REPUBLIC OF THE PHILIPPINES
DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS (DPWH)

PREPARATORY SURVEY FOR EXPRESSWAY PROJECTS IN MEGA MANILA REGION

CENTRAL LUZON LINK EXPRESSWAY PROJECT (Phase I)

FINAL REPORT MAIN TEXT

NOVEMBER 2012

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

CTI ENGINEERING INTERNATIONAL CO., LTD
MITSUBISHI RESEARCH INSTITUTE, INC.
ORIENTAL CONSULTANTS CO., LTD
METROPOLITAN EXPRESSWAY CO., LTD

EI
CR(3)
12-145(1)

CLLEX

EXCHANGE RATE

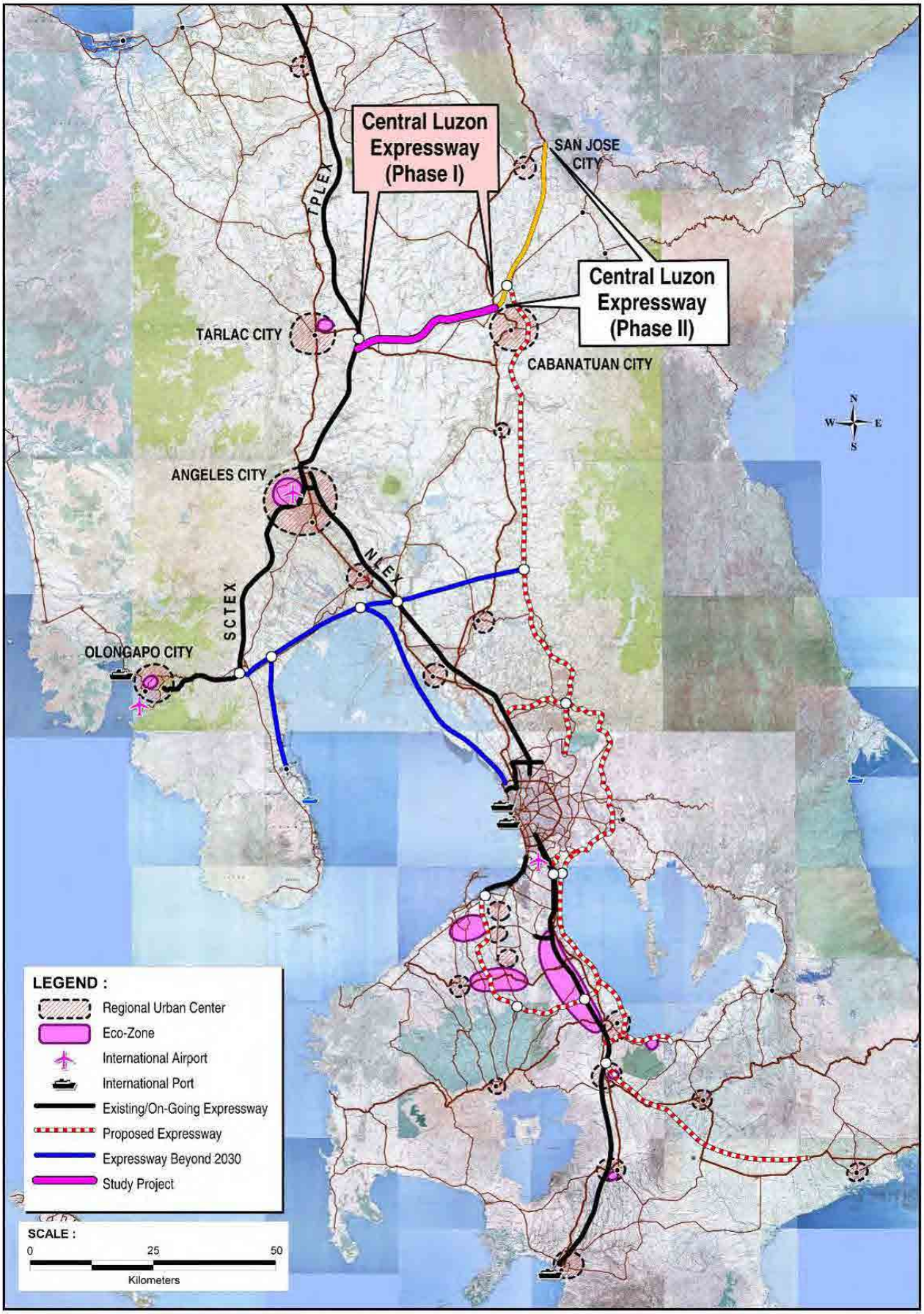
July 2011

1PhP= 1.86 Japan Yen

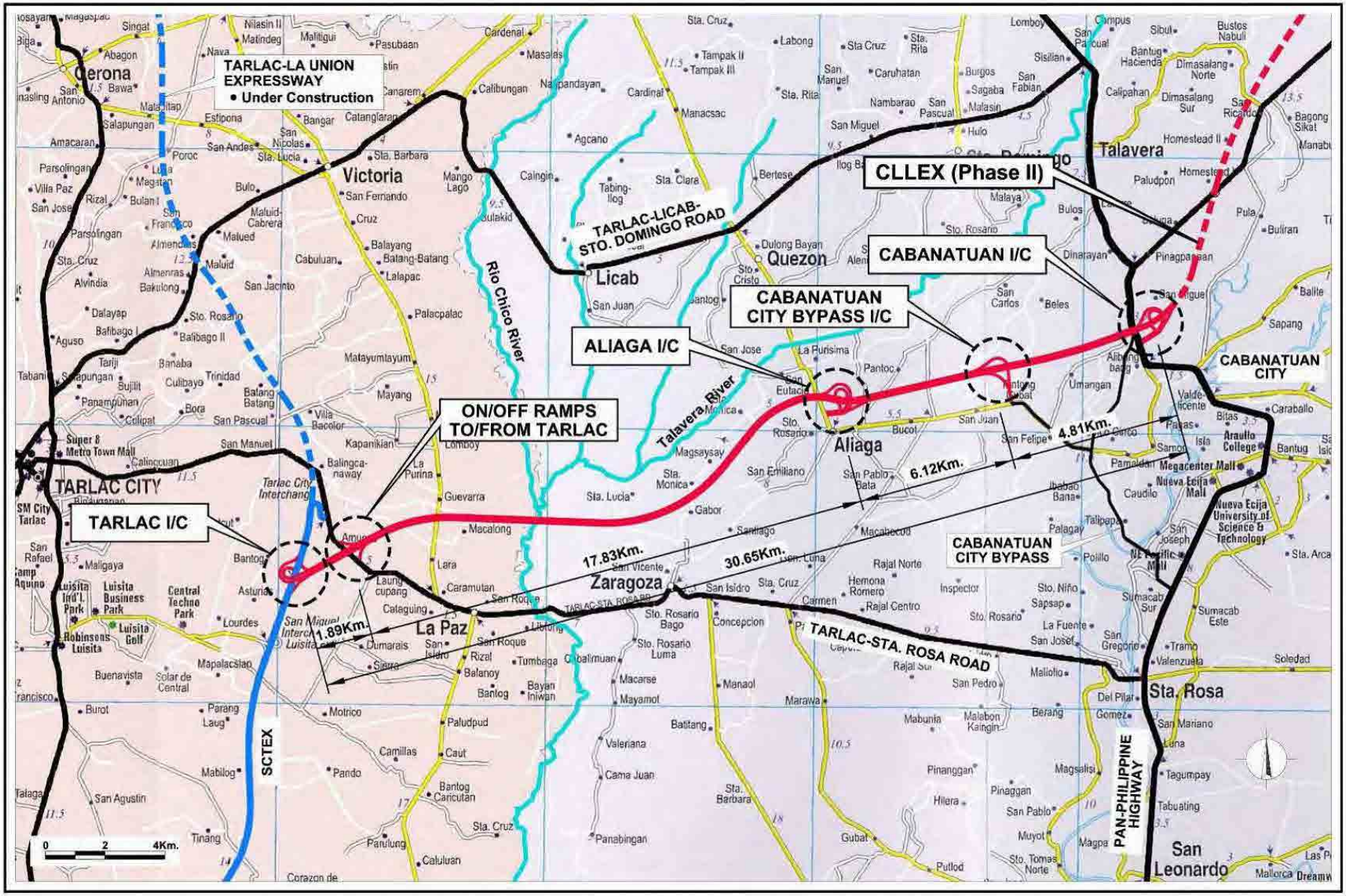
1US$=43.7Philippine Peso

1US$= 81.2 Japan Yen

Central Bank of the Philippines



LOCATION MAP OF CLLEX



PROPOSED CLLEX ALIGNMENT AND LAYOUT OF INTERCHANGES

TABLE OF CONTENTS

Executive Summary

Main Report

List of Figure

Executive Summary

Main Report

List of Table

Executive Summary

Main Report

ACRONYMS AND ABBREVIATIONS

ADB	:	Asian Development Bank
B/C	:	Benefit/Cost Ratio
BCDA	:	Bases Conversion Development Authority
BLT	:	Build-Lease-Transfer
BOT	:	Build-Operate and Transfer
CAAP	:	Civil Aviation Authority of the Philippines
CDCP	:	Construction Development Corporation of the Philippines
CLEx	:	Central Luzon Expressway
DBFO		Design, Build, Finance and Operate
DBP	:	Development Bank of the Philippines
DENR	:	Department of Environment and Natural Resources
DBM	:	Department of Budget and Management
DOF	:	Department of Finance
DOTC	:	Department of Transportation and Communications
DPWH	:	Department of Public Works and Highways
DTI	:	Department of Trade and Industry
EIA	:	Environmental Impact Assessment
EIRR	:	Economic Internal Rate of Return
EIS	:	Environmental Impact Statement
EO	:	Executive Order
FIRR	:	Financial Internal Rate of Return
GDP	:	Gross Domestic Product
GFS	:	Government Financing Support
GOCCs	:	Government-Owned and Controlled Corporations
GOJ	:	Government of Japan
GRP	:	Government of the Republic of the Philippines
HSH	:	High Standard Highway
ICC	:	Investment Coordinating Committee
IEE	:	Initial Environmental Examination
IFC	:	International Finance Corporation of World Bank Group
IRR	:	Internal Rate of Return
JICA	:	Japan International Cooperation Agency
KOICA	:	Korean International Cooperation Agency
LAPRAP	:	Land Acquisition Plan and Resettlement Action Plan
LGUs	:	Local Government Units
LRTA	:	Light Rail Transit Authority
MARINA	:	Maritime Industry Authority
MRG	:	Minimum Revenue Guarantee
MIAA	:	Manila International Airport Authority
MMDA	:	Metro Manila Development Agency
MRT	:	Mass Rail Transit
MRTC	:	Metro Rail Transit Corporation
NCR	:	National Capital Region
NDC	:	National Development Corporation
NEDA	:	National Economic Development Authority
NGO	:	Non-Governmental Organization
NLEx	:	North Luzon Expressway
NPER	:	Net Public Expenditure Reduction
NPV	:	Net Present Value
O&M	:	Operation and Maintenance
ODA	:	Official Development Assistance
OSG	:	Office of the Solicitor General
PD	:	Presidential Decree
PEA	:	Philippine Estate Authority
PEGR	:	Philippines-Australia Partnership for Economic Governance Reform
PIP	:	Public Investment Plan
PMO-BOT	:	Project Management Office for Build-Operate-Transfer
PNCC	:	Philippine National Construction Company
PNR	:	Philippine National Railways
PPA	:	Philippine Port Authority
PPP	:	Public-Private Partnership
R.A.	:	Republic Act
RAP	:	Resettlement Action Plan
ROW	:	Right of Way
SC	:	Steering Committee
SCTEx	:	Subic-Clark-Tarlac Expressway
SLEx	:	South Luzon Expressway
SPC	:	Special Purpose Company
STAR	:	Southern Tagalog Arterial Road
STOA	:	Supplemental Toll Operation Agreement
TCA	:	Toll Concession Agreement
TOA	:	Toll Operation Agreement
TOC	:	Toll Operation Certificate
TOR	:	Terms of Reference
TPLEx	:	Tarlac-Pangasinan-La Union Expressway
TRB	:	Toll Regulatory Board
TWG	:	Technical Working Group
USAID	:	United States Agency for International Development
WACC	:	Weighted Average of Capital Cost
WB	:	World Bank

EXECUTIVE SUMMARY

1. BACKGROUND OF THE CLLEX PROJECT

The Philippines has been experiencing relatively slower economic development partly due to limited flow of direct investments into manufacturing sector compared to other rapidly growing ASEAN countries after the recovery from Asian Economic Crisis. In order to foster both domestic and foreign investments, improving overall investment climate including road network has been an urgent matter. In particular, the economic activities are extremely concentrated in Metro Manila where 37% of GDP and 13% of total population are accumulated in merely 0.2% of the country's land. This extreme concentration causes serious congestion and delays of distribution of goods and movement of people, resulting to huge damage to economy and lowering the country's international competitiveness as an investment destination. Likewise living condition in Metro Manila has eroded due to air pollution and traffic noise caused by chronic congestion. In summary, solving traffic congestion in Metro Manila by networking surrounding cities and upgrading/expanding highways around Mega Manila – the area covering Metro Manila, Central Luzon and CALABARZON – contributes to improvement of both investment climate and living climate.

Central Luzon Link Expressway (CLLEX) improves access between the two-north large cities, Tarlac and Cabanatuan, and supports industrialization of North part of Mega Manila and eases the extreme concentration in Metro Manila as CLLEX allows better connection between North part of Mega Manila and Metro Manila. Central Luzon is expected to increase its efficiency as an industrial hub with Clark Airport receiving international flights.

In 2010, JICA-assisted High Standard Highway Network Development Master Plan (hereinafter referred to "HSH Master Plan Study") formulated the expressway network in the 200 km radium sphere from Metro Manila. The Study recommended CLLEX as one of eight first priority projects.

In 2010, DPWH completed the Feasibility Study for the Proposed Central Luzon Expressway (now Central Luzon Link Expressway) (hereinafter referred to 2010 FS) under the supplemental agreement of JICA-funded Arterial Bypass Project.

In 2010, JICA-assisted Preparatory Survey for Public-Private Partnership (PPP) Infrastructure Development Projects (hereinafter referred to as "PPP Infra Projects"). This Study prioritized PPP expressway projects in accordance with the criteria established which are based on the necessity and urgency of project, profitability of the project and implement-ability of the project. Phase I of CLLEX was ranked no. 4 out of 10 priority projects.

2. NECESSITY OF THE CLLEX PROJECT

CLLEX is needed from the viewpoints of the following;

- To reduce traffic congestion of Pan Philippine Highway (or Daang Maharlika)
- To strengthen lateral (east-west) road network.
- To develop regional growth pole cities to decongest overconcentration of socio-economic activities in Metro Manila.
- To develop impoverish area of the Pacific Ocean Coastal area through development of Cabanatuan City which functions as a hub city for the area.
- To develop an integrated multi-modal logistics/transport system
- To promote PPP projects.

3. OBJECTIVE OF THE CLLEX PROJECT

The objectives of CLLEX Project are summarized as follows:

- To provide fast, safe, comfortable and reliable mode of transport in Region III for socio-economic development.
- To decongest traffic of Pan-Philippine Highway (or Daang Maharlika)
- To support sound development of Regional Growth Pole Cities of Tarlac City and Cabanatuan City, thus contributing to the decongestion of over-concentration of Metro Manila
- To form an important lateral (east-west) link of overall Expressway network of Region III
- To provide faster access from Metro Manila to Cabanatuan City which is the base (or hub) city for Pacific Ocean Coastal Area Development

4. TRAFFIC DEMAND FORECAST

4.1. Existing Traffic Condition

(1) Traffic Volume

Traffic volume along major roads in Central Luzon as well as in the road network surrounding the CLLEX is shown in **FIGURE 4.1-1**. As seen in the figure, the two major highways (Manila North Road and Pan Philippine Highway) exhibited high number of traffic. The NLEX is also carrying a very heavy traffic confirming the very active socio-economic exchanges between cities in the North and Metro Manila.

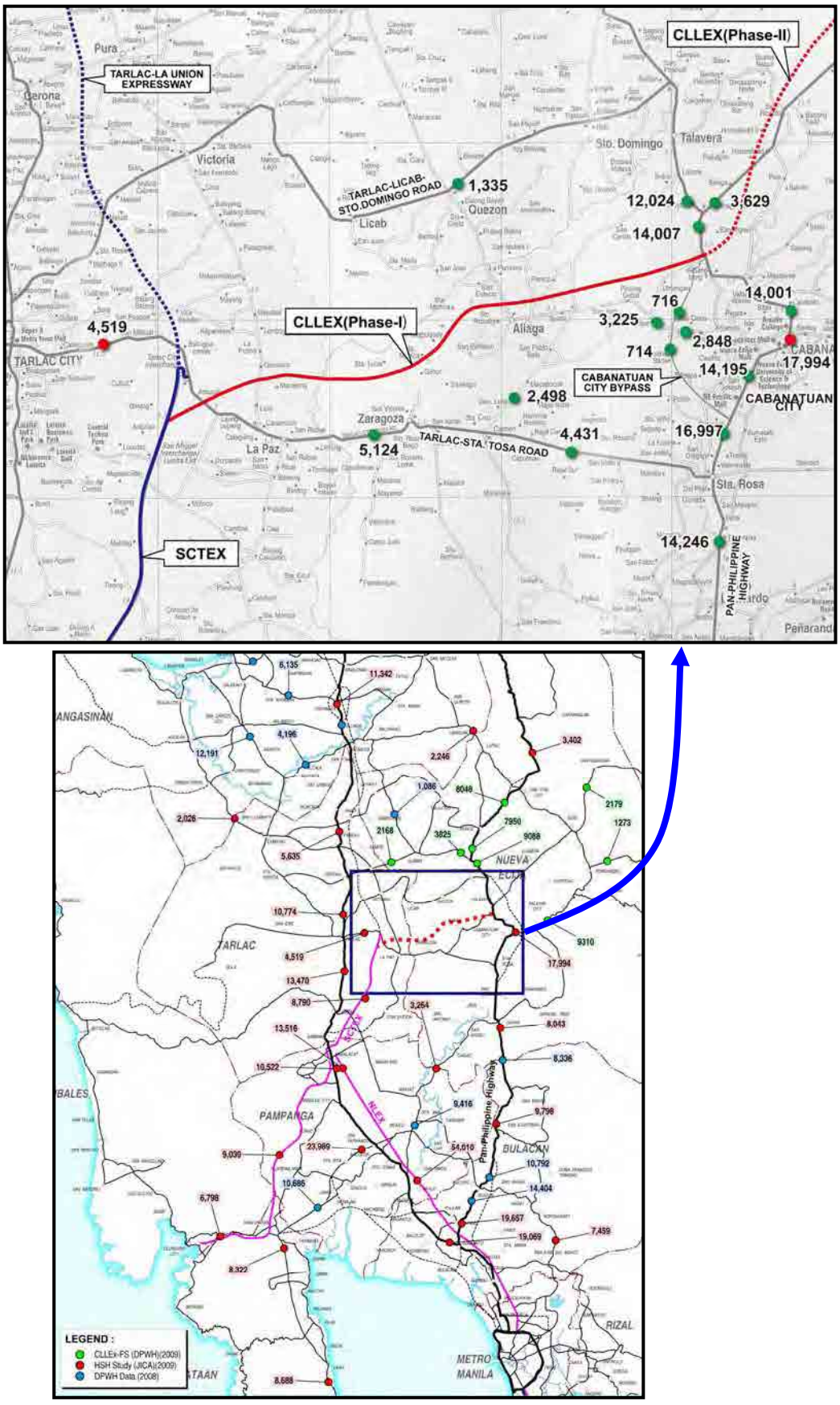


FIGURE 4.1-1 TRAFFIC VOLUME IN CENTRAL LUZON

(2) Travel Speed

The study entitled 'Feasibility Study of the Proposed Central Luzon Expressway', 2010, carried out a travel speed survey. The raw data used to plot travel speed shown in **FIGURE 4.1-2** and **4.1-3** were taken from the said study. The following were observed from the figures:

- Tarlac – Sta. Rosa Road is relatively congested free except at the center of towns of La Paz, Zaragosa and its approach to Tarlac. Travel time to traverse the 39.9 km road is about 60 minutes.
- Tarlac - Carmen – Cabanatuan Road (via Aliaga) is also free of traffic congestion except of its approach to Tarlac and Pan Philippine Highway (Cabanatuan side). Average travel time is about 69 minutes to cross the 46 km route.
- Gapan - Cabanatuan – Talavera (Pan Philippine Highway) has a severe traffic congestion from Sta. Rosa all the way to Carmen – Cabanatuan Road. Traffic congestion is particularly heavy inside Cabanatuan City where local and through traffic merges. At the center of Cabanatuan City, most of the traffic is composed of jeepneys which served local traffic. Average travel time from Gapan to Cabanatuan reaches about 60 minutes for merely 24 km road. Likewise, average travel time from Cabanatuan to Talavera (10 km) is about 24 minutes.
- Pan Philippine Highway (NLEX Sta. Rosa Exit to San Jose) observed serious traffic congestion at the town centers of Ildefonso, Sta. Rosa, Cabanatuan, Talavera, Sto. Domingo and San Jose.

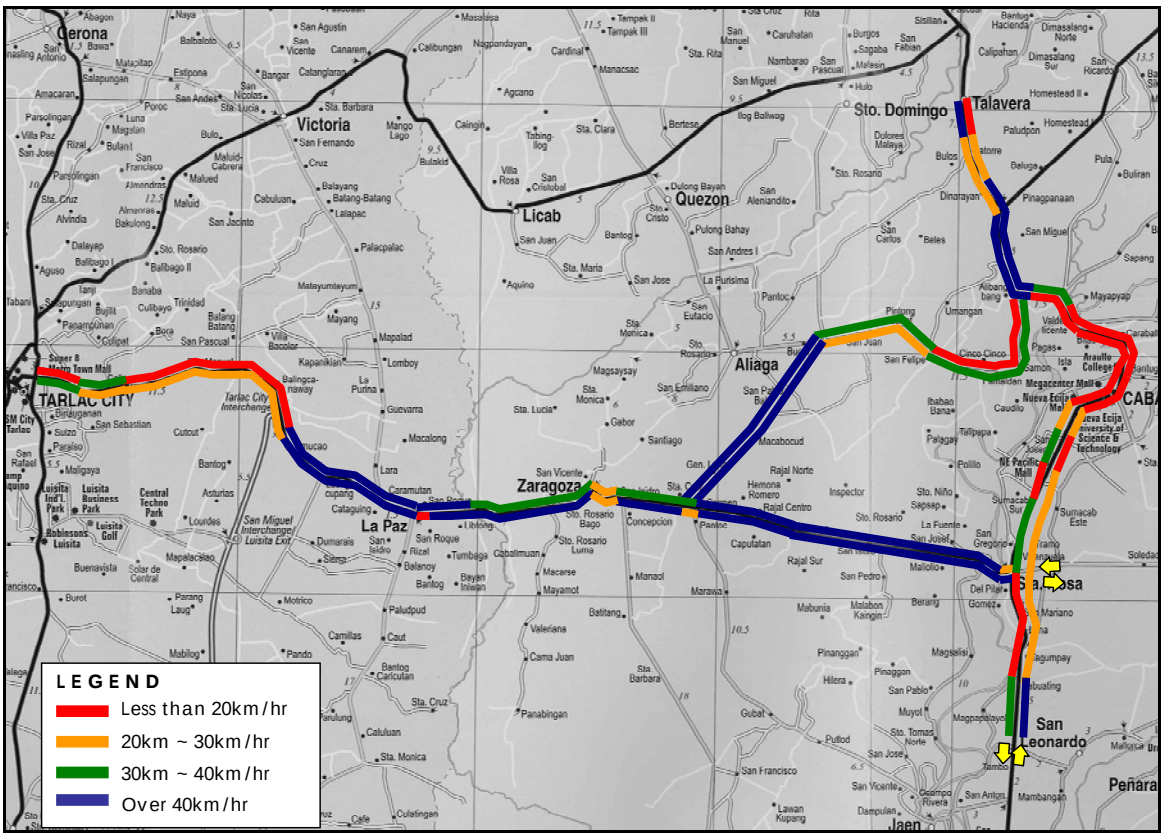


FIGURE 4.1-2 TRAVEL SPEED (AFTERNOON PEAK)

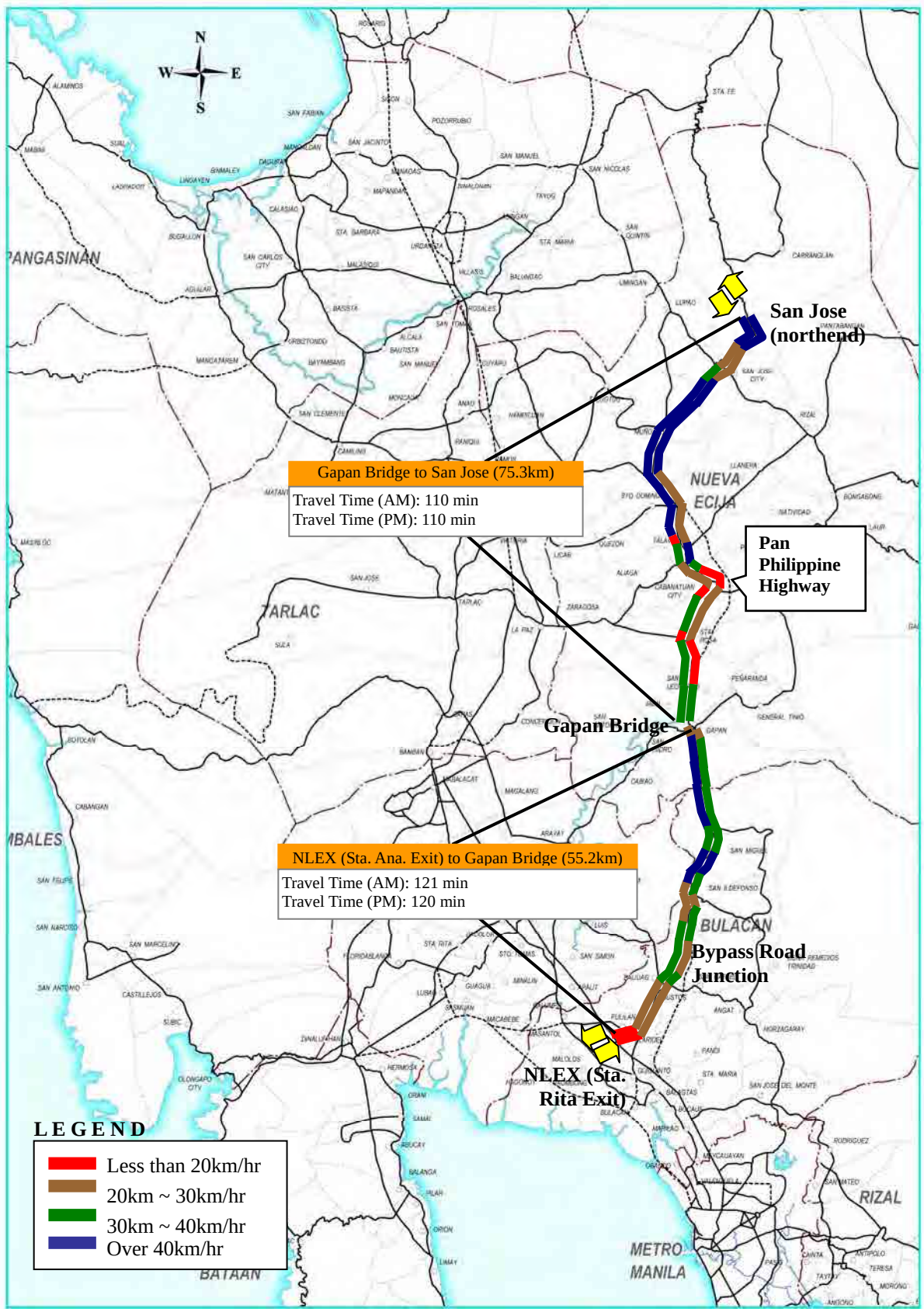


FIGURE 4.1-3 TRAVEL SPEED ALONG PAN PHILIPPINE HIGHWAY

(3) Toll Rate vs. Traffic Volume

In order to set the proper toll rate of CLLEX, the traffic volume and the amount of revenue are estimated by traffic assignment model. **FIGURE 4.1-4** shows the result of traffic assignment of toll rate.

- In case of toll free, total traffic volume to enter CLLEX is 16,197 vehicles/day
- The toll rate for getting higher revenue is about 3.0 to 4.5 Peso/km and the amount of revenue is about 1.14 and 1.18 million Peso/day. Although maximum amount of revenue is 4.0 peso case, traffic volume to enter CLLEX is only 8,628 vehicle /day which is about half of toll free case.
- The desirable toll rate for attractive to motorist and higher revenue is 3.0 Peso/km. total traffic volume to enter CLLEX is 11,236 vehicle/day (70% of toll free case) and estimated toll revenue 1.14 million Peso/day. 3.0 Peso/km in year 2017 converts about 2.2 Peso /km in year 2011. This toll rate is the almost same as that of NLEX and other present interurban expressway. Most motorists may accept the 3.0 peso/km in year 2017.

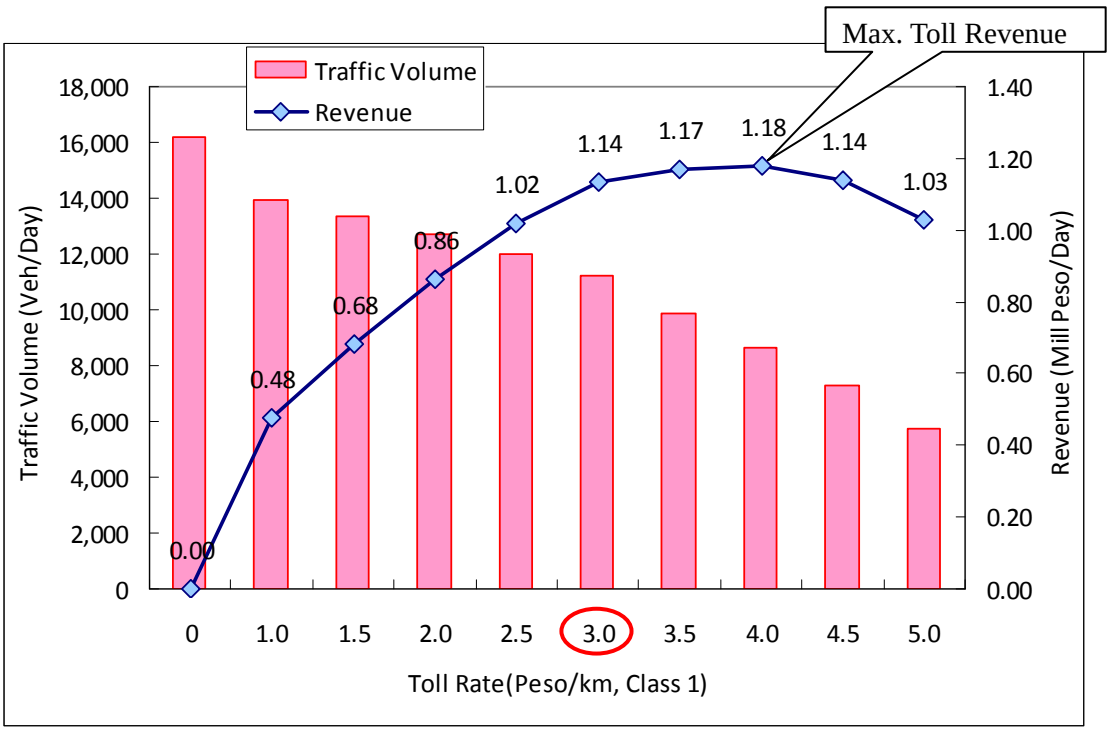


FIGURE 4.1-4 TOLL RATE VS REVENUE (YEAR 2017)

4.2. Future Traffic Volume on CLLEX PHASE-1 Section

To estimate the traffic volumes on CLLEX, traffic demand system data developed on the Study of Master plan on High Standard Highway Network Development funded by JICA was used. The number of lane of CLLEX PHASE-1 section assumed to be 4 lanes both directions after discussion with DPWH. The total volume to enter CLLEX Phase 1 and total vehicle*km are shown as **TABLE 4.2-1** in the year 2017, 2020 and 2030.

TABLE 4.2-1 TRAFFIC VOLUME AND VEHICLE KM (CLLEX PHASE-1)

Item	Vehicle Class	Year 2017	Year 2020	Year 2030
Traffic Volume	Class 1	9,052	10,967	15,450
	Class 2	2,886	3,030	4,346
	Class 3	241	257	381
	Total	12,629	14,254	20,177
LOS		A	A	A
Volume/Capacity Ratio		0.17	0.19	0.23
Vehicle*km	Class 1	256,672	289,609	410,372
	Class 2	78,158	82,733	119,680
	Class 3	6,321	6,837	10,457
	Total	341,151	379,179	540,509

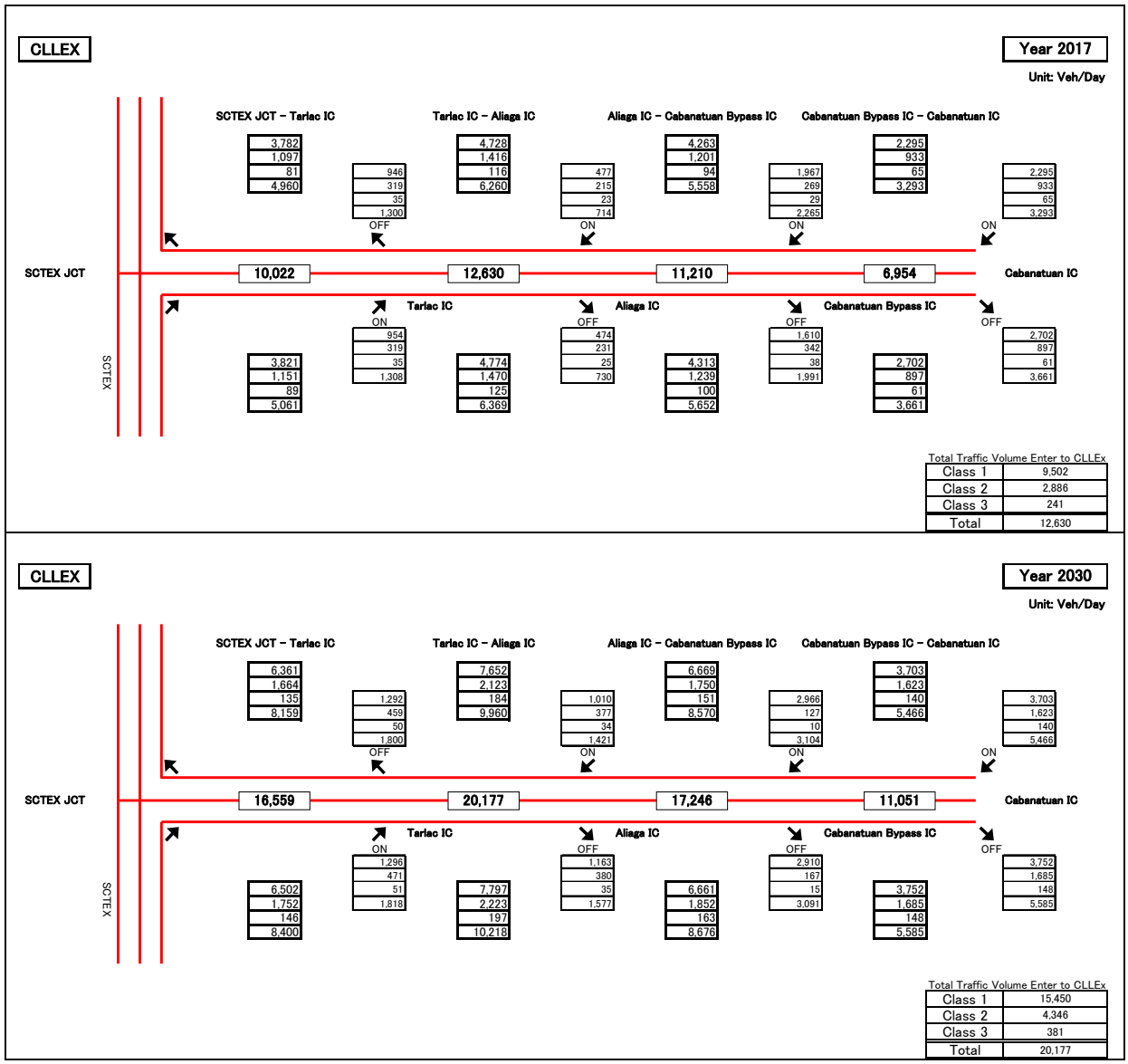


FIGURE 4.2-1 TRAFFIC PROJECTION OF CLLEX PHASE-1

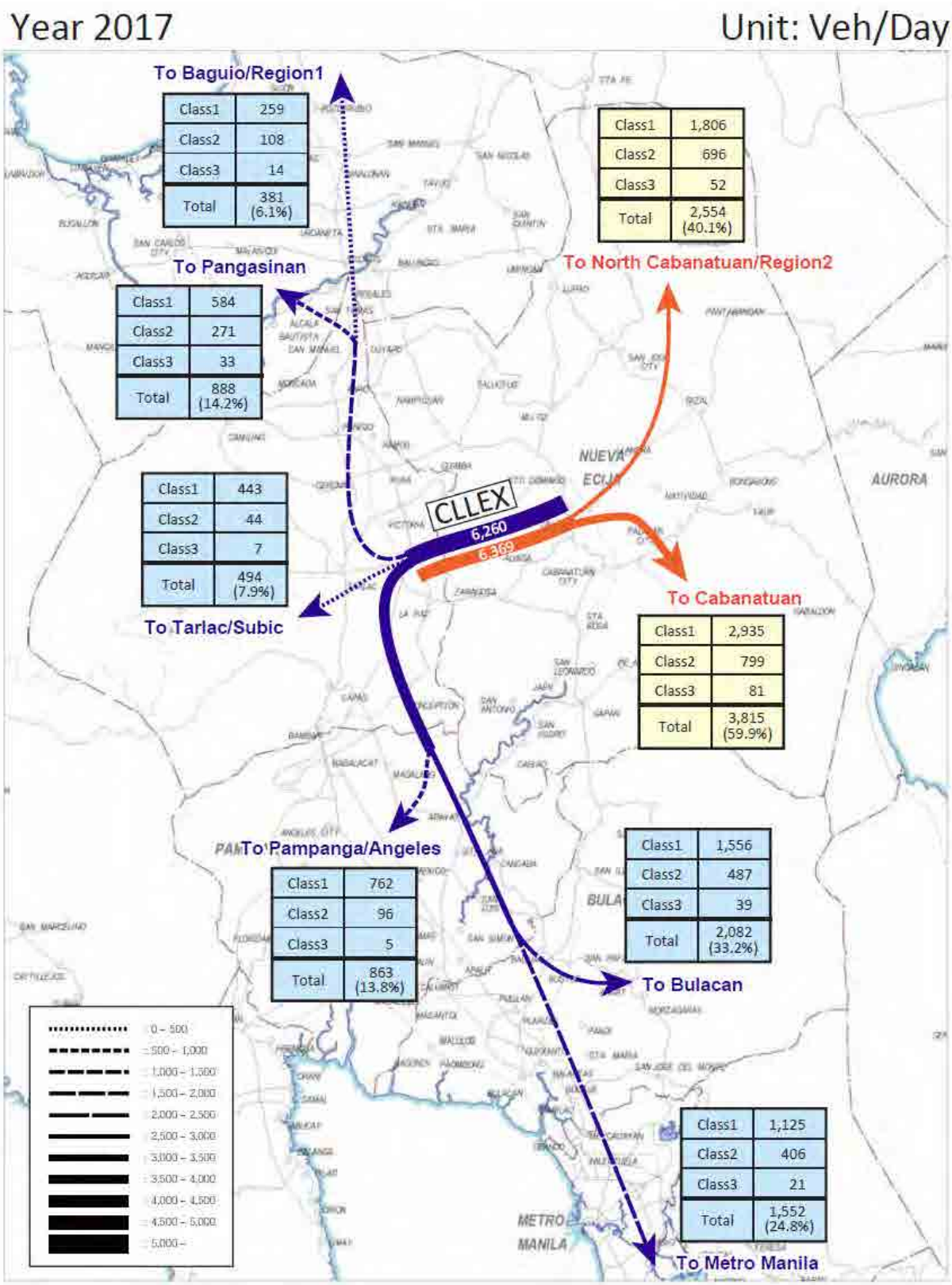


FIGURE 4.2-2 TRAFFIC FLOW OF CLLEX PHASE-1 BY DESTINATION (YEAR 2017)

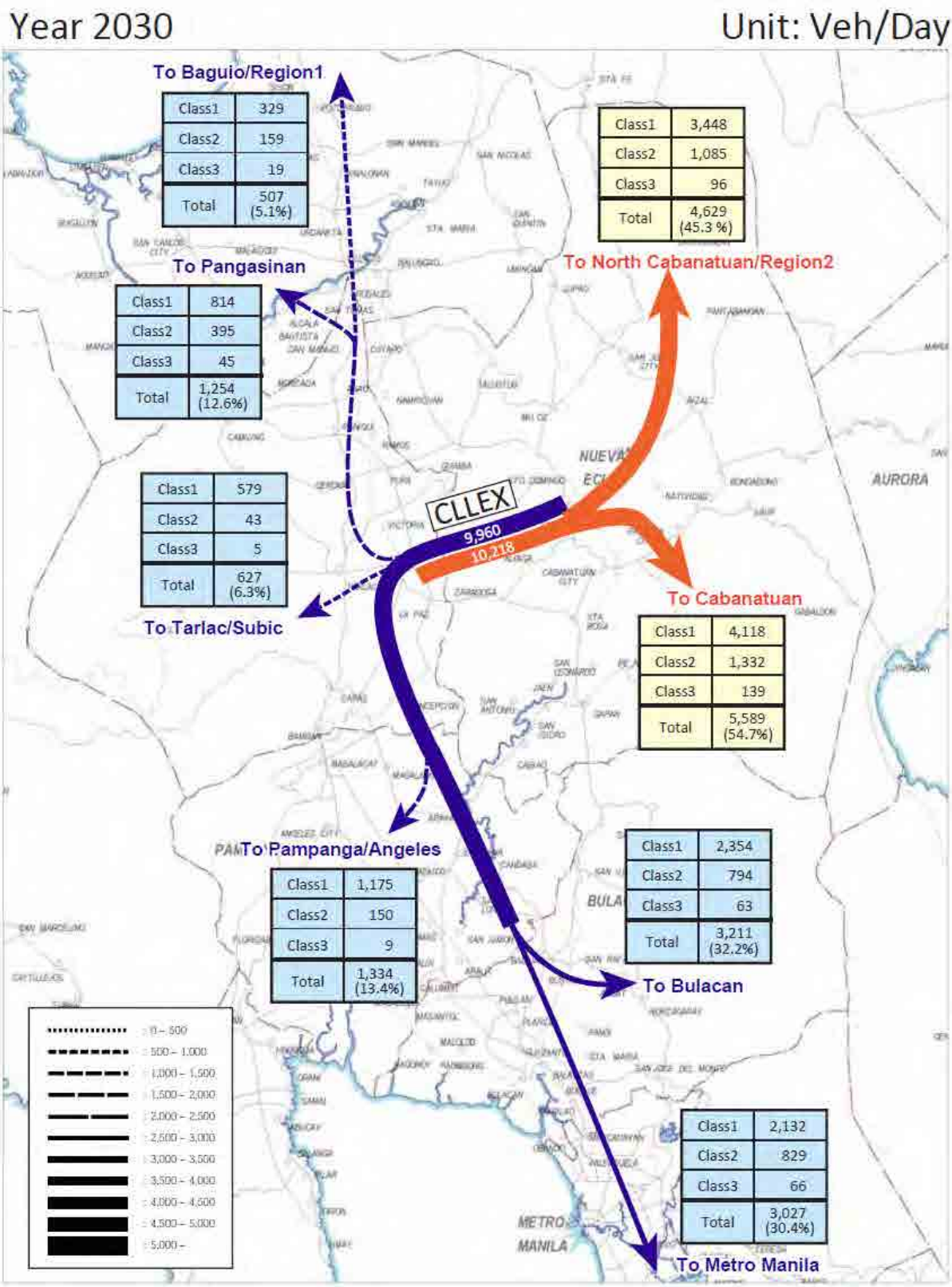


FIGURE 4.2-3 TRAFFIC FLOW OF CLLEX PHASE-1 BY DESTINATION (YEAR 2030)

5. REVIEW OF 2010 FEASIBILITY STUDY OF CLLEX PHASE-1

5.1. Technical Issues of CLLEX in the past study

The feasibility study of CLLEX was completed in 2010. Some technical issues have found as follows (see **FIGURE 5.1-1**):

- Tarlac I/C needs to be reviewed on how to connect with SCTEX / TPLEX.
- No I/C was planned for 28 km stretch between Tarlac and Cabanatuan cities. One I/C will be needed at about Aliaga Municipality.
- Cabanatuan Interchange (I/C) was planed at the location of a 5-leg intersection, thus quite complexed I/C was planned. A church was built at the proposed I/C location. Therefore, review of I/C is needed.
- Access to / from south area of Cabanatuan City, it should be to pass the congested area in the city centre of Cabanatuan, thus it is necessary to improve direct accesses to / from the southern Cabanatuan City.
- CLLEX passes though flood-prone area. The bridge location and its length need to be reviewed.
- Toll Collection System should be studied.

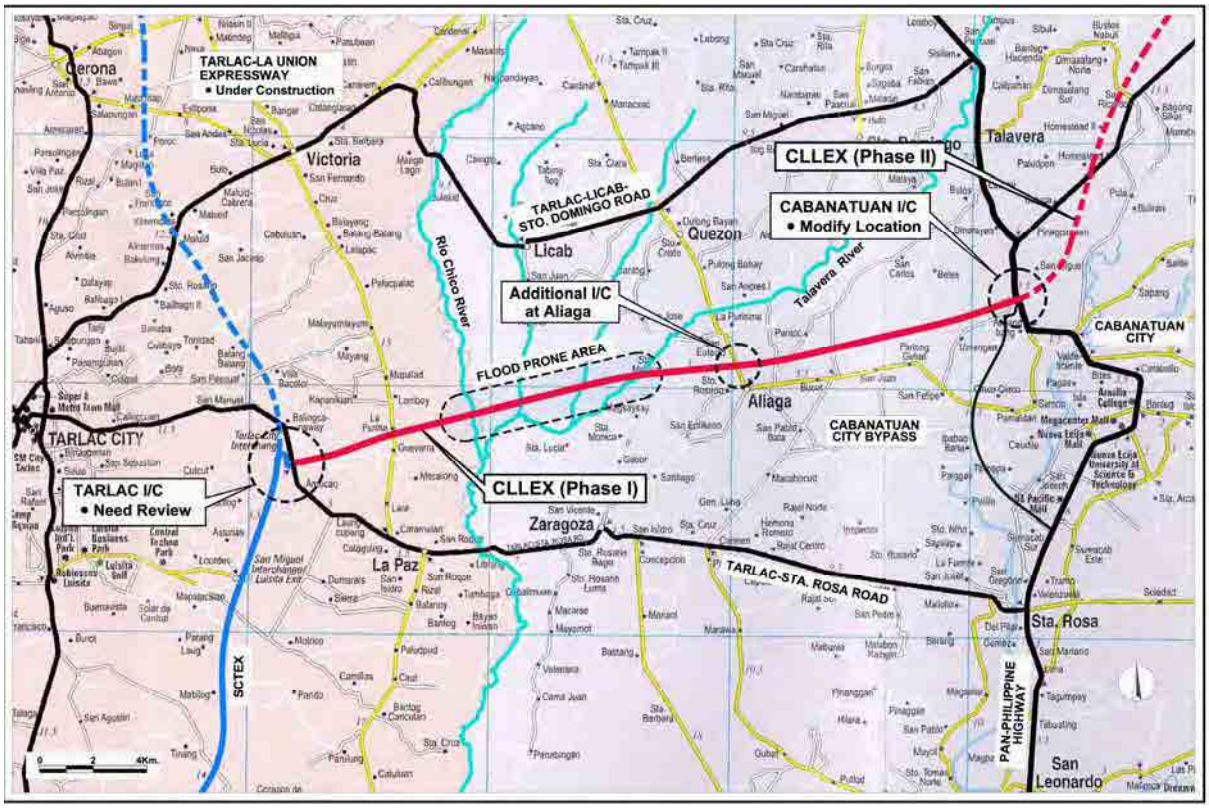


FIGURE 5.1-1 TECHNICAL ISSUES OF CLLEX PHASE-1

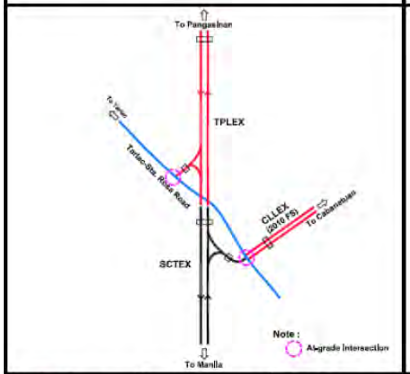
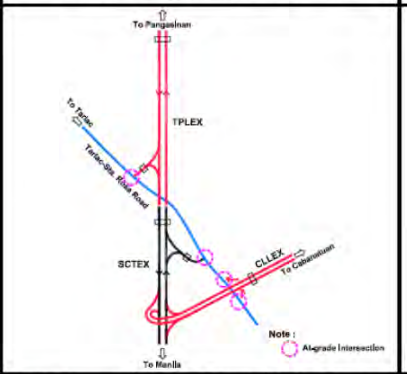
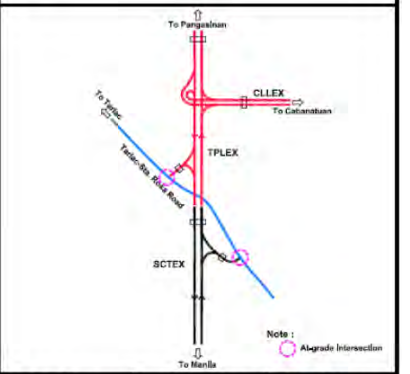
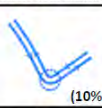
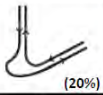
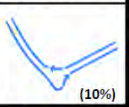
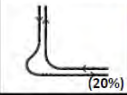
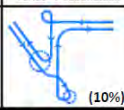
5.2. Direct Connection with the expressway of SCTEx or TPLEx

The 2010 FS proposed that CLLEX was not directly connected with SCTEx, but was connected via the national road of Tarlac – Sta. Rosa Road. The type of Tarlac Interchange was changed. According to the latest plan of SCTEx and TPLEx, Tarlac Interchange is a half interchange at CLLEX and another half interchange at TPLEx. To maintain efficient traffic flow on the expressways, two expressways should be directly connected, but not via national or provincial road.

Three (3) alternative connection options were studied. The evaluation of 3 alternatives is shown in **TABLE 5.2-1**, and then the alternative-2 (connected with SCTEx) was recommended due to the following reasons;

- Alternative-2 provides direct connection between 2 expressways.
- Most preferred alternative for traffic between Manila side and Cabanatuan City, which is the predominant traffic flow.

TABLE 5.2-1 ALTERNATIVES OF CONNECTION BETWEEN CLLEX AND SCTEX/TPLEX

ALTERNATIVE - 1			ALTERNATIVE - 2			ALTERNATIVE - 3		
Concept : • Proposed plan by 2010 FS. • CLLEx is connected with SCTEx via Intersection.			Concept : • CLLEx is directly connected with SCTEx. • On and off ramps is provided from/to Tarlac-Sta. Rosa Road for better linkage between Tarlac and Cabanatuan.			Concept : • CLLEx is directly connected with TPLEx.		
								
Manila ⇆ Cabanatuan	Pangasinan ⇆ Cabanatuan	Tarlac ⇆ Cabanatuan	Manila ⇆ Cabanatuan	Pangasinan ⇆ Cabanatuan	Tarlac ⇆ Cabanatuan	Manila ⇆ Cabanatuan	Pangasinan ⇆ Cabanatuan	Tarlac ⇆ Cabanatuan
 (70%)	 (20%)	 (10%)	 (70%)	 (20%)	 (10%)	 (70%)	 (20%)	 (10%)
• All via national road • Longer than Alternative-2	• All via national road	• All via national road • Shortest connection	• Shortest connection • Best linkage	• Longer than Alternative-3, but traffic is not so high	• Good connection • Longer than Alternative-1	• Longest connection	• Shortest connection	• Complicated
X	X	O	O	△	O	△	O	X
Not Recommended			Recommended			Not Recommended		

5.3. Additional Interchange at Aliaga Municipality

The 2010 FS proposed no interchange between Tarlac and Cabanatuan City for the extension of 28 km. In general, the longest interval of interchanges is set at 15 to 25 km, an interval of 28 km is too long and additional exits should be needed during emergency cases.

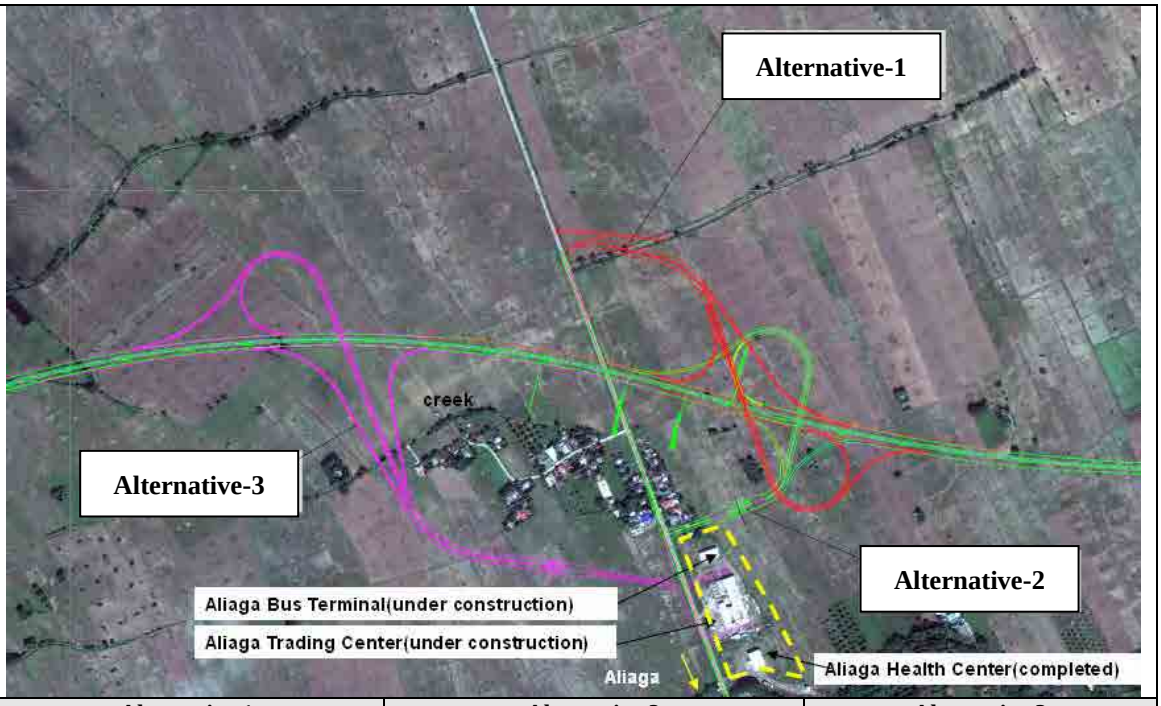
- Maximum Interval : 30 km
- Standard Interval
  - ✧ Mega City, Major Industrial Area : 5 ~ 10 km

- ✧ Rural Area with Small to Medium Cities : 15 ~ 25 km
- ✧ Rural Area and Mountainous Area : 20 ~ 30 km

In view of the above, it is necessary to add an interchange in the Municipality of Aliaga. Three (3) interchange alternatives were prepared for comparison as shown in **TABLE 5.3-1**, which also shows evaluation of alternatives. Alternative-2 was recommended due to the following reasons;

- It provides efficient access to New Development Site.
- Least construction cost.
- Although two houses are affected, it achieves the minimum ROW acquisition or land take.

TABLE 5.3-1 ALIAGA INTERCHANGE OF COMPARATIVE STUDY

Plan						
	Alternative 1		**Alternative 2**		**Alternative 3**	
Concept	Indirect connection with Aliaga Trading Center		Direct connection with Aliaga Trading Center		Direct connection with Aliaga Trading Center	
Ramp length	1,581m		1,204m		2,081m	
Relocation	0		2 houses		0	
Construction Cost	△	Middle	○	Least	X	Highest
Social Environment	○	No relocation	△	2 houses of relocation	○	No relocation
Natural Environment	△	Medium land take of Agri-land.	○	Smallest land take of Agri-land.	X	Largest land take of Agri-land.
Construction Cost	△	Higher than Alt. 2	○	Lowest	X	Highest
Accessibility to Aliaga Trading Center / Bus Terminal	X	Poor	○	Good	○	Good
Rank	2		**1**	**Recommended**	3	

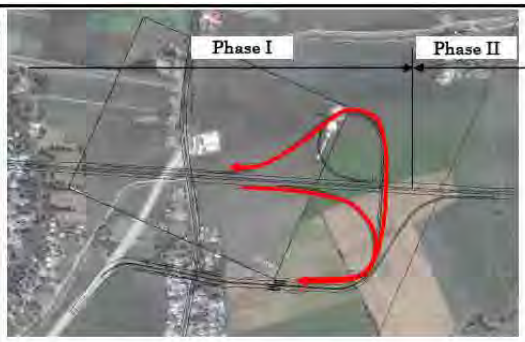
5.4. Cabanatuan IC Location

At the location of Cabanatuan Interchange proposed by the 2010 FS, the new church was built, thus the IC location is required to be re-planned. The following recommendations should be considered.;

- CLLEX center line alignment should be shifted to avoid affecting the new church.
- Interchange location should be almost at the same location selected by the 2010 FS.
- An alignment of the proposed Cabanatuan Ring Road will be selected by the City Government with due consideration of new interchange location.

The 2010 FS proposed two (2) stages development of the interchange for CLLEX Phase 1 and Phase 2, and ramps constructed during Phase-1 are proposed to be abandoned during Phase 2. The stage development of the interchange is necessary, however, it should be planned to avoid useless investment during Phase-1. Two alternatives were studied and evaluated as shown in **TABLE 5.4-1**. The alternative-2 was recommended, since it can avoid useless investment during Phase-1.

TABLE 5.4-1 CABANATUAN INTERCHANGE COMPARATIVE STUDY

Plan					
	Alternative 1		**Alternative 2**		
Concept	• Recommended by FS 2010 • To construct interim ramp for Phase I and to construct trumpet type of IC for Phase II • To demolish interim ramp when extension of Phase II is implemented.		• To construct trumpet type of IC with stage development. Two ramps (in red color) is constructed at the initial stage. Remaining two ramps (in black color) is constructed when Phase II is implemented.		
Road Length (Main)	+0m		+200m		
Ramp Length (Phase I)	820m		1,413m		
Relocation	Phase I: 3 houses, Phase II : 12 houses (including new church)		Phase I: 12 houses, Phase II: 0 house		
Social Environment	X	• Relocation of a new church is practically impossible. • Relocation of 3 houses along interim ramps during Phase 1 becomes useless (unnecessary relocation is required).	○	• Unnecessary relocation can be avoided.	
Natural Environment	△	• Land acquired for the interim ramps during Phase I becomes useless during Phase II. (Unnecessary land take of agri-land.)	○	• Unnecessary ROW acquisition can be avoided.	
Traffic flow of expressway and ordinal road	△	• Phase I: 2 at-grade intersection required. Traffic flow is disturbed at these intersections. • Phase II: 1 at-grade intersection required.	○	• Phase I and II: 1 at-grade intersection. Traffic is less disturbed than Alternative-I.	
Phase I Construction Cost	X	• Phase I: Construction cost for interim ramps wasted since these are not used in Phase II.	○	• Unnecessary investment can be avoided.	
Rank	2		1	Recommended	

5.5. Improvement of access CLLEX To/From Southern Cabanatuan City

The only road traversing Cabanatuan City in the north-south direction is the Pan-Philippine Highway (or Daang Maharlika) which is heavily congested due to huge number of slow moving vehicles such as tricycles and jeepneys. Travel speed on this road within Cabanatuan City is very slow with less than 15km/hour. Cabanatuan IC of CLLEx is located at northern periphery of Cabanatuan City, which will attract traffic to/from northern area of Cabanatuan City. Traffic from southern area will rarely utilize Cabanatuan IC, thus some measures is required for traffic generated in southern areas of Cabanatuan City. It is recommended that another half interchange (only on-ramp and off-ramp

from/to southern Cabanatuan City) should be constructed. Traffic generated from southern Cabanatuan City will use City Bypass and Quezon-Aliaga-Cabanatuan Road to access to CLLEX. This Cabanatuan City Bypass Interchange is proposed to be located at about 4 km west of Cabanatuan City Bypass.

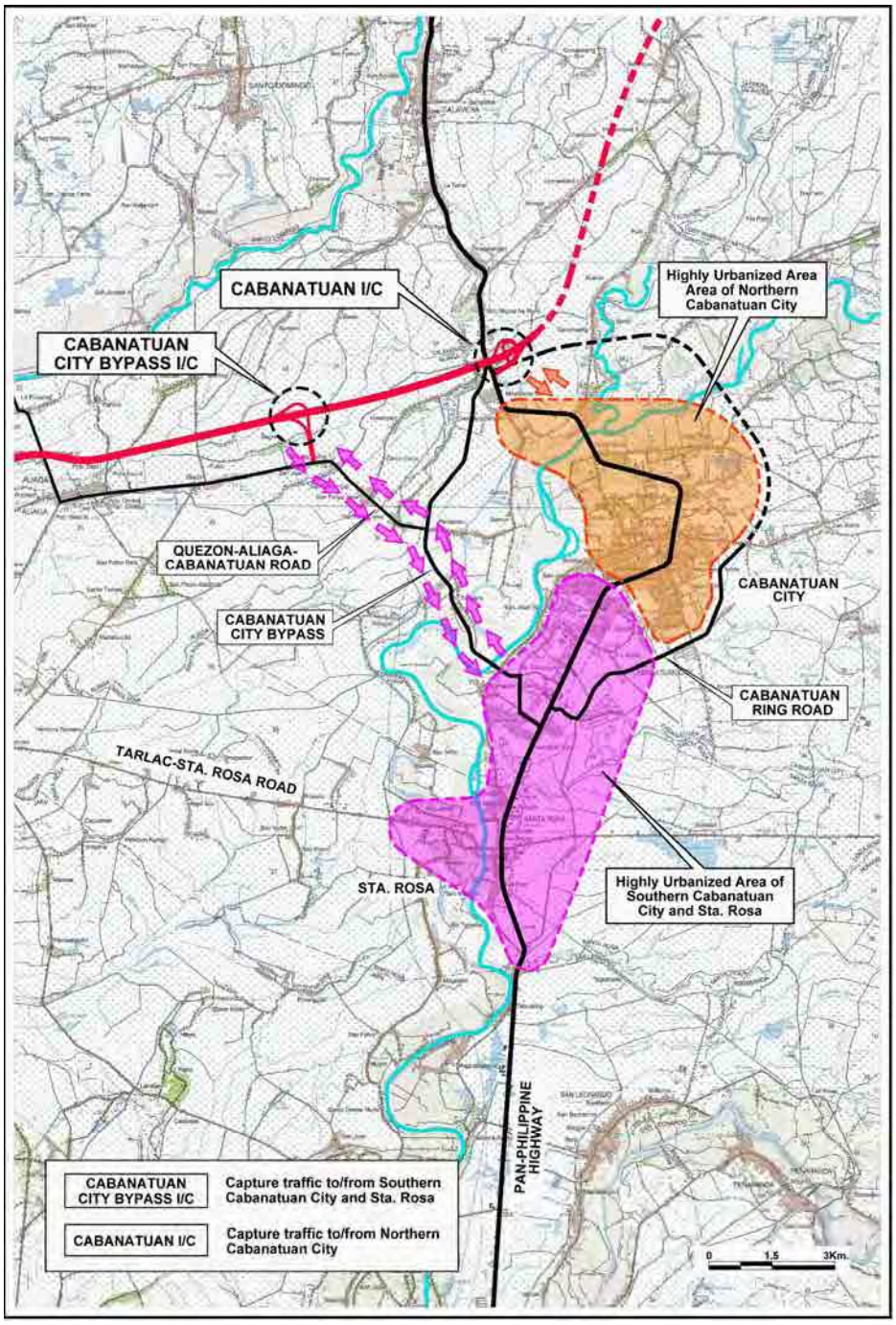


FIGURE 5.5-1 NEED OF CABANATUAN CITY BYPASS IC

5.6. Appropriate CLLEX Alignment in the Rio Chico Flood-Prone Area

(1) Condition of Flood-Prone Area

The CLLEX project has to traverse the flood-prone area. There are two (2) big rivers, namely Rio Chico River and Talavera River. There are other four (4) small rivers. All of these rivers join into one river, and then it is called as Rio Chico River. The longitudinal slope of the Rio Chico river bed is very flat at about 1/3,000 (or 0.03%), therefore, velocity of the flood water is estimated as not so fast. All rivers in Rio Chico River Area overflow the banks and flood area extends for quite wide area. Flood areas were identified by interviews to municipality officials, which is illustrated in **FIGURE 5.6-1**.

- The Ordinary river flow area (orange color) is frequent flood area (average 1 time/1-2 years), the past maximum flood area by Typhoon Ondoy/Pepeng in 2009 is shown in green color.
- The water velocity in the frequent flood areas (blue area) is very slow except the vicinity of the ordinary river flow area.
- The water velocity in the area (green area) between the frequent flood area and the past maximum flood area is minimal and almost dead water.

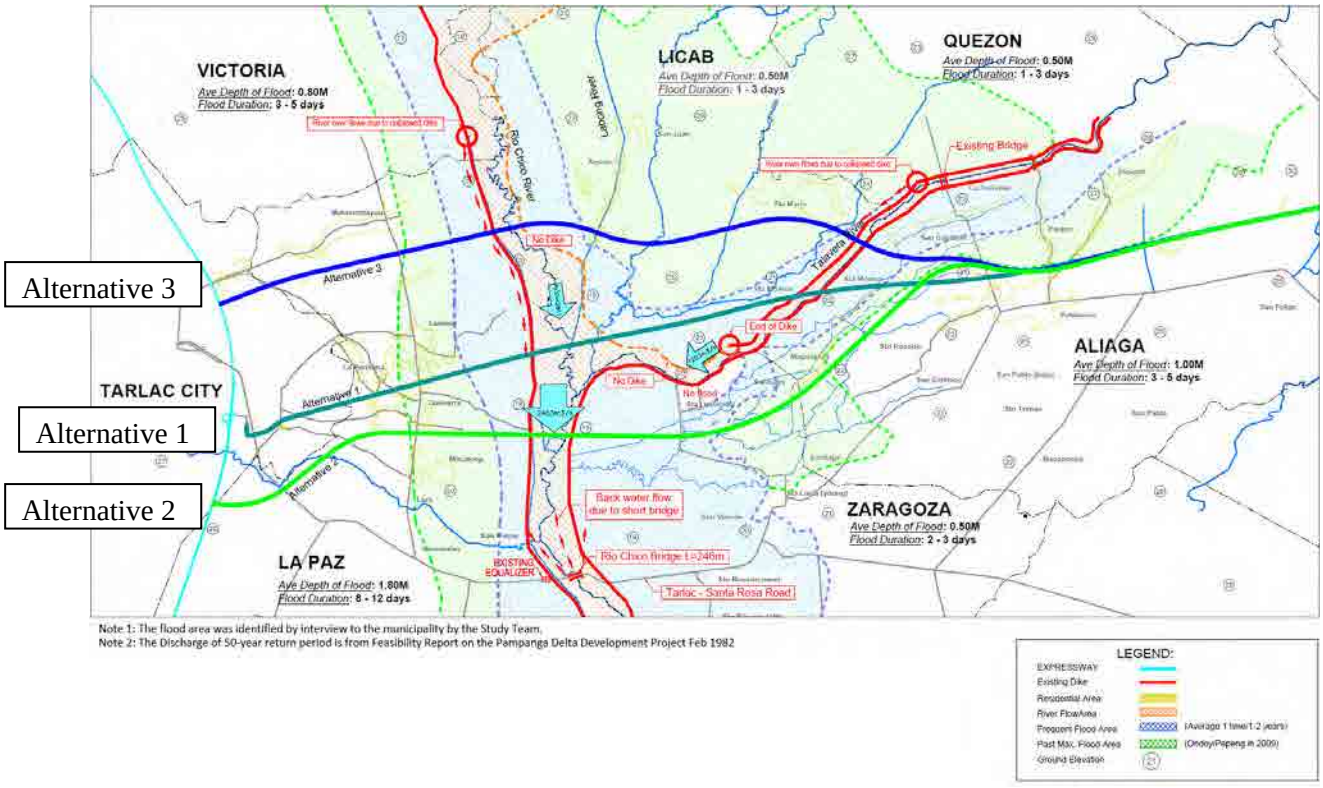


FIGURE 5.6-1 FLOOD CONDITION AT RIO CHICO A FLOOD-PRONE AREA

(2) Alternative Alignment study passing through Flood-prone Area Rico Chico River

Three (3) alternative alignments as shown in **FIGURE 5.6-**1 were studied.

Alternative-1: Alignment recommended by the 2010 FS. The alignment starts at SCTEx Tarlac Interchange entrance/exit point. It traverses at slightly upstream side of confluence point of Rio Chico River and Talavera River.

Alternative-2: This alignment starts at SCTEx and traverses at the downstream side of confluence point.

Alternative-3: This alignment starts at TPLEx and passes through the upstream side of confluence point.

TABLE 5.6-1 EVALUATION OF ALIGNMENT ALTERNATIVES

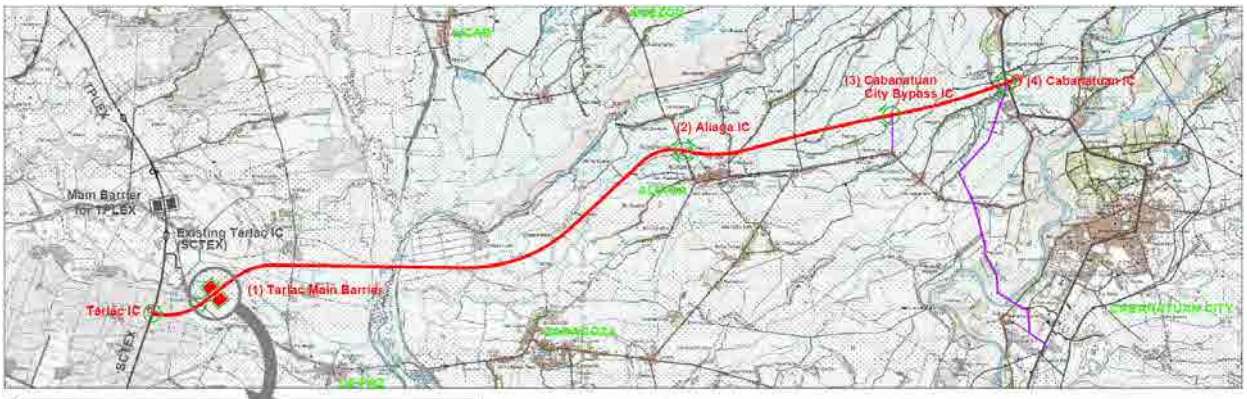
	Alternative 1		Alternative 2		Alternative 3	
Concept	2010 FS Alignment (Passing at Confluence Point of 2 rivers)		Passing at Downstream of Confluence Point		Passing at Upper stream of Confluence Point of 2 rivers (crossing 2 rivers independently)	
Road length	28.23 km (1.00)		30.31 km (1.06) (+1.84 km)		28.48 km (1.01) (+0.25 km)	
Bridge length over Rio Chico / Talavera Rivers	3,000 m (2 Bridges) (2.00)		1,500 m (1 Bridge) (1.00)		1,740 m (2 Bridges) (1.16)	
Equalizing zone for Flood Area (Section with Box Culverts)	6,584 m (1.77)		3,720 m (1.00)		2,930 m (0.79)	
Length passing flood area: Max. Flood Area / Frequent Flood Area	Max. in the past:11,950 m, Frequent: 9,580 m		Max. in the past: 9,220 m, Frequent: 5,220 m		Max. in the past: 13,190 m, Frequent: 4,670 m	
Construction Cost + ROW Cost = Total (not including IC)	Const. Cost = 13.97 B, ROW = 0.48 B, Total = 14.45 B		Const. Cost = 11.21 B, ROW = 0.52 B, Total = 11.73 B		Const. Cost = 11.31 B, ROW = 0.49 B, Total = 11.80 B	
Number of Affected Houses/Structure	56		28		33	
Appropriateness of CLLEX Location at River / Flood Area Crossing	X	• CLLEX passes near confluence point of Rio Chico River and Talavera River, thus passes through the worst condition area. • Requires longest bridge length. • Passes through longest frequent flood area, thus requires longest equalizing zone.	△	• CLLEX crosses the downstream side of confluent point of Rio Chico River and Talavera River. • Although required bridge length is longer than Alternative-3, but shorter than Alternative-1. • Passes through shorter frequent flood area than Alternative-1, but longer than Alternative-3. • Located within the range of back flow from Rio Chico Bridge along Tarlac – Sta. Rosa Road.	○	• CLLEX crosses two rivers independently. • Required bridge length is shorter than Alternative-1, but longer than Alternative-2. • Passes through shortest frequent flood area, thus the best location from the viewpoint of river/flood area crossing.
Expressways Connectivity and Transport Efficiency	X	• SCTEx and CLLEx is not directly connected but made via intersection with national road thus continuity of an expressway is poor. • Connection from Cabanatuan to Manila is bad.	○	• SCTEx and CLLEx is directly connected. • Best transport efficiency.	X	• TPLEx and CLLEx is directly connected. • Manila-Cabanatuan connection is the longest in distance.
Social Environmental Impact	X	• Highest number of houses/structure affected. • Community is divided by CLLEX at La Paz.	○	• Least number of houses/structures affected.	△	• Second highest number of houses/structures affected.
Natural Environmental Impact	○	• Land take of agri-land smallest.	△	• Land take of agri-land highest.	○	• Land take of agri-land smallest.
Constructability	X	• Passes through the longest frequent flood area, thus construction work is seriously affected by floods. • Highest construction cost.	○	• Passes through the second longest frequent flood area. • Lowest construction cost.	○	• Passes through the shortest frequent flood area. • Lowest construction cost.
Rank	3		1	**Recommended.**	2	

The evaluation of alternative alignments is shown in **TABLE 5.6-1**. The alternative-2 was recommended due to the following reasons;

- The most preferred alignment for traffic between Manila side and Cabanatuan City which is dominant traffic on CLLEX.
- The alignment passes through the area where there are banks on both sides of the river; therefore water course is controlled and stable. Flood water overflows the banks, thus enough bridge length needs to be provided.
- Number of affected houses is the least.
- Construction cost is the least, although it is almost the same as Alternative-3.
- Alternative-1 passes through the confluent points of two rivers, not appropriate for the alignment to pass.
- From the view point of river crossing location, Alternative-3 is also appropriate, however, from the view points of traffic efficiency, Alternative-3 is not recommended.

5.7. Toll Collection System of CLLEX

Toll fee should be imposed based on travel distance based toll to assure fairness to expressway users, hence the closed toll collection system should be established which is shown in **FIGURE 5.7-1**. Number of toll booth was computed on the assumption that toll collection would be done manually. Actual toll collection shall be partially done by the electronic toll collection system. Weigh-in-motion equipment for overloaded truck control, administrative maintenance office, and toll houses are also planned at the strategic locations.



Toll Collection System Is Proposed As CLOSED SYSTEM

NAME	DESCRIPTION	NO. OF TOLL BOOTH *
(1) Tarlac Main Barrier	From SCTEX : Pay SCTEX Toll And Get Ticket For CLLEX	3
	From Tarlac IC : Get Ticket For CLLEX	2
	To SCTEX : Pay CLLEX Toll And Get Ticket For SCTEX	3
	To Tarlac IC : Pay CLLEX Toll	2
(2) Aliaga IC	Entrance : Get Ticket	2
	Exit : Pay CLLEX Toll	2
(3) Cabanatuan City Bypass IC	Entrance : Get Ticket	2
	Exit : Pay CLLEX Toll	2
(4) Cabanatuan IC	Entrance : Get Ticket	2
	Exit : Pay CLLEX Toll	3
	TOTAL	23

Note: * Number of Toll Booth is estimated by future traffic volume and service time (entrance - 6 sec/veh., exit 14 sec/veh.)

FIGURE 5.7-1 PROPOSED TOLL COLLECTION SYSTEM OF CLLEX

6. SCOPE OF THE PROJECT

The proposed CLLEX is to be constructed in the provinces of Tarlac and Nueva Ecija, which are part of Region III. The starting point of the expressway is at Tarlac City (about 125km. from Manila), and ends at Cabanatuan City (CLLEX Phase I). The proposed Project has a ROW of 60 meters in width, and a length of 30.7 kilometers.

6.1. Outline of the CLLEX Project

The proposed CLLEX alignment and interchange layout has been planned and summarized as below.

TABLE 6.1-1 OUTLINE OF CLLEX PHASE-1

Project Name	Central Luzon Link Expressway (CLLEX) Project : PHASE 1
Project Proponent	Department of Public Works and Highways (DPWH)
Project Contents	Expressway construction through La Paz, Aliaga and Cabanatuan City including 7 bridges.
Expressway Length	30.7 km
Number of Lane	4-lane
ROW (width)	60m
Number of I/C	5
Number of Bridges and Length	7 bridges, 1,886 m
Equalizing Zone Length	3.78 km
Number of Overpass / Underpass for Intersecting Roads	Overpass: 1, Underpass: 37, Total: 38
Toll Collection System	• Closed toll collection • Toll Fee: Distance-based toll fee • Manual and Electrons toll collection booths • Weigh-in-motion equipment to control overloaded truck

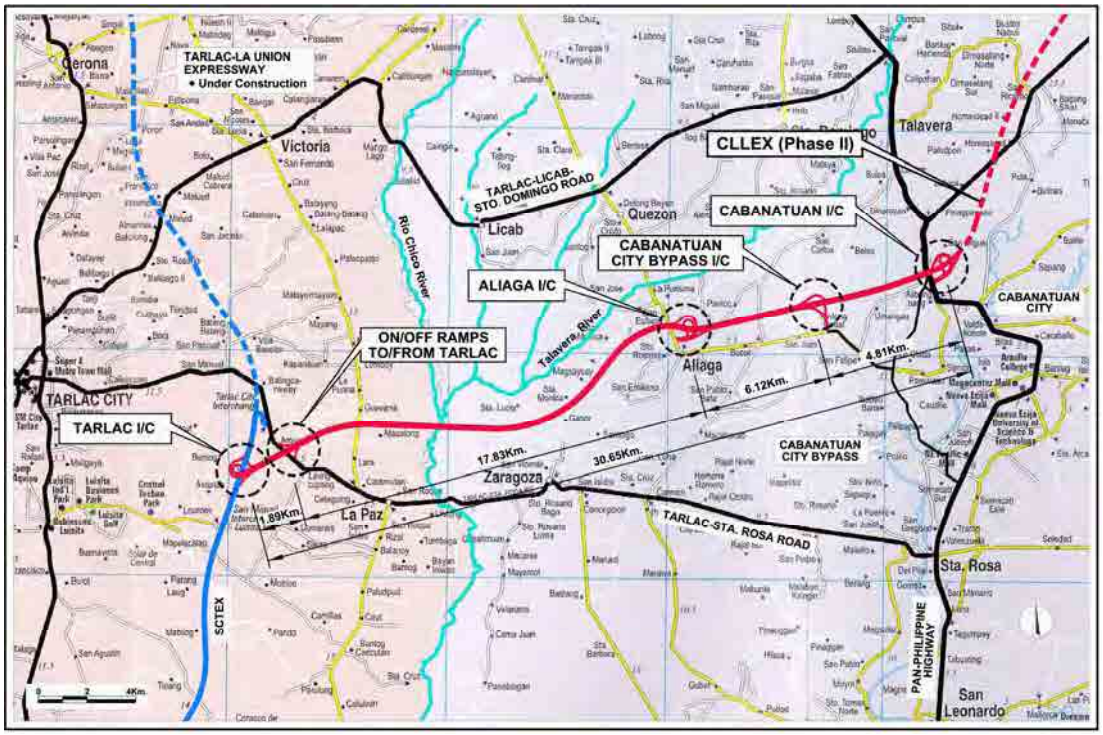


FIGURE 6.1-1 PROPOSED CLLEX ALIGNMENT AND LAYOUT OF INTERCHANGES

6.2. Design Standard

The design concept is to provide a high speed toll road that allows safe and efficient movement of traffic as an expressway with fully controlled access, especially to improve the access from Tarlac (connection to SCTEx) to Cabanatuan (Pan Philippines Highway) in the total length of 30.73km.
The following standard is mainly used as reference in CLLEX PHASE-1 design, and the geometrical design standards are set up as shown in **TABLE 6.2-1**.

- A Policy on Geometric Design of Highways and Streets, AASHTO 2004
- Highway Safety Design Standards Part 1 Road Safety Design Manual, May 2004, DPWH
- Japan Road Association, Road Structure Ordinance,2004
- Highway design manual, Metropolitan Expressway Co., Ltd., Japan
- Highway design manual, NEXCO, Japan

TABLE 6.2-1 GEOMETRICAL DESIGN STANDARD OF CLLEX

Category	Item	Unit	Roadway Standard	Ramp way Standard
Basic Element	Design Speed	km/h	100	40
	Design Vehicle	-	WB-15	WB-15
	Stopping Sight Distance	m	185	50
	Passing Sight Distance	m	670	270
Cross Section Element	Pavement Type	-	Asphalt Concrete	Asphalt Concrete
	Number of lane	nos	4	1
	Lane Wide	m	3.50	3.50
	Median Width	m	3.00	1.00
	Inner Shoulder Width	m	1.00	1.00
	Outer Shoulder Width	m	2.50	2.50
	Normal Cross fall	%	2.00	2.00
	Maximum Super Elevation		6.00	6.00
	Super Elevation	%	Exhibit 3-26	Exhibit 3-26
	Maximum relative Gradients	%	0.43	0.66
Horizontal Alignment	Minimum Radius	m	437	50 (absolute 43)
	Minimum Transition Curve length	m	56	22
	Minimum Radius not requiring Transition Curve	m	2560	525
	Super elevation Run off	%	0.43	0.66
Vertical Alignment	Maximum Vertical Gradient	%	3 (absolute 4)	6 (absolute 7)
	Minimum K Value Crest	%	85.0	6.0
	Minimum K Value Sag	%	52.0	9.0
	Minimum Vertical Curve Length	%	60	60
	Maximum Composition Grade	%	-	11.5
	Vertical Clearance (Road)	m	5.200	5.200

6.3. Typical Roadway Cross Section

Typical cross sections of roadway, viaduct and bridge are illustrated as **FIGURE 6.3-1**.

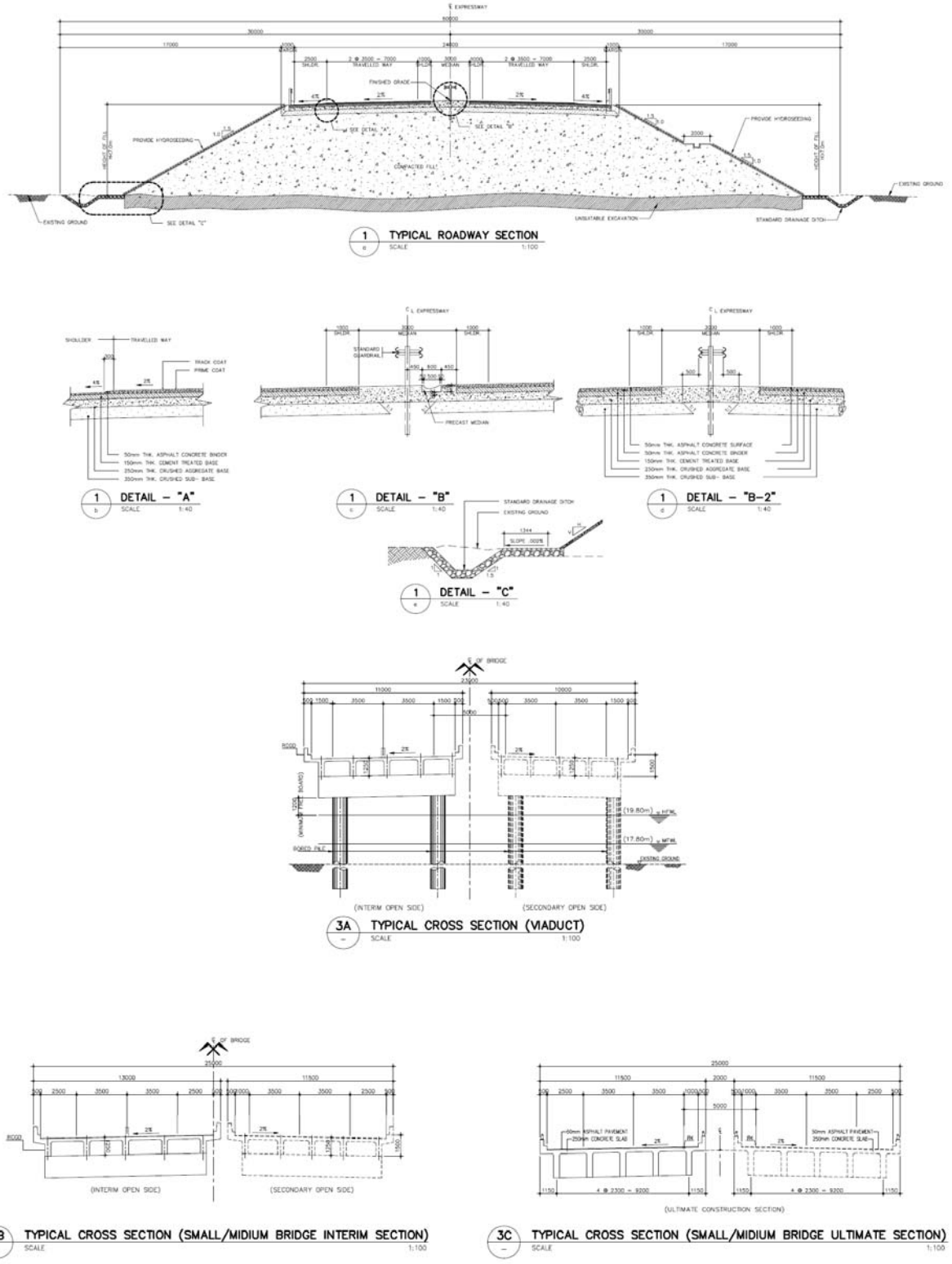


FIGURE 6.3-1 TYPICAL CROSS SECTION

7. PROJECT COST

The estimated project costs were summarized by currency component (foreign, local and tax) and by cost sharing (GOP, ODA, and Private Components). The construction cost composed of civil works, consultancy service, ROW acquisition and administrative Cost. The operation and maintenance cost also estimated by annual base and periodical base.

TABLE 7-1 ESTIMATED CONSTRUCTION COST OF CLLEX PHASE-1

Unit: Million Pesos in 2011 price

Category	Items	Total	Currency Component			Cost Sharing		
			Foreign	Local	Tax	GOP	ODA	Private
Civil Work Cost	4 lanes Construction	11,359.39	4,060.69	5,897.33	1,401.37	1,401.37	9,958.02	0.00
	Toll Facility Installation	614.93	219.62	319.44	75.87	0.00	0.00	614.93
	Sub-Total	11,974.32	4,280.31	6,216.77	1,477.24	1,401.37	9,958.02	614.93
Consultancy Services Cost	Detail Design	190.62	152.00	18.20	20.42	20.42	170.20	0.00
	Tender Assistance	35.71	27.32	4.56	3.83	3.83	31.88	0.00
	Review of D/D and Construction Supervision	361.71	245.51	77.44	38.76	38.76	322.95	0.00
	Transaction Service: Document Preparation	56.83	47.98	2.76	6.09	6.09	50.74	0.00
	Transaction Service: Tender Assistance	53.97	44.23	3.96	5.78	5.78	48.19	0.00
	Design / Supervision of Toll Facility Installation	43.05	31.15	7.30	4.60	0.00	0.00	43.05
	Independent Consultant: Toll Facility Installation	48.49	40.35	2.94	5.20	24.25	0.00	24.24
	Sub-Total	790.38	588.54	117.16	84.68	99.13	623.99	67.26
ROW Acquisition Cost		574.96	0.00	513.36	61.60	574.96	0.00	0.00
Administrative Coast		143.69	0.00	143.69	0.00	143.69	0.00	0.00
Total		13,483.35	4,868.85	6,990.98	1,623.52	2,219.15	10,582.01	682.19

TABLE 7-2 ESTIMATED OPERATION AND MAINTENANCE COST OF CLLEX PHASE-1

Unit: Million Pesos in 2011 price

Category	Items	Total
Annual Maintenance and Maintenance Cost	Operation Cost	100.40
	Maintenance Cost	20.82
	Insurance Cost	16.97
	Sub-Total	138.19
Periodic Maintenance Cost (every 5 years)		420.42

8. ECONOMIC EVALUATION

8.1. Assumption and Indicators of Economic Analysis

Economic costs and benefits throughout the project life periods are compared by a discount cash flow analysis. The discount rate is at 15%, which is widely used in Philippines as a social discount rate. For economic evaluation, three indicators are calculated: EIRR, B/C and NPV. In addition, the economic life is assumed to be 30 years, taking into account future rapid growth and changes of socioeconomic conditions. Therefore, the Pro-forma cash flow of a project evaluation will be prepared for 2011-2046. The Unit VOC and travel time cost applied are explained in the **TABLE 8.1-1** and **8.1-2**.

TABLE 8.1-1 UNIT VOC BY FOUR (4) VEHICLE TYPES IN 2011 (Peso/km/veh)

Speed (km/hr)	Passenger Car	Jeepney	Bus	Truck
20	14.46	10.32	26.16	37.93
30	13.05	9.14	23.23	34.01
40	11.64	7.97	20.30	30.09
50	10.23	6.79	17.37	26.16
60	10.04	6.73	17.40	25.94
70	9.86	6.66	17.43	25.71
80	9.67	6.59	17.45	25.48
90	9.76	6.81	17.50	25.69
100	9.86	7.02	17.54	25.90

TABLE 8.1-2 UNIT TRAVEL TIME COST IN 2011 (Peso/min/veh)

Vehicle Type	2011
Passenger Car	7.18
Jeepney	7.83
Bus	29.36
Truck	1.33

8.2. Results of Economic Analysis

The performance indicators of the project in stage construction and 4-lane construction are as sown in **TABLE 8.2-1**. The economic costs and benefits of the project generated a positive NPV and an EIRR that is higher than the government-prescribed hurdle rate (15%). These values indicate that the project is economically viable.

TABLE 8.2-1 THE RESULTS OF ECONOMIC ANALYSIS

	Stage Construction	4-lane Construction
EIRR	20.6%	19.4%
B/C	1.50	1.39
NPV (Million peso @ i=15%)	3,522.5	3,093.4

8.3. Economical Project Sensitivity

The Result of sensitivity analysis shows that the project is able to hurdle the minimum acceptance criteria of EIRR = 15% and NPV = 0 in all case.

TABLE 8.3-1 PROJECT SENSITIVITY

Case Set	NPV (Million Pesos)	B/C	EIRR
Base Case	3093.4	1.39	19.4%
Cost plus 10%	2502.7	1.29	18.3%
Cost plus 20%	1911.9	1.20	17.3%
Benefit less 10%	2140.2	1.27	18.1%
Benefit less 20%	1186.9	1.15	16.8%
Cost plus 10%, Benefit less 10%	1549.4	1.18	17.1%
Cost plus 10%, Benefit less 20%	596.2	1.07	15.8%
Cost plus 20%, Benefit less 10%	958.6	1.10	16.2%
Cost plus 20%, Benefit less 20%	5.4	1.00	15.0%

9. PPP SCHEME

Project IRR which is the internal rate of return when all costs including ROW acquisition are shouldered by the private sector, is estimated about 3.5%. The project needs financial support of the Government. Otherwise, the private sector will not be interested. For the projects with low Project IRR, the possible PPP modalities are as follows;

Type-1	Design and build by the Government and lease the facility to the private. The Private operates and maintains the facility and pays lease fee to the Government (SCTEx model). Traffic demand and revenue risks shall be borne by the private.
Type-2	The private sector undertakes just O & M. Toll rate can be reduced compared to other modality.
Type-3	Design, build and O & M by the private. The facility is leased to the Government who shall pay lease fee to the private (MRT-3 model). The Government shall bear the traffic demand and revenue risk

Type-1 was selected due to the following reasons;

- The Government can recover its investment from lease fee.
- The Government can utilize ODA fund which provides soft loan with low interest rate, long repayment period with long grace period.
- Because of ODA soft loan, total project cost becomes much less than Type-3. Since Type-3 has to secure higher interest rate fund and shorter repayment loan from the private commercial banks.

Financial analysis was undertaken based on the following PPP modality;

Option-1: Stage Development (Initially 2-lane Widen to 4-lane	Government	• ROW Acquisition • Design & Build of 2-lane Expressway (Yen loan)
	Private	• Installation of toll collection facility • O & M (2-lane) • Design & Build & Finance Widening (2 to 4-lane) • O & M (4-lane) • Pay lease fee to the Government (or Toll revenue sharing between GOP and the Private)
Option-2: Full Development (4-lane from the Beginning)	Government	• ROW Acquisition • Design & Build of 4-lane Expressway (Yen loan)
	Private	• Installation of toll collection facility • O & M (4-lane) • Pay lease fee to the Government (or Toll revenue sharing between GOP and the Private)

10. FINANCIAL EVALUATION

10.1. Assumption and Conditions of Financial Analysis

Assumptions and conditions of financial analysis are summarized in **TABLE 10.1-1**. The assumption for lease fee is shown in **TABLE 10.1-2**.

TABLE 10.1-1 ASSUMPTIONS AND CONDITIONS OF FINANCIAL ANALYSIS

Item			Assumption
1. PPP Modality			Lease Scheme
2. Base Year			2011
3. Operation		Operation Period	34 years (From 2017 to 2050)
4. Price Escalation		Foreign	1.6%
		Local	3.8%
5. Toll Rate		Initial Toll Rate in 2017	3.0 Pesos/vehicle*km (Class 1)
		Toll Rate Adjustment	100% every 2 years (+7.6%)
6. Financing			
(1) ODA Loan			
	Signing L/A		February 2012
	Interest rate	Civil work	1.4%
		Consultancy Service	0.01%
	Loan Repayment Period		30 years (From 2012 to 2041)
	Grace Period		10 years (From 2012 to 2021)
	Repayment Structure		Even annuity basis
	Commitment Charge		0.1% of Loan
(2) Commercial Bank Loan			
	Financing Closure		2016
	Interest rate		10.49%
	Repayment Period		12 years
	Grace Period		3 years
	Repayment Structure		Even annuity basis
	Financing Charge		1.0% of Loan
	Short-term loan	Interest Rate	5%
		Repayment Period	1 year
7. Depreciation		Methodology	Liner
		Depreciation Period	34 years
8. Taxation		Corporate Income Tax Rate	30%
		Corporate Income Tax Holiday	7 years from the commencement of the operation (in accordance with Executive Order No. 226, The Omnibus Investments Code of 1987)
		Net Operating Loss Carry Over	The Net Operating Loss of the Concessionaire shall be carried over as a deduction from gross income for the next 3 taxable years.
		Local Government Tax	3% of Gross Revenue
		VAT	No
		Property Tax	No

TABLE 10.1-2 ASSUMPTION FOR LEASE FEE

Item		Description
Amount of Lease Fee		Lease fee will be paid to the DPWH by the Concessionaire to compensate repayment of ODA Loan. In this study, amount of the lease fee is assumed to be equal to amount of principal and interest of ODA Loan excluding Interest During Construction and Commitment Charge.
Annual Lease Fee	Scenario 1: Constantly	Constant annual lease fee is paid
	Scenario 2: ODA Loan Amortization	Annual lease fee is equal to annual amortization of ODA Loan.
	Scenario 3: Linear	Annual lease fee will increase by constant value every year
Lease Fee Payment Period	Scenario 1: Repayment Period of ODA Loan	From the opening to the end of repayment period of ODA Loan
	Scenario 2: Operation Period	From the opening to the end of Concession period
Exchange Rate Risks		-10% decrease of current Exchange Rate(Yen/Pesos) (The value of amortization of ODA Loan in Pesos will be increase.)

10.2. Results of Financial Analysis

The results of financial analysis are shown in **TABLE 10.2-1** and **10.2-2**.

TABLE 10.2-1 FINANCIAL ANALYSIS RESULTS OF CLLEX PHASE-1 OPTION-1 (2-lane to 4-lane)

Exchange Rate Risk for Lease Fee: -10% Yen/Pesos

Yellow cell above WACC：9.64% (after Corporate Income Tax)

Option 1 **Equity IRR Hurdle Rate: 15%**

Case			Major item							Results				Year of becoming positive cash flow
			PPP Modality	Equity /Loan	GFS for Private Portion	Annual Lease Fee			Tax Exemption (Net Operating Loss Carry-Over & Tax Holiday)	Short-term Loan	Project IRR	IRR for SPC	Equity IRR	Government IRR	
						Payment	Initial Charge	Period							
1-1	Phase 1	Option 1 (2-lane & widening)	Lease (with ODA)	3:7	No	Constant	0	25 yrs	No	No	**3.45%**	**6.00%**	**5.31%**	**4.27%**	
1-2									Yes	Yes	**3.51%**	**6.13%**	**7.01%**	**3.87%**	
1-3						ODA Loan Amortization basis						**7.11%**	**8.83%**	**3.57%**	
1-4						Linear		34 yrs				**11.59%**	**17.22%**	**2.74%**	**2038**
1-5	Phase 1+2					Linear	15 Million PHP/yr (Based on Interest of ODA Loan)	Ph1: 35yrs Ph2: 30yrs	Yes	Yes	3.52%	**11.90%**	**14.09%**	**2.83%**	
1-6							0 (Phase 2 Only: 15 Million PHP/yr)					**13.98%**	**20.96%**	**2.72%**	**2037**

TABLE 10.2-2 FINANCIAL ANALYSIS RESULTS OF CLLEX PHASE-1 OPTION-2 (4-lane)

Option 2

Case			Major item							Results				Year of becoming positive cash flow
			PPP Modality	Equity /Loan	GFS for Private Portion	Annual Lease Fee			Tax Exemption (Net Operating Loss Carry-Over & Tax Holiday)	Short-term Loan	Project IRR	IRR for SPC	Equity IRR	Government IRR	
						Payment	Initial Charge	Period							
2-1	Phase 1	Option 2 (4-lane)	Lease (with ODA)	3:7	No	Constant	0	25 yrs	No	No	**3.48%**	**7.05%**	**6.86%**	**3.95%**	
2-2									Yes	Yes	**3.54%**	**7.19%**	**13.36%**	**3.62%**	
2-3						ODA Loan Amortization basis			Yes	Yes		**9.41%**	**20.58%**	**3.34%**	
2-4										No		**9.41%**	**9.24%**	**3.48%**	
2-5						Linear	15 Million PHP/yr (Based on Interest of ODA Loan)		Yes	Yes		**17.46%**	**24.10%**	**2.73%**	**2030**
2-6										No		**17.46%**	**20.12%**	**2.74%**	
2-7	Phase 1+2					Linear	15 Million PHP/yr (Based on Interest of ODA Loan)	Ph1: 35yrs Ph2: 30yrs	Yes	Yes	**3.65%**	**17.84%**	**23.68%**	**2.75%**	**2030**
2-8										No		**17.84%**	**21.49%**	**2.76%**	
2-9			Ph1: Lease Ph2: BTO		50%		0	Ph1: 35yrs	Yes	Yes		**9.97%**	**12.28%**	**2.25%**	

11. ENVIRONMENTAL AND SOCIAL CONSIDERATION

11.1. Prediction / Assessment and Mitigation of the Impacts and Monitoring

Impact to natural and social environment for directly affected area and its PAPs are predicted and magnitude of the impact is assessed based on the Study. Assessment results, mitigation measures and monitoring in Pre-construction / construction phase and Operation / maintenance phase are shown in **TABLE 11.1-1** and **TABLE 11.1-2**.

TABLE 11.1-1 EIA RESULTS (PRE-CONSTRUCTION AND CONSTRUCTION PHASE)

	Item	Assessment	Mitigation Measures	Monitoring Item
1	Involuntary Resettlement	A total of 64 structure (i.e. residential houses) with 67 households (or 337 people) will be affected. All of them except 1 household (5 people) are informal settlers. One household is tenant. A total of about 507 farm land lots (or 201 ha.) will be affected. About 95.6% are land owners, about 1.3% are tenants, About 3.1% are free occupants with permit of land owners.	• To prepare Final RAP with full consensus with PAPS, and inventories of land and other assets.	• Inventory of land and asset • Valuation of land and assets by replacement cost.
			• To provide relocation sites for PAPs to be relocated.	• Relocation sites are provided and at PAPs' satisfaction.
			• To provide just (or fair) compensation, relocation sites, and other supports that are stated in LARRIPP/WB OP 4.12.	• Valuation is made at the replacement cost and fair compensation is offered to PAPs.
2	Local Economy such as Employment	(+) Demands for labor to the construction and related work are expected to be increased temporarily, which further stimulates local economy. (-) Shops and small businesses locating on CLLEX I/C construction sites will have to be relocated.	• To assure priority employment of PAPs during construction. Construction contract between DPWH and the selected contractor shall specify this condition.	• Contract specified this condition. • They are employed during construction.
			• To provide just (or fair) income loss compensation and rehabilitation assistance.	• PAPs are provided such compensation and assistance.
3	Land Use	About 201 ha of lands, almost all of which are palay (rice) field will be lost and change to CLLEX. These lots along the new road and around the interchanges might be converted to market places / shopping malls, or residential uses.	• Respective LGUs shall amend city/municipality Land Use Plan and Zoning Ordinance to control unorderly urban development along CLLEX and to restrict conversion of farm land to other land use purposes, and strictly enforce amended zoning ordinance.	• Zoning ordinance is amended and implemented.
	Utilization of Local Resources	Project site is located in abundant sand/gravel resources, construction of pavement and bridges/other structure can utilize these resources.	• Detailed design shall adopt construction methods which utilize available local resources.	• Local resources are incorporated in design. • Local resources are used.
			• Construction contract between DPWH and the selected contractor shall specify maximum utilization of available local resources.	• Utilization of local resources are specified in the contract. • Local resources are used.
	Farm Land	About 201 ha of farmland will be lost by this project in exchange to the expressway. Negative impact to farmers is expected in a form of loss of lands. Division of farmlands by CLLEX might cause inconvenience to access their cultivating lands.	• To provide just (or fair) compensation, replacement of land when feasible and other supports such as disturbance compensation and rehabilitation assistance in accordance with LARRIPP/WB OP 4.12.	• Fair valuation is made, fair compensation is estimated and paid.
			• Detailed design shall be undertaken focusing on maintaining of existing irrigation system and existing farm roads to assure accessibility to farm lands. • Detailed design shall be undertaken to provide accessibility between the lands divided by CLLEX by providing enough box-culverts.	• Detailed Design is made in accordance with this concept. • Designed features are constructed and functioning efficiently as design concept.

	Item	Assessment	Mitigation Measures	Monitoring Item
4*	Social Institution, and Local Decision-making	No concern regarding Social Institution and Local Decision-making system were raised by PAPs.	• Although no concern was raised by PAPs, DPWH shall continue to dialogue with social institution and local decision-making bodies.	• Any concerns are raised.
	Social Infrastructure	There are some universities and hospitals in Tarlac, Aliaga and Cabanatuan. During the construction, it might create difficulty in access to those social infrastructure due to the increasing in vehicles and congestion by construction.	• To construct temporary road within the road right-of-way for transporting construction materials, equipment and laborers. • To implement proper traffic management with close coordination with local police and barangay captains. • To provide proper information on construction schedule and traffic management plan.	• These are specified in the contract. • These are implemented.
5*	Poor	About 58.7% of affected households belong to the poor (or below Region III poverty threshold). (+) Demands for labor to the construction and related work are expected to be increased temporarily, which further stimulates local economy. (-) Shops and small businesses locating on CLLEX I/C construction sites will have to be relocated	• Qualified skilled workers and laborers in the Direct Impact Areas (DIA) duly endorsed by the Brgy. Captains will be given priority in hiring during implementation of the project. • To include condition of priority employment of PAPs below poverty line into construction contractor's contract. • To provide just (or fair) compensation for income loss and rehabilitation assistance in accordance with LARRIPP/WB OP 4.12.	• These are specified in the contract. • These are implemented by the Contractor. • Fair compensation and rehabilitation assistance are made.
9*	Water Use, Water Rights	All project areas are provided with the irrigation system.	• To assure by Detailed Design that the existing irrigation system shall not be disturbed. Irrigation channels and their maintenance roads shall be provided with box culverts and when necessary, rechanneling of irrigation canal shall be designed. • Inventory of drainages and irrigation distribution means must be cataloged with lawful owners and practical users' name. In case of the area where CLLEX Project takes place, the water right for irrigation belongs to National Irrigation Administration (NIA). Just allocation of irrigation water to the farmers is NIA's responsibility.	• Detailed Design incorporated this requirement. • Designed features are constructed and functioning efficiently
10*	Sanitation	Sanitary condition around construction site is anticipated to become worse due to generation of wastes during the construction.	• Temporary sanitation facilities such as garbage bins and portable toilets must be provided by the Contractor at the construction area. • Regular disposal of the solid and domestic wastes to the designated disposal areas duly-approved by respective LGUs and DPWH must be strictly complied with. • Weekly inspection of the work sites must be undertaken by DPWH to ensure proper management of the solid and domestic wastes generated.	• These requirements are specified in the contract. • These are properly implemented.

	Item	Assessment	Mitigation Measures	Monitoring Item
11*	Risk, HIV/AIDS, Infectious disease	Temporally increase in infectious and communicable diseases is possible during construction phase due to influx of construction workers. Poor sanitary environment can generate and spread communicable diseases such as diarrhea, common cold, and such.	• Temporary sanitation facilities such as garbage bins and portable toilets must be provided by the Contractor at the construction area. • Regular disposal of the solid and domestic wastes to the designated disposal areas duly-approved by respective LGUs and DPWH must be strictly complied with. • Weekly inspection of the work sites must be undertaken by DPWH to ensure proper management of the solid and domestic wastes generated. • To provide Information, Education and Communication (IEC) on healthy behavior and Sexually Transmitted Disease (STD) to the construction workers.	• These requirements are specified in the contract. • These are properly implemented.
12*	Accident	Accidents involving construction works, vehicles and machineries operation are anticipated. Traffic accidents may happen by construction vehicles and heavy machines during construction. Construction personnel, particularly operators of heavy equipment and machineries may experience respiratory ailments. Fall down from higher position such as piers and bridges may happen.	• To construct temporary construction road within road right-of-way, implement traffic management plan in coordination with local police and inform construction schedule, etc. to people within the project area to prevent traffic accidents. • To implement proper stock piling of materials, watering of soils and covering materials to prevent dusting. • To educate construction workers on various construction safety measures, and strictly implement such safety measures. • To provide adequate lighting and reflectors and construction warning signs at construction sites as well as at traffic accident-prone sections of roads. • To provide temporary fences so as ordinary people not to enter in the construction sites.	• These are specified in the contract. • These are properly implemented.
14	Soil Erosion	During the construction stage, erosion is likely to occur mainly by intense rain.	• To provide proper temporary drainage system to prevent water concentration at certain locations. • To provide temporary dike within the road right-of-way to prevent flow of eroded soils. • For high embankment construction section, to cover embankment by vinyl sheet during heavy rain for prevention of slope collapse.	• These are incorporated in the contract. • These are properly implemented.
15	Groundwater	Groundwater table at project site is between GL-0.5m and GL-4.3m deep. Groundwater level might temporarily be dropped during construction by cutting off of recharge source e.g. surface water flow.	• To seal, remove, or contain solid wastes and other construction hazardous materials off from bare ground to prevent seeping into the ground especially when it rains. • To install and manage portable toilets for construction workers properly. • To maintain machineries and generators and prevent oil leakage.	• These are specified in the contract. • These are properly implemented.
16	Hydrology	CLLEx traverses the flood-prone area where the river bed gradient is very gentle	• To design and construct sufficient length of bridges and also provide sufficient number of box-culverts in order not to change and worsen the	• These are incorporated in the detailed design.

	Item	Assessment	Mitigation Measures	Monitoring Item
		(1/3,000). Due to insufficient river banks distance, sufficient river channel capacity is not provided, thus storm water overflows the banks. By construction of CLLEx, hydrological condition may be affected if proper design is not made.	current condition. • During construction, to undertake bridge substructure construction only during dry season and to avoid stockpiling of materials in a manner to disturb water flow.	• Check work schedule of the Contractor
17	Flora, Fauna and Biodiversity	Agricultural flora, mainly rice, and trees growing in CLLEX alignment are expected to be removed. Removal of such flora also causes impact. Slightly on local ecology and biodiversity negatively.	• To obtain "Permit To Cut" prior to tree cutting activities along the alignment. • To limit Tree cutting only within the required ROW. • Relocation of trees will be carefully undertaken. • Reforestation at areas designated by the DENR-FMB to replace cut tree species. Replacement ratio and species to be introduced will be determined by the DENR-FMB (Forest Management Bureau).	• These are properly implemented.
20*	Global Warming	It is estimated that total emission of CO_2 will be about 59,584 tons during construction phase.	• To use clean filters and mufflers of engines. • To minimize idling of engines. • To minimize traveling frequencies between construction sites and origin by making and executing efficient construction materials transportation schedule. • To prohibit old model equipment and vehicles. • To follow mitigation measures suggested for AIR POLLUTION. • To off-set this impact, plant enough trees along expressway and interchange sites.	• These requirements are specified in the contract. • These are properly implemented.
21*	Air Pollution	Air quality was measured at 4 stations in dry season (2010 FS) and 7 stations in wet season (2011). Results shows that highest values of TSP, SO_2 and NO_2 are 299 (DENR Standard: 300), 30 (DENR Standard: 340) and 11 (DENR Standard: 260), respectively. Although SO_2 and NO_2 are far below DENR standard, TSP at one station in Cabanatuan City is close to DENR Standard. Construction work near the section to Cabanatuan City needs to be done carefully.	• To spray exposed ground with water to minimize dust re-suspension. • To cover temporary stockpiles of excavated materials and construction spoils with tarpaulin or sack materials. • To transport and dispose construction spoils regularly to hauled areas duly-approved by the DENR/LGUs. • To perform regular maintenance of construction vehicles, heavy equipment and machineries. • Follow mitigation measures suggested for GLOBAL WARMING. • Aggravation of air pollution will be minimized by adoption of above measures, considering that most of construction sites are located in the rice field areas.	• Measure air quality quarterly. • These are specified in the contract. • These are properly implemented.
22*	Water Pollution	Water quality was measured at 2 stations in dry season (2010 FS) and 7 stations in wet	• To adopt construction method minimizing generation of drainage water (e.g. river realignment plan for substructure construction).	• These are specified in the contract.

	Item	Assessment	Mitigation Measures	Monitoring Item
		season (2011). In dry season, all of BOD, TSS and Total Coliforms exceeded DENR Standard. In wet season, BOD exceeds DENR Standard at one station, TSS at 4 stations and TC at 5 stations. It is important not to worsen water quality than at present.	• To seal, remove, or contain solid wastes and other construction hazardous materials off from bare ground to prevent seeping into the ground especially when it rains. • To install and manage portable toilets for construction workers properly. • To maintain machineries and generators and to prevent oil leakage. • Aggravation of water quality will be minimized by adoption of above measures.	• These are properly implemented.
23*	Soil Contamination	During the construction, excavated soil, surface water and oil from vehicles and machineries may pollute the ground.	• To seal, remove, or contain solid wastes and other construction hazardous materials off from bare ground to prevent seeping into the ground especially when it rains. • To install and manage portable toilets for construction workers properly. • To maintain machineries and generators and prevent oil leakage. • Aggravation of soil contamination will be minimized by adoption of above measures.	• These are specified in the contract. • These are properly implemented.
24*	Waste	Construction debris and excavated soil are generated during the construction. Human waste will be generated from workers during construction and operation.	• To seal, remove, or contain solid wastes and other construction wastes. • To dispose them at the disposal sites approved by respective LGUs and DPWH. • To select eco-friendly waste disposal methods. • To edificate and educate construction workers. • To conduct EIS on the disposal site if the site is to be newly developed for the project. • Effect of waste will be minimized by adoption of above measures.	• These are specified in the contract. • These are properly implemented.
25*	Noise and Vibration	Noise level was measured along the national roads at 3 stations in dry season (2010 FS) and 5 stations in wet season (2011). Noise level at all stations exceeded DENR Standard. It is important to adopt measures not to worsen noise level than at present. Noise and vibration occur from machineries and vehicles used during construction work, hence construction work and transporting of materials need to be carefully done.	• To bore piles using a special boring equipment will be adopted during foundation works instead of pile driving. • To use noise suppressors equipped machineries. • To work in day time or non-critical time to minimize noise disturbance to adjacent residential areas. • To install temporary noise barriers at noise sensitive areas such as residential, schools, and places of worships to maintain noise level at permissible limit. • To strictly prohibit overloading on trucks. • Aggravation of noise and vibration will be minimized by adoption of above measures, considering that most construction sites are located in the rice field area.	• Measure noise quarterly. • These are specified in the contract. • These are properly implemented.

	Item	Assessment	Mitigation Measures	Monitoring Item
27*	Offensive Odor	Possible offensive odor might be generated from construction vehicles and portable toilets for workers during construction.	• To seal, remove, or contain solid wastes and other construction wastes. • To dispose them off in an LGU approved solid wastes disposal site. • To install and manage portable toilets for construction workers properly. • To do good camp management.	• These are specified in the contract. • These are properly implemented.
29*	Traffic Congestion	During the construction, trucks transporting construction materials will cause traffic congestion.	• To implement traffic management plan in coordination with local police. • To transport materials during off-peak hours. • To prohibit parking of construction-related vehicles on the national/provincial roads. • To use temporary construction road built within the acquired road right-of-way as much as possible. • To educate truck drivers.	• These are specified in the contract. • These are properly implemented.

TABLE 11.1-2 EIA RESULTS (OPERATION AND MAINTENANCE PHASE)

	Item	Assessment	Mitigation Measures	Measures Monitoring Item
3	Farm Land	Estimated monetary values of paray that would yield in the land acquired for CLLEX were estimated to be 14.75 million pesos per year. Some of PAPs who lose farm land might face financial difficulty if their losses of income sources are not properly compensated or alternative means of compensation have been provided.	• To adopt high productivity farming methods and high yield seeds. • To educate and finance farmers so as for them to adopt above	• Check rice production of provinces of Tarlac and Nueva Ecija.
			• Proper compensation such as job training and prioritized job opportunity.	• Number of PAPs who received training. • Number of jobs provided to PAPs
12*	Accident	CLLEX will be built as 4-lane divided facility with center median and international geometric design standard is adopted. Traffic on CLLEX will not be so heavy; therefore, occurrence of accidents will be unlikely due to quality of the facility. Accident may occur only when a driver does not follow traffic rules and regulations. Traffic on existing roads will be decreased, thus accidents will be expected to reduce.	• Educate drivers to follow traffic rules and regulations. • Install traffic signboards at appropriate places. • Regularly repair roads and bridges to ensure good condition for vehicle movement.	• Check report of Concessionaire.
20*	Global Warming	Amount of GHG e.g. CO_2 is expected to increase as number of vehicles travel through CLLEX increases. But CO_2 is estimated to decrease 16,810 tons, 21,073 tons and 34,654 tons in 2017, 2020 and 2030, respectively compared with the without Project case.	• To use clean filters and mufflers of engines • To minimize idling of engines • To maintain vehicle mechanics, engines, oil filter, exhaust pipe, and such in proper shape • To prohibit old model vehicles • To strengthen vehicle emission regulation	• Check report of Concessionaire on traffic volume and travel speed.
21*	Air Pollution	Predicted air qualities such as NOX, $SO^2$and PM-10 are less than 1μg/Ncm with CLLEX. During all parameters are below DENR Standards.	• To use clean filters and mufflers of engines • To minimize idling of engines • To maintain vehicle mechanics, engines, oil filter, exhaust pipe, and such in proper shape • To prohibit old model vehicles • To strengthen vehicle emission regulation	• Measure air quality quarterly.
22*	Water Pollution	Litters on road surface and eroded soils from embankment slope may cause water pollution, however, minimal impact.	• Implement proper road maintenance.	• Check maintenance report of the Concessionaire.

11.2. RAP Requirement

Overall RAP requirements are shown in **TABLE 11.2-1**.

TABLE 11.2-1 OVER-ALL RAP REQUIREMENTS

Compensation Structure	LARRIPP, 2007	This Project
For Structure	Cash including cost of restoring the remaining structure Determined by Appraisal Committee No deduction for salvaged building materials (Replacement Cost)	No. of residential houses affected: 61 (67 HH, 334 persons) 1 is tenant, 63are occupation of private land and 3 on public land (a total of 66 are informal settlers) 1 formal settler and 66 informal settlers 61 (67 HH) shall be provided with relocation site by respective LGUs
For Other Improvement	Cash Replacement cost for the affected portion of public structure to the Government or non-Government agencies or to the community Cost for reconnecting the facility such as water, power and telephone	Sugar land: 3 ha. Auxiliary Structure: 50 Public Infrastructure: 6
For Crops, Trees and Perennials	Cash Commercial value as determined by DENR or Appraisal Committee PAFs given sufficient time to harvest crops Compensation for damaged crops (palay, corn) at market value Fruit-bearing trees based on assessment of Provincial/Municipal Assessors	Fruit bearing/crops: 897 None Fruit Bearing Trees: 281
For Land	Replacement Cost Initial Offer: Zonal Valuation Second Offer: Market Value Land Swapping if feasible (Land for Land) (Cash compensation when affected holding has a higher value than relocation plot.)	Residential house land: 9 lots (9 owners, all severe) Farm Land: Approximately 505 lots (Severe 31, Marginal 474) Sample Survey Result…95.6% are land owners, 1.3% are tenants and 3.1% are free occupation with permit.
Other Types of Assistance or Entitlement	Disturbance Compensation Lessees: 5 times the average of gross harvest for the past three years, but not less than Php15,000. Tenant: Value of gross harvest of 1 year and not less than Php15,000 per ha. (E.O. 1035)	About 95.6% of farm lands are owned. No Lessee 4.4% are classified as tenant farmers
	Income Loss Loss of business/income, entitled to an income rehabilitation assistance not to exceed Php15,000 or based on tax record.	Four (4) Sari-sari store owners are affected.
	Inconvenience Allowance Php10,000 to PAF when severely affected structures which require relocation and new construction.	Sixty one (61) residential houses (67 households)
	Rehabilitation Assistance Skills training and other development activities equivalent to Php15,000 per family	Max. Sixty seven (67) households who lose income. Some farmers who become land less.
	Rental Subsidy Without sufficient additional land to allow reconstruction of their lost house. Equivalent to prevailing average monthly rental. Period between delivery of house compensation and the delivery of land compensation	When availability of relocation sites is delayed, this should be considered (maximum of 67 households)
	Transportation Allowance and Assistance	67 households

Note: Severe –More than 20% of Total Land/Properties affected

Marginal – Less than 20% and still viable for continued use.

11.3. Summary of Relocation Assets

TABLE 11.3-1 shows number of residential houses, households and people affected and relocated.

TABLE 11.3-1 NUMBER OF RESIDENTIAL HOUSE, HOUSEHOLD AND PEOPLE AFFECTED

Municipality/ City	Barangay	No. of Residential Houses Affected	No. of Household Affected	No. of People Affected	PAPs with Loss of Income
La Paz	Macalong	2	2	14	0
	Laungcapang	1	1		
	Sub-Total	3	3	14	0
Aliaga	Pantoc	3	3	158	0
	Betes	2	2		
	Bucot	1	1		
	Umangan	25	26		
	Sub-Total	31	32	158	0
Cabanatuan City	Caalibang-bangan	27	37	162	4
Total		61	67	334	4

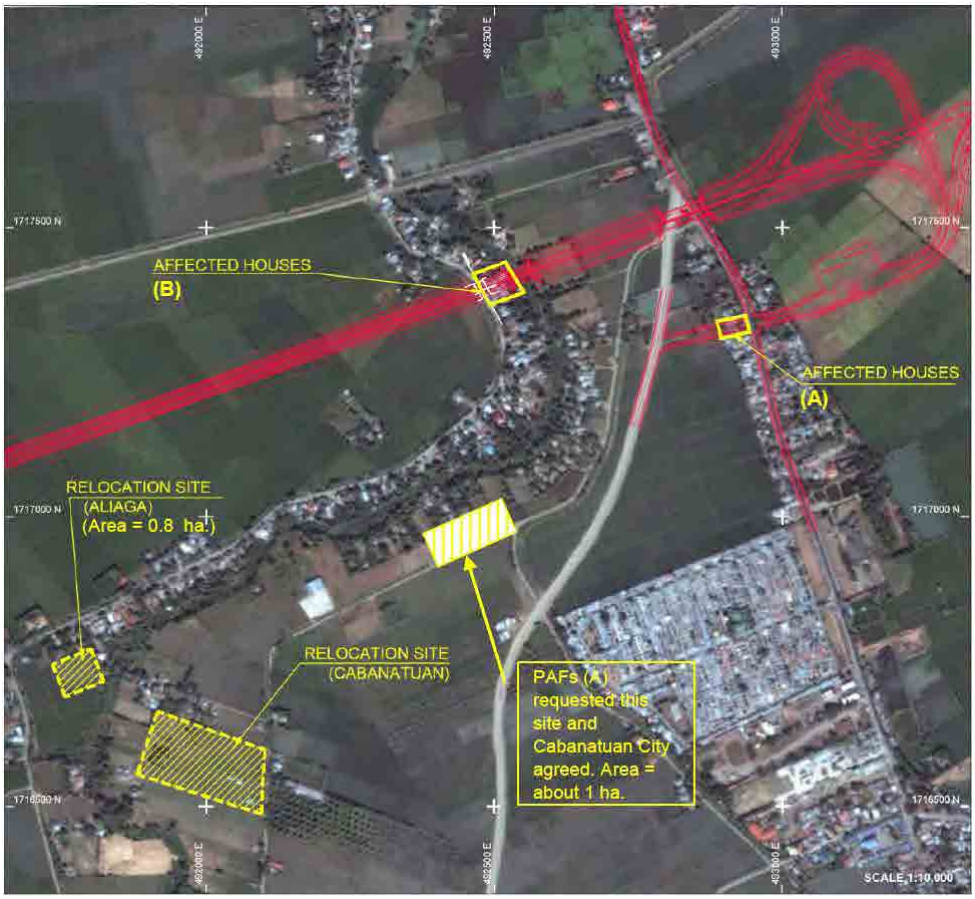


FIGURE 11.3-1 FINALLY PROPOSED RELOCATION SITES (Umangan, Aliaga Municipality)

11.4. Organization Chart of RAP Implementation

Organization chart of RAP Implementation is shown in **FIGURE 11.4-1**.

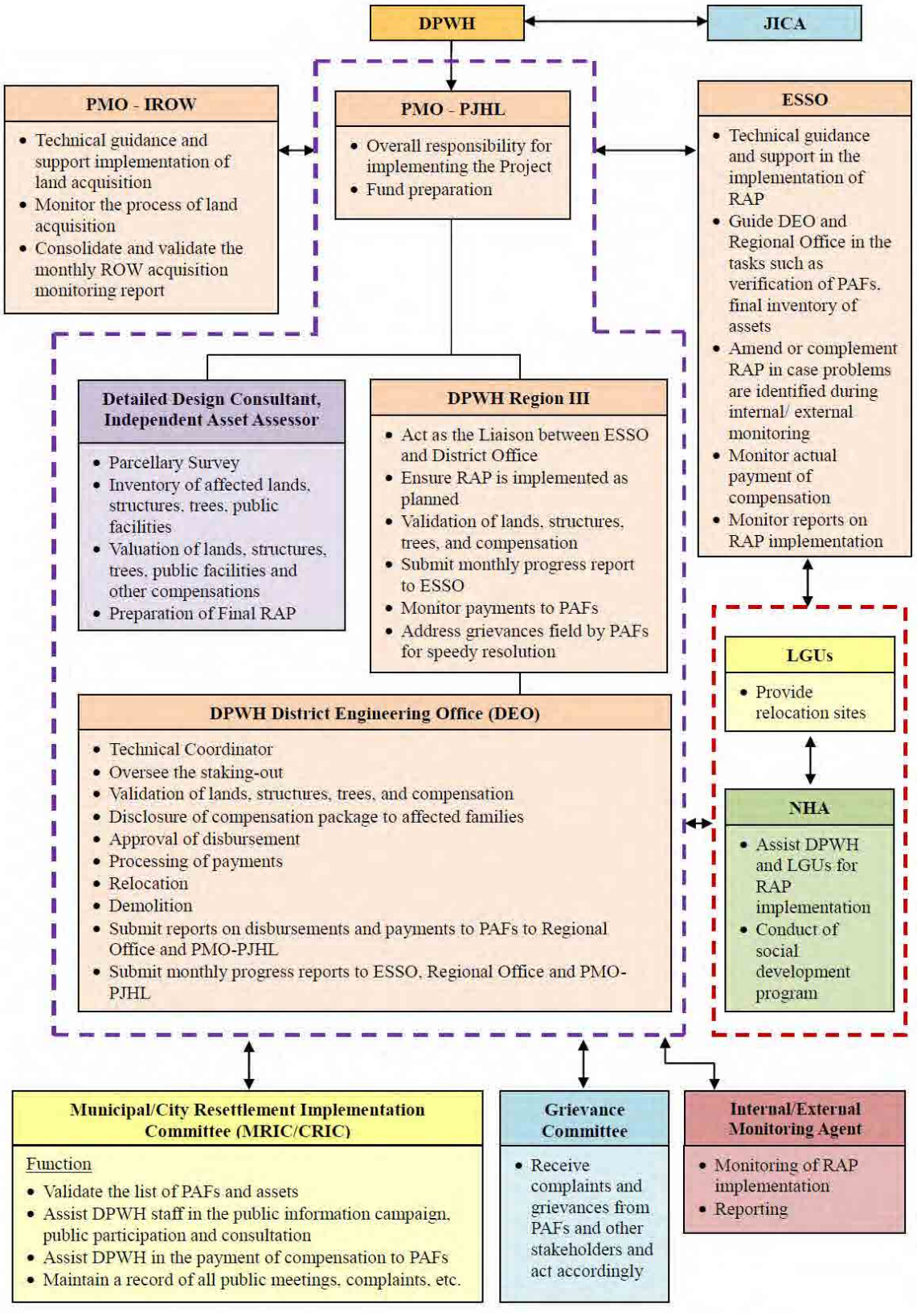


FIGURE 11.4-1 RAP IMPLEMENTATION ORGANIZATION

11.5. RAP Implementation Process

RAP implementation process is shown in **FIGURE 11.5-1**. The implementation schedule is described as **TABLE 11.5-1**.

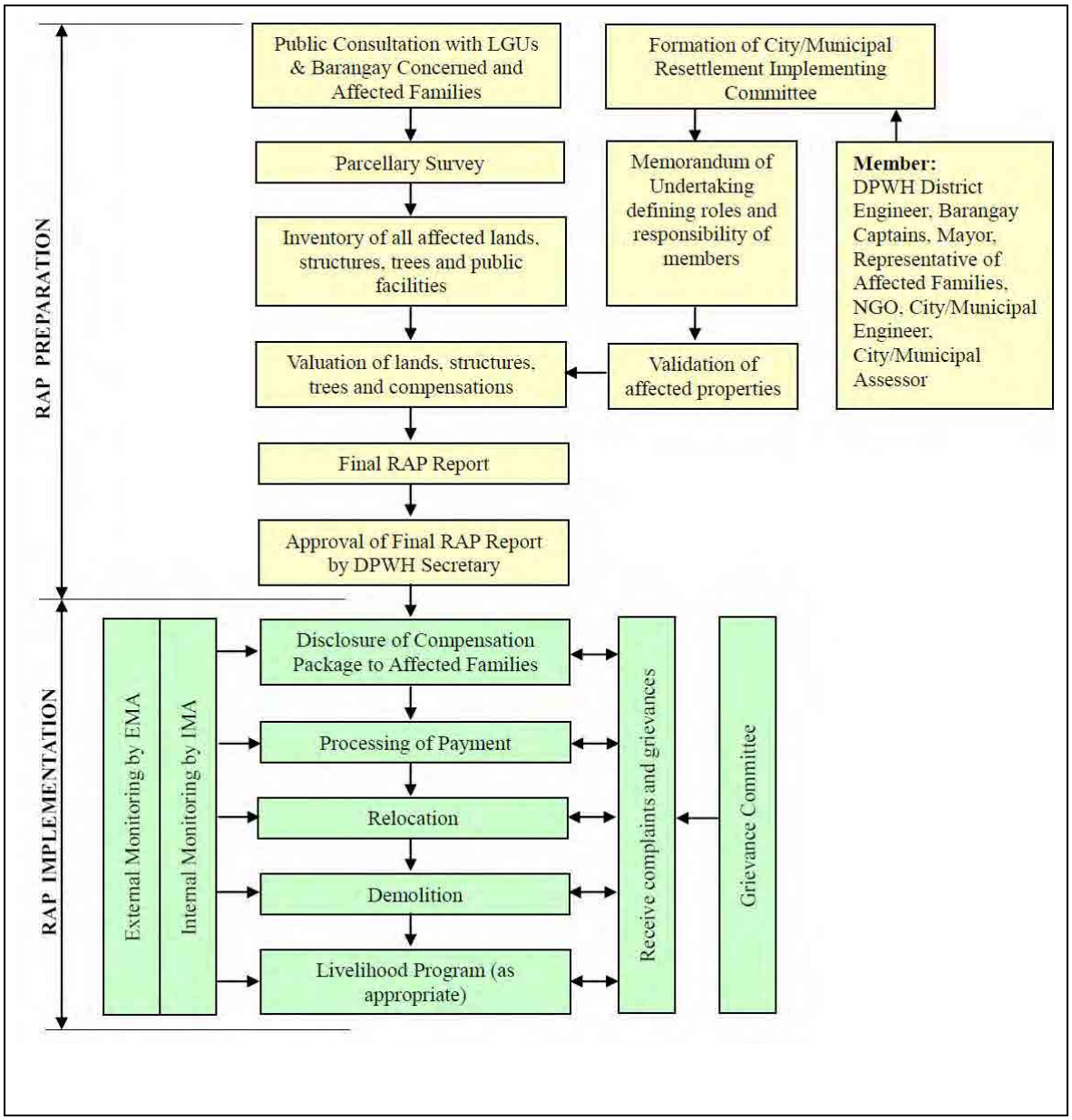


FIGURE 11.5-1 RAP IMPLEMENTATION PROCESS

TABLE 11.5-1 RAP IMPLEMENTATION SCHEDULE

Activities	2011				2012				2013	
	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q
First Disclosure (PCM)										
Preparation of RAP										
Conduct of Parcellary Survey										
Validation of APs and Finalization of RP										
Approval of the Final RP										
Formation of the CRIC										
Disclosure of final RP to APs										
Notification of APs										
Compensation										
Provision of Replacement Land										
Relocation to Replacement Land										
Income Restoration										
Approval of Road Design										
Commencement of Civil Works										
Monitoring & Evaluation										
Internal Monitoring										
External Monitoring and Evaluation										

12. PROJECT IMPLEMENTATION

(1) Implementation Strategy

Two options were studied in the economic and financial evaluations, because the traffic level of CLLEX is not so high. The conditions of two options are as follows;

- Option-1: Stage Development option, which construct initially 2-lane with overtaking lane, then widened to 4-lane
- Option-2: Full Development option, which construction 4-lane drive way initially

The condition and results of economical and financial evaluation are summarized as followings.

1) Traffic level

	Year	Traffic Volume (veh/day)	Level of Service	Volume / Capacity Ratio
Option-1	2017 :	11,221	D	0.37
	2020 :	12,967	D	0.43
	2025 :	14,979	D	0.49
	2030 :	17,340	E	0.57
Option-2	2017 :	12,630	A	0.17
	2020 :	14,255	A	0.19
	2025 :	16,959	A	0.23
	2030 :	20,177	A	0.27

2) Project Cost

Option-1	Total Project Cost :	14,199.85 Million Peso
	GOP	10,309.85 Million Peso
	Local Fund	1,998.08 Million Peso
	Yen Loan	8,311.77 Million Peso
	Private	3,890.00 Million Peso

Option-2	Total Project Cost :	13,483.35 Million Peso
	GOP	12,801.16 Million Peso
	Local Fund	2,219.15 Million Peso
	Yen Loan	10,582.01 Million Peso
	Private	682.19 Million Peso

3) Economic Evaluation

	Economical Indicators
Option-1	• Economic IRR = 20.6 % • NPV = 3,522.5 Million Pesos • B/C Ratio = 1.51
Option-2	• Economic IRR = 19.4 % • NPV = 3,093.4 Million Pesos • B/C Ratio = 1.39

4) PPP Scheme

Option-1	Government	• ROW Acquisition • Design & Build of 2-lane Expressway (Yen Loan)
	Private	• Installation of toll collection facility • O & M (2-lane) • Design, Build and Finance Widening (2 to 4-lane) • Operation & Maintenance (4-lane) • Pay lease fee to the Government (or Toll revenue sharing between GOP and the Private)
Option-2	Government	• ROW Acquisition • Design & Build of 4-lane Expressway (Yen Loan)
	Private	• Installation of toll collection facility • Operation & Maintenance (4-lane) • Pay lease fee to the Government (or Toll revenue sharing between GOP and the Private)

5) Financial Evaluation

	Results of Financial Evaluation Indicators
Option-1	• O & M Period : 34 years • Lease fee shall be an equivalent amount to Yen Loan Repayment • Equity : Debt = 3 : 7 • Short term loan : Considered • WACC = 9.64 % • Financial Evaluation Result Project IRR = 3.51 % IRR for SPC = 11..59 % Equity of IRR = 17.22 % Government IRR = 2.74 %
Option-2	• O & M Period : 34 years • Lease fee shall be an equivalent amount to Yen Loan Repayment • Equity : Debt = 3 : 7 • Short term loan : Considered • WACC = 9.64 % • Financial Evaluation Result Project IRR = 3.54 % IRR for SPC = 17.46 % Equity of IRR = 24.10 % Government IRR = 2.73 %

(2) Recommended Implementation Strategy

Option-2: Full Development (Construction of 4-lane from the Initial Stage) is recommended due to the following reasons;

- Total project cost can be saved by 742.67 Million Pesos at 2011 price level due to the following;
  - ✧ In case of Option-1, during widening stage, some works done during the initial stage must be removed and constructed again, i.e. double investment is required for pavement works, embankment works, center median works, etc.
  - ✧ For the long bridge, wider 2-lane bridge is required at the initial stage in consideration of broken down vehicle on the bridge.
  - ✧ Option-1 needs additional consultancy cost and construction supervision during widening stage.
- Even though an overtaking lane is provided during the initial stage under Option-1, possibility of traffic accidents is higher than Option-2. Also during widening stage, possibility of traffic accidents will become higher due to the construction work along the expressway in operation.
- The project requires high embankment. Uneven settlement of embankment between embankment built at the initial stage and embankment built during widening stage will be expected.
- On the part of the private sector, 3.89 Billion Pesos (at 2011 price level) required for the widening stage under Option-1 is not required but only 0.68 Billion Pesos is required under Option-2, which will greatly reduce investment risks. Thus more investors will be interested in the project.

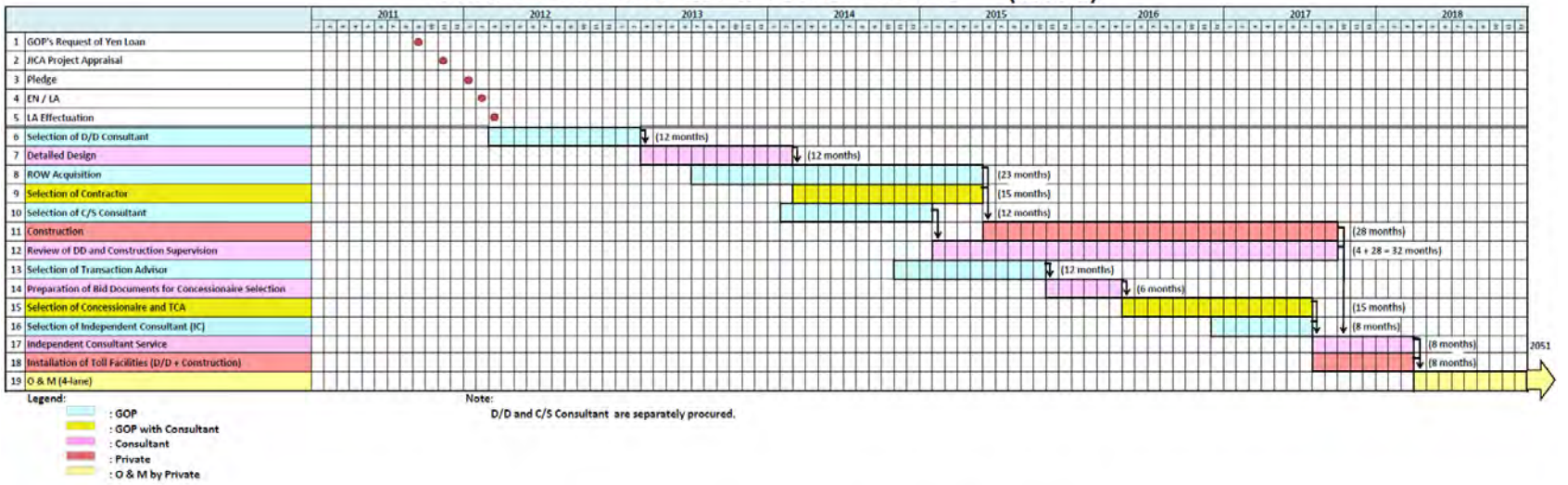
(3) Implementation Schedule

Implementation Schedule is shown in **TABLE 12-1**. Two cases are shown in table;

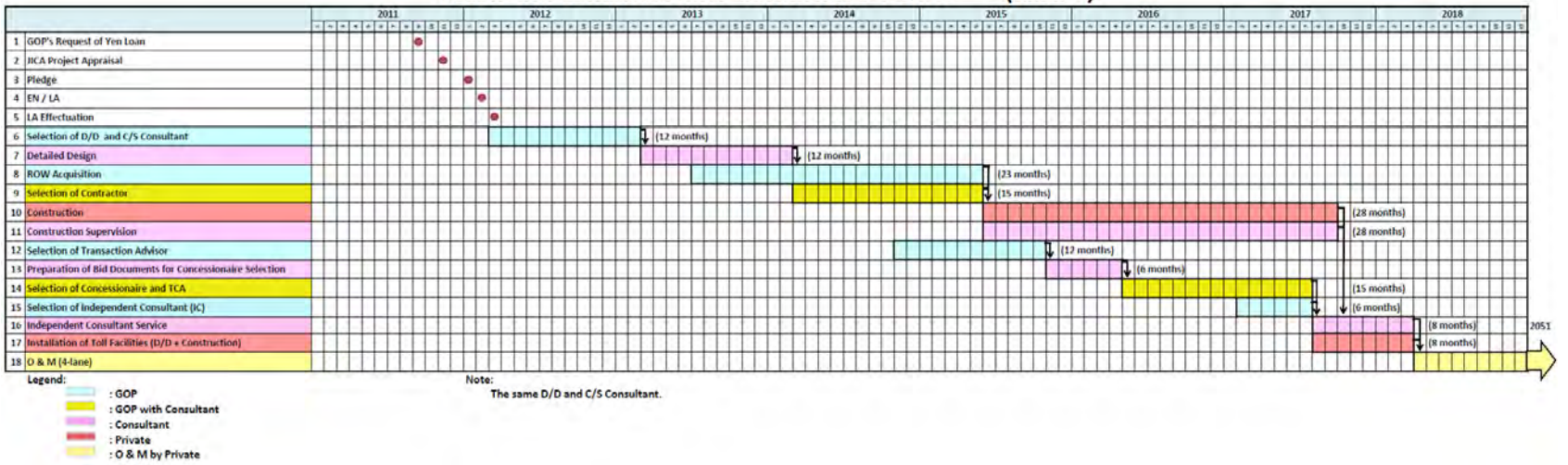
- Case-1: This is the case when the selection of the detailed design (D/D) consultant and the construction supervision (C/S) consultant is separately undertaken.
- Case-2: This is the case when the detailed design (D/D) consultancy services and construction supervision (C/S) consultancy services are combined, and one group of consultant for D/D and C/S is selected.

TABLE 12-1 IMPLEMENTATION SCHEDULE

CLLEX IMPLEMENTATION SCHEDULE : 4-LANE (Case-1)



CLLEX IMPLEMENTATION SCHEDULE : 4-LANE (Case-2)



13. OPERATION AND EFFECT INDICATORS

(1) Selected Operation and Effect Indicators

In order to enable project monitoring and evaluation on the basis of consistent indicators, operation and effect indications are introduced for ODA loan projects. Operation and effect indicators are basically equivalent to the outcome indicators and performance indicators used by the World Bank. For this study, they are defined as follows:

- Operation indicators: quantitative measure of the operational status of project.
- Effect indicators: quantitative measure of the effects generated by a project.

In view of project objective and expected effects, the indicators as **TABLE 13-1** were selected.

TABLE 13-1 OPERATION AND EFFECT INDICATORS

Operation and Effect Indicators		Data Collection Method
Operation Indicators	Traffic Volume of CLLEX (veh./day)	Traffic count survey
	Toll Revenue	Data collection from Operator
Effect Indicators	Traffic Congestion Rate (Volume/Capacity Rate)	Calculation based on Traffic count survey
	Travel Time Saving (veh.-hour/day)	Calculation based on Travel Time Survey
	Travel Time Cost Saving (Peso/Year)	Calculation based on Time Cost and Travel Time Survey

(2) Study and Estimation of Operation and Effect Indicators

The summarized operation and effect indicators are shown in **TABLE 13-2**.

TABLE 13-2 OPERATION AND EFFECT INDICATORS

	Indicators	Road Name	Baseline (2009)	Target (2020)
Operation Indicators	Traffic Volume (vehicle /day)	CLLEX (Tarlac IC ~ Aliaga IC)	-	14,255
	Toll Revenue (Thousand Peso/day)	CLLEX		1,535
Effect Indicators	Traffic Congestion Rate (V/C Rate)	Tarlac – Sta. Rosa Road (Zaragosa)	0.56	0.41
		Pan Philippine Highway (San Leonardo)	0.83	0.85
	Travel Time (hr:min)	Cabanatuan – Balintawak		
		Via SCTEX(Thru Aliaga)	2:14	Via SCTEX and CLLEX 1:53
		Via Pan-Philippine Highway	3:06	
	Travel Time Saving (hours / day)	Due to transferred traffic from Tarlac -Sta. Rosa road and PPH to CLLEX	-	5,162
	Travel Time Cost Saving(Peso/year)		-	1.26 billion

Note: Opening Year = Year 2018

CHAPTER 1
INTRODUCTION

1.1 BACKGROUND AND BRIEF HISTORY OF THE PROJECT

1.1.1 Background of the Project

The Philippines has been experiencing relatively slower economic development partly due to limited flow of direct investments into manufacturing sector compared to other rapidly growing ASEAN countries after the recovery from Asian Economic Crisis. In order to foster both domestic and foreign investments, improving overall investment climate including road network has been an urgent matter. In particular, the economic activities are extremely concentrated in Metro Manila where 37% of GDP and 13% of total population are accumulated in merely 0.2% of the country's land. This extreme concentration causes serious congestion and delays of distribution of goods and movement of people, resulting to huge damage to economy and lowering the country's international competitiveness as an investment destination. Likewise living condition in Metro Manila has eroded due to air pollution and traffic noise caused by chronic congestion. In summary, solving traffic congestion in Metro Manila by networking surrounding cities and upgrading/expanding highways around Mega Manila – the area covering Metro Manila, Central Luzon and CALABARZON – contributes to improvement of both investment climate and living climate. Central Luzon Link Expressway (CLLEX) improves access between the two-north large cities, Tarlac and Cabanatuan, and supports industrialization of North part of Mega Manila and eases the extreme concentration in Metro Manila as CLLEX allows better connection between North part of Mega Manila and Metro Manila. Central Luzon is expected to increase its efficiency as an industrial hub with Clark Airport receiving international flights.

1.1.2 Brief History of the Project

In 2010, JICA-assisted High Standard Highway Network Development Master Plan (hereinafter referred to "HSH Master Plan Study") formulated the expressway network in the 200 km radium sphere from Metro Manila. The Study recommended CLLEX as one of eight first priority projects.

In 2010, DPWH completed the Feasibility Study for the Proposed Central Luzon Expressway (now Central Luzon Link Expressway) (hereinafter referred to 2010 FS) under the supplemental agreement of JICA-funded Arterial Bypass Project.

In 2010, JICA-assisted Preparatory Survey for Public-Private Partnership (PPP) Infrastructure Development Projects (hereinafter referred to as "PPP Infra Projects"). This Study prioritized PPP expressway projects in accordance with the criteria established which are based on the necessity and urgency of project, profitability of the project and implementability of the project. Phase I of CLLEX was ranked no. 4 out of 10 priority projects.

1.2 OBJECTIVES OF THE PROJECT

Objectives of the project are as follows:

OBJECTIVES OF THE PROJECT

(i) To provide fast, safe, comfortable and reliable means of transport in Region III for socio-economic development.
(ii) To decongest traffic of Pan-Philippine Highway (or Daang Maharlika).
(iii) To support sound development of Regional Growth Pole Cities of Tarlac City and Cabanatuan City, thus contributing to the decongestion of over-concentration of Metro Manila.
(iv) To form an important lateral (east-west) link of overall Expressway network of Region III.
(v) To provide faster access from Metro Manila to Cabanatuan City which is the base (or hub) city for Pacific Ocean Coastal Area Development.

1.3 THIS REPORT

This report presents all the findings and recommendations made for the Central Luzon Link Expressway (CLLEx) Project.

CHAPTER 2
ROAD SECTOR OVERVIEW

2.1 PHILIPPINE DEVELOPMENT PLAN (2011 – 2016)

Philippine Development Plan (PDP), 2011-2016 was announced in 2011. Development policies of infrastructure are as follows;

DEVELOPMENT POLICIES OF INFRASTRUCTURE

"**Accelerating Infrastructure Development"**

(1) To optimize resources and investment
- Improve project preparation, development and implementation
- Synchronize planning and budgeting
- Coordinate and integrate infrastructure initiative

(2) To attract investments in infrastructure
- Improve the institutional and regulatory environment of the infrastructure sector
- Encourage PPPs

(3) To foster transparency and accountability in infrastructure development
- Encourage stakeholder participation

(4) To adopt to climate change and mitigate the impacts of natural disasters
- Institutionalize Climate Change Act (CCA) and Disaster Risk Reduction Management (DRRM)

(5) To provide productive employment opportunities
- Adopt a labor-intensive scheme where applicable.

With regards to the transport sector, issues and challenges are established as follows;

TRANSPORT SECTOR ISSUES AND CHALLENGES

(a) Assessment and Issues
- Lack of integrated and coordinated transport network
- Overlapping and conflicting functions of transport and other concerned agencies
- Transport safety and security concerns

(b) Strategic Plan and Focus
- Adopt a comprehensive long-term National Transport Policy (NTP)
- Develop strategic transport infrastructure assets
  - Prioritize asset preservation
  - Provide access to major and strategic tourism destinations and production areas
  - Promote environmentally sustainable and people-oriented transport

(c) Develop an Integrated Multi-modal Logistics and Transport System
- Identify and develop strategic logistics corridors based on a National Logistics Master Plan
- Improve RORO terminal system
- Explore ASEAN connectivity through sea linkages

(d) Separate the Regulatory and Operation Functions of Transport and Other Concerned Agencies. To address the overlapping and conflicting functions of transport and other concerned agencies.

(e) Comply with Safety and Security Standards. To ensure transport safety and standards.

(f) Provide Linkages to Bring Communities into the Mainstream of Progress and Development. To promote conflict-affected and highly impoverished areas.

2.2 ROAD DEVELOPMENT GOALS

Public Investment Program (PIP) (2011 - 2016) was formulated by DPWH in 2011. Goals were set as follows;

DEVELOPMENT GOALS UNDER PIP

1. Provide safe environment through quality infrastructure facilities;
2. Increase mobility and total connectivity of people through quality infrastructure resulting to improved quality of life;
3. Strengthen national unity, family bonds and tourism by making the movement of people faster, cheaper and safer;
4. Facilitate the decongestion of Metro Manila via a transport logistics system that would ensure efficient linkages between its business centers and nearby provinces;
5. Implement more Public-Private Partnership (PPP) projects for much needed infrastructure and level playing field for investment;
6. Study the mechanism for longer maintenance period for roads and bridges; and
7. Generate more transport infrastructure with minimal budget cover or contingent liabilities.

Strategic focuses were set as follows;

STRATEGIC FOCUS

- Implement activities in the following order of priorities:
  a. Maintenance or asset preservation – to preserve existing roads in good condition
  b. Rehabilitation – to restore damaged roads to their original designed condition
  c. Improvement – to upgrade road features so that they efficiently meet traffic demands; and
  d. New Construction
- Prioritize upgrading of the national road network, as to quality and safety standards
- Prioritize national roads to address traffic congestion and safety in urban centers and designated strategic tourism destinations
- Completion of on-going bridges along national roads
- Develop more Public-Private Partnership (PPP) projects for much needed infrastructure and level playing field for investments
- Study the mechanism for a longer maintenance period (5 – 10 years) in road and bridges construction contract provision
- Prioritize flood control projects in major and principal river basins to address climate change based on master plan and adopting new technologies in flood control and slope management
- Prioritize adequate flood control and upgraded drainage design standards and facilities in flood-disaster prone areas to mitigate loss of river and damage to properties
- Promote innovative technology such as geo-textiles and coco-netting in slope protection and soil erosion control
- Promote retarding basin and rain water harvesting for non-domestic use
- Prioritize water supply in designated strategic tourist destinations/centers

2.3 Master Plan on High Standard Highway Network

The study of master plan on High Standard Highway (HSH) Network Development was conducted in Year 2010. **Figure 2.3-1** shows the proposed HSH network in Metro Manila and 200 km sphere. Based on this master plan, Public Investment Program (2011-2016) for expressway projects was formulated.

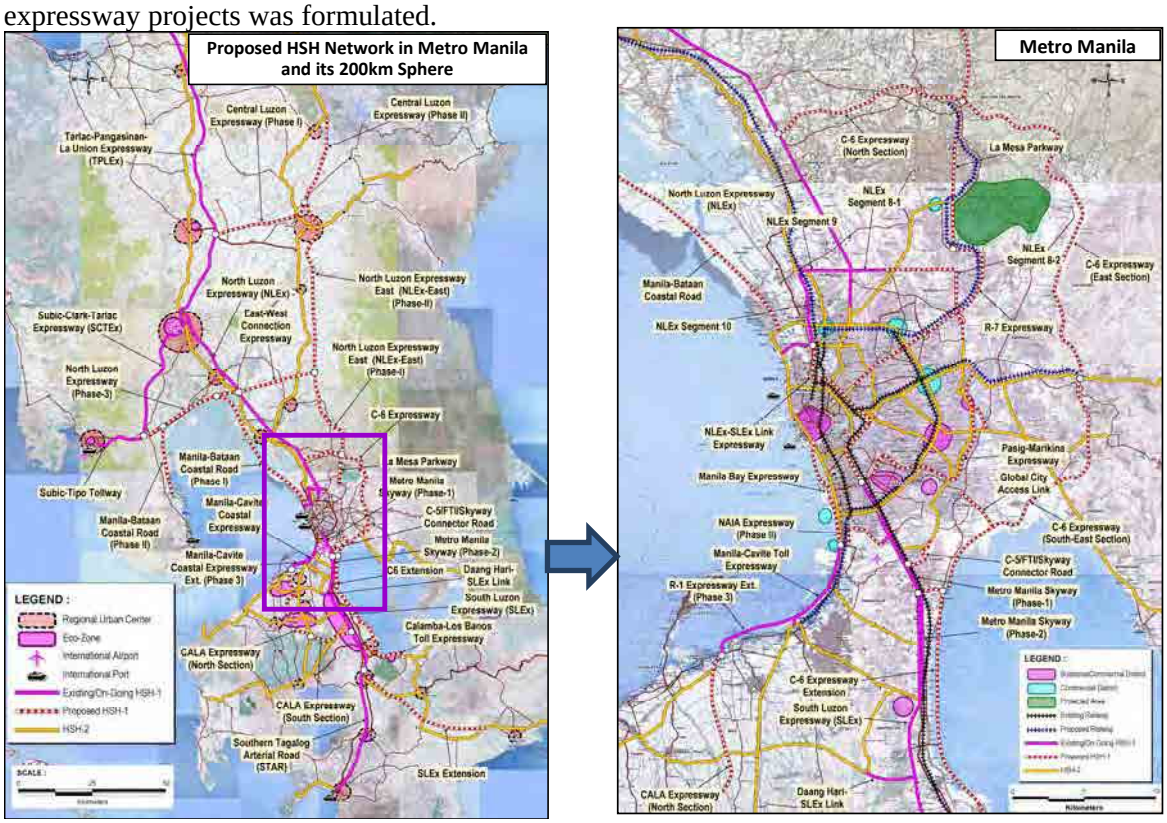


FIGURE 2.3-1 PROPOSED HSH NETWORK

Source: The Study of Master plan on High Standard Highway Network Development, 2010, JICA

CLLEX is one of the 1st priority projects in this Master plan shown in **Table 2.3-1**.

TABLE 2.3-1 PROPOSED HSH PROJECTS PRIORITY

	Name of HSH	Length (km)	Cost (billion pesos)
1st Priority Group	NLEx–SLEx Link Expressway	13.4	31.14
	CALA Expressway	41.8	19.67
	C-5/FTI/SKYWAY Connector Rd.	3.0	4.76
	NAIA Expressway (Phase 2)	4.9	12.18
	C-6 Expressway/Global City Link	66.5	54.29
	Central Luzon Expressway (CLLEX)	63.9	29.23
	SLEx Extension (to Lucena)	47.8	16.45
	Calamba-Los Banos Expressway	15.5	5.23
	Sub-total	256.8	172.95
2nd Priority Group	R-7 Expressway	16.1	25.81
	NLEX East / La Mesa Parkway	103.0	38.94
	Manila – Bataan Coastal Road	70.3	72.94
	NLEX (Phase 3)	36.2	28.42
	East-West Con. Expressway	26.6	16.48
	C-6 Extension	43.6	18.61
	Manila Bay Expressway	8.0	46.54
	Pasig Marikina Expressway	15.7	49.58
	Sub-total	319.5	297.32
TOTAL		576.3	470.27

Source: The Study of Master plan on High Standard Highway Network Development, 2010, JICA

2.4 Current Road Infrastructure Sector and its Development Plan Related to the Project

DPWH Public Investment Program (PIP) for 2011 -2016 contains the following target and priority programs

TABLE 2.4-1 TARGET OUTCOMES OVER THE MEDIUM TERM

	Year			Requirement
	2011	2014	2016	
a. National Arterial Roads (15,987 km)	94% Paved	100% Paved in good condition		· Paving of 1,443km · Rehab./ widening/ upgrading/ construction of 2,828km
b. National Secondary Roads (15,372 km)	72% Paved	81% Paved	100% Paved in good condition	· Paving of 3,329km · Rehabilitation of 1,798km
c. National Bridge (330,089m) (7,792 bridges)	95%	98%	100% Permanent	· Replacement of 8,544 lm of temporary bridges · Improvement of 6,047 lm of existing bridges · Construction of 2,154 lm new bridges · Repair/rehabilitation of 104,293 lm of bridges

Source: Public Investment Program (2011-2016) As of April 2012, DPWH

Under the PIP for 2011-2016, DPWH is envisaging a total investment of 698,084 million pesos. Of this total investment requirement in the PIP, 585,938 million pesos or 84% is earmarked for the highway sector, 83, 948 million pesos (12%) for flood control works and 28,198 million pesos (4%) for other locally-funded projects over the six (6) year program.
The total investment requirement for 2013 up to 2016 is based on the annual 10% increase from the approved budget of 99,490 million pesos for Y2012.

TABLE 2.4-2 (2011-2016) PUBLIC INVESTIMENT PROGRAM SUMMARY

List of Project	Prior Year	Proposed Allocation (in Million Pesos)						
		2011	2012	2013	2014	2015	2016	Total (2011-2016)
1.Roads	**75,703**	**75,047**	**81,246**	**91,697**	**101,347**	**113,722**	**122,878**	**585,938**
-Foreign assisted project	41,490	19,566	14,257	30,313	28,889	35,186	39,162	167,645
-PPP	-	-	1,474	11,164	7,450	4805	-	24,894
-Locally funded project	34,213	55,481	65,243	50,219	65,008	73730	83,715	393,398
2.Flood Control Project	**19,692**	**11,166**	**10,816**	**12,523**	**13,854**	**14,960**	**20,628**	**83,948**
-Foreign assisted project	13,283	2,978	2,300	2,670	3,728	6656	12,406	30,738
-Locally funded project	6,419	8,188	8,517	9,853	10,127	8304	8,221	53,211

List of Project	Prior Year	Proposed Allocation (in Million Pesos)						
		2011	2012	2013	2014	2015	2016	Total (2011-2016)
3. Other Locally Funded DPWH Project	**36,288**	**4,474**	**7,428**	**5,219**	**5,181**	**3,738**	**2,157**	**28,198**
GRAND TOTAL	**131,683**	**90,687**	**99,490**	**109,439**	**120,383**	**132,421**	**145,663**	**698,084**

Source: Public Investment Program (2011-2016) As of April 2012, DPWH

2.5 Past and Future Plan of Other Donor's Project Related to PPP Policies

(1) Technical Assistance by ADB, AusAID, and CIDA

In terms of capacity building, "Technical Assistance for Strengthening Public-Private Partnerships in the Philippines" are being carried out as of November 2011. This is a capacity development program financed by ADB AusAID (the Australian Agency for International Development), and CIDA (The Canadian International Development Agency). The purpose of the program is to help the Philippines to clear obstacles and to pave the way for PPP. Under this program, ADB provides a US$1.5 million grant, AusAID provides a US$7 million grant and CIDA provides a US$1.2 million grants. The program is to run from April 2011 to July 2013.

The expected outputs of the program are 1) Strengthening of PPP Enabling Framework, 2) Strengthening Capacity of the PPP Center, 3) Institutionalization of PPP Best Practice and 4) Establishment of Long-term Financing and Risk Guarantee Mechanisms.

(2) Other Programs and Activities

Besides ADB TA, there are several assistance programs planned by GoP and foreign agencies.

Singapore Cooperation Enterprise (SCE) has agreed with GoP to provide TA to promote PPP. The objectives of SCE TA are to:

- Achieve an in-depth understanding of the benefits and challenges for greater private sector participation in the financing of public sector projects; and the policy actions required to strengthen the enabling environment, legislative and regulatory frameworks for PPP;
- Build capabilities for key public sector officials involved in the procurement and implementation of infrastructure projects, through the implementation of a pilot PPP transaction; and
- Provide examples of Singapore's infrastructure procurement process by sharing Singapore's lessons and experience in developing successful and commercially viable PPP projects.

It was agreed that SCE will provide a grant worth approximately S$1.423 million (P48.373 Million) to DOTC for PPP capacity development of DOTC. GoP will provide counterpart fund of S$ 270,100. The grant will cover one-year period. Based on the Joint Press Release issued by SCE and Temasek Foundation on March 31, 2011, SCE will work with the DOTC to develop institutional capabilities for key agencies within the Philippine Government responsible for the procurement of infrastructure projects under the PPP framework.

Furthermore, according to the Joint Press Release, SCE will send a team of Singapore PPP experts to work with DOTC to prepare and structure a pilot project for procurement under the PPP framework. The pilot project will provide a real-life and hands-on case study where Philippine Government officials can adapt relevant lessons from Singapore to bring projects to a biddable and bankable stage.

SCE will also help DOTC organize a series of capacity building workshops to build capacity for some 100 Philippine Government officials in the development and implementation of PPP transactions. During these workshops, Singapore public sector agencies, such as Public Utilities Board, Singapore Sports Council and Institute of Technical Education, will share with the workshop participants the key challenges Singapore had faced, including the policy considerations, regulatory framework and practical experiences in implementing Singapore's PPP projects. The Singapore private sector players involved in Singapore's PPP projects will also share the perspective of the private sector investors and project developers in investing in a PPP project.

There is also information about assistance coming from the World Bank. According to the World Bank's website, they are interested in helping specific projects, such as expansion of the LRT System and the sewerage system in Manila. There can be further assistance that is directed towards individual projects.

2.6 Relation between other ODA Loan Projects

Project related of CLLEX is Plaridel Bypass Project.

Plaridel Bypass Project

A Plaridel Bypass road aims to ease serious traffic congestion and enhance transportation capacity and efficiency around Plaridel City, one of the core cities north of Metro Manila. The bypass also aims to enhance the function of the Philippine-Japan Friendship Highway which connects urban areas north of Metro Manila to the Cabanatuan City and Cagayan Valley Area from where agricultural products originate and are transported to Metro Manila areas.

Pradiel Bypass consist of two phase, financed under a loan agreement between the Government of the Philippines and Japan International Cooperation Agency (JICA). Phase 1 of the overall Plaridel Bypass is under implementation.
Phase 2 starts at the town of San Rafael and proceeds towards the northerly direction to the town of San Ildefonso, both are in the province of Bulacan.

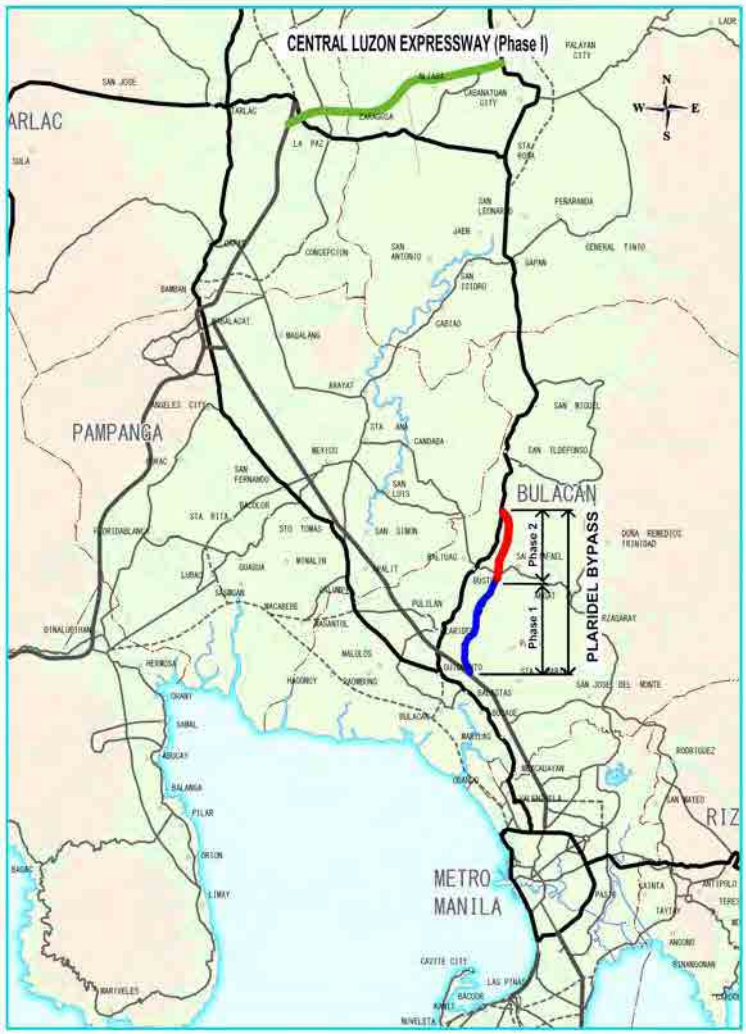


Figure 2.6-1 Location Map of Plaridel Bypass and CLLEX

2.7 Lesson and Countermeasure from the Similar Past Project

Interview surveys were conducted to government officials and the private O& M companies in order to identify the bottleneck and recommendation in the Preparatory Survey for PPP infrastructure Development Project (JICA 2011).

Table 2.7-1 shows the summary of major issues and bottlenecks of PPP project and corresponding recommendations.

TABLE 2.7-1 MAJOR ISSUES AND BOTTLENECKS OF PPP PROJECTS

	Issues and Bottlenecks of PPP Projects	Recommendations
1. Legal Framework	1.1 There are two laws/E.O. to allow the private sector to invest infrastructure projects: a) RA 7718 (BOT Law) and its IRR b) EO 423 and its Guidelines and Procedure for entering into joint venture agreement between the Government and the private entities. ▪ No NEDA ICC nor NEDA Board's project approval is required. ▪ Head of Agency has authority to approve the JV Agreement regardless of project cost.	1.1 Options: **Option 1** : EO 423 be abolished and integrated into RA 7718 **Option 2** : Modification of Guidelines and Procedure - Project should be approved by NEDA ICC or NEDA Board - Ceiling of project cost should be specified. - Enough time should be given to challengers.
	1.2 Modification of IRR of RA 7718 Amendments of IRR is being studied on i) Approval of Individual Projects and Draft Contract, ii) List of Priority Projects, iii) Publication of Invitation, iv) Approving Authority for the Contract, v) Contract Variation, vi) Protest Fee, vii) Timelines, viii) Substitution/Withdrawal of a Member of a Consortium/Joint Venture, ix) Government Shoulder the Differential, x) Period of Comparative Bids Preparation, xi) Information Disclosure of Unsolicited Proposal, xii) New ROW Acquisition Under Unsolicited Proposal	1.2 Amendments should be finalized as early as possible.
	1.3 Creation of PPP Laws Present BOT Law is for the one type of PPP schemes, which should be improved by adding other PPP schemes so as to add more flexibility to other types of PPP schemes and to specify the Government's responsibilities.	1.3 Study on creation of PPP Law should start.

Source: Preparatory Survey for Public-Private Partnership (PPP) Infrastructure Development Project (JICA2010)

TABLE 2.7-1 MAJOR ISSUES AND BOTTLENECKS OF PPP PROJECTS

	Issues and Bottlenecks of PPP Projects	Recommendations
2. Institutional Framework	2.1 Lack of Experiences/Capacity of Government Officials for Planning and Implementation of PPP Projects - Historically, planning and implementation of BOT projects was led by the private sector's initiative. - The Government is discouraging the unsolicited proposals. - The Agencies are required to be more pro-active and take a leadership for PPP projects.	2.1 Agencies should take a leadership for promotion of PPP projects. - Develop priority projects with implementation priority and firm implementation schedule. - The roles of the private sector, government agencies and other authorities as well as LGUs in transport infrastructure development in operation and management needs to be defined.
	2.2 No PPP Project Specialized Office except DPWH.	2.2 Organize PPP Specialized Office.
	2.3 BOT Center has been not so active.	2.3 In close coordination with Agencies, BOT center should be more active in project development of PPP projects.
	2.4 Strengthening of DPWH Planning Service and PMO-BOT - In line with the DPWH Rationalization Plan, DPWH is planning to upgrade existing PMO-BOT to PPP Service.	2.4 PMO-BOT should be upgraded to PPP Service as early as possible.
	2.5 Materials for PPP Capacity Development and manuals/standards are incomplete. - Training materials for PPP - Standard PQ/Tender and Draft Toll Concession Agreement - O & M manual	2.5 Necessary materials, standards and manuals should be prepared. DPWH should establish regular PPP training course.
3. PPP Project Financing	3.1 Long period (sometimes years) is required for financial closure due to unfavorable offer of banks to the investor (short repayment period with no grace period and high interest rate). Some commercial banks are not familiar with the PPP project financing.	3.1 PPP fund to finance the private entities needs to be created.
	3.2 Delay in ROW acquisition delays financial closure.	3.2 Refer to 4.4

Source: Preparatory Survey for Public-Private Partnership (PPP) Infrastructure Development Project (JICA2010)

TABLE 2.7-1 MAJOR ISSUES AND BOTTLENECKS OF PPP PROJECTS

	Issues and Bottlenecks of PPP Projects	Recommendations
3. PPP Project Financing	3.3 Project Development Fund (PDF) of BOT Center is not fully utilized.	3.3 PDF needs to be revitalized by increasing fund as well as establishment of rules and guidelines for usage.
	3.4 On the part of financing the Government expenditure, it is still relying on the project loans from the international lending institutions and/or bilateral sources.	3.4 PPP fund to finance the Government expenditure needs to be studied and established.
4. Bottlenecks in PPP Project Cycle	4.1 <u>Master Plan/Basic Plan/Project Identification Stage</u> • Master Plan and/or basic plans were not updated. • Listing of projects and their implementation schedule was not updated. • Project promotion has been largely relied on the private sector.	4.1 Master Plan, project list and project implementation priority should be always updated and firm implementation schedule and corresponding budgeting should be done.
	4.2 <u>Business Case/Feasibility Study Stage</u> • Level of feasibility studies has been incomplete/inadequate. • Soon after a feasibility study is completed, it has been difficult to go into a tendering stage due to unfixed ROW, lack of ECC, lack of LGUs' endorsement, etc. • Agencies' capacity and local consultants' capacity to undertake a feasibility study of PPP project is not sufficient.	4.2 • More fund and time should be spent for this study • Complete information and documents for NEDA's project approval and succeeding tendering should be prepared.
	4.3 <u>Project Approval Stage</u> • Lengthy time is required until the project is approved by NEDA ICC or NEDA Board.	4.3 • Complete information and documents should be prepared during the feasibility study stage. • NEDA should undertake seminars on "ICC Project Evaluation Procedure and Guidelines".

Source: Preparatory Survey for Public-Private Partnership (PPP) Infrastructure Development Project (JICA2010)

TABLE 2.7-1 MAJOR ISSUES AND BOTTLENECKS OF PPP PROJECTS

	Issues and Bottlenecks of PPP Projects	Recommendations
4. Bottlenecks in PPP Project Cycle	4.4 <u>ROW Acquisition / Resettlement Stage</u> • Preparation of IROW plan and parcellary plan takes long time due to inaccurate land registration, difficulty to locate land owners, inaccurate record of lot boundary, etc. • A lot of documentations are needed and lot owners have difficulty to prepare required documents. • Land valuation is made based on BIR land valuation for the first offer, and based on Provincial/ City Appraisal Committee or Land Bank valuation for the second offer, these are close to, but still lower than market value. • In case that land owners fail to prepare complete documents, expropriation is the only solution. • ROW acquisition Teams are not provided sufficient logistics (like service vehicles, computers, etc.). • More staff who are familiar with ROW acquisition are needed. • Some Toll Concession Agreements include the private sector's funding for ROW acquisition.	4.4 • Preparation of IROW plan and parcellary plan and succeeding ROW acquisition should start soon after the project is approved by NEDA Board or NEDA ICC. • Once major critical documents are prepared, cash advance by the private sector should be made to PAPs through the Government, which shall be refunded to the private sector. This arrangement should be specified in TCA. • Land value should be based on the prevailing market price. • Enough logistics support such as service vehicles, computers, etc. should be provided for ROW acquisition team, cost of which should be included in the project cost. • IROW Procedural Manual should be updated and more staff should be trained.
	4.5 <u>Tender Stage</u> *1) Government Projects* • Selection of Consultants and Contractors takes lengthy time. - Consultant selection - over 8 months - Contractor selection - over 10 months *2) Selection of Project Proponent of PPP Project* • Selection of project proponent takes lengthy time - over 12 months *3) Unsolicited Proposal* • Takes much longer time to finalize due to many disputes and counteroffers and negotiation of contract terms such as toll rates, risk allocation, etc.	4.5 *1) Government Projects* • Selection of Consultants should target 6 months or less. • Selection of Contractor should target 8 months or less. *2) Selection of Project Proponent of PPP Project* • Selection of Project Proponent should target 10 months or less. • Agency should undertake project campaign and enough information should be disclosed before the project is advertized. • All tender conditions and draft Toll Concession Agreement should be agreed between DPWH and TRB before advertisement.

Source: Preparatory Survey for Public-Private Partnership (PPP) Infrastructure Development Project (JICA2010)

TABLE 2.7-1 MAJOR ISSUES AND BOTTLENECKS OF PPP PROJECTS

	Issues and Bottlenecks of PPP Projects	Recommendations
4. Bottlenecks in PPP Project Cycle	4.6 Contracting Stage • Review of Toll Concession Agreement (TCA) by TRB usually takes lengthy time. • Approval of NEDA Board also takes lengthy time.	4.6 • Close coordination between NEDA and Agencies should be made.
	4.7 Toll Operation Agreement Stage • Review by TRB of toll adjustment formula and other O & M aspects take considerable time.	4.7 • From the feasibility study stage, TRB should be involved.
	4.8 Fund Procurement/Preparation Stage • Government - Budget constraints and delay in budget release - Difficult to cope with cost overrun. • Private - Delay in attaining financial closure due to difficulty in meeting lender's requirement such as complete ROW acquisition, government financial support, approval of toll rates and toll rate adjustment formula. - Difficult to find appropriate financer (short repayment period with no grace period, and high interest rates). - Unexpected changes requiring additional costs due mainly to additional facilities required by LGUs and LGU fees.	4.8 • Government - Needs provision of adequate annual budget. - Needs to tap ODA. • Private - Creation of fund to finance the private sector for infrastructure project implementation should be studied.
	4.9 Detailed Design Stage • Lacks proper coordination with LGUs, thus modification of design, requirement of additional facilities, etc. is required by LGUs. • Lacks proper coordination with utility companies for relocation/protection of public utilities affected.	4.9 • Proper coordination with LGUs and utility companies should be done during the feasibility study. • Value engineering should be exercised.

Source: Preparatory Survey for Public-Private Partnership (PPP) Infrastructure Development Project (JICA2010)

TABLE 2.7-1 MAJOR ISSUES AND BOTTLENECKS OF PPP PROJECTS

	Issues and Bottlenecks of PPP Projects	Recommendations
4. Bottlenecks in PPP Project Cycle	4.10 Construction Stage • Delayed construction due to delayed delivery of ROW and financial closure. • Needs more strict quality control and schedule control.	4.10 • An Independent Certificate Engineer should be employed at the cost of the Government.
	4.11 Operation and Maintenance Stage • Approval of toll fee and adjustment of toll fee by TRB is delayed. • Increase of toll fee is usually objected by the people and politicians and adoption of new toll rate is delayed.	4.11 • TRB should approve toll fee and its adjustment in accordance with provisions of TCA. • The Government should compensate the loss of revenue due to delayed increase of toll rates. • TRB and operators should jointly make information disclosure to the people why toll rates and toll adjustment are needed and determined and what are benefits of users.
	4.12 End of Contract and Facility Transfer Stage No experience on this stage, yet.	-

Source: Preparatory Survey for Public-Private Partnership (PPP) Infrastructure Development Project (JICA2010)

2.8 DPWH Organization and Current O& M Company

(1) DPWH Organization (Central Office)

Organization chart of DPWH is shown in **Figure 2.8-1**. Offices within the DPWH which are related to the development of PPP projects are highlighted and discussed below.

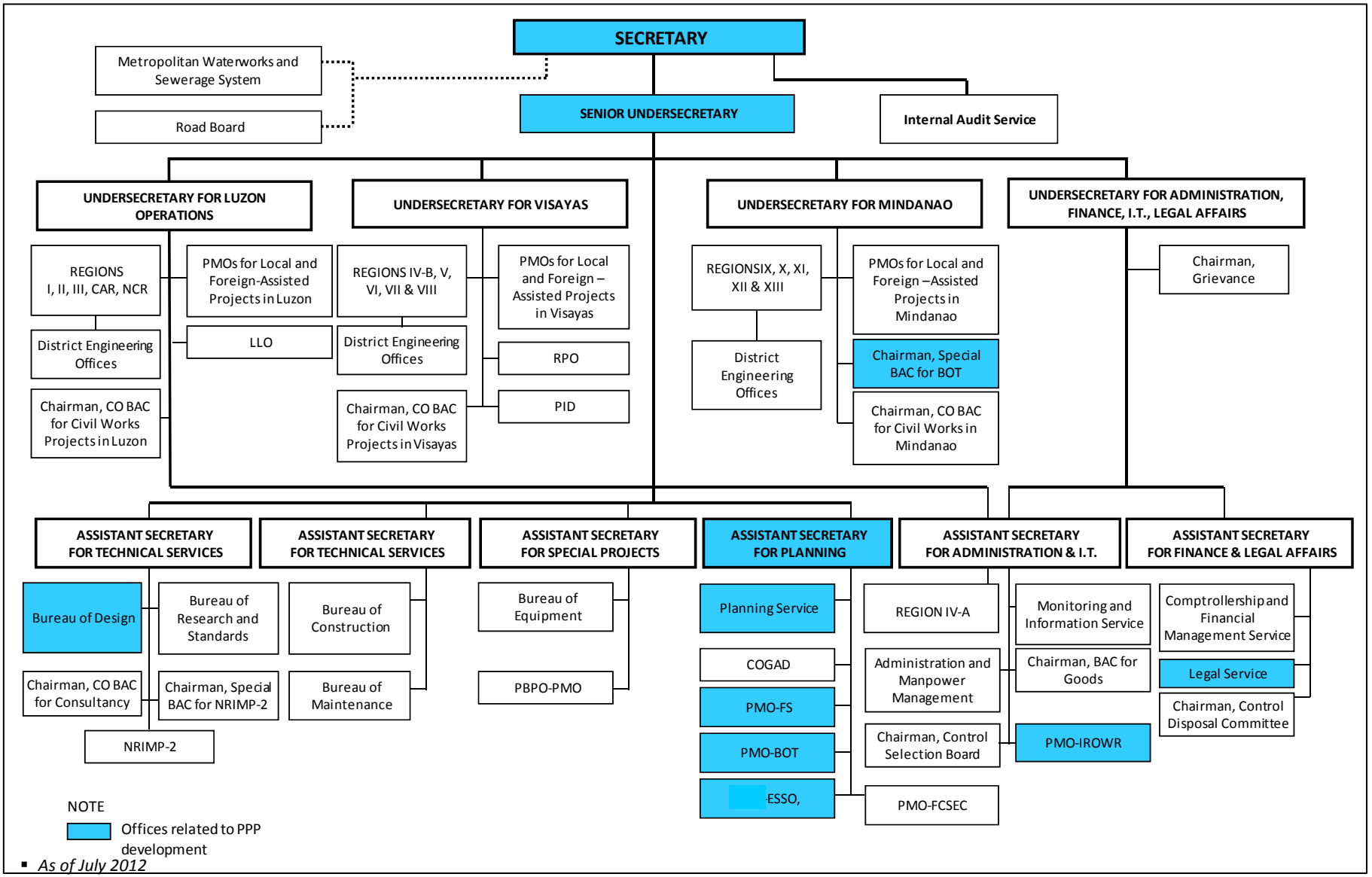
Planning Service (PS)
Tasked to formulate policies, plans and programs for the development of the national road network, which includes expressways; prepare PPP proposals for ODA financing; maintain a national road database; and prepare multi-year and annual budgets for the construction (including right-of-way and engineering) and maintenance of national roads.

PMO-Feasibility Studies (PMO-FS)
Assigned to conduct/supervise FS of major foreign-assisted and locally-funded road and expressway projects; and assist the PS and PMO-BOT in preparing project proposals for ODA financing.

PMO-Built-Operate-Transfer (PMO-BOT)
Tasked to identify and initiate projects for BOT/PPP implementation; prepare/review feasibility studies (FS) and proposals for BOT/PPP projects for approval of the NEDA-Investment Coordinating Committee (ICC); prepare bidding documents; participate in negotiations and finalization of BOT/PPP contracts; and monitor/supervise the implementation of BOT/PPP projects.

Environmental and Social Services Office (ESSO)
Involved in preliminary planning activities related to Environmental Impact Assessment (EIA), Social Impact Assessment (SIA), Rapid Social Assessment, Resettlement Action Plan (RAP); conduct public consultations on PPP projects; conduct Information, Education and Communication (IEC) on environment-related concerns; and compliance and effects monitoring of ECC conditions and Environmental Management Plan (EMP).

PMO-Infrastructure Right-of-Way and Resettlement (PMO-IROWR)
Tasked to consult with LGUs, local communities, project affected persons, and the designer/contractor for PPP projects; coordinate with the Presidential Commission for the Urban Poor (PCUP) and the National Housing Authority (NHA) on the relocation of squatter families; conduct census and tagging of affected lots and improvements; coordinate with the Bureau of Internal Revenue or BIR (for zonal valuation), Registry of Deeds (for titles), Assessor's Office, and DAR (for land conversion); coordinate and negotiate with affected property owners on the sale of their properties; coordinate with the Office of the Solicitor General (OSG) for filing of expropriation proceedings; and effect payment of affected properties.



Source: DPWH website

FIGURE 2.8-1 ORGANIZATION CHART OF DPWH

(2) Overview of Current toll expressway companies for construction and O&M

Table 2.8-1 shows the summary of toll expressway investors and O&M companies and **Table 2.8-2** shows the summary of current toll collection system and traffic control system.

TABLE 2.8-1 TOLL EXPRESSWAY COMPANY

Investors	Operating Expressway(length)	O&M Companies	Remarks
Manila North Tollways Corp.(MNTC)	・North Luzon Expressway (82.6km) ・Subic-Tipo Tollway (8.5km)	Tollways Management Corp.	Metro Pacific Investment Corp.(Hong Kong Fund)
(BCDA)	・Subic-Clark-Tarlac Expressway (93.8km)	Tollways Management Corp.	Construction by ODA fund
Private Infrastructure Development Corp. (PIDC)	・Tarlac-Pangasinan-La Union Expressway (88.0km under construction)	－	PIDC was established by ten (10) local contractor companies
UEM-MARA Philippine Corp.	・Manila-Cavite Coastal Expressway (8.8km) and Extension (11.2km)	Direct operation	Malaysian Fund
Citra Metro Manila Tollways Corp./ San Miguel Corp.	・Skyway：PhaseI (9.4km) ・South Luzon Expressway (13.4km) ・Skyway：PhaseII (6.8km)	Skyway O&M Company	Indonesia Fund
San Miguel Corp.	・South Luzon Expressway (37.2km)	South Luzon Tollways Corp.	Philippine Fund
Ayala Corp/	・Daang Hari SLEx Link Road		Philippine Fund
San Miguel Corp.	・Southern Tagalog Arterial Road (STAR) (41.9km)	Star Infrastructure Development Corp.	Philippine Fund

TABLE 2.8-2 TOLL EXPRESSWAY'S TOLL COLLECTION SYSTEM AND TRAFFIC CONTROL SYSTEM

Operating Expressway(length)	Toll Collection System	Traffic Control System
・North Luzon Expressway (82.6km)	・Cash, EC-tag, Easy Trip	Yes, CCTVs, Vehicle detectors and VMSs (Variable Message e Sign) are installed.
・Subic-Clark-Tarlac Expressway (93.8km) ・Subic-Tipo Tollway (8.5km)	・Cash only	Not yet installed
・Manila-Cavite Coastal Expressway (8.8km) and Extension (11.2km)	・Cash only	Not yet installed
・Skyway：PhaseI (9.4km) ・South Luzon Expressway (13.4km) ・Skyway：PhaseII (6.8km)	・Cash, E-pass	Yes, CCTVs are installed.
・South Luzon Expressway (37.2km)	・Cash, E-pass	Yes, CCTVs and VMSs are installed.
・Southern Tagalog Arterial Road (STAR) (41.9km)	・Cash only	Not yet installed

CHAPTER 3
SOCIO-ECONOMIC CONDITION OF THE PROJECT AREA AND REGIONAL DEVELOPMENT PLAN

3.1 SOCIO-ECONOMIC CONDITIONS

3.1.1 Physical Profile

As mentioned, the project is located in Region III specifically in the provinces of Tarlac and Nueva Ecija. Region III, better known as the Central Luzon Region, is composed of six provinces namely Nueva Ecija, Tarlac, Pampanga, Bulacan, Aurora, Zambales and Bataan. The region covers about 22,014.6 square kilometers or equivalent to 6.4% of the land area of the country. Table 3.1.1-1 shows the land area share of Region III to country as well as share of neighboring regions to the country.

TABLE 3.1.1-1 POPULATION SHARE

Region	Land Area (sq. km.)	Share to Philippines (%)
Philippines	344,879.4	
CAR	20,122.28	5.8
NCR	619.5	0.2
Region I	13,012.6	3.8
Region II	28,228.8	8.2
Region III	**22,014.6**	**6.4**

Source: National Statistics Office

3.1.2 Demographic Trend

The population of Region III reaches 9.7 million in 2007. This number represents 11% of the total population of the country. Growth rate of population recorded at 2.4% annually from 2000 to 2007. This is higher that the growth rate posted in the neighboring regions like CAR, Region I, Region III and NCR as shown in Table 3.12-1. This high growth of population is expected to continue partly due to population spillover from NCR and recent development in the area.

Population of Barangays Directly Affected by the Expressway Project

The alignment of CLLEX originates from Tarlac City and traverses the municipalities of Lapaz (Tarlac side), Zaragasa (Cabanatuan side), Aliaga and terminates at Talavera. There are 29 barangays located in Nueva Ecija (Cabanatuan side) with total population of 135,072 and there are 10 barangays located in Tarlac side with total population of 28,857 as presented in Table 3.1.2-2. The total area covered by these barangays is about 245 km^2 of which 203 km^2 is located in Cabanatuan side and the remaining is on the side of Tarlac. Barangays directly affected by the expressway project is illustrated in Figure 3.1.2-1

TABLE 3.1.2-1 DEMOGRAPHIC TREND IN THE STUDY AREA

Region	Province	Actual Population				Land Area	Density (persons/sq km)				Past Annual Population Growth Rate		
		1990	1995	2000	2007	(sq km)	1990	1995	2000	2007	1990-1995	1995-2000	2000-2007
Philippines		60,703,206	68,616,536	76,504,077	88,574,614	340,575	178	201	225	260	2.48	2.20	2.11
NCR		7,948,392	9,454,040	9,932,560	11,553,427	620	12,830	15,261	16,033	18,650	3.53	0.99	2.18
CAR		1,146,191	1,254,838	1,365,220	1,520,743	19,422	59	65	70	78	1.83	1.70	1.55
Region I		3,550,642	3,803,890	4,200,478	4,545,906	13,013	273	292	323	349	1.39	2.00	1.14
Region II		2,340,545	2,536,035	2,813,159	3,051,487	28,229	83	90	100	108	1.62	2.10	1.17
Region III		6,338,590	7,092,191	8,204,742	9,720,982	22,015	288	322	373	442	2.27	2.96	2.45
	Aurora	139,573	159,621	173,797	187,802	3,147	44	51	55	60	2.72	1.72	1.11
	Bataan	425,803	491,459	557,659	662,153	1,373	310	358	406	482	2.91	2.56	2.48
	Bulacan	1,505,219	1,784,441	2,234,088	2,826,926	2,796	538	638	799	1,011	3.46	4.60	3.42
	***Nueva Ecija**	**1,312,680**	**1,505,827**	**1,659,883**	**1,853,853**	**5,751**	**228**	**262**	**289**	**322**	**2.78**	**1.97**	**1.59**
	Pampanga	1,295,929	1,401,756	1,618,759	1,911,951	2,063	628	680	785	927	1.58	2.92	2.41
	***Tarlac**	**859,708**	**945,810**	**1,068,783**	**1,243,449**	**3,054**	**282**	**310**	**350**	**407**	**1.93**	**2.47**	**2.19**
	Zambales	369,665	289,512	433,542	493,085	593	96	76	113	129	(4.77)	8.41	1.86
	Angeles City	236,686	234,011	263,971	314,493	60	3,925	3,881	4,378	5,215	(0.23)	2.44	2.53
	Olongapo City	193,327	179,754	194,260	227,270	103	1,872	1,740	1,881	2,200	(1.45)	1.56	2.27
Project Area (Nueva Ecija + Tarlac)		**2,172,388**	**2,451,637**	**2,728,666**	**3,097,302**	**8,805**	**247**	**278**	**310**	**352**	**2.45**	**2.16**	**1.83**

Source: NSO, 2007

*Note: *CLLEX is located in the provinces of Nueva Ecija and Tarlac*

TABLE 3.1.2-2 POPULATION OF BARANGAYS DIRECTLY AFFECTED BY THE PROJECT

	Province / City / Municipality	Barangay	Land Area (Sq. Km.)	Population		Growth Rate (% per annum)
				2000	2007	
NUEVA EJICA	**NUEVA ECIJA**		**5,751.300**	**1,659,883**	**1,853,853**	**1.59**
	Aliaga		**86.576**	**50,004**	**61,270**	**2.95**
		Betes	3.719	1,542	1,889	2.94
		Bibiclat	4.339	6,212	7,612	2.95
		Bucot	5.784	3,930	4,815	2.94
		La Purisima	4.915	1,451	1,778	2.95
		Magsaysay	3.288	1,855	2,273	2.95
		Pantoc	5.157	1,651	2,023	2.95
		Poblacion Centro	0.529	1,414	1,733	2.95
		Poblacion East I	0.343	1,700	2,083	2.95
		Poblacion East II	0.433	1,297	1,589	2.94
		Poblacion West III	0.376	985	1,207	2.95
		Poblacion West IV	0.464	646	792	2.95
		San Carlos	4.029	2,238	2,742	2.94
		San Emiliano	1.630	873	1,070	2.95
		San Eustacio	7.777	1,283	1,572	2.94
		San Felipe Matanda	2.646	2,089	2,560	2.95
		San Juan	5.630	3,931	4,817	2.95
		San Pablo Bata	1.456	1,686	2,066	2.95
		Santa Monica	3.906	764	936	2.94
		Santo Rosario	3.165	1,963	2,405	2.94
		Sunson	2.047	633	776	2.95
		Umangan	7.211	2,679	3,283	2.95
	Cabanatuan City		**163.628**	**222,859**	**259,267**	**2.19**
		Caalibangbangan	4.057	6,167	8,456	4.61
		Dalampang	1.764	1,559	1,585	0.24
	Licab		**46.088**	**21,593**	**23,675**	**1.32**
		San Jose	2.235	1,017	1,115	1.32
		San Juan	10.417	2,788	3,057	1.32
		Aquino	1.396	1,712	1,877	1.32
	Talavera		**83.256**	**97,329**	**105,122**	**1.11**
		Mamandil	3.492	904	976	1.10
		San Miguel na Munti	2.298	2,634	2,845	1.11
	Zaragosa		**76.826**	**37,645**	**40,355**	**1.00**
		Santa Lucia Old	15.957	956	1,025	1.00
		Santa Lucia Young	6.205	2,654	2,845	1.00
TARLAC	**TARLAC**		**3,053.600**	**1,068,783**	**1,243,449**	**2.19**
	La Paz		**102.166**	**52,907**	**61,324**	**2.13**
		Guevarra	6.144	3,872	4,488	2.13
		Kapanikian	1.730	1,601	1,856	2.13
		La Purisima	3.662	2,400	2,782	2.13
		Lomboy	4.137	2,897	3,358	2.13
		Laungcupan	4.2305	2,443	2,832	2.13
		Macalong	4.282	1,865	2,162	2.13
	Tarlac City		**201.365**	**262,481**	**314,155**	**2.60**
		Amucao	4.8365	2,187	2,618	2.60
		Balingcanaway	6.789	5,181	6,201	2.60
		Bantog	5.859	1,696	2,030	2.60
		Cut-cut II	0.098	443	530	2.59

Source: NSO, 2007

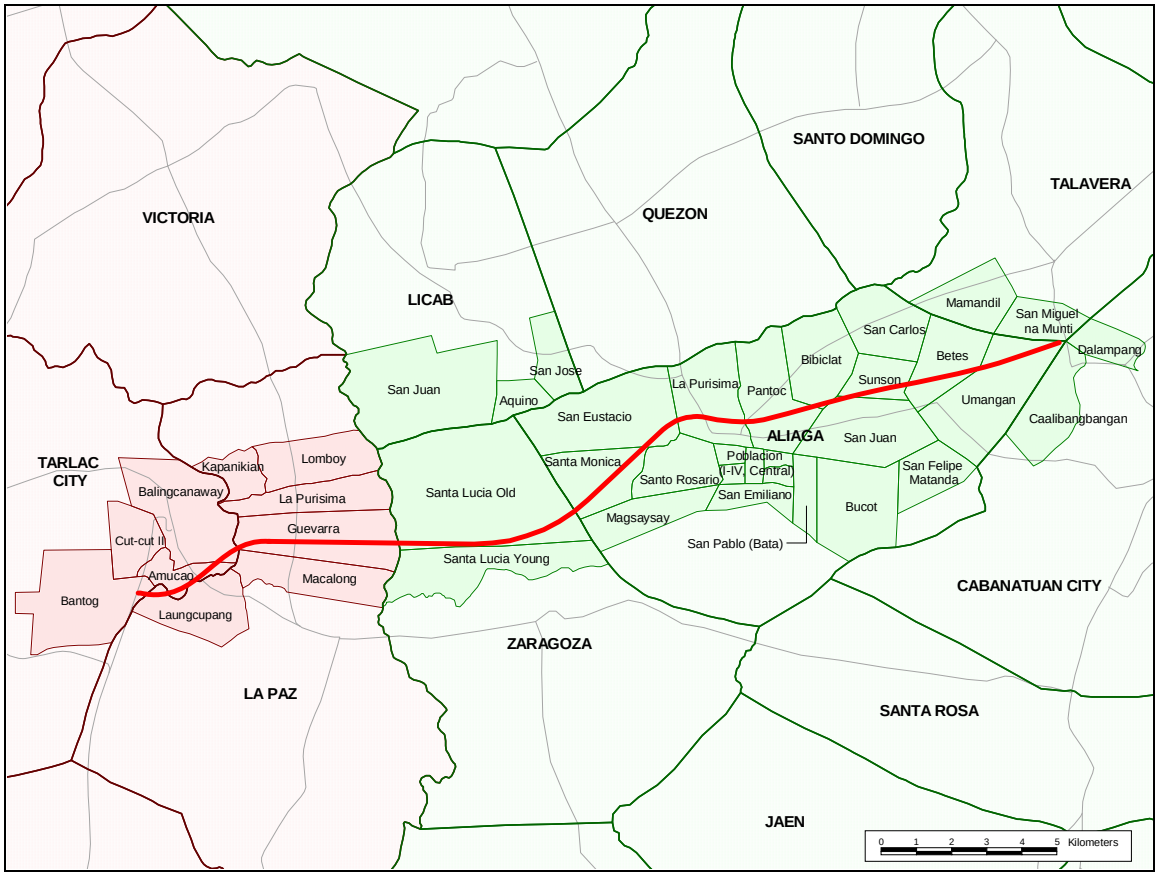


FIGURE 3.1.2-1 ALIGNMENT OF CLLEX SHOWING DIRECTLY AFFECTED BARANGAYS

3.1.3 Economic Trend

The economic performance of Region III as well neighboring provinces is depicted in Figure 3.1.3-1. The three regions are considered the economic engine of the country which is reflected in the very high economic growth. NCR for instance even surpassed the national average. Although Region III's growth is lower than the two regions, this growth is still very high compared to other regions in the country.

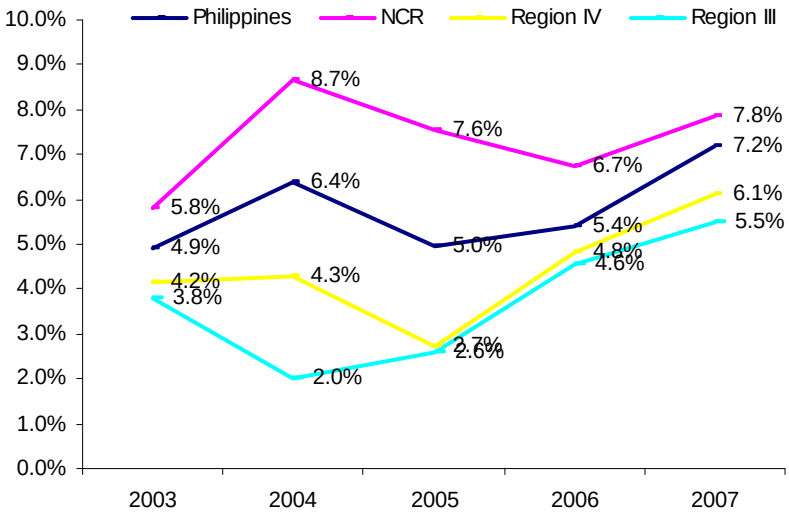


FIGURE 3.1.3-1 GDP AND GRDP GROWTH RATE

The industrial structure of the economy of the study area as well as surrounding regions is shown in Table 3.1.3-1. Region III's industrial structure is a balanced share of primary, secondary and tertiary. It is interesting to note that although Region III is known to possess a fertile flat land, the share of agriculture is limited to just 25% and service industry shoot to 40%. As mentioned, the region is absorbing the spillover population and activities in NCR thus service sector is beginning to lead the region's economy.

In terms of economic growth rate, Region III had a healthy growth ranging from 2% to 6%. Although this is lower that the growth rate of the country in the same period, it is expected that the region will continue to grow and eventually overtake the national average due to its strategic location sitting beside NCR. Further, the region has strategic infrastructure assets like international airport and international port. The complete operation of SCTEX and its eventual integration with NLEX will further facilitate the economic development of the region. This is further enhances once the TPLEX opened for public to use. Therefore, economic prospect of the region is very bright.

TABLE 3.1.3-1 INDUSTRIAL STRUCTURE OF THE ECONOMY, 2007

	Primary	Secondary	Tertiary	Total
Philippines	251,272	445,486	671,883	1,368,641
NCR	1	151,135	295,656	446,793
CAR	4,338	18,794	7,315	30,447
Region I	17,294	5,832	17,270	40,396
Region II	13,711	4,349	9,126	27,187
Region III	27,963	40,500	45,539	114,001
IN PERCENTAGE				
Philippines	18	33	49	100
NCR	0	34	66	100
CAR	14	62	24	100
Region I	43	14	43	100
Region II	50	16	34	100
Region III	**25**	**36**	**40**	**100**

Source: NSO, 2007

3.1.4 Per Capita GDP and GRDP

The per capita GRDP in current price and constant price are shown in Table 3.1.4-1 and table 3.1.4-2 respectively. As expected, NCR being the capital of the country has the highest per capita GRDP which almost 3 fold higher than the national average. Per capita GRPD of Region III is a bit lower that the national average at .70.

The country's per capita GRDP grew by 3.8% per annum from 2003 to 2007. Highest growth is realized in NCAR and followed by Region I, Region II and Region III. Except NCR, all regions recorded growth with less than the national average.

TABLE 3.1.4-1 PER CAPITA GRDP IN CURRENT PRICE

Unit: Peso

	2003	**2004**	**2005**	**2006**	**2007**	
Philippines	52,718	58,149	63,556	69,365	74,947	1.00
NCR	148,743	165,814	184,758	205,117	223,332	2.98
CAR	66,749	71,247	75,556	82,523	85,319	1.14
Region I	27,943	30,725	33,405	35,996	38,063	0.51
Region II	26,829	30,474	30,369	33,799	36,605	0.49
Region III	**39,407**	**42,256**	**45,789**	**49,469**	**52,351**	**0.70**

TABLE 3.1.4-2 PER CAPITA GRDP IN CONSTANT PRICE

Unit: Peso

	Per Capita GRDP					Growth Rate
	2003	**2004**	**2005**	**2006**	**2007**	**2003-2007**
Philippines	13,252	13,789	14,186	14,681	15,429	3.87
NCR	31,730	33,867	35,742	37,856	40,252	6.13
CAR	17,848	18,111	17,919	18,208	19,120	1.74
Region I	7,209	7,442	7,727	7,988	8,286	3.54
Region II	7,590	8,228	7,649	8,122	8,511	2.91
Region III	**11,092**	**11,054**	**11,142**	**11,448**	**11,904**	**1.78**

3.1.5 Employment

The number of establishment in Region III reaches 84,361 in 2007. This number is higher that the number of establishment recorded in the neighboring provinces except Metro Manila. The said number of establishments generated 421,962 employments in the region.

TABLE 3.1.5-1 NUMBER OF ESTABLISHMENTS AND EMPLOYMENTS BY REGION/PROVINCE: LUZON

Region/Province	No. of Establishments			No. of Employments		
	2005	2006	2007	2005	2006	2007
Philippines	782,980	783,065	783,869	5,479,297	4,984,883	5,187,793
NCR	195,412	195,632	196,426	1,976,359	1,869,507	2,025,751
CAR	14,762	14,744	14,738	70,444	61,717	62,731
Region I	44,134	44,117	44,082	175,325	144,269	144,495
Region II	23,978	23,982	23,932	88,827	69,271	69,052
Region III	**84,368**	**84,344**	**84,361**	**480,020**	**419,320**	**421,962**
Bataan	6,026	6,027	5,982	39,501	36,796	34,686
Bulacan	23,152	23,135	23,139	129,883	113,827	113,674
Nueva ecija	**18,239**	**18,228**	**18,148**	**65,273**	**49,198**	**49,006**
Pampanga	19,104	19,091	19,165	136,087	120,074	125,567
Tarlac	**9,172**	**9,169**	**9,158**	**51,587**	**45,697**	**44,071**
Zambales	7,335	7,355	7,431	53,865	50,629	51,936
Aurora	1,340	1,339	1,338	3,824	3,099	3,022
Luzon Total	362,654	362,819	363,539	2,790,975	2,564,084	2,723,991

Source: NSO, Statistical Sampling and Operations Division, 2000 List of Establishments

3.2 REGIONAL DEVELOPMENT PLAN

The Philippine Development Plan (2011 – 2016) is pursuing the following national development policies;

NATIONAL DEVELOPMENT POLICIES

- Development of an integrated multi-modal logistics/transport system to achieve an economic corridor
- Decongestion of Metro Manila
- Promotion of development of impoverished area
- Promotion of PPP projects for acceleration of infrastructure development

Due to economic growth in the capital regions, economic sphere is expanding from Metro Manila towards its neighboring regions of Region III and Region IV-A. Thus, the development strategy cannot be planned only for Metro Manila but involving Region III and Region IV-A as a whole. Overall development strategy will be as follows;

1) 200 km radius sphere from Metro Manila

- Metro Manila together with Region III and Region IV-A will continue to propel the country's economy.

- To promote decentralization and to mitigate overconcentration of Metro Manila, regional urban centers outside Metro Manila shall be developed. (see **Figure 3.2-1)**

- Strategic areas along the Pacific coast shall be regarded as the impoverished areas for universal development and accessibility to those areas shall be strengthened. (see **Figure 3.2-2)**

- In order to support tourism development, the tourism development axes shall be developed for the strategic areas of tourism development. (see **Figure 3.2-2)**

2) Metro Manila and its suburbs

- Due to accumulation of infrastructure of expressways, international airports and ports and economic zones along the north-south direction, the north-south industrial development beltway which connects Batangas-Metro Manila-Clark-Tarlac will be the key axis for the development of the Metropolitan areas and the country as a whole. (see **Figure 3.2-3)**

- Sound urbanization of Metro Manila and its suburbs shall be achieved. (see **Figure 3.2-1)**

3) North of Metro Manila

- Clark-Subic corridor shall be developed as a logistic axis not only for the country but also for the southeast and ASEAN countries. (see **Figure 3.2-3)**

- To support the development of CAR and Region I, the North-West Luzon development axis shall be developed. (see **Figure 3.2-3)**

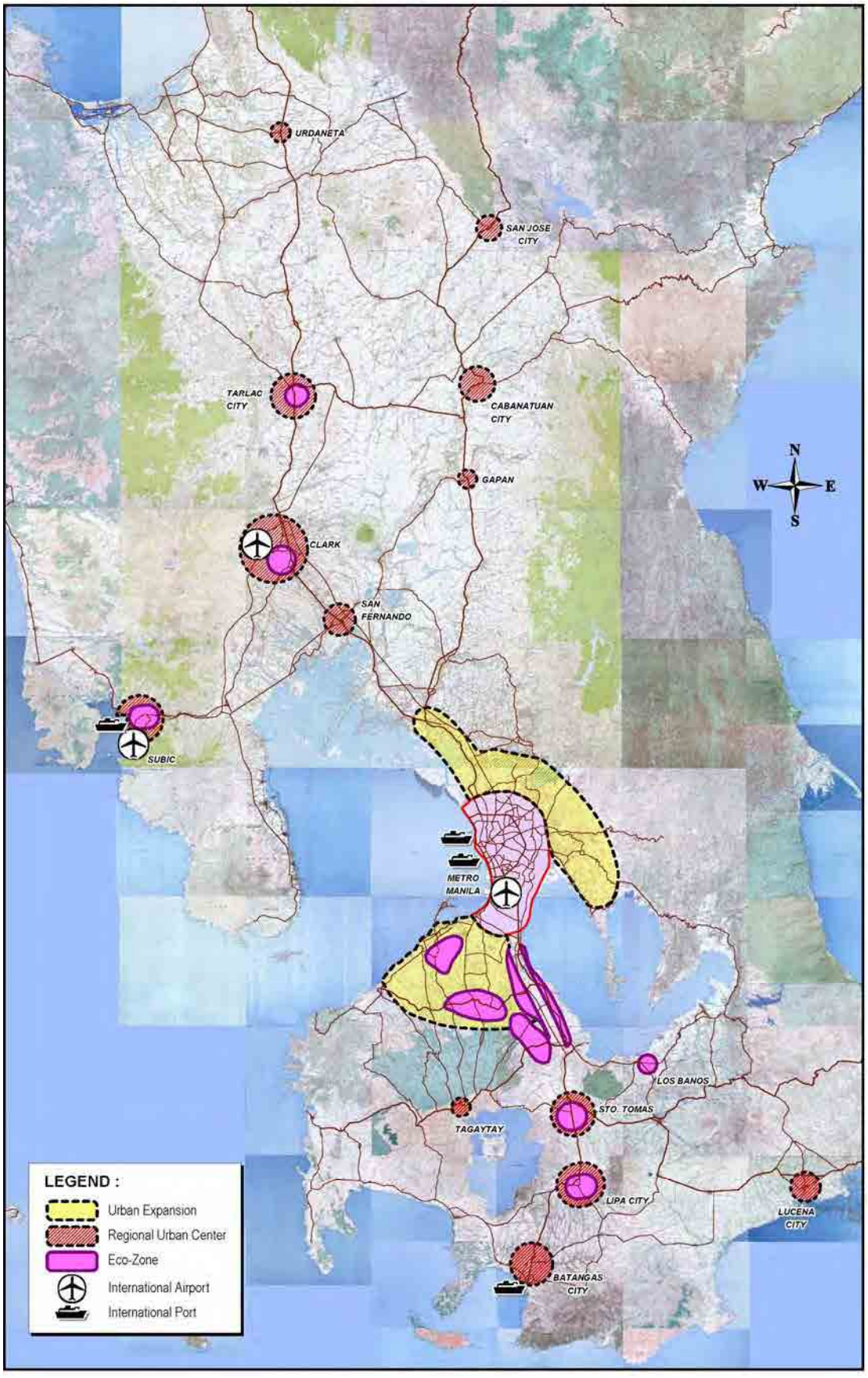
- For the development of Region II, the North-East Luzon development axis shall be developed. (see **Figure 3.2-3)**

4) South of Metro Manila

- To support the development of Region V, the South-Luzon development axis shall be developed. (see **Figure 3.2-3)**

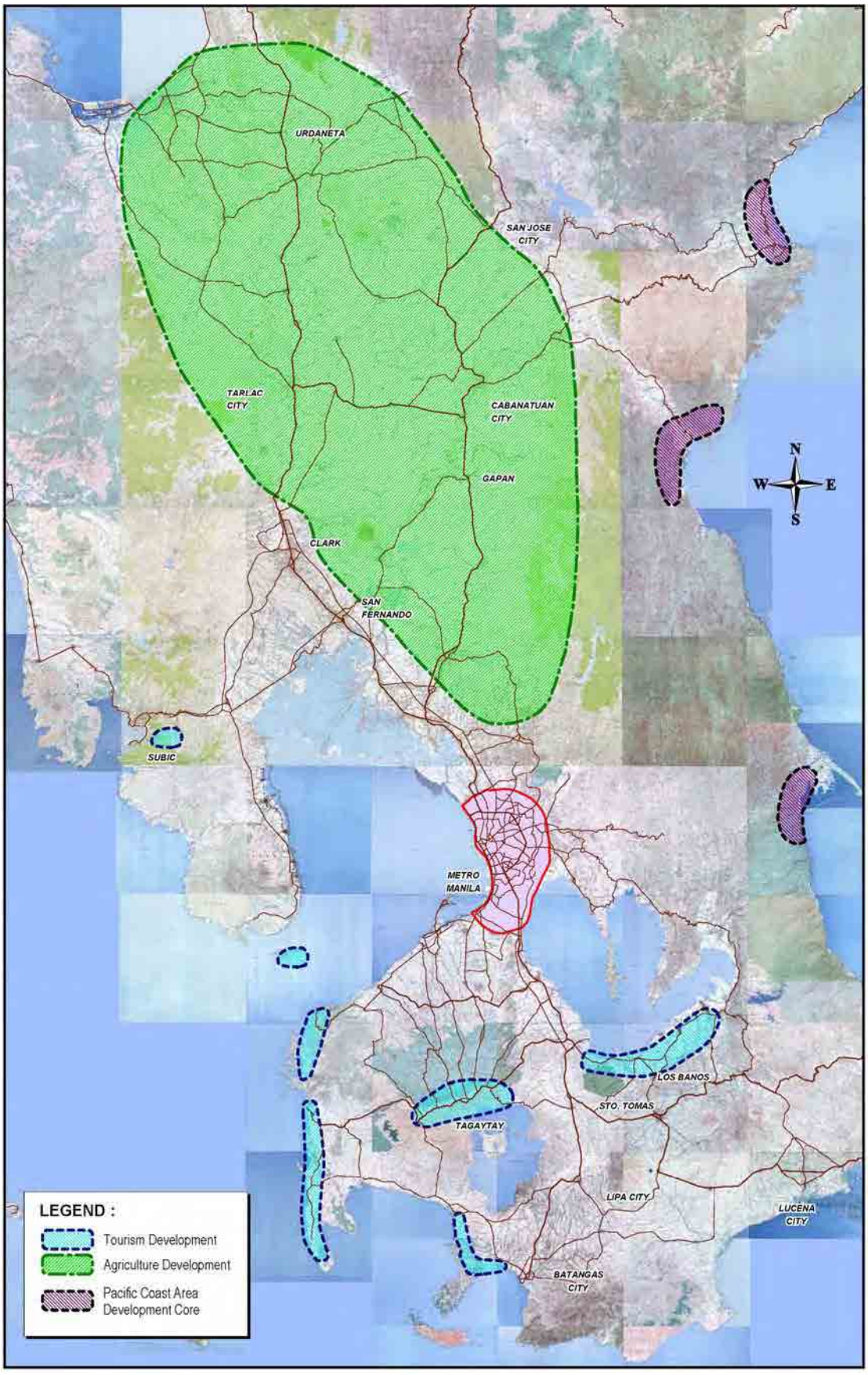
5) Overall Regional Development Scenario

- Overall regional development scenario is shown in **Figure 3.2-4.**



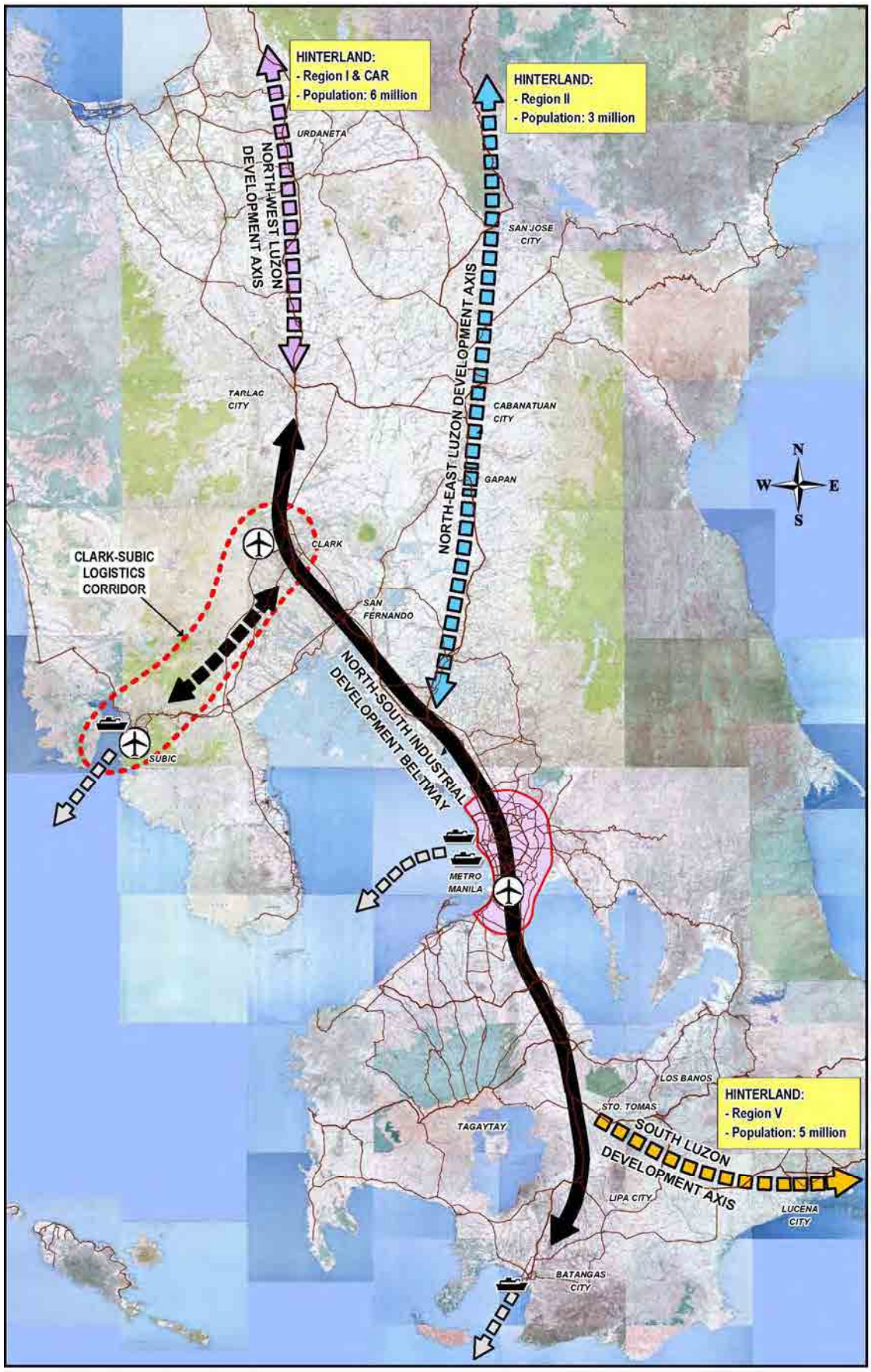
Source: HSH Development Master Plan, JICA, 2010

FIGURE 3.2-1 URBAN DEVELOPMENT STRUCTURE



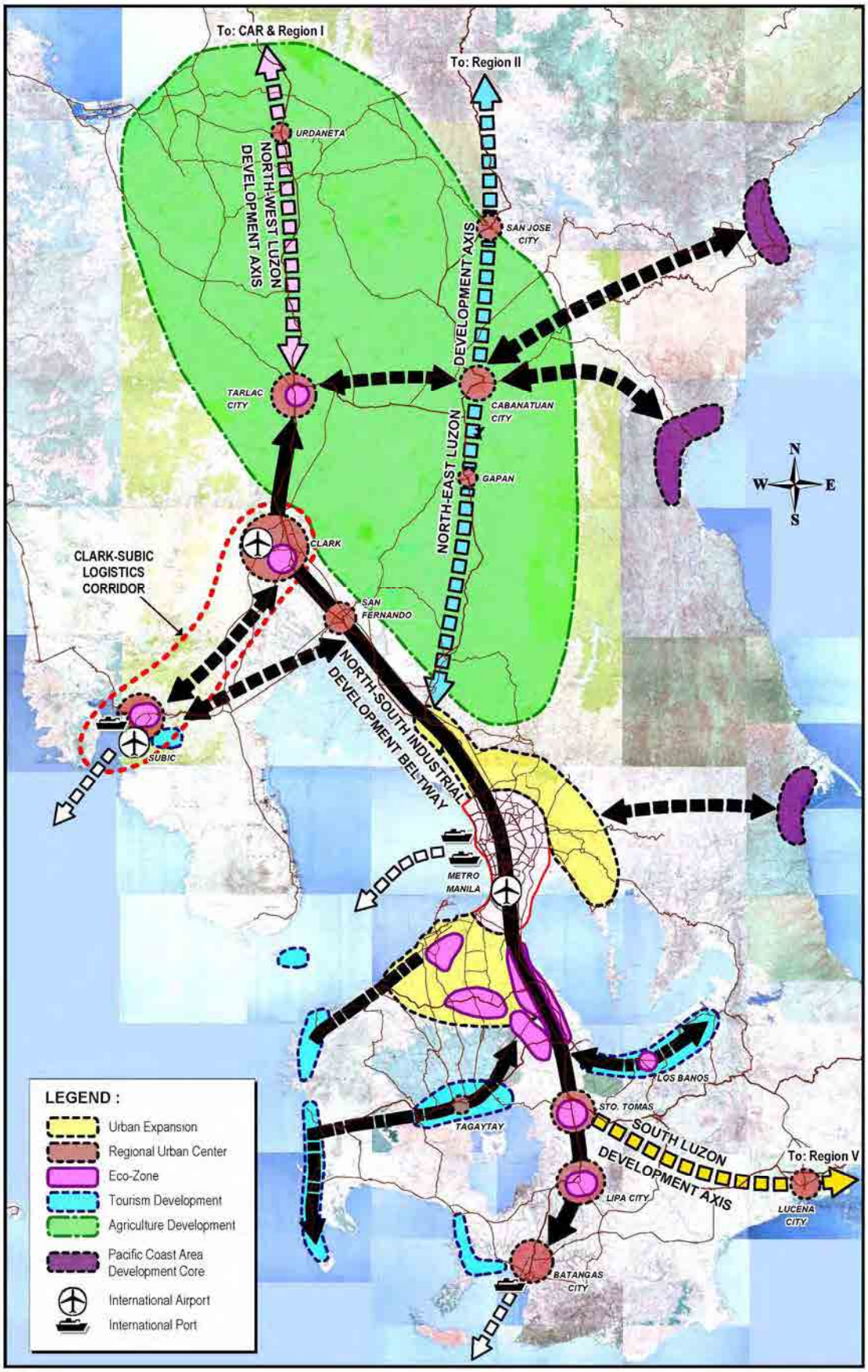
Source: HSH Development Master Plan, JICA, 2010

FIGURE 3.2-2 AGRICULTURE AND TOURISM DEVELOPMENT AND PACIFIC COAST DEVELOPMENT



Source: HSH Development Master Plan, JICA, 2010

FIGURE 3.2-3 DEVELOPMENT AXES



Source: HSH Development Master Plan, JICA, 2010

FIGURE 3.2-4 DEVELOPMENT STRATEGY : 200KM RADIUS SPHERE OF METRO MANILA

3.3 MANUFACTURING COMPANIES IN THE PROJECT INFLUENCE AREA

1) Luisita Industrial Park, San Miguel, Tarlac (as of Sept. 2009)

- Land area: 120 ha.
- Number of factories/establishments in operation: 7
- Type of factories/establishments

Type of Factories/Establishment	No. of Factories	No. of Employees
Feed Mill	1	45
Electrical Parts/Equipment	2	500
Electronic/IT Related Parts	1	800
Vehicle Parts/Transport Equipment	3	4,500
Total	**7**	**5,845**

Outline of major factories are as follows;

a) San Miguel Foods, Inc.
- Share of Capital : 100% Domestic
- Floor area
  - Factory : 10,000 sq. m
  - Stock Yard : 34,000 sq. m
  - Warehouse : 10,000 sq. m
- No. of Employees : 45
- Products : Animal Feeds (7,500 ton/month)
- Where does raw material come from?
  - Corn : Within the country
  - Soya : Argentina
- Where are the products consumed? Within Region III

b) Sanyo Semiconductor Manufacturing Philippines, Corp.
- Share of Capital : 100% Japan
- Floor area
  - Factory : 4,205 sq. m
  - Stock Yard/Warehouse : 425 sq. m
- No. of Employees : 143
- Products : Integrated Circuits (30 Million pcs/month)
- Where does raw material come from?
  - IC Chips : Japan
  - Lead Frames : Overseas, Laguna, Cavite
  - Mold Resin : Japan, Thailand, Laguna
- Where are the products transported?
  - Japan : 70%
  - Hongkong : 15%
  - Taiwan : 10%
  - Singapore : 5%

c) SDE Philippines, Corp.
- Share of Capital : 100% Japan
- Floor area
  - Factory : 2,147 sq. m
- No. of Employees : 68

- Products : Circuit & Assembly Board (59,000 pcs/month)
  Applicator Parts (3,200 pcs/month)
- Where does raw material come from?

POM	:	Singapore
Circuit & Assembly Board Parts	:	Japan

- Where are the products transported?

Japan	:	14%
USA	:	1%
ASEAN	:	9%
Region III	:	67%
Region IV-A	:	9%

2) Bio-fuel Factory in San Mariano, Isabela, Region II

Itochu Corp. Japan is constructing a bio-fuel factory in San Mariano City, Isabela, Region II. The factory will be constructed and completed in May 2012. 8,000 hectares of land around the factory will be converted to sugar cane land by March 2012 which will be expanded to 10,000 hectares by May 2012 and further expanded to 25,000 ha.

The project will employ 3,000 families for sugar cane productions and about 10,000 employments will be created.

54,000 kl/year or about 200,000 l/day of bio-fuel will be produced and transported to Metro Manila.

The Pan Philippine Highway will be used for transportation, however, when CLLEx will be completed, CLLEx will be used instead of the Pan Philippine Highway from Cabanatuan City to NLEx which is currently suffering traffic congestion at urban areas.

CHAPTER 4
TRAFFIC STUDY

4.1 PRESENT TRAFFIC CONDITION

4.1.1 Type of Surveys Carried Out

A number of surveys were carried out to better understand the characteristics of the study area as shown in the table below:

TABLE 4.1.1-1 TYPE OF SURVEYS CARRIED OUT

Survey Type		Number of Samples
a.	Willing to Pay Survey for Car Users	820
b.	Interview Survey to Trucking Companies	10
c.	Interview Survey to Bus Companies	9
d.	Interview Survey to Manufacturing Companies	5

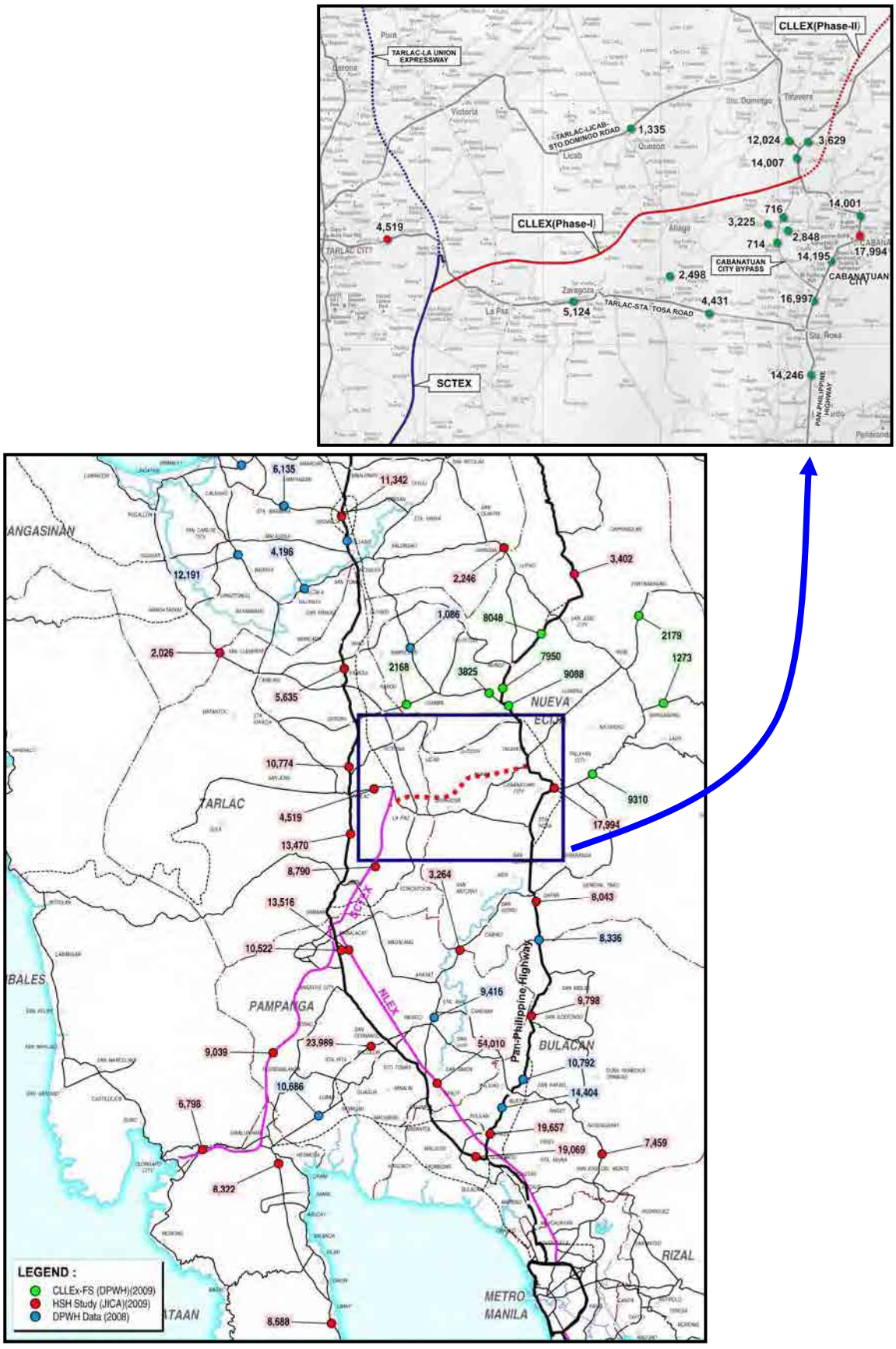
Other important data such as traffic volume was sourced out from the two reports which are Feasibility Study of the Proposed Central Luzon Expressway (DPWH, 2010) and The Study of Master Plan on High Standard Highway Network Development (JICA, 2010) and DPWH count stations. Travel speed data of the road network in the study area was taken from the Feasibility Study of the Proposed Central Luzon Expressway.

4.1.2 Traffic Volume

Traffic volume along major roads in Central Luzon as well as in the road network surrounding the CLLEX is shown in **Figure 4.1.2-1**. As seen in the figure, the two major highways (Manila North Road and Pan Philippine Highway) exhibited high number of traffic. The NLEX is also carrying a very heavy traffic confirming the very active socio-economic exchanges between cities in the North and Metro Manila.

Construction of CLLEX provides smooth connection between two major cities in the north. Currently, there are two roads that motorists may take from Tarlac City to Cabanatuan City, Tarlac - Sta. Rosa Road, and Tarlac – Talavera Road. These roads run parallel to the future Central Luzon Link Expressway (CLLEX). The Tarlac – Sta. Rosa Road is becoming the main corridor of commuters coming from Cabanatuan City and nearby cities and municipalities going to Metro Manila due to heavy traffic congestion along the Pan Philippine Highway. This road connects motorist to two expressways that guarantee them smooth travel. At first, they will be connected to SCTEX, then to NLEX which brings them to Metro Manila. Volume of traffic at three count stations assigned along Tarlac – Sta. Road have the following numbers: Lapaz - Zaragosa section (5,124), Zaragosa - Sta. Rosa section (4,431), and Aliaga - Cabanatuan section (2,498) as shown in **Figure 4.1.2-1**. Traffic volume at intersection counts is shown in **Figure 4.1.2-2** to **Figure 4.1.2-4**.

The Tarlac – Talavera Road on the other hand is used by motorist going further north like San Jose City and Tuguegarao City. This road serves as bypass road to avoid heavy congestion at Sta. Rosa – Talavera section of Pan Philippine Highway when using the Tarlac-Sta. Rosa Road. Traffic volume at Licab – Quezon section of Tarlac – Talavera Road is 1,335.



Note : All data in AADT; June and May refers to actual month of survey

FIGURE 4.1.2-1 TRAFFIC VOLUME IN CENTRAL LUZON AND ROAD NETWORK SURROUNDING CLLEX

unit: vehicle/day

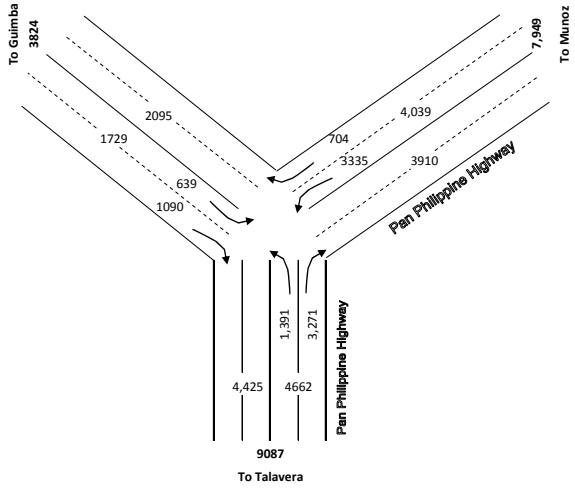


FIGURE 4.1.2-2
TALAVERA/GUIMBA/MUNOZ JUNCTION

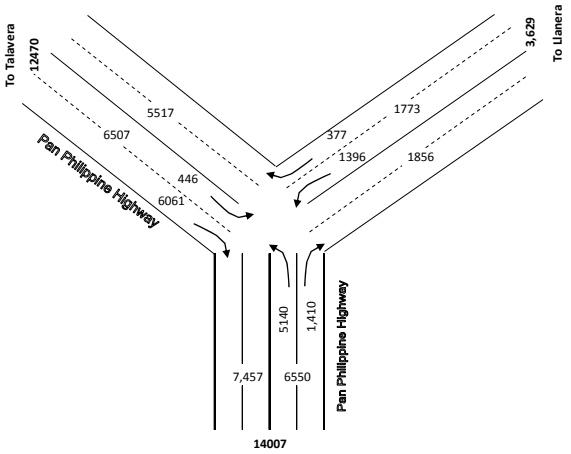


FIGURE 4.1.2-3
CABANATUAN/TALAVERA/LLANERA JUNCTION

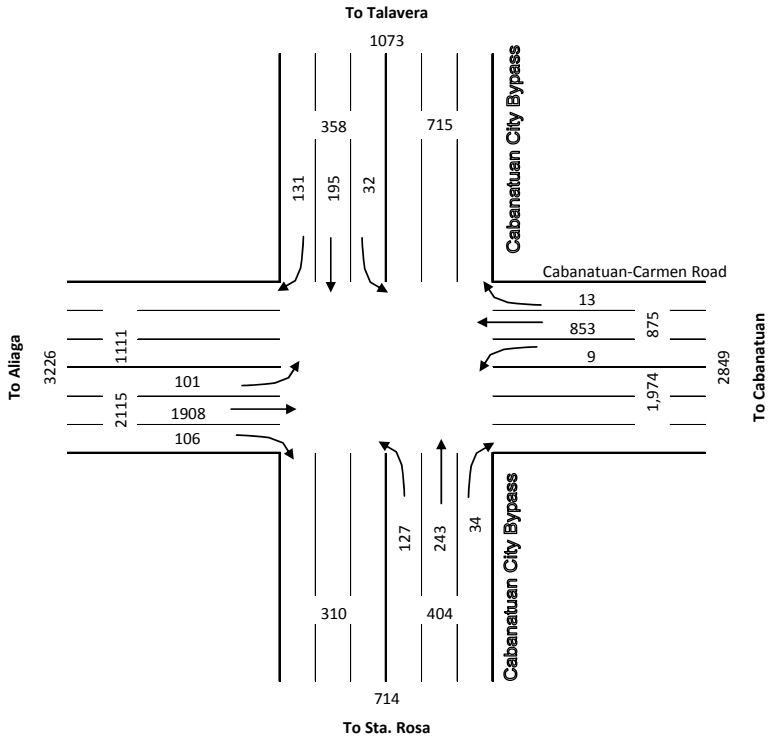


FIGURE 4.1.2-4 ALIAGA/TALAVERA/STA.ROSA/CABANATUAN JUNCTION

4.1.3 Hourly Variation of Traffic

Hourly variation of traffic at the two roads (i.e. Tarlac - Sta. Rosa Road, Tarlac – Talavera Road) connecting Tarlac City and Cabanatuan City are shown from **Figure 4.1.3-1** to **Figure 4.1.3-4**. At the Tarlac – Sta. Rosa Road, three count stations were assigned at the following sections: Lapaz-Zaragosa, Zaragosa-Sta. Rosa, and Aliaga-Cabanatuan.

At Lapaz-Zaragosa section, high traffic volume is observed from 8:00AM to 7:00PM where traffic registered constantly exceeded 100. Highest volume of traffic is in the direction of Lapaz and recorded between 1:00PM to 2:00PM and 4:00PM to 5:00PM.

Peak hour traffic is observed at noon time from 12:00 to 5:00PM. Highest number of recorded traffic in an hour is 216. At Zaragosa - Sta. Rosa Road, traffic volume seems to be constant and exceeded 100 vehicles on both directions from 8:00AM until 5:00PM. Hourly variation of traffic at the Pan Philippine Highway is shown in **Figure 4.1.3-5** to **Figure 4.1.3-6**.

unit: vehicle/hour

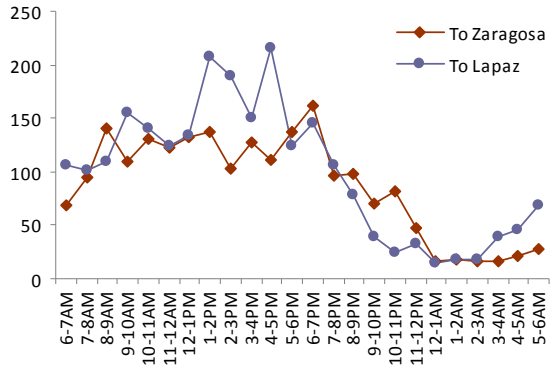


FIGURE 4.1.3-1 TARLAC – STA. ROSA ROAD (LAPAZ-ZARAGOSA SECTION)

unit: vehicle/hour

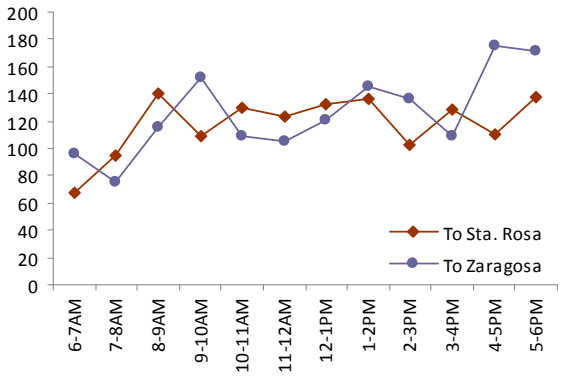


FIGURE 4.1.3-2 TARLAC – STA. ROSA ROAD (ZARAGOSA-STA. ROSA SECTION)

unit: vehicle/hour

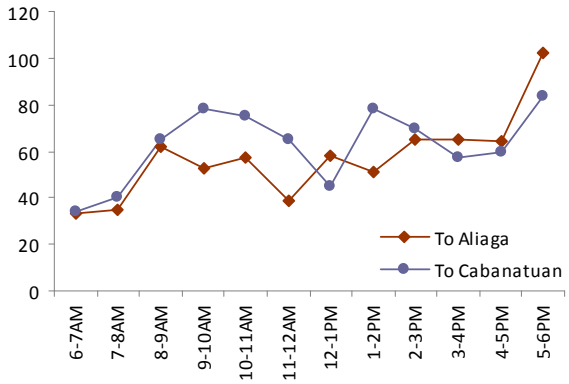


FIGURE 4.1.3-3 TARLAC – STA. ROSA ROAD (ALIAGA-CABANATUAN SECTION)

unit: vehicle/hour

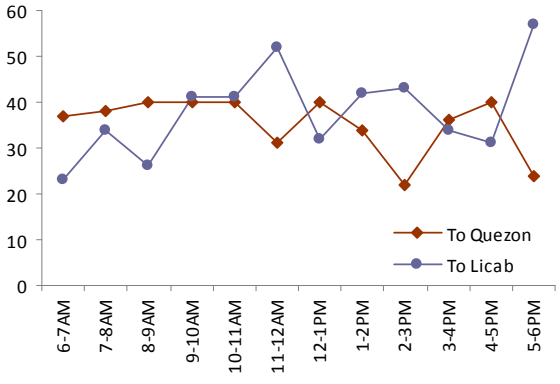


FIGURE 4.1.3-4 TARLAC – TALAVERA ROAD (LICAB-QUEZON SECTION)

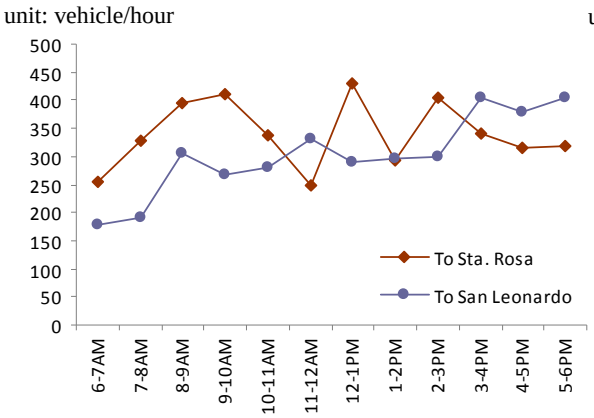


FIGURE 4.1.3-5 PAN PHILIPPINE HIGHWAY (SAN LEONARDO-STA. ROSA)

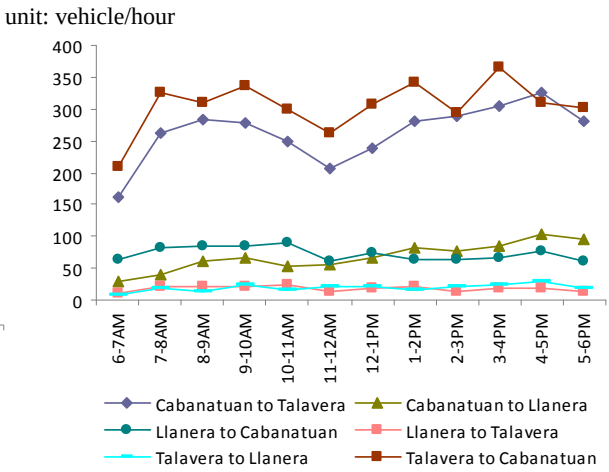


FIGURE 4.1.3-6 PAN PHILIPPINE HIGHWAY (CABANATUAN-TALAVERA-LLANERA JUNCTION)

4.1.4 Traffic Composition

Vehicles traversing Tarlac - Sta. Rosa Road are dominated by cars and trucks. At Lapaz-Zaragosa section, share of car reaches 42% of traffic and the same number is reached by trucks. Share of jeepney is 13% and share of bus is merely 4%. At Zaragosa - Sta. Rosa section, proportion of different transport mode has not changed; car (47%), jeepney (20%), bus (3%), and truck (30%) The decline on the share of bus means that perhaps some buses took the Aliaga - Cabanatuan route and their destination is most likely Region II. See **Figure 4.1.4-1** and **Figure 4.1.4-2**.

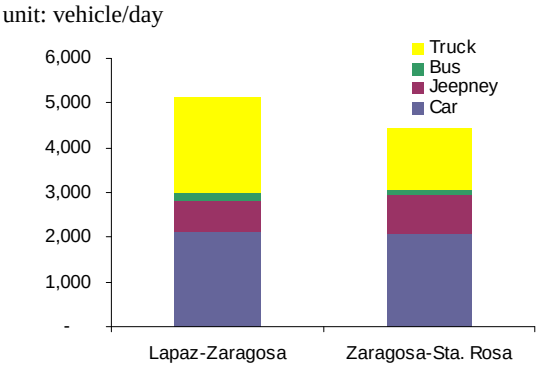


FIGURE 4.1.4-1 TRAFFIC COMPOSITION AT TARLAC - STA. ROSA ROAD

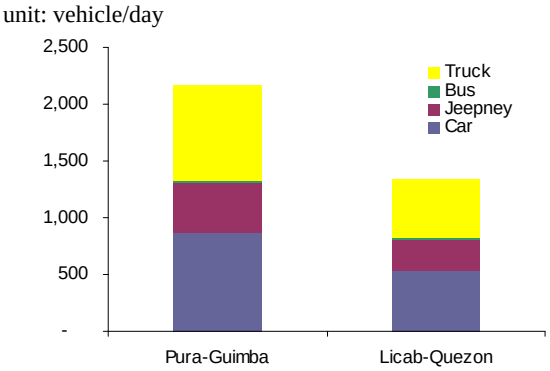


FIGURE 4.1.4-2 TRAFFIC COMPOSITION AT OTHER ROADS CONNECTING TARLAC SIDE AND CABANATUAN SIDE

Composition of vehicles plying Pan Philippine Highway is shown in **Figure 4.1.4-3**. Share of different transport mode at San Leonardo - Sta. Rosa section of Pan Philippine Highway are: 42% for car, 10 for jeepney, 5% for bus and 43% for truck. Share of jeepney substantially increased to 28% inside Cabanatuan City (Palayan Road – Mabini St.) and share of truck reduced to just 27%. Jeepney which is the main public transportation in medium cities is mixing with through traffic that created serious traffic congestion.

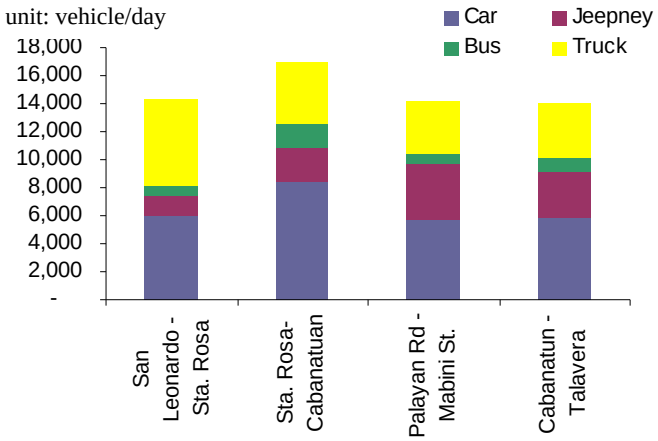


FIGURE 4.1.4-3 TRAFFIC COMPOSITION AT PAN PHILIPPINE HIGHWAY

4.1.5 Travel Speed

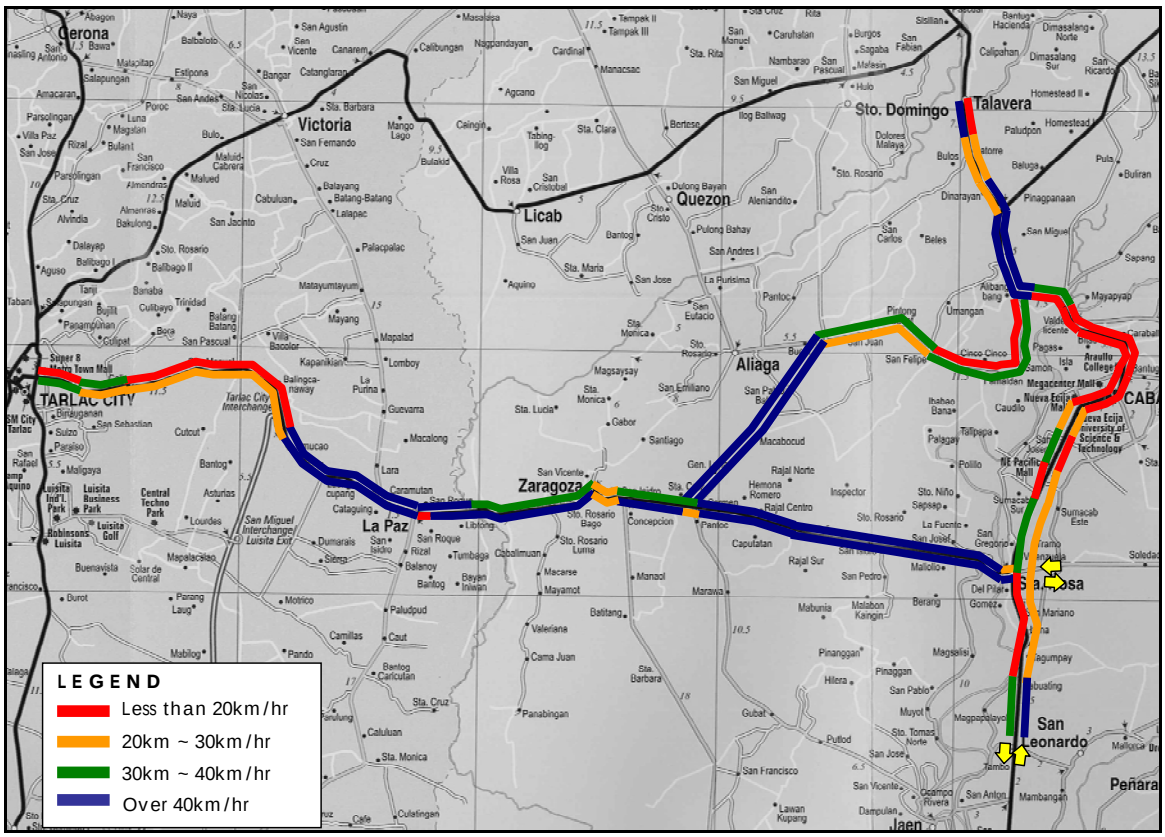
The study entitled 'Feasibility Study of the Proposed Central Luzon Expressway', 2010, carried out a travel time survey. The raw data used to plot travel speed shown in **Figure 4.1.5-1** were taken from the said study. The following were observed from the figure:

Tarlac – Sta. Rosa Road
This road is relatively congested free except at the center of towns of La Paz, Zaragosa and its approach to Tarlac. Travel time to traverse the 39.9 km road is about 60 minutes. See **Figure 4.1.5-2**.

Tarlac - Carmen – Cabanatuan Road (via Aliaga)
This route is also free of traffic congestion except of its approach to Tarlac and Pan Philippine Highway (Cabanatuan side). Average travel time is about 69 minutes to cross the 46 km route. See **Figure 4.1.5-2**.

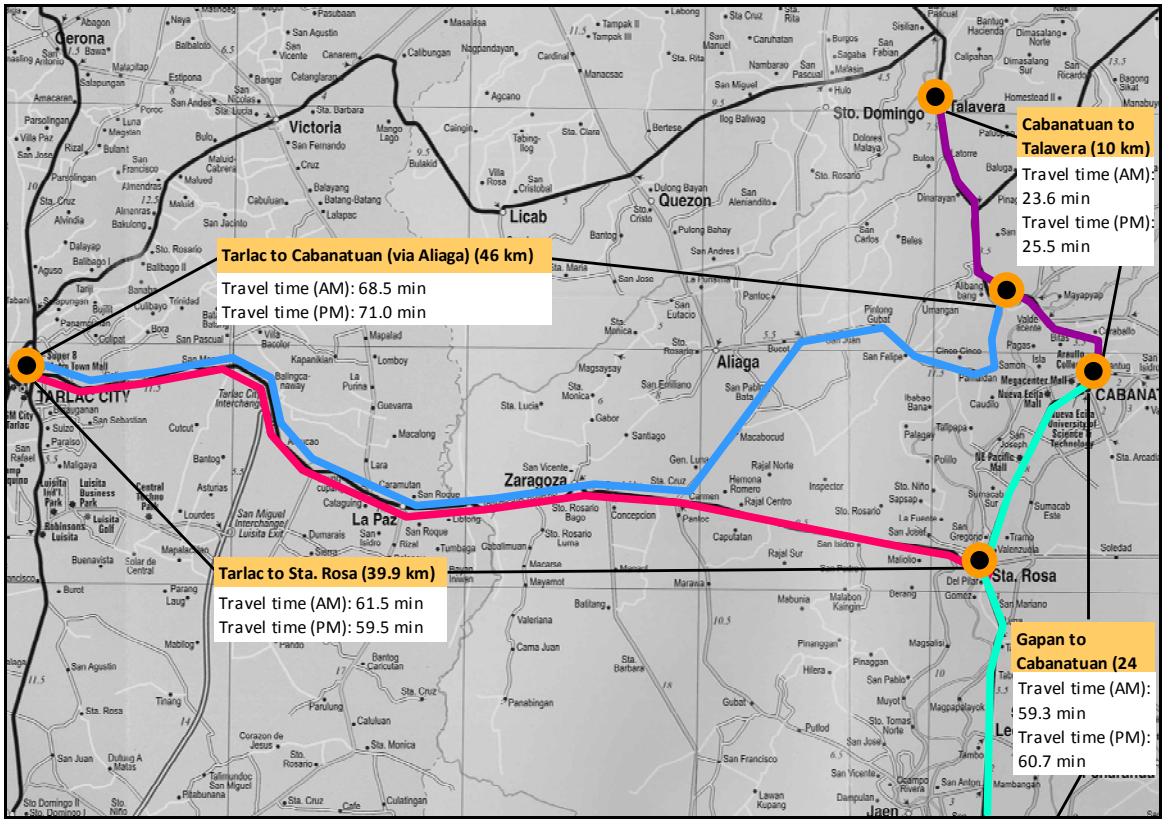
Gapan - Cabanatuan – Talavera (Pan Philippine Highway)
Traffic congestion is severe from Sta. Rosa all the way to Carmen – Cabanatuan Road. Traffic congestion is particularly heavy inside Cabanatuan City where local and through traffic merges. At the center of Cabanatuan City, most of the traffic is composed of jeepneys which served local traffic. Average travel time from Gapan to Cabanatuan reaches about 60 minutes for merely 24 km road. Likewise, average travel time from Cabanatuan to Talavera (10 km) is about 24 minutes. See **Figure 4.1.5-2**.

Pan Philippine Highway (NLEX Sta. Rosa Exit to San Jose)
Travel speed of motorists along Pan Philippine Highway from Sta. Rosa Exit of NLEX until San Jose is shown in **Figure 4.1.5-3**. Traffic congestion is observed to be serious at the town centers of Ildefonso, Sta. Rosa, Cabanatuan, Talavera, Sto. Domingo and San Jose.



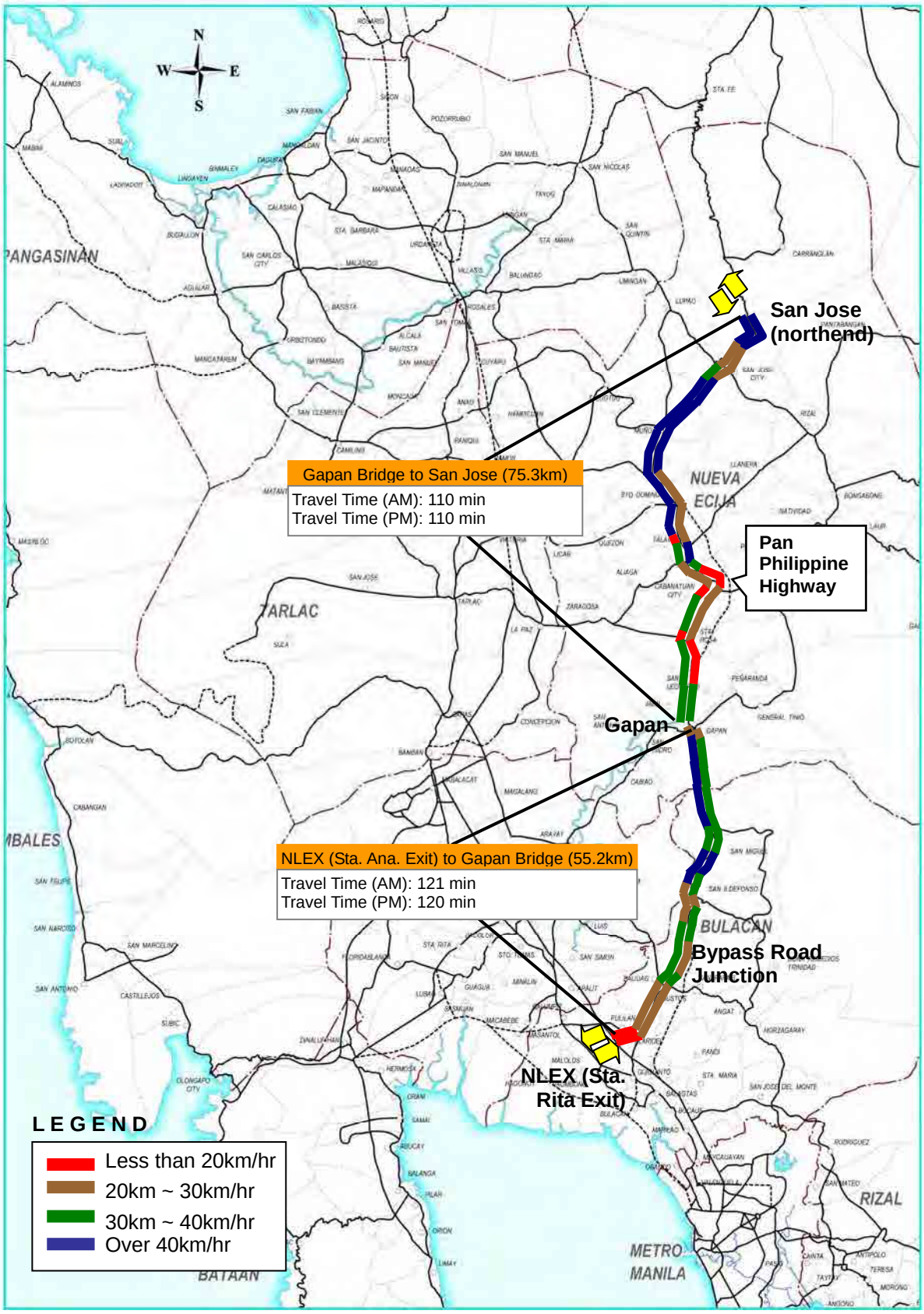
Note: Raw data is taken from Feasibility Study of the Proposed Central Luzon Expressway, DPWH (2010)

FIGURE 4.1.5-1 TRAVEL SPEED (AFTERNOON PEAK)



Note: Raw data is taken from Feasibility Study of the Proposed Central Luzon Expressway, DPWH (2010)

FIGURE 4.1.5-2 TRAVEL TIME (AM AND PM)



Source: The Study of Master Plan on High Standard Highway Network Development (JICA, 2010)

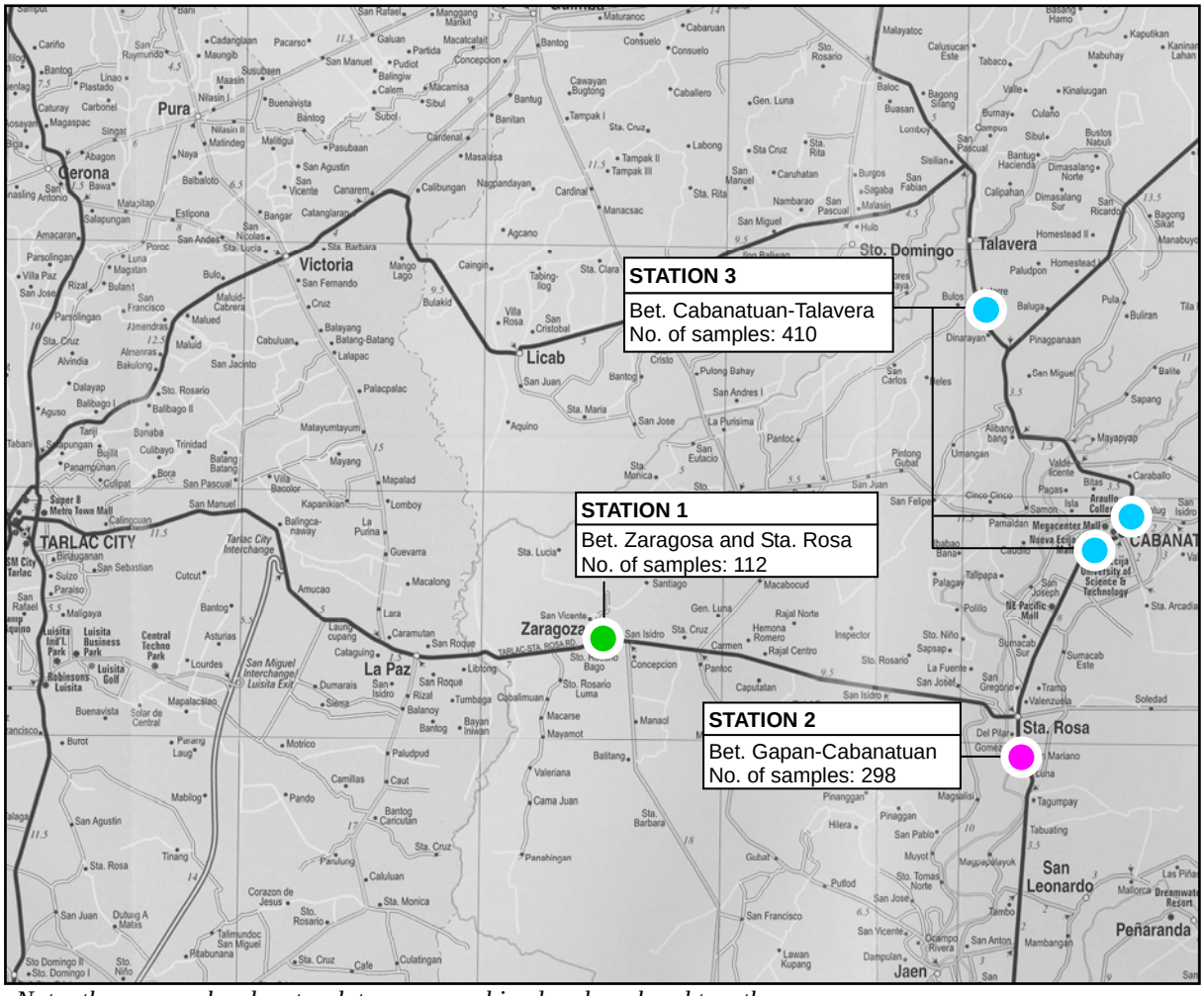
FIGURE 4.1.5-3 TRAVEL SPEED ALONG PAN PHILIPPINE HIGHWAY

4.1.6 Willingness-To-Pay Survey For Use of CLLEX (Private Car Users)

a. Survey Locations and Hypothetical Question for Willingness-to-pay Survey

Figure 4.1.6-1 shows the survey locations where the willingness-to-pay survey was carried-out. Samples collected from each site were treated differently to know car users' response depending on their location in relation to CLLEX. This process allows us to determine areas where high shift to expressway can be expected and areas where shift cannot be expected.

CLLEX can provide congestion-free travel to residents of Tarlac City and Cabanatuan City and neighboring municipalities. For those living in Cabanatuan side, the expressway can be used for their trips to Subic or to Baguio or to Metro Manila. See **Figure 4.1.6-2** for the survey questionnaire which also presents a map showing the possible routes that can be served by the CLLEX.



Note: the same color denotes data were combined and analyzed together

FIGURE 4.1.6-1 LOCATION FOR WILLINGNESS-TO-PAY SURVEY

Expressway Projects in Mega Manila Region in the Republic of the Philippines

WILLINGNESS TO PAY SURVEY (FORM 3)

FOR STUDY PURPOSE ONLY

General Info.

Sample ID No: ☐☐☐☐☐☐☐☐ Date (month/day) ☐☐/☐☐

Location:
- ☐ Sta. Rosa-Tarlac Road
- ☐ Maharlika Highway (bet. Cabanatun & Gapan)
- ☐ Maharlika Highway (bet. Cabanatun & Talavera)

Time ☐☐:☐☐

Personal Information

1-Sex ☐ 1-Male 2-Female

2-Age 1)20-29 2)30-39 3)40-49 4)50-59 5)>60 ☐

3-Occupation ☐☐

1- Admin. 2- Professional 3- Tech./assist. 4- Clerk 5- Sale/Services 6- Farmer/fisher
7- Craftman 8- Production 9- Unskilled 10- Student 11- House wife 12- Retired
13- Jobless 14- Other (specify):

4-Monthly Income (Pesos)

1) None 4) 10,000 - 14,999 7) 30,000-39,999 10) 100,000-149,000
2) Under 5,000 5) 15,000 - 19,999 8) 40,000-59,999 11) 150,000 and above
3) 5,000-9,999 6) 20,000 - 29,999 9) 60,000-99,9999

Trip Information

5- Trip OD

Where did you start this trip? _____ ☐☐☐☐☐☐
(City/Municipality)

Where do you end this trip? _____ ☐☐☐☐☐☐
(City/Municipality)

6- Trip purpose ☐☐

1.Work 4.Selling/Delivering 7.Shopping/Eating 10.Medical treatment
2.Education 5.Meeting/business 8.Sending/ Fetching 11.Social
3.Home 6.Return to work place 9.Recreation 12.Other

7- Current Route ☐

Which route do you usually take going to Metro Manila and back?

1. Route 1 (Maharlika Highway - NLEX)
2. Route 2 (Sta. Rosa Road - SCTEX - NLEX)
3. Others: _____

Willingness to Pay

Hypothetical Question

The government is planning to construct the Central Luzon Link Expressway (CLLEX) to link Cabanatuan City to SCTEX. Like other expressways in the country, certain amount will be collected to use the expressway.

8 - If you go to Tarlac or Subic, will you use CLLEX for your travel?

[via Sta. Rosa Road = 70 min]
[CLLEX = 20 min]

Time Saved is about 40 min!

☐

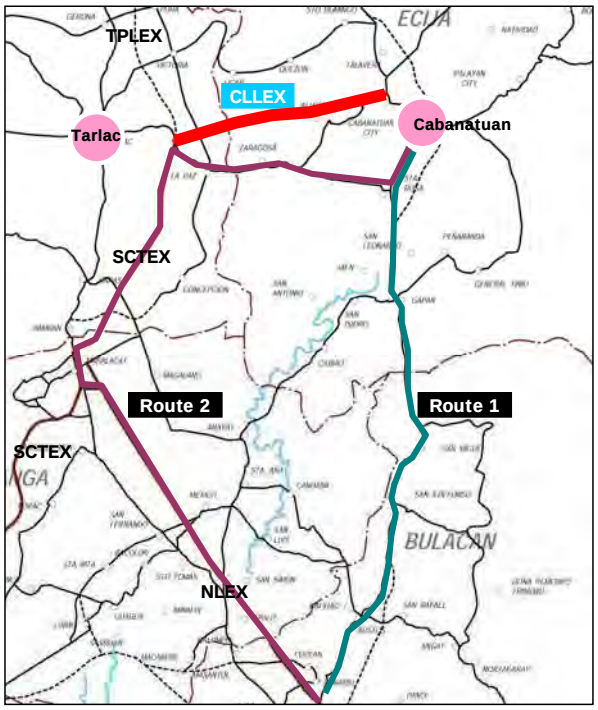
1) Yes → How much you are willing to pay?
a) 50 b) 70 c) 100
2) No, I will take ordinary road
why _____

9 - If you go to Manila, will you use CLLEX for your travel?

- Cabanatuan-NLEX via Maharlika Highway (166 min)
- Cabanatuan-Sta.Rosa Rd-SCTEX-NLEX (130 min)
- Cabanatuan-CLLEX-SCTEX-NLEX (90 min)

☐

1) Yes → How much you are willing to pay?
a) 50 b) 70 c) 100
2) No, I will take ordinary road
why _____

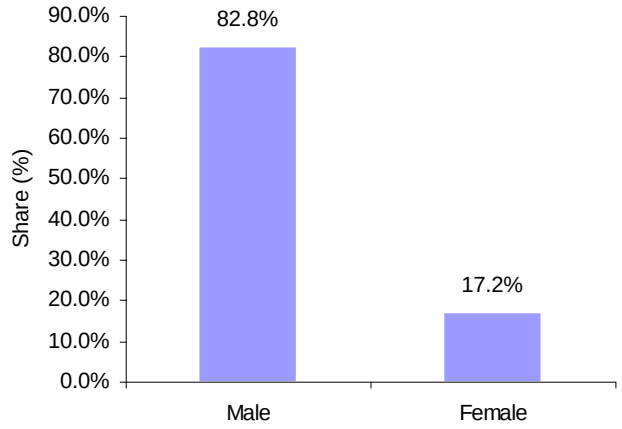


That's All. Thank You Very Much for Your Cooperation.

FIGURE 4.1.6-2 WILLINGNESS-TO-PAY SURVEY FORM

b. Sex Distribution

For sex distribution, most of the car users captured in the survey are male (82.8%) and the remaining 17.2% are female. See **Figure 4.1.6-3**.

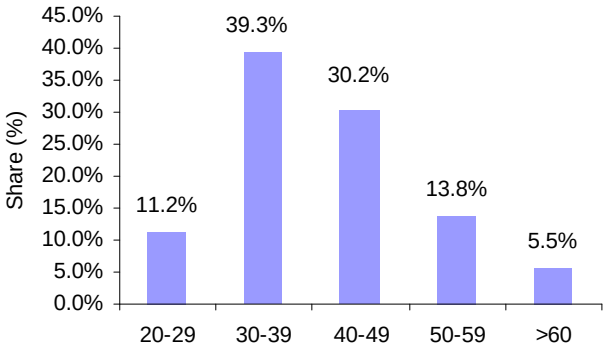


Number of sample = 820

FIGURE 4.1.6-3 SEX DISTRIBUTION

c. Age Distribution

For age distribution, more than half of the respondents (69.5%) are between the age range of 30 to 49. See **Figure 4.1.6-4**.

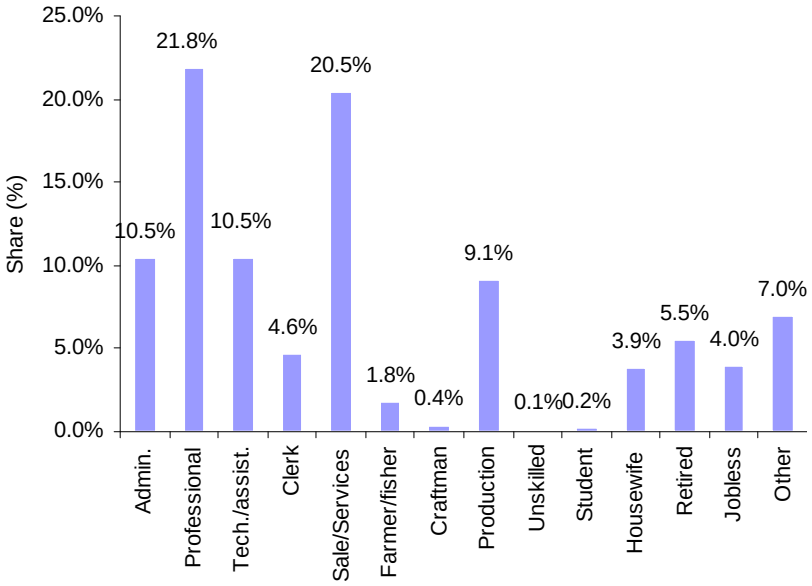


Number of sample = 820

FIGURE 4.1.6-4 AGE DISTRIBUTION

d. Occupation Distribution

For occupation of the captured respondents, most of them are engaged in professional work (21.8%) and sales/services (20.5%). See **Figure 4.1.6-5**.

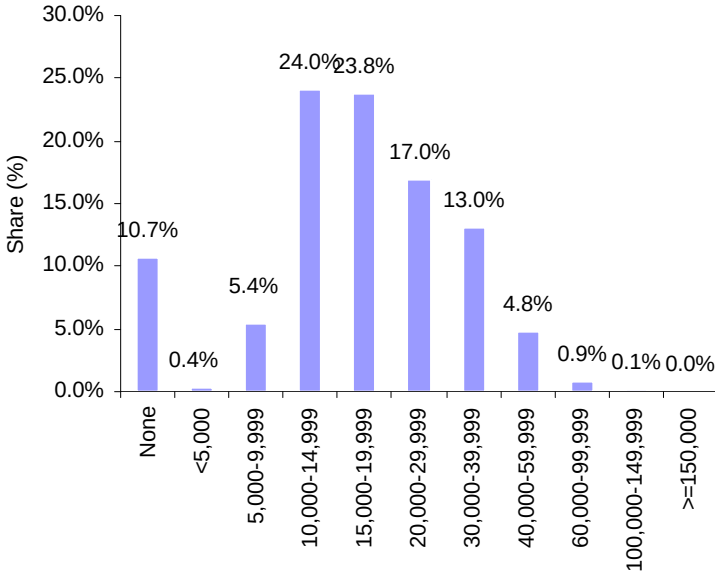


Number of sample = 820

FIGURE 4.1.6-5 OCCUPATION DISTRIBUTION

e. Monthly Income Distribution

For monthly income, notable income brackets which the respondents belong are: 10,000-14,999 (24.0%) and 15,000-19,999 (23.8%). For respondents which declared 'none' or lack of income, they are normally students or housewives. See **Figure 4.1.6-6**.



Number of sample = 820

FIGURE 4.1.6-6 MONTHLY INCOME DISTRIBUTION

f. OD Distribution

The captured OD trips at Station 1 (Tarlac – Sta. Rosa Road) are discussed below.

- 36.6% of trips come from municipalities of Nueva Ecija such as Zaragosa, San Leonardo, Munoz, Jaen, San Antonio, etc. Although Cabanatuan City is under Nueva Ecija, trip from this city is separated to distinguish the number of trips coming from this city. As shown in the figure below, 18.8% of trips originate from Cabanatuan city. Other notable origin of trips is Tarlac 17.9% and Metro Manila 14.3%. See **Figure 4.1.6-7.**
- For destination, major destinations are municipalities of Nueve Ecija such as Gapan, Zaragosa, Sta. Rosa (29.5%), Cabanatuan City (21.4%), and Tarlac (21.4%). See **Figure 4.1.6-8.**

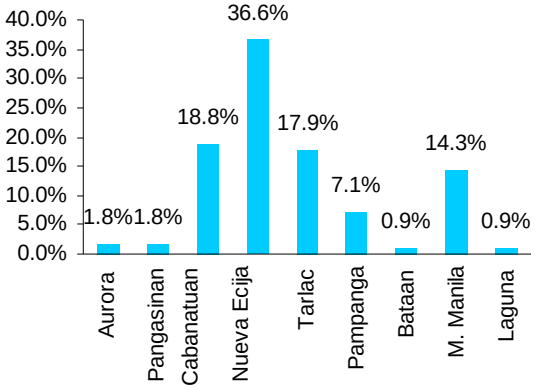


FIGURE 4.1.6-7 ORIGIN OF TRIPS AT STATION 1 (TARLAC – STA. ROSA ROAD)

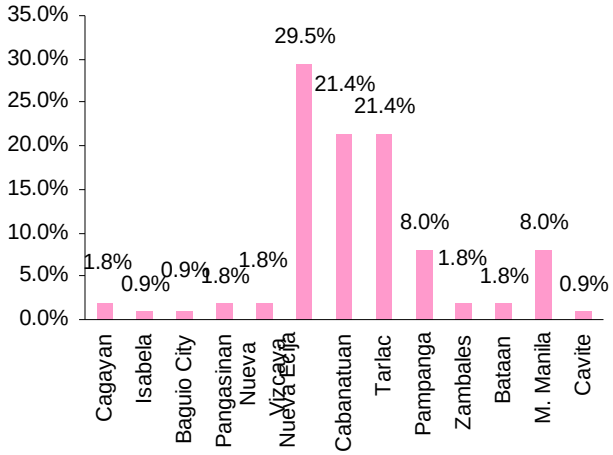


FIGURE 4.1.6-8 DESTINATION OF TRIPS AT STATION 1 (TARLAC – STA. ROSA ROAD)

For the captured OD trips at Station 2 (Cabanatuan – Gapan), this has the following features:

- Places with substantial trips originated are: Cabanatuan (30.9%), other cities/municipalities of Nueva Ecija (34.2%), and Tarlac (14.8%).
- For destinations, places which have major share are: other cities/municipalities of Nueva Ecija (21.8%), Tarlac (21.5%) and Cabanatuan City (20.8).

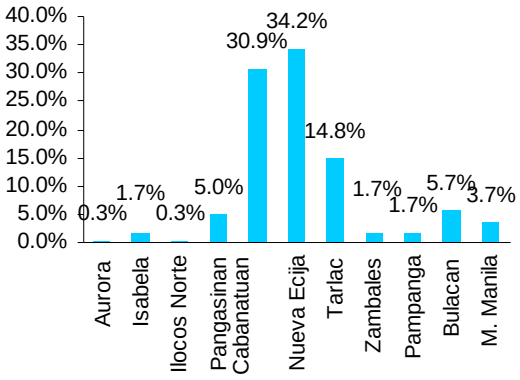


FIGURE 4.1.6-9 ORIGIN OF TRIPS AT STATION 2 (PAN PHILIPPINE HIGHWAY AT CABANATUAN - GAPAN)

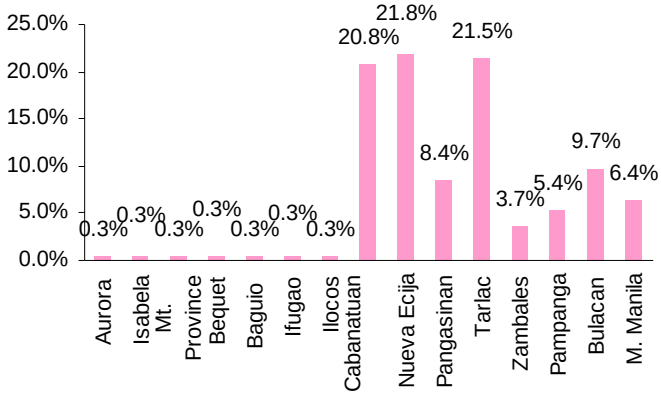


FIGURE 4.1.6-10 DESTINATION OF TRIPS AT STATION 2 (PAN PHILIPPINE HIGHWAY AT CABANATUAN - GAPAN)

For the captured OD trips at Station 3, this has the following features:

- Most trips come from other cities/municipalities of Nueva Ecija (36.6%), Cabanatuan City (26.8%) and Tarlac (17.2%).
- For destinations, places which have major share are: Tarlac (31.9%), Metro Manila (18.4%), other cities/municipalities of Nueva Ecija (15.7%) and Cabanatuan city (7.9%).

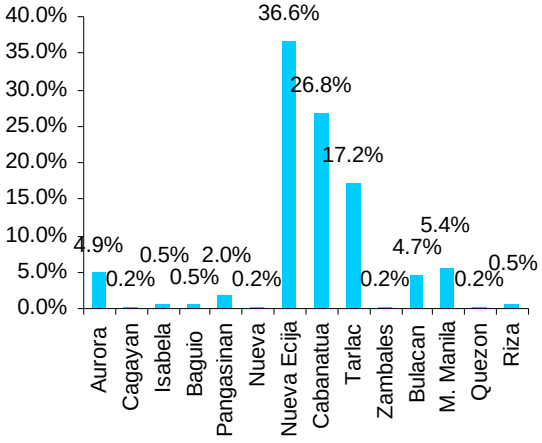


FIGURE 4.1.6-11 ORIGIN OF TRIPS AT STATION 3 (PAN PHILIPPINE HIGHWAY AT CABANATUAN - TALAVERA)

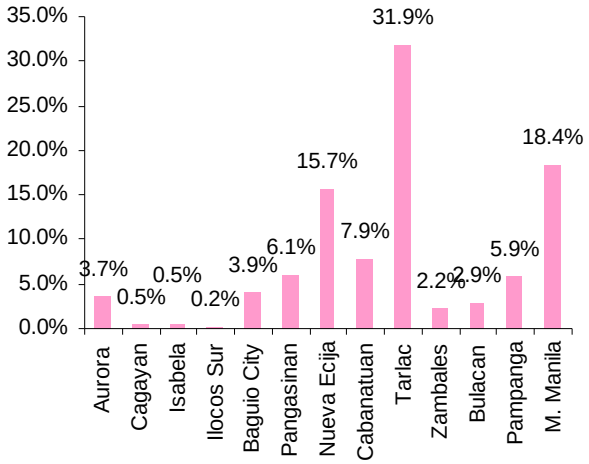


FIGURE 4.1.6-12 DESTINATION OF TRIPS AT STATION 2 (PAN PHILIPPINE HIGHWAY AT CABANATUAN - TALAVERA)

g. Trip Purpose Distribution

For trip distribution, most of the respondents have the following trip purpose: social (19.6%), selling/delivering (13.7%), going home (13.5%) and meeting/business (11.5%). See **Figure 4.1.6-13.**

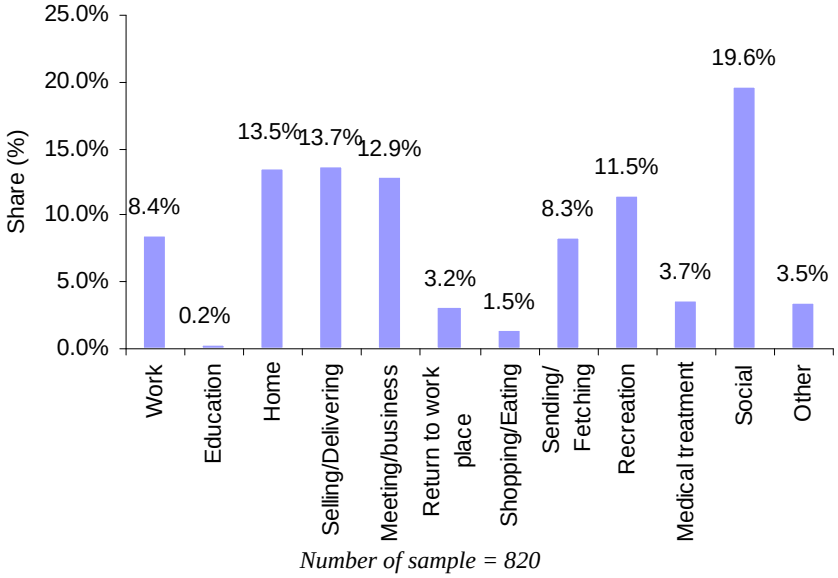


FIGURE 4.1.6-13 TRIP PURPOSE DISTRIBUTION

h. Current Route Choice to/from Manila

The respondents were asked of their current route choice in going/from Metro Manila. There were three locations where the surveys were conducted: (i) Station 1 - Along Sta Rosa-Tarlac Road, (ii) Station 2 - Pan Philippine Highway between Gapan-Cabanatuan section, and (iii) Station 3 - Pan Philippine Highway Cabanatuan – Talavera section (See **Figure 4.1.6-1**). **Figure 4.1.6-14** illustrates the route choice per location.

Station 1 (Sta. Rosa – Tarlac Road at Zaragosa Municipality)
89% of interviewed respondents are using Route 2 (Sta. Rosa – SCTEX – NLEX route) when they travel to/from Manila and the remaining 11% still uses the direct but congested route (Pan Philippine Highway – NLEX route).

Station 2 (Gapan – Cabanatuan near Sta. Rosa Municipality)
65 % of respondents are travelling to/from Manila via Route 2 (Sta. Rosa – SCTEX – NLEX route) and substantial number (35%) still uses the shorter but congested route of Pan Philippine Highway – NLEX.

Station 3 (Cabanatuan – Talavera)
64 % of respondents are travelling to/from Manila via Route 2 (Sta. Rosa – SCTEX – NLEX route) and the remaining 36% still uses the direct Pan Philippine Highway – NLEX.

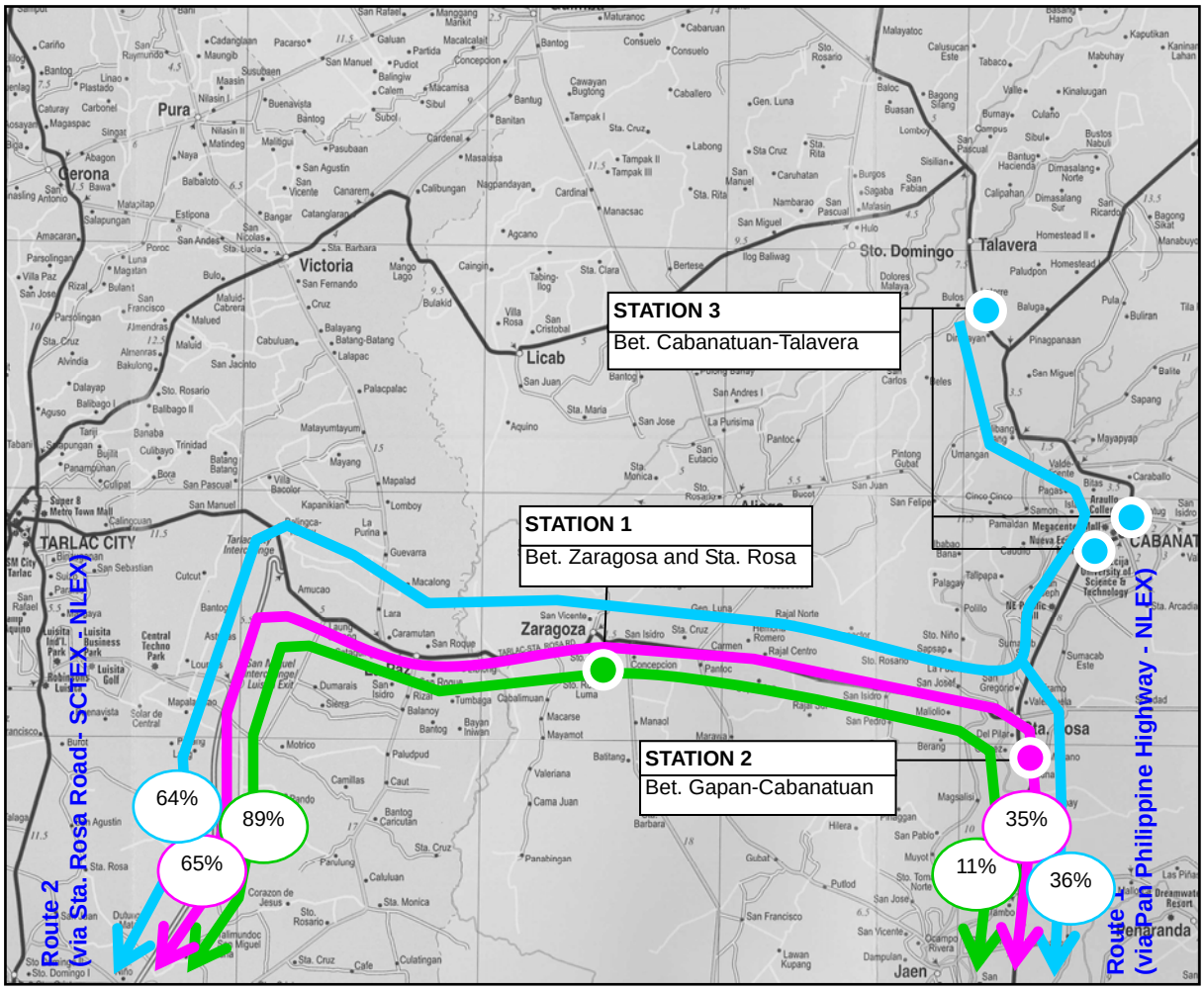
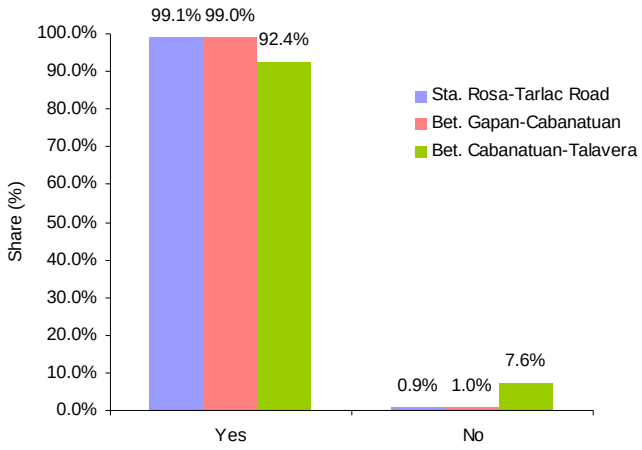


FIGURE 4.1.6-14 CURRENT ROUTE CHOICE TO/FROM MANILA

i. Will they Use CLEX to/from Tarlac/Subic (Time saved is 40 min)

As mentioned, aside from going to Metro Manila, motorists making trips between the two towns of Cabanatuan City and Tarlac City might use the expressway for their daily trips. Thus, such question was asked for car users. And as can be seen in the figure below, at all survey stations, car users' willingness to use CLLEX is very high which is above 90%. See **Figure 4.1.6-15**.

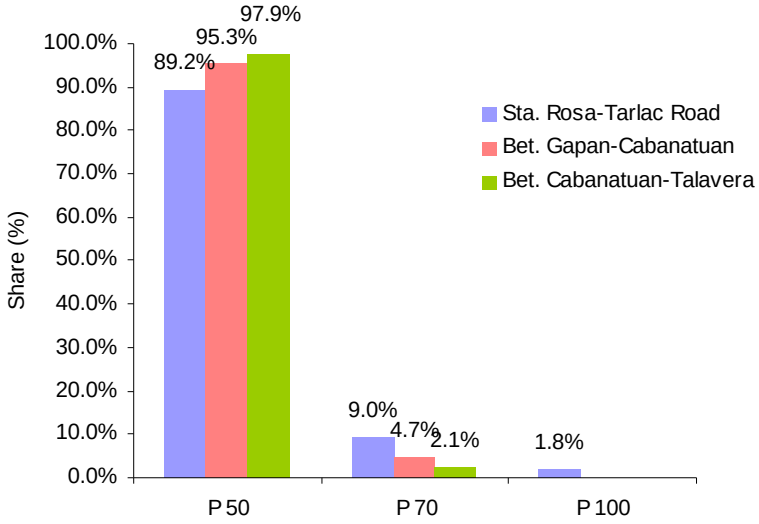


Sample size (Sta. Rosa-Tarlac = 112; Gapan-Cabanatuan = 298; Cabanatuan-Talavera = 410)

FIGURE 4.1.6-15 WILL THEY USE CLEX TO/FROM TARLAC/SUBIC

j. How much they are willing to pay to use CLEX to/from Tarlac/Subic?

As for the amount they are willing to pay to use the expressway for their trip between Tarlac/Subic and Cabanatuan City, most of the respondents is willing to pay 50 pesos. See **Figure 4.1.6-16**.

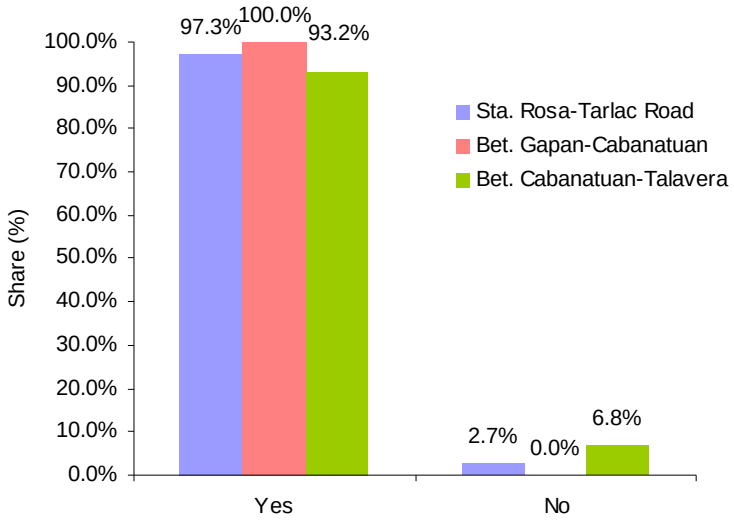


Sample size (Sta. Rosa-Tarlac = 112; Gapan-Cabanatuan = 298; Cabanatuan-Talavera = 410)

FIGURE 4.1.6-16 AMOUNT THEY ARE WILLING TO PAY TO/FROM TARLAC/SUBIC

k. Will they Use CLEX to/from Metro Manila (Time saved is 40 min)

When respondents were asked if they would also use the expressway when they travel to/from Metro Manila, motorists interviewed at Pan Philippine Highway (between Gapan – Cabanatuan) all indicated their willingness to use the expressway. Majority of respondents from other two survey stations expressed also their willingness to use the expressway (97.3% at Sta. Rosa- Tarlac Road and 93.2% at Pan Philippine Highway, Cabanatuan-Talavera Section). See **Figure 4.1.6-17**.

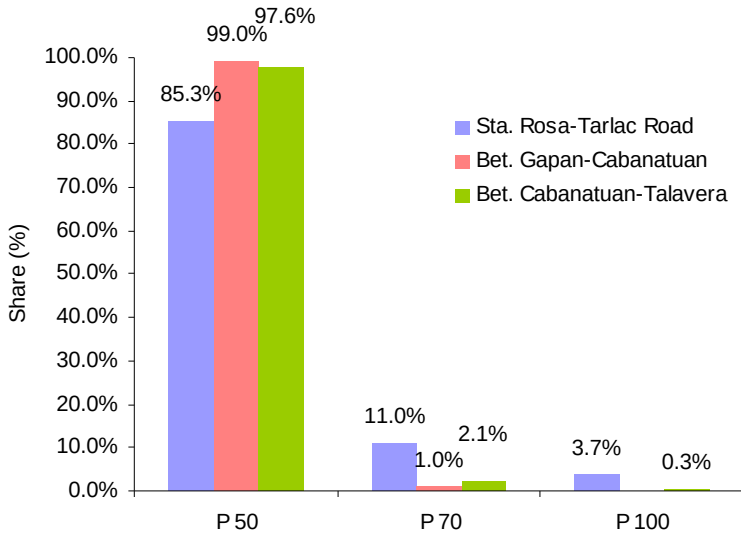


Sample size (Sta. Rosa-Tarlac = 112; Gapan-Cabanatuan = 298; Cabanatuan-Talavera = 410)

FIGURE 4.1.6-17 WILL THEY USE EXPRESSWAY TO/FROM METRO MANILA

l. How much they are willing to pay to use CLEX from/to Manila?

For the amount of money they are willing to pay for the use of CLLEX, majority of the respondents revealed that they are willing to pay 50 pesos. See **Figure 4.1.6-18**.



Sample size (Sta. Rosa-Tarlac = 112; Gapan-Cabanatuan = 298; Cabanatuan-Talavera = 410)

FIGURE 4.1.6-18 AMOUNT THEY ARE WILLING TO PAY TO/FROM METRO MANILA

4.1.7 Willingness-To-Pay Survey For Use of CLLEX (Bus Operators)

m. How many buses you owned? (Q5)

The number of bus owned and used for operation by the nine (9) bus companies interviewed is presented in **Table 4.1.7-1**. The total number of bus used by these companies is 1,587 bus unit or an average of 176 buses per company. Taking into account the share of each type of bus, 64% are composed of two-seater air-conditioned bus and this followed by ordinary bus (24%) and others (most of buses refer as others are 2x3 bus which means five seats in one row all together and normally 'ordinary bus' without air-conditioned) with a share of 9.0%. See survey form in Appendix 4-1.

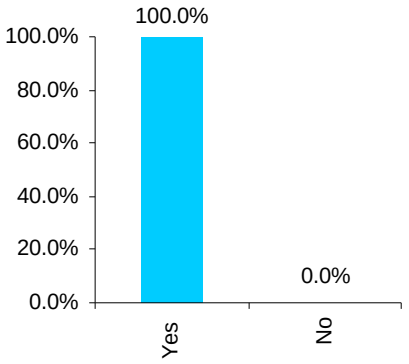
TABLE 4.1.7-1 NUMBER OF BUS OWNED BY BUS COMPANIES

Bus Type	BC 1	BC 2	BC 3	BC 4	BC 5	BC 6	BC 7	BC 8	BC 9	Total
Mini-bus										0
Ordinary bus			20		100			19	247	386
Air-conditioned bus (single-seater)						15			29	44
Air-conditioned bus (two-seater)	10	42	45	3	200	115	10		590	1,015
Others (2x3 bus)				57		4		15	66	142
Total	**10**	**42**	**65**	**60**	**300**	**134**	**10**	**34**	**932**	**1,587**

Note: BC = Bus Company; Number of sample = 9

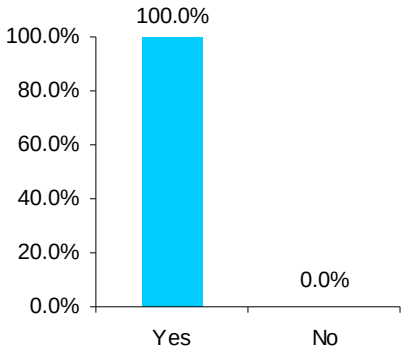
n. Do you allow your driver to use expressways? (Q7)

Interviewed bus managers revealed that they allow their drivers to use expressway both for single-seater (special bus) and double-seater bus (regular bus). Refer to the two figures below.



Number of sample = 9 (note that only 4 companies have single-seater bus)

FIGURE 4.1.7-1 SINGLE-SEATER BUS

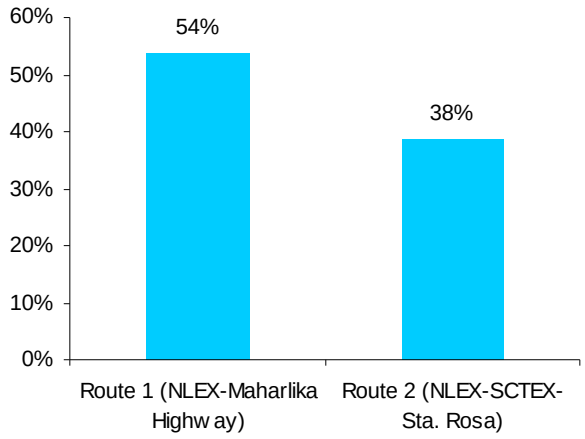


Number of sample = 9

FIGURE 4.1.7-2 TWO-SEATER BUS

o. Bus Route - Cabanatuan to/from Manila? (Q8)

The bus managers were also queried regarding the route used by their drivers for Manila – Cabanatuan (and neighboring municipalities) route. Seven managers (54%) said that they are still using the NLEX-Pan Philippine highway which passes medium size towns like Bustos, San Miguel, Gapan, etc. The others revealed that they are using the NLEX - SCTEX - Sta. Rosa route which is longer but faster. See **Figure 4.1.7-3**.

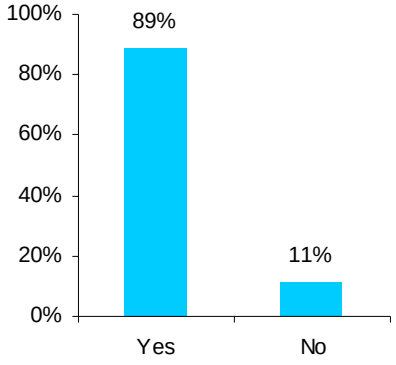


Number of sample = 9; the missing 8% are not using both route (destination is Pangasinan)

FIGURE 4.1.7-3 BUS ROUTE FOR MANILA - CABANATUAN

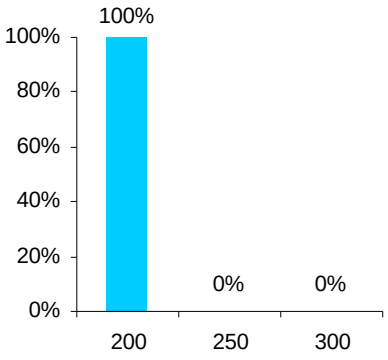
p. Willingness-to-pay to Use CLLEX - from SCTEX to Cabanatuan? (Q10)

All of the interviewed managers except one revealed that they will allow their bus drivers to use the expressway if it served their route. The amount of toll they are willing to pay for the expressway is 200 pesos. See the two figures below.



Number of sample = 9

FIGURE 4.1.7-4 WILL THEY ALLOW THEIR BUS DRIVERS TO USE CLLEX?

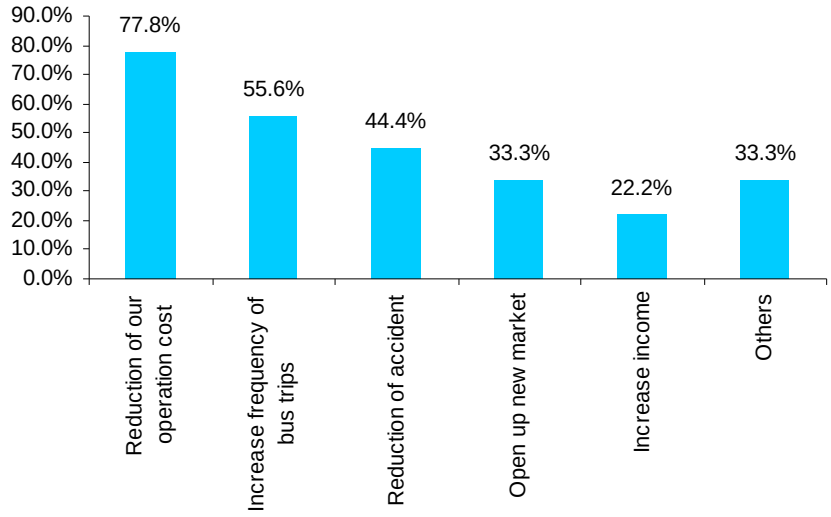


Number of sample = 9

FIGURE 4.1.7-5 AMOUNT THEY ARE WILLING TO PAY?

q. Perceived Benefits by Bus Managers from CLLEX? (Q14)

If the Central Luzon Link Expressway is constructed in the future, managers of bus companies were asked if what kind of benefits that this new infrastructure can bring to their business. Most managers believed that the new expressway would reduce their operation cost (29.2%), increase frequency of trips (28.8%), and would help in reduction of accident (12.5%). Others which have a share of 12.5% refer to shortening of travel time. See **Figure 4.1.7-6**.



Number of sample = 9; Note: Respondents were allowed for multiple answers

FIGURE 4.1.7-6 PERCEIVED BENEFITS BY BUS OPERATORS OF CLLEX

r. Problems Encountered by Bus Company in their daily operations. (Q12)

Interviewed operation managers of nine (9) bus companies reveal the following as the problems they encountered in their daily operation:

- Traffic congestion along town/city center
- High maintenance cost due to poor road condition
- High operation cost due to poor road condition
- High cost of fuel
- Bad road condition of road
- Road accidents

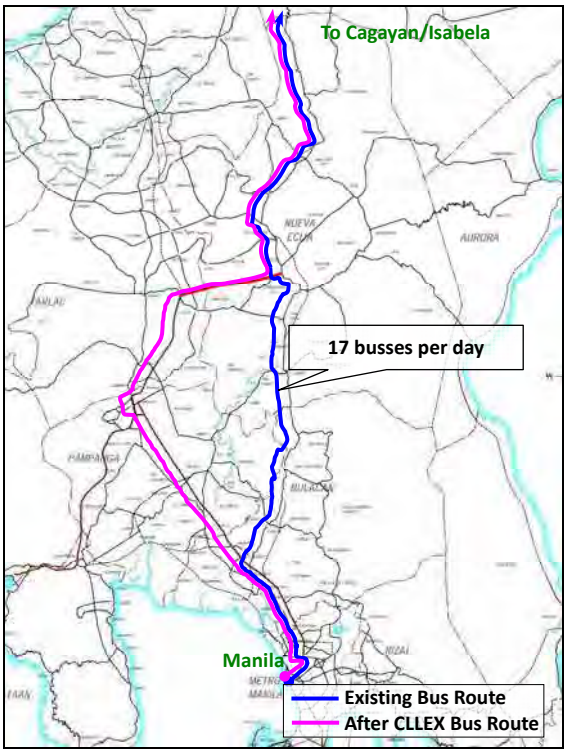
s. Comments and Suggestions to Improve Business Operation of Bus Industry. (Q13)

The following were the comments and suggestions expressed by the interviewed bus managers' which could help improve their operation.

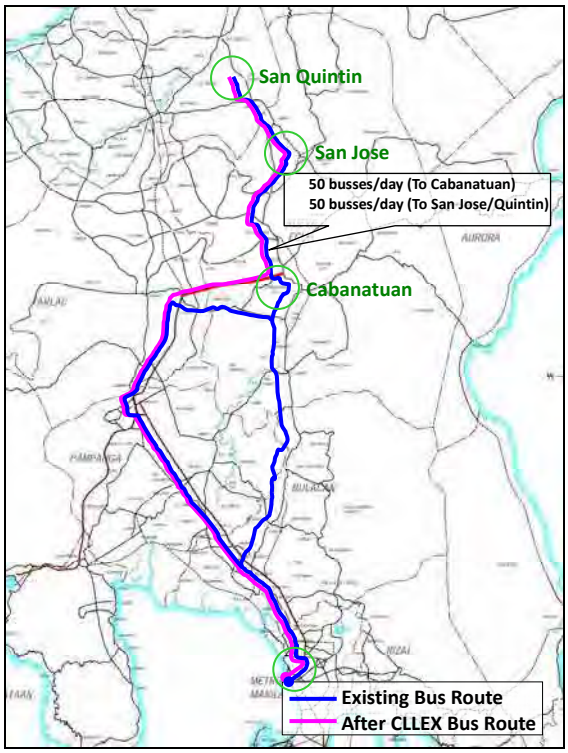
- Expedite repairs of damage roads and highways
- Construction of more durable and accessible roads
- To have continuous education process with our drivers on how to prevent accident and how to use expressway.
- Full implementation of traffic rules and regulations like in Subic.
- Evaluation of franchise given to bus companies

t. Bus Routes Before and After Construction of CLLEX

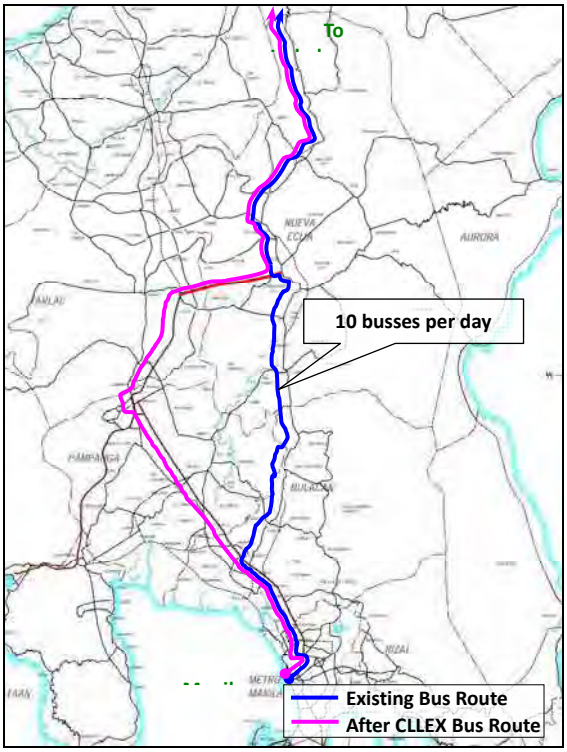
The current routes and number of buses that is likely to use the CLLEX if constructed in the future is shown in **Figure 4.1.7-7**. Most of these buses have their destination in Cagayan Valley which is further north from Cabanatuan City. These buses are utilizing the heavily congested Pan Philippine Highway with the exception of few which are plying through NLEX, SCTEX, Tarlac-Sta. Rosa road. The total number of buses that would utilize the CLLEX from these six (6) companies is 282 per day.



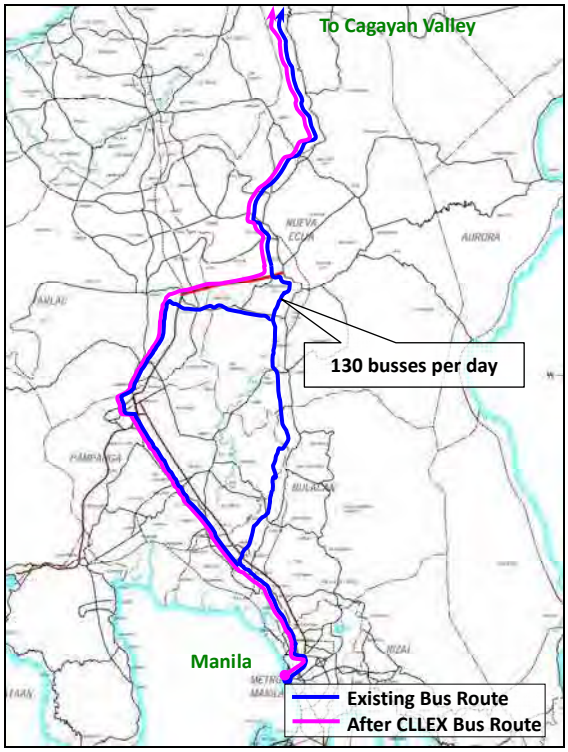
Bus Company 1



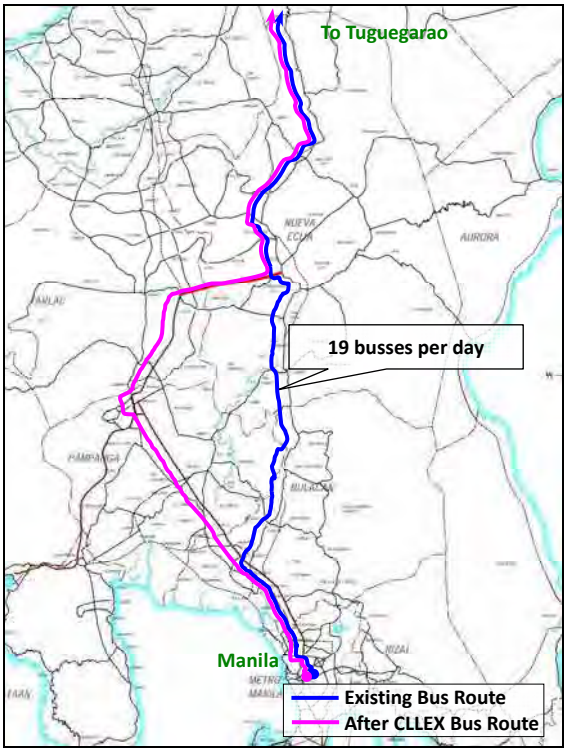
Bus Company 2



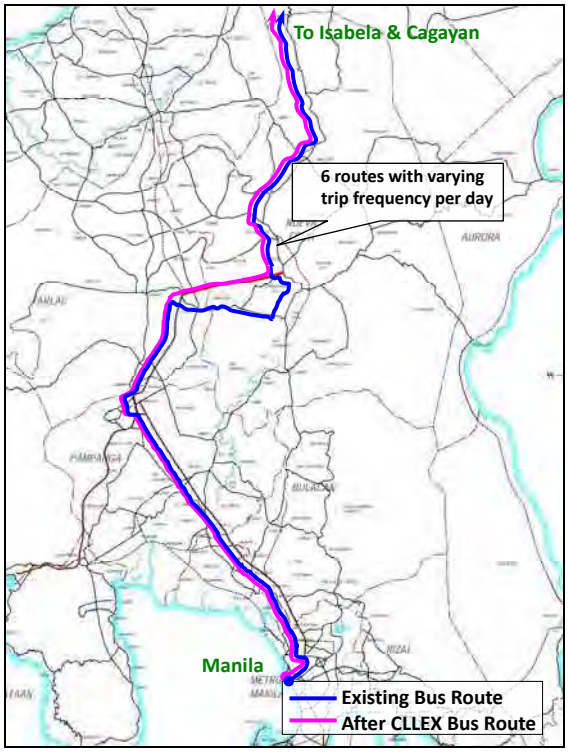
Bus Company 3



Bus Company 4



Bus Company 5



Bus Company 6

FIGURE 4.1.7-7 EXISTING BUS ROUTE AND AFTER CLLEX BUS ROUTE (WILLINGNESS TO USE)

4.1.8 Willingness-To-Pay Survey For Use of CLLEX (Truck Operators)

a. How many vehicles used for operation? (Q5)

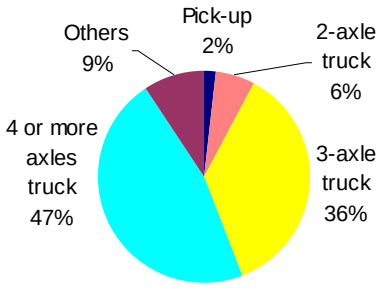
The number of trucks used for operation by the interviewed trucking companies is shown in **Table 4.1.8-1**. The total number of trucks used for operation and owned by these ten (10) companies is 282 while the number of rented trucks reaches 444.

TABLE 4.1.8-1 NUMBER OF TRUCKS OWNED BY TRUCK COMPANIES

Type	T-1	T- 2	T- 3	T- 4	T- 5	T- 6	T- 7	T- 8	T- 9	T- 10	Total	
Pick-up		2			1	1	4			6	14	
2-axle truck		2	3	9	4	6	2		(8)	8	34	(8)
3-axle truck	10			6	2	10 (10)	2	(160)	(20)	40	70	(190)
4 or more axles truck						15		(240)	(6)	73	88	(246)
Others					3					63	66	
Total	10	4	3	15	10	42 (10)	8	(400)	(34)	190	282	(444)

Note: T= Truck Company; ( ) rented trucks used for operation

The average number of trucks per company used for operation is around 73 trucks (owned and rented). For type of trucks used by these companies, the dominant types are: 4-axle trucks (47%), 3-axle trucks (36%), and others (e.g. vans, pick-up, canter) with 9% share. See **Figure 4.1.8-1.**

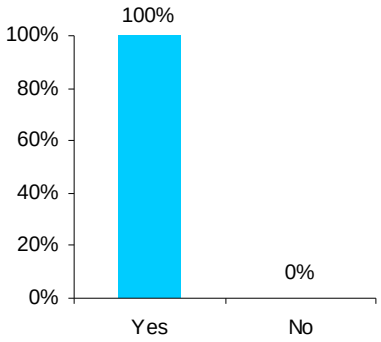


No. of sample = 10

FIGURE 4.1.8-1 DISTRIBUTION OF TRUCK TYPES

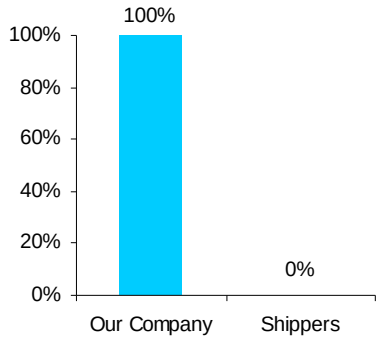
b. Do you allow your truck drivers to use expressways? (Q6)

When the truck company managers were asked if they allow their drivers to use expressway in their trips, all of them revealed that they allow them to use expressway. For the issue of toll fee, all interviewed managers said that their company is the one shouldering the toll fee. See **Figure 4.1.8-2** and **Figure 4.1.8-3**.



No. of sample = 10

FIGURE 4.1.8-2 DO YOU ALLOW YOUR TRUCK DRIVERS TO USE EXPRESSWAY (YES OR NO)

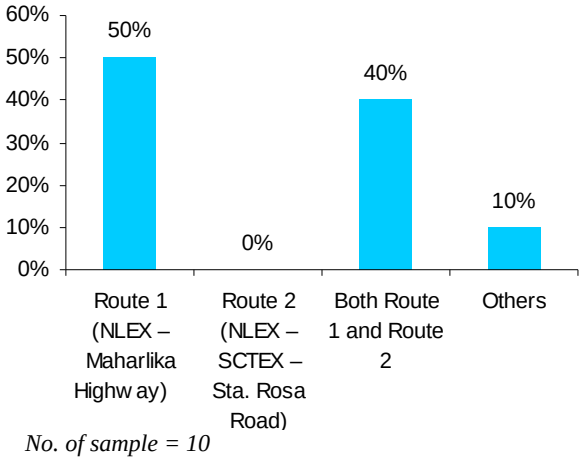


No. of sample = 10

FIGURE 4.1.8-3 WHO SHOULDER THE TOLL FEE

c. Which route do you take in delivering goods from Manila to Cabanatuan and neighboring municipalities? (Q7)

Five (5) of the ten (10) managers reveals that their drivers still uses NLEX-Pan Philippine Highway when they have delivery from Manila to Cabanatuan or at neighboring municipalities. Four managers said that their drivers are using both Route 1 (NLEX-Pan Philippine) and Route 2 (NLEX-SCTEX-Sta. Rosa). One manager said that their delivery is mostly in the Pangasinan area thus their route is via NLEX-SCTEX most of the time. See **Figure 4.1.8-4**.

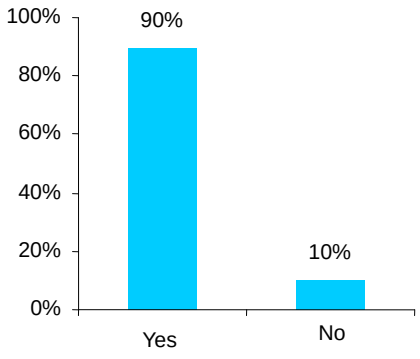


No. of sample = 10

FIGURE 4.1.8-4 TRUCK ROUTES FOR MANILA – CABANATUAN DELIVERY

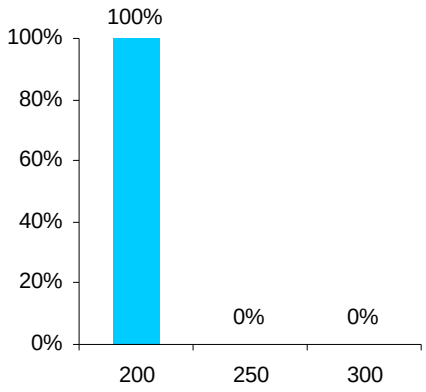
d. Will they allow their truck drivers to use CLLEX in delivering their goods? (Q10)

Only one manager expressed his intention not to allow their drivers to use CLLEX. The other nine (9) managers revealed that they will allow their drivers to use the CLLEX if it serves their route. For the amount of toll fee they are willing to pay, all of them said 200 pesos. See **Figure 4.1.8-5** and **Figure 4.1.8-6**.



No. of sample = 10

FIGURE 4.1.8-5 WILL YOU ALLOW YOUR TRUCK DRIVERS TO USE CLLEX (YES OR NO)

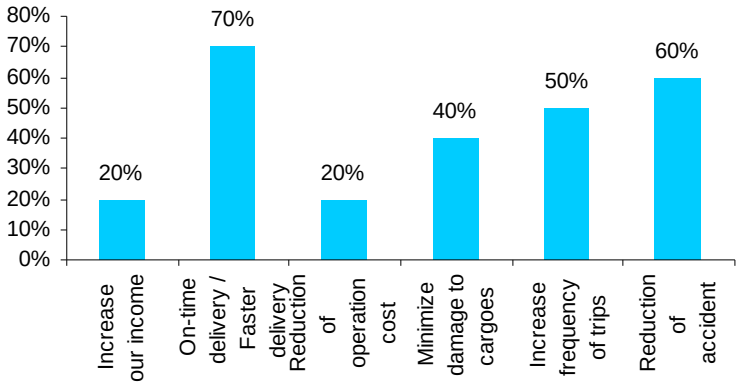


No. of sample = 10

FIGURE 4.1.8-6 HOW MUCH ARE YOU WILLING TO PAY FOR USE CLLEX

e. Perceived Benefits by Truck Managers from CLLEX (Q11)

Truck managers were also asked if what kind of benefits the Central Luzon Link Expressway can bring to their business. Most managers believed that it would help them to deliver their cargo on time (27%) and it could also help in reduction of road accidents (23%). Some believed it would increase their frequency of trips (19%) and minimize damage to cargoes (15%). See **Figure 4.1.8-7**.



No. of sample = 10; Note: Respondents were allowed for multiple answers

FIGURE 4.1.8-7 PERCEIVED BENEFITS BY TRUCK OPERATORS FROM CLLEX

f. Problems Encountered in their operations? (Q12)

The most common problems mentioned by the twenty (20) managers of trucking companies are:

- Heavy traffic at main arterials roads (Pan Philippine Highway going Cagayan Valley)
- Problem at ports and shipping lines
- Traffic congestion at roads going to client's place
- Overweight limit
- Overloading causes accidents
- Corrupt traffic enforcers
- LTO/MMDA are more interested of finding violations of trucks that enforcing traffic rules during night time
- Traffic congestion at inner roads of small towns

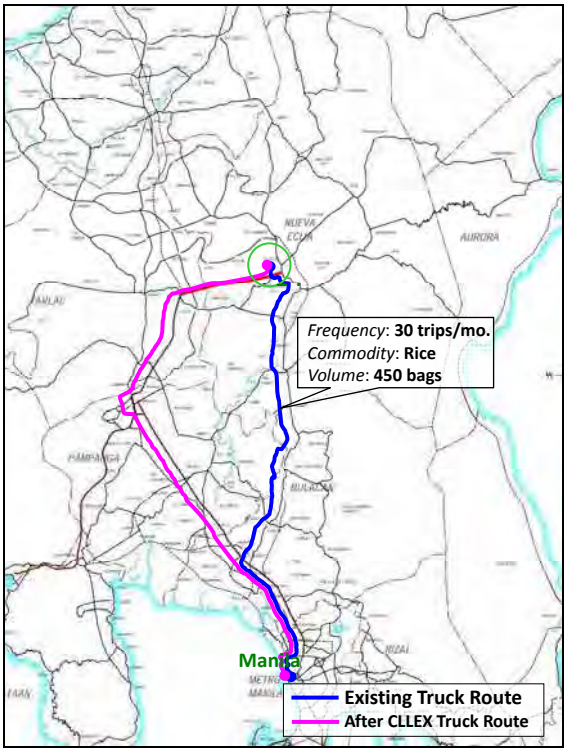
g. Comments that could improve their business operations? (Q13)

The following were comments made by the managers of trucking companies:

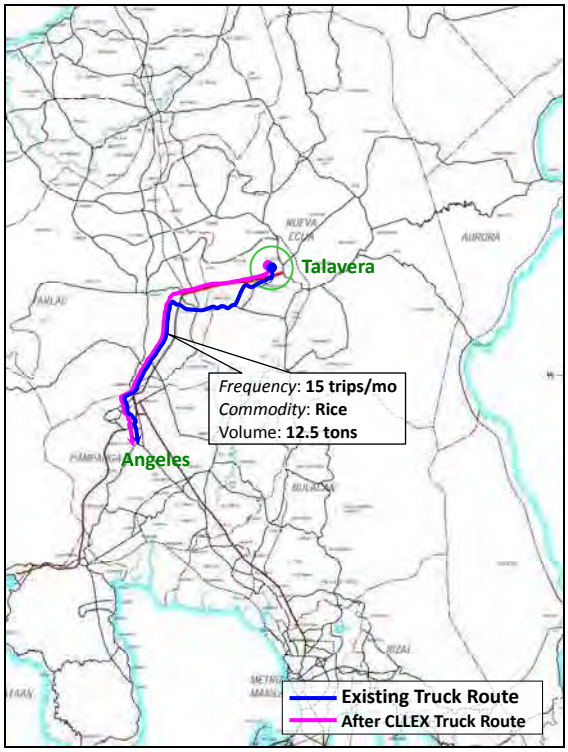
- Open new alternative routes, example Baloc - Sto. Domingo
- No truck overloading
- Government plans should be acceptable to manufacturers/trucking companies
- Fuel increase should be controlled
- Traffic enforcer should follow the government's rules and regulations
- Provisions for motorcycle lane

h. Truck Routes Before and After Construction of CLLEX

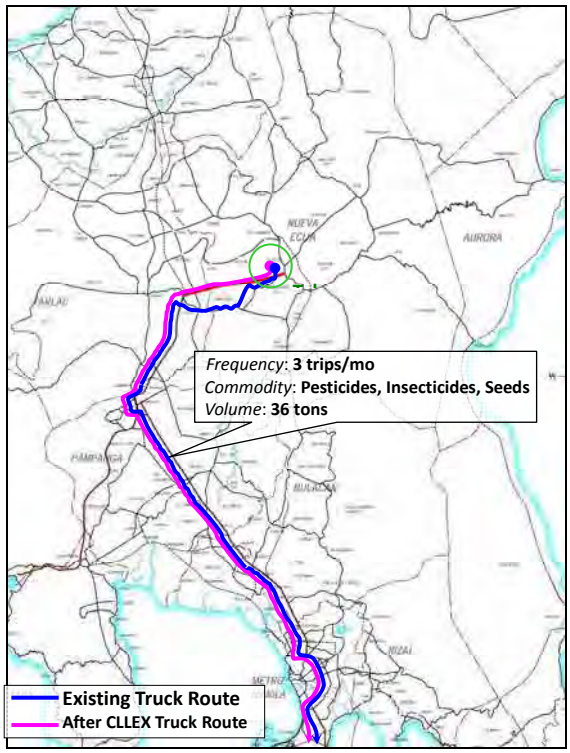
Of the ten (10) interviewed companies, nine (9) companies found the CLLEX to be useful to their current operation. As a result, at least 852 trips per month (28 trips/day) will be attracted to the CLLEX from these companies. Current routes of their trucks as well as possible routes after the construction of CLLEX are shown in **Figure 4.1.8-8**.



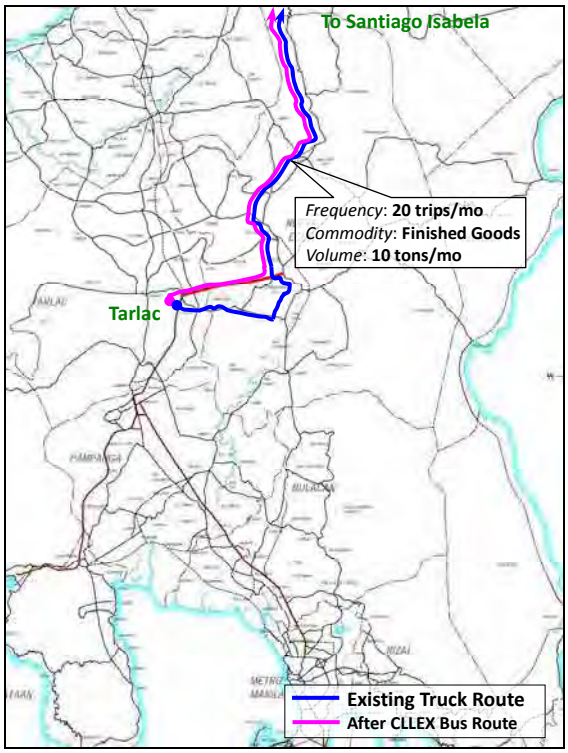
Truck Company 1



Truck Company 2

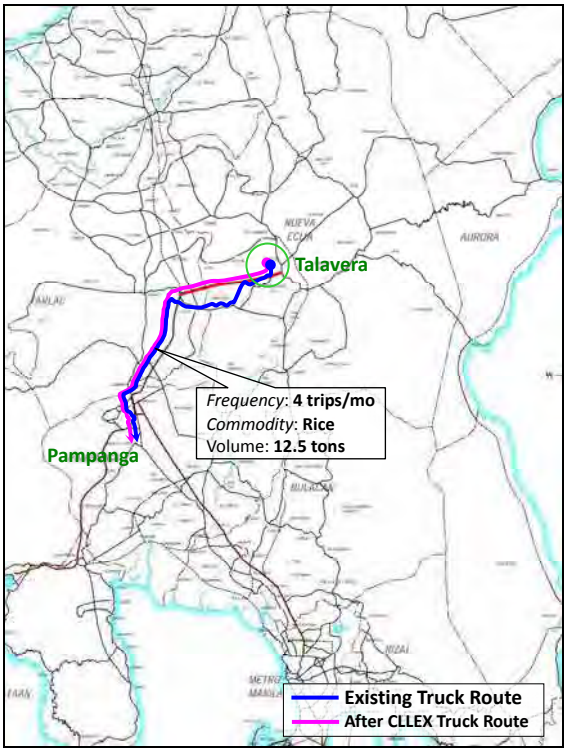


Truck Company 3

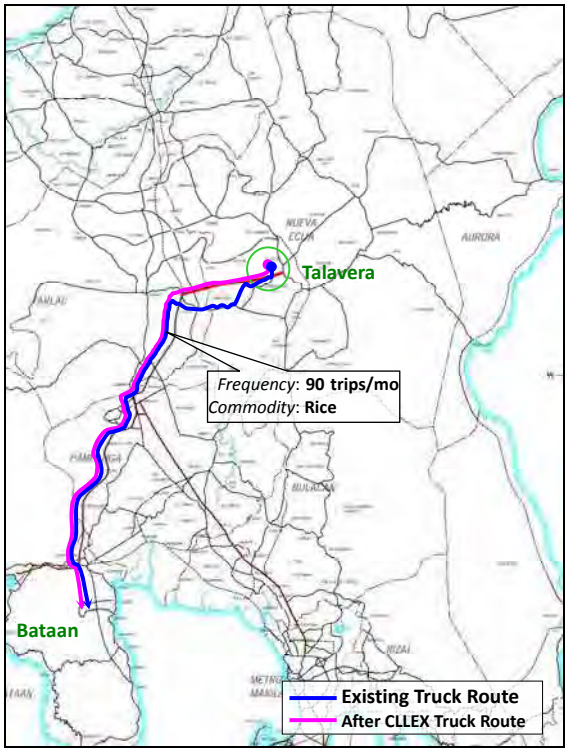


Truck Company 4

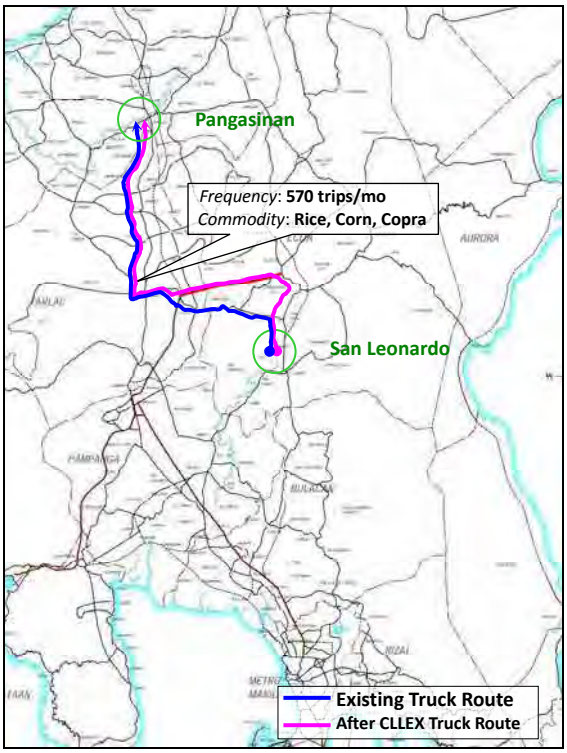
FIGURE 4.1.8-8 (1/2) EXISTING TRUCK ROUTE AND AFTER CLLEX BUS ROUTE



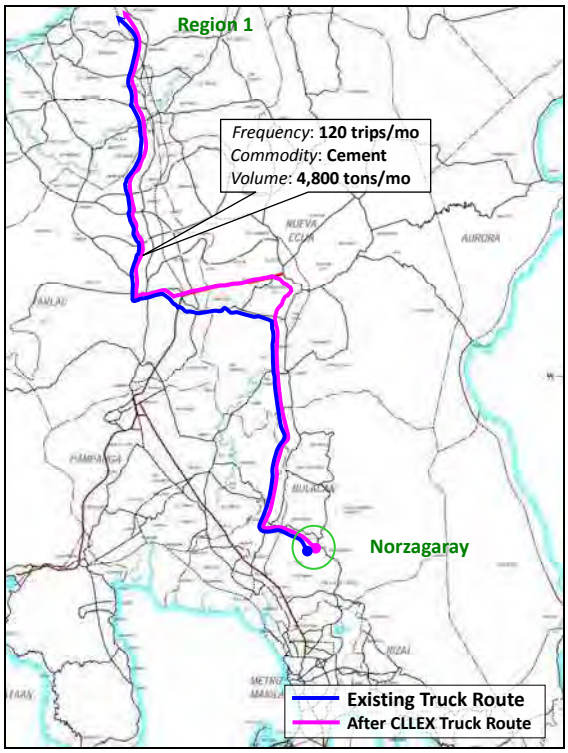
Truck Company 5



Truck Company 6



Truck Company 7



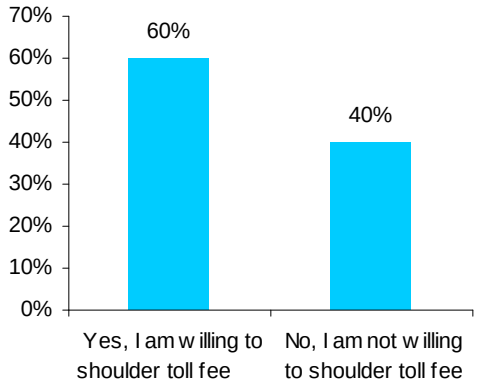
Truck Company 8

FIGURE 4.1.8-8 (2/2) EXISTING TRUCK ROUTE AND AFTER CLLEX BUS ROUTE

4.1.9 Willingness-To-Pay Survey For Use of CLLEX (Manufacturing Companies)

a. Are you willing to shoulder the toll fee to be paid by trucking companies?(Q7)

The five (5) officials of manufacturing companies interviewed revealed different opinions. Three (3) of them agreed to shoulder toll fee of expressway if this can help for speedy delivery of their cargoes. On the other hand, the two (2) other interviewed officials representing two manufacturing companies said that they are not willing to pay for toll fee because this should be paid by trucking companies (See **Figure 4.1.9-1**). It should be noted that for the case of CALAX, all interviewed officials of manufacturing companies in Cavite Province expressed their willingness to shoulder toll fee.

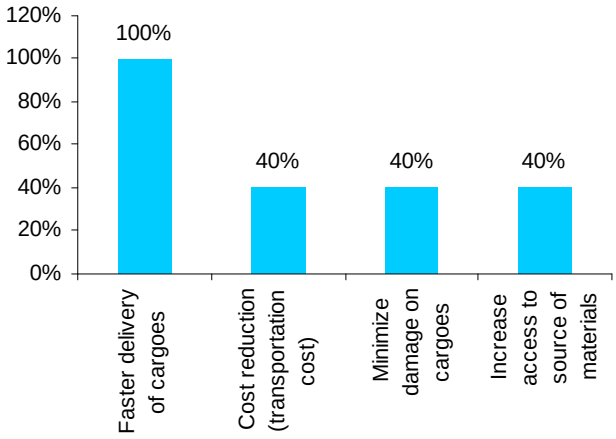


No. of sample = 5

FIGURE 4.1.9-1 PERCENTAGE OF WILLING AND NOT WILLING TO SHOULDER TOLL FEE

b. Perceived Benefits by Manufacturing Companies from CLLEX?(Q8)

For the benefits they are hoping to get after the construction of expressway, these are: faster delivery of cargoes (46%), cost reduction (18%), minimize damage on cargoes (18%) and increase access to source of raw materials (18%). See **Figure 4.1.9-2**.



No. of sample = 5; Note: Respondents were allowed for multiple answers

FIGURE 4.1.9-2 PERCEIVED BENEFITS BY MANUFACTURING COMPANIES FROM CLLEX

c. Plans by Manufacturing Companies after construction of CLLEX?(Q9)

The plans after the construction of CLLEX revealed by interviewed officials of manufacturing companies are:

- Better scheduling of delivery of raw materials
- Better scheduling of delivery of finished goods
- Try to realize cost reduction

d. Problems Encountered by Manufacturing Companies?(Q10)

The problems mentioned by the officials of manufacturing companies are:

- Late arrival of raw materials which affect our operations
- Difficulty in maintaining huge inventory levels of stock
- High cost of expressway toll fees

e. Comments and Suggestions by Manufacturing Companies?(Q11)

The following were comments made by officials of manufacturing companies:

- Roll back of diesel price
- Continuous implementation of government rules and regulations

f. Summary of Transportation Routes of Manufacturing Companies

A mentioned, five manufacturing companies were interviewed to understand their freight movement among others. Three (3) were Japanese-affiliated companies and two (2) were locally owned and some of the biggest companies in the country. Three of five (5) interviewed manufacturing companies have their factory in Tarlac. These three companies have very simple transportation routes – i.e. Tarlac via SCTEX and NLEX to Manila port or Cavite and Batangas area. Therefore, these companies have no opportunity to use CLLEX.

Two other companies are located in Nueva Ecija. CLLEX is useful to both these companies but only one company reveals their intention to use CLLEX. Another company has no plan to use the expressway because their product is not time sensitive (rice distribution). Below is the discussion for the company that had expressed intention to use CLLEX. See **Figure 4.1.9-3** for the summary of transportation routes.

1. Manufacturing Company A (Local Company)

Location : San Leonardo, Nueva Ecija
Products : Line of business is poultry and livestock feeds

- The company is getting its supplies from Tarlac City, municipalities of Ibaan and Mariveles (Batangas), and other cities/municipalities of the country via ports of Manila.
- They are currently using the Tarlac – Sta. Rosa Road in getting raw materials from Tarlac to their factory in San Leonardo and it takes them almost one hour.
- For other supplies, they are using the heavily congested Pan Philippine Highway (from Manila ports to San Leonardo and from Ibaan, Mariveles (Batangas) to San Leonardo).
- They are hoping for early construction of CLLEX which will help realize faster delivery of supplies and it will also increase their access to source of materials.
- ***If CLLEX is constructed, they intend to use the expressway instead of Tarlac – Sta. Rosa Road to avoid heavy traffic congestion which causes late arrival of raw materials.***

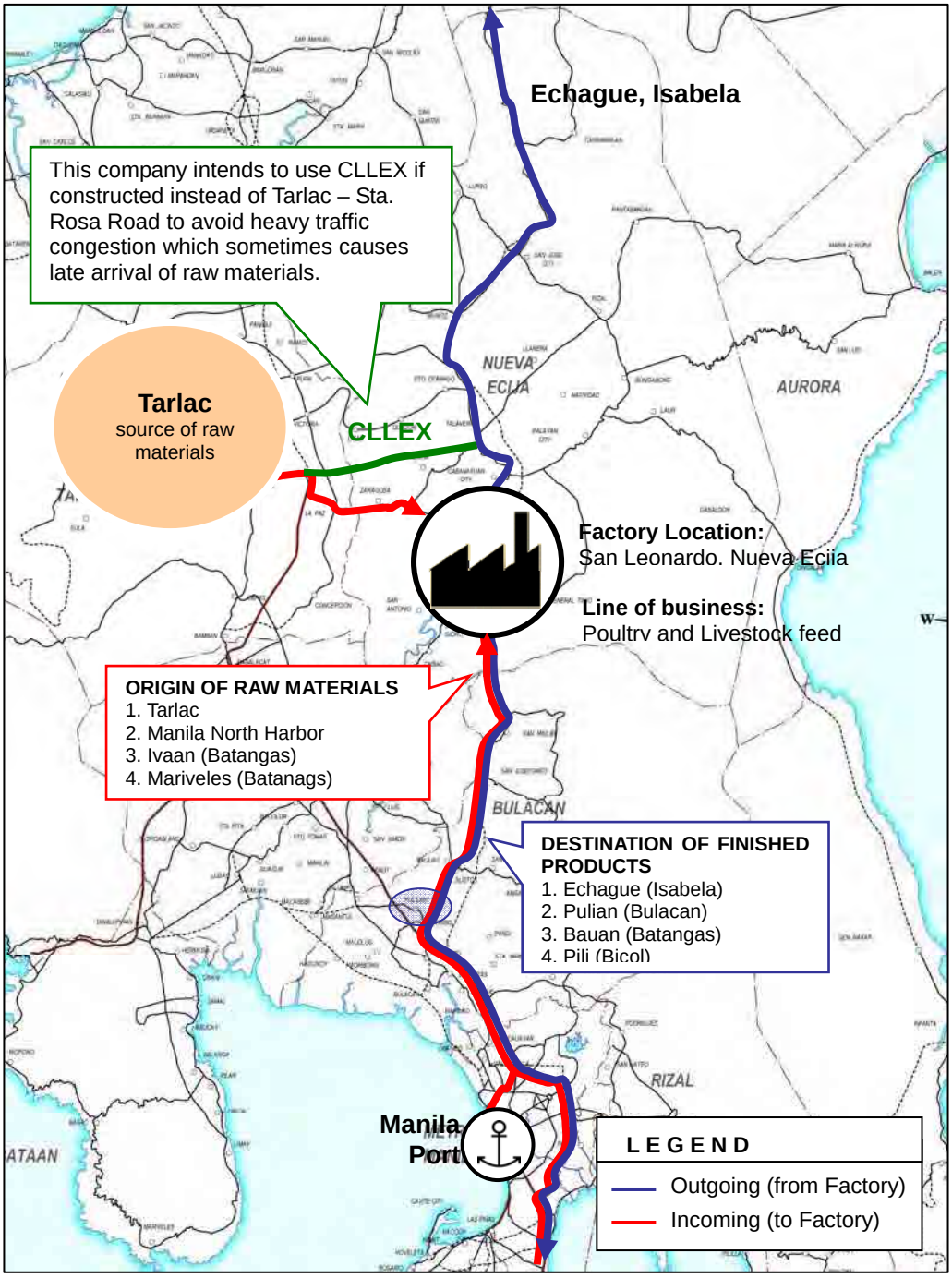


FIGURE 4.1.9-3 TRUCK ROUTES OF MANUFACTURING INDUSTRY IN CLLEX

4.1.10 Summary

Based on the results of the survey carried out on private car users, bus companies, trucking companies, and manufacturing companies, the following are the noted findings:

- PRIVATE CARS: Private car users captured at all stations revealed that they intend to use CLLEX if constructed in the future (more than 90%) for their trips to/from Manila or other regular trips that would be served by the said expressway.

- The dominant amount (85% to 97% depending on interview sites) of toll they are willing to pay to use CLLEX is 50 pesos.

- BUS COMPANY: Eight (8) out of nine (9) bus managers interviewed (89%) disclosed that if CLLEX is constructed in the future, they will allow their bus drivers to use it.

- All eight (8) bus managers revealed that the amount of toll they are willing to pay for the use of CLLEX is 200 pesos.

- TRUCKING COMPANY: Out of ten (10) interviewed managers, nine (9) affirmed their intention to allow their truck drivers to use CLLEX if it serves their delivery route.

- All nine (9) managers pointed out that the amount of toll they are willing to pay for the use of CLLEX is 200 pesos.

- MANUFACTURING COMPANIES: Of the five (5) managers interviewed, only two manufacturing companies found the CLLEX useful for their operations. However, only one company will utilize the expressway in getting their material supply. Another company is rice distributor and they don't intend to use CLLEX since their products are not time sensitive. The three (3) other companies have found CLLEX not useful to their current routes thus they could not use it.

4.2 FUTURE TRAFFIC DEMAND

4.2.1 Approach

To estimate the traffic volumes on CLLEX, traffic demand system data developed on the Study of Master plan on High Standard Highway Network Development funded by Japan International Cooperation Agency (hereinafter HSH), was used.

The overall flow diagram of the methodology used in forecasting the traffic volumes on CLLEX, and the present road network in the two cased of “Without Project” and ”With Project ”, is shown in **Figure 4.2.1-1**.

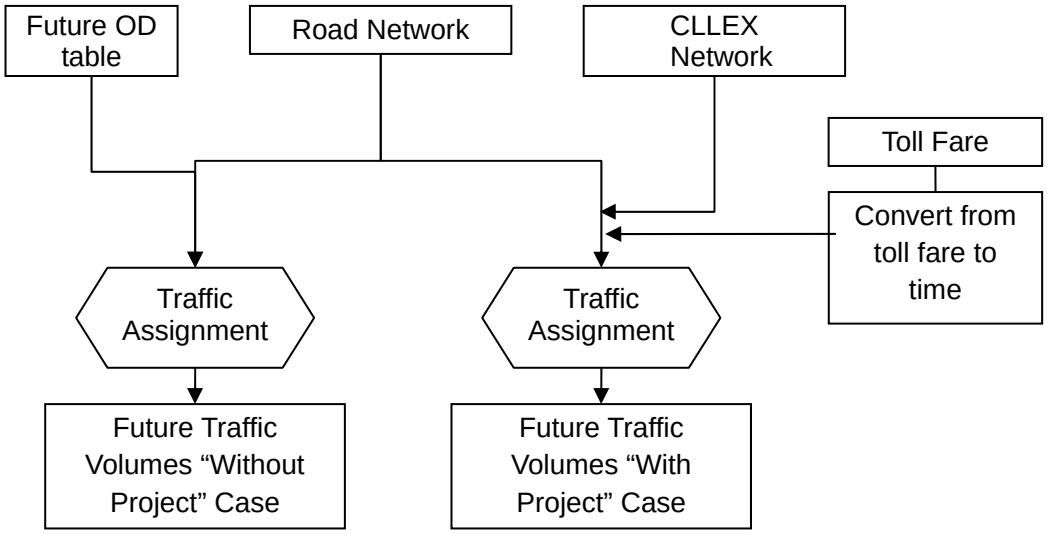


FIGURE 4.2.1-1 FORECAST OF TRAFFIC VOLUMES ON ROAD NETWORK

Traffic volumes are assigned first on the existing road network without CLLEX, which is the case of “Without Project”. Next, volume of traffic which will be handled in the future on CLLEX network are determined, which is the case of “With Project”.

In the Study, the zone system comprised of Region III (Nueva Ecija, Tarlac, Pampanga, Bulacan and etc.), NCR, Region IV-A and Region I. The total zoning number is 320 zones, presented in **Figure 4.2.1-2~3** and **Table 4.2.1-1**.

TABLE 4.2.1-1 (1) TRAFFIC ZONING SYSTEM

Small Zone	Barangay	Medium Zone	City/Municipality	Large Zone	Province	Region
1	City of Manila 1 - Barangay 20	1	City of Manila	1	Metro Manila	NCR
2	City of Manila 2 - Barangay 105					
3	City of Manila 3 - Barangay 375					
4	City of Manila 4 - Barangay 48					
5	City of Manila 5 - San Nicolas					
6	City of Manila 6 - Binondo					
7	City of Manila 7 - Barangay 310					
8	City of Manila 8 - Quiapo					
9	City of Manila 9 - Barangay 413					
10	City of Manila 10 - San Miguel					
11	City of Manila 11 - Barangay 570					
12	City of Manila 12 - Barangay 450					
13	City of Manila 13 - Port Area					
14	City of Manila 14 - Intramuros, Ermita					
15	City of Manila 15 - Paco					
16	City of Manila 16 - Malate					
17	City of Manila 17 - Santa Ana					
18	City of Manila 18 - Barangay 601					
19	City of Manila 19 - Pandacan					
20	Pasay City 1 - Barangay 46	2	Pasay City			
21	Pasay City 2 - Barangay 132					
22	Pasay City 3 - Barangay 183					
24	Pasay City 4 - Barangay 1					
82	Pasay City 5 - Barangay 76					
23	Parañaque City 1 - Don Bosco	3	Parañaque City			
25	Paranaque City 2 - Baclaran					
84	Parañaque City 2 - Sun Valley, San Martin De Porr					
85	Parañaque City 3 - Marcelo Green Village					
86	Parañaque City 4 - B.F. Homes					
92	Parañaque City 5 - San Isidro					
93	Parañaque City 6 - San Dionisio					
26	Makati City 1 - Bangkal, San Lorenzo	4	Makati City			
27	Makati City 2 - Palanan					
28	Makati City 3 - Olympia					
29	Makati City 4 - Guadalupe Viejo					
30	Makati City 5 - Bel-Air					
31	Makati City 6 - Rizal, Pembo					
34	Makati City 7 - Magallanes					
32	Santa Ana		Pateros			
33	Taguig 1 - Western Bicutan	5	Taguig			
81	Taguig 2 - Upper Bicutan					
83	Taguig 3 - Signal Village, Lower Bicutan					
35	Mandaluyong City 1 - Poblacion	6	Mandaluyong City			
36	Mandaluyong City 2 - Plainview					
37	Mandaluyong City 3 - Mauway					
39	Mandaluyong City 4 - Wack-wack Greenhills					
40	San Juan 1 - West Crame		San Juan			
41	San Juan 2 - Corazon de Jesus					
38	Pasig City 1 - Ugong	7	Pasig City			
78	Pasig City 2 - Santolan					
79	Pasig City 3 - Santa Lucia					
80	Pasig City 4 - Pinagbuhatan					
42	Quezon City 1 - Tatalon, Damayang Lagi	8	Quezon City			
43	Quezon City 2 - Santo Domingo (Matalahib)					
44	Quezon City 3 - Baesa, Sangandaan					
45	Quezon City 4 - Bagong Pag-asa					
46	Quezon City 5 - Pinyahan, (Trinoma/SM West)					
47	Quezon City 6 - Paltok, Del Monte					
48	Quezon City 7 - Kamuning					
49	Quezon City 8 - E. Rodriguez, Crame					
50	Quezon City 9 - Camp Aguinaldo					
51	Quezon City 10 - Kamias (East/West)					
52	Quezon City 11 - U.P. Campus					
53	Quezon City 12 - Pasong Tamo					
54	Quezon City 13 - Batasan Hills					
55	Quezon City 14 - Commonwealth					
56	Quezon City 15 - Payatas					
57	Quezon City 16 - North Fairview					
61	Quezon City 17 - Greater Lagro, Novaliches Proper					
62	Quezon City 18 - Tandang Sora					
75	Quezon City 19 - Pansol, Loyola Heights					
77	Quezon City 20 - White Plains, Libis (Eastwood)					
58	Kalookan City (North) 1 - Barangay 178	9	Kalookan City (North)			
59	Kalookan City (North) 2 - Barangay 176					
60	Kalookan City (North) 3 - Barangay 171					
63	Valenzuela City 1 - Ugong	10	Valenzuela City			
64	Valenzuela City 2 - Canumay, Maysan					
65	Valenzuela City 3 - Malinta					
66	Valenzuela City 4 - Malanday					
71	Valenzuela City 5 - Marulas					

TABLE 4.2.1-1 (2) TRAFFIC ZONING SYSTEM

Small Zone	Barangay	Medium Zone	City/Municipality	Large Zone	Province	Region
67	Malabon 1 - Concepcion	11	Malabon	1	Metro Manila	NCR
70	Malabon 2 - Potrero					
68	Navotas - North Bay Blvd South		Navotas			
69	Kalookan City (South) 1 - Barangay 12		Kalookan City (South)			
72	Kalookan City (South) 2 - Baranagay 132					
73	Kalookan City (South) 3 - Barangay 120					
74	Marikina City 1 - Concepcion Uno, Parang	12	Marikina City			
76	Marikina City 2 - Malanday					
87	Muntinlupa City 1 - Sucat		Muntinlupa City			
88	Muntinlupa City 2 - Alabang					
89	Muntinlupa City 3 - Putatan					
90	Las Pinas City 1 - Almanza (Uno, Dos)	13	Las Pinas City			
91	Las Pinas City 2 - B.F. International Village					
94	Las Pinas City 3 - Zapote					
320	Manila Port	-	-	1	Metro Manila	NCR
133		24	BACOOR	2	CAVITE	Region IV-A
134			IMUS			
135			CAVITE CITY			
136			KAWIT			
137			NOVELETA			
138		25	ROSARIO			
139	Tejero		GENERAL TRIAS			
140	Pasong Camachile II					
141						
142	Amaya		TANZA			
143	Halayhay					
144	Bagtas					
146	Ibayo Silangan	26	NAIC			
147	Palangue 2 & 3					
161			GENERAL EMILIO AGUINALDO			
145		27	TRECE MARTIRES CITY (Capital)			
148	Datu Esmael (Bago-a-ingud)		DASMARIÑAS			
149	Paliparan III					
150	Langkaan II					
151		28	SILANG			
153			GEN. MARIANO ALVAREZ			
154			CARMONA			
162			AMADEO			
163			ALFONSO			
164			TAGAYTAY CITY			
152		29	SAN PEDRO	3	LAGUNA	
155			BIÑAN			
156			CITY OF SANTA ROSA			
157		30	CABUYAO			
158	Pansol, Parian		CITY OF CALAMBA			
159	Canlubang					
160			BAY			
165		31	SANTA MARIA			
166			MABITAC			
167			FAMY			
168		32	KALAYAAN			
169			CAVINTI			
170		33	LILIW			
171			PAGSANJAN			
172		34	ALAMINOS			
173	Del Remedio		SAN PABLO CITY			
174	Santisimo Rosario					
175	San Francisco					
176	Santo Angel					
116	San Jose	19	RODRIGUEZ (MONTALBAN)	4	RIZAL	
117	Burgos					
118		20	SAN MATEO			
119	Cupang		CITY OF ANTIPOLO (Capital)			
120	San Jose (Pob.)					
121	Inarawan					
122		21	CAINTA			
123			TAYTAY			
124			ANGONO			
125		22	BINANGONAN			
126			TERESA			
127			MORONG			
128			CARDONA			
129		23	BARAS			
130			TANAY			
131			PILILLA			
132			JALA-JALA			
95		14	CITY OF MEYCAUAYAN	5	BULACAN	Region III
96			MARILAO			
97			OBANDO			
98		15	BULACAN			
99			BOCAUE			

TABLE 4.2.1-1 (3) TRAFFIC ZONING SYSTEM

Small Zone	Barangay	Medium Zone	City/Municipality	Large Zone	Province	Region
100		15	BALAGTAS (BIGAA)	5	BULACAN	Region III
101			GUIGUINTO			
102			CITY OF MALOLOS (Capital) 1			
103		16	PAOMBONG			
104			HAGONOY			
105			CALUMPIT			
106			PULILAN			
107			PLARIDEL			
108		17	PANDI			
109	Poblacion, Guyong		SANTA MARIA			
110	Pulong Buhangin					
111	Muzon	18	SAN JOSE DEL MONTE			
112	Gumaoc					
113	Kaypian					
114	Tigbe		NORZAGARAY			
115	San Mateo					
205		43	BALIUAG			
206			BUSTOS			
207			ANGAT			
208		44	SAN ILDEFONSO			
209			DOÑA REMEDIOS TRINIDAD			
214		46	APALIT	6	PAMPANGA	
220			CANDABA			
215		47	MINALIN			
219			BACOLOR			
224	Dolores		CITY OF SAN FERNANDO			
225	Bulaon					
216		48	MASANTOL			
217			LUBAO			
218			FLORIDABLANCA			
221		49	ARAYAT			
222			MAGALANG			
223		50	PORAC			
226	Dau		MABALACAT			
227	Mabiga, Calumpang					
228	Cutcut		ANGELES CITY			
229	Santo Domingo					
230	Balibago					
231	Malabanias					
177		35	BALAYAN	7	BATANGAS	Region IV-A
178			AGONCILLO			
179			LAUREL			
180		36	CITY OF TANAUAN			
181			SANTO TOMAS			
182			BALETE			
188	Marauoy		LIPA CITY			
189	Antipolo Del Norte					
190	Lodlod					
191	San Jose					
183		37	CUENCA			
187			ALITAGTAG			
184		38	PADRE GARCIA			
185			SAN JUAN			
186			LOBO			
192	Santa Rita Karsada	39	BATANGAS CITY (Capital)			
193	Gulod Itaas					
194	Libjo					
195	Pinamucan					
196		40	GENERAL NAKAR	8	QUEZON	
197			LUCBAN			
198		41	CITY OF TAYABAS			
203			LUCENA CITY (Capital)			
204			AGDANGAN			
199		42	SARIAYA			
200			CANDELARIA			
201			DOLORES			
202			SAN ANTONIO			
210		45	LIMAY	9	BATAAN	Region III
211			ABUCAY			
212			BAGAC			
213			DINALUPIHAN			
249	Barreto	56	OLONGAPO CITY	10	ZAMBALES	
250	East Bajac-bajac					
251	Santa Rita					
252	New Cabalan					
253	Calapacuan	57	SUBIC			
254	Cawag					
255	Pamatawan					
256	Naugsol					
257		58	CASTILLEJOS			

TABLE 4.2.1-1 (4) TRAFFIC ZONING SYSTEM

Small Zone	Barangay	Medium Zone	City/Municipality	Large Zone	Province	Region
258		59	BOTOLAN	10	ZAMBALES	
259		60	CANDELARIA			
232		51	BAMBAN			
234			CAPAS			
233		52	CONCEPCION			
236			LA PAZ			
246	Matatalaib		CITY OF TARLAC			
247	San Rafael					
248	Maliwalo					
235		53	SAN JOSE			
240			CAMILING	11	TARLAC	
237		54	VICTORIA			
238			PURA			
239			GERONA			
241		55	RAMOS			
242			ANAO			
243			SAN MANUEL			
244	Poblacion Norte		PANIQUI			
245	Balaoang					
260	San Nicolas	61	CITY OF GAPAN			Region III
261	San Roque					
262			CABIAO			
263			JAEN			
264			SAN LEONARDO			
265			GENERAL TINIO (PAPAYA)			
266			SANTA ROSA			
267		62	GABALDON (BITULOK & SABANI)			
268			BONGABON			
282			CARRANGLAN			
269		63	GENERAL MAMERTO NATIVIDAD			
270			SANTO DOMINGO	12	NUEVA ECIJA	
275			SCIENCE CITY OF MUÑOZ			
276			LUPAO			
281			SAN JOSE CITY			
271		64	ALIAGA			
272			LICAB			
277	Bantug Norte	65	CABANATUAN CITY			
278	Caalibangbangan					
279	San Josef Norte					
280	Campo Tinio					
273		66	GUIMBA			
274			CUYAPO			
284		68	UMINGAN			
285			NATIVIDAD			
286			ASINGAN			
287			SAN MANUEL			
298			BALUNGAO			
288		69	POZZORUBIO			
289			BUGALLON			
290			CALASIAO			
291			BINMALEY	13	PANGASINAN	Region I
294		70	AGUILAR			
295			BASISTA			
296			BAUTISTA			
297			VILLASIS			
299	Bayaoas		CITY OF URDANETA			
300	Pinmaludpod					
301	Palina East					
292		71	CITY OF ALAMINOS			
293			AGNO			
283		67	All Municipalities	14	AURORA	Region III
302	Zone 302-319 Out of Study Area.	72		15	Benguet	CAR
303						
308					Ifugao	
309						
312					Mt. Province	
313					Kalinga	
314					Abra	
316					Apayao	
304					Nueva Vizcaya	Region II
305						
306					Quirino	
307					Isabela	
317					CAGAYAN	
310					LA UNION	Region I
311					ILOCOS SUR	
315					ILOCOS NORTE	
318					All Provinces	Region IV-B
319					All Provinces	Region V

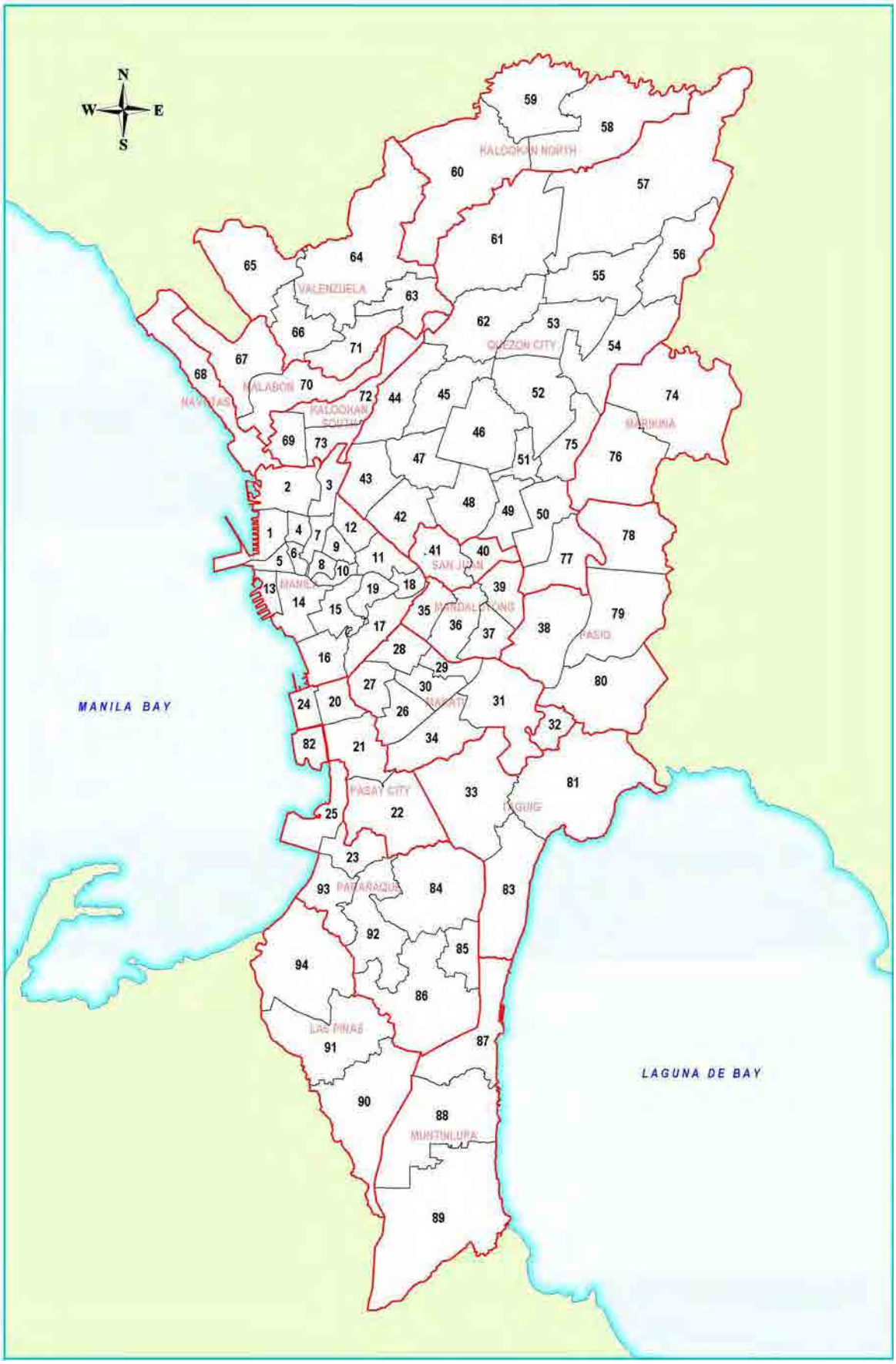


FIGURE 4.2.1-2 ZONING MAP – METRO MANILA

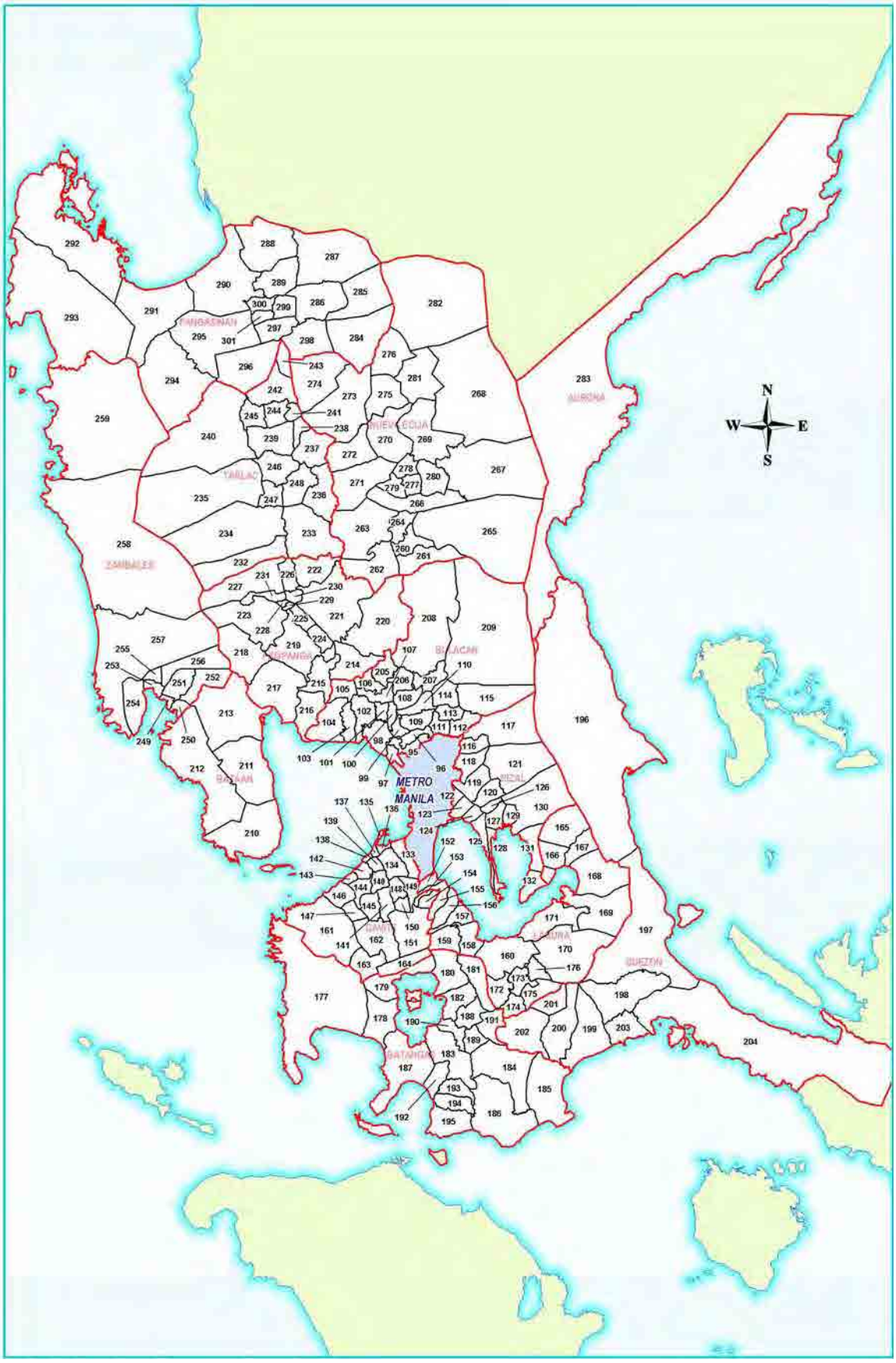


FIGURE 4.2.1-3 ZONING MAP – OUTSIDE METRO MANILA

4.2.2 Future Socio-Economic Framework

The future socio-economic indicators were formulated by the Study of Master Plan on High Standard Highway Network Development based on the past trend.

The socio-economic profile is summarized below.

(1) Population projection

The population annual growth rate of HSH Study is 2.3% up to 2020 and 1.8% from 2021 to 2030.

Tarlac and Nueva Ecija is the almost same growth rate.

TABLE 4.2.2-1 FUTURE POPULATION

	Population(thousand)			AAGR	
	Y2009	Y2020	Y2030	09-20(%)	21-30(%)
Metro Manila	11,962	14,511	15,942	1.8%	0.9%
Cavite	3,242	5,154	7,102	4.3%	3.3%
Laguna	2,625	3,511	4,194	2.7%	1.8%
Rizal	2,481	3,535	4,419	3.3%	2.3%
Bulacan	3,020	4,199	5,300	3.0%	2.4%
Pampanga	2,336	3,000	3,676	2.3%	2.1%
Batangas	2,347	3,050	3,843	2.4%	2.3%
Quezon	1,792	2,143	2,496	1.6%	1.5%
Bataan	694	895	1,114	2.3%	2.2%
Zambales	749	921	1,101	1.9%	1.8%
Tarlac	1,297	1,627	1,950	2.1%	1.8%
Nueva Ecija	1,914	2,400	2,870	2.1%	1.8%
Pangasinan	2,705	3,046	3,356	1.1%	1.0%
Aurora	192	216	241	1.1%	1.1%
Total	37,356	48,041	57,214	2.3%	1.8%

Source: HSH (JICA 2010)

(2) GRDP projection

The estimated GRDP growth rate of Region III (Central Luzon) is between 6.0 ~ 6.5% .

TABLE 4.2.2-2 GDP AND GRDP GROWTH RATE

			2012-2014	2015-2020	2021-2025	2026-2030
GDP			5.0%	5.5%	5.5%	5.0%
GRDP	NCR	National Capital Region	6.5%	6.5%	6.5%	6.0%
	III	Central Luzon	6.0%	6.5%	6.5%	6.5%
	IV-A	CARABARZON	6.5%	7.0%	7.0%	6.5%

Source: HSH (JICA 2010)

(3) Employment projection

The number of employment is estimated on population and GRDP in HSH Study.

The employment annual growth rate of HSH Study is higher than that of population. The growth rate of employment is 2.8% up to 2020 and 2.0% from 2021 to 2030.

The growth rate of Tarlac and Nueva Ecija is a little higher than the rate of study area.

TABLE 4.2.2-3 FUTURE EMPLOYMENT

	Employment(thousand)			AAGR	
	Y2009	Y2020	Y2030	09-20(%)	21-30(%)
Metro Manila	4,575	6,103	7,378	2.7%	1.9%
Cavite	1,092	1,583	2,058	3.4%	2.7%
Laguna	1,371	1,807	2,214	2.5%	2.1%
Rizal	454	654	821	3.4%	2.3%
Bulacan	675	976	1,240	3.4%	2.4%
Pampanga	800	1,124	1,427	3.1%	2.4%
Batangas	485	683	872	3.2%	2.5%
Quezon	218	283	344	2.4%	2.0%
Bataan	227	297	357	2.5%	1.9%
Zambales	339	478	604	3.2%	2.4%
Tarlac	282	398	506	3.2%	2.4%
Nueva Ecija	293	409	520	3.1%	2.4%
Pangasinan	651	739	798	1.2%	0.8%
Aurora	21	26	33	2.0%	2.4%
Total	11,483	15,560	19,172	2.8%	2.1%

Source: HSH (JICA 2010)

4.2.3 Present and Future OD Matrix

Traffic demand forecast was conducted in HSH Study. Annual growth rate in study area is 2.8 %(2009-2017) and 2.0 %(2021-2030). The growth rate of Tarlac and Nueva Ecija is the same rate of study area.

TABLE 4.2.3-1 ESTIMATED GENERATION TRIP AND ANNUAL GROWTH RATE

	Generation Trip(Vehicle/day)			Annual Growth Rate	
	Y2009	Y2020	Y2030	2009-2017	2021-2030
Metro Manila	3,539,909	4,496,863	5,173,752	2.2%	1.4%
Cavite	570,765	838,206	1,159,496	3.6%	3.3%
Laguna	400,087	619,695	811,382	4.1%	2.7%
Rizal	303,205	431,995	544,728	3.3%	2.3%
Bulacan	509,021	811,307	1,050,340	4.3%	2.6%
Pampanga	31,055	44,979	52,820	3.4%	1.6%
Batangas	38,817	51,355	59,416	2.6%	1.5%
Quezon	17,390	23,253	26,719	2.7%	1.4%
Bataan	14,690	18,468	20,446	2.1%	1.0%
Zambales	4,563	6,253	7,805	2.9%	2.2%
Tarlac	12,552	16,970	21,177	2.8%	2.2%
Nueva Ecija	20,484	28,016	35,037	2.9%	2.3%
Pangasinan	12,908	17,868	19,666	3.0%	1.0%
Aurora	430	562	687	2.5%	2.0%
Out of study area	11,322	14,941	18,665	2.6%	2.3%
Total	5,487,198	7,420,728	9,002,132	2.8%	2.0%

Source: HSH (JICA 2010)

Future OD was prepared in Year 2017, 2020 and 2030. Year 2017 is the opening year of CLLEx.

Table 4.2.3-2 to **4.2.3-3** shows the Vehicle OD Table.

TABLE 4.2.3-2 FUTURE VEHICLE OD TABLE (YEAR 2020)

	Metro Manila	Cavite	Laguna	Rizal	Bulacan	Pampanga	Batangas	Quezon	Bataan	Zambales	Tarlac	Nueva Ecija	Pangasinan	Aurora	Out of study area	Total
Metro Manila	4,122,744	95,382	66,285	115,250	65,312	3,538	12,042	3,292	1,514	1,456	848	2,401	2,145	315	4,340	4,496,863
Cavite	95,382	706,597	26,667	1,804	2,908	201	2,929	1,052	42	57	14	26	53	0	477	838,206
Laguna	115,250	1,804	8,977	489,063	3,016	56	269	791	31	25	0	32	44	108	231	619,695
Rizal	66,285	26,667	320,055	8,977	1,922	157	6,331	856	67	38	83	32	79	0	449	431,995
Bulacan	65,312	2,908	1,922	3,016	718,670	9,343	390	33	692	946	307	6,200	484	7	1,079	811,307
Pampanga	3,538	201	157	56	9,343	24,266	52	20	1,453	1,660	1,085	558	2,025	1	566	44,979
Batangas	12,042	2,929	6,331	269	390	52	25,891	2,730	101	27	2	106	36	0	451	51,355
Quezon	3,292	1,052	856	791	33	20	2,730	14,200	0	14	129	0	20	0	118	23,253
Bataan	1,514	42	67	31	692	1,453	101	0	12,455	1,118	416	328	112	2	140	18,468
Zambales	1,456	57	38	25	946	1,660	27	14	1,118	98	212	188	82	120	214	6,253
Tarlac	848	14	83	0	307	1,085	2	129	416	212	12,016	940	604	1	316	16,970
Nueva Ecija	2,401	26	32	32	6,200	558	106	0	328	188	940	14,467	1,423	1	1,315	28,016
Pangasinan	2,145	53	79	44	484	2,025	36	20	112	82	604	1,423	5,977	0	4,787	17,868
Aurora	315	0	0	108	7	1	0	0	2	120	1	1	0	0	8	562
Out of study area	4,340	477	449	231	1,079	566	451	118	140	214	316	1,315	4,787	8	453	14,941
Total	4,496,863	838,206	431,995	619,695	811,307	44,979	51,355	23,253	18,468	6,253	16,970	28,016	17,868	562	14,941	7,420,728

Source: HSH (JICA 2010)

TABLE 4.2.3-3 FUTURE VEHICLE OD TABLE (YEAR 2030)

	Metro Manila	Cavite	Laguna	Rizal	Bulacan	Pampanga	Batangas	Quezon	Bataan	Zambales	Tarlac	Nueva Ecija	Pangasinan	Aurora	Out of study area	Total
Metro Manila	4,710,201	119,731	81,228	144,569	80,310	4,061	14,268	3,853	1,718	1,768	1,386	2,862	2,285	374	5,142	5,173,752
Cavite	119,731	992,007	35,395	2,540	3,808	266	3,708	1,188	52	75	21	34	64	0	610	1,159,496
Laguna	81,228	35,395	403,660	12,149	2,492	182	7,722	1,000	77	54	118	42	86	0	526	544,728
Rizal	144,569	2,540	12,149	645,949	4,152	90	332	1,006	44	37	0	41	49	141	286	811,382
Bulacan	80,310	3,808	2,492	4,152	935,477	11,422	464	42	886	1,199	434	7,647	548	9	1,455	1,050,340
Pampanga	4,061	266	182	90	11,422	28,144	57	23	1,601	2,026	1,251	715	2,314	2	669	52,820
Batangas	14,268	3,708	7,722	332	464	57	28,945	3,089	128	33	2	130	38	0	502	59,416
Quezon	3,853	1,188	1,000	1,006	42	23	3,089	16,191	0	16	147	0	23	0	142	26,719
Bataan	1,718	52	77	44	886	1,601	128	0	13,315	1,376	543	409	117	2	181	20,446
Zambales	1,768	75	54	37	1,199	2,026	33	16	1,376	133	326	261	93	146	264	7,805
Tarlac	1,386	21	118	0	434	1,251	2	147	543	326	14,677	1,172	739	2	362	21,177
Nueva Ecija	2,862	34	42	41	7,647	715	130	0	409	261	1,172	17,270	1,670	2	2,785	35,037
Pangasinan	2,285	64	86	49	548	2,314	38	23	117	93	739	1,670	6,486	0	5,158	19,666
Aurora	374	0	0	141	9	2	0	0	2	146	2	2	0	0	12	687
Out of study area	5,142	610	526	286	1,455	669	502	142	181	264	362	2,785	5,158	12	574	18,665
Total	5,173,752	1,159,496	544,728	811,382	1,050,340	52,820	59,416	26,719	20,446	7,805	21,177	35,037	19,666	687	18,665	9,002,132

Source: HSH (JICA 2010)

4.2.4 Traffic Assignment Model

The traffic assignment procedure allocates vehicle traffic into individual road links. This step uses as input the matrix of flows (vehicles) that indicate the volume of traffic between origin and destination pairs.

1) Assignment Method

There are many assignment techniques that can be used to estimate traffic volume ranging from manual methods to complex iterative procedures by computer programs. In this study, the capacity restraint assignment which is the most straightforward for use in network models was applied. This assignment technique is based on the speed – flow relationship. Flowchart of the applied methodology is presented in **Figure 4.2.4-1**.

In this assignment technique, and by calculating the required travel time for each link according to its travel speed and road conditions, the program determines the fastest routes between each origin and destination by evaluating the consuming time on links, and assigns the trips between the given origin and destination. As congestion increases until a certain level, alternative routes are introduced to handle the unassigned traffic. Zone-to-zone routing is built, which is the fastest path from each zone to any other, and all trips are assigned to these optimum routes.

Regarding tolled expressway, travel time adds the sum up of travel time conversion from toll fee (= toll fee divided by time evaluation value) and time calculation from travel speed.

Since the link-travel time varies with the traffic volume of vehicles using that link, which can be explained as a degree of link congestion, the OD tables are divided to apply an iteration procedure on ten stages. At each iteration, and depending upon the current link loadings, the flows are divided between all the shortest routes generated and a new travel time is computed for the average assigned link flow at each pass. The iteration continues to re-estimate the speed on that links considering the assigned traffic on links, and to produce alternative routes so that more accurate allocation can be achieved. The accumulated assigned traffic volume from each OD pair on the links composes the total assigned traffic volumes per direction for the network. JICA STRADA is used to estimate traffic volumes.

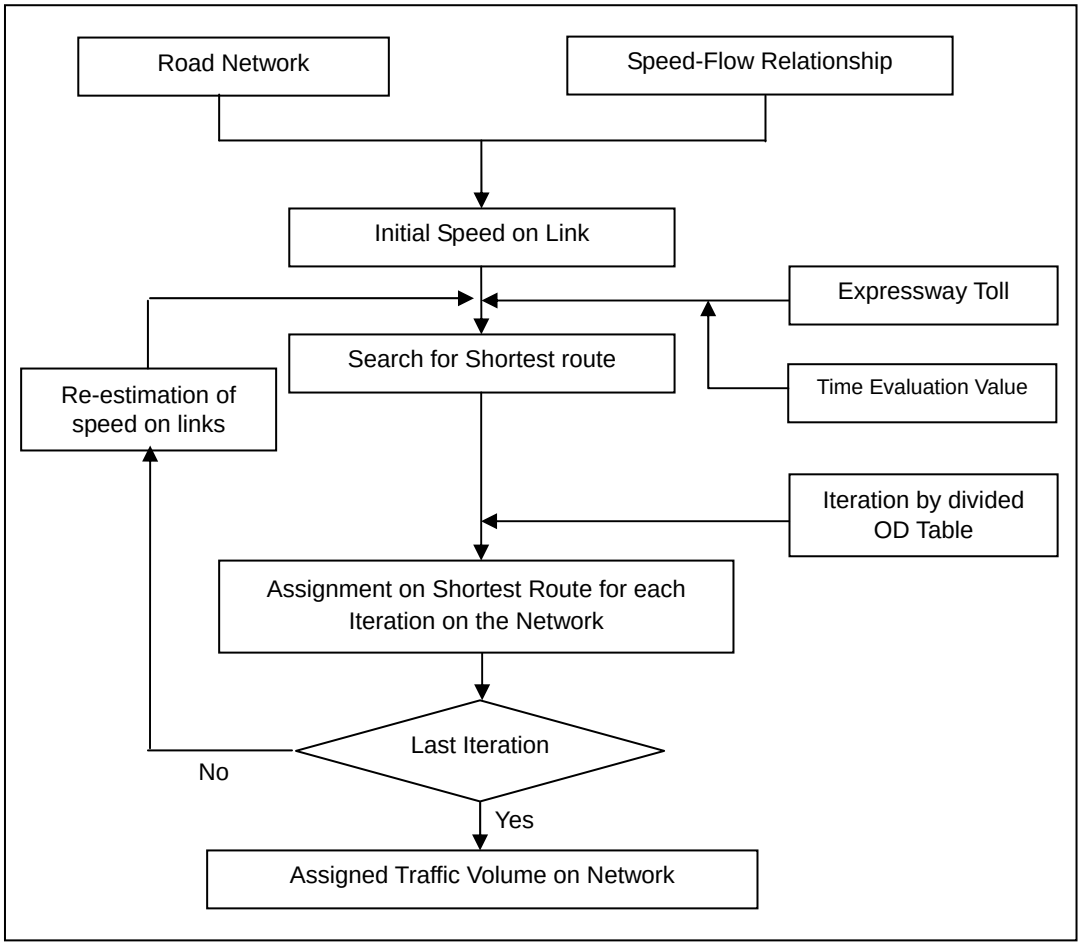


FIGURE 4.2.4-1 TRAFFIC ASSIGNMENT PROCEDURE

2) Speed Flow Relationship

The speed-flow relationship used in the traffic assignment procedure is shown in **Figure 4.2.4-2**. When the traffic volumes are over the maximum capacity 0.3*Qmax, it is assumed that vehicle speed drastically reduces. The basic free flow and capacity is shown in **Table 4.2.4-1**.

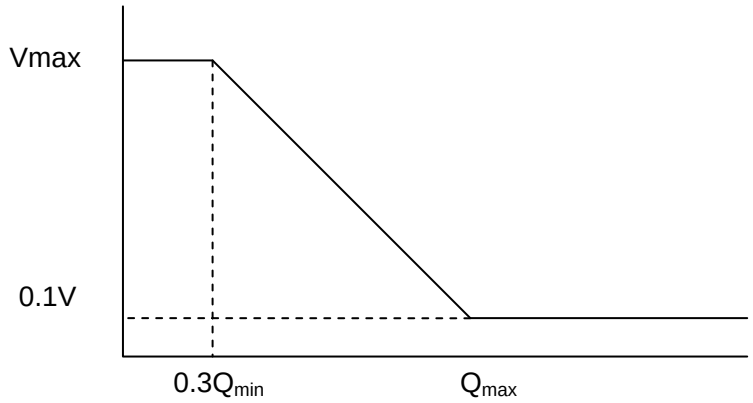


FIGURE 4.2.4-2 SPEED – FLOW RELATIONSHIP

TABLE 4.2.4-1 FREE SPEED AND CAPACITY BY ROAD TYPE

QV Type	Pavement	Road Class	Topography	Lane	Vmax	Qmax
1	Paved	Inter-Urban Expressway	Plain	4	100	80,000
2				3	100	60,000
3				2	100	40,000
4				1	70	20,000
5			Mountains	2	70	28,000
6				1	60	10,500
7		Intra-Urban Expressway	Plain	3	80	60,000
8				2	60-80	40,000
9				1	60	15,000
10		Interstate Highway	Plain	4	40	60,000
11				2	30	18,000
12			Mountains	4	30	42,000
13				2	25	12,600
14		Urban Arterial	Mountains	10	60	120,000
15				8	60	96,000
16				6	50	72,000
17				4	40	48,000
18				2	30	14,400
19		Local	Plain	4	40	40,000
20				2	30	12,000
21			Mountains	2	30	8,400
22	Unpaved		Plain	2	20	6,000
23			Mountains	2	10	4,200

3) Passenger Car Unit

Table 4.2.4-2 shows the Passenger Car Unit (PCU) used in vehicle traffic conversion. This value is the same used by the DPWH.

TABLE 4.2.4-2 PASSENGER CAR UNIT (PCU)

Vehicle Type	Passenger Car Unit
Passenger Car	1.0
Jeepney	1.5
Bus	2.2
Truck	2.5

4) Time Evaluation Value

An important input for the demand forecast is the trip maker's time value. This time value is the basis for a trip maker to decide whether to use toll expressway or not. The time values were derived from MMUEN (JICA, The Development of the Public –Private Partnership Technique for the Metro Manila Urban Expressway Network) survey results. Though MMUEN data is based on the Metro Manila and surrounding area, Time Evaluation Value in Region III is lower than that of MMUEN. Based on the rate of GRDP per capita (GRDP per capita of Region III / that of NCR and Region IV-4A = 50,176 peso / 96,505 peso = 0.52), Time Evaluation Value in Region III is set.

Supposing time value will increase in accordance with inflation rate of 5% per year, the figures in **Table 4.2.4-3** will be the time value.

TABLE 4.2.4-3 TIME EVALUATION VALUE BY VEHICLE TYPE

Unit: Peso/hour

Area	MMUEN (Metro Manila and surrounding Area)	Region III (Study Area)		
Year	Y2009	Y2009	Y2020	Y2030
	(a)	(b=a*0.52)	($c=b*1.05^{11}$)	($d=c*1.05^{10}$)
Car	331.4	172.4	294.8	480.2
Jeepney	465.9	242.3	414.4	675.0
Bus	1,524.2	792.8	1,355.9	2,208.7
Truck	873.2	454.1	776.6	1,265.0

4.2.5 Assignment Validation

The procedure of model validation entails two steps: first, the current OD matrix is assigned on an existing network. Second, the assigned traffic volume is compared with the result of the traffic count surveys at each corresponding location. This verification aims to check the accuracy of both the current OD matrix and an existing network model representing the existing transport situation.

Table 4.2.5-1 presents traffic volumes generated from traffic assignment and observed traffic (traffic count survey). **Figure 4.2.5-1** shows the result of comparison between the assigned traffic volumes and observed traffic volume. This comparison between observed traffic count and assigned traffic flow at individual sites is done via the Mean Absolute Difference (MAD)[1] Ratio. For daily traffic counts, the value of the MAD ratio is 0.21 which is considered to reflect a good calibration.

TABLE 4.2.5-1 COMPARISON OF OBSERVED AND ASSIGNED TRAFFIC VOLUME (Veh/day)

Road Name, Site	Observed Traffic Volume	Assigned Traffic Volume	Difference	Rate
1.SCTEX (Between Luisita IC and Capas IC)	8,790	10,432	-1,642	16%
2.SCTEX (Between Floridablanca and Porac IC)	9,039	8,564	475	-6%
3.Pan-Philippine HWY, Sto. Domingo	7,950	6,242	1,708	-27%
4.Pan-Philippine HWY, San Jose City	8,048	9,417	-1,369	15%
5.Pan-Philippine HWY, Zaragosa	14,246	12,089	2,157	-18%
6.Pan-Philippine HWY, Gapan	19,657	19,864	-207	1%
7.Pan-Philippine HWY, Plaridel	8,043	8,359	-316	4%
8.Sta Rosa-Tarlac Rd-1	5,124	5,422	-298	5%
9.Sta Rosa-Tarlac Rd-2	4,431	3,658	773	-21%
10.Caalibangbangan - Aliaga Rd-1	3,225	1,835	1,390	-76%
11.Caalibangbangan - Aliaga Rd-2	2,848	1,777	1,071	-60%
12.Nueve Ecija-Aurora Rd	1,273	2,092	-819	39%
13.Pinagpanaan-Rizal-Pantabangan Rd	2,179	2,990	-811	27%
14.MacArthur Hwy, Paniqui	5,635	6,409	-774	12%
15.NLEX-Dau Exit, National Hwy	13,516	14,536	-1,020	7%

[1] MAD Ratio is defined by the following formula: MAD Ratio = $\sum \left| \frac{Count - assignment}{assignment} \right| / n$ where n is the number of observations.

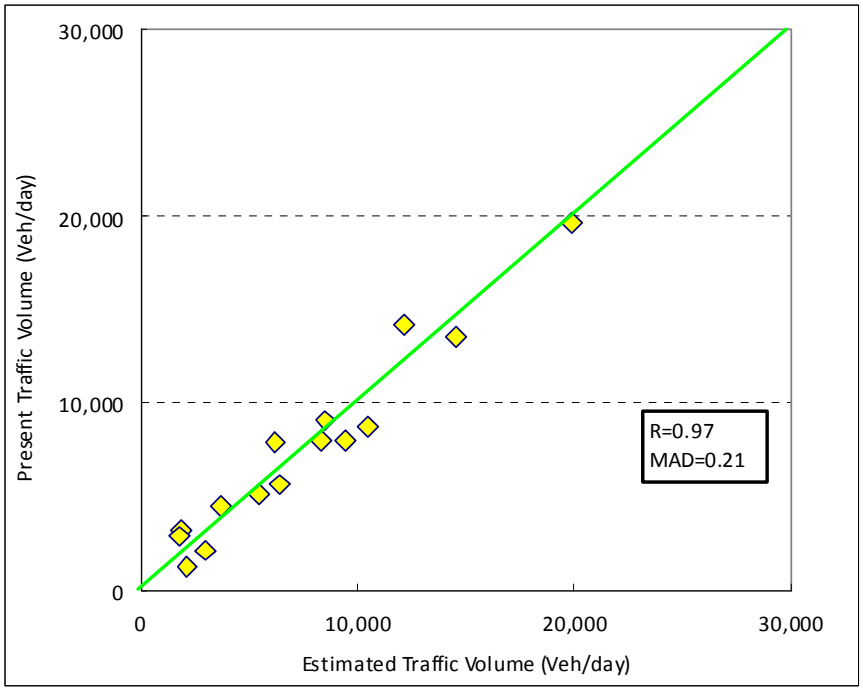


FIGURE 4.2.5-1 COMPARISON OF OBSERVED AND ASSIGNED TRAFFIC VOLUME (Veh/day)

4.2.6 Toll Rate vs. Revenue

In order to set the proper toll rate of CLLEX, the traffic volume and the amount of revenue are estimated by traffic assignment model. **Figure 4.2.6-1** shows the result of traffic assignment of toll rate.

- In case of toll free, total traffic volume to enter CLLEX is 16,197 vehicles/day

- The toll rate for getting higher revenue is about 3.0 to 4.5 Peso/km and the amount of revenue is about 1.14 and 1.18 million Peso/day. Although maximum amount of revenue is 4.0 peso case, traffic volume to enter CLLEX is only 8,628 vehicle /day which is about half of toll free case.

- The desirable toll rate for attractive to motorist and higher revenue is **3.0 Peso/km**. total traffic volume to enter CLLEX is 11,236 vehicle/day (70% of toll free case) and estimated toll revenue 1.14 million Peso/day. 3.0 Peso/km in year 2017 converts about 2.2 Peso /km in year 2011. This toll rate is the almost same as that of NLEX and other present interurban expressway (see **Table 4.2.6-1**). Most motorists may accept the 3.0 peso/km in year 2017.

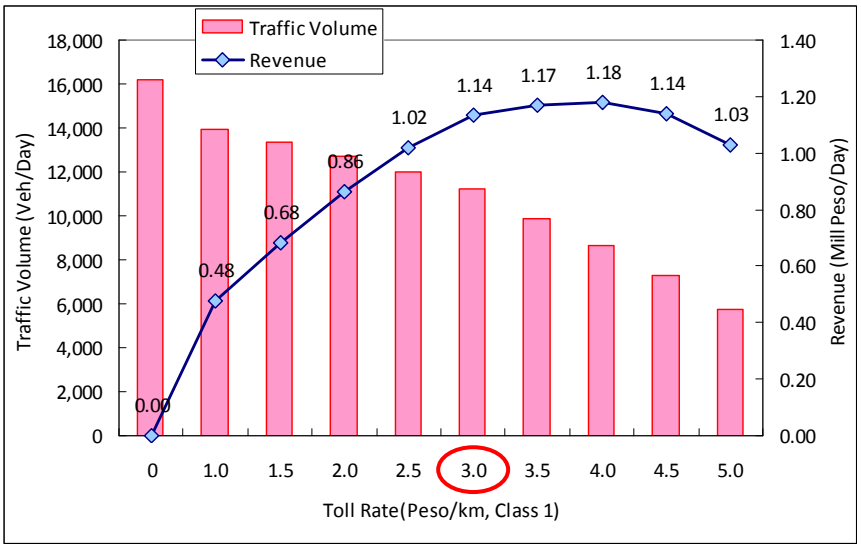


FIGURE 4.2.6-1 TOLL RATE VS REVENUE (YEAR 2017)

TABLE 4.2.6-1 PRESENT TOLL RATE

(Peso/km)

Toll Road		Class 1 *Car, Jeep, Pick-up*	Class 2 *Light Truck*	Class 3 *Heavy Truck, Trailer*	Remarks
Metro Manila Skyway (MMS)	Elevated Phase 1	6.84	13.68	20.53	Skyway/Buendia - Bicutan (9.50 km)
	Elevated Phase 2	11.92	23.84	35.76	Alabang - Bicutan (6.88 km)
	At grade	7.85	15.70	23.56	Magallanes - Alabang (13.50 km)
North Luzon Expressway (NLEX)		2.38	5.92	7.08	
South Luzon Expressway (SLEX)		3.02	6.04	9.10	
Manila Cavite Toll Expressway (MCTE)	Phase 1	3.33	6.82	9.85	R-1 Extension to Bacoor (6.6 km)
	Phase 2	8.96	17.92	26.87	Bacoor Bay to Kawit (6.475 km)
Southern Tagalog Arterial Road (STAR)		1.43	2.86	4.26	
Subic-Clark-Tarlac Expressway (SCTEX)		2.68	5.36	8.04	

Source: TRB, 2011 May

4.2.7 Traffic Assignment Result

1) Case-1 CLLEX (Phase-1) Initial Stage 2 lane

a) Total Traffic Efficiency

Table 4.2.7-1 shows the traffic assignment of without CLLEX (Phase-1) case and with case.

This study area is Tarlac, Nueva Ecija, Bulacan, Pampanga,

TABLE 4.2.7-1 TRAFFIC INDICATORS OF W/O CLLEX CASE AND WITH CASE

Year	Case	Total Travel Time (PCU*hr)	Total Vehicle Km (PCU*km)	Average Travel Speed (km/hr)
2017	With	922,689	27,459,992	29.8
	W/O	933,781	27,351,557	29.3
	With-W/O	-11,092	108,435	0.5
2020	With	1,036,424	29,758,637	28.7
	W/O	1,053,098	29,710,937	28.2
	With-W/O	-16,674	47,700	0.5
2030	With	1,452,642	37,346,746	25.7
	W/O	1,474,010	37,219,691	25.3
	With-W/O	-21,368	127,055	0.4

Source JICA Study Team
Note: PCU: Passenger Car Unit

- If CLLEX were constructed, many motorists may use this expressway even though their trips become longer. Total PCU*km of with case will be higher than that of without case.

- Total travel time will be decrease if CLLEX were constructed. The difference of total travel time is 11,092 hours/day in year 2017 which much traffic time can be saved by CLLEX.

b) Traffic Assignment

Figure 4.2.7-1 to **4.2.7-3** shows the estimated traffic volume of CLLEX (Phase-1) 2lane.

- The highest IC section is between Tarlac IC and Aliaga IC, which number of traffic are 11,222 (vehicle/day) in year 2017, 12,966 (vehicle/day) in year 2020 and 17,118 (vehicle/day) in year 2030.

Figure 4.2.7-4 to 4.2.7-6 shows the traffic assignment result with CLLEX (Phase-1) and **Figure 4.2.7-7 to 4.2.7-9** shows the difference of traffic volume with case and without case.

Figure 4.2.7-10 to 4.2.7-12 shows the number of traffic CLLEX (Phase-1) destination.

- About 60% of CLLEX traffic from west side to east are going to Cabanatuan City.

- The major destinations of CLLEX traffic from east to west are Bulacan or Metro Manila…

Table 4.2.7-2 shows the total traffic volume to enter CLLEX and total vehicle km of CLLEX

TABLE 4.2.7-2 TOTAL TRAFFIC VOLUME AND TOTAL VEHICLE KM (CLLEX PHASE-1, 2LANE)

Year	Traffic Volume (Veh/day)				Total vehicle*km			
	Class1	Class2	Class3	Total	Class1	Class2	Class3	Total
2017	8,427	2,576	219	11,222	222,318	69,635	5,722	297,675
2018	8,931	2,618	223	11,772	237,330	70,581	5,823	313,735
2019	9,464	2,661	227	12,352	253,356	71,541	5,927	330,823
2020	10,030	2,705	232	12,966	270,463	72,513	6,032	349,009
2021	10,268	2,818	242	13,328	276,853	75,721	6,332	358,906
2022	10,512	2,936	253	13,700	283,393	79,070	6,647	369,110
2023	10,761	3,058	264	14,084	290,088	82,568	6,977	379,633
2024	11,017	3,186	276	14,480	296,942	86,220	7,324	390,486
2025	11,279	3,320	289	14,887	303,957	90,034	7,688	401,679
2026	11,546	3,459	302	15,307	311,137	94,016	8,071	413,224
2027	11,821	3,603	316	15,740	318,488	98,175	8,472	425,135
2028	12,101	3,754	330	16,185	326,012	102,517	8,893	437,422
2029	12,389	3,911	345	16,645	333,714	107,052	9,335	450,101
2030	12,683	4,074	361	17,118	341,597	111,787	9,800	463,184
2031	12,984	4,245	377	17,606	349,667	116,732	10,287	476,686
2032	13,293	4,422	394	18,109	357,928	121,895	10,798	490,622
2033	13,608	4,607	412	18,627	366,384	127,287	11,335	505,006
2034	13,931	4,800	430	19,162	375,040	132,918	11,899	519,856
2035	14,262	5,001	450	19,713	383,900	138,797	12,490	535,187
2036	14,601	5,210	470	20,281	392,969	144,936	13,111	551,017
2037	14,948	5,428	492	20,867	402,253	151,347	13,763	567,363
2038	15,303	5,655	514	21,472	411,756	158,042	14,448	584,245
2039	15,666	5,891	537	22,095	421,483	165,033	15,166	601,682
2040	16,038	6,138	561	22,738	431,440	172,333	15,920	619,693
2041	16,419	6,395	587	23,401	441,633	179,956	16,712	638,300
2042	16,809	6,662	614	24,085	452,066	187,916	17,542	657,524
2043	17,208	6,941	641	24,790	462,746	196,228	18,415	677,388
2044	17,617	7,231	670	25,518	473,678	204,908	19,330	697,916
2045	18,035	7,533	701	26,270	484,868	213,971	20,291	719,131
2046	18,464	7,849	732	27,045	496,323	223,436	21,300	741,059

2-LANE

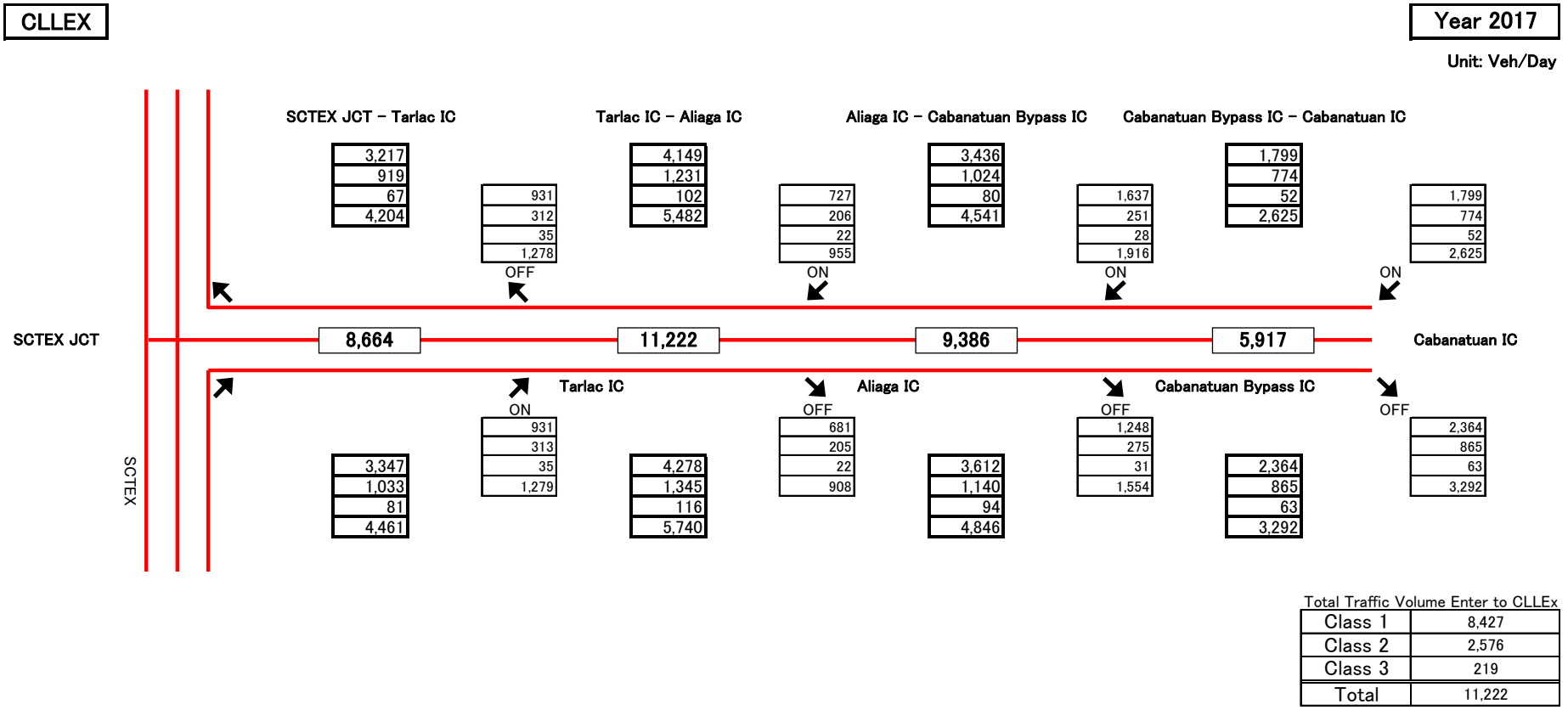
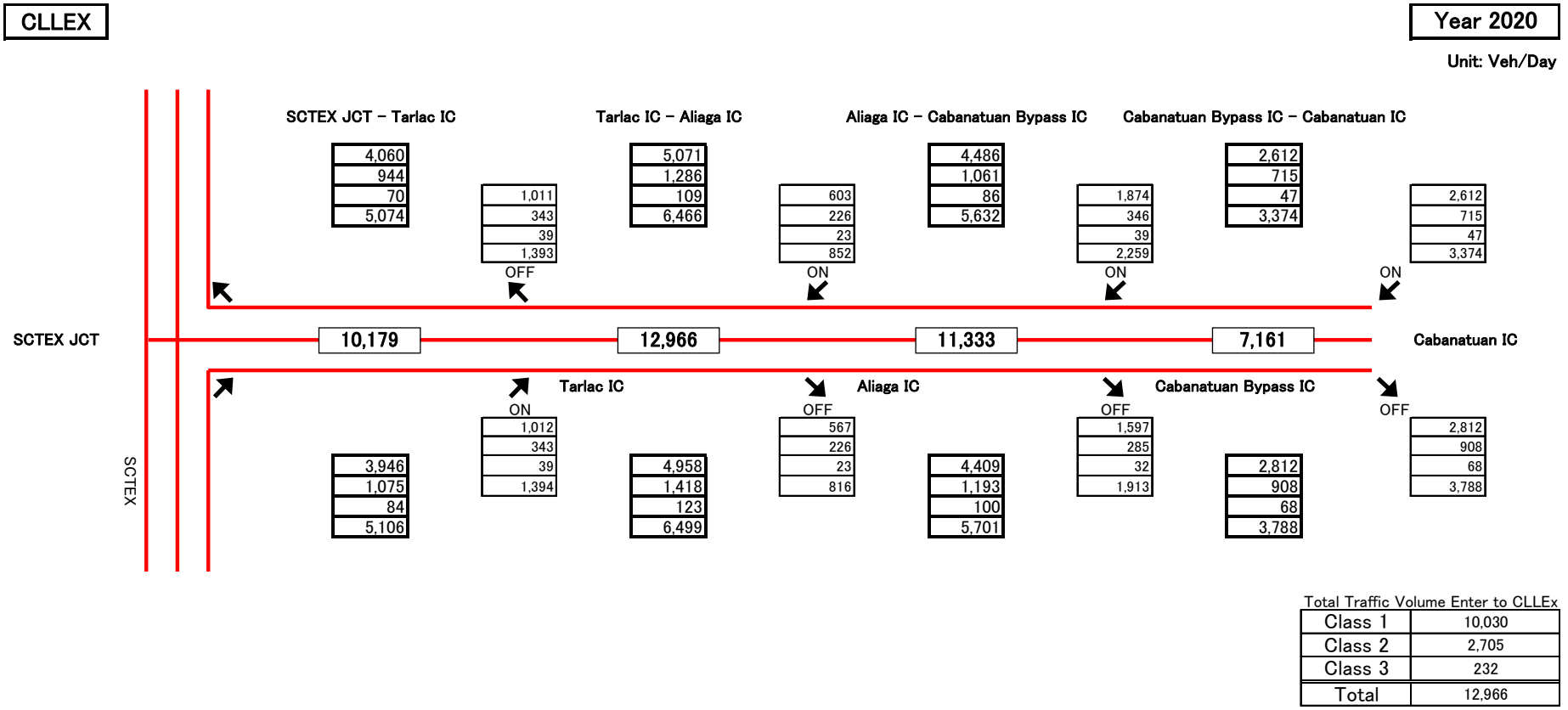


FIGURE 4.2.7-1 TRAFFIC PROJECTION (YEAR 2017) OF CLLEX (PHASE-1) 2-LANE CASE

2-LANE



Total Traffic Volume Enter to CLLEx

Class 1	10,030
Class 2	2,705
Class 3	232
Total	12,966

FIGURE 4.2.7-2 TRAFFIC PROJECTION (YEAR 2020) OF CLLEX (PHASE-1) 2-LANE CASE

2-LANE

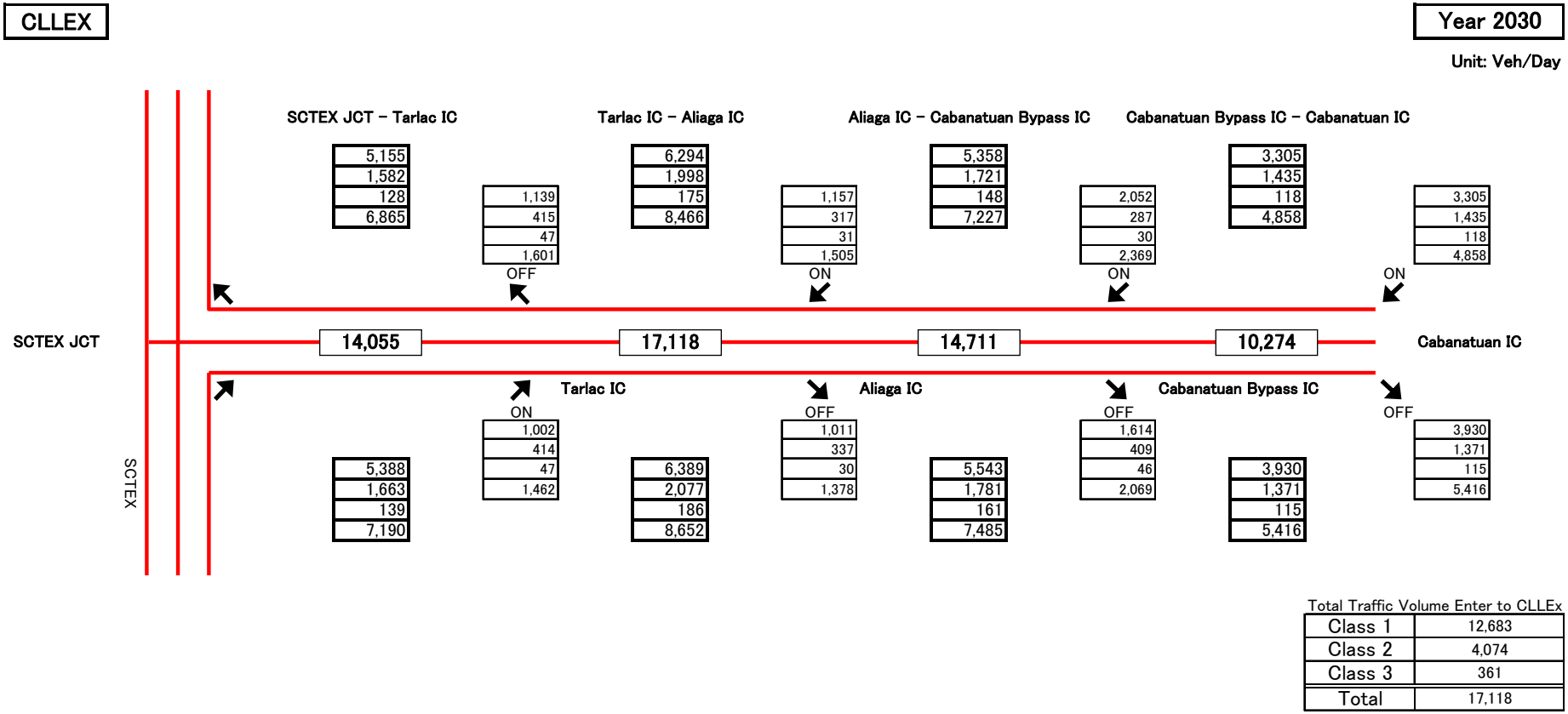


FIGURE 4.2.7-3 TRAFFIC PROJECTION (YEAR 2030) OF CLLEX (PHASE-1) 2-LANE CASE

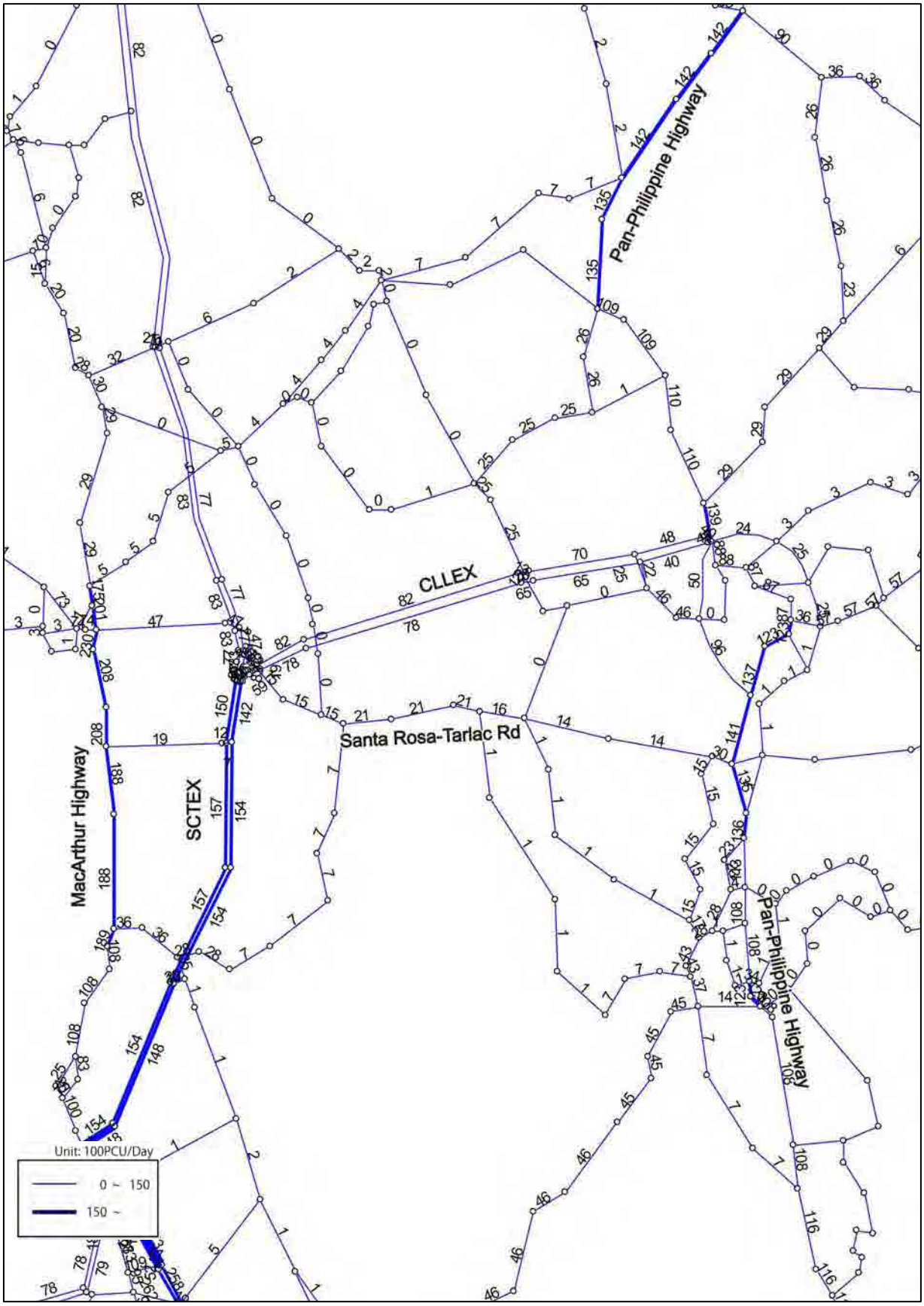


FIGURE 4.2.7-4 RESULT OF TRAFFIC ASSIGNMENT IN YEAR 2017 (PHASE-1, 2-LANE)

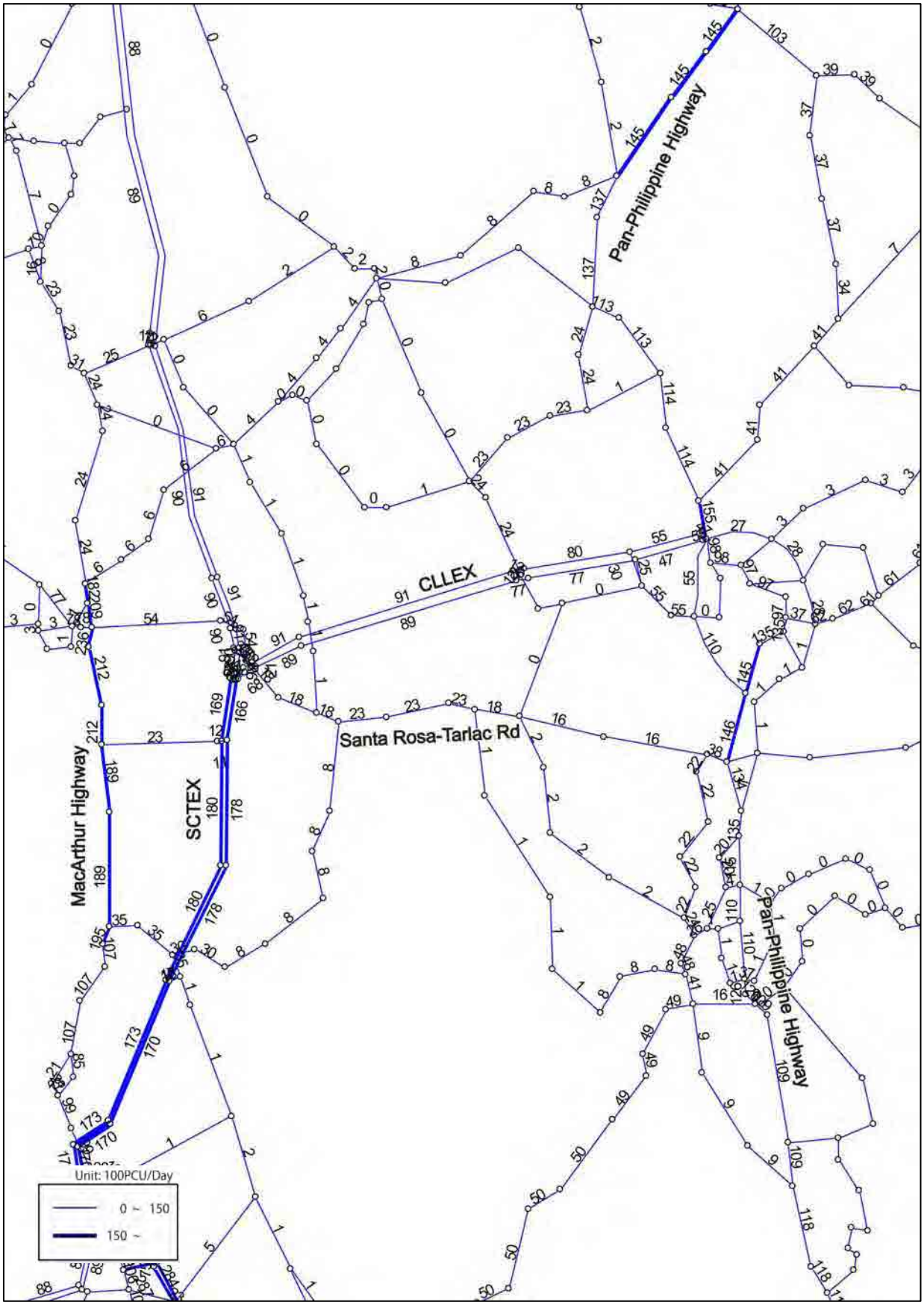


FIGURE 4.2.7-5 RESULT OF TRAFFIC ASSIGNMENT IN YEAR 2020 (PHASE-1, 2-LANE)

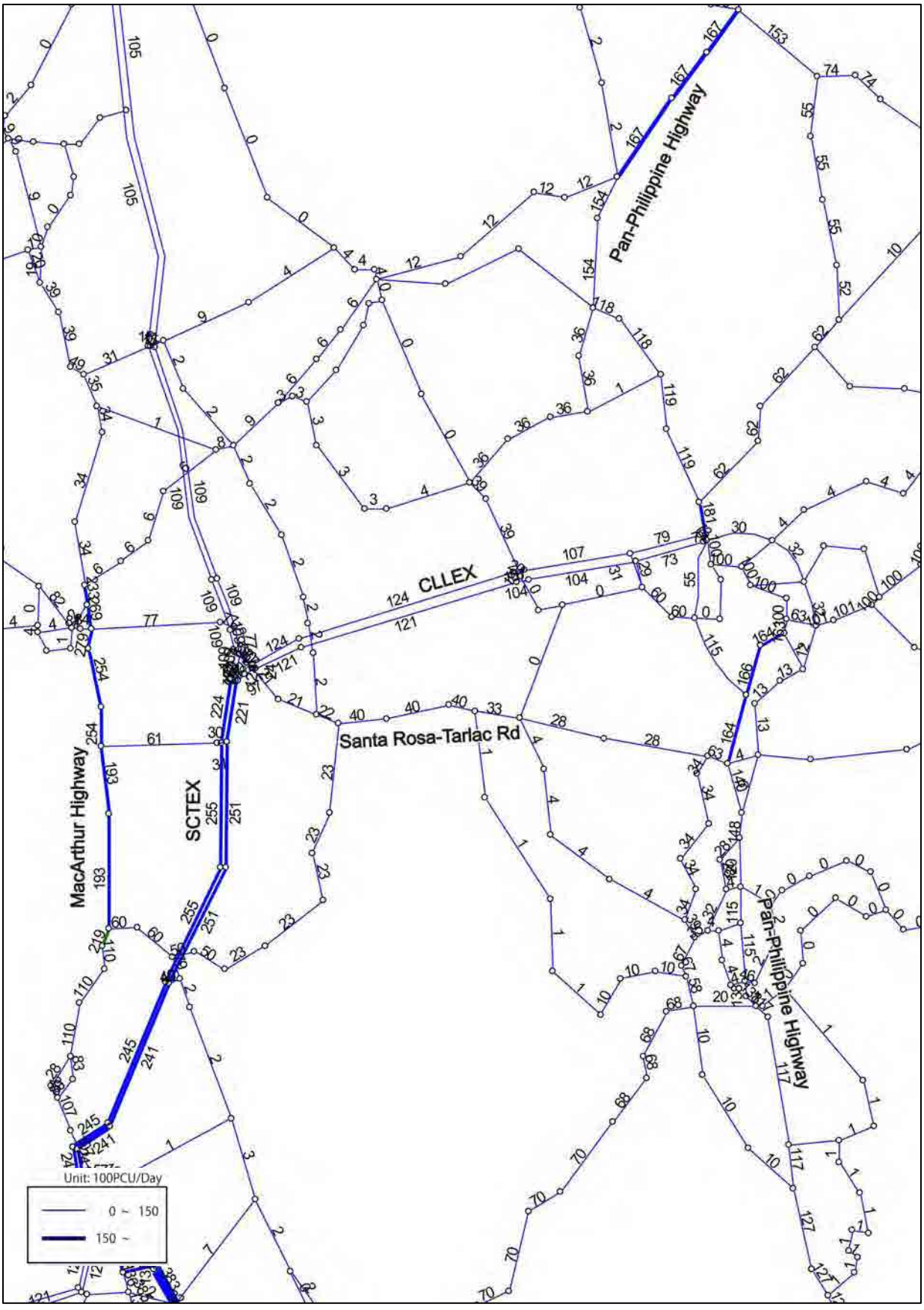


FIGURE 4.2.7-6 RESULT OF TRAFFIC ASSIGNMENT IN YEAR 2030 (PHASE-1, 2-LANE)

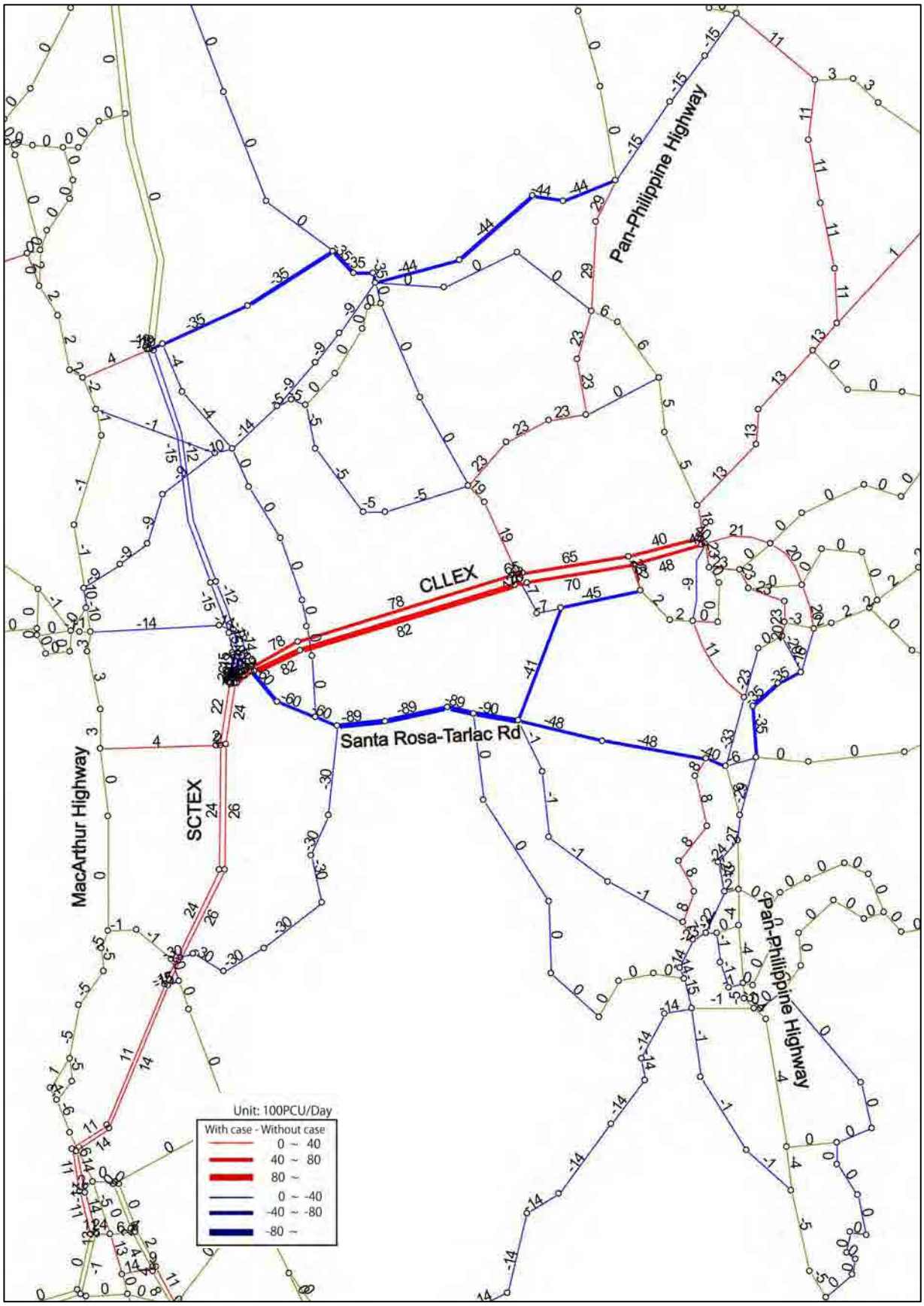


FIGURE 4.2.7-7 COMPARISON OF WITH CASE AND WITHOUT CASE IN YEAR 2017 (PHASE-1, 2-LANE)

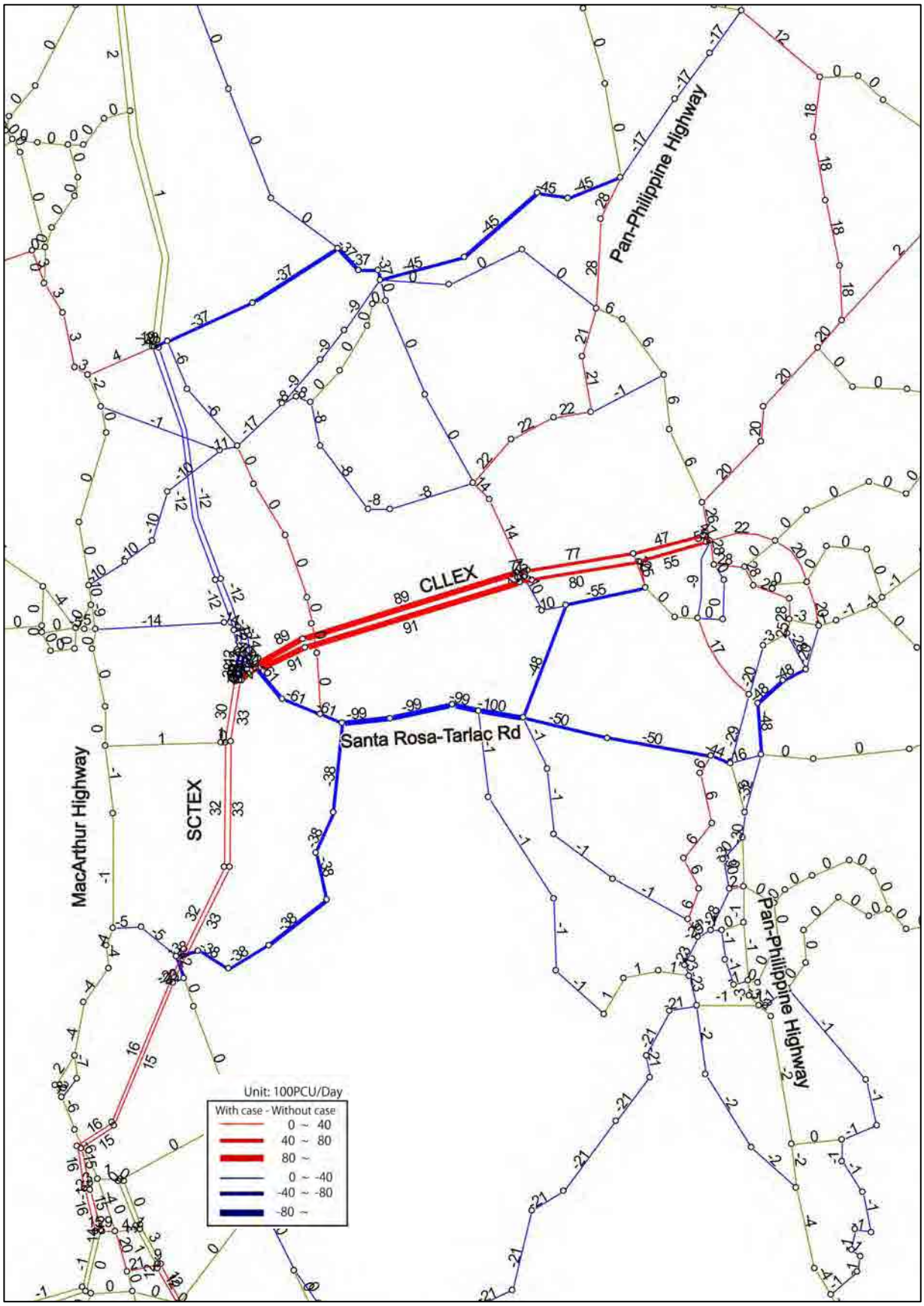


FIGURE 4.2.7-8 COMPARISON OF WITH CASE AND WITHOUT CASE IN YEAR 2020 (PHASE-1, 2-LANE)

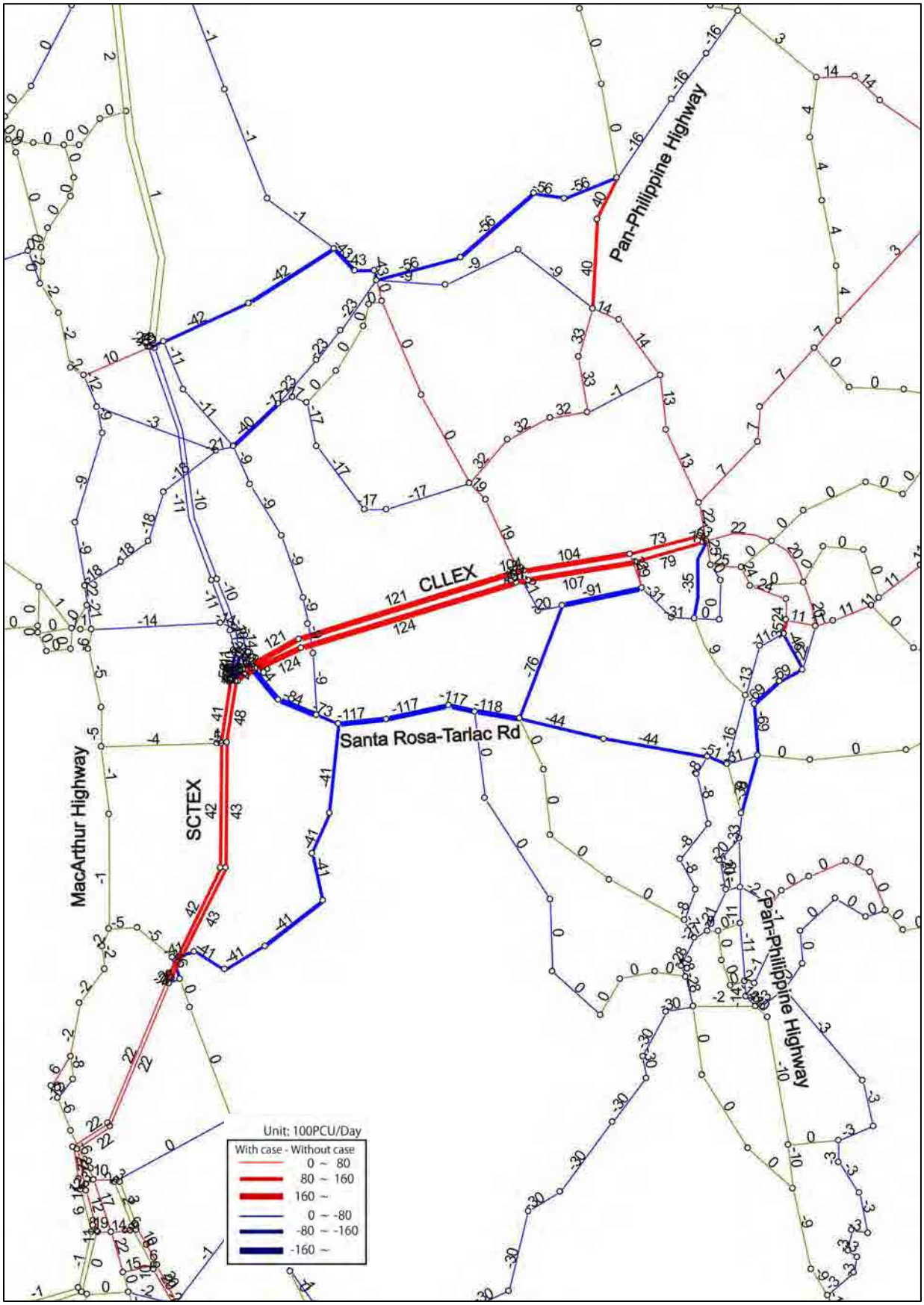
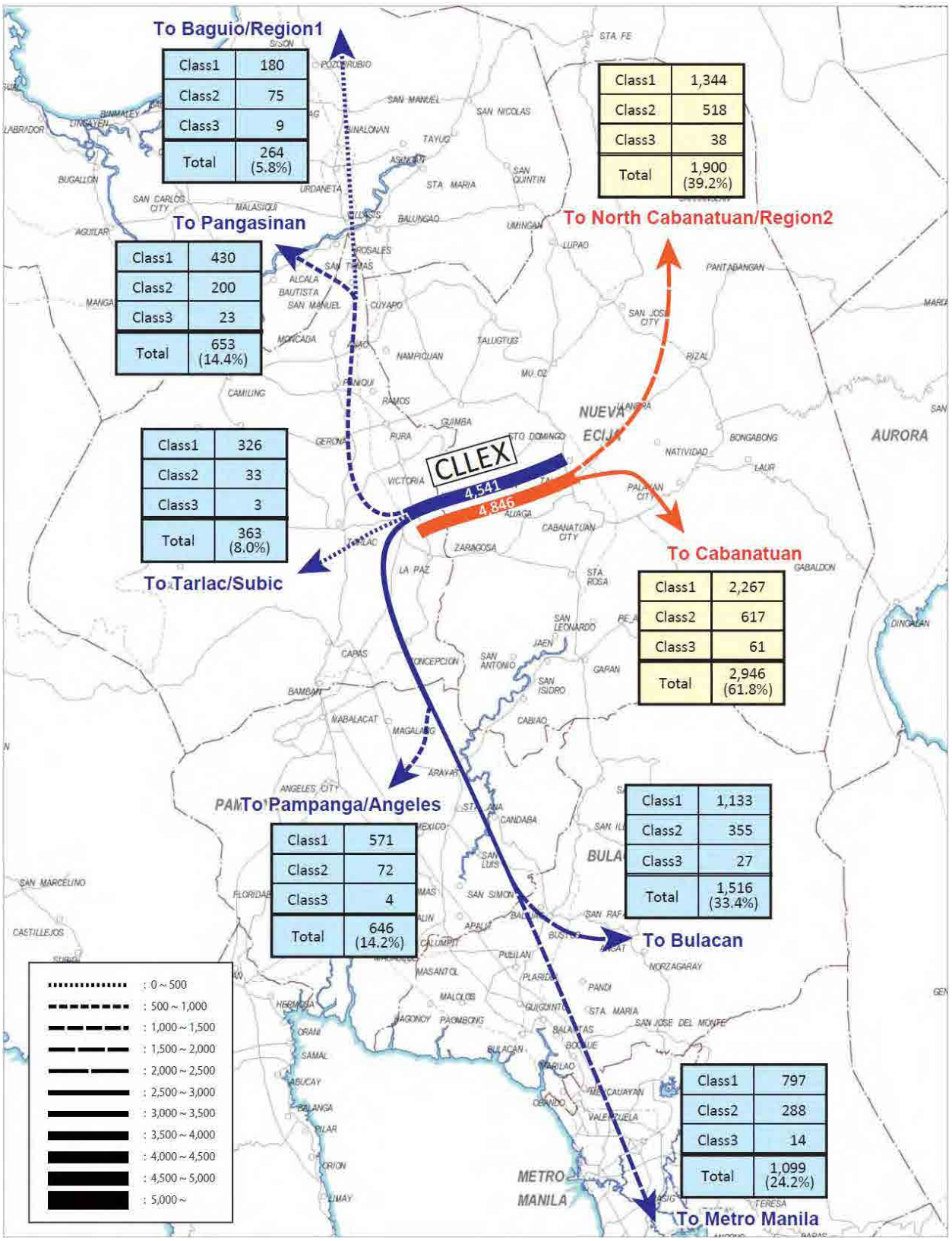
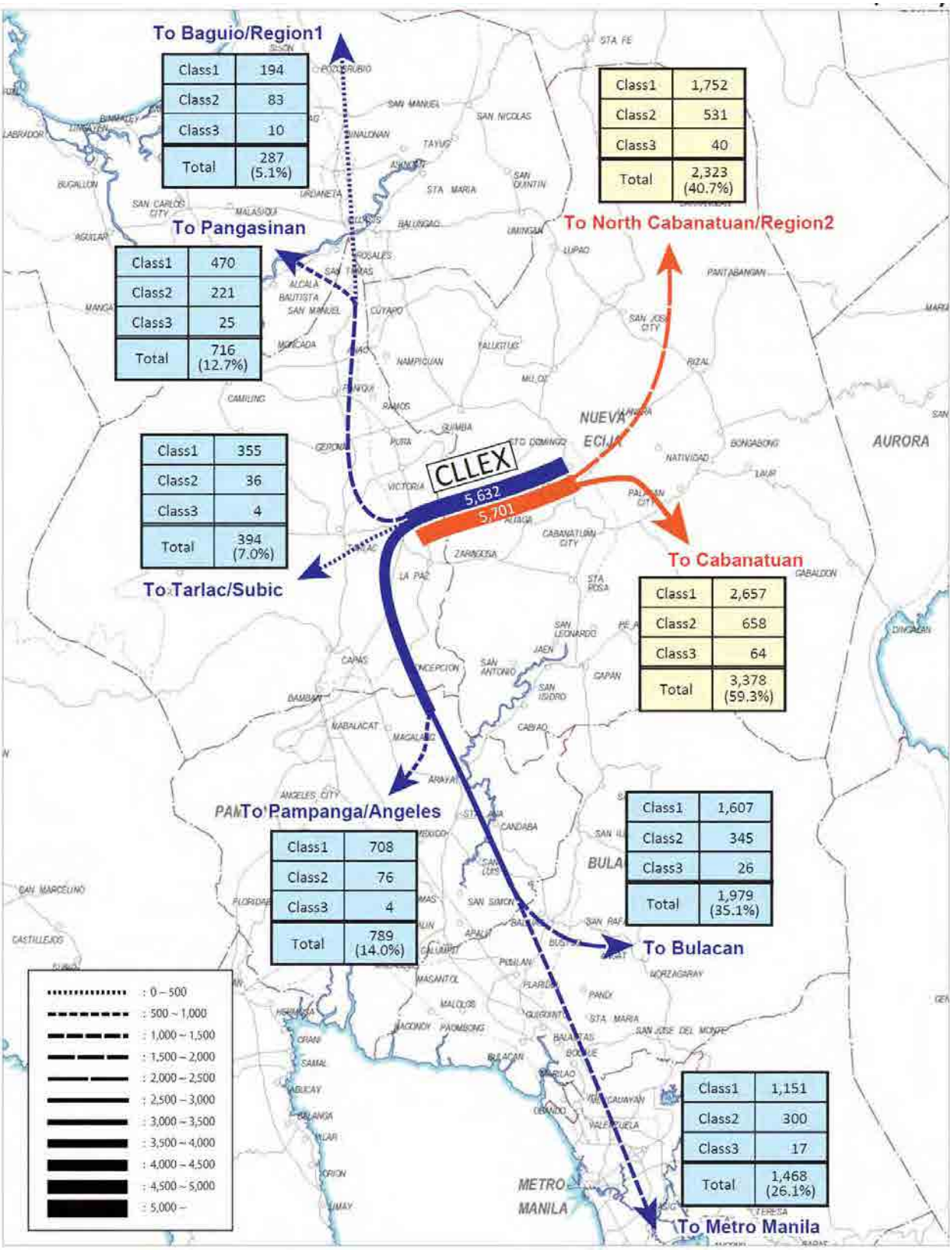


FIGURE 4.2.7-9 COMPARISON OF WITH CASE AND WITHOUT CASE IN YEAR 2030 (PHASE-1, 2-LANE)



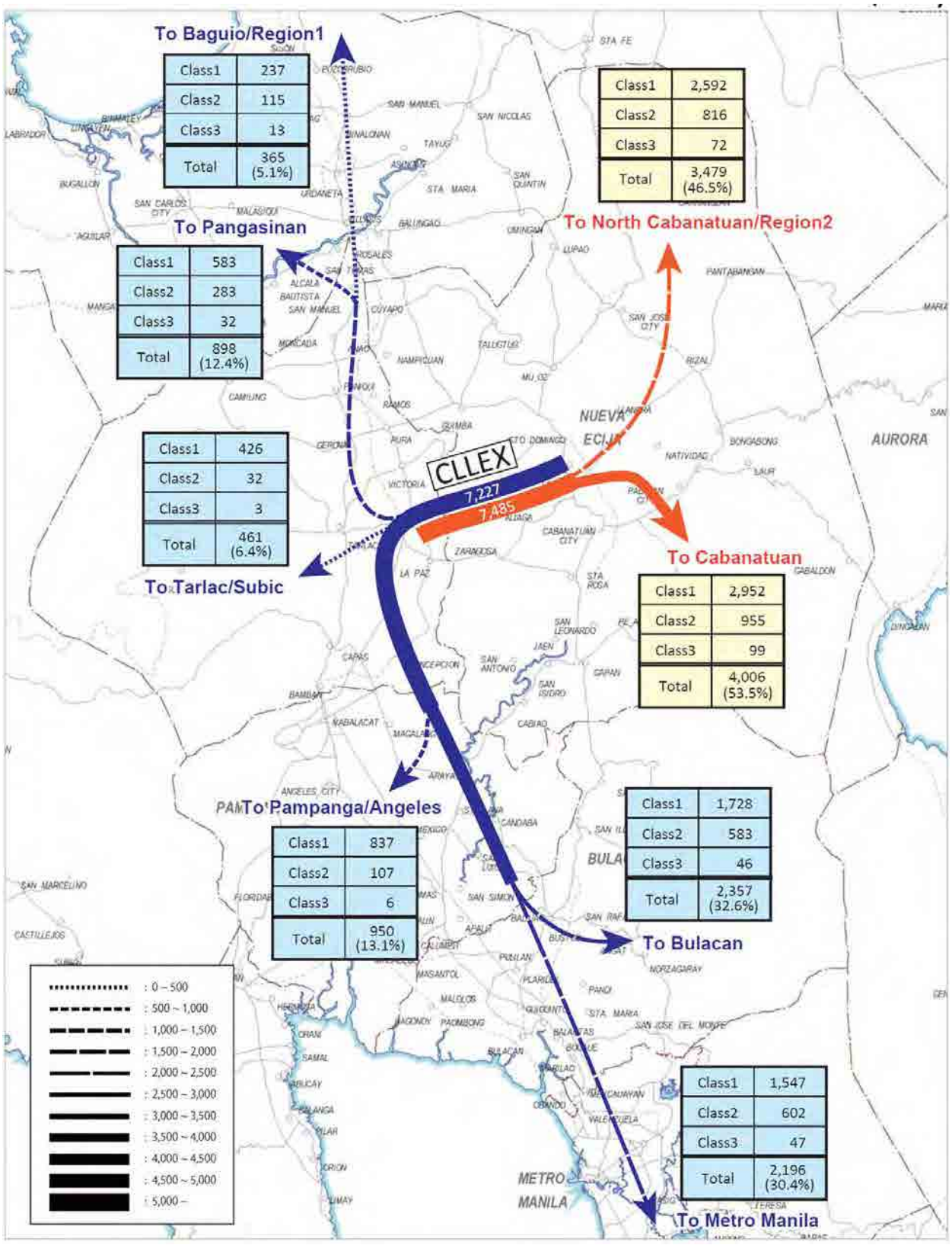
Unit: Vehicle/day

FIGURE 4.2.7-10 TRAFFIC VOLUME OF CLLEX DESTINATION (YEAR 2017) (PHASE 1, 2 LANES)



Unit: Vehicle/day

FIGURE 4.2.7-11 TRAFFIC VOLUME OF CLLEX DESTINATION (YEAR 2020) (PHASE 1, 2 LANES)



Unit: Vehicle/day

FIGURE 4.2.7-12 TRAFFIC VOLUME OF CLLEX DESTINATION (YEAR 2030) (PHASE 1, 2 LANES)

2) Case-2 CLLEX (Phase-1) 4 lane

Figures 4.2.7-13 to **4.2.7-15** shows the estimated traffic volume of CLLEX (Phase-1).

- Traffic assignment of CLLEX (Phase-1) 4lane case is a little higher than that of 2lane case. Traffic volume between Tarlac IC and Aliaga IC are 12,630 (vehicle/day) in year 2017, 14,255 (vehicle/day) in year 2020 and 20,177 (vehicle/day) in year 2030.

Table 4.2.7-3 shows the total traffic volume to enter CLLEX (Phase-1) and total vehicle km of CLLEX(Phase-1).

3) Case-3 CLLEX (Phase-2) 2 lane

Traffic assignment of CLLEX (Phase-2) was estimated based on the assumption of CLLEX (Phase-1) also 2-lane.

Figures 4.2.7-16 to **4.2.7-18** shows the estimated traffic volume of CLLEX (Phase-2).

- Traffic assignment of CLLEX (Phase-2) case is lower than phase-1 traffic. Traffic volume between Cabanatuan IC and Llanera IC are 7,402(vehicle/day) in year 2017, 8,402 (vehicle/day) in year 2020 and 12,984 (vehicle/day) in year 2030.

Figures 4.2.7-19 to **4.2.7-21** shows the number of traffic CLLEX (Phase-1) destination.

Table 4.2.7-4 shows the total traffic volume to enter CLLEX (Phase-2) and total vehicle km of CLLEX (Phase-2).

TABLE 4.2.7-3 TOTAL TRAFFIC VOLUME AND TOTAL VEHICLE KM (CLLEX PHASE-1, 4-LANE)

Year	Traffic Volume (Veh/day)				Total vehicle*km			
	Class1	Class2	Class3	Total	Class1	Class2	Class3	Total
2017	9,502	2,886	241	12,629	256,672	78,158	6,321	341,151
2018	9,967	2,933	246	13,147	267,212	79,654	6,489	353,355
2019	10,455	2,981	252	13,688	278,185	81,179	6,660	366,025
2020	10,967	3,030	257	14,254	289,609	82,733	6,837	379,179
2021	11,349	3,141	267	14,758	299,881	85,845	7,134	392,859
2022	11,745	3,257	278	15,280	310,517	89,073	7,443	407,034
2023	12,155	3,376	289	15,820	321,530	92,423	7,767	421,720
2024	12,578	3,500	301	16,379	332,934	95,899	8,104	436,937
2025	13,017	3,629	313	16,959	344,743	99,506	8,455	452,704
2026	13,471	3,762	325	17,558	356,970	103,249	8,822	469,041
2027	13,940	3,900	339	18,179	369,631	107,132	9,205	485,968
2028	14,426	4,044	352	18,822	382,741	111,161	9,605	503,507
2029	14,929	4,192	366	19,488	396,316	115,342	10,022	521,680
2030	15,450	4,346	381	20,177	410,372	119,680	10,457	540,509
2031	15,989	4,506	396	20,891	424,927	124,181	10,911	560,019
2032	16,546	4,671	412	21,629	439,998	128,852	11,385	580,234
2033	17,123	4,843	429	22,394	455,604	133,698	11,879	601,180
2034	17,720	5,021	446	23,187	471,763	138,726	12,394	622,884
2035	18,338	5,205	464	24,007	488,495	143,944	12,932	645,372
2036	18,977	5,396	483	24,856	505,821	149,358	13,494	668,673
2037	19,639	5,594	502	25,735	523,762	154,975	14,079	692,816
2038	20,324	5,800	522	26,645	542,338	160,804	14,691	717,833
2039	21,032	6,013	543	27,588	561,574	166,851	15,328	743,754
2040	21,766	6,234	565	28,564	581,492	173,127	15,994	770,612
2041	22,524	6,463	588	29,574	602,116	179,638	16,688	798,442
2042	23,310	6,700	611	30,621	623,471	186,394	17,412	827,278
2043	24,122	6,946	636	31,704	645,584	193,405	18,168	857,157
2044	24,963	7,201	661	32,826	668,482	200,679	18,957	888,118
2045	25,834	7,466	688	33,987	692,191	208,226	19,780	920,198
2046	26,735	7,740	715	35,190	716,742	216,058	20,638	953,438

4-LANE

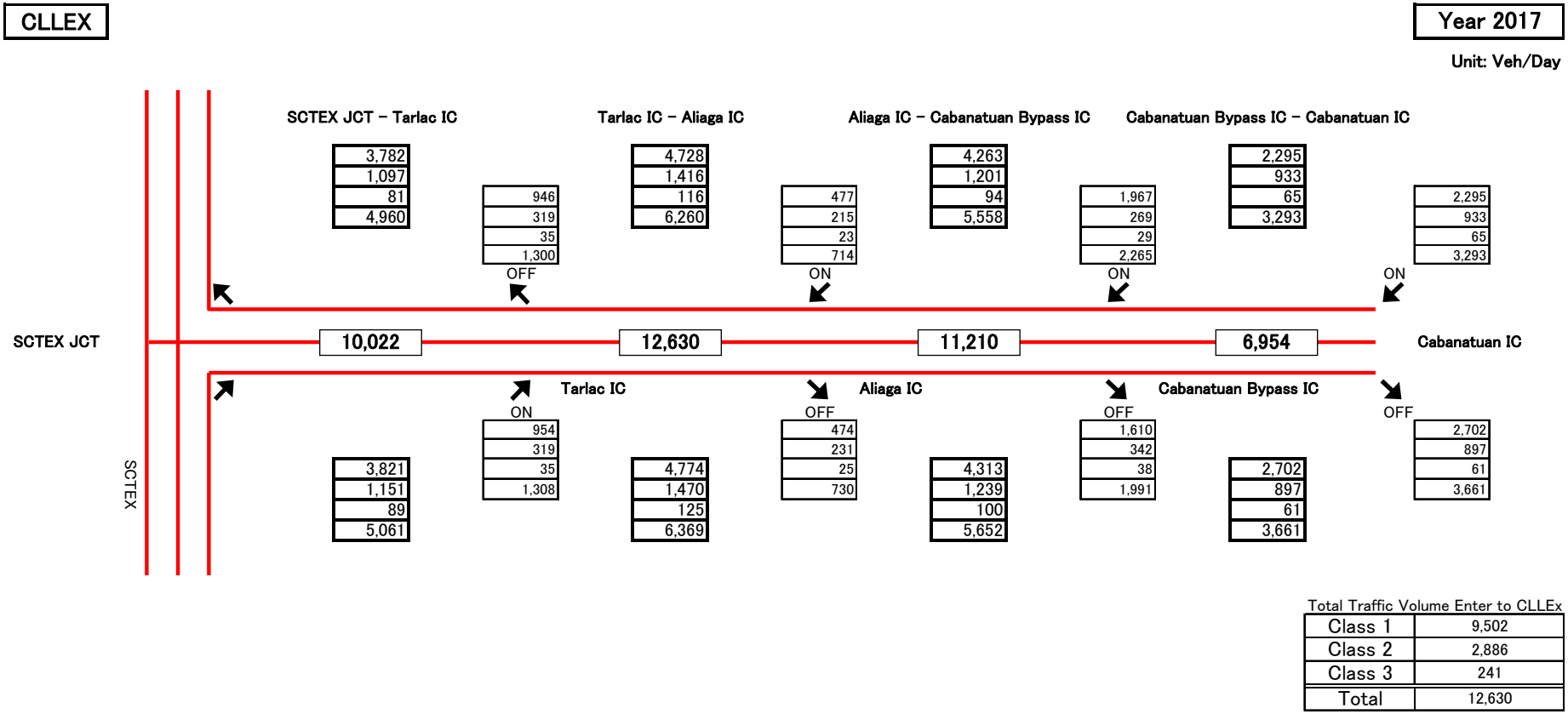
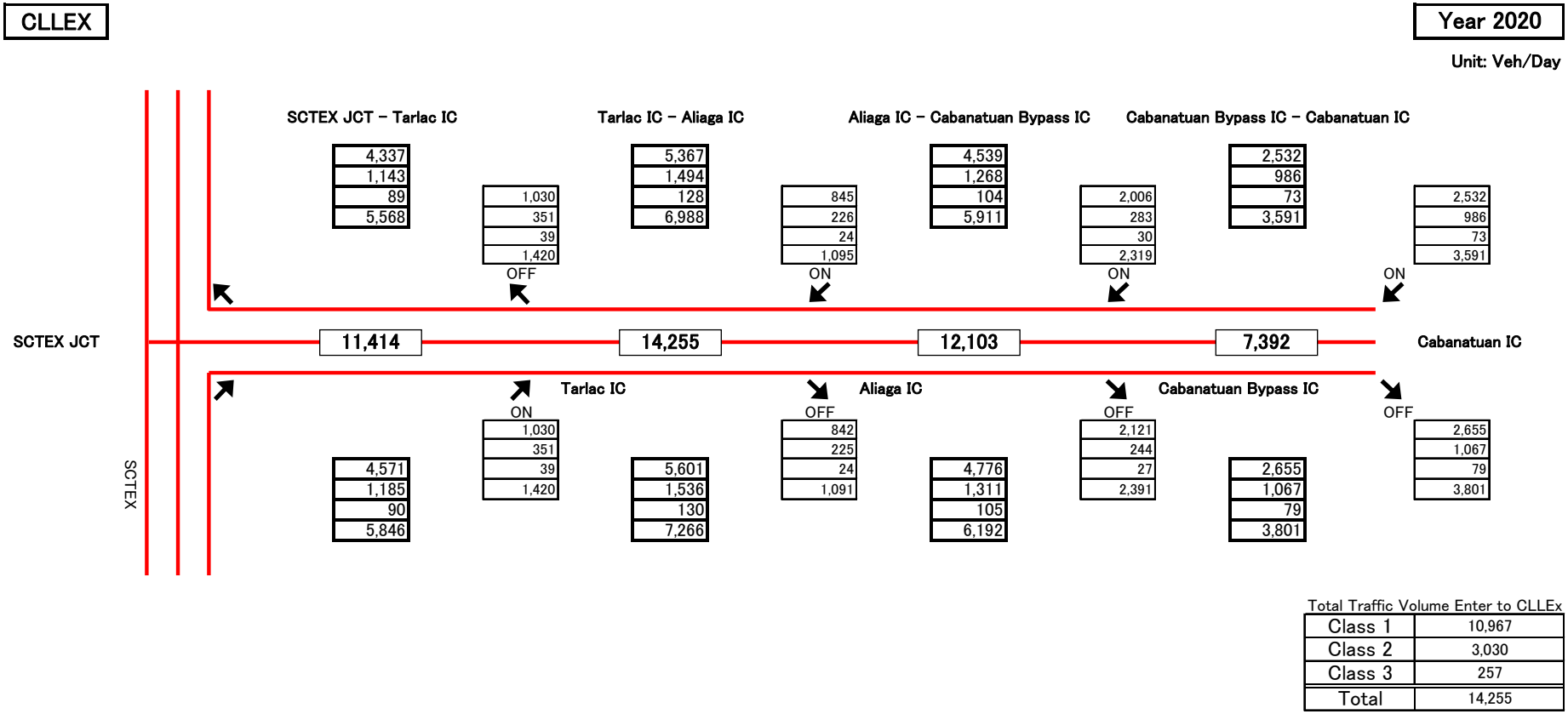


FIGURE 4.2.7-13 TRAFFIC PROJECTION (YEAR 2017) OF CLLEX (PHASE-1) 4-LANE CASE

4-LANE

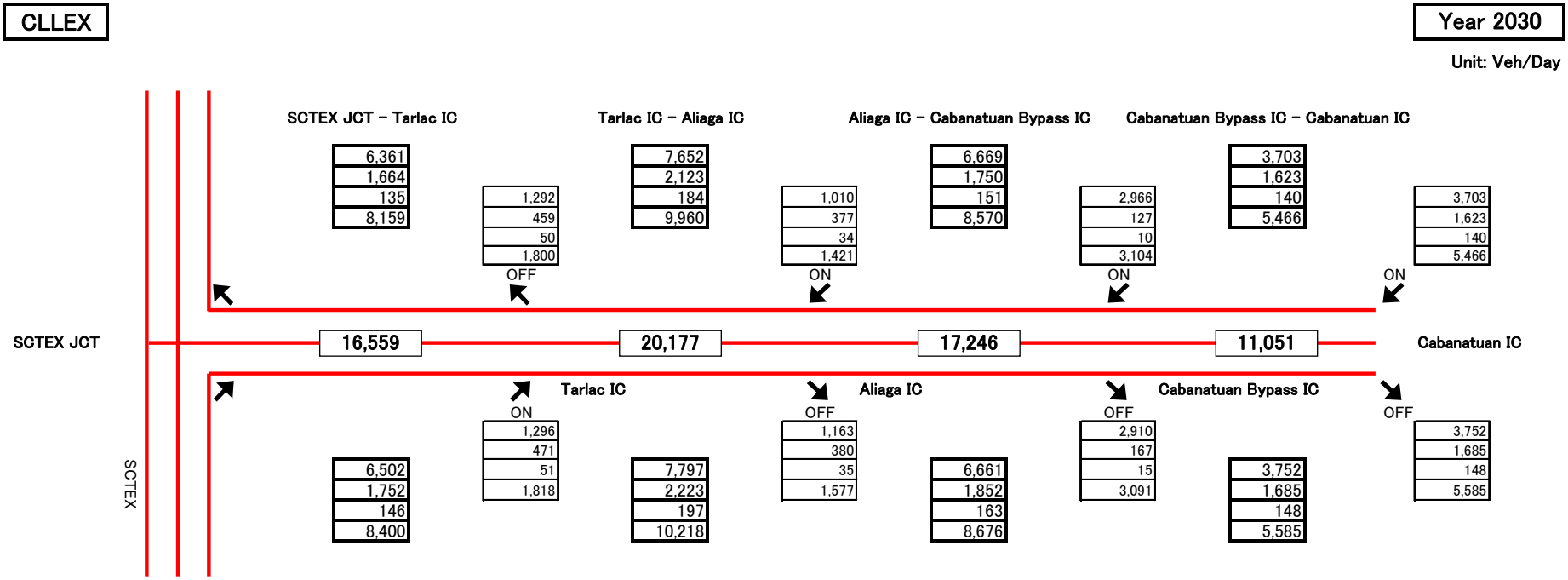


Total Traffic Volume Enter to CLLEx

Class 1	10,967
Class 2	3,030
Class 3	257
Total	14,255

FIGURE 4.2.7-14 TRAFFIC PROJECTION (YEAR 2020) OF CLLEX (PHASE-1) 4-LANE CASE

4-LANE



Total Traffic Volume Enter to CLLEx

Class 1	15,450
Class 2	4,346
Class 3	381
Total	20,177

FIGURE 4.2.7-15 TRAFFIC PROJECTION (YEAR 2030) OF CLLEX (PHASE-1) 4-LANE CASE

TABLE 4.2.7-4 TOTAL TRAFFIC VOLUME AND TOTAL VEHICLE KM (CLLEX PHASE-2, 2-LANE)

Year	Traffic Volume (Veh/day)				Total vehicle*km			
	Class1	Class2	Class3	Total	Class1	Class2	Class3	Total
2017	5,583	1,875	159	7,617	190,890	66,585	5,667	263,142
2018	5,865	1,915	163	7,944	200,733	68,020	5,793	274,547
2019	6,162	1,957	166	8,285	211,084	69,487	5,922	286,493
2020	6,474	1,999	170	8,643	221,968	70,985	6,054	299,007
2021	6,769	2,077	177	9,023	232,266	73,744	6,302	312,312
2022	7,077	2,158	184	9,419	243,042	76,609	6,561	326,213
2023	7,399	2,242	192	9,833	254,318	79,587	6,830	340,735
2024	7,736	2,329	200	10,265	266,117	82,680	7,111	355,907
2025	8,088	2,420	208	10,716	278,464	85,893	7,402	371,759
2026	8,457	2,514	217	11,187	291,383	89,231	7,706	388,320
2027	8,842	2,612	226	11,679	304,902	92,698	8,022	405,622
2028	9,244	2,714	235	12,193	319,048	96,301	8,352	423,700
2029	9,665	2,819	245	12,729	333,850	100,043	8,694	442,587
2030	10,105	2,929	255	13,289	349,339	103,931	9,051	462,321
2031	10,565	3,043	266	13,874	365,547	107,970	9,422	482,939
2032	11,046	3,162	277	14,484	382,506	112,166	9,809	504,481
2033	11,549	3,285	288	15,122	400,253	116,525	10,212	526,989
2034	12,075	3,413	300	15,787	418,822	121,053	10,631	550,506
2035	12,625	3,545	312	16,482	438,254	125,758	11,067	575,078
2036	13,199	3,684	325	17,208	458,586	130,645	11,521	600,752
2037	13,800	3,827	339	17,966	479,862	135,722	11,994	627,578
2038	14,429	3,976	353	18,757	502,126	140,996	12,486	655,608
2039	15,086	4,131	367	19,584	525,422	146,476	12,998	684,896
2040	15,772	4,292	383	20,447	549,799	152,168	13,532	715,499
2041	16,491	4,459	398	21,348	575,307	158,082	14,087	747,475
2042	17,241	4,632	415	22,289	601,998	164,225	14,665	780,888
2043	18,026	4,813	432	23,271	629,928	170,607	15,267	815,802
2044	18,847	5,000	450	24,297	659,153	177,237	15,893	852,284
2045	19,705	5,195	468	25,369	689,735	184,125	16,545	890,405
2046	20,602	5,397	488	26,487	721,735	191,281	17,224	930,240

2-LANE

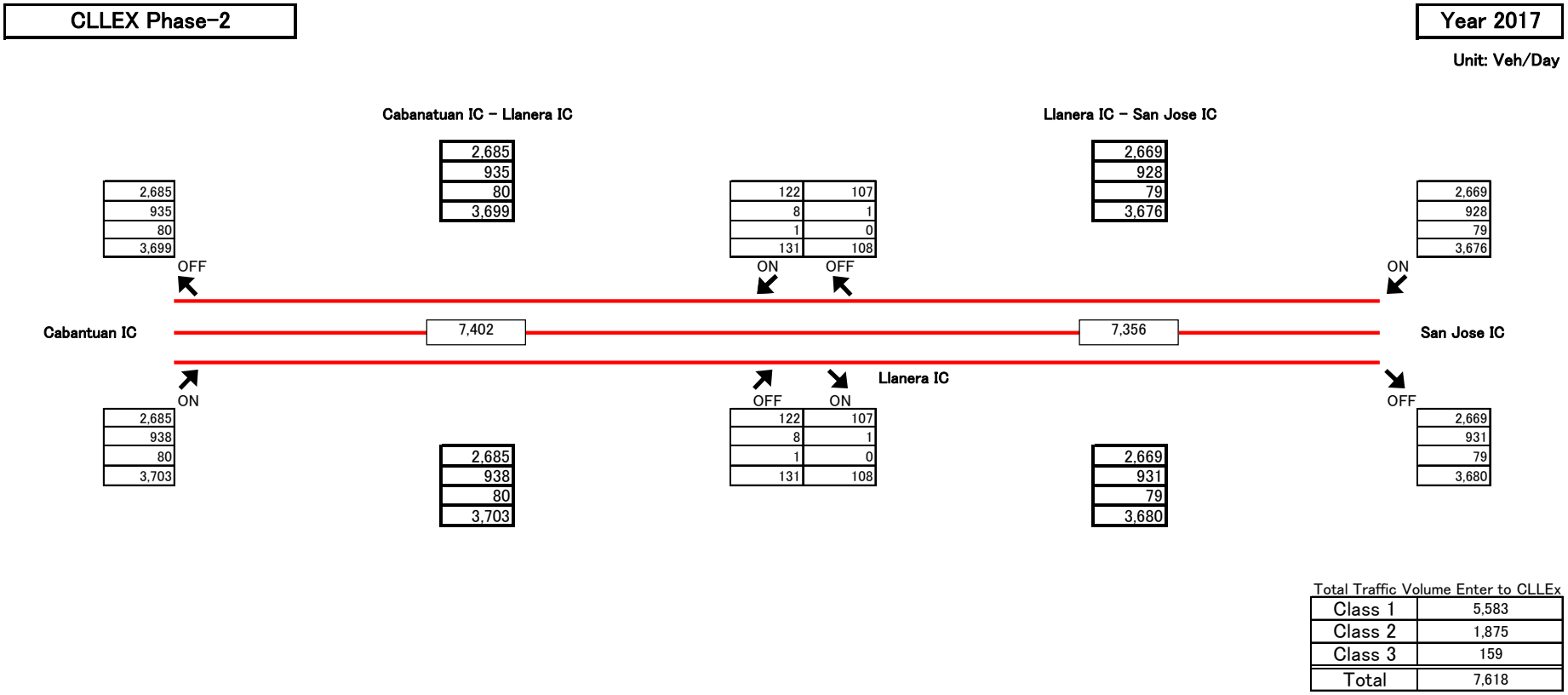


FIGURE 4.2.7-16 TRAFFIC PROJECTION (YEAR 2017) OF CLLEX (PHASE-2) 2-LANE CASE

2-LANE

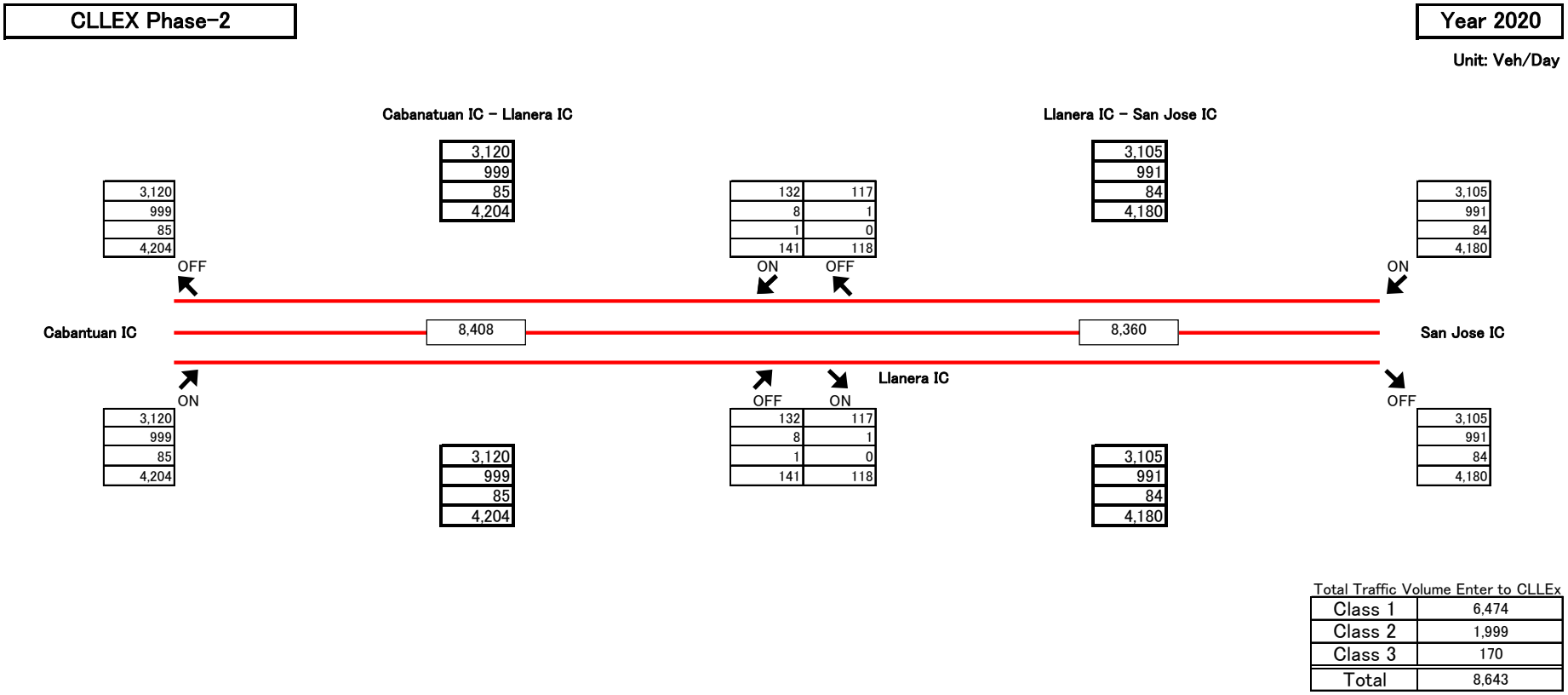


FIGURE 4.2.7-17 TRAFFIC PROJECTION (YEAR 2020) OF CLLEX (PHASE-2) 2-LANE CASE

2-LANE

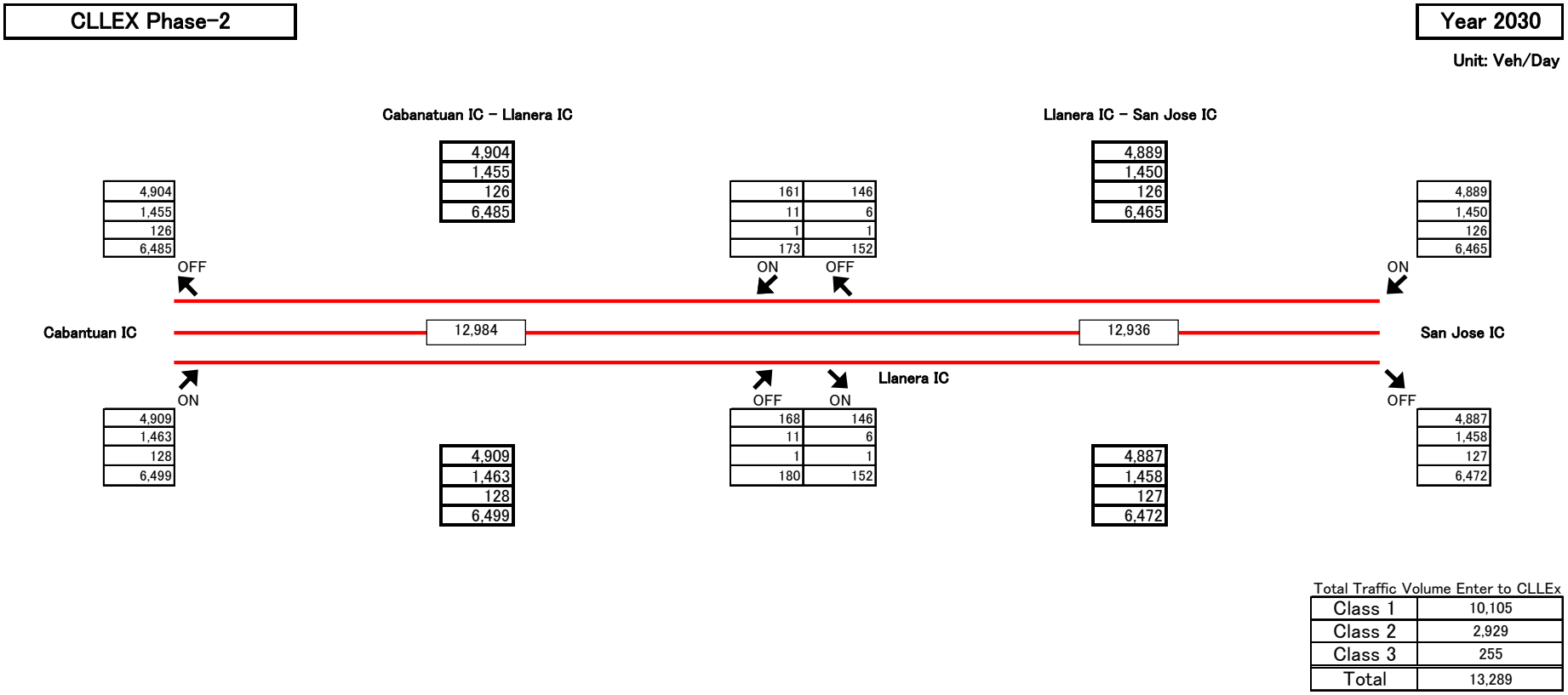


FIGURE 4.2.7-18 TRAFFIC PROJECTION (YEAR 2030) OF CLLEX (PHASE-2) 2-LANE CASE

Year 2017 **Unit: Veh/Day**

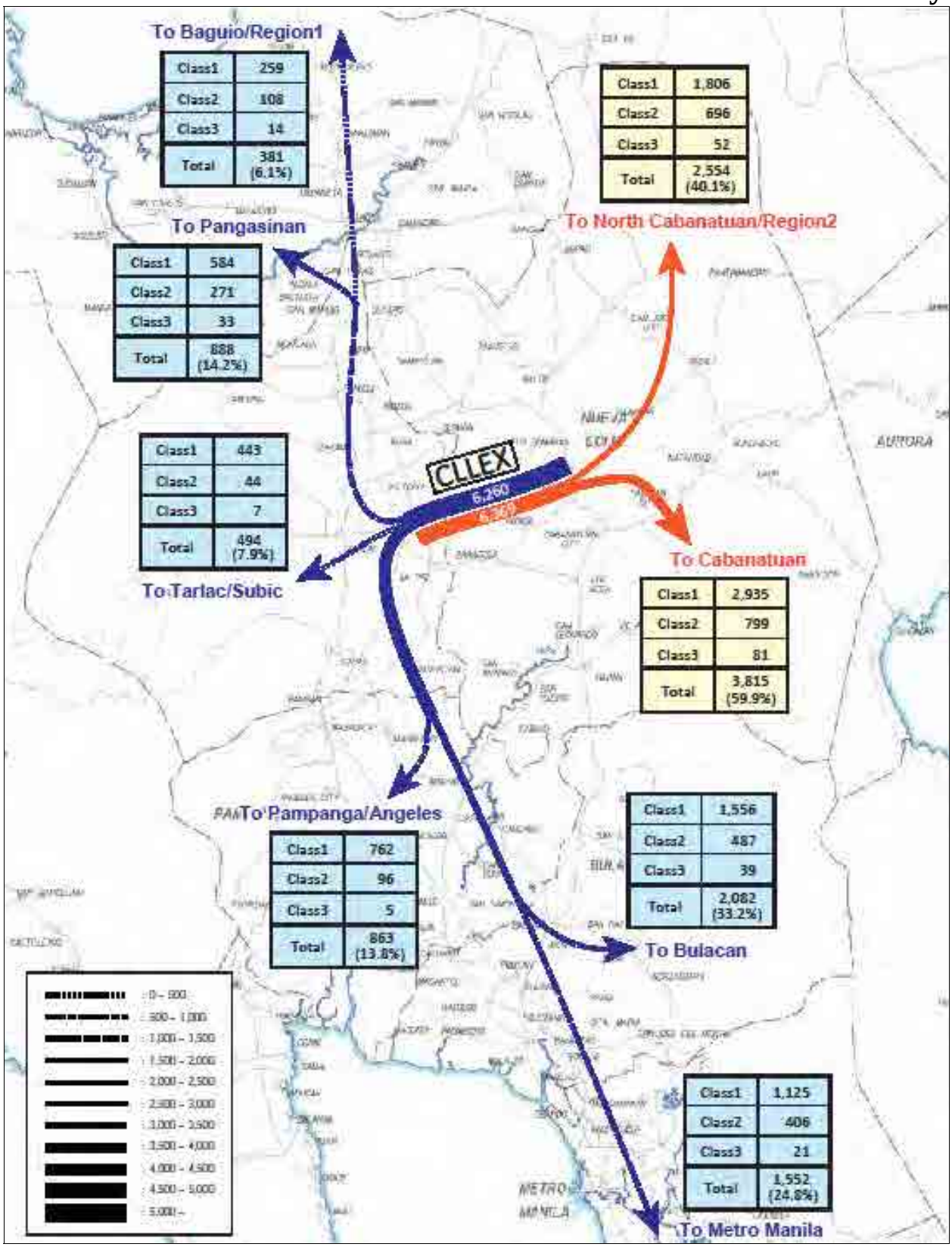


FIGURE 4.2.7-19 TRAFFIC FLOW OF CLLEX PHASE-1 BY DESTINATION (YEAR 2017) 4 LANES

Year 2020 **Unit: Veh/Day**

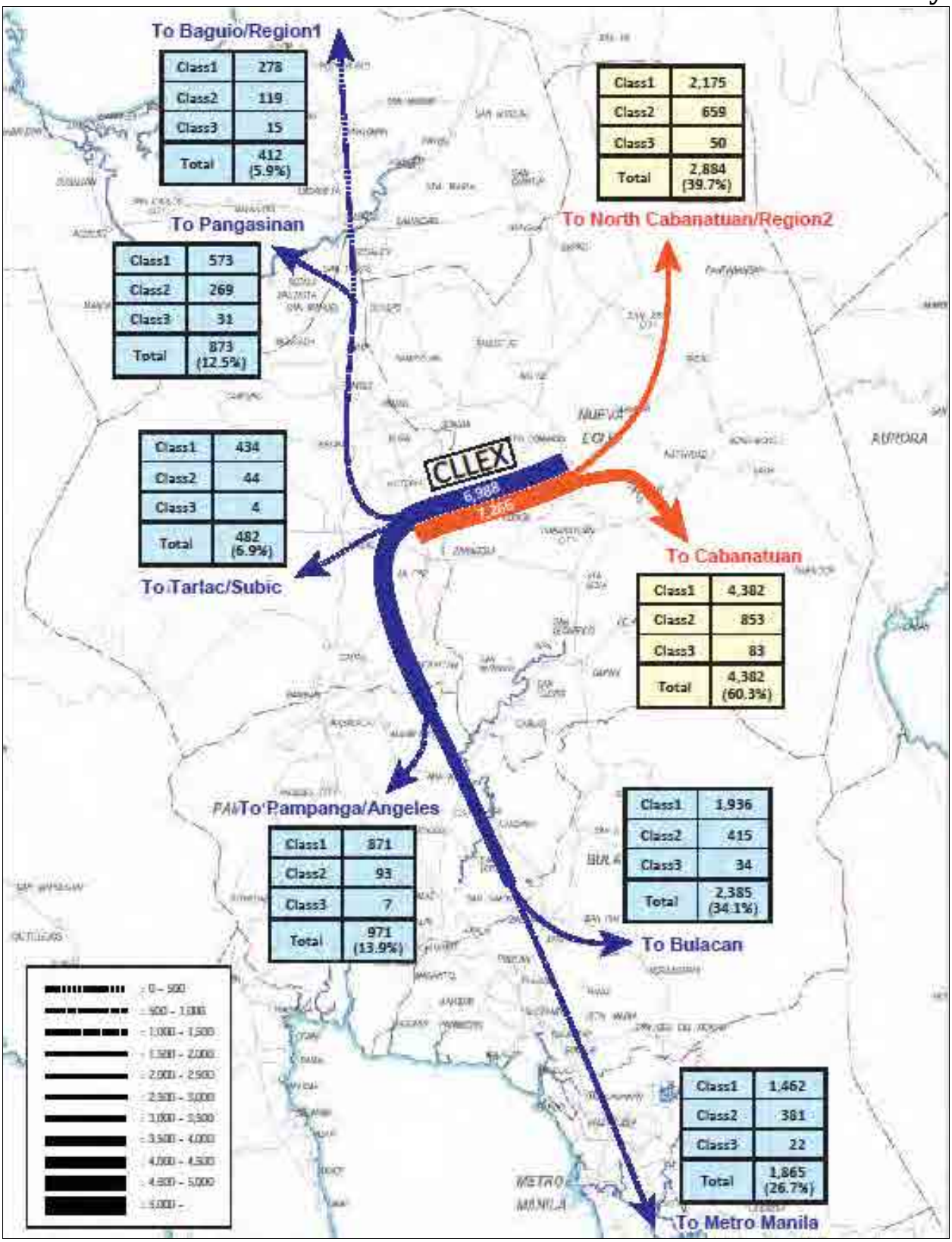


FIGURE 4.2.7-20 TRAFFIC FLOW OF CLLEX PHASE-1 BY DESTINATION (YEAR 2020) 4 LANES

Year 2030 **Unit: Veh/Day**

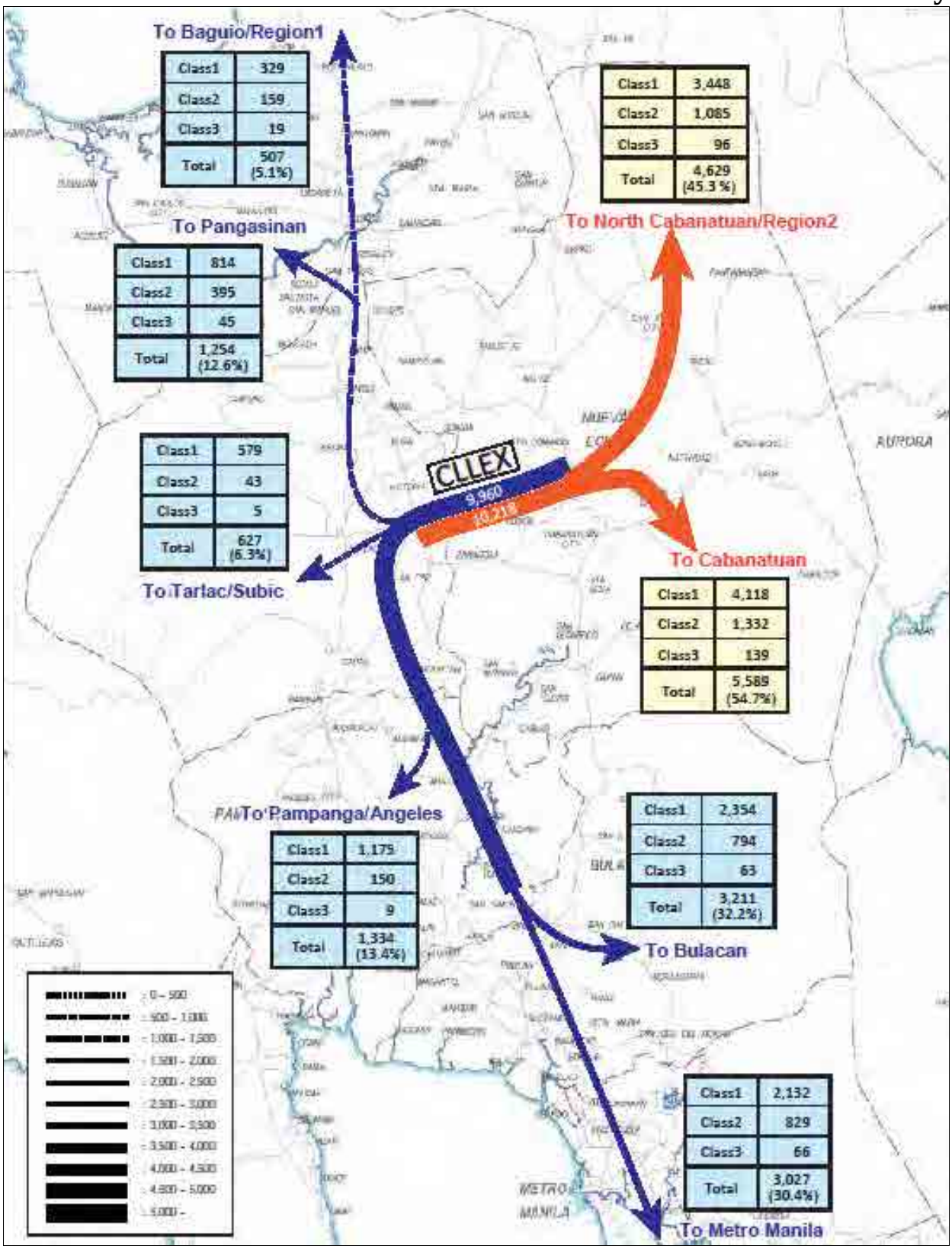


FIGURE 4.2.7-21 TRAFFIC FLOW OF CLLEX PHASE-1 BY DESTINATION (YEAR 2030) 4 LANES

CHAPTER 5
REVIEW OF 2010 FEASIBILITY STUDY

5.1 NECESSITY OF THE PROJECT

1) Traffic Congestion on Pan Philippine Highway

Eastern areas of Region III and whole Region II are served by Pan Philippine Highway, which passes through urban areas at 5-10 km interval. Urban sections of Pan Philippine Highway suffer chronic traffic congestions due to sharp increase of local traffic such as jeepneys and tricycles, and travel speed becomes less than 20 km/hr.

With the completion of SCTEx, some traffic of long distance trips, such as between Metro Manila and Cabanatuan City or Region II, are already diverting to the route of NLEx-SCTEx-Tarlac-Sta. Rosa Road from Pan Philippine Highway. When Tarlac-Sta. Rosa Road is replaced by CLLEx, more traffic will be diverted to this route from Pan Philippine Highway, thus traffic congestion of Pan Philippine Highway will be mitigated.

2) Need of Strengthening of Lateral (East-West) Road Network

Figure 5.1-1 shows the distribution of population in Region III and road network. For north-south direction, traffic is served by NLEx-SCTEx-TPLEx, Manila North Road and Pan Philippine Highway along which major urban centers are distributed. However, road network in the east-west direction is still weak and needs to be strengthened, thereby socio-economic inter-action in that direction is stimulated and overall socio-economic activities will be activated for socio-economic development of the Region and the country as a whole.

3) Need to Develop Regional Growth Pole Cities

Overconcentration of socio-economic activities in Metro Manila has been one of the critical issues of the country. To mitigate such conditions, Regional Gorwth Pole Cities must be developed, so that socio-economic activities of Metro Manila can be shared with such Regional Growth Pole Cities as Tarlac City and Cabanatuan City.

4) Need to Develop Impoverish Area

Pacific Ocean Coastal area in Region III is one of the impoverished areas of the country. Cabanatuan City is the base city (or hub city) for the development of Pacific Ocean Coastal area. If accessibility to Cabanatuan City is improved, the impact will be extended to Pacific Ocean Coastal area.

5) Need to Develop Integrated Multi-modal Logistics/Transport System

In order to achieve faster, safer, more cost effective and reliable logistics/transport system, an expressway network development in the Region is vitally needed.

Approach sections of Rio Chico River Bridge along Tarlac-Sta. Rosa Road which is currently an important to provide transport services in the east-west direction is often flooded and traffic is interrupted. More reliable transport facility is needed.

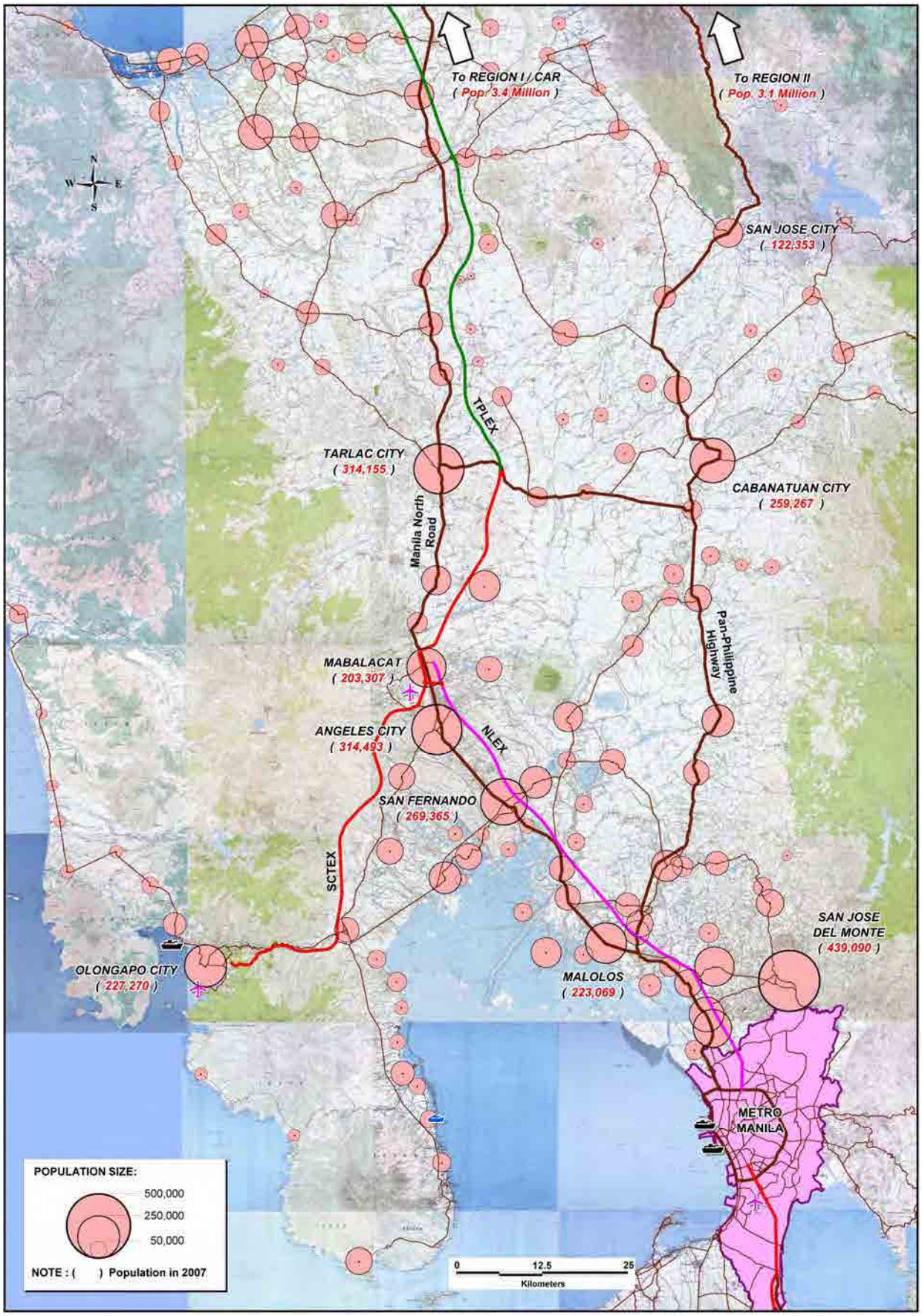


FIGURE 5.1-1 DISTRIBUTION OF POPULATION IN REGION 3 AND ROAD NETWORK

5.2 TECHNICAL ISSUES

5.2.1 Summary of Technical Issues

After thorough review of 2010 FS, the following technical issues were identified (see **Figure 5.2.1-1**);

TECHNICAL ISSUES

- How to connect with SCTEx or TPLEx
- Needs additional interchange at Aliaga Municipality
- Cabanatuan IC location and how to attract more traffic from/to Cabanatuan City
- Appropriate Location of Alignment in the Flood-prone Area
- Toll Collection System
- Need to Study Stage Construction

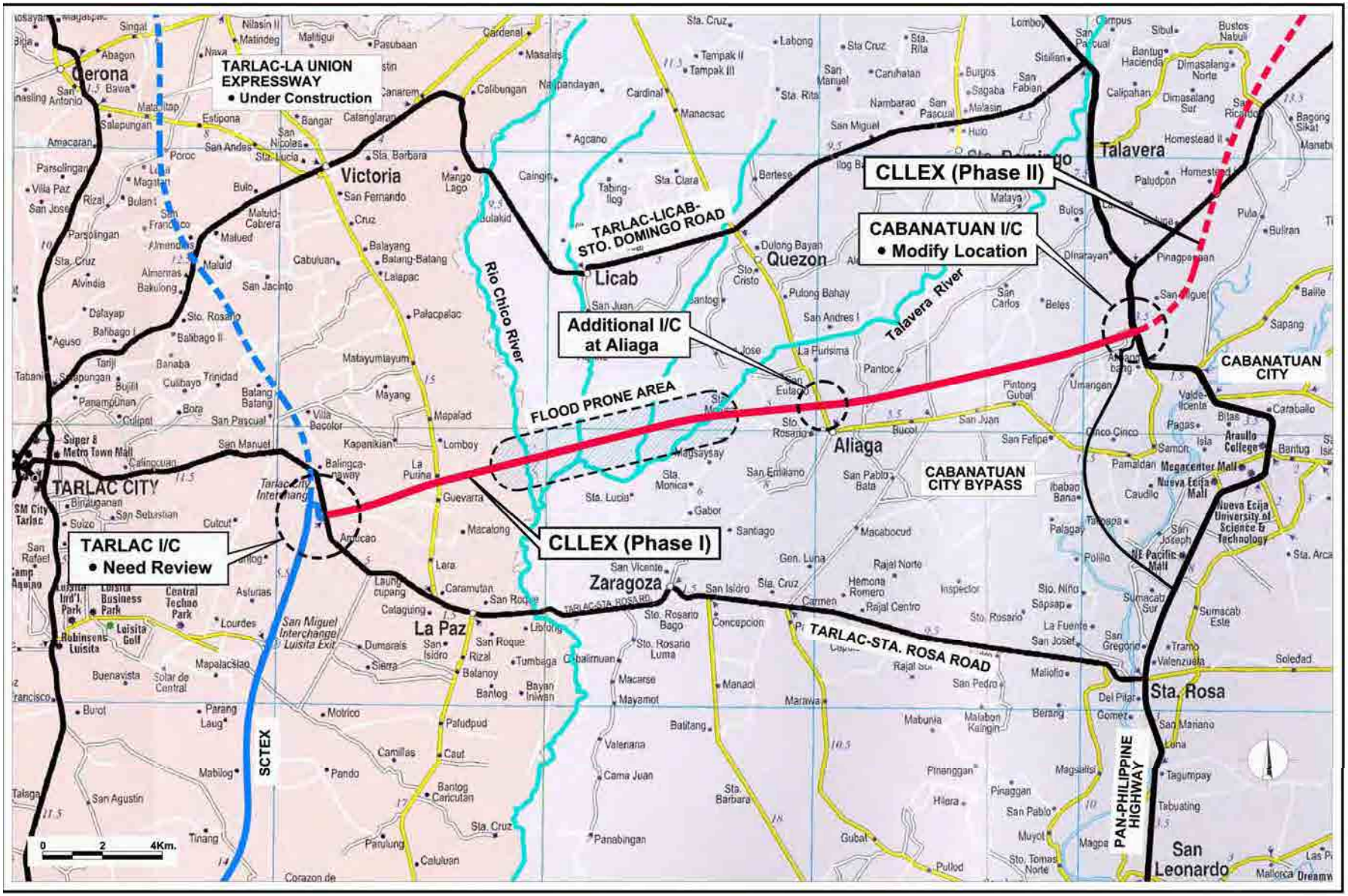


FIGURE 5.2.1-1 TECHNICAL ISSUES OF CLLEX PHASE I

5.2.2 How to connect with SCTEx or TPLEx

2010 FS proposed that CLLEx is to be connected with the existing SCTEx Tarlac Interchange exit/entrance, thus, CLLEx is not directly connected with SCTEx, but is connected via the national road of Tarlac – Sta. Rosa Road. Another new development is that the type of Tarlac Interchange was changed. According to the latest plan of SCTEx and TPLEx, Tarlac Interchange is a half interchange at CLEx and another half interchange at TPLEx as shown in **Figure 5.2.2-1.**

To maintain efficient traffic flow on the expressways, two expressways should be directly connected, but not via national or provincial road. Three (3) alternative connection options were studied (see **Table 5.2.2-1**);

ALTERNATIVES OF CONNECTION POINT

Alternative-1	:	2010 FS Option Proposed by 2010 FS
Alternative-2	:	Direct connection with SCTEx
Alternative-3	:	Direct connection with TPLEx

Traffic volume attracted to CLLEx is about 11,000 veh./day in the proposed opening year of 2017 and approximately composed of the following;

• Traffic between Manila side and Cabanatuan City	:	70%
• Traffic between Pangasinan side and Cabanatuan City	:	20%
• Traffic between Tarlac side and Cabanatuan City	:	10%

As shown above, traffic between Manila side and Cabanatuan City is predominant. Connection point between CLLEx and SCTEx/TPLEx should be selected giving primary consideration of traffic between Manila side and Cabanatuan City.

Evaluation of 3 alternatives is shown in **Table 5.2.2-2**, and Alternative-2 (connected with SCTEx) was recommended due to the following reasons;

- Alternative-2 provides direct connection between 2 expressways.
- Most preferred alternative for traffic between Manila side and Cabanatuan City, which is the predominant traffic flow.

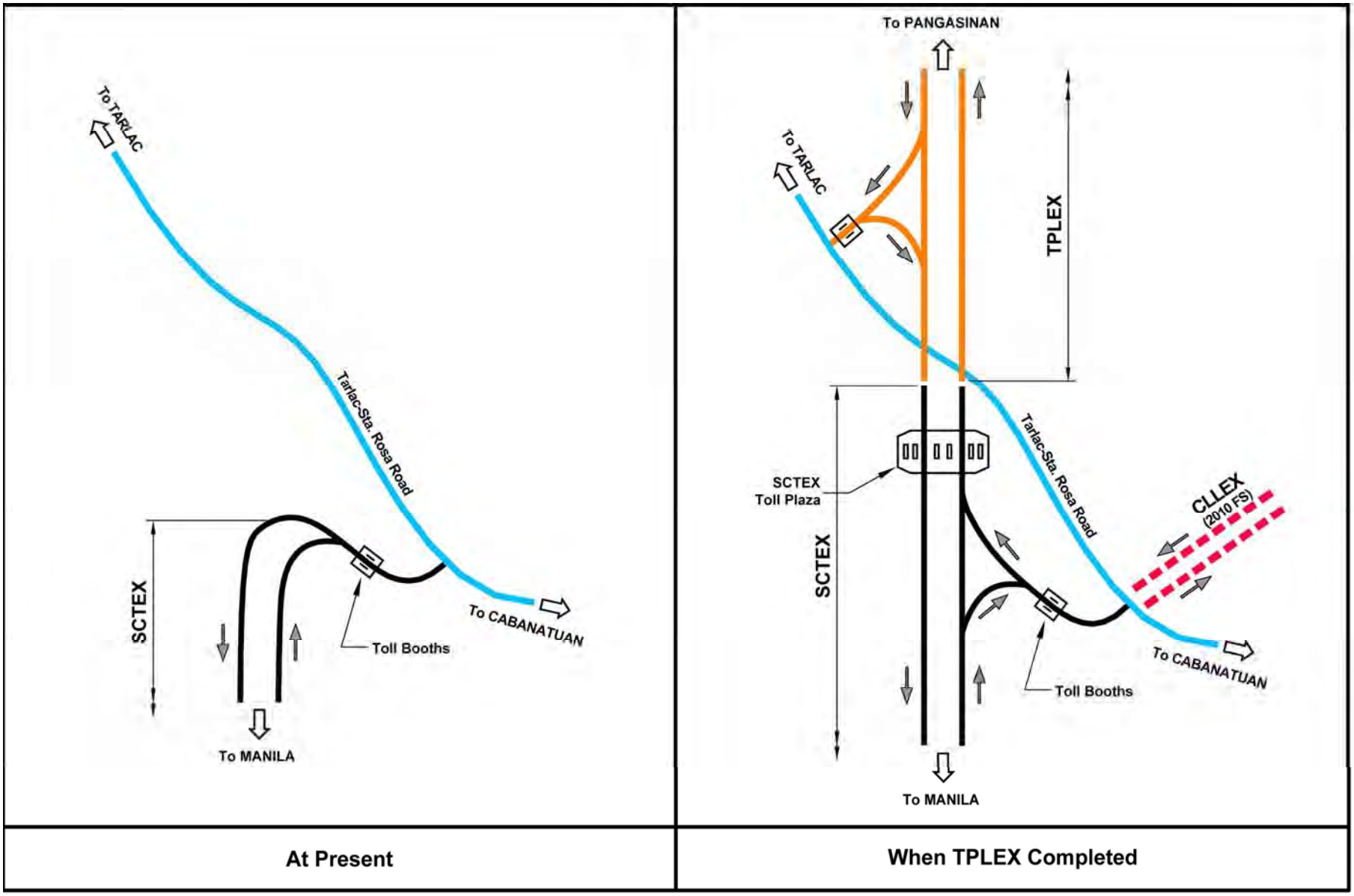


FIGURE 5.2.2-1 CONNECTION BETWEEN SCTEX AND TPLEX

TABLE 5.2.2-1 ALTERNATIVES OF CONNECTION BETWEEN CLLEX AND SCTEX/TPLEX

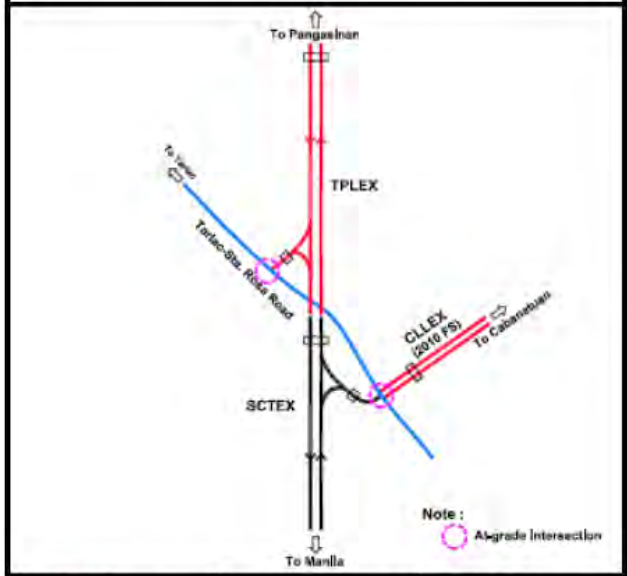
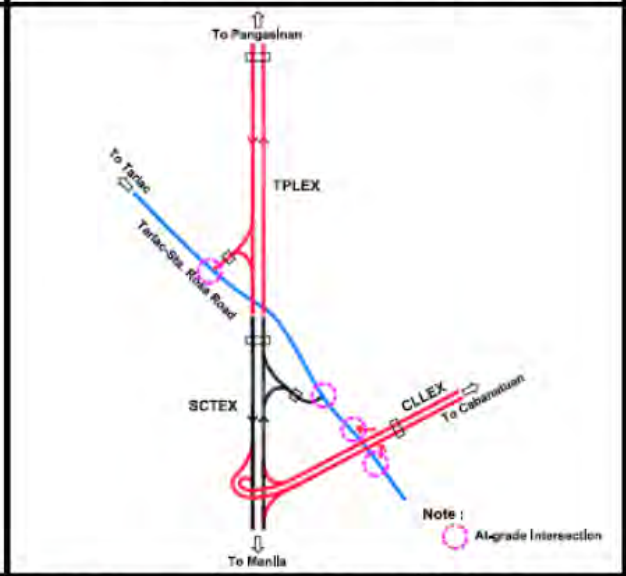
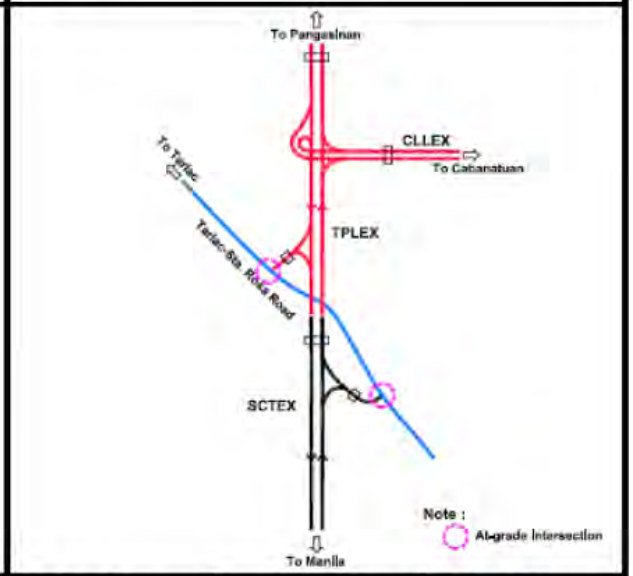
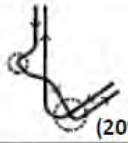
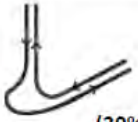
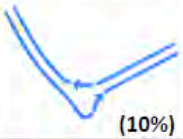
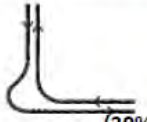
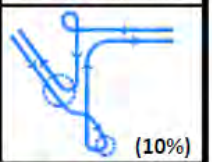
ALTERNATIVE - 1	ALTERNATIVE - 2	ALTERNATIVE - 3
Concept : • Proposed plan by 2010 FS. • CLLEx is connected with SCTEx via Intersection.	**Concept :** • CLLEx is directly connected with SCTEx. • On and off ramps is provided from/to Tarlac-Sta. Rosa Road for better linkage between Tarlac and Cabanatuan.	**Concept :** • CLLEx is directly connected with TPLEx.
		
Manila ⇆ Cabanatuan	Pangasinan ⇆ Cabanatuan	Tarlac ⇆ Cabanatuan
 (70%)	 (20%)	 (10%)
• All via national road • Longer than Alternative-2	• All via national road	• All via national road • Shortest connection
X	X	O
Manila ⇆ Cabanatuan	Pangasinan ⇆ Cabanatuan	Tarlac ⇆ Cabanatuan
 (70%)	 (20%)	 (10%)
• Shortest connection • Best linkage	• Longer than Alternative-3, but traffic is not so high	• Good connection • Longer than Alternative-1
O	△	O
Manila ⇆ Cabanatuan	Pangasinan ⇆ Cabanatuan	Tarlac ⇆ Cabanatuan
 (70%)	 (20%)	 (10%)
• Longest connection	• Shortest connection	• Complicated
△	O	X
Not Recommended	Recommended	Not Recommended

TABLE 5.2.2-2 EVALUATION OF ALTERNATIVES

Traffic Between	Alternative-1	Alternative-2	Alternative-3
From Manila side to Cabanatuan City	• SCTEx off-ramp ⟶ Intersection with National Road ⟶ CLLEx (Travel distance is longer by 2 km than Alternative-2) • Passes 2 toll booths (or 2 stops)	• SCTEx ⟶ CLLEx (Direct), Shortest distance • Passes 1 toll booth (or 1 stop only)	• TPLEx ⟶ CLLEx (Direct), Longer by 7.1 km than Alternative-2. • Passes 2 toll booths (or 2 stops)
	X	◎	△
From Cabanatuan City to Manila side	• CLLEx ⟶ National Road (2.2 km) ⟶ TPLEx IC • Longer by 8.2 km. than Alternative-2. • Passes 3 toll booths (or 3 stops)	• CLLEx ⟶ SCTEx (Direct), shortest distance. • Passes 1 toll booth (or 1 stop only)	• CLLEx ⟶ TPLEx (Direct), Longer by 7.1 km. • Passes 2 toll booths (or 2 stops)
	X	◎	△
From Pangasinan side to Cabanatuan City	• TPLEx off-ramp ⟶ National Road (2.2 km.) ⟶ CLLEx. • Passes 2 toll booths (or 2 stops)	• TPLEx ⟶ SCTEx ⟶ CLLEx (Direct), Longer by 7.1km than Alternative-3.	• TPLEx ⟶ CLLEx (Direct), Shortest • Passes 1 toll booth (or only 1 stop)
	X	△	◎
From Cabanatuan City to Pangasinan side	• CLLEx ⟶ Intersection with National Road ⟶ TPLEx • Passes 2 toll booths (or 2 stops)	• CLLEx ⟶ TPLEx (Direct), Longer by 7.1 km than Alternative-3. • Passes 2 toll booths (or 2 stops)	• CLLEx ⟶ TPLEx (Direct), Shortest • Passes 1 toll booth (or 1 stop only)
	X	△	◎
From Tarlac side to Cabanatuan City	• National Road ⟶ CLLEx • Passes 1 toll booths (or 1 stop only)	• National Road ⟶ CLLEx • Passes 1 toll booth (or 1 stop only)	• National Road ⟶ SCTEx ⟶ TPLEx ⟶CLLEx • Passes 2 toll booths (or 2 stops)
	○	○	X
From Cabanatuan City to Tarlac side	• CLLEx ⟶ National Road • Passes 1 toll booths (or 1 stop only)	• CLLEx ⟶ National Road • Passes 1 toll booth (or 1 stop only)	• CLLEx ⟶ TPLEx ⟶ National Road • Passes 2 toll booths (or 2 stops)
	○	○	X
Overall Evaluation	X Not Recommended	◎ **Recommended**	△ Not Recommended

5.2.3 Needs of Additional Interchange at Aliaga Municipality

2010 FS proposed no interchange between Tarlac and Cabanatuan City for the extension of 28 km. In Japan, the longest interval of interchanges is set at 15 to 25 kms. as follows;

- Maximum Interval : 30 km
- Standard Interval
  - Mega City, Major Industrial Area : 5 ~ 10 km
  - Rural Area with Small to Medium Cities : 15 ~ 25 km
  - Rural Area and Mountainous Area : 20 ~ 30 km

An interval of 28 km is too long and additional exits should be needed during emergency cases.

There is also strong request from the Municipal Government of Aliaga to provide an interchange within the municipality.

In view of the above, it is necessary to add an interchange in the Municipality of Aliaga. Urbanization condition of Aliaga town proper and its vicinity is shown in **Figure 5.2.3-1**. Aliaga Town Proper is traversed by Quezon-Aliaga-Cabanatuan Road. New development site is being developed at the north-west area of Aliaga Town Proper, the Health Center was already built and Aliaga Trading Center and Bus Terminal are currently under construction. CLLEx passes northern periphery of Aliaga Town Proper. Location of Aliaga Interchange was so selected that it is not so far from Aliaga Town Proper and efficient access can be provided to new development site.

Three (3) interchange alternatives were prepared for comparison as shown in **Table 5.2.3-1**, which also shows evaluation of alternatives. Alternative-2 was recommended due to the following reasons;

- It provides efficient access to New Development Site.
- Least construction cost.
- Although two houses are affected, it achieves the minimum ROW acquisition or land take.

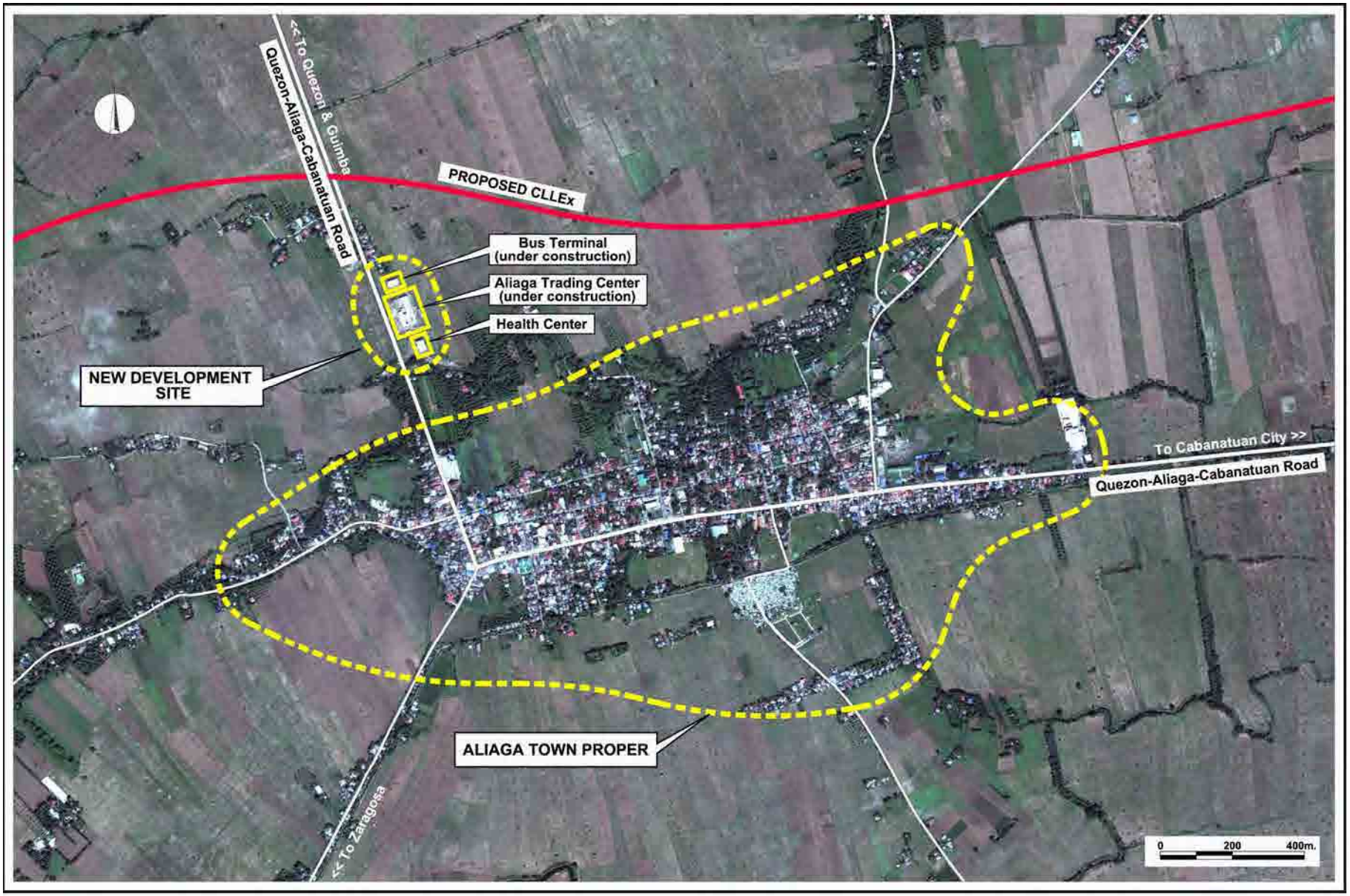
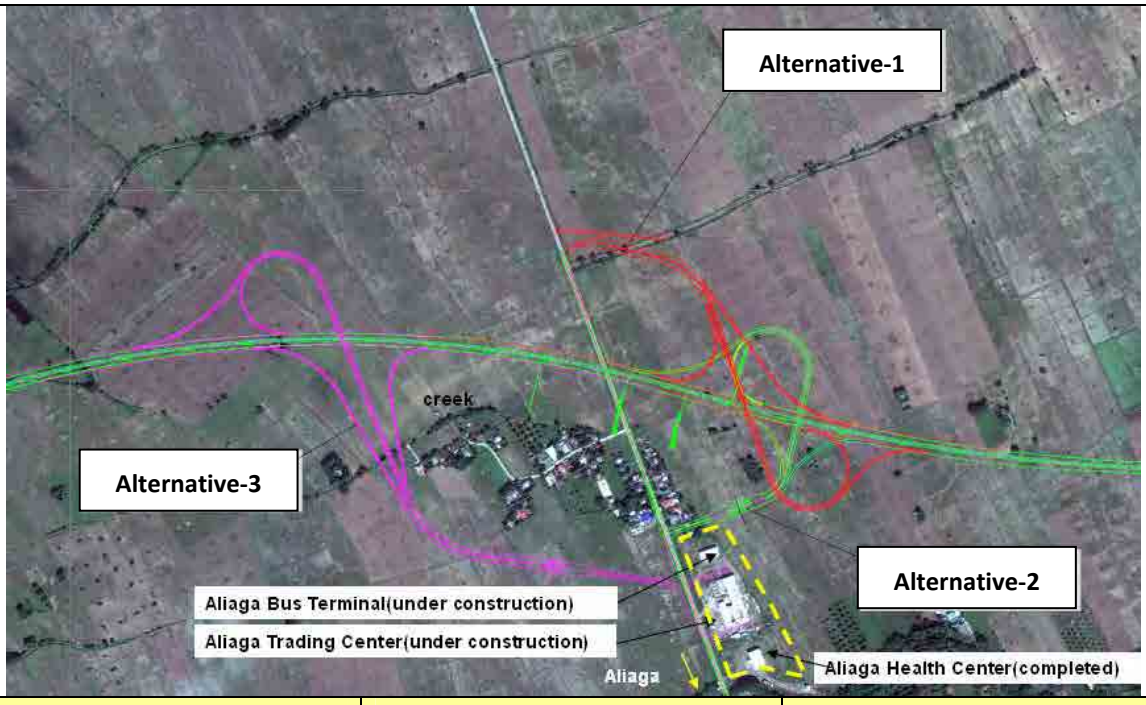


FIGURE 5.2.3-1 ALIAGA TOWN PROPER AND ITS VICINITY

TABLE 5.2.3-1 ALIAGA INTERCHANGE OF COMPARATIVE STUDY

Plan						
	Alternative 1		**Alternative 2**		**Alternative 3**	
Concept	Indirect connection with Aliaga Trading Center		Direct connection with Aliaga Trading Center		Direct connection with Aliaga Trading Center	
Ramp length	1,581m		1,204m		2,081m	
Relocation	0		2 houses		0	
Construction Cost	△	Middle	○	Least	X	Highest
Social Environment	○	No relocation	△	2 houses of relocation	○	No relocation
Natural Environment	△	Medium land take of Agri-land.	○	Smallest land take of Agri-land.	X	Largest land take of Agri-land.
Construction Cost	△	Higher than Alt. 2	○	Lowest	X	Highest
Accessibility to Aliaga Trading Center and Bus Terminal	X	Poor	○	Good	○	Good
Rank	2		**1**	**Recommended**	3	

5.2.4 Cabanatuan IC Location and How to Attract More Traffic To/From Cabanatuan City

1) Cabanatuan IC Location

At the location of Cabanatuan Interchange proposed by 2010 FS, new church was built, thus IC location is required to be re-planned.

The Cabanatuan City Government recommended the following;

- CLLEx center line alignment be shifted to avoid affecting the new church.
- Interchange location be almost at the same location selected by 2010 FS.
- An alignment of the proposed Cabanatuan Ring Road will be selected by the City Government with due consideration of new interchange location.

2010 FS proposed two (2) stages development of the interchange for CLLEx Phase I and Phase II, and ramps constructed during Phase I are proposed to be abandoned during Phase II. The stage development of the interchange is necessary, however, it should be planned to avoid useless investment during Phase-II. Two alternatives were studied and evaluated as shown in **Table 5.2.4-1**. Alternative-2 was recommended, since it can avoid useless investment during Phase-I.

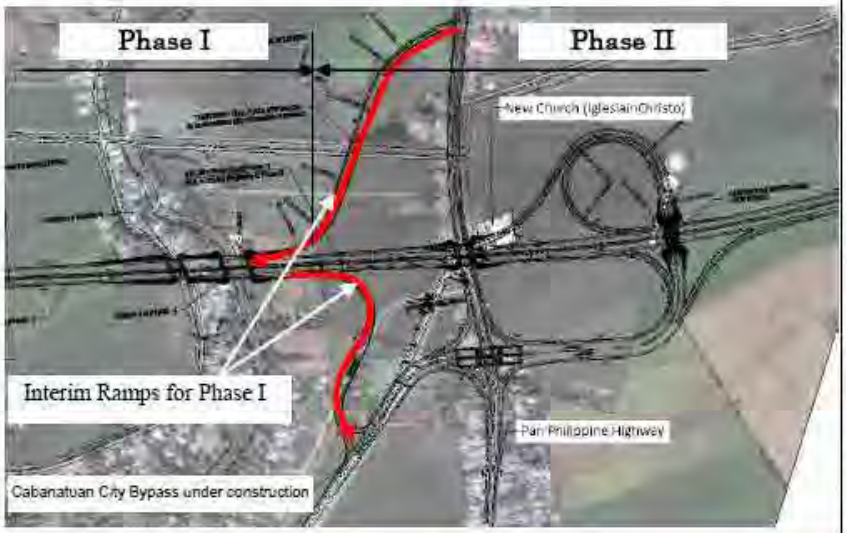
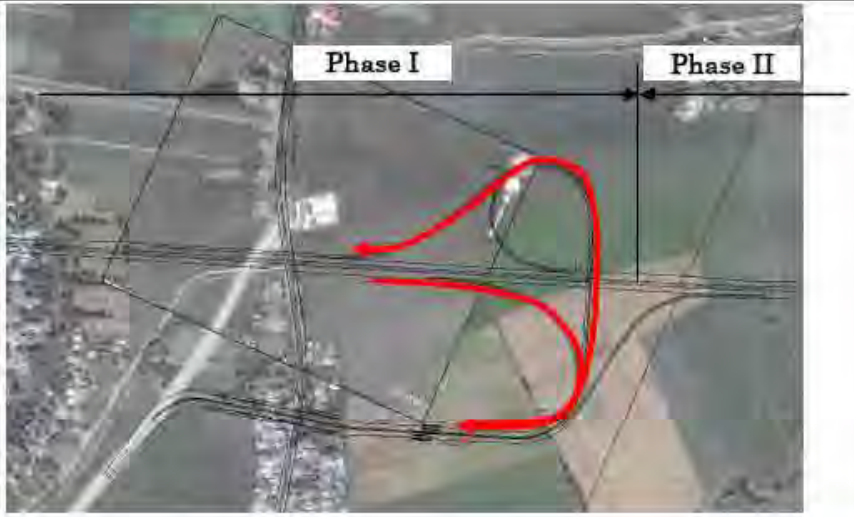
2) How to Attract More Traffic To/From Cabanatuan City

The only road traversing Cabanatuan City in the north-south direction is the Pan-Philippine Highway (or Daang Maharlika) which is heavily congested due to huge number of slow moving vehicles such as tricycles and jeepneys (see **Figure 5.2.4-1**). Travel speed on this road within Cabanatuan City is very slow with less than 15km/hour.

Cabanatuan IC of CLLEx is located at northern periphery of Cabanatuan City, which will attract traffic to/from northern area of Cabanatuan City. Traffic from southern area will rarely utilize Cabanatuan IC, thus some measures is required for traffic generated in southern areas of Cabanatuan City.

It is recommended that another half interchange (only on-ramp and off-ramp from/to southern Cabanatuan City) should be constructed. Traffic generated from southern Cabanatuan City will use City Bypass and Quezon-Aliaga-Cabanatuan Road to access to CLLEx. This Cabanatuan City Bypass Interchange is proposed to be located at about 4 km west of Cabanatuan City Bypass.

TABLE 5.2.4-1 CABANATUAN INTERCHANGE COMPARATIVE STUDY

Plan					
	Alternative 1			**Alternative 2**	
Concept	• Recommended by FS 2010 • To construct interim ramp for Phase I and to construct trumpet type of IC for Phase II • To demolish interim ramp when extension of Phase II is implemented.			• To construct trumpet type of IC with stage development. Two ramps (in red color) is constructed at the initial stage. Remaining two ramps (in black color) is constructed when Phase II is implemented.	
Road Length (Main)	+0m			+200m	
Ramp Length (Phase I)	820m			1,413m	
Relocation	Phase I: 3 houses, Phase II : 12 houses (including new church)			Phase I: 12 houses, Phase II: 0 house	
Social Environment	X	• Relocation of a new church is practically impossible. • Relocation of 3 houses along interim ramps during Phase 1 becomes useless (unnecessary relocation is required).		○	• Unnecessary relocation can be avoided.
Natural Environment	△	• Land acquired for the interim ramps during Phase I becomes useless during Phase II. (Unnecessary land take of agri-land.)		○	• Unnecessary ROW acquisition can be avoided.
Traffic flow of expressway and ordinal road	△	• Phase I: 2 at-grade intersection required. Traffic flow is disturbed at these intersections. • Phase II: 1 at-grade intersection required.		○	• Phase I and II: 1 at-grade intersection. Traffic is less disturbed than Alternative-I.
Phase I Construction Cost	X	• Phase I: Construction cost for interim ramps wasted since these are not used in Phase II.		○	• Unnecessary investment can be avoided.
Rank	2			1	**Recommended**

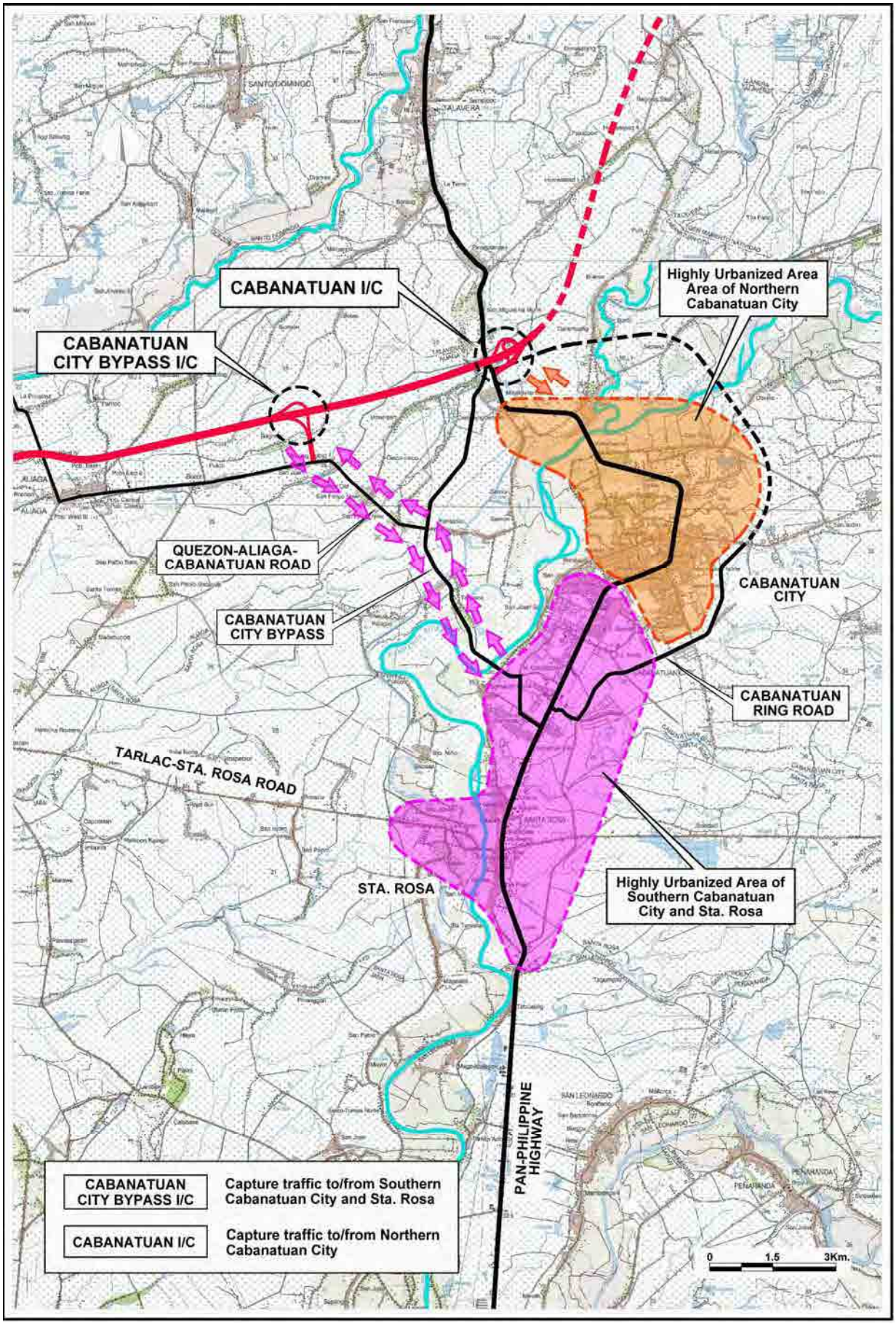


FIGURE 5.2.4-1 NEED OF CABANATUAN CITY BYPASS IC

5.2.5 Appropriate Location of Alignment in the Flood-prone Area

1) Condition of Flood-prone Area

The project has to traverse the flood-prone area. There are two (2) big rivers, namely Rio Chico River and Talavera River. There are other four (4) small rivers. All of these rivers join into one river, and then it is called as Rio Chico River (see **Figure 5.2.5-1**).

- Rio Chico River has a west bank but no east bank at the up-stream side of the confluence point. West bank has damage at the upstream side and the river water flows outside the bank when medium to heavy rainfall occurs.

- The downstream side of Rio Chico River from the confluence point has both west and east banks.

- Talavera River has both west and east banks until near the confluence point, however, west bank ends before it reaches to the confluence point. West bank has damage at Aliaga Municipality and Water flows outside the west bank.

- After the confluence point, Rio Chico River has both west and east banks.

- Discharge of 50-year return period estimated by Feasibility Study on Pampanga Delta Development Project (1982) is as follows;
    - Rio Chico River before the confluence point : 1,260 m^3/sec
    - Talavera River : 1,203 m^3/sec
    - Rio Chico River after the confluence point : 2,463 m^3/sec

- River bed longitudinal slope is very flat at about 1/3,000 (or 0.03%), therefore, velocity of the flood water is estimated as not so fast.

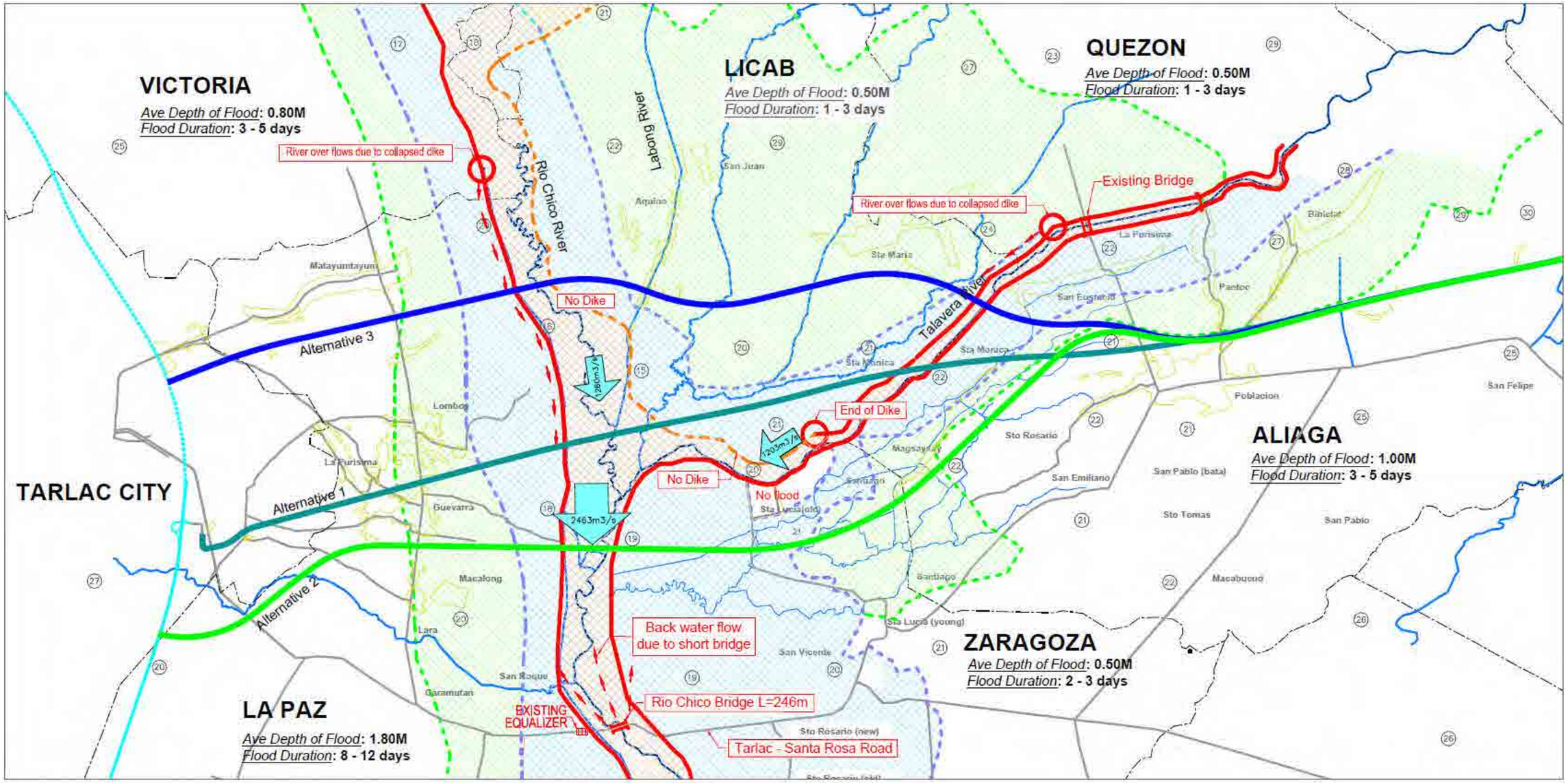
- All rivers overflow the banks and flood area extends for quite wide area.

- At downstream side of Rio Chico River, Tarlac – Sta. Rosa Road crosses this river with the 246 m bridge. West approach of the bridge is provided with the equalizer (or series of box-culverts). The bridge constricts the flood water due to insufficient bridge length, flood water back flows towards upstream side until near the confluence point.

- Flood areas were identified by interviews to municipality officials is shown in **Figure 5.2.5-1**.
    - Ordinary river flow area in orange color
    - Frequent flood area (average 1 time/1-2 years)
    - Past maximum flood area by Typhoon Ondoy/Pepeng in 2009) in green color

- Water velocity in the frequent flood areas (blue area) is very slow except the vicinity of the ordinary river flow area.

- Water velocity in the area (green area) between the frequent flood area and the past maximum flood area is minimal and almost dead water.



Note 1: The flood area was identified by interview to the municipality by the Study Team.
Note 2: The Discharge of 50-year return period is from Feasibility Report on the Pampanga Delta Development Project Feb 1982

LEGEND:
- EXPRESSWAY
- Existing Dike
- Residential Area
- River FlowArea
- Frequent Flood Area (Average 1 time/1-2 years)
- Past Max. Flood Area (Ondoy/Pepeng in 2009)
- Ground Elevation (21)

FIGURE 5.2.5-1 FLOOD CONDITION AT RIO CHICO AND TALAVERA RIVER CONFLUENCE POINT

2) CLLEx Alignment Selection

Three (3) alternative alignments were studied.

Alternative-1: Alignment recommended by 2010 FS.
The alignment starts at SCTEx Tarlac Interchange entrance/exit point. It traverses at slightly upstream side of confluence point of Rio Chico River and Talavera River.

Alternative-2: This alignment starts at SCTEx and traverses at the downstream side of confluence point.

Alternative-3: This alignment starts at TPLEx and passes through the upstream side of confluence point.

TABLE 5.2.5-1 OUTLINE OF ALTERNATIVE ALIGNMENTS

		Alternative-1	Alternative-2	Alternative-3
Starting Point		Existing SCTEx Tarlac Interchange	About 2 km south of SCTEx Tarlac Interchange	About 5.1 km north of SCTEx Tarlac Interchange
Crossing Point in Flood-prone area		About 1.2 km upstream side of confluence point	About 1.2 km downstream side of confluence point	About 4.5 km upstream side of confluence point
Bank Condition	Rio Chico River (upstream)	No east bank	–	No east bank
	Talavera River	East and west banks	–	East and west bank
	Rio Chico River (after 2 rivers merged)	–	East and west banks	–
Bridge Crossing	Rio Chico River (upstream)	Skewed crossing	–	Crossing perpendicular to water flow
	Talavera River	Skewed crossing	–	Crossing perpendicular to water flow
	Rio Chico River (after 2 rivers merged)	–	Crossing perpendicular to water flow	–

Evaluation of alternative alignments is shown in **Table 5.2.5-2**. Alternative-2 was recommended due to the following;

- The most preferred alignment for traffic between Manila side and Cabanatuan City which is dominant traffic on CLLEx.

- The alignment passes through the area where there are banks on both sides of the river; therefore water course is controlled and stable. Flood water overflows the banks, thus enough bridge length needs to be provided.

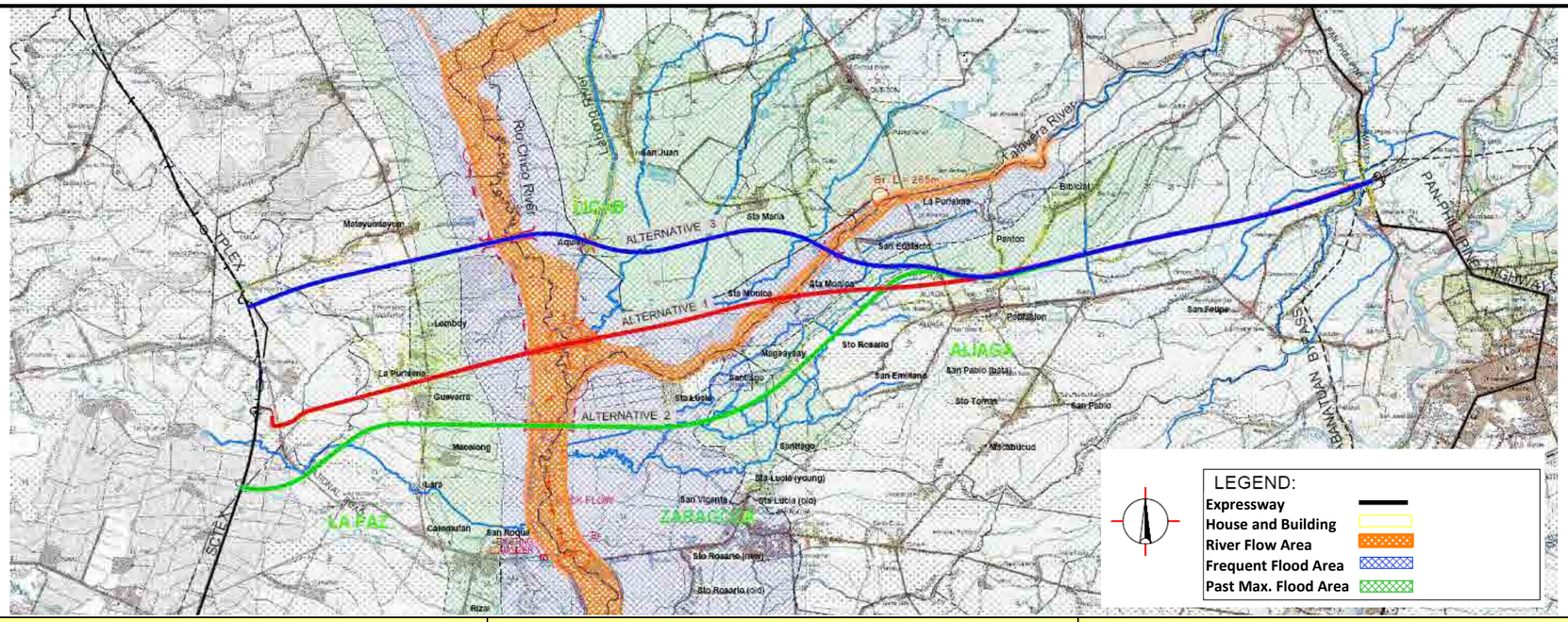
- Number of affected houses is the least.

- Construction cost is the least, although it is almost the same as Alternative-3.

- Alternative-1 passes through the confluent points of two rivers, not appropriate for the alignment to pass.

- From the view point of river crossing location, Alternative-3 is also appropriate, however, from the view points of traffic efficiency, Alternative-3 is not recommended.

TABLE 5.2.5-2 EVALUATION OF ALIGNMENT ALTERNATIVES

Plan						
	Alternative 1		Alternative 2		Alternative 3	
Concept	2010 FS Alignment (Passing at Confluence Point of 2 rivers)		Passing at Downstream of Confluence Point		Passing at Upper stream of Confluence Point of 2 rivers (crossing 2 rivers independently)	
Road length	28.23 km (1.00)		30.31 km (1.06) (+1.84 km)		28.48 km (1.01) (+0.25 km)	
Bridge length over Rio Chico / Talavera Rivers	3,000 m (2 Bridges) (2.00)		1,500 m (1 Bridge) (1.00)		1,740 m (2 Bridges) (1.16)	
Equalizing zone for Flood Area (Section with Box Culverts)	6,584 m (1.77)		3,720 m (1.00)		2,930 m (0.79)	
Length passing flood area: Max. Flood Area / Frequent Flood Area	Max. in the past:11,950 m, Frequent: 9,580 m (1.30) (1.83)		Max. in the past: 9,220 m, Frequent: 5,220 m (1.00) (1.00)		Max. in the past: 13,190 m, Frequent: 4,670 m (1.43) (0.89)	
Construction Cost + ROW Cost = Total (not including IC)	Const. Cost = 13.97 B, ROW = 0.48 B, Total = 14.45 B (1.23)		Const. Cost = 11.21 B, ROW = 0.52 B, Total = 11.73 B (1.00)		Const. Cost = 11.31 B, ROW = 0.49 B, Total = 11.80 B (1.01)	
Number of Affected Houses/Structure	56		28		33	
Appropriateness of CLLEX Location at River / Flood Area Crossing	X	• CLLEX passes near confluence point of Rio Chico River and Talavera River, thus passes through the worst condition area. • Requires longest bridge length. • Passes through longest frequent flood area, thus requires longest equalizing zone.	△	• CLLEX crosses the downstream side of confluent point of Rio Chico River and Talavera River. • Although required bridge length is longer than Alternative-3, but shorter than Alternative-1. • Passes through shorter frequent flood area than Alternative-1, but longer than Alternative-3. • Located within the range of back flow from Rio Chico Bridge along Tarlac – Sta. Rosa Road.	○	• CLLEX crosses two rivers independently. • Required bridge length is shorter than Alternative-1, but longer than Alternative-2. • Passes through shortest frequent flood area, thus the best location from the viewpoint of river/flood area crossing.
Expressways Connectivity and Transport Efficiency	X	• SCTEx and CLLEx is not directly connected but made via intersection with national road thus continuity of an expressway is poor. • Connection from Cabanatuan to Manila is bad.	○	• SCTEx and CLLEx is directly connected. • Best transport efficiency.	X	• TPLEx and CLLEx is directly connected. • Manila-Cabanatuan connection is the longest in distance.
Social Environmental Impact	X	• Highest number of houses/structure affected. • Community is divided by CLLEX at La Paz.	○	• Least number of houses/structures affected.	△	• Second highest number of houses/structures affected.
Natural Environmental Impact	○	• Land take of agri-land smallest.	△	• Land take of agri-land highest.	○	• Land take of agri-land smallest.
Constructability	X	• Passes through the longest frequent flood area, thus construction work is seriously affected by floods. • Highest construction cost.	○	• Passes through the second longest frequent flood area. • Lowest construction cost.	○	• Passes through the shortest frequent flood area. • Lowest construction cost.
Rank	3		1	**Recommended.**	2	

5.2.6 Proposed CLLEx Alignment and Interchange Layout

Proposed CLLEx alignment and interchange layout is shown in **Figure 5.2.6-1**.

OUTLINE OF CLLEX

Expressway Length	30.7 km
Number of Bridges	7
Bridge Length	1,886 m
Equalizing Zone Length	3.78 km
Number of Overpass or Underpass for Intersecting Roads including underpasses for farm roads	Overpass : 1 Underpass : 37 Total : 38
Number of Interchanges: • Between expressways (SCTEx and CLLEx) • Between CLLEx and intersecting roads	5 1 4

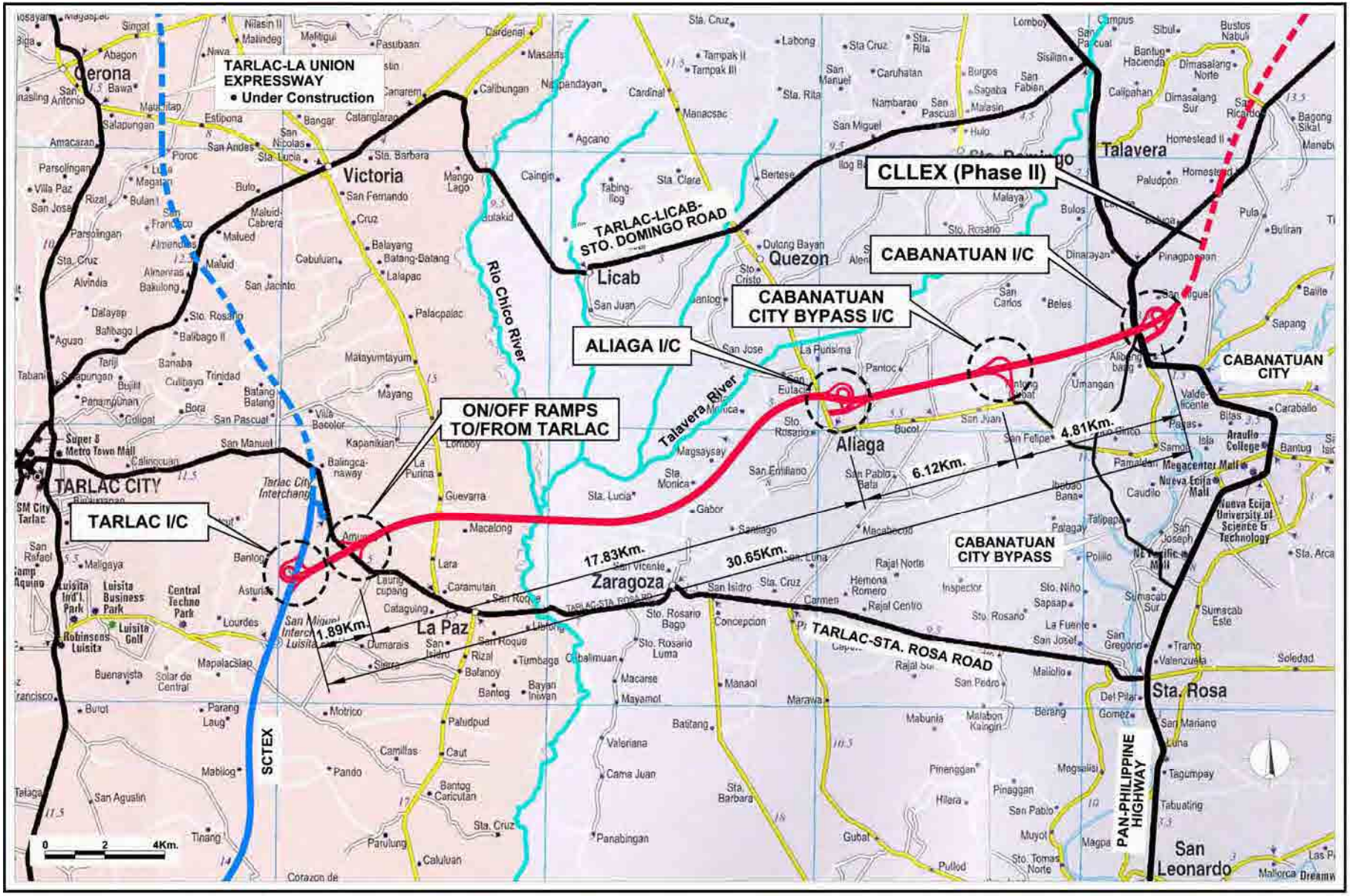


FIGURE 5.2.6-1 PROPOSED CLLEX ALIGNMENT AND LAYOUT OF INTERCHANGES

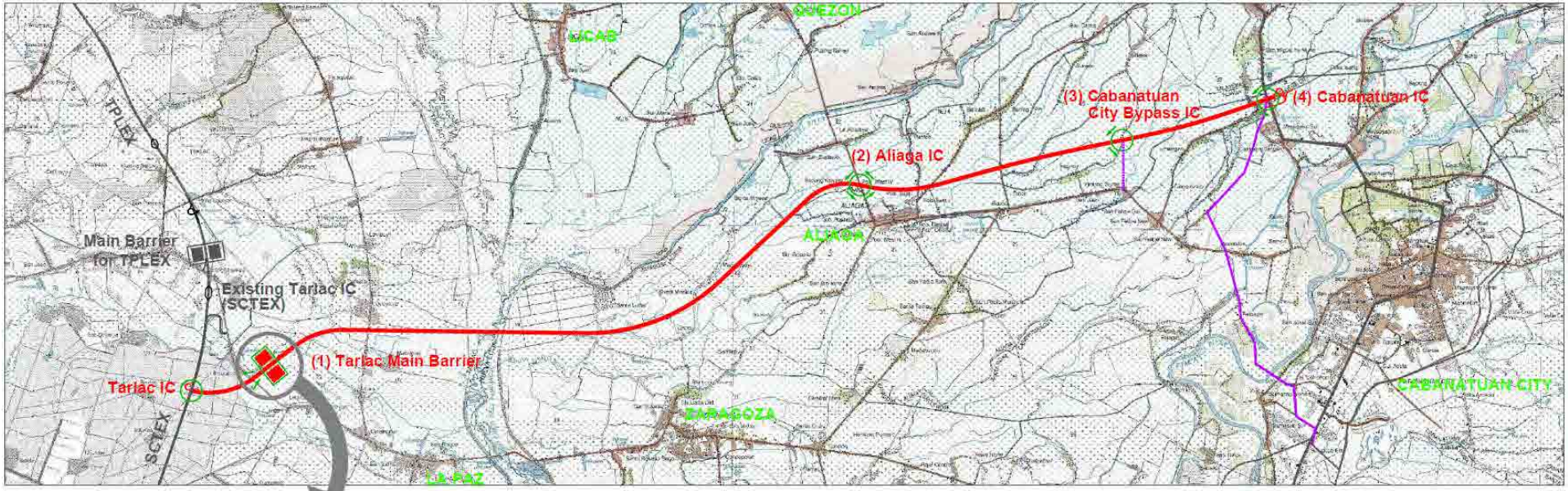
5.2.7 Toll Collection System

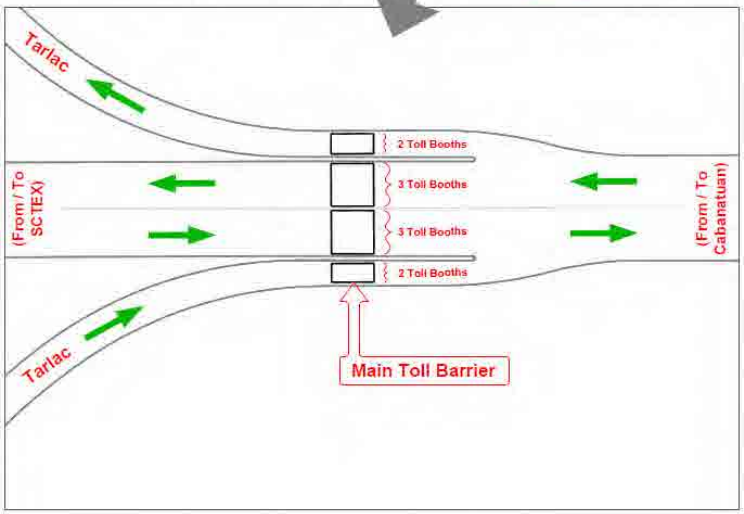
Toll fee should be imposed based on travel distance based toll to assure fairness to expressway users, hence the closed toll collection system should be established which is shown in **Table 5.2.7-1.**

Number of toll booth was computed on the assumption that toll collection would be done manually and is shown in **Table 5.2.7-2.** Actual toll collection shall be partially done by the electronic toll collection system.

Weigh-in-motion equipment for overloaded truck control, administrative maintenance office, and toll houses are planned at the strategic locations as shown in **Table 5.2.7-3.**

TABLE 5.2.7-1 PROPOSED TOLL COLLECTION SYSTEM OF CLLEX





Tarlac Main Barrier Schematic Map

Toll Collection System Is Proposed As CLOSED SYSTEM

NAME	DESCRIPTION	NO. OF TOLL BOOTH *
(1) Tarlac Main Barrier	From SCTEX : Pay SCTEX Toll And Get Ticket For CLLEX	3
	From Tarlac IC : Get Ticket For CLLEX	2
	To SCTEX : Pay CLLEX Toll And Get Ticket For SCTEX	3
	To Tarlac IC : Pay CLLEX Toll	2
(2) Aliaga IC	Entrance : Get Ticket	2
	Exit : Pay CLLEX Toll	2
(3) Cabanatuan City Bypass IC	Entrance : Get Ticket	2
	Exit : Pay CLLEX Toll	2
(4) Cabanatuan IC	Entrance : Get Ticket	2
	Exit : Pay CLLEX Toll	3
	TOTAL	23

Note: * Number of Toll Booth is estimated by future traffic volume and service time (entrance - 6 sec/veh., exit 14 sec/veh.)

TABLE 5.2.7-2 NUMBER OF TOLL BOOTH REQUIRED

Assumption : All Manual Toll Collection

Year 2017

No.	Interchange		AADT (2017)	Peak (%)	Peak Hr. Traffic Total	Toll Collection	Toll Capacity (Manual)	Necessary Toll Booth (Manual)	Necessary Toll Booth (Add.)	Necessary Toll Booth (Total)
			(a)	(b)	(c=a*b)		(d)	(e=c/d)	(f)	(g=e+f)
1	Tarlac	Main -->	4,461	8%	357	Pay	255	1.4		2
2	Tarlac	Main <--	4,204	8%	336	Pay	255	1.3		2
3	Tarlac	Entrance	1,279	8%	102	Ticket	600	0.2	1	2
4	Tarlac	Exit	1,278	8%	102	Pay	255	0.4	1	2
5	Aliaga	Entrance	955	8%	76	Ticket	600	0.1	1	2
6	Aliaga	Exit	908	8%	73	Pay	255	0.3	1	2
7	Cabana. By	Entrance	1,916	8%	153	Ticket	600	0.3	1	2
8	Cabana. By	Exit	1,554	8%	124	Pay	255	0.5	1	2
9	Cabanatuan	Entrance	2,625	8%	210	Ticket	600	0.4	1	2
10	Cabanatuan	Exit	3,292	8%	263	Pay	255	1.0		2
								Total		**20**

Exit	255	14 sec/veh
Entry	600	6 sec/veh
Flat	450	8 sec/veh

Year 2020

No.	Interchange		AADT (2020)	Peak (%)	Peak Hr. Traffic Total	Toll Collection	Toll Capacity (Manual)	Necessary Toll Booth (Manual)	Necessary Toll Booth (Add.)	Necessary Toll Booth (Total)
			(a)	(b)	(c=a*b)		(d)	(e=c/d)	(f)	(g=e+f)
1	Tarlac	Main -->	5,106	8%	408	Pay	255	1.6		2
2	Tarlac	Main <--	5,074	8%	406	Pay	255	1.6		2
3	Tarlac	Entrance	1,394	8%	112	Ticket	600	0.2	1	2
4	Tarlac	Exit	1,393	8%	111	Pay	255	0.4	1	2
5	Aliaga	Entrance	852	8%	68	Ticket	600	0.1	1	2
6	Aliaga	Exit	816	8%	65	Pay	255	0.3	1	2
7	Cabana. By	Entrance	2,259	8%	181	Ticket	600	0.3	1	2
8	Cabana. By	Exit	1,913	8%	153	Pay	255	0.6	1	2
9	Cabanatuan	Entrance	3,374	8%	270	Ticket	600	0.4	1	2
10	Cabanatuan	Exit	3,788	8%	303	Pay	255	1.2		2
								Total		**20**

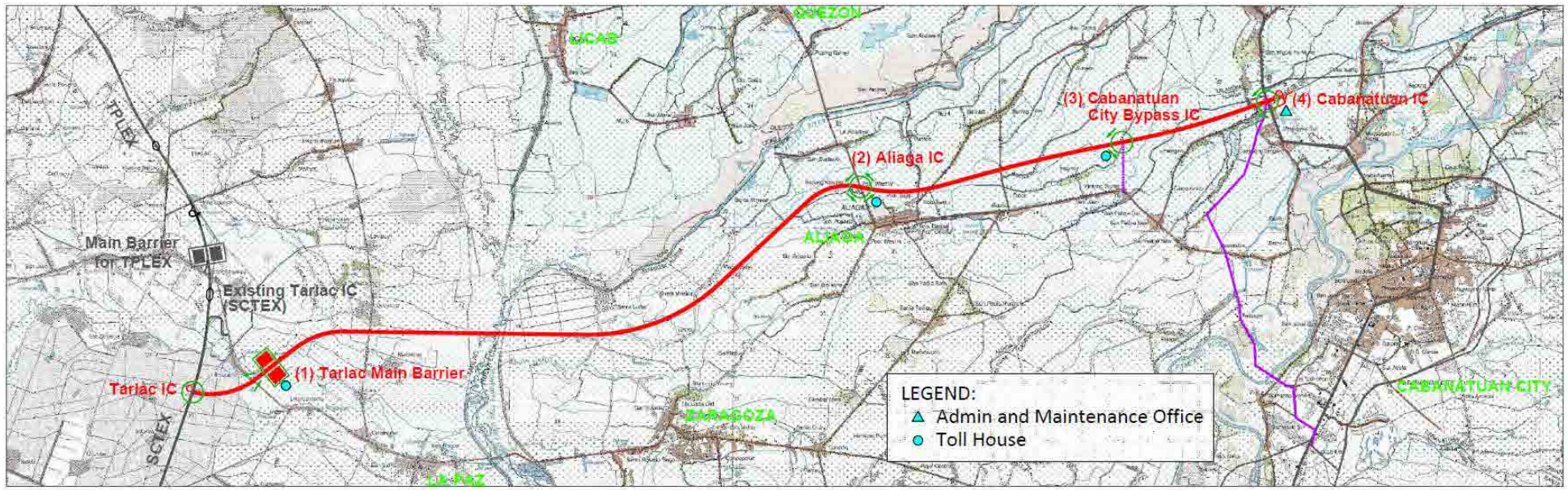
Exit	255	14 sec/veh
Entry	600	6 sec/veh
Flat	450	8 sec/veh

Year 2030

No.	Interchange		AADT (2030)	Peak (%)	Peak Hr. Traffic Total	Toll Collection	Toll Capacity (Manual)	Necessary Toll Booth (Manual)	Necessary Toll Booth (Add.)	Necessary Toll Booth (Total)
			(a)	(b)	(c=a*b)		(d)	(e=c/d)	(f)	(g=e+f)
1	Tarlac	Main -->	7,568	8%	605	Pay	255	2.4		3
2	Tarlac	Main <--	5,185	8%	415	Pay	255	1.6	1	3
3	Tarlac	Entrance	2,375	8%	190	Ticket	600	0.3	1	2
4	Tarlac	Exit	2,373	8%	190	Pay	255	0.7	1	2
5	Aliaga	Entrance	1,524	8%	122	Ticket	600	0.2	1	2
6	Aliaga	Exit	1,497	8%	120	Pay	255	0.5	1	2
7	Cabana. By	Entrance	2,309	8%	185	Ticket	600	0.3	1	2
8	Cabana. By	Exit	2,899	8%	232	Pay	255	0.9	1	2
9	Cabanatuan	Entrance	3,906	8%	312	Ticket	600	0.5	1	2
10	Cabanatuan	Exit	6,328	8%	506	Pay	255	2.0	1	3
								Total		**23**

Exit	255	14 sec/veh
Entry	600	6 sec/veh
Flat	450	8 sec/veh

TABLE 5.2.7-3 LOCATION FOR TRAFFIC AND MAINTENANCE OFFICE



INTERCHANGE	DESCRIPTION	NO. OF TOLL BOOTH *	WEIGHT IN MOTION	ADMIN/MAINT. OFFICE	TOLL HOUSE
(1) Tarlac Main Barrier	From SCTEX : Pay SCTEX Toll And Get Ticket For CLLEX	3	-	-	1
	From Tarlac IC : Get Ticket For CLLEX	2	1		
	To SCTEX : Pay CLLEX Toll And Get Ticket For SCTEX	3	-	-	-
	To Tarlac IC : Pay CLLEX Toll	2	-		
(2) Aliaga IC	Entrance : Get Ticket	2	1	-	1
	Exit : Pay CLLEX Toll	2	-		
(3) Cabanatuan City Bypass IC	Entrance : Get Ticket	2	1	-	1
	Exit : Pay CLLEX Toll	2	-		
(4) Cabanatuan IC	Entrance : Get Ticket	2	1	1	-
	Exit : Pay CLLEX Toll	3	-		
	TOTAL	23	4	1	3

Note: * Number of Toll Booth is estimated by future traffic volume and service time (entrance - 6 sec/veh., exit 14 sec/veh.)

5.2.8 Study on Stage Construction

Traffic volume attracted to CLLEx was estimated in Section 4.2.7 of this report. Traffic volume in 2017, 2020, 2030 was estimated at 11,221, 12,967, 17,340 veh./day, respectively. For this level of traffic volume, there is a need to study the options; one is the stage construction, and the other is on full development from the initial stage;

Option-1: Stage Construction
Initial Stage – 2-lane (1-lane by direction) with overtaking lane at strategic location
Second Stage – Widening to 4-lane

Option-2: Full Development
4-lane from the initial stage

1) <u>2-lane Expressway in the Philippines and Japan</u>

In the Philippines, there are two (2) existing 2-lane expressways and one (1) 2-lane expressway under construction as follows;

- Section between Lipa City and Batangas City of STAR *(existing)*
  - Traffic Volume in 2009 : **9,181 veh/day**
  - No overtaking lanes, thus fatal traffic accidents are being experienced.

- Subic-Tipo Expressway (existing)
  - Traffic Volume in 2009 : **6,798 veh/day**
  - Climbing lane is provided.

- Tarlac-Pangasinan-La Union Expressway (TPLEx) *(under construction)*
  - Estimated traffic volume is as follows;

TRAFFIC FORECAST OF TPLEX

Section	2015	2020	2030
Tarlac – Victoria	14,595	19,196	34,167
Victoria – Gerona	14,824	19,653	35,559
Gerona – Paniqui	12,822	16,940	30,428
Paniqui – Moncada	11,471	15,105	26,952
Moncada – Carmen	9,138	12,033	21,467
Carmen – Urdaneta	4,281	5,656	10,155
Urdaneta – Pozorrubio	8,270	10,969	19,847
Pozorrubio – Rosario	7,501	9,956	18,040

***Source**: Terms of Reference for Tarlac-La Union Toll Expressway Phase I, August 2007*

- 2-lane Expressway in Japan

  There are thirty one (31) 2-lane expressways in Japan, of which traffic volume in April, 2011 is shown in **Table 5.2.8-1**.

  - Traffic volume more than 10,000 veh./day – 20 expressways
  - Traffic volume more than 20,000 veh./day – 3 expressways

  Expressways with traffic volume of 10,000 ~ 20,000 veh./day are built and operated as a 2-lane expressway.

TABLE 5.2.8-1 DAILY TRAFFIC VOLUME OF TWO-LANE EXPRESSWAY IN JAPAN (2011 APRIL)

Unit: Vehicle/day

	Expressway name	Min. Section. (vehicle/day)	Max. Section. (vehicle/day)	Average (vehicle/day)
1	Do-ou Expressway	2,549	11,575	5,073
2	Do-tou Expressway	2,046	8,034	6,110
3	Aomori Expressway	5,399	6,443	5,807
4	Hachinohe Expressway	7,277	10,253	7,310
5	Kamaishi Expressway	2,429	2,894	2,579
6	Akita Expressway	5,636	11,626	7,694
7	Yamagata Expressway	4,919	14,799	7,102
8	Tohoku Chuo Expressway	8,876	18,040	11,885
9	Nihonkai Tohoku Expressway	18,095	23,143	20,619
10	Ban'etsu Expressway	6,961	7,776	7,446
11	Jyoban Expressway	902	4,206	4,206
12	Higashi Kanto Expressway	1,655	1,655	1,655
13	Tateyama Expressway	10,420	11,482	11,400
14	Jo-Shin'etsu Expressway	10,896	12,103	11,517
15	Chubu Transversal Expressway	5,391	7,615	6,290
16	Tokai Hokuriku Expressway	6,034	11,647	8,864
17	Kise Expressway	9,431	12,256	11,021
18	Maizuru Wakasa Expressway	6,700	16,709	12,469
19	Hanwa Expressway	12,179	13,428	12,947
20	Harima Expressway	1,367	1,367	1,367
21	Tottori Expressway	6,066	9,818	8,152
22	Okayama Expressway	12,441	13,135	12,788
23	Yonago Expressway	8,496	12,135	9,913
24	Hamada Expressway	5,648	13,220	6,552
25	Sanyo Expressway	5,283	6,281	5,849
26	Takamatsu Expressway	16,671	19,324	17,988
27	Matsuyama Expressway	15,542	20,136	18,240
28	Tokushima Expressway	6,066	9,818	8,152
29	Kochi Expressway	17,959	21,476	18,352
30	Nagasaki Expressway	9,845	11,574	10,709
31	Higashi Kyushu Expressway	7,010	16,149	11,303

Note:
Traffic Volume more than 10,000 veh./day
Traffic Volume more than 20,000 veh./day

2) Level of Service (LOS) Analysis

Definition of Level of Service (LOS) by Highway Capacity Manual (HCM) 2000 of USA for the 2-lane highway and for the multi-lane highway is shown in **Table 5.2.8-2** and **5.2.8-3**, respectively.

TABLE 5.2.8-2 DEFINITION OF LOS FOR TWO-LANE HIGHWAY

LOS A	The highest quality of traffic service, when motorists are able to travel at their desired speed. Without strict enforcement, this highest quality would result in average speeds of 90 km/h or more on two-lane highways.
LOS B	Traffic flow with speeds of 80 km/h or slightly higher on level terrain. The demand for passing to maintain desired speeds becomes significant and approximates the passing capacity at the lower boundary of LOS B.
LOS C	Further increases in flow, resulting in noticeable increases in platoon formation, platoon size, and frequency of passing impediments. The average speed still exceeds 70 km/h on level-terrain.
LOS D	Unstable traffic flow. The two opposing traffic streams begin to operate separately at higher volume levels, as passing becomes extremely difficult. Speeds of 60 km/h still can be maintained under base conditions.
LOS E	Even under base conditions, speeds may drop below 60 km/h. Average travel speeds on highways with less than base conditions will be slower, even down to 40 km/h on sustained upgrades. The capacity of the highway, generally 3,200 pc/h total in both directions. Operating conditions at capacity are unstable and difficult to predict.
LOS F	Heavily congested flow with traffic demand exceeding capacity. Volumes are lower than capacity and speeds are highly variable.

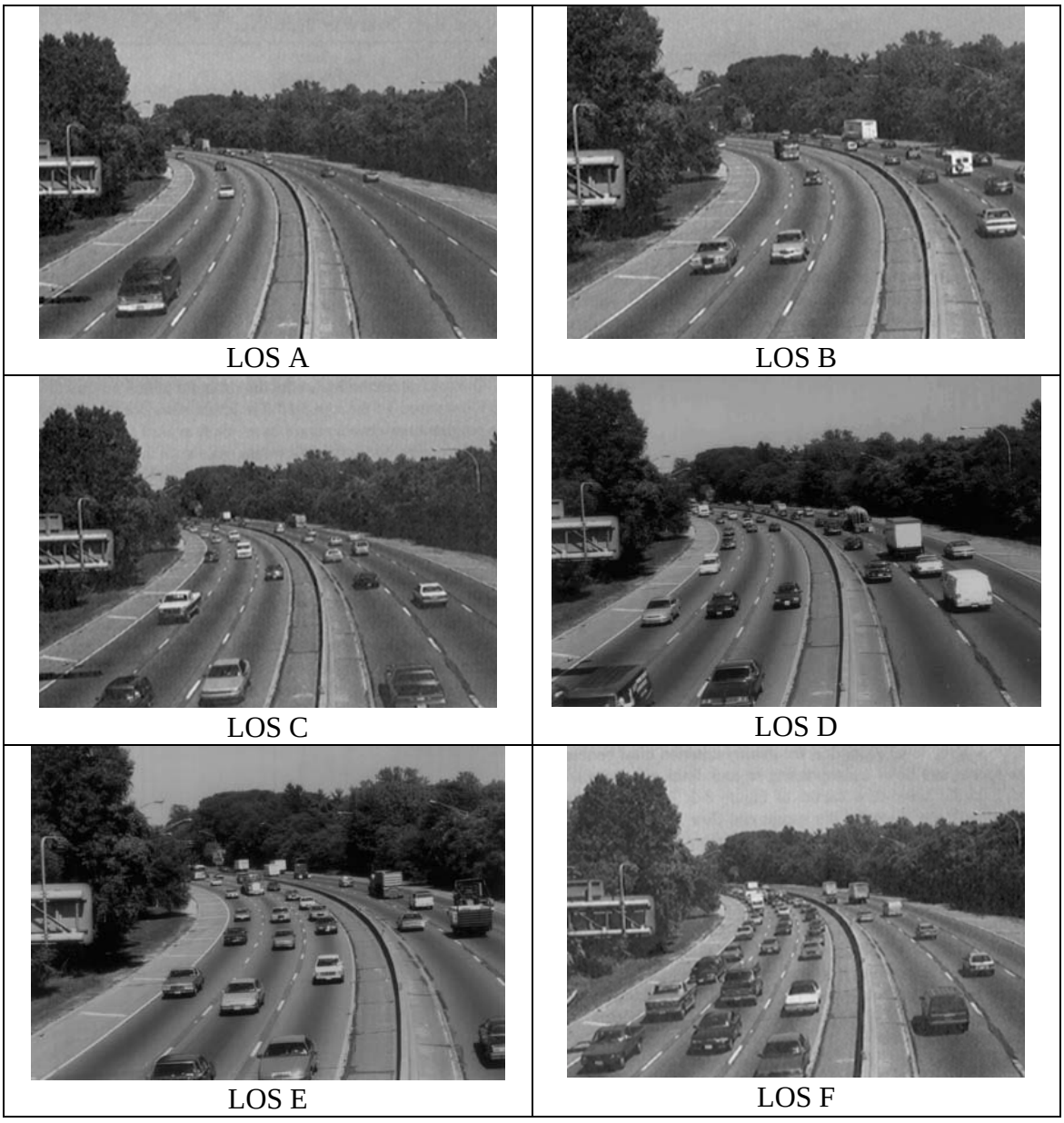
Source: *HCM 2000*

TABLE 5.2.8-3 DEFINITION OF LOS FOR MULTI-LANE HIGHWAY

LOS A	Free-flow operations. Free-flow speeds prevail. Vehicles are almost completely unimpeded in their ability to maneuver within the traffic stream.
LOS B	Reasonably free flow. Free-flow speeds are maintained. The ability to maneuver within the traffic stream is only slightly restricted, and the general level of physical and psychological comfort provided to drivers is still high.
LOS C	Flow with speeds at or near the Free Flow Speed of the freeway. Freedom to maneuver within the traffic stream is noticeably restricted, and lane changes require more care and vigilance on the part of the driver.
LOS D	The level at which speeds begin to decline slightly with increasing flows and density begins to increase somewhat more quickly. Freedom to maneuver within the traffic stream is more noticeably limited, and the driver experiences reduced physical and psychological comfort levels.
LOS E	Operation at capacity. Operations at this level are volatile, because there are virtually no usable gaps in the traffic stream. Vehicles are closely spaced leaving little room to maneuver within the traffic stream at speeds that still exceed 80 km/h. Maneuverability within the traffic stream is extremely limited, and the level of physical and psychological comfort afforded the driver is poor

LOS F	Breakdowns in vehicular flow. Such conditions generally exist within queues forming behind breakdown points. Breakdowns occur for a number of reasons: • Traffic incidents can cause a temporary reduction in the capacity of a short segment, so that the number of vehicles arriving at the point is greater than the number of vehicles that can move through it. • Points of recurring congestion, such as merge or weaving segments and lane drops, experience very high demand in which the number of vehicles arriving is greater than the number of vehicles discharged. • In forecasting situations, the projected peak-hour (or other) flow rate can exceed the estimated capacity of the location.

Source: *HCM 2000*



Source: *HCM 2000*

FIGURE 5.2.8-1 LEVEL OF SERVICE FOR MULTI-LANE HIGHWAY

Appropriate Level of Service by AASHTO

A Policy on Geometric Design of Highways and Streets, 2004 (AASHTO) suggests the appropriate level of service for each functional class of road as follows;

GUIDELINES FOR SELECTION OF DESIGN LEVEL OF SERVICE

Functional class	Appropriate level of service for specified combinations of area and terrain type			
	Rural level	Rural rolling	Rural mountainous	Urban and suburban
Freeway	B	B	C	C
Arterial	B	B	C	C
Collector	C	C	D	D
Local	D	D	D	D

Source: A Policy on Geometric Design of Highways and Streets, 2004, AASHTO

According to the above guidelines, expressways are recommended that LOS be "B" or "C", however, the guideline seems to be aiming quite high LOS. LOS may be lowered by one rank, say from "B" to "C".

Service Traffic Volume of Two-lane CLLEx

In accordance with HCM formula, the service traffic volume of two-lane CLLEx was estimated as shown in **Table 5.2.8-4**. Estimated traffic volume and LOS is shown in **Table 5.2.8-5**. The LOS of the 2-lane CLLLEx at the opening year will be "D" and it will be "E" in year 2029. The widening to a 4-lane expressway should be made before LOS reaches to "E". In consideration of some allowance, CLLEx needs to be widened by the end of 2025. Development scenario of Option-1 will be as follows;

Initial Stage (2-lane)	:	2017 – 2024 (8 years)
Second Stage (4-lane)	:	2025 -

TABLE 5.2.8-4 SERVICE TRAFFIC VOLUME OF TWO-LANE CLLEX

LOS	Service volume for LOS	
	Veh/Hour (both directions)	Veh/Day (both directions)
A	Less than 110	Less than 1,375
B	Less than 320	Less than 4,000
C	Less than 700	Less than 8,750
D	Less than 1,310	Less than 16,375
E	Less than 2,430	Less than 30,375
F	More than 2,430	More than 30,375

Consultant's estimate based on Highway Capacity Manual 2000 (HCM2000)

Note:

Assumptions: *60/40 directional split: 80-percent no-passing zones for level, 23 percent truck and bus; free flow speed; 100km/hr.*

TABLE 5.2.8-5 ESTIMATED 2-LANE CLLEX TRAFFIC VOLUME

Year	Daily Traffic Assignment (Veh./day)	Peak Hour Traffic Volume (Veh./hour)	LOS	Volume/Capacity Ratio
2017	11,221	898	D	0.37
2018	11,771	942		0.39
2019	12,352	988		0.41
2020	12,967	1,037		0.43
2021	13,344	1,068		0.43
2022	13,733	1,099		0.45
2023	14,135	1,131		0.47
2024	14,550	1,164		0.48
2025	14,979	1,198		0.49
2026	15,421	1,234		0.51
2027	15,878	1,270		0.52
2028	16,349	1,308		0.54
2029	16,836	1,347	E	0.55
2030	17,340	1,387		0.57
2031	17,859	1,429		0.59
2032	18,396	1,472		0.61
2033	18,951	1,516		0.62
2034	19,524	1,562		0.64
2035	20,116	1,609		0.66
2036	20,728	1,658		0.68
2037	21,360	1,709		0.70
2038	22,013	1,761		0.72
2039	22,688	1,815		0.75
2040	23,386	1,871		0.77

Assumption: *Peak hour rate: 8 percent*

Service Traffic Volume of Four-Lane CLLEx

Service traffic volume of four-lane CLLEx is shown in **Table 5.2.8-6**. Estimated traffic volume and LOS of four-lane CLLEx is shown in **Table 5.2.8-7**. The LOS of the 4-lane CLLEx will be "A" from the opening year of 2017 until 2035 and "B" thereafter until 2040, which suggests that a 4-lane CLLEx is too much ideal.

Which option to be selected, namely Option-1: Stage Construction or Option-2: Full Development should be determined based on the economic viability of the option.

Service Traffic Volume of CLLEx Phase-II: Cabanatuan – San Jose Section

Estimated 2-lane Phase-II (Cabanatuan – San Jose Section) of CLLEx traffic volume and LOS is shown in **Table 5.2.8-8**.

LOS of Phase-II section will be as follows;

2017 - 2022 : LOS C
2023 - 2040 : LOS D

LOS of the Phase II section will not reach to "E" before 2040, thus 2-lane will be enough for Phase-II.

TABLE 5.2.8-6 SERVICE TRAFFIC VOLUME OF FOUR-LANE CLLEX

LOS	Service volume for LOS	
	Veh/Hour (2-lane)	Veh/Day (4-lane)
A	Less than 1,170	Less than 24,374
B	Less than 1,850	Less than 38,541
C	Less than 2,660	Less than 55,415
D	Less than 3,260	Less than 67,915
E	Less than 3,590	Less than 74,790
F	More than 3,590	More than 74,790

Consultant's estimate based on Highway Capacity Manual 2000 (HCM2000)

Note:

Assumptions: *Rural Area, 23 percent truck and bus; free flow speed; 100km/hr.*

TABLE 5.2.8-7 ESTIMATED 4-LANE CLLEX TRAFFIC VOLUME (TARLAC IC – ALIAGA IC SECTION)

Year	Daily Traffic Assignment (Veh./day) **(both directions)**	Daily Traffic Assignment (Veh./day) **(one direction)**	Peak Hour Traffic Volume (Veh./hour) **(one direction)**	LOS	Volume/Capacity Ratio
	(a)	(b = a * 0.6)	(c = b * 0.08)		
2017	12,630	7,578	606	A	0.17
2018	13,150	7,890	631		0.18
2019	13,691	8,215	657		0.18
2020	14,255	8,553	684		0.19
2021	14,759	8,855	708		0.20
2022	15,281	9,168	733		0.20
2023	15,821	9,493	759		0.21
2024	16,380	9,828	786		0.22
2025	16,959	10,176	814		0.23
2026	17,559	10,535	843		0.23
2027	18,180	10,908	873	A	0.24
2028	18,823	11,294	903		0.25
2029	19,488	11,693	935		0.26
2030	20,177	12,106	968		0.27
2031	20,890	12,534	1,003		0.28
2032	21,629	12,977	1,038		0.29
2033	22,394	13,436	1,075		0.30
2034	23,185	13,911	1,113		0.31
2035	24,005	14,403	1,152		0.32
2036	24,854	14,912	1,193	B	0.33
2037	25,732	15,439	1,235		0.34
2038	26,642	15,985	1,279		0.36
2039	27,584	16,550	1,324		0.37
2040	28,559	17,136	1,371		0.38

Assumptions: *60/40 directional split, Peak hour rate : 8 percent*

TABLE 5.2.8-8 ESTIMATED 2-LANE CLLEX PHASE-II TRAFFIC VOLUME AND LOS (CABANATUAN – SAN JOSE SECTION)

Year	Daily Traffic Assignment (Veh./day)	Peak Hour Traffic Volume (Veh./hour)	LOS	Volume/Capacity Ratio
2017	7,288	583	C	0.24
2018	7,556	604		0.25
2019	7,834	627		0.26
2020	8,122	650		0.27
2021	8,372	670		0.28
2022	8,630	690		0.28
2023	8,896	712	D	0.29
2024	9,170	734		0.30
2025	9,452	756		0.31
2026	9,743	779		0.32
2027	10,043	803		0.33
2028	10,353	828		0.34
2029	10,671	854		0.35
2030	11,000	880		0.36
2031	11,339	907		0.37
2032	11,688	935		0.38
2033	12,048	964		0.40
2034	12,419	994		0.41
2035	12,801	1,024		0.42
2036	13,196	1,056		0.43
2037	13,602	1,088		0.45
2038	14,021	1,122		0.46
2039	14,453	1,156		0.48
2040	14,898	1,192		0.49

Assumption: *Peak hour rate: 8 percent*