

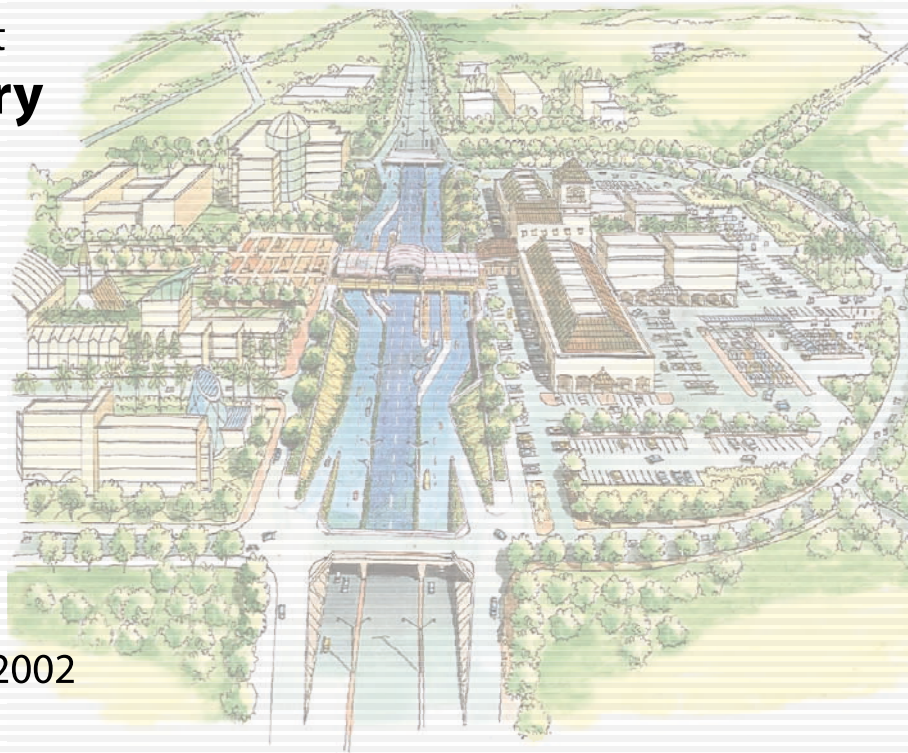
JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

No.

NATIONAL ECONOMIC AND DEVELOPMENT AUTHORITY,  
THE REPUBLIC OF THE PHILIPPINES

# The Feasibility Study of the Proposed Cavite Busway System

Final Report  
**Summary**



November 2002

**ALMEC Corporation**  
**Pacific Consultants International**

SSF

JR

02-154

Exchange Rate Used

PHP 1 = JP ¥ 2.34

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)  
NATIONAL ECONOMIC AND DEVELOPMENT AUTHORITY,  
THE REPUBLIC OF THE PHILIPPINES

The Feasibility Study of the Proposed  
**Cavite Busway System**

Final Report  
**Summary**

November 2002

**ALMEC Corporation**  
**Pacific Consultants International**

## PREFACE

In response to the request from the Government of the Republic of the Philippines, the Government of Japan decided to conduct the Feasibility Study of the Proposed Cavite Busway System and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA selected and dispatched a study team headed by Mr. Takashi Shoyama of ALMEC Corporation and consist of ALMEC Corporation and Pacific Consultants International to the Philippines from November 2001 to September 2002. In addition, JICA set up an advisory committee headed by Mr. Takashi Ariyasu, Urban Development Corporation between November 2001 and September 2002, which examined the study from specialist and technical points of view.

The team held discussions with the officials concerned of the Government of the Philipines and conducted field surveys, a series of transportation/traffic analyses, transportation demand forecast and planning of the Cavite Busway Systems. Upon returning to Japan, the team conducted further studies and prepared this final report.

I hope that this report will contribute to the improvement of public transportation in Cavite Area and to the enhancement of friendly relationship between our two countries.

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

November 2002



---

Takao Kawakami  
President  
Japan International Cooperation Agency

November 2002

Mr. Takao Kawakami  
President  
Japan International Cooperation Agency

### **Letter of Transmittal**

Dear Sir,

We are pleased to formally submit herewith the final report of “The Feasibility Study of the Proposed Cavite Busway System”.

This report compiles the results of the study which was undertaken both in the Philippines and Japan, from November 2001 to September 2002 by the study team, organized jointly by ALMEC Corporation & Pacific Consultants International.

We owed a lot to many people for the accomplishment of this report. First, we would like to express our sincere appreciation to all those who extended their kind assistance and cooperation to the study team, in particular, the National Economic and Development Authority.

We also acknowledge the officials of your agency, the JICA Advisory Committee and the Embassy of Japan in the Philippines for their valuable advice and cooperation given to us throughout the course of the study.

We wish the report would contribute to Cavite’s public transportation development in the near future.

Very truly yours,



---

Takashi Shoyama  
Team Leader,  
The Study Team for the Feasibility Study  
of the Proposed Cavite Busway System

# TABLE OF CONTENTS

---

	Page
<b>1. INTRODUCTION</b> .....	1
1.1 Study Background .....	1
1.2 Objectives .....	1
1.3 Study Area .....	1
1.4 Study Organization.....	2
<b>2. REVIEW OF THE BUSWAY DEVELOPMENT PLAN AND REGIONAL FRAMEWORK</b> .....	3
2.1 Review of the Cavite-Laguna (CALA) Transport Study.....	3
2.2 Regional Framework and Socio-Economic Conditions .....	3
2.3 Provincial Urban Structure and Municipal Structure Plans .....	4
<b>3. PRESENT SITUATION ON THE BUSWAY CORRIDOR</b> .....	6
3.1 Natural Condition .....	6
3.2 Road and Road Transport System.....	6
3.3 Physical/Social Constraints on Busway Corridor .....	8
<b>4. DEMAND FORECAST</b> .....	10
4.1 Methodology.....	10
4.2 Future Demand Forecasts.....	11
4.3 Other Planning Issues.....	15
<b>5. ANALYSIS OF THE ALTERNATIVE PLANS AND CORRIDOR DEVELOPMENT CONCEPT</b> .....	16
5.1 Major Planning Issues of the Cavite Busway System .....	16
5.2 Examination of the Busway Cross-sections .....	16
5.3 Examination of Alternative Alignments and Terminal Locations .....	18
5.4 Terminals and Bus Stops Development.....	22
5.5 Secondary Road Network and Intersection Planning.....	25
5.6 Busway Corridor Development Strategies .....	26
<b>6. ENGINEERING STUDY</b> .....	29
6.1 General .....	29
6.2 Structural Aspect.....	29
6.3 Pavement Structure.....	30
6.4 Highway Drainage System.....	30
6.5 Street Lighting System .....	31
6.6 Ancillary and Miscellaneous Structures.....	31

<b>7.</b>	<b>COST ESTIMATION, INVESTMENT SCHEDULE AND ECONOMIC ANALYSIS</b> .....	32
7.1	Composition of Project Cost (PC) .....	32
7.2	Project Cost Estimation.....	33
7.3	Investment Schedule and Economic Evaluation .....	34
<b>8.</b>	<b>BUS OPERATION PLANNING</b> .....	37
8.1	Bus Operation .....	37
8.2	Operator .....	37
8.3	Bus Operation and Management .....	37
8.4	Financial Analysis .....	38
<b>9.</b>	<b>SOCIAL DIMENSIONS</b> .....	41
9.1	Public Consultations and Participation .....	41
9.2	Summary of Social Impacts .....	41
9.3	Overview of Socioeconomic Information .....	42
9.4	Dimensions of Land Acquisition and Resettlement.....	43
9.5	The Resettlement Policy Framework and the Resettlement Action Plan.....	44
9.6	Special Arrangement for ROW Acquisition .....	44
<b>10.</b>	<b>ENVIRONMENTAL EXAMINATION</b> .....	46
10.1	Site Conditions and Initial Findings.....	46
10.2	Identification of Adverse Impact caused by Project Implementation.....	47
10.3	Projection of Emission Amount as Environment Benefit.....	47
10.4	Summary of Environmental Examinations.....	49
<b>11.</b>	<b>CONCLUSION AND RECOMMENDATIONS</b> .....	50
11.1	Conclusion .....	50
11.2	Recommendations.....	53

## LIST OF FIGURES

---

Figure 1.1	Study Area .....	2
Figure 1.2	Study Organization .....	2
Figure 2.1	Urban Center Hierarchy (CALA Study) .....	4
Figure 2.2	Proposed Land Use of Bacoor, Imus and Dasmariñas.....	5
Figure 3.1	Existing Road Network in the Study Area .....	7
Figure 3.2	Bus Traffic Flow, 2002 .....	8
Figure 3.3	Jeepney Traffic Flow, 2002.....	8
Figure 3.4	Major Land Use Features .....	9

Figure 4.1	Framework for the Demand Forecast .....	10
Figure 4.2	Passenger Volume on Busway .....	12
Figure 4.3	Road Traffic Demand in the Study Area .....	13
Figure 5.1	Major Planning Issues on the Alignment Study.....	17
Figure 5.2	Proposed Typical Cross-section for the Busway.....	17
Figure 5.3	Proposed Alternative Alignment.....	18
Figure 5.4	Alternative Alignments and Cross-Sections for Coastal Road Access .....	19
Figure 5.5	Alternative Location for its Southern Terminal .....	19
Figure 5.6	Proposed One-way System for Tentative Measure .....	20
Figure 5.7	Proposed Terminal and Bus Stop Location and their Demand.....	22
Figure 5.8	Conceptual Design of Bus Terminals.....	23
Figure 5.9	Sketch Layout for Typical Bus Stops .....	24
Figure 5.10	Overview of the Proposed Bus Stop Area.....	24
Figure 5.11	Proposed Secondary Road Network and Intersection .....	25
Figure 5.12	Land Use Development Concept .....	26
Figure 5.13	Terminal Area Development/ Redevelopment Concept.....	27
Figure 5.14	New Type of Mode Interchange with Town Center .....	27
Figure 5.15	Financial Scheme for the CBPC .....	28
Figure 7.1	Project Cost Components .....	32
Figure 10.1	Site Conditions and Initial Findings.....	46
Figure 10.2	Summary of Emission Amount of CO, CO <sub>2</sub> , NO <sub>x</sub> , HC, and TSP and Example of Speed Related Emission Factor (NO <sub>x</sub> ) .....	48

## LIST OF TABLES

---

Table 2.1	Future Population of the Study Area.....	4
Table 4.1	Traffic Assignment Cases .....	11
Table 4.2	Busway Demand Summary.....	11
Table 5.1	Evaluation of the Alternative Alignments and Terminal Locations .....	21
Table 7.1	Project Cost.....	33
Table 7.2	Project Cost for Coastal Road Access .....	33
Table 7.3	Investment Schedule and Annual Composition of Amount .....	34
Table 7.4	Economic Cost of the Project.....	34
Table 7.5	Unit VOC by Public and Private Mode as of 2002 .....	35
Table 7.6	Cash Flow of Economic Cost and Benefit.....	36
Table 7.7	Sensitivity Analysis by Changing Cost and Benefit.....	36



Table 8.1	Summary of Evaluation of the Five Types of Operation .....	37
Table 8.2	Requirements for the CBS Operators and Operation .....	37
Table 8.3	Summary of Operation and Management.....	38
Table 8.4	Balance Sheet Pro-forma .....	39
Table 8.5	Income Statement Pro-forma.....	39
Table 8.6	Cashflow Statement Pro-forma.....	40
Table 8.7	Financial Indicators Pro-forma.....	40
Table 9.1	Categories of Project Affected Families.....	42
Table 9.2	Scale of Affected Structures and Households .....	43
Table 9.3	Land Requirement and Resettlement Cost.....	44
Table 10.1	Matrix for Impact Identified by Project Phase .....	47
Table 10.2	Summary of Environmental Examinations.....	49

## ANNEX

---

Annex 1	Members of the Respective Committees/Teams for the Feasibility Study of the Proposed Cavite Busway System
---------	--

## LIST OF ACRONYMS AND ABBREVIATIONS

---

AASHTO	American Association State Highway and Transportation Office
A/C	Air Conditioned
ACEL	Associated Construction Equipment Lessors, Inc.
ADB	Asian Development Bank
ADZ	Agricultural Development Zone
APC	Asset Participation Certificate
BCDA	Bases Conversion and Development Authority
BOI	Board of Investments
BOT	Built Operate Transfer
CA	Commonwealth Act
CALA	Cavite-Laguna
CALABARZON	Cavite-Laguna-Batangas-Rizal-Quezon
CBD	Central Business District
CBPC	Cavite Busway Public Corporation
CBS	Cavite Busway System
CBR	California Bearing Ratio
CDC	City Development Council
CDP	Comprehensive Development Plan
CDZ	Coastal Development Zone
CENRO	Community Environment and Natural Resources Office
CLUDEMS	Cavite-Laguna Urban Development and Environmental Management Study
CLUP	Comprehensive Land Use Plan
COA	Commission on Audit
CMP	Community Mortgage Program
CNG	Compressed Natural Gas
CPC	Certificate of Public Convenience
CPDO	City Planning Development Office
CO	Contractor Overheads
DAO	Department Administrative Order
DA	Department of Agriculture
DAR	Department of Agrarian Reform
DBM	Department of Budget and Management
DC	Direct Cost
DENR	Department of Environment and Natural Resources
DILG	Department of the Interior and Local Government
DO	Department Order
DOTC	Department of Transportation and Communications
DPWH	Department of Public Works and Highways
ECA	Environmentally Critical Area
ECC	Environmental Compliance Certificate
ECP	Environmentally Critical Project
EDZ	Ecological Development Zone
EIA	Environmental Impact Assessment
EIAPO	Environmental Impact Assessment Project Office
EIRR	Economic Internal Rate of Return
EIS	Environmental Impact Study
EMB	Environmental and Management Bureau
EO	Executive Order
ERA	Environmental Risk Assessment
FGDs	Focused Group Discussions
FIRR	Financial Internal Rate of Return
FPA	Fertilizer Pesticide Authority

GOJ	Government of Japan
GOP	Government of the Philippines
GDP	Gross Domestic Product
GVA	Gross Value Added
ICC	Investment Coordination Committee
IDC	Indirect Cost
IDF	Intensity-Duration-Frequency
IEE	Initial Environmental Examination
JBIC	Japan Bank for International Cooperation
JICA	Japan International Cooperation Agency
KIIs	Key Informants Interviews
HLURB	Housing and Land Use Regulatory Board
HOV	High Occupancy Vehicle
LDCs	Local Development Councils
LGUs	Local Government Units
LIZ	Light Industrial Zone
LRT	Light Rail Transit
LRTA	Light Rail Transit Authority
LTFRB	Land Transportation and Franchising Board
MERALCO	Manila Electric Company
MMCPPI	Metro Manila Consumer Price Index
MMDA	Metro Manila Development Authority
MMTC	Metro Manila Transit Corporation
MMUTIS	Metro Manila Urban Transportation Integration Study
MOA	Memorandum of Agreement
MPDOs	Municipal Planning and Development Offices
NAAD	Network of Areas for Agricultural Development
NAMRIA	National Mapping and Resource Information Authority
NEDA	National Economic and Development Authority
NGO	Nongovernmental Organization
NGAs	National Government Agencies
NIPAS	National Integrated Protected Areas System
NPAA	Network of Protected Agricultural Areas
NPC	National Power Corporation
NPV	Net Present Value
NSO	National Statistics Office
NOx	Nitrogen oxides
OD	Origin Destination
ODA	Official Development Assistance
PAGASA	Philippine Atmospheric Geophysical and Astronomical Services Administration
PAPs	Project Affected Persons
PCU	Passenger Car Unit
PD	Presidential Decree
PE	Project Evaluation
PEA	Public Estates Authority
PENRO	Provincial Environment and Natural Resources Office
PHIVOLCS-USGS	Philippine Institute of Volcanology and Seismology-United States Geological Service
PNR	Philippine National Railway
PNOC	Philippine National Oil Company
PPFP	Provincial Physical Framework Plan
PPP	Private-Public-Partnership
PUD	Planning Unit Development
RA	Republic Act
RIC	Resettlement Implementation Committee

RAP	Resettlement Action Plan
RDC	Regional Development Council
ROW	Right of Way
ROWA	Right of Way Acquisition
S/C	Sales-Cost
SLEX	South Luzon Expressway
SSS	Social Security System
SCF	Standard Conversion Factor
TRB	Toll Regulatory Board
TODA	Association of Tricycle Operators and Drivers Association
TSP	Total Suspended Particulates
TLV	Threshold Level Value
TCT	Transfer Certificate Title
UCZ	Urban Core Zone
UDHA	Urban Development and Housing Act
UEZ	Urban Expansion Zone
UP-NCTS	UP National Center for Transportation Studies
VOCM	Vehicle Operating Cost Model

## **Executive Summary**

### **Objectives and Background**

This study intends to examine the feasibility of the proposed Cavite Busway System in accordance with the request of the Government of the Philippines. However, because this proposed project has been subjected to a wide consultation and consensus among related government organizations, the objectives of this study are not only limited to testing the feasibility of the Project but also to planning and proposing realistic solutions for the remaining project issues to accelerate project implementation. In addition, technology transfer to the Filipino counterpart staff is intended during the course of the Study.

Cavite is one of the most rapidly growing areas around Metro Manila. Its population was 2.1 million in 2000 and is predicted to increase to 4.1 million by 2015. This population growth, coupled with industrial and commercial development, has brought about serious traffic congestion in the area. The Cavite Busway Project has been proposed under these circumstances based on the Metro Manila Urban Transportation Integration Study (MMUTIS, JICA 1999), and the Cavite-Laguna Urban Development and Environmental Management Project (World Bank 2000).

### **Study Area**

The three (3) municipalities of Bacoor, Imus and Dasmariñas in Cavite, where the proposed busway corridor is located, cover the primary study area. The study area is adjacent to Metro Manila.

In terms of population, Cavite province has a total population of just over 2 million, as of latest population census conducted in May 2000. Between 1990 and 2000, the province has experienced a rapid increase in population growth, brought about to a great extent by in-migration. The three municipalities of Bacoor, Imus and Dasmariñas, which will be served by the Cavite Busway System, have the highest municipal populations in the province and they are projected to grow rapidly in the future.

#### **Future Population of the Study Area**

Municipality	Estimated Population		
	2005	2010	2015
Bacoor	230,157	354,520	478,884
Imus	261,215	358,678	456,140
Dasmariñas	231,757	450,389	669,021
Cavite Province Total	2,562,246	3,104,943	3,647,622

### **Future Transport Demand**

On 2005, the Busway would have a ridership of nearly 100,000 passengers/day. This is expected to increase to around 150,000 passengers/day in the next 5 years. Spurred by the expected development in Imus and Dasmariñas and the development of the first section of the East-West Road, it is expected that the demand on the busway along these sections will grow at a proportionately much higher rate.

**Busway Demand Summary**

Year	No. of Pass/day	Ave. trip length (km)	Ave. Fare (P/ride)	No. of Pass/day	Ave. trip length (km)	Ave. Fare (P/ride)
2005	98,562	9.2	12.52	100,092	9.0	12.41
2010	141,246	9.4	12.64	155,002	8.7	12.32
2015	239,491	8.8	12.34	224,783	9.1	12.51

Note) Busway fare is assumed to be the same as the existing A/C bus (₱10 for the first 4km and additional ₱0.48 per km).

Boarding and alighting would be concentrated primarily at terminals. The Northern and Southern terminals would need to cater to around 60,000 passengers/day in 2010. In 2010, 7 of the 12 intermediate stations would be catering to more than 15,000 passengers/day. By 2015, traffic at northern and southern terminal will be around 128,000 and 89,000 passengers/day respectively.

With respect to traffic volume on the ordinary roads, the Busway had little impact on the network. On the other hand, the development of service roads provides motorists another alternative and this will result in a shift in traffic demand as manifested in the lowered traffic volume at parallel links (*i.e.* Aguinaldo Highway and Molino Road). Similarly, travel speeds are not significantly improved as a result of the Busway without the service roads. However, the development of the service roads helped balance the north-south traffic and higher travel speeds to as much +3.5kph can be attained.

Since Aguinaldo Highway and Molino Road will run parallel to the proposed Busway, the Busway's impact on public transport demands in these roads are significant. With the development of the Busway, it is projected that there will be a greater decrease in the number of operating buses than jeepneys at Aguinaldo Highway by about 15-20%. The numbers of operating jeepneys are projected to increase with the development of the Busway in some roads because jeepneys can play the role of feeder transport to the Busway. But generally, the number of operating public transport will decrease by 10-30% in the existing parallel roads with the development of the Busway.

### **Route and Structure of Busway**

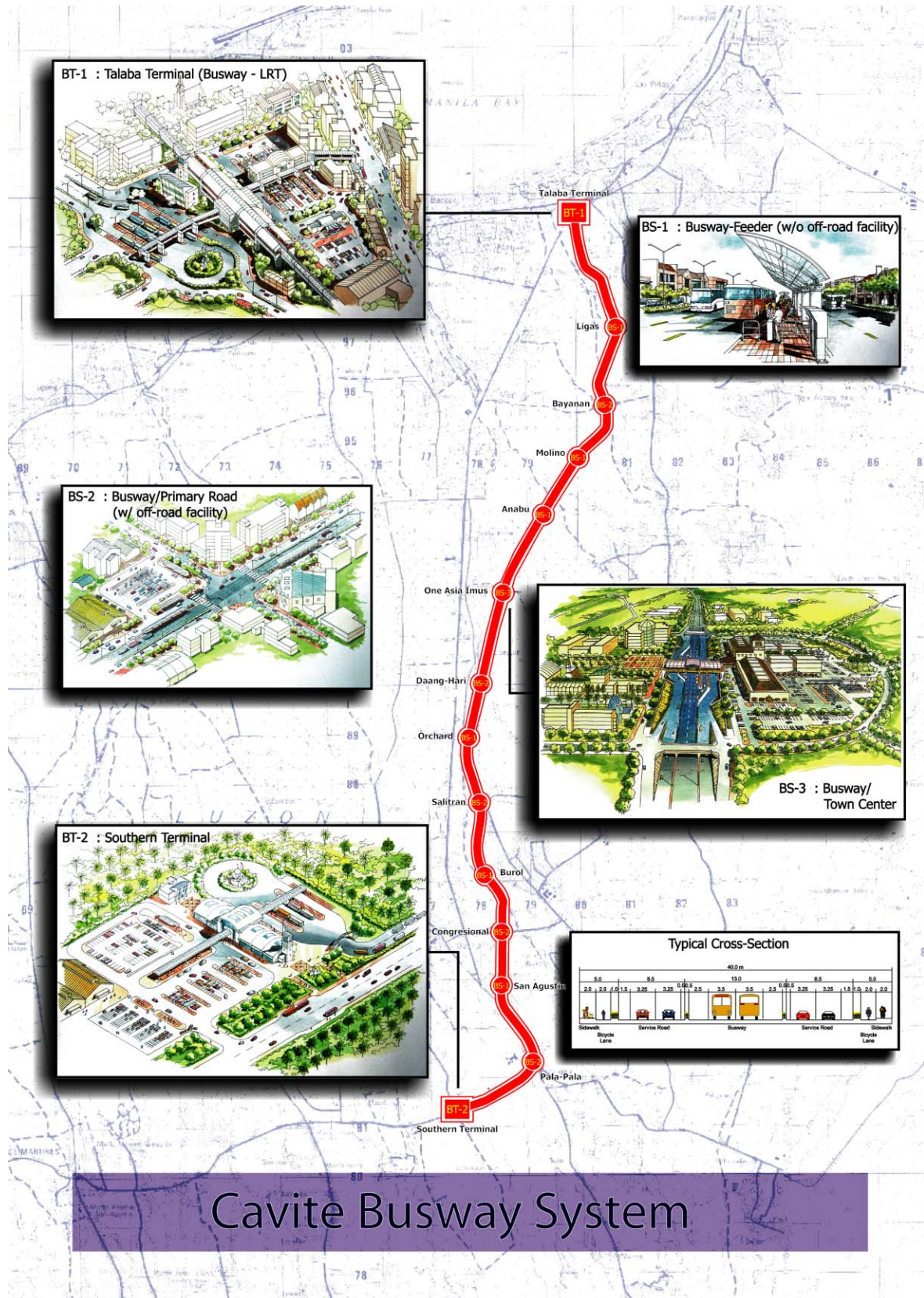
Based on demand forecast and various analyses on road safety, road hierarchy and so on, the typical cross-section of the busway was determined. The ordinary section will be a 2-

lane busway with 4-lane service road. Exclusive busway will be 13m wide, providing sufficient lateral clearance for emergency parking and vehicle breakdown. In the bus stop section, 3 lanes will be provided including stopping lane and two passing lanes for both directions. In addition, based on the DPWH guideline, a bicycle lane (for non-motorized vehicle) will be provided. The total required ROW would be 40m.

In order to determine an optimum alignment for the proposed busway, several alternative plans were prepared taking into account the major issues identified in the study. Preparation of the alternative alignments was made based on the landuse and administrative boundary of Bacoor, Imus and Dasmariñas. Each alternative was then evaluated from various aspects including land acquisition, construction cost, social impact on existing built-up area, structural standard and so on.

Measures to provide more convenient public transport are the introduction of suitable modes of transport and the smooth transfer between modes. One of the more critical aspects of public transport, especially mass public transport, is the need for passengers to transfer from one mode to another. Therefore, smooth transfer between modes is the key factor to ensure success of a public transport system. While the proposed busway project will have to provide a high level of service in terms of travel speed of buses, a 1 to 2-km bus stop spacing was adopted in this study considering the future land use and points of transfer with other modes.

The intersection type was determined on the class, function and traffic volume of intersecting road. The intersections with major roads should be grade-separated while it is basically at-grade in the case of less important roads. In any case, however, bus priority measures are required, and safety of boarding/alighting passengers should be ensured. In addition, traffic enforcers are needed at each intersection of busway to prevent ordinary traffic to enter the busway.





### **Busway Corridor Development Strategies**

The proposed Busway will enhance the potential for urban development of the corridor. In order to promote public transport oriented urban development, not only will the preparation of strategic land use and urban development plans be necessary but also a strong institutional setup will be indispensable. Such institution should be able to take the lead backed with strong financial resource for the corridor urban development. It will be difficult for the government sector to directly commit to urban development as it is constrained with budget shortages and administrative bureaucracy. Therefore, a new organization should be established solely for the public transport corridor urban development. The functions of the proposed organization, herein referred to as the Cavite Busway Public Corporation/Company (CBPC), could be, but not necessarily limited to, as follows:

- To develop the land use plan and development program for the corridor (the plans should be enacted);
- To reconfigure the shape of lands in the designated corridor through land swapping and land readjustment method in order to develop the necessary infrastructure outside of the proposed busway (the busway will be constructed by DPWH); and
- To prepare fund resources for the corridor urban development (e.g. taking advantage of the possible increase of land price).

It is desirable for the CBPC to be formed by the busway LGUs, which includes the Provincial Government of Cavite, and the Municipal Governments of Bacoor, Imus and Dasmariñas. As to whether the private sector can be involved in the CBPC is still subject for careful study since the organization has to deal with individual landowners for land swapping and land readjustment as well as undertake development of urban infrastructures for public use. The interrelation of CBPC with the bus company is also subject to further discussion.

### **Project Cost**

The project cost of the 21-km busway was estimated at ₱8.7 billion, of which 38% is for the exclusive busway and 62% for the service road. The construction cost accounts for about 45% and land acquisition/compensation cost for about 43%. As to the Coastal Road Access, the cost was estimated at about ₱1.0 billion, although it is subject to review in relation to the possible cost sharing with the LRT 1 Extension Project.

### Project Cost

(Unit Cost: Million Pesos)

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)	
Total of Construction Cost (PC1)		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	

### Project Cost for Coastal Road Access

Description		F/C (M Peso)	L/C (M Peso)	Total (M Peso)	
Total of Construction Cost (PC1)		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
	Total of Indirect Cost		62.0	486.7	548.8
Grand Total		346.7	676.5	1,023.1	

### Economic Evaluation

Implementation period of the CBS is assumed to be 2003-2007. The busway will start its operation on the first day of 2008.

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 unit VOC and TTC used in MMUTIS were updated using overall inflation rates during 1997-2001.

The entire project including two exclusive bus lanes and four lanes of service road will have a high EIRR at 35.9%. According to NEDA’s criteria, the threshold value to judge the economic feasibility of a project is 15% in the Philippines. 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.

### Bus Operation

The CBS will be operated in a closed system between the Northern and the Southern Terminal. This operation type was selected from managerial/administrative point of view. The bus company should have a minimum capital of about ₱800 million and will pay a rental fee to CBPC for the busway and its related facilities.

**Summary of Bus Operation and Management**

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.

Operation of the bus company will be sound. FIRR is 20%. Although it does not appear to be so attractive for business, the financial statements are sound and show that the project itself is profitable.

**Financial Indicators Pro-forma**

(Unit Cost: Million Pesos)

Financial Indices	2008	2010	2015	2022
Break-even Point	503.70	550.73	800.68	903.92
Rate of Return on Investment	0.18	0.36	0.40	0.18
Rate of Return on Equity	0.30	0.79	3.40	4.98
Rate of Return on Assets	0.18	0.33	0.35	0.17
FIRR	20%			
S/C under 12% of Discount Rate	1.04			
NPV under 12% of Discount Rate	₱255million			

**SOCIAL DIMENSIONS**

The process of consultation and participation was heavily employed in this study for project appreciation, acceptance, and preparation. It covered not only the 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.). The consultation and participation process in the CBS project cycle at the community level involved key informants interviews (KIIs), focus group discussions (FGDs), and a structured socio-economic survey of right-of-way affected families or project affected persons (PAPs).

Expected impact of the CBS Project is wide ranging. Based on the KIIs and FGDs, the impacts are expected to be mostly positive. However, land acquisition was identified as the major potential adverse impact of the project.

Within the proposed road alignment, there exist numerous structures and various categories of affected households.

**Scale of Affected Structures and Households**

Area	Estimated No. of Structures	Estimated No. of Households	Total Population
<b><u>Bacoor</u></b> Coastal Rd. Access Line B	211	263	1,130
<b><u>Imus</u></b> Segment 1	None	None	None
Segment 2	None	None	None
<b><u>Dasmariñas</u></b> Segment 1	None	None	None
Segment 2	200 <sup>1)</sup>	323	1,389

1) Estimated.

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 in Bacoor and Dasmariñas, it is then necessary to prepare a Resettlement Policy and a Resettlement Action Plan (RAP). These were drafted in this study.

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. 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. Meantime, many things could happen as to hamper the subsequent ROW acquisition.

An option that maximizes the role of the local government and the private sector in the project is to create a TRUST aiming to preempt the land necessary for the project. 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.

However, the agreement for the Trust has not yet been reached despite a series of extensive discussions with the related bodies. Instead, a Project Board would be constituted to achieve the same objective of advancing negotiations for the ROW. A draft Memorandum of Agreement (MOA) has been prepared for the DPWH, LGUs, and private sector for this purpose.

### **Summary of Environmental Examinations**

Environmental examination was carried out based on available information and qualitative and quantitative methods to address the GOP's requirement. Special attention was given however to Resettlement and Air Pollution as identified in the initial environmental examination. For the latter, quantitative evaluation based on future traffic demand information was conducted. Consequently, no significant impact was anticipated in this evaluation, aside from the resettlement issue dealt with separately.

### **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.

## **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<sub>x</sub> 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).