FINAL REPORT

Summary

1 INTRODUCTION

1.1 Study Background

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). The latter found it very important to construct an effective public transport system for Cavite which, if successfully implemented, is expected to be a good model for other areas.

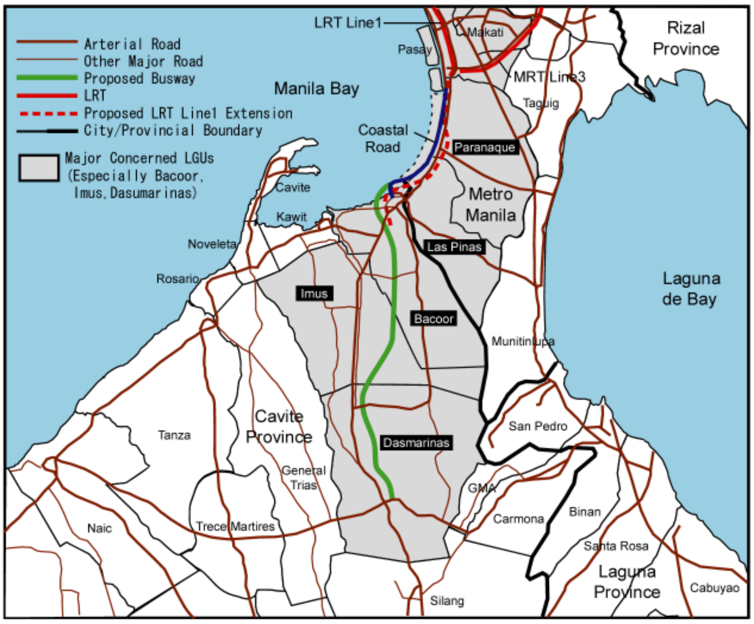
1.2 Objectives

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.

1.3 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. However, entire Cavite and a part of Metro Manila (Las Piñas, Parañaque and Pasay) were included in the Study depending on the characteristics of analysis.

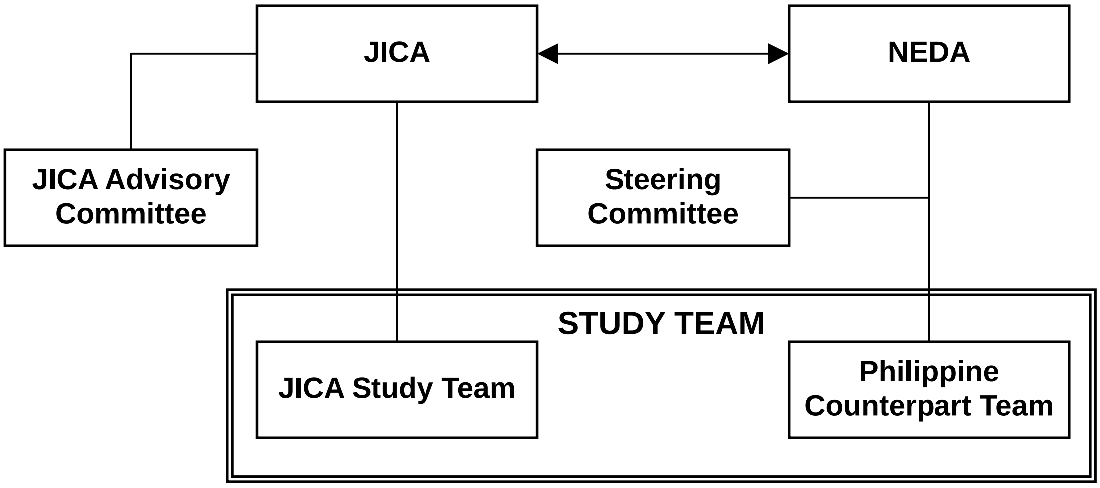
Figure 1.1 Study Area



1.4 Study Organization

The study organization is composed of the JICA Advisory Committee and the JICA Study Team on the Japanese side and the Steering Committee and the counterpart team on the Philippine side as shown in Figure 1.2.

Figure 1.2 Study Organization



2 REVIEW OF THE BUSWAY DEVELOPMENT PLAN AND REGIONAL FRAMEWORK

2.1 Review of the Cavite-Laguna (CALA) Transport Study

The CALA Transport Study (CALA Transport Strategy and Short-term Programs and Policies) was a follow-up technical assistance provided by the World Bank to Cavite and Laguna provinces as a component of the CALA Urban Development and Environmental Management Project. This Study had objectives relating to both long-term and short-term transport development in the area. In the CALA Transport Study, the transport network plan was developed to follow the spatial development framework defined for the CALA area. Among a number of transport projects for CALA, priority projects were identified among to approximately ₱28.2 billion.

The Cavite Busway System was recommended as one of the priority projects under the CALA Transport Study. A mass transit system in the form of a busway has been identified to meet the current and future transport requirement in CALA. The priority corridor under consideration was the highly congested coastal corridor in the province of Cavite, south of Metro Manila. Because of physical constraints and uncontrolled roadside developments, an alignment option was chosen – starting from Palapala and running northward as close to Aguinaldo Highway before shifting eastward from Mambog area and connects with the southern extension of the LRT Line 1 at Niog area. Preliminary economic analysis showed that the Cavite Busway Project is viable with an IRR of 22% under the conditions set in the CALA Transport Study.

2.2 Regional Framework and Socio-Economic Conditions

Cavite is located just south of Metro Manila, and its proximity to the National Capital Region has led to a high level of urbanization and population increases similarly experienced by the metropolis.

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. Under a scenario where urban centers will grow and more strict land use will take place, the future population was estimated by municipality.

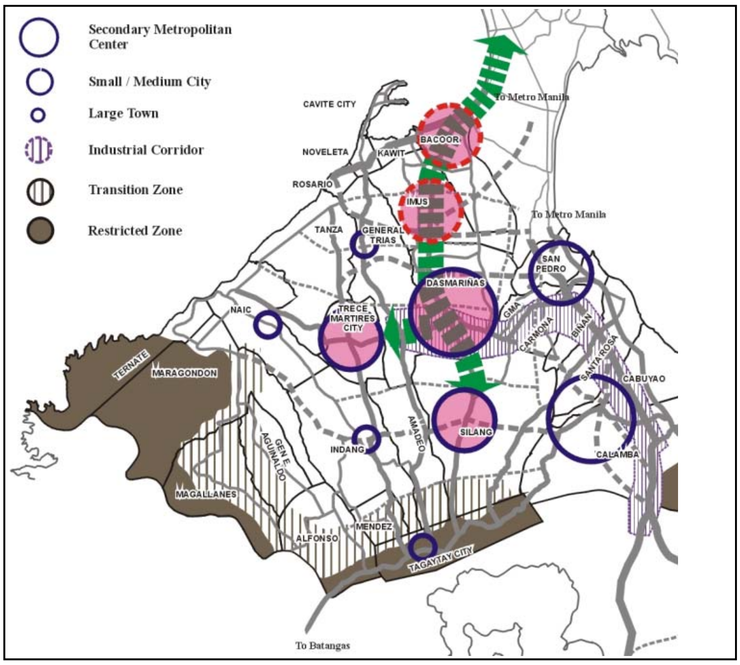
Table 2.1 Future Population of the Study Area

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

2.3 Provincial Urban Structure and Municipal Structure Plans

Figure 2.1 shows the urban structure proposed in the CALA2 Urban Development Study. With Dasmariñas at the junction of these two major corridors, it has been structured as a main urban center in the province. This is evident in its population growth over the past few years.

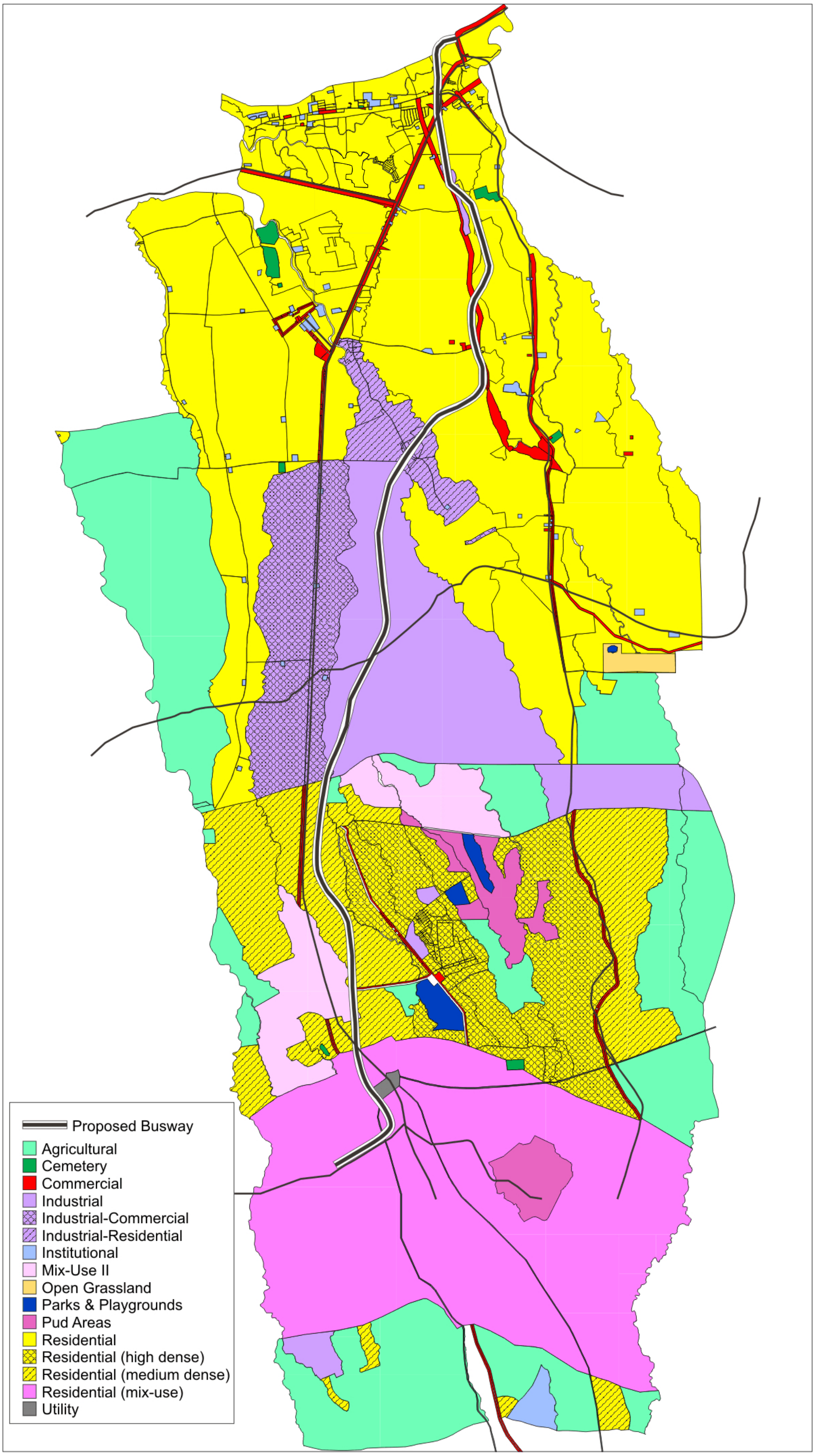
Figure 2.1 Urban Center Hierarchy (CALA Study)



Source: CALA 2 Urban Development Study

Figure 2.2 shows the land use plan proposed for the Study Area. The provision of a busway corridor in the Bacoor - Imus - Dasmariñas cluster will necessitate a change in planning activities for the three municipalities. Land use controls need to be instituted for the busway corridor in order to achieve the desired benefits from the system. If land uses and road access along the corridor is not managed carefully, the provision of the new transport system may not be able to service the transport needs of Cavite's commuters to the desired service levels.

Figure 2.2 Proposed Land Use of Bacoor, Imus and Dasmariñas



Source: JICA Study Team, based on proposed land use maps submitted by the municipalities of Bacoor, Imus and Dasmariñas.

3 PRESENT SITUATION ON THE BUSWAY CORRIDOR

3.1 Natural Condition

The topography of Cavite Province is a product of volcanic processes of the Southern Tagalog volcanic field. Nearby volcanic structures that have influenced the form of the area are Bataan, the Taal Lake Caldera and Mount Palay-palay. In general, land in Cavite Province slopes to the north, descending from the highlands of the Tagaytay Ridge which fringes the Taal Caldera, down to the coast at Manila Bay. River drainage in Cavite Province follows two patterns, a south to north direction in general, while in the east of the province and in neighbouring Laguna Province, drainage is eastwards flowing into Laguna de Bay lake. Land in the north of the province is flat or level, while in the south it becomes rolling to hilly, as the north-south aligned river valleys are deeply eroded.

The geology of Cavite Province can be divided into two areas; alluvial deposits and Guadalupe formation. Foundation conditions are assessed as fair to good for the busway construction. However, the region is susceptible to strong earthquakes.

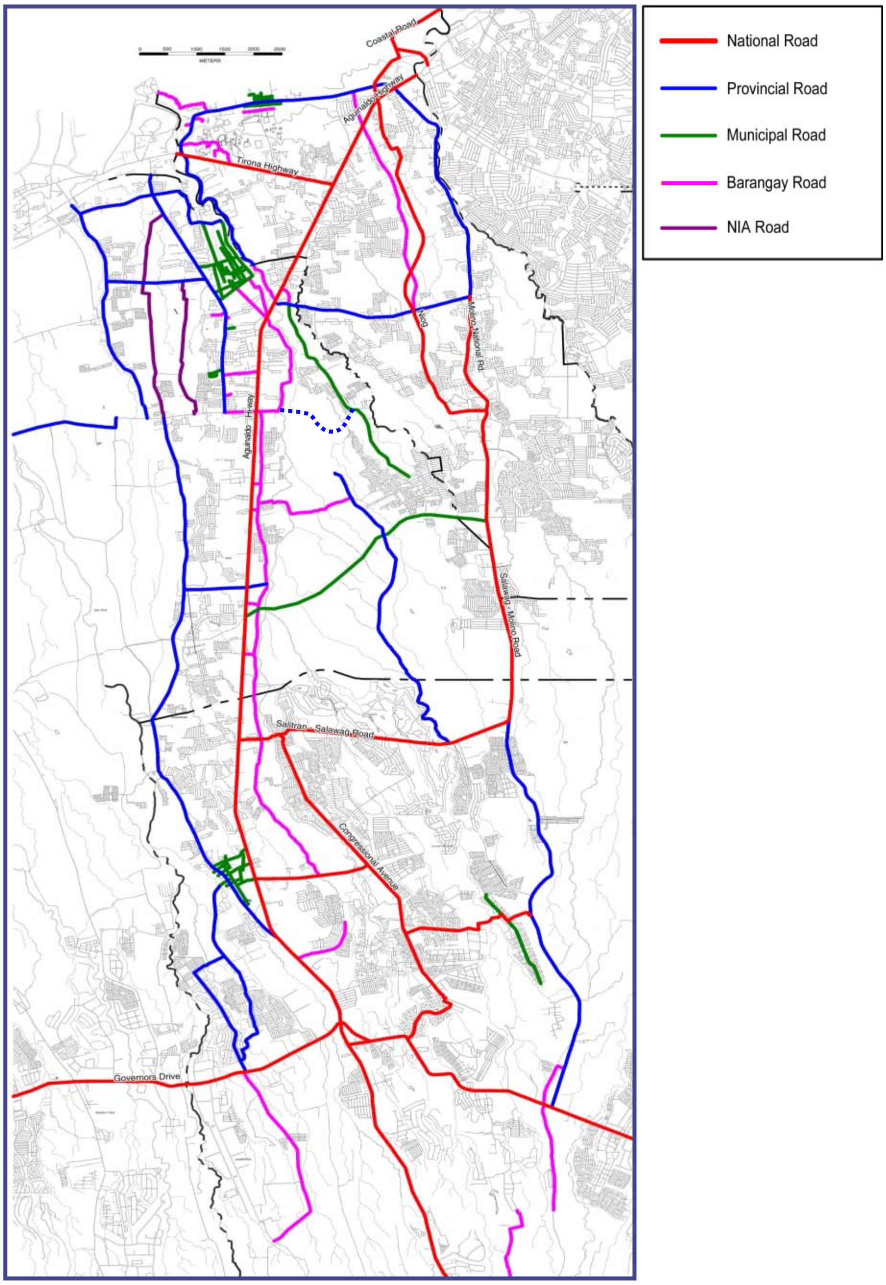
Cavite province belongs to the climatic region-type 1 that is characterized by two pronounced seasons: dry season from November to April and wet season from May to October. These two seasons are caused by the northeast monsoon, two trade winds and southwest monsoon. Amount of annual rainfall in the project area ranges from 2000 mm to 2500 mm.

According to the site investigations, there is no river flooding problem along the proposed road trace alignments except in Bacoor area. According to the simulation results, high water elevation is 2.82 m MSL. Accordingly, the area in the coastal zone of Bacoor would be inundated under a 50- year return period flood.

3.2 Road and Road Transport System

At present, the transport network in the Study Area is only composed of roads which are primarily of paved two-lane roads. Roads are administratively classified as national, provincial, municipal, and barangay roads as shown in Figure 3.1. The Study Area is characterized by two main national roads: Aguinaldo Highway and Molino Road. They are running parallel with each other and are the roads which will be influenced most significantly by the proposed busway since it will be located between these two roads. The traffic situation in the Study Area is already seriously being affected by chronic traffic congestion. With the rapidly growing population, the traffic congestion is anticipated to become further serious. This is one of the reasons why the busway, which will provide a stable and fast transport service, is being proposed.

Figure 3.1 Existing Road Network in the Study Area



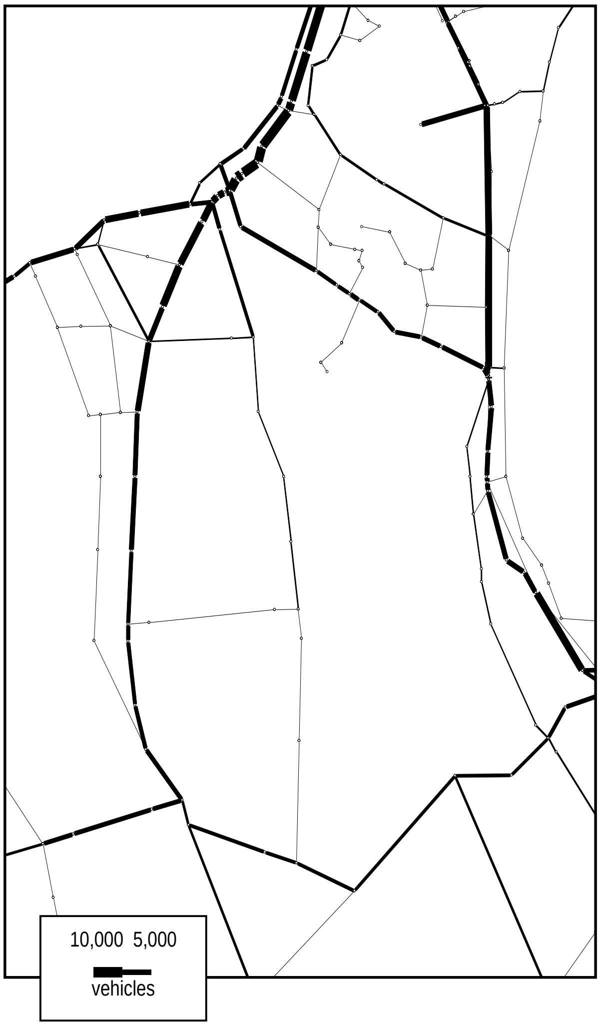
Source: JICA Study Team, based on road maps submitted by the municipalities of Bacoor, Imus and Dasmariñas.

Within the Study Area, Costal Road has the highest traffic volume at 68,000 vehicles per day. Aguinaldo Highway has a traffic volume of 40,000 vehicles at the boundary of Bacoor and Imus and 33,000 vehicles at the boundary of Imus and Dasmariñas.

The routes of Jeepneys are covering most major roads in the Study Area. In general, the jeepney services shorter-length routes. The existing traffic flow of buses are concentrated on Aguinaldo Highway and Real Road (2,000 vehs./day in each road) and Coastal Road (4,500 vehs./day). The distribution of jeepney traffic flow is basically similar with buses, but it is more spread to other minor roads.

Figure 3.2 Bus Traffic Flow, 2002

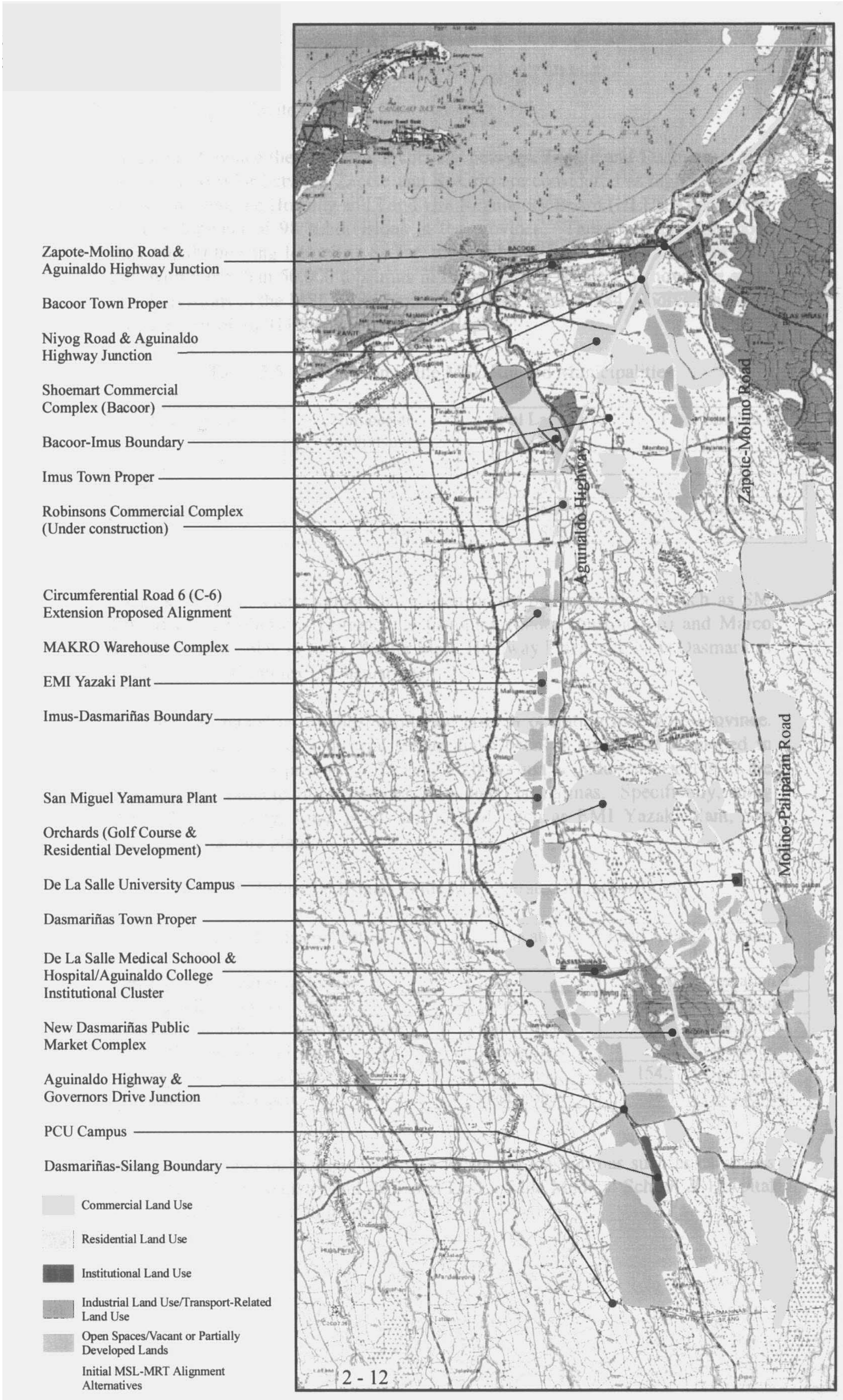
Figure 3.3 Jeepney Traffic Flow, 2002



3.3 Physical/Social Constraints on Busway Corridor

In Bacoor, there are no social as well as environmental issues involved in the alignment. For linking the busway with the Coastal Road, however, a considerable number of existing structures need to be relocated. In Imus, the line will affect some residential areas that are partially developed and open areas for development. Owing to the large-scale land owner cooperative to the busway project, no major constraint is foreseen in Imus. In Dasmariñas, the line will affect several houses at the intersection of Congressional Road and the squatter areas along Aguinaldo Highway. In addition, there are high-voltage electric power lines along Aguinaldo Highway. The proposed busway should be constructed so that the negative impact should be minimized.

Figure 3.4 Major Land Use Features

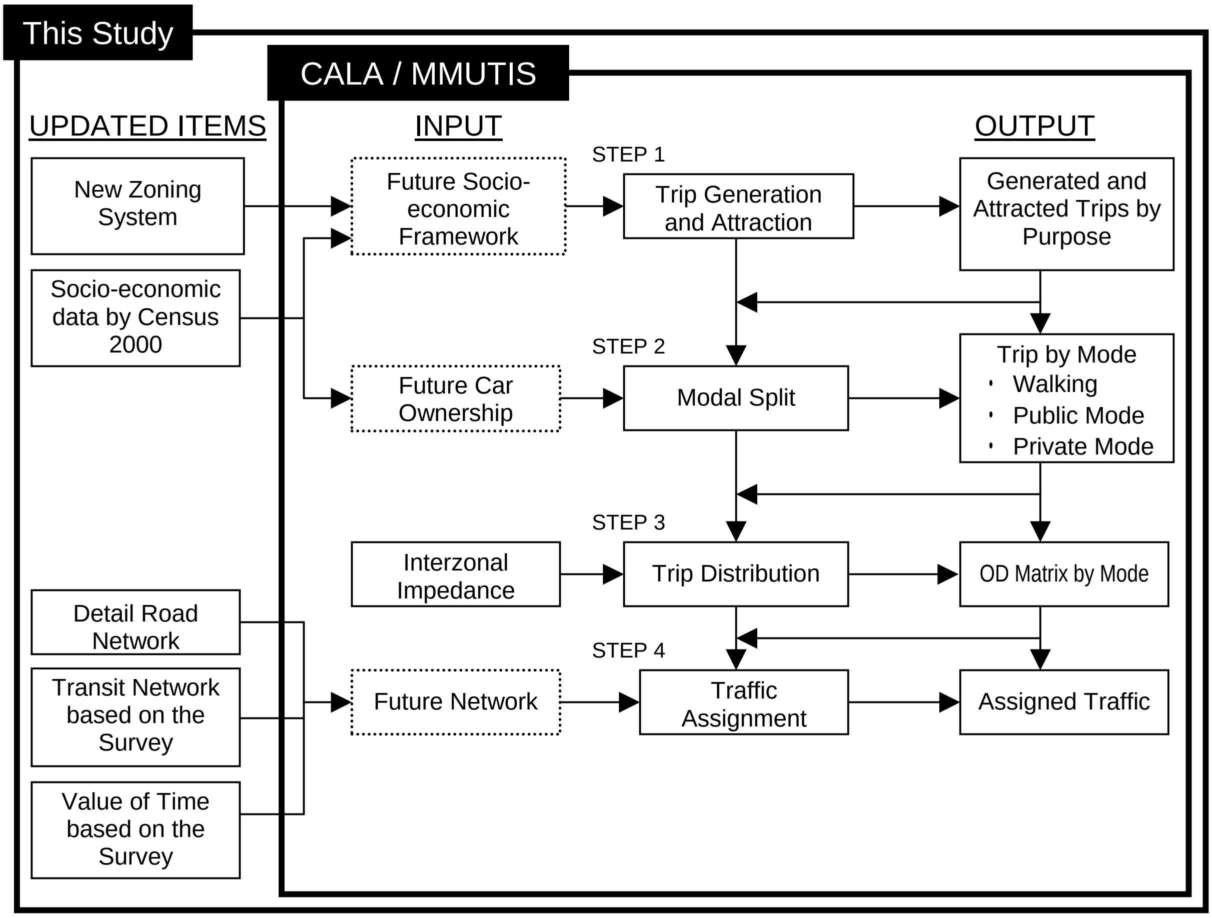


4 DEMAND FORECAST

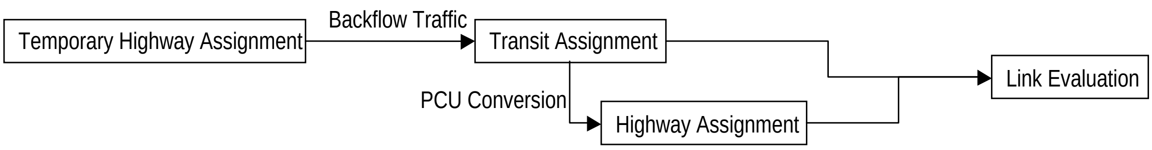
4.1 Methodology

The demand forecast in this study was done as shown in Figure 4.1. This methodology of demand forecast and input data are basically the same as that used in the World Bank's CALA Transport Study. In order to develop a calibrated model, the replication of the model was examined by comparing it with the data from the traffic count survey conducted in March 2002.

Figure 4.1 Framework for the Demand Forecast



Procedure of Assignment



4.2 Future Demand Forecasts

Traffic assignments for the cases shown in Table 4.1 were conducted in this Study. Busway was assumed to have 2 lanes and to be operated at 20km/h. LRT 1 Extension was assumed to exist after 2005 (Baclaran – Bacoor). For the purpose of estimating demand, the proposed busway was assumed to start operation in 2005 (different from actual implementation).

Table 4.1 Traffic Assignment Cases

Cases of Traffic Assignment \ Year	2002	2005	2010	2015 (full network)	2015 (2010 network)
Without Busway					
With no road on busway alignment	x	x	x	x	x
With 2-lane road on busway alignment		x	x	x	x
With 4-lane road on busway alignment		x	x	x	x
With Busway					
With 2-lane busway + 2-lane service road		x	x	x	x
With 2-lane busway + 4-lane service road		x	x	x	x

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. In 2015, assuming a comprehensive and extensive road network development in the Study Area, as proposed by MMUTIS, demand on the Busway would be stagnated. However, it is likely that such an extensive road development may not materialize and in such a case, demand on the Busway will continue to grow rapidly by as much as 70% in the succeeding 5 years after 2010.

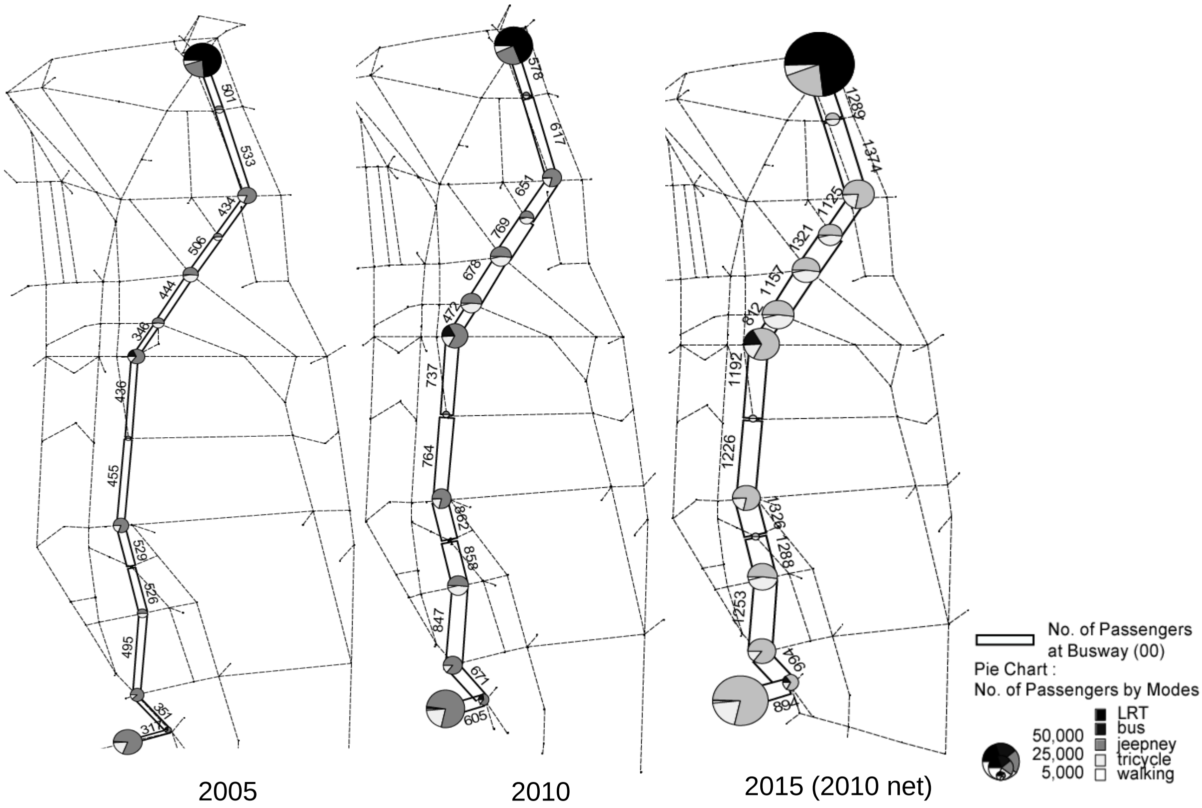
Table 4.2 Busway Demand Summary

Service Road	4 lanes			2 lanes		
	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 (full net)	155,801	9.2	12.55	174,530	8.6	12.27
2015 (2010 net)	239,491	8.8	12.34	224,783	9.1	12.51

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.

Figure 4.2 Passenger Volume on Busway



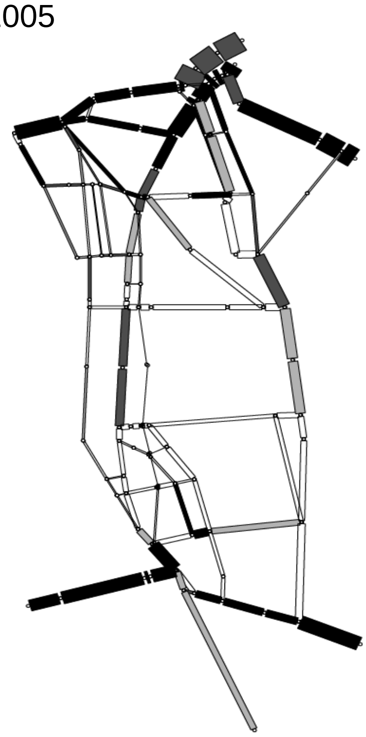
With respect to traffic volume on the ordinary roads, the Busway had little impact on the network. On the other hand, the development of service roads provides motorists another alternative and this will result in a shift in traffic demand as manifested in the lowered traffic volume at parallel links (*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.

In summary, the busway is very significant to the traffic improvement in the area with an average of 30-50% increase in travel speed if it is coupled with the service roads.

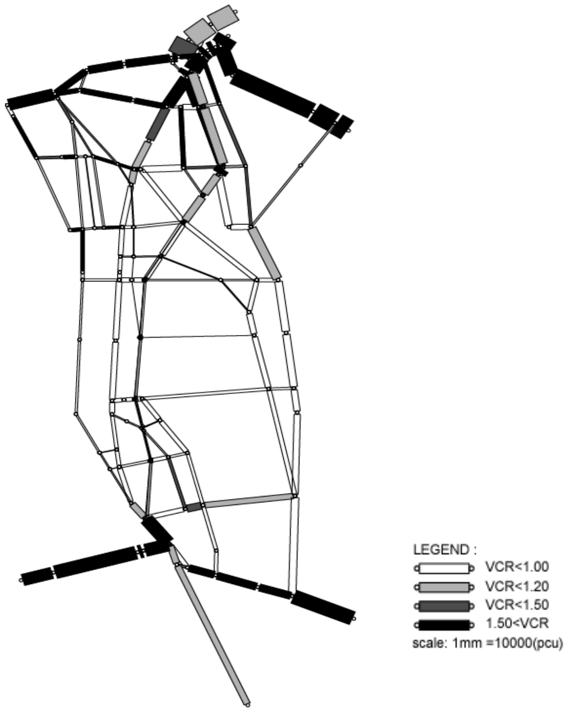
Since Aguinaldo Highway and Molino Road will run parallel to the proposed Busway, the Busway's impact on public transport demands in these roads are significant. With the development of the Busway, it is projected that there will be a greater decrease in the number of operating buses than jeepneys at 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

Figure 4.3 Road Traffic Demand in the Study Area

2005

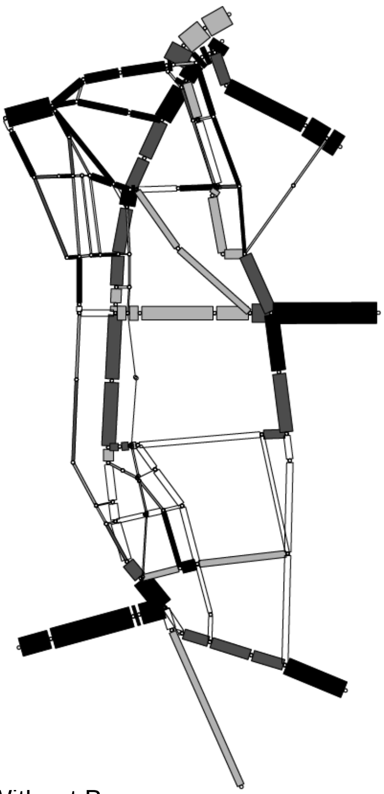


Without Busway

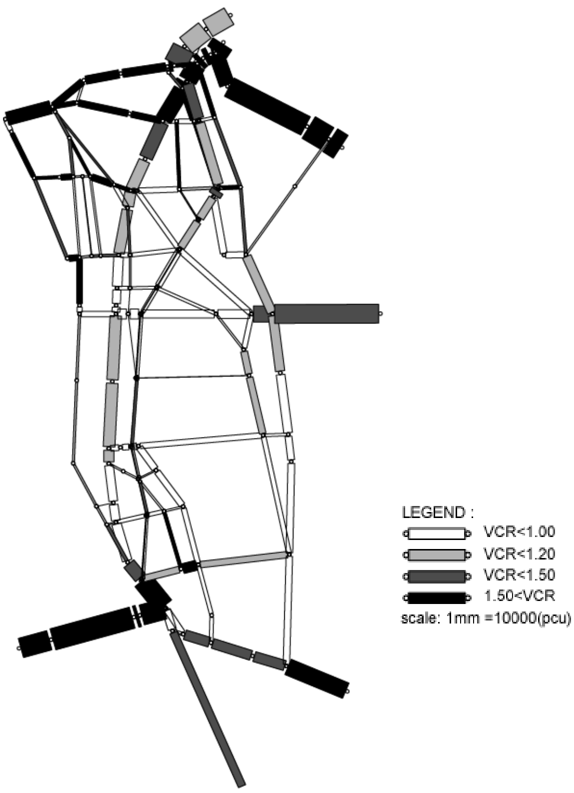


With Busway
4-lane Service Road

2010



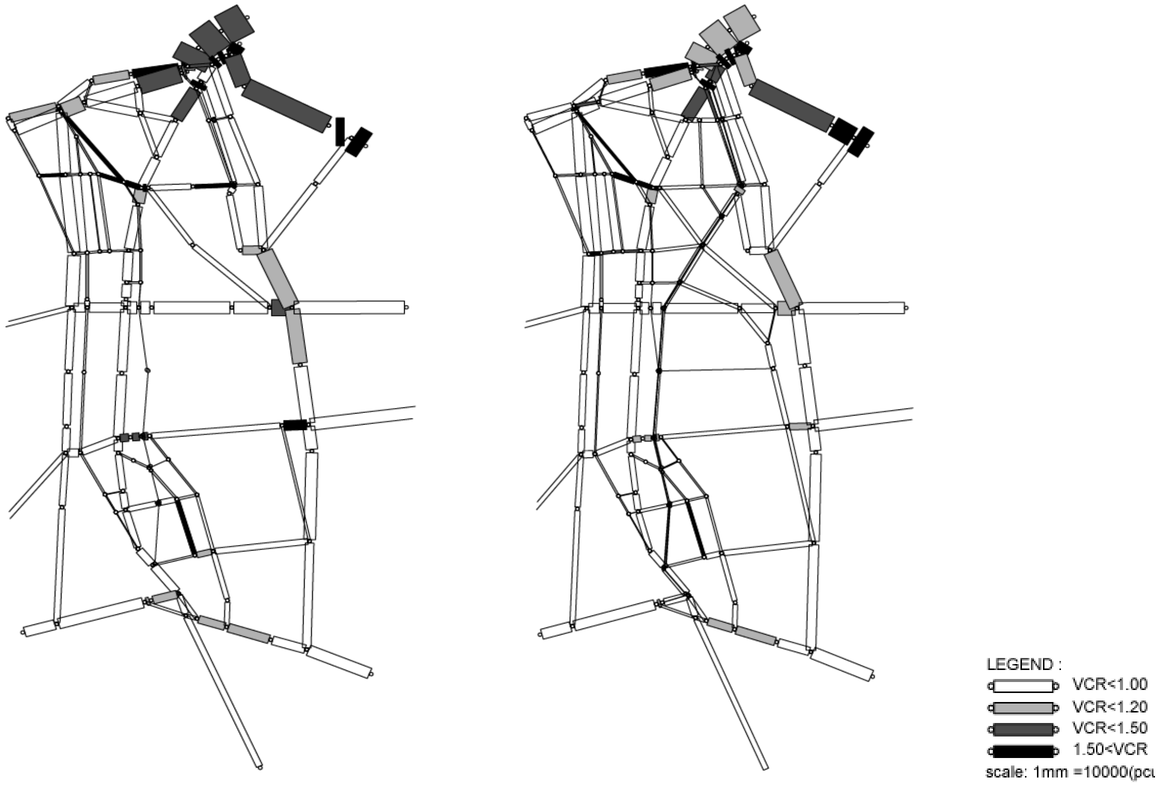
Without Busway



With Busway
4-lane Service Road

Figure 4.3 Road Traffic Demand in the Study Area *(Continued)*

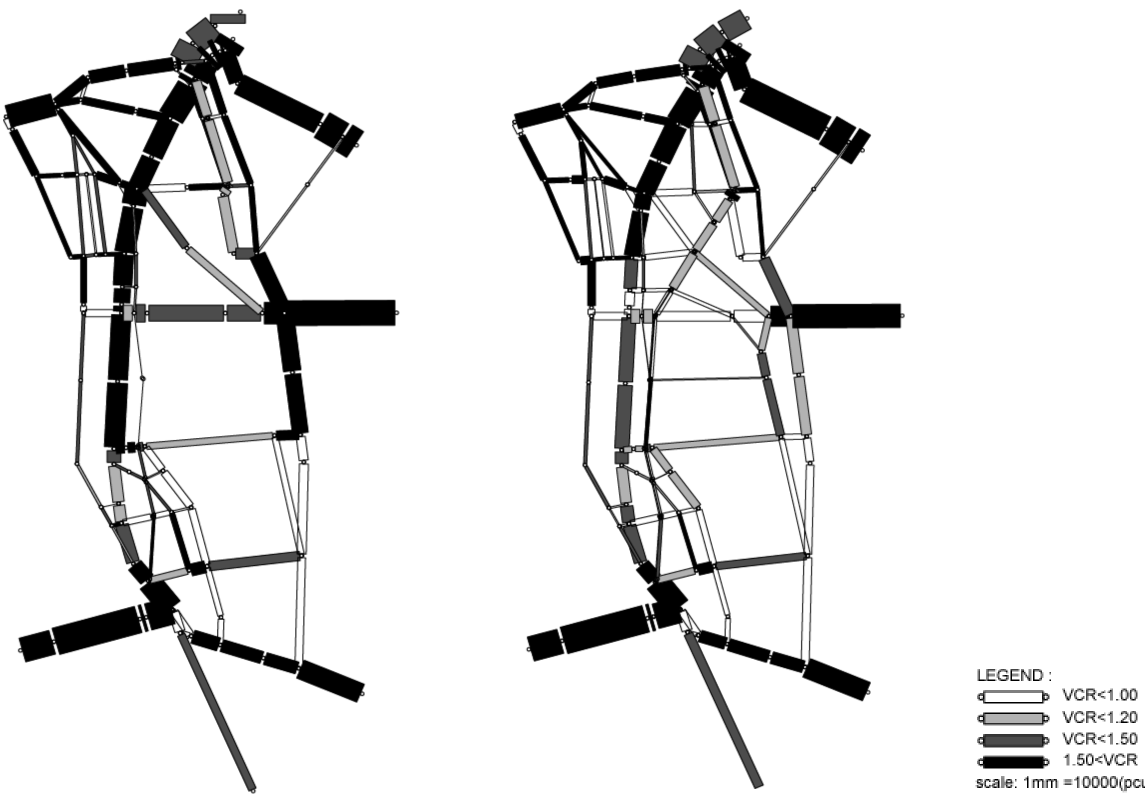
2015（full net）



Without Busway

With Busway
4-lane Service Road

2015（2010 net）



Without Busway

With Busway
4-lane Service Road

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. Because of the decrease in traffic volume of public vehicles on these roads, private vehicles will increase in some areas, especially in Bacoor. This is due to traffic improvement of the study area. In conclusion, the total volume of traffic will decrease by 10-20% in Aguinaldo Highway and 10-30% in Molino Road.

4.3 Other Planning Issues

In order to test the demand elasticity to the fare level, various alternatives were compared. The flat fare system tends to discourage short-distance trips from using the Busway but will tend to attract more end-to-end or long-distance trips. On the other hand, charging high marginal rates for distance traveled could discourage longer trips. At the fixed rate of ₱10 for the first 4 kilometers and ₱0.48 for every succeeding kilometer, performance indicators, most important of which is revenue, are the highest among other alternatives. Incidentally, it is the same rate charged by air-conditioned (A/C) buses. Practically, however, the fare rate of the proposed busway could be set at a reasonably higher level than the existing A/C buses, considering the quality of service provided by the busway.

According to DOTC and LRTA, LRT Line 1 Extension is scheduled to be operational by 2005. However, there is still a possibility for the LRT Line 1 Extension Project to be delayed or suspended if the financial arrangement is not made successfully. Since the primary role of the CBS Project is to construct a Busway between Dasmariñas and Bacoor that can feed into the LRT, the failure in implementing LRT Line 1 Extension could cause tremendous problems for the CBS Project. In order to avoid these problems, the Study Team have decided to prepare a contingency plan assuming the LRT Line 1 Extension is not implemented as scheduled. In order to test this hypothetical scenario, a series of traffic assignment were conducted. Judging from the results of analysis, the existence of LRT Line 1 Extension increases the busway demand, indicating that they are feeding into with each other. If LRT Line 1 is not existing the busway will lose it patronage by about 20-30%. However, if the busway operation is extended to Baclaran, the demand will remain at a similar level. The extension of busway service up to Baclaran seems to significantly contribute to public transport users of the corridor. In the enginnering study of the proposed busway, a smooth linkage of the busway to the Coastal Road should be considered.

5 ANALYSIS OF THE ALTERNATIVE PLANS AND CORRIDOR DEVELOPMENT CONCEPT

5.1 Major Planning Issues of the Cavite Busway System

The CALA World Bank Study has examined the basic planning issues such as selection of the conceptual alignment for the proposed public transport system. This Study has identified and analyzed the detailed issues specifically on the design components of the proposed busway system. These details and remaining major issues on the busway physical planning are as follows:

(1) Confirmation of the cross-section
(2) Finalization of the proposed busway alignment
(3) Preparation of the terminal and bus stop development
(4) Coordination with other regional road network
(5) Coordination with urban development in the corridor

These are global issues and were taken into consideration on the physical planning of the proposed busway. Besides, the constraints for the alternative alignment study are shown in Figure 5.1.

5.2 Examination of the Busway Cross-sections

Figure 5.2 shows a proposed typical cross-section for the busway. 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.

Cross-sectional arrangement for the ordinary traffic road space will differ accordingly depending on the road functions. The road functions are examined dividing into the three sections, namely Section 1: Molino Boulevard Segment in Bacoor, Section 2: New Township Development (One-Asia) Segment in Imus and Section 3: Dasmariñas Segment. In consequence, the cross-section for the ordinary traffic function in the busway corridor. Sections 1 and 2 will adopt this typical cross-section while Section 3 will apply a two-directional operation for ordinary traffic lanes.

Figure 5.1 Major Planning Issues on the Alignment Study

- Connection with the Coastal Expressway
- Coordination with LRT Line 1 extension project at Niog.
- Crossing the existing built-up area in Bacoor. Options are to either widen the existing main road or cross the residential area.
- Coordination with the ongoing highway project, Molino Blvd. ROW will be 30m or less.
- How to minimize the impact on many existing and ongoing subdivision developments providing a sufficient design for the proposed Busway.
- Coordination with a large-scale landowner and to encourage public transport oriented urban development.
- Avoiding the existing subdivision developments in the narrow area between Aguinaldo Highway and the river running parallel to the highway.
- Limited space for busway because of the existing subdivision developments and electric substation, transmission lines and tower.
- Selection of the best location for the busway terminus from both traffic and urban center development perspectives.

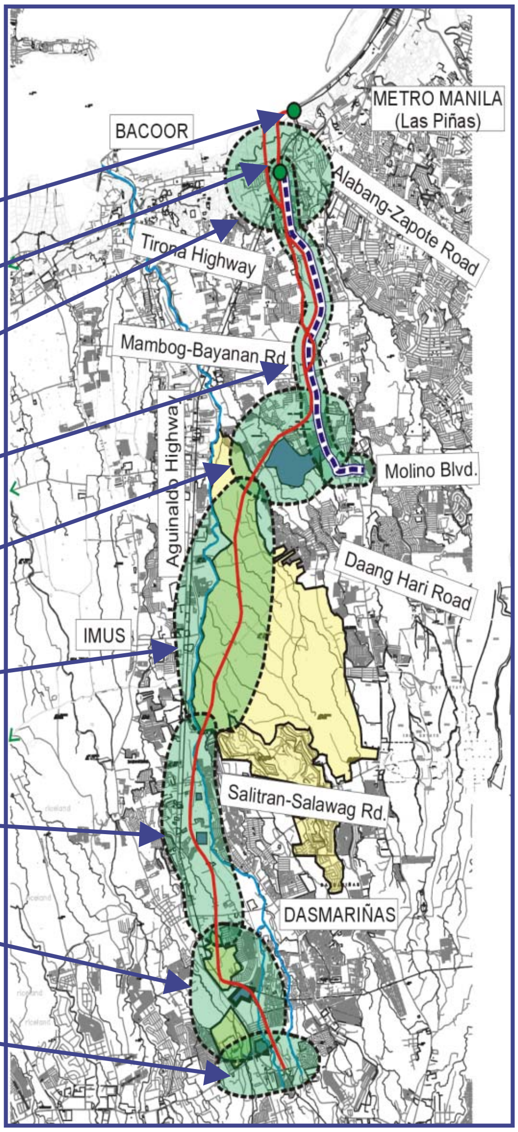
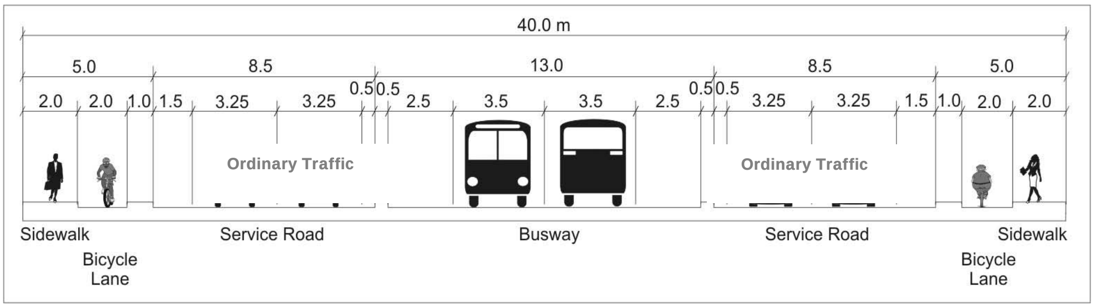


Figure 5.2 Proposed Typical Cross-section for the Busway

Normal Section



5.3 Examination of Alternative Alignments and Terminal Locations

In order to determine an optimum alignment for the proposed busway, several alternative plans are prepared and evaluated taking into account the major issues discussed in the previous sections. Preparation of the alternative alignments was made based on the landuse and administrative boundary of Bacoor, Imus and Dasmariñas, while and Coastal Road Access and location of the Southern Terminal are examined separately. The segments or location for the alternative analysis are:

a) Bacoor	Segment 1:	Brgy Niog to Mambog-Bayanan Road
b) Imus	Segment 1:	Mambog-Bayanan Road to Anabu I
c) Dasmariñas	Segment 1:	Salawag-Salitran Road to Congressional Road
	Segment 2:	Congressional Road to Governor's Drive
d) Coastal Road Access in Bacoor		
e) Southern Terminal in Dasmariñas		

The location of the proposed alternative alignments are shown in Figures 5.3. Alternative alignments and cross-section for Coastal Road access are shown in Figure 5.4 and the alternative locations for the Southern Terminal are shown in Figure 5.5.

Figure 5.3 Proposed Alternative Alignment

Bacoor Imus Dasmariñas

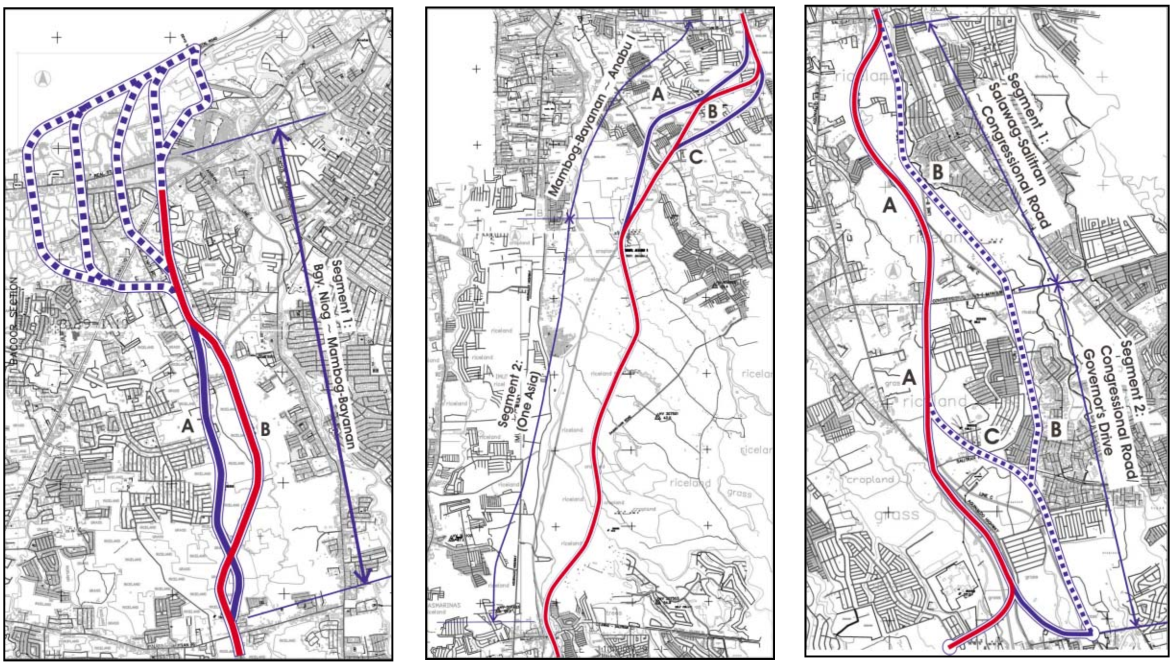


Figure 5.4 Alternative Alignments and Cross-Sections for Coastal Road Access

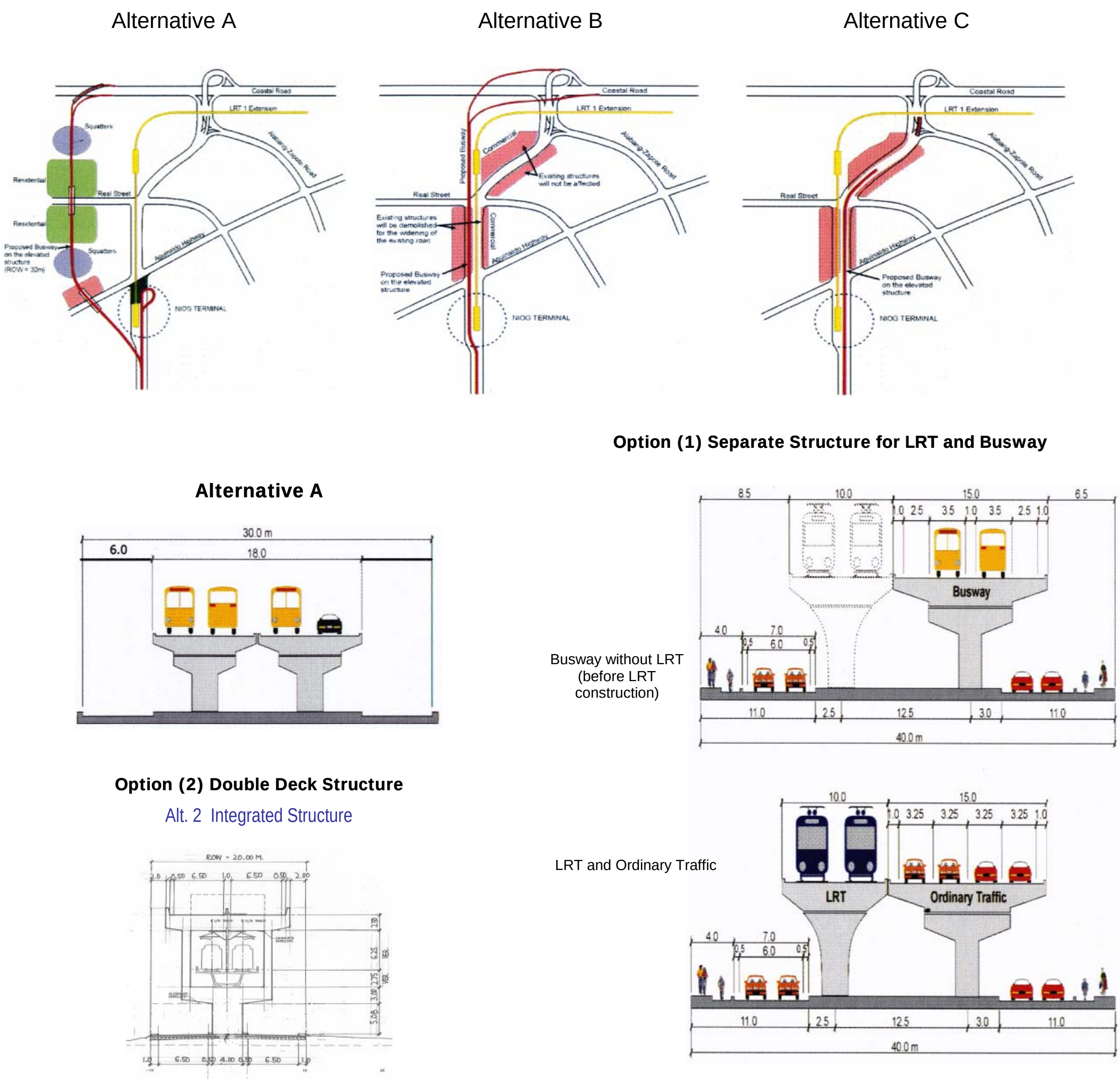
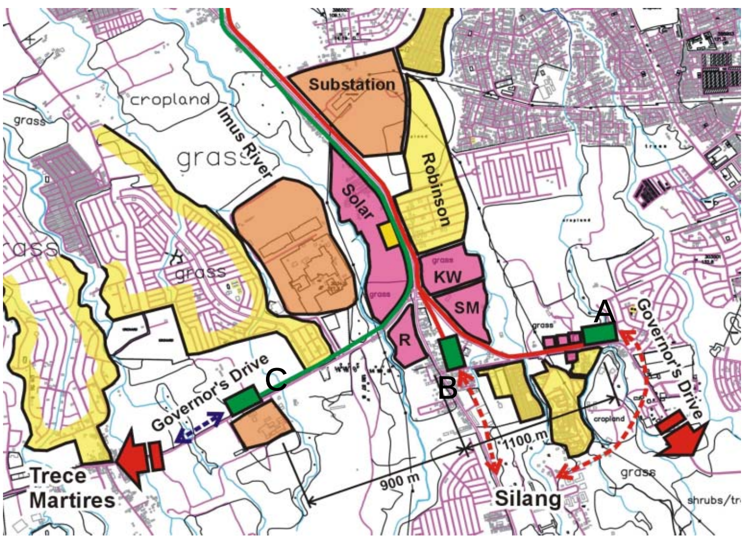


Figure 5.5 Alternative Location for its Southern Terminal



The results of the evaluation of the alternative plans are presented in Table 5.1 and are summarized below:

The segment in Bacoor, the alternative alignment which is sharing the ROW with Molino Boulevard is perturbed in spite of the counter proposal. For Imus Segment 1, although a clear predominance is not observed among the three alternatives, line B may be selected from the viewpoint of the magnitude of disturbance on the existing subdivision development and adequacy of the alignment.

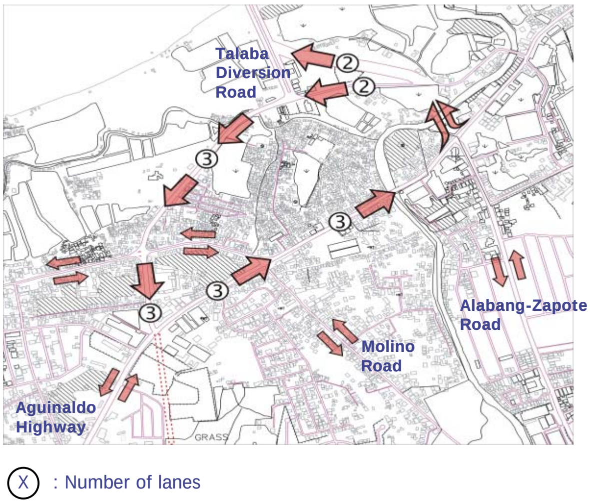
For Dasmariñas section, Segment 1, Line A, which is passing through the center of the narrow area is a favorable alignment judging from the magnitude of project capital requirement. For Segment 2, land survey, negotiation with the electric power substation and preparation of Line B and C were undertaken to determine the most feasible line. However, the alternative alignments will be difficult to justify due to the new subdivision development beside the substation. Eventually, Line A along Aguinaldo Highway was selected.

For the Coastal Road Access, the integrated Structure Line C(b) indicates advantages both on the social impact and on the difficulty in ROW acquisition. However, the other criteria items do not rate this line positively. Thus, eventually, based on the comprehensive evaluation, Line B is selected as the preferred plan.

Although Line B is the preferred plan, there still exist many issues to be addressed during project implementation, as follows, (1) Disturbance on the existing commercial activities along Talaba Diversion Road, and (2) Traffic congestion particularly during the construction stage.

Coordination with LRT Line 1 Extension Project is very important as described above. In case the busway project would be implemented earlier than the LRT project, introduction of an alternative traffic management system (one-way road network) will be effective mitigating measure. (See Figure 5.6.)

Figure 5.6 Proposed One-way System for Tentative Measure



The proposed Southern Terminal will be located westbound of Governor’s Drive, with providing for a preferred accessibility on the feeder system heading towards Trece Martires. However, accessibility toward south, Silangbound, will also be indispensable to generate a sufficient ridership on the proposed busway system so that sufficient facilities for southbound should be provided either at the Pala-pala station or San Agustin station located along Aguinaldo Highway.

Table 5.1 Evaluation of the Alternative Alignments and Terminal Locations

BACOOR SECTION

Alternative Options	Line A	Line B
Magnitude of Disturbance on Existing Development	B	A
Difficulty in ROW Acquisition	B	A
Construction Difficulty	A	A
Adequacy of the Alignment for the Project	A	A
Magnitude of Project Capital Requirement	B	A
Overall Evaluation (Preferred Alignment)	B	A

IMUS SECTION

Alternative Options	Line A	Line B	Line C
Magnitude of Disturbance on Existing Development	B	A	A
Difficulty in ROW Acquisition	C	B	B
Construction Difficulty	A	A	A
Adequacy of the Alignment for the Project	C	A	B
Magnitude of Project Capital Requirement	C	A	A
Overall Evaluation (Preferred Alignment)	C	A	B

DASMARIÑAS SECTION Segment 1 (Salawag-Salitran Rd. to Congressional Rd.)

Alternative Options	Line A	Line A Variation A-1	Line B: East Line + Line Variation B-1
Magnitude of Disturbance on Existing Development	A	A	A
Difficulty in ROW Acquisition	B	B	A
Construction Difficulty	A	A	B
Adequacy of the Alignment for the Project	B	B	A
Magnitude of Project Capital Requirement	A	A	B
Overall Evaluation (Preferred Alignment)	A	B	B

DASMARIÑAS SECTION Segment 2 (Congressional Rd. to Governor's Drive)

Alternative Options	Line A (Western Alignment)	Line B (Eastern Alignment)	Line C
Magnitude of Disturbance on Existing Development	A	B	C
Difficulty in ROW Acquisition	A	C	B
Construction Difficulty	B	C	C
Adequacy of the Alignment for the Project	A	B	C
Magnitude of Project Capital Requirement	B	B	A
Overall Evaluation (Preferred Alignment)	A	C	B

COASTAL ROAD ACCESS

Alternative Options	Line A	Line B	Line C(a)	Line C(b)
Magnitude of Disturbance on Existing Development	C	B	B	A
Difficulty in ROW Acquisition	C	B	B	A
Construction Difficulty	A	B	B	C
Adequacy of the Alignment for the Project	-	-	-	-
Magnitude of Project Capital Requirement	B	A	C	C
Overall Evaluation (Preferred Alignment)	C	A	B	C

SOUTHERN TERMINAL LOCATION

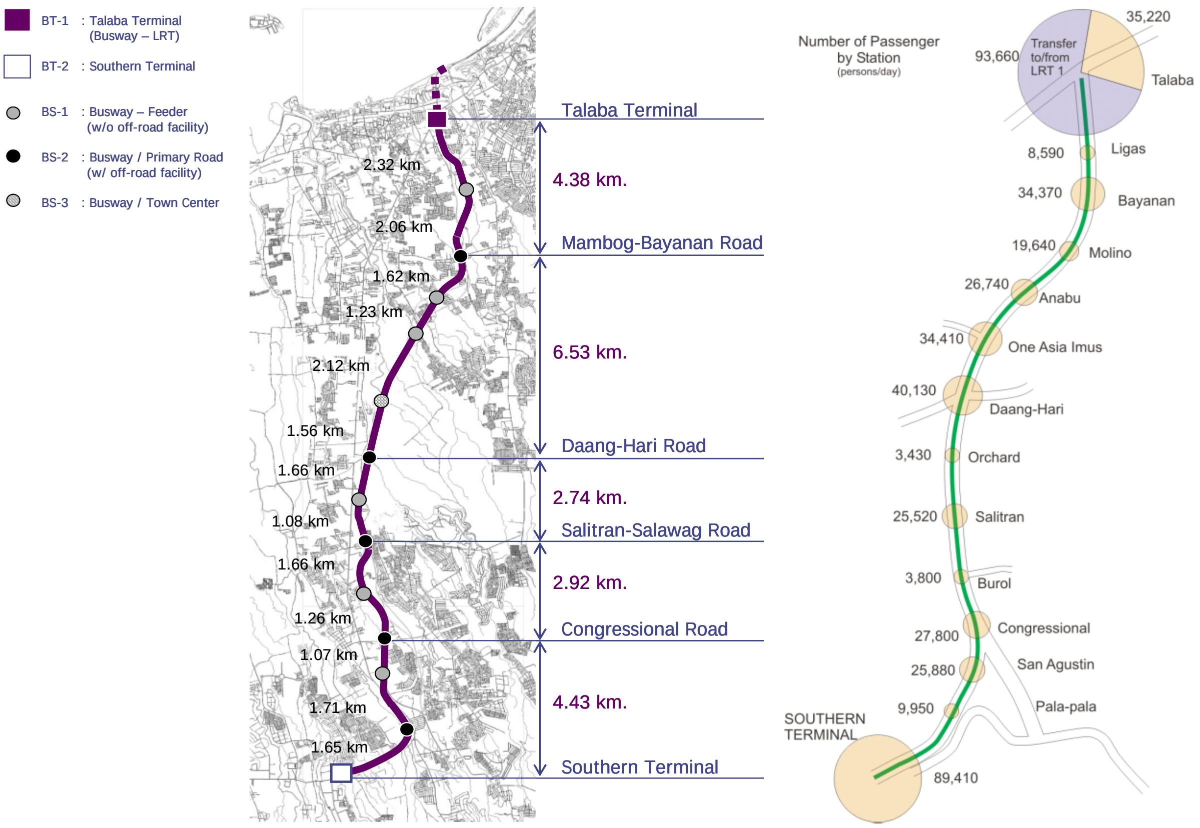
Alternative Options	A	B	C
Distance from Pala-pala	B	A	B
Accessibility for the Feeder			
Silang	A	A	C
GMA	C	B	A
Trece Martires	B	C	A
Impact to the Traffic Congestion at Pala-pala Intersection	B	C	A
Land Availability on Approach Section	C	B	A
Overall Evaluation (Preferred Alignment)	C	B	A

5.4 Terminals and Bus Stops Development

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.

Typical bus stop spacing based on prevailing practices range from approximately 300m to 500m. While the proposed busway project will have to provide a high level of service in terms of travel speed of buses, a distance longer than the above-mentioned range should be considered in deciding the proper bus stop spacing. Based on the above discussion, the intersected roads and the land use, a 1 to 2-km bus stop spacing can be adopted in this study. Proposed Terminal and Bus Stop Location and their boarding/alighting passenger demand are shown in Figure 5.7.

Figure 5.7 Proposed Terminal and Bus Stop Location and their Demand



Two (2) types of bus terminals and three (3) types of bus stops are identified as shown in Figures 5.7, with the conceptual designs illustrated in Figures 5.8 based on the following description. Overview of the proposed Bus Stops and Bus Stop Areas are illustrated in Figure 5.9 and 5.10.

Figure 5.8 Conceptual Design of Bus Terminals

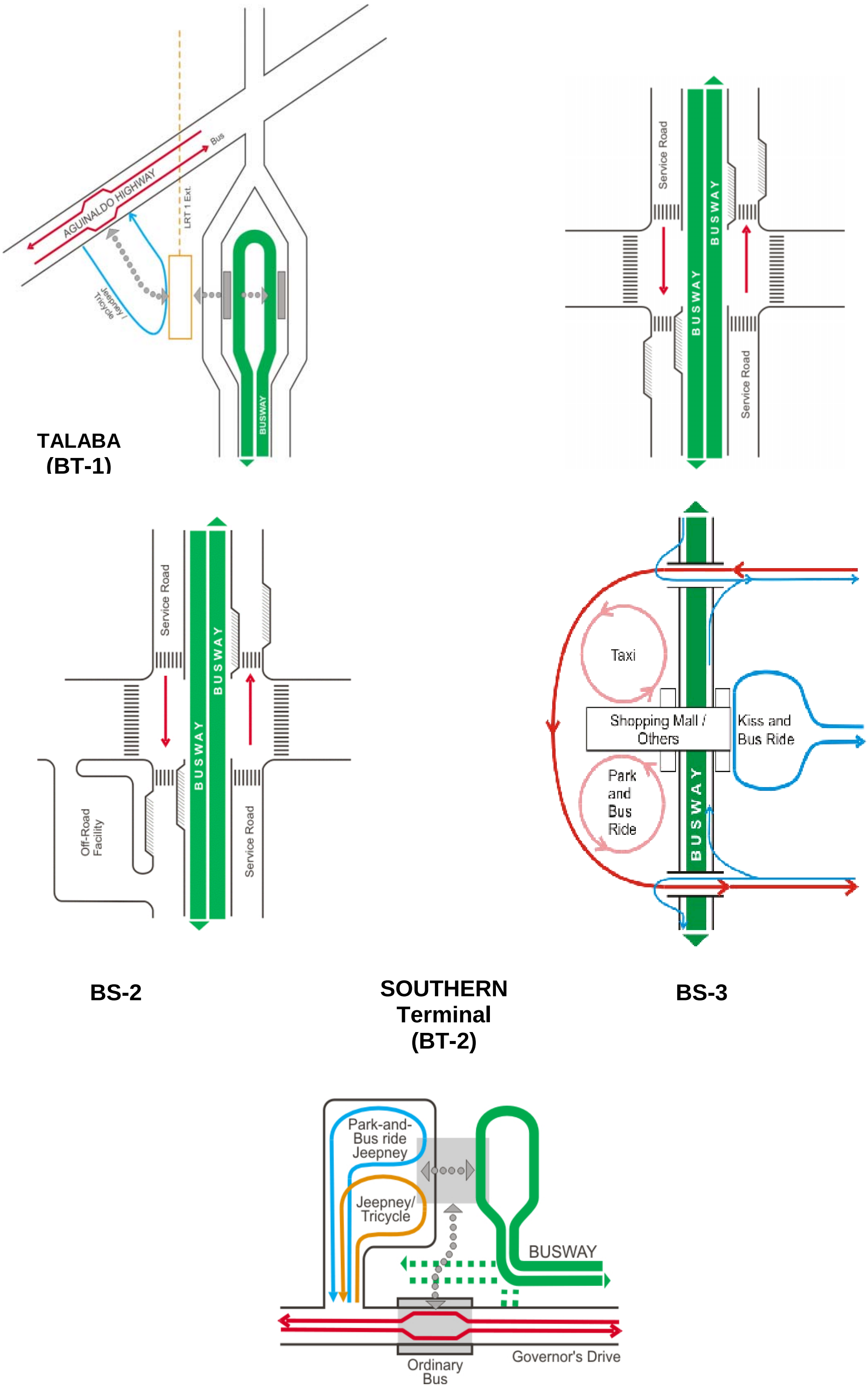


Figure 5.9 Sketch Layout for Typical Bus Stops

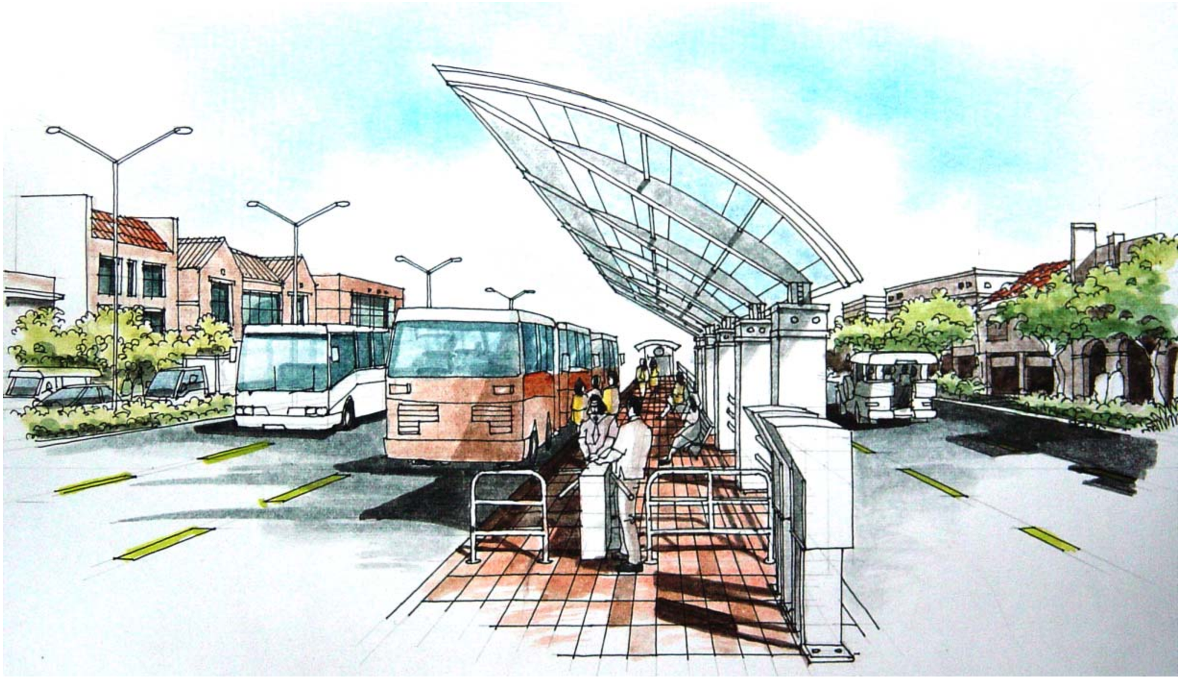


Figure 5.10 Overview of the Proposed Bus Stop Area

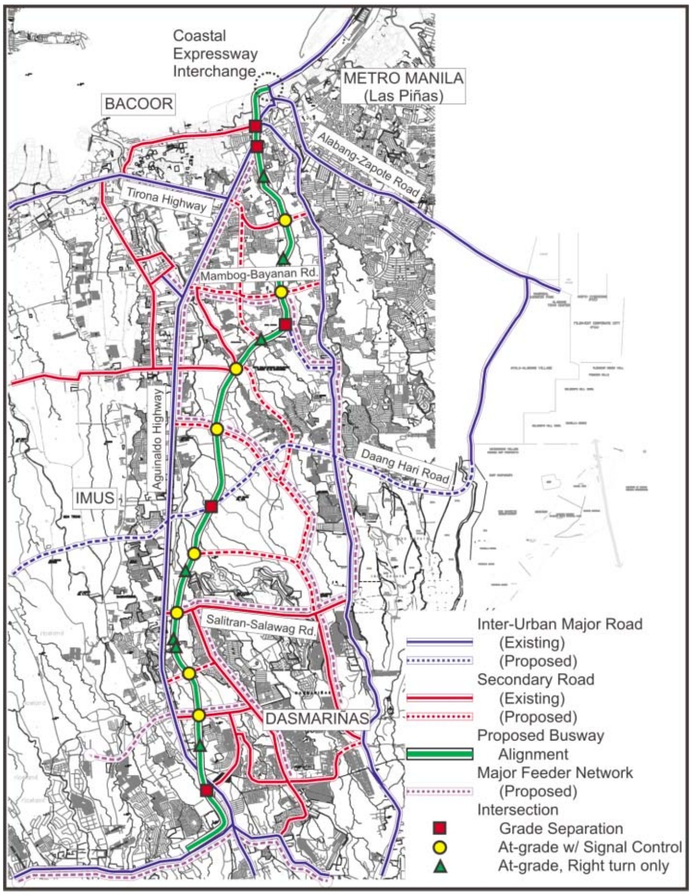
5.5 Secondary Road Network and Intersection Planning

Secondary road network system for the Study area is examined based on the concept of the urban road systems and existing road conditions. The proposed secondary road network with Busway Feeder system in the Study area is shown in Figure 5.11.

The proposed busway will cross several primary, secondary and even local roads from the Coastal Expressway in Bacoor to Governor’s Drive in Dasmariñas. Whether these intersections will be at-grade or grade-separated will be dependent on not only traffic demand but also function of the roads being intersected.

Intersection planning on the proposed busway will basically refer to the two aspects of the busway, the bus exclusive lane and the secondary road and it should be examined carefully on each crossing point. The intersection planning for the bus exclusive lane may require higher standard of intersection facilities to provide a better bus transport services such as travel speed, comfort and such other factors. In addition, design of the busway at intersections should be coordinated with the design of the proposed bus terminal/bus stop and future extension of the LRT system on the proposed busway. The proposed type of intersection is shown in the figure.

Figure 5.11 Proposed Secondary Road Network and Intersection



5.6 Busway Corridor Development Strategies

Land uses along the corridor can accommodate higher development densities than can be currently achieved with the present transport infrastructure network with the provision of a higher capacity busway along the new proposed alignment.

The land uses along the corridor vary throughout the alignment, with the areas surrounding the major terminals generally having a commercial use, and residential uses predominant in the areas between the two end terminals. Some industrial uses will also be located in the suburban development zone in Imus, as well as an urban expansion zone in Bacoor. Institutional uses will be located in the Imus suburban development, as well as retention of educational uses for the mixed use zone in Dasmariñas. Figure 5.12 shows the development concept of land use along the busway corridor, described by general zones and major land uses.

Figure 5.12 Land Use Development Concept

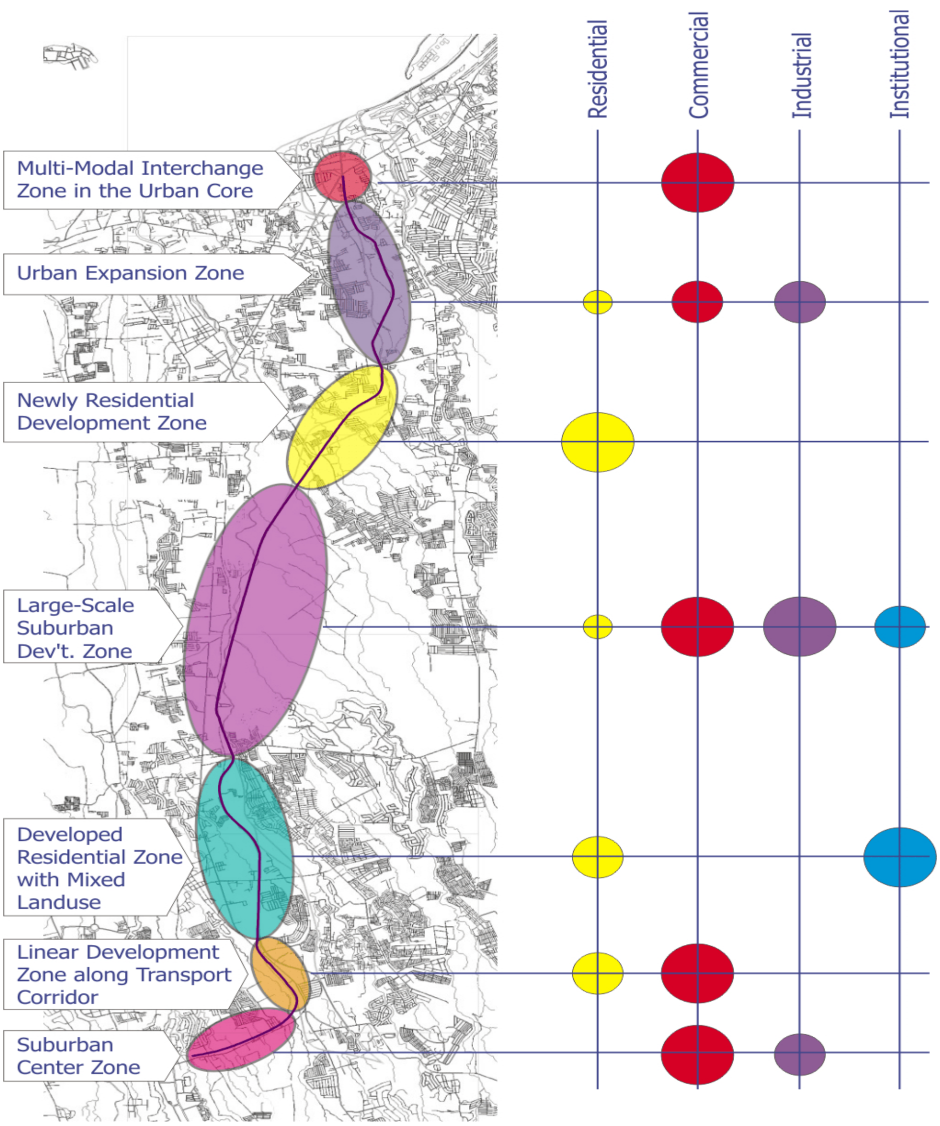


Figure 5.13 and Figure 5.14 are showing the examples for the integrated urban center development with proposed Bus Terminals and major Bus Stops.

Figure 5.13 Terminal Area Development/ Redevelopment Concept

Figure 5.14 New Type of Mode Interchange with Town Center

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:

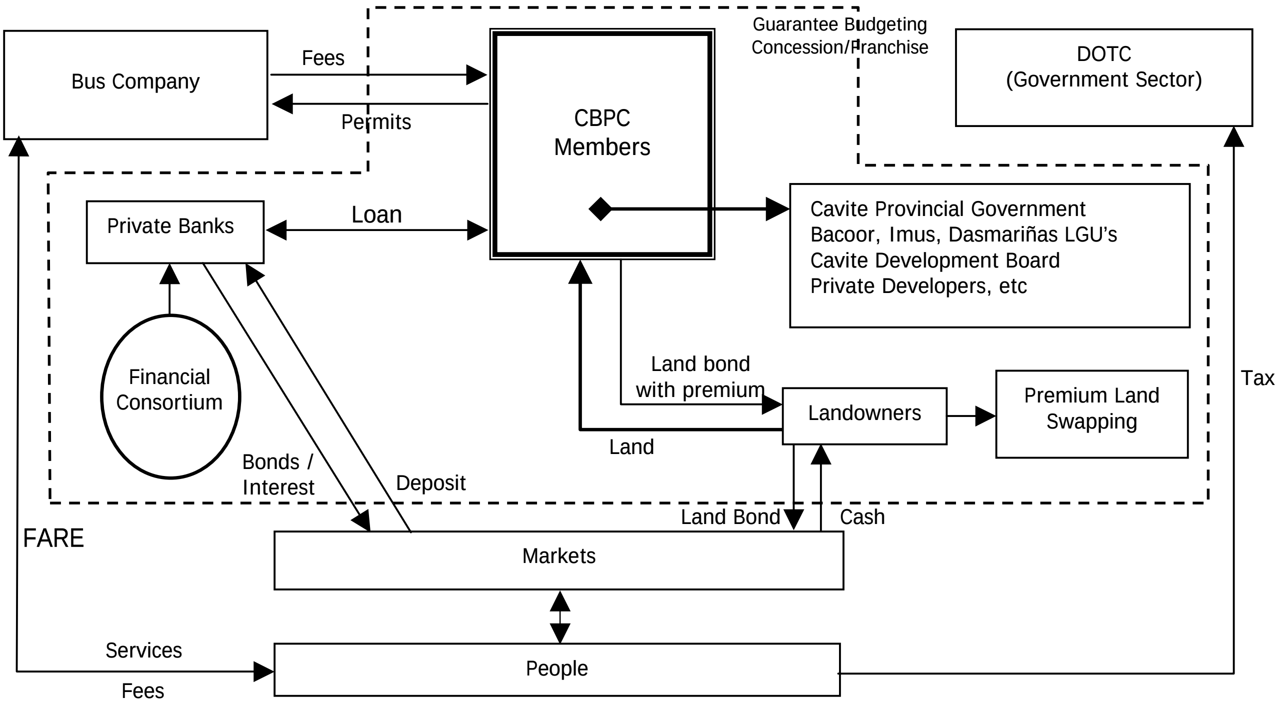
- To develop the land use plan and development program for the corridor (the plans should be enacted);

- 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.

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 financial mechanism for the operation of CBPC is conceptually summarized in Figure 5.15.

Figure 5.15 Financial Scheme for the CBPC



CBPC: Cavite Busway Public Corporation
Premium Land Swapping: Special premium and priority purchase rights given to land bond holders for the land developed in the busway corridor.

6 ENGINEERING STUDY

6.1 General

The Design Standard and Guidelines adapted for this project were based on the "Guide for the Design of High Operational Vehicles (HOV) Facilities", AASHTO 1998, for the Busway component. Some dimensions of the relevant LRT System have been referred from the standards of LRTA and these were considered in planning the cross section and vertical alignment of the Busway facility. Other manuals have been referred to, such as AASHTO's "A Policy on Geometric Design of Highways and Streets", 2001 Ed. and the DPWH Design Guidelines, Criteria and Standards, 1988 Edition, for the service road component and in consideration of local conditions.

The Busway has been planned initially as a Highway facility. However, provisions have been made for future conversion of the proposed facility to accommodate the LRT System, in anticipation of the proposed extension of LRT 1 from Baclaran to Zapote and eventually to Imus in Cavite.

Widths of carriageway for both the Busway facility and service roads are based on the abovementioned guidelines with due consideration to projected traffic volumes and composition. Shoulders for Busway and service roads with sufficient widths were also provided to allow horizontal clearance, to provide traffic safety and convenience, and to protect the structural component of the roadways. One Bike lane in each direction, has been included in the cross sectional features of the Busway facility.

6.2 Structural Aspect

The choice of structure for the flyover and bridges was based on the following criteria:

a. Economy
b. Characteristics of Structure
c. Construction Method (Construction Period and Traffic Obstruction)
d. Maintenance Cost
e. Aesthetics

The results of the evaluation of the loadings by HS20-44 and LRT System indicate the necessity to design the structures for the Busway in accordance with the LRT loading requirements.

Planned structures for the Busway facility are as follows:

a. Molino Blvd. Flyover
b. Imus River Bridge
c. Baluctot River or Ilang ilang River Bridge
d. Aguinaldo Flyover
e. Orchard Road Overpass
f. Vista Verde Subdivision Overpass
g. Pala-pala River Bridge

6.3 Pavement Structure

Basically, the results of the traffic study for the Busway project and the selected design variables considering soils conditions and specifications of materials to be used, served as the basis in determining the different thickness of the pavement structure components.

The results of the pavement structure evaluation indicate the following thickness:

For Busway facility:

a. Surfacing: 100 mm Asphalt Concrete
b. Base Course: 100 mm Asphalt Treated Base
   150 mm Crushed Aggregate Base Course
c. Subbase: 200 mm Aggregate Subbase Course

For the Service Road (In all segments/sections)

a. Surfacing: 230 mm Portland Cement Concrete Pavement
b. Subbase: 200 mm Aggregate Subbase Course

The evaluation considers using improved sub-grade having CBR of 10% minimum, since the alignment passes through lands, which were utilized previously for agricultural purposes.

6.4 Highway Drainage System

The proposed drainage system of the Busway facility consists of collector pipes and curb inlet manholes to drain surface runoff from the pavement. On the other hand, pipe and box culverts were provided for existing and minor waterways. Rivers were provided with bridge structures as discussed above.

The sizes of drainage structures were established based on the hydrologic and hydraulic analysis conducted along the busway corridor. The process involve determining various factors such as flood frequencies, intensities and rainfall duration, topographical features of the project area and tributary areas or water catchment areas.

6.5 Street Lighting System

Considering traffic safety and convenience especially at night, street lighting system shall be provided. The street poles will be installed every 35m interval or as required along the alignment. Design and specifications shall conform to those provided in the Memorandum of Agreement executed between the DPWH and MERALCO.

6.6 Ancillary and Miscellaneous Structures

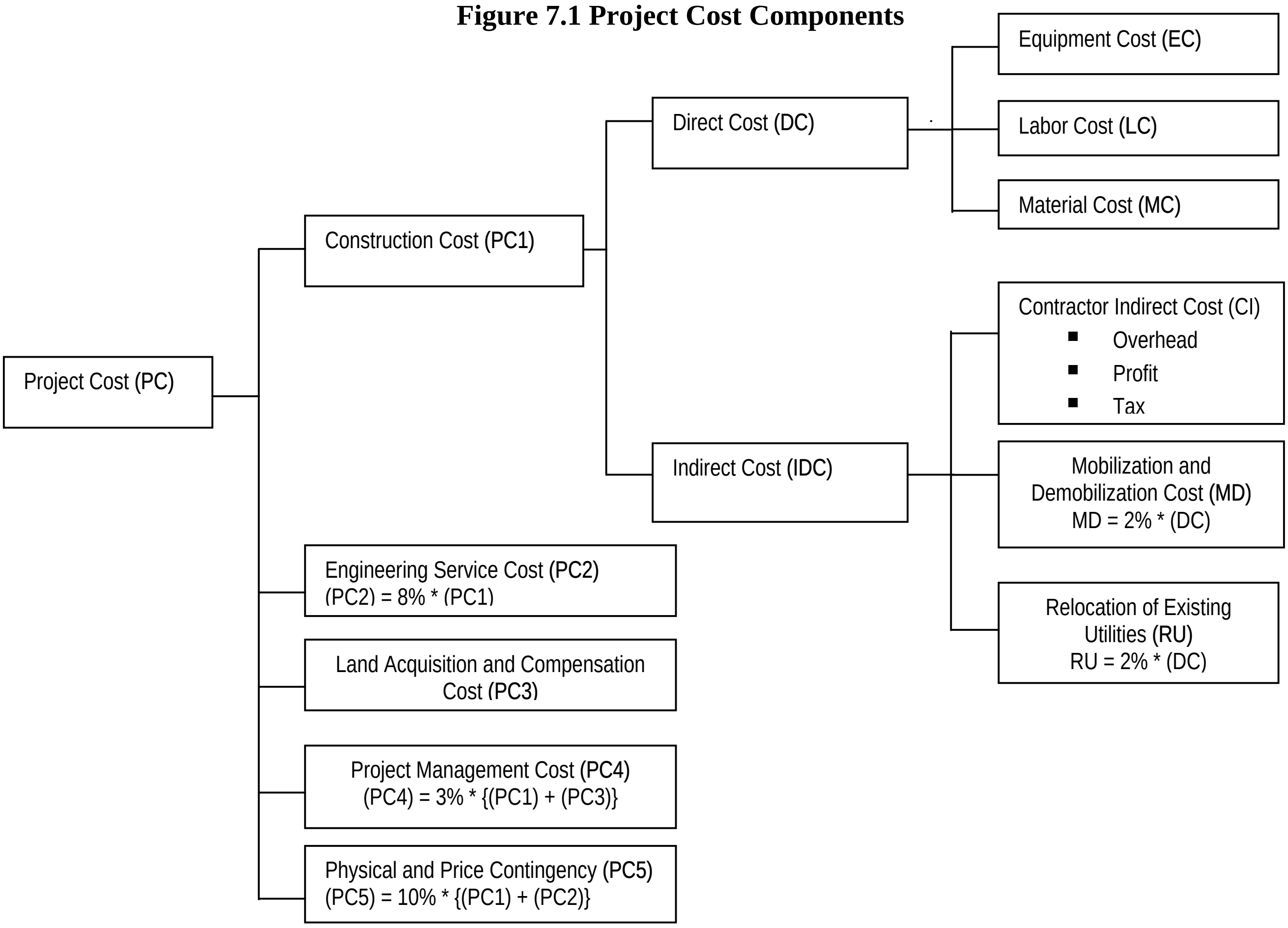
Traffic signs and pavement markings will be provided for road safety requirements. Major intersections will be signalized. Provisions and specifications will be based on the guidelines set forth in the Philippines Manual on traffic signs and markings and other applicable manuals and references.

7 COST ESTIMATION, INVESTMENT SCHEDULE AND ECONOMIC ANALYSIS

7.1 Composition of Project Cost (PC)

The components of the Project Cost (PC) consists of Construction Cost (PC 1), Engineering Service Cost (PC 2), Land Acquisition and Compensation Cost (PC 3), Administration Cost (PC 4), and Contingency (PC 5) as shown in Figure 7.1.

Figure 7.1 Project Cost Components



1) Construction Cost (PC 1)

The Construction Cost consists of Direct Cost (DC) and Indirect Cost (IDC), and Direct cost comprises with equipment costs, material costs and labor costs. (DC) of Each Work Item is estimated by applying the following estimating method: Unit Cost multiplied by work Quantities concerned. And Total Construction Cost is calculated by adding up the Cost of Each Work Item.

Indirect Costs are basically classified as Contractor Overheads (CO), Contractor Profit (CP), Mobilization and Demobilization Cost (MD) and Tax (VAT) and those are calculated by applying the percentage to the calculated Direct Cost (DC) respectively. Those percentages are as shown in the above Figure 7.1.

2) Engineering Service Cost (PC 2), Land Acquisition and Compensation Cost (PC3), Administration Cost (PC 4), Contingency (PC 5)

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.

7.2 Project Cost Estimation

The Estimated Project Cost is the sum of the Construction Cost, Engineering Service Cost, Land Acquisition and Compensation Cost, Administration Cost, and Physical and Price Contingency.

Summary of Project Cost is shown with Currency Components in Table 7.1 and 7.2.

Table 7.1 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)
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 7.2 Project Cost for Coastal Road Access

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

7.3 Investment Schedule and Economic Evaluation

Investment schedule for the Cavite Busway is shown in Table 7.3. The busway will start its operation on the first day of 2008.

Table 7.3 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	

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 and one-time overlay will cost ₱863 million every 5 years assuming ₱1,300 per one square meter.

Economic cost of the project was estimated by applying a standard conversion factor (SDF) of 83% to all the cost components except land cost.

Table 7.4 Economic Cost of the Project

(Unit Cost: Million Pesos)

Project Component	DD Cost (Foreign C.)	Construction		ROW Cost (Local C.)	Total Cost		
		Foreign/C.	Local/ C.		Foreign/C.	Local/ C.	Total
Busway	59.0	1109.8	648.0	1135.2	1168.8	1783.2	2952.0
Service Road	72.3	1241.8	980.8	2648.8	1314.0	3629.6	4943.6
Coastal Access	15.7	279.8	197.0	432.4	295.5	629.4	924.9
Total	147.0	2631.3	1825.8	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, respectively after conversion.

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 as shown in Table 7.5 using overall inflation rates during 1997 – 2001.

Table 7.5 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

By applying above unit costs to assigned traffic volume and summing VOC and TTC on each link, aggregate transportation cost was estimated. 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.

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. 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 7.6).

Sensitivity analysis was made by changing the initial/maintenance cost upward and economic benefit downward as shown in Table 7.7. The entire project will remain economically feasible unless the cost increases over 1.5 times and the benefit drops to less than 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%.

In this analysis, it was assumed that road network would 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 will become 26.8% and EIRR of busway alone is 18.2%.

Table 7.6 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

Table 7.7 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

In addition, if all the six lanes are used as ordinary road instead of the busway, EIRR of the general 6-lane road becomes higher at 48.7%. This means that the exclusive use of two lanes for bus service will sacrifice some part of benefit accruing to private car users. However, in order to promote public transport, to improve living environment and to meet the demand of the lower-income class, the Cavite Busway has been proposed from social, political and environmental viewpoints.

8 BUS OPERATION PLANNING

8.1 Bus Operation

Five types of operation are examined and the "closed operation" is selected.

Table 8.1 Summary of Evaluation of the Five Types of Operation

Evaluation Item	Type of Operation				
	Closed Operation	Open at South End	Open at South and Major Stops	Open at North Terminal	Fully Open Ended
New Transport Model	Good	Fair	Fair	Poor	Poor
Operational Controllability	Good	Poor	Poor	Poor	Poor
Congestion at Station	Poor	Good	Good	Good	Good
Administration	Good	Poor	Poor	Poor	Poor
Financial Robustness	Good	Fair	Fair	Fair	Fair
Total of Categorized Score	13	9	9	8	8

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

8.2 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.

Table 8.2 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

8.3 Bus Operation and Management

The concept of bus operation and management is described in Table 8.3.

Table 8.3 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.

8.4 Financial Analysis

(1) 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).

Table 8.4 Balance Sheet Pro-forma

(Unit Cost: Million Pesos)

Items	Year			
	2008	2010	2015	2022
Current Assets				
Cash on hand and in banks	286.2	939.2	6737.4	21839.9
Fixed Assets				
Buses (Accumulated Invest.)	1111.8	1305.7	2235.2	4520.6
Buses (Accumulated Deprec.)	100.8	341.4	1303.8	3166.7
Others (Accumulated Invest.)	4.8	16.3	62.2	151.2
Others (Accumulated Deprec.)	2.4	8.2	31.1	75.6
Assets Total	1299.6	1911.7	7699.9	23269.4
Liability				
Short-term Loan	0.0	0.0	0.0	0.0
Long-term Loan	336.5	300.9	127.6	0.0
Liability Total	336.5	300.9	127.6	0.0
Capital				
Paid-up Capital	800.0	800.0	800.0	800.0
Accumulated Income	163.1	810.7	6772.3	22469.4
Capital Total	963.1	1610.7	7572.3	22469.4
Liability and Capital	1299.6	1911.7	7699.9	23269.4
Note: Net Worth / Total Capital	0.74	0.84	0.98	1.00

(2) Income Statement Pro-forma

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 8.5 Income Statement Pro-forma

(Unit Cost: Million Pesos)

Items	Year			
	2008	2010	2015	2022
Sales	810.9	1317.0	3784.8	4600.5
Operation Cost	488.2	617.6	1181.7	1366.6
Gross Income from Operation	322.8	699.4	2603.1	3233.9
General and Administrative Cost	24.3	39.5	113.5	138.0
Net Income from Operation	298.4	659.9	2489.6	3095.9
Other Income/(Expenses)	-58.6	-26.5	234.3	885.1
Interest Payable	70.0	64.1	35.2	0.0
Gain on Sale of Bus	0.0	0.0	0.0	11.5
Interest Receivable	11.4	37.6	269.5	873.6
Income/Loss before Tax	239.9	633.4	2723.9	3981.0
Corporate Tax	76.8	202.7	871.6	1273.9
Income for the Year	163.1	430.7	1852.2	2707.1
Sales/ Break-even Point	1.6	2.4	4.7	5.1

(3) Cashflow Statement Pro-forma

Cashflow is consistently sound. Total of discounted free cashflow with 12% discount rate is ₱7,432 million in the first 15 years (2008~2022). This amount is considered to show the high value of this company.

Table 8.6 Cashflow Statement Pro-forma

(Unit Cost: Million Pesos)

Items	Year			
	2008	2010	2015	2022
Operation Activities				
Net Income/Loss for the Year	163.1	430.7	1852.2	2707.1
Depreciation Expenses	103.2	130.1	245.5	283.3
Operation Activities Total	266.3	560.8	2097.7	2990.4
Investment Activities				
Fixed Assets	1116.6	104.8	194.9	244.1
Investment Activities Total	1116.6	104.8	194.9	244.1
Financial Activities				
Paid-up Capital	800.0	0.0	0.0	0.0
Long-term Loan	350.0	0.0	0.0	0.0
Short-term Loan	0.0	0.0	0.0	0.0
Repayment of Loan	13.5	19.4	48.3	0.0
Dividends	0.0	80.0	80.0	80.0
Financial Activities Total	1136.5	-99.4	-128.3	-80.0
Balance	286.2	356.6	1774.6	2666.3
Term-start Cash on hand/banks	0.0	582.6	4962.8	19173.7
Term-end Cash on hand/ banks	286.2	939.2	6737.4	21839.9
In Discount Rate = 12%,				
Discounted Free Cashflow	286.2	276.1	725.2	445.3
Total of Disc. Free Cashflow	7431.6			
Discount Rate = 12%				

(4) Financial Indicators Pro-forma

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. Sales-cost ratio is 1.04 and NPV is ₱255 million under 12% discount rate.

Table 8.7 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			

9 SOCIAL DIMENSIONS

9.1 Public Consultations and Participation

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).

9.2 Summary of Social Impacts

Expected impact of the CBS Project is wide ranging. Based on the KIIs and FGDs, the impacts are expected to be mostly positive. Highlights of the impacts that surfaced during the interviews and discussions conducted are as follows:

- <u>Road Users' Needs</u>. The CBS project was viewed as an initiative that would provide remedy for the present road condition and traffic congestion in the three municipalities. Presently, public transport users of more than 60,000 per day are expected to be the immediate beneficiaries of the project.

- <u>Road Users' Demands</u>. It is expected that travel time and air quality will be improved. The demand for road expansion and improvement was highly acknowledged by the people during the consultation.

- <u>Potential Benefits</u>. These include improvement in traffic management, reduction in pollution, time savings, improvement in health due to improved air quality, and increased opportunity for employment and income. Significant gender distributional effect would contribute to easier movement for women.

- <u>Potential Adverse Impact</u>. Minimal adverse effects are foreseen. However the projects needs to be aware of the: (a) involuntary resettlement of people and commercial communities, (b) temporary nuisance during construction, (c) inability of some vulnerable people to afford the resettlement housing cost, and (d) loss of income of people from their present economic activities.

Mitigation and compensatory measures that can be adopted to address the identified impacts are: (a) the resettlement policy framework ensures that people are compensated and that they are in better or similar condition as before the project took place; (b) effective management during construction is followed to minimize negative effects; (c) assistance and support for most vulnerable families; and (d) a Resettlement Implementation Committee is established in the LGU to facilitate and effective and systematic resettlement and to handle compensation and grievances.

9.3 Overview of Socioeconomic Information

A socioeconomic survey was conducted for all the proposed alignment options and covered the affected households within a maximum right-of-way width of 60 meters**.** This was carried out in tandem with the survey of affected structures to determine the severity of people and structures affected.

There are three types of Project Affected Persons (PAPs) as indicated in Table 9.1.

Table 9.1 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.

The survey covered a total of 263 households in Bacoor, none in Imus and only 24 in Dasmariñas (despite an estimate of more than 323 households in the area). The survey could not be conducted in Dasmariñas due a standing court order to eject informal dwellers from the old government road. Highlights of the survey results are as follows:

- Many of the respondents fall under the income bracket of P 6,000 to P 8,000 per month (18% of total respondents);
- Most respondents resided in the area for over 10 years; 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

Within the proposed road alignment, there exist numerous structures and various categories of affected households. A summary on the magnitude of structures and households affected is indicated in Table 9.2.

Table 9.2 Scale of Affected Structures and Households

Area	Estimated No. of Structures	Estimated No. of Households	Total Population
Bacoor Coastal Rd. Access Line B	211	263	1,130
Imus Segment 1 Segment 2	None None	None None	None None
Dasmariñas Segment 1 Segment 2	None 200 [1/]	None 323	None 1,389

1/ Estimated.

The resettlement options are presented below as follows:

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.

Option 2: Compensation on Structure. This option provides cash compensation equivalent to replacement cost of the structure. No provision of land for PAPs taking this option**.**

Option 3: Socialized Housing. This option, the government may purchase from private developers at socialized cost (₱165,000 per house and lot) or utilize the existing NHA's socialized housing on a rent scheme.

Both options 1 and 2 were considered for the CBS affected families based on the type of housing structures owned. Table 9.3 below gives the land requirement and cost for resettlement and compensation that may be incurred.

Table 9.3 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 carried out here.

9.5 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 in Bacoor and Dasmariñas, 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.

9.6 Special Arrangement for ROW Acquisition

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. 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. 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 Trust can be organized with the following objectives:

- To consolidate or reserve the lands required by the CBS 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.

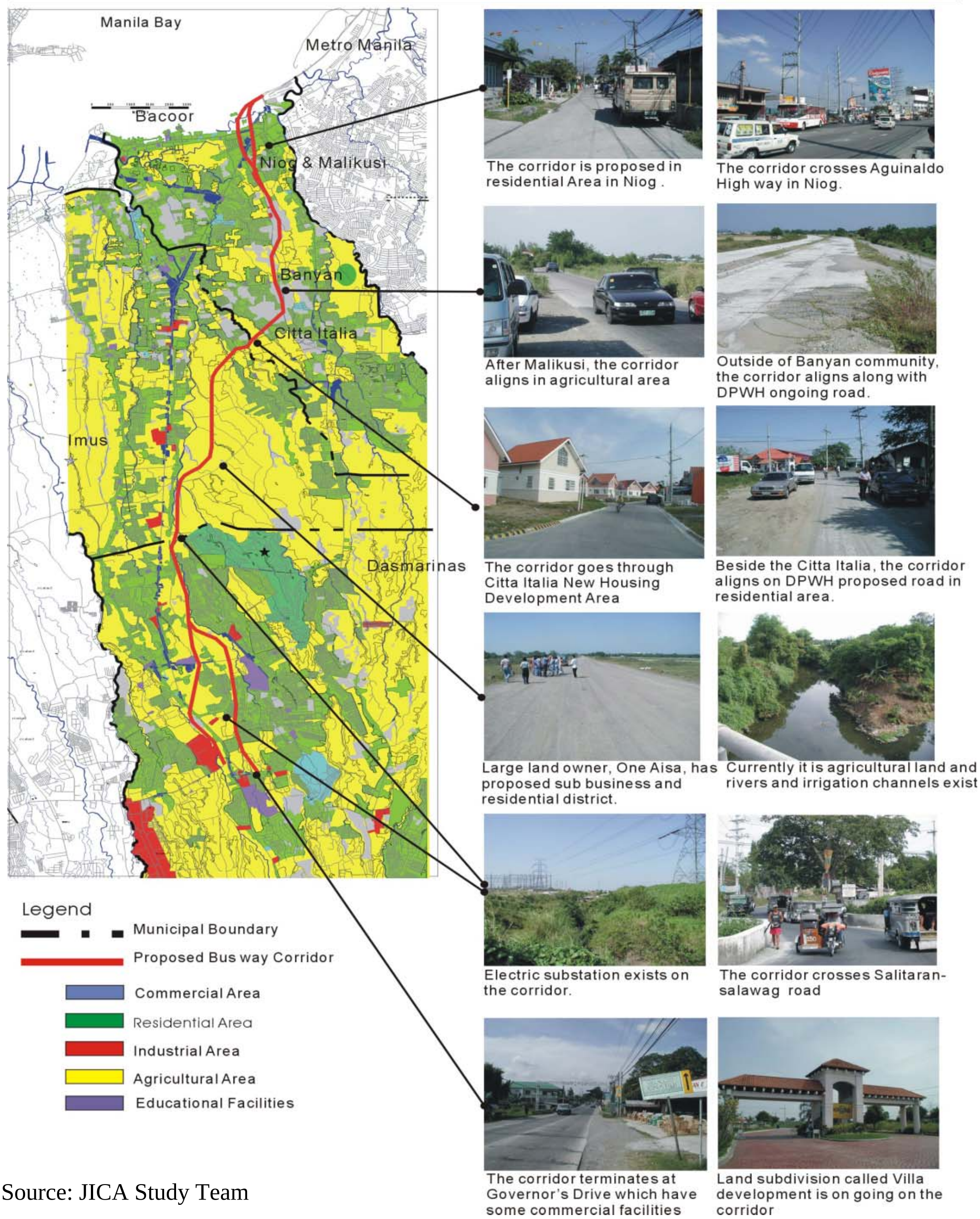
However, the agreement for the Trust has not yet been reached despite a series of extensive discussions with the related bodies. Instead, a Project Board would be constituted to achieve the same objective of advancing negotiations for the ROW. A draft Memorandum of Agreement (MOA) has been prepared for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

10 ENVIRONMENTAL EXAMINATION

10.1 Site Conditions and Initial Findings

The proposed busway alignment is located in the southern suburbs of Metro Manila characterized by flat agricultural land, newly developed housing and industrial park areas shown in the Figure 10.1. There is neither natural vegetation nor rich flora and fauna in this area, and most of the areas are inhabited. Hence, social issues are the more important concerns for project implementation.

Figure 10.1 Site Conditions and Initial Findings



Source: JICA Study Team

10.2 Identification of Adverse Impact caused by Project Implementation

Two notable impacts were identified: resettlement during the preparation stage and air pollution during the operation stage. Besides these factors, minor impacts (economic activity, traffic, rights of common, waste, ground water, hydrology in pre-operation and split of community, landscape in operation stage) were identified from the initial findings as shown in Table 10.1. Relocation for ROW acquisition is the most critical issue and air pollution brought about by busway operation is the second issue.

Table 10.1 Matrix for Impact Identified by Project Phase

Environmental Factors		Major facilities, activities which may cause impacts	Facilities/Construction					
			Overall Evaluation	Before Operation		Operation		
				Reclamation and spatial occupancy	Construction	Occupancy of land	Operation of Road	Activity 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 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						

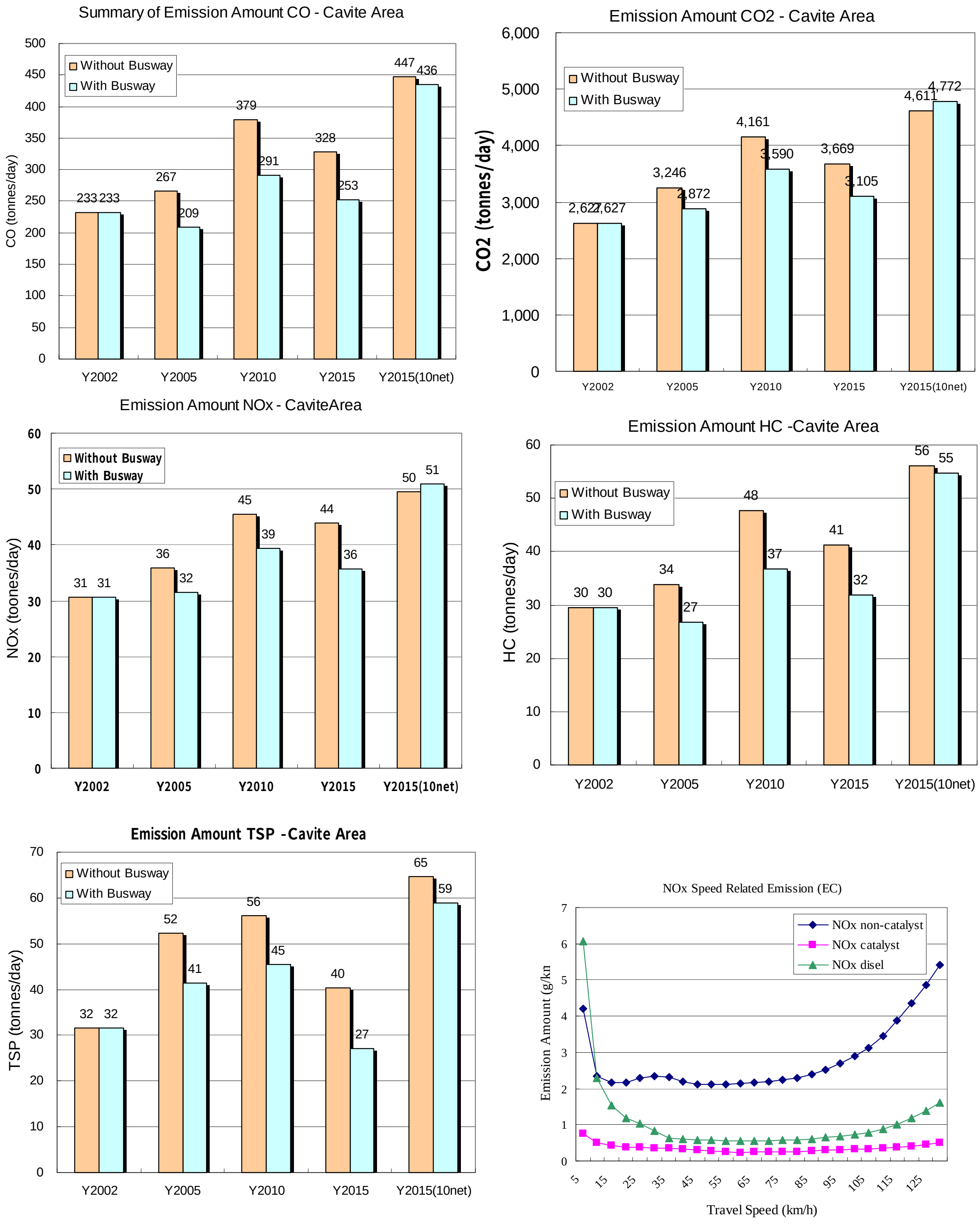
Note:
XX: The environmental items to which special attention has to be paid. They might be serious impacts that may affect the project formulation depending on the magnitude of the impacts and the possibility of the measures.
X: The environmental items that may have a significant impact depending on 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 Projection of Emission Amount as Environmental Benefit

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 this projection exercise is that most of the 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 means that the proposed busway project proved to be environmentally favorable.

Figure 10.2 Summary of Emission Amount of CO, CO_2, NOx, HC and TSP and Example of Speed Related Emission Factor (NOx)



10.4 Summary of Environmental Examinations

Environmental examination was carried out based on available information and qualitative and quantitative methods to address the GOP's requirement as summarized in Table 10.2. 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 10.2 Summary of Environmental Examinations

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.

11 CONCLUSION AND RECOMMENDATIONS

11.1 Conclusion

<u>The Proposed Busway</u>

- 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.

<u>Demand</u>

- 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).

ANNEX

ANNEX 1
Members of the Respective Committees/Teams for the
FEASIBILITY STUDY OF THE PROPOSED CAVITE BUSWAY SYSTEM

JICA Advisory Committee Members

1)	Mr. Takashi ARIYASU	Chairman
2)	Mr. Toshihiko TAKAHASHI	Road Planning
3)	Ms. Michiyo MACHIDA	Public Transport Planning
4)	Mr. Ryutaro KONISHI	Public Transport Planning (successor)
5)	Mr. Akira TAKESHIMA	Railway Planning

JICA Coordinator

1)	Ms. Reiko FUNABA	Coordinator

JICA Manila Office

1)	Mr. Hiroyuki Abe	Assistant Resident Representative
2)	Mr. Takafumi YASUMOTO	Assistant Resident Representative (successor)

JICA Study Team Members

1)	Mr. Takashi SHOYAMA	Team Leader / Public Transport Planning
2)	Mr. Michimasa TAKAGI	Deputy Team Leader / Road Planning / Traffic Management
3)	Mr. Naoshi OKAMURA	Transport Demand Forecast
4)	Mr. Ricardo M. Yuzon Jr.	Planning and Design of Busway Facilities
5)	Mr. Akitoshi IIO	Environmental Analysis
6)	Ms. Beulah E. Pallana	Relocation Planning
7)	Dr. Geronimo V. Manahan	Land Use Planning / City Planning
8)	Mr. Hajime TANAKA	Project Implementation and Operation Planning
9)	Mr. Tetsuo WAKUI	Economic and Financial Analysis
10)	Mr. Ian Paterson	Topography / Geology
11)	Mr. Borala L. Jayaratne	Meteorology / Hydrology
12)	Mr. Toshio UENO	Road and Structure Design
13)	Mr. Toshinari KOBAYASHI	Construction Planning / Cost Estimate
14)	Mr. Masato KOTO	Transport Node Planning
15)	Mr. Kazuyuki OTSUKA	Railway Planning

16) Mr. Kiyotaka HAYASHI	Land Readjustment
17) Dr. Tetsuji MASUJIMA	Transport Survey / Analysis
18) Dr. Shizuo IWATA	Transport Policy
19) Mr. Rene Santiago	PFI (Private Financing Initiative)
20) Ms. Lynn M. Sison	LGU Coordination

Steering Committee

1) Mr. Teodoro T. Encarnacion	Undersecretary, DPWH
2) Mr. Ayong S. Maliksi	Governor, Province of Cavite
3) Mr. Oskar D. Balbastro	Regional Director, NEDA Region IV-A
4) Mr. Samuel C. Custodio	Director for Planning, DOTC
5) Ms. Cora Cruz	Assistant General Manager, MMDA
6) Mr. Leonilo B. Lariosa	Regional Director, DILG
7) Mr. Hussein Lidasan	Executive Director, UP NCTS
8) Mr. Ricardo G. Sigua	Executive Director, UP NCTS (successor)

Philippine Counterpart Team

1) Mr. Godofredo Z. Galano	Director, BOT, DPWH
2) Mr. Nestor V. Agustin	Regional Director, DPWH Region IV-A
3) Mr. Jaime Martinez	District Engineer, Province of Cavite
4) Ms. Criste Navida	EIAPO, DPWH
6) Ms. Liberty Abellon	Division Chief, EDD, NEDA Region IV A
7) Mr. Terry Galvante	Railway Division, DOTC
8) Mr. Jesse Francisco	MPDC, Municipality of Bacoor
9) Ms. Angelina Cantimbuhan	MPDC, Municipality of Imus
10) Mr. Moises Menguito	MPDC, Municipality of Dasmariñas
11) Mr. Chris T. Pablo	Project Manager, CALA Project