operations with some operators exhibiting financial inadequacies.

(6) Conclusion

The above discussions can be summarized in Table 8.2 as follows.

Table 8.2 Summary of Evaluation of the Five Types of Operation

Evaluation Item	Pattern				
	1	2	3	4	5
New Transport Model	Good	Fair	Fair	Poor	Poor
Operational Controllability	Good	Poor	Poor	Poor	Poor
Congestion at Terminals/Stops	Poor	Good	Good	Good	Good
Traffic Administration	Good	Poor	Poor	Poor	Poor
Financial Soundness	Good	Fair	Fair	Fair	Fair
Total of Categorized Score	13	9	9	8	8

Note: Good=3, Fair=2, Poor=1

The 1st type shows the highest score among the five possible types of operations. The discussions hereafter concentrates on the 1st type bus operation. However, it should be noted that based on the results of the demand forecasting done by the Study Team, demand in the open-ended case is higher than that of the close-ended case, primarily because of through passengers. This signifies that the transfers to other modes should be considered. At some time in the future, after the bus service has stabilized, the more complicated operation of converging the busway operations with local road services should be further studied.

8.1.2 Operator

The National Government, through the DPWH, shall construct the busway infrastructure itself. However, it cannot authorize the bus operator itself since the franchising authority is DOTC and LTFRB. There are other facilities required for bus operation such as terminals, bus stops, station plazas, and refueling facilities that are not usually provided by the bus operator. These will have to be provided under the project, but its subsequent maintenance has to be assumed by another entity.

The requirements for the CBS operator are summarized in Table 8.3. The rationale of the indicated figures is explained hereafter. The basic scheme is for the selected bus operator(s) or concessionaire to acquire the vehicle fleet and deploy them on the busway using all government-provided facilities. In turn, the bus operator shall

contribute amounts for the maintenance of these facilities or maintain them at his expense.

Table 8.3 Requirements for the CBS Operators and Operation

Minimum Capital	₱800 million
Experience of Operation	Five years or more
Busway and Facilities Rental Fee	₱45 million/year

In order to establish the viability of the bus service, the following operational components (Table 8.4) have been analyzed.

Table 8.4 Summary of Operation

Item		Description
Operator		Exclusive operator
Period for Analysis		15 years from 2008
Daily Demand		124,000 passengers in 2008 and 240,000 passengers after 2015
Fleet	Type	Capacity: 69 passenger (39 seats) Motor: Diesel (CNG when supply system is completed)
	No. of Buses	170 buses in 2005, 317 buses in 2015
Route	Route	Cavite Busway Corridor
	Service	Express, Local
Facilities	Busway	To be developed by DPWH. Operator pays for the repair/ maintenance of the road infrastructure, maintains it by itself or by contracting another entity.
	Terminal	Basic bus stop modules to be developed by DPWH as part of the project. Other spaces to be developed by respective property owners as part of their commercial plans, but scheme to be approved by CBPC.
	Bus stop	To be developed by DPWH as intrinsic part of the project. Bus stops are fenced and tickets are examined at this barrier. Bus stop is located every 1.5km on the average. Maintenance of the bus stops by CBPC, using contributions from the bus operator.
	Garage, Workshop	To be developed by DPWH and assigned to a non-profit entity called CBPC. Operator leases these facilities from CBPC.
Fare System	Fare	Fixed rate plus distance-proportional rate. 10% higher than the prevailing A/C bus fare.
	Escalation	To be adjusted by the bus operator in consonance with industry changes in A/C bus fares, which is already deregulated.

8.2 Bus Operation and Management

8.2.1 Demand

The required number of buses is calculated from the forecasted traffic volumes at the major sections as shown in Table 8.5.

Table 8.5 Required Number of Buses during Peak Hour

Year/Major Section	Daily Traffic (Pax/Day)	Peak Hour Traffic [a] (Pax/Hour)	Peak Hour Traffic [b] (Buses/Hour)
	Both Directions	Single Direction	Single Direction
2008			
Talaba (N. Terminal)~Anabu	72,571	5,225	76
Anabu-Daang-Hari	59,258	4,267	62
Daang-Hari~Congressional	73,758	5,311	77
Congressional~Southern Terminal	70,543	5,079	74
2010			
Talaba (N. Terminal)~Anabu	76,922	5,538	81
Anabu~Daang-Hari	67,790	4,881	71
Daang-Hari~Congressional	86,220	6,208	90
Congressional~Southern Terminal	84,716	6,100	89
2015			
Talaba (N. Terminal)~Anabu	137,384	9,892	144
Anabu~Daang-Hari	115,686	8,329	121
Daang-Hari~Congressional	132,610	9,548	139
Congressional~Southern Terminal	125,312	9,022	131

[a] A peak hour ratio of 7.2% for the crowded direction (12% for both directions) is assumed based on MMUTIS.

[b] 69 passengers/bus is assumed. This is 100% of bus capacity. All buses run terminal to terminal because number of passengers does not change much. Commercial speed is set at 20 km/hr and the route length is 21.0km. Travel hour is almost one hour.

Total number of required buses for the busway operation can be computed from Table 8.5; the results are shown in Table 8.6.

Table 8.6 Total Number of Required Buses for the Busway

Year	For Operation	Reserve Units	Total
2008	154	16	170
2010	180	18	198
2015	288	29	317

8.2.2 Diagram

(1) Buses dispatched by Time Zone

The operation of 36 bus companies presently serving the Cavite to Manila route was studied. The ratio of operational over fleet size by 36 companies was calculated, and the number of buses dispatched by time zone was obtained as the product of this ratio and the biggest number of peak hour traffic shown in Table 8.5. The number of buses by time zone is shown in Table 8.7.

From Table 8.7, the minimum headway in 2008 is calculated at 47 seconds, 40 seconds in 2010 and 25 seconds in 2015. These are comparable to some actual examples shown in Table 8.8, which was based on the *Study of Bus Priority Systems in Less Developed Countries* (by J. Cracknell, P. Cornwell, G. Gardner).

Headway is independent from other route attributes (results of t-test using data in Table 8.8). It means that practically, the minimum headway as shown in Table 8.8 is 9.5 seconds or 53 meters in 20km/hr running speed. In spite of these findings, a convoy system is proposed for a more reliable bus operation service.

Table 8.7 Buses by Time Zone

Time Zone	Owned Total of Operating Companies	Running Total of Operating Companies	Buses by Time Zone		
			2008	2010	2015
00:00~01:00	0	0.000	0	0	0
01:00~02:00	112	0.185	29	34	54
02:00~03:00	287	0.475	74	86	137
03:00~04:00	471	0.780	121	141	225
04:00~05:00	594	0.983	152	177	284
05:00~06:00	600	0.993	153	179	286
06:00~07:00	604	1.000	154	180	288
07:00~08:00	604	1.000	154	180	288
08:00~09:00	604	1.000	154	180	288
09:00~10:00	604	1.000	154	180	288
10:00~11:00	604	1.000	154	180	288
11:00~12:00	604	1.000	154	180	288
12:00~13:00	564	0.934	144	169	269
13:00~14:00	564	0.934	144	169	269
14:00~15:00	564	0.934	144	169	269
15:00~16:00	583	0.965	149	174	278
16:00~17:00	583	0.965	149	174	278
17:00~18:00	566	0.937	145	169	270
18:00~19:00	566	0.937	145	169	270
19:00~20:00	551	0.912	141	165	263

Table 8.7 Buses by Time Zone *(Continued)*

Time Zone	Owned Total of Operating Companies	Running Total of Operating Companies	Buses by Time Zone		
			2008	2010	2015
20:00~21:00	463	0.767	119	139	221
21:00~22:00	215	0.356	55	65	103
22:00~23:00	109	0.180	28	33	52
23:00~24:00	49	0.081	13	15	24
Number of Services			2,829	3,307	5,280
No. of Buses operated			154	180	288
Reserves			16	18	29
Total Number of Buses			170	198	317
Total running km per Day			59,409	69,447	110,880
Average running km per Day			386	386	385
Average running km per Month			11,059	11,060	11,037
Average running km per Year			132,706	132,721	132,440
Total running km per Year			20,436,696	23,889,768	38,142,720

Table 8.8 Examples from Other Countries

City	Busway	Peak Bus Flows (buses/hour/ direction)		Peak Available Passenger Places (pass/hour/ direction)		Peak Passenger Flows (pass/hour/ direction)		Average Commercial Bus Speed (kph)		Headway (second)	
		AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
Abidjan	Blvd de la Republique	204	197	20.200	19,600	16,000	19,500	12.8	8.0	17.6	18.3
Ankara	Besevler-Dikimevi	91	91	7,300	7,300	7,300	6,500	12.0	10.4	39.6	39.6
Belo Horizonte	Av. Cris. Machado	216	205	19,200	18,200	15,800	14,500	24.6	29.3	16.7	17.6
Curitiba	Eixo Sur	94	80	11,400	9,800	9,900	7,000	21.0	21.3	38.3	45.0
Istambul	Taksim-Zincirlikuyu	169	143	12,800	11,000	10,700	7,300	14.0	11.3	21.3	25.2
Porto Alegre	Assis Brasil	326	260	33,600	27,000	26,100	18,300	22.7	17.8	11.0	13.8
Porto Alegre	Farrapos	378	304	39,400	31,300	15,300	17,500	21.9	19.7	9.5	11.8
Sao Paulo	Avi 9 de Julho	230	221	20,300	19,400	18,600	20,300	19.6	16.3	15.7	16.3

Source: Study of Bus Priority Systems in Less developed Countries (J. Cracknell, P. Cornwell, G. Gardner)

(2) Express Service

Passengers boarding and alighting at Talaba, One Asia in Imus, Congressional, and Southern Terminal comprise around 30% of all passengers during the Study period (Table 8.9). The ratio of an express service to a local service is 1:2.

Table 8.9 Potential Express Service User

Year	Passengers	Potential Express Service Users	Ratio of Potential Users
2008	124,416	42,781	0.35
2010	141,784	51,292	0.37
2015	239,272	80,506	0.34

From the above table, it can be surmised that interspersing express service (i.e., limited stops on the busway) would be appropriate, and lead to faster travel.

(3) Commercial speed

Based on Table 8.8, the average commercial speed of the bus routes in some developing countries is 17.7 km/hr, and the standard deviation is 4.9 km/hr. The commercial speed of bus on an exclusive lane is highly dependent on the number of passengers, bus capacity and distance of bus stops. The CBS has lesser number of buses, passengers and bus capacity, and would operate on exclusive lanes.

Although 30 km/h could be achieved, specially during the first few years of operation, a 20 km/hr average commercial speed was assumed for conservatism. In addition, the proposed ticketing at the stations can further contribute to ensuring the commercial speed. Ticketing on board is one of the main causes of the delay in boarding/alighting.

(4) Vehicle Specification

The routes in Table 8.8 show that the number of passengers ranged from 76-123, or an average of 95 passengers, with a standard deviation of 11.2 passengers. The demand forecast results do not necessitate the application of 100 passengers capacity. Hence, a regular size bus of 39 cross-seats with two doors is assumed in CBS. Buses are powered by diesel engine (with a possibility of CNG engine examined after natural gas supply system is completed) and are air-conditioned. Dimension of the proposed bus is shown in Table 8.10.

Table 8.10 Bus Dimension

Item		Proposal	Reference for Increasing Capacity
Seat Arrangement		Cross seat	Side seat
Seats	Dual Seat	Width 0.9m; 9 Seats	-
	Single Seat	-	Width 0.45m;18 Seats x 2
	Rear Seat	5 Seats	5 Seats
	Total	39 Seats	41 Seats
Aisle	Length	8.1m	8.1m
	Width	0.5m	0.8m
	Area	4.05 m^2	6.48 m^2
Standing Room	7 Pax/m^2	28 Passengers	45 Passengers
Total Capacity		69 Passengers	86 Passengers
Body Size	Length	10.45m	10.45m
	Wide	2.45m	2.45m
Seat Pitch		0.9m	0.9m
Doors		Two Doors	Two Doors

8.2.3 Operation Control

A bus location system can provide various information. However, the only information that would be essential for the proposed operator is the exact location of buses at a particular time. When a bus encounters problems or delay at any point in the busway, the buses can communicate with the control center via telephone or radio, and the control center can send information to terminals, bus stops and bus workshops, if necessary.

In view of this scenario, a taxi location system (which requires only half the cost of the bus location system) or other third party communication services (such as the vehicle locator system being offered by SMART) is proposed for the CBS.

8.2.4 Terminals and Bus Stops

A survey at the Baclaran Terminal shows an average alighting/boarding time of 3.1 seconds per passenger with a standard deviation at 1.5 seconds per passenger. The alighting/boarding time shall be shortened because of the adoption of ticketing at bus stops/terminals. Necessary alighting/boarding time is assumed at 3 seconds per passenger.

Based on the survey and the estimated number of passengers alighting/boarding, the required time for passengers to alight/board were calculated. Corresponding bus stops/terminal booth requirements were likewise estimated.

Estimations were made for the four points (two Terminals and the Express Bus Stops, One Asia in Imus and Congressional). These are shown in Table 8.11.

Table 8.11 Alighting/Boarding Time and Required Minimum Number of Bus Booth

2008	Peak hour alight/board pax (original, pax/hr)	Peak hour alight/board pax (transfer, pax/hr)	Buses arrived/ departed (buses/hr)	Alight/ board time (sec/bus)	Bus arrival interval (sec)	Maximum bus number in Convoy
Talaba/Northern Terminal	2,141	0	77	84	47	2
One Asia, Imus	586	471	77	42	47	2
Congressional	523	464	77	39	47	2
Southern Terminal	1,813	0	77	71	47	2
2010						
Talaba/Northern Terminal	2,082	0	90	70	40	2
One Asia Imus	740	554	90	44	40	2
Congressional	702	611	90	44	40	2
Southern Terminal	2,177	0	90	73	40	2
2015						
Talaba/Northern Terminal	4,637	0	144	97	25	3
One Asia Imus	1,240	963	144	46	25	3
Congressional	1,001	844	144	39	25	3
Southern Terminal	3,221	0	144	68	25	3

Issuing and inspection of ticket at terminal/bus stop is therefore proposed and a fenced platform is necessary. Aside from ordinary tickets, prepaid cards will also be issued. Management/operation of terminals and bus stops is assumed contracted out at a cost of 3% of the ticket sales.

8.2.5 Garage, Workshop and Gas Station

The garage, workshop and gas station will be located at the same site. Drivers' quarter is likewise to be provided in the Depot. Repair, maintenance and fuel supply services can be done in-house or contracted out, at option of the bus operator. Bus inspection at the start and end of a day's operation, as well as trouble-shooting, will be conducted by the in-house mechanics. Two Depots are proposed for the busway: (1) inside One Asia property and (2) near Southern Terminal. Detailed location shall be identified during the detailed design phase.

8.2.6 Organization

The typical organizational structure of a bus company consists of 3 functional groups: Finance and Administration, Operations and Maintenance. The Operation Manager shall oversee the operation control center, service planning, crew scheduling and fleet deployment. The Maintenance Department is responsible for the garage and workshop.

8.2.7 Fare

The fare system applied for the CBS is assumed to be 10% higher than that of the air-conditioned buses in Metro Manila. This premium can be justified by the superior service: shorter travel time on the busway, comfortable bus stops, brand-new fleet. The rate of escalation is set with the Metro Manila Consumer Price Index, for purposes of financial projection. In practice, this will follow industry norms, i.e., when other air-con bus operators adjust their fares, the CBS operator would follow suit.

8.3 Financial Analysis of Bus Company

8.3.1 Price Escalation

(1) Linear Regression of the Metro Manila Consumer Price Index (MMCPI)

MMCPI is used for the price escalation index. Table 8.12 shows the MMCPI in the last 10 years.

Table 8.12 Metro Manila Consumer Price Index (1990~2000)

Year	MMCPI Index
1990	62.7
1991	75.6
1992	83.8
1993	91.6
1994	100.0
1995	108.2
1996	117.3
1997	125.2
1998	137.9
1999	145.3
2000	149.4

The result of the regression analysis is as follows:
Price Index = 8.7191 Year-17285.8 (r^2=0.998)

(2) Forecast of the Metro Manila Consumer Price Index

Estimate of MMCPI is obtained from the said regression analysis and is shown in Table 8.13.

Table 8.13 MMCPI Estimates

Year	MMCPI	MMCPI ratiowith that of 2002	MMCPI Ratiowith that of 2005
2002	169.84	1.00	-
2003	178.56	1.05	-
2004	187.28	1.10	-
2005	196.00	1.15	1.00
2006	204.71	1.21	1.04
2007	213.43	1.26	1.09
2008	222.15	1.31	1.13
2009	230.87	1.36	1.18
2010	239.59	1.41	1.22
2011	248.31	1.46	1.27
2012	257.03	1.51	1.31
2013	265.75	1.56	1.36
2014	274.47	1.62	1.40
2015	283.19	1.67	1.44
2016	291.91	1.72	1.49
2017	300.62	1.77	1.53
2018	309.34	1.82	1.58
2019	318.06	1.87	1.62
2020	326.78	1.92	1.67

8.3.2 Farebox Revenues

(1) Fare

Fare is calculated by travel distance, with the CBS bus fare set at 10% higher than the 2002 Metro Manila A/C bus fare. This bus fare shall be escalated in accordance with the MMCPI escalation forecast.

Bus fares between representative stations with escalation (2008, 2010 and 2015) and without escalation (2002) are shown in Table 8.14.

(2) Revenues

The passenger demand between representative stations is shown in Table 8.15. Sales are estimated as a product of the demand and fare (Table 8.16). The case of “without escalation” is used for FIRR calculation only.

Table 8.14 Fares between Representative Stations (2005, 2010, 2015)

	Talaba	One Asia, Imus	Congressional	Southern Terminal
Distance (km)				
Talaba	0.00	4.15	10.40	13.00
One Asia, Imus	4.15	0.00	6.25	8.85
Congressional	10.40	6.25	0.00	2.60
Southern Terminal	13.00	8.85	2.60	0.00
2002 Fare (Peso)				
Talaba	0.00	14.00	17.00	20.00
One Asia, Imus	14.00	0.00	13.00	15.00
Congressional	17.00	13.00	0.00	11.00
Southern Terminal	20.00	15.00	11.00	0.00
2008 Fare (Peso)				
Talaba	0.00	19.00	23.00	27.00
One Asia, Imus	19.00	0.00	18.00	20.00
Congressional	23.00	18.00	0.00	15.00
Southern Terminal	27.00	20.00	15.00	0.00
2010 Fare (Peso)				
Talaba	0.00	27.00	33.00	39.00
One Asia, Imus	27.00	0.00	26.00	29.00
Congressional	33.00	26.00	0.00	22.00
Southern Terminal	39.00	29.00	22.00	0.00
2015 Fare (Peso)				
Talaba	0.00	46.00	56.00	66.00
One Asia, Imus	46.00	0.00	44.00	49.00
Congressional	56.00	44.00	0.00	37.00
Southern Terminal	66.00	49.00	37.00	0.00

Table 8.15 Passenger Traffic Demand

(passenger/day)

2008	zone 1	zone 2	zone 3	zone 4	Total
zone 1	28,562	10,793	5,628	12,016	56,999
zone 2	10,793	0	290	7,644	18,727
zone 3	5,628	290	0	4,981	10,899
zone 4	12,016	7,644	4,981	0	24,641
Total	56,999	18,727	10,899	24,641	111,266
2010					
zone 1	5,976	17,675	6,151	14,632	44,434
zone 2	17,675	536	1,458	14,618	34,287
zone 3	6,151	1,458	0	13,102	20,711
zone 4	14,633	14,618	13,102	0	42,353
Total	44,435	34,287	20,711	42,352	141,785
2015					
zone 1	29,658	28,556	11,146	26,883	96,243
zone 2	28,556	1,104	2,453	19,086	51,199
zone 3	11,146	2,453	0	16,681	30,280
zone 4	26,883	19,086	16,681	0	62,650
Total	96,243	51,199	30,280	62,650	240,372

Note: Zone 1: Talaba to Molino
Zone 2: Anabu to Daang-Hari
Zone 3: Orchard to Congressional
Zone 4: San Agustin to Southern Terminal

Table 8.16 Forecast Revenues

(₱ million/year)

Year	Sales (with escalation)	Sales (without escalation)
2008	831.73	613.49
2009	1,091.27	702.00
2010	1,350.80	693.90
2011	1,857.00	790.50
2012	2,363.20	887.09
2013	2,869.40	983.68
2014	3,375.60	1,080.27
2015	3,881.80	1,176.86
2016	3,881.80	1,176.86
2017	3,881.80	1,176.86
2018	3,881.80	1,176.86
2019	3,881.80	1,176.86
2020	3,881.80	1,176.86
2021	3,881.80	1,176.86
2022	3,881.80	1,176.86

(3) Non-Operating Income

Typically, bus companies earn extra income from advertising and stall leases on bus terminals. No such income is assumed in the financial projection, except for disposal of assets. The future sale of buses is considered as non-operating income. The selling price of buses after 10-year use is assumed at 5% of the price of a new bus of the present year (Table 8.17)

Table 8.17 Gain from Sales of Buses

Year	Fleet (buses)	Scrapped (buses)	Gain on Sales of Buses (Million Pesos)
2008	170	0	0.00
2009	184	0	0.00
2010	198	0	0.00
2011	223	0	0.00
2012	247	0	0.00
2013	271	0	0.00
2014	295	0	0.00
2015	317	0	0.00
2016	317	0	0.00
2017	317	0	0.00
2018	317	170	92.89
2019	317	14	7.87
2020	317	14	8.08
2021	317	25	14.43
2022	317	24	13.85

8.3.3 Expenses

(1) Unit Cost

DPWH compiles Vehicle Operating Costs for inter-city traffics. DPWH data has segregated costs per km and costs per running hour. DPWH bus model uses 80,000 km running per year in 3,000 running hours. From these figures, all of the unit costs represented in running hour were changed to the unit costs represented in running km.

Baliwag Transit Inc. (with 740 employees and 509 buses) shared its 2000 financial data with the Study Team during a recent interview. It was consulted as unit cost data based on actual operation, after modification of money terms to the year 2002. The results of analysis of these data are summarized in Table 8.18.

Table 8.18 Unit Operation Costs (pesos/bus-km)

Items	DPWH	Baliwag Transit (Financial S.)	Unit Cost adopted for this Study
Operation Cost Total	13.86	10.71	16.30
Personnel Cost	1.87	3.33	3.33
Fuel Cost	3.19	2.68	3.19
Repair/Maintenance Cost	3.15	2.57	3.15
Insurance Cost	0.16	0.13	1.86
Depreciation Cost	4.17	1.00	3.77
Buses	4.17	0.96	3.77
Buildings & Others	0.00	0.04	-
Other Transportation Cost	1.32	1.09	1.09

(2) Details of Unit Cost (by item)

(a) Operational Personnel Cost

DPWH unit cost is 1.87 as compared with Baliwag Transit's 3.33, with DPWH cost applied nationwide while that of Baliwag is applicable only for Metro Manila. Since the proposed company also operates in Cavite, next to Metro Manila, the cost of Baliwag is adopted for purposed of this Study.

(b) Fuel Unit Cost

Unit cost for fuel of DPWH is 3.19 while Baliwag Transit's cost is 2.68. Since the exclusive operation is similar to intercity operation, the DPWH figure is adopted.

(c) Repair/Maintenance Unit Cost

The cost of repair/maintenance for DPWH is 3.15 while Baliwag Transit's cost is 2.57. Since the exclusive operation is similar to intercity operation, the DPWH figure is adopted.

(d) Depreciation Unit Cost (Bus)

Accounting practices follow a straight-line method of depreciation with no residual value. In the financial projection, a life of 10 years for urban buses was adopted.

The price for new A/C buses was surveyed, and is in the range of ₱5 million to ₱6million. In this Study, A/C bus price is assumed at the lower range of ₱5 million due to expected large fleet purchase. The depreciation unit cost of ₱3.77/km was derived from the acquisition cost of ₱5 million divided by commercial running km of 10 years (1,327,210 km). This figure is higher than that of Baliwag Transit's depreciation unit cost of 0.96 but lower than 4.17 unit cost of DPWH.

(e) Depreciation Unit Cost (Buildings)

In this study, all of the buildings are leased from the CBPC, thus, no depreciation cost shall be incurred by the operator.

(f) Insurance Unit Cost

The insurance cost applied is based on current rate for commercial cars in the Philippines, which is 5.1% of purchased price. Insurance unit cost is obtained as this insurance cost over running km in a year, that is, ₱1.86/km (5,000,000 x 0.051/137,721= 1.86). It is very high as compared with DPWH's cost of 0.16 and Baliwag Transit's 0.13. These discrepancies come from difference in insurance coverage.

(g) Other Operating Cost

Except for ₱1.32 overhead cost, there is no other transport cost in DPWH VOC break down. Baliwag Transit, on the other hand, has ₱1.09/km. For this Study, ₱1.09/km is applied.

(3) Other Cost

(a) Busway Infrastructure Cost Recovery

Construction cost for the busway (excluding land acquisition cost) is estimated at ₱3,954.84 million. To recover this cost for 30 years period and 5% p.a. interest, the annual amortization amounts to ₱257.27 million/year. Bus operators in the Philippines normally do not pay capital cost of roads, but the CBS bus operator is

provided with an exclusive road space. In any case, the financial projection assumed an annual rental fee of ₱257.27 million.

(b) Facility Rental Fee

Construction cost of additional bus service facilities (excluding land acquisition cost and maintenance/repair of machines cost) is estimated at ₱296.10 million. Equal payments of that construction cost under the condition of 30 years period and 5% p.a. interest amounts to ₱19.26 million/year. This amount shall be the base figure for Facility Rental Fee.

(c) Busway Maintenance Cost

Routine maintenance cost of Busway (including facilities) is estimated at ₱0.48 million p.a. and periodic maintenance cost is estimated at ₱281.06 million every 5 years. It is reasonable to expect full contribution from the bus operator for this cost, payable to the proposed CBPC or contracted out by the bus company.

(d) Tax

The following taxation rules shall be adopted, as follows:

- Corporate income tax of 32%.
- Common carrier tax of 3% of farebox revenues.
- No other taxes are assumed.

(e) Interest

Loan condition is assumed as shown in Table 8.19.

Table 8.19 Loan Condition

Item		Condition
Loan Condition	Period	10 years
	Interest	20% p.a.

(4) Annual Operating Expenses (excluding Busway Rental Fee, Facility Rental Fee, Tax, and Interest)

Annual expenses of "with escalation" and "without escalation" are calculated using running km (Table 8.7) and unit costs (Table 8.18). The results are summarized in Table 8.20.

Table 8.20 Operating Expenses

(₱ million)

Year	Km	Unadjusted by escalation factor	Adjusted by escalation factor	Escalation factor
2008	20,436,696	333.13	435.73	1.31
2009	22,163,232	361.27	491.09	1.36
2010	23,889,768	389.41	549.34	1.41
2011	26,740,358	435.88	637.26	1.46
2012	29,590,949	482.34	729.96	1.51
2013	32,441,539	528.80	827.42	1.56
2014	35,292,130	575.27	929.66	1.62
2015	38,142,720	621.74	1,036.67	1.67
2016	38,142,720	621.73	1,068.58	1.72
2017	38,142,720	621.73	1,100.50	1.77
2018	38,142,720	621.73	1,132.42	1.82
2019	38,142,720	621.74	1,164.34	1.87
2020	38,142,720	621.74	1,196.26	1.92
2021	38,142,720	621.73	1,228.17	1.98
2022	38,142,720	621.73	1,260.09	2.03

(5) Other Annual Expenses

From the preceding discussions, expenses which are independent from running km are listed in Table 8.21.

Table 8.21 Other Annual Expenses

(₱ million)

Items	Amounts
Busway Infrastructure Rental Fee	257.27
Facility Rental Fee	19.26
Busway Maintenance Cost	
Routine Maintenance (Every Year)	0.48
Periodic Maintenance (Every Five Year)	281.06

8.3.4 Financial Analysis

(1) Assumptions

Children's Fare

Children's fare (half price of adult fare) is applied for children in the primary school level, assumed to be 5% of total passengers.

Bus Life

A survey conducted on 36 bus companies shows that more than 50% of buses are 8 years or more and they run an average of 222,000 km per year, (total run of 8 years is 1.8 million km). For the proposed CBS Project, a bus is expected to run an annual average of 132,000km (refer to Table 8.5). Assuming 10 years life, it runs 1.3 million km. Thus, a 10-year bus life is considered reasonable with engine overhaul.

Busway Rental Fee and Maintenance Fee

In this study, 10% of busway rental fee and 100% of maintenance fee is shouldered on the proposed operator every year. The busway rental fee is justified as follows:

a) Construction cost of the busway is ₱3,955 million.
b) Legal guideline on depreciation of structure is 67 years.
c) Hence, residual value of road becomes ₱885 million.
d) 10% busway rental fee is ₱26 million.
e) Total of d) becomes ₱866 million in 2022 considering the interest (10% based on the actual time deposit interest rate).
f) From c) and e), payment of 10% of busway repayment fee as busway rental fee is justified.

Terminals/Bus Stops Rental and Management Fee

In this Study, the proposed operator shall shoulder every year 100% of facility rental fee. Three (3) percent of ticket sales are considered as management fee and necessary maintenance fee.

Capital

To ensure a financially sound operation of the busway, the paid-up Capital used in this Study is ₱800 million, justified as follows.

a) An initial investment of ₱1,112 million is projected for the first year bus fleet acquisition. This means that the sum of paid-up Capital and Loans must be more than ₱1,112 million.

b) In the Philippines, the maximum ratio of loan over assets is 70%.

c) From a), a paid-up Capital of ₱800 million and loan of ₱350 million (total P1,150 million) is analyzed. In this case, Liability/Assets ratio is 0.74, which means that the necessary loan will be obtained. When Capital is reduced to ₱700 million and loan is increased to ₱450 million, Liability/Assets ratio becomes 0.69.

(2) FIRR, S/C, NPV

Based on the above assumptions, the FIRR, does not seem to be attractive for the private sector, if a threshold value of 20% is assumed. The financial results, however, are sound and show the project itself profitable. Sales-cost ratio is 1.04 and NPV is ₱254.84 million under 12% discount rate. These are shown in Table 8.22.

Sensitivity analysis (Table 8.23) shows this FIRR is very sensitive to the varying demand and expenses. It means meticulous management of sales and control of cost should improve the viability.

Table 8.22 FIRR, S/C, NPV (Million Pesos)

Year	Sales	Cost	Discouted Sales	Discounted Expenses	DS-DE
2008	598.15	1247.02	598.15	1247.02	-648.87
2009	684.45	497.75	602.32	438.02	164.3
2010	676.55	525.65	523.92	407.06	116.86
2011	770.74	629.95	525.24	429.29	95.95
2012	864.91	1236.35	518.68	741.43	-222.75
2013	959.09	723.52	506.14	381.82	124.32
2014	1053.26	772.81	489.14	358.9	130.24
2015	1147.44	812.11	468.93	331.89	137.04
2016	1147.44	702.10	412.66	252.5	160.16
2017	1147.44	1264.22	363.14	400.1	-36.96
2018	1147.44	1552.10	319.56	432.26	-112.7
2019	1147.44	772.11	281.22	189.23	91.99
2020	1147.44	772.11	247.47	166.52	80.95
2021	1147.44	827.10	217.77	156.98	60.79
2022	1147.44	467.72	191.64	78.12	113.52
		Total	6265.98	6011.14	254.84
		IRR	20%		
		S/C	1.04	Discount Rate 12% p.a.	
		NPV	254.84		

Table 8.23 Sensitivity Analysis

(Unit: percent)

Changes of Demand	Changes of Expenses		
	1.00	1.05	1.10
1.00	20	13	6
0.95	12	6	0
0.90	5	-	-

(3) Balance Sheet

The Balance Sheet pro forma (Table 8.24) is sound. The ratio of Net Worth over Total Capital shows 0.74 or more and increases constantly. The high figure from the beginning is largely due to very high initial capital outlay, but constant increase means continuous sound business condition will be sustained during the project period (making profits continuously).

(4) Income Statement

Fare level for this operation is set at 10% higher than the usual A/C bus. This is justified by higher level of service due to exclusive operation on the busway. If the assumed price level is sustainable, a sound Income Statement is assured as shown by the Sales/Break-even point which reflects more than 1 from the beginning of operation and never goes below 1 (Table 8.25).

(5) Cashflow Statement

Dividend starts from the third year. Owing to the large capital investments and sound growth of sales, cash flow remains sound. The total of discounted free cashflow with 12% discount rate is ₱7,432 million in the first 15 years (2008-2022). This amount already indicates the high value of this company (Table 8.26).

(6) Financial Indicators

Common-use financial indicators are listed in Table 8.27.

Table 8.24 Balance Sheet Pro-forma

Items	Year														
	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	201	2020	2021	2022
Current Assets															
Cash on hand and in banks	286.2	582.6	939.2	1501.0	2358.8	3510.9	4962.8	6737.4	8808.4	10995.1	11848.4	14194.3	16663.7	19173.7	21839.9
Fixed Assets															
Buses (Accumulated Invest.)	1111.8	1207.0	1305.7	1488.5	1670.1	1857.9	2051.8	2235.2	2235.2	2235.2	3783.4	3914.5	4049.2	4289.7	4520.6
Buses (Accumulated Deprec.)	100.8	214.4	341.4	488.8	657.6	849.0	1064.0	1303.8	1550.9	1805.5	2067.4	2336.7	2613.4	2890.0	3166.7
Others (Accumulated Invest.)	4.8	10.2	16.3	23.3	31.4	40.5	50.8	62.2	74.0	86.2	98.7	111.6	124.8	138.0	151.2
Others (Accumulated Deprec.)	2.4	5.1	8.2	11.7	15.7	20.3	25.4	31.1	37.0	43.1	49.4	55.8	62.4	69.0	75.6
Assets Total	1299.6	1580.3	1911.7	2512.4	3387.0	4540.0	5975.9	7699.9	9529.7	11468.0	13613.8	15827.8	18161.9	20642.3	23269.4
Liability															
Short-term Loan	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Long-term Loan	336.5	320.3	300.9	277.6	249.7	216.1	175.9	127.6	69.6	0.0	0.0	0.0	0.0	0.0	0.0
Liability Total	336.5	320.3	300.9	277.6	249.7	216.1	175.9	127.6	69.6	0.0	0.0	0.0	0.0	0.0	0.0
Capital															
Paid-up Capital	800.0	800.0	800.0	800.0	800.0	800.0	800.0	800.0	800.0	800.0	800.0	800.0	800.0	800.0	800.0
Accumulated Income	163.1	460.0	810.7	1434.7	2337.3	3523.9	5000.1	6772.3	8660.1	10668.0	12813.8	15027.8	17361.9	19842.3	22469.4
Capital Total	963.1	1260.0	1610.7	2234.7	3137.3	4323.9	5800.1	7572.3	9460.1	11468.0	13613.8	15827.8	18161.9	20642.3	23269.4
Liability and Capital	1299.6	1580.3	1911.7	2512.4	3387.0	4540.0	5975.9	7699.9	9529.7	11468.0	13613.8	15827.8	18161.9	20642.3	23269.4
Net Worth / Total Capital	0.74	0.80	0.84	0.89	0.93	0.95	0.97	0.98	0.99	1.00	1.00	1.00	1.00	1.00	1.00

Table 8.25 Income Statement Pro-forma

Items	Year														
	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Income Statement															
Sales	810.9	1064.0	1317.0	1810.6	2304.1	2797.7	3291.2	3784.8	3901.3	4017.8	4134.4	4250.9	4367.4	4484.0	4600.5
Operation Cost	488.2	551.5	617.6	720.8	828.8	941.7	1059.3	1181.7	1217.3	1252.8	1288.4	1324.0	1359.6	1363.1	1366.6
Gross Income from Operation	322.8	512.5	699.4	1089.8	1475.3	1856.0	2232.0	2603.1	2684.0	2765.0	2845.9	2926.9	3007.8	3120.8	3233.9
General and Administrative Cost	24.3	31.9	39.5	54.3	69.1	83.9	98.7	113.5	117.0	120.5	124.0	127.5	131.0	134.5	138.0
Net Income from Operation	298.4	480.6	659.9	1035.4	1406.2	1772.1	2133.2	2489.6	2567.0	2644.5	2721.9	2799.3	2876.8	2986.3	3095.9
Other Income/(Expenses)	-58.6	-44.0	-26.5	-0.1	38.8	90.5	155.3	234.3	326.8	425.9	551.3	574.3	673.3	779.0	885.1
Interest Payable	70.0	67.3	64.1	60.2	55.5	49.9	43.2	35.2	25.5	13.9	0.0	0.0	0.0	0.0	0.0
Gain on Sale of Bus	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	77.4	6.6	6.7	12.0	11.5
Interest Receivable	11.4	23.3	37.6	60.0	94.4	140.4	198.5	269.5	352.3	439.8	473.9	567.8	666.5	766.9	873.6
Income/Loss before Tax	239.9	436.6	633.4	1035.3	1445.0	1862.6	2288.5	2723.9	2893.8	3070.3	3273.2	3373.6	3550.1	3765.3	3981.0
Corporate Tax	76.8	139.7	202.7	331.3	462.4	596.0	732.3	871.6	926.0	982.5	1047.4	1079.6	1136.0	1204.9	1273.9
Income for the Year	163.1	296.9	430.7	704.0	982.6	1266.6	1556.2	1852.2	1967.8	2087.8	2225.8	2294.1	2414.0	2560.4	2707.1
Sales/ Break-even Point	1.6	2.0	2.4	3.1	3.6	4.1	4.4	4.7	4.8	4.9	5.0	5.0	4.9	5.0	5.1

Table 8.26 Cashflow Statement Pro-forma

Items	Year														
	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Cash Flow Statement															
Operation Activities															
Net Income/Loss for the Year	163.1	296.9	430.7	704.0	982.6	1266.6	1556.2	1852.2	1967.8	2087.8	2225.8	2294.1	2414.0	2560.4	2707.1
Depreciation Expenses	103.2	116.3	130.1	150.9	172.9	195.9	220.2	245.5	253.1	260.6	268.2	275.7	283.3	283.3	283.3
Operation Activities Total	266.3	413.2	560.8	854.9	1155.5	1462.5	1776.3	2097.7	2220.9	2348.4	2494.0	2569.8	2697.3	2843.7	2990.4
Investment Activities															
Fixed Assets	1116.6	100.6	104.8	189.8	189.7	196.9	204.2	194.9	11.8	12.2	1560.7	144.0	147.9	253.7	244.1
Investment Activities Total	1116.6	100.6	104.8	189.8	189.7	196.9	204.2	194.9	11.8	12.2	1560.7	144.0	147.9	253.7	244.1
Financial Activities															
Paid-up Capital	800.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Long-term Loan	350.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Short-term Loan	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Repayment of Loan	13.5	16.2	19.4	23.3	28.0	33.6	40.3	48.3	58.0	69.6	0.0	0.0	0.0	0.0	0.0
Dividends	0.0	0.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0
Financial Activities Total	1136.5	-16.2	-99.4	-103.3	-108.0	-113.6	-120.3	-128.3	-138.0	-149.6	-80.0	-80.0	-80.0	-80.0	-80.0
Balance	286.2	296.4	356.6	561.8	857.8	1152.0	1451.9	1774.6	2071.1	2186.7	853.3	2345.9	2469.4	2510.0	2666.3
Term-start Cash on hand/banks	0.0	286.2	582.6	939.2	1501.0	2358.8	3510.9	4962.8	6737.4	8808.4	10995.1	11848.4	14194.3	16663.7	19173.7
Term-end Cash on hand/ banks	286.2	582.6	939.2	1501.0	2358.8	3510.9	4962.8	6737.4	8808.4	10995.1	11848.4	14194.3	16663.7	19173.7	21839.9
In Discount Rate = 12%,															
Discounted Free Cashflow	286.2	260.9	276.1	382.9	514.4	608.0	674.3	725.2	744.8	692.0	237.6	574.9	532.6	476.4	445.3
Total of Disc. Free Cashflow	7431.6														
Discount Rate = 12%															

Table 8.27 Financial Indicators Pro-forma

Items	Year														
	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Financial Indices															
Break-even Point	503.70	523.87	550.73	587.79	634.29	686.27	742.01	800.68	814.44	825.00	833.96	857.09	889.99	897.05	903.92
Rate of Return on Investment	0.18	0.30	0.36	0.47	0.49	0.47	0.44	0.40	0.34	0.29	0.26	0.23	0.21	0.19	0.18
Rate of Return on Equity	0.30	0.55	0.79	1.29	1.81	2.33	2.86	3.40	3.62	3.84	4.09	4.22	4.44	4.71	4.98
Rate of Return on Assets	0.18	0.28	0.33	0.41	0.43	0.41	0.38	0.35	0.30	0.27	0.24	0.21	0.20	0.18	0.17

8.3.5 To Further Improve the Financial Feasibility of the Project

The results of the financial analysis indicate that the bus company would operate profitably. There are two factors that could boost its attractiveness to the private sector: 1) 10% premium over the usual A/C bus; 2) removal or reduction of the bus infrastructure fee amounting to ₱26 million/year and 3) reduction of the ₱800 million required capitalization.

(1) Fare

The A/C bus fare at present is not regulated. This means that the A/C bus operators may decide by themselves to increase or decrease their respective fare levels. However, due to competition between air-con buses, as well as with non-aircon service, the fare level converges among operators. Based on passenger interview survey, the bus passengers are agreeable to pay an extra 1-2 pesos for extra service.

Regarding schedule and manner of busway operation, the following preferences were strongly indicated in the survey: 24 hours service, security in buses and at bus stops/terminals, voluntary highway patrol, clean buses and stops/terminals, and courteousness of bus companies' employees to passengers.

Thus, record of experience on such services must be among the requirements on the operator.

(2) Capital

The paid-up capital assumed in the projection is ₱800 million, which is a relatively large amount in the local bus industry. For example, two large bus companies reported only ₱100 million and ₱25 million paid-up capital. If the fleet requirement is reduced by maintaining the commercial speed higher than the assumed 20 km/hr, the purchase cost would go down and the equity requirement would then go down as well.

9 SOCIAL DIMENSIONS

9.1 Public Consultations and Participation

9.1.1 Project Stakeholders

The process of consultation and participation was heavily employed in this Study for project appreciation, acceptance and preparation. It covered not only the residential communities in the project area but also relevant national government agencies, local government units (LGUs), landowners/land developers, non-government organizations (NGOs), business interest groups and people's associations (i.e. transport groups, women's group, etc.). A schedule of activities involving consultative meetings, workshops, interviews and focus group discussions to draw out the participation of the various project stakeholders are outlined in Table 9.1.

The issues and concerns on the project vary by stakeholders. Those of the citizenry or community are presented in this section, which largely centered on project acceptability, acceptance, and preparation for eventual implementation of the project.

Mainstreaming participation of various stakeholders in the CBS Project process is one way of ensuring that all views are heard and that the project takes into account people's needs and priorities. It also enables smooth implementation and enhances the chance that the project will meet its objectives. The process aims at achieving the following:

- Share information about the project
- Consultation on community options and priorities
- Collaborative decision making

9.1.2 Community Consultations

The community consultation and participation process in the CBS project cycle is indicated in Table 9.2. The actual application of the consultation process occurs in all stages of the project. However, for this feasibility study stage, those activities listed in the project preparation stage were conducted. Specifically, these activities are as follows:

A. Key Informants Interview

This included the barangay captains of the affected areas, representatives of community groups, LGU's key persons, social workers, landowners, and other people of similar standing in the community. The interviews with key informants helped in establishing the perceptions, needs and socioeconomic trends of the local

community. Overall, the activity served to validate the extent to which the CBS project addresses the needs and demands of the community and gain social acceptability.

Table 9.1 Schedule of Consultative Activities

Activity	Date	Purpose
1. Initial Meeting with Bacoor Planners	Dec. 9, 2001	Orientation/Guidelines on incorporation of social dimensions
2. Initial Meeting with Dasmariñas Planners	Dec. 12, 2001	Orientation/Guidelines on incorporation of social dimensions
3. First LGU Plenary Workshop	Dec. 13, 2001	Orientation on the Project
4. Initial Meeting with Imus Planners	Jan. 10, 2002	Orientation/Guidelines on incorporation of social dimensions
5. Key Informant Interviews (KII) with Barangay leaders, women's group, Homeowners' Association leaders of three municipalities	Jan. 16 – 18, 2002	Initial social assessment/ perception survey on the busway project.
6. Informal interviews with selected households and private land wners	Jan. 16 – 18, 2002	Perception of the people in the area on the project.
7. Second LGU Plenary Workshop	March 1, 2002	Presentation and validation of the Progress of the Study and
8. Meeting with Large Property Owners/Developers	March 13 – 14, 2002	For the incorporation of the busway alignment in their property development plan.
9. Socio-economic Survey	June 24 – July 30, 2002	Interview of affected households (both formal and informal dwellers) within the right-of-way of the busway.
10. Workshop with LGU Mayors/ Vice-Mayors of Bacoor, Imus and Dasmariñas and a Property Developer	May 16 – 24, 2002	Formulation of an arrangement among LGUs and private sector for securing the right-of-way for the busway prior the implementa-tion of the project
11. Third LGU Plenary Workshop	May 29, 2002	Presentation and validation of a "Trust" scheme for right-of-way acquisition prior implementation of the project.
12. Meeting with the Governor of Cavite Province	August 15, 2002	Discussion on the MOA for TRUST formation and CBPC.
13. Various Meetings with officials of LGUs	August 21 – 30, 2002	Discussion on the MOA for TRUST formation and the Draft Resettlement Action Plan.

B. Focus Group Discussion

Focus group discussion (FGD) obtained up-to date information on socio-economic condition, both quantitative and qualitative. This activity is particularly useful in exploring community concerns, priorities and soliciting views about the project. FGDs were conducted in three LGUs and were participated by selected sectoral groups such as the barangay leaders and association of tricycle drivers (TODA).

Table 9.2 Community Participation Process for the CBS Project

Project Stages	Participants	Activities	Purpose
A. .Project Preparation	LGUs, DPWH NEDA Barangay Leaders Study Team Project Affected Persons Land owners	• Project Orientation - Plenary Sessions - FGDs - Key Informant's Interview • Social Assessment - Socioeconomic survey of PAPs • Preparation of Resettlement Policy • Preparation of RAP	• Acceptance of the project • Decision on alternative alignment options • Identification of PAPs • Inventory of PAPs and affected structures • Achieving just and fair compensation • Transparency of resettlement plan
B. Project Implementation	LGUs DPWH NEDA Barangay Captains LGUs	• Creation of RAP Implementation Committee (RIC)	• Facilitate and address grievances • Ensure/oversee implementation of RAP
b.1 . Pre-relocation Social preparation	PAPs LGU RIC Barangay officials	• Site visit/orientation • Planning for transfer • Organizing community support groups on bayanihan system of demolition	• Acceptance of resettlement site • Deciding on resettlement option • Securing commitment for voluntary transfer
b.2. Relocation phase	Sending LGU Host LGU PAPs NGOs Demolition Team DPWH RIC	• Demolition and transfer • Home reconstruction	• Manpower support in dismantling • Cooperation and peaceful transfer to site • Dwelling units established
	PAPs Host LGU Monitoring Team Support agencies DPWH	• Implement livelihood assistance program • Community organization and social integration	• Maintaining social network and integration to host community • Cooperative undertaking of new settlers
b.3 Monitoring and Evaluation	RIC Host LGU Comunuty	• Internal monitoring of RAP activities • External monitoring RAP Activities	

C. Structured Socio-economic Household Survey

The structured socio-economic household survey obtained the profile of the project-affected families as well as their views on the proposed project. The survey was conducted in all the areas of the proposed alignment options of the busway. Results of the survey also provided an overview of the magnitude of the resettlement involved, as well as afforded an evaluation of the options on road

alignment in terms of financial viability on right of way acquisition and minimal displacement.

The target for the structured survey was to cover one hundred percent (100%) of the project affected persons (PAPs). About 5 % was allowed as margin of error, including factors like refusal or unavailability of the respondents for interview. In Bacoor area, the social survey was able to cover ninety five percent (95%) of the PAPs. The remaining five percent (5%) refused to be interviewed.

The PAPs in Segment 1 of Dasmariñas were surveyed. The rate of refusal for the interview was high in the three subdivisions that were to be affected. Only a few families (24) consented to be interviewed.

The Segment 2 of Dasmariñas passes at the periphery area of Solar Properties, Inc. Hence, the property owner agreed in principle to swap the affected portion of his land with the old government road that is running in the middle of his land. No survey was conducted in this segment as the barangay captain advised the team against it due to a standing court order of ejecting informal dwellers from the Solar property land. Based on the data of Solar, it was estimated that 414 families considered as informal dwellers occupy their land. For this Study, it was estimated that about 200 families live within the inner portion of the old government road.

9.2 Summary of Social Impacts

9.2.1 Perceived Project Impacts

The information on social impacts has been obtained from consultation meetings such as the focus group discussions (FGDs) and key informants' interview (KIIs) undertaken during the early stages of the Study.

Expected impacts of the CBS Project are wide ranging but perceived to be mostly positive. There are potential negative impacts, but on the whole they can be mitigated. Continuous monitoring and mitigation are essential for a successful project implementation. Perceived impacts that surfaced during the interviews and discussions are enumerated below.

A. Road Users Needs

The CBS Project was viewed as an initiative that would provide a remedy for the present road condition and traffic congestion manifesting in the three municipalities. The potential beneficiaries include the entire population of Cavite and in particular, the populace of Bacoor, Imus and Dasmariñas. Presently, public transport users of more than 60,000 per day are expected to be the immediate beneficiaries of the project.

Table 9.3 Population Data, 2000

Area	No. of Households	Household Population
Bacoor	64,067	305,382
Imus	42,232	195,043
Dasmariñas	77,315	378,135
Cavite	428,879	2,063,161

Source: NSO, 2001

B. Road Users Demands

Heavy traffic congestion in the target areas has been observed. Travel time on the national road is long. Commuters are exposed to air pollution due to heavy traffic congestion. The demand for road expansion and improvement was highly acknowledged by the people during the consultation.

C. Potential Benefits

These include improvement in traffic management, reduction in pollution, time savings, improvement in health due to reduced exposure to emissions and increased opportunity for employment and income. Significant gender distributional effect contributes to easier movement for women in accessing basic facilities.

D. Potential Adverse Impact

If the project is carried out according to government policy guidelines, minimal adverse effects are foreseen. The project needs to be aware of the following:

- Involuntary resettlement of people and commercial communities
- Temporary nuisance during construction
- Inability of people to afford the resettlement housing cost for which there is a direct cost recovery
- Loss of income to people benefiting from their present economic activities

9.2.2 Mitigation and Compensatory Measures

The following mitigation and compensatory measures are threshed out to cushion expected adverse impacts:

- Resettlement according to the established policy framework (Annex H) and Resettlement Action Plan (Annex I) is an absolute pre-requisite. The policy framework ensures that people are compensated and that they are in a better or in similar condition as before the project took place. In many cases, resettlement provides the opportunity to improve the lives of resettled families.
- Effective management during construction can minimize negative effects such as traffic congestion and noise. This can be done by providing appropriate detour signs and adequate information of the project before implementation.
- Assistance and support for most vulnerable families especially female headed households is required to gain access to housing, basic services and income generating activities. Some forms of assistance may be provided through measures as simple as information dissemination on social and basic services, credit facilities, and other income generating opportunities.
- A Resettlement Implementation Committee (RIC) needs to be established in the LGU to facilitate an effective and systematic resettlement and to handle the compensation and grievance.

9.3 Overview of Socioeconomic Information

The CBS Project requires an acquisition of some 21 kilometers for the busway. In compliance with the policies of both JBIC and GOP that require resettlement to be reduced where feasible, the three (3) proposed road alignments in Bacoor and Dasmariñas were examined and an assessment of several road options were undertaken in order to assess the most feasible, cost effective and minimal displacement of people.

A socioeconomic survey was conducted for all the proposed alignment options and covered the affected households within a maximum ROW width of 60 meters. Inasmuch as actual ROW required is 40 meters, an additional 20 meters (10 meters each side from centerline of ROW) was covered to afford availability of data for physical planning flexibility. This was carried out in tandem with the survey of structures to determine the severity of people and structures affected. It covered basic socioeconomic information to gain an understanding of profile and conditions of the affected families within the proposed road alignments. Assistance from the DPWH (Regional and District Offices) was provided during the survey in terms of documenting through photographs and cost estimates of the structures.

There are about 1,424 households found within the Bacoor busway segment (including all the alignment options). However, on the preferred alignment, which is Line B in Bacoor, there are 263 households affected although this number will decrease when the required ROW of 40 meters is followed. Majority of the population belong to the core or nucleus families although there is a significant number that are considered as extended family members. There are three types of Project Affected Families (PAFs) as indicated in Table 9.4.

Table 9.4 Categories of Project Affected Families

Category of Households	Bacoor Coastal Road Access			Dasmariñas	Imus
	Line A	Line B [1/]	Line C	Segment 2	
Land Owners	2	11	0	24[2/]	None
Renters	87	61	21	5	None
Informal dwellers	662	191	66	200 [3/]	None
Total	751	263	87	323	None

1/ Selected project alignment.
2/ Only 24 households interviewed as rate of refusal was high. Actual residential structure count was 118.
3/ Estimated for the government old road cutting across Solar Property since a survey was not possible.

Of the above categories, majority are informal dwellers in Bacoor for all three alignment options. The same is true in Dasmariñas, although the exact household population is not available. The highlights of the survey results are given in Table 9.5 below.

Table 9.5 Highlights of Socio-economic Survey Results [1/]

Information Category	Item	Bacoor (%)	Dasmariñas (%)	Total (%)
Type of Household Respondent	Husband	22.1	33.3	23.0
	Wife	63.5	45.8	62.0
	Child	4.5	4.2	6.3
	Parents	4.2	16.7	5.2
	In-laws	0.4	-	0.4
	Other Caretaker	3.4	-	3.1
Educational Attainment of Respondents	No Formal Education	0.0	4.2	0.3
	Elementary	33.8	20.8	32.8
	High School	38.8	33.3	38.3
	Vocational	11.0	0.0	10.1
	College	14.4	41.7	16.7
	Graduate	1.9	0.0	1.7

Table 9.5 Highlights of Socio-economic Survey Results [1/] *(Continued)*

Information Category	Item	Bacoor (%)	Dasmariñas (%)	Total (%)
Occupation of Respondents	Farmer	7.6	29.2	9.4
	Skilled Laborer	5.3	4.2	5.2
	Unskilled Laborer	12.9	8.4	12.5
	Professional/Employee	10.3	4.2	9.6
	Business Operator	8.4	16.7	9.1
	Housekeeper	28.9	12.5	27.5
	Hunter/Gatherer	1.9	0.0	1.7
	OFW (Overseas Worker)	4.6	0.0	4.2
	Others	9.5	20.8	10.5
	No Answer	10.7	4.2	10.1
Origin	Same Place	20.2	66.7	24.0
	Within Municipality	11.4	8.3	11.1
	Visayas Region	24.3	25.0	24.4
	Luzon Region	30.4	0.0	27.9
	Mindanao Region	2.3	0.0	2.1
	Others	11.4	0.0	10.5
Length of Stay	Less than 1 year	0.0	25.0	2.1
	1 to 5 years	27.0	4.2	25.1
	Over 5 years	20.2	4.2	18.8
	Over 10 years	31.6	66.7	34.5
	No Answer	21.3	0.0	19.5
Household Size	1 – 3	31.9	8.3	30.0
	4 – 6	46.0	66.7	47.7
	7 – 9	14.1	25.0	15.0
	9 – 12	8.0	0.0	7.3
Household Income	2,000 – 4,000	3.8	25.0	5.6
	4,001 – 6, 000	3.8	16.7	4.9
	6,001 – 8,000	15.6	45.8	18.1
	8,001 – 10,000	9.1	0.0	8.4
	10,001 – 12,000	13.7	0.0	12.5
	12,001 – 14,000	6.1	8.3	6.3
	Over 14,000	6.1	0.0	5.6
	No Answer	41.8	4.2	38.7
Household Structure	Single/Nucleus	65.4	54.2	64.5
	Extended	8.8	45.8	11.9
	Joint	14.1	0.0	12.9
	No Answer	11.8	0.0	10.8
Project Awareness	Yes	29.7	25.0	29.3
	No	57.0	75.0	58.5
	No Answer	13.3	0.0	12.2
Willingness to be Relocated	Yes	35.4	41.7	35.9
	No	31.6	58.3	33.8
	Not Sure	33.1	0.0	30.3
Resettlement Option	Go back to former location	0.8	0.0	0.7
	Find another place	10.7	41.7	13.2
	Back to province	36.9	0.0	33.8
	Not Sure	51.7	58.3	52.3
Preference on Compensation	Resettlement	19.8	12.5	19.2
	Cash Compensation	43.7	87.5	47.4
	Undecided	36.5	0.0	33.5

1/ Based on sampling size of 263 families in Line B alignment of Bacoor and only 24 in Segment 2 of Dasmariñas.

As revealed from the survey, the notable characteristics of the affected families are as follows:

- Many of the respondents fall under the income bracket of ₱6,000 to ₱8,000 per month (18% of total respondents);
- Most respondents resided in the area for over 10 years;
- About 35% of the families have originated within the same municipality;
- About 36% of the families are willing to be relocated while another 30% are not decided; and
- Most of the informal dwellers were undecided/not sure as to which resettlement option to choose (52%).

9.4 Dimensions of Land Acquisition and Resettlement

9.4.1 Scale of Land Requirement and Affected Households

Table 9.6 presents ROW required per municipality for the busway.

Table 9.6 Land Requirement for ROW

Municipality	ROW Requirement (kms.)
Bacoor	6.84 (2.45)*
Imus	5.74
Dasmariñas	8.42
Total	21.00 (2.45)*

* Coastal Road Access

The acquisition of the ROW will be the responsibility of the Project ROW Taskforce, which was created in November 29, 2001 and has already convened during the interim report stage of the Study. The Creation of the Taskforce and their specific functions is attached as Annex D of this report.

Within the proposed road alignments, there exist numerous structures and various categories of affected households. These households greatly vary in terms of living condition, economic activities, shelter, and household sizes. A summary on the magnitude of land, structures and households affected in the proposed busway alignment is indicated in Table 9.7. The data will be useful in evaluating the financial and social implication of the busway project. This is also necessary for the LGUs in deciding the option that is doable in terms of cost effectiveness and minimal social displacement. The overall results show that a total of 211 structures, with 263 households, are within the alignment in Bacoor while there are none in Imus and about 323 households in Dasmariñas.

Table 9.7 Scale of Affected Structures and Households

Area	Estimated No. of Structures	Estimated No. of Households	Total Population
Bacoor			
Coastal Rd. Access (Preferred Line B)	211	263	1,130
Imus			
Segment 1	None	None	None
Segment 2	None	None	None
Dasmariñas			
Segment 1	None	None	None
Segment 2	119 1/	323	1,389

1/ Does not include the structures found within the old government road

In Imus, efforts to avoid the structures within the proposed ROW were done, thus, only a few number of informal dwellers would be affected. These families are tenants, which can easily be transferred by the landowner to a vacant lot nearby

9.4.2 Classification and Cost of Land

Categories of land that will be affected in the ROW acquisition vary by municipality and by type of structures and households settled on the land.

In Bacoor, majority of the project-affected persons (PAPs) are informal dwellers on government land. Only a few are legitimate landowners. PAPs seem to have confusion as to the ownership of land. Some claimed that the land belongs to the government (Philippine National Oil Company) while others believed it belongs to a private person. The real situation is, people are paying amelioration to the government and at the same time paying rent to the private person. As such, the true ownership of the land needs to be established before project implementation. Two of the landowners have indicated their willingness to sell a portion of their land affected by the project provided they would be fairly compensated. An indicative cost of land in the three municipalities is indicated in Table 9.8.

Table 9.8 Cost of Land

Classification	Cost (per square meter)		
	Bacoor	Imus	Dasmariñas
Agricultural	₱1,000	₱1,000	₱1,000
Residential	2,000-3,000	2,000-2,500	2,000 –2,500
Industrial/Commercial	8,000-10,000	8,000-10,000	8,000-12,000
Subdivision	3,000 –5,000	3,000-4,000	3,000 –4,000

In Imus, a major portion of the affected land belongs to One Asia and the latter has signified their willingness to accommodate the CBS ROW. Majority of the land (75%) affected for the ROW is agricultural.

In Dasmariñas, the categories of land affected by the ROW are a combination of all four classifications: a major portion (60%) is agricultural, residential (20%) commercial and subdivision, (20%). About 20% of the land for the ROW belongs to Solar.

9.4.3 Resettlement Approach for the Busway Project

The three LGUs' perception of and approach to resettlement is characterized by the following elements:

- Priority for resettlement within the LGUs' immediate environs to avoid economic dislocation
- Accessibility to transport and basic services
- Availability of resettlement sites with basic facilities

One of the major constraints in Bacoor is the unavailability of a resettlement site wherewith to relocate the informal dwellers. The preferred options of the majority of PAPs are resettlement to serviced plots where they can transfer their salvaged materials. An advantage of providing serviced plots rather than cash compensation is that it offers long – term solution and security of tenure for the families. PAPs could also utilize their salvaged materials to immediately put up their dwelling units. Studies revealed that PAPs tend to build their houses more quickly when they are allowed to arrange for the construction of their own dwellings.

In Dasmariñas, Solar Property has signified willingness to provide resettlement sites for those who would voluntarily relocate from their property. This is in compliance to the BP 220 law where private developers are compelled to provide 20% of their development cost for government's housing program. Solar has signified willingness to appropriate at least 25 sq. meters of land for each household, along with minimum basic amenities.

Dasmariñas is the center of National Housing Authority's resettlement sites, and as a host community, the LGU has been involved in providing social services to the displaced families.

The resettlement options that are currently practiced are presented below to provide an overview of resettlement requirements and the cost estimates for each option. In selecting the best option, some of the important criteria that need to be

considered are (a) the preferred option of the PAPs, (b) the level of affordability of the PAPs, (c) LGUs financial capacity, and (d) cost recovery.

Option 1: Serviced Plots/Land Stewardship. This option will provide beneficiaries with land plots of about 60 square meters in the resettlement sites provided by the government and will allow them long term occupancy with minimal fee for rent. The standard cost established by DPWH on serviced plot is ₱60,000. Formalization of land tenure may be obtained by paying monthly amortization payable in 25 years through the Community Mortgage Program (CMP) or Pag-IBIG. This compensation provides permanent residency and enables families sufficient time to obtain security of tenure. Families will also be allowed to use their salvageable materials to reconstruct their homes. Transportation assistance will be provided to PAPs during transfer.

Option 2: Compensation on Structure. This option provides cash compensation equivalent to replacement cost of the structure. No land is provided for PAPs taking this option**.** Compensation cost is based on standard cost set by the Assessor's Office of the province of Cavite and undertaken by the DPWH during the survey.

The advantage of this option is that, it is cheaper and does not involve land acquisition and development cost of resettlement site and quick scheme. However, it does not provide long-term solution to housing needs of PAPs, resulting to informal dwellers going back to squatting.

Option 3: Socialized Housing. In this option, the government may purchase from private developers, units at socialized cost of P165,000 (per house and lot) or utilize the existing NHA's socialized housing on a rent scheme. Assistance will be provided to resettlers to visit NHA's resettlement sites and in facilitating the application, entry, and occupancy procedures. Cost of rent will be determined by NHA. The advantage of this option is that PAPs will immediately have access to dwelling units, but the issue on affordability and cost recovery needs to be ensured.

The scale of land required for resettlement will depend on the magnitude of affected families as shown in various options and the type of resettlement option that government will decide during the implementation. Table 9.9 presents the logical combination of options 1 and 2 based on the profile of the informal dwellers in the area.

Table 9.9 Land Requirement and Resettlement Cost

Area/Type of Structure	No. of Housing Structures	Resettlement Option	Total Cost (P 000) [1/]	Land Requirement (sq.m.)
Bacoor	211			
1. Shanty	11	Serviced Lots	660	792
2. Light Materials	15	Serviced Lots	900	1,080
3. Predominanly Wooden	53	Compensation	7,950	none
4. Predominantly Concrete	132	Compensation	52,800	none
Dasmariñas	200 [2/]	Service Lots	Not Available	12,000
Total	411	-	62,310	13,872

1/ Based on DWPH standard of P60,000 per household.

2/ Only estimated number of households. No survey could be carried out here.

9.4.4 The Resettlement Policy Framework and the Resettlement Action Plan

It became apparent that the CBS Project would require the relocation of people at a level that would be considered "significant" (i.e, more than 200 persons will be affected). As the scale of PAPs has reached over 200 persons in each of the options examined, it is then necessary to prepare a Resettlement Policy and a Resettlement Action Plan (RAP).

The Resettlement Policy Framework and the RAP are documents that provide guidelines in land acquisition, resettlement and compensation. The former establishes the policy guidelines while the latter provides the strategy in the implementation of the resettlement of PAPs. Both basically adhere to the policy and practices of the DPWH.

Some of the outstanding issues that need to be addressed before project implementation are the following:

- A decision on where to resettle the informal dwellers of Bacoor on the option chosen.
- Securing of a firm commitment for land swapping on the ROW in Dasmariñas between the LGU and Solar Properties and a resolution on the issue on clearance of squatters from both Solar and government land.
- Commitment of Solar for the provision of a resettlement site for the relocation of informal dwellers on their land as well as those on government land.
- Decision on the options that best suit the needs of PAPs and the level of their affordability.

9.5 Special Arrangement for ROW Acquisition

Land acquisition for road or railway development involves long strips of land. It entails extended negotiations with many owners of lots and improvements. Basically, there is transfer of ownership stated in a document called Torrens Title (often called Transfer Certificate of Title or TCT). The acquisition method can either be voluntary or involuntary, as shown in Table 9.10 and associated activities are illustrated in Figure 9.1.

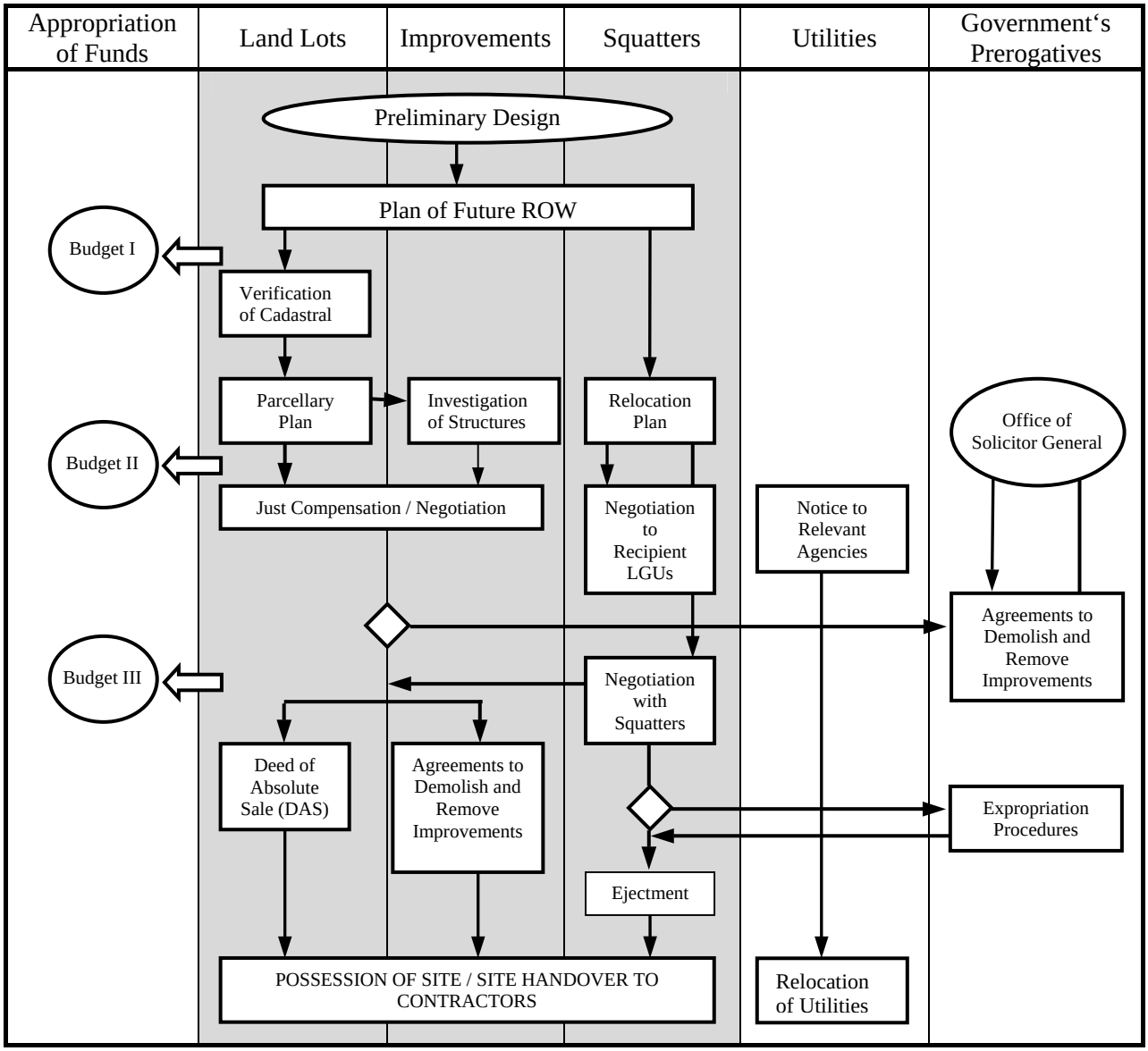
Table 9.10 ROW Acquisition Methods

	Voluntary	Involuntary
Types	• Negotiated land purchases • Lease agreement • Joint venture agreement • Donation • Usufruct • Reclamation • Land Pooling/ Readjustment	• Expropriation • Forced Sales • Auction
Features	Success depends on willingness of lot owners	Government exercise of its power of eminent domain
Issues	• Depends on sense of mission of government workers tasked to undertake ROW acquisition; • Availability of funds at the right time and right amounts; • Must follow convoluted government procedures.	• Detested by owners because of its coercive character; • Hinges on efficiency of the judicial system

There are several parties involved in the ROW acquisition. But among them, one has to perform the role of a "quarterback". This role is often assumed by DPWH but may be assumed by an entity with the greatest incentive and motivation to realize the CBS project.

The main disadvantage of DPWH is time – it needs the funds before it can act and initiate the process. That usually entails 2 to 3 years delay – from completion of project feasibility and decision to include the project in its capital investment program. The budget for the project's ROW must be included in the Annual General Appropriations Act – which is prepared by the Executive Branch in the first quarter and submitted to the Legislative Branch in July of every year, and takes effect in January of the following year. Meantime, during that period, many things could happen as to hamper the subsequent ROW acquisition. Among these are: speculations by some unscrupulous lot owners or government functionaries, invasion of the planned corridor by squatters lured by potential relocation and compensation benefits, and introduction of permanent improvements by lot owners that make subsequent voluntary sale more difficult.

Figure 9.1 Various Activities and Associated Work Flow with Land Acquisition Program



An option that maximizes the role of the local government and the private sector in the project is to create a TRUST. The key parties to the TRUST will be Cavite Provincial Government, the Busway LGUs (Bacoor, Imus, and Dasmariñas), DPWH, One Asia (representing the private property owners), and the Cavite Development Council.

The TRUSTcan be organized with the following objectives:

- To consolidate or reserve the lands required by the Cavite Busway System project, by negotiating with individual lot owners, in advance of project implementation;
- To protect and conserve the required rights-of-way;

- To undertake land re-adjustment activities integral to the CBS project, such as re-plotting, combining and dividing lots into blocks of appropriate sizes and shapes, issuance of asset participation certificates (APCs), entering into options to buy/sell/swap land parcels;
- To capture, and distribute, the benefits of the project more equitably and proportionately among the affected parties.

The proposed responsibilities of the different parties in the TRUST are as follows:

a) Cavite Province and the Bacoor-Imus-Dasmariñas LGUs

- Provide copies of Tax Declarations, TCTs, values of improvements, and other pertinent information about the affected lots/properties;
- Enact ordinances providing exemptions from realty taxes for parcels of land ceded to the Trust and exchanged with APCs, for a period of 10 years;
- Determine the fair and just compensation of the affected property (Land and Improvement);
- Persuade lot owners to participate in the project and to voluntarily sell their properties to the TRUST.
- Inventory and relocate informal occupants;
- Freeze building and/or development permits 20 meters from center-line of the ROW;

b) DPWH

- Decide/approve the final metes and bounds of the proposed road;
- Delineate the road boundary and its effect on the individual lots along the ROW;
- Secure the budget for the acquisition and payment of the lots from either the lot owners or through the Trust;
- Design and construct, by itself or through contractors, the road and all its appurtenant facilities;
- Undertake relocation of affected utilities, if any.

c) One Asia

- Provide the administrative, legal and organizational resources for the Trust, including stewardship of all records and documents;
- Coordinate the acquisition and negotiation process with individual lot owners;

- Recommend, for approval of the Trustee, the appropriate re-plotting and valuation of the lots and the corresponding issuance of APCs;
- Identify lot owners unwilling to sell or posing major obstacles to the project, and recommend to the Board, specific countermeasures;
- Recommend, for approval of the Trustee, the appropriate types of property developments at the different busway stations;
- Perform other roles as may be delegated by the Board of Trustees

d) Cavite Development Council

- Provide the Trust impartial and independent opinions on the project;
- Line up interim financing for the TRUST.

The DPWH is intended to be one of parties of the TRUST. However, it is legally constrained not to initiate any action in securing CBS right-of-way without available funds (Sec. 40 of the Revised Administrative Law of 1987). As such, the LGUs and other private parties can assist the DPWH in assembling the needed land for the ROW and prepare it for eventual acquisition. Said assistance can take the following form:

a) Finalization of the ROW alignment in coordination with the DPWH;

b) Identification of lot owners and convincing them to voluntarily accede to part with their land holdings in favor of the project;

c) Collating data on zonal, assessment and fair market values pertaining to the land holdings affected by the ROW;

d) Inspection of structures affected by the alignment and quantifying their values;

e) Identification of squatter colonies and coordination on their relocation from site;

f) Identifying schemes for maximization of the ROW fund, such as through land swaps, re-parcellarization and subdivision of lots and the like;

g) Identification of liens and encumbrances burdening affected land holdings, including real estate tax arrearages thereon;

h) Preparation of incentives in the municipal level to encourage the voluntary cession, if not donation of lots needed for the project.

Hence, a draft Memorandum of Agreement (MOA) has been prepared for the DPWH, LGUs, and private sector for the formation of a TRUST body (Annex G).

10. ENVIRONMENTAL EXAMINATIONS

This chapter focuses on the understanding of environmental legal framework in the Philippines, compliance with environmental requirements for project approval and initial findings in terms of environmental impact of the proposed Busway corridor.

10.1 Legal Framework of Environmental Protection in the Philippines

In the Philippines, environmental legislations are well crafted and enacted. Presidential Decree (PD) 1151 represents the basis of the environmental policy in the country. Department Administrative Order (DAO) 96-37, as its operational guideline, outlines the required process in order to proceed with the Environmental Impact Statement (EIS) system, a requirement for the issuance of an Environmental Compliance Certificate (ECC) for project approval by the government.

10.1.1 The Government Strategy of Environmental Protection and Related Legislations

The government has established and defined its environmental strategy as articulated in Article XII of the 1987 Constitution and in a 1989 Cabinet Resolution No.37, quoted below as follow.

1987 Constitution, Article XII

The goals of the state are "...a sustained increase in the amount of goods and services produced by the nation for the benefit of the people...". The State may enter into co-production, joint venture, or production-sharing agreements in the exploration; development and utilization of natural resources by Filipino citizens may be allowed. The State shall protect the rights of indigenous cultural communities to their ancestral lands.

1989 Cabinet Resolution No. 37

Philippines Strategy for Sustainable Development serves as a framework and guide in the formulation of policies consistent with the intents of the Constitution. Environmental protection, conservation, development and management through strategic alliances *and partnerships and appropriate information technology towards sustainable development.*

The Constitution defines that the state shall conserve national resources while the Cabinet Resolution emphasizes on sustainable development.

In addition, there are several other environmental legislations (Table 8.1), which includes two important legislations on environmental impact assessment: PD 1151 (1977) on the Philippine Environmental Policy and PD 1586 (1982) on Environmental Impact Statement (EIS) system.

Table 10.1 Environmental Legislations in the Philippines

Law No.	Year	Title
Republic Act No. 3931	1964	An Act Creating the National Water and Air Pollution Control Commission
PD No. 984	1976	Pollution Control Law
PD No. 1121	1977	The National Environmental Protection Council
PD No. 1151	1977	The Philippine Environmental Policy
PD No. 1144	1980	Vesting the Fertilizer and Pesticide Authority (FPA) (with the authority) to regulate or ban the use of pesticides
PD No. 1586	1982	Revising the provision of PD 1151 in relation to the Environmental Impact Statement (EIS)
Executive Order No. 192	1986	Creation of the Department of Environment and Natural Resources
Republic Act No. 6969	1990	Toxic Substance and Hazardous and Nuclear Waste Control Act
Republic Act No. 7160	1991	Local Government Code

10.1.2 Environmental Impact Assessment System in the Philippines

PD 1151, also known as the Philippine Environmental Policy, is the first policy in the country that institutionalized the Environmental Impact Assessment (EIA) System.

Section 4 states that it explicitly requires "*all agencies and instrumentalities of the national* government*, including government-owned and controlled corporations, as well as private corporations, firms and entities, to prepare an environmental impact system (EIS) for every action, project or undertaking which significantly affects the quality of the environment"*.

PD No.1586 formally established the Environmental Impact Statement (EIS) system in 1982. PD No.1151, for its part, introduced the concepts of environmentally critical projects (ECPs) and projects within environmentally critical areas (ECAs) and further requires that these projects should submit an EIS. It provides that "*no person, partnership or corporation shall undertake or operate any such declared ECP or project within an ECA without first securing an Environmental Compliance Certificate (ECC)*". An ECC therefore can only be issued to a project appraised to be complying with the EIS requirements.

In 1996, the DENR issued the EIS procedural manual in its Department Administrative Order No.37 (DAO 96-37) for a more effective planning and management of, and as a regulatory tool in addressing the, environmental issues in the country. This manual was primarily drafted for use by DENR staff, project proponents, EIA preparers, local government units, and other concerned groups for

smooth implementation of EIS system. The manual clarifies steps and procedures that are required to implement the various provisions.

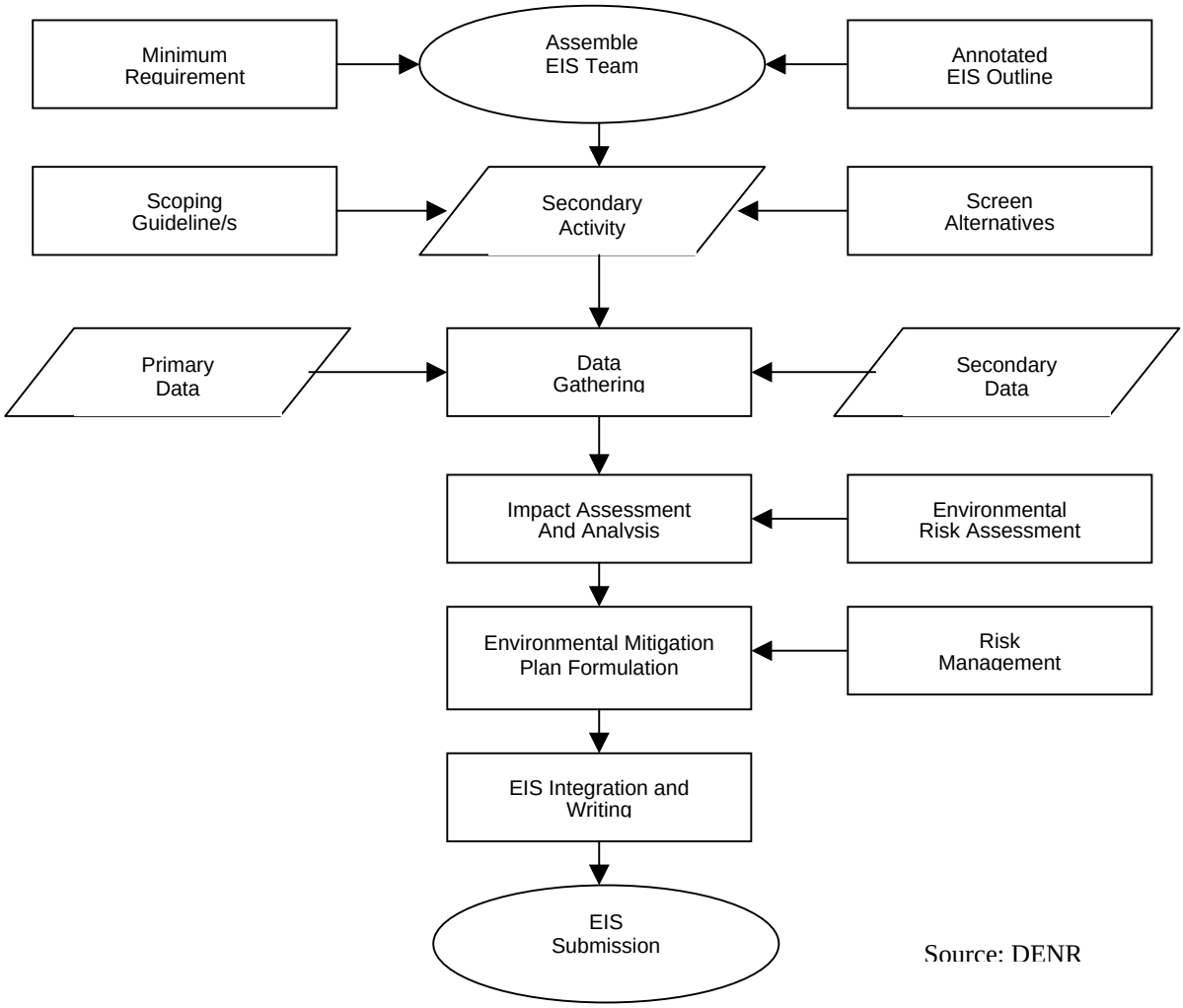
DAO 96-37 was promulgated to address key environmental issues by attaining the following objectives:

i. Ensure that environmental considerations are incorporated at the earliest possible stage of project development.
ii. Further streamline the current procedures in the conduct of the EIA in order to improve its effectiveness as a planning, regulatory and management tool.
iii. Enhance maximum public participation in the EIA process.

The following are the key features of DAO 96-37:

i. Formalization of the scoping process
ii. Strengthening of public participation process
iii. Standardization of EIS document
iv. Standardization of review procedures by establishing the procedural and substantive review criteria
v. Strengthening of environmental monitoring
vi. Incorporation of an Environmental Risk Assessment (ERA) component for projects that pose significant public risks
vii. Accreditation system for the EIA preparation.

Figure 10.1 EIS Preparation and Submission



Source: DENR

10.1.3 Environmental Institutions

The DENR, Department of Agriculture (DA) and Department of Agrarian Reform (DAR) are the government agencies that are primarily responsible for the conservation, management, development, and proper use of the country's environment and natural resources, with the DENR as responsible for EIS system in the country.

10.1.4 Compliance with Government of the Philippines (GOP) and Donor Agencies' Requirements for Environmental Assessment

For project implementation purposes of the proposed Cavite Busway System, the required EIS system, both in terms of the procedure in the country and in compliance with possible funding source, is evaluated.

(1) Compliance with Investment Coordination Committee's (ICC) requirement for project approval of projects proposed for overseas development assistance (ODA) financing

ICC is the GOP's project appraisal inter-agency committee under the NEDA. This Committee is primarily tasked to review all proposed projects for ODA financing and make a recommendation to the President. The following are the project requirements for application for ODA financing:

a) Feasibility Study
b) Accomplished ICC-Project Evaluation Forms
c) Endorsement of the concerned Regional Development Council (RDC) for region-based projects
d) Endorsement from other concerned agencies
e) Clearance from Department of Budget and Management
f) Endorsement from the GCMCC with respect to the financial capacity of the concerned agencies
g) Agency Plan for ROW acquisition (when applicable)
h) Location map (when applicable)
i) EIS
j) ECC for projects that fall within the EIS system set by the Environmental Management Bureau (EMB)

Items g, h and i are all related to EIS system. For purposes of this Study, according to EIAPO representatives during initial project coordination meetings, a conditional approval to be issued by DENR is sufficient to meet the EIS requirement for project approval of loan projects.

(2) Compliance with Japan Bank for International Cooperation (JBIC) Loan

JBIC has developed a JBIC Environmental Guideline for ODA Loans to also guide self-help efforts of developing countries directed towards attaining sustainable development. It is JBIC's policy that "responsibility with regard to environmental consideration of a project rests ultimately with the recipient country"[1].

The guideline has classified proposed projects into three categories, with the proposed Cavite Busway System falling under its Category A:

Category A: Submission *of Environment Impact Assessment Report (hereinafter "EIA Report") is required.* The *EIA Report must be accompanied by a summary in English or Japanese. The project is then appraised in the light of the Guidelines.*

Thus, this proposed project is subjected to the requirement of an EIA. However, a conditional EIS approval by the GOP is already acceptable for purposes of JBIC application. The GOP has already a precedent in terms of loan application to JBIC with only a conditional approval of the EIA.

[1] JBIC Environmental Guideline for ODA Loans, JBIC 1999

10.1.5 Commencement of EIS Procedure

Scoping is the first step of EIS system, outlined briefly as follows.

This is undertaken by the project proponent together with the DENR and various project stakeholders in order to define the range of environmental issues, actions, alternatives, and impacts that should be included in the EIS. The procedure is illustrated in Figure 10.2.

- Request for Project Scoping
- Determination of Number of Scoping Sessions to be held and areas where these will be undertaken
- Determination of Stakeholders to be invited
- Scheduling of Scoping Session(s)
- DENR Representative(s) to attend scoping
- Invitation of Stakeholders to the Scoping meeting
- Social Preparation
- Overall Management of the Scoping Meeting
- Facilitation of Scoping Meeting
- Rules and Procedures to be followed in the Scoping meeting
- Questions on rules, policies and procedures
- Mediation, in case of conflicts during the scoping meeting
- Participation in the Scoping
- Preparation of Scoping Report
- Scoping report review/approval
- Distribution of Copies of Approved Scoping Report

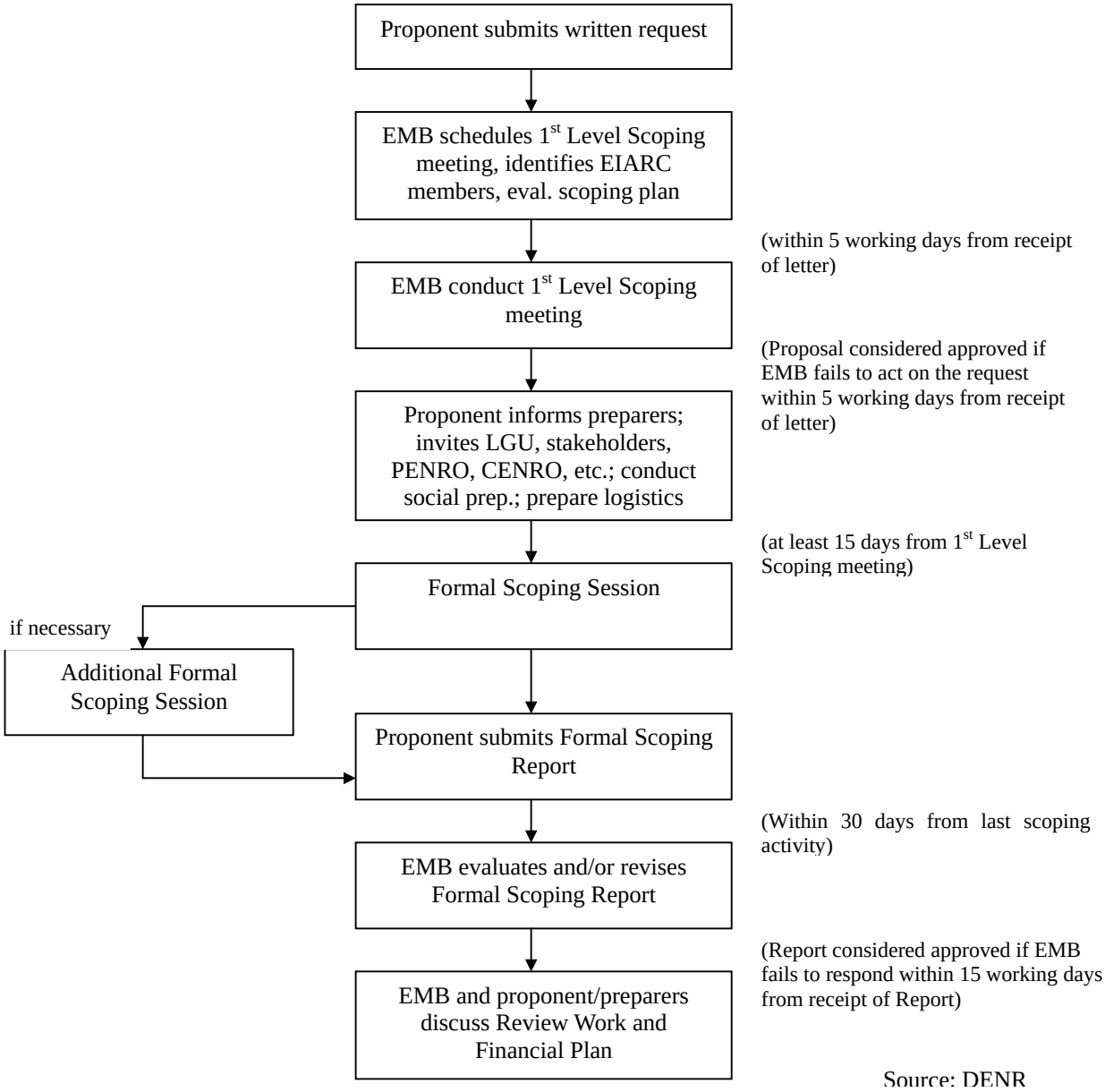
10.2 Environmental Findings on the Proposed Busway Corridor

This section presents preliminary identified project implementation factors for environmental consideration based on reconnaissance survey conducted and secondary data gathered.

10.2.1 Initial Identification of Environmentally Critical Factors in the Proposed Corridor

The proposed busway corridor runs parallel to Aguinaldo Highway from Bacoor, Imus and Dasmariñas. The corridor stretches from the end of the Coastal Road to Governor's Drive in Dasmariñas on mostly flat land. The length of the corridor is approximately 20 km and the corridor lies in between Aguinaldo Highway and Molino-Paliparan Road.

Figure 10.2 EIS Scoping Process



Source: DENR

The area along the proposed corridor is suburban in nature, with a mixed-use landuse highly characterized by new housing developments (subdivisions and villas or village-type residential developments), industrial estate and agricultural lands. With the steady increase in urbanization, the existing road network, both the regional and the secondary roads network, is already insufficient to address the road space demand in the area.

The proposed busway corridor lies on the foot of the volcano which includes some undulations encroached by rivers which however are mostly flat. There are some rivers stretching from south to north and the rivers are used for agriculture and discharge system. It seems to be that there is no primary vegetation and it is mostly for secondary vegetation.

The proposed busway corridor is proposed on non-urbanized area, except on sections passing through some urbanized areas such as Niog and Maliksi. Each of these sections is explained and a summary is presented in Table 10.2.

(1) Bacoor Section

This is the most environmentally critical section of the corridor. Proposed corridor is stretching from the coastal road to the barangays of Niog and Maliksi which area characterized by shallow seashore, mixed land use along the Aguinaldo Highway and other major roads and highly population density due to the presence of residential areas.

Sea Shore Area

A reclamation project is proposed for this area extending from Baclaran, however, project implementation is not seen at the moment. Along the coast is a small-scale fishermen's village. Thus, relocation and marine environmental protection might be required if reclamation shall be done by this project.

Niog and Maliksi

This suburban area is typically with a mixed land use with commercial facilities along the roads and residential areas behind. The proposed corridor crosses on such land use. This project shall therefore require relocation of both residence and commercial facilities. In addition, high voltage power cable exists along the Aguinaldo Highway thus height clearance shall be considered. A traffic management plan should also be developed in consideration of the existing traffic flow.

Bayanan compound

The corridor crosses Mambog-Bayanan Road and through a compound along with a DPWH road project. Thus, extension of land acquisition is required for the busway project.

Citta Italia new housing development area

This is a newly developed residential subdivision, marketing and sales of which are ongoing. The proposed busway corridor shall pass just beside Citta Italia thus necessary coordination with Citta Italia shall be made. It is also necessary to have environmental mitigation measures in the area.

(2) Imus Section

Beside Citta Italia

The busway corridor is proposed to follow an existing district road just south of Citta Italia where there are some subdivision residential areas aside from small rivers. This shall therefore require relocation of residents and the re-routing of the river flow. A DPWH road is also being proposed on this area along with the corridor up to One Asia property.

One Asia

This section of the proposed busway corridor shall run mostly on an agricultural land owned by One Asia, a property developer which has several mixed-use development plans for their property. There is no foreseen major environmental impact on this section, however, presence of some rivers such as irrigation channels shall require hydrology studies.

(3) Dasmariñas Section

Orchard Country Club

The corridor goes through along a river and crosses Salitran-Salawag Road where there are residential communities and commercial and public facilities such as bus depot which shall necessitate relocation.

Dasmariñas

The presence of medical, educational and religious facilities on and near the proposed corridor shall require the development of environmental mitigation measures for the project. In addition, a traffic management plan shall be developed considering the existing traffic flow.

Electric Sub Power Station Area

With only a very limited available land in the area, this facility shall be a huge obstacle for the corridor. Relocation of the alignment from that planned in the CALA Study will be required. On the other hand, traversing Aguinaldo Highway shall cause a change in the existing traffic flow.

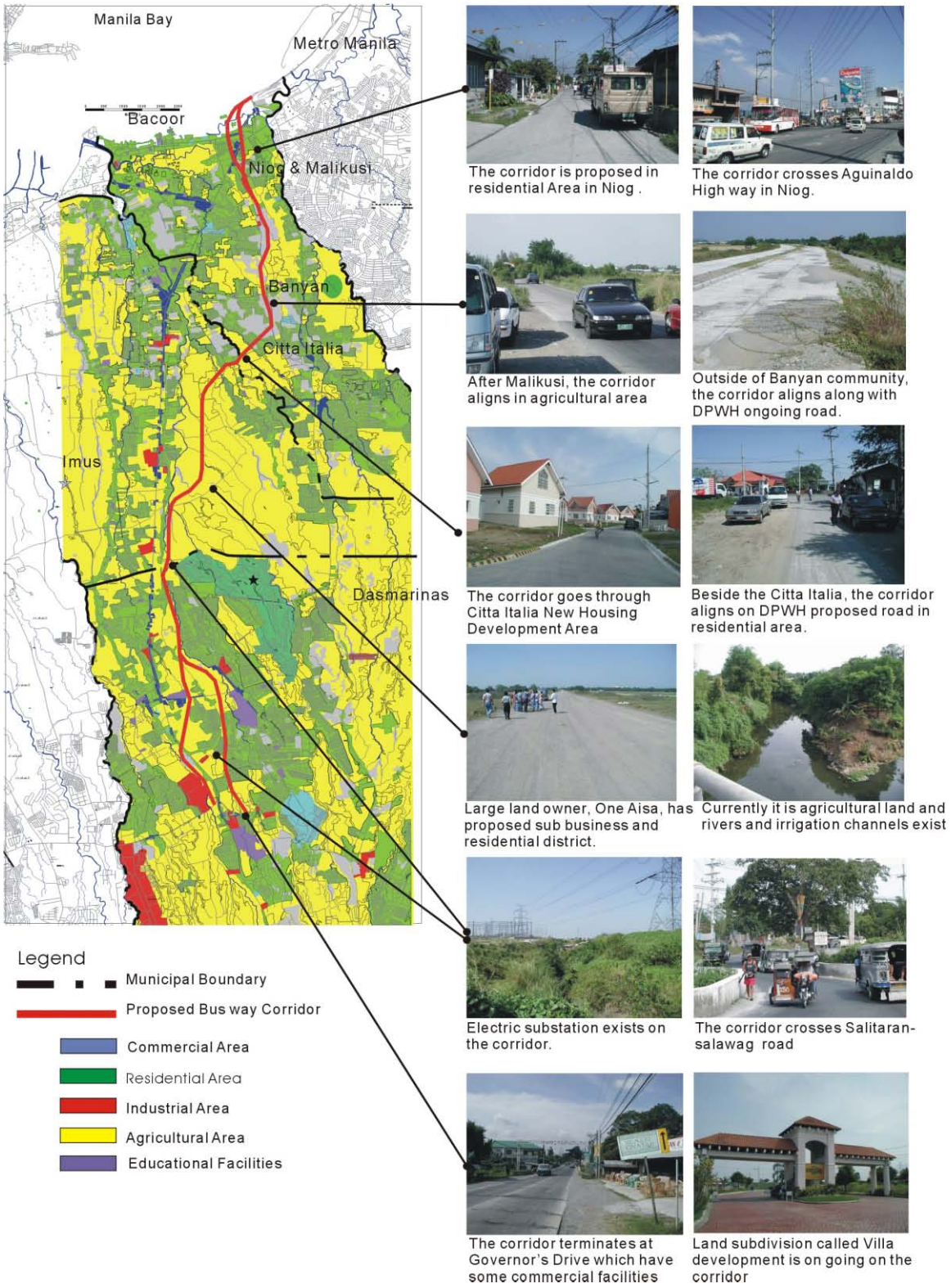
Governor's Drive (Southern terminus of the busway corridor)

The proposed busway corridor will be terminated at Governor's drive. Aside from pasture and agricultural lands, there are a few commercial facilities which shall be required to relocate. There is also a part of this area that forms a valley with sharp slope that may cause landslide. Thus, a detailed study should be done.

Table 10.2 Matrix of Environmental Factors and Impacts by Proposed Sections

Admin.	Section	Initial Findings	Impacts
Bacoor	Coastal Area	▪ Shallow seashore lies on the coastal line and reclamation project is proposed. ▪ Fisherman's village engaged in small-scale fishing activity and other residential housing exist along the coastal area which looks like high density informal settlers. ▪ Proposed alignment on the existing road might have impacts	▪ Relocation ▪ Economic Activities ▪ Marine environment ▪ Public utilities ▪ Traffic ▪ Air and Noise
	Niog & Maliksi	▪ Residential (e.g. St.Joseph Village) and commercial (along Aguinaldo Highway) land use ▪ Water supply facility exists in Niog ▪ Heavy traffic with a high voltage power cable line along Aguinaldo Highway.	▪ Relocation ▪ Public facilities ▪ Traffic
	Bayanan	▪ There are houses and factories at intersection. ▪ The other area is for agricultural use. ▪ There is an ongoing DPWH secondary road project along the corridor connecting to Molino-Palipalan Road	▪ Relocation
	Citta Italia	▪ Relatively new large housing development (Citta Italia) is ongoing with most of the sold lots already built up. ▪ Residential area might have air and noise impacts	▪ Relocation ▪ Hydrology ▪ Air and Noise
Imus	Beside Citta Italia	▪ Some residential housing exists along the corridor and a channel exists	▪ Relocation ▪ Hydrology ▪ Air and Noise
	One Asia	▪ Currently an agricultural land (paddy land) owned by a real estate developer ▪ Irrigation channels and rivers exist ▪ After development of One Asia, emission will affect residential area	▪ Hydrology ▪ Air and Noise
Dasmariñas	Orchid Country Club	▪ River ▪ Housing and commercial facilities exist along the Salitran-Salawag Road	▪ Relocation ▪ Hydrology ▪ Traffic
	Dasmariñas	▪ Presence of major road, medical, educational, and religious facilities near the proposed busway corridor	▪ Relocation ▪ Traffic ▪ Public facilities
	Electric Sub Power Station	▪ Presence of a sub power station and new housing development along the proposed corridor ▪ Traffic might have impact if the alignment across Aguibnaldo Highway	▪ Relocation ▪ Public facilities ▪ Traffic
	Governor's Drive	▪ Limited area for terminal ▪ Portion of the proposed corridor is sharp valley which may cause landslide in the future	▪ Relocation ▪ Traffic

Figure 10.3 Initial Environmental Appraisal Map of the Busway Corridor



10.3 Issues and Measures for Environmental Considerations

10.3.1 Anticipated Issues And Measures

There is no significant environmental impact so far that the proposed busway may cause. However, land acquisition is the most critical issue that this project shall have to deal with in the future. Minor impacts such as hydrology, traffic issues, marine environment, etc. were however initially identified but these shall be addressed in the environmental management plan which is included in the EIS system. The following are some of the anticipated major issues and proposed countermeasures during the course of the project:

(1) Effective Coordination among concerned agencies of the GOP to ensure smooth land acquisition procedure

Smooth land acquisition is a key first step for a successful project implementation. Related governmental agencies and LGUs should coordinate among themselves regarding this matter effectively. Coordination meetings such as workshops and/or stakeholders' meeting are effective tools for coordination.

(2) Participation of and consultation with Public Transport Operators (Jeepney, Intercity Bus)

Public transport operators such as intercity buses and jeepneys are presently operating in the study area. These operators should participate and be consulted as well during project preparation.

(3) Effective Traffic Management

Since the proposed busway corridor traverses major existing roads, traffic management on the intersections is essential for enhancing the busway traffic. The busway should also improve existing traffic in the Study area.

(4) Avoiding influx of informal settlers in the proposed busway right of way

As experienced in other government projects, once ROW has been decided on, there is an influx of informal settlers which makes acquisition of ROW harder and more expensive since these informal settlers expect the project to compensate them for relocation. Thus, fast and effective measures should be taken during the implementation stage.

(5) Hydrology

There are some small rivers within the study area of the proposed busway corridor. Since the river water is mainly used for agriculture and for discharge of residual water from both agriculture and human activities, the proposed busway corridor should be designed carefully so as not to disturb their functions.

10.3.2 Initial Environmental Examination (JICA IEE)

In addition to the anticipated issues of and proposed mitigating measures for the Study, an initial environmental examination of the Project is conducted based on JICA's Guidelines. The Philippine system does not require an initial environmental examination, but rather a full-blown EIA is carried out directly (DAO 96-37). It should be noted, however, that both systems have the same set of objectives (varying only in terms of procedure and timing); and that similar procedure of JICA IEE is included in the Philippine EIS system such as the Scoping. It can be said that this JICA IEE supports the beginning of the Philippine EIS procedure. Moreover, results of the JICA IEE can be utilized for the full-blown EIA.

The essence of the JICA IEE is to determine first whether an EIA is necessary or not. On the other hand, in the Philippine EIS system, if a Project falls under environmentally critical projects (ECPs), it is automatically required an EIA.

The JICA IEE has the following objectives:

(1) To identify significant environmental impact in each project phase (before, during, and after construction) based on readily available data and information; and

(2) To evaluate impacts that requires a more detailed examination.

The next two tools/procedures are that of JICA IEE.

(1) Screening

Screening is a tool of rational impact prediction using existing data and information. Possible impacts including environmental risks to be considered are identified in each phase of the project. Figure 10.4 shows the Impact Identification Flow by Phases.

Figure 10.4 Impact Identification Flow by Phases

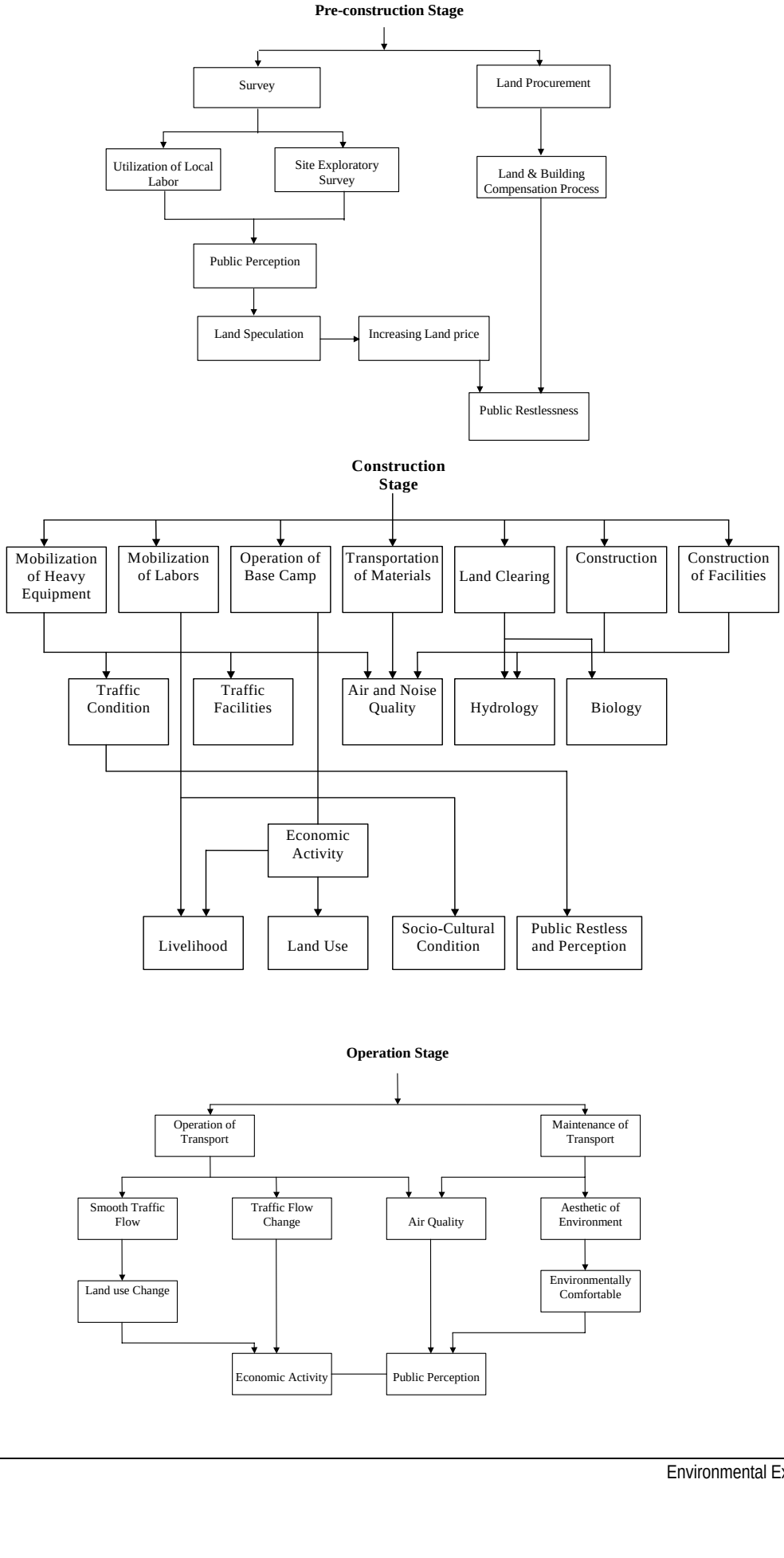


Table 10.3 Screening of Proposed Busway Project

No.	Environmental Items	Description	Evaluation	Remarks
Social Environment				
1	Resettlement	Resettlement by occupancy of proposed land	YES	Formal and informal housing exist in the ROW
2	Economic Activities	Loss of productive opportunity such as land	YES	Various economic activities exist in the ROW
3	Traffic and Public Facilities	Influence of existing traffic such as congestion	YES	Electric power cable exist in the ROW
4	Split of Communities	Split of Communities by obstruction of traffic	Unknown	Some access controlled roads may create split
5	Cultural Property	Loss of cultural property and falling of values	NO	No cultural heritage is identified in the ROW
6	Water Rights and Rights of Common	Obstruction of fishing rights, water rights, and common rights of forest	Unknown	Rivers and irrigation channel exist in the ROW
7	Public Health Condition	Deterioration of a hygienic environment by production of refuse and noxiousness	NO	Large refuse amount will not be produced
8	Waste	Occurrence of waste dumps and solid waste	YES	Some construction waste of dumps will be produced
9	Hazards (Risk)	Increase of possibility of danger of landslide and accident	NO	Low possibility
Natural Environment				
10	Topography and Geology	Change of valuable topography and geology by excavation or filling works	NO	No large scale structure or earth work
11	Soil Erosion	surface soil erosion by rainwater after land development (vegetation removal)	NO	Subject areas are urbanized already
12	Ground Water	Change of distribution of ground water by large scale excavation	Unknown	earth work might cause changes of ground water level
13	Hydrological Situation	Change of river discharge and riverbed condition due to landfill and drainage	Unknown	No structure will be built on the rivers
14	Coastal Zone	Coastal erosion and sedimentation due to landfill or change in marine condition	NO	Project area is on land
15	Flora and Fauna	Obstruction of breeding and extinction of spices due to change of habitat condition	NO	Project sites are urbanized and developed area
16	Meteorology	Change of temperature, precipitation, wind ,etc., due to large-scale devmt.	NO	no large scale development affecting meteorology
17	Landscape	Change of topography and vegetation by land development and harmonious obstruction by structural objects	Unknown	Existing urban landscape will be affected by projects
Pollution				
18	Air Pollution	Pollution caused by exhaust gas or toxic gas from vehicles and factories	YES	Impact by exhaust gas from increasing traffic
19	Water Pollution	Pollution by inflow of silt, and effluent into rivers and ground water	NO	Discharge residual water form transport facilities
20	Soil Contamination	Contamination of soil by dust and chemicals	NO	No chemical activities for soil and fuel will be unleaded
21	Noise and Vibration	Noise and vibration generated by vehicles	YES	During construction and operation
22	Land Subsidence	Deformation of land and land subsidence due to the lowering of ground water	NO	Sensitive lands do not exist in the subject area
23	Offensive Odour	Generation of exhaust gas and offensive odour by facilities and operation	NO	No factor
Overall evaluation		Environmental Impact Assessment (EIA) is required or not	From the results of the evaluation, EIA is required.	

(2) Scoping

Based on the result of the screening, scoping was carried out in order to identify items that should be examined in more detail in the next stage of the Study. As a result, Resettlement, Economic Activities, Traffic and Public Facility, and Air Pollution are the most important aspects to be examined further. Next important factors are Split of Community, Noise and Vibration and Waste.

Table 10.4 Scoping of Proposed Busway Project

No.	Environmental Items	Evaluation	Remarks
Social Environment			
1	Resettlement	A	Resettlement will be occurred by ROW acquisition which includes the part of new road and widening of existing roads for Busway especially in the urbanized area
2	Economic Activities	B	Various kinds of economic activities exist along the proposed ROW on the existing roads.
3	Traffic and Public Facilities	B	Electric power cable lies on the proposed ROW on the existing roads and the cable shall be relocated and current traffic flow will be affected by construction of busway
4	Split of Communities	B	A part of access controlled roads will create split of community
5	Cultural Property	D	Cultural properties is not identified on the ROW
6	Water Rights and Rights of Common	B	There are some rivers and irrigation channels on and by the ROW.
7	Public Health Condition	D	Large amount of refuse will not be generated
8	Waste	B	Some amount of waste will be produced in construction stage
9	Hazards (Risk)	C	Low possibility for natural disasters to occur
	Natural Environment		
10	Topography and Geology	D	Large land development is not included
11	Soil Erosion	D	Large scale of soil erosion has not been identified
12	Ground Water	C	There is no large scale underground structure planned
13	Hydrological Situation	C	No large scale excavation will be included
14	Coastal Zone	D	Project area is on land
15	Flora and Fauna	D	There is no valuable flora and fauna identified
16	Meteorology	D	Large scale felling tree and construction of high building are not planned
17	Landscape	C	There is no valuable landscape and large scale earth work is not planned.
Pollution			
18	Air Pollution	B	Air pollution will be increased by increasing traffic volume during operation stage
19	Water Pollution	C	It is unknown factor, Busway does not create or discharge residual water
20	Soil Contamination	D	There is no action that would create soil contamination
21	Noise and Vibration	B	There is some impact on noise but vibration is unknown by increasing traffic volume during operation stage
22	Land Subsidence	D	No sensitive lands exist in the project area
23	Offensive Odour	D	There is no concern regarding offensive odour

Note: Evaluation categories:
A: Serious impact is predicted
B: Some impact is predicted
C: Extent of impact is unknown (Examination is needed. Impact may become clear as study progresses)
D: No impact is predicted. EIA is not necessary
Note 2: The evaluation should be made with reference to the Explanation of Item.

(3) Impacts Identified by Project Phase

Major impacts identified are divided by project phase: "Before Operation" and "During Operation". Most of the impacts identified are present before operation and one of these is the Resettlement. During the operation stage, notable impacts are Air Pollution and Split of Community. Table 10.5 shows the Matrix for Scoping classified by Project Phase.

Table 10.5 Matrix for Scoping Classified by Project Phase

Major facilities, activities which may cause impacts / Environmental Factors			Facilities/Construction					
			Overall Evaluation	Before Operation		Operation		
				Reclamation and spatial occupancy	Construction	Occupancy of land	Operation of Road	Corpus of People and goods
Social Environment	1.	Resettlement	XX	XX				
	2.	Economic Activities	X	X				
	3.	Traffic and Public Facilities	X	X	X			
	4.	Split of Communities	X			X		
	5.	Cultural Property						
	6.	Water Rights and Rights of Common	X	X				
	7.	Public Health Condition						
	8.	Waste	X		X			
	9.	Hazards (Risk)						
Natural Environment	10.	Topography and Geology						
	11.	Soil Erosion						
	12.	Ground Water	X	X				
	13.	Hydrological Situation	X	X				
	14.	Coastal Zone						
	15.	Flora and Fauna						
	16.	Meteorology						
	17.	Landscape	X			X		
Pollution	18.	Air Pollution	XX		X		XX	
	19.	Water Pollution						
	20.	Soil Contamination						
	21.	Noise and Vibration	X		X		X	
	22.	Land Subsidence						
	23.	Offensive Odour						

Note:

XX: The environmental items to which special attention has to be paid. They might be serious impacts that may affect the project formulation depending on the magnitude of the impacts and the possibility of the measures.

X: The environmental items that may have a significant impact depending on the scale of the project and site condition

No mark: The environmental items requiring no impact assessment since the anticipated impacts are, in general, not significant.

10.3.3 Environmental Factors for Further Study

Important environmental factors for further study were identified through screening and scoping activities as shown in Table 10.6.

Table 10.6 Environmental Factors for Further Study

Factors		Remarks
Social Environment		
1	Resettlement	ROW acquisition is required in order to secure project area. Some of the required ROW is residential and commercial area so that resettlement shall occur. Detailed survey of public perception, number of household, number of informal settlers, etc., should be further studied.
2	Economic Activities	The alignment lies on Agunaldo Highway in Bacoor so that widening is required. Existing commercial facilities have to be relocated causing loss of economic opportunity.
3	Traffic and Public Facilities	During construction of the busway corridor, an expected disruption to traffic flow is expected. Possible effects to telecommunication lines and water supply pipes are not yet established at this time.
4	Split of Communities	Access controlled special occupancy may affect split of community.
5	Cultural Property	n/a
6	Water Rights and Rights of Common	The continuous supply of water is a concern due to agricultural land use along the proposed alignment.
7	Public Health Condition	N/A
8	Waste	During the construction, construction waste is generated and disposal site shall be considered.
9	Hazards (Risk)	N/A
Natural Environment		
10	Topography and Geology	N/A
11	Soil Erosion	N/A
12	Ground Water	Even small-scale earthwork might affect some changes of ground water conditions.
13	Hydrological Situation	There are rivers and irrigation channels on the alignment. Earthwork may affect on hydrological conditions in the project area.
14	Coastal Zone	N/A
15	Flora and Fauna	N/A
16	Meteorology	N/A
17	Landscape	Large structures can affect the visual impact on the project area. Major land use is agriculture and residential.
Pollution		
18	Air Pollution	A large portion of the alignment is a new road so that vehicles may go through nearby residential area. Emission may therefore be increased.
19	Water Pollution	N/A
20	Soil Contamination	N/A
21	Noise and Vibration	As well as air pollution, new Busway will generate noise.
22	Land Subsidence	N/A
23	Offensive Odour	N/A

10.4 Environmental Monitoring Survey

Environmental factors, which will have adverse impacts in operation stage based on the result of the initial environmental examination, were monitored.

10.4.1 The Scope of Monitoring Survey

The monitoring survey which included air quality, noise levels and traffic count were undertaken in five sampling stations across the CBS project area from June 5-11, 2002.

(1) Survey Items and Sampling Methodology

a) Air Quality Sampling

The air quality survey covers the ambient measurements of particulate matter and gaseous pollutants which include the following parameters:

- Total Suspended Particulates (TSP)
- Sulfur Dioxide (SO_2)
- Nitrogen Dioxide (NO_2)
- Carbon Monoxide (CO)

Table 10.7 Measurement Conditions of Air Quality Monitoring

Parameters	Measurement Equipments Used	Averaging Time	Method of Analysis
1. TSP	Staplex High-Volume Sampler	24 Hours 1 hour	Gravimetric Method
2. SO_2	Kimoto Di-Gas Bubbler	24 Hours 1 Hour	Pararosaniline Method
3. NO_2	Kimoto Di-Gas Bubbler	24 Hours 1 Hour	Griess-Saltzmann Method
4. CO	TESTO CO Ambient Probe	Every hour/ Every 30 minutes	In-situ concentrations

Sampling was undertaken using specialized equipment and the samples were analysed by the Ostrea Mineral Laboratories. Analyses of gaseous pollutants were made following procedures recommended by DENR (Pararosaniline Method for SO_2 and Griess-Saltzmann Method for NO_2). TSP analysis was made using gravimetric method and the CO ambient probe measured CO in-situ concentrations.

The average time used in the sampling of SO_2, NO_2 and TSP was 24 hours for all sampling stations. In addition, towards the end of the survey, one-hour samples of SO_2, NO_2 and TSP were also taken from each sampling station.

The CO ambient probe gives direct digital reading of the CO concentrations in parts per million (ppm). The suggested frequency of measurement was every one-hour. However, it was decided to increase the frequency to once every 30 minutes to have finer time resolution. Another purpose is to avoid long intervals between measurements, which may cause the observer to feel drowsy and tend to forget the

next measurement

b) Noise Level Sampling

Baseline noise level measurements were conducted at the air quality sampling stations (at a distance where the noise coming from the high volume sampler is no longer audible) using a TES Digital Sound Level Meter. The frequency of reading noise levels is once every 10 minutes. The duration of noise level measurement per day was 24 hours corresponding to the DENR standard for noise which varies according to different time periods: daytime, night time, and early evening/early morning.

c) Traffic Volume Survey

Simultaneous with the air quality and noise level surveys, a traffic volume survey was conducted at same stations as air quality and noise level monitoring from June 5 to 11, 2002.

The vehicle types were classified into nine (9) types according to size and/or capacity. These were grouped into the following categories:

- Car (less than 8 pax capacity)
- Utility Vehicle (8 pax or more capacity)
- Jeepney
- Truck and Trailer
- Standard Bus
- Mini-Bus
- Motorcycle
- Tricycle
- Others (pedicab, bicycle, etc.)

Using hand-held counters, vehicles from both directions, which were northbound and southbound for Stations 1 to 4 and westbound/eastbound for Station 5, were continuously recorded for 24 hours in each station.

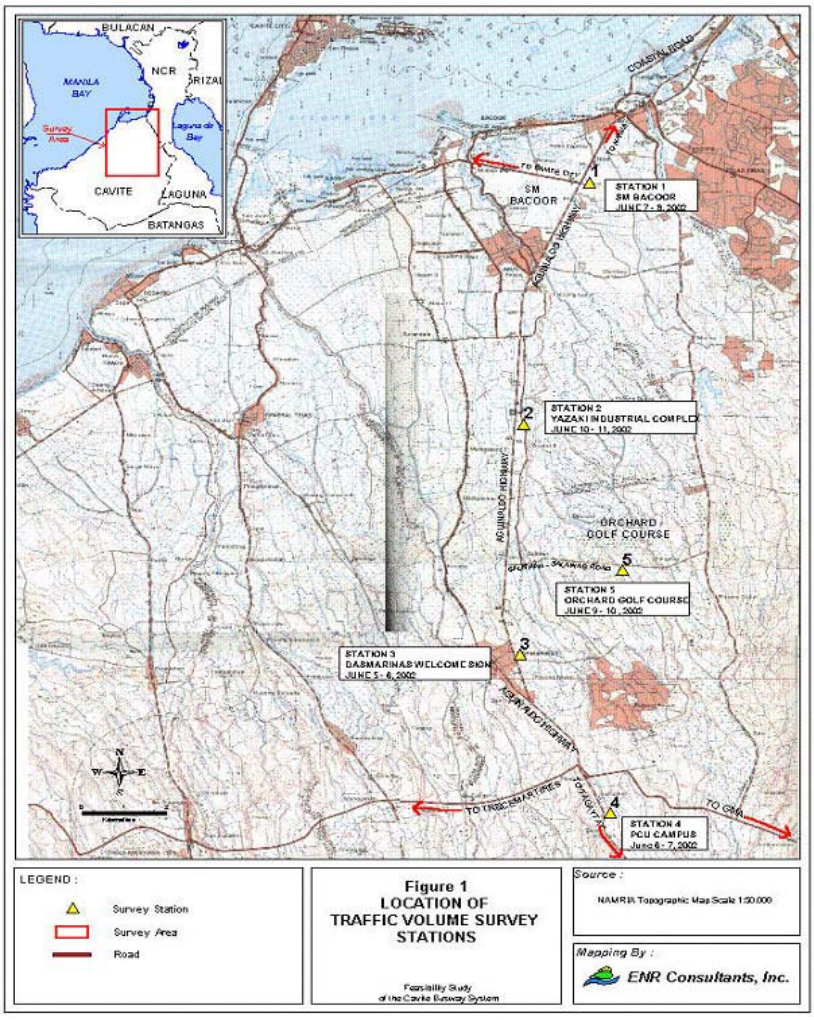
(2) The Sampling Locations

The total sampling location is five (5) and each of the sampling location is explained below and is shown in Figure 10.5.

Table 10.8 Detailed Explanation of Sampling Locations

Station	General Location	Sampling Location Description	Site Condition	Period of Survey
1.	Brgy. Panapaan 1, Bacoor, Cavite	One-meter more or less along Aguinaldo Highway in a vacant lot across BPI Bank near intersection fronting SM City Bacoor	Commercial cum residential area; weather was fine and hot during the day although at times cloudy; scattered rains occurred during the night; one-way traffic employed in the area.	Friday to Saturday 2002/6/7 18:00 2002/6/8 18:00
2.	Brgy. Anabu 2A, Imus, Cavite	One-meter more or less along Aguinaldo Highway in an idle gas station across the northern boundary of the Yazaki Industrial Complex	Industrial cum residential area; weather was clear, hot and humid throughout the day; work shift in industrial complex causing traffic.	Monday to Tuesday 2002/6/10 12:00 2002/6/11 12:00
3.	Brgy. Zone 1, Dasmariñas, Cavite	Around 3 meters from Aguinaldo Highway in a vacant lot (which is also used as tricycle terminal)adjacent to the intersection bearing the Welcome sign to Dasmariñas town proper	Commercial cum residential area; weather was partly cloudy, hot and humid; interior road inside town (used by jeepneys and buses)divert some of the traffic away from Aguinaldo Highway	Wednesday-Thursday 2002/6/5 11:00 2002/6/6 11:00
4.	Brgy. Sampaloc 1, Dasmariñas, Cavite	A meter away from the Aguinaldo Highway in front of the Union Theological Seminary of the Philippine Christian University (PCU)Campus	Institutional cum residential area; weather was fine and hot, partly cloudy and windy	Thursday-Friday 2002/6/6 14:00 2002/6/7 14:00
5.	Brgy. Salawag, Dasmariñas, Cavite	Less than a meter away from the Salitran - Salawag Road fronting the entrance gate of the Orchard Golf Course and Country Club.	Residential and open spaces area; weather was clear and fine during the day with rains in the afternoon and night.	Sunday-Monday 2002/6/9 10:30 2002/6/10 10:30

Figure 10.5 Air Quality and Noise Level Monitoring Locations



10.4.2 Survey Results

(1) Road Side Ambient Air Quality Monitoring

a) Summary of Air Quality Monitoring

The results of monitoring vary depending on sampling locations. TSP concentration is comparatively high in this area that TSP concentration exceeded the 24-hour DENR standards in 3 sampling stations (Stations No.1 to No.3), corresponding to areas where traffic volume is also comparatively heavy. One-hour TSP concentrations, however, exceeded the DENR standard in only one station (Station 3). While the other ambient concentration of substances such as SO_2, NO_2 and CO were below the standard. The summary of ambient air quality monitoring and DENR standard for ambient air quality are shown bellow:

At same time, traffic volume survey for 24 hours in all stations were surveyed. Traffic volume was heaviest in Station 1 followed by Stations 2 and 3. By vehicle type, passenger cars are the most predominant (30%), followed by light duty truck (utility vehicles) (24%), jeepney (21%), trucks (11%) and others (14%).

Table 10.9 Summary of Ambient Air Quality Monitoring

No.	Location	TSP (µg/Ncm)		SO_2 (µg/Ncm)		NO_2 (µg/Ncm)		CO (ppm)		Traffic Volume
		1-hour	24-Hrs	1-hour	24-Hrs	1-hour	24-Hrs	1-hr	30 min.	
1	SM Bacoor	176.5	633.5	ND	ND	9.3	8.8	2	0-5	54,640
2	Yazaki Industrial Complex	16	266.9	ND	ND	12.9	9.7	1	0-4	40,276
3	Dasmariñas Welcome Sign	312	234.4	ND	19.8	11.5	38.5	1	0-2	36,784
4	PCU Campus	44.8	127.3	8.2	13.6	10.7	19.2	0	0-2	15,964
5	Orchard Golf Course	16.5	222.5	ND	ND	93.8	9.6	0	0-1	8,909
DENR Standards		300	230	340	180	260	150	30	9 (8-hr.)	-

Note: Traffic volume shows number of traffic. Source: JICA Study Team

b) Implications of Air Quality Monitoring

Air quality conditions along the road stations in the project area according to the survey results showed that the existing 24-hour TSP concentrations have already exceeded the DENR standards in three out of five sampling stations. This means that part of the project area is already a non-attainment area for TSP. For one-hour concentrations, the DENR standard is exceeded only in one station . Exceedances to TSP standards are common in the country especially along major roads in Metro Manila and nearby provinces.

This is largely contributed by vehicle emissions (soot) especially for diesel engine, dust re-suspension in roads particularly during dry days and wind action. As the results, it generally indicates that the higher number of traffic volume is the higher TSP concentration in the sampling stations.

Table 10.10 National Ambient Air Quality Guideline Values

Pollutants	Short Term[a]			Long Term[b]		
	µg/Ncm	ppm	Averaging Time	µg/Ncm	ppm	Averaging Time
Suspended Particulate Matter[c] –						
TSP	230[d]		24 hours	90		1 year[e]
PM-10	150[f]		24 hours	60		1 year[e]
Sulfur Dioxide[c]	180	0.07	24 hours	80	0.03	1 year
Nitrogen Dioxide	150	0.08	24 hours			
Photochemical Oxidants as	140	0.07	1 hour			
Ozone	60	0.03	8 hours			
Carbon Monoxide	35 mg/Ncm	30	1 hour			
	10 mg/Ncm	9	8 hours			
Lead[g]	1.5		3 months[g]	1.0		1 year

[a] Maximum limits represented by ninety-eight percentile (98%) values not to exceed more than once a year.
[b] Arithmetic mean.
[c] SO_2 and Suspended Particulate matter are sampled once every six days when using the manual methods. A minimum of twelve sampling days per quarter or forty-eight sampling days each year is required for these methods. Daily sampling may be done in the future once continuous analyzers are procured and become available.
[d] Limits for Total Suspended Particulate Matter with mass median diameter less than 25-50 µm.
[e] Annual Geometric Mean.
[f] Provisional limits for Suspended Particulate Matter with mass median diameter less than 10 µm and below until sufficient monitoring data are gathered to base a proper guideline.
[g] Evaluation of this guideline is carried out for 24-hour averaging time and averaged over three moving calendar months. The monitored average value for any three months shall not exceed the guideline value.

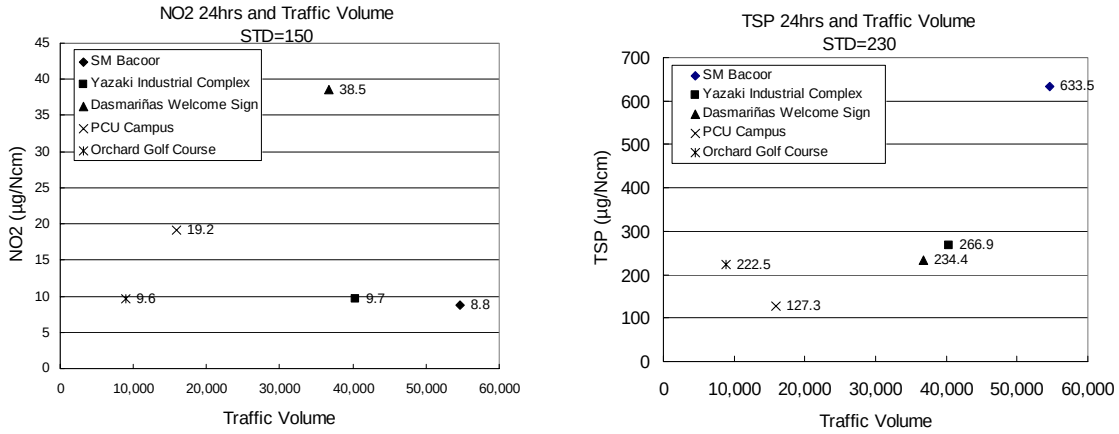
Source:DENR

Table 10.11 National Ambient Air Quality Standards

Pollutant	Concentration		Averaging Time
	ug/Ncm	ppm	
Ammonia	200	0.28	30 min
Carbon Disulfide	30	0.01	30 min
Chlorine and Chlorine Compounds as Cl2	100	0.03	5 min
Formaldehyde	50	0.04	30 min
Hydrogen Chloride	200	0.13	30 min
Hydrogen Sulfide	100	0.07	30 min
Lead	20		30 min
Nitrogen Dioxide	375	0.20	30 min
	260	0.14	1 hr
Phenol	100	0.03	30 min
Sulfur Dioxide	470	0.18	30 min
	340	0.13	1 hr
TSP	300		1 hr
PM-10	200		1 hr

Source: DENR

Figure 10.6 NO_2 and TSP Monitoring Results



The ambient concentrations of gaseous pollutants (SO_2, NO_2, and CO) are still within DENR standards for both 24-hour and one-hour averaging time. Ambient concentration levels of gaseous pollutants along roads vary depending on fuel used by different types of vehicles and air dispersion patterns in the area.

Generally, private cars and trucks with gas fuel mostly emit CO. In the survey, CO level ranges recorded are highest in Stations 1 and 2 where cars and trucks are among the highest recorded number of vehicles plying the area during the survey period.

SO_2 emissions mostly come from stationary sources rather than mobile sources, which explain why these are non-detected in all the stations, except in Stations 3 and 4 where the wind direction and air dispersion pattern could have been a factor. In addition, depending on the speed and acceleration rates of vehicles, gaseous emissions may be increased or minimized.

Nitrogen oxides (NOx) are emitted in larger amounts at higher speeds and rapid acceleration rates while CO emission is greater during idling and low speeds.

(2) Road Side Noise Level Monitoring

a) Summary of Noise Level Monitoring

Ambient noise levels recorded mostly exceeded the DENR standards for commercial and even heavy industrial areas. However, the results (which were obtained about one-meter from the roadside) are better compared with the Threshold Level Value (TLV) for the human ear, which is 80 dB(A) for 8-hour exposure, inasmuch as they can be considered noise emissions rather than ambient data. In this case, the data generally show an 8-hour running average of more than 80 dB(A).

Figure 10. 7 Monitoring Results of Noise Level Survey

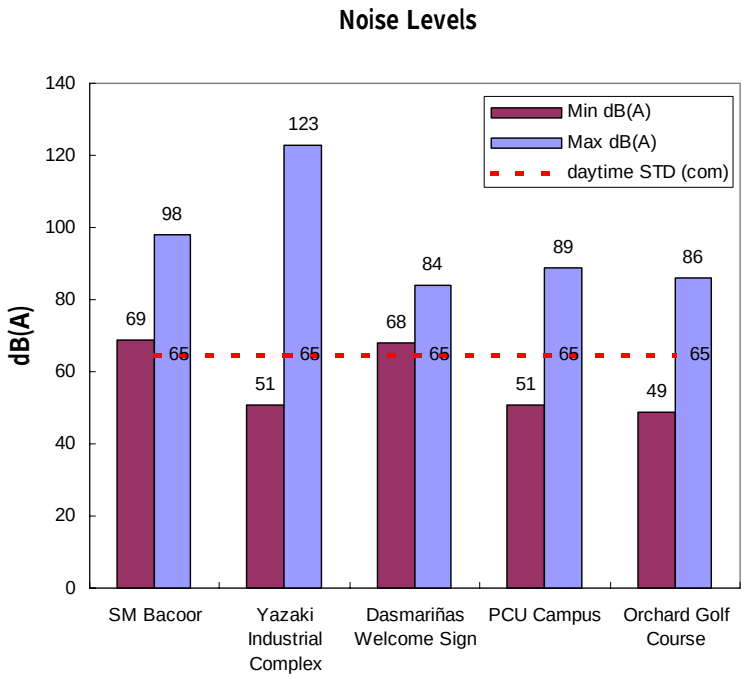


Table 10.12 Summary of Noise Level in dB(A)

Survey Station	Early Morning (5:00 – 9:00)	Daytime (9:00 – 18:00)	Early Evening (18:00 – 22:00)	Night time (22:00 – 5:00)	Traffic Volume
1	69 – 94	74 – 93	76 – 95	69 – 98	54,640
2	55 – 93	51 – 98	52 – 123	51 – 99	40,276
3	70 – 78	68 – 84	72 – 78	68 – 77	36,784
4	71 – 89	64 – 80	70 – 79	51 –78	15,964
5	60 – 80	56 – 85	52 – 86	49 – 80	8,909
STD Commercial	60	65	60	55	-
STD Hvy.Industrial	70	75	70	65	-

Source: JICA Study Team

Table 10.13 DENR Standards for Noise in General Areas

Area	Maximum Allowable Noise Level, dB(A)		
	Daytime (9:00-18:00)	Morning (5:00-9:00)/ Early Evening (18:00-22:00)	Night time 22:00-5:00)
Schools, Hospitals	50	45	40
Residential	55	50	45
Commercial	65	60	55
Light Industrial	70	65	60
Heavy Industrial	75	70	65

Source: DENR

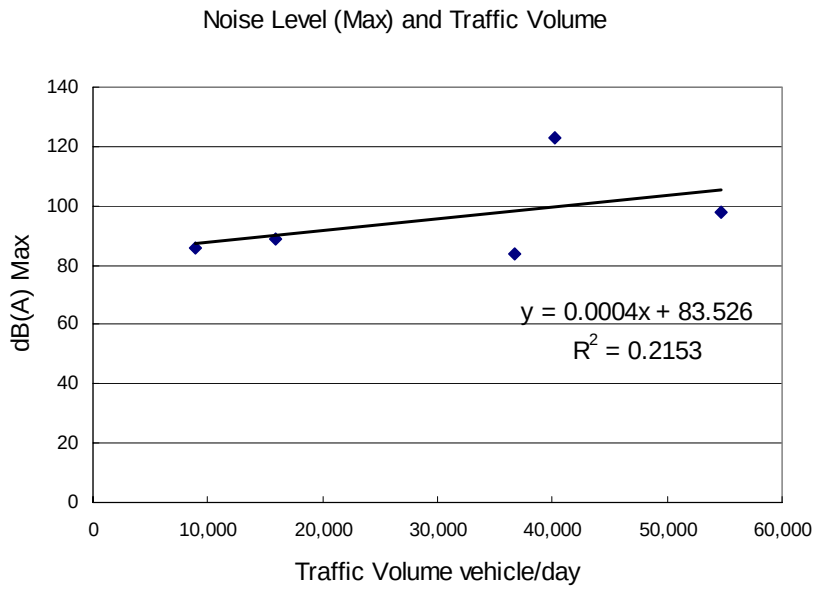
b) Implications of Noise Level Monitoring

Road side noise is generated depending on vehicle conditions (engine and tire), pavement condition, vehicle speed, horn level and frequency, driving manner, etc. According to the survey, many of the instantaneous noise levels measured along roads were very high, mostly exceeding DENR noise standards for industrial and commercial areas, except for certain periods in Stations 2 and 5.

However, it should be noted that the DENR noise standards refer to general areas such as residential, commercial, light industrial and heavy industrial. This means that we compare these standards with the noise level representative to these general areas.

The noise levels obtained during the survey were taken about one meter from the roadside, which can be considered as noise emissions from vehicles rather than ambient data. These are noise levels to which some persons, such as sidewalk vendors, are exposed. Therefore, the threshold level value (TLV) for the human ear, which is 80 dB(A) for 8 hours exposure, may be used rather than the ambient DENR standards.

Figure 10.8 Noise Level and Traffic Volume



10.5 Environmental Impact Evaluations

There is no significant adverse impact identified in the course of the environmental impact evaluation. However some considerable factors such as air quality and noise during operation stage, as well as other identified impacts during the initial stage, were examined in the Study.

10.5.1 Air Quality

(1) Evaluation Criteria

Emissions from road traffic have the potential to lead to exceedences of air quality objectives that is experienced particularly during heavy or slow-moving (congested) traffic. It means that the amount of emissions is related to vehicle operation speed, thus, this aspect is considered.

Major source of air pollution from vehicles is emissions, which mainly include CO, NOx, HC and TSP and Green House Effects gas is represented by CO2 from vehicles. So that the amount of five (5) substances are considered as evaluation criteria, and each of the amount is estimated in accordance with speed related emission factors by engine type.

(2) Evaluation Cases

The amount of emission of each substance was estimated in accordance with the following cases as well as traffic demand forecast. The cases consist of road network in the project area with "With Busway cases" and "Without Busway cases" in each target year. In addition, air quality simulation for major pollutants, NOx and TSP, along the Busway were examined.

Table 10.14 Evaluation Cases

Cases	Without Case	With Case
Year 2002	Existing	
Year 2005	Without Busway +2005 net	With Busway + 4 lanes (2+2) side road + 2005 net
Year 2010	Without Busway +2010 net	With Busway + 4 lanes (2+2) side road + 2010 net
Year 2015	Without Busway +2015 net	With Busway + 4 lanes (2+2) side road + 2015 net
Year 2015	Without Busway +2010 net	With Busway + 4 lanes (2+2) side road + 2010 net

(3) Projection of Emission Amount from Vehicles

A total emission amount in each substances were estimated based on demand forecast information and speed related emission factors by engine type responding to the cases as follows:

a) Estimation Formula

The emissions were estimated base don following formula.

$$Qem = \sum_{i}^{x} \sum_{Lk} \left(\frac{Tv}{cu} \times LL \times emFix\right)$$

Where,
Qem: Total emission amount of all link in *x*
Lk: link
Tv: Traffic volume (vehicle)
cu: PCU conversion unit
LL: Link Length (in km)
EmFix: Speed related emission factor by engine type (*i*) and pollutant (*x*) (g/km)
*x : Pollutnats (*CO, CO2, NOx, TSP, HC)
i: type of vehicle (petrol, petrol with catalyst and diesel)

b) Hypothesis

The following hypothesis is set for the emission amount estimations.

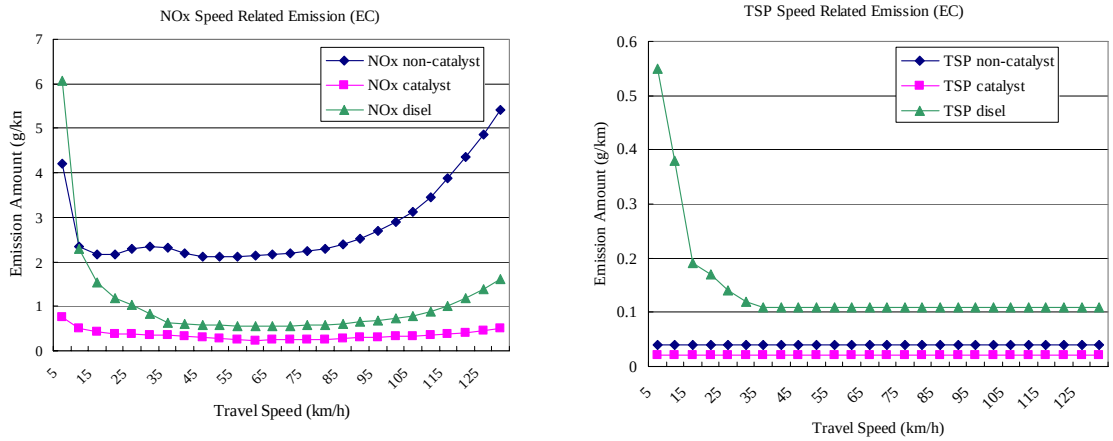
Vehicle type recognition:
Public transport including Bus and Jeepny are equipped with diesel engine
Passenger car is equipped with non-catalytic gasoline engine
Truck is equipped with diesel engine

PCU conversion ratio
Passenger Car 1.0
Bus 2.0
Jeepny 1.5
Truck 2.5

Speed Related Emission Factor:
European emission factor (London Research Centre, 1991) was applied for this case. It assumes that the vehicle condition in operation in Metro Manila is similar condition with the factors.

Engine Type	Contents
Petrol Engine	Based on a fleet of cars with different engine sizes. It is assumed that 48% are less than 1.4 litres, 45% are between 1.4 to 2.0 litres and 7% are greater than 2.0 litres. The pollutants are given in grams/km
Catalyst	Based on a fleet of cars with different engine sizes. It is assumed that 48% are less than 1.4 litres, 45% are between 1.4 to 2.0 litres and 7% are greater than 2.0 litres. The pollutants are given in grams/km
Diesel Engine	Based on a fleet of cars with different engine sizes, 84% have engine sizes greater than 2.0 litres and 16% have less than 2.0 litres It is assumed that 48% are less than 1.4 litres, 45% are between 1.4 to 2.0 litres and 7% are greater than 2.0 litres. The pollutants in the table are given in grams/km

Figure 10.9 Speed Related Emission Factor- NOx and TSP



(4) Projection of Emission Amount as Benefit

Four gaseous substances (CO, CO_2, NOx, HC) and one solid particulate (TSP) were estimated in accordance with cases shown in Figure 10.10. The results show that in 2015, almost all of the WITH BUSWAY cases have lesser amount of emission than those of the WITHOUT BUSWAY cases.

Figure 10.10 Summary of Emission Amount of CO, CO_2, NOx, HC and TSP

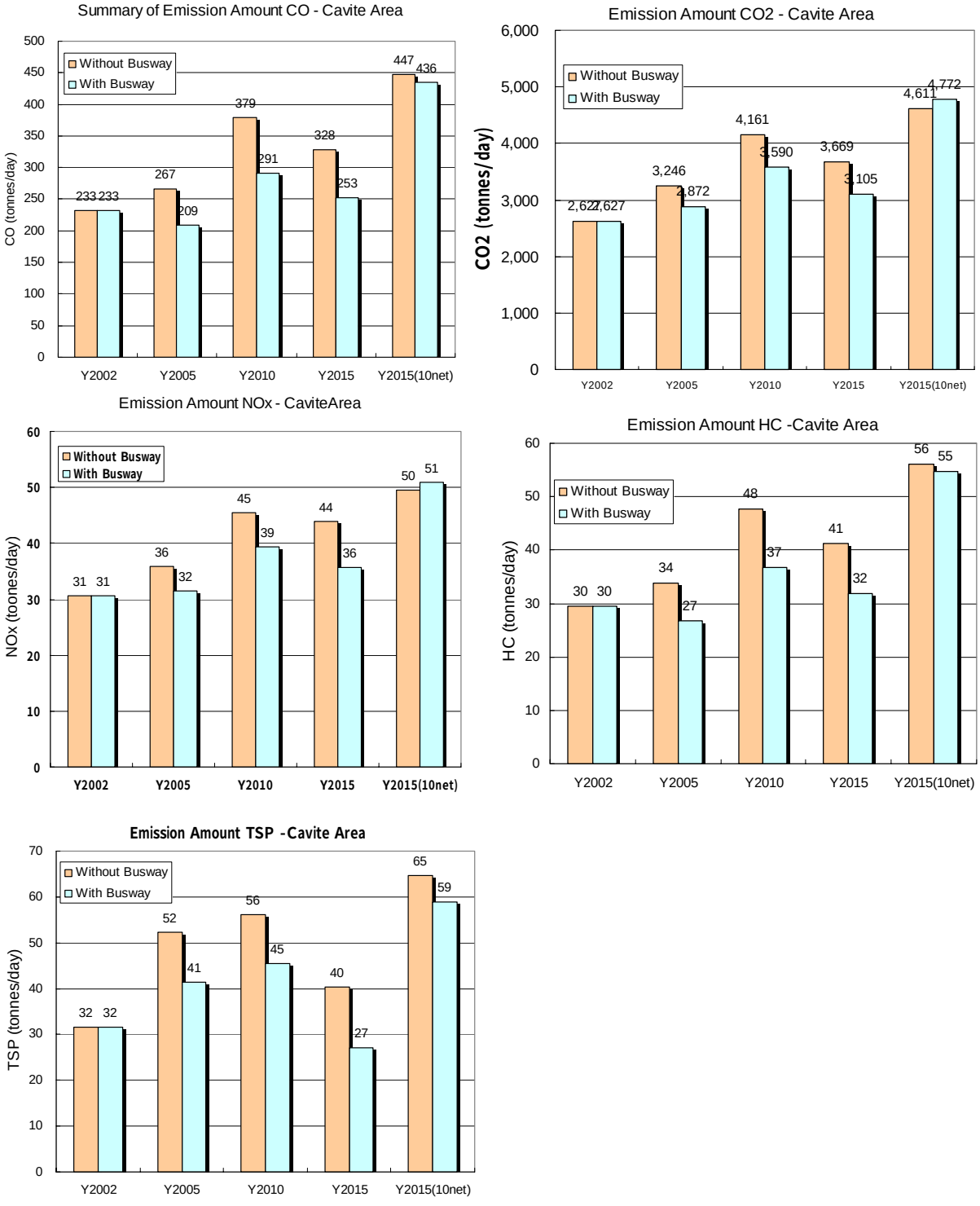


Table 10.15 Improvement Ratio of Emission Amount Comparison between With and Without Cases in Each Target Year

Year	Mode	CO	CO2	NOx	TSP	HC
Year2005	Public(Bus+Jeepny)	-10.7%	-10.9%	-8.6%	-21.3%	-9.8%
	P.Car (P.car+Truck)	-21.7%	-11.8%	-13.3%	31.3%	-21.3%
	Total	-21.6%	-11.5%	-11.9%	-20.9%	-21.0%
Year2010	Public(Bus+Jeepny)	-10.0%	-10.3%	-7.8%	-19.7%	-9.0%
	P.Car (P.car+Truck)	-23.2%	-15.1%	-15.3%	21.8%	-23.2%
	Total	-23.0%	-13.7%	-13.4%	-19.3%	-22.8%
Year2015	Public(Bus+Jeepny)	-17.3%	-15.9%	-19.2%	-33.3%	-18.2%
	P.Car (P.car+Truck)	-23.0%	-15.2%	-18.4%	2.2%	-22.7%
	Total	-22.9%	-15.4%	-18.5%	-32.7%	-22.7%
Year2015+2010net	Public(Bus+Jeepny)	-0.2%	0.5%	4.0%	-9.6%	0.9%
	P.Car (P.car+Truck)	-2.5%	4.7%	2.1%	42.5%	-2.5%
	Total	-2.5%	3.5%	2.6%	-9.1%	-2.4%

Source: JICA Study Team

(5) Simulation of Air Quality along the Busway Corridor

Major source of air pollution, NOx, was simulated by diffusion model and the results are as follows:

1) Formula

Plume equation model was used for air quality simulation as shown:

$$C(x,y,z) = \frac{q}{2\pi \cdot \sigma y \cdot \sigma z \cdot u} \cdot F(y) \cdot F(z)$$

$$F(y) = \exp\left\{-\frac{y2}{2\sigma y2}\right\}$$

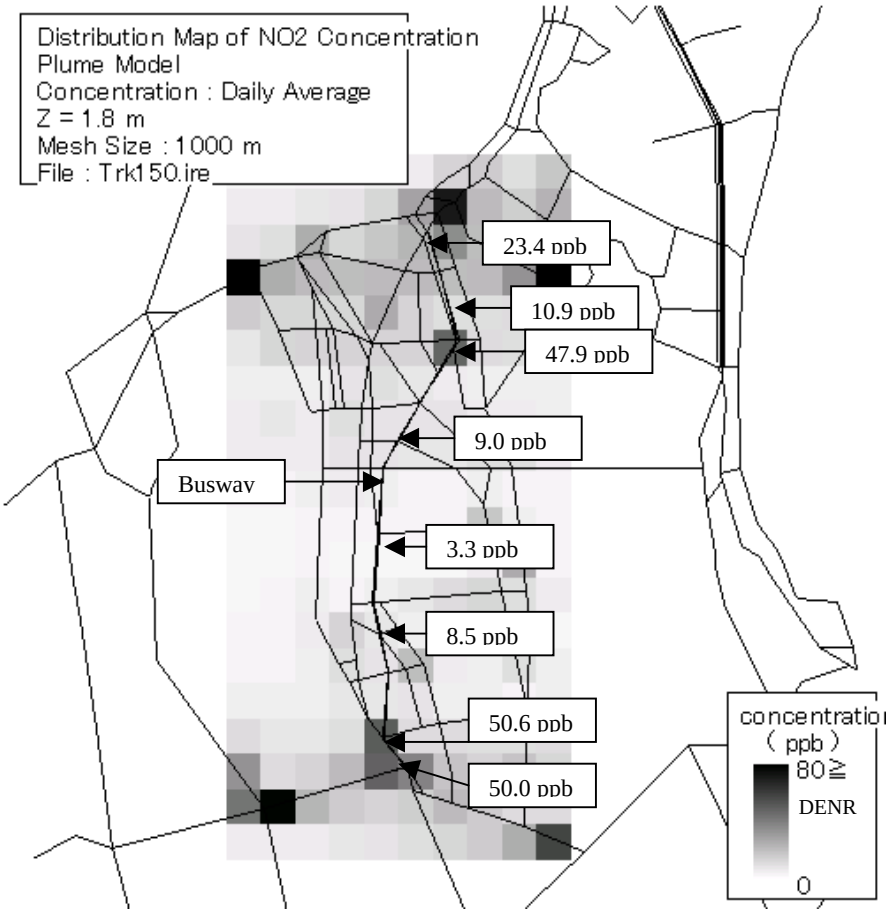
$$F(z) = \exp\left\{-\frac{(H-z)2}{2\sigma z2}\right\} + \exp\left\{-\frac{(H+z)2}{2\sigma z2}\right\}$$

C: concentration
q: emission amount per time unit
u: Wind velocity
δy, *δx*: diffusion width of y and x direction

2) Result of the simulation

Figure 10.11 shows the result of NO_2 simulation. In this case, 1 km mesh presentation was used based on simulation result. Baccor area, Bayanan community area, intersection between Aguinaldo Highway and the Busway, and intersection between Governors' Drive and Aguinaldo Highway were marked higher concentration (23.4-50.6 ppb). However, these were within DENR standard (80 ppb-24 hours), while the other sections marked low concentration (3.3-10.9 PPB). Hence, the proposed Busway will not significantly register a negative impact.

Figure 10.11 Result of NO_2 Simulation



10.5.2 Noise

Roadside noise level was examined by acoustic model estimation along the proposed Busway.

(1) Methodology

Noise from vehicle is estimated taking into consideration mainly the operation stage. In general, noise from road is highly dependent on vehicle conditions (engine and tire), speed, road pavement, horn, and driving manner (acceleration and breaking) and the traffic volume by type (passenger car, light duty vehicle and heavy duty vehicle) and by speed. These factors were used in the analysis of noise level.

Receptor point is set every fifty meters from the Busway centerline and is up to 250 m from the centerline.

Threshold Value Level is considered for evaluation of the result due to that ambient the noise level simulated is roadside noise instead of ambient noise level.

(2) Simulation Formula

The following is the functional model used in the simulation system.

$$L_j(x) = L_{0,j} + 10\log_{10}\frac{Q_j}{1000vx} + 0.2v \quad (10m < x < 200m; v > 10kph)$$

The overall road segment noise, L, can be estimated from individual vehicle types by aggregating as follows:

$$L = 10\log_{10}\sum_j 10^{L_j/10}$$

where:

$L_j(x)$ is the noise level at a distance x [m] from road center originating from vehicle type j [dB(A)$_{eq}$]

L_{0j} noise level from one vehicle of type j extrapolated to $x = 0$ (specific emission). [dB(A)$_{eq}$]

Q_j traffic flow as hourly average for vehicle category j. [vehicle/h]

v average velocity of vehicles. [km/h]

(3) Simulation Results

Noise level of each cross-section is summarized in Table 10.16. Station 1, which is in Bacoor area, was exceeded THV [80 dB(A)] at 50 m while other stations at 50 m were with THV. Noise level decreases gradually towards Station 12, which is towards the last segment of the Busway in Dasmariñas. In reference, comparisons between human audition and ambient noise level are shown in Table 10.17.

Table 10.16 Results of Noise Simulation

Station	Distance form Road Centre				
	50m	100m	150m	200m	250m
1	82	79	77	76	75
2	79	76	75	73	72
3	79	76	75	73	72
4	79	76	75	73	72
5	78	75	73	72	71
6	75	72	70	69	68
7	74	71	69	68	67
8	73	70	68	67	66
9	74	71	69	68	67
10	73	70	68	67	66
11	66	63	61	60	59
12	65	62	60	59	58

Source: JICA Study Team

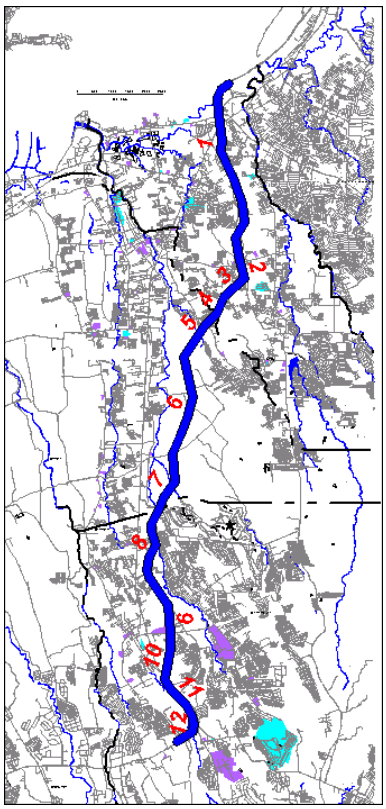


Table 10.17 Comparisons between Human Audition and Ambient Noise Levels

Sound Level	Audition Level	DENR Standard			Survey Results dB(A) (Road side) Threshold Level Value (80 dB(A))
		School, Hospital, Residential	Commercial	Light and Heavy Industrial	
20 dBA	Leaf with wind level				
30 dBA	Whisper level				
40 dBA	In the park or library level	40-			49 (min)
50 dBA	In Administrative office	-55	55-		51 (min)
60 dBA	Crowded office		-65	60-	69, 68 (min)
70 dBA	Telephone ring level distance from 1m			-75	
80 dBA	In subway				84, 89, 86, 84 (max)
90 dBA	Noisy factory				98 (max)
100 dBA	Under the railway bridge level				
120 dBA	Near by air craft engine				123 (max)

Note: Ambient noise level varies depending on Day Time (9:00-18:00), Morning (5:☺-9:00)/ Early Evening (18:00-22:00) and /Night Time (22:00-5:00).

10.5.3 Examination of Other Identified Impacts

Impacts identified in the initial stage which may have a significant impact depending on the scale of the project and site conditions, marked as “X” such as economic activity, traffic and public facility, waste, hydrology, etc., were rationally examined based on existing information. Based on the results, no significant impacts were anticipated as shown in Table 10.18.

10.5.4 Summary of the Examinations

Environmental impact examination was carried out based on available information and qualitative and quantitative methods to address the GOP’s requirement as summarized in Table 10.19. Based on the results of the examination, no significant impact was identified, however some countermeasures shall be taken in the project implementation stage.

In addition, special attention were given however to Resettlement and Air Pollution as identified in the initial environmental examination and evaluation by quantitative methods based on future traffic demand information were conducted. Consequently, no significant impact was anticipated on this evaluation, although proposed programs such as relocation shall duly be taken in the implementation stage.

Table 10. 18 Other Predicted Impacts and Evaluation

Factors		Predicted Impacts	Analysis	Evaluation
Social Environment				
1	Resettlement	ROW acquisition is required in order to secure project area. Some of the required ROW is residential and commercial area so that resettlement shall occur. Detailed survey of public perception, number of households, number of informal settlers, etc. should be further studied.	Relocation program (land owner and informal dwellers) including compensation for ROW acquisition was formulated in accordance with DPWH guideline. If the program is duly executed, no significant impact is anticipated.	Not significant (Detailed analysis has been done)
2	Economic Activities	The alignment will require the expansion on one side of the existing Talaba Diversion Road. This will temporarily suspend economic activities along this road and may cause loss of economic opportunity.	It may not be possible to expand the existing road. Thus, there is no significant impact on this factor.	Not significant
3	Traffic and Public Facilities	During construction of the Busway corridor, an expected disruption to traffic flow is expected. Possible effects to telecommunication lines and water supply pipes are not yet established at this time.	Traffic management will be formulated during the detail design stage. There is no negative impact.	Not significant
4	Split of Communities	Access controlled special occupancy may affect split of community.	Crossing and intersections are proposed on the Busway. There is no negative impact.	Not significant
6	Water Rights and Rights of Common	The continuous supply of water is a concern due to agricultural land use along the proposed alignment.	Agricultural lands are reserved for future development in this corridor especially for large landowner areas.	Not significant
8	Waste	During construction stage, construction waste is generated and disposal site shall be considered.	Construction program is formulated in detail design stage and there is no negative impact.	Not significant
Natural Environment				
12	Ground Water	Even small-scale earthwork might affect some changes of ground water conditions.	There are no major affected subjects along the corridor.	Not significant
13	Hydrological Situation	There are rivers and irrigation channels on the proposed alignment. Earthwork may affect on hydrological conditions in the project area.	Rivers and channels are not touched by the projects. (Bridges are proposed) There is no negative impact.	Not significant
17	Landscape	Large structures can affect the visual impact on the project area. Major land use is agriculture and residential.	There is no valuable landscape identified so far.	Not significant
Pollution				
18	Air Pollution	A large portion of the alignment is a new road so that vehicles may go through nearby residential area. Emission may therefore be increased.	Some part of proposed alignments are new, however, results of the air quality analysis show that the values are within standard.	Not significant (Detail analysis has done)
21	Noise and Vibration	As well as air pollution, new Busway will generate noise.	As well as air quality, the Busway aligns on existing, on-going road.	Not significant (Detail analysis has done)

Note: Relocation and air pollution were discussed in Chapter 9 and this chapter, respectively.

Table 10.19 Summary of Environmental Impact Evaluation

Factors		Evaluation Result	Remarks
Social Environment			
1	Resettlement	B	Social survey for ROW acquisition was done and there was no constraint. Relocation program (for land owner, tenant and informal dwellers) including compensation for ROW acquisition was drafted in accordance with DPWH guideline and will be validated. If the program is duly executed, no significant impact would be anticipated.
2	Economic Activities	C	The alignment will require the expansion on one side of the existing Talaba Diversion Road. This will temporarily suspend economic activities along this road and compensation will be made according to DPWH guideline so that the impacts are minimized.
3	Traffic and Public Facilities	C	During construction of the Busway corridor, there will be an expected disruption to traffic flow. Traffic management will be formulated during the detail design stage. The expected adverse impact will be for a limited duration.
4	Split of Communities	C	Although there are crossing and intersections proposed on the Busway, no negative impact is perceived.
5	Cultural Property	C	N/A
6	Water Rights and Rights of Common	C	Agricultural lands are reserved for future development in this corridor especially for large landowner areas. No negative impact is anticipated.
7	Public Health Condition	C	N/A
8	Waste	C	Construction program is formulated in detail design stage and most of construction wastes are recycled in this area so there is no negative impact.
9	Hazards (Risk)	C	N/A
Natural Environment			
10	Topography and Geology	C	N/A
11	Soil Erosion	C	N/A
12	Ground Water	C	Ground water resources are rich in this area due to volcanic alluvial fun. There are no major affected subjects along the corridor.
13	Hydrological Situation	C	Rivers and channels are not touched by the project (bridges are proposed). There is no negative impact.
14	Coastal Zone	C	N/A
15	Flora and Fauna	C	N/A
16	Meteorology	C	N/A
17	Landscape	C	There is no valuable landscape identified so far in this urbanized corridor. No negative impact.
Pollution			
18	Air Pollution	C	Some part of proposed alignments are new, however, based on the results of the air quality analysis, the values were within standard.
19	Water Pollution	C	N/A
20	Soil Contamination	C	N/A
21	Noise and Vibration	C	The proposed Busway is expected to generate noise. However, based on simulation, the proposed Busway may not affect significant impact.
22	Land Subsidence	C	N/A
23	Offensive Odour	C	N/A

Note: A: Significant impact is anticipated (Adequate countermeasures are required and the project itself should duly be considered.), B: Some Impacts are anticipated (countermeasures are required), C: No negative impact is anticipated.

10.5.5 Over-all Implications

There is no significant adverse impact on the environment identified in the course of the Study. However, the following should be taken in consideration for project realization.

(1) Less Emission Amount as Benefit

Emission amount as benefit is depending on vehicle travel speed and engine type. As the results of estimation as shown in Figure 10.10, every WITH BUSWAY case has less emission amount compared with WITHOUT BUSWAY case. This therefore indicates that the project implementation leads to environmental benefit in the project area.

Emission amount is related to vehicle speed. In particular, slow speed and traffic congestion leads to higher amount of emission. Table 10.20 shows the average travel speed within the network between WITH BUSWAY and WITHOUT BUSWAY cases in each year. It is evident that the speed is increased, so its benefit translates not only for economic but also for environment.

Table 10.20 Average Travel Speed of Road Network

Cases	Without Case (km/h)	With Case (km/h)
Year 2002	27.3	n/a
Year 2005	25.2	26.8
Year 2010	23.3	25.4
Year 2015	31.1	32.4
Year 2015+2010net	21.3	22.7

Source: JICA Study Team

(2) Reduction Measures of TSP Concentration

At present, air particulate matters generated by diesel motor vehicle are the major and remarkable source of air pollution in Metro Manila and its vicinity areas. DENR has been periodically monitoring the ambient air quality. The result of this monitoring, as shown in Table 10.21, indicates that some of its monitoring stations have recorded TSP concentrations higher than that of the DENR standard. This condition is being attributed to improper combustions (soot) which can be addressed by vehicle maintenance. Thus, a regular bus fleet maintenance system is strongly recommended for the CBS.

Table 10.21 TSP Ambient Air Quality 2001

Station	1st Quarter (mg/Ncm)	2nd Quarter (mg/Ncm)
Valenzuela	208	277
Congressional	233	222
Ateneo	95.1	105
East Avenue	277	271
EDSA-DPWH	152	142
Pasig	135	111
Makati	213	172
Mandaluyong	139	106
Las Pinas	99	51
DENR Standard	230	

Source: DENR NCR-Metro Manila

(3) Air Pollutants and Green House Effects

In terms of macro environmental benefit from the project implementation, emission amount of substances including air pollutants (CO, NOx, HC and TSP) and Green House Effects gas (CO_2) based on the Cavite area road network was examined in accordance with traffic volume and speed-related emission factor by engine type corresponding to “With” and “Without” Busway cases in each target year.

The result of projection shows that most cases indicated that the amount of emission would be reduced in the “With” cases. However, if the road network is not improved by 2015 as proposed by MMUTIS, the emission of pollutant gas will not differ much between “With” and “Without” cases. This further indicates that the proposed Busway project proved to be environmentally favorable.

(4) Further Consideration of Introduction of Compressed Natural Gas Vehicles (NGVs)

NGVs are quite environmentally friendly in terms of less particulate emission, and NGVs are in operation worldwide. Given that natural gas operation is already in the preparation stage, with the source of natural gas coming from the Batangas Province, the feasibility of using the NGVs soon is highly probable. However, there are advantages and disadvantages in the use of NGVs.

The advantages of NGVs includes 1) very low particulate emission, 2) low emission of airborne toxins, 3) negligible emission of oxides of sulphur, and 4) more quiet operation, having less vibration and less odour than the equivalent diesel engines.

On the other hand, the following are the disadvantages of using NGVs: 1) much more expensive distribution and storage, 2) higher vehicle cost, 3) shorter driving range, 4) much heavier fuel tank, and 5) potential performance and operational problems compared to liquid fuel.

Table 10.22 Emissions Benefits of Replacing Conventional Diesel with CNG in Buses

Fuel Type	CO (g/km)	Nox (g/km)	PM (g/km)
Diesel	2.4	21	0.38
CNG	0.4	8.9	0.012
% reduction	84	58	07

Note: Medium duty buses. Central business district test cycle. Unit is g/km.
Source: ESMAP International Experience with CNG Vehicles, UNDP/The World Bank, 2001

11 CONCLUSION AND RECOMMENDATIONS

11.1 Conclusion

The Proposed Busway

- The Cavite Busway System is envisioned over a 21-km stretch between the Northern Terminal at Niog in Bacoor and the Southern Terminal along Governor's Drive in Dasmariñas. The alignment follows north to south orientation between Aguinaldo Highway and Molino Road. A 2.45 km section linking the Busway to the Coastal Road was also explored as an integral part of the Project.

- The proposed bus-only roadway has a width of 13 m (2-lanes). It can be used as a three-lane busway where overtaking is necessary (e.g. near bus stops). On both sides of the busway, a two-lane service road, bicycle lane and sidewalk shall also be developed. Design speed of the bus-only roadway and service road is 80 km/h. The total width of the busway is 40 m.

- Secondary roads feeding into the busway were planned using the existing roads as much as possible. The intersections of the busway with the secondary roads will be at-grade. However, the intersections with high-standard or high-volume roads (e.g. Molino Road and Aguinaldo Highway) should be grade-separated.

- 12 bus stops should be developed between the northern and the southern terminal. The terminals and these 12 bus stops should be developed according to the magnitude of passengers' alighting/boarding demand and their expected roles in urban development.

Demand

- The demand for the proposed busway is large. It is about 99 thousand for year 2005, rising to 239 thousand passengers per day by 2015. The maximum cross-sectional demand is almost comparable to that of the Light Rail.

- The proposed busway will significantly improve the traffic situation in the project area. The impact is remarkable particularly on the parallel roads Aguinaldo Highway and Molino Road.

- The revenue of the bus service will reach its maximum at about the same rate as the current air-conditioned bus (₱10 for the first 4 km and ₱0.48 per succeeding km). This, however, could be raised to some extent considering the travel speed and the levels of service.

- The demand for busway will decrease by about 20-30% if LRT Line 1 Extension is not constructed. However, a patronage of the same level could be maintained if the busway operation is extended northward to Baclaran, in such an event.

Bus Operation

- The operation of the busway should be exclusive and closed between the northern and southern terminals. The operator should be selected on a competitive bidding process from the private sector, and should be capable of acquiring and managing a fleet of at least 170 buses in 2008 (initial year of operation) and 317 buses in 2015.

- The average speed of the buses on the bus-only roadway is expected to be 20 km/h due to the ideal operating conditions according to the world's experience. However, a higher travel speed could be attained if efficient traffic management is implemented.

- The bus operation consists of ordinary service (stopping at every station) and express service (stopping at only two bus-stops on the way). Judging from the magnitude of demand and travel speed of 20kph, a convoy operation up to three units would be necessary to ensure smooth operation of the busway until 2015. Double platforms to be developed at major stations will facilitate the headway control. The minimum headway in 2008 is 47 seconds and 25 seconds in 2015.

Project Cost

- The total cost of the proposed busway project including the service road, busway facilities and the access to the Coastal Road will reach about ₱9.7 billion, of which about 43% is the imputed cost for land acquisition and compensation. The 2.45-km access to the Coastal Road is expensive, accounting for 12% of the total cost.

Economic Evaluation

- The EIRR of the entire project was calculated at 35.9%. Its economic feasibility is very robust, achieving higher than the threshold 15% against a combined benefit decrease and cost increase by up to 50%.

- If the bus exclusive lanes are separately evaluated aside from the service roads, its EIRR will decrease to 20.5%. It is still higher than the threshold 15% but only up to a 30% benefit decrease or cost increase.

- If the entire road space of 6 lanes is not exclusive for bus (i.e. 6-lane ordinary road), the EIRR will be higher at 48.7%. This maybe because the benefits from public transport were not captured in the overall calculations, nor the impact to lower-income commuters considered.

Financial Analysis

- Financial analysis has revealed that the operation of bus transit could be very profitable. The FIRR was calculated at 20% despite the assumed burden of the rental fee for the busway infrastructure and high initial paid-up capital of ₱800 million. Nevertheless, even under this severe set of assumptions, the bus operator's financial results are favorable:
  a) Discounted cashflow of ₱7,431 million in the first 15 years compared to the initial ₱800 million investment,
  b) 1.6 or more of sales/break-even point ratio, and
  c) no negative cash balance without short-term loan.

Social Dimensions

- In the proposed alignment of the busway, more than 500 households will be affected, and most of them need to be relocated. This is a significant number, but more than 50% of them have already started negotiations with the landowners (particularly in Dasmariñas). The total cost of land acquisition of this project is estimated at about ₱4.2 billion (including those segments to be donated by a private property developer). As long as the legitimate and fair process of land acquisition is maintained, no serious difficulties are foreseen in land acquisition judging from the result of the interview survey with the affected residents.

Environment

- Aside from the relocation of residents, the major environmental issue of the proposed busway is the air pollution. The proposed project will reduce the emission of pollutant gas by increasing the travel speed of public transport and by shifting passengers from private to public mode of transport. The effect is remarkable particularly for TSM.

- Better emissions can be achieved if the bus fleet were to be fueled by CNG, rather than diesel.

Special Arrangement for ROW Acquisition

- In order to reserve the lands required for the proposed busway and to protect them, the creation of a Trust was explored. The key parties of the Trust will be the DPWH, Cavite Province, the Busway LGUs (Bacoor, Imus and Dasmariñas), One Asia (representing the private sector) and the Cavite Development Board.

- From the extensive discussions with the parties, it was agreed that the formation of a Trust be deferred. However, a Project Board would be constituted to achieve the same objective of advancing negotiations for the ROW. The Board will basically act as an intermediary between the private sectors (landowners) and DPWH (land purchaser), prior to the actual implementation of the CBS. A draft Memorandum of Agreement (MOA) for this purpose has been prepared in this Study and circulated among the concerned parties.

11.2 Recommendations

Fund Source

- The most likely fund source for this project is the ODA. Since the project proposed here shows a very stable economic return, the actions necessary to tap the fund should be taken as soon as possible. The process for clearance of NEDA-ICC and for approval of DPWH should be immediately pursued using the results of this Study.

Acceleration of Land Acquisition

- The ROW Task Force was created by virtue of a Department Order of DPWH in December 2001 to facilitate the land acquisition for the CBS. The efforts of the Task Force should now be folded under the umbrella of the Project Board mentioned above, and reiterated below.

Project Board

- The draft Memorandum of Agreement (MOA) prepared by this Study should be refined and signed by the related parties at the earliest possible opportunity. The LGUs (Bacoor, Imus and Dasmariñas) should prepare a new zoning ordinance taking the busway into consideration. The PUD (Planning Unit Development) system may be utilized.

CBPC

- The unique situation of the CBS creates some institutional gaps as to who will be responsible for each aspects of the project. Of special attention is the maintenance of the bus-only roadway and the ancillary bus stops and terminals.

- Initially recommended is the formation of a Cavite Busway Public Corporation by the parties to the Project Board, excluding DPWH. The CBPC can be organized as a non-governmental and non-profit organization similar to the Makati Parking Authority (MAPSA), to handle the maintenance of the busway once completed by DPWH, the maintenance of the bus stops, traffic management along the busway, terminals and bus stops, as well as coordination of the land use development along the busway corridor.

- Although the CBPC is conceived as a non-profit oriented company, it can generate revenues from the payments of the bus operator, parking fees along the corridor and contributions from the LGUs. From these inflows, it shall spend for the maintenance of the busway, its facilities and expenses for traffic enforcement.

- The formation of the CBPC could, therefore, obviate the need for a Trust. If formed early, its Board can be the same Project Board stipulated in the draft MOA and spearhead the securing of the ROW in advance.

CNG Bus

- The CNG buses should be strongly considered in the CBS. It will reduce the emission of TSP by 97% and of NO_X by 58% compared to the diesel buses. Since CNG is produced in Palawan and will be transported (by pipeline) to Batangas, it will be easy to supply the prospective requirements of CBS buses. The DOE is promoting the CNG use and planning to introduce some incentives to entice conversion. The CBS can serve as the pilot project of the DOE, with the collateral benefits of improving the financial situation of the CBS.

Fare Level

- The fare level of busway should be set at a slightly higher level than the current air-conditioned bus. Based on passenger interview surveys, they are willing to pay extra ₱1-2 if a high-quality service is provided (24-hour service, security, clean environment, good manner of busway employees, etc).