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METRO CEBU DEVELOPMENT AND COORDINATION BOARD (MCDCB)

THE ROADMAP STUDY FOR SUSTAINABLE URBAN DEVELOPMENT IN METRO CEBU

FINAL REPORT

MAIN TEXT

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ABBREVIATIONS

ADB	Asian Development Bank
AGT	Automated Guideway Transit
AIEZ	Agro-Industry Export Zone
ASEAN	Association of Southeast Asian Nations
ATC	Area Traffic Control
B/C	Cost Benefit Ratio
BEMS	Building Energy Management System
BOD	Biochemical oxygen demand
BOI	Board of Investment
BOT	Build Operate Transfer
BPI	Bureau of Plant Industry
BPO	Business Process Outsourcing
BRT	Bus Rapid Transit
CAD	Computer Aided Design / Computer Aided Manufacturing
CAPEX	Capital Expenditure Cost
CBC	Cebu Business Club
CBD	Central Business District
CBO	
CB3R	Community Based 3R
CCCI	Cebu Chamber of Commrce & Industry
CCFL	Cold Cathode Fluorescent Lamp
CCI	Chamber of Commerce & Industry
CCPL	Central Cebu Protected Landscape
CCRB	Central Cebu River Basins
CEDF	Cebu Educational Development Foundation
CIPC	Cebu Investment Promotion Center
CITOM	City Traffic Operation and Management
CLC	Consolacion, Liloan, Compostela
CLUP	Comprehensive Land Use Plan
CNC	Certificate of Non-Coverage
CNES	Centre National d Etudes Spatiales
CML	Cebu – Mandaue – LapuLapu
CO^2	Carbon Dioxide
COD	Chemical Oxygen Demand
CPA	Cebu Port Authority
CPDO	City Plannning and Development Office
CTS	Collection and Transport System
CUSW	Cebu Uniting for Sustainable Water Foundation
CVURPO	The Central Visayas Urban and Regional Project Office
DB	Distribution Block
DBP	Development Bank of Philippines
D/D	Detailed Design
DENR	Department of Environment and Natural Resources
DILG	Department of Interior and Local Government
DOA	Department of Agliculture
DOF	Department of Finance
DOH	Department of Health
DOT	Department of Tourism
DOTC	Department of Transportation and Communications

DOST	Department of Science and Technology
DPWH	Department of Public Works and Highways
DRRMP	Disaster Risk Reduction and Management Plan
DTI	Department of Trande and Industry
EAS	Environmental Assessment System
EAP	Economic Active Population
ECC	Environmental Compliance Certificate
EIA	Environmental Impact Assessment
EIRR	Economic Internal Rate of Return
EIS	Environmental Impact Statement
EMB	Environmental Management Bureau
EPIRA	Electric Power Industry Reform Act
EPZ	Export Processing Zone
ERC	Energy Regulatory Commission
ESL	English as a Second Language
EV	Electric Vehicle
FDI	Foreign Direct Investments
FIRR	Financial Internal Rate of Return
FS	Feasibility Study
GDP	Gross Domestic Products
GFI	Government Financial Institutions
GHG	Greenhouse Gas
GIS	Geographical Information System
GL	Ground Line
GLA	Greater London Authority
GNDP	Gross National Domestic Product
GNMRC	Guimaras National Mango Reserc Center
GPS	Global Positioning System
GRDP	Gross Regional Domestic Product
GOCC	Government-Owned and Controlled Corporation
GRT	Gross Registered Tonnage
GTH	Gifts, Toys & Housewares
GVA	Gross Value Added
GVRD	Greater Vancouver Regional District
GVS & DD	Greater Vancouver Sewarage and Drainage District
GVWD	Greater Vancouver Water District
H & W	Health & Welfare
HIS	Household Interview Survey
HLURB	Housing and Land Use Regulatory Board
HOV	High-Occupancy Vehicles
HR	Human Resource
HRD	Human Resource Development
HUC	Highly Urbanized Cities
IA	Implementing Agency
ICT	Information and Communication Technology
IDI	Infrastructure Development Institute
IDP	Industrial Development Program
IEC	Information Education and Communication
IEE	Initial Environmental Evaluation
IEER	Initial Environmental Examination Report
IEEC	Initial Environmental Examination Checklist

IMF	International Monetary Fund
IPP	Investment Priorities Plan
IRA	Inernal Revenue Allotment
ISFs	Informal Settler Families
IT	Information Technology
ITO	Information Technology Outsourcing
ITH	Income Tax Holiday
ITR	Interim Report
IWRM	Integrated Watershed Resources Management
JBIC	Japan Bank for International Cooperation
JCM	Joint Crediting Mechanism
JETRO	Japan External Trade Organization
JICA	Japan International Cooperation Agency
JPY	Japanese Yen
JST	JICA Study Team
JV	Joint Venture
KOIKA	Korea International Cooperation Agency
KPO	Knowledge Process Outsourcing
LBP	Land Bank of the Philippines
LCC	Low Cost Carrier
LGU	Local Government Unit
LGUGC	Local Government Unit Guarantee Corporation
LNG	Liquefied Natural Gas
LRT	Light Rail Transit
LTFRB	Land Transportation Franchising. & Regulatory Board
LTO	Land Transportation Office
LUWA	Local Water Utilities Administration
MCCI	Mandaue Chamber of Commerce and Industry
MCDCB	Metro Cebu Development and Coordination Board
MCDA	Metro Cebu Development Alliance
MCDC	Metro Cebu Development Council
MCDP	Metro Cebu Development Project
MCDPO	Metro Cebu Development Project Office
MCIA	Mactan – Cebu International Airport
MCIAA	Mactan – Cebu International Airport Authority
MCIADP	Mactan – Cebu International Airport Development Project
MCIB	Mega Cebu Investment Board
MCIFDS	Metro Cebu Integrated Flood and Drainage System
MCLUTS	Metro Cebu Land Use and Transport Study
MC-SWMC	Metro Cebu Solid Waste Management Council
MCWD	Metropolitan Cebu water District
MDFO	Municipal Development Fund Office
MEPZ	Mactan Export Processing Zone
METI	Ministry of Economy, Trade and Industry
MEZ	Manufacturing Economic Zone
MGB	Mines and Geosciences Bureau
MHI	Mitsubishi Heavy Industries
MICE	Meeting, Incentive tour, Convention/Conference, Exhibition
MIMAROPA	Mindoro (Occidental Mindoro at Oriental Mindoro), Marinduque, Romblon at Palawan
ML	Mandaue – Lapu Lapu
MLIT	Ministry of Land, Infrastructure, Transport and Tourism

MMDA	Metro Manila Development Authority
MNDC	Metro Naga Development Council
MOA	Memorandum Of Agreement
MOU	Memorandum Of Understanding
MP	Master Plan
MRF	Materials Recovery Facility
MRI	Mitsumi Realty, Inc.
MRI	Mactan Rocks Indstries.
MRT	Mass Rapid Transit
MSME	Micro, Small and Medium Enterprise
MVHC	Metro Vancouver Housing Corporation
MW	Mega Watt
NAIA	Ninoy Aquino International Airport
NAMRIA	National Mapping and Resources Information Authority
NCR	National Capital Region
NEDA	National Economic and Development Authority
NEECP	National Energy Efficiency and Conservation Program
NGA	National Governmental Agency
NGO	Non-Governmental Organizations
NIA	National Irrigation Administration
NIMBY	Not In My Back Yard
NIPAS	National Integrated Protected Areas System
NPV	Net Present Value
NREP	National Renewable Energy Program
NRW	Non-Revenue Water
NSO	National Statistical Office
NSSMP	National Sewerage and Septage Management Program
NWRB	National Water Resources Board
O&M	Operations and Maintenance
OD	Origin–Destination
ODA	Official Development Assistance
ODM	Original Design Manufacturing
OEM	Original Equipment Manufacturing
OFW	Overseas Filipino Workers
PAMB	Protected Area Management Board
PCU	Passenger Car Unit
PD	Presidential Decree
PDIP	Provincial Development Investment Plan
PDP	Philippine Development Plan
PDPFP	Provincial Development and Physical Framework Plan
PENRO	Provincial Environment and Natural Resources Office
PEZA	Philippines Economic Zone Authority
PFI	Private Financial Institutions
PHP	Philippine peso
PHIVOLCS	Philippine Institute of Volcanology and Seismology
PIDS	Philippine Institute of Development Studies
PIPP	Philippine Investment Promotion Plan
PMO	Project Management Office
PNR	Philippine National Railways
PPA	Philippine Ports Authority
PPP	Public-Private Partnership

PRRC	Pasig River Rehabilitation Commission
PSWMFP	Provincial SWM Framework Plan
PUB	Public Utility Buses
PUJ	Public Utility Jeepney
PUV	Public Utility Vehicle
QOL	Quolity of Life
RA	Regional Act
RAFI	Ramon Aboitiz Foundation Inc.
R&D	Research and Development
RCC	Rational Compression Condition
RCOA	Retail Competition and Open Access
RDC	Regional Development Conference
RES	Retail Electricity Supplier
RO	Reverse Osmosis
RO-RO	Roll-On Roll-On
ROW	Right of Way
RROW	Road Right Of Way
S&T	Science and Technology
SCF	Standard Conversion Factor
SDR	Social Discount Rate
SEA	Strategic Environmental Assessment
SEIPI	Semiconsuctors and Electronics Industry of the Philippines Inc.
SEZ	Special Economic Zone
SL	Screen Line
SLF	Sanitary Landfill
SM	Shoe Mart
SME	Small and Medium-scale Enterprises
SR	Supporting Report
SRP	South Road Properties
SRTM	Shuttle Radar Topographic Mission
STEP	Special Terms for Economic Partnership
SWM	Solid Waste Management
SWOT	Strength, Weakness, Opportunity, Threat
TDM	Traffic Demand Management
TDS	Total Dissolved Solids
TEU	Twenty-feet Equivalent Unit
TEZ	Tourism Export Zone
TFO	Transport Franchising Office
TIA	Traffic Impact Assessment
TMG	Tokyo Metropolitan Government
TMO	Traffic Management Office
TOD	Transit Oriented Development
TOR	Terms Of reference
TPTM	Transport Planning and Traffic Management
TSS	Total Suspended Solid
UNCTAD	United Nations Conference on Trade and Development
UNIDO	United Nations Industrial Developnment Organization
UP	University of Philippines
US	United States
USAID	United States Agency for International Development
USC	University of San Carlos

USC-CAFA	University of San Carlos, College of Architecture and Fine Art
USC-WRC	University of San Carlos, Water Resource Center
USD	US Dollar
VAT	Value Added Tax
VCR or V/C	Vehicle Capacity Ratio
VECO	Visayan Electric Company
VFM	Value For Money
VGF	Viability Gap Fund
VOC	Vehicle Operating Cost
VOT	Value of Time
VTT	Value of Travel Time
WACC	Weighted Average Cost of Capital
WB	World Bank
WCIP	Wesr Cebu Industrial Park
WD	Water District
WRRP	Waste Reduction and Recovery Program
WS	Work Shop
WSP	Water and Sanitation Program
WSRE	Waste Segregation and Reduction Enhancement
WSREP	Waste Segregation and Reduction Enhancement Program
WTE	Waste to Energy
WTP	Willingness To Pay
WTTC	World Travel & Tourism Council
WW	Water Works

PART I

1 STUDY SCOPE AND PROGRESS

1.1 Study Scope

1) Study Background

1.1 Metro Cebu is the second largest metropolis of the Philippines with a population of 2.55 million in 2010, and is considered the economic center of the central region of the country. Historically, the area has been a regional trading hub and recognized for its world-class marine resorts. In recent years, the region has been experiencing high levels of private business investments and industrial expansion. However, due to rapid urbanization and population growth, various interrelated urban issues have emerged across the sectors of transport, drainage, water, and waste management. Therefore, a more comprehensive and sustainable development approach is required to address the diverse range of urban challenges accompanying the rapid growth of Metro Cebu.

1.2 The Japan International Cooperation Agency (JICA) conducted “the Study on the Cebu Integrated Area Development Master Plan” way back in1994 and a study of this kind has not been conducted since then. It is, therefore, recognized that a new comprehensive and integrated metropolitan development plan for Metro Cebu should be prepared.

1.3 Given this background, JICA in collaboration with the City of Yokohama has supported Metro Cebu in 2013, through the Metro Cebu Development and Coordination Board (MCDCB), to come up with a long-term development vision called “Mega Cebu Vision 2050.” Furthermore, JICA and MCDCB have agreed to conduct a follow-up study to formulate a roadmap and action plan to realize the Mega Cebu Vision 2050.

2) Study Objectives

1.4 The ultimate objective of this study is to draw up a roadmap and detailed action plan for Metro Cebu which consists of the following:

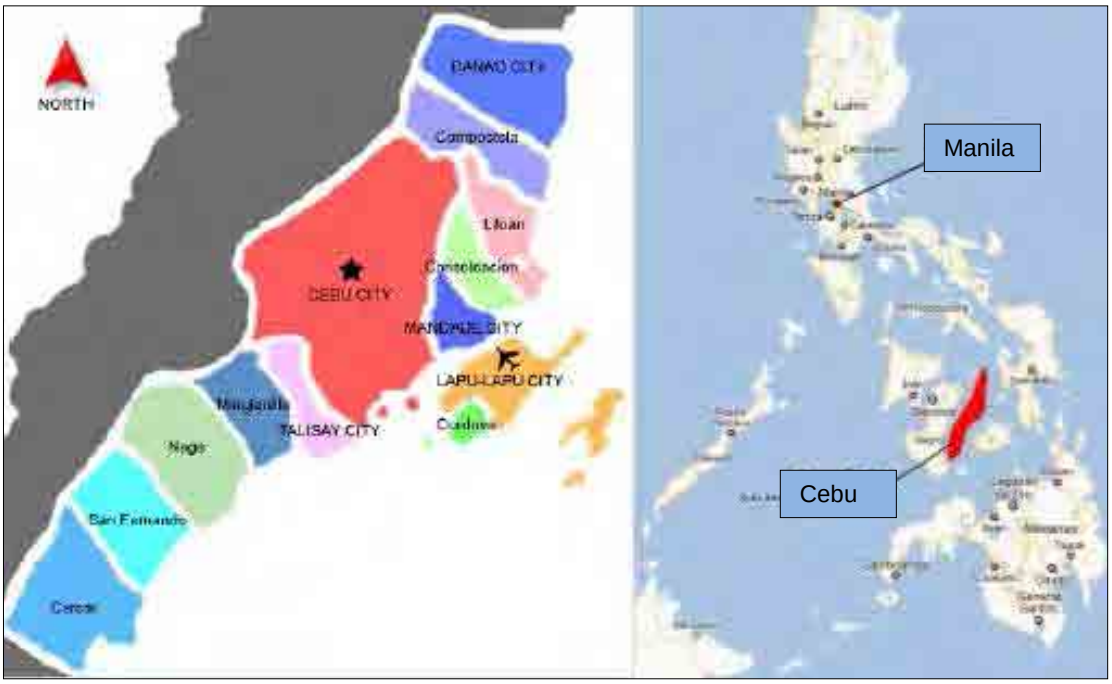
(i) A long-term roadmap (up to 2030, thence up to 2050) in order to realize the Mega Cebu Vision 2050;

(ii) A detailed action plan consisting of priority projects for the short term (1–3 years) and medium term (4–6 years); and

(iii) The hazard map covering Metro Cebu and the northern part of Cebu Province.

3) Study Area

1.5 The study area covers Metro Cebu consisting of the seven cities of Cebu, Danao, Mandaue, Lapu-Lapu, Talisay, Naga and Carcar, and the six municipalities of Compostela, Liloan, Consolacion, Cordova, Minglanilla and San Fernando (see Figure 1.1). In the aftermath of Typhoon Yolanda (international code name: Haiyan), the study area was extended to cover the northern part of Cebu Province only in terms of map preparation and hazard map analysis.



Source: JICA Study Team.

Figure 1.1 Location and Coverage of Metro Cebu

1.2 Study Activities

1.6 The overall study work flow is shown in Figure 1.2 and the general activities of the study are as follows:

1) Study Mobilization

1.7 The JICA Study Team (JST) submitted the Inception Report to MCDCB in Novermber 2013. It was deliberated upon in separate meetings with the Steering Committee, the Cebu Province Governor (chairman of MCDCB), and the Cebu City Mayor (vice chairman of MCDCB) and was accepted. The first seminar originally scheduled for November 2013 was postponed to January 30, 2014 due to Typhoon Yolanda which struck part of Central Visayas on November 8, 2013 and caused severe damages. The first seminar was attended by 91 participants from MCDCB, the 14 local government units (LGUs), national government agencies, the academe, and JST. The agenda included pre-feasibility studies suggested by JST for the short-term priority projects, and disaster prevention planning and management.

2) LGU Outreach Meetings

1.8 JST, in collaboration with MCDCB, conducted two rounds of outreach meetings at the 13 LGUs to collect data and information, and to understand urban infrastructure and urban development related issues. The first round of outreach meetings was done during the period November–December 2013 while the second was in January–February 2014.

3) Database Development for Planning Works

1.9 JST conducted a Household Interview Survey (HIS) and some traffic surveys from February to April 2014. The preparation of maps and GIS works commenced at the same time as the surveys. The results from these surveys were analyzed and a database was developed for planning works. The data and maps generated in this study are all contained in Supporting Report 1 : Database Formation, which is an integral part of this report.

4) Short-term Priority Projects

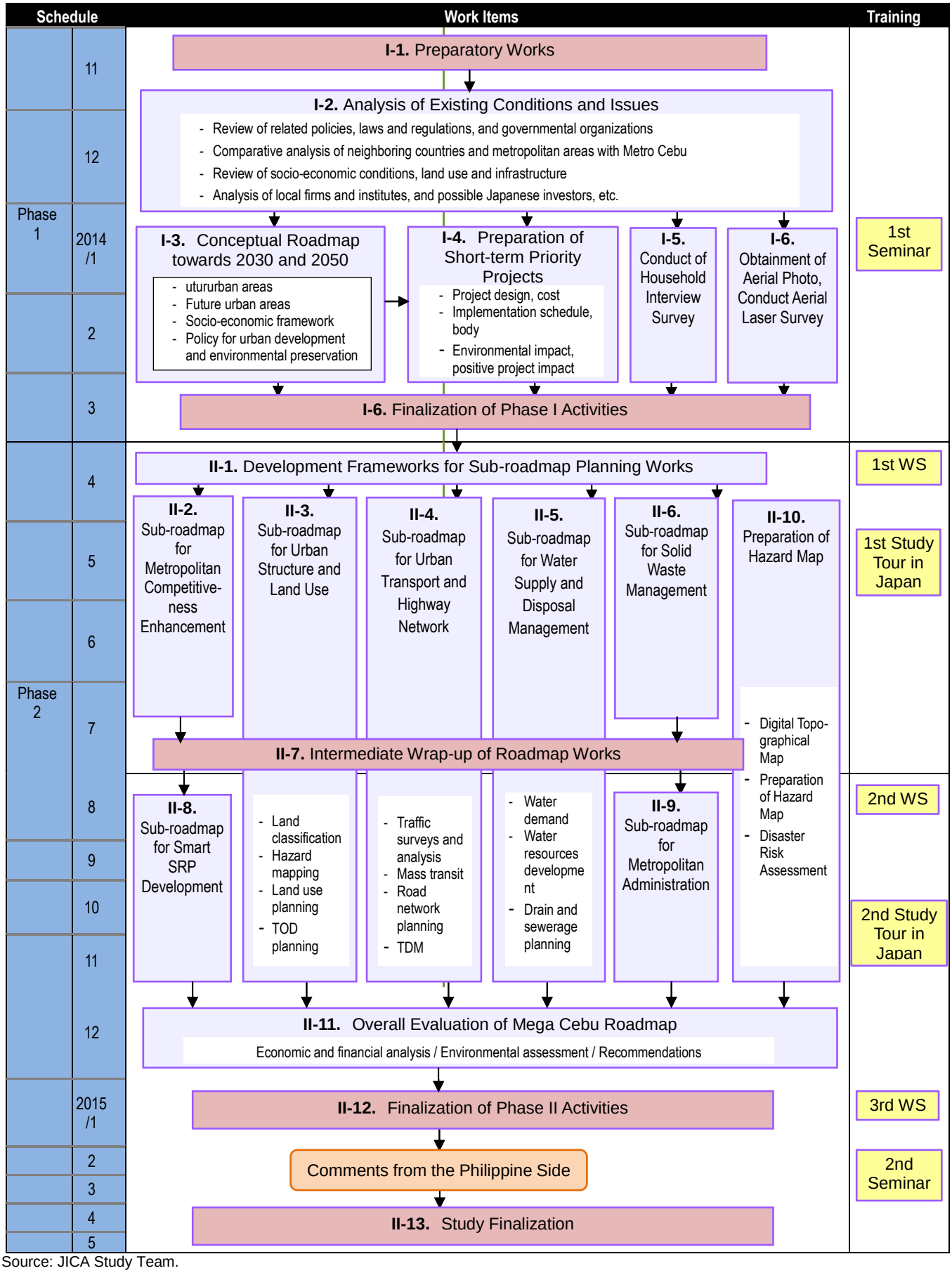
1.10 Short-term priority projects subject to pre-feasibility studies were identified during the first seminar on January 30, 2014 as well as during the two workshops held on February 27 and March 7, 2014. As a result, around 20 projects were identified. Pre-FS have been conducted for 7 projects.

5) Development Frameworks for Sub-roadmap Planning Works

1.11 In order to formulate a roadmap for each sector, a development framework as a precondition for each roadmap has been considered and outlined in Chapter 6.

6) Sub-Roadmap Planning Works and Related Workshops

1.12 Sub-roadmap planning works was conducted. JST has conducted a number of workshops (WS) in connection with the roadmap for “Economic and Investment”, “Water Supply,” “Land Use” and “Smart SRP Development.” Participants to these workshops were from the LGUs as well as from the organized metropolitan sub-team consisting of representatives from selected national government offices, the provincial government and the MCDCB.



Source: JICA Study Team.

Figure 1.2 Overall Work Flow

7) Deliberations on the Interim Reports

1.13 JST submitted the first Interim Report (ITR-1) on April 8, 2014 and it was deliberated upon and accepted by the Steering Committee. JST then held the first workshop on April 10, 2014 with about 100 participants from MCDCB, 13 LGUs, national government agencies, the academe and private companies.

1.14 ITR-2 was submitted by JST on August 12, 2014. It was, likewise, accepted by the Steering Committee. Similar to the first report, JST held the second workshop on August 13, 2014 with about 100 participants from MCDCB, 13 LGUs, national government agencies, the academe and private companies.

1.15 ITR-3 was submitted on January 29, 2015 by JST. This was also deliberated upon and accepted by the Steering Committee. In addition, JST held the third workshop by sector. The workshop for “Transportation and Land Use” was conducted on January 27, 2014 while the workshop for “Water-Related Issues" (water supply, septage and drainage) was conducted on January 28, 2015 with about 60 participants, respectively, from MCDCB, 13 LGUs, national government agencies, the academe and private companies.

8) Study Tours in Japan

1.16 The first study tour was conducted in cooperation with Yokohama City, with 10 participants including the Mayor of the Municipality of Cordova, during May 25 to 31, 2014. Seven of the participants were funded by JICA.

1.17 The second study tour was conducted with 17 participants, including the Governor of Cebu Province, Mayor of Danao City, Mayor of City of Naga, Mayor of Municipality of Compostela, and Mayor of Municipality of San Fernando. This was also done in cooperation with Yokohama City, during October 27 to November 2, 2014. Thirteen of the participants were funded by JICA.

9) GIS Training

1.18 To respond to a request from counterpart agencies, GIS training was conducted for four days. The basic course was held on February 12–13, 2015 and the advanced course on February 16–17, 2015. There were about two participants each from the 13 LGUs, MCDCB, Ramon Aboitiz Foundation, inc. (RAFI), and the Province of Cebu.

1.3 Study Organization

1) Counterpart Agency

1.19 The counterpart agency for this study is MCDCB, chaired by the Governor of Cebu Province and co-chaired by the Mayor of Cebu City and the President of RAFI. The members of the Steering Committee are shown in Table 1.1.

Table 1.1 Members of Steering Committee

No.	Name	Institution
1	Hon. Hilario P. Davide III	Chair, MCDCB / Governor, Province of Cebu
2	Hon. Michael L. Rama	Co-Chair, MCDCB / Mayor, Cebu City
3	Mr. Roberto E. Aboitiz	Co-Chair, MCDCB / RAFI
4	Mr. Dondi Joseph	Chair, Execom and Chair, Focus Area-Based Committee (FABCom) on Integrated Development and Planning / CBC
5	Ms. Dominica B. Chua	Vice Chair, Execom / RAFI
6	RD Efren Carreon	Secretariat, MCDCB and Co-Chair, FABCom on HR, Assets and Partnerships / NEDA 7
7	Prov. Director Jerome Gonzales	Member, MCDCB / DILG 7
8	Ms. Tess Chan	Chair, FABCom on HR, Assets and Partnerships / CCCI
9	Mr. Stanley Go	Chair, FABCom on Environment and Public Safety / MCCI
10	Mr. Lope Doromal	Chair, FABCom on ICT and Knowledge Management / IBM
11	Hon. Teresa Alegado	Co-Chair, FABCom on Integrated Development and Planning / Consolacion
12	RED Isabelo Montejo	Co-Chair, FABCom on Environment and Public Safety / DENR 7
13	RD Edilberto Paradela	Co-Chair, , FABCom on ICT and Knowledge Management / DOST 7

Source : JICA Study Team.

1.20 In addition, JST requested MCDCB to organize two counterpart teams. One is the metropolitan sub-team consisting of designated representatives from key national government agencies and the provincial government. Another is the LGUs counterpart team consisting of assigned representatives from all 13 LGUs comprising Metro Cebu. The total number of members in the LGU counterpart team is 96 persons.

1.21 In order to conduct this multi-sectoral study in an efficient manner, JST also organized a Philippine Experts Team which includes many Cebu-based consultants and academic researchers.

2) JICA Study Team

1.22 The members of the JICA Study Team are listed in Table 1. 2.

Table 1.2 Members of JICA Study Team

No.	Name	Position
1	NAGAYAMA Katsuhide, PhD.	Team Leader/Urban Planning
2	KUMAZAWA Ken	Deputy TL/ Land Use Planning/ Transport Planning
3	Primitivo C. CAL, PhD.	Capacity Development for Planning and Implementation
4	IWADARE Yoshihiko / MATSUOKA Hiroshi	Industrial Development/ Private Investment
5	KOBAYASHI Hisako, PhD.	Public Policy Capability Evaluation/Public Policy Management / Metropolitan Administration
6	SHIMOMURA Nobuko	Environment and Social Considerations / Consensus Building
7	TAJIMA Rie	Economic and Financial Analysis/ PPP for Infrastructure Development
8	Lynn SISON	Urban Infrastructure Planning
9	HARADA Atsushi	Road Planning
10	HIDAKA Shimao	Water Supply Planning
11	SHIRAI Masami	Drainage and Sewerage Planning
12	YAMAMOTO Masaki	Solid Waste Management Planning
13	OKAMURA Naoshi	Traffic Demand Forecast
14	KANAI Yoshikazu, PhD.	Social and Traffic Surveys
15	SAKAI Yuko	Disaster Prevention Planning
16	JITSUKATA Hiromichi	Smart City Planning
17	KANEKO Natsu	Study Coordinator/Residential Area Development
18	KAWABATA Rie	Hazard Mapping
19	Alma PORCIUNCULA	Waterworks Organization

Source: JICA Study Team.

2 OVERVIEW OF THE STUDY AREA

2.1 Socio-economic Conditions

1) Labor Force

2.1 An advantage of Metro Cebu for development is its abundant labor force. In 2007, the labor force population in Metro Cebu was 1,422,100 persons or 62% of the population, which was higher than the national level of 58%. The abundant labor supply was more prominent in the urban centers of Metro Cebu, namely Cebu City and Mandaue City where 64% and 63%, respectively, of their populations are in the labor market. On the other hand, the labor force population ratios of the City of Carcar and the Municipality of San Fernando were the lowest among the 13 LGUs and below the national level.

2.2 In addition to labor force supply, the quality of labor population matters for economic development. Nearly 30% of the population 25 years and over in Metro Cebu attended college or academic degree programs. This is 6% higher than the national average, indicated the existence of a large number of qualified labor force in Metro Cebu. In Cebu City, 37% of the 25 years and older population received higher education, followed by 32% in Minglanilla, 31% in the City of Talisay, and 30% in Mandaue City. This abundant and educated labor force provides Metro Cebu a strong advantage for economic development. Nevertheless, not all LGUs in Metro Cebu could provide qualified labor force. Almost 50% of 25 years and over population in the City of Carcar and the Municipality of San Fernando did not receive an education beyond the elementary level.

Table 2.1 Labor Force and Educational Attainment (Population 25 Years and Over) in Metro Cebu in 2007

	Labor Force Population (15–60)		Education Attainment (Population 25 Year and Over)						
	Persons	%	Elementary or Less*	High School	Post Secondary	College Undergraduate / Academic Degree Holder	Post Baccalaureate	Not Stated	Total
City of Carcar	56,871	56.6	22,181	12,055	852	6,748	93	2,145	44,074
Compostela	22,924	64.1	6,785	6,245	466	3,481	46	544	17,567
Consolacion	54,218	58.5	12,521	14,968	1,265	11,339	79	539	40,711
Cordoba	26,890	62.0	8,018	6,992	392	4,197	39	363	20,001
Danao City	64,141	59.8	21,534	17,257	1,289	8,473	104	845	49,502
Liloan	55,700	58.8	14,518	14,169	1,560	9,622	94	2,697	42,660
Minglanilla	59,447	61.7	14,894	13,881	1,206	14,330	141	504	44,956
Naga City	55,053	60.2	17,400	15,074	958	8,202	61	514	42,209
San Fernando	31,070	63.2	11,504	7,491	434	3,924	113	567	24,033
City of Talisay	107,189	60.1	24,617	24,411	2,383	24,772	372	3,845	80,400
Cebu City	507,784	57.9	84,337	122,095	10,927	136,223	1,599	13,601	368,782
Lapu-Lapu	179,958	56.6	35,883	50,576	4,084	32,561	205	5,530	128,839
Mandaue City	200,846	61.1	34,740	54,854	5,251	42,858	357	3,096	141,156
Metro Cebu	1,422,091	61.8	308,932	360,068	31,067	306,730	3,303	34,790	1,044,890
Cebu	1,371,636	56.4	535,414	315,918	22,836	189,583	2,333	27,105	1,093,189
Region VII	3,662,083	57.4	1,323,666	825,912	72,608	612,741	6,798	64,507	2,906,232
Philippines	51,416,747	58.2	14,140,953	13,840,636	1,871,844	9,201,947	117,255	715,512	39,888,147

Source : National Statistics Office, Population and Housing Census 2007.
Note : * Including “No Grade Completed” and “Pre-school.”

2) Regional Economy

2.3 The regional economy of Central Visayas has grown since 2009 as compared with the national economy and the regional economy of the National Capital Region. The gross regional domestic product (GRDP) of Central Visayas increased to PHP56,500 per capita at constant 2000 price in 2012, at an annual growth rate of 7.9%. The growth of Central Visayas' economy was driven by all three economic sectors, which recorded higher annual average growth rates than those of the Philippines. In particular, the secondary sector or industry significantly expanded its production from 2009 to 2012 (see Table 2.2).

2.4 The growth in the industry sector did not contribute to the expansion of employment as much as the other sectors. The industry sector increased employment by only 0.7% per annum, compared to 2.7% and 4.2% of the primary and tertiary sectors, respectively. It is the primary and tertiary sectors that have been leading the surge in regional employment, more than the secondary sector (see Table 2.3).

Table 2.2 Central Visayas Gross Domestic Product (GRDP) and Per Capita GRDP by Sector in 2009 and 2012 (At Constant 2000 Prices/ Million Pesos)

Sector / Year		2009	2012	Average Annual Growth Rate 2009–2012	
				Region VII Central Visayas	Philippines
Per capita GRDP	Pesos	44,993	56,507	7.9	4.2
Primary (Agriculture, Hunting, Forestry and Fishing)	Million Pesos	27,013.2	28,781.4	2.1	1.7
	% Share in GRDP	9.0	7.2		
	% Share in GNDP	4.1	4.1		
Secondary (Industry)	Million Pesos	98,301.7	145,507.4	14.0	6.7
	% Share in GRDP	32.6	36.6		
	% Share in GNDP	5.9	7.2		
Tertiary (Service)	Million Pesos	176,568.0	223,362.9	8.2	6.6
	% Share in GRDP	58.5	56.2		
	% Share in GNDP	6.0	6.2		
Gross Regional Domestic Product	Million Pesos	301,882.9	397,651.7	9.6	6.0
	% Share in GNDP	5.7	6.3		

Source: National Statistical Coordination Board.

Table 2.3 Employment in Central Visayas in 2007 and 2011

Major Industry Group	2007		2011				Annual Average Growth Rate 2007–2011, (%)	
	Employment (1000 persons)		Employment (1000 persons)		Share in Total (%)			
	Central Visayas	Philippines	Central Visayas	Philippines	Central Visayas	Philippines	Central Visayas	Philippines
Primary: Agriculture, Hunting, Forestry and Fishing	817	11,786	906	12,268	31.2	33.0	2.6	1.0
Secondary: Industry	524	5,121	538	5,530	18.5	14.9	0.7	1.9
Tertiary: Service	1,236	16,654	1,459	19,394	50.3	52.1	4.2	3.9
Total	2,577	33,560	2,902	37,192	100	100	3.0	2.6

Source: National Statistics Office, Labor Force Survey.

3) Poverty Incidence and Informal Settler Families

2.5 Reflecting the strong economic growth in the region, poverty incidence dramatically declined in Central Visayas as well as in Cebu Province from 2006 to 2012 (see Table 2.4). In 2006, the poverty incidences among families and population of Cebu

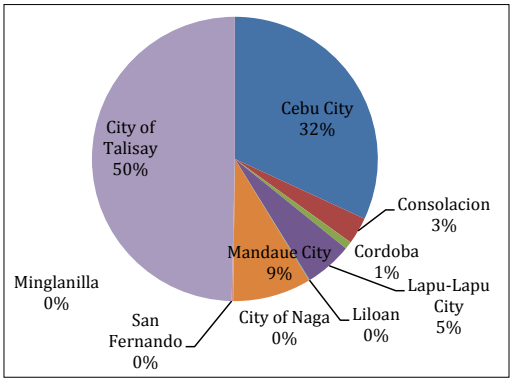
Province and Central Visayas were higher than the national level. Six years later, poverty incidence in the province was lower than the Philippines'. Nevertheless, poverty still persists in Central Visayas and Cebu Province, where nearly 30% of the regional population and about 23% of the provincial population are considered poor.

Table 2.4 Poverty Incidence in Cebu Province, Region VII and the Philippines in 2006 and 2012

Region/Province	Magnitude of Poor Population		Poverty Incidence among Families (%)		Magnitude of Poor Population		Poverty Incidence among Population (%)	
	2006	2012	2006	2012	2006	2012	2006	2012
Cebu	209,301	185,603	25.6	18.9	1,184,478	1,000,163	30.4	22.7
Central Visayas	411,431	405,694	30.7	25.7	2,274,400	2,094,911	35.9	30.2
Philippines	3,809,283	4,214,921	21.0	19.7	22,643,980	23,745,895	26.6	25.2

Source: National Statistical Coordination Board.

2.6 There are 35,217 informal settler families (ISFs) in Metro Cebu. Nearly 50% of the ISFs reside in the City of Talisay, followed by Cebu City with 32% (see Figure 2.1). The informal settler families of the two LGUs account for more than 80% of ISFs in Metro Cebu. Many informal settlements are found in the coastal areas or riverbanks and often occupy government land or sites for infrastructure.



Source: LGUs.

Figure 2.1 Location and Coverage of Metro Cebu's ISFs

4) Development Issues and Priorities of 13 LGUs in Metro Cebu

2.7 Two series of LGU meetings conducted by the JST from late November to the beginning of December 2013 and in February 2014, revealed the development issues and priorities of each LGU.

2.8 There are four major development issues in Metro Cebu; namely: (1) septage and sewerage management, (2) solid waste management, (3) traffic management, public transport, roads and other transport infrastructure, and (4) water supply. In addition, the member LGUs of the metropolis also identified concerns for rapid population increase and informal settlements, economic development and the environment.

2.9 LGUs determined their development priorities based on identified development issues, their future vision and development strategy. Due to differences in LGUs' goals, development priorities include diverse options from water supply, public transport, road or bridge development, reclamation, informal settlement, solid waste management and sanitary landfill, public market, and new city center (see Table 2.5).

Table 2.5 Development Issues, Priorities, and Good Practices of 13 LGUs in Metro Cebu

LGU	Development Issues	Development Priority
Compostela	• Public market • Septage management • Increase in population • Relocation areas for informal settlers • Water supply (develop own water supply because of abundant water supply) • Solid waste management and dumping site • Traffic congestion	• Road development • Reclamation • Sea-based transport • Development of IT park with fiber-optic line • Water supply
Consolacion	• Public transport • Water treatment, septage and sewerage programs • Rapid urbanization and population inflow • Informal settlement • Economic development • Water supply (80% supplied by MCWD) • Solid waste management	• Health care • Agriculture • Security • Education • Improvement of public services • Economic development • Infrastructure development • Environmental preservation • Cultural preservation • Tourism • Housing policy • Sports
Liloan	• Education • Healthcare • Economic development • Traffic congestion on trunk roads • Population increase • Garbage disposal facilities • Septage and sewerage treatment facilities	• Education • Health care • Sea-based public transport • Sanitary landfill • Septage and sewerage system
Cebu City	• Drainage • Roads and bridges • Public transport • Environment and coastal management • Population increase • Traffic congestion • Informal settlers • Solid waste management • Air pollution • Septage and sewerage management • Housing • Water supply • Environment (disposal of hazardous waste) • Institutional issues - overlapping of functions (river easement- LGU, DPWH and DENR)	• Hospital • Improvement of roads and drainage • Implementation of circumferential road • Septage and sewerage • Public transport (BRT) • Regulation of tricycle and trisikad
Mandaue City	• Economy • Education • Informal settlement • Transportation infrastructure • Environment • Development control • Salt water intrusion or contamination • Pollution caused by industry • Solid waste management • Septage and sewerage	• School • Roads • Drainage for Fortuna Street • Traffic management • Informal settlement • Tourism • Transport (PUJ and buses) • Talisay-SM-Mandaue BRT • Solid waste management • Septage and sewerage
Danao City	• Traffic congestion • Public transport • Dumping site • Sewerage and septage	• Road network • Bulk water supply system • Sewerage
Talisay City	• Water resource and water supply • Population increase • Sewerage • Salt water intrusion • Solid waste management	• Improvement of drainage • New roads and road widening • Public market • Relocation of informal settlement • Schools

LGU	Development Issues	Development Priority
	• Drainage • Public market • Roads, transport • Traffic management • Informal settlers	• Solid waste management (each barangay should have a MRF) • Rehabilitation of earthquake hit schools • International marina • SRP fish port
Carcar City	• Social security • Poverty incidence • Existing port • Flooding • Social issues (drug addicts) • Solid waste management	• New city center • Road widening and diversion bypass roads
Minglanilla	• Rapid population inflow • Development control • Traffic congestion • Drainage (creeks have no existing drainage) • No sewerage system • Solid waste management • PHP100 million flyover by DPWH	• New public market (including public transport terminal) • Trunk road (old PNR) • 100 ha reclamation and industrial estate • Modern traffic signal installation • Port expansion to have a RORO from Minglanilla to Bohol
Naga City	• Mass transport • Port • Public buildings (police, fire, etc.) • Septage • Lack of water supply	• Water supply • Road repair • Tourism resource • Drainage and sewerage • Port • New Naga public market • Education (new college)
Lapu-Lapu City	• Water supply • Solid waste management • Power supply • Waste water treatment • Transport and traffic congestion • Salt water intrusion	• Reclamation (northern part) • Sport recreation • Urban redevelopment • Road widening • Drainage • Intermodal transport • Water resource
Cordova	• Traffic congestion • Solid waste • Informal settlement • Water supply • A lack of sanitary landfill • Public transport terminal • Power supply (island barangays depending on solar energy) • Narrow roads • Socialized housing • Sewerage	• New Mactan bridge • New port • Reclamation • Bridge from Cordova to Bohol • RORO transport system from SRP to Shell Island and Causeway from Shell Island to Cordova • Septage and sewerage
San Fernando	• Population increase • Water resource and water supply • Dumping site • Traffic • Septage • Flooding	• Sanitary landfill • Secondary diversion road • Implementation of circumferential road

Source: JICA Study Team.

2.2 Natural Conditions

1) Topographical and Geological Condition

(1) Topographical Conditions

2.10 The study area is mainly composed of hilly uplands and mountains. The distribution of flat land is quite limited. The study area extends from northeast to southwest. Its eastern edge is facing the Camotes Sea and Cebu Strait and the western edge is covered by hilly uplands and mountains.

(2) Elevation

2.11 Elevation in the study area varies from below 0 m to more than 500 m. The low elevation area covers the coastal area and riverbanks. On the other hand, high mountainous areas are located in Cebu City, Talisay, Mingalanilla and Danao. The other cities have low-rise hilly uplands. Two cities in Mactan Island, Lapu-lapu and Cordova, have no highland.

(3) Slope

2.12 The slope of the land is one of the indicators to show the availability of land for development. Steep slope usually causes serious environmental problems such as erosion of surface soil or even a landslide. Housing, industrial development and infrastructure development, etc. will be controlled mostly by the slope gradient. Slope of less than 8%, which makes for higher land use suitability, can be found mainly in the alluvial lowland areas along the coastline.

(4) Geology

2.13 According to the geology map published by the Mines and Geosciences Bureau (MGB), geology in the study area is classified into 24 types. The main geology is sedimentary rock which formed the backbone of Cebu Island. Tertiary rocks consisting of limestone, sandstone and conglomerate are widely distributed in the island. Quaternary limestone is also distributed widely in the fringe area of older sedimentary rocks. Alluvium has developed near the mouths of rivers and coastal lowland. Basically, development of the alluvial lowland is suitable for agricultural, industrial and urban development. However, that area is hazardous for liquefaction in the event of earthquake and requires special consideration.

2) Protected Areas

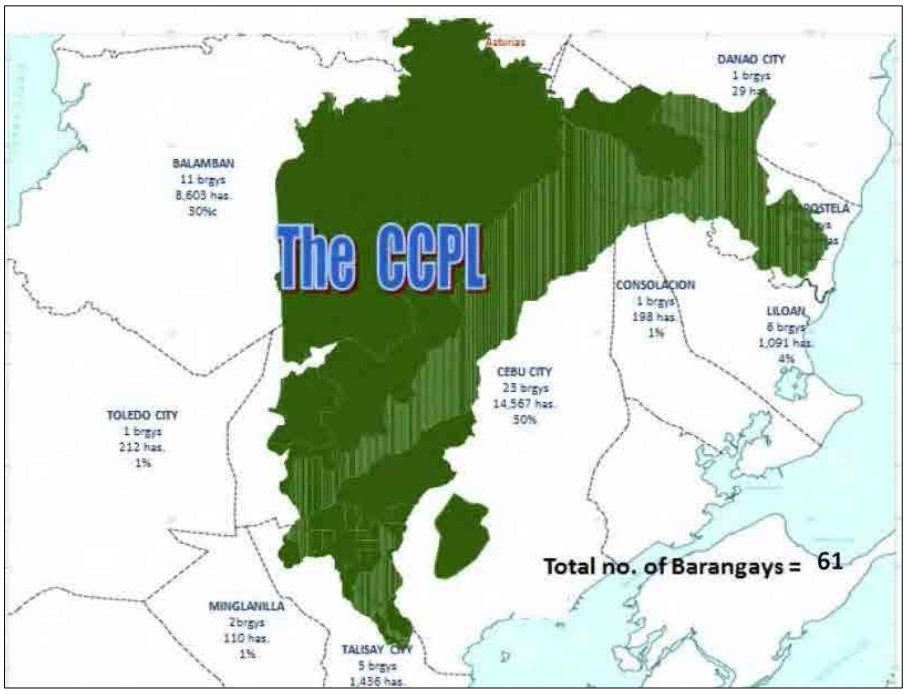
2.14 The National Integrated Protected Areas System (NIPAS) Act of 1992 (Republic Act 7586) defines protected areas as the "identified portions of land or water set aside by reason of their unique physical and biological significance, managed to enhance biological diversity and protected against destructive human exploration." The law provides the legal framework for the establishment and management of protected areas in the Philippines.

2.15 As summarized in Table 2.6, a total of six protected areas were established in Cebu Province with three areas located in Metro Cebu.

Table 2.6 Protected Areas in Metro Cebu

No.	Name of Protected Area	Location	Proclamation No./Date	Area (hectares)
1	Guadalupe Mabugnao Mainit Hot Spring Natl Park	Carcar, Cebu	RA 6429/June 17, 1972 Proc. 335A/May 30, 1986	57.50
2	Olango Island Wildlife Sanctuary (Game Refuge and Bird Sanctuary)	Sta. Rosa, Lapu-lapu City	Proc 903/May 14, 1992	920
3	Central Cebu Protected Landscape (CCPL)	Cities of Cebu, Talisay, Toledo, Danao and Mun. of Minglanilla, Consolacion, Liloan, Compostela and Balamban	RA 9486/June 7, 2007 Proc. 441/August 12, 2003	29,062

Source: National Integrated Protected Areas System (NIPAS) Act of 1992 (Republic Act 7586).



Source: DENR.

Figure 2.2 Location of Central Cebu Protected Landscape (CCPL)

2.3 Mapping, GIS Development and Hazard Analysis

1) Maps and GIS

(1) Available Maps and GIS

2.16 In the Philippines, the National Mapping and Resources Information Authority (NAMRIA) is mandated to provide mapmaking services including GIS, as well as geographic and resource information to both the public and private sectors. However, their maps covering Metro Cebu are prepared mostly in 1:50,000 scale, and partly in 1:10,000 scale. Therefore, any map covering the whole study area in detailed scale such as 1:10,000 was not available from NAMRIA.

2.17 Instead, JST collected maps and GIS information from the LGUs. The most advanced LGUs for GIS information are Cebu and Mandaue. They have developed their own systems for managing urban planning and urban facilities or land cadastral and tax collection. Some other LGUs have already prepared GIS maps through local consultants and these are kept by designated persons in the LGUs. However, the rest of the LGUs do not have GIS databases due to the lack of appropriate staff and the budget to purchase computer and application software.

(2) Preparation of Topographic Map

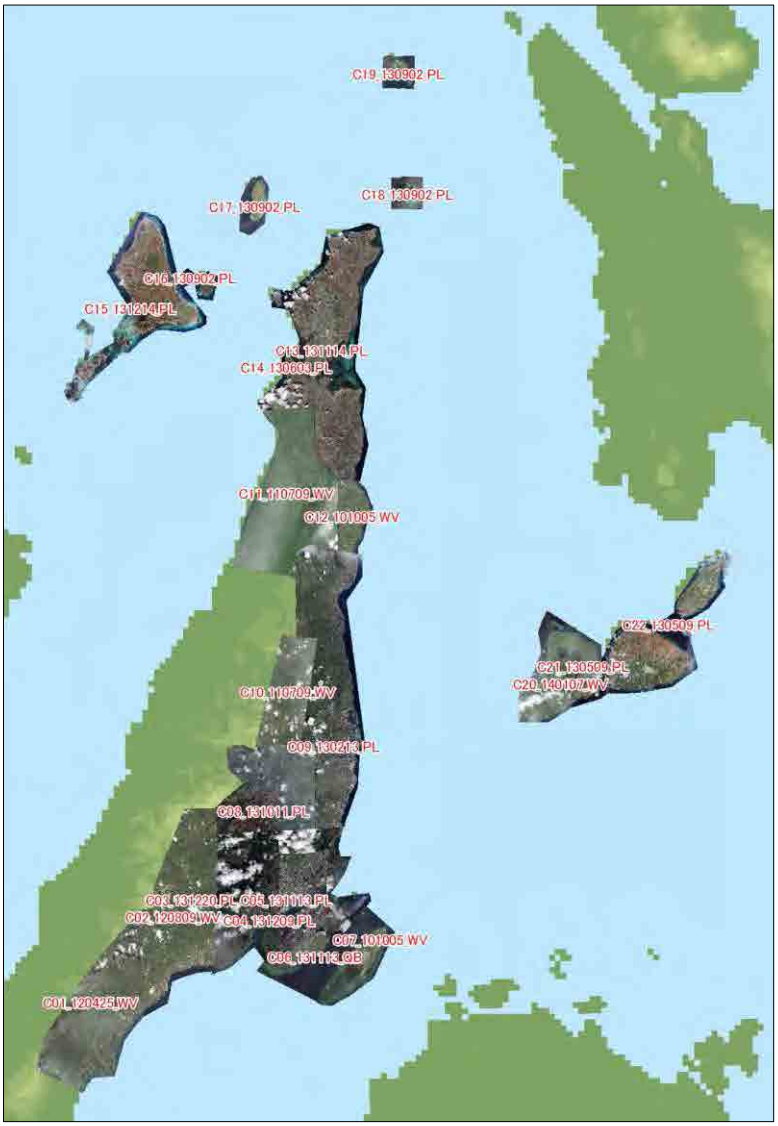
2.18 The topographic map is essential for urban planning and identification of land use type. As such, JST prepared a land use map for both existing and future conditions in 1:10,000 scale. Since no maps and GIS information were available from the LGUs, JST conducted a mapping survey and prepared a topographic map in 1:10,000 scale for Metro Cebu and developed a GIS database for roadmap planning.

2.19 In addition, considering the serious damages wrought by Typhoon Yolanda on November 8, 2013 in northern Cebu, JICA decided to expand the mapping area to

cover not only the study area in Metro Cebu but also such areas for topographic mapping and hazard assessment. Its scale, however, is confined to 1:25,000 which is enough for large area management and hazard mapping.

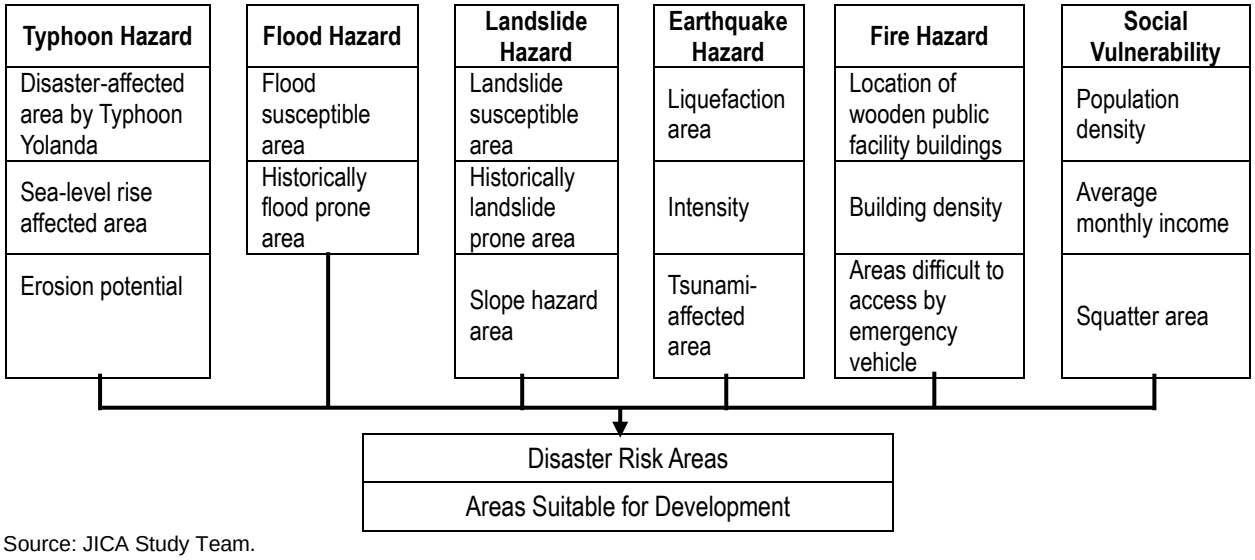
(3) Hazard Mapping

2.20 Based on the topographic map in 1:10,000 and 1:25,000 scale, hazard maps were prepared. The expected natural disasters in the study area are typhoon, flood, landside and earthquake. In addition, fire is identified as the most serious man-made disaster. Hazards of these disasters were identified on the maps using GIS analytical tools. The hazard levels were assessed and the assessments were compiled for all disaster categories. Finally, disaster risk areas and areas which are suitable for development were identified. Figure 2.4 illustrates these procedures.



Source: JICA Study Team processed satellite imagery Include copyrighted materian of Digital Globe, Inc., All Rights Reserved and Centre National d Etudes Spatiales (CNES) production, Distribution Astrium Services / Spot Image S.A., France, all rights reserved.

Figure 2.3 Geological Mapping Area



Source: JICA Study Team.

Figure 2.4 Procedure of Disaster Risk Assessment

2) Hazard Analysis

(1) Reservation Area and Hazardous Areas

2.21 To evaluate the potential occurrence of natural disasters in the current urbanized area and determine the areas for future development, Metro Cebu land was classified according to the following categories:

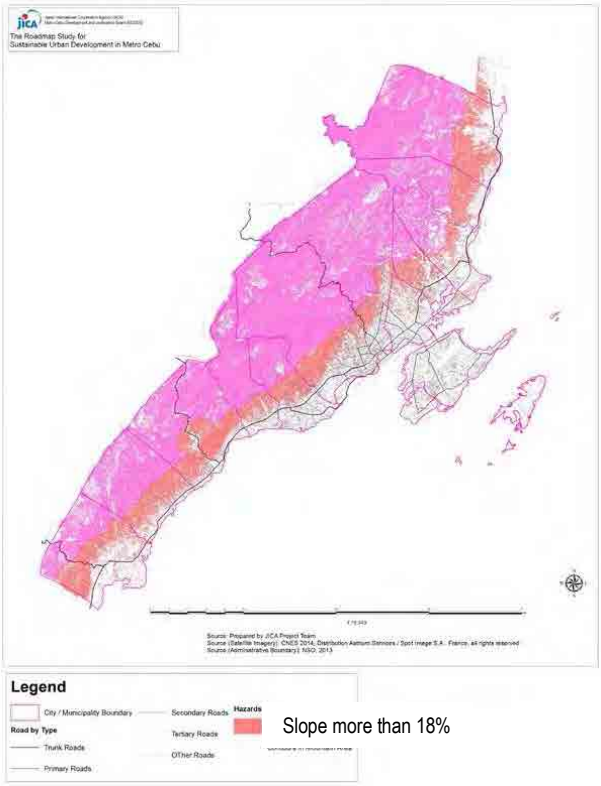
(a) **Protected Area by Laws and Ordinances:** Olango Island Wildlife Sanctuary (Game Refuge and Bird Sanctuary: 920 ha), Central Cebu Protected Landscape (CCPL: 29,062 ha).

(b) **Slope Hazard Area:** the constrained areas of slope according to Philippine laws are those with more than 18% gradient, and these cover 72% of the study area (see Figure 2.5).

(c) **Lowland Hazard Area:** JST defined areas less than 2 m above sea level as lowland hazard area that is highly affected by sea level rise caused by climate change. It covers 0.13% of the study area (see Figure 2.6).

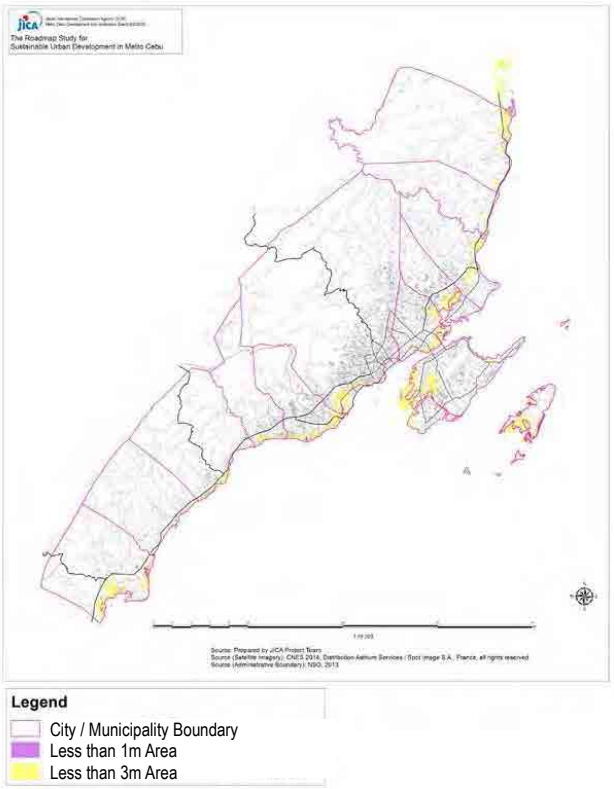
(d) **Flood Hazard Area:** flood hazards are evaluated at three levels (Low/ Moderate/ High) with consideration of topography, stream flow capacity and inundation patterns (see Figure 2.7).

(e) **Landslide Hazard Area:** landslide hazards are evaluated at three levels (Low/ Moderate/ High) based on analysis of satellite images, digital geographical features model and contour (see Figure 2.8).



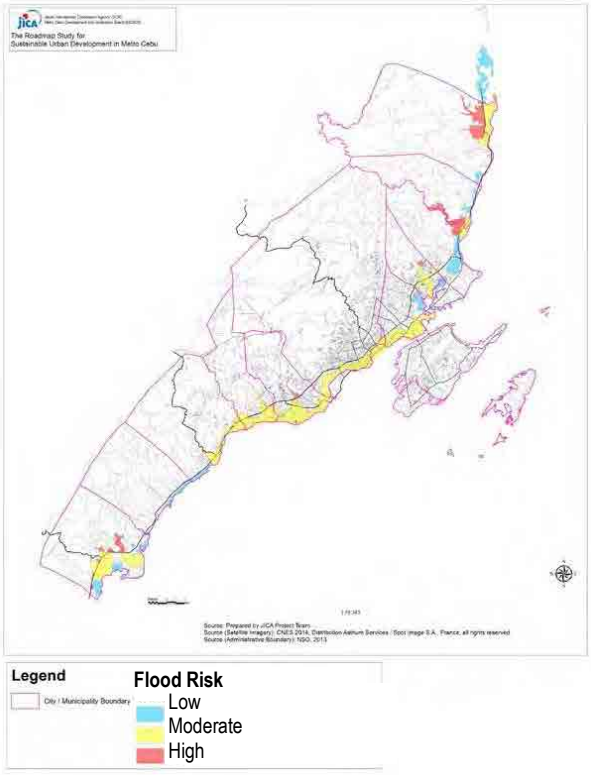
Source : JICA Study Team.

Figure 2.5 Slope Hazard Area



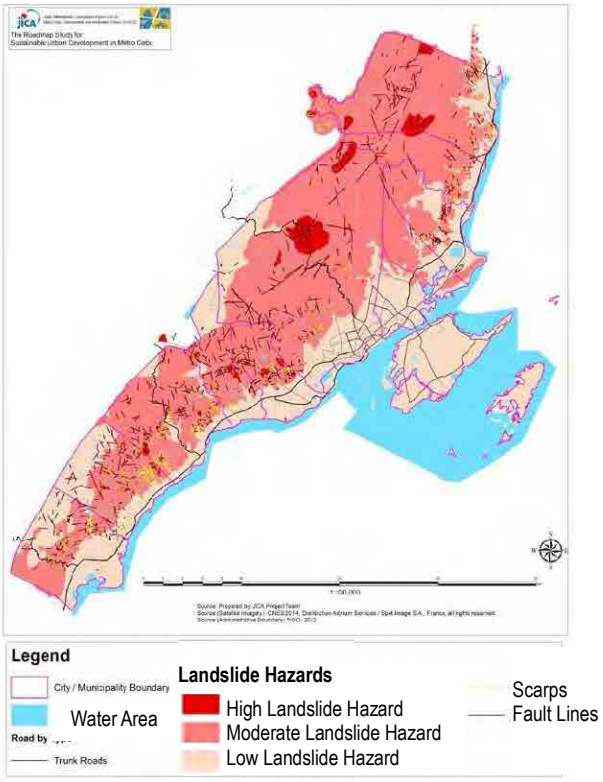
Source : JICA Study Team.

Figure 2.6 Lowland Hazard Area



Source : JICA Study Team.

Figure 2.7 Flood Hazard Area



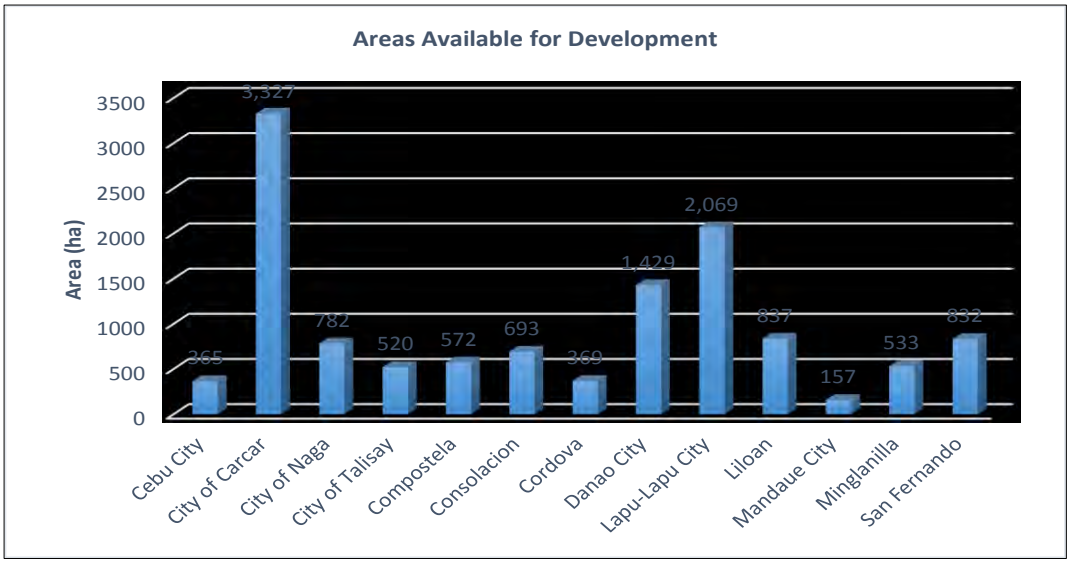
Source : JICA Study Team.

Figure 2.8 Landslide Hazard Area

(2) Possibile Land Supply for Urbanization

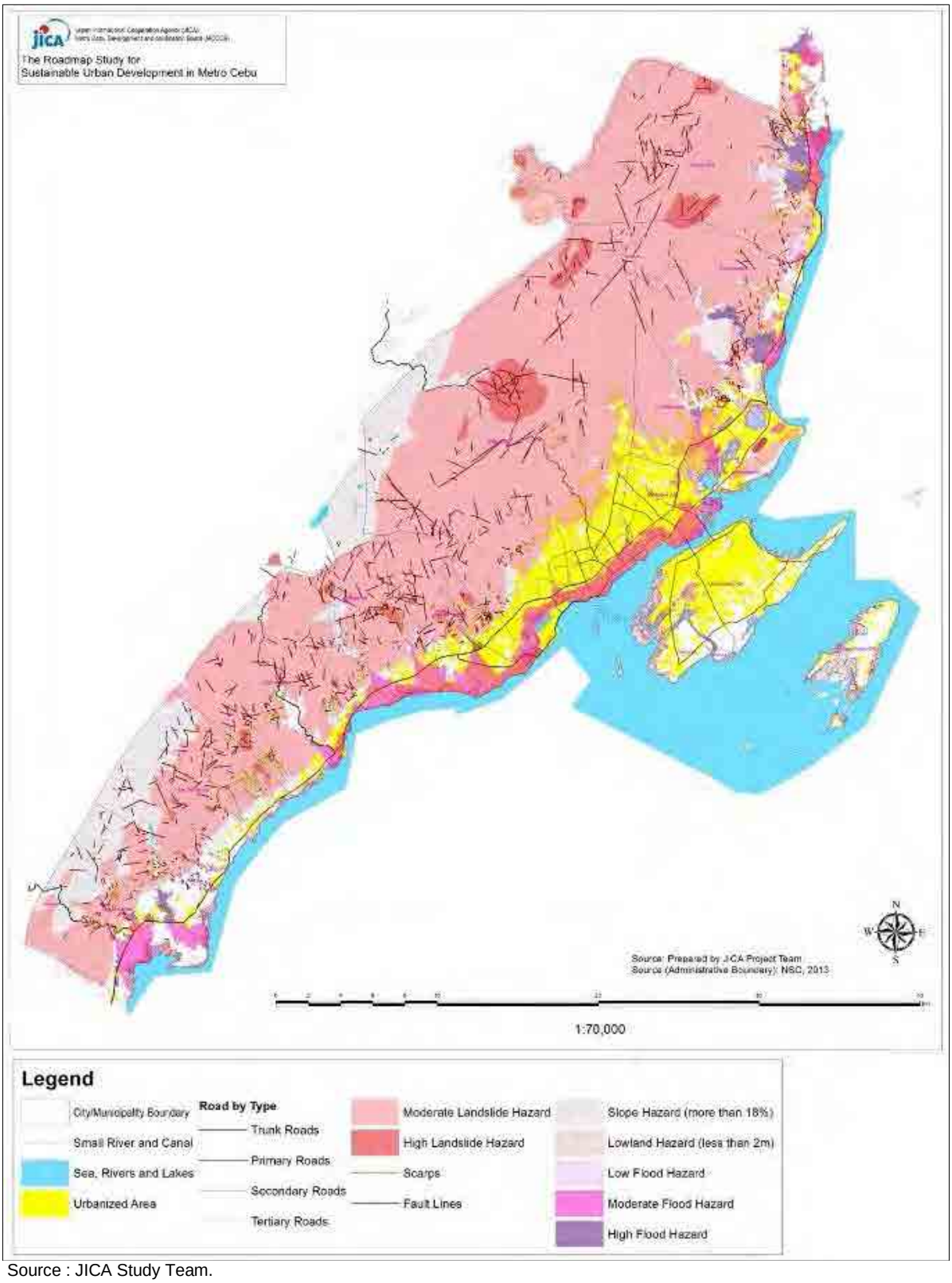
2.22 Based on the results of hazard analysis, land in Metro Cebu suitable for urban development was analyzed. However, flood hazard is not considered as a constraining factor because flood characteristically often occurs as a result of urbanization and it can be avoided through infrastructure development measures such as capacity expansion and cleaning of rivers and waterways. As a result, 76% of the study area is considered hazardous and not suitable for urban development. About 1.9% of this unsuitable area is located in the current urbanized area (see Figure 2.10).

2.23 Development suitable area which has not been urbanized and without any hazards is 11,948 ha, or 10.9% of the study area (see Figure 2.9). In developing a good urban area, future urbanization should only be considered within this area.



Source: JICA Study Team.

Figure 2.9 Areas Available for Development per LGU (ha)



Source : JICA Study Team.

Figure 2.10 Hazard Area and Urbanized Area

3 URBAN STRUCTURE AND INFRASTRUCTURE

3.1 Review of Urban Development

1) MCLUTS Experience and Post MCLUTS

3.1 The development of Metro Cebu between 1980 and 2000 was guided by a structure plan formulated by the Metro Cebu Land Use and Transport Study (MCLUTS) which was completed in 1981 (see Figure 3.1). That study was undertaken under the leadership of the Department of Transportation and Communications (DOTC), with technical assistance from the Australian Government. The main objectives of MCLUTS were as follows:

(i) To formulate a Land Use and Transportation Strategy Plan for Metropolitan Cebu;

(ii) To prepare, within the framework of the Strategy Plan, policies, guidelines, programs and proposals to meet the short-, medium- and long-term transport requirements to year 2000; and

(iii) To undertake projects designed to effect immediate alleviation of existing critical transport and traffic problems.

3.2 Under MCLUTS, the number of LGUs comprising Metro Cebu was 10, without Danao City, San Fernando and Carcar.

(1) MCLUTS' Strategic Planning

3.3 MCLUTS adopted a mathematical approach to formulating a structure plan for Metro Cebu, making use of a set of mathematical models, called TRANSTEP, to enable the effects of alternative land use-transportation plans to be simulated. The preparation of alternative plans was based on an analysis of development constraints and opportunities and proposed housing and employment projects. Land was classified according to relative suitability for urban development to ensure that planned or projected land uses were broadly responsive to natural constraints and the maintenance and protection of environmentally sensitive areas. The four basic plans were based on issues such as:

(i) Reclamation or no reclamation;

(ii) Stimulation of development on the mainland or Mactan Island or both;

(iii) Concentration of development within the cities of Cebu and Mandaue, or dispersal of growth to new communities in Consolacion, Talisay and outer smaller municipalities;

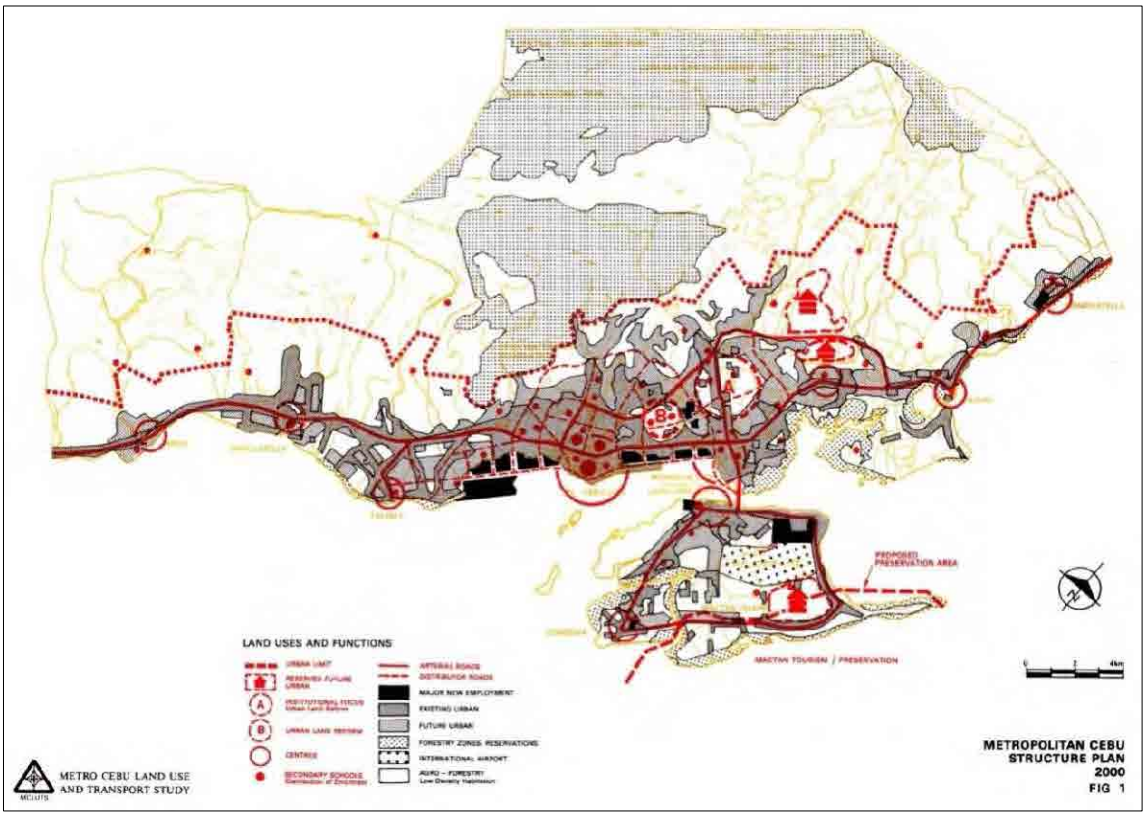
(iv) Concentration of central area activities or dispersal to district centers; and

(v) Continuation of current trends or high level of government intervention.

3.4 Four basic alternative plans had been formulated and subjected to detailed testing and evaluation.

(2) Plan Implementation

3.5 The Philippine Government decided to implement the MCLUTS plans and programs. The national components of the MCLUTS Transportation Improvement Program had been absorbed by the World Bank-funded Central Visayas Regional Projects. The LGUs within Metro Cebu likewise proceeded to implement their components of the plans and programs (see Table 3.1).



Source: MCLUTS.

Figure 3.1 Metro Cebu 2000 Structure Plan (Plan 2)

Table 3.1 MCLUTS Plan Implementation Status

The Components Implemented	The Components NOT Implemented
• Mandaue City reclamation project; • South reclamation project; • New roads built such as the connector road from M. J. Cuenco to P. Del Rosario St., By-pass road from H. Cortez to the Reclamation Area, Extension of F. Cabahug St. to H. Cortez St., and Tayug Link as part of Plan 3; • Construction of 2nd bridge between the mainland and Mactan Island; • Widening/improvement of arterial roads; • Construction of the southern bus terminal; • Installation of a modern traffic signal system; • Implementation of some traffic management measures; and • Development of the Mactan tourism area.	• Creation of the Metro Cebu Development Authority; • Construction of other new roads such as a circumferential road from A. Fortuna to the South Road, Extension of H. Cortes St., A. Abellana St., and the Northern Ring Road from Talamban to Liloan; and • Improvement/ Widening of existing roads, e.g., Gov. Cuenco Ave.

Source : JICA Study Team.

3.6 The population of Metro Cebu was forecasted by MCLUTS to reach 1.889 million by year 2000, which exceeded the actual value by 12.6%. It would appear that the construction of the 2nd bridge and the Tayud Link affected the population distribution.

(3) Lessons Learned from MCLUTS

3.7 A number of important lessons have been acquired from the conduct of the MCLUTS. These include the following:

(i) The inclusion of action-oriented activities earned support from the stakeholders.

(ii) The participation of the private sector in the conduct of the project was very important, especially with the changing national and local administrations, and the NGOs became advocates of the plan.

(iii) The continuing existence of a study team was necessary to move the plan forward.

(iv) The provision of plan alternatives allowed flexibility in plan implementation. For example, the 2nd bridge was a component of Plan 4 and the Tayud Link was a component of Plan 3.

(v) It is impossible to forecast accurately land use developments, therefore a mechanism should be established to allow the conduct of periodic updating of plans.

2) Metro Cebu Development Project (MCDP)

3.8 The Metro Cebu Development Project (MCDP) was conducted in three terms (Phases 1 to 3) by a Yen-loan to realize the comprehensive development of urban infrastructure.

(1) MCDP (Phase 1)

3.9 MCDP (Phase 1) was conducted from 1988. The total amount of this project came to about JPY2 billion. The purpose of MCDP (Phase 1) was mitigation of traffic congestion and improvement of traffic network in order to solve the lack of infrastructure caused by rapidly increasing population. The main projects of MCDP (Phase 1) were: (i) new construction/ extension of national road, (ii) improvement of traffic management system (installation of traffic signals and road signs, etc.), and (iii) constrution of the Cebu South Bus Terminal.

3.10 In 1992, the Cebu South Bus Terminal was completed, then the number of bus services and number of shops in the terminal building were increased. As a result of terminal development, the level of comfort and safety or connection between bus, taxi and jeepney, etc. was improved. In 1995, road development projects (i) and (ii) were completed. In consequence, mitigation of peak time traffic congestion and shortening of driving time was achieved and traffic safety was improved.

(2) MCDP (Phase 2)

3.11 MCDP (Phase 2) was conducted from 1989. The total amount of this project came to about JPY4.3 billion. The main projects of MCDP (Phase 2) were: (i) extension of national road/ new construction of roads (Mandaue causeway, etc.), (ii) construction of the Cebu North Bus Terminal, (iii) expansion/ development of public markets (Mandaue public market and Talisay public market), and (iv) development of a solid waste disposal system (Inayawan sanitary landfill). These projects were implemented to solve problems related to lower urban service level caused by population increase in Metro Cebu and to improve the living environment for residents.

3.12 Regarding results of MCDP (Phase 2), traffic congestion was eased and regional development was promoted by the project (i) on extension of national road/ new construction of roads. In 1994, project (ii) on the construction of the Cebu North Bus Terminal was completed. Though there were some problems on the location of the bus terminal and the convenience of connection between other transportation modes, utilization of the terminal by passengers was good and convenience for bus users was improved. The implementation of project (iii) on public markets contributed to

improvement of the living environment by provision of good quality service and business opportunity to neighboring residents. Regarding project (iv) on the sanitary landfill, athough there was a problem of inefficient operation, solid waste collection rate improved to about 90% (as of 2001) and urban service was improved.

(3) MCDP (Phase 3)

3.13 MCDP (Phase 3) was conducted from 1995. This is the larger-scale project than the previous two projects, with a total cost of about JPY30.7 billion. The main projects of MCDP (Phase 3) were: (i) reclamation project in the Cebu South Road Property (SRP), and (ii) construction of the Cebu South Coastal Road.

3.14 The SRP reclamation project was conducted to develop a new industrial park and attract foreign enterprises to Cebu. However, its purpose was not achieved because of the Asian Financial Crisis in 1997.[1] Therefore, the purpose of this project was changed to attract domestic enterprises/ industries. Currently, SRP accommodates part of the schoolbuilding of the University of the Philippines (UP), shopping malls, residences, and factories for light-manufacturing businesses.

3.15 The construction of the Cebu South Coastal Road was conducted to smoothen road traffic flow and contribute to the growth of the regional economy. As a result of this project, traffic jams were alleviated since vehicles began to take a detour through the coastal road.

3.16 In addition, two Yen-loan projects were conducted simultaneously with MCDP.

(4) Mactan – Cebu International Airport (MCIA) Development Project

3.17 The MCIA development project was launched in 1991. The project aimed to expand and repair facilities of MCIA (the second largest airport in Philippines) to deal with demand increase and to improve safety. The total amount of this project came to about JPY10.5 billion.

3.18 The runway extension done through this project gave access to large-sized airplanes, which could accommodate more passengers, enabling the operation of international direct flights connecting MCIA to some foreign cities such as Narita, Hong Kong, Singapore, Malaysia and Taiwan. Additionally, the significant need to export products by air cargo from Mactan Export Processing Zone (MEPZ), which is located next to MCIA, meant that development of the airport and the basic infrastructure around MEPZ contributed greatly to its domestic business.

(5) The Second Mactan Bridge Construction Project

3.19 In 1993, the Second Mactan Bridge project was launched to lighten the increased traffic load caused by urban growth and the deterioration of the First Mactan Bridge, which was heavily damaged by a typhoon in 1990. The total cost of the project came to about JPY6.6 billion. Its goal was to control traffic volume increase as well as to dissolve chronic traffic congestion on the existing first bridge by constructing a new bridge between Cebu island and Mactan island, where most international resorts and tourist spots are located.

[1] This was a period of financial crisis that gripped much of East Asia beginning in July 1997 and raised fears of a worldwide economic meltdown due to the financial contadion.

3.20 Construction of the Second Mactan Bridge was completed in 1999. Traffic congestion on the first bridge was solved and traffic flow between both islands was greatly improved. Transport efficiency between Cebu island and MCIA/ MPEZ, etc. improved the lives of residents and greatly boosted economic growth in the region.

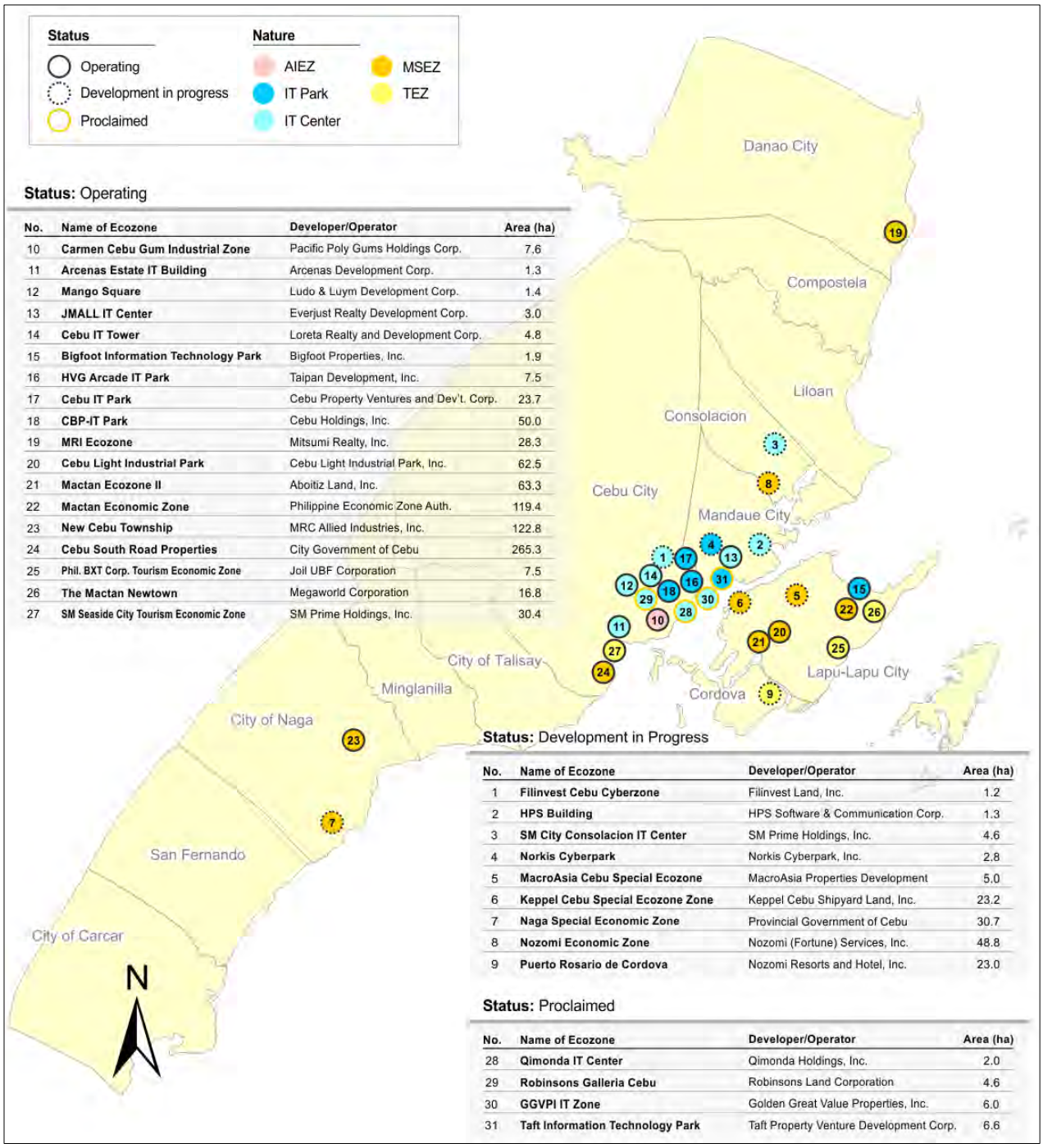
3) PEZA-Registered Projects

3.21 The Philippine Economic Zone Authority (PEZA) is a government agency under the Department of Trade and Industry (DTI) that was established in 1995 in order to realize investment promotion, employment provision and export facilitation. There are several types of economic zones under PEZA such as manufacturing economic zone, information technology park/ center, agro-industrial economic zone, tourism economic zone, and medical tourism park/ center. As of February 2014, there are 300 economic zones in operation under PEZA.

3.22 PEZA zones offer substantial incentives to investors. These include exemption/ reduction of corporate tax, customs exemption when importing machinery, equipment/ parts and raw materials, exemption of property tax, and so on. In the case of a manufacturing economic zone, each site office has ample authority to support manufacturers, including issuance of building permit, export/import permit, and visa for employees and their family members.

3.23 There are 64 PEZA-registered projects in Metro Cebu, covering a total of 989 ha. In terms of development phase, 37 projects with 825 ha are operating, 14 projects with 143 ha are under development, and 13 projects with 21 ha are proclaimed (see Figure 3.2).

3.24 As to project type, six manufacturing economic zones (MEZ) currently operate in Metro Cebu, including Cebu SRP (265 ha), Mactan Economic Zone (112 ha), Mactan Economic Zone II (63 ha), Cebu Light Industry (62 ha), and New Cebu Township (123 ha). There are as many as 27 operating IT park/ center projects occupying a total of 101 ha. Among them, the Cebu Business Park (50 ha) and the Cebu IT Park (24 ha) are representative. Three tourism economic zones (TEZ) and one agro-industrial economic zone (AIEZ) also operate in Metro Cebu. Among the abovementioned operating projects, many sites are fully occupied while some still remain largely vacant, such as the Cebu SRP and New Cebu Township in Naga City. Both the large-scale projects are rather mixed and self-contained for commercial, business, R&D and residential development.



Status: Operating

No.	Name of Ecozone	Developer/Operator	Area (ha)
10	Carmen Cebu Gum Industrial Zone	Pacific Poly Gums Holdings Corp.	7.6
11	Arcenas Estate IT Building	Arcenas Development Corp.	1.3
12	Mango Square	Ludo & Luym Development Corp.	1.4
13	JMALL IT Center	Everjust Realty Development Corp.	3.0
14	Cebu IT Tower	Loreta Realty and Development Corp.	4.8
15	Bigfoot Information Technology Park	Bigfoot Properties, Inc.	1.9
16	HVG Arcade IT Park	Taipan Development, Inc.	7.5
17	Cebu IT Park	Cebu Property Ventures and Dev't. Corp.	23.7
18	CBP-IT Park	Cebu Holdings, Inc.	50.0
19	MRI Ecozone	Mitsumi Realty, Inc.	28.3
20	Cebu Light Industrial Park	Cebu Light Industrial Park, Inc.	62.5
21	Mactan Ecozone II	Aboitiz Land, Inc.	63.3
22	Mactan Economic Zone	Philippine Economic Zone Auth.	119.4
23	New Cebu Township	MRC Allied Industries, Inc.	122.8
24	Cebu South Road Properties	City Government of Cebu	265.3
25	Phil. BXT Corp. Tourism Economic Zone	Joil UBF Corporation	7.5
26	The Mactan Newtown	Megaworld Corporation	16.8
27	SM Seaside City Tourism Economic Zone	SM Prime Holdings, Inc.	30.4

Status: Development in Progress

No.	Name of Ecozone	Developer/Operator	Area (ha)
1	Filinvest Cebu Cyberzone	Filinvest Land, Inc.	1.2
2	HPS Building	HPS Software & Communication Corp.	1.3
3	SM City Consolacion IT Center	SM Prime Holdings, Inc.	4.6
4	Norkis Cyberpark	Norkis Cyberpark, Inc.	2.8
5	MacroAsia Cebu Special Ecozone	MacroAsia Properties Development	5.0
6	Keppel Cebu Special Ecozone Zone	Keppel Cebu Shipyard Land, Inc.	23.2
7	Naga Special Economic Zone	Provincial Government of Cebu	30.7
8	Nozomi Economic Zone	Nozomi (Fortune) Services, Inc.	48.8
9	Puerto Rosario de Cordova	Nozomi Resorts and Hotel, Inc.	23.0

Status: Proclaimed

No.	Name of Ecozone	Developer/Operator	Area (ha)
28	Qimonda IT Center	Qimonda Holdings, Inc.	2.0
29	Robinsons Galleria Cebu	Robinsons Land Corporation	4.6
30	GGVPI IT Zone	Golden Great Value Properties, Inc.	6.0
31	Taft Information Technology Park	Taft Property Venture Development Corp.	6.6

Source : PEZA.

Figure 3.2 PEZA-Registered Development Projects in Metro Cebu

4) Residential Development

3.25 Data from the Housing and Land Use Regulatory Board (HLURB) show that subdivisions and other residential development projects or formal housing projects are suitable for middle- to high-income groups.

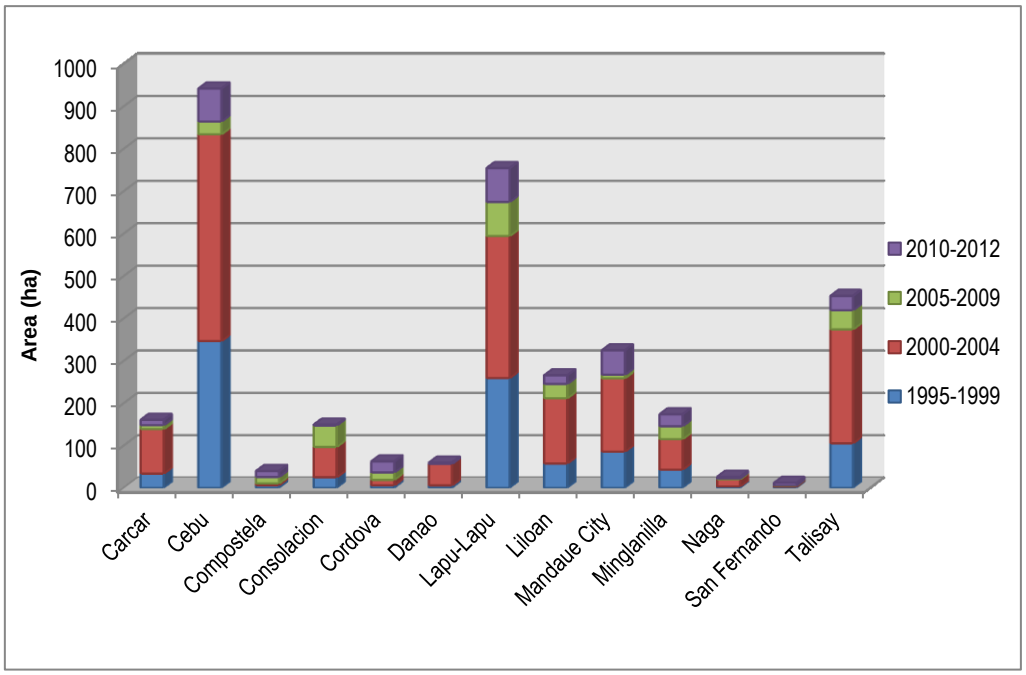
3.26 According to data on the residential development trend in Metro Cebu, there were 6,541 projects covering a total of 2,696 ha reported to HLURB between 1995 and 2012. The average project site area was 4,123 m^2 or almost one acre.

3.27 In the late 1990s, Metro Cebu experienced a real estate boom which was brought

about by concerted urban infrastructure development efforts such as MCDP. After the Asian Financial Crisis, another boom occurred in the early 2000s resulting from a favorable economic development environment. In January 2007, Cebu hosted the 12th ASEAN Summit. Since 2008, moderate land conversion to residential use has been reported to HLURB, averaging 107 ha annually.

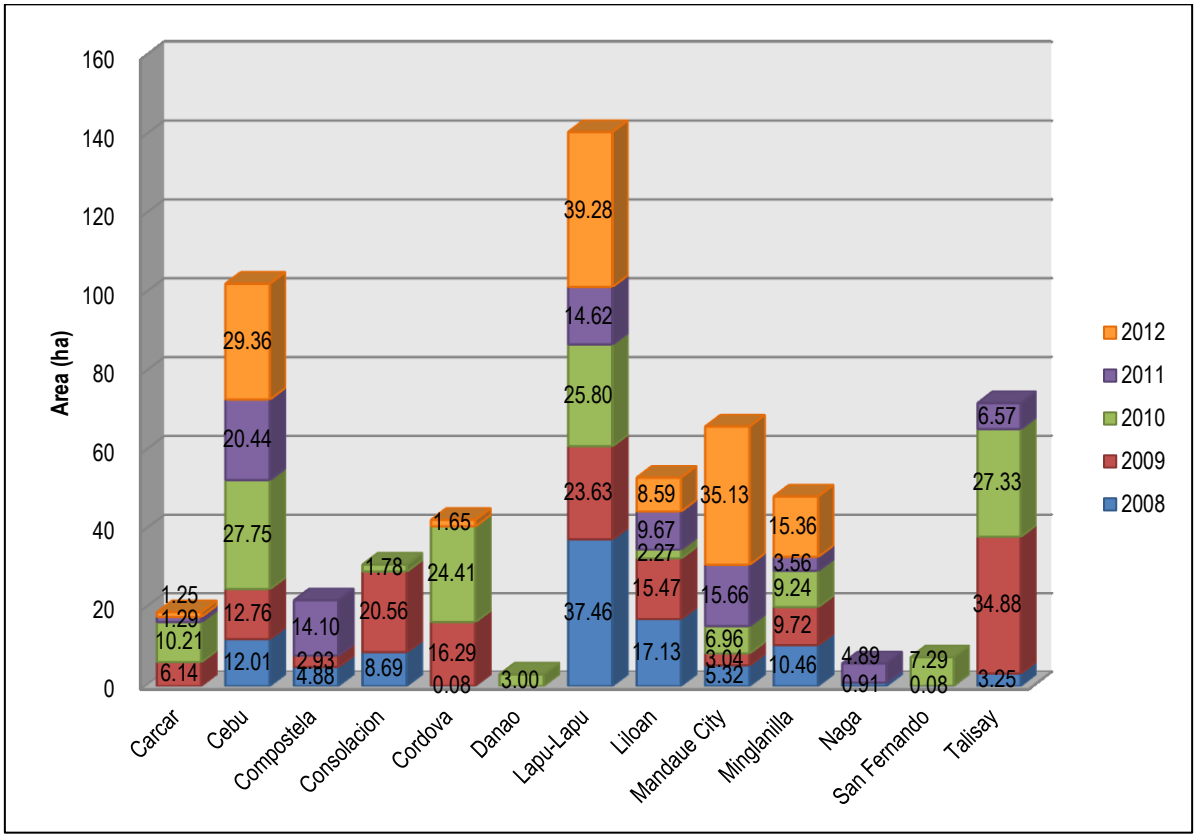
3.28 Ranked by LGU, Cebu City recorded the largest residential area development between 1995 and 2012 (761 ha or 1,824 projects), followed by Lapu-Lapu City (616 ha, 1,411 projects), Talisay City (319 ha, 884 projects), and Mandaue City (267 ha, 841 projects), as shown in Figure 3.3.

3.29 In recent years (2008–2012), however, Lapu-Lapu City has overtaken Cebu City as the largest supplier of new residential lands (see Figure 3.4). As land scarcity in Cebu City continued, urbanization pressure radiated not only to Mandaue City and Talisay City but also significantly to Liloan and Minglanilla. Another recent phenomenon in residential land development is the increase in project sites averaging 1.2 ha from the previous 0.4 ha. This may indicate an active suburban development on the outskirts of urbanized Cebu City.



Source: HLURB, Unit: ha.

Figure 3.3 Trends in Residential Land Development in Metro Cebu, 1995–2012



Source : HLURB, Unit: ha.

Figure 3.4 Trends in Subdivision Development in Metro Cebu, 2008–2012

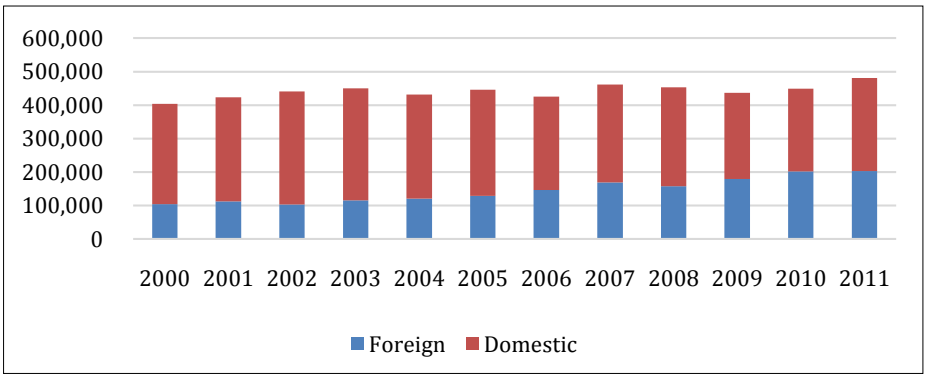
3.2 Sea and Air Gateways

1) Seaport

3.30 Cebu is a historical port city where the port has supported local economy and life. It is the Philippines' main domestic shipping port and is home to about 80% of the country's domestic shipping companies.

3.31 The Cebu Port Authority (CPA), which was created under RA 7621 in 1992, manages 111 public and private ports and port facilities.

3.32 The Port of Cebu has five management offices and 29 berths, receiving numerous and various port calls from container ships, bulk carriers, general cargo ships and passenger ships. In 2011, 29,554 domestic shipping ships and 409 overseas shipping ships entered the port. Due to a shallow wharf depth of -8.5 meters at maximum, the average overseas shipping ship size is severely restricted to 11,929 GRT. Despite such capacity constraint, overseas container traffic has steadily increased by 5.5% since 2000. On the other hand, domestic container traffic shows a rather erratic growth ranging between 250,000 and 340,000 TEU per year in the last decade (see Figure 3.5).



Source : CPA, Unit: TEU.

Figure 3.5 Growth of Container Traffic at Cebu Port

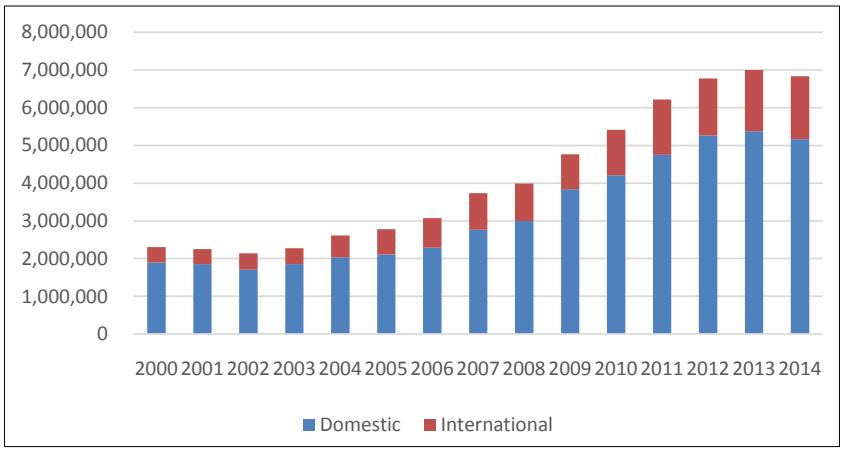
3.33 In order to meet overseas container demand, there is a plan to expand the container terminal at Tayud, Consolacion. The new terminal is designed to be 450 m long and -13 m deep which can handle 400,000 TEU at the beginning. It is noted that there are some port development ideas at different locations. However there is no concrete plan except for the site at Tayud, Consolacion. CPA, which intends to dredge the existing approach channel to -12 m deep, submitted an investment proposal to the Development Bank of the Philippines (DBP). So far, DBP has not confirmed to provide a financing arrangement for the project.

2) Airport

3.34 The Mactan (Cebu) Airport started operations in the mid 1960's as the replacement for the Lahug Airport. Due to the steady increase of traffic and passenger volume and the introduction of wider bodied aircrafts coupled with the emergence of modern aviation technology, some airport facilities had become obsolete and inadequate. This gave rise to the conception and materialization of the Mactan (Cebu) International Airport Development Project (MIADP), including runway extension (up to 3,300 m), passenger terminal building (floor area: 33,300 m^2), etc.

3.35 The Mactan-Cebu International Airport Authority (MCIAA) was created through Republic Act 6958. The MCIAA is a government-owned and controlled corporation and is an attached agency of the DOTC and started to operate on December 18, 1990.

3.36 Mactan Cebu International Airport (MCIA) has witnessed significant growth in traffic and handled more than 5.16 million domestic passengers and more than 1.67 million international passengers in 2014. It is the second largest airport, next to the Ninoy Aquino International Airport (NAIA) in Manila. Average growth rates in the last decade are 10.5% for domestic flight passengers and 10.6% for international flight passengers (see Figure 3.6). As of March 2014, there are nine international destinations directly connecting with MCIA. The busiest route is Inchon, followed by Hongkong and Singapore.



Source: MCIAA, Unit: passenger.

Figure 3.6 Growth in Passenger Traffic at MCIA, 2000–2014

3.37 In 2013, there was an international bidding for the MCIA Passenger Terminal PPP project. According to DOTC's project background paper, the scope of the project under the PPP arrangement would cover: (i) Construction of a new passenger terminal, along with all associated infrastructure and facilities, (ii) Construction of apron for the new passenger terminal; (iii) Renovation and expansion of the existing terminal along with all associated infrastructure and facilities; (iv) Installation of all the required equipment and other associated facilities; (v) Installation of the required IT and other equipment commensurate with the operations; and (vi) Operation and maintenance of both the passenger terminals (new and existing) during the entire concession period.

3.38 It is informed that the PPP concession shall be for a period of 25 years with terminal creation/ expansion.

3.3 Road Network

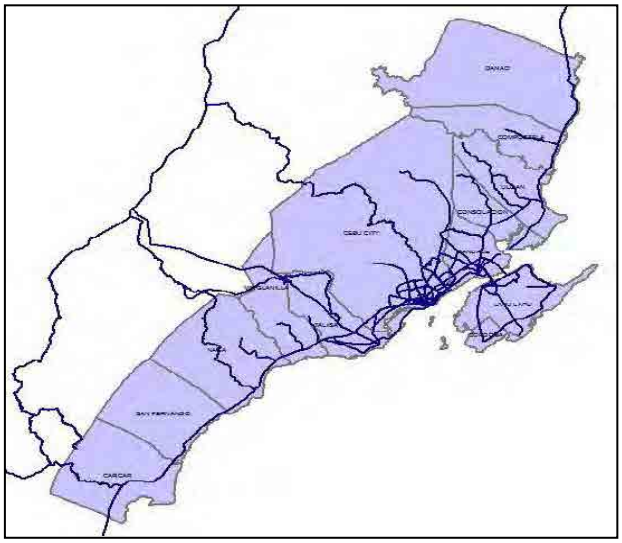
1) Road Network in Metro Cebu

3.39 The total length of the road network in Metro Cebu is 1,140.2 km (see Table 3.2 and Figure 3.7). The share of highways, which include national roads and provincial roads, is 23.9%. In Metro Cebu, most roads have two lanes even if it is a highway, and there are a few wide roads with four lanes. The generally narrow width of roads is aggravated by the decreasing traffic capacity caused by jeepneys or taxis waiting for passengers on the road and passengers getting on and off the public utility vehicles on the road. Regarding pavement condition, 46% of roads in Metro Cebu are not paved and most of the non-paved roads are barangay roads.

Table 3.2 Road Length in Metro Cebu by Road Classification

Road Classification	Length (km)
National Road	159.6
Provincial Road	112.5
City Road	171.1
Municipal Road	66.4
Barangay Road	630.6
Total	1,140.2

Source: RBIA Generated Report as of 15 November 2011.



Source: MCTPS Report.

Figure 3.7 Existing Metro Cebu Road Network

2) MCDCB's Road Network Improvement Program

3.40 In 2013, MCDCB was presented the proposed road network projects in Metro Cebu in the MCLUTS and MCDP that were left unimplemented. Subsequently, the following development strategies and action plan for the envisioned road network of Metro Cebu were recommended:

(i) Select projects according to timeline (short-term, medium-term, long-term);

(ii) Identify projects for immediate implementation;

(iii) Prioritize (important and urgent); and

3.41 Identify responsibilities.

3.42 The basic concept of the proposed road network program in Metro Cebu encompasses the distribution of urban centers, distribution of economic zones, strategies of regional/ urban development, topographical constraints, and existing traffic conditions.

3.43 The unimplemented road network projects were discussed with the LGUs, working group and MCDCB over a series of meetings/ workshops, after which important road network projects were selected based on the basic concept and criteria of the Metro Cebu Road Network Program.

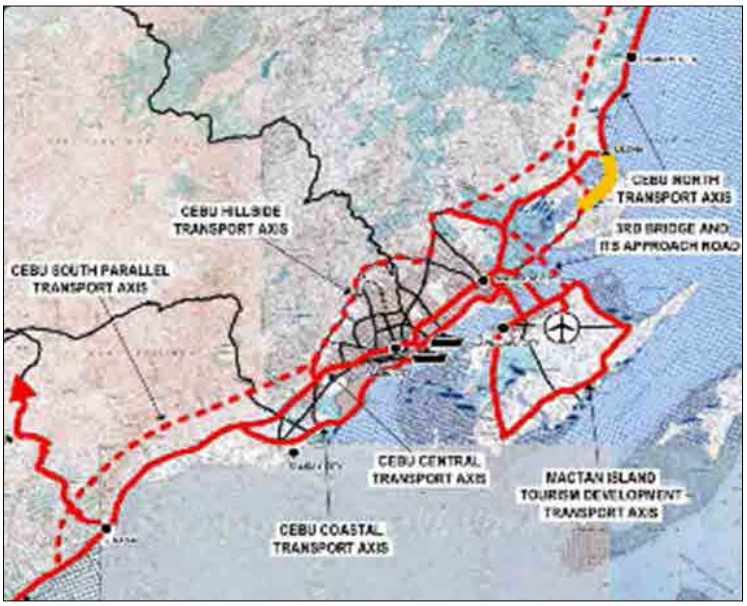
3.44 The proposed road network projects are categorized into the following three clusters for inclusion in the DPWH budget:

(a) **Priority List 1:** Projects requiring immediate implementation;

(b) **Priority List 2:** Projects for short- to medium-term implementation; and

(c) **Priority List 3:** Projects identified by MCLUTS.

3.45 Based on these categories, the proposed road network is shown in Figure 3.8.



Source: MCDCB Report.

Figure 3.8 Map of Proposed Road Network in Metro Cebu

3.4 Water Supply

1) Current Water Supply Service and Sources

3.46 At present, the supply of water in Metro Cebu is managed and operated either by the LGUs or the Water District (WD) holding a franchise over the area (see Table 3.3). Eight out of the 13 LGUs in the study area are served by the Metro Cebu Water District (MCWD) (see Table 3.4). Water in the remaining five LGUs, referred hereinafter as non-MCWD areas, are supplied and managed by water district or waterworks of the respective LGUs supported by a private water supply company.

Table 3.3 Institutions Managing the Water Supply Distribution System

N	LGUs	Water Provider	Demand Coverage, (%)
1	Danao City	Danao Waterworks (LGU)	40
2	Compostela	MCWD / Community Water associations	26
3	Liloan	MCWD / Community Water associations / Communal water systems	48
4	Consolacion		50
5	Cordoba	MCWD / Private water vendors	29
6	Lapu-Lapu City	MCWD / Private water providers (such as MRII)	29
7	Mandaue City	MCWD / Community Water associations / Private water providers	36
8	Cebu City	MCWD Community Water associations / Private water vendors	57
9	City of Talisay	MCWD / Communal water systems/ Community Water associations Helpmate, MABWASCO	47
10	Minglanilla	Miwasco (cooperative), Abejo, Helpmate(Private)	-
11	City of Naga	Abejo (LGU through Private Operation)	-
12	San Fernando	San Fernando Waterworks	-
13	City of Carcar	Carcar City Water District	39

Source: MCWD-2013. MCWD, Water for All Cebuanos, Water Resources Management Action Plan for Central Cebu (2005–2039) 2006.
Note: Highlighted part is MCWD service area. Some information were gathered from the respective LGUs MRII :*Mactan Rocks Industries.

Table 3.4 Feature of MCWD's Service Area

Feature Item	Number	Share
1. Population in the MCWD service area	2,191,848	
of which MCWD served	1,222,727	55.8%
2. Number of service connections	Total: 154,919	
Residential	151,524	97.81%
Commercial / industrial	2,968	1.92%
Government	191	0.12%
Communal	116	0.07%
Sub-division/condo	120	0.08%
3. Consumption by Consumer Type	Total :137,451 (m^3)	
Residential	123,383 (m^3)	89.8%
Non-Residential	14,068 (m^3)	10.2%

Source: MCWD.

3.47 The private water supply companies also distribute water for consumers with high purchasing power and commercial users as long as they are entitled to receive the water permit to exploit groundwater from the National Water Resources Board (NWRB). Some giant drinking water companies develop their own wells for production. MCWD supplies water to only 10% of commercial consumers and approximately 38% of residential consumers with subsidized water tariff, and faces difficulty in expanding its service area.

3.48 The main water source of MCWD is groundwater, which constitutes 98% of the water supply (see Table 3.5). Surface water accounts for only a small fraction of 2%. In 2013, the total water supply in the MCWD service area was nearly 209,000 m^3/day. For the non-MCWD service areas, water supply yielded a total of 5,541 and 12,732 m^3/day for the northern and southern areas, respectively.

Table 3.5 Existing Water Sources and Rated Production in Metro Cebu, 2013

Sources	Actual Supply (m^3/day)	Ratio, (%)
(a) MCWD Service Area	209,252	92
Groundwater	173,183	76.1
Surface water	3.080	1.4
Bulk supply (Private supplier)	28,108	12.4
Desalination (Mactan Rocks)	4,881	2.1
(b) Non-MCWD Service Area	18,273	8
[1] Northern Areas- Danao	5,541	2.4
Southern Areas	12,732	5.6
[2] Minglanilla (Miwasco)	2,690	1.2
[3] Naga (Abejo)	1,200	0.5
[4] San Fernando (LGU)	1,271	0.6
[5] Carcar (Water District)	7,571	3.3
Total Rated Production (m^3/day)	227,525	100.0

Source: MCWD Databook.
Notes: [1] Danao Waterworks, [2] Miwasco, [3] Naga Planning, [4] San Fernando, [5] Carcar Water District.

Bushisan Dam

Tisa Water Treatment Plant

Source: JICA Study Team.

Figure 3.9 Buhisan Dam Built 100 Years Ago and Tisa Water Treatment Plant

3.49 According to MCWD data, the source of groundwater is Jaclupan while surface water is sourced from the Buhisan dam, which is processed by the Tisa Water Treatment Plant (see Figure 3.9). The dam was constructed more than 100 years ago and is not operational for three months per year due to dredging. The Tisa Water Treatment Plant applies a slow sand filter treatment process mostly used with the capacity of 10,000 m^3/day and a rapid sand filter treatment process used for emergency with capacity of 5,000 m^3/day. However, the composition of the sand filter for the slow sand filter treatment is uncertain and the pressure of backwashing for the rapid sand filter treatment is insufficient. A detention time of flocculent settling basin on the hillside is too short.

2) MCWD Service Area Characteristics

3.50 The water supply service of MCWD is characterized by the following:

(i) The served population of MCWD in 2013 was around 1.2 million, with 157,000 connections consuming 151,000 m^3/day.

(ii) Average per capita consumption in 2013 was 160 liters/ person/ day (this value can be obtained using the formula: total water consumption/ number of house connections x 5.1). This level remains almost the same in the last five years.

(iii) The average share of commercial/ industrial water consumption in the total water consumption is 12.7% in the last four years.

(iv) Non-Revenue Water (NRW) in 2013 was 25%, a decrease from 30.8% in 2010.

(v) In 2014, additional bulk water supplied by the private water supply companies is 29,000 m^3/day. This includes 18,000 m^3/day water produced by the water treatment plant operated by Manila Water through water intake from Carmen.

3) Non-MCWD Service Area Characteristics

3.51 The non-MCWD service areas have the following features:

(i) The served population in Danao City located in the northern part of Metro Cebu is 47%, with 11,000 household connections.

(ii) In the southern area of Metro Cebu, the served population in the City of Carcar is 39%, consisting of 7,100 household connections. In the City of Naga and the municipalities of San Fernando and Minglanilla, there are a total of 17,000 household connections consuming 12,000 m^3/day of water. It is difficult to get a breakdown of the data related to the water supply system in this area because of the disorganized data in each LGU and the private water company supplied water.

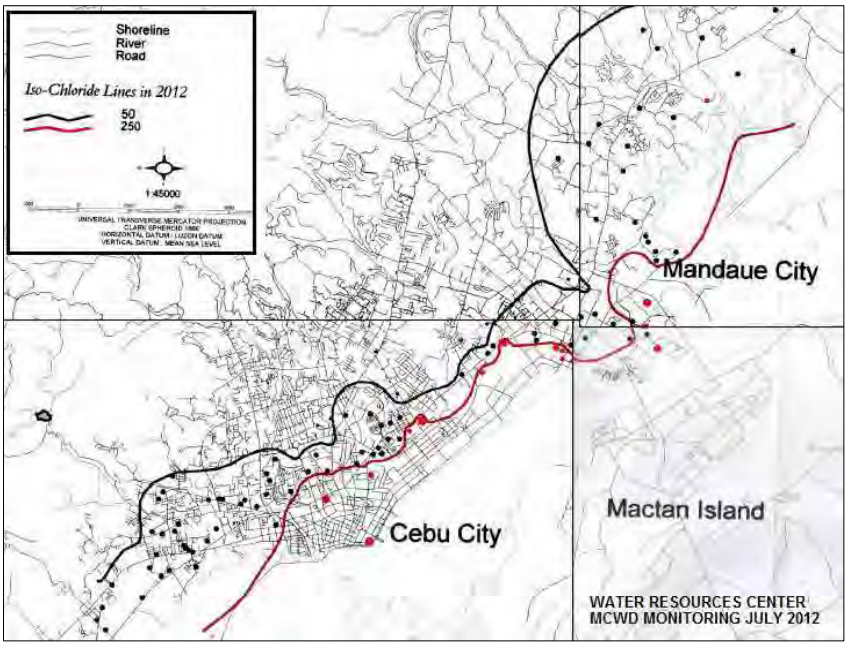
(iii) Average per capita consumption in the non-MCWD area is 119 liters/ person/ day in the northern area of Metro Cebu and 147 liters/ person/ day in the southern area.

4) Issues and Concerns

3.52 The current water supply system in Metro Cebu is beset with several issues, as follows:

(a) Salinity Intrusion

3.53 Water supply for the greater Metro Cebu relies heavily on groundwater sources. It is estimated that more than 25,000 wells are located along the coastal aquifer. The unregulated extraction of water sources results in salinity intrusion. At present, the 250 mg/L TDS (total dissolved solids) is approaching Fuente Osmeña Circle. Without proper control of groundwater extraction, salt water contamination will affect the MCWD well in Talamban area (see Figure 3.10).



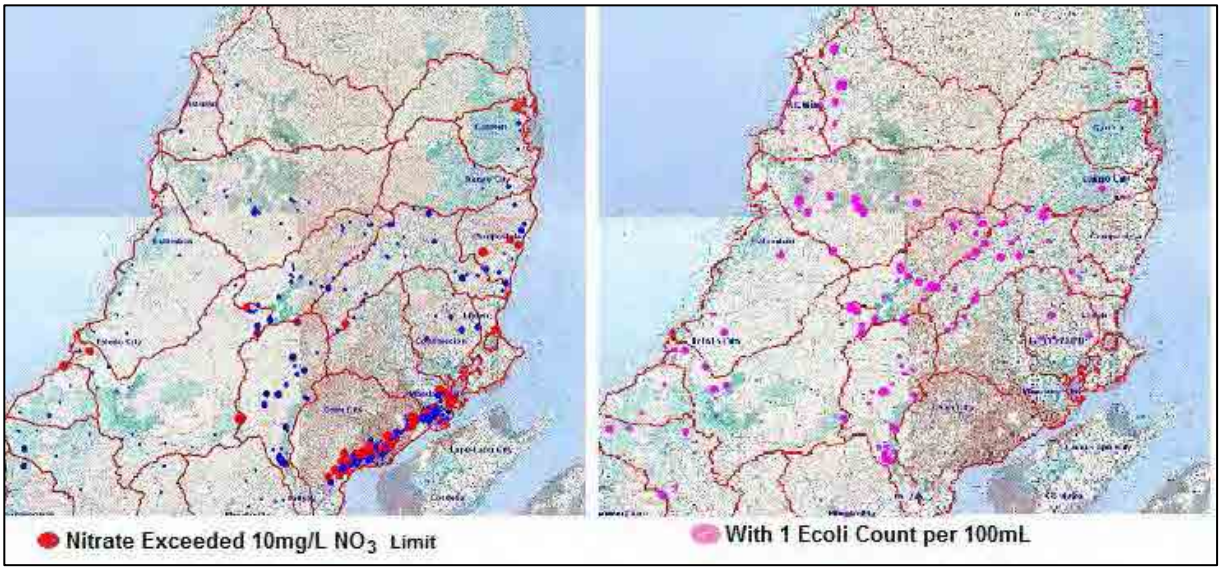
Source: University of San Carlos - Water Resources Center.

Figure 3.10 Salinity Map of Metro Cebu Water

(b) Nitrate and *E.coli* Contamination

3.54 The monitoring conducted by the City Health Office indicates a contamination of groundwater from domestic sewage. This is due to the lack of a septic tank system and/or proper design and construction / operation of the same.

3.55 The parameters indicating sewage contamination is measured by the level of nitrate, phosphate and *E.coli* present in the water wells. Data from water sampling show a high level of *E.coli* and nitrate and phosphate in the water supply (see Figure 3.11). This highlights the need for the installation of a bottom-sealed septic tank system and the proper management of septage, as reported in the Integrated River Basin Management and Development Master Plan for Central Cebu River Basin Final Report.



Source: City Health.

Figure 3.11 Nitrate and *E-coli* Map (Red and Pink Colored Areas Exceeded the Limit)

(c) **Peripheral Urbanization in the Watershed Areas**

3.56 While it is true that the watershed is declared a protected area and as such the development is restricted only to allowable use, the natural growth of development and urbanization is inevitable. This growth is also encouraged due to road access.

(d) **Active Faults in Cebu**

3.57 A review of the previous studies noted the issues concerning the four active faults in Cebu Province that pass through or near the location of proposed dams, thus needing special attention.

(e) **Access to Water by the Poor**

3.58 The general water tariff of MCWD is approximately PHP20/m^3.[2] The attempt to increase the current tariff has been met by strong resistance from consumers. The fee required for initial connection as well as expanding the distribution network (i.e., pipe water network) amounts to around PHP10,000. Consequently, many poor residents cannot enjoy MCWD's water directly. Those who cannot access MCWD have to purchase water from neighbors who have access to MCWD or private water distributors, the price of which ends up more than four times (see Figure 3.12). Moreover, the water price in the vending machine is much more expensive. The challenge to MCWD is how to expand its service area as well as decrease its initial connection fees in order to improve the current situation where the poor cannot access the inexpensive water of MCWD.

[2] The water tariffs of MCWD are as follows: first 10 m^3 is applied the lowest tariff of PHP15.20/m^3. 11–20 m^3 is PHP16.8/m^3, and 21-30 m^3 is PHP19.77/m^3

MCWD Direct Connection
= approximately PHP20/m^3

MCWD Customers re-selling water per container (PHP 2 to 3 per 5-gallon container)
= PHP88/ m^3

Water Vending Machine
(PHP1/250ml) = PHP4,000/ m^3

Soure: JICA Study Team.

Figure 3.12 Various Ways to Obtain Water

3.5 Storm Water and Water Disposal Management

1) Storm Water

(1) Current Situation

3.59 The drainage system in Metro Cebu is divided into the same categories for draining rainwater, such as (i) River, (ii) Creek, and (iii) Drainage. The flood-prone areas in Metro Cebu are identified by the respective LGUs. There are many flood-prone areas in the metropolis although flooding happens only when high tide and heavy rain occur at the same time.

3.60 One of the major problems regarding rivers, creeks and drainages are the presence of informal settlements and irresponsible private property owners along the riverbanks, which generate an enormous amount of garbage that obstructs the flow of natural and man-made waterways (see Figure 3.13). While it is understood that the responsibility to manage the rivers within their jurisdiction is devolved to the LGUs, the overall responsibility is not clearly delegated to a specific office.

3.61 In 1995, the JICA Study on Flood Control on Rivers in the Selected Urban Centers was conducted, which selected Cebu City as one of the target areas. The study carried out surveys on five rivers in Cebu City, which pointed out that the key measure is to increase the flow capacity of rivers. However, no river improvement project or flood control project have been conducted so far. Land acquisition for resettlement along rivers might be one of the obstacles to realize the river improvement projects. In addition, the major cities in Metro Cebu have their drainage master plans (including Cebu City, Mandaue City, Lapu-Lapu City, Talisay City, and Naga City). However, the problems associated with flooding caused by many interrelated factors necessitate a review and harmonization of these plans in order to attain a greater measure of success in addressing flooding in the area.

(2) Issues

3.62 The biggest problem of storm water management lies in the lack of information on conditions of flooding. In addition, there is no estimation of the economic losses caused by flooding. If the condition of storm water facilities is not improved in the future, flooding in the Metro Cebu area will become more widespread and the duration of inundation would become longer.

Relentless Waste Disposal

Houses Near the Clogged Waterways

Illegal Housing on the River

Clogged Waterway

Source: JICA Study Team, MCDCB.

Figure 3.13 Current Conditions of Riverways in Metro Cebu

2) Waste Water Disposal

(1) Overview of Laws and Orders

3.63 Several Philippine laws provide the legal bases for septage management programs, including the “Philippine Clean Water Act of 2004” and th “Code on Sanitation of the Philippines (PD 856, 1975).” Moreover, various reference materials have been prepared for operating sludge treatment and disposal. The Clean Water Act of 2004, for example, requires water utilities to provide sewerage or septage management services within five years of the law’s passage. In the absence of a water utility, the LGU must provide these services, either on their own or through a service contract. In some instances, private entities may provide these services in the absence of LGU action, or in parallel with an LGU or a water utility. Aside from the laws cited, the National Building Code of the Philippines (RA 6541) and the Revised National Plumbing Code of the Philippines also have provisions addressing the proper design and operation of septic tanks and their maintenance.

(2) Current Situation

3.64 The Environmental Management Bureau (EMB) of DENR has classified water bodies according to their intended beneficial usage and water quality to be maintained, and EMB has conducted water quality monitoring in Metro Cebu. The water quality monitoring results show that downstream of Butuanon River’s biochemical oxygen demand (BOD) is about 70 mg/L compared to the standard 15 mg/L, and downstream of Guadalupe River’s BOD is also about 70 mg/L as against the standard 10 mg/L. At the Mactan Beach Resort, more than 1,000 MPN (most probable number)/100mL of fecal coliform was detected versus the standard 200 MPN/100mL, and maximum data was 1.6 million 5MPN/100mL.

3.65 In terms of groundwater quality, the results of well investigation show that a high number of water samples has exceeded the allowable limit of 10 mg/L of nitrate and *E.coli.*

3.66 The Willingness to Pay survey (WTP survey)[3] which targeted about 400 households in the MCWD franchise area (covering 8 LGUs) showed that 20% of respondents have experienced water-borne diseases such as diarrhea, dysentery, skin diseases, etc. In addition, 7% of the 400 sample households have no toilet and at least two households admitted that they flush directly to the river.

3.67 Based on the home interview survey conducted in this study, it is estimated that between 85% and 90% of the surveyed households in Metro Cebu have septic tanks for black water (waste water with human waste), while the WTP survey shows that 97% of interviewed households in MCWD franchise area have septic tanks. However, most households do not treat gray water (waste water without human waste) generated from the kitchen and bathroom. While the exact number cannot be determined, many septic tanks do not meet the minimum requirements for standard septic tank design. Moreover, about 80% of the households who have septic tanks have not properly carried out septage desludging. These results show that most water sources are unprotected from the continuing risk of fecal contamination in groundwater

3.68 Commercial, institutional and industrial establishments like Ayala Business Park, IT Park, and Mactan Resort Hotels have their own treatment facilities for wastewater. However, these establishments have no sludge treatment facility. The sludge generated from wastewater treatment facilities are disposed of at landfill sites or anywhere else.

3.69 Originally, the first public sewerage system was operated in the North Reclamation Area. Over the course of time, the operation stopped due to several issues, as follows: (i) the sewer line was silted and sewage flow reduced in capacity, (ii) technical issue and cost in maintaining the facility, (iii) SM mall (which was the only client) constructed its own sewage treatment facility, and (iv) the sewer/drainage lines were damaged over time due to road improvement and was no longer incorporated in the centralized treatment program. Currently, the JICA pilot septage management project[4] is using the lagoon of this sewerage system and installed a dewatering plant.

3.70 MCWD conducted the "Metro Cebu Septage Management Project Feasibility Study" in 2009. So far, this project has progressed to the acquisition of land for the Cordova Septage Treatment Plant, and is now preparing the bidding documents and public consultation.

(3) Issues

3.71 The biggest problem regarding wastewater management in Metro Cebu is the lack of wastewater treatment. Based on World Bank estimates, the economic losses due to poor sanitation in the Philippines is more than PHP77.8 billion annually.

3.72 In the absence of an effective wastewater management system, the waterside environment would continue to be degraded by wastewater. As a consequence, the livability of Metro Cebu would get worse. Its competitiveness, for example as an investment and tourist destination, would also decrease.

[3] The WTP survey was conducted by the JICA Study Team in October 2014.
[4] JICA Project on Applicability of Dewatering Equipment for Septage Management of Cebu City in the Philippines (January 2014–December 2015).

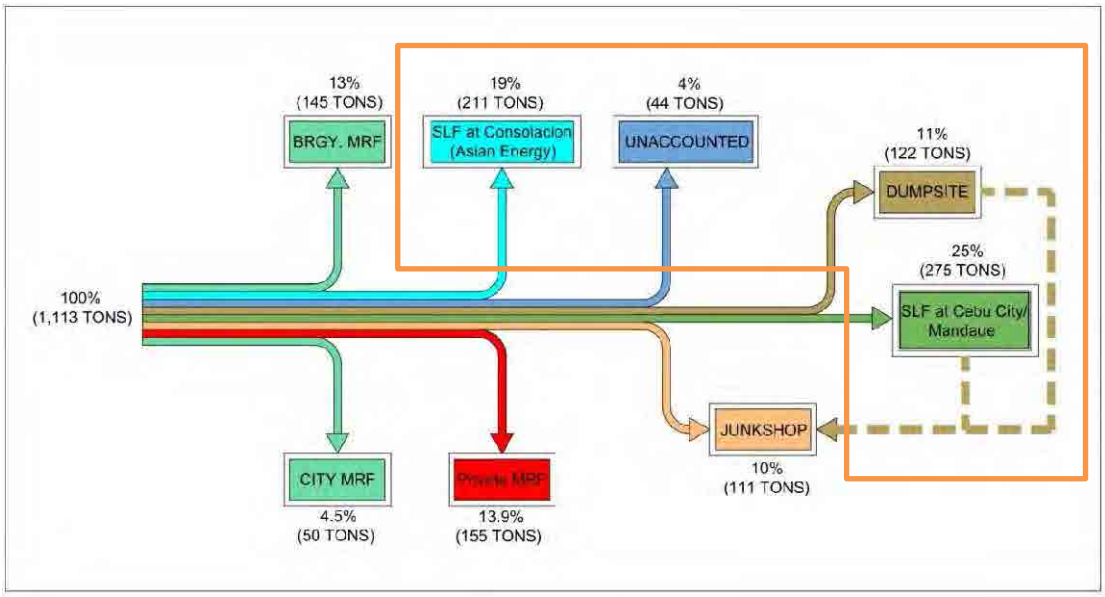
3.6 Waste Management

1) Current Situation and Challenges

(1) Solid Waste Flow from Generation to Disposal

3.73 At present, three categories of solid waste segregation are adopted in Metro Cebu, namely: “Biodegradable,” “Non-biodegradable,” and “Residual.” [5] The biodegradable and non-biodegradable wastes are collected at designated collection service areas on different days. The garbage collection method in Metro Cebu is similar to the "door-to-door collection method” in Japan, whereby vehicles collect garbage from garbage disposal areas along the road.

3.74 Figure 3.14 shows the current conceptual overall solid waste flow from generation to disposal. The solid waste generation volume is estimated to be 1,113 t/ day. Of this, some 355 t (32%) are sent to the materials recovery facilities (MRFs). Among the MRFs, about 145 t (or 13% of total waste) are processed in barangay MRFs, 155 t (14%) are processed in privately-owned MRFs, and 50 t (4.5%) in the city MRF. Approximately 111 t (10%) are brought to junkshops.



Source: Estimated by JICA Study Team based on the data between 2010–2013.

Note: Figures are daily volume. SLF: Sanitary Landfill Facility.

Figure 3.14 Estimated Overall Flow of Solid Waste in Metro Cebu

3.75 The estimated total volume of solid waste sent to final disposal sites or unidentified dumpsites can be as large as 652 t per day (60% of total waste generated). Of this, 275 t (25% of total waste) are disposed in the SLFs in the cities of Cebu and Mandaue, while another 211 t (19%) go to the private SLF at Consolacion. The remaining 122 t (11%) are disposed in the various dumpsites. Some 44 t, or 4% of total

[5] Segregation categories based on the Enlightenment Leaflet in Barangay Talamban, Cebu City are as follows:

Biodegradable	Food leftovers, Vegetables, Leaves, Fruit peels, Paper / Boxes, Fish intestines, Animal waste
Non-Biodegradable	Plastic bags, Plastic forks / straw, Ice plastics, Water bottle, Packages of junk foods, Scotch tape, Styrofoam, Tetra packs
Residuals	Napkins, Diapers, Soiled clothes, Battery, Fluorescent lamps, Unused bottles

solid waste, are regarded as unaccounted, which might end up in illegal dumping sites.

3.76 Table 3.6 shows the disposal sites and the corresponding unit cost of disposal of respective LGUs in Metro Cebu.

Table 3.6 Waste Disposal Sites in Metro Cebu and Unit Cost of Disposal

LGUs	Disposal Site	Unit Cost (PHP / ton)
Cebu City	Inayawan SLF and SLF at Asian Energy in Consolacion	700
Lapu-Lapu	SLF at FDR Con in Naga	1,350
Mandaue	LGU SLF at Umapad and SLF at Asian Energy in Consolacion	700
Talisay	LGU dumpsite	–
Danao	LGU dumpsite in Guinacot	–
Carcar	SLF at FDR Con in Naga	1,000 (Collection, Materials Recovery, Treatment, etc. Including)
Naga	SLF at FDR Con in Naga	750 (Collection, Materials Recovery, Treatment, etc. Including)
Compostela	SLF at Asian Energy in Compostela	100 PHP/m^3
Consolacion	SLF at Asian Energy in Consolacion	350
Cordova	SLF at Asian Energy in Consolacion	700
Liloan	LGU dumpsite	–
Minglanilla	SLF at FDR Con in Naga	1,100 (Collection, Materials Recovery, Treatment, etc. Including)
San Fernando	LGU dumpsite	–

Source: JICA Study Team.
Note: Unit cost is a fee charged for the amount of waste disposed of by customers (LGU/private collectors) at a landfill.

(2) Treatment and Disposal of Hazardous Waste

3.77 Today, the hygienic treatment of hospital waste and the proper treatment of hazardous waste are of serious importance in Metro Cebu. The development of a "Waste to Energy" plant in Lapu-Lapu City, mainly for treating hazardous, toxic and medical waste, has secured an environmental compliance certificate (ECC) from DENR on February 18, 2014. Table 3.7 summarizes the salient features of the plant, which is expected to generate 5 MW of electricity from waste.

Table 3.7 Profile of the Waste to Energy Plant

Item	Features
Location	Cebu Light Industrial Park–SEZ, Bo. Basak, Lapu-Lapu City
Project Entity	Aquilini Mactan Renewable Energy, Inc.
Processing Object	Hazardous waste, Toxic waste, Hospital waste, Industrial waste, etc.
Capacity	75 tons/day
Power Generation Capacity	5 MW
Initial Cost	USD20 million (PHP870 million)
Operation Start	First quarter of 2015

Source: Lapu-Lapu City.

2) Current Status and Forecast of Solid Waste Generation Volume

(1) Solid Waste Generation Volume and Waste Generation Unit

3.78 Table 3.8 shows the solid waste generation volume per day, generation unit per capita/day and estimated disposal volume. Against the total generation of 1,113 t/day, the total final disposal volume is estimated at 652 t/day. However, considering that not all the waste transported to the MRFs are recycled, approximately 858 t/day or 77% of the total volume generated are for disposal at the final disposal sites. This assumes that around half of those at the MRFs and junkshops is recycled and/or reused in the

market, and the remaining half is directed to the dumpsites as waste. In reality, some waste is discarded into creeks and rivers especially in areas where there is no planned collection system. Therefore, it seems rational to assume that the current recycle rate is around 20%.

3) Issues Related to the Final Disposal Site

(1) Securing Land for the Final Disposal Site

3.79 Securing land for the establishment of a sanitary landfill is a common concern for many LGUs. Based on the guidelines under the Ecological Solid Waste Management Act (Republic Act 9003),[6] LGUs should select proper landfill sites. In Metro Cebu, however, no new sanitary landfills have been established due to the limited availability of appropriate lots for this purpose in inland areas as well as the strong opposition from local residents around the candidate areas (the so-called "not in my backyard" or NIMBY syndrome).

Table 3.8 Solid Waste Generation Volume and Unit, and Disposal Volume

LGUs	Population (in 2010)	Solid Waste Generation		Estimated Disposal (tons/day)
		Generation (tons/day)	Rate (g/capita・day)	
Cebu City	866,171	423	488	390
Lapu-Lapu	350,467	175	499	50
Mandaue	331,320	180	543	175
Talisay	200,772	80	400	60
Danao	119,252	45	377	16
Carcar	107,323	30	280	25
Naga	101,571	21	207	18
Compostela	42,574	15	352	10
Consolacion	106,649	35	328	30
Cordova	50,353	20	400	10
Liloan	100,500	34	338	25
Minglanilla	113,178	45	400	40
San Fernando	60,970	9	148	9
Total	2,551,100	1,113	436	858

Source : JICA Study Team.
Note: The solid waste generation unit for Talisay and Minglanilla is assumed to be 400 g/capita・day. The unit of San Fernando is much lower than other LGUs due to substantial amount of unaccounted waste caused by illegal dumping

(2) Leachate Treatment at the Existing Disposal Site

3.80 Leachate is not properly processed even at the existing sanitary landfills. Leachate treatment facilities usually only consist of a settling tank for removal of sediment and floating particles, or only a purification pond after the tank. There is a need to improve the functionality and performance of the system of collecting leachate as well as the leachate treatment equipment. Many existing dumpsites or sanitary landfills are located in the mountainous area, which may cause groundwater pollution and/or cause ambient air pollution by dispersion. It is necessary to strengthen and review the structure and capacity of leachate treatment facilities urgently.

[6] RA 9003 (Ecological Solid Waste Management Act of 2000) is DENR 2001-34, adopting a systematic, comprehensive and ecological solid waste management program.

(3) Management of the Inayawan Landfill

3.81 Even though the Inayawan Sanitary Landfill has been banned to accept waste since December 2011, more than 200 t/day of waste had been brought to this landfill as a transfer point for sorting. In January 2015, a formal order to ban the disposal of waste in Inawayan Landfill was announced. Since the new MRF for the JICA pilot project of manufacturing the alternative fuel using plastic waste has become operational in late 2014, Cebu City permits disposal of plastic waste.

3.82 Residual wastes after segregation are transferred to the the private disposal site in Consolacion. The formal closure of the landfill to transform to other economic use is under consideration with assistance of the Korean company.

3.83 Since detection of mercury from the soil, leachate, sediments, and grass was reported,[7] an environmental closure plan needs to be drafted urgently.[8]

Inayawan Final Disposal site (left)
MRF inside the compound (right)
Source: JICA Study Team.

Figure 3.15 Inayawan Final Disposal Site and the MRF Inside the Compound

[7] Fate and Transport of Mercury in the Inayawan Landfill, Cebu City Philippines, A2D, December 2013.

[8] The LGU is the primary agency responsible for solid waste management policy but the JICA Study Team recommends to promote an area-wide action plan to cover the whole Metro Cebu, as elaborated in Part II.

4 BUSINESS AND INVESTMENT IN METRO CEBU

4.1 Business and Investment Conditions

4.1 In the "Mega Cebu Vision 2050," one of the development strategy areas is "Competitiveness." Competitiveness of Mega Cebu will be enhanced through industrial development. In recent years, the Philippines is seen in a new light and is becoming popular as an investment destination.

4.2 Metro Cebu has a wide variety of industrial sub-sectors. In other words, industries are fragmented and there is no salient sector which will function as a locomotive of future industrial development. Metro Cebu needs to foster some highly potential industries to enhance its competitiveness.

1) Manufacturing Sector

4.3 For manufacturing, some conventional sub-sectors such as food processing, furniture and garment, which used to be major sectors in each LGU, are currently facing global competition and are losing cost competitiveness against Vietnamese or Chinese competitors. It may be difficult for these sectors to lead the industrial development of Metro Cebu in the future.

4.4 There are some Japanese electronics and optical product companies mostly located in the Mactan industrial zone. In general, their business model is a simple assembling process where imported materials and parts are assembled into electronic parts and products and exported to other countries. These companies create a large number of jobs and export products to foreign countries generate foreign currencies (see Table 4.1). The electronics industry tends to be located in industrial zones, but almost all existing industrial estates are full and it is getting difficult to find a location for additional factories.

4.5 The advantage and strength of Metro Cebu as a manufacturing location principally lie in its human resources, especially labor force with reasonable cost (wage). As it will be described later, the average wage for factory workers is much lower than in Manila. Managers and team leaders are fluent in English.

Table 4.1 Manufacturing Economic Zone in Cebu (PEZA Registered)

Name of Economic Zone	Location	No. of Locators	No. of Employees	Land Area (In Hectares)
Cebu Light Industrial Park	Basak, Lapu-lapu- City, Mactan, Cebu	35	1,756	62.5
Cebu South Road Properties	South Reclamation Project, Cebu City	-	-	295.7
Mactan Economic Zone	Lapu-lapu City, Mactan, Cebu	158	58,814	295.7
Mactan Ecozone II	Basak, Lapu-lapu city, Mactan, Cebu	54	12,216	63.3
MRI Ecozone	Sabang, Danao City, Cebu	7	16,615	28.3
New Cebu Township	Cantao-an, Naga, Cebu	4	876	122.8
West Cebu Industrial Park	Arpili and Bunoy, Balamban, Cebu	20	16,873	169.9

Source: PEZA and CIPC.

2) IT / BPO Sector

4.6 Another major industrial sub-sector in Metro Cebu is IT and Business Process Outsourcing (BPO). Some of the BPOs are developing into Knowledge Process Outsourcing (KPO), outsourcing services for knowledge-based process such as research and development.

4.7 There are more than 130 companies with nearly 100,000 employees in the IT industry in Cebu (see Table 4.2). The Philippines as whole, is a hub of design centers for plants and ships. DASH Engineering (an affiliate of Mitsui Zosen) and Tsuneishi are operating in Cebu. In Manila, major Japanese plant engineering companies are operating R&D centers where Filipino operators design plants by utilizing CAD/ CAM.

4.8 The advantage of Metro Cebu in the IT/ BPO sector is its abundance of graduates from higher education institutions. Eight universities with IT diploma courses and more than 30 colleges are located in Metro Cebu, where the wage level is lower than Manila. For communications, an optical fiber business track can be connected between Cebu and Japan.

Table 4.2 Number of Companies and Employees of the IT Industry in Cebu (as of end of 2012)

	No. of Companies	No. of Employees
Voice Operations (Call centers)	35	45,000
Non-voice Operations (including CAD, Financial Services, etc.)	104	50,000
Total	139	95,000

Source: Cebu Investment Promotions Center (from investment seminar material).

3) Tourism Sector

4.9 Cebu is famous as a beach-oriented tourism destination. In addition, Cebu has an International Convention Center built in 2007. However, the center was severely damaged by the earthquake in October and typhoon in November 2013 and is under restoration. Almost all the events have been cancelled until the summer of 2014. The convention center, though, is isolated from existing commercial areas. If Metro Cebu would like to develop the MICE (Meetings, Incentives, Conferences and Exhibitions) business as one of the industrial pillars of the region, integrated development will be needed.

4.10 The global competition in the MICE business is getting more severe in recent years. For meetings, a key success factor is the number of regional headquarters in the region. This may be difficult for Cebu even in the future. For incentive tours, the Chinese companies are recently the main customers and a capacity for receiving around a thousand persons is needed. For exhibitions, the question is the size of the hinterland market. China has an overwhelming advantage in this. Cebu may have some advantages for conventions/ conferences since there are some renowned universities in the province.

4) Technology Development and Potential New Industry

(1) University–Industry Linkage and Industrial Development

4.11 There have emerged some start-up businesses based on the technology developed in Cebu. University and industry linkages are beginning to develop. Through technology transfer from the academe to industry, there will be more new businesses incubated. In particular, taking advantage of its strength in the fields of biology and chemical engineering, the University of San Carlos (USC) has conducted research and set up a joint venture with the private sector for development of agricultural products, recycling, pollution reduction, and pharmaceutical products.

(2) Eco-Friendly, Pro-Environment Innovation

4.12 PROSTAFF, an Aichi-based company with an affiliate company in Consolacion, named Prozza Hirose Manufacturing Inc., has developed a 7-seater E-Trike called

"Pecolo." In the Philippines, 3.5 million tricycles are used, which are remodeled from the motorbike. However, because of the CO2 emission issue and the steep rise of fuel price, an alternative is needed. To promote domestic industries, the Government of the Philippines is promoting the E-trike as a national project.

5) Incentive Scheme for Investment

4.13 Most of the industrial zones and IT buildings in Cebu are registered with PEZA. Tax incentives are given to investments satisfying PEZA's qualification requirements. Export-oriented companies located in the PEZA-registered special economic zones are eligible to receive tax incentives. Among these are an income tax holiday provided for four years for non-pioneer projects and six years for pioneer projects, extendable to a maximum of eight years under certain conditions.

6) Business Platforms with Japan

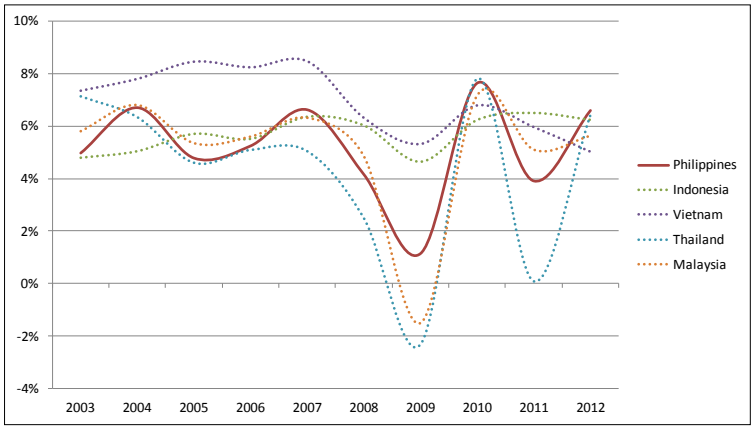
4.14 There are some cooperation partnerships between Cebu and Japan which can function as business platforms. They include the following:

- Technical cooperation partnership for urban development;
- Business development support in Yokohama; and
- Human Resource Training for Manufacturing by Saitama Prefecture.

4.2 Comparative Analysis between Metro Cebu and Neighboring Countries and Metropolises

1) Economic Growth

4.15 From investors' viewpoint, a comparison of the Philippines' national and regional economic growth with those of neighboring countries is more important. The only domestic competitors are Manila and the National Capital Region (NCR). Investors in the manufacturing sector may set up factories and train workers, and their initial investment is large and takes long time to recover. Therefore, investors are concerned with long-term growth potential and economic stability. Over the past 10 years, the growth of the Philippine economy has been moderate, averaging around 5% a year (see Figure 4.1). This is not outstanding compared to neighboring countries.



Source: IMF, World Economic Outlook 2013.
Chart Real GDP Growth Rate of the Philippines and neighboring countries.

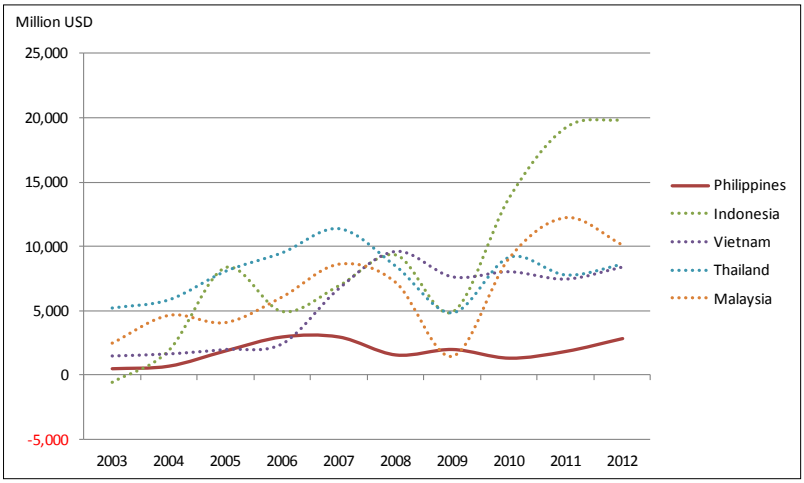
Figure 4.1 Real GDP Growth Rate of the Philippines and Neighboring Countries

2) Foreign Direct Investment (FDI)

4.16 In the last 10 years, FDI in the Philippines have been low compared to those of other ASEAN countries (see Figure 4.2). In the 1990s when the Philippines experienced an investment boom, the main location selection factor was incentives. Investors set up factories in ASEAN countries to export to developed countries such as the US or European countries. However, the purpose of investments has changed in recent years. The potential of the domestic market is more important than ever.

4.17 Even though the Philippines has a large population, the local market is fragmented from island to island. Competent human resources tend to go abroad as Overseas Filipino Workers (OFW). The incentives are given primarily to export-oriented investments. There has also been a negative impression of social safety in the country. From these reasons, investments into the Philippines have been in low gear.

4.18 However, there are opportunities for the Philippines. In 2011, a flood hit Ayutthaya, Thailand and the supply chains were severely damaged. Wages in Thailand has been rising sharply. It is getting difficult to hire workers in Vietnam. There have been serious labor disputes and demonstrations in Indonesia. The Philippines has been re-evaluated and some large investments were made in the past few years. However, those investments are concentrated in the Luzon region, instead of Cebu. In the discussion with private companies operating in Cebu, there is not much space left for factory location. Development of new industrial zones is, therefore, essentially needed.

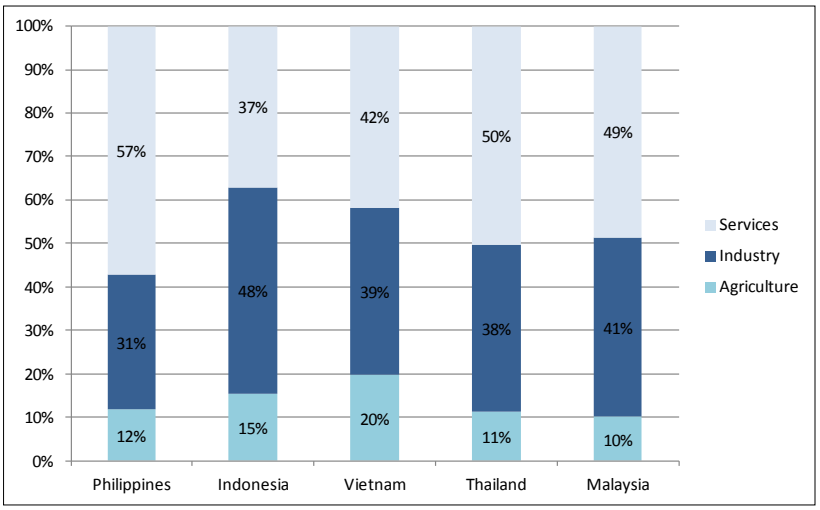


Source: UNCTAD, "World Investment Report 2013".

Figure 4.2 Foreign Direct Investments in Major ASEAN Countries

3) Composition of Economic Activity

4.19 The composition of GDP of the Philippines is unique compared to neighboring countries. The services sector accounts for 57% of total GDP, whereas the industry sector only has a 31% share (see Figure 4.3). For industry, majority of activities are simple assembling. Thus, gross value added is made by the assembling process with a relatively inexpensive labor force. For the services industry, the IT and BPO sectors are concentrated and producing higher value added.

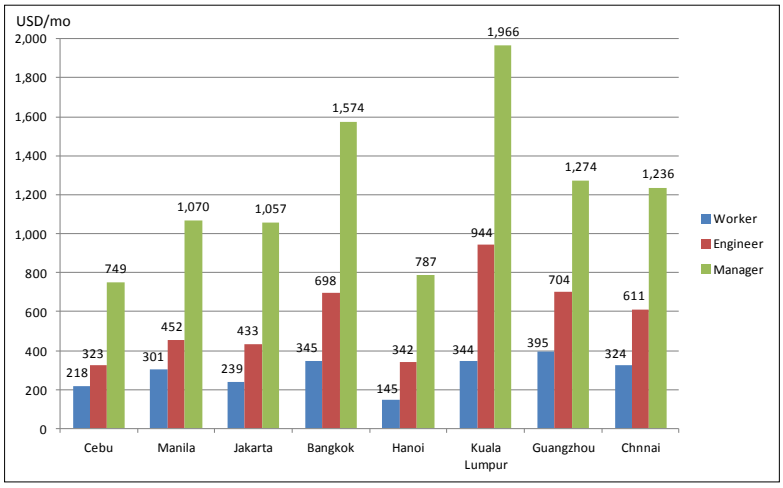


Source: Asian Development Bank, "Key Indicators for Asia and Pacific 2013."

Figure 4.3 Composition of GDP by Economic Activities

4) Wages

4.20 As mentioned earlier, Cebu has a large advantage in its human resources. The wage level is competitive with those in neighboring countries, and lower than in Manila (see Figure 4.4). This is true for all types of human resources. Only Hanoi, Vietnam is lower than Cebu, but the comparative advantage of Cebu is the workers' fluency in English.



Source: JETRO, "Toshi cost Hikaku (Comparison of cost for investments)" database (http://www.jetro.go.jp/world/search/cost/)

Figure 4.4 Comparison of Wages

4.3 Opportunities for Yokohama-based Companies

1) Target Sector

4.21 In terms of industrial development and private investments, not only Yokohama-based companies but also other Japanese companies are looking at the Philippines as a potential destination. It is more realistic to enhance existing advantages and resources rather than build up a completely new industrial sector. The potential target sectors, therefore, are identified as follows:

(i) Simple assembling and exporting sectors of manufacturing;

(ii) IT / BPO / KPO sectors;

(iii) Tourism sector; and

(iv) Technology-driven sector, such as environmental, eco-friendly products and services.

2) Profiles of Potential Investors in Cebu

(1) Potential Investors from Yokohama City

4.22 There are some potential Japanese investors to Cebu. As the City of Yokohama concluded a memorandum of understanding (MoU) with Cebu City, they are supporting Yokohama-based companies to expand their businesses into Cebu. The potential investors mainly from Yokohama City are summarized in Table 4.3.

(2) Investment Supporting Agencies in Yokohama

4.23 The City of Yokohama is supporting Yokohama-based companies to expand their businesses abroad, especially in the infrastructure sector. For other sectors, the Yokohama Industrial Development Corporation (IDEC) and JETRO Yokohama encourage and support local companies to do business in foreign countries.

Table 4.3 Potential Investors from Yokohama City

		Company Name	Main Business
(1) Yokohama-based companies that are operating in Cebu (F/S Phase)	1	Amcon Inc.	Sludge dewatering press and thickener
	2	Mansei Recycle Systems Co., Ltd.	Waste disposal and recycling
	3	Nihon Genryo Co., Ltd.	Water filtration material
(2) Companies that participated in infrastructure development workshops in Yokohama	1	Uyeno Green Soluations Ltd.	Solar energy system
	2	Unimation System Inc.	Flood alarm system
	3	Inter Action Corporation	Renewable energy
	4	Network of Engineering and Textile Processing	Water purification system
	5	Finetech Co., Ltd.	Plant factory
	6	Osumi Co. Ltd.	Environment assessment system
	7	Granpa Co. Ltd.	Plant factory
	8	Midori Sangyo Co. Ltd.	Waste recycling system
(3) Companies already operating in Cebu which will be able to play a lead role	1	Prostaff	Automotive parts and accessories

Source: Asian Development Bank, “Key Indicators for Asia and Pacific 2013”.

(3) Potential Counterparts in Cebu City

4.24 For business matching, the Cebu Chamber of Commerce and Industry is the responsible organization. For technology development and university-industry relationship, it will be USC and the University of San Jose-Recoletos.

5 SURVEY RESULTS

5.1 Household Interview Survey

1) Overview of the Survey

5.1 In order to grasp current situation in Metro Cebu to formulate roadmaps, the Household Interview survey (HIS) was conducted to collect data about socioeconomic conditions, characteristics of weekday trips of Metro Cebu residents, and opinions about development issues in Metro Cebu, etc. An overview of the HIS is shown in Table 5.1.

Table 5.1 Overview of the Household Interview Survey

	Household Interview Survey
Survey Objectives	• To obtain basic data in aid of formulating comprehensive urban development plans. • To be utilized not only as an important resource for understanding evaluations and opinions on the existing infrastructure, public services, and living environment and for making evaluation indicators for future policies, but also as an essential database from which to cull out existing travel behaviors of people and to forecast future traffic demand. • To familiarize citizens with the Mega Cebu Vision 2050
Survey Area and Number of Samples	• All barangays in the study area. • Target households are selected from every barangay on a random basis with a sampling rate of 1%, which implies a total of 6,527 sample households.
Survey Items	(a) **Household Information:** Socioeconomic characteristics of the household, its structure, family income, number of years in the present residence, access to public services, etc. (b) **Household Member Information:** Socioeconomic characteristics of each household member, including age, gender, education level, occupation, work or school address, personal income, car ownership, etc. (c) **Trip Records:** Characteristics of weekday trips made by each household member 5 years old and above, including trip origin and destination, trip purpose, travel mode, transfers, as well as departure and arrival times. (d) **People's Satisfaction/ Perception on Existing Living Conditions and Urban Services:** Public opinion on preparation for natural disasters, water supply, sewage and drainage system, electricity supply, solid waste collection, traffic congestion and public transport, and governance, including the Mega Cebu Vision 2050
Survey Methodology	Interviewers randomly select target households in the field and visit the households to perform the interviews with the respective household heads and every household member according to the prepared survey forms.

Source: JICA Study Team.

5.2 A local survey team was organized in January 2014. The survey team held a comprehensive training course from January 29 to February 2, 2014. The survey team also had a debriefing on February 4, 2014 to share problems they met in the dry-runs and their solutions. The actual field survey commenced on February 7, 2014. The survey was finished by March 31, 2014 and data entry work was accomplished by April 15, 2014.

5.3 On the other hand, an online HIS was also conducted on an experimental basis by using the same questions in the normal HIS. Though invitation to participate in the online survey was sent to 255 persons via e-mail, there were only 29 respondents (13%). Regarding the characteristic of respondents of online survey, connectivity to urban services is high as many households have high income levels.

2) Survey Results

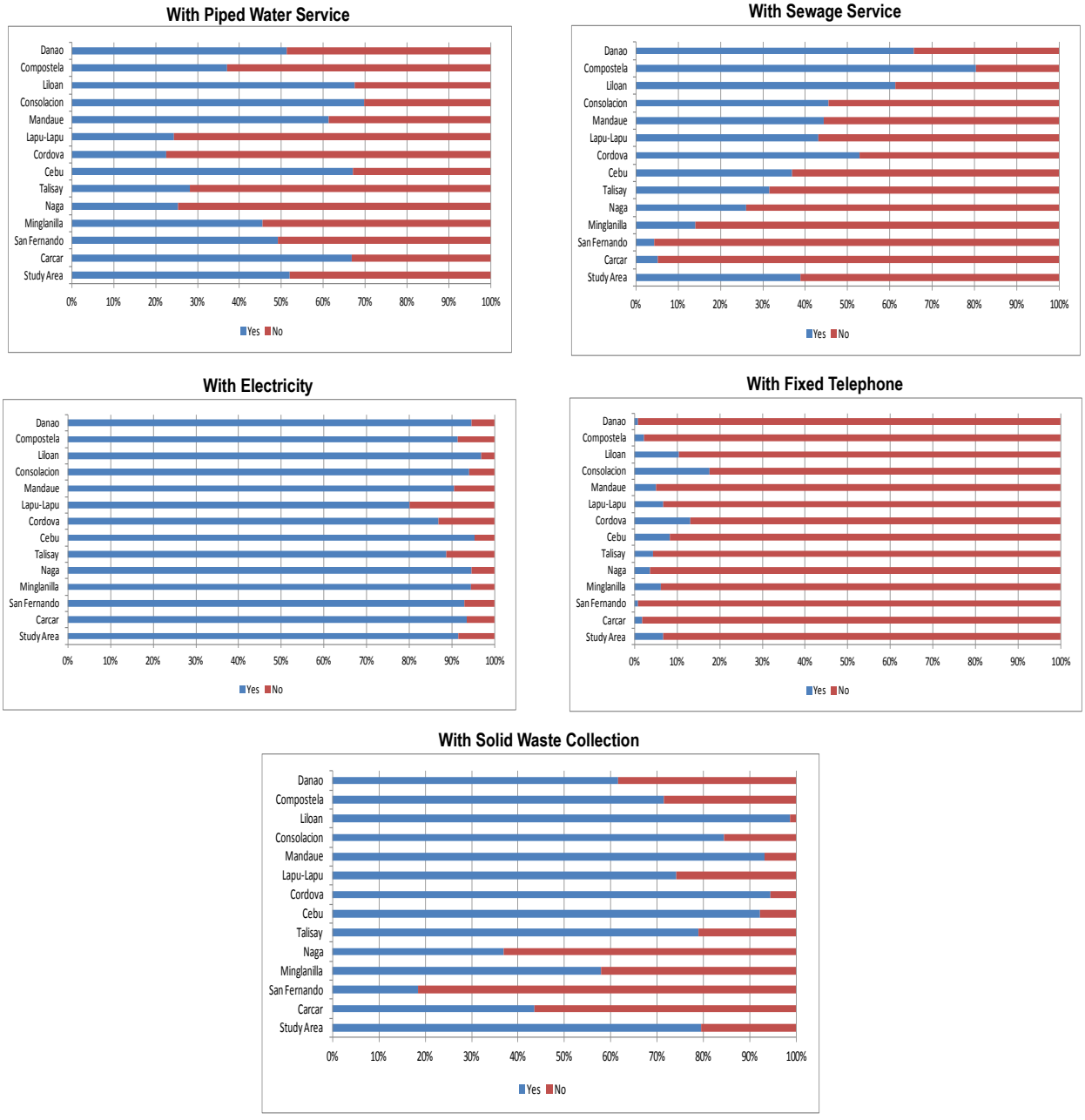
5.4 The HIS survey results are summarized as follows:

(1) Household Information

5.5 Regarding the conditions of habitation, many houses are relatively new with 28% less than 10 years in age and 25% are between 11 to 20 years. Moreover, the length of habitation of many residents (33%) fall within the 10 years or less category.

5.6 Household income was categorized into 20 income levels in the survey, from no income to PHP499,999. Many of the respondents are from the monthly income range of PHP15,000 and below.

5.7 Access of the households to basic urban services are shown in Figure 5.1.



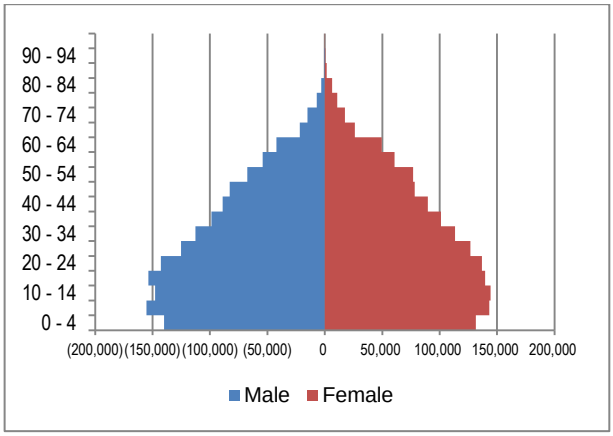
Source: JICA Study Team–HIS 2014.

Figure 5.1 Basic Services in Metro Cebu

(2) Household Members' Information

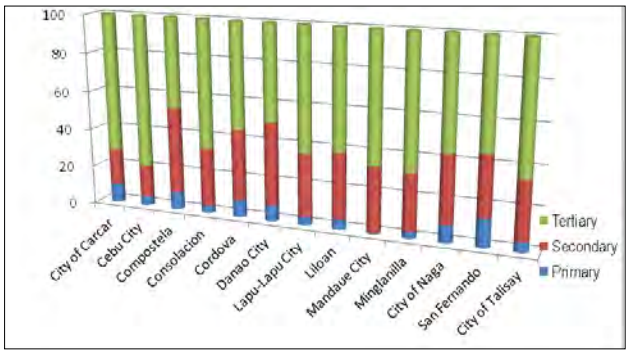
5.8 The HIS results regarding gender and age was adjusted using the 2010 NSO results. The population pyramid shows a decreasing base of the young age group of below 4 years of age (see Figure 5.2). This is an indication of a slowing down of population growth due to lesser natural births.

5.9 For employment, a large number of workers are engaged in the tertiary or services sector followed by the secondary or manufacturing sector (see Figure 5.3). With urbanization taking hold of the metropolis, employment in the primary or agriculture sector is falling far behind from the other two sectors. However, when looking at the occupation of all the respondents, it is striking to note that a high share of unemployed people in Metro Cebu (close to 30%) exists. This is followed by the share of students/pupils (about 25%).



Source: JICA Study Team–HIS 2014.

Figure 5.2 Population Pyramid in Metro Cebu

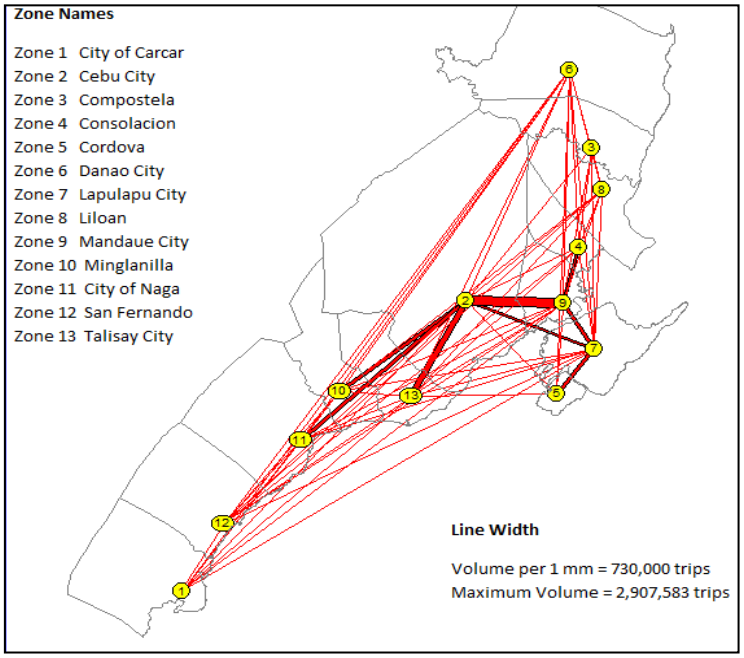


Source: JICA Study Team–HIS 2014.

Figure 5.3 Employment by Industry Sector

(3) Trip Record

5.10 Some of the resulting analysis from the data provided are shown in Figure 5.4 in terms of desire lines of trips made by mode such as truck, jeepney, private car, bus and motorcycle, which is a visual illustration of the origin and destination of trips. For all modes, the largest number of trips made is shown to be between the core urban areas composed of Cebu City, Mandaue city and Talisay City.



Source: JICA Study Team–HIS 2014.

Figure 5.4 Desire Lines of O-D Trips

5.11 Table 5.2 shows trip generation (number of trips) by purpose and by LGUs, respectively. In the whole Metro Cebu, trip to home is the most (45%) often-cited purpose, and the second highest trip purpose is to work (26%), followed by trip to school. Trips for private purpose account for just 6% of the total.

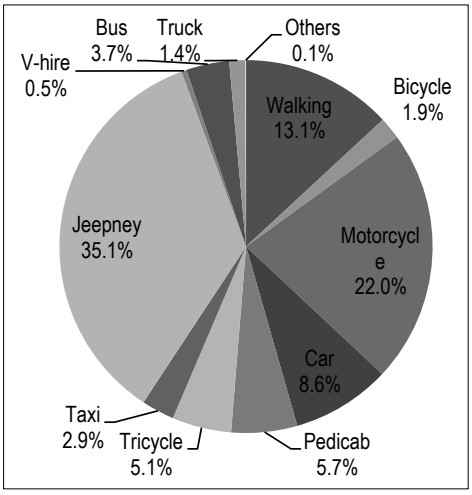
Table 5.2 Trip Generation by Purpose (No. of Trips)

City / Municipality	Generation					
	To Home	To Work	To School	Business	Private	Total
City of Carcar	93,296	61,551	48,788	2,638	11,220	217,493
Cebu City	1,693,193	812,849	612,624	92,012	285,683	3,496,361
Compostela	42,902	22,771	23,831	157	3,156	92,817
Consolacion	124,960	108,009	63,539	9,428	24,607	330,543
Cordova	68,172	68,698	66,052	4,416	8,002	215,340
Danao City	123,433	74,967	41,514	6,480	10,370	256,764
Lapu-Lapu City	732,750	426,538	267,169	74,524	56,901	1,557,882
Liloan	101,010	75,473	78,108	7,945	10,826	273,362
Mandaue City	522,268	255,785	181,617	53,634	94,153	1,107,457
Minglanilla	124,973	95,464	83,879	3,272	11,967	319,555
City of Naga	139,419	98,840	102,389	10,461	35,856	386,965
San Fernando	60,371	47,856	49,474	299	4,964	162,964
City of Talisay	210,258	135,164	96,137	28,477	19,021	489,057
Metro Cebu	4,037,005	2,283,965	1,715,121	293,743	576,726	8,906,560

Source: JICA Study Team–HIS 2014.

5.12 Figure 5.5 shows the number of trips by traffic mode in the entire Metro Cebu. The most used traffic mode is the jeepney (35.1%). Though Metro Cebu is a metropolitan area, the rate of utilization for bus (3.7%) is lower than the rate of utilization for tricycle (5.1%) or pedicab (5.7%). These results show that the road traffic conditions in Metro Cebu depend on low-capacity public transportation modes. For private transportation modes, the rate of utilization of motorcycle (22.0%) is higher than the car, and this condition is inefficient for road traffic.

5.13 Comparing the ratio of public transportation and private transportation modes which was calculated by subtracting walking and bicycle from the total number of trips by mode, the share of public transportation is 64% and that of private transportation is 36%. This shows that Cebu has a high rate of private transportation, considering its urban level as a metropolis. Therefore, public transportation which has a high efficiency (capacity) to transport and a high service level, should be introduced.



Source: JICA Study Team.

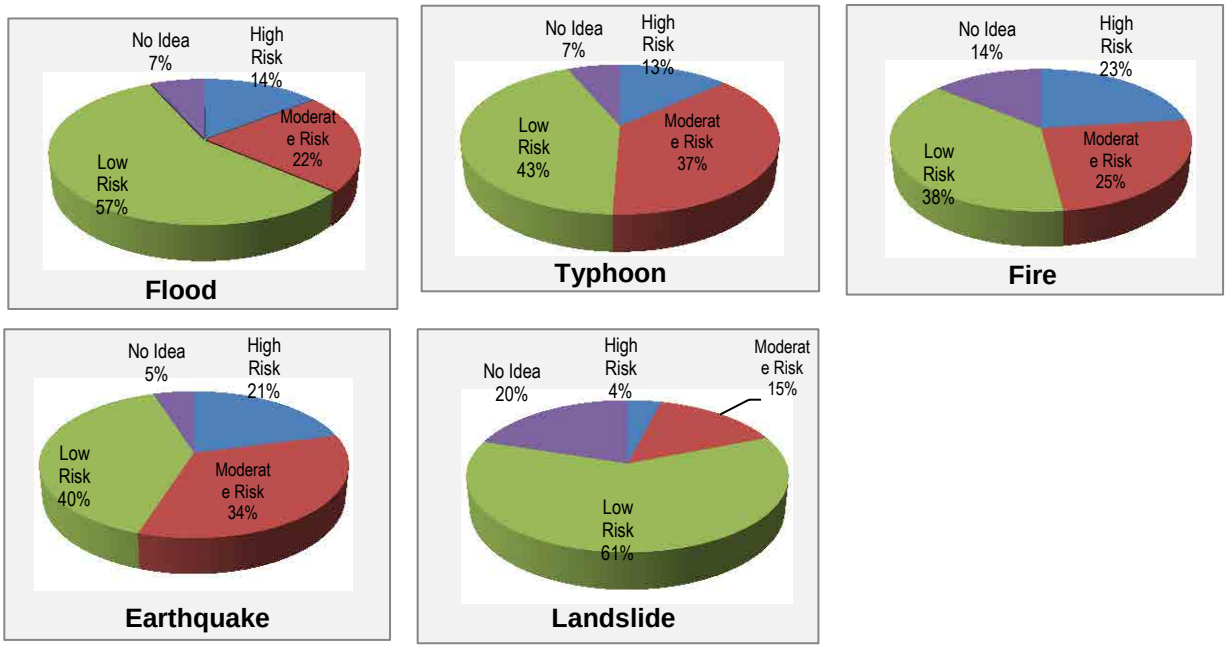
Figure 5.5 Modal Share of Trips by Traffic Mode

(4) People's Satisfaction/ Preceptions on Existing Living Conditions and Urban Services

(a) **Disasters:** Majority of Metro Cebu households perceived the level of risk of their house against disasters to be low (see Figure 5.6). Landslide, in particular, was regarded to be the least risky. On the other hand, fire and earthquake were perceived to pose the highest risk (seen by 23% and 21% of the respondents, respectively, as high risk disasters).

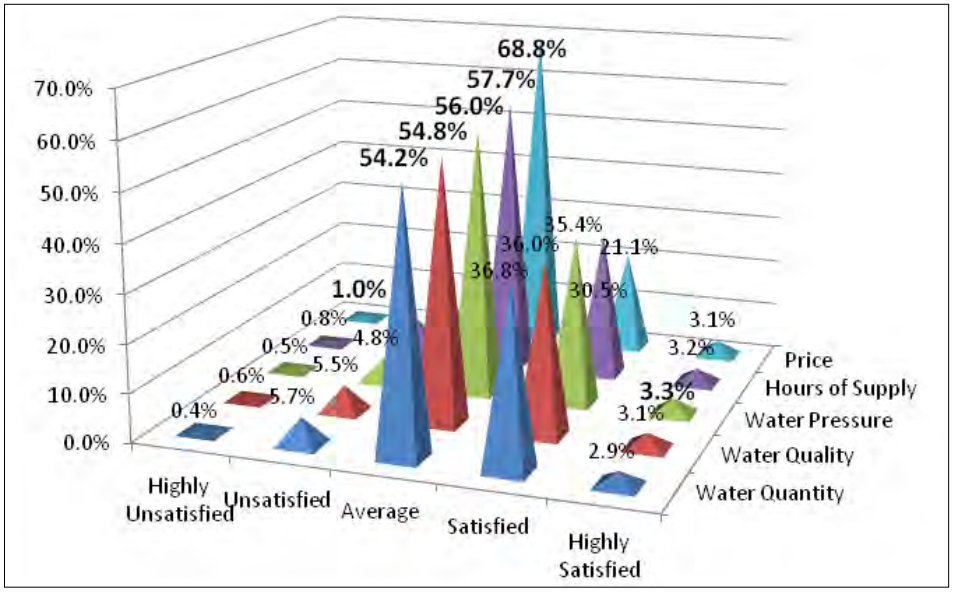
(b) **Water Supply Service:** Most of the households connected to the piped water supply system in Metro Cebu perceived its current service level in terms of water quantity, water quality, water pressure, hours of supply, and price as average to satisfactory (see Figure 5.7).

(c) **Sanitation:** Many (80%) of the sample households in Metro Cebu use pour-flush toilets in their houses. Only 4% have flush toilets while 9% use pit latrine. Moreover, a great majority (up to 77%) of the households did not see the sanitation issues of offensive odor, pipe clogging, and overflow of wastewater as problems (see Figure 5.8).



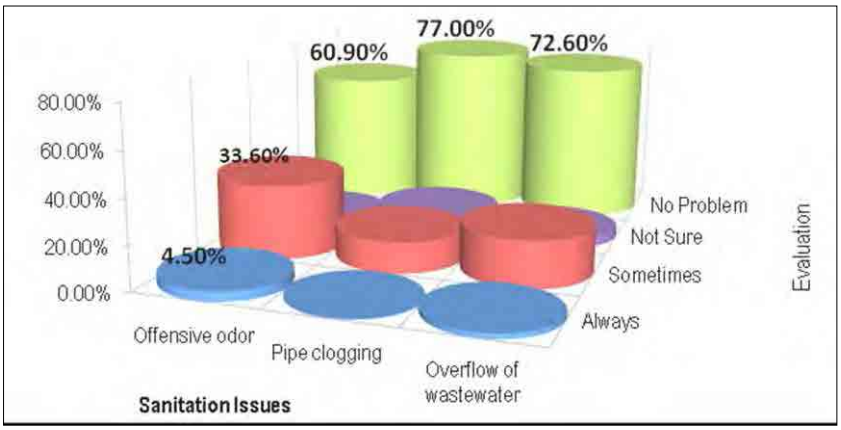
Source: JICA Study Team.

Figure 5.6 Perceived Risk of House Against Natural/ Man-Made Disasters



Source: JICA Study Team.

Figure 5.7 Satisfaction with Current Service Level of Piped Water Supply System in Metro Cebu



Source: JICA Study Team.

Figure 5.8 Evaluation of Household Sanitation in Metro Cebu

(d) **Drainage:** About 58% of sample households in Metro Cebu have drainage systems in their respective neighborhoods. Majority (61.5%) of households rated the drainage systems in their vicinities as average. Compared across LGUs, however, it shows that people in Mandaue City were the least satisfied with their drainage system. According to the sample households, flooding more frequently occurs–at least yearly–in Mandaue City (57.8%), Danao City (40.1%), and Cebu City (28.3%).

(e) **Electricity and Fuel:** Half of the households in Metro Cebu only consumes an average of 50 kWh or less of electricity per month. Another fourth of the total averages 51–100 kWh. Regarding frequency of electricity blackout in Metro Cebu, 48.2% of the sample responded “several times a year”, with the others citing “less than once a year” (29.7%), “1-3 times a month” (10.7%), “never experienced” (8.8%), and “more than once a week” (2.5%). Some 53.5% of the sample in Metro Cebu assessed the current electricity charges as reasonable, while 45.7% found the rates expensive, and 0.8% said they were inexpensive.

(f) **Solid Waste Disposal:** Some 82.0% of sample households in Metro Cebu have access to solid waste collection services in their areas. Most (78.0%) said that their solid wastes are collected directly from their residences. The schedule of solid waste collection in Metro Cebu is quite regular and fairly frequent, with 24.3% of households reporting a daily collection, 36.0% being served 2–4 times a week, and 37.8% having their solid waste picked up at least once a week. The households generally find the current solid waste collection services provided to them as acceptable, with many of them rating their level of satisfaction as either average or satisfactory (about 80%) especially in terms of the situation of the city's dumpsite, cleanliness of the surroundings, and the frequency and method of collection (see Table 5.3). As to the collection fee, a significant number (38%) are either satisfied or highly satisfied, while some could not respond probably because they do not know about the fee rates.

Table 5.3 Level of Satisfaction with Solid Waste Collection Services in Metro Cebu

Area / Facet	Level of Satisfaction											
	Highly Unsatisfied		Unsatisfied		Average		Satisfied		Highly Satisfied		Don't know	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Frequency of Collection	70	1.3	830	15.5	2,846	53.3	1,394	26.1	194	3.6	7	0.1
Method of Collection	68	1.3	797	14.9	2,899	54.3	1,396	26.2	175	3.3	2	0.0
Fee	29	0.5	222	4.2	2,113	39.8	1,511	28.4	509	9.6	929	17.5
Cleanliness of the surrounding	64	1.2	571	10.7	3,362	63.0	1,157	21.7	165	3.1	15	0.3
Situation of the city's dumpsite	119	2.9	427	10.5	2,759	67.7	675	16.6	94	2.3	0	0.0

Source: JICA Study Team.

(g) **Traffic Congestion:** The evaluation of traffic congestion in Metro Cebu is almost consensually assessed as bad. In a metropolitan scale level, the two primary causes of traffic congestions in Metro Cebu are: first, due to increasing usage of automobiles (36.8%), then followed by a lack of discipline of drivers (16.9%). Majority of the households indicated their preferences for some transport improvement measures. The top selections include construction and improvement of roads (96%), followed closely by installation and improvement of traffic signals (95.2%), control of air pollution (94.3%), and improvement of sidewalks, pedestrian crossings, and bridges (94.1%) as shown in Table 5.4.

Table 5.4 Transport Improvement Measures

	Transport Improvement Measures	Agree		Disagree		Not Sure	
		No.	%	No.	%	No.	%
1	Construction/Improvement of roads	6,261	96.0	155	2.4	106	1.6
2	Construction/Improvement of flyovers	5,485	84.2	759	11.6	272	4.2
3	Installation/improvement of traffic signals	6,204	95.2	177	2.7	135	2.1
4	Improvement of sidewalks, pedestrians crossings, and bridges	6,119	94.1	243	3.7	144	2.2
5	Introduction of bus rapid transit	3,333	51.2	2,405	36.9	775	11.9
6	Construction of urban railway	5,088	78.1	874	13.4	555	8.5
7	Improvement of water transportation system	5,443	83.5	454	7.0	619	9.5
8	Restriction of truck traffic	4,149	63.6	1,488	22.8	882	13.5
9	Restriction of car/motorcycles	3,276	50.3	2,286	35.1	946	14.5
10	Increase of user charges for car/motorcycle	1,295	19.9	4,410	67.7	813	12.5
11	Restriction of motorcycles, pedicabs, tricycles, and calesa	2,473	37.9	3,174	48.7	877	13.4
12	Development of public parking facilities	5,533	84.8	592	9.1	399	6.1
13	Control of air pollution	6,156	94.3	257	3.9	114	1.7
14	Promotion of people's understanding on transport problems	6,079	93.3	260	4.0	174	2.7
15	Promotion of bicycles	3,482	67.5	1,063	20.6	610	11.8

Source: JICA Study Team.

5.2 Supplemental Survey on Willingness to Pay for Water Supply

1) Overview of the Willingness to Pay (WTP) Survey

5.14 With its fast increasing population and economic growth, Metro Cebu ‘s current water supply will be unable to meet its future demand. In addition, though Cebu is heavily dependent on extracting groundwater sources, salt water has already intruded into its groundwater and pollution problems have also been observed. Considering this situation, a supplemental survey on WTP was conducted to collect information to plan out a sub-roadmap for improvement of water supply and septage system. An overview of the WTP survey is shown in Table 5.5.

Table 5.5 Overview of WTP Survey

	Contents of WTP Survey
Survey Objectives	• Examine the current status of water usage of those served and unserved by MCWD • Examine the extent of the desludging and septic treatment practice • Determine the households' willingness to pay
Survey Area and Number of Samples	• Target Area: target barangays were selected based on coverage rate/ no. of connections to MCWD service and geographical character of MCWD-serviced LGUs (Compostela, Liloan, Consolacion, Cordova and City of Lapu-Lapu, Maudaue, Cebu and Talisay) • Target Households: 416 households which were selected at random from the above barangays
Survey Items	(a) **Household Information:** household members' information, type of house (material, ownership), monthly household expenditure, income level (b) **Water Supply:** water supplier, relationship between water resource and life activities, monthly consumption, monthly expenditure amount, payment method, weekly consumption and expenditure of bottled water, problems related to water supply, frequency of absence of water supply, alternative of other water resource during absence of current water supply (c) **Willingness to Pay for Water Supply Service Improvement:** evaluation of Metro Cebu water supply improvement scenario, agree/ disagree to WTP, acceptable additional amount, reason why they can't pay (d) **Sanitation/ Septage Management:** ownership of toilet and facility condition, availability of septic tank, frequency of desludging, management/ operation situation of public toilet, experience of water-borne diseases (e) **Willingness to Pay for Septage Management Service:** evaluation of Metro Cebu septage management improvement scenario, agree/ disagree to WTP, acceptable additional amount, reason why they can't pay
Survey Dates	October 11–19, 2014
Survey Methodology	Interviewers randomly select target households in the field and visit the households to perform the interviews with the respective household heads and every household member according to the prepared survey forms.

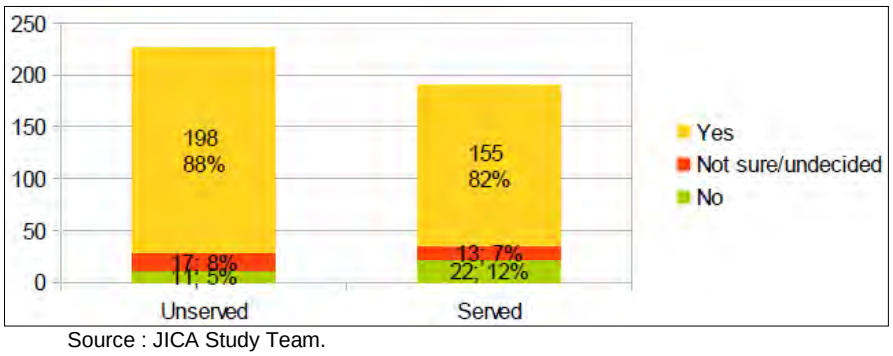
Source: JICA Study Team.

2) Survey Results

5.15 Following is a summary of the WTP survey results:

(1) Water Supply Service

5.16 About 85.0% of the respondents expressed their willingness to pay on top of what they are currently paying for water in exchange for a better water supply service (see Figure 5.9). The willingness to pay by household income level, current residential area and current water source (connected to MCWD / not connected to MCWD) has a similar trend (see Table 5.6).



Source : JICA Study Team.

Figure 5.9 Respondents Willingness to Pay by Water Supply Connection

Table 5.6 Willingness to Pay by Income Level

Income Level	Frequency						Total
	Willing to Pay		Not Willing to Pay		Undecided		
	No.	%	No.	%	No.	%	
Low	189	84	22	10	15	7	226
Middle	123	87	10	7	8	6	141
High	13	93	-	-	1	7	14
Withheld Data	28	80	1	3	6	17	35
Total	353	85.00	33	8.00	30	7.20	416

Source: JICA Study Team.

5.17 The most acceptable extra amount that people are willing to pay for the improvement of water supply is between PHP50–PHP100, to which 44% of respondents agreed (see Table 5.7).

Table 5.7 Additional Amount Willing to be Pay for the Implement of Water Supply

Amount Willing to Pay	No.	%
Below PHP50	118	33.43
PHP51–60	49	13.88
PHP61–70	26	7.37
PHP71–80	12	3.40
PHP81–90	12	3.40
PHP91–100	58	16.43
more than PHP100	66	18.70
Undecided how much to pay	12	3.40
Total	353	100.00

Source: JICA Study Team.

5.18 Buying bottled water for drinking is done by a great majority of the sample households (88%), including those in the low income level and those connected with MCWD (90%). This behavior shows that people will be willing to spend extra for safer drinking water. This extra expense may be considered as a disposable income which can be diverted to pay for a safer and cheaper water supply as an alternative to the bottled water. However, this would require convincing proof that such water is at least as safe for drinking as the bottled water which has gained the trust of the people.

5.19 Households buying water by retail from water refilling stations, which range from public wells at PHP1–3 per 5 gallons, are spending more than those who are directly served by MCWD. With the retail amount they are paying, these households are paying about PHP50 to PHP150/m^3 of water, which is more expensive than MCWD's water.

5.20 Based on the above findings, there is obviously a general clamor for clean, safe, consistent and sufficient supply of water in Metro Cebu.

(2) Septage Management Service

5.21 After being made aware of the present scenario of Metro Cebu's septage management, how it is affecting people's health and environment, and by presenting the proposed intervention, a high percentage (87.7%) of the respondents expressed their willingness to pay (see Table 5.8).

Table 5.8 Willingness to Pay for Desludging Service by Income Level

Income Level	Frequency				Total	WTP (%)
	Willing to Pay	Not Willing to pay	No Sure / Undecided	No Response		
Low Income Level	196	16	12	2	226	87
Middle Income Level	128	7	6		141	91
High Income Level	14	-	-	-	14	100
Withheld Info	27	4	3	1	35	77
Total	365	27	21	3	416	
Percentage	87.7	6.5	5.0	0.7	100.0	

Source: JICA Study Team.

5.22 Though many respondents show their willingness to pay for septage management and treatment services, the average amount the respondents are willing to pay is PHP1,242.00, which is much lower than the current cost of desludging in the market of about PHP3,000. The cause of this gap might be that payment for septage management and treatment may be considered as a new expense by most households since most of them do not pay for any septage service under existing conditions. This finding points out that it might be better to add the septage management and treatment fee to the water supply fee than collecting it separately.[9]

5.23 The above WTP survey results have clarified the issues requiring deep thought by MCWD and the LGUs about septage management and treatment. For residents of Metro Cebu, there is a need for disseminating information related to septage management/ treatment and for further education on the water issues confronting the metropolis.

Table 5.9 Amount Willing to Pay for Septage Management and Treatment

Amount WTP	Income Level				Total
	High	Low	Middle	No Response	
PHP50.00	1	4			5
PHP100.00	1	13	2	1	17
PHP200.00		2	4		6
PHP250.00		1			1
PHP300.00		1	1		2
PHP400.00	1	1			2
PHP500.00	2	77	37	11	127
PHP600.00		1			1
PHP1,000.00	1	27	18	5	51
PHP1,500.00	1	23	16	1	41
PHP2,000.00	2	10	21	4	37
PHP2,500.00		16	15	5	36
PHP3,000.00	4	11	6		21
>PHP3000		5	5		10
No Response	1	34	16	8	59
Total	14	226	141	35	416

Source : JICA Study Team.

[9] If it is supposed that desludging (PHP3,000/ time) is conducted once every five years, it is simply estimated that the monthly additional amount to pay becomes PHP50. However, this means that septage management services can be operated with PHP 2~3/ m^3 as additional amount if it is assumed that water consumption amount per month per household is about 20 m^3, For instance, Dumaguete City operates a septage management amd treatment facility at present. They collect septage fee to add PHP2/ m^3 to water supply fee.

5.3 Traffic Survey

1) Overview of the Traffic Surveys

5.24 Table 5.10 provides an overview of the traffic surveys, including Cordon Line Survey, Screen Line Survey, Public Transport Passenger Interview Survey, and Travel Speed Survey.

Table 5.10 Overview of the Traffic Surveys

	Cordon Line Survey	Screen Line Survey	Public Transport Passenger Interview Survey	Travel Speed Survey
Survey Objectives	• To determine the trips to/from the survey area made by residents living outside the study area. • To calibrate the distributed traffic volume obtained from the HIS.	• To provide vehicular and passenger traffic information to calibrate the current distributed traffic volume obtained from the HIS.	• To know passengers' trip purpose, trip frequency, and perceptions on existing and future public transport services as well as their socioeconomic characteristics such as age, gender, occupation, car ownership and income class. • To explore development directions of mass rapid transit services and public transport terminals.	• To obtain driving data of taxis to measure travel speed at major road sections by the day, time period and direction. • To identify bottlenecks in the road network in Metro Cebu.
Survey Items	• Vehicular/Passenger traffic count; • Vehicle occupancy; • Trip information (e.g., origin and destination, address, trip purpose, freight, etc.); and • The vehicle occupancy survey is performed at roadside survey stations only.	• Vehicular traffic count; and • Vehicle occupancy.	• Perceptions on the level of present public transport services; • Willingness to pay for a planned mass rapid transit service; • Trip information and reason for modal choice; and • Socioeconomic characteristics of the passengers.	• Driving data (i.e., coordinates, time and speed) for 7 successive days per vehicle; and • Profiles of sampled operators and vehicles.
Survey Locations	• 7 survey stations for the roadside at the study area's boundary, 9 stations at ferry terminals, and 2 stations at the Mactan Cebu International Airport	• 20 survey stations which are located at roadsides and Pier 3, Cebu Port.	• 9 survey stations	
Survey Methodology	• Origin–destination (OD) interview survey, traffic count survey, and vehicle occupancy survey are conducted at the boundaries of the survey area.	• The traffic count survey and the vehicle occupancy survey are conducted at road sections crossing the screen lines in the study area.	• Passengers waiting for their departure are interviewed at random. The target number of samples is 3,000.	• Driving data (i.e., coordinates, time and speed) of sampled taxis which is recorded with GPS loggers for 7 successive days per vehicle. • The target number of effective samples is 315 vehicle-days. In addition, data recorded on Saturdays and Sundays should be more than 20% of the total amount of data.

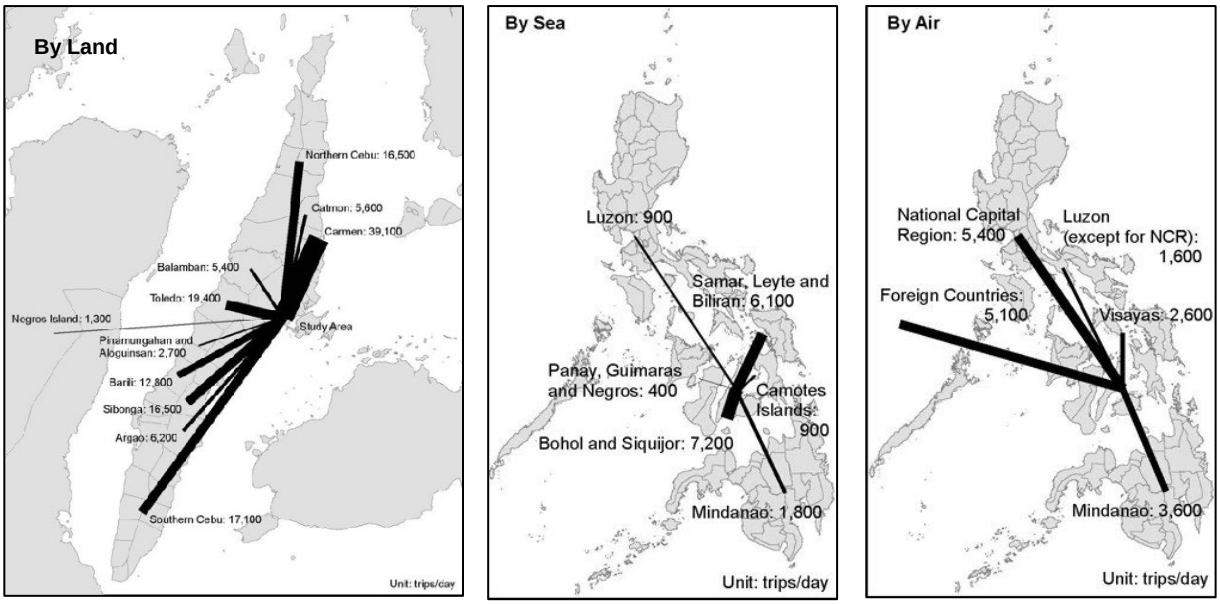
Source: JICA Study Team.

5.25 The Screen Line Survey started on February 5, 2014. The Cordon Line Survey began in the third week of February 2014 and ran for one month. The Public Transport Passenger Interview Survey was conducted for 2 weeks starting February 17, 2014. The Travel Speed Survey was implemented from February 24 until the end of March 2014.

2) Survey Results

(1) Cordon Line Survey

5.26 Figure 5.10 shows the number of daily trips from/to the study area by mode. There is a considerable amount of intercity traffic from/to other LGUs in Cebu Island thanks to bus and v-hire services and well-maintained trunk roads. With regard to sea and air transport, passengers from/to nearby destinations (e.g., Bohol, Camotes, Leyte, Cagayan de Oro, etc.) use fast craft, ferry and RO-RO services while long-haul shipping services are no longer competitive against reasonably-priced and frequent air services.



Source: JICA Study Team.

Figure 5.10 Number of Daily Trips from/to the Study Area by Mode

5.27 Regarding the share of trip purpose by resident/ non-resident and by travel mode, the results may suggest the following:

(a) **Land:** Many people across the study area boundary have daily work and business affairs. The study area seems to have strong economic and social relationships with the other LGUs in Cebu Island.

(b) **Sea:** More than half of passengers use shipping services to see relatives or friends across the islands, while about a fifth travel across for work or business. Reliable and affordable shipping services should be maintained to support ties among Visayan provinces.

(c) **Air:** More than 30% of passengers from distant cities come to the study area for work or business purposes while tourists account for more than 40%. Nearly half of residents also fly out on work or business trips while most of the rest do so either to visit family and friends or for holiday/ leisure. Traffic demand for business trips due to the growing economy in the study area would require punctual, convenient and comfortable access transit to MCIA as well as expansion of the airport terminal capacity.

(2) Screen Line Survey

5.28 Figure 5.11 shows the locations of the screen line survey stations. The following five screen lines (SLs) are considered in this sub-section:

(a) **SL1:** S1–S10;

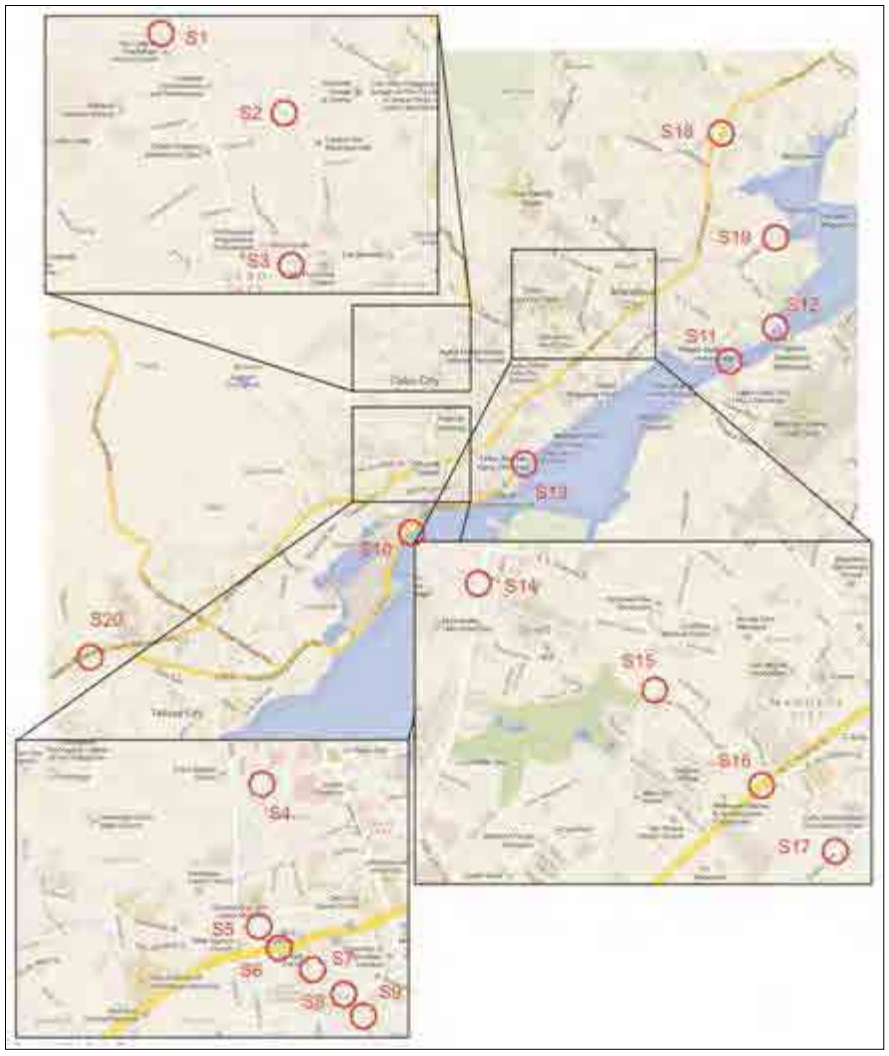
(b) **SL2:** S11–S13;

(c) **SL3:** S14–S17;

(d) **SL4:** S18–S19; and

(e) **SL5:** S20.

5.29 SL1 and SL2 are the major ones used for adjusting person trip data collected in the HIS. Figure 5.11 shows the hourly vehicular traffic volume across each screen line by direction and vehicle class. The figures show clear morning (between 6:00 and 8:00 a.m.) and evening (between 5:00 and 7:00 p.m.) peaks commonly seen in metropolitan areas.



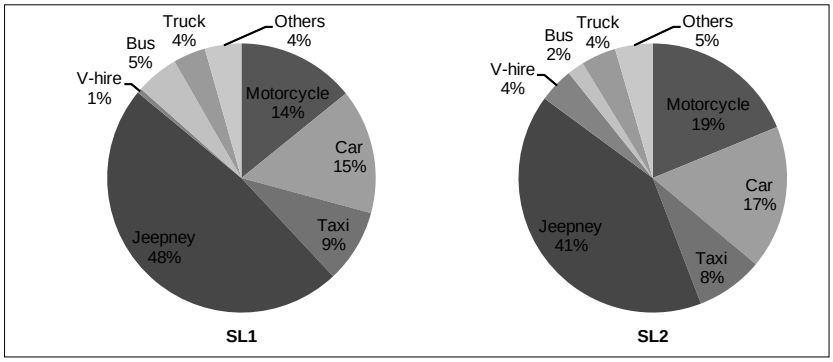
Source: JICA Study Team.

Figure 5.11 Locations of Screen Line Survey Stations

5.30 It should be pointed out that the morning peak at SL1, SL2 and SL4 are particularly sharp. A possible traffic demand management measure is off-peak commuting to ease road congestion in the morning peak hours.

5.31 Figure 5.12 shows the modal share at two screen lines (SL1 and SL2) on the passenger traffic volume basis. While there are relatively more motorcycles, cars and taxis on the road, more or less 50% of passengers use high-occupancy vehicles (HOVs) such as jeepneys, v-hires and buses in the most urbanized areas. It just goes to show that public transport vehicles occupy a smaller portion of the road compared to private vehicles but carry the most passengers. It is the more efficient way of road space usage. Under the current situation of complete dependence on the road transport system, greater use of public transport would have to be encouraged.

5.32 The survey results show that around 968 thousand and 318 thousand passengers are crossing SL1 (i.e., Guadalupe River) and SL2 (i.e., Opon Channel), respectively, everyday. There is, therefore, enough demand for the introduction of mass rapid transit services such as urban railway and BRT.



Source: JICA StudyTeam.

Figure 5.12 Modal Share on the Passenger Traffic Volume Basis

(5) Public Transport Passenger Interview Survey

5.33 The survey collected a total of 3,457 samples. Following is a summary of the survey results:

5.34 The survey asked passengers' opinions on the current level of public transport services in terms of 15 service areas (Frequency, Cost/Fare, Travel Time, Crowdedness in the Vehicle, Onboard Safety, Onboard Comfort, Onboard Air Quality, Onboard Noise, Cleanness of the Vehicle, Driver's/ Conductor's Behavior, Access to Terminals/ Routes, Easiness of Transfer, Information Provision, Waiting Conditions, and Terminal Facilities), using a five-point rating scale with 1 as the lowest and 5 as the highest. The results suggest the following points:

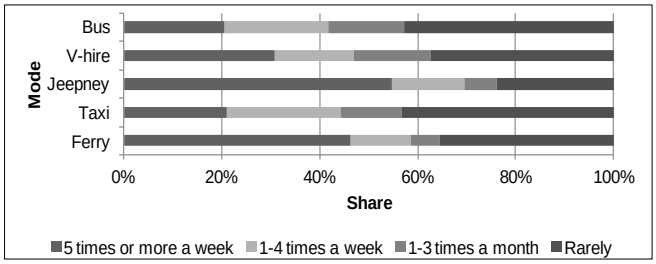
(a) **Bus:** In-vehicle crowdedness and noise need to be improved;

(b) **V-hire:** In-vehicle crowdedness, waiting conditions, and terminal facilities need to be improved; and

(c) **Jeepney:** Passengers are not satisfied with the current level of service in all aspects. It is particularly suggested to modernize vehicles because the worst points are in-vehicle crowdedness, air quality and noise.

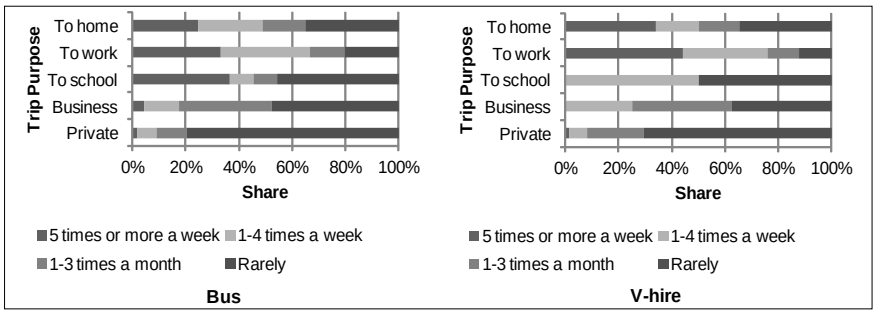
5.35 Figure 5.13 shows the percentage of frequency of use by mode. Jeepneys and

the Cebu-Mactan Ferry service are thought to be convenient traffic modes for daily use. Also, more than 40% of bus and v-hire passengers use the service regularly (at least once a week). Those people are considered to make long trips from their homes to Cebu or their homes in Cebu to provinces mainly for work, as shown in Figure 5.14. It is suggested to develop economic sub-centers in other cities/municipalities to ease overconcentration in Cebu City.



Source: JICA Study Team.

Figure 5.13 Frequency of Use by Mode

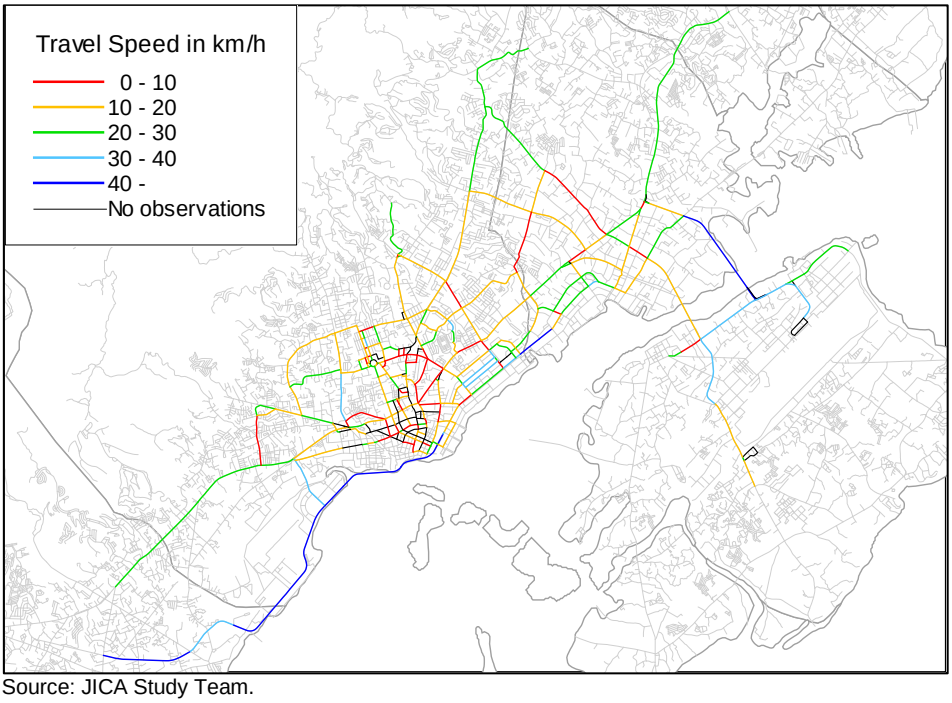


Source: JICA Study Team.

Figure 5.14 Frequency of Use by Trip Purpose for Bus and V-hire Users

(6) Travel Speed Survey

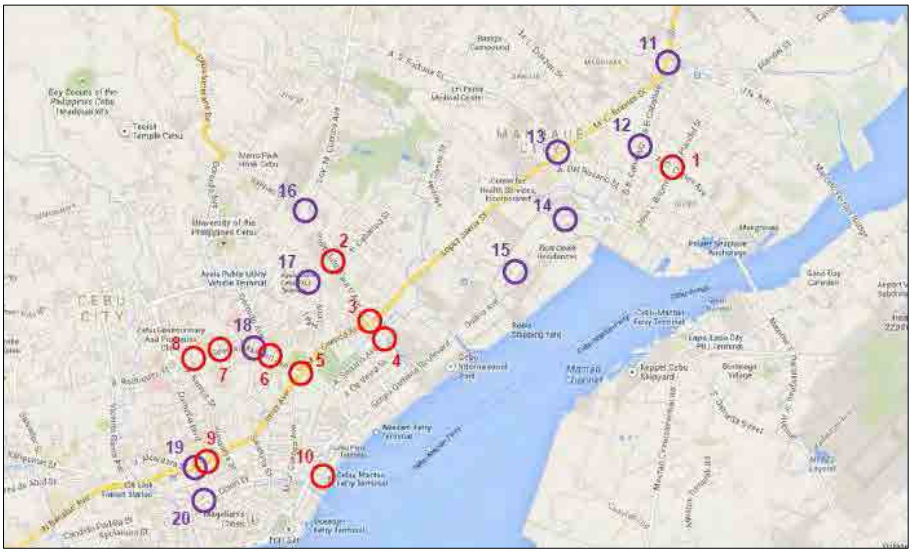
5.36 The survey collected driving data for 7,060 hours or 294 days in total including data recorded while parking. Among the road sections with larger amount of data (i.e., sections in red or orange in Figure 5.15), 343 sections were set to calculate travel speed with the driving data. Figure 5.15 shows the median travel speed by direction at 3:00–6:00 p.m. on weekdays when the heaviest road congestion is observed. A decrease of travel speed to lower than 20 km/h is found at most sections in the urban area during this time period. The analysis particularly shows serious congestion (i.e., travel speed lower than 10 km/h) in Cebu's downtown area.



Source: JICA Study Team.

Figure 5.15 Cumulative Driving Data Volume for the Urban Area

5.37 Figure 5.16 shows 20 heavily congested intersections within the urban areas as identified in the travel speed survey. This is due to the high traffic volume and the decrease in speed. Many of these intersections happen to be located in Cebu City and Mandaue City.



Note: red circle means first priority to be improved, blue cicle means second priority to be improved

Source: JICA Study Team.

Figure 5.16 Locations of Congested Intersections at Urban Areas

PART II

6 DEVELOPMENT FRAMEWORK FOR MEGA CEBU ROADMAP

6.1 Mega Cebu Vision 2050

6.1 Mega Cebu Vision 2050 was formulated in 2013 by MCDCB in cooperation with JICA and Yokohama City. It consists of the following four strategic pillars, which further translate to 15 development directions (see Figure 6.1):

(i) Competitiveness;

(ii) Mobility;

(iii) Livability; and

(iv) Metropolitan Management.

Source: MCDCB-JICA 2013.

Figure 6.1 Strategies and Development Directions of Mega Cebu Vision 2050

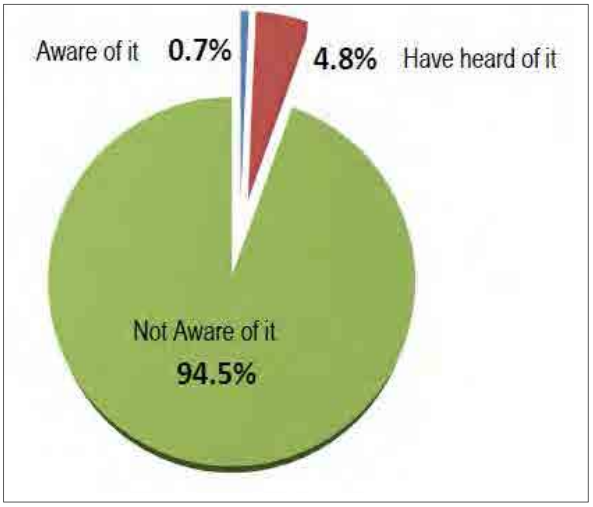
6.2 Adopting the catch phrase “Mega Cebu–Making W.A.V.E.S” (which stands for "Wholesome, Advanced, Vibrant, Equitable and Sustainable"), the following vision statement was formulated:

“A vibrant, equitable, sustainable and competitive environment that embraces Cebu’s creativity and its culture, historical and natural resources, with strong citizen participation and responsive governance.”

6.3 A Household Interview Survey (HIS) was conducted in the first quarter of 2014 in all barangays of the Study Area with a target sample of over 6,500 randomly selected households. Survey results concerning citizens' awareness of Mega Cebu Vision 2050 reveal that less than 1% of the respondents understood the contents of the vision and

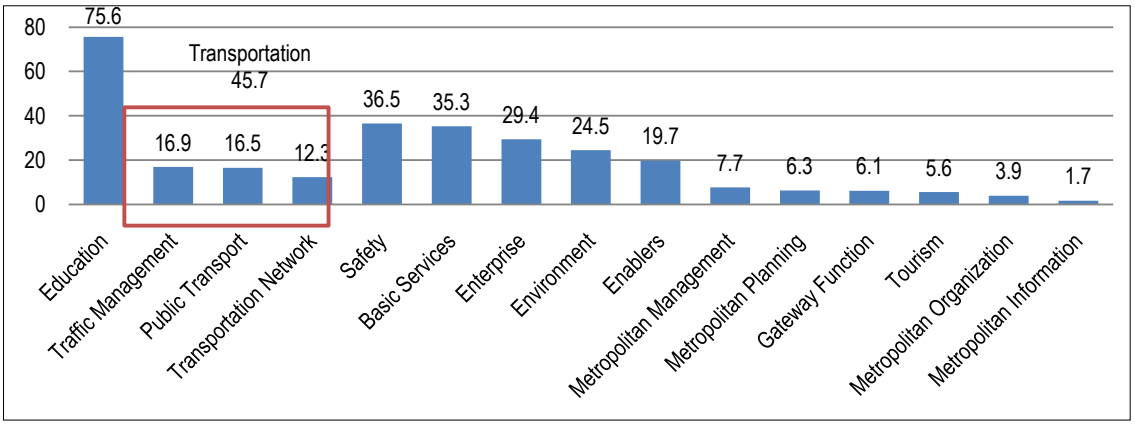
about 5% had heard of the vision (see Figure 6.2). The rest, or 94%, of the households remains to be the target for raising the awareness of "Mega Cebu Vision 2050".

6.4 In the HIS, the residents were made to choose 3 out of the 15 development directions which they considered most important to them. What came out as the most important direction for 75.6% of respondents is "Education (higher education, skills training, matching for workforce, foreign language)." This is followed by "Transportation (combined results for traffic management, transportation network, and public transport)" with 45.6%, "Safety (resilience from natural disasters, crime and drugs prevention)" with 36.5%, closely followed by "Basic Services (safe water supply, sanitation and drainage, slum upgrade)" with 35.3% (see Figure 6.3).



Source: JICA Study Team - HIS 2014.

Figure 6.2 Recognition of Mega Cebu Vision 2050



Source: JICA Study Team - HIS 2014.

Figure 6.3 Supported Development Directions

6.2 Urban Population and Urbanization Framework

1) Future Urban Population

6.5 The future population of Metro Cebu was projected using logistic regressionof past census data. Metro Cebu's population is estimated to reach 3.8 million in 2030 and will reach nearly 5.0 million people in 2050, which is double the 2010 population of about 2.5 million (see Table 6.1 and Figure 6.4).

6.6 In 2030, Cebu City would have 1.1 million people as a result of continuous

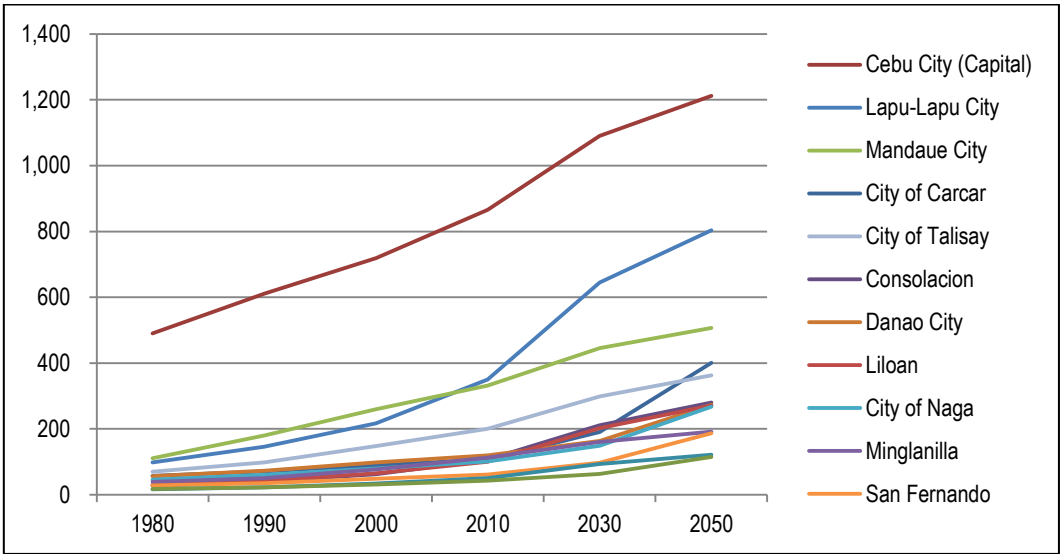
population increase. However, its share in the total population of Metro Cebu consistently declined from 45% in 1980 to 34% in 2010 and would further decrease to 27% in 2050. Likewise, Mandaue City and City of Talisay will show the same decreasing trend in their population shares. The populations of the other LGUs, on the other hand, would steadily increase.

Table 6.1 Population of Metro Cebu, 1980–2050

(Unit: thousand)

City / Municipality Name	Population				Projection		Change
	1980	1990	2000	2010	2030	2050	2050 / 2010
City of Carcar	57.8	70.8	89.2	107.3	190.9	400.5	3.7
Cebu City (Capital)	490.3	610.4	718.8	866.2	1,090.7	1,211.6	1.4
Compostela	17.5	22.0	31.4	42.6	63.1	114.5	2.7
Consolacion	27.5	41.3	62.3	106.6	210.9	280.4	2.6
Cordoba	16.5	22.3	34.0	50.4	93.0	121.5	2.4
Danao City	57.0	73.4	98.8	119.3	163.1	273.1	2.3
Lapu-Lapu City	98.7	146.2	217.0	350.5	645.2	803.8	2.3
Liloan	30.2	42.6	65.0	100.5	202.8	271.0	2.7
Mandaue City	110.6	180.3	259.7	331.3	445.4	506.9	1.5
Minglanilla	38.5	50.9	77.3	113.2	160.6	192.2	1.7
City of Naga	45.8	60.4	80.2	101.6	148.8	267.2	2.6
San Fernando	28.3	35.1	48.2	61.0	96.9	187.1	3.1
City of Talisay	69.7	98.0	148.1	200.8	298.3	363.3	1.8
Metro Cebu	1,088.0	1,454.0	1,930.0	2,551.0	3,810.0	4,993.0	2.0

Source: JICA Study Team, calculated based on Census.



Source: JICA Study Team.

Figure 6.4 Population Projection of Metro Cebu, 2030–2050

2) Demands for Urban Development

6.7 Continuous population increase will translate to high density in the existing urbanized area, cause environmental deterioration and exacerbate urbanization pressure. Moreover, this will require the creation of new employment opportunities. The supply of new residential areas can be gleaned from statistics of the Housing and Land Use Regulatory Board (HLURB). The creation of new employment opportunities with urban development is made through registration of development areas with the Philippine

Economic Zone Authority (PEZA). PEZA-registered areas include special districts for manufacturing industry, IT parks/ IT centers, trade and agricultural product processing industry, and tourism.

6.8 HLURB and PEZA statistics show that the annual increase of new urbanized area in Metro Cebu after 1995 is 150 ha of residential area and 52 ha of industrial and service land. Although Metro Cebu's population is increasing by about 60,000 persons/year, the annual expansion of total new residential area is not enough to accommodate such an increase but can only accommodate about 30,000 persons. The rest of the additional population is accommodated in the existing urbanized area, including informal settlements

6.9 During the roadmap planning periods, Metro Cebu's population increase is expected to maintain its pace of 60,000 persons per year. Similar to experiences in developed countries, it is expected that there will be a decrease in informal settlements as growth of the local economy will absorb informal settlers into the formal employment sector, thus leading to increased incomes. In such a situation, all additional population can be accommodated in the formal property market by 2050 and the amount of annual residential land supply will be 300 ha, which is twice the current area, and formal employment opportunities will continue to increase.

6.10 In this Study, JST assumed that demand for urban development will further increase and estimated that the total requirement for new urban land for the period 2011–2050 is 12,120 ha (see Table 6.2). This is 11% of the total area of Metro Cebu and two-thirds of the current urbanized area.

Table 6.2 Land Development Demand of Metro Cebu, 2011–2050

Type	Yearly Demand (in ha.)	Aggregated Demand (2011–2050; in ha.)	JST Estimated Demand (2011–2050; in ha.)
Residential Land under HLURB Category	150–300	6,000–12,000	9,000
Industrial and Service Land under PEZA Category	52–104	2,080–4,160	3,120
Total	202–404	8,080–16,160	12,120

Source: JICA Study Team.

6.3 Trade and Investment Framework

1) Economy

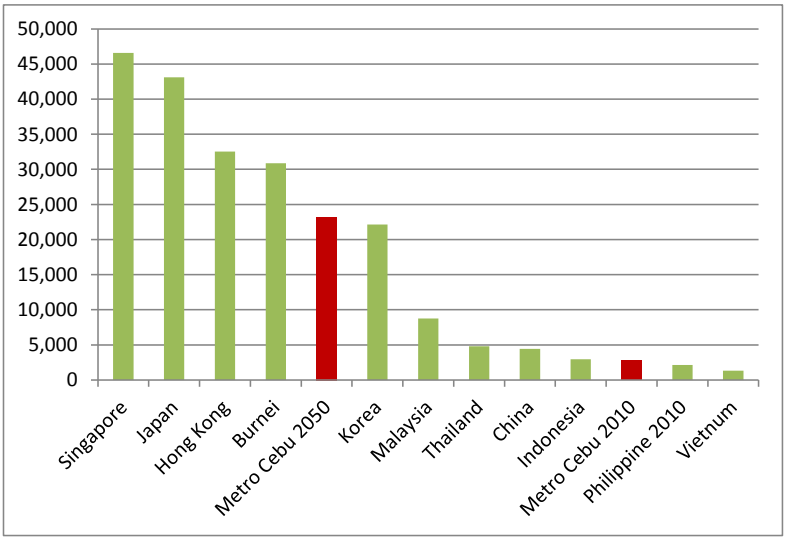
6.11 In spite of the natural disasters that hit the country in the fourth quarter of 2013, the Philippines economy has continued to enjoy a solid growth and many of the international organizations such as ADB, the World Bank and IMF have fairly positive outlook for the coming year’s performance.

6.12 Metro Cebu constitutes the core part of the Central Visayas Region, which also enjoys a fairly positive economic performance. The region's long-term vision is that by 2030, the Central Visayas Region will be a leading growth center in the country, responsible for steering the economy of the Philippines to greater heights.

6.13 Metro Cebu will enjoy a steady economic growth even in the long term. People’s affluence level, in terms of per capita GRDP, is projected to grow to more than USD20,000 in 2050, which is almost the same as Korea's as of 2010 (see Figure 6.5). To realize this sustainable growth, macroeconomic policies should be properly undertaken so as to break

out of the so-called "Middle Income Trap [1]."

6.14 The study projected the growth potentials of economic activities up to 2050. GRDP of Metro Cebu will grow at 8.3% per year between 2010 and 2020, 7.8% per year from 2020 to 2030, then 5.8% per year from 2030 to 2050 (see Table 6.3). As a result, the magnitude of economic activities in Metro Cebu will be almost 15 times as large as their 2010 level.



Source: JICA Study Team.

Figure 6.5 Comparison of Per Capita GDP among Asian Countries in 2010 and Metro Cebu 2050 (USD at 2000 prices)

Table 6.3 Projection of GRDP of Metro Cebu Area

	Actual	Projection			Annual Growth Rate, (%)		
	2010	2020	2030	2050	2020 / 2010	2030 / 2020	2050 / 2030
GRDP (mil. PHP at 2000 prices)	229,443	509,059	1,079,115	3,334,325	8.3	7.8	5.8
GRDP per Capita (PHP at 2000 prices)	89,939	162,100	276,900	667,800	6.0	5.5	4.5

Source: JICA Study Team.

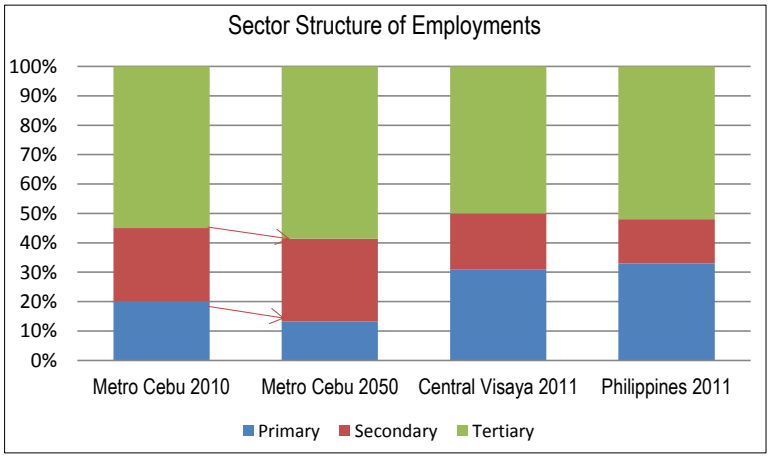
2) Employment

6.15 Metro Cebu's labor force of 1.4 million is 62% of its total population, which is slightly higher than the national average of 58% (2007). The prominent feature of employment in Metro Cebu is its highly educated human resources. About 30% of 25-year olds, or 307,000, had college or upper college education. This is higher than the national average of 6%.

6.16 By 2050, total employment in Metro Cebu will reach 2 million with approximately 1 million already created in 2010. Employment will shift to a more industrialization-oriented structure, where the economy will be driven by strategic development of industrial and urban service sectors (see Figure 6.6).

[1] Middle Income Trap – unable to compete with low-income, low-wage economies in manufactured exports and with advanced economies in high-skill innovations. Such countries cannot make a timely transition from resource-driven growth, with low-cost labor and capital, to productivity-driven growth.(Source: Asia 2050, ADB)

6.17 To ensure such an economic movement in Metro Cebu, about 317,000 new jobs should be created in the secondary sector and 641,000 in the tertiary (service) sector (see Table 6.4). Diversification of the urban economy is a must, inducing more foreign direct investments (FDIs) as well as encouraging local investors in various potential business areas.



Source: JICA Study Team.

Figure 6.6 Comparison of Sector Structure of Employment among Metro Cebu (2010 and 2050), Central Visayas (2011) and the Philippines (2011)

Table 6.4 Projection of Employment by Sector in Metro Cebu in 2050

Urban Cluster	Population 2050 ('000)	EAP (15–60 yes old)	Employment Needs in Formal Sector	Sector Structure of Employment (%)			Employment by Sector ('000)			
				Primary	Secondary	Tertiary	Primary	Secondary	Tertiary	Total
Danao–Compostela	387.6	232.5	162.8	30	20	50	48.8	32.6	81.4	162.8
Consolacion–Liloan	551.4	330.8	231.6	20	25	55	46.3	57.9	127.4	231.6
Cebu–Mandaue	1,718.5	1,031.1	721.8	5	35	60	36.1	252.6	433.1	721.8
Talisay–Minglanilla–Naga	822.7	493.6	345.5	20	20	60	69.1	69.1	207.3	345.5
San Fernando–Car- car	587.6	352.6	246.8	25	15	60	61.7	37.0	148.1	246.8
Lapu Lapu–Cordova	925.3	555.2	388.6	5	35	60	19.4	136.0	233.2	388.6
Metro Cebu 2050	4,993.1	2,995.8	2,097.1	13.4	27.9	58.7	281.5	585.2	1,230.4	2,097.1
< Comparison between 2010 and 2050 >										
Metro Cebu 2010	2,551.1	1,530.7	1,071.5	20	25	55	214.3	267.9	589.3	1,071.5
Increase 2010–2050	2,442.0	1,465.2	1,025.6	-6.6	2.9	3.7	67.2	317.4	641.1	1,025.6

Source: JICA Study Team.
Note: (1) Economically Active Population (EAP) is assumed to share 60% of the total population.
(2) It is assumed that 70% of EAP will demand for employment in the formal sector.

3) Trade and Port

6.18 Together with the steady growth of the economy, Philippine export and import performance has also shown robust growth. Exports in 2013 (including services) expanded by 7 .7% from its 2012 level.

6.19 Total exports of Metro Cebu show constant growth in the past two decades and even during the Asian financial crisis in 1997. Imports to Cebu are mostly raw materials for foreign export firms that locate in Cebu's growing export processing or special economic zones. Despite the lack of space for locators in the economic zones and the limited

expansion space in Cebu Port and Mactan International Airport, Gross Value Added (GVA) in trade in Central Visayas grew by 9.8% in 2010, 4.6% in 2011, and 12.1% in 2012.

6.20 Metro Cebu's exports are directed mostly to the US and Japan. The rest are shipped to other countries in Asia, Europe and Canada. Most of Cebu's imports also come from the US and Japan.

6.21 No longer traditional in composition, exports from Metro Cebu are now mostly composed of manufactured goods notably semi-conductors, electronics and other related items coming from Cebu's growing number of foreign export firms. Export of furniture, fashion accessories, garments, toys and house wares are also increasing from Cebu's local producers. In addition Cebu is also known for the processing and export of marine products as well as other traditional export crops collected and processed by Cebu's growing number of export entrepreneurs.

6.22 Historically Metro Cebu is the Visayas' trading hub supported by Cebu Port. Cebu Port has a share of 7.0% in terms of cargo throughput among Philippine Ports Authority (PPA) and Cebu Port Authority (CPA) ports while its domestic container volume has a more significant share of 13.1% in 2010. The port handles mostly general cargo and containerized cargo. However, bulk cargo and vehicles are rarely recorded. It may reflect the local industry structure such as assembling, manufacturing (except vehicles), and trade and commercial activities.

6.23 In recent years, Cebu Port suffers from shallow berth facilities up to -8.5 meters. It is a serious concern particularly among international shipping operators when assigning their container ships on the routes to Cebu. Another issue is the small container yard. There are several container depots around Cebu Port to offset its container yard shortage. According to the METI forecast, total cargo volume at CAP in 2030 will be 1.9 times that in 2010, and 2.9 times for international containers. A potential bottleneck in infrastructure lurks at Cebu Port; with increasing trade, this will become tangible in the near future.

4) Tourism and Airport

(1) Metro Cebu Tourism in Perspective

6.24 The island of Cebu is located at the center of Central Visayas and as the first island to be colonized and settled by the Spaniards, Cebu is rich in history and cultural heritage. Countless number of historical and architectural artifacts can be found not only in Cebu City, where Christianity was first introduced in the country, but also in its rural towns and barangays. Cebu is also gifted with breathtaking natural attractions and white sand beaches that can be found in almost all its coastal towns and cities and numerous small islands. Add to this the presence of many travel-related amenities and activities along with the presence of an international airport and seaport, good medical and educational facilities, and these explain why Cebu has become a major destination of choice for visitors in the country.

6.25 In 2013, Cebu's total number of tourist arrivals breached the 2.5 million mark at 2.59 million composed of 1.15 million foreign tourists and 1.44 million domestic tourists. This represented a 16.8% increase over the previous year's total tourist arrivals of 2.23 million.

6.26 From 2006 to 2013, growth in total tourist arrivals in Cebu averaged 11.2% annually, broken down into 13.9 % average annual increase for foreign tourists and

9.4% for domestic tourists. Significant growth in this sector was enjoyed especially in the past two years. Based on past statistics, the following three forecast scenarios for tourist arrivals in Cebu have been prepared (see Table 6.5):

(a) **Scenario a (WTTC Forecast):** 6% annual growth, which is the growth forecast rate for 2014 to 2024 by World Travel and Tourism Council;

(b) **Scenario b (Past Trend):** 9.0% annual growth, which is the actual trend between 2006 and 2011; and

(c) **Scenario c (Current Trend):** 11.2% annual growth, which is the average growth between 2006 and 2013.

Table 6.5 Tourist Arrival Forecast for Three Scenarios

Scenario	Annual Growth Ratio, (%)	2006	2011	2013	2020	2030
Scenario a	6.0	125	192	259	368	621
Scenario b	9.0	125	192	259	435	944
Scenario c	11.2	125	192	259	489	1,269

Source: JICA Study Team.
Unit: million persons

6.27 Considering the forecast by WTTC for the international tourist arrivals for the Philippines, scenarios (b) and (c) seem to be too much.

6.28 The growth in tourist arrivals raises issues on accommodations. According to the Department of Tourism (DOT), there were 20,000 rooms available in Cebu based on its 2012 survey. Assuming the average number of guests in a room as 1.7, days of stay per person as 2.5, and occupancy rate as 60%, the accommodation capacity in Metro Cebu is calculated as 2,980,000. This requires immediate actions to improve accommodation capacity to meet tourist demand. Improvement of occupancy rate and expansion of capacity need to be considered, otherwise within a year or two, capacity will run short of the demand.

(2) Economic Impact of Tourism

6.29 Travel and tourism is an important industry, not only for its direct economic impact but also for its significant indirect and induced impacts. WTTC estimates that the economic impact of tourism as its direct contribution to the Philippines' GDP was PHP472.0 billion in 2013[2].

6.30 Assuming that 2.6 million tourists to Cebu spend an average of USD60 each, half of which may go to the travel agency in the country of origin, with the indirect and induced impact, roughly USD230 million will be the benefit to Cebu (2.6 million x USD 60 / 2 x 3 days[3]). The Provincial Government recognizes tourism as a priority sector. Considering the competition with neighboring countries, it is important for Cebu to cooperate with other area in the region, such as Bohol, where the construction of the new international airport has started.

6.31 Due to the operation of low-cost carrier (LCC) services and more direct international flights, the Mactan Cebu International Airport (MCIA) has experienced

[2] Travel & Tourism Economic Impact 2014 Philippines, WTTC.
[3] Average days for travel stay.

unprecedented air traffic growth since 2009. In order to cope with this situation, the management rights for the terminal was transferred to a private concessionaire in 2014. Construction of the second terminal will be launched by the private sector in 2015.

6.32 Based on KOICA's projections, MCIA will handle 13.3 million passengers and 114,000 aircraft movements in 2030. This will further increase to 15 million and 126,000 aircraft movements in 2040, from 7 million and 64,000 in 2013. Under this 2040 scenario, MCIA would be very congested if only one runway would serve airport operation.

6.33 Although the tourism sector in Metro Cebu will become an even bigger sector and some constraints are emerging in both airport and hotel facilities, the bottleneck at the airport can be addressed by service and investment by private concessionaires for the meantime. FDI in hotel facilities, investment by local capital, and effective promotion of tourism products will become more important in the future.

5) Investments and Economic Zone

6.34 Metro Cebu is now one of the most progressive investment centers in the country and in Asia. Many foreign investors are attracted to Cebu because of its abundant supply of highly skilled and educated labor force, strategic location, availability of infrastructure, presence of related and supporting industries, good peace and order situation, and supportive local government officials.

6.35 Over the past 10 years, investments in the province of Cebu had been very robust. From 2004 up to 2013, total accumulated investments in Board of Investments (BOI)-approved projects reached USD2.9 billion, creating 26,777 new employment. This was equivalent to 93.6% of the entire investments in Central Visayas. Investments in BOI-approved projects in Cebu declined after the Lehman’s financial shock in 2008 as many foreign investors became reluctant to increase their investments in Asia. However, new investments in Cebu already started recovering just a few years after.

6.36 According to the Philippine Economic Zone Authority (PEZA), a total of 278 industry locators in the 6 economic and export processing zones in Cebu have poured in PHP13.8 billion in investments and provide employment to over 116,000 employees. The IT-BPO industry is a big sector in Cebu's economy. There are 139 locators in this particular sector in Cebu. The Cebu Investment Promotion Center (CIPC) estimates that there are 95,000 IT-BPO employees.

6.37 Based on the total employment level and their daily wage rates, CIPC estimates that these FDIs contribute PHP8.2 billion of monthly payroll to Cebu's economy (see Table 6.6).

Table 6.6 FDI Contribution to the Cebu Economy

	Employee	Monthly Wage
Direct effect on the economy of Cebu		
Manufacturing sector;	116,650	PHP1,393 million
IT – BPO sector;	95,000	PHP1,900 million
Indirect effect on the economy of Cebu		
Support industries such as café, restaurant, accommodation, transport, shopping malls, etc,	211,650	PHP1,617 million
Maintenance and Operating Expenses		PHP3,293 million
Total	423,300	PHP8,203 million

Source: Calculated by JICA Study Team based on Foreign Investment in Cebu, CIPC.

7 SUB-ROADMAP FOR METROPOLITAN COMPETITIVENESS ENHANCEMENT

7.1 Industry and Investments in the Region

1) Regional Economy

7.1 The regional economy of Central Visayas has grown since 2009, compared with the economies of the nation and the National Capital Region. The GRDP of Central Visayas increased to PHP56,500 per capita at constant 2000 price in 2012, at an annual growth rate of 7.9% (see Table 7.1). Although the per capita GRDP of Region VII was lower than the national average, this economic gap has been reduced by 2012.

7.2 The growth of the regional economy was driven by all three industrial sectors, which recorded higher annual average growth rates than those of the nation. In particular, the secondary sector (Industry) significantly expanded its production from 2009 to 2012. Having grown at 14% annually, a growth rate more than twice the national level, the industry sector's contribution to the regional economy increased by 4% to 36.6% in 2012. On the other hand, the primary and tertiary sectors reduced their percentage contribution to the regional economy, in spite of their growth in production in absolute terms.

Table 7.1 Gross Regional Domestic Product per Capita by Region, 2009–2012

(at constant 2000 prices/million Pesos)

Region / Year	2009	2010	2011	2012	Average Annual Growth Rate 2009–2012
Central Visayas	44,993	49,966	52,528	56,507	7.9
Metro Manila (NCR)	162,321	171,442	173,975	183,747	4.2
Philippines	58,199	61,570	62,739	65,904	4.2

Source: National Statistical Coordination Board.

7.3 Employment in Central Visayas, registered as 2.9 million in 2011, has been growing at a faster average annual rate than that of the Philippines. It is the primary and tertiary sectors that have been leading the surge in regional employment, more than the secondary sector. Employment in the industry sector increased by only 0.7% per year, compared to 2.7% and 4.2% of the primary and tertiary sectors, respectively. Combined, the primary and tertiary sectors provided employment to 85% of the region's labor force.

7.4 For foreign direct investments (FDI), PEZA-registered economic zones are the major destinations in Cebu, which hosts 7 approved export processing zones, 6 IT Parks, 21 IT Centers, an Agro-Industry Export Zone (AIEZ), and 3 Tourism Export Zones (TEZ). These ecozones generated a total of PHP25.2 trillion of investments, USD7.7 billion worth of exports, and direct employment of over 170,000. However, most of the ecozones are almost full and cannot accommodate the increasing demand of FDI. Preparation of a feasibility study for industrial parks / estates development projects to accommodate new locations should be done as a short-term project.

7.5 Annual tourist arrivals (foreign and domestic) to Cebu continue to increase over the years, breaching the 2.5 million mark in 2013. Using the World Travel and Tourism Council (WTTC) forecast of 6% annual growth from 2014 to 2024, the number of tourists to Cebu is projected to reach 3.7 million in 2020 and 6.2 million by 2030. With this rapid growth in the tourism sector, there is a need to expand the province's accommodation capacity

7.6 While poor infrastructure and logistics and high investment costs are the issues for sustaining the growth of new investments, Cebu's livability and Quality of Life (QOL) factors such as education, medical and health care, and recreation give the province an advantage in promoting FDI. However, Cebu needs to fully recognize its impact and advantage of such resources for better foreign direct investment promotion to further grow its economy.

2) Industrial Development Policy

7.7 Relevant development policies and plans include the Public Investment Promotion Plan (PIPP) 2011–2016, Investment Priority Plan (IPP) and DTI Industry Development Program (IDP) Roadmap in 24 sectors as the national plans, the Central Visayas Regional Development Plan 2011–2016 as the regional plan, and the Provincial Development and Physical Framework Plan (PDPFP) 2014–2019 as basis for the Provincial Development Investment Plan (PDIP).

Table 7.2 Relevant Development Policies

Type of Plan	Title
National Plans	• Public Investment Promotion Plan (PIPP) 2011–2016, • Investment Priority Plan (IPP), and • DTI Industry Development Program (IDP) Roadmap in 24 sectors
Regional Plan	• Central Visaya Regional Development Plan 2011–2016
Provincial Plans	• Provincial Development and Physical Framework Plan 2014–2019 (PDPFP) • Provincial Development Investment Plan (PDIP)

Source: JICA Study Team.

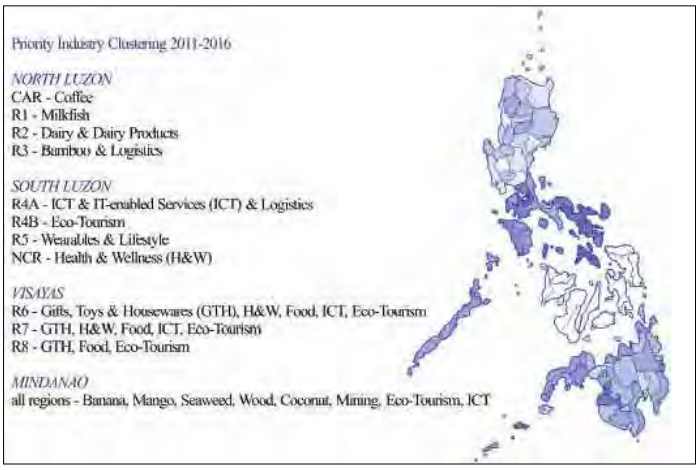
7.8 The major regional industries of Central Visayas are (i) Manufacturing, (ii) BPO, (iii) Tourism, and (iv) Electronics / Semiconductors, all of which the DTI also defines as the priority sectors in the region.

3) Cluster Development

7.9 In developing identified industries, the government's policy in recent years is to pursue an industry cluster program to foster inter-enterprise linkages among micro, small and medium enterprises (MSMEs) and strengthen collaborative networks. An industry cluster is a geographic concentration of competing, collaborating and interdependent businesses, working on a similar regional infrastructure and creating wealth of regions through exports. It fosters the transfer and adoption of new technologies, creates risk capital, and attracts foreign investment. It breaks down organizational, geographical and sector boundaries, all needed for creating a cycle of sustainable economic growth. The industry clustering strategy is vital for linking manufacturing with other sectors (e.g., mining, agriculture, tourism, construction, etc.), particularly as these affect raw material needs of manufacturing and the manufactured-product requirements of other sectors.[4]

7.10 An industry cluster map has been developed by PDP to guide national and local government agencies, the private sector, development partners, and local communities in developing their respective industry clusters which take into account their comparative advantages (see Figure 7.1). For the Central Visayas Region, among the identified priority industry clusters are the gifts, toys and housewares (GTH), health and wellness (H&W), food, ICT, and ecotourism.

[4] Philippine Development Plan 2011–2016, Cluster Development, NEDA, 2011.



Source: Philippine Development Project (PDP) 2011–2016.

Figure 7.1 Industry Cluster Map

4) Local Development Management

7.11 Guided by the national industry development priorities, the 13 LGUs of Mega Cebu have drawn up their respective local development plans and programs. Taking into consideration their strengths, weaknesses, development opportunities and challenges, the LGUs have set their respective priorities (see Table 7.3). In the study, the JICA Study Team summarized the LGU's development priority directions from information provided in the series of consultative workshops and individual meetings.

Table 7.3 Development Priorities and Directions of 13 LGUs

LGU	Priority / Direction	LGU	Priority / Direction
Danao	Development as a north gate pole/Sub-urban center of Metro Cebu, IT, Agriculture, Agro-industry and Tourism. In addition to MRI, new Industrial Zone 2 & 3 in the northern coastal area, potential to IT cluster second to MEPZ	Cordova	Second gateway to/from Mactan with new bridge, Reclamation for new business and industrial locations, Marine tourism. Has a policy of no manufacturing industry.
Compostela	Reclamation for new industrial locations, Development of IT park with fiber-optic line, Agriculture, Agro-Industry	Cebu	IT/BPO business center (smart city) at SRP, Commercial and business center, High education and training hub, City tourism, Gateway functions of Mega Cebu to international investors and visitors
Liloan	Education, Health care, Agro-industries, Sea-based public transport terminal	Talisay	Public market, International marina, fish port and food processing industries, Agro-industry, Commercial, Industry
Consolacion	Reclamation for new industrial locations, Container port and Logistic center, Light industries to compliment MEPZ, Agriculture, Tourism, Education, Sports-recreational center	Minglanilla	Light industry, Service industry, Reclamation for industrial locations of SMEs, Agro-industry, Wood craft and furniture, Bus terminal with a sub-regional market
Mandaue	IT/BPO center, Commercial and business sub-center, Logistic center, Recreational and tourism center. Largest industrial area (925 ha) in Metro Cebu.	Naga	Development as a Sub-urban center, Naga Valley Industrial Park (36 ha) has developed in 2014 and Naga SEZ (30 ha) will be implemented. Home to Apo Cemex cement factory. Tourism resource center, New Naga public market, Education and vocational training center (new college), Agro-industry
Lapu-Lapu	Sub-urban center with business and commercial functions, Reclamation project (northern part) for new industrial locations, Sport-recreational center, Sophisticated marine tourism, Eco-tourism gateway, Health services	San Fernando	Agriculture, Agro-industry, Industrial estate for basic industrial locations and logistic services. Home to Taiheiyo Cement Php.Inc. Educational Center for Cebu-South.
		Carcar	Historical and Eco-tourism, Agro-industry, Food processing industry, Bus terminal with a sub-regional market

Source: JICA Study Team.

5) Human Resource Development / Education

7.12 Cebu is highly organized for human resource development for the IT sector. The Cebu Educational Development Foundation for IT (CEDF-IT), organized over 10 years ago, is a consortium / foundation of academic institutions and private practitioners dedicated towards developing human capital for Cebu's target IT subsectors. To further ensure the availability of appropriate skills and the interplay of hardware and software, all of Cebu's 11 universities offer IT courses. Most of the college graduates in Cebu are in the field of business, IT, and engineering (see Table 7.4).

Table 7.4 Average Number of College Graduates in Cebu, 2010–2012

	Number	% of Total
Accounting	547	2.4
Business Courses	4,408	19.4
Medical Courses	2,937	12.9
IT Courses	3,858	16.9
Engineering	2,674	11.7
Other Courses	8,333	36.6
Total	22,757	100.0

Source: CIPC.

7.13 In addition to the IT sector, Cebu's human resources in the medical service sector such as hospital and health care, general college and ESL, are also highly regarded. Patients from the Visayas region and neighbouring countries come to get medical treatment in Cebu. Also, students go to Cebu to study medical and English courses.

7.2 Roadmap Direction on Metropolitan Competitiveness

1) Industrial Development Policy

(1) Strengthening Competitiveness (Lessons from Other Countries)

7.14 In the past decades, despite achieving certain progress, the Philippines' promotion of industrial growth has paled in comparison with other ASEAN countries. Cebu, as the nation's second premier city, and its surrounding area, Mega Cebu, have a potential to be more flexible and take the initiative to evolve more rapidly than the whole the nation in order to compete with neighbouring countries.

7.15 Firstly, it needs to have a more practical and focused industry development policy. When considering the policy, Cebu can draw upon lessons from globally successful developed countries. Singapore's success in economic growth stemmed from its industrialization policy in the 1960s, assisted by the UN's Survey Mission to Singapore led by Dr. Albert Winsemius.

7.16 Since there are many reports that analyze the Singaporean industrial development success story, the Winsemius Report, may not be new. However, Singapore's industrial policy at that time cannot be adapted to every developing country, but one that has a free trade tradition, accumulated capital, and well-developed financial market. These are factors that Cebu is considered to have.

7.17 One of the lessons to be considered from Singapore's industrial development policy is a clear understanding of the current problem, demand for employment and improvement of the living standard.

7.18 The second important lesson is the firm decision of the Singapore government

at that time to eradicate corruption and establish an efficient bureaucracy. Studying the lessons from failure of neighbouring countries in this respect, the Singapore government strongly resolved to address the problem of corruption. The cleanliness of the Singaporean bureaucracy and transparency in its political decision-making are among the most important factors for the foreign investors' decision to invest in that country.

7.19 All the neighbouring countries in the ASEAN region also struggle with the same problems, though at varying degrees. From the lessons of Singapore, it is not too much to say that only the nations who could overcome this problem can be successful. As earlier mentioned, if the change of the national culture takes time, Cebu should be the pioneer in bringing about change at least in the provincial level.

(2) Regional Industrial Model

7.20 In formulating regional industrial development policies, various global models can be good references. But before going into the details of industrial models, it is important to emphasize the potential of Cebu's Quality of Life (QOL). The importance of the QOL for attracting foreign investors and international organizations is often underestimated. QOL infrastructure such as international schools for their children, hospitals where English communication is available, churches and places of worship for a variety of religions, and recreational facilities and accommodations of international standard cannot be prepared in a very short time. In this regard, Cebu has a comparative advantage and can prioritize the improvement of primary and secondary infrastructure.

7.21 To improve its investment environment, alternative models/types of the regional industry that Mega Cebu targets will be considered, such as the following:

(i) Silicon Valley Model;

(ii) Italian Model;

(iii) Austin Model (collaboration between industry, government and academe); and

(iv) Other regional industry models.

7.22 Much research and analysis has already been done on the Silicon Valley Model, which many regions and countries are following. The Italian Model, unlike contemporary models in which high quality, low price and mass production are required, pursues high quality, small production and high value-added.

7.23 The success of the Italian Model depends on the reputation and success of its brand. Regional brand and branding for Cebu will be discussed in the following section, but the establishment of the brand such as the Italian Model is not possible in the short term. Other models, such as the Tsubame-Sanjo Model (modified Italian model), can be a good reference for Cebu. Its characteristics are summarized below:

(a) Originated by the technology that has been fostered in the region;

(b) Integrated solution-oriented companies with high market linkage capability;

(c) Face challenges by (i) strengthening of access to customer, (ii) capability of understanding customer needs, and (iii) capacity to propose to niche market;

(d) Establish a certain position in the market as stylish Italian Model;

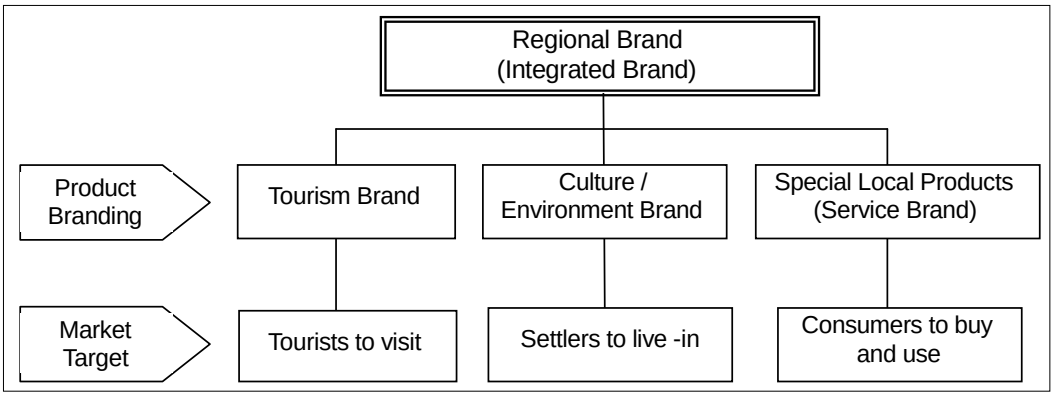
(e) Aggressive investment in research and development and capital investment to internalize important technology to grow into a mid-sized product development-oriented company; and

(f) Strengthen the ability to respond to market needs and technological innovation, stronger than that of the Italian Model, as a regional industry.

7.24 When considering the further development of the Mega Cebu area, it is inevitable to develop under the concept of whole Cebu province, especially the coordination with the Western area such as WCIP. For example, the shipping industry, one of the major industries in WCIP, needs to procure necessary shipping parts include small metal products. According to the Tsuneishi Heavy Industries, they need to produce such parts by themselves since there's no such suppliers in Cebu Province include Mega Cebu area. This kind of basic manufacturing industries maybe established and allocated to the proposed SEZ in Naga as it is a gateway to the western side of the province. Regional Industrial Model shall be developed based on the regional characteristics and requirement of the area.

2) Regional Branding

7.25 While marketing is the "creation of a system of selling," branding is the "creation of a system of sustainable selling." Regional branding is "adding value that appeals to the region." The functions of branding include guarantee of quality, differentiation, and recall. Its effects include premium price effect and loyalty effect. Figure 7.2 presents an example of tourism branding.



Source: JICA Study Team.

Figure 7.2 Regional Branding for Economic Growth

7.26 It is easy to conclude that the failure to establish a regional brand is due to lack of attractive high quality resources (variety, quality, quantity). However, the essence of regional branding is the establishment of the integrated brand (special local products, culture and environment brand, tourism brand) by fully utilizing regional resources (nature, history and culture, local industry, etc.).

7.27 Cebu needs a better understanding of the importance of developing its regional brand and how to fully utilize the potential of its resources in different economic sectors.

3) Strengthening Research and Analysis Function and HRD

7.28 For strengthening the priority sectors it is necessary to further develop the function of R&D and HRD (Education). Cebu has a reputation for its excellence in education (academe), hospital and health care. Many students from the region come to Cebu for

study. Not only the universities but also the high quality of English schools in Cebu attracts foreign students from neighbouring countries such as Korea and Japan.

7.29 The advantage of English as an official language will be further utilized as in the BPO / KPO sector. As the academic center of the region, Cebu's high level of educational facilities will enable it to provide high quality human resources to foreign companies that invest in the region.

7.30 Currently, Cebu's hospitals, healthcare facilities and their related educational services also have a good reputation in the region. Further strengthening of this sector will expand opportunities for accepting more patients from all over the world. Similar to the CEDF-IT in the IT sector, an educational development center for the healthcare and medical sector is recommended to be established.

7.31 To further develop Metro Cebu's strengths, it is recommended to establish a Cebu Brand Development Institute that will study and analyze the competitive resources of Cebu and identify and develop the potential resources to become the Cebu Brand. The institute will be composed of the personnel from industry, public sector and academe.

4) Mega Cebu Investment Board (MCIB)

7.32 After the closure of the Cebu Investment Promotion Center (CIPC) in December 2013, investment promotion is made by various organizations such as BOI, DTI, Cebu Province, LGUs, chambers of commerce and industry (CCIs), Business Club, Phil Export, etc. All of the promotion activities are important and need to be strengthened. However, this situation lacks the organization that represents the whole the area, thus bringing confusion and inconvenience to investors. An Investment Board for Mega Cebu needs to be urgently established to facilitate implementation of a unified investment promotion strategy for both public and private sectors and for the entire area.

7.33 As mentioned earlier, research and analysis on the strategies of neighbouring countries and global investors such as China+1 and Thailand+1 also needs to be made efficiently to address the stiff competition from neighbouring countries and cities. The proposed investment board shall have this function and will take the lead in developing and implementing a unified investment promotion strategy for the area.

7.34 The proposed MCIB should consist of concerned organizations from public, private and academic sectors and will not be dependent on a particular political party, hopefully to be managed through income from membership and service fees. One of the recommended structures of the MCIB will consist of four government representatives (Provincial Governor, Mayors from Cebu City, Mandaue City and Lapu-Lapu City, DTI, RDC, etc.) and five representatives of the private sector (business associations such as CCCI, MCCI, Lapu-Lapu CCI, Cebu Business Club, Phil Export, private enterprise) and will have an executive director and a small staff complement from private and public organizations.

7.3 Summary of Sub-Roadmap Projects for Metropolitan Competitiveness Enhancement

1) Short-Term Roadmap

(a) The Mega Cebu Investment Board (MCIB) is to be urgently established to facilitate implementation of a unified investment promotion strategy for the entire area for both public and private sectors. It should also have the function of investment research,

especially to study international investors' strategy on investment. From the lesson of the previous CIPC, this new organization should not dependent on any particular organization and shall be composed of every party concerned with investment.

(b) Prepare a feasibility study for industrial parks/estates development projects to accommodate new locators of strategic industries based on the above research.

(c) Establish a Cebu Branding Institute to study the possibility of the regional branding. It should establish a good network with academe and research institutes. For example, it should establish a good relationship with the Guimaras National Mango Research Center (GNMRC) by BPI when studying about the Cebu mango's branding. This branding institute could be structured under the MCIB.

(d) Establish a Cebu Educational Development Foundation for Health Care (CEDF-HC) as a consortium of industry, academe, government and NGO's that seeks to increase the quantity and improve the quality of professionals in the health care sector and medical services industry. After its establishment, it shall also start its promotion function to the region and neighbouring countries for medical health care treatment in Cebu.

(e) A Research and Development Center for Tourism will be established to further utilize the existing tourism resources and facilities and to develop new attractions. Compared to the beaches, Cebu's historical and cultural heritage sites and existing facilities such as the zoo and aquarium are not first class attractions that tourists visit as the main purpose of their trip. The R&D Center will do research on successful examples such as the Singapore Zoo and Churaumi Aquarium (Okinawa) to establish a new aquarium which will have synergistic effect with Oslob's Whale Shark watching tour. Similarly, the tarsier center at the Rain Forest Park is a first class attraction that needs to have dramatic improvement[5].

(f) Research will also cover the quick option to access the resorts that are scattered in the region. Following the success of the Maldives' Air Taxi, a Cebu Air Taxi service using seaplanes will bring more opportunities for tourists to explore more island resorts. This will develop Cebu as the hub of Visayas region's resorts such as Malapasqua, Bantayan, Oslob, Moalboal, Dumaguete, Siquijor and Bohol (currently, some of these resorts are out of the visitors' reach because of the distance and poor access). The FS work includes the study on the Subic Bay Air Taxi and future study to connect cities along the Cebu coasts such as Argao, Carcar, San Fernando, Danao, Bogo, Toledo, etc. Most probably, this research together with the study for establishment of a new aquarium/zoo could be one of the first activities for the proposed Research and Development Center for Tourism.

(g) Update the Master Plan for the entire Cebu Province to meet the expanded situation of Mega Cebu.

2) Medium-Term Roadmap

(a) Continue further research and analysis on the strategies of global investors and neighbouring countries.

(b) Implement the short-term roadmap project for investment promotion and industrial

[5] In the chapter of land use plan, this study proposes to establish a new aquarium at the proposed reclamation area of the coast of North-East part of Lapu-Lapu City, near the last station of proposed MRT line.

development and Mega Cebu brand developed by the proposed branding institute.

3) Facilitate development of new industrial parks / estates under a newly conceptualized PPP scheme in collaboration with the investment promotion agency (MCIB).**Long-Term Roadmap**

(a) Realize the vision of the long-term target set up by the Mega Cebu 2050.

(b) Propagate firm-level productivity and competitiveness in line with full human resource development.

(c) Facilitate entrepreneurial mindset and a proactive attitude to assure constant improvement and innovation in the business sector in association with a governmental support program.

Table 7.5 Sub-Roadmap for Metropolitan Competitiveness

Term	Year	
Short-Term	2015	・ Establishment of Mega Cebu Investment Board (MCIB)
	2016	・ Preparation of feasibility study for industrial parks/estates development projects
	2016	・ Establishment of a Cebu Branding Institute for regional branding with good networking with existing institutes
	2016	・ Establish a Cebu Educational Development Foundation for Health Care and capacity development of HR in the sector
	2016	
	2020	・ Establishment of a research and development center for Tourism
		・ Update the Master Plan for the entire Cebu Province
Mid-Term	2025	・ Further research and analysis on the strategies of global investors and neighbouring countries.
	2025	・ Implementation of the short-term project for investment promotion and Mega Cebu brand
	2025	・ Facilitate development of new industrial parks/estates under a newly conceptualized PPP scheme
Long-Term	2050	・ Realize the vision of the long-term target set up by the Mega Cebu 2050
	2030	・ Propagate firm-level productivity and competitiveness in line with HRD
	2030	・ Facilitate entrepreneurial mindset and a proactive attitude to assure sustainable improvement and innovation

Source: JICA Study Team.

8 SUB-ROADMAP FOR URBAN STRUCTURE AND LAND USE

8.1 Urban Society in 2050

8.1 The smallest administrative units in the country are the barangays. These are further classified into urban barangays and rural barangays. In Metro Cebu, urban barangays house 85% of all the metropolitan population, i.e., 2.55 million people in 2010. It is confirmed that Metro Cebu has already formed a big urban society. In the roadmap planning period, almost all population increase will be absorbed into this urban society.

8.2 In the early 1980's, four urban structures were comparatively analyzed towards the beginning of the 21st century when Metro Cebu would be a metropolis of 2 million people.[6]

8.3 For this planning exercise, the available land resource of Metro Cebu is limited and thus the most suitable lands for urban uses have to be developed in order to accommodate the 5 million population forecasted for 2050. Today we don't have a variety of urban structure alternatives like before. Only two alternatives can be presented taking the future population increase into account.

(a) **Monocentric and Densely Inhabited Urban Area**

8.4 The present urbanization pattern will continue. Urban development will still be concentrated in Cebu City, Mandaue City and Lapu-Lapu City. Urban sprawl will encompass Liloan, Consolacion, Talisay City and Minglanilla and the urban conurbation will intensively strengthen. They will experience dense habitation like Metro Manila.[7] Traffic congestion will worsen and eventually hamper economic and social activities, discouraging spacious suburban development. Many people will try to live on hilly areas if distance to workplaces is reasonable. As a result, landslides from the hillside development areas and floods at the downstream areas will occur at a wider scale.

(b) **Polycentric and Equitably Developed Urban Areas**

8.5 New workplaces and residential areas will be distributed throughout Metro Cebu. Urban population density will be more or less 100 persons per hectare and no new urban land with over 150 persons per hectare will be planned. Hillside development will be constrained and favourable urban amenity will be created so as to prevent urban disasters such as landslides and floods.

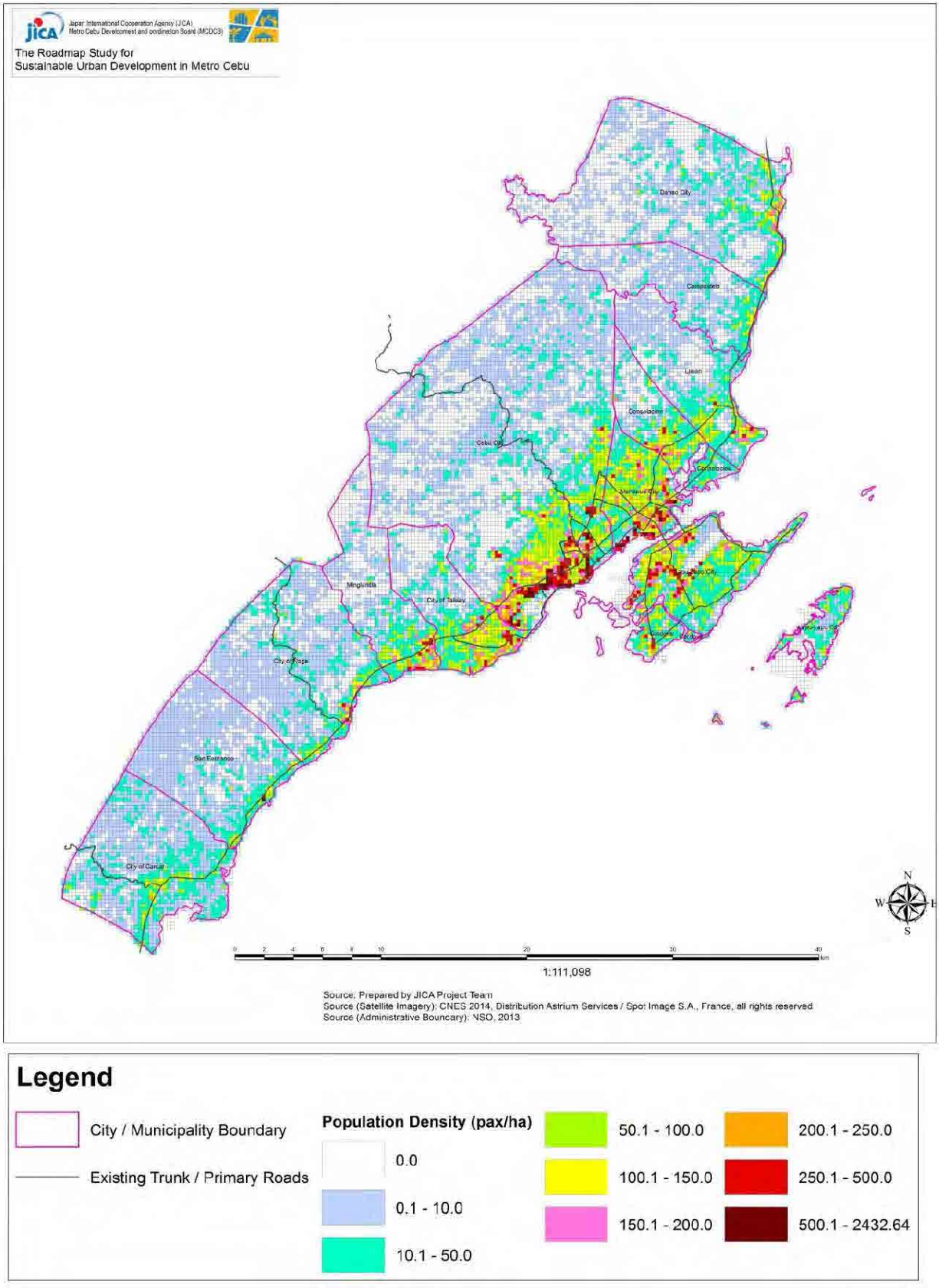
8.6 The former is the continuation of the existing urban development pattern. Such a monocentric and densely inhabited metropolis will be realized as a result of slow infrastructure development and poor metropolitan management. In order to realize a polycentric and equitably developed urban place, infrastructure development will take an important role to enhance development potential at suitable lands for urbanization and guide investment flow to these. For industrial development, high-standard highways are essential to connect industrial lands with port, airport and large cities. For residential development, railway commuter service must be realized to provide punctual and fast service regardless of road traffic congestion. Incorporation of such prime infrastructures into the spatial plan of Metro Cebu is recommended for its metropolitan planning.

[6] Metro Cebu Land Use and Transport Study (MCLUTS) in 1981.
[7] Metro Manila has a population of 11.9 million in 2010. The land territory (638 km^2) is largely flat to support high density habitation (186 persons/ha).

8.7 Previous urban structure discussions opted for large-scale reclamation projects to create an alternative urban structure. Reclamation may give a large impact on urban structure. It can develop prime infrastructure and essential urban functions. But a reclamation project from preparation, civil works and building activities on site is generally costly and time-consuming. For instance, Metro Cebu's experiences in reclamation for 35 years since the beginning of 1980s enumerate only South Point in Mandaue City (180 ha), SRP in Cebu City (300 ha) and the new city center of Naga City (several ha). Many of these reclamation lands are still vacant.

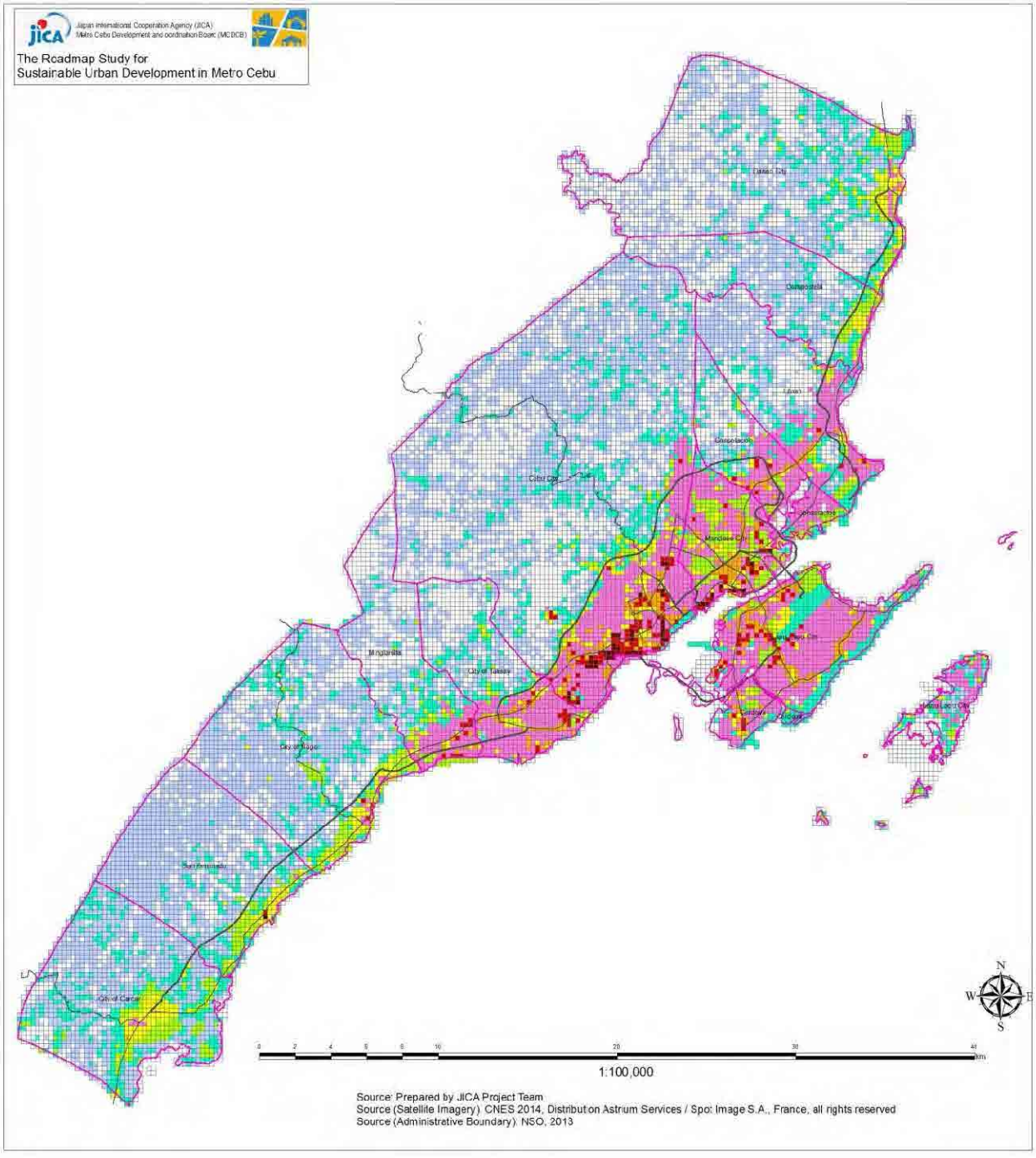
8.8 New reclamation may occur during the roadmap planning period up to 2050. Taking the previous experiences into account, the magnitude of new reclamation projects seems not so large, e.g., several hundred ha or several percent of new urban areas. The reclamation impact will be limited to the future urban structure of Metro Cebu.

8.9 The roadmap study has physically analyzed Metro Cebu in terms of 17,600 grids. Population distribution patterns have been prepared taking existing land use and possible future land use in the grids into account. As a result, Figure 8.1 shows existing population distribution in 2010. Figure 8.2 shows a future population distribution pattern under the monocentric and densely inhabited metropolis while Figure 8.3 shows another pattern under the polycentric and equitably developed urban area.



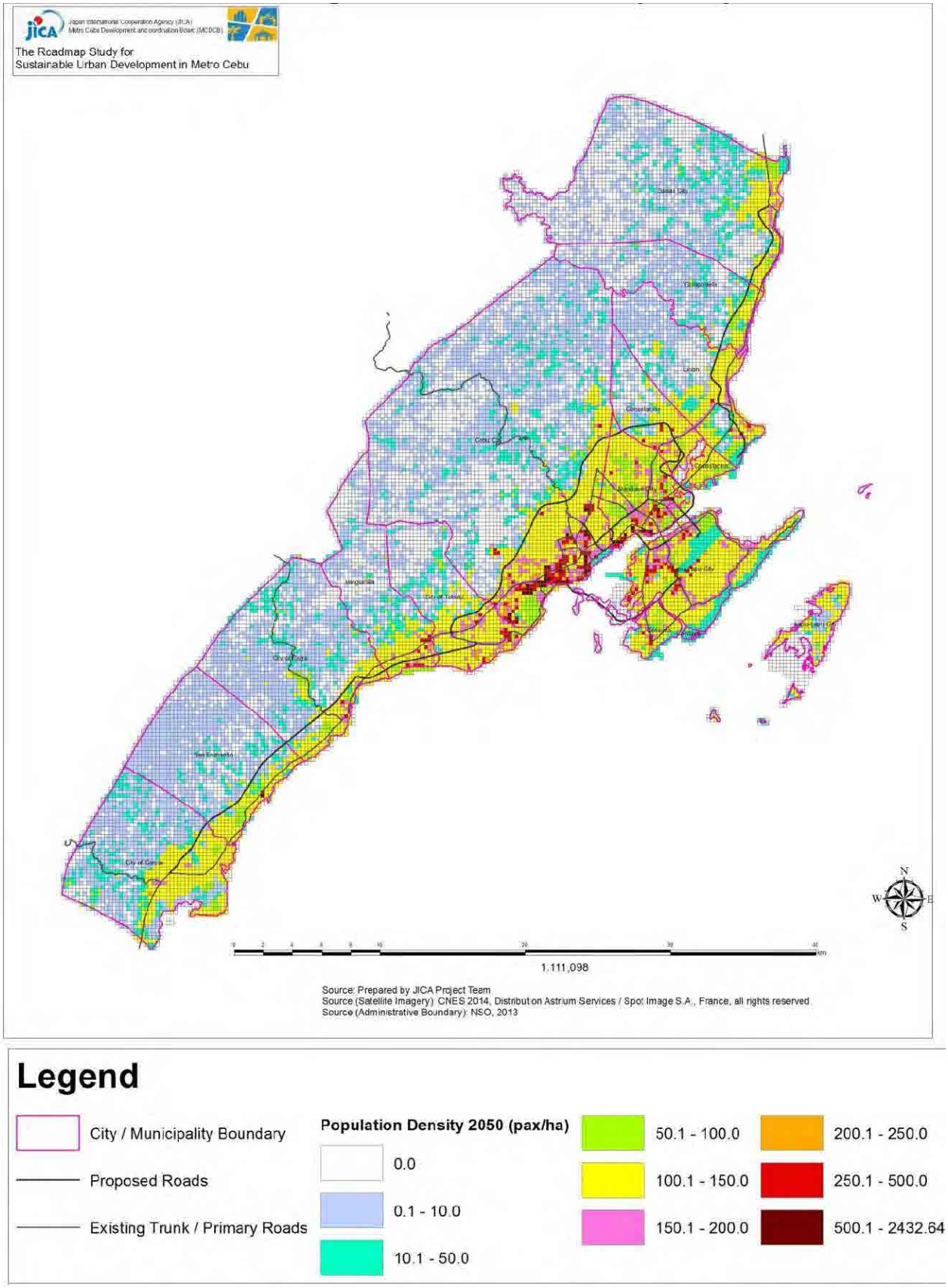
Source: JICA Study Team.

Figure 8.1 Existing Population Distribution in 2010



Source: JICA Study Team.

Figure 8.2 Monocentric and Densely Inhabited Urban Society in 2050



Source: JICA Study Team.

Figure 8.3 Polycentric and Equitably Developed Urban Society in 2050

8.2 Urban Structure and Urban Functions

8.10 In Metro Cebu, some viewpoints are crucial to design an urban structure and urban functions like:

(i) Development and preservation policy which addresses inherent local history, culture and geographical conditions;

(ii) Creation of innovative and liveable urban environment; and

(iii) Inter-connected and compact urban areas.

8.11 In order to embody the above-mentioned viewpoints, the Study applies three planning devices which have been discussed locally. They are:

(a) **Urban Cluster System**

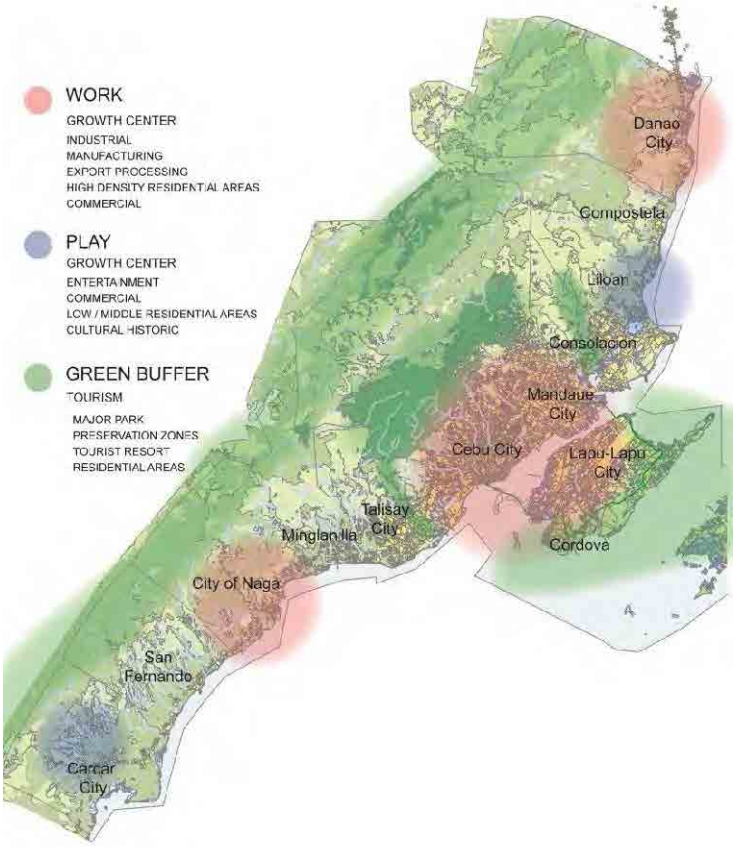
8.12 Metro Cebu is divided into six clusters to design urban functions. For example, Danao City and Naga City will be developed as growth poles next to the core area (Cebu City, Mandaue City and Lapu-Lapu City).

(b) **Urban Limits**

8.13 Urban limits are set on hilly slopes so as to form less hazardous urban space from landslides and floods. The proposed Metro Cebu Circumferential Road in particular will be able to control urban development when no arterial road is planned at the upper lands above the circumferential road.

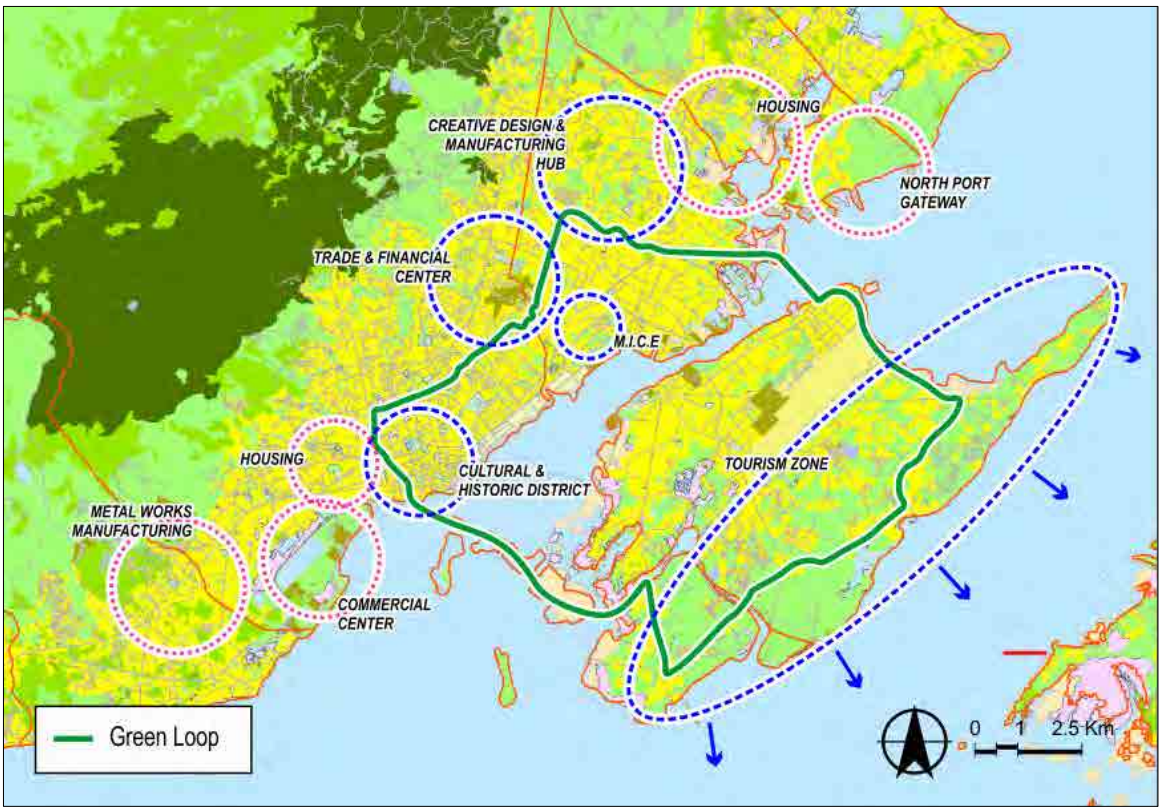
(c) **Green Loop**

8.14 The Green Loop gives two re-definition concepts on and along the designated road space at the Metro Cebu's core area (Cebu City, Mandaue City and Lapu-Lapu City). One is the re-definition of a road user to include not only a road vehicle owner, which is a small percentage of the citizenry, but also pedestrians and bicycle users. The Green Loop project aims to develop comfortable road space for all users. Another re-definition is to identify urban boundary which should promote more attractive urban functions in the Green Loop, namely, Cultural and Historic District; Trade and Financial Center; Meetings, Incentives, Conventions and Exhibits (MICE) Center; Creative Design and Manufacturing Hub; and Tourism Zone.



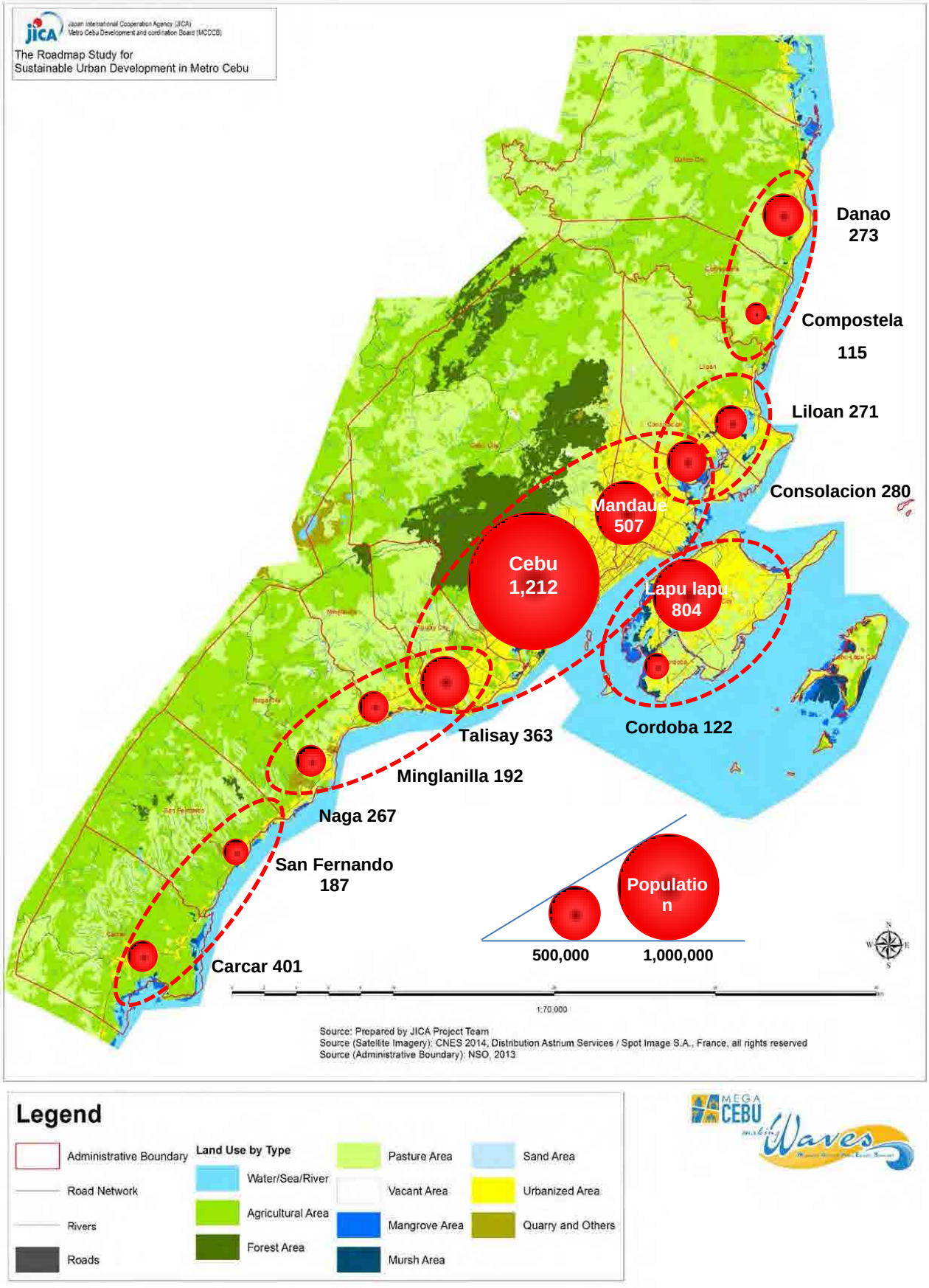
Source: JICA Study Team.

Figure 8.4 Concept of Urban Structure and Urban Functions in Metro Cebu



Source: JICA Study Team.

Figure 8.5 Concept of the Green Loop



Source: JICA Study Team.

Figure 8.6 Population Distribution and Urban Cluster System in 2050

8.3 Greening Measures in the Urban Area

1) Urban Development and Greening

8.15 Urban greening will provide superior environment and energy efficient urban space, and it is also one of the measures to realize the concept of "smart growth." The following are measures to create green design in every urban space:

(a) **Roads:** Vehicle traffic has priority in all main roads in Metro Cebu, as evidenced by narrow spaces for pedestrians. The National Building Code only prescribes the development of a one-meter pedestrian lane along roads in densely populated areas. It is necessary to create more sufficient pedestrian lanes and greening space as well as road width in the main road and improve road structure that allows rainwater to be absorbed easily by the earth and plantation.

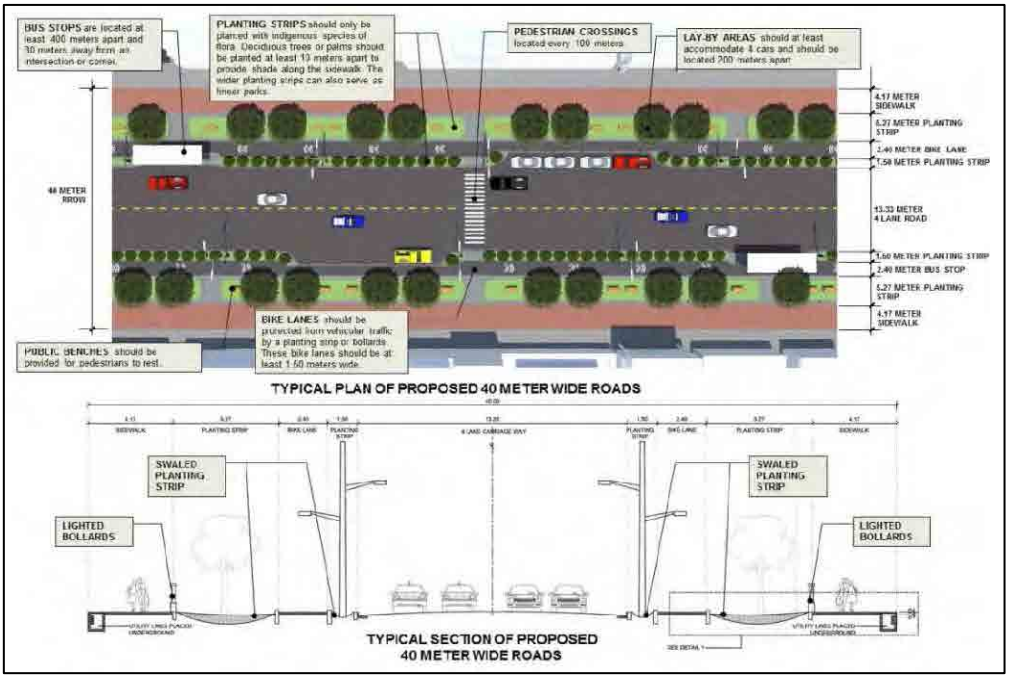
(b) **Parks:** Parks in the urban areas are important for disaster prevention, public leisure, and social well-being. There are, however, just a few public parks in Metro Cebu. Hence, park development in the metropolis should be promoted under the urban development program.

(c) **Sky Walk:** Sky walks, or special connective elevated pedestrian walkways, should be installed for pedestrians to prevent them from walking on ground or street level in the central high building area.

(d) **Parking Space:** Adequate parking spaces should be developed paved with high rainwater-permeable materials.

(e) **City Wastewater Reuse:** Although the current drainage system is to flow domestic and industrial wastewater directly into rivers, it should be reused in water parks, etc. after treatment through waste water disposal facility.

(f) **Waterways:** To improve the water quality of rivers, several solutions should be taken such as social, economic and physical measures to relocate informal settlers, etc.



Source: JICA Study Team.

Figure 8.7 Green Designed Arterial Roads (width of road: 40 m)

2) Preservation of Major Rivers and Eco-Tourism Park

8.16 In the upper reaches of the major rivers in Cebu, the river is the source of water for some limited farming village community activities. In the urban areas around the lower reaches of the rivers, there is no or little leisure area for citizens. To revitalize the rivers and riparian zones, there should be a program to remove garbage and contaminants dumped into the rivers, relocate informal settlers away from the riverbanks, and construct sewage disposal to protect the river from pollution of industrial liquid waste. The Philippine Water Code (PD 1067) mandates the design of a buffer zone of 3 m or more from the riparian zones, and aims to create attractive urban space by developing wide buffer zones in possible areas and open space such as green road.

8.17 In order to utilize and protect the water resources along major rivers in Metro Cebu, a plenty of discussions have been done among LGUs, NGO and the academies. However discussion results have been rarely implemented.

8.18 The Roadmap Study analyses river environment improvement along the Guadalupe River flowing in Cebu City. The improvement plan is divided into two parts: mini dams and gabion dams will be developed to prevent floods and irrigate waters for agricultural use in the upper zone and riverside open spaces will be converted to urban parks together with massive riverine greenery in the middle stream zone. (Refer to Figure 11.8)

8.19 The project costs are estimated at PHP233 million. The project effects of flood control and riverine beautification may justify the project costs and get citizen consent. Implementation difficulty comes from a variety of stakeholders. Cebu City is only a stakeholder to be related to both upper and middle stream zones. When a similar riverine beautification project is implemented at the lower stream zone of Guadalupe River, more difficulty must be faced due to many informal settlers.

8.20 More than ten rivers flow within Metro Cebu. The longest river of Mananga is not so long as 24.5 km. Therefore compact river environment management is possible. Since large open spaces remain along the rivers of Mananga and Cansaga, they can be improved to ecological parks.

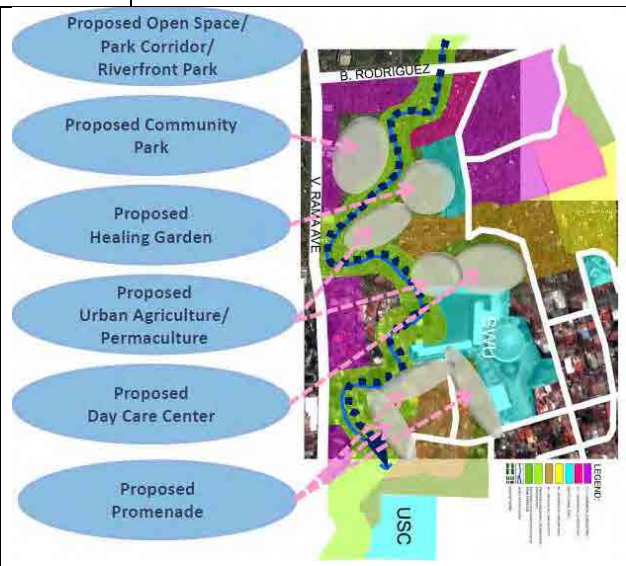
8.21 It is suggested that a river environment improvement plan be prepared at every major river in Metro Cebu. Taking no successful practice in the past into account, it is important to experience a good practice at any of major rivers.

(The Upper Stream – Water Resource Preservation and Utilization)

- For flood control and irrigation water, mini dams (8 places) and gabion dams (742 m3 in total) will be constructed.
- Stakeholders: DOA、DENR、Cebu City and Land owners
- Project Cost: P 7.6 million

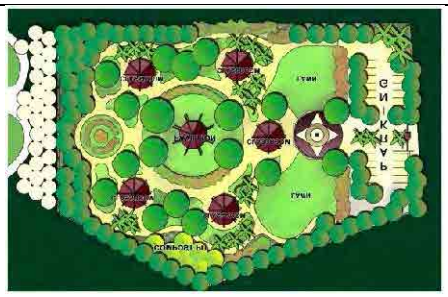
(The Middle Stream – River Environment Improvement)

- Protection of riverside greenery
- Open spaces (public lands and private lands) along the river: To be converted to urban parks
- Stakeholders; Cebu City, Local barangays and Land owners
- Project Cost: P 225百million (aggregated areas of 5 ha)



Urban Parks Layout Plans

Community Park



Daycare Canter

Source: CUSW Foundation.

Figure 8.8 Water Source and River Environment Improvement Plan of Guadalupe River

8.4 Metro Cebu Spatial Plan

1) Confirmation of Existing Land Use

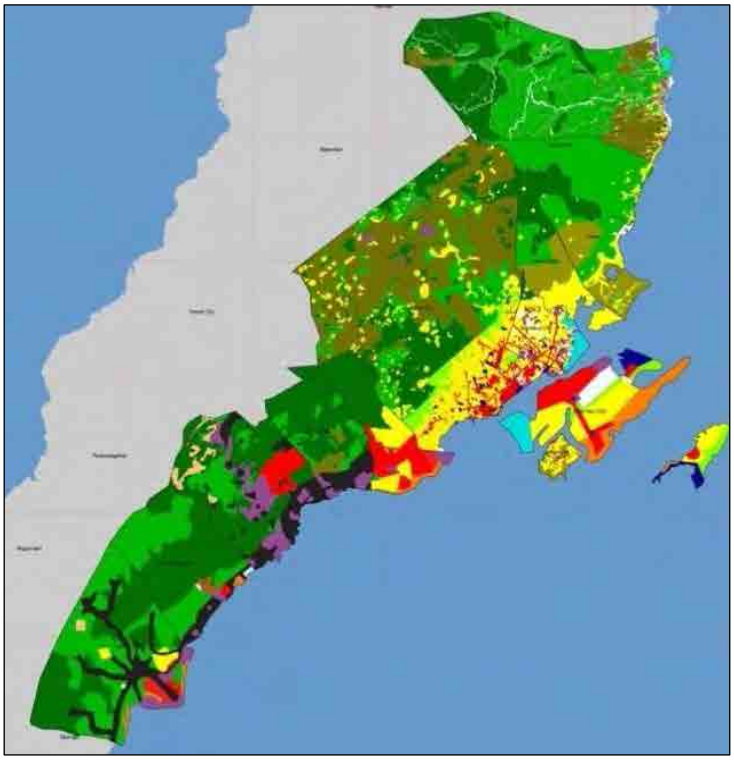
8.22 At the beginning of the Study, there was no existing land use map for Metro Cebu since individual LGUs prepared their own existing land use maps at different scales, categories and drawing methods. In order to confirm the existing land use, the Study organized a workshop to coordinate such identified issues and surveyed an original map. Figure 8.9 shows all LGUs existing land use maps in mosaic while Figure 8.10 shows the existing land use confirmed by the Study.

Table 8.1 Areas by Land Use Type in Metro Cebu

Urbanized Area (ha)								
Areas for Urban Use								
Sub-Total	Road	Residential	Commercial	Industrial	Infrastructure / Utilities	Institutional	Parks and Other Recreational Spaces	Tourism
16,609	1,394	11,316	519	1,385	569	315	1,092	10
15.1%	1.3%	10.3%	0.5%	1.3%	0.5%	0.3%	1.0%	0.0%

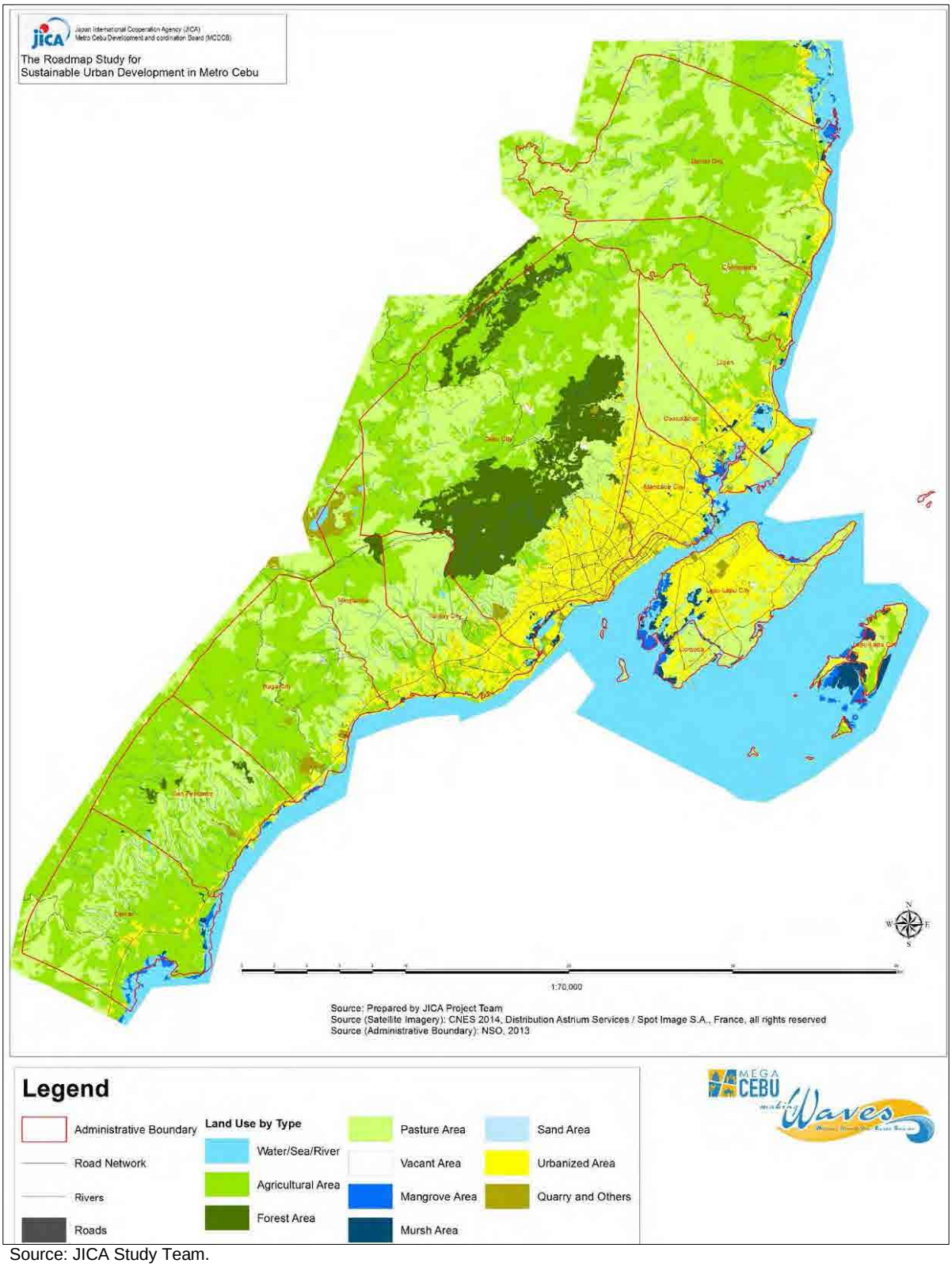
Non-Urbanized Area (ha)									
Sub-Total	Areas Available for Conversion			No Development Area					
	Agriculture	Shrub / Pasture	Waste/ Vacant Land	Water	Forest	Mangrove	Wetland	Sand / Rock	Quarry and Others
93,397	42,714	38,271	296	1,749	7,905	709	855	20	879
84.9%	38.8%	34.8%	0.3%	1.6%	7.2%	0.6%	0.8%	0.0%	0.8%

Source: JICA Study Team based on Topographic Map 1:10,000.



Source: Harmonization Workshop, MCDCB.

Figure 8.9 LGUs' Land Use Maps in Mosaic



Source: JICA Study Team.

Figure 8.10 Existing Land Use Map in Metro Cebu

2) Draft Spatial Plan

8.23 SWOT analysis was done by workshop participants in the formulation process of the Mega Cebu Vision 2050. Lack of infrastructure and urban land use plan are highlighted by the participants as weaknesses. Originating from poor planning, the low level of

physical and social infrastructure is recognized as a major bottleneck for development in Metro Cebu.[8]

8.24 In order to address this, the Study has drafted a spatial plan at a scale of 1:10,000 subject to future urban areas in collaboration with LGU counterparts, relevant national government agencies, the academe and experts. This spatial plan will be a guiding document when infrastructure projects are planned and private development permits are issued.

8.25 The draft spatial plan illustrates the following planning information:

(i) Urban limits to delineate future urban areas;

(ii) Future land use zones (residential, commercial, industrial, tourism, agriculture, public facilities, infrastructure, park and open space, river, preserved mangrove, preserved forest);

(iii) Inter-city roads, collector roads in urban areas; and

(iv) Inter-city rails

8.26 The lands for public facilities include administrative office, school, hospital, library, etc. The lands for infrastructure include airport, port, station square, sanitary landfill, water supply / distribution, sewerage / septage treatment plant, etc.

8.27 Main points to be discussed among the LGUs of Metro Cebu and relevant national government agencies at the workshop[9] include, among others:

(i) How to determine and illustrate future urban areas such as urban limits;

(ii) Planning contents of trunk infrastructure which affects metropolitan structure as well as LGUs;

(iii) Planning contents of local infrastructure which will be mainly developed by LGUs and private urban development in the permission process with related LGUs;

(iv) Appropriateness of the planned future land use zones and necessity of further detailed land use zones[10]; and

(v) Others in relation with a long-term spatial plan towards 2050.

8.28 All the LGUs which are going to issue the next CLUPs in the coming years answered that they will incorporate the Metro Cebu Spatial Plan into their CLUPs.

8.29 The Metro Cebu Spatial Plan and its land use table are indicated in Figure 8.11 and Table 8.2. As an example of a LGU-wide spatial plan, Liloan Spatial Plan is illustrated in Figure 8.12. The supporting document II contains the spatial plans for all the LGUs.

Table 8.2 Land Use Plan of Metro Cebu (Year 2050)

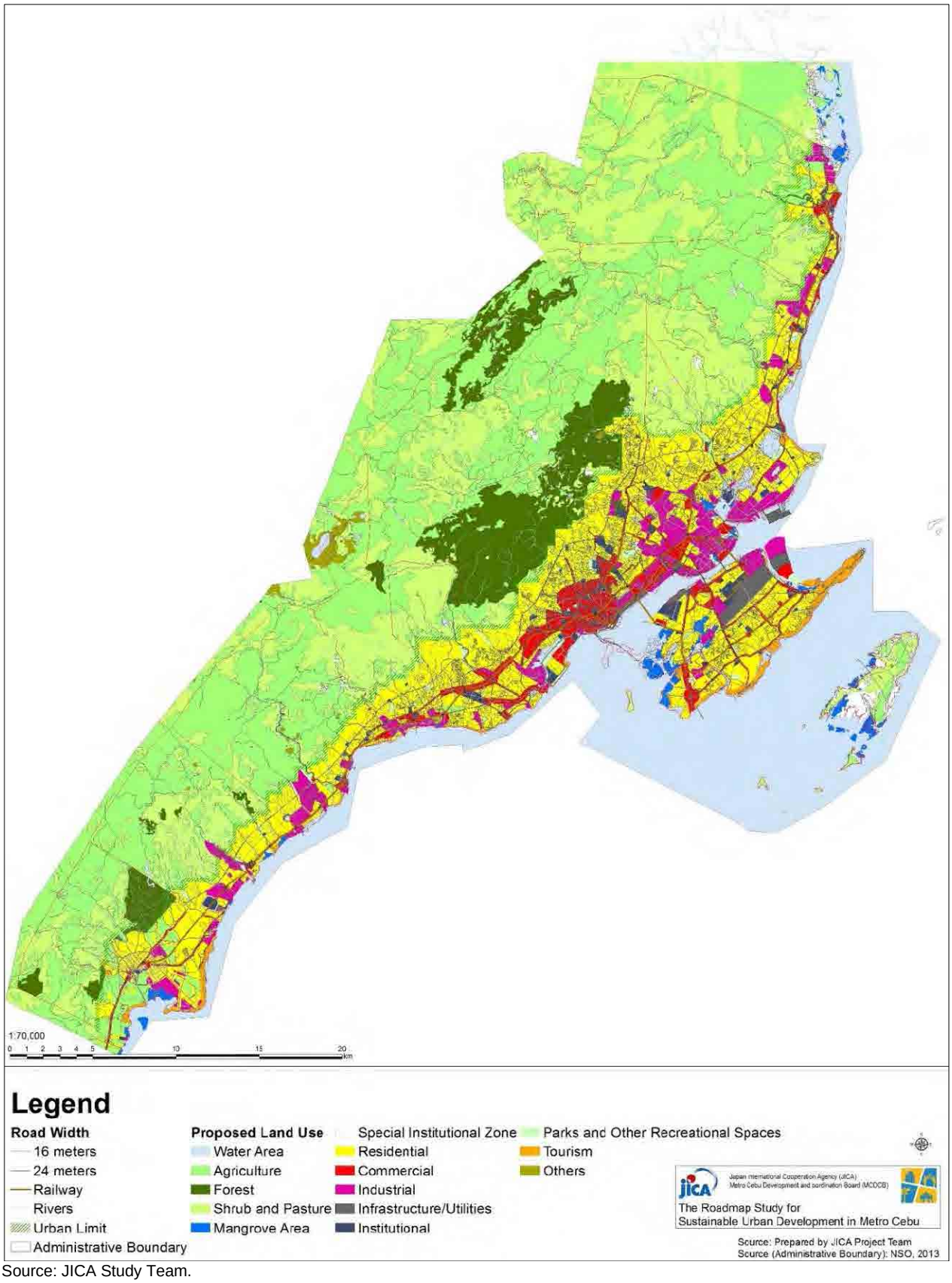
LGU	Urbanized Area								Non-Urbanized Area
	Residential	Commercial	Industrial	Infrastructure/ Utilities *	Institutional	Parks and Recreational	Tourism	Sub-total	
Metro Cebu	19,240	2,747	4,224	886	1,146	1,024	956	30,223	71,116

Source: JICA Study Team, Note: * excluding road and Rail ROW.

8 Workshop on January 23–24, 2013.

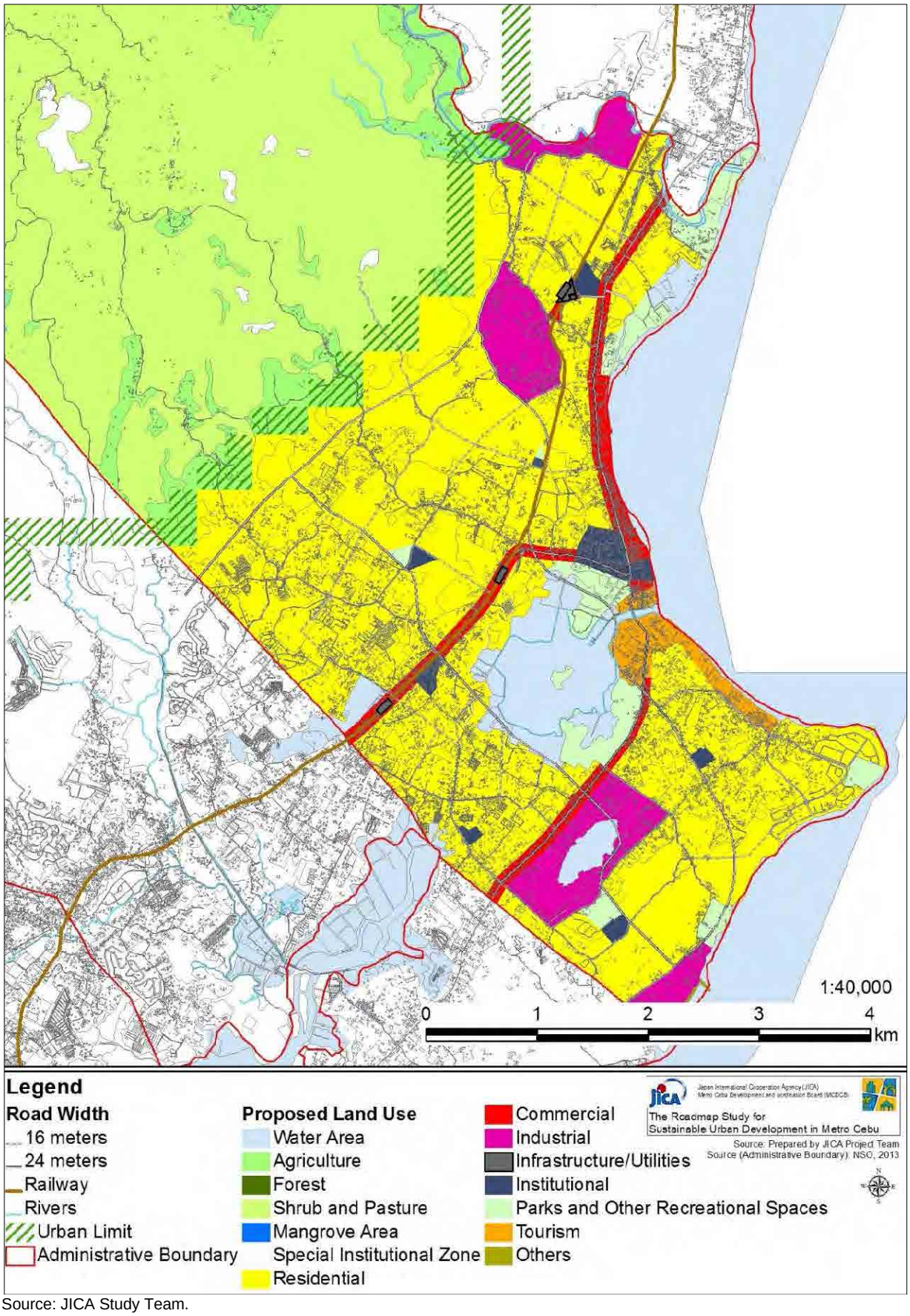
9 The workshop was held on January 27, 2015 at Harold's Hotel.

10 According to the HLURB's land use zone code, residential lands are further divided into high density residential land (more than 20 houses/ha), low density residential land (less than 20 houses/ha) and social housing land.



Source: JICA Study Team.

Figure 8.11 Metro Cebu Spatial Pan (2050)



Source: JICA Study Team.

Figure 8.12 Liloan Spatial Plan (2050)

8.5 Tools to Realize the Spatial Plan

8.30 Spatial plan which depicts future land use zones that incorporates infrastructure development is commonly not regarded as an approved plan in the Philippines. As such, the Metro Cebu Spatial Plan will not work as a statutory document unless the following measures will be critically done:

1) Sharing and Use of Spatial Plan

8.31 Firstly, it is imperative that Metro Cebu Spatial Plan will be recognized as an urban development guiding document between LGUs and relevant national government agencies in Metro Cebu.

8.32 Metro Cebu Spatial Plan is made on the existing land use map at the scale of 1:10,000 which informs existing building conditions. Administrative routine works will be established to understand existing conditions and future development at once based on the spatial plan.

8.33 A more environmental sensitive development plan is necessary to undertake urban development on a more vulnerable site against land slide, flood, etc. Effective Land Use Control Guidelines will be prepared to conserve environment-sensitive areas and guide land development activities to proper land uses, based on the potential and hazardous land assessment.

2) Development Permit in accordance with Spatial Plan

8.34 Generally speaking in the Philippines, private urban investment does not contribute to infrastructure development at a satisfactory level.[11] Development permit in accordance with the spatial plan will guide the private developer to direct their contribution of roughly 30% from their development lands for roads, parks and public facilities lands.

8.35 Subdivision development has a large share in residential development in the Philippines. In many cases, a subdivision is planned to just connect to the nearby trunk road and thus a subdivision developer does not contribute to local road network at all. Luxury subdivisions are likely to develop gated areas. It is important to guide such a subdivision developer to contribute to local development based on the spatial plan as a condition to development permit.

8.36 A developer who demonstrates desirable urban development based on the spatial plan should be rewarded by way of relaxation of development control, priority development of roads and public facilities around a project site.

3) Human Resource Development for Using and Revising Spatial Plan

8.37 Regular update of existing conditions and planning contents is necessary in the spatial plan. For the area where urbanization is acute like Metro Cebu, it is suggested that existing conditions be updated every 5 years and planning contents every 10 years. An update manual with human resource development is important to enable such continuous update.

8.38 The spatial plan can be effective for wider areas when its GIS is utilized for

[11] In Japan, land readjustment projects have supplied around 30% of all urban areas where project contribution covers roads and other infrastructure and public facilities lands. Even in each building activity, permission is necessary. Sometimes permission is conditioned such as building setback to widen a front road in accordance with a respective city plan.

planning rather than just as a printed document alone. GIS usage provides a greater benefit to LGUs in particular. It is suggested that necessary training be provided for handling GIS database of the spatial plan.

8.39 Metro Cebu Spatial Plan cannot be managed by only 13 LGUs efforts for the regular update and the advocacy among all development entities. A metropolitan platform must work. This role is expected to be lodged with the MCDCB or its future organization.

8.6 Summary of Sub-Roadmap Projects for Urban Structure and Land Use

1) Short-Term

(a) Utilize Metro Cebu Spatial Plan in the administration services for trunk infrastructure development at a metropolitan level, local infrastructure and public facilities and land use zoning at the LGU level. (2015–2017)

(b) Develop effective Land Use Control Guidelines to conserve environment-sensitive areas and guide land development activities to proper land uses. For instance, the guidelines control urban development at hazardous areas such as steel slope lands over 18 % and vulnerable low lands below 2 m from the sea level. One unified guidelines for Metro Cebu will be produced. (2015–2017)

(c) Facilitate “Urban Greening Program” to create an urban green network integrating with all available greening resources in every development undertakings, including greenery thoroughfares, urban disaster prevention parks, skywalks, rainwater permeable parking space, wastewater reuse, riparian environment improvement, etc. Although those greening works will be implemented over the roadmap period, some good practices will be achieved in the short-term (2015–2020)

2) Mid to Long-Term

(a) Complete “Green Loop” for comfortable road space for all users at the core metropolitan area in line with related infrastructure projects such as greenery thoroughfares, spacious pedestrian/bicycle space on the new two Cebu- Mactan bridges, intersection improvement for the safety of pedestrian/bicycle. (2021–2030)

(b) Provide human resource development programs to utilize and update Metro Cebu Spatial Plan. In this connection, urban development monitoring will be done by every 5 years while update of spatial plans by every ten years, e.g., 2025, 2035 and 2045. All the LGUs are encouraged to participate in the training programs. MCDCB will establish a Technical Research Unit so as to manage the consolidated spatial plan database of Metro Cebu, provide training programs and support LGUs to monitor and update their spatial plans. (2021–2050)

(c) Structure a Mega Cebu Spatial Skeleton where transit oriented development (TOD) is promoted for compact urbanization. All roads within Metro Cebu are regarded as urban roads with sufficient sidewalks. (2021–2050)

(d) Facilitate beautification projects of major rivers and revitalize rivers and riparian zones, including relocation of informal settlements. (2021–2050)

Table 8.3 Sub-Roadmap for Urban Structure and Land Use

Term	Title
Short-Term	・ Utilize Metro Cebu Spatial Plan in the various administration services in relation to infrastructure and land use zoning (2015–2017) ・ Develop effective Land Use Control Guidelines (2015–2017) ・ Facilitate urban greening measures (2015–2020)
Mid to Long-Term	・ Complete 'Green Loop' (2021–2030) ・ Provide programs to utilize and update Metro Cebu Spatial Plan (2021–2050) ・ Promote rail and TOD for compact city, wide pedestrian space at roads (2021–2050) ・ Improve riverine environment (2021–2050)

Source: JICA Study Team.

9 SUB-ROADMAP FOR HIGHWAY NETWORK AND PUBLIC TRANSPORT

9.1 Highway Network

1) Strategic Planning of Highway Network

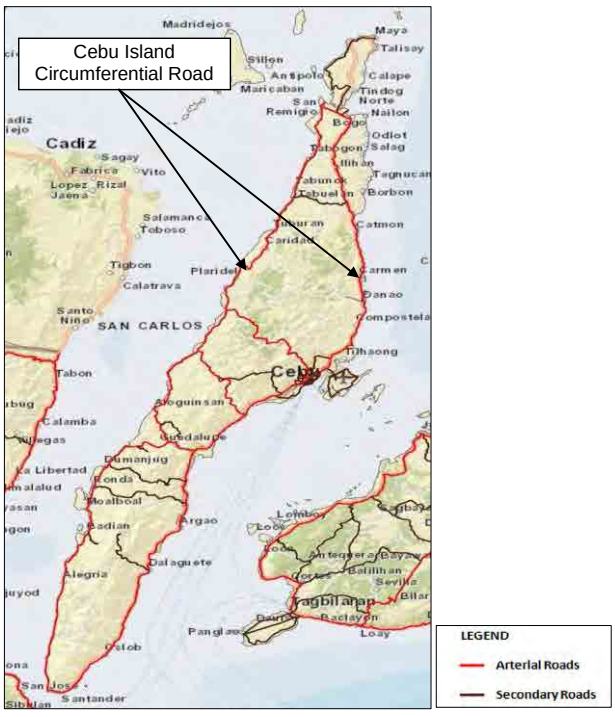
(1) Regional Road Network

9.1 Three layers of regional road networks are incorporated into the highway network of Metro Cebu, as follows:

(a) **Cebu Island Circumferential Road:** This is a 512 km road project. The project includes a new link between Aloguinsan and Barili and the widening and rehabilitation of existing roads (see Figure 9.1).

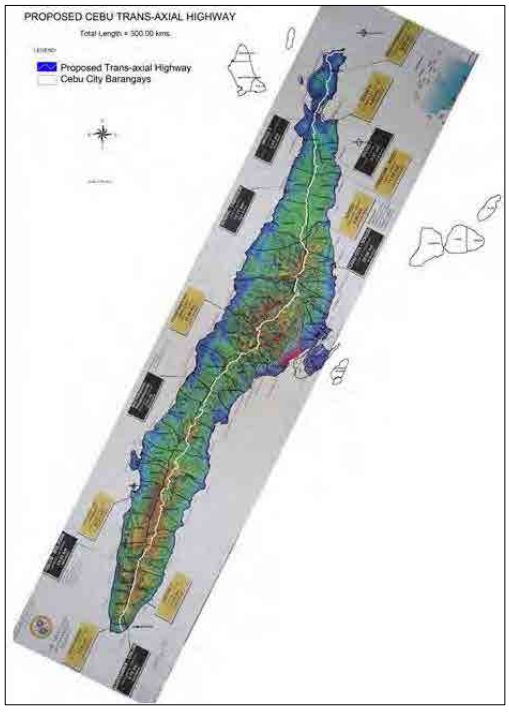
(b) **Cebu Trans-Axial Highway:** Cebu Province promotes the Trans-Axial Highway Project which traverses the main island from north to south, 300 km long (see Figure 9.2). The project will open up the mountainous areas of Metro Cebu.

(c) **Cebu Island East-West Roads:** There are two national roads connecting Metro Cebu with the western seaboard of Cebu Island, namely: the Naga-Toledo road (35.3 km) and the Transcentral Highway from Cebu City to Balamban (40.5 km). Since the Naga–Toledo road is designated as part of the North-South Backbone Road Network[12], Naga Port is required to smoothly connect between RO-RO ships and road vehicles.



Source: DPWH.

Figure 9.1 Cebu Island Circumferential Road



Source: Cebu Province.

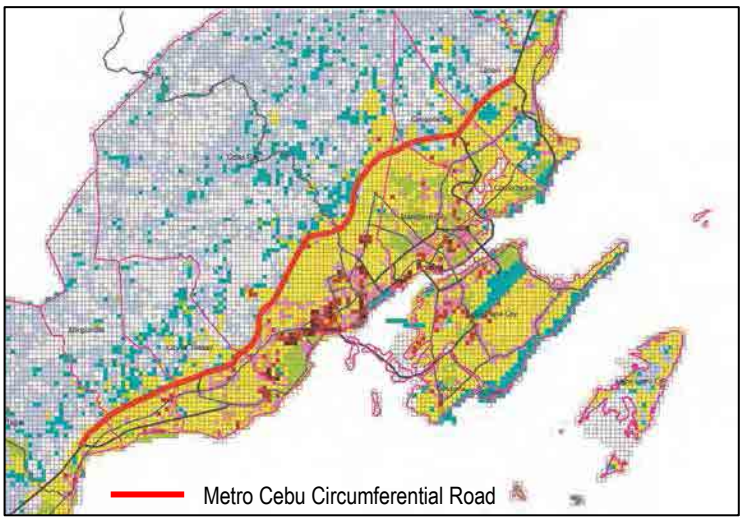
Figure 9.2 Cebu Trans-Axial Highway

[12] Otherwise known as the Nautical Highway Network System, it is a combination of roads and RO-RO shipping routes, 5,151 km in total.

(2) Metro Cebu Circumferential Road

9.2 The proposed Metro Cebu Circumferential Road is strategically important to structure urban areas, guiding orderly urbanization and controlling upland development above the proposed road.

9.3 The proposed road alignment is designed from Liloan to Minglanilla, 39.5 km long, based on the grid analysis for future urban areas (see Figure 9.3).



Source: JICA Study Team.

Figure 9.3 Metro Cebu Circumferential Road and Future Urban Areas

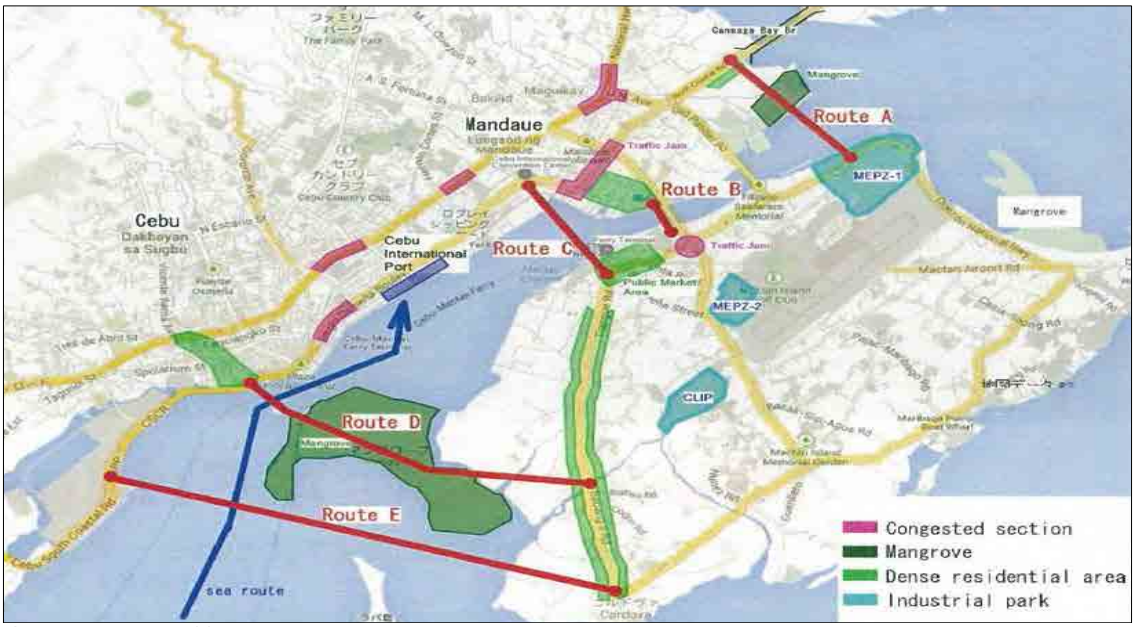
(3) Mactan Link

9.4 There are presently two bridges serving inter-island traffic between Cebu and Mactan. The First Mactan Bridge (the old bridge) opened in 1972 with a 2-lane carriageway while the Second Mactan Bridge (the new bridge or Marcelo Fernan Bridge) started its operation in 1999 with a 4-lane carriageway. Both bridges are toll-free.

9.5 The traffic survey conducted in early 2014 shows that this is the first time that more traffic on the new bridge was observed compared to the old bridge. Since vehicular traffic on the old bridge has reached its capacity, it is expected that only the new bridge will absorb additional traffic in the coming years. But by around 2020, it is highly possible that the new bridge will experience congestion.

9.6 The Infrastructure Development Institute (IDI) of Japan selected five alternative routes for the proposed Third Bridge and compared them from mainly a physical condition viewpoint (see Figure 9.4).[13] The Study has reviewed the IDI report, including updated conditions of the five alternatives, traffic demand forecast in 2030, and social acceptability among local stakeholders (see Table 9.1).

13 The Preliminary Study Report for the Construction of the Third Bridge over the Mactan Channel in Metro Cebu, Cebu Province (January 2014).



Source: IDI Report 2014.

Figure 9.4 IDI Bridge Alternatives

Table 9.1 Comparison of Bridge Alternatives

Route	A	B	C	D	E
Main Bridge (m)	420	340	340	710	1,220
Approach Bridge (m)	3,000	2,200	3,400	10,000	9,650
Channel Width (m)	800	360	1,100	500	1,600
Height Restriction (m)	45	45	45	140	165
No. of Lanes	6 (2 for AGT)	4	4	4	4
Structure Type	Steel Box Girder	Extra Doused	Extra Doused	Steel Box Girder	Cable-stayed
Construction Cost (Billion Pesos)	9.6 (incl. 3.2 for rail)	7.9	11.1	16.8 – 24.1	40.0
No. of Buildings to be Relocated	10 houses, 1 office / factory (Lapu-Lapu)	110 houses, 10 office/factories (Mandaue) 40 houses, 2 office / factories (Lapu-Lapu)	109 houses, 38 offices, 4 schools, 5 shopping malls / markets (Lapu-Lapu)	280 houses, 20 office / factories (Cebu City) 30 houses, 3 office/factories (Cordova)	30 houses, 3 office/factories (Cordova)
Natural Environment	Mangrove habitation at Mandaue	Negligible	Negligible	Mangrove habitation at Cordova	Mangrove habitation at Cordova
Expected Traffic in 2030	30,700 PCU	-	47,400 PCU	32,400 PCU	-
Local Acceptance	Highly Supportive	Negative	Negative	Supportive	No concern
Remarks	Dual-mode bridge (road and AGT) is proposed.	Approach roads have 4 lanes at both sides		A private toll operator shown an interest to bridge only	
Evaluation by JST	**Recommendable**	Rehabilitation or replacement of the existing bridge rather than new bridge	Difficult to implement	**Conditional**	Not Recommendable

Source: JICA Study Team based on IDI Report 2014, Field Survey and Stakeholders' Interview.

9.7 Based on the review, Route A at the north is recommendable. Both Mandaue City and Lapu-Lapu City support this route. If a dual-mode bridge for road and rail is constructed, it is possible to draw the shortest alignment to the airport terminal from among the bridge alternatives. There are mangrove habitations at the Mandaue side but the city administration intends to develop a water park partly for mangrove preservation.

9.8 The dilapidated First Bridge is a serious safety issue but a serious traffic jam issue must occur at the Second Bridge when the First Bridge is closed. It is obvious that the Second Bridge cannot meet the existing traffic alone. The First Bridge has prohibited large vehicles for a long time without any repairing works. The most desirable scenario is to construct a new bridge as soon as possible while repairing works are done without total closure at the First Bridge. After a new bridge is completed, it is possible to close the First Bridge for full-scale rehabilitation or new replacement.

9.9 In order to meet traffic demand, two road bridges will be necessary. As another bridge, Route D is recommended with some conditions. The route will be able to promote a balanced Mactan Island development. A private toll operator shows an interest to construct and operate a new toll bridge but it is uncertain who will construct the connecting approach bridge or causeway of at least 6 km long. There are widespread mangrove habitations at Cordova and numerous buildings to be relocated at Cebu City.

2) Metro Cebu Highway Network

9.10 The Metro Cebu Land Use and Transport Study (MCLUTS) in the early 1980s produced the first entire road network plan for Metro Cebu. Its implementation was done by DPWH and MCDP using Japan's ODA loan in the 1990s. But there have been a lot of backlogs in the implementation of many projects.

9.11 In the 2000s, progress of metropolitan planning and implementation was lagging. In the early 2010s, however, two important documents were produced. One is the JICA-assisted DPWH's High Standard Highway Master Plan Study in 2010 while the other is MCDCB's road network project list submitted to DPWH for the year 2014 budgeting. In the latter case, MCDCB served as a platform for participating LGUs to compile a Metro Cebu proposal.

9.12 The Study has proposed road projects for three time frames: short-term until 2020, mid-term until 2030, and long-term towards 2050, taking into consideration the two documents, and the results of the Study related workshops and other MCDCB meetings. The proposed projects are illustrated in Figure 9.5 and described in the following tables.

Table 9.2 Short-Term Road and Bridge Projects (until 2020)

No.	Project Name	Project Area	Length (km)	Cost (PHP mil)
1	Dual Mode Mactan Bridge and Mandaue Scenic Coastal Road	Lapu-Lapu City via Mandaue Scenic Coastal Road	3.8	15,569
2	Road Widening	Arterial Roads, mainly unimplemented projects from MCLUTS, including among others: Guadalupe Road (from M. Velez to Guadalupe), Arch. Reyes Ave. (from Gorordo to M.L. Quezon), Cebu North Road (from M.L Quezon to Rizal St.), F. Jaca St. (from Cebu South Road to Talisay), Tagunol Highway (from Inayawan to Mambaling), Talisay Distributor (from Tabunok to San Roque), Lapulapu Link (from Lapulapu to Mactan East-West)	-	4,264

Source: JICA Study Team.

Table 9.3 Medium-Term Road and Bridge Projects （2021–2030）

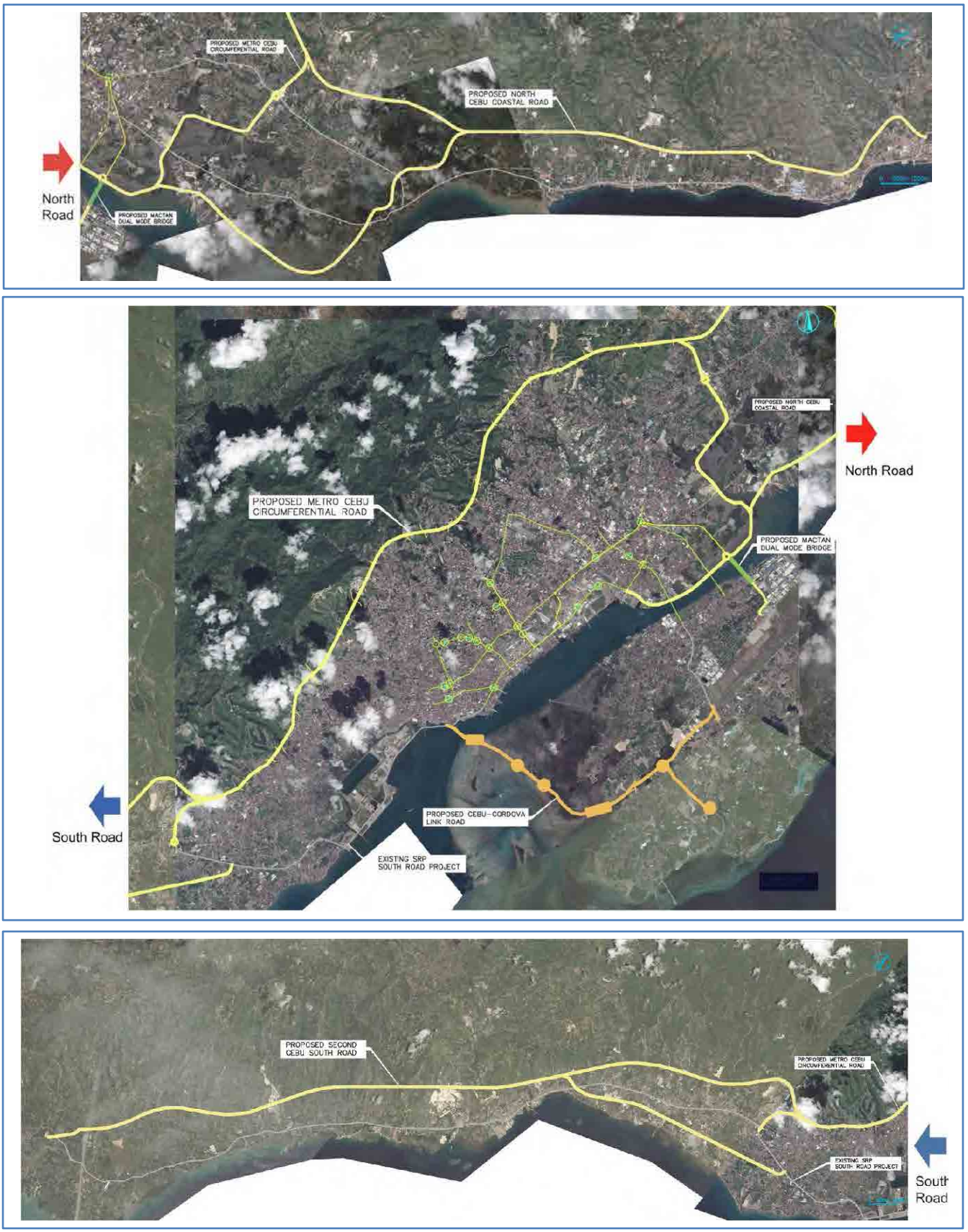
No.	Project Name	Project Area	Length (km)	Cost (PHP mil)
1	Metro Cebu Outer Circumferential Road	Minglanilla–Liloan	39.5	15,561
2	Second Cebu North Road	Consolacion–Liloan–Compostela–Danao	18.5	3,380
3	Second Cebu South Road	Talisay–Minglanilla–Naga–San Fernando–Carcar	35.0	7,980
4	Third Cebu Mactan Bridge include Approach Causeway of Cordova side	Cebu City C. Padilla to Cordova (Part of Green Loop Plan)	10.0	16,880
5	Talisay – Naga Coastal Road (ex PNR)	Brg. Lawaan, Talisay–Minglanilla New Center–Brg. Colon, Naga	7.1	1,315
6	Tayud Coastal Road with the Second Cansaga Bay Bridge	Mandaue–Brg. Tayud, Consolacion–Brg. Poblacion, Liloan	8.9	3,262
7	Rest of Mandaue Scenic Coastal Road (2 sections)	Ouano Ave –the Second Bridge, Cebu North Road–Cansaga Bay Brige	5.4 in total	4,834
8	Airport Underpass Road	The Second Bridge–MCIA–Brg. Pajak, Lapu-Lapu	2.7	2,438
9	Mactan MRT Avenue (incl. 1 bridge)	Brg. Dapitan, Cordova–Brg. Mactan, Lapu-Lapu	8.6	2,244

Source: JICA Study Team.

Table 9.4 Long-Term Road and Bridge Projects (2031–2050)

No.	Project Name	Project Area	Length (km)	Cost (PHP mil)
1	Mega Cebu Coastal Expressway	Part of Coastline from Danao to Carcar	unknown	N.A.

Source: JICA Study Team.



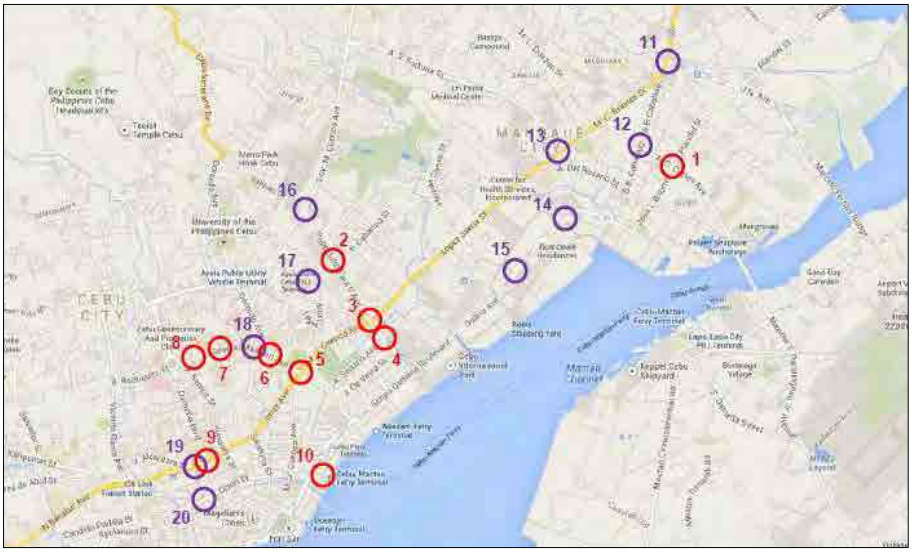
Source: JICA Study Team.

Figure 9.5 Major Road and Bridge Projects in Metro Cebu

9.2 Mitigation Measures of Traffic Bottlenecks

1) Intersections to be Improved

9.13 Simultaneous with the hierarchical road network development, certain measures must be necessary to mitigate traffic congestions at particular bottlenecks. The Study placed GPS on 296 taxis for several days to gauge travel speeds on roads in Metro Cebu. Results identified traffic congestion on road links and intersections where vehicles can only run at less than 10 km/hour. The Study finally assessed 10 very congested intersections as the first priority and another 10 congested intersections as the second priority.



Source: JICA Study Team.
Note: Red Circle – First Priority, Blue Circle–Second Priority.

Figure 9.6 Congested Intersections for Improvement

2) Bottleneck Mitigation Measures

9.14 In order to mitigate the 20 bottlenecks identified above, four kinds of measures are proposed from less capital-intensive traffic management measures to capital-intensive infrastructure measures as follows:

(i) Traffic management improvement by intersection;

(ii) Area traffic control (ATC) system;

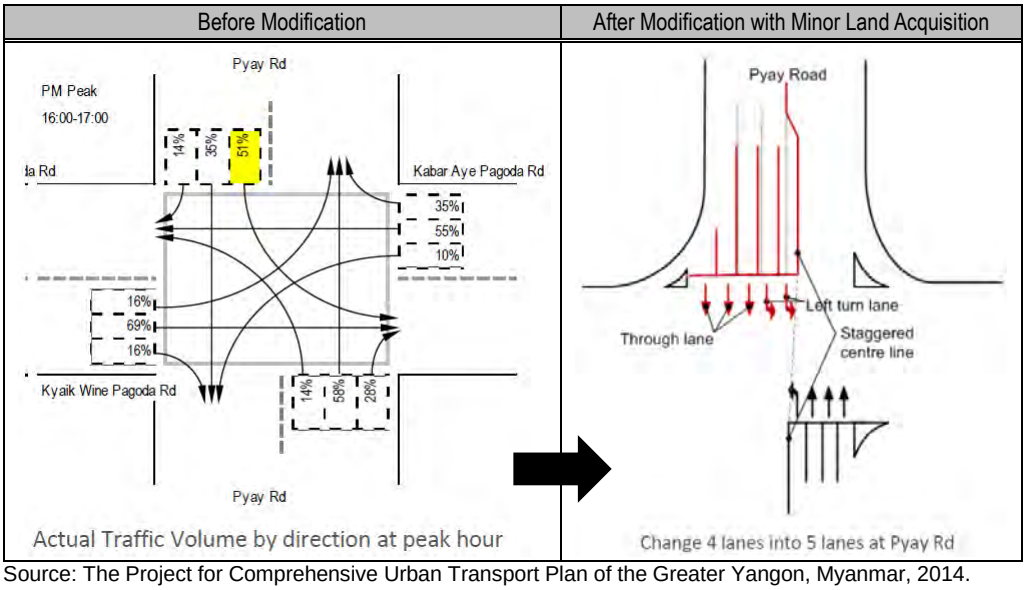
(iii) Grade separation by intersection and a couple of intersections; and

(iv) Road widening.

(1) Traffic Management Improvement by Intersection

9.15 It is the quickest impact traffic management measure among the applicable measures. Firstly, traffic volume by direction, traffic signal pattern and intersection design is surveyed. After traffic engineering analysis, more suitable traffic signal and intersection design is proposed to meet actual traffic flows.

9.16 For example, if traffic congestion is mainly attributed to small turn-right traffic capacity to meet actual demand, additional turn-right lane may alleviate the congestion (see Figure 9.7). Extended green signal to the turn-right lane can expect the similar effect. Minor land acquisition such as corner lots to make a flared intersection enables further smooth traffic flows.



Source: The Project for Comprehensive Urban Transport Plan of the Greater Yangon, Myanmar, 2014.

Figure 9.7 Example of Intersection Geometric Design Modification

9.17 There are still many non-signal intersections in Metro Cebu. It is said that CITOM holds over 500 traffic enforcers who are mainly assigned at such non-signal intersections during peak hours. Priority must go to such non-signal intersections.

(2) Area Traffic Control System

9.18 Area Traffic Control (ATC) is a popular system to control the traffic flow through synchronized traffic signals, message signboards, and lane control signals. In order to effectively control the traffic flow, traffic flow on real time must be surveyed by camera and detector devices and analyzed at a traffic control center (see Figure 9.8). By ATC, a network of roads and intersections can be optimized in traffic management.

9.19 When introducing ATC service in Metro Cebu, major development issues are not only applicable technology and service menu but also policy coordination among LGUs such as truck ban. Therefore it is important to conduct a feasibility study for Metro Cebu ATC in advance. During the study, policy coordination among participating LGUs and their commitment should be made.

Source: roadtraffic-technology.com.

Figure 9.8 Concept of Area Traffic Control

(3) Grade Separation by Intersection and a Couple of Intersections

9.20 The 20 intersections identified as traffic bottlenecks are all located on trunk roads and further substantial traffic increase is expected in the future. It is obvious that minor modifications of traffic signal and geometric design will not solve bottlenecks in the long run. Grade separation is a measure to expand intersection capacity such as flyover, underpass, elevated road over two intersections and underground road of more than two intersections.

9.21 When planning such grade separation, overall transport infrastructure development should be duly considered. For example, flyover is not a good option when elevated railway or tollway is planned on the same road ROW. Similarly underpass is not good when subway is planned on the same route.

9.22 Grade separation may change landscape and urban environment. Social acceptance becomes important particularly in the case of flyover, judging from the previous Cebu City's experience. To minimize environmental impact during construction, advanced technologies such as the rapid construction method by steel box and steel deck slab type bridges and steel pier can be applied.

Source: SRP Report.

Source: Kosaka Intersection Construction Report in Japan.

Figure 9.9 Examples of Underpass and Flyover

(4) Road Widening

9.23 When congestion occurs not only at intersections but also on the road itself along a considerable distance, road widening is a fundamental solution. The Study has identified the following 6 critical road sections, 7,305 m in total (see Table 9.5, Figure 9.10, and Figure 9.11). The MRT Central Line is planned along the consecutive road section (i). This is one of most congested road sections and subway structure is proposed for MRT development. Therefore, road widening will be done before MRT construction.

(i) Imus Ave.–M J Cuenco Ave.–Lopez Jaena St.–M C Briones St. (Between North and South Road);

(ii) General Maxilom Ave.; and

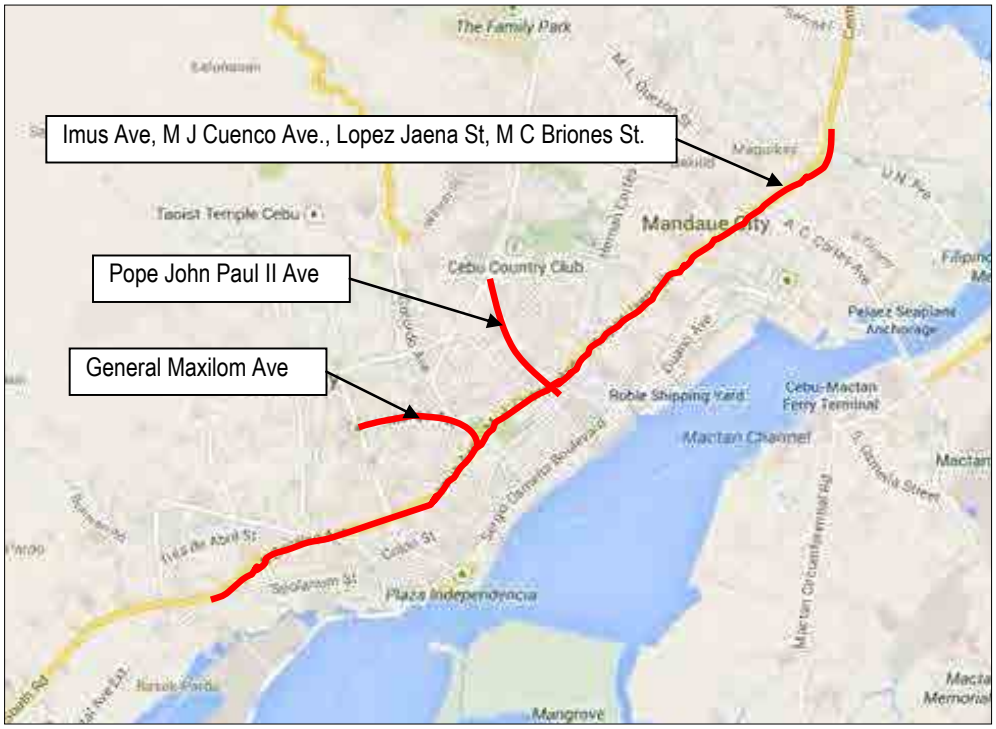
(iii) Pope John Paul II Ave.

9.24 It is suggested that the existing 4-lane road with a ROW of 16 m be widened to a 6-lane road with a ROW of 30 m, adding vehicular lanes, widening sidewalks or adding bicycle lanes.

Table 9.5 Road Improvement with Widening

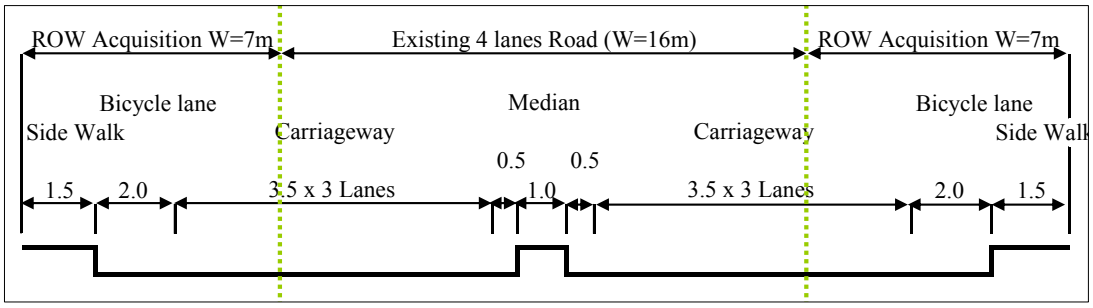
No.	Location	Length (m)	Const. Cost (,000 Pesos)	ROW Cost (,000 Pesos)
1	Imus Ave.	770	64,680	169,400
2	M J Cuenco Ave.	540	45,360	118,800
3	Lopez Jaena St.	2,125	178,500	467,000
4	M C Briones St.	1,210	101,640	266,200
5	General Maxilom Ave.	1,360	114,240	299,200
6	Pope John Paul II Ave	1,300	109,200	286,000
Total		7,305	613,620	1,606,600

Source: JICA Study Team.



Source: JICA Study Team.

Figure 9.10 Proposed Road Widening along Congested Intersections



Source: JICA Study Team.

Figure 9.11 Road Section Plan after Road Widening

9.3 Public Transport

1) Two Scenarios

9.25 Because of geography, urban development of Metro Cebu has been confined to a narrow strip on the coastal areas of Cebu Province. In fact, Metro Cebu can be characterized as a paratransit-dependent city on a rapid growth path of motorization constrained by low investments in road infrastructure. A couple of urban rail projects were advocated since the 1990s but none came to be realized. Today urban transport enjoys innovative technologies and services but without any application observed in Metro Cebu.

9.26 Under such situation, Cebu City has been promoting the Bus Rapid Transit (BRT) system. The World Bank supported the feasibility study for the Cebu City BRT Project in 2012. The NEDA Board approved the project and DOTC is currently undertaking the detailed design and the bidding for the project.

9.27 The Cebu City BRT Project affects other urban transport development movements and possibilities, which include an expanded BRT network within Cebu City. It also leaves an option for rail development.

9.28 In order to prepare a sub-roadmap for public transport, the Study has analyzed and compared two scenarios. Scenario One is to maximize the road network for use of the BRT, buses and paratransit such as jeepneys and tricycles (see Table 9.6). Scenario Two is to introduce urban rail as a main public transport mode and the road-based public transport services will support it (see Table 9.7).

Table 9.6 Indicative Roadmap for Scenario One

Scenario One	Present Situation	Target Situation 2030	Target Situation 2050
Route Coverage and Configuration	Cebu City-centric route structure; dominated by PUVs with some inter-urban buses. Tricycles as feeder service.	A more dispersed route network. Buses on trunk routes; PUVs on secondary routes and narrow roads.	Busways upgraded into BRT lines; PUVs converted into modern design and battery-powered.
Operating Business Model	Atomized and fragmented. PUVs compete with each other. Drivers hired on "boundary system."	Coordinated deployment by corridor or groups of transit operators must be in place.	Bus and PUV operators are paid on service delivered. Common E-ticketing system and system-wide scheduling.
Key Success Factors	Many enterprising small-scale investors, willing to navigate under soft rules.	Strong political leadership at city level, cooperation among 13 LGUs.	A Metro-wide Transport Authority enabled by smart technologies

Source: JICA Study Team.

Table 9.7 Indicative Roadmap for Scenario Two

Scenario Two	Present Situation	Target Situation 2030	Target Situation 2050
Route Coverage and Configuration	Same as in Scenario One	One rail-based Mass Transit line in operation; Buses on other truck routes; PUVs re-deployed to feeder routes.	A hierarchical route network with rail, bus, and PUVs operating as a family of transit modes.
Operating Business Model	Same as in Scenario One	Coordinated deployment by corridor or groups of road-based transit operators desirable.	Autonomy in the operations and maintenance of rail transit; Common E-ticketing for rail and bus is desirable.
Key Success Factors	Same as in Scenario One	Establishment of a local rail transit entity; Support from LTFRB on other modes is helpful.	Funding support for the capital costs, plus appropriate PPP modality to ensure sustainability.

Source: JICA Study Team.

2) Success Factors and Limitations of Road-Based Public Transport Services

9.29 BRT is ranked highest on the hierarchy of road-based public transport. But BRT has broadly four critical success factors:

(a) Existence of a strong political will (bold leadership at city level) to champion the priority of BRT in allocating dedicated lanes and bus stops on the designated routes. On the other hand, private car owners will agree with the diminution of their available road space along the BRT routes;

(b) The removal and relocation of current paratransit providers such as jeepneys on the BRT routes;

(c) Construction of more flyovers or grade-separated interchanges to increase road capacities, not only for public transit but also for other vehicles since the BRT route is designated on narrow roads such as 4-lane or 6-lane carriageways (see Figure 9.12); and

(d) Willingness of the adjoining LGUs with Cebu City to implement the above-three factors in order to extend BRT routes to their jurisdictions.

9.30 With those combined efforts to promote BRT services, however, Scenario One in Metro Cebu has to face limitations. For instance, the following limitations of BRT are foreseen in relation to operation capacity and length:

(a) **Capacity:** The Cebu City BRT project has a designed capacity of 4,500–5,400 passengers/hour/direction according to the FS report in 2012. Other cities' experiences show that BRT's capacity is more or less 3,000 passengers/hour/direction without overtaking lanes and with intersections on a route. It should be noted that huge numbers of PUVs are observed on some streets in Metro Cebu. The numbers of PUV frequency may exceed the capacity of the Cebu City BRT on 10 street sections. For example, more than 6 PUVs per minute are counted on N. Bacalso Avenue, an aggregated capacity of 5,400 passenger seats/hour/direction. Even in the opening year, the Cebu City BRT may not serve all the passengers to be shifted from PUVs on N. Bacalso Avenue.

(b) **Route Length:** Since an average BRT service speed is around 25 km/hour if it runs without overtaking lanes and with intersections on a route, the BRT's practical route length is 20 km or so. In the case of Metro Cebu, there are more than 70 km from Danao City to Carcar City. Obviously, it is too long for a BRT to serve. Inter-city rail must come in such a route. BRT is suitable to provide feeder service to inter-city rail as long as access road to a rail station is wide enough.

Table 9.8 High Frequency Road Sections of PUV Service

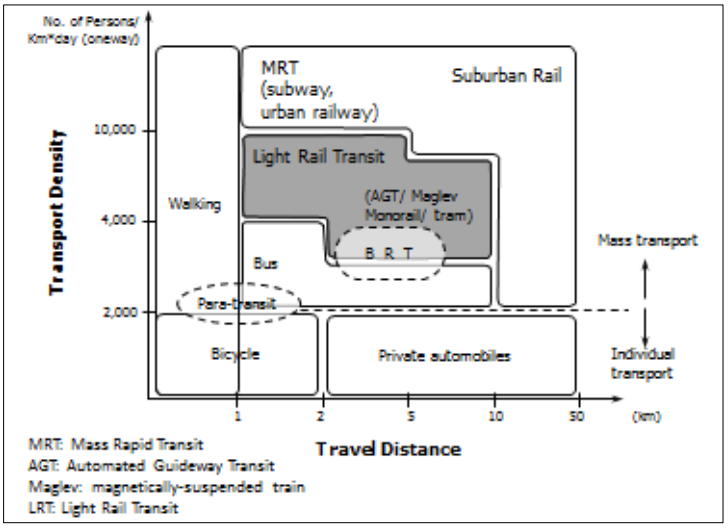
Name of Road Links	Pax/Day (2-way)	No. of PUVs (highest direction)	Implicit Headway (sec)
1. M.J. Cuenco Avenue	169,950	3,452	3.5
2. M.C. Briones Street	67,200	2,850	4.3
3. Gen. Maxilom Extension	123,750	2,131	5.4
4. V. Gullas Street	57,560	2,026	4.7
5. Sanciangko Street	56,900	1,993	5.1
6. Colon Street	100,800	1,749	5.1
7. Legaspi Street	57,100	1,724	5.6
8. N. Bacalso Avenue	95,400	1,521	6.4
9. Mabini Street	56,300	1,420	6.6
10. Lapu Lapu Street	48,400	1,359	6.1

Source: Analyzed by JST based on LTFRB data and traffic survey results.
Note: Over 5,000 passenger seats / hour / direction.

9.31 In conclusion, Metro Cebu will develop its public transport according to Scenario One for the time being while, simultaneously, Scenario Two will be prepared by a planning study. Thereafter, Scenario Two will be implemented.

3) Policy of Rail-Based Public Transport Services

9.32 It is desired that Metro Cebu will develop the most suited transport system by a combination of road and rail transport modes by 2050 when it is called a mega city over 5 million populace. The trunk mode will be a large capacity transport system such as MRT carrying large people, e.g., 20-50 thousand passengers/hour/direction. The next will be a middle capacity system such as LRT (some thousand – 20 thousand passengers/hour/direction). Bus will serve for entire urban areas and give access services to MRT/LRT stations.



Source: MLIT Japan, The Seminar on Urban Transport Systems in Metro Cebu, 2014.

Figure 9.12 Optimum Combination of Transport Modes in a Mega City

(1) LRT System to be Introduced by Early 2020s

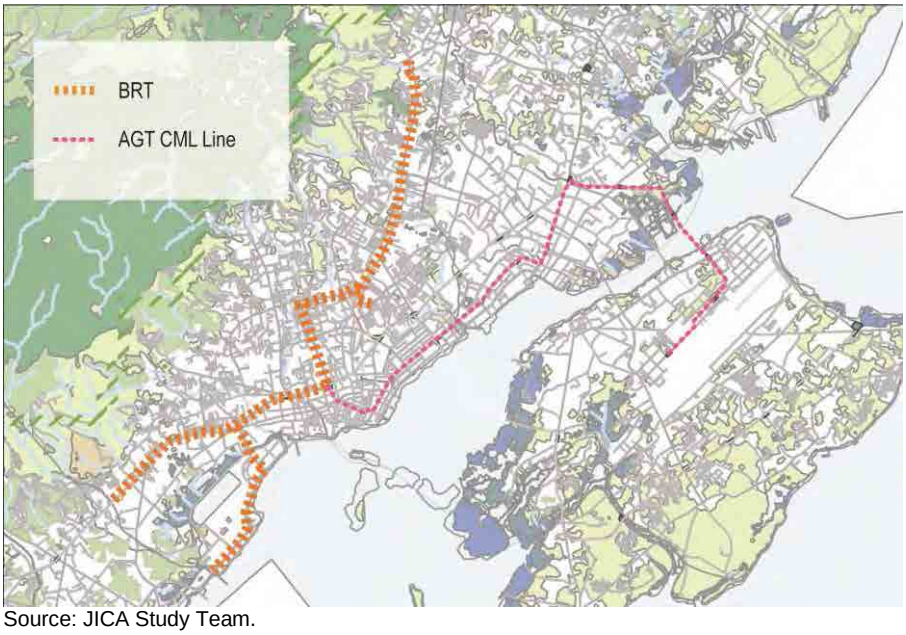
9.33 The Study has analyzed road congestion conditions in the central areas of Metro Cebu and the performance of road-based public transport services within such congested areas. Then, LRT development opportunities have been identified with some advantages such as a simple and compact system, less land acquisition requirement, and economical construction.

9.34 Since it is the first urban rail in Metro Cebu, route alternatives were prepared taking a potential local market into account. Suitable urban rail users may encompass airport passengers, commuters to business parks / IT parks, visitors to large-scale shopping malls and orderly developed subdivision dwellers among Cebu City, Mandaue City and Lapu-Lapu City. As results, one route is recommended from the viewpoints of traffic demand and engineering analysis.

9.35 Among medium-capacity LRT systems, the Automated Guideway Transit (AGT)-type which is suitable for a ridership of 5,000–15,000 passengers/hour/direction is selected to operate on the route between Cebu City center, Mandaue City center and MCIA. The route length is 19.2 km while the capital cost is USD819 million.

9.36 This AGT–CML (Cebu, Mandaue, Lapu-Lapu) Line is subject to pre FS. The

study results and project evaluation are reported in Chapter 20 of this report.



Source: JICA Study Team.

Figure 9.13 Alignment of AGT-CMLLine

(2) MRT System to be Introduced from 2020s and by 2050

9.37 A MRT system has been studied together with a metropolitan land use plan so as to promote urban growth in the metropolis. The proposed routes are divided into several phases taking demand and construction cost into account. The draft spatial plan includes the following MRT lines with a route length of 96.6 km and 50 stations in total (see Figure 9.14):

(i) MRT North Line (Danao City–Liloan: 24.7 km, USD1,369 million);

(ii) MRT Central Line (Consolacion–Talisay City: 21.2 km, USD1,774 million);

(iii) MRT South Line (Minglanilla–Carcar City: 29.2 km, USD1,799 million); and

(iv) MRT Mactan Line (Cebu City–Lapu-Lapu City: 21.5 km, USD1,737 million).

9.38 In regard to construction timings, traffic demand forecast suggests the MRT Central Line to be constructed by 2030 and other 3 lines in the 2030s and the 2040s in order to avoid worse road traffic congestions from the present situations.

4) Policy of Public Transport Terminals

9.39 Although bus use in Metro Cebu is still limited, public transport terminal is a good tool to increase bus patronage. It has been demonstrated by the Cebu South Bus Terminal and the Cebu North Bus Terminal, both were constructed by MCDP in the 1990s. Today, the two terminals still take an important role. In other areas, Danao City has a public transport terminal and Lapu-Lapu City has a jeepney terminal, both at city center areas or 'Barangay Poblacion'.

9.40 Carcar City envisions a new city center including public transport terminal which is designed to serve city route buses within Metro Cebu and long-distance buses to the west coast and south coast of Cebu Island. The Study has conducted a pre FS on the terminal project. (Refer to Chapter xx of this report)

9.41 When the Carcar public transport terminal is ready, city route buses from the

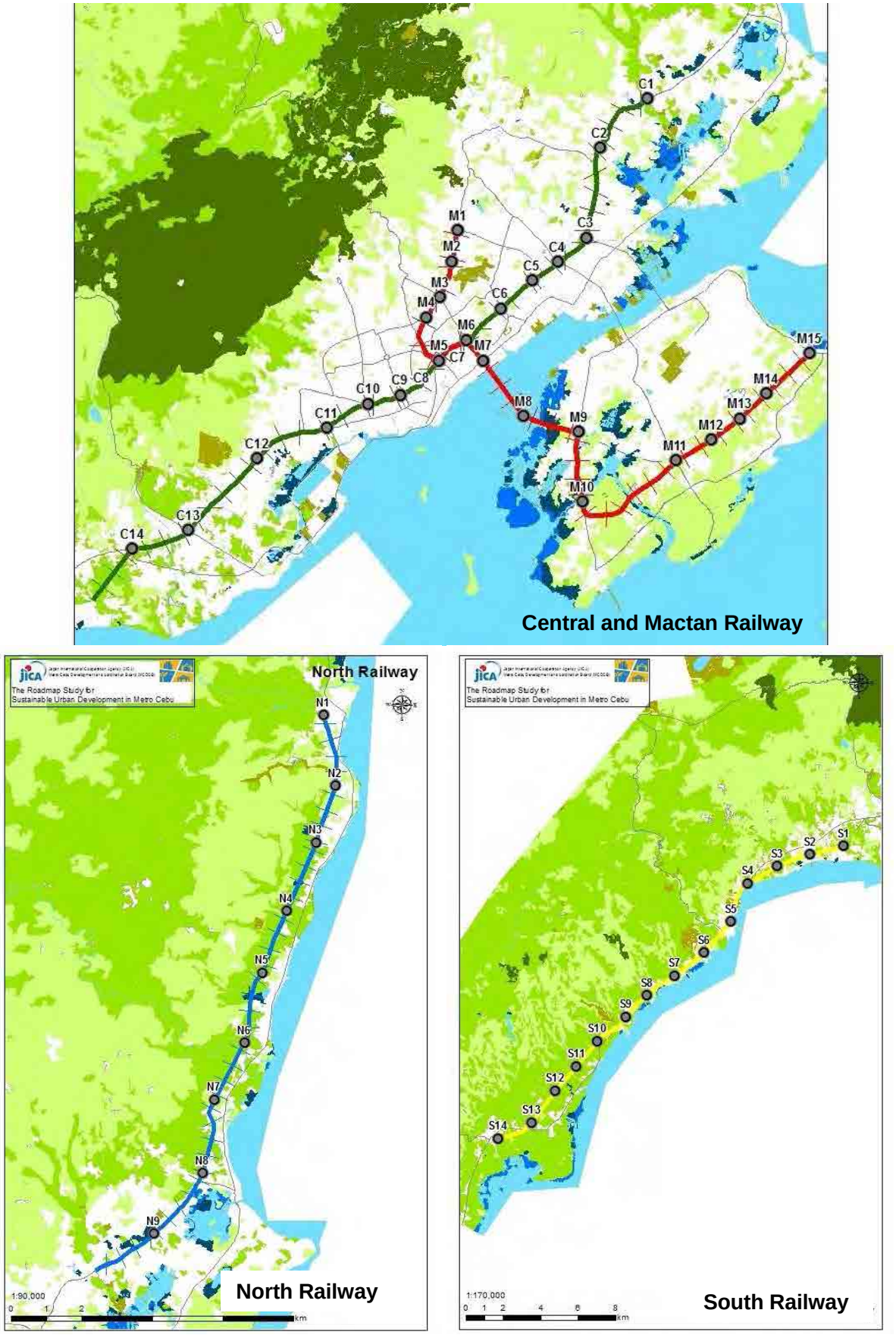
central area of Metro Cebu will end at Danao Terminal at the north and Carcar Terminal at the south. If city buses extend their routes to Mactan Island, Lapu-Lapu Jeepney Terminal will be converted to a public transport terminal.

9.42 The Cebu North Bus Terminal (0.6 ha) currently suffers from land scarcity. After terminal management is transferred from Cebu City to Mandaue City in 2021, the terminal will be expanded.

5) Convenient Urban Transport Services

9.43 The Roadmap Study intends to restructure Metro Cebu from a highway network only to a hybrid network of highway and rail in the future. In the future network, bus / minibus / jeepney will take a feeder role.

9.44 The proposed rail network consisting of MRT and LRT has 110 stations. Compact and convenient transit oriented development will be promoted around rail stations. Station squares are designed at most of the suburb stations where bus / minibus / jeepney are expected to develop various convenient networks for the people live in surrounding areas.



Source: JICA Study Team.

Figure 9.14 MRT Lines for Metro Cebu Coastal Shipping in Urban Commuting

9.4 Coastal Shipping in Urban Commuting

1) Current Services and Citizens' Expectations

9.45 In the past, ferry services between Mactan and the Cebu mainland were thriving. Bridge infrastructure has changed the situation. Today, there is only one ferry service left between Pier 3 of Cebu Port and the downtown of Lapu-Lapu City.

9.46 Generally speaking, ferry operators face difficulty in competing with road-based public transport services in terms of the following aspects:

(i) Plenty of short hops, every one kilometer or less (which is uneconomical for the ferry to do);

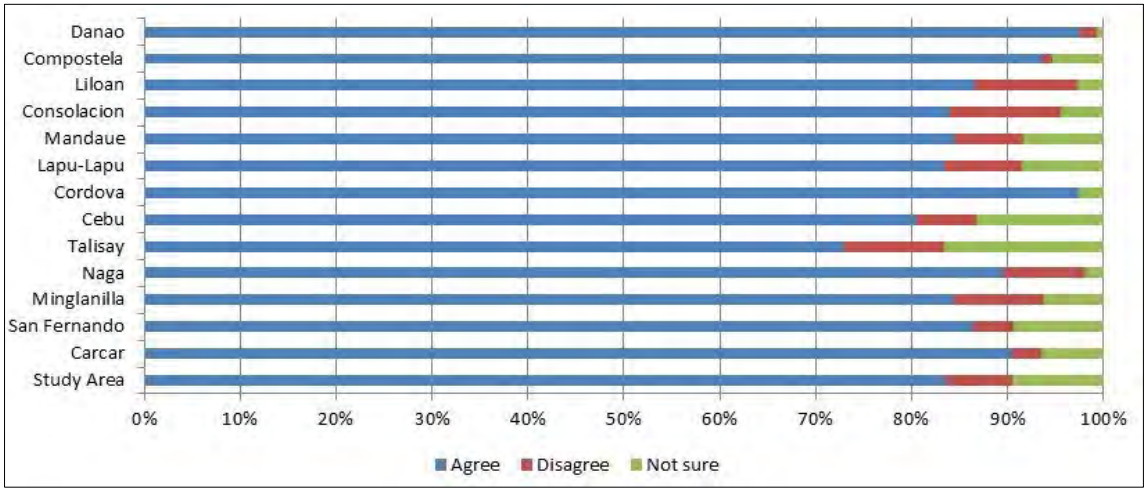
(ii) Desired frequency of 5 minutes or less (which a ferry service must assign smaller vessels, but which would then be uneconomical);

(iii) Fares on PUVs are so low, as to be unviable to a ship operator;

(iv) Rapid motorization where households aspire for car/motorcycle ownership reduces public transport's role in commuting; and

(v) Shipping is more vulnerable against weather conditions such as strong wind and high tide rather than road vehicles when providing scheduled services.

9.47 On the other hand, the results of the HIS in the Roadmap Study clearly show that most of the respondents agree with the improvement of water transport, implying a dilemma between hard shipping business environments and people's expectations (see Figure 9.15).



Source: JICA Study Team, HIS 2014.

Figure 9.15 Opinion Polling for the Improvement of Water Transport

2) Lessons from the Pasig River Ferry

9.48 The case of the Pasig River Ferry is instructive for Metro Cebu. In order to provide urban commuting service, it has undergone three attempts at revival, all ending in failures. There is no reason why the latest fourth attempt, which started in June 2014, is an exception.

9.49 Various kinds of ferry boats from 15-seat to 150-seat capacity have been assigned on the route of around 15 km between Guadalupe (Makati City) and Escolta (Manila City). For better services, garbage and other debris which clogged the river were removed and

passenger amenities such as sheds, toilets, and security guards were provided. With government financial support and a loan from ADB, the third attempt was launched in a wider scope in 2007. But the services ceased operations with a considerable debt in 2011.

9.50 The Pasig ferry experiences show business difficulty for water transport to provide alternative commuting services. Notwithstanding these trials and failures in the past, a ferry boat sailing without congestion seems attractive particularly as an alternative to the congested roads.

3) Conditions of Coastal Shipping to Serve for Commuters

9.51 In order to provide coastal shipping service to commuters in Metro Cebu, support from the public sector is a prerequisite, likely including pier / terminal development, subsidy for ferry procurement, and navigational aids for night-time operation.

9.52 Favorable to a shipping business environment are more congested roads which force longer vehicle travel time for commuters.

9.53 The HIS results indicate that more than 90% of respondents agree with the improvement of water transport at Danao City, Compostela, Cordova, Naga City and Carcar City which are located far from the central areas of Metro Cebu (i.e., Cebu City and Mandaue City) and, thus, local residents may be forced to put up with longer commuting time. As a last resort under the situation that road and rail development would lag behind their schedule, coastal shipping is worth studying for commuting use.

9.5 Summary of Sub-Roadmap Projects for Highway Network and Public Transport

1) Short-Term Projects (until 2020)

(a) Conduct Master Plan and FS on the mass transit system (BRT/LRT/MRT) development for Metro Cebu. (2015–2017)

(b) Implement the Cebu City BRT Project. Associated efforts will be done to reorganize bus / PUV services, modernize and environmentally improve road-based public transport fleets. (2015–2017)

(c) Conduct FS on Area Traffic Control (ATC) for Metro Cebu (2015–2017)

(d) Repair major intersection signals and introduce a synchronized signalization system by traffic control center covering major intersections in Metro Cebu. (2018–2020)

(e) Widen arterial road ROW (especially unimplemented MCLUTS projects) together with widening sidewalks and bicycle lanes (2018–2020)

(f) Construct Carcar Public Transport Terminal (2017–2020)

(g) Construct a dual-mode bridge between Mandaue City and Mactan North. Necessary measures will be taken for the dilapidated First Mactan Bridge in line with the new bridge construction. (2018–2020)

2) Medium-Term Projects (2021–2030)

(a) Construct and operate the CML-AGT Line serving Metro Cebu's core area (Cebu City, Mandaue City and Lapu-Lapu City). (2018–2021)

(b) Construct the Metro Cebu Circumferential Road, the Second Cebu South Road and the Second Cebu North Road in order to establish by-pass to the existing national

highways and guide new urban development. (2021–2030)

(c) Construct a new road bridge between Cebu City and Mactan South. (2021–2030)

(d) Continuously improve congested intersections by grade separation and road widening connecting congested intersections. (2021–2030)

(e) Construct and operate the MRT Central Line stretching from Consolacion to Talisay City. (2021–2030)

(f) Revitalize the abandoned PNR ROW from Talisay City to Naga City for road and railwayComplete the Mandue's Scenic Coastal Road and the Tayud Coastal Road as an access road to the Consolacion new port. (2021–2030)

(g) Strengthen the road network of Mactan Island by means of a new airport tunnel road and a new MRT avenue (2021–2030)

(h) Construct secondary roads and collector roads in accordance with Metro Cebu Spatial Plan by means of public works and private developers' contribution through issuance of development permit. (2021–2030)

(i) If urban traffic would be seriously clogged due to delayed highway and railway development, commuting service by ferry could be provided as a last resort.

3) Long-Term Projects (2031–2050)

(a) Complete the Metro Cebu MRT system including the MRT North Line, the MRT South Line and the MRT Mactan Line (2031–2050)

(b) Develop bus/minibus/jeepney routes using MRT/LRT station squares and promote TOD around stations so as to form compact and convenient urban areas. (2031–2050)

(c) Continuous construction of secondary roads and collector roads in accordance with Metro Cebu Spatial Plan by means of public works and private developers' contribution through issuance of development permit. (2031–2050)

(d) Construct a toll skyway over congested road sections regardless of the abovementioned efforts. (2031–2050)

Table 9.9 Sub-Roadmap for Urban Transport and Highway Network

Term	Projects
Short-Term	・ MP and FS on mass transit system (BRT/LRT/MRT) development for Metro Cebu (2015–2017) ・ The Cebu City BRT Project, reorganization of bus/PUV routes (2015–2017) ・ FS on ATC for Metro Cebu (2015–2017) ・ A synchronized signalization system covering major intersections by TCC (2018–2020) ・ Carcar public transport terminal (2018–2020) ・ RROW Widening with wide sidewalks and bicycle lanes (2018–2020) ・ A dual-mode bridge between Mandaue City and Mactan North (2017–2020)
Medium-Term	・ Construction and operation of the CML-AGT Line (2018–2021) ・ Urban fringe roads (the Metro Cebu Circumferential Road, the Second Cebu South Road and the Second Cebu North Road) (2021–2030) ・ A new road bridge between Cebu City and Mactan South (2021–2030) ・ Continuous improvement of congested intersections (2021–2030) ・ Construction and operation of the MRT Central Line (2021–2030) ・ Revitalization of the abandoned PNR ROW for road and railway (2021–2030) ・ Completion of the Mandaue's Scenic Coastal Road and the Tayud Coastal Road (2021–2030) ・ Strengthening of the Mactan Island Road Network (2021–2030) ・ Construction of secondary roads and collector roads in accordance with Metro Cebu Spatial Plan (2021–2030) ・ Introduce ferry commuting service (when urban traffic is seriously clogged)
Long-Term	・ Completion of the remaining MRT lines (2031–2050) ・ Promotion of bus/minibus/jeepney and TOD around MRT/LRT stations (2031–2050) ・ Continuous construction of secondary roads and collector roads in accordance with Metro Cebu Spatial Plan (2031–2050) ・ Construct toll skyway (when necessary)

Source: JICA Study Team.

4) Environment and Social Considerations

(1) Legal Basis of the Environmental Assessment

9.54 Environmental Assessment System (EAS) of the Philippines is established which cover Environmental Impact Assessment (EIA) and Strategic Environmental Assessment (SEA) under the Philippine Environmental Assessment Act of 2010. SEA refer to the systematic process for evaluating the environmental consequences of proposed policy, plan or program initiatives in order to ensure they are fully included and appropriately addressed at the earliest appropriate stage of decision-making on par with economic and social considerations. The EIA system is the process of predicting the likely environmental consequences of implementing a project and designing appropriate mitigating and enhancement measures as an input to decision making. The EIA is conducted by a project proponent or an expert group commissioned by the proponent. In the Philippines, the results of the EIA are documented and submitted to the DENR's Environment Management Bureau for review as the major basis for decision on Environmental Compliance Certificate (ECC) applications.

(2) Environmental and Social benefits of Public Transport

9.55 The Household Interview Survey (HIS) provides current perceptions of transport among residents of Metro Cebu. The HIS results indicate that more than 70% of sample households feel that traffic congestion and air pollution in the metropolis are getting worse compread to 5 years ago. Nearly 90% think that public transport services must be improved and expanded in the future (Table 5.4 in the Part I)..

9.56 The short to long term urban transport project in the Sub-Roadmap is design to

move large number of commuters in fast and efficient manner. In the case of Metro Cebu, where the public transport mode is dominated by heavily fumes-emitting jeepneys that congested major thoroughfares and arterial roads, a mass-transit system will effectively address congestion by lessening the number of vehicles on road, air pollution, and health issues, and eventually will considerably offer savings in labor, materials and energy.

(3) Current Status of EIA Status

9.57 The Cebu City Government/DOTC BRT project listed in the Short-Term project was already issued an ECC RO7-1211-029114.

9.58 There are a number of flyover projects in Cebu City with nine issued with ECCs. Some of the projects did not materialised due to opposition by a number of local groups. Given the tendency of the proponents to only mark enviornmental aspects asked in the Initial Envionrmental Examination (IEE)-Checklist having relevance to the project, the IEE document to support DPWH to obtain ECC were generally unable to present important unique environmental and social features and important mitigation and enhancement measures that could clearly communicate the benefits and significance of the project to address trafic issues. The absence of public consultation, as this is not required in IEE project types, is one major factor that ignite passionate oppotion to the past flyover project proposals. The IEE-Checklist needs to be upgraded so that there will be room for an active public participation to deal enviornmental and soclia aspects exhausitively. This aspect needs to be dealt in the context of the entire transport network, i.e. in the Transport Master Plan of Metro Cebu.

[14] However, it was reported that there are already amendments/modifications of the original project design which may require amending the EIA study and the ECC

10 SUB-ROADMAP FOR WATER SUPPLY, STORM WATER AND WASTEWATER MANAGEMENT

10.1 Water Supply Development

1) Water Demand Projection

10.1 Water demand projection is mainly based on the population of the study area and future per capita consumption. Niche water demand is also considered. For this Study, 80% of served population targeted in 2050 is adopted based on the water supply volume; approximately 800,000 m^3/day, the service population; 3.8 million, unit volume of consumption; 160 L/capita/day

Table 10.1 Total Required Production of Water in Metro Cebu

Metro Cebu Area	2020	2030	2040	2050
MCWD Area (m^3/day)	282,104	370,589	497,972	638,577
Non-MCWD, Northern Area (m^3/day)	21,134	28,513	38,849	47,729
Non-MCWD, Southern Area (m^3/day)	37,863	55,449	82,393	110,220
Total Required Production (m^3/day)	341,101	454,551	619,214	795,526

Source: JICA Study Team.

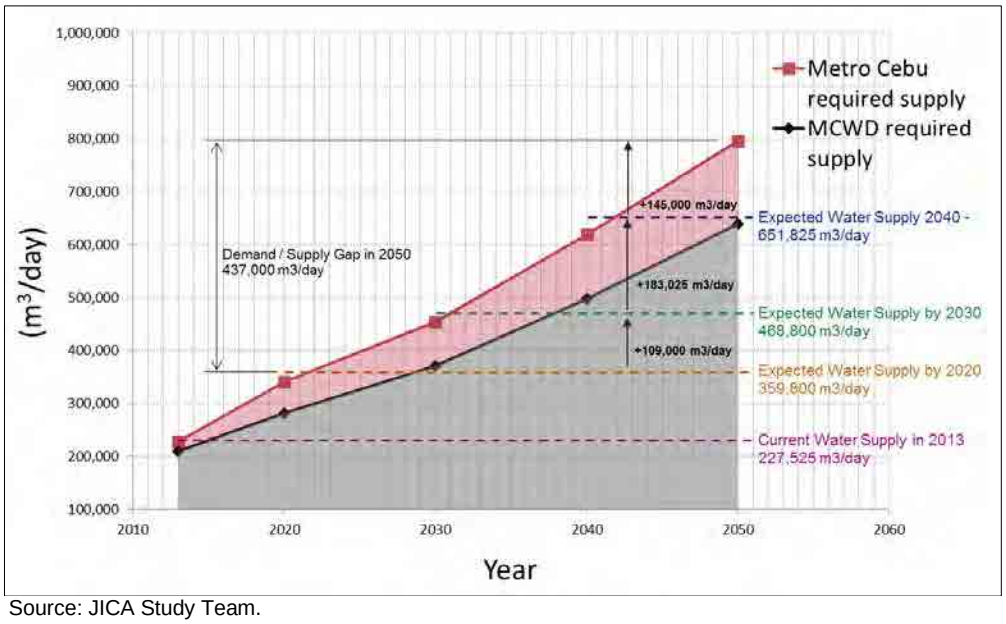
Table 10.2 Supply and Demand Balance for MCWD and Metro Cebu

	MCWD Area	2020	2030	2040	2050
1	Required supply (m^3/day)	282,104	370,589	497,972	638,577
2	Supply (m^3/day)	341,552	341,552	341,552	341,552
3	Surplus/Deficit (m^3/day)	59,448	-29,307	-156,420	-297,025
	Metro Cebu Area	2020	2030	2040	2050
1	Required Supply (m^3/day)	341,101	454,551	619,214	795,526
2	Supply (m^3/day)	359,825	359,825	359,825	359,825
3	Surplus / Deficit (m^3/day)	18,724	-94,726	-259,389	-436,701

Source: JICA Study Team.

10.2 The difference between required production water (demand) and existing supplied water potential (supply) is the required new water source. The water supply and demand projections for MCWD and Metro Cebu are shown in Table10.2.

10.3 Figure 10.1 shows water demand and required future water supply capacity at each planning term (Short Term, Medium Term, Long Term). Required water supply capacity at Short term (Up to 2020), Medium Term (up to 2030), and Long Term (up to 2050) is indicated in the graph shown in Figure 10.1.



Source: JICA Study Team.

Figure 10.1 Future Water Demand and Required Water Supply Capacity

2) Water Resource Potentials

10.4 To meet the future demand for water in Metro Cebu, several water sources may be considered including surface water, groundwater, desalination, and rain water harvesting.

(1) Surface Water

10.5 Based on the projected water requirement discussed in the previous section, new surface water sources will have to be developed. Identified sources in previous studies are the dams in Mananga, Kotkot, Lusaran, Malubog, and the existing Carmen. These areas are shown in Figure 10.2 and described in the next section.

Source: JICA Study Team. Note: Carmen Weir is established and operational.

Figure 10.2 Location of Proposed Dams for Water Supply

(a) Mananga II Dam

10.6 Table 10.3 presents relevant information on Mananga II Dam based on past studies between 1991 and 2008. From the latest study done on this proposed

dam, it will have a height of 76 m, an impounding area of 83 ha, a projected yield of 68,000 m^3/day, and will cost around PHP2.12 billion to build. Another required water supply facilities are a raw water transmission pipeline and WTP. Total construction cost of the said water supply facilities is estimated PHP1.2 billion.

Table 10.3 Features of Proposed Mananga II Dam

Parameters		ADB(Electro Watt, 1991)	US Trade Development Agency:(Bechtel International, 2001)	Dutch :Water Remind Study (2006)
1	Dam Height (m)	76	76	73
2	Impounding area (ha)	150	-	83
3	Capital cost (PHP)	-	2.12 Billion	2.39 Billion
4	Firm yield (m^3/day)	-	68,000	77,000

Source: Bechtel International (2001) Mananga II High Dam and Treated Bulk Water Supply Project, , Water for Cebuanos‐Excerpt from Water Remind Study 2006 / Water Resources Management Action Plan for Central Cebu (2005–2030) (Dutch Government)

10.7 Breakdown of construction cost of the dam and the water supply facilities related to Mananga Dam is shown in below,

- Mananga Dam; Million PHP 1,980.00
- Raw water transmission pipeline (φ900mm, L=8 km); Million PHP 310.00
- Water Treatment Plant (Q=68,000 m^3/day); Million PHP 890.00
- Total Construction Cost; Million PHP 3,180.00

(b) **Lusaran Dam**

10.8 Based on studies conducted in 1977 and 2008, Lusaran Dam will have a height of 63.3 m, an impounding area of 203 ha, an expected yield of 109,000 m^3/day, and an estimated development cost of PHP2.35 billion (see Table 10.4). Another required water supply facilities are mostly the same as Mananga Dam except raw water transmission tunnel. Total construction cost of the said water supply facilities including raw water transmission tunnel is estimated PHP4.2 billion.

Table 10.4 Features of Proposed Lusaran Dam

Parameters		Kampsax-Kruger (1977)	Water Remind Study (2006)
1	Dam height (m)	63.3	47.4
2	Impounding area (ha)	206	203
3	Capital cost (PHP)	2.35 Billion	2.24 Billion
4	Firm yield (m^3/day)	109,000	108,000

Source: Water for Cebuanos–Excerpt from Water Remind Study 2006.

10.9 Breakdown of construction cost of the dam and the water supply facilities related to Lusaran Dam is shown in below,

- Lusaran Dam; Million PHP 2,090.00
- Raw water transmission tunnel (1.6 m x 2.7 m); Million PHP 1,970.00
- Raw water transmission pipeline (φ1100mm, L=22 km); Million PHP 1,140.00
- Water Treatment Plant (Q=108,000 m^3/day); Million PHP 1,110.00
- Total Construction Cost; Million PHP 6,310.00

(c) **Kotkot Dam**

10.10 In the Water Remind Study, there are two variations of the proposed Kotkot Dam, namely the 25 m and the 19 m dam. The estimated yield is around 54,000 m^3/day for the 25 m dam and 52,000 m^3/day for the smaller dam. The impounding area is estimated to be around 225 ha (ADB, 2011). The capital cost is around PHP875 million. Another required water supply facilities are the same as Mananga Dam. Total construction cost of the said water supply facilities is estimated PHP1.3 billion

(d) **Malubog Dam**

10.11 Aqua-Atlas proposed to develop the Malubog Dam to supply MCWD with an estimated volume of 100,000 m^3/day. The proposed development intends to raise the existing dam by another 4 m high, divert the flow via a 12.3 km tunnel with 2.5 m diameter, and dump the water to Lagtang for treatment prior to supplying MCWD. The main problems to consider are how to cross the active fault line and to construct the very long tunnel. The proposed development would cost around PHP3.4 billion (estimated in 2006) including raw water transmission tunnel, augment of the dike.

(e) **Danao River**

10.12 The City of Danao informed that there was an offer from a private company to develop this source to produce around 20,000 m^3/day and plans to supply MCWD.

(2) Groundwater

10.13 Groundwater sources may be explored both in the northern and southern parts of Metro Cebu. In the northern area, groundwater source may be explored from Liloan to Danao City. In the southern portion, groundwater exploration (study) may be done from Minglanilla to Carcar City. Since an exploration study has not been done yet in the southern area, it should be done soon for future water source. MCDW is recommended agency to execute for an exploration study.

(3) Desalination

10.14 The desalination system is currently used by several establishments for their needs. Bulkwater supply is provided by Mactan Rocks Industries (MRI) to MCWD in Lapu-Lapu City. JBIC did a study on desalination in 2005. The study estimated the price of desalinated water at PHP70/m^3. This is too expensive compared to the current price of approximately PHP20/m^3 of MCWD-supplied water. Therefore, the desalination system would be better considered as one of the future water sources if found viable then.

(4) Rainwater Harvesting

10.15 In the Water Remind Study, rainwater harvesting is one of the proposed strategies to augment water supply. In the urban residential areas, it is estimated to produce around 5,800 m^3/day, while in the commercial and industrial establishments, approximately 2,600 m^3/day can be harvested.

10.16 At present, most of the LGUs are now requiring new developers to construct rainwater harvesting facilities as part of their development plans. In Cebu City, an

ordinance is enforced requiring each residential house to construct a cistern of 0.5 m^3 per 30 m^2 roof area while a commercial/ industrial establishment is required to have a cistern of 0.5 m^3 per 15 m^2 roof area. However, it is difficult to assume this as water supply source as this will not be accounted for stabilized water sources.

3) Summary of Sub-Roadmap Projects for Water Supply Management

(1) Short-Term Projects (- 2020)

10.17 According to MCWD, the large supply deficit will not be anticipated in 2020. However, there is uncertainty in bulk water supply volume. In order to fill in the anticipated gap (approximately 95,000 m^3/day in 2030) between water demand and supply, the following short-term projects are proposed.

(a) **Project for Construction of New Water Supply Facilities (Reservoirs, Pump Stations, Well Development).**

10.18 Based on the JICA report on "The Study for Improvement of Water Supply and Sanitation in Metro Cebu in the Republic of the Philippines" published in August 2010, requirements for technical improvement of MCWD water supply system and facilities were proposed. It included the production of 41,500 m^3/day of water by 63 new wells. The design concept and criteria are as follows:

(i) To apply gravity water supply system;

(ii) To establish distribution block water supply system

Table 10.5 Selected Short-Term Priority Project Components

Item	Description	Unit	Quantity
1-1	Well Construction (250 mm diameter, 150 m depth)	Well	63
2-1	Reservoir (V=10,000 m^3)	Site	2
2-2	Reservoir (V=5,000 m^3)	Site	1
2-3	Elevated Water Tank (V=2,000 m^3)	Site	2
3-1	Raw Water Pipeline (100 mm and 150 mm)	m	31,500
3-2	Transmission Pipeline (400 mm and 800 mm)	m	26,800
3-3	Inter-reservoir Pump Station	Site	2
3-4	Main Distribution Pipeline (300 mm to 700 mm)	m	32,200
3-5	Secondary Distribution Pipeline (75 mm to 200 mm)	m	37,000
3-6	Flow Meter installation	Site	6

Source: JICA Study Team.

(b) **Construction of Mananga II Dam**

10.19 Development of the Mananga River for municipal water supply has been studied over the last 30 years. The expected volume of water produced by a 76 m-high Mananga II Dam is 68,000 m^3/day is applied for this proposed project. The location of the Mananga II Dam is upstream of Mananga River in Barangay BouTaup in Cebu. The proposed dam construction method is the roller compacted concrete method.

10.20 This project consists of water intake, conveyance tunnel/transmission pipeline, water treatment plant, pumping station, and transmitting pipelines beside a high dam. It is recommended to acquire a property for the water treatment plant because there is no existing land for the plant until now. The inundated area will be approximately 140 ha.

10.21 After completion of these short-term projects, expected additional production water is 109,000 m^3/day.

(2) Medium-Term Projects (2020–2040)

10.22 To fill in the projected water supply-demand gap in 2040, the following medium-term projects are proposed.

(a) **Construction of Kotkot Dam**

10.23 With a height of 25 m, Kotkot Dam is expected to produce 54,000 m^3/day of water. The construction method for this dam is the roller compacted concrete method, the same as for Mananga II Dam. Similarly, land for the Kotkot Dam's water treatment plant will need to be secured. Construction of the dam will submerge as large as 210 ha of land due to flat geographical feature.

(b) **Lusaran Dam**

10.24 The volume of expected development water production by Lusaran Dam, with a height of 63 m, is 109,000 m^3/day. Construction of this dam is expected to involve a rock fill dam construction method. The same as in the other dams, land for the water treatment plant for the Lusaran Dam will need to be secured. Construction is expected to affect around 200 ha of land.

10.25 There is an alternative proposed idea that Kotkot Dam and Lusaran Dam may be connected by tunnel, which would allow dam height to be lower, but water supply volume will be expected to decrease to 110,000 m^3/day.

(c) **Groundwater Exploitation Study**

10.26 As earlier discussed, the volume of development water production by the two dams can meet the water demand in 2030. Nevertheless, it is recommended to conduct a study of groundwater exploitation at the northern and southern areas of Metro Cebu to identify future water sources. Liloan, Compostela and Danao City in the northern area are prospective areas for exploration.

(d) **Reduction of NRW**

10.27 Reduction of NRW from 20 % in 2020 to 17 % in 2030 is the same meaning to produce water of 20,000 m^3/day. So reduction of NRW is one of the new water resources development.

10.28 After completion of these medium-term projects, expected additional production water is 183,000 m^3/day.

(3) Long-Term Projects (up to 2050)

10.29 In order to address the large projected water supply-demand gap, 145,000 m^3/day in 2050, the following long-term projects are proposed.

(a) **Development of Surface Water and Groundwater at the Northern and Southern areas of Metro Cebu**

10.30 Based on the proposed groundwater exploitation study in 2030, new development of surface water and groundwater will be undertaken to meet water demand in 2050. It is expected to produce 100,000 m^3/day of water from groundwater and 50,000 m^3/day from surface water.

(b) **Desalination**

10.31 Development of 20,000 m^3/day of water is planned through a desalination plant. Considering, however, that unit price of water by desalination is more expensive, the capacity of the proposed desalination plant will be smaller.

(c) **Reduction of NRW**

10.32 Reduction of NRW from 2030 to 2050 can be estimated to develop water of 50,000 m^3/day

(d) **Recharge to the Groundwater**

10.33 This is expected to produce 5,000 m^3/day of water.

(e) **Use of Recycled Water**

10.34 Recycling of treated wastewater is expected to add 10,000 m^3/day of water supply.

10.35 After completion of these long-term projects, expected additional production water is 145,000 m^3/day

10.36 Aside from the long-term projects described above, the targets for the water supply system are 24 hours continuous operation, 8 hours water storage, and 80% of served population.

4) Implementation Schedule

10.37 Key issues on water supply in Metro Cebu are future water deficit as well as salinity intrusion, nitrate and E.coli contamination, peripheral urbanization in the watershed areas. In order to address such critical issues, a sub-roadmap with a vision," to narrow the gap between demand, supply and increase safe water coverage and provide 24 hours service to uplift the people's quality of life" is proposed.

10.38 For a short term, projects with the purpose of developing new water resources and increasing water production volume in order to fill in the gap between water supply and demand are important.

10.39 In a medium term, in order to narrow the supply demand gap, projects to increase water supply volume by additional water source development and measures to reduce NRW will be implemented.

10.40 Long term projects include the construction of desalination plant, recharge to groundwater, use of recycled water in addition to continuous groundwater development and reduction of NRW to be implemented in medium term projects.

10.41 Investment cost by term is shown in the following table. Investment for short term projects is approximately 7.1 billion peso. The project cost for medium and long term projects is approximately 9.2 billion peso and 17 billion peso respectively. In total, the investment is projected to be 33 billion peso for this sub-roadmap.

Table 10.6 Sub-Roadmap of Water Supply

Term	Project	Start Year	Project Cost* Million Peso
Short	· Project for Construction of New Water Supply Facilities (Reservoirs, Pump Stations, Well Development)	2015–2020	2,326
	· Construction of Mananga II Dam	2015–2020	4,778
	Subtotal		7,104
Medium	· Construction of Kotkot and Lusaran Dam	2018–2030	7,500
	· Groundwater Exploitation Study	2018–2030	620
	· Reduction of NRW		1,100
	Subtotal		9,220
Long	· Development of Surface Water and Groundwater at the Northern and Southern areas of Metro Cebu	2028–2040	11,220
	· Construction of Desalination Plant	2028–2040	3,100
	· Reduction of NRW	2028–2040	1,100
	· Recharge to the Ground Water	2028–2040	440
	· Use of Recycled Water	2028–2040	1,100
	Subtotal		16,960
Total			34,370

Source: JICA Study Team * Exchange Rate: 1PHP=2.442 JPY (JICA, November 2014).

5) Environmental and Social Considerations

10.42 Due to insufficient water supply volume, MCWD's service coverage is merely 45%, and targets to expand is up to 60% by 2020. While MCWD has made efforts to decrease NRW from over 30% to 25 %, it requires further efforts to decrease it to 15%, and to expand the transmission and distribution pipelines to increase consumers. The current situation which 98% of potable water source depending on groundwater is not sustainable at all due to salinity intrusion and contamination. There was proposal of desalination project for the JICA loan several years ago, but concluded as not feasible in terms of cost and others. Desalination will not likely to become a useful water resources in the medium and short terms. It is necessary to conduct consumer campaign to address the necessity of building a large scale bulk water supply dams.

10.43 Among projects of the roadmap framework, the large scale dams has greater impact on the ecosystem due to large-scale land modification, and require resettlement due to inundation. Subsequently, the MCDCB and JICA study team held the two water forums in July and October 2014 in order to build consensus to implement the proposed projects, specifically Mananga Dam. The participants were MCWD, Cebu Province, Cebu City and other LGUs, DENR, NEDA, private water companies, academia and NGO. The agenda was (i) Current demand / supply gap and future projection, (ii) Alternative water supply sources to bridge the gap, (iii) Public Private Partnership, Implementation framework, project costs, and (iv) Financial schemes of alternative implementation frameworks.

10.44 However, participants faced difficulties to reach the consensus to decide the proponent of Mananga II Dam. MCWD insisted on their focus on expanding the distribution, and recommended that LGUs (such as Cebu City or / and Cebu Province) plus private proponents should implement, while they can lead and facilitate the implementation. There are also opinions for national government agencies to provide sufficient resources, and

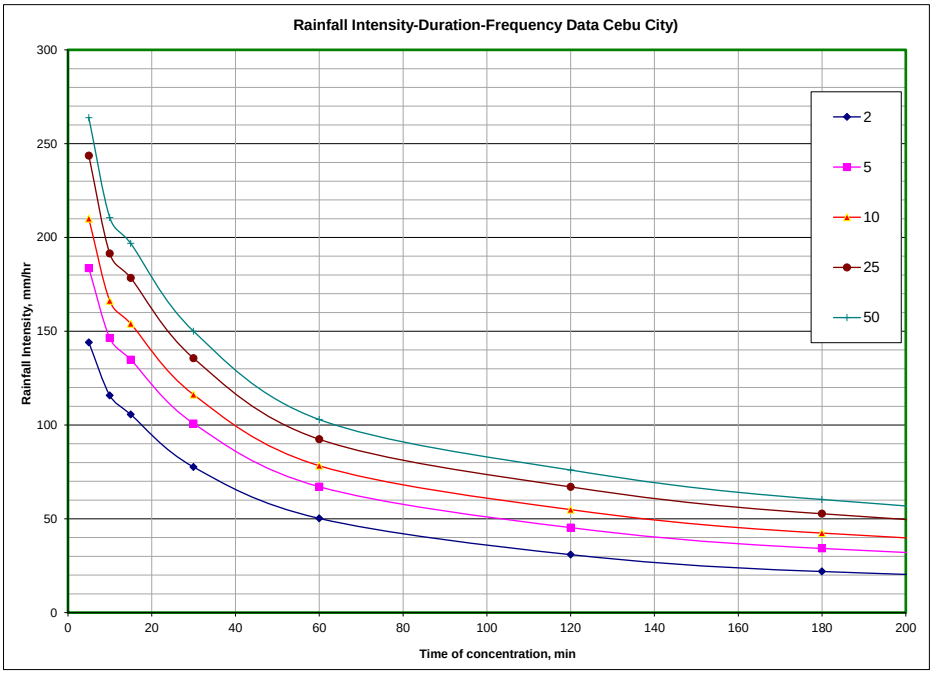
against PPP scheme. Besides these two forums, MCDCB's led meetings continuously discussed this project as one of the priorities, and reached consensus for PPP scheme, but hardly reached the consensus for the proponent / the implementation body as of February 2015.

10.45 LGUs which host the large scale dams have to acknowledge the requirement of environmental and social assessment study, and take it into consideration for their future land use plans. National government bodies including DENR which regulate the watershed as well as Central Cebu Protected Land (CCPL), NEDA who plans for development projects are essential to involve the discussion. It is urgently required to decide a project proponent / implementing body for preparing for a resettlement action plan with LGU and affected barangays, and for studies on environmental protection as well as risk such as active faults.

10.2 Strom Water Management

1) Objectives and Target

10.46 The objective for storm water management is to analyze storms and its frequency in order to determine needed provisions for the present and the future. In this study, the return period for the storms is set at a 5-year return period on 2050 and a 2-year return period on 2030. The intensity frequency duration curve mentioned in drainage master plan conducted by Cebu city is shown in the figure below.



Source: Final Drainage Master Plan Preliminary Engineering Report 2006.

Figure 10.3 The Frequency Duration Curve

2) Summary of Sub-Roadmap Projects for Storm Water Management

(1) Short-Term Projects

(a) **Implementation of a "Comprehensive Study for a Metro Cebu Integrated Flood and Drainage System Master Plan"**

10.47 The detailed causes of flooding are not mentioned in existing drainage

master plans prepared by the LGUs. There is no assessment of the effectiveness of planned projects and risk of flooding in other areas. To address this concern, the DPWH is planning to conduct this comprehensive study that aims to formulate an integrated flood and drainage master plan encompassing the entire Metro Cebu area. Cleaning of Rivers, Creeks and Drainages

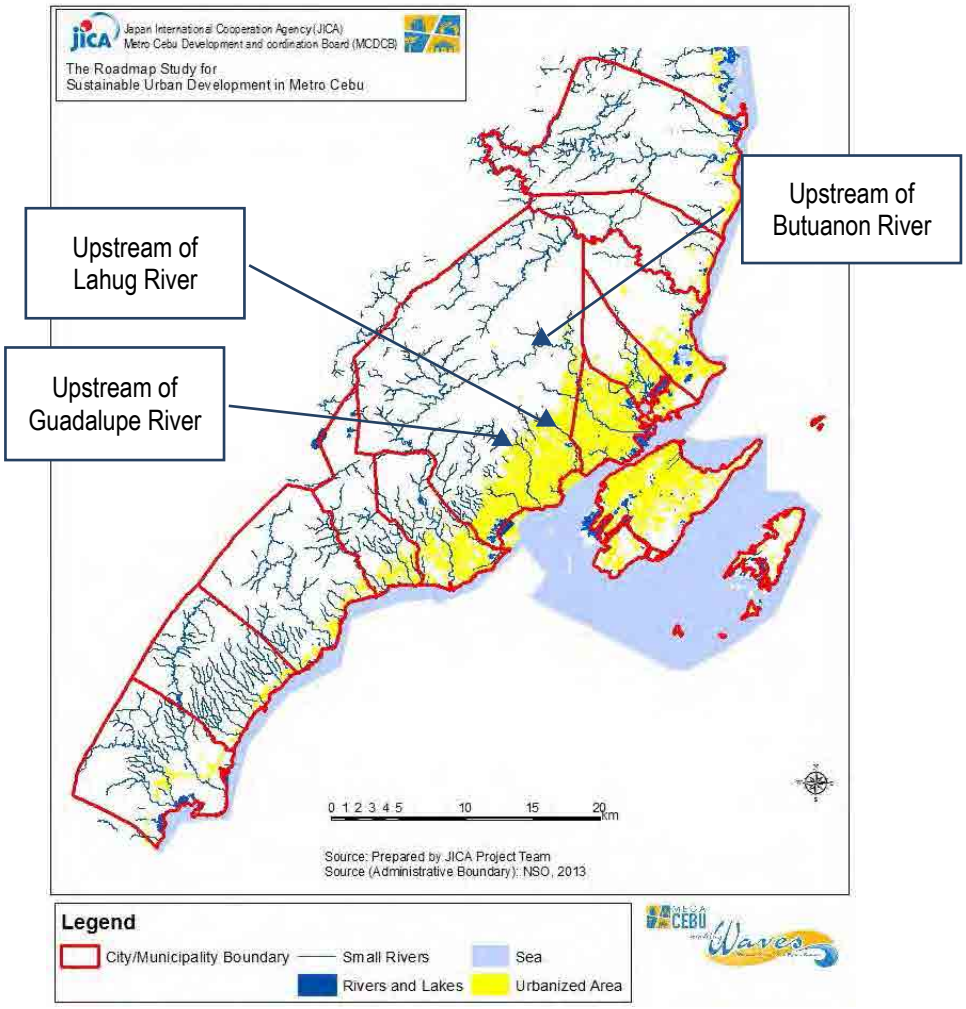
10.48 The existing rivers, creeks, and drainages are not realizing their actual capacities due to clogging from garbage, deposited solids, and informal settlements. In the existing plans of the LGUs, actual river capacities are supposed to be sufficient for rain water disposal. Thus, it is very important for the LGUs to urgently implement the cleaning of rivers and creeks, and dredging of deposited solids of rivers, creeks, and drainages.

(b) **Construction of Small-Scale Rainwater Storage Facilities**

10.49 There are important measures that not only enhance flow capacity but also reduce flow quantity in natural and man-made waterways. One of these measures is the utilization of rainwater storage facilities at the household and commercial / industrial levels. This, however, depends on the policy and the cost to each household / establishment, unless the LGU has passed an ordinance requiring mandatory installation of rainwater collection facilities.

10.50 At the government level, construction of mini-dams is effective to reduce runoff quantity. Mini-dams are useful for flood mitigation and also provide water for the community, as mentioned in the drainage master plan of Cebu City. However, a mini-dam for the purpose of mitigating flooding have to be constructed with outlets for a delayed releasing of water during fine weather days. Then it cannot be used for water supply. Therefore, mini-dams should be constructed appropriately.

10.51 The proposed sites for mini-dams in Metro Cebu are shown in Figure 10.4. Each will have an estimated capacity of 6,000 m^3 for a total of 18,000 m^3. The total cost of the proposed structure is approximately 82 million pesos (excluding the cost of lot acquisition / right of way).



Source: JICA Study Team.

Figure 10.4 Proposed Sites for Mini-Dams in Metro Cebu

(2) Medium-Term Projects

(a) Construction of Drainage Facilities Based on Integrated Flood Master Plan

10.52 Construction of drainage facilities should be implemented based on the integrated flood control master plan by DPWH and the LGUs.

(b) River Improvement Project

10.53 The JICA Study conducted in 1995 identified key rivers that required rehabilitation and improvement. The specific rivers considered for the implementation of river improvement projects are the Subangdaku River, the Kinalumsan River and the Lahug River. The overall cost of river improvement for these three rivers is estimated as 2.25 billion PHP.

(c) Countermeasures such as Relocation

10.54 Flooding occurs during heavy rainfall and during high tide. The locations of flooding areas are at the coastal areas where the ground level is comparatively low. Since pumping stations are not considered as a measure due to their prohibitive cost (i.e., construction and maintenance), it is recommended to consider leveling and relocation of residents in the concerned areas.

(3) Long-Term Projects

(a) River Improvement Projects

10.55 Similar works on river improvement are proposed for the long terms project implementation. The rivers considered are the Guadalupe River in Cebu City and Butuanon River in Mandaue City which will increase resilience of urban centers. The estimate cost of these two river improvement is approximately 2,33 billion PHP.

(b) Construction of Large-Scale Rainwater Storage Facilities

10.56 There are large-scale projects that can be undertaken to achieve the 2050 objective of eliminating flooding against a 5-year return period including the widening of rivers and creeks and construction of pumping stations. However, it might be impossible to implement such waterway widening projects because of urbanization, overcrowding, and presence of special facilities that cannot removed, such as traditional churches and historical sites. The necessity of pumping stations is considered low because the ground level along the sea shore (2 m) is higher than the tide level. (1.8 m) The construction of pumping stations is not considered for the roadmap.

10.57 Large-scale rainwater storage facilities have to be constructed at downstream areas. However, there are no spaces for storage facilities due to rapid urbanization. The operational cost would also range from PHP7.5 million to PHP15 million.

Table 10.7 Capacity of Large-Scale Rainwater Storage Facilities

Catchment Area	Catchment Area (ha)	Length of River / Creek (km)	Storage Volume (m^3)	Estimated Cost (PHP)
Guadalupe River Catchment	1,950	8.8	50,000	500,000,000
Laung Creek Catchment	790	5.4	30,000	300,000,000
Mahiga Creek Catchment	1,050	5.2	30,000	300,000,000
Subangdaku River Catchment	1,200	5.4	40,000	40,000,000
Butuanon River Catchment	5,800	8.9	135,000	1,350,000,000

Source: JICA Study Team.

10.58 As for short term projects, the purpose is to decrease flow quantity and impact of flooding. For the objectives, a “Comprehensive Study for a Metro Cebu Integrated Flood and Drainage System (MCIFDS) Master Plan”, cleaning of rivers and creeks to increase capacity of existing facilities and construction of small scale rain water storage facilities will be conducted.

10.59 Medium term projects include such projects as construction of drainage facilities based on MCIFDS, river improvement projects, and embankment at inundation places in rural area to enhance safety for flooding.

10.60 In the long run, there are big projects in order to achieve 2050 objectives which eliminate flooding against 5 to 10-year return period, including construction of large-scale rainwater storage facilities as well as some river improvement projects.

10.61 Investment cost by term is shown in the following table. Investment for short term projects is around 282 million peso. The project cost for medium term

projects is 2.9 billion peso. As for long term projects, cost will be determined after the master plan for integrated flood and drainage system is developed.

Table 10.8 Sub-Roadmap of Storm Water Management

Term	Project	Start Year	Project Cost* Million Peso
Short Term	· Implementation of "A Comprehensive Study for A Metro Cebu Integrated Flood and Drainage System (MCIFDS) Master Plan"	2015–2020	75
	· Cleaning Rivers, Creeks, and Drainages	2015–2020	125
	· Construction of Small Scale Rain Water Storage Facilities	2015–2025	82
	Subtotal		282
Medium Term	· Construction of drainage facilities based on MCIFDS	2020–2030	720
	· River Improvement Projects	2020–2040	2,250
	· Embankment at inundation places in rural area	2020–2030	
	Subtotal		2,970
Long Term	· River Improvement Projects	2030–2050	2,330
	· Construction of Large Scale Rain Water Storage Facilities	2030	2,850
	Subtotal		5,180
Total			8,432

Source: JICA Study Team

Note: Relocation cost is estimated in the Master plan.

3) Environmental and Social Consideration

10.62 Due to the complexity of responsible institutions of water bodies such as LGUs-city/province/municipal, National Government Agencies (such as DPWH, DENR), MCWD, NGOs/CUSW etc), there are some overlaps among their tasks. Informal settler, illegal building as well as large volume of solid waste are the one of the serious factors of the flooding. Resettlement of informal settler in flood prone areas is required based on the resettlement policies. LGUs need to consider the various factors in the implementation of resettlement.

10.3 Waste Water Management

1) Objectives

10.63 The principal objective of wastewater treatment is to allow human and industrial effluents to be disposed of properly without endangering human health or the natural environment. In order to achieve this objective, wastewater treatment population ratios are set by 50% and 90% in 2030 and 2050, respectively.

2) Summary of Sub-Roadmap Projects for Waste Water Management

(1) Short-Term Projects

(a) Construction and Operation of a Septage Treatment Plants

10.64 A centralized sewerage system will be desirable, but it is not realistic to materialize in short-term due to higher cost, maintenance, longer period for

construction. The detailed project action plan for septage treatment is described in PART III Chapter 19 “DEVELOPMENT OF SEPTAGE PLANTS AND ITS NETWORK”.

(b) **Improvement of Inappropriate Septic Tanks**

10.65 The construction and operation of the septage treatment plant will improve the water body environment in the metropolis. Nevertheless, inappropriate septic tanks with no concrete bottoms but only one chamber are still contaminating water bodies including groundwater which is the source of potable water. Therefore, the LGUs have to conduct investigation on existing septic tanks and exert greater efforts to improve the septic tank system through appropriate policies and regulations, vigilant enforcement, and local community assistance.

(c) **Construction of Proper Wastewater Treatment Facility for Development Area**

10.66 There are many development areas which should ensure the provision of appropriate wastewater treatment facilities. It is required that new subdivisions have to get an ECC from the DENR. Proper wastewater treatment facilities will have to be constructed based on existing law (Code of Sanitation of the Philippines, PD856-Chapter XVII) not only for the development areas but also for large shopping malls and industrial areas.

(2) Medium-Term Projects

(a) **Partly Construction of a Centralized Sewerage System**

10.67 The treatment efficiency of a septic tank is lower than that of a sewerage system, and many households treat black water only by septic tank. Even if septage management is going well, improvement of water quality is limited. Therefore, a new centralized sewerage system must be constructed to meet Metro Cebu’s future wastewater treatment requirements. A separate system and conventional activated sludge technology are recommended for Metro Cebu in terms of environmental aspects. The new centralized sewerage system should cover the three highly urbanized areas of Cebu City, Mandaue City and Lapu-Lapu City.

(b) **Promotion of Ecological Sanitation Technologies**

10.68 For rural areas, a centralized sewerage system is not appropriate because of its high construction cost. Also, there are many households which do not have septic tanks and even toilets. So if construction of a new facility or improvement of old facilities in rural areas would be undertaken, it is recommended to put in place instead ecological sanitation technologies such as urine diversion toilets.

(3) Long-Term Projects

(a) **Expansion of Centralized Sewerage Systems**

10.69 The existing urban areas in Metro Cebu will expand and spread out to adjacent LGUs over time. Population growth and increase in population density will lead to an increase of pollution load on the environment. Construction of new sewerage systems for the adjacent areas with high population density is impractical and uneconomical. Instead, expansion of existing sewerage systems is recommended in order to cover the expanding urbanized area and to treat

generated wastewater.

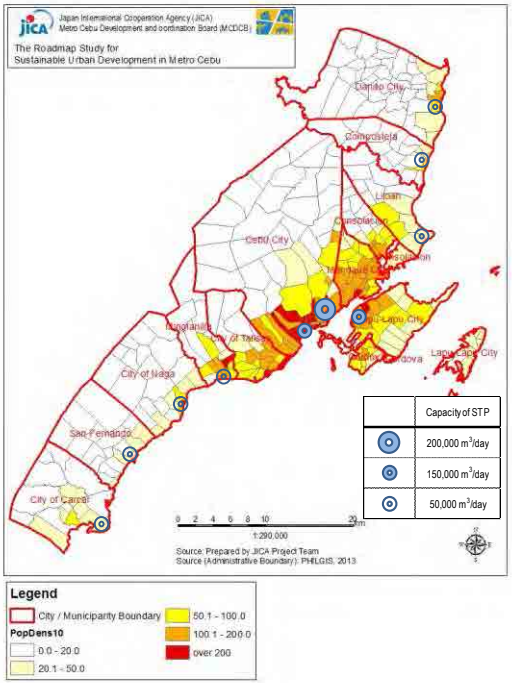
(b) **Construction of New Sewerage Systems for Urban Area**

10.70 In order to achieve the objective of wastewater treatment population ratio of more than 90% by 2050, construction of sewerage systems for the urban area of each LGU is necessary. The future plan for sewerage systems are summarized in Table 10.11 and Figure 10.6.

Table 10.9 Sewerage System Coverage Area in 2050

Area	Population (No.)	Volume of Wastewater (m^3/day)	LGU Coverage
Cebu North	1,380,000	221,000	Northern part of Cebu, Mandaue, Consolacion
Cebu South	1,041,000	167,000	Southern part of Cebu, Talisay
Lapu-Lapu	789,000	126,000	Lapu-Lapu City, Cordova
Liloan	245,000	39,000	Liloan
Compostela	85,000	14,000	Compostela
Danao	255,000	41,000	Danao City
Minglanilla	265,000	42,000	Minglanilla
Naga	210,000	34,000	Naga City
San Fernando	116,000	19,000	San Fernando
Carcar	207,000	33,000	Carcar City
Total	4,593,000	736,000	

Source: JICA Study Team.



Source: JICA Study Team.

Figure 10.5 Location of Required Sewerage Systems

3) Institutional Arrangement for Wastewater Treatment Projects

10.71 As stated in the Clean Water Act, the cities or municipalities are primarily responsible to ensure clean water. However where there are operational water districts, the responsibility is accorded to the water districts. This mandate is also explicitly stated in PD 198 or the law that created the water districts.

10.72 The first level of intervention for community-wide wastewater treatment would be septage management services, and eventually upgraded to a sewerage system since the

septage management system is not built in Metro Cebu. Septage management services require lower and less lumpy investments. Current technology is such that incremental capacity upgrades can be modular, so that additional investments can be phased with the growth in demand. Moreover, septage management as shown in Table 10.12 is a cost effective first line intervention.

10.73 Several feasibility studies on septage management done for water districts show that this service is financially viable[15]. Full cost recovery can be achieved with an average increase of 8–10% of the monthly water bill. The same cannot be said for the combined (interceptor) sewerage system or a separate sewerage system. The investments are so high making the tariffs exorbitant if full cost recovery is intended. Hence for these types of interventions, a subsidy will be necessary. Presently, the National Sewerage and Septage Management Program of DPWH earmarked a fund to subsidize sewerage projects of highly urbanized cities, up to 40% of the capital cost. The fund has not been fully utilized yet.

Table 10.10 Options on Sanitation Interventions

Strategy	Pollution Reduction Potential	Capital Expenditure Cost :PHP ('000) per Household
Increase Septic Tank Use	Up to 50% (for new, properly constructed septic tanks)	5 to 10
Improve Septic Tank Design	Up to 50% (retrofit)	2 to 5
On-site Secondary	Up to 90%	20 to 40
Septage Management Program	Up to 50% (for properly constructed and improved septic tanks)	2 to 3
Separate sewerage System	Up to 90%	90 and up
Combined (Interceptor) Sewerage System	Up to 90% (During dry weather only)	30 to 70

Source: Presentation of the Development Bank of the Philippines, June 2014.

Source: JICA Study Team.

Figure 10.6 Implementation Steps and Institutional Building for Septage Project

10.74 MCWD which covers eight cities and municipalities has explicit mandates and existing systems, such as collection, that would make it easy to add septage management as another service line. Hence, MCWD is expected to be an implementing body to provide septage management services. According to USAID feasibility study in 2009, septage treatment plants can be planned so that service areas are clustered thereby optimizing economies of scale of the facilities. LGUs within the MCWD franchise area can help make the projects' economic and environmental impact more effective if they pass ordinances

[15] Seventeen feasibility studies for water districts were supported by the USAID-funded Philippine Water Revolving Fund Support Program.

requiring periodic de-sludging and retro-fitting of septic tanks to comply with the standard.

10.75 Nevertheless, as of 2014, there is no septage treatment plant operated by MCWD. As for the option of the septage treatment plant under the direct management of Cebu City, it might be difficult to arrange for the fee for septage management service to be added to the water tariff of MCWD. As such, a practical measure to secure financial viability will be required in the near future.

10.76 For cities and municipalities without water districts, such as Danao, San Fernando and Naga, the LGUs will be the implementing agencies. If these LGUs are proximate enough to facilities that will be put up by water districts, then they can opt to bring the sludge in the existing facilities subject to a tipping fee, thereby limiting investments to dislodging trucks. Should they have constraints in user fee collection, an alternative is to recover the cost from real property taxes. An example of such a scheme is found in San Fernando, La Union.

10.77 As regards to the financing and procurement strategy, a PPP arrangement has prima facie benefits. De-sludging services are already provided by the private sector which may be able to operate more efficiently than water districts and LGUs. Contracts with private operators can include incentives and penalties that will drive achievement of performance standards cost effectively.

Table 10.11 Sub-Roadmap of Waste Water Management

Term	Project	Start Year	Project Cost* PHP mil.
Short Term	・ Construction of Septage Treatment Plants	2016	1,215
	・ Improvement for Inappropriate Septic Tanks	2016	-
	・ Construction of Proper Waste Water Treatment Facility for Development Areas	2016	-
	Subtotal		1,215
Medium Term	・ Partly Construction of centralized sewerage system	2020	41,500
	・ Promotion of Ecological Sanitation technologies	2025	-
	Subtotal		41,500
Long Term	・ Expansion and Construction of centrlized sewerage systems	2030	56,100
	Subtotal		56,100
Total			98,815

Source: JICA Study Team.
Note: Cost of existing septic tanks and water treatment facilities for development area, ecological sanitation technologies are not included as it requires to grasp the current condition of those and other development plan as well as willingness of residents and developers.

4) Environmental and Social Considerations

10.78 The main purpose of the septage treatment management is to protect water resources from pollution and people from water contamination, thus, it is environmentally enhancement. Further, it is one of the most serious problems to improve the contamination of water bodies, and to protect human from contaminated water. Even though the groundwater is the major source of drinking, the contamination of groundwater is exacerbated due to poor sanitary condition. The cost of economic loss on human health, fishery, agriculture, and tourism sectors and others caused by contaminated drinking water is not properly estimated, but not negligible amount. By improving wastewater, it is expected to improve living environment in addition to decreasing these losses.

10.79 However, it requires to acquire Environmental Compliance Certificate (ECC) in

accordance with the EIS guideline for solid waste treatment facilities since this includes waste water treatment. The proposed septage plants requires EIA and application for ECC according to the following table.

Table 10.12 Requirement of EIA by Project Size Parameter

Type	Project Size Parameter	EIS	IEER or IEEC	CNC*
Domestic Wastewater Treatment Facility	Quantity of wastes to be treated annually	≥5,000 cu.mtr / (13.7 cmd)	<5,000 cu.mtr	<30 cu.mtr

Source: DENR
Note Environmental Impact Statements (EIS), Initial Environmental Examination Report (IEER), Initial Environmental Examination Checklist (IEEC), Certificate of Non-Coverage (CNC)

10.80 Under the JICA pilot project on Applicability of Dewatering Equipment for Septage Management introduced in Cebu city, water quality of effluent, odor of the plant, sludge cake has been monitored for environmental and social consideration16.

10.81 As for the land, it is assumed that the land value of location of plants might be affected.

[16] According to the Pilot Project Team, following measures are conducted.
Water quality: BOD, COD, TDS, TSS of filtrate and lagoon are monitored based on the DAO No.35 Revised Effluent Regulations of 1990 every month.
Odor; Will take necessary measures if there are complaint from neighbours
Compost of dewatered sludge: Monitoring is conducted based on the Operation Manual on Rules and Regulations Governing Domestic Sludge and Spetache by DOH (2008).
Treating the saptage, safety of staff and placement of security guard are considered based on the Occupational Safety and Health Standards of the Labour Law.

11 SUB-ROADMAP FOR SOLID WASTE MANAGEMENT

11.1 Projection of Final Disposal Volume

11.1 The projection for the solid waste volumes until 2050 based on the estimated unit of per capita waste generation is shown in Table 11.1

Table 11.1 Projection of Solid Waste Generation Volume

	2016	2020	2030	2040	2050
Population	3,013,519	3,213,900	3,809,800	4,402,900	4,993,000
Waste Generation Rate (g/capita･day)	452	540	700	800	840
Solid Waste Generation (t/day)	1,362	1,736	2,667	3,522	4,194
Solid Waste Generation (t/year)	497,170	633,460	973,404	1,285,647	1,530,854

Source: JICA Study Team.
Note: The unit volume has been estimated based on the growth rate of economic development of the Philippines, and Japanese figures and its correlation.

11.2 Based on assumptions that organic waste shares 55% of the total generated waste and the recyclable materials at 25%, the recovery rates of these organic and recyclable materials would gradually increase from 30% to 95%, as shown in Table11.2. The waste recycling rates are projected to be 48% in 2030 and 76% in 2050. This is attainable with aggressive measures pursued for recycling. Thus, given these assumptions, the recycling rate will be able to reach the targets of 80% by 2050 under the Mega Cebu Vision 2050.

Table 11.2 Solid Waste Recycling Rate in Metro Cebu, 2016–2050

	2016	2020	2030	2040	2050
Recovery rate (%)	30	40	60	80	95
Recovered amount of Organic (t/day)	225	382	880	1,550	2,191
Recovered amount of Recyclable Materials (t/day)	102	174	400	704	996
Recycling rate (%)	24	32	48	64	76

Source: JICA Study Team.

11.3 If the contents of recycling from “Residual” are considered in the rate of recycling, the recycling rates in 2030, 2040, and 2050 would be 50%, 67% and 80% respectively. If disposal volumes are calculated each year by linear interpolation, the disposal volume in Metro Cebu would be decreasing, as shown in Table 11.3

Table 11.3 Solid Waste Disposal Volume in Metro Cebu, 2031–2050

	2031	2035	2040	2050	Total （2031-2050）
Disposal volume (t/day)	1,316	1,248	1,162	839	-
Disposal volume (t/year)	480,458	455,483	424,263	306,171	8,116,732

Source: JICA Study Team.

11.2 Summary of Sub-Roadmap Projects for Solid Waste Management

1) Objective

11.4 The protection of public health and the environment is ensured by establishing the solid waste management system underpinned by environmentally-sound methods and technology. For this purpose, cooperation and self-regulation among citizens and private sector as waste generators are encouraged, and public-private cooperation for sustainable business development for the medium to long term is promoted. Consequently, achievement of “Livability”, one of the Mega Cebu Visions, will be ensured.

2) Short-Term Project

(1) Comprehensive Solid Waste Management Master Planning for Metro Cebu

11.5 The conduct of a study is urgently needed to formulate a "comprehensive solid waste management master plan" for Metro Cebu based on the medium- and long-term perspectives. This is especially so considering the current insufficiency of information and situation analysis in this field. Developing the comprehensive SWM master plan should give important consideration to adopting environmentally sustainable and appropriate technology, promoting active involvement of local communities, and identifying effective and doable projects.

(2) Enhanced Waste Reduction and Recovery Program

11.6 Recognizing the complicated challenges in proper perspective, the measures to solve the issues need to be addressed as “one program.” This is the most important element for conducting the study for the abovementioned master plan. The program may be composed of the following projects:

(i) Initiate a Community-Based 3R Program (CB-3Rs);
(ii) Promote a rational "Source Segregation System" involving community activities;
(iii) Promote market-oriented recycling businesses / industries to form a resource recovery society;
(iv) Improve the guidelines for proper waste collection and transportation methods;
(v) Construct and upgrade the operation and maintenance of a city-wide MRF;
(vi) Upgrade existing composting facilities; and
(vii) Introduce a Waste Management Buy-Back Recycling System for electric products, with construction of a resource recovery center.

11.7 Project A is an integrated promotion of “Reduction”, “Recycle” and “Reuse”, so-called 3R, in each community as an activity unit, which is regarded as widely acceptable in the Philippines. Projects (ii) to (vii) are a set of solid waste management components for effective program implementation covering collection, transportation, MRF and composting.

11.8 The ongoing waste separation method at discharge source in Metro Cebu results in low accuracy and irrationality of classification of recyclable materials because it is widely assumed by collectors that the garbage will be further sorted at the MRFs. This method is never efficient. Further, due to limited accuracy in segregation of biodegradable waste, the quality of composts produced under these circumstances cannot be assured as some mixture of toxic substances is evident in the compost through the segregation activities.

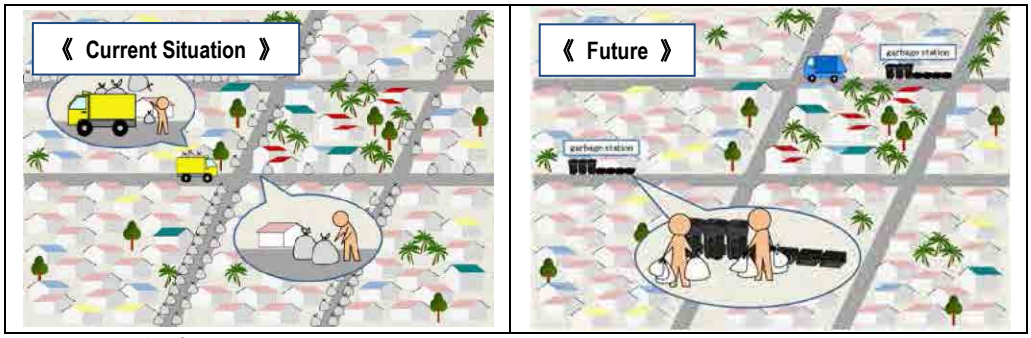
11.9 The “no segregation, no collection policy” has long been advocated in Metro Cebu. However, unreliable segregation at the discharge source and the current insufficient collection method cause stagnation of the recycling rate, an increase in disposal volume, and strain on the capacity of the disposal site. It seems that lack of thoroughness in segregation creates jobs for waste pickers, but this exposes them to unhealthy working conditions.

11.10 These issues originate from the institutional design related to segregation, collection method, and the way that the MRF should be. If the new sanitary landfill

follows the present practices, there would be a repeat of the issues besetting the Inayawan Landfill. To address these, the following segregation, collection and transportation methods, and modification of MRFs are proposed as short-term priority projects to establish a proper separate collection system:

(a) **Introduction of New Garbage Collection Method**

11.11 A new garbage collection method that combines the “garbage station method" with the designated “collection point method" is proposed, instead of the present “door-to-door collection method.” The new method will utilize collection bins at designated garbage stations. Each garbage station will generally service 30 households (approximately 150 people). For a barangay of 50,000 people, for example, 330 garbage stations will be placed. The new, modified collection method is conceptually shown in Figure 11.1.



Source: JICA Study Team.

Figure 11.1 Concept of Modified Collection Method

11.12 The most ideal material separation plan will be the one with seven kinds of segregation, i.e., “Organic”, “Plastic”, “Metal”, “Glass”, “Bottle”, “Paper”, and “Residual”, which is in accordance with the segmentation of recycling material commercial markets. However, it is quite difficult to implement since high public awareness for full compliance with these in a disciplined manner is a prerequisite. While considering the recycle service companies and market for recycled and reused products, the accurate segregation practices at discharge sources must be addressed in such a way that local residents can accept and undertake. Full-scale community-based consultations are required for this purpose.

11.13 A number of challenges are expected when the new garbage collection system is introduced. To address these, which may hinder the successful implementation of the program, continuing efforts such as the regular conduct of seminars in the barangays and community units are necessary. It will be effective if the seminars aim to arouse a sense of solidarity and encourage cooperation in communities, through the specific activities such as supervision of segregation and discharging activities, and managing collection bins by rotation among residents, systems and capacities of communities are developed.

11.14 At the same time, there is a need to establish a wider coordination body, such as an area-wide organization / council or a “Metro Cebu Solid Waste Management Council (MC-SWMC).” The wider coordination body will strengthen the cooperation among area-wide organizations and different LGUs to pursue collective solutions of common issues.

(b) **Upgrading of Existing Composting Facilities**

11.15 Regarding the program component F, it is proposed that a composting facility with a land area of 1,500 m^2 and a building floor area of around 800 m^2 be established. The facility shall be equipped with one wheel loader with bucket capacity of 2 m^3, two shredders for organic waste, and two screening machines for compost.

11.16 With such a facility, the total production of compost in the entire Metro Cebu is projected to reach approximately 112 thousand t in 2030 and about 280 thousand t in 2050, as shown in the Table11.4.

Table 11.4 Production Volume of Compost in Metro Cebu, 2030–2050

	2030	2040	2050
Composting Production (t/year)	112,428	197,990	279,955

Source: JICA Study Team.

11.17 Compost is expected to be marketed as fertilizer for agricultural use. It is estimated that the total potential volume of compost utilized for agricultural lands in Cebu Province is from 1,331,690 to 2,663,380 t/year depending on the planted area.[17] This is based on the assumption that fertilizers like compost are used in farm lands at 10 to 20 t/ha/year. Comparing the total potential volume, the projected volume of compost produced from composting activities in Metro Cebu would only satisfy approximately 5–6% of the total compost requirement, which means the production of compost will never be in over-supply.

(3) Action Plan for Environmentally Sustainable Closure of the Inayawan Sanitary Landfill

11.18 An action plan for the environmentally sustainable closure of the Inawayan Sanitary Landfill is required in order to transform the land area from a serious pollution source to a place with urban amenities such as recreational parks and for public facilities and residential areas.

11.19 To this end, there is a need to investigate the existence or non-existence, the level of contamination, the presence or absence and scope of dispersion and permeation from soil, leachate, sediments, and grass at the Inayawan Landfill with special attention to the report regarding the detection of mercury.

11.20 In the report on the "Fate and Transport of Mercury in the Inayawan Landfill, Cebu City Philippines," the actual situation and appropriate countermeasures could not be assumed due to the fact that the assessment of the soil at the site is based on the density of mercury and that sampling points are at superficial layers (0–15 cm). However, since "Fluorescent" and "Battery"are classified as "Residuals," it is highly possible that mercury detected at the Inayawan Landfill originates from these. Hence, the following scope of the investigation to determine current status is proposed:

(i) Confirmation of characteristics, structure, and specification of ground and seepage control work;
(ii) Dissolution test (existing landfill waste, soil deeper than the depth of seepage control work, soil around landfill);

[17] Commodity Profile, Office of the Provincial Agriculturist, Province of Cebu.

(iii) Measurement of mercury concentration in leachate (retained water near field region of batholith (seepage control work), retained water in the deep part of the pond); and

(iv) Measurement of mercury concentration in underground water around the landfill, and measurement of current direction and velocity.

(a) **Appropriate Measures Toward Environmentally Sustainable Closure**

11.21 Based on the above survey, the appropriate measures for environmentally sustainable closure should be thoroughly analyzed. The possible methods are roughly classified as (i) original position confinement method, (ii) excavation and removal, (iii) in situ extraction, and (iv) in situ decomposition.

11.22 The in situ extraction and in situ decomposition methods cannot be applied, considering the fact that mercury was widely and thinly detected at the Inayawan Landfill. Moreover, the excavation and removal method is neither practical nor implementable due to some actual conditions, that is, (i) another serious problem and/or difficulty in treatment and disposal of excavated wastes may occur; (ii) the volume of excavated waste to be moved is considerably large; and (iii) such a large volume of excavated waste might generate massive hazardous gas caused by quick excavation. Therefore, the original position confinement method is considered as the only measure applicable for the Inayawan Landfill.

11.23 The original position confinement method can be classified into two, namely: “vertical impervious wall method” and “capping method.” Both methods need a long period, say, ten years, to stabilize the landfill. As effective utilization of the old site cannot be expected for some time, the following considerations will be necessary:

(i) From the economical point of view, the capping method is considered superior. However, it cannot be recommended yet from an appropriate engineering standpoint because some significant facts cannot be clarified at present, i.e., the waste is accumulated at more than GL+10 m. Because of this, seriousness of some influence to groundwater and the situation of the bottom of the landfill are unknown.

(ii) On the other hand, in the vertical impervious wall method of construction, the landfill's environs are surrounded with steel sheet piles, steel sheets and cement, which increases the cost of construction. The appropriate length of the vertical impervious wall cannot be decided yet due to the uncertainty of whether or not there is impermeable stratum at the bottom of the Inayawan Landfill. Moreover, it also cannot be determined whether or not chemical feeding into the entire bottom of the landfill is necessary.

11.24 Based on the above considerations, a thorough site condition survey, which was earlier discussed, should be urgently implemented to explore the most appropriate engineering method for the environmental closure of the Inayawan Landfill. The mercury influence should be secured at any cost.

(b) **Necessity of Management of Mercury-Containing Waste**

11.25 The Minamata Convention on Mercury for international mercury management was adopted and signed on 19 October 2013. The convention comes

into effect 90 days after ratification by 50 countries, which is estimated to be sometime in 2016. Based on the convention, it is assumed that mercury waste corresponds to wastes such as fluorescent light tube and battery. In view of mercury detection at the Inayawan Landfill, the specification of other mercury contaminants and their selection criteria should be closely observed.

(4) Management System of Medical and Hazardous Waste Treatment

11.26 With regard to medical waste management, the joint policy between the DENR and the DOH was formulated in 2005, and with regard to hazardous waste management, the law to control toxic substances and hazardous and nuclear wastes, (RA 6969) was enacted. Although the incineration treatment is the most effective and safest for medical waste, the Clean Air Act (RA 8749) bans the burning of municipal, bio-medical and hazardous wastes, which emits poisonous and toxic fumes. It is, therefore, necessary to build treatment facilities which apply the appropriate environmental technology, including incineration, that can comply with the legal constraints and to institutionalize the appropriate management system. Taking into account the scale of economy and efficient management capacity, the involvement of the Provincial Government will be important.

3) Medium and Long-Term Projects

(1) Implement Comprehensive Solid Waste Management Master Plan for Metro Cebu

11.27 While the master plan will formulate specific projects which should be carried out according to medium-term perspectives and goals, the following infrastructure projects should be especially focused and implemented:

(i) Construction of two Sanitary Landfill Facilities under the condition of mutual management system of several LGUs;

(ii) Strengthening and prolonging the life of existing SLFs by optimizing their structure and efficiency; and

(iii) Implementation of closure of SLF including Inawayan Landfill.

(2) Develop Metropolitan Disposal Sites with Sanitary Landfill Standard

(a) Seamless Obligations of LGUs

11.28 Many LGUs did not establish sanitary landfills although it is the LGUs' responsibility to manage their own waste disposal. It is also irrational for the 13 LGUs of Metro Cebu to establish sanitary landfills with insufficient capacity for long-term use. Moreover, each LGU has a seamless responsibility to develop the final disposal site within its jurisdiction territory, when the existing landfill reaches its full capacity. Improper management and insufficient monitoring of a landfill will result in interspersing and spread of the risk of environmental contamination.

11.29 Furthermore, spreading of landfill facilities around Metro Cebu requires proper operation and maintenance systems over a long period of time. This is more important even after closure of the site, requiring sustainable environmental monitoring and practical countermeasures against the negative impacts.

(b) Necessity of a Metropolitan Organization / Council for Collective SWM

11.30 RA 9003 stipulates that a solid waste management board should be organized in the province, city and town. As of now, however, there exists no

institution for solid waste management which covers Metro Cebu. The solid waste management is not a specific issue which needs to have an area-wide organization for efficient decision and implementation. It is expected that the newly established metropolitan organization, MCDCB, having a collaboration/ cooperation of 13 LGUs, should play an active governance role in addressing common waste management issues including the development of an area-wide waste disposal site.

11.31 The administrative process with deliberation, coordination, consensus-building and planning towards developing the metropolitan disposal site(s) is a time-consuming process. It seems that the preparatory process, including site-selection, conducts of surveys, planning, designing, financing arrangement, bidding and their related procurement process need a considerably long period. Therefore, the target year for realizing the completion of the metropolitan site is set at the end of 2030.

(c) **Required Landfill Capacity for the Future**

11.32 The required sanitary landfill capacity from 2031 to 2050 in Metro Cebu is summarized in Table 11.5. The total required landfill capacity toward the year 2050 is significantly large by as much as 8.12 million m^3. Assuming that garbage shall accumulate at 10 m high on the average, it is computed that the land area of about 81 ha is required to accommodate this volume of waste.

11.33 As a phasing concept, provision of this capacity is proposed to be divided into stages, that is, the capacity of about 4.5 million m^3 needs to be provided during the period between 2031–2040, and another capacity of about 3.6 million m^3 should be assured during the period between 2041 and 2050.

11.34 If the land were available enough to accommodate such large capacity of solid waste, it would be more economically and technically feasible to develop a large scale facility rather than composite of several small scale facilities. However, in practice, it seems impossible to secure an inland landfill site with the capacity of several million m^3.

Table 11.5 Required Sanitary Landfill Capacity in Metro Cebu

	2031–2040	2041–2050	2031–2050
Required landfill capacity (m^3)	4,530,000	3,590,000	8,120,000

Source: JICA Study Team.
Note: The volume conversion factor is assumed to be 1.0 m^3/ton.

11.35 Because of the extreme difficulty in finding sufficient land for the final disposal sites, the development of seashore landfills within Metro Cebu might be one of the technical options[18]. The target wastes of a seashore landfill are those not floating in sea water. There is a need to establish a waste management organization not only to reduce disposal volume but also to prevent items consisting mainly of plastic waste from mixing into the landfill.

11.36 As selection of the construction site is always controversial, a study of necessary structure of the facility needs to be commenced as soon as possible,

[18] For example, in the case of the Minami Honmoku Final Disposal Plan in Yokohama City (Japan), the site consists of two blocks of 4.27 million m^3 and five blocks of about 4 million m^3.

taking into consideration natural disasters owing to frequent typhoons and earthquakes in Cebu. In addition, financial and economic viabilities as well as environmental issues for the metropolitan disposal site development project(s) should be assured, because hefty investment is required.

11.37 As a general concept, disposition and arranging metropolitan disposal sites into two sections (North and South), which divides Metro Cebu into two sub-metropolitan areas, are proposed. Selection of the two candidate areas is an extremely sensitive issue. Moreover, the disposition is highly related to principles and policy of future general waste management. It is proposed that, firstly, preparation of a master plan for total waste management in Metro Cebu from 2016 should to be started and, secondly, this should be followed by discussions and coordination on narrowing down and selecting candidate sites for construction of the area-wide disposal site as well as how the site should be operated and managed.

(3) Enhancement of Existing SLFs (Appropriate for Structure and Efficiency)

(a) Necessity of Appropriate Treatment

11.38 The service of the metropolitan disposal site is expected to commence in 2031. Until then, a sustainable operation and management of existing landfill facilities should be encouraged, otherwise a garbage crisis might take place in a considerably short period of time. At present, the private disposal site with 6.9 ha in Consolacion is being used by many LGUs. As unused areas of 30 to 40 ha more are available, the disposal site can last until 2030, given a proper manner of usage. It should be noted that the existing landfill is not endowed with equipment and sufficient capability for treating leachate to prevent the contamination of the underground water. The installation of a well-functioning leachate treatment facility at the Consolacion landfill site is a must. This should be coupled with an optimal sanitary landfill operation and management method in order to prolong its life till 2030.

(b) Measures for Improvement

11.39 In order to improve technical imperfections related to leachate treatment, there is a need to improve the criteria on the structure, operation and maintenance of such facility, and to legally require strict adherence to the technical guide and criteria. In terms of structure, it seems that the criteria on required components such as water catchment facility, adjusting facility (tank), water treatment facility, and sludge treatment equipment are stipulated. This can make the facilities comply with the stipulated requirements related to required capacities. There is also a need for detailed stipulations on matters to be observed, managed, and supervised for the proper operation and maintenance of the facilities, following the criteria on structure.

11.40 Many organic and hazardous waste components are included in the landfill waste in the Philippines. It would appear that leachate treatment is arranged by the structure of equipment focusing on removal of organic pollution load. If hazardous waste is managed poorly, and if hazardous waste is included in disposal waste, then hazardous matters are also found in the leachate. Therefore, items on effluent standards and proper management and organization for hazardous waste should

be included in the discussion of criteria for both composition and operation and maintenance.

(4) Introduction of Appropriate Technology of "Waste-to-Energy"

11.41 A waste-to-energy (WTE) plant treating hazardous and medical waste is anticipated to be operated by private companies in Lapu-Lapu City in the near future. However, all of the waste generated in Metro Cebu cannot be fully treated by such a single facility.

11.42 Consequently, there is a need to invite other groups to set up similar facilities. The plan for the Lapu-Lapu WTE project was examined in terms of the feasible capacity for investment. Based on the review, it is revealed that an ideal feasible facility scale of WTE may be more or less 75 t/day capacity, taking into account initial investment, O&M cost and rational profitability.

11.43 However, since incineration solution is not encouraged in the Philippines under the Clean Air Act (RA8749), appropriate and applicable WTE technologies need to be pursued for Metro Cebu. In this sense, a bio-gas based WTE system deserves examination, using methane gas generated from the closed landfill efficiently and convert it into fuel and power generation. The conduct of a feasibility study is needed for appropriate technology introduction in collaboration with private entities with such advanced technologies.

11.44 It should be noted that generated gas from closed landfill site cannot be recovered efficiently (capture), and that methane concentration is low, for the biogas power generation from methane recovery. It is expected to be difficult to ensure business profitability. Combination of compost from the organic waste (aerobic treatment) and methane fermentation (anaerobic treatment), as well as such as biogas power generation from methane fermentation can be implemented in the future.

(5) Implementation of Environmental Closure and Restoration Project for Closed Dumpsites

11.45 There are several closed dumpsites in Metro Cebu. Even sanitary landfills appear to be not properly implemented with environmental conservation measures. This increases significant risks of groundwater contamination and soil contamination in the long-run even after the dumpsites are closed.[19] The restoration projects have a tendency to increase in scale and cost as the number of years of neglect or non-action continues. In order to avoid huge investment social costs or even debt, it is proposed to undertake the proper treatment and environmental restoration projects for closed dumpsites at an earlier stage.

11.46 The roadmap comprises of a number of projects and programs as summarized in Table11.6.

[19] In 1997, many improperly closed dumpsites were recognized as significant social and environmental problem in Japan. A large amount of public investment and social costs were spent for the detoxification and restoration projects for those closed dumpsites.

Table 11.6 Proposed Projects for Solid Waste Management System in Metro Cebu

Term	Proposed Projects / Programs
Short Term	・ Formulate a Comprehensive Solid Waste Management Master Plan for Metro Cebu
	・ Enhance a Waste Reduction & Recovery Program - Community Based 3R/Waste segregation program (CB3Rs) - Improving collection and transport system (CTS) - Promotion of market oriented recycle business - Formulating guidelines for improving collection and transportation - Study for Construction, and upgrading the operation and maintenance of City-Wide MRF - Upgrading of existing composting facilities - Introduction of Waste Management Buy-Back Recycling System for electric products, etc. and Construct the Centers
	・ Conduct Action Planning and Implement the project for Environmentally Sustainable Closure of the Inayawan Sanitary Landfill
	・ Introduce an effective management system of medical waste and hazardous waste treatment facilities
Medium Term	・ Implement the medium-term projects/programs identified in the Comprehensive Solid Waste Management Master Plan for Metro Cebu
	・ Implement the Enhanced Waste Reduction & Recovery Program with special attention to develop following infrastructures - Develop Area-wide (Metropolitan) Disposal Sites with Sanitary Landfill Standard and Secure the land and Formulate Construction Plan for two SLFs
	- Enhance the Existing SLFs (Appropriate for Structure and Efficiency)
	- Implement Environmental Closure and Restoration Project for Closed Dumpsites in Metro Cebu
	・ Construct and upgrade the operation and maintenance of City-Wide MRF
	・ Construct the medical waste and hazardous waste treatment facilities and develop an appropriate operation and management system
	・ Conduct the feasibility study for appropriate technologies of Waste-to-Energy (WTE) facilities
Long Term	・ Implement log-term projects and programs proposed by the Comprehensive Solid Waste Management Master Plan for Metro Cebu
	・ Construct two (2) Metropolitan Sanitary Landfill Facilities based on the feasibility study to be conducted in the medium-term
	・ Enhance and disseminate the Waste Reduction & Recovery Program, based on the community-based 3R Movement
	・ Construct Waste-to-Energy facilities based on feasibility studies to be conducted in the medium-term
	・ Achieve the Mega Cebu Vision with a sustainable waste management system in Metro Cebu

Source: JICA Study Team.

11.3 Project Cost

11.47 It is necessary to implement a number of both soft and hard type projects towards the improvement of the solid waste management system in Metro Cebu. The indicative cost estimate of the proposed projects/programs was made and the summary is as shown in Table 11.7. It is noted that the direct costs for the master planning and feasibility studies are not estimated at this stage.

11.48 The total amount is estimated at approximately PHP2.75 billion out of which a project cost of PHP697 millionaire required for the short-term projects. In the short term, the cost of starting from formulating master plan and various policy-making and planning are estimated. In the medium term, approximately PHP943 million are estimated. In the long term, project cost will be estimated at PHP1,107 million since it will include the construction of regional landfill sites. In this term, the largest investment will be required for construction of two metropolitan sanitary landfill facilities, costing approximately PHP500

million.

11.49 It should be noted that the project cost estimated here indicates the required costs for entire Metro Cebu, and does not include the assignment which LGU will execute on their own budget.

Table 11.7 Indicative Project Cost Estimate for Solid Waste Management

Term	Proposed Projects/Programs	Year to Commence	Indicative Project Cost Mill. PHP
Short Term	・ Formulate a Comprehensive Solid Waste Management Master Plan for Metro Cebu	2015–6	-
	・ Enhance a Waste Reduction & Recovery Program	2015–6	287
	・ Conduct Action Planning and Implement the project for Environmentally Sustainable Closure of the Inayawan Sanitary Landfill	2015	328
	・ Introduce an effective management system of medical waste and hazardous waste treatment facilities	2015–6	123
	Sub-total		697
Medium Term	・ Implement the medium-term projects/programs identified in the Comprehensive Solid Waste Management Master Plan for Metro Cebu	–2020	205
	・ Implement the Enhanced Waste Reduction & Recovery Program with special attention to develop following infrastructures	–2018	287
	・ Construct and upgrade the operation and maintenance of City-Wide MRF	–2018	246
	・ Construct the medical waste and hazardous waste treatment facilities and develop an appropriate operation and management system	– 2018	205
	・ Conduct the feasibility study for appropriate technologies of Waste-to-Energy (WTE) facilities	2018	-
	Sub-total		943
Long Term	・ Implement log-term projects and programs proposed by the Comprehensive Solid Waste Management Master Plan for Metro Cebu	– 2030	205
	・ Construct two (2) Metropolitan Sanitary Landfill Facilities based on the feasibility study to be conducted in the medium-term	–2025	820
	・ Enhance and disseminate the Waste Reduction & Recovery Program, based on the community-based 3R Movement	–2025	82
	・ Construct Waste-to-Energy facilities based on feasibility studies to be conducted in the medium-term	–2025	-
	・ Achieve the Mega Cebu Vision with a sustainable waste management system in Metro Cebu	2030	-
	Sub-total		1,107
Total			2,747

Source: JICA Study Team.

11.4 Environmental and Social Considerations

11.50 The lack of appropriate and efficient waste management results in health hazards and discomfort. The causes of health hazards are classified as (i) human feces, (ii) industrial waste with potentially hazardous materials, (iii) air pollution caused by methane generation from open burning and abandoned waste, and (iv) infectious waste with risk which people are infected or contains pathogens that may be infectious. Many LGUs face difficulties to cope with the final disposal of waste under limited budgets and human resources. Owing to the fact that final disposal system are not managed hygienically, the quality of life of Metro Cebu citizens will worsen.

11.51 The LGU has a mandate to develop a waste management master plan, to reduce waste, to promote recycling, and to manage residual. However, few LGUs are able to prepare a comprehensive master plan. Having an environmental management framework

plan up to 2015 for Cebu Province, it should play the role of policy guidelines for respective LGUs. However, as seen by the dispute of transporting solid waste exceeding each LGU area, such as Cebu, Mandaue and, Lapu-Lapu, there is limitation for managing overall solid waste issues by a single LGU. The provincial government must strengthen the institutional building for guideline, public hearing and assessment of solid waste management projects based on the various environmental laws that the LGUs have to comply with. Many issues beyond respective LGU boundary needs to be tackled.

11.52 Thereby, various policy measures/ projects can be introduced based on assessment of waste generation volume, recycling methodologies, environmental impact of landfill by the experts and with consultation among LGUs and private sector. Finally, it is important to build a system to apply economically viable and environmentally sustainable policies. Since there are valuable good examples of solid waste management by LGUs and NGOs in the Philippines, it is desirable to develop the solid waste management master plan based on those lessons and best practices.

12 SUB-ROADMAP FOR SMART SRP DEVELOPMENT

12.1 Current Energy Situation in the Philippines and in SRP

1) Energy Situation in the Philippines

12.1 The Philippines depends on fossil fuel for as large as 60% of its energy supply. Renewable energy, including geothermal and biomass energy, accounts for a substantial share of up to 40% of total supply. The country's energy self-sufficiency ratio is as high as 60%.

12.2 With modernization and an increasing population, Philippine energy demand is expected to increase nationwide. However, supply has not been able to catch up with this growing demand. In addition, the cost of providing power has risen with increasing fuel cost. Moreover, as typhoons frequently occur in the Philippines, the importance of generating power supply by off-grid (on-site) is also recognized.

12.3 Pursuant to Section 31 of the Electric Power Industry Reform Act of 2001 (EPIRA), the operating and regulatory policies and guidelines for the implementation of Retail Competition and Open Access (RCOA) were put in place to guide the retail market participants and ensure their smooth transition to the retail market. Today, as de-regulated energy suppliers for customers with monthly average peak demand of at least 1 MW, retail electricity suppliers (RES), local RES, etc. are registered by the Energy Regulatory Commission (ERC) and have started supplying electricity (see Table 12.1).

Table 12.1 Summary of RCOA Registration (as of April 2014)

Participants	Applicant	Registered	Total Registered and Applicant
Retail Electricity Supplier	4	16	20
Local Retail Electricity Supplier	6	7	13
Retail Metering Service Provider	5	23	28
Contestable Customer	30	324	354
Supplier of Last Resort	6	3	9
Total	51	373	424

Source: "24th Electric Power Industry Reform Act Implementation Status Report," Department of Energy.
Note: RCOA – Retail Competition and Open Access.

2) Energy Situation in the Visayas Region

12.4 Similar to the country as a whole, 60% of electricity in the Visayas Region is supplied by fossil fuel. Geothermal power shares as high as 37%, even though Cebu has no geothermal plant but gets its supply from the power plants in Negros Island and Leyte Island through the power grid. Biomass shares only a small 2% of the total power supply while the shares of hydro, solar and wind power are negligible.

3) Energy Situation in Metro Cebu

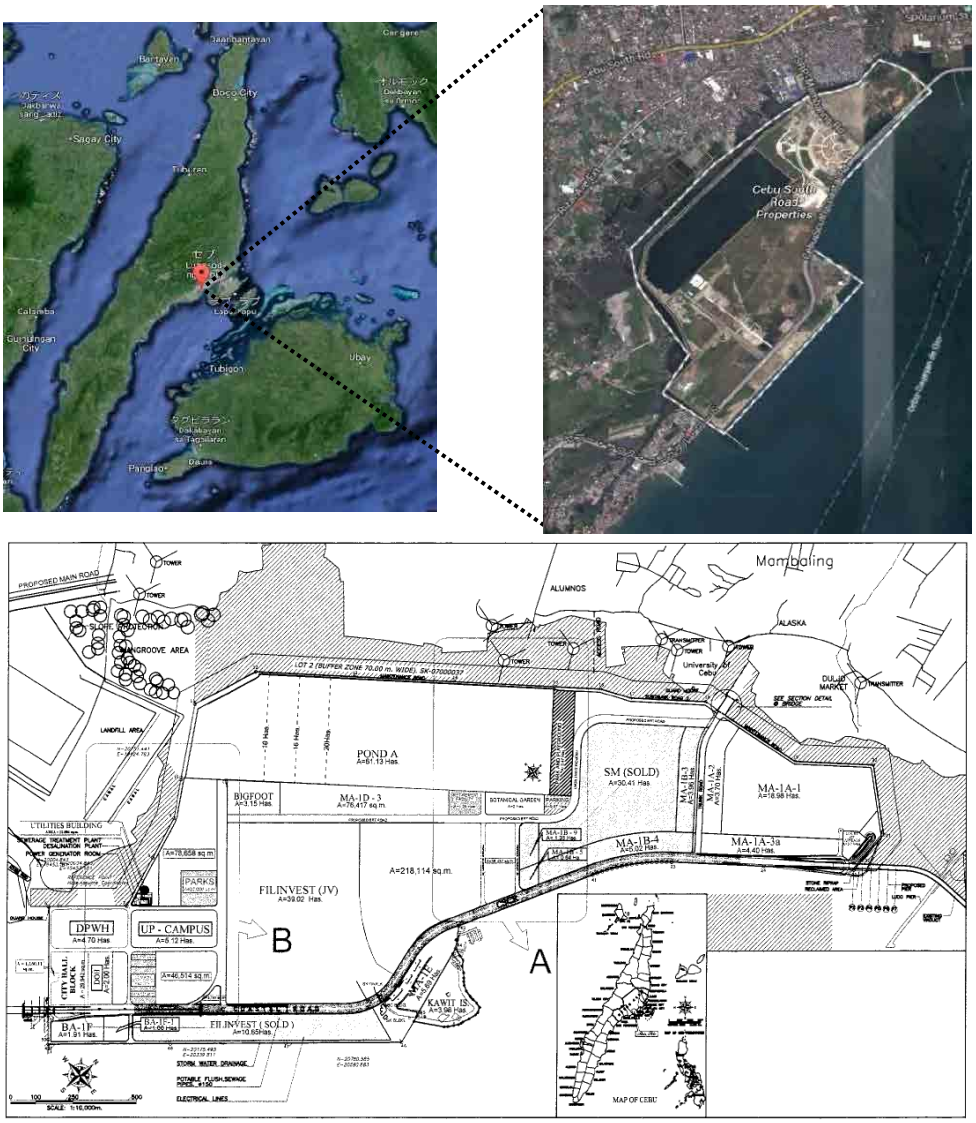
12.5 Three companies, namely VECO, CEBECO and MECO, distribute power in Cebu and Mactan islands. Many power generating companies exist, such as KEPCO, TREDO Power, EAST Asia, etc. Shell, among others, supply oil and natural gas. Since there is no gas pipeline being built nor a demand for warm air/water, there are few examples of heat supply services.

12.2 SRP Development and Energy Demand

1) Development Situation in SRP

12.6 South Road Properties (SRP) is a 300-ha reclamation area and a newly developed road which was constructed under a Japanese yen loan. Cebu City will finish repayment of the yen loan in 2025. Since they were short of landfill cost, there is an unfilled portion that became a pond called “pond A” in the developed area (see Figure 12.1).

12.7 Current occupants in SRP include private companies and public institutions in various stages of development/construction (see Table 12.2). These include government offices, a university, a resort, residential buildings, and the SM Group's seaside shopping mall which will be the biggest shopping mall in Metro Cebu that targets to operate in 2015.



Source: SRP Project Office, Cebu City.

Figure 12.1 SRP Map

Table 12.2 List of Current SRP Occupants

Facility Type	Occupant	Condition	Land Area in Possession (m^2)
Shopping Mall, etc.	SM Prime Holdings, Inc.	Sale	30 ha (304,100 m^2)
Residence	Filinvest Land, Inc.	Joint Venture	40 ha (400,000 m^2)
Integrated Resort	Filinvest Land, Inc.	Sale	10.6 ha (106,148 m^2)
Movie Studio	Bigfoot Studios, Inc.	Lease (2007–2032)	3.1 ha (31,127 m^2)
University	University of the Philippines	Donation	5 ha (51,372 m^2)
Business (Department of Public Works and Highways)	National Government	Donation	5 ha (42,936 m^2)
Business (Department of Health)	National Government	Donation	2 ha (20,000 m^2)
Business (Court of Appeals)	National Government	Donation	0.7 ha (7,123 m^2)
		Total	96.3 ha (962,806 m^2)

Source: SRP Project Office, Cebu City.

2) Energy Supply and Demand in SRP

12.8 The power supply situation in SRP is characterized by the following:

(i) No gas supply Infrastructure has been installed (e.g., neither LNG terminal nor gas pipeline).

(ii) SRP is a seaside coastal area rich in land to accommodate renewable energy facilities. Therefore, it has potential for developing renewable energy, such as solar energy (electricity and heat), wind power, tide power, wave power, etc.

(iii) Basic electricity supply infrastructure such as grid, utility poles, substations, etc. have already been installed.

12.9 Energy demand in SRP is described as follows:

(i) A shopping mall, leisure facilities and residences have large energy demand.

(ii) The estimated electricity demand as a whole in SRP is 50–60MW. Now, the electricity demand is about 2 MW at most because most of facilities are still under construction.

(iii) The average daily maximum temperature in SRP is over 30℃ all year round. Therefore, demand for air conditioning (basically cooling) exists all year round.

(iv) The major portion of energy demand will go to cooling / air conditioning (electricity), refrigeration equipment cooling (electricity), and lighting. There will also be other components requiring energy, for example, office devices and cooking gas (propane), etc.

(v) Heat demand is less required. If any, hot water and heat in the house are often supplied by electric heaters in the Philippines.

(vi) A seasonal fluctuation of power demand is not obvious. Peak demand in diurnal variation pattern is estimated for 1:00–3:00 pm, the hottest hours, because cooling air conditioning systems would be hard at work.

12.3 Developing a Smart SRP

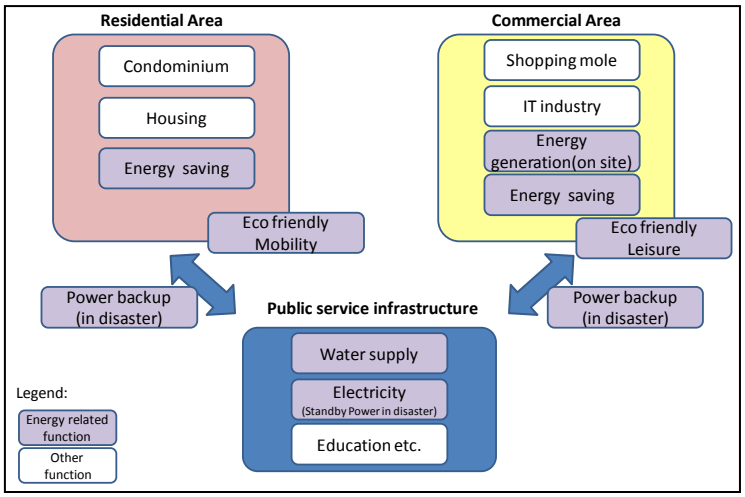
1) Concept of a Smart SRP

12.10 Cebu City intends to promote SRP as a base for the IT industry and a hosting place for retired technical and skilled overseas labor. Thus, SRP aims to be an IT-concentrated industry model area for Metro Cebu. To this end, a stable power supply and an effective disaster response system need to be pushed forward. In addition, investment incentives such as tax benefits, simplification of import procedures and working

visa for foreigners, among others, will be beneficial.

12.11 A Smart Area includes residential and commercial areas. It is required to provide public services including water supply, sewage and power supply, and software services including education in respective zones utilizing efficient infrastructure.

12.12 The commercial area will provide the suitable requirements for the IT industry (e.g., stable power supply, air conditioning, backup system for BPO, call center, data center, software developer, etc.) and retirees from abroad (e.g., language support, hospital, re-education service, etc.). The residential area will provide the residences for SRP's industry / commercial sector workers and retirees from abroad (see Figure 12.2).



Source: JICA Study Team.

Figure 12.2 Basic Concept of Smart Development for SRP

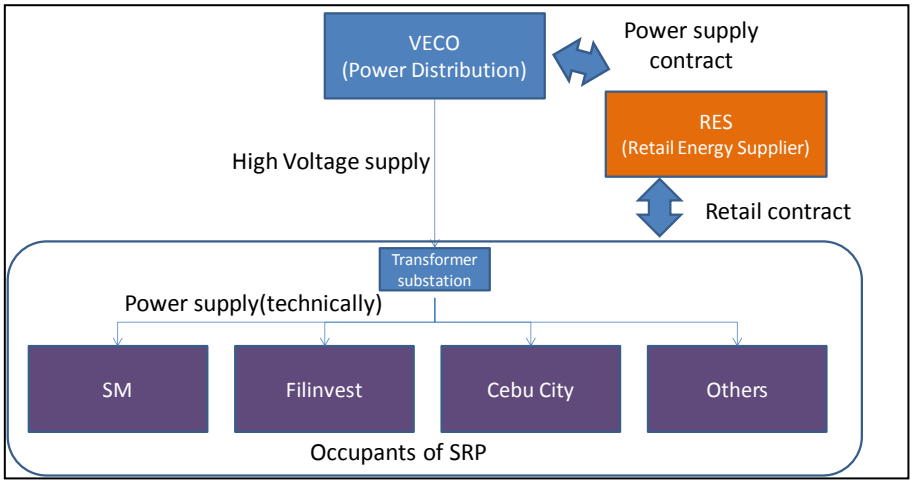
2) Business Implementation System

12.13 To realize the Smart SRP concept, a comprehensive power supply system is required. This would include utilizing a RES system and collaboration between a power distribution company and RES to supply electricity (see Figure 12.3).

12.14 Two advantages of jointly establishing RES instead of individual contracts of tenant companies and power supply companies in SRP are as follows:

(i) It is possible to generate relatively less deflect electricity demand by combining various demand curve components even as each of the facilities has a large fluctuation. Thus, the combination enables to sub-duct peak time consumption, generates relatively smooth electricity demand, and enables to benefit from a low unit price.

(ii) It is possible to make use of such advanced energy-saving technologies via energy service consulting by RES to tenants. Specific analysis of advanced technology is described in the next section.

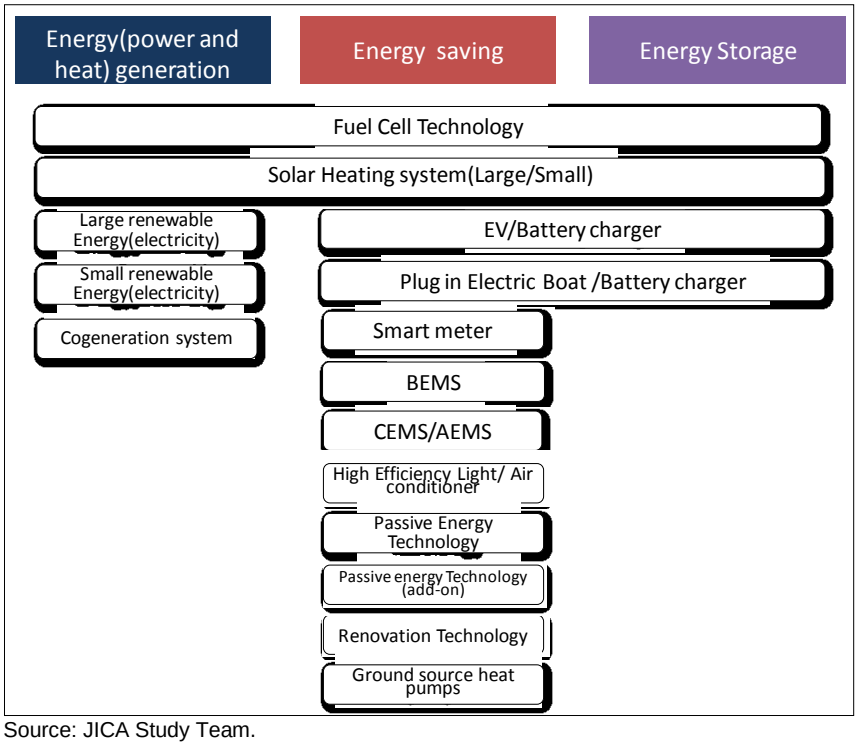


Source: JICA Study Team.

Figure 12.3 Energy Distribution Framework in SRP

3) Application Examination of Advanced Technology

12.15 This section discusses the technology elements potentially applied to a Smart Area. The major technology elements often discussed are shown in Figure 12.4. These are chosen mainly from Japanese technology, considered to have fewer barriers for introduction, and can be applied to SRP. These energy-related technology elements can be classified into three types, namely energy generation, energy saving and energy storage.



Source: JICA Study Team.

Figure 12.4 Examples of Smart Technology Elements in Japan

12.16 SRP is a newly developed area requiring comprehensive development of both software and hardware facilities. No gas infrastructure has been installed. As SRP is located in the tropical zone and has no distinct rainy season, it has a large potential to utilize solar heat energy. On the demand side, a large potential is predicted for cooling air

conditioning and lighting demand in shopping malls, offices, etc. This also takes into account that SRP also plans to develop leisure facilities and, therefore, transportation should have a desirably low environmental load.

12.17 As a result, the following technology elements have been listed as suitable technology elements for SRP development: large renewable energy (electricity), solar heating system (solar cooling system); passive energy technology (Total Heat Exchanger), high efficiency light / air conditioner (this time lightning only), BEMS, EV/battery charger and plug-in electric boat/ battery charger (see Table 12.3).

Table 12.3 Overview of Smart Technology Elements Suitable for SRP

Name of Smart Technology Elements		Overview of Technology
1	Large Renewable Energy	Introduction of high-quality solar panels at low price.
2	Solar Heating System	Hot and cold water generation system using solar alternative to fossil fuel.
3	Passive Energy Technology	Mechanism for saving energy by using natural forces. To add heat and steam taken out from the exhausted air to intake-air (total heat exchanger) etc.
4	High Efficiency Light / Air conditioner	Illumination system by CCFL (cold cathode tube) which has the longer life and higher color rendering than fluorescent light
5	BEMS	Building energy management system to visualize and control energy consumption.
6	EV / Battery Charger	Introduction of electric vehicles and charging facilities as transfer means of transportation such as taxi, jeepney, bus and car-sharing, etc. within SRP area.
7	Plug-in Electric Boat / Battery Charger	To reduce carbon dioxide emission, introduction of plug-in electric boat which is powered by battery as traffic mode between SRP and Cebu City / Mactan Island.

Source: JICA Study Team.

12.4 Summary of Sub-Roadmap Projects for Smart SRP Development

1) Short-Term Projects

12.18 In the short term, an effort to create an optimal energy supply-demand structure should be mounted within SRP, regarding SRP as a unified area. When creating the structure, a united cooperative organization should be organized. It is effective to structure an energy service system reasonably utilizing RES or a similar system. Thus, demand is considered for the whole area and the corresponding supply is totally managed as an area. This can be a prototype model for area energy management. On this basis, establishing a consanguine, flexible and open consultative mechanism where both the power distribution company and the consumers participate, is among the results of this project.

12.19 When the platform is consolidated, starting with technology introduction centering on energy saving technology step by step is considered effective from a cost perspective. Then, energy saving technology such as a solar heating system, which can be introduced on site, chosen from renewable energy and which corresponds to appropriate demand should be introduced with minimum energy loss.

12.20 On the other hand, the share of renewable energy such as geothermal energy is already quite large in the Philippines. As the FIT price of solar, wind and other variable power sources is set relatively low, the electricity distribution companies have struggled with the handling of renewable energy. Therefore, in this area, it is not highly likely to introduce renewable energy technology on a large scale and applicable to other areas.

12.21 Following the construction of an area energy management platform, visualizing energy demand centering on electricity should be prioritized. It is necessary to develop a demand control system utilizing means suitable for the SRP area. As discussed above, it is

most important in the short term to prevent excess energy consumption and to lower sourcing energy cost.

12.22 For introduction of technology elements, development of infrastructure including heat utilization, energy saving, wastewater treatment and more should be considered and promoted. To promote infrastructure development, it could be useful and beneficial to provide technology introduction support for small and medium-scale enterprises (SMEs) conducted by the Japanese Government, and infrastructure development support applying PPP and other subsidies. Furthermore, introduction of the JCM scheme can be considered. JCM scheme aims to reduce CO_2 with the introduction of Japanese technology, which has already been promoted in 13 countries.

2) Mid-Term and Long-Term Projects

12.23 For long-term implementation, the knowledge acquired in efforts of SRP as a model area can be applied to other similar areas in Metro Cebu.

12.24 For example, the commercial areas near Cebu City or other PEZA areas can apply the same incentive for development as SRP. And then, it will widely spread through other areas because the price of technology's components will adequately decrease and the know-how to use these technologies will be adequately understood.

12.25 It is necessary to promote the orientation which improves the self-sufficiency rate of energy, raises the practical use rate of renewable energy, and encourage energy savings for every sector based on the trend, for example, in domestic resources and renewable energy development and the trend in electric power system reform.

Table 12.4 Sub-Roadmap Projects for Smart SRP Development

Term	Item
Short-Term	・ Establishment of unified management system of energy supply and demand in SRP. (2015–2017) ・ Introduction of management system to visualize energy demand. (2018–2020) ・ Introduction of individual technology elements which are suitable for each area. (2018–2020)
Mid-Term and Long-Term	・ To expand knowledge and know-how obtained from SRP efforts to Cebu City and the whole Metro Cebu area. (2021–2050) ・ Establishment of the most suitable energy management scheme based on resource development in the Philippines, development of renewable energy, and trend of power system reform. (2021–2050)

Source: JICA Study Team.

13 SUB-ROADMAP FOR METROPOLITAN GOVERNANCE

13.1 Need for Metropolitan Governance in Metro Cebu

13.1 Metro Cebu has established metropolitan-wide development administration for several times in the past. The regional administration offices were organized as project offices for the Central Visayas Rural and Urban Project Office (CVURPO) in 1981, the Central Visayas Regional Projects Office in 1983, and the Metro Cebu Development Council (MCDC) in 1997. The MCDC was designed as a coordinating body tasked with coordination, preparation, and monitoring and implementation of development planning, programs and projects.[20] Though the bill for the creation of "Metropolitan Development Authority" was brought in the House of Representatives by the Senator of Cebu in 2001, the bill remained unacted. Having been keenly aware of the importance of developing Metro Cebu in integrated and coordinated manner, the MCDCB consisting of Provincial Government as well as 13 LGUs, National Government Agencies, Business Communities and Civil was established with the strong support of the Roberto Aboitiz Foundation, Inc. This became a unique plat form to judge how to plan and implement projects in context of the area-wide Metropolitan Management of Cebu.

13.2 The population growth and expansion of urban areas in the last decades have raised the needs for metropolitan governance in Metro Cebu. Metro Cebu has shown higher population growth than those of the national average as well as Metro Manila in last two decades. In Metro Cebu, urban population accounts for 80% according to Population Census 2010 and urbanized area is estimated to be about 15.1% of total land in 2014.[21] Though the demographic trend indicates declining population growth in the core city of Cebu, the suburban areas are experiencing sprawl. The adjacent LGUs such as Consolacion, Liloan, and Lapu-Lapu are growing rapidly at more than 4% per annum.

13.3 As a result of such rapid growth, various development issues have appeared in Metro Cebu, which include deterioration of living environment due to concentration, chronic traffic congestion, delay in development of roads and infrastructure, insufficient coverage of public services provision, shortage of affordable housing, increased informal settler families, and so on. These problems and issues cannot be solved by separate actions of each LGU, due to their characteristics of economic and spatial interconnectedness and interdependence. Thus, metropolitan governing institutions to guide and regulate development are urgently required for an integrated and balanced development of Metro Cebu. In particular, there are six areas identified where interventions are required at the metropolitan level.

(i) Coordination of development planning (especially land use) and growth management;

(ii) Transport planning and traffic management;

(iii) Affordable housing (for low-income households);

(iv) Disaster risk reduction and environmental management – flood control, water resource management, and solid waste management;

[20] Mercado, Ruben G. 1998. Metropolitan Cebu: The Challenge of Definition and Management. Discussion Paper Series No. 98-15 (Revised). Philippine Institute of Development Studies.
Gonzales, Glenda R. 2004. Metro Cebu: A Metropolitan Area in Need of Coordinative Body. Discussion Paper Series No. 2004-49. Philippine Institute of Development Studies.

[21] Urban area data from JICA Study Team.

(v) Enhancing competitiveness; and

(vi) Strengthening public finance and project financing.

13.4 For balanced growth of Metro Cebu, development plans of the LGUs need to be coordinated. In particular, land use and transport planning should be integrated. However, not all the LGUs have an updated Comprehensive Land Use Plan (CLUP) and coordination efforts among their plans were rarely taken at the metropolitan level before the MCDCB's initiatives. As a result, their land use policies are inconsistent and a number of similar or overlapping projects are proposed by the LGUs. Hence, integration and coordination of land use, transport, and infrastructure guided by metropolitan-wide development directions is necessary for efficient land use, environmental protection, and development of livable urban environment.

13.5 Importantly, transport planning including mass rail transit, as a key component for growth control, must be prepared and implemented through deliberation and discussion with relevant organizations, since it determines urban structure and development directions of Metro Cebu. Traffic management system should also be installed, covering at least the major urban centers of the metropolitan area, since traffic congestion within and toward the core cities is one of the issues which need collaborative action at the metropolitan level.

13.6 Meanwhile, good quality and sufficient quantity of affordable housing should be strategically developed, together with transport development to reduce backlog of housing and fill the increasing demand of population growth. Future residential areas shall be located in the hazard free areas, and be identified in the land use plan in order to prevent unregulated development in steep slope or environmentally sensitive areas. Affordable housing for low-income families' needs to be incorporated in transit oriented development (TOD) together with the development of mass rail transit.

13.7 Metropolitan level initiatives for disaster reduction and environmental management are required for strengthening flood control, which is the most serious disaster in Metro Cebu, protection of water resource, prevention of pollution, and promotion of waste water treatment and metro-wide solid waste management. In particular, water supply is the most critical development issue in Metro Cebu. Due to the interrelated nature of disaster and environmental issues, an integrated approach including regulation of ground water use, protection of watershed areas, and installing waste water treatment facilities is effective in addressing this water related issue, which contributes to reduction of flood risk, water resource management, and reduction of pollution.

13.8 Although Metro Cebu has been an attractive destination for foreign direct investment as the second largest urban area in the Philippines, due to globalization, competitiveness of a metropolitan area matters more than before in intensifying competition with Asian metropolises. Hence, the strategies for economic development need to be developed for enhancing competitiveness of Metro Cebu as a whole, taking advantage of its existing assets and resources such as the international airport, industrial estates in PEZA, tourism, BPO, and highly skilled labor.

13.9 Lack of financial resources for infrastructure development is one of the impending issues in Metro Cebu. The rapid population growth and urbanization, and need for improvement of competitiveness place pressure on infrastructure development for transport, water supply, and waste water treatment, including park and cultural facilities for

amenity. For infrastructure development, therefore, it is necessary to improve financial bases of LGUs and develop project financing schemes. Project financing for infrastructure development can include public private partnership (PPP), foundation of development corporations / enterprises, or establishment of a development fund. At the same time, technical support should be provided for the LGUs in the field of project implementation and management. It may be important to lobby the national government agencies for project implementation support and allotment of financial resources.

13.2 Models of Institutions for Metropolitan Governance

1) Models of Institutions for Metropolitan Governance

13.10 There are two models of institutions for metropolitan governance: (i) metropolitan authority model, which is to establish certain form of formal authority covering a metropolitan area, and (ii) inter-municipal cooperation model, which is to manage metropolitan issues and development through inter-municipal cooperation. The metropolitan institution models are eventually categorized into four types in accordance with five characteristics of territorial match with metropolitan area, multi/ mono-purpose, political legitimacy, financial resources, and intergovernmental relationships as shown in Table 13.1. In the real world, however, metropolitan regions develop a variety of forms of the governance.

Table 13.1 Metropolitan Governance Institution Models

Models	Metropolitan Authority Model		Inter-municipal Cooperation Model	
	Metropolitan Authority	Special District	Inter-municipal Association	Inter-municipal Agreement
Territorial Match with Metropolitan Area	Matched	Not always	Not always	No
Multipurpose	Multi-purpose	Mono-purpose	Multi-purpose	Multi-/ Mono-purpose
Political Legitimacy	Direct / Indirect	Indirect	Indirect	Indirect
Financial Resources	Own resources / central / provincial governments	Own resources / central / provincial governments	Provincial / local government	Local governments
Inter-governmental relationships	Autonomous / part of provincial governments	Autonomous / part of central / provincial government	Association of local governments	Selected local governments
Examples	• Greater London Authority • Vancouver • Poland • Metro Manila Development Authority	• Transport authority • Special district (water, drainage & sewerage, school, etc.)	• Bolongne • Metro Naga Development Council	

Source: JICA Study Team, developed based on Rodriguez and Oviedo (2001) in Klink (2008) and Lefevre (2008).

2) Metropolitan Authority Model[22]

(1) Metropolitan Authority

13.11 Metropolitan authority model is basically to create a new form of body for metropolitan management. A metropolitan authority is established to cover the entire

[22] The discussion of section 9.3. 2) and 3) is based on:
Klink, Jeroen. (2008). Recent Perceptives on Metropolitan Organization, Functions, and Governance and Christian. Lefevre (2008) Democratic Governability of Metropolitan Areass. In Eduardo Rojas, Juan R. Cuadrado-Roura, and José Miguel Fernández Güell (eds.), Governing the Metropolis: Principles and Cases. Inter-American Development Bank: Washington D.C.
Lefevre, Christian. (2008). Democratic Governability of Metropolitan Areass. In Eduardo Rojas, et. al. (eds.).
Bird, Richard and Enid Slack (2008). Fiscal Aspect of Metropolitan Governance. In Eduardo Rojas, et. al. (eds.).

metropolitan area where the authority is responsible for development planning, economic development, land use, transportation, environmental management, public and social services, etc. The authority has its own financial resources from taxes, user charges, and other revenues and transfer from the national government. Strong political legitimacy can be established through direct election of a leader and council members of the authority. The authority can be autonomous or founded under the local government, such as a province. Establishing a metropolitan authority is a typical practice for metropolitan management, which has been adopted in urban areas all over the world. However, it has been criticized for inefficiency and ineffectiveness in public service delivery and other expected roles. Recently, a new type of "weak" authority, for example which does not have functions of project implementation or relies on consensus of local government, has become more prevalent than a "strong" authority with autonomy and responsibilities covering most government functions. The examples include the Greater London Authority, Metro Vancouver. Metro Manila Development Authority (MMDA) is also one of them, though its authorization system is different from those of others.

(2) Special Purpose District

13.12 Special purpose districts are established within a metropolitan area for provision of a certain public service, such as transport, water, sewage, drainage, and school. Considering economies of scale and externality, many special districts are designed to provide mono-sectoral service and receive user fees and charges, and occasionally subsidies and grant from the central and regional governments. Besides special districts for public service provision, there are other types of districts such as special economic zones.

3) Inter-municipal Cooperation Model

(1) Inter-municipal Association

13.13 In recent years, flexible arrangements for metropolitan governance, so called "new regionalism," has emerged around the world. This model is to establish an inter-municipal association or council based on voluntary cooperation and collaboration among local governments. This type of associations differs from a formal government such as a metropolitan authority which has an established jurisdiction over the metropolitan area discussed before. Its decision making mechanism relies on consensus among local governments, respecting autonomy of local governments. An inter-municipal association or council becomes a venue for coordination and cooperation of planning and implementation of development plans, projects and programs. Primary financial sources of the associations are often contributions from local government members. The examples of inter-municipal associations include Bologna and Milan, Italy, and Metro Naga Development Council (MNDC) of the Philippines.

(2) Inter-municipal Agreement

13.14 The inter-municipal agreement model is one where local governments make inter-municipal agreements or develop voluntary cooperation arrangements, and based on the agreements, jointly provide public services, and develop and implement spatial plan and projects. This model is the most flexible model with a wide variety of forms, including PPP and informal consensus to more formal written agreements.

Financial resources are basically contributions from local governments.

13.15 The Japanese model is one of the typical cases. In Japan, LGUs which cover area-wide administration can form a “cooperative for mutual partial administration” to provide public services jointly. While respective LGUs provide their public services fundamentally, those which might be neither financially viable, nor effective for human resource in terms of scale merit, such as firefighting, referral hospital services and/or solid waste management are services to jointly be provided by the cooperative organized by respective member LGUs. LGUs endorse partial authorization to the cooperative. Provincial governor’s approval is required for establishing these cooperatives for provision of such multi-LGUs collective services.

13.16 On the other hand, the case of establishment of “LGUs Alliance“ has been increasing recently in Japan. By forming an alliance with strong coordination among LGUs, partial authorization for provision of national government services can be transferred to this alliance, especially on advanced medical care and higher education.. The approval of the Minister of Internal Affairs and Communications is required for the establishment of a LGUs alliance. Selection of chief and representatives of the alliance are legally accepted by direct election of residents, but mostly the selection is approved by the concerned local government assemblies.

4) Issues on Development of Metropolitan Governance

(1) Functional, Political and Social Legitimacy

13.17 The institutions for metropolitan governance must be established on functional, political, social legitimacy. Needs for metropolitan institutions are translated into functional legitimacy, including demand for integrated and balanced growth, logic of efficiency or economies of scale, and necessity for policy and cooperation to address externality issues. Functional legitimacy of metropolitan institutions is validated only by effective implementation of expected functions.

13.18 In order to establish functional and effective metropolitan institutions, responsibility and tasks of each government and organization, i.e., what functions and authorities are integrated at or devolved to the metropolitan institutions, must be clearly delineated. However, determining distribution and transfer of authorities is primarily a political process. In the countries where strong local autonomy is guaranteed in a decentralized political system, such as the Philippines, political legitimacy of metropolitan institutions must be confirmed by acceptance of all the local governments in a metropolitan area, appropriate coordination and decision making arrangement to mediate power difference between a core city such as Cebu City and other LGUs, and foundation of democratic institutions.

13.19 Lastly, social legitimacy means whether or not Metro Cebu is acknowledged as one integrated community sharing culture, history, and future by citizens, or in other words, whether or not citizens have a sense of belonging to Metro Cebu.[23] According to the Home Interview Survey (HIS) in this study, Mega Cebu vision is recognized by only about 5% of the respondents. Thus, upon building a metropolitan regime in future, it is necessary to improve the awareness of the community as Metro Cebu.

[23] Lefevre (2008). Ditto

(2) Selection of a Model and Development Process of Metropolitan Governance Institution

13.20 Selection of an institutional model for metropolitan governance is influenced by political and socio-economic conditions of the region and the existing and history of cooperative relations and coordination system between governments. There is neither one-size-fits-all answer nor right answer in selection of a metropolitan institution. In addition, a long period of time is required to build institution of metropolitan governance.[24] Necessity and legitimacy of metropolitan institutions should be neither given from the upper level of the government, nor desirable to force the region to adopt a certain type of institution. Such top down authorization is not logical in a democratic sense. An appropriate form of metropolitan institution by public participation will emerge from a process where regional problems and issues are clarified and discussed, and a consensus of relevant organizations is formed through deliberation and experience of inter-governmental cooperation in implementation of actual projects and programs. Therefore, designing a process is crucial for establishment of metropolitan institutions.[25]

13.21 In fact, many of the existing metropolitan institutions were born as a result of the past experiences of regional cooperation and collaboration to solve issues and implement projects. Therefore, successful metropolitan institutional development requires a preparation period of a process toward metro-wide cooperation. That process should be supported and accelerated by providing incentives to encourage inter-municipal cooperation, setting up forums where stakeholders are networked, and issues and policies are discussed, and taking action to achieve goals at the metropolitan level.[26]

13.22 Through trial and error in such process, the most appropriate metropolitan institutions will be explored and then established with confidence and consensus. In particular, a first step toward metropolitan institutions is to examine coordination and decision making mechanisms by sector, to share information and enhance capacity of relevant organizations, through planning and implementation of projects at the metropolitan level.

(3) Role of the State

13.23 Though initiatives from local governments are primarily a driving force in the institutional development, creation of a new metropolitan authority such as the Metro Cebu Development Agency should be approved by the Congress. The national line agencies such as NEDA and DPWH have essential roles to be played in facilitating discussion, assisting coordination, and providing support in the process of devolution of authority and allocation of roles and functions, securing financial resources, and providing capacity building for project implementation. The national government might have to intervene when a problem arises among local governments. While the support by national government agencies for technical, legal, financial support is essential, provincial government is required to take an initiative of policy consultation and

[24] Klink (2008) and Lefevre (2008). Ditto.
[25] Lefevre (2008). Ditto.
[26] Kübler, Daniel.(2005). Problems and Prospects of Metropolitan Governance in Sydney: Toward 'old' or 'new' regionalism?. City Future Research Center. Research Paper No. 2.

establishment of metropolitan institutions at the same time. Currently the MCDCB is installed under the RDC; the chairperson of the Metro Manila Development Authority is appointed by the President; and Metro Naga Development Council receives allotments from the national government. These relationships between the metropolitan governance institutions and the national government need to be reviewed to identify appropriate connections with the nationla government. In addition to the national government, the provincial government is also expected to take a lead role in institutional building of a metropolitan governance system, and policy development process, since the development of the metropolitan area, which is the center of economic, political and social activities, significantly influences the prospect of the province. Given expected growth of urban areas, there would be increased needs to develop a legislative framework at the national level, which encourages establishment of metropolitan governing institutions or intermunicipal cooperation in the long run.

(4) Leadership and Decision-Making Process

13.24 In order to integrate different opinions and demands from diverse organizations, groups, and citizens related in metropolitan governance, strong leadership is indispensable. Leadership can be performed by an individual or organization, who has strong power to take action and integrate concerned parties.[27] A common method for selection of leaders of metropolitan institutions is indirect election in a board, council, or assembly. The issues to be carefully examined include: the composition of members of such decision making body, i.e., whether or not local council members and/or the private sector representatives should be involved in addition to mayors, and distribution of votes among LGUs in proportion to the population of local governments. If strong authority is given to a leader, political legitimacy of the leader should be obtained through direct election by citizens and consensus or joint decision making among the members have to be adopted as a check and balance of power and to motivate cooperation and collaboration among the member local governments.

(5) Accountability and Civil Society Involvement

13.25 One of the important issues in setting metropolitan institutions is accountability. A metropolitan authority is often criticized, because its roles and functions are not clear to the citizens. Metropolitan institutions focusing on metro-wide issues are not directly involved in local matters and leaders of the institutions are not selected by residents. Thus, policies and decision makers of a metropolitan institution are not scrutinized by the public, because of lack of sufficient information and interests in them.[28] Therefore, accountability in metropolitan governance should be improved by disclosing information, improving access of the citizens, and involving NGOs, community associations, and the private sector in decision-making process.

(6) Ensuring the Consistency and Sustainability of Development Policy and Plans

13.26 Owing to a change of LGU leaders by the election of every three years, development policies and consistency of plans of medium and longer term perspective are often discarded. Subsequently, the efforts come to nothing and targeted goals are not achieved. That is, regret to say, the history that materialization of medium- and

[27] Lefevre (2008). Ditto.

[28] Lefevre (2008). Ditto.

long-term plans were repeatedly hampered in Metro Cebu. Some implementing bodies free from political risk such as pursuing political ends and benefits for specific groups need to be established in order to implement the development visions formed by grass-root level with consistent and sustainable manner.

13.27 Needless to say, a firm commitment underpinned by political wills must be a prerequisite for promotion and materialisation of development projects, however, political interventions should be minimized in terms of planning in order to ensure the consistency as well as sustainability of plans which has been endorsed by citizens.

(7) Funding Sources

13.28 Securing financial resources matter to performance and sustainability of metropolitan governance. This issue of financial resources is related to selection of governance system. In the case of a metropolitan authority, a primary concern in finance is determination of financial bases, namely, taxation power, revenue sharing with the local governments, user charges and fees from public service provision, and other own financial resource.[29]

13.29 On the other hand, a critical financial issue of intermunicipal associations is how much contribution member LGUs should make. For example, the major revenues of the Metro Manila Development Authority entail transfer from the central and local governments, traffic management income and fines, and other fees and charges, while, the Metro Naga Development Council (MNDC) receives allotments from the national government and contributions from the member local governments, and established a joint development fund. It is important to take account of promotion of cooperation between the national government and LGUs, and utilization of private sector funds. For cost-recovery type of projects, utilization of long-term ODA soft-loans and a PPP model should be pursued for the implementation.

(8) Capacity Building and Institutional Development

13.30 As the process of institutional development of metropolitan governance is a long-term process as discussed, an appropriate institution for the metropolitan governance shall be explored through and based on experiences in implementing projects and performing other actual tasks. Meanwhile, it is necessary to provide local governments, line agencies, NGOs, and CBOs with capacity building and awareness campaigns for planning, project coordination and implementation, and finance management at the metropolitan level.

13.3 Institution Building for Metropolitan Governance

1) Options for Metropolitan Governance in Metro Cebu

13.31 There are three effective models proposed for metropolitan governance in Metro Cebu. The following sections discuss each of the three models

(1) Intermunicipal Association Model: Metro Cebu Development Alliance: MCDA

13.32 As a model of intermunicipal association, the Metro Cebu Development Alliance (MCDA) is proposed (refer to Figure 13.1). In this model, local governments, national government agencies, the private sector, NGOs and civil society organizations

[29] Bird and Slack (2008). Ditto.

will establish an alliance for development of Metro Cebu, based on cooperation agreements. Policy networks organized by sector under this arrangement will take a lead role in planning, designing and implementing policies and projects. A core organization or institution will be determined among stakeholders or newly formed in each policy network. A development fund will be also created.

Source: JICA Study Team.

Figure 13.1 Intermunicipal Association: Metro Cebu Development Alliance

(2) Establishment of Monosectoral Agencies / Special Purpose District

13.33 Mono-sectoral authorities focusing on problem-shooting by issue are established rather than focusing on establishing some comprehensive metropolitan management bodies. Specific public services can be planned and coordinated jointly such as transport planning and traffic management, water supply and waste water treatment system, provision of social housing, and solid waste management. These authorities will be a basis or outposts of Intermunicipal Association Model and Metropolitan Authority Model.

13.34 Most successful example is “Translink” which is specialized in comprehensive public transport management in the metropolitan area which function as policy building, facility/system planning, implementation of policies and plans, maintenance and operation, so on. This model was initially adopted in England, Canada (Toronto and Vancouver), Australia (Brisbane) and others.

(3) Metropolitan Authority Model: Metro Cebu Development Agency

13.35 In order to develop a functional metropolitan system, Metro Cebu Development Agency (MCDA) is proposed to be established in the medium-term as another alternative. Here, the term of “agency” is used, not using “authority”, because it should be more practically competent to pragmatize the roadmaps and plans, rather than politically authorized in a bureaucratic system. Metro Manila Development Authority (MMDA) is the similar model to this proposed organization, but its

fundamental function should be different in terms of involvement of private and business sectors and NGOs as well as relevant government agencies for its management and decision-making mechanism.

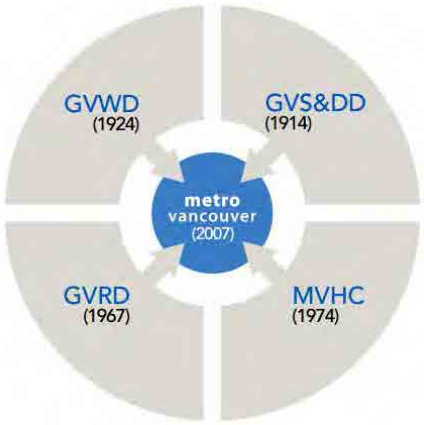
13.36 The MCDA can be evolved from the Metro Cebu Development Alliance（MCDA) and be established by integrating its association into a consolidated formal governmental organization. Unlike the MMDA, the MCDA will be operated on the basis of cooperation and decision-making by consensus of the local governments reserving their independent authorities of the core agencies to provide basic public services. The private sectors and civil society organizations have to be involved in the management division of MCDA in order to secure the consistency and sustainability of the plans and the roadmaps from every three years political change.

13.37 The “Metro Vancouver” established for the Vancouver metropolitan region is considered as the model under this concept. The Metro Vancouver, consisting of 24 LGUs, have four corporations of (i) water supply system, (ii) sewerage and drainage system, (iii) housing corporation, and (iv) Greater Vancouver development. These four components were historically established as legal corporations to provide sector services under respective boards. The Metro Vancouver was established in 2007, integrating these four entities into a single organization for the metropolitan governance based on a legal framework as shown in Figure 13.2

Political Organization:
- Metro Vancouver

Four Legal Corporations:
- Greater Vancouver Sewerage and Drainage District (GVS&DD)
- Greater Vancouver Water District (GVWD)
- Greater Vancouver Regional District (GVRD)
- Metro Vancouver Housing Corporation (MVHC)

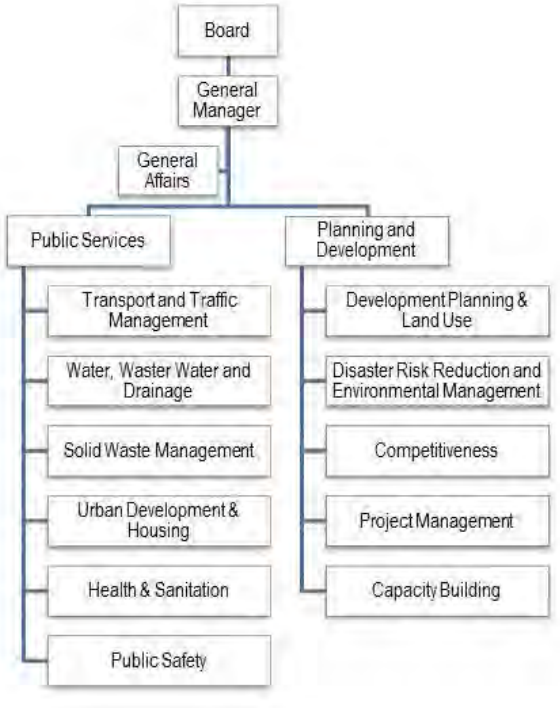
The smaller local authorities are only members of some of the four legal corporations while the larger local authorities are members of all four.



Source: JICA Study Team.

Figure 13.2 Structure of Metro Vancouver

13.38 This “Metro Vancouver” can be recognized as a good reference for Metro Cebu, but it should be careful to introduce the system into the Metro Cebu development management. MCDA has to manage not only each coordination among LGUs, but also perform coordination of implementation among planned programs/projects in a comprehensive manner. MCDA needs to manage more sectors. Figure 13.3 demonstrates an indicative basic organizational structure of the MCDA.



Source: JICA Study Team.

Figure 13.3 Metro Cebu Development Agency (Draft)

2) Development Process of Metropolitan Governance

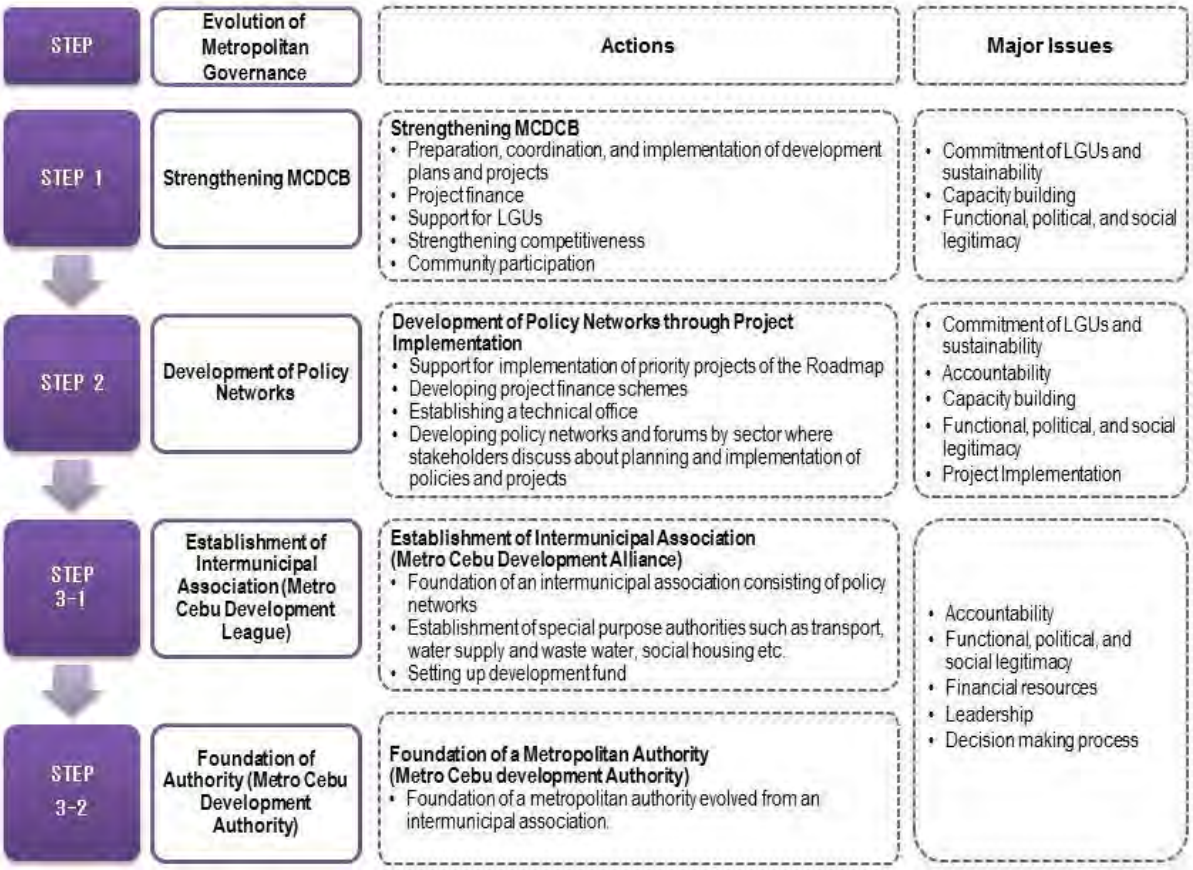
13.39 Since LGUs in the Philippines are comparably small, major urban areas such as Metro Cebu, which has rapid urbanization in accordance with urban economic growth, inevitably deal with the issues in coordination with several LGUs. The metropolitan area should be regarded as a metropolitan development governance area, and development of effective administrative system is further required including legal basis. Establishment of a "Metro Cebu Model" is meaningful for the Philippines as a public-private partnership model based on the involvement of private sectors and civil society organizations.

13.40 Having this recognition, indicative development process of metropolitan governance institutions based upon the abovementioned" alternative metropolitan models" is summarized in Figure 13.4. This proposed process is not selecting one model out of the three alternatives conceptualized previously, but these may be milestones of institutionalizing the process with enhancing governance function.

13.41 More specifically, the institutional development process for metropolitan governance begins with strengthening the MCDCB and then developing policy networks that will form an organizational framework of metropolitan institution later. "Policy networks" are developed by sector, consisting of forums where policies and project planning and implementation are discussed and implementing agencies and stakeholders are networked. It is expected that some of leading organizations in policy networks will be established as a special authority, such as one which will be responsible for traffic management, water supply and sewerage systems, or social housing provision. Subsequently, coordinating bodies consisting of LGUs and relevant agencies of that specific policy network will be established on a rational basis.

13.42 Furthermore, as an evolved model of the intermunicipal association, the Metro Cebu Development Agency (MCDA) will be established for management of metropolitan

areas. However, its need, effectiveness and legitimacy concerns must be assessed by scrutinizing the existing political and social situations before making a decision. In addition, there may be a case of installing a metropolitan organization directly from the policy networks bypassing the intermunicipal alliance. With necessary interventions and adjustments such as strengthening functions, capacity building, and restructuring organizational structure, the MCDCB is expected to take a role of secretariat in foundation and management of policy networks and the intermunicipal local association model.



Source: JICA Study Team.

Figure 13.4 Development Process of Metropolitan Governance Institution

3) Strengthening of Metro Cebu Development Coordination Board (MCDCB)

13.43 Impending issues for projects implementation include building capacity and expanding activities and functions of MCDCB. The areas with needs for reinforcement are as follows.

(a) **Preparation of a Metro Cebu Long-term Development Master Plan:** to draft a comprehensive Metro-wide Master Plans, based on the 2050 Visions and this Roadmap Study

(b) **Coordination of Feasibility Studies for various Prioritized Programs / Projects:** to coordinate with LGUs and line agencies of the national government for conducting feasibility studies for selected priority projects

(c) **Arrangement of Project Finance:** to develop appropriate project financing schemes such as PPP models, for the implementation of priority projects proposed by this Roadmap Study.

(d) **Enhancement of Planning Capacity:** to form the "technical team" which can provide technical supports for facilitating proper decision-making and justifying the implementation of (a) to (c) above.

(e) **Support for LGUs:** to provide technical advice for development planning and project implementation, identification of project funding, and assistance to capacity building of LGUs

(f) **Strengthening Competitiveness of Cebu Province as a Whole:** to conduct and support investment promotion activities, and develop a one-stop center for improvement of competitiveness of the entire Cebu Province, not limited to Metro Cebu,

(g) **Promotion of Public Participation:** to raise public awareness on Metro Cebu development visions, strategies and programs/projects for which strong citizens'' cooperation and involvement are required in the implementation process, fostering a sense of unity and belonging to Metro Cebu.

4) Project Implementation and Consolidation of Management System

13.44 Programs/Projects proposed by this Roadmap are to benefit fundamentally the entire Metro Cebu metropolitan area beyond the respective LGUs. It is required, therefore, to identify an implementing body based on the aforementioned Metro Cebu framework. Accordingly MCDCB is expected to be a main coordinator for implementing the priority programs/ projects.

13.45 To this end, several institutional issues on the existing situation of MCDCB need to be clarified or settled as follows:

(i) MCDCB is established without the legal basis, but based on the agreement (MOA) of respective LGUs' mayors and councils. Although MCDCB is approved as a planning coordinator by Regional Development Council (RDC), the role and authority of project implementation are not granted.

(ii) While validity of existing MOA is basically three years which is in line with political regime, it is unconfirmed this MOA is being effective after election of 2016, despite that the MOA is expected to be effective on a long-term basis.

(iii) Due to the lack of Lapu Lapu City's agreement on this MOA, MCDCB, strictly speaking, is not regarded as a representative organization of all member LGUs in Metro Cebu under the MOA.

(iv) Financial sustainability is not secured because any regular financial resource for the operation and management of MCDCB is not ensured.

13.46 These issues are related to the foundation of existence of MCDCB, but it is not lethalness. It is possible to solve them through additional RDC's resolutions and necessary legal rearrangements. Assuming that all will be taken actions, an implementation framework of prioritized projects, based on MCDCB's initiative, is proposed as follows.

13.47 The role of MCDCB will be changed, depending upon the type of projects. Figure 13.5 indicates anticipated project implementing bodies in a matrix of project types. The horizontal axis indicates two categories by project scale: Category A is an independent infrastructure project with large scale capital investment; and Category B is a project with comparatively small/medium scale investment which coordination with local stakeholders is indispensable for the smooth implementation. The vertical axis indicates characteristics

of public investments: Category I is a project with possible cost-recovery; and Category II is a non-cost recovery project.

13.48 Obviously, projects classified in Category A cannot be realized without authorizations and initiatives from the line agencies of the national government in charge of infrastructures. Category A-I projects shall be considered for applying some PPP scheme. In order to initiate and execute these projects, MCDCB is expected to strengthen its coordinating capacity with the national government.

13.49 On the other hand, the function of MCDCB is maximized for implementing Category B projects. Projects to improve the living environment are included in this category, such as projects for intersections improvement, traffic management, bulk water supply development for increasing water sources, wastewater treatment and drainage systems. Especially, MCDCB's functions shall be fully exerted for the implementation of Category B-I projects, because these projects need strict business sense of project profiling process.

		A	B
		Large-scale and Large Capital Investment-Required Projects (more than USD 100 mil.)	Small/Medium Scale and Locally Initiated Coordination-Required Projects (less than USD 100 mil.)
I	Cost Recovery	Central Line Agencies and/or PPP under Central Line Agencies	**MCDCB**
II	Non-cost Recovery Government Services	Central Line Agencies (DPWH, DOTC, DOH, DENR…)	LGUs and/or **MCDCB** under LGU's contract

Source: JICA Study Team.

Figure 13.5 Project Implement Bodies by Category

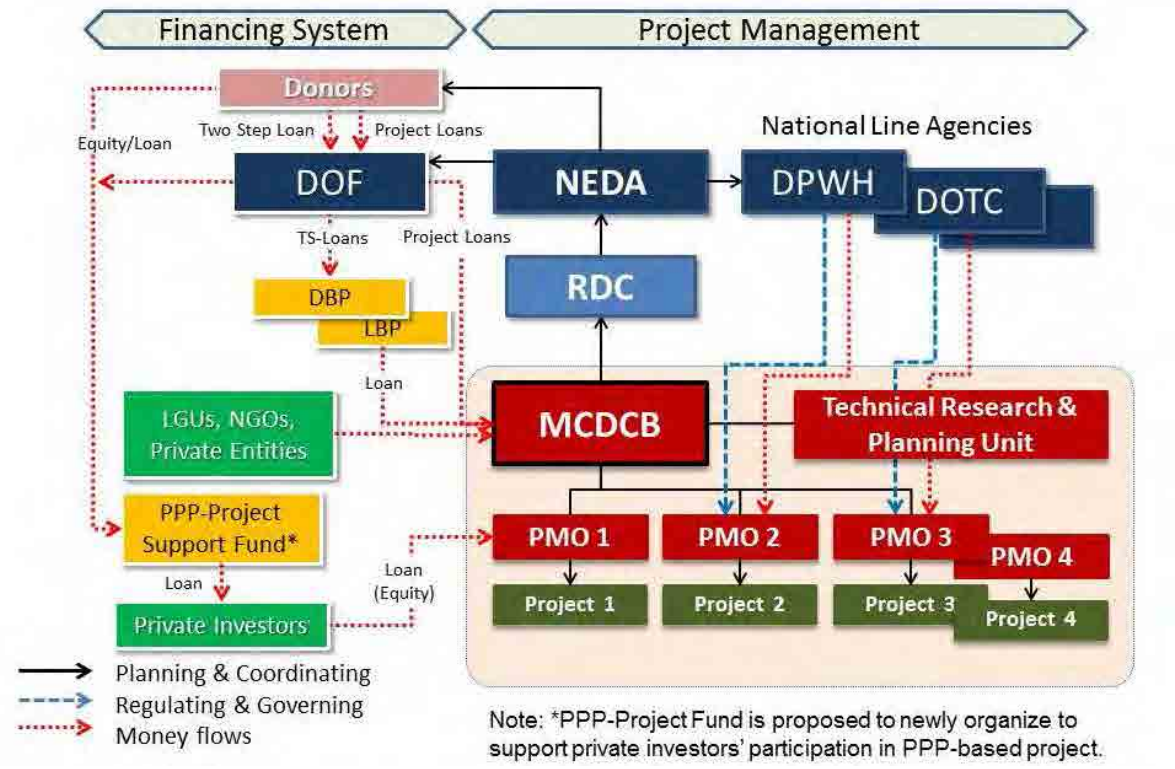
13.50 A mechanism of priority project implementation under MCDCB's initiatives, management and coordination is tentatively depicted as shown in Figure 13.6. As the ordinal approving procedure from RDC to NEDA headquarter is required to have authorization of priority projects, MCDCB has an important role to promote the procedure. For the sake of facilitating technically rational decision-making in the official procedure, it is necessary to establish a Technical Research Unit inside MCDCB, and to invite professional experts for planning and designing infrastructures and their economic/financial viability assessment.

13.51 At the outset of project implementation, a project management office (PMO) shall be established per project, and project manager and staffs are dispatched from relevant organizations based on the modality of involvement. Naturally, the personnel from LGU are included. The PMO needs to receive official guidance from line agencies of the national government, regarding relevant legal systems, technical guidelines, bidding procedure and contracts, so on.

13.52 On the other hand, various financial sources such as loans from Development Bank of the Philippines (DBP), Land Bank of the Philippines (LBP) and PPP project support funds need to be explored in addition to the national government sources such as government special funds, and ODA funds managed through Department of Finance.

13.53 Deliberate considerations are necessary with involvement of the stakeholders to deepen discussions on how to uneventfully implement the metropolitan-oriented priority

programs/projects and how to strengthen MCDCB's coordinating functions in the implementation process. Specifically, it is significant to remove above mentioned constraints of MCDCB and to deal with the legal aspect to tackle problems included in the proposed mechanism.



Source: JICA Study Team.

Figure 13.6 Priority Project Implementation and Management System

13.4 Summary of Sub-Roadmap Projects for Metropolitan Governance

13.54 The roadmap program and projects for metropolitan governance is summarized in following Table 13.2.

Table 13.2 Sub-Roadmap for Metropolitan Governance

Term	Objectives	Projects / Programs
Short-term (up to Year 2020)	· Strengthening MCDCB through project implementation and capacity building · Development of Policy Networks for preparation, coordination, and implementation of policies and projects · Foundation of an intermunicipal association (Metro Cebu Development Alliance) derived from policy networks	· Continuation of a study on appropriate metropolitan institution, governance, and legal system. · Establishment of Metro Cebu "Technical Research and Planning Unit" and posting relevant experts. · Foundation of Metro Cebu Investment Promotion Center, with an action plan · Foundation of a Metro Cebu Traffic Management Center
Mid-term (up to Year 2030)	· Strengthening an intermunicipal association (Metro Cebu Development Alliance) · Preparation study on foundation of a metropolitan governance institution, Metro Cebu Development Agency (MCDA) which is evolved from the intermunicipal association and preparation of the foundation	· Strengthening institutions and units which would be core in policy networks · Evaluation of the intermunicipal association (Metro Cebu Development Alliance) in terms of improvement on public service delivery, etc.) · Preparatory study on needs and effectiveness of metropolitan authority (Metro Cebu Development Agency)
Long-term (up to Year 2050)	· Foundation of a metropolitan governance institution, MCDA, evolved from then intermunicipal association	· Provision of capacity development and institutional development to the metropolitan governance body (Metro Cebu Development Agency) · Assessment of performance of the metropolitan governance body (Metro Cebu Development Agency)

Source: JICA Study Team.

14 EVALUATION OF MEGA CEBU ROADMAP

14.1 Proposed Projects

1) Project Prioritization

14.1 The proposed investment program is underpinned by the development directions of the Mega Cebu Vision 2050 and the Region VII Development Plan, as shown in Table 14.1.

Table 14.1 Development Directions

Mega Cebu Vision 2050	Region VII Development Plan (2011-2016)
(a) Be a premier tourism destination (b) Develop enterprises and generate jobs in IT/BPO, Knowledge Process Outsourcing; become a retirement haven and develop Cebu-originated new businesses in clean technology products, creative industry and manufacturing (c) Develop human resources through technical and business education that matches requirements of industries (d) Develop enablers for competitiveness, including critical infrastructure and business continuity plan (e) Strengthen connectivity through integrated mass transit system, improved road connection and efficient traffic management (f) Strengthen gateway functions through air and maritime transport improvement (g) Ensure basic services to constituents, such as water and sanitation services (h) Protect the environment and improve resilience from natural disasters-- flooding in particular	Long Term Vision: • Be a premier tourism destination • Be the center of trade and industry, ICT innovation in the country • Achieve ecological integrity and resource use equity • Generate employment opportunities to make employment rate the highest in the country Goals: (a) Achieve high and sustainable economic growth, targeting 8.6 to 9% GRDP growth rate per annum and real investment rate of 25.8 to 26.5% of GRDP (b) Equalize access to development opportunities, raise employment rate to 95.4% and lower incidence of poverty to 14.1% (c) Develop effective development support systems. Infrastructure development is essential for competitiveness and attractiveness of the Region as an investment destination and is a pre-requisite to the efficient service delivery to its constituents.

Source: JICA Study Team

14.2 The prioritization considerations in investment programming are:

- Fast track deferred or delayed priority infrastructure facilities and services
- Address biggest demand gaps and binding constraints to the high economic growth targets of Mega Cebu
- Enable inclusive growth and social inclusion through improved mobility of labor force and improved access to social services
- Steer physical development and more balanced distribution of economic growth opportunities
- Improve environment protection and resilience, and ensure ecological integrity
- Establish an institutional and organizational framework to enable sustainable urban development with wide range of stakeholders

2) Implementation Timing

14.3 Each of the sub-roadmaps identified investment programs according to the following time frames: short-term (2015–2020), medium-term (2021–2030), and long-term (2031-2050) for rational and efficient project implementation.

14.4 The short term program includes fast track projects such as deferred priority projects with funding commitments, addresses the biggest demand gaps that, if unresolved, will be binding constraints to the high growth trajectory of Mega Cebu. They are thus

reactive and are intended to catch up to reduce or eliminate shortfalls in basic services in water and sanitation services, reduce severe transportation bottlenecks and alleviate social and economic losses from flooding. Moreover the short term program will also include projects with high level of preparedness and government commitment in terms of: having feasibility studies, approval by oversight bodies, with ROW secured or being secured, and/or included in the budget program.

14.5 The medium and long term programs adopt a strategic and pro-active approach to addressing sustained economic growth, aligning development support to economic roles of local government units comprising Metro Cebu, further improving connectivity of production, trade and industry hubs with supply areas and sources of labor, and ensuring environment protection and ecological integrity. These projects are indispensable to put the plan on track for sustainable urban development of Metro Cebu.

14.6 A summary of the proposed infrastructure projects for Mega Cebu Roadmap is shown in Table 14.2.

Table 14.2 Summary of the Proposed Infrastructure Projects for Mega Cebu Roadmap

1. Urban Transport and Highway Network

Name of Project		Area	Status	Description		Total Cost (PHP mil. or USD mil.)	Implementing Agency	Environment & Social Considerations		Finance	Schedule	Remarks
				Type	Length (km)			E	S			
A. Roads & Highways	1. Dual-Mode Bridge and Scenic Coastal Road between the Second Bridge and Cansaga Bay Bridge	Mandaue Reclamation, Cansaga Bay and the northern part of Lapu-Lapu	Proposed	New	3.80	PHP15,569	DPWH	P: B- O: B+	P: B- O:A+	Tracking fee by rail operator	2018–2020	Incl. rail substructure
	2. FS on Area Traffic Control in Metro Cebu	Metro Cebu	Proposed	Study	-	USD1.2	DPWH/ LGUs/ MCDCB	P: E	P: C+		2015–2017	
	3. Synchronized Signalization System in Urban Areas	Replacement of 69 signals by MCDP and development of synchronized system with new ones	Proposed	Upgrade	-	PHP1,285	DPWH/ LGUs/ MCDCB	P: E O: C+	P: E O: C+		2018–2020	
	4. Roads Widening	Arterial roads, mainly unimplemented from MCLUTS	Proposed	Upgrade	-	PHP4,264	DPWH	P: B- O: B+	P: B- O: C+		2018–2020	
	5. Metro Cebu Outer Circumferential Road	Talisay to Consolacion	Proposed	New	39.5	PHP15,561	DPWH	P: A- O: B+	P: B- O: C+		2021–2030	
	6. Second Cebu North Road	Consolacion–Liloan–Compostela-Danao	Proposed	New	18.5	PHP3,380	DPWH	P: B- O: B+	P: A- O: B+		2021-2030	
	7. Second Cebu South Road	Talisay-Minglanilla-Naga-San Fernando-Carcar	Proposed	New	35.0	PHP7,980	DPWH	P: B- O: B+	P: A- O: B+		2021-2030	
	8. Cebu-Cordova Bridge (3rd Bridge)	Cebu City (C. Padilla) to Cordova (part of Green Loop Corridor)	Proposed	New	10.0	PHP16,880	Private/ LGUs/ DPWH	P: B- O: C+	P: B- O: B+	Toll Bridge	2021 - 2030	Incl. approach causeway at Cordova
	9. Metro Cebu Intersection Improvements (Grade-separation)	20 Intersections at Cebu City and Mandaue City	Proposed	Upgrade	-	PHP9,214	DPWH	P: C- O: B+	P: B- O: B+		2021–2030	
	10. Road Widening on the MRT Central Line and Its Access Roads	Imus Ave., MJ Cuenco Ave., Lopez Jaena St., MC Briones St., General Maxilom Ave., Pope John Paul II Ave.	Proposed	Upgrade	7.3	PHP2,220	DPWH	P: B- O: A+	P: A- O: A+		2021–2030	
	11. Talisay – Naga Coastal Road (ex PNR)	Brg. Lawaan, Talisay–Minglanilla New Center – Brg. Colon, Naga	Proposed	New	7.1	PHP1,315	DPWH	P: B- O: B+	P: A- O: B+	Tracking fee by rail operator	2021–2030	Incl. MRT South Line ROW
	12. Tayud Coastal	Mandaue–	Proposed	New	8.9	PHP3,262	DPWH	P: B-	P: A-		2021–	To

Name of Project		Area	Status	Description		Total Cost (PHP mil. or USD mil.)	Implementing Agency	Environment & Social Considerations		Finance	Schedule	Remarks
				Type	Length (km)			E	S			
	Road with the Second Cansaga Bay Bridge	Brg. Tayud, Consolacion–Brg. Poblacion, Liloan						O: B+	O: B+		2030	serve for a new port
	13. Rest of Mandaue Scenic Coastal Road (2 sections)	Ouano Ave.–the Second Bridge, Cebu North Road–Cansaga Bay Bridge	Proposed	New	5.4 in total	PHP4,834	DPWH	P: B- O: B+	P: A- O: B+			
	14. Airport Underpass Road	The Second Bridge–MCIA–Brg. Pajak, Lapu-Lapu	Proposed	New	2.7	PHP2,438		P: C- O: C+	P: C- O: B+	Possibly toll road	2021–2030	
	15. Mactan MRT Avenue (incl. 1 bridge)	Brg. Dapitan, Cordova–Brg. Mactan, Lapu-Lapu	Proposed	New	8.6	PHP2,244		P: B- O: B+	P: C- O: B+	Tracking fee by rail operator	2021–2030	
	16. Metro Cebu Coastal Expressway	Part of Coastal Line from Danao to Carcar	Conceptualized	New	unknown	N.A.		P: A- O: B+	P: A- O: B+		2031–2050	
B. Public Transport / Mass Transit	1. BRT Line	Cebu City (Talamban–Bulacao - SRP)	Committed	New	23	USD212	DOTC	P: C- O: A+	P: B- O: A+	LOT	2015–2018	World Bank
	2. MP and FS on Metro Cebu Mass Transit System Devt	Metro Cebu	Proposed	Study	-	USD2.0	DOTC	P: E-	P: C+		2015–2016	
	3. Public Transport Terminal	Carcar City Center	Proposed	New	-	PHP140	LGU/ MCDCB	P: C- O: C+	P: C- O: B+		2017–2018	
	4. Public Transport Terminal (Second Phase)	Cebu North Terminal	Upgrade	New	-	PHP118	LGU/ MCDCB	P: C- O: C+	P: C- O: B+		2021–2030	
	5. AGT–CML Line	Cebu City–Ouano Ave., Mandaue City - MCIA	Proposed	New	19.2	USD819	DOTC / Private	P: C- O: A+	P: C- O: A+	BOT or LOT	2017–2021	
	6. MRT Lines											
	a. Central	Consolacion to Talisay	Proposed	New	21.2	USD1,774	DOTC / Private	P: C- O: A+	P: C- O: A+	BOT or LOT	2021–2030	
	b. North	Danao City to Liloan	Proposed	New	24.7	USD1,369	DOTC / Private	P: C- O: A+	P: C- O: A+	BOT or LOT	2031–2050	
	c. South	Minglanilla to Carcar City	Proposed	New	29.2	USD1,799	DOTC / Private	P: C- O: A+	P: C- O: A+	BOT or LOT	2031–2050	
	d. Mactan	Cebu City–Lapu Lapu City	Proposed	New	21.5	USD1,737	DOTC / Private	P: C- O: A+	P: C- O: A+	BOT or LOT	2031–2050	
C. Others	1. FS on Consolacion New Port	Tayud, Consolacion	Committed	Study	-	USD1.5	DOTC	P: E-	P: C+		2015–2017	KOICA
	2. Consolacion New Port Const and Revitalization of Cebu Port	Cebu City, Consolacion	Proposed	New	-	PHP9,900	DOTC / Private	P: A- O: C+	P: B- O: A+	PPP	2018–2022	
	3. MCIA Development Project	MCIA	Committed	New	-	PHP17,500	DOTC / Private	P: B- O: C+	P: B- O: A+	PPP	2015–2020	GMR – Megawide Group
	Total (2015–2030)					PHP241,731						

Source: JICA Study Team.

2. Water Supply and Disposal Management

	Name of Project	Area	Status	Total Cost (PHP mil.)	Implementing Agency	Impact Factor			Schedule	Remarks
						ESC		Finance		
						E	S			
Water Supply	1. Construction of New Water Supply Facilities	Cebu City, Liloan, Consolacion, Compostela, Mandaue, Talisay, Lapu-lapu, and Cordova	Proposed	2,326	MCWD	P: C- O: B+	P: B- O: A+		2015–2020	Reservoirs, Pump Stations, Well Development
	2. Mananga Dam Bulk Water Supply	MCWD franchise area, Danao, Minglanilla, Naga, San Fernando and Carcar	Proposed	4,778	TBD	P: B- O: A+	P: B- O: A+	BOT or JV	2015–2020	Incl. transmission pipeline and water treatment plan, but not resettlement
	3. Kotkot Dam and Lusuran Dam	Metro Cebu	Proposed	7,500	TBD	P: B- O: A+	P: A- O: A+	BOT or JV	2018–2030	
	4. Groundwater Exploitation Study	Northern and southern areas of Metro Cebu	Proposed	620	MCWD	P: E	P: D+		2018–2030	
	5. Reduction of Non-Revenue water I	MCWD Service Area	On-going	1,100	MCWD	P:F O:F	P:F O:F		–2030	
	6. Development of Surface Water	Can-Asujan River, Pangdan River, Cantao River in Naga-Minglanilla	Proposed	11,220	TBD	P: B- O: A+	P: B- O: A+		2028–2040	
	7. Development of Groundwater	Northern and southern areas in Metro Cebu	Proposed		MCWD	P: C- O:B-	P: C- O: B+		2028–2040	
	8. Construction of Reverse Osmosis Desalination Plant	Lapu-Lapu City	Proposed	3,100	MCWD	P: C- O: B+	P: C- O: B+		2028–2040	
	9. Reduction of Non-Revenue water II			1,100	MCWD				2030–2040	
	10. Groundwater Occurrence (recharge)	Metro Cebu	Proposed	440	MCWD	P :F O: F	P: F O: F		2028–2040	
	11. Use of Recycling Water	Metro Cebu	Proposed	1,100	MCWD	P: F O: F	P: F O: F		2028–2040	
Storm Water Management	12. Implementation of "A Comprehensive Study for A Metro Cebu Integrated Flood and Drainage System (MCIFDS) Master Plan"	Metro Cebu	Proposed	75	DPWH LGU	P: E	P: C+		2015–2020	
	13. Cleaning Rivers, Creeks, and Drainages	Mandaue City	Committed	125	DPWH LGU	P: C- O: B+	P: B- O: B+		2015–2020	
	14. Construction of Small Scale Rain Water Storage Facilities	Upstream of Guadalupe River, Lahug River, and Butuanon River	Proposed	82	LGUs	P: E O: B+	P: E O: B+		2015–2025	
	15. Construction of drainage facilities based on MCIFDS	TBD	Proposed	720	DPWH LGU	P: C- O: B+	P: B- O: B+		2020–2030	
	16. River Improvement Projects	Subangdaku, Kinalumsan, and Lahug Rivers	Proposed	2,250	TBD	P: C- O: B+	P: B- O: B+		2020–2040	
	17. Embankment at inundation places in rural area		Proposed		TBD	P: C- O: B+	P: B- O: B+		2020–2030	
	18. River Improvement Projects	Guadalupe, Butuanon Rivers	Proposed	2,330	TBD	P: C- O: B+	P: B- O: B+		2030–2050	
	19. Construction of Large Scale Rain Water Storage Facilities	Catchment of Guadalupe River, Lahug Creek, Mahiga Creek,	Proposed	2,850	DPWH LGU	P: C- O: B+	P: B- O: B+		2030–2050	

	Name of Project	Area	Status	Total Cost (PHP mil.)	Implementing Agency	Impact Factor			Schedule	Remarks
						ESC		Finance		
						E	S			
		Subandaku River, Butuanon River								
Waste Water Management	20. Construction of Septage Treatment Plant	Metro Cebu	Proposed	1,215	MCWD LGU	P: C- O: A+	P: C- O: A+	BOT or JV	2016–2020	
	21. Improvement for Inappropriate Septic Tanks	Metro Cebu			MCWD LGU	P: C- O: A+	P: C- O: A+		2016–2020	
	22. Construction of Proper Waste Water Treatment Facility for Development Areas	Metro Cebu	Proposed		TBD	P: C- O: A+	P: C- O: A+		2016–2020	
	23. Construction of centralized sewerage system	Lapu Lapu City, Cebu City and Mandaue City	Proposed	41,500	MCWD	P: C- O: A+	P: C- O: A+		2020–2030	
	24. Promotion of Ecological Sanitation technologies	Metro Cebu	Proposed	-	MCWD LGU	P: C- O: A+	P: C- O: A+		2025–2030	
	25. Expansion and Construction of existing sewerage systems	Metro Cebu	Proposed	56,100	MCWD	P: C- O: A+	P: C- O: A+		2030–2050	
	26. Construction of Small Scale Water Detention Facilities	Cebu City and Mandaue City Rivers upstream	Proposed	1,215	DPWH	P: C- O: B+	P: C- O: B+		2015–2016	
	Total			141,746						

Source: JICA Study Team

3. Solid Waste Management

Name of Project	Area	Status	Total Cost (PHP mil.)	Implementing Agency	Impact Factor			Schedule	Remarks
					ESC		Finance		
					E	S			
1. Formulate a Comprehensive Solid Waste Management Master Plan for Metro Cebu	Metro Cebu	Proposed	-		P: E	P: C+		2015~6	
2. Enhance a Waste Reduction & Recovery Program	Metro Cebu	Proposed	287		P: D- O: A+	P: B+ O: A+		2015~6	
3. Conduct Action Planning and Implement the project for Environmentally Sustainable Closure of the Inawayan Sanitary Landfill	Cebu City	Proposed	328		P: E	P: C+		2015	
4. Introduce an effective management system of medical waste and hazardous waste treatment facilities	Metro Cebu	Proposed	123		P: C- O: A+	P: C+ O: A+		2015~6	
5. Implement the medium-term projects/programs identified in the Comprehensive Solid Waste Management Master Plan for Metro Cebu	Metro Cebu	Proposed	205		O: A+	O: A+		–2020	
6. Implement the Enhanced Waste Reduction & Recovery Program with special attention to develop infrastructures	Metro Cebu	Proposed	287		P: C- O: A+	P: C+ O: A+		–2018	
7. Construct and upgrade the operation and maintenance of City-Wide MRF	Metro Cebu	Proposed	246		P: C- O: A+	P: C+ O: A+		– 2018	
8. Construct the medical waste and hazardous waste treatment facilities and develop an appropriate operation and management system	Metro Cebu	Proposed	205		P: C- O: A+	P: C+ O: A+		– 2018	
9. Conduct the feasibility study for appropriate technologies of Waste-to-Energy (WTE) facilities	Metro Cebu	Proposed	-		P: E	P: C+		2018	
10. Implement log-term projects and programs proposed by the Comprehensive Solid Waste Management Master Plan for Metro Cebu	Metro Cebu	Proposed	205		P: E	P: C+		–2030	
11. Construct two (2) Metropolitan Sanitary Landfill Facilities based on the feasibility study to be conducted in the medium-term	Metro Cebu		820		P: C- O: A+	P: C+ O: A+		–2025	
12. Enhance and disseminate the Waste Reduction & Recovery Program, based on the community-based 3R Movement	Metro Cebu		82		P: D- O: A+	P: B+ O: A+		–2025	
13. Construct Waste-to-Energy facilities based on feasibility studies to be conducted in the medium-term	Metro Cebu	-			P: C- O: A+	P: C+ O: A+		–2025	
Total			2,788						

Source: JICA Study Team.

4. SMART SRP

Name of Project	Status	Description	Total Cost (PHP mil.or USD mil.)	Implementing Agency	ESC		Finance	Schedule	Remarks
					E	S			
1. Establishment of unified management system of energy supply and demand in SRP	Proposed	Establishment of Energy Consumers' Cooperative with the Optimum Energy Consumption Plan	PHP37	LGU/Land Owners & Tenants/VECO	O: A+	O: A+		2015–2017	
2. Introduction of management system to visualize energy demand and supply	Proposed	Introduction of Energy Monitoring System (50 sites)	PHP185	LGU/Land Owners & Tenants/VECO	O: A+	O: A+	Private	2018–2020	
3. Implementation of introduction of individual technology elements which is suitable for each area	Proposed	Installment of Energy-saving Equipment (solar panel, EV)	PHP 1,074	LGU/Land Owners & Tenants/VECO	O: A+	O: A+	Private	2018–2020	Covering 25% of SRP energy consumption
4. Expansion of knowledge and know-how from SRP to other parts of Metro Cebu	Proposed	Metro Cebu	TBD	LGU/Private Sector/VECO	O: A+	O: A+		2021–2030	
5. Establishment of suitable energy management scheme for Metro Cebu	Proposed	Metro Cebu	TBD	LGU/Private Sector/VECO	O: A+	O: A+		2021–2030	
Total (2015–2030)			PHP 1,296						

Source: JICA Study Team

<Legend>
ESC: Environment & Social Considerations;
E: Environment; S-Social;
A: Significant impacts are expected,
B: Major;
C: Moderate impacts are expected,
D: Minor,
E: Impacts are negligible/insignificant;
F: Impacts are not known; To Be Determined);
NA: Not applicable;
P:pre-construction and construction phases;
O: Operational phases;
"+"Positive Impacts,
"-"Negative/Adverse Impacts

14.2 Impact of the Development

1) Transport Network

14.7 The Mega Cebu Roadmap proposed a road network with functions to guide new urban area development, to strengthen weakness of the existing road network and to support a logistic network by new port and railway. In addition, the direction of railway network development is identified based on the role and limitation of the road based public transport system.

14.8 Current heavy road traffic congestion happened daily in Metro Cebu is observed through the traffic survey conducted in the Study in 2014 at various road sections. In case the current population increase will continue in future and economic development will be achieved, it is obvious that the current infrastructure will not able to afford the demand and traffic congestion will be worsened.

14.9 To analyse the traffic demand of current and future network, traffic assignment analyses were conducted repeatedly and estimated future traffic situation and effectiveness of the proposed roads and railways network. The results of the traffic demand forecast is summarized in Table 14.3 and the outputs are depicted in Figure 14.1.

(a) **Year 2014:** Cariburation of the existing traffic situations was done based on the OD matrices in 2014 and the existing road network so as to reproduce the actual traffic situation in the simulation model. The road congestion ratio amounts to 1.05 where several traffic congestions occurrs because of lack of road capacity

(b) **Year 2030:** In case the scenario as the existing road network still works, the road congestion ratio amounts to 1.64 where the arterial roads in Metro Cebu would be totally choked. Even considering the proposed road projects upto 2030, the road congestion ratio amounts to 1.15 which is worsened from the current situations. In the case with 2 urban railways serving among 3 major cities consisted of Cebu City, Mandaue City and Lapu-lapu City in Metro Cebu, the proposed road and rail network would slightly ease the existing road congestions. The required investment cost amouts to 214.3 billion pesos.

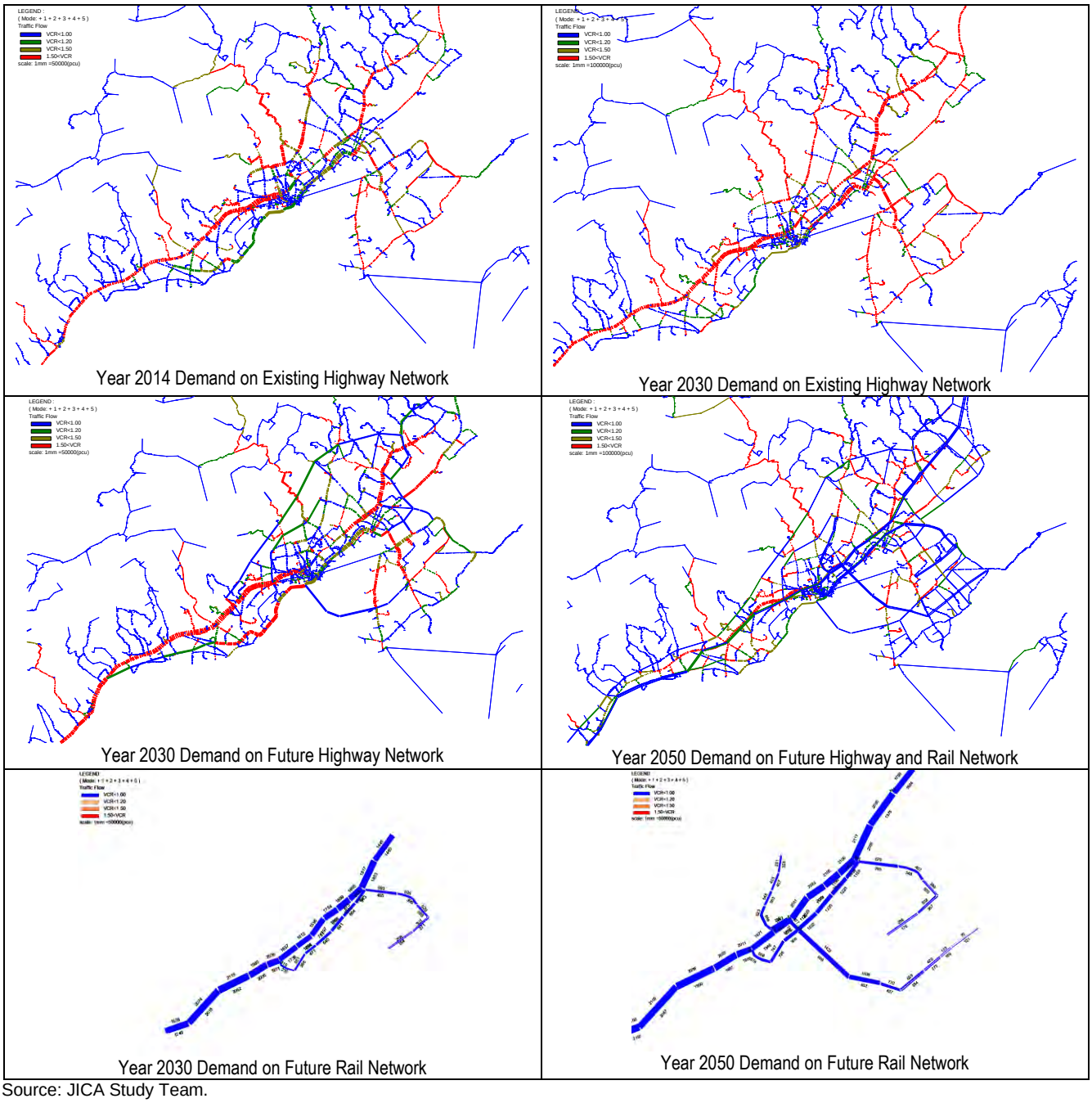
(c) **Year 2050:** A rapid urbanization is expected in the other areas from 3 major cities in the 2030s and 2040s. The remaining 3 urban rail lines will contribute to railway networking and smooth road traffic flows. The required investment cost amounts to 215.8 billion pesos.

Table 14.3 Daily Traffic Volume by Network Scenario based on Traffic Assignment

	Existing Network (Do Nothing)			Existing + Proposed Highway			Existing + Proposed Highway and Railway		
	Private	Public	Rail	Private	Public	Rail	Private	Public	Rail
Year 2014									
Total person trips (000)	3,271	4,531							
Rail ridership (000)			0						
Road PCU (000 km)	9,365	4,396							
Road PCU (000 hours)	2,091	1,227							
Road vehicle capacity ratio (V/C)	1.05								
Year 2030									
Total person trips (000)	5,561	6,023		5,561	6,023		5,561	6,023	
Rail ridership (000) *1			0			0			1,223

	Existing Network (Do Nothing)			Existing + Proposed Highway			Existing + Proposed Highway and Railway		
Road PCU (000 km)	15,459	6,174		15,656	6,258		13,429	5,807	
Road PCU (000 hours)	3,775	1,912		3,427	1,732		2,833	1,473	
Road vehicle capacity ratio (V/C)	1.64			1.15			1.01		
Year 2050									
Total person trips (000)	6,652	8,585		6,652	8,585		6,652	8,585	
Rail ridership (000) *2									2,744
Road PCU (000 km)	19,270	9,837		19,781	10,131		14,349	8,667	
Road PCU (000 hours)	4,975	3,054		4,389	2,693		3,128	1,967	
Road vehicle capacity ratio (V/C)	2.21			1.30			1.00		

Source: JICA Study Team.
*1 includes AGT-CML Line and MRT Central Line
*2 includes AGT-CML Line, MRT Central Line, MRT North Line, MRT South Line and MRT Mactan Line



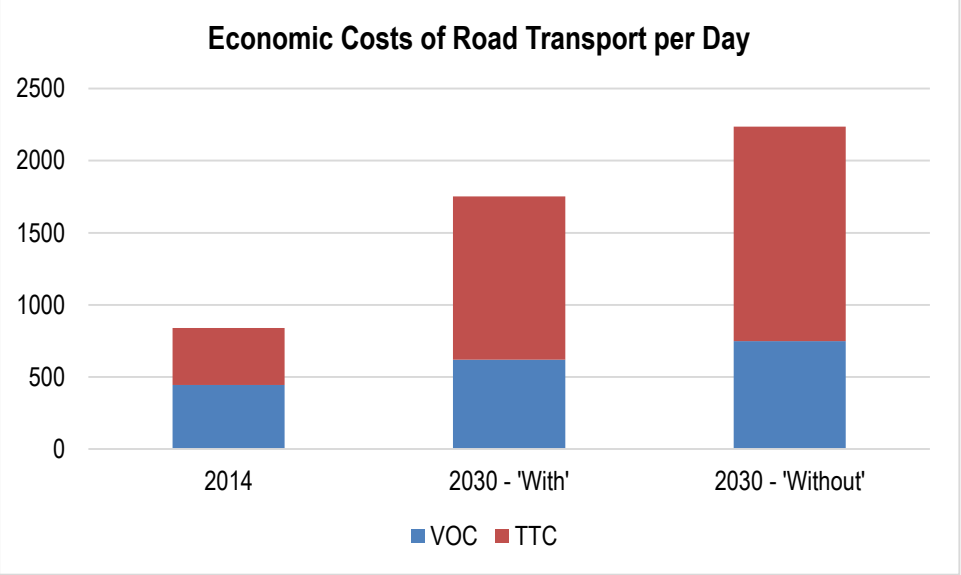
Source: JICA Study Team.

Figure 14.1 Examples of Network Assessment

14.10 Severe traffic congestions are often seen in the core area of Metro Cebu, e.g., decreasing vehicular travel speed to less than 10 km/hr. If all vehicular traffic could enjoy faster travel by 5 km/hr, traffic congestions would disappear at almost all intersections and traffic bottlenecks. Under such situations, vehicle operating cost (VOC) and its travel time cost (TTC) must be greatly saved.

14.11 Both the parameters are estimated in the Roadmap Study: P 177.8 million for daily VOC saving and P 216.6 million for daily TTC saving or P 394.4 million in total. In other words, the daily economic loss caused by traffic congestions in Metro Cebu in 2014 would be as much as P 394.4 million.

14.12 Should there be no transport network improvement undertaken in the period up to the year 2030, compared to the Roadmap case in that the proposed highway and railway network development is implemented, accumulated economic loss by road traffic congestions would amount to P 3,455 billion pesos where a discounted rate of 12% is applied to estimate present value.



Note: million pesos
Source: JICA Study Team

Figure 14.2 Economic Costs of Road Transport in Metro Cebu

2) Environmental and Social Consideration

14.13 Proposed projects under the Roadmap are prioritized by contribution for environmental challenges considering the current environmental laws and regulations. Preliminary environmental assessment was done in terms of pollution control, protecting natural environment, and social environment. The assessment was done both in the construction period and operational period. These environmental challenges are further studied and quantified in the Feasibility Study and Detail Design Stage. At the same time, the impacts are analyzed based on the successive consultation among stakeholders.

14.14 The major environmental challenges in Metro Cebu are contamination of water sources and insufficient tap water, increase of risk due to poor waste management, and air pollution caused by exacerbated traffic jams, all owing to rapid population growth. Points to consider for implementation will be summarized as follows.

14.15 Transportation; Proponents make efforts to minimize the resettlement and land

acquisition for the purpose of securing right of way, and negative impact during the construction and traffic jams caused by. The positive impact such as decrease of congestion after the completion of construction and improvement of air quality are also expected. The volume of air pollutants reduction by building public transport network were estimated approximately in Manila. Such positive impacts can be specifically estimated during the planning of BRT and MRT.

14.16 Owing to exacerbated flood and contamination of rivers in Metro Cebu year by year, vulnerable areas do exist in watershed of the hilly areas, coastal zone, especially mangrove habitats. The proposed projects have to address the pollution mitigation measures. Soft measures such as public consultation are important in Infrastructure development. Developing environmental management plan will be important when the proposed prioritized projects are implementing stage while facilitating consensus building. Natural resource management cannot be done solely by investing infrastructure, but in tandem with consensus among, and efforts of residents. Institutional building and public awareness of environmental management is necessary.

14.17 The challenges of institutional issues such as overlapping of responsible government authorities, and its vagueness of the mission are repeatedly discussed through the process of crafting the roadmap. For example, river management has faced difficulties to solve the problem jointly by bordering LGUs. Coordination for solving problems among the following plural stakeholders has been not straightforward; DPWH for flood control infrastructure, DENR for water quality, LGU for controlling the disposal waste into the river, settlement in the prohibited riverside, and illegal settlers, NGO: advocate natural environment protection / assistance for informal settlers, River Committee of respective LGUs, etc. Similar difficulties are applicable to solid waste management as well. Institutional building is prerequisite for sound environmental management and its monitoring system.

14.3 Investment

1) Public Investment Affordability

14.18 Affordability of the national government for infrastructure investment in the roadmap projects is assessed. However, the target project period is focused to the short-term and mid-term only because of unpredictable economic condtion and infrastructure needs of the long-term projects (2031-2050).

14.19 According to NEDA, the ratio of the infrastructure investment by the national government to GDP is 3.5% for 2015-2020 and 5.0% for 2021–2030. It is higher than its conventional ratio (2.5%) and it shows how the current administration lays stress on infrastructure development.

14.20 In the case of Metro Cebu, by comparing national economic growth ratio and infrastructure investment ratio of Metro Cebu based on appropriate indicators, the investment affordability amounts to 608.3 billion pesos. Within this amount, net investment affordability is estimated to 486.6 billion pesos by reserving 20% of the total amout (0.7% - 1.0% to GDP) for annual routine works including smale-scale infrastructure investment and maintenance of the existing infrastructures.

14.21 Besides, the required investment for the short to middle-term roadmap projects (2015-2030) amounts to 308.6 billion pesos including the investments for major infrastrucre sectors such as transport (PHP241.4 billion), water (PHP64.4 billion) and solid

waste management (PHP2.8 billion). It consists of 63% of the national government's budget envelope if all the amount is shouldered by the national government. It has proved that the new investment amount is not excessive considering the current government's standpoint and its expected growth in the future.

Table 14.4 Budgt Envelope of Infrastructure Investment by National Government to Metro Cebu

		2015–2020	2021–2030	Total
GDP (2013 constant price)	Growth Rate (%/year)	6.3	5.5	-
	Aggregated GDP (PHP, Bil.)	91,523	240,083	-
Budget for Infrastructure	3.5% till 2020; 5.0% till 2030 of GDP	3,203.3	12,004.2	15,207.5
	Region 7 (6% of National)	192.2	720.2	912.4
	Metro Cebu (4% of National)	128.1	480.2	608.3
	Net Budget for Metro Cebu Infrastructure (excl. 20%)	102.5	384.1	486.6

Source: JICA Study Team.

2) PPP Scheme Applications

14.22 Implementing agencies are advised to adopt a deliberate approach to explore PPP arrangements as these are effective ways of increasing the resource pie. PPP should be used as a financing strategy for the investment portfolio, using value for money analysis as the rationale for the PPP implementation arrangement. Public funds can be leveraged to mobilize more investments, for example by providing viability gap funding for economically desirable but financially unviable projects, or credit enhancements to mitigate risks that cannot be fully controlled by the private sector, or bundling or unbundling of assets to improve financial viability.

14.23 Based on a preliminary review, the following projects which have excludable economic benefits, that can generate revenues and that lend themselves to commercial operation appear suitable for PPP arrangements. Moreover these projects do not require new and untested technology that would entail construction and operating risks. Also, an advantage for Metro Cebu is the wealth of experience in the same or similar types of projects in the Philippines and other countries. The lessons learned can help improve the structuring of the deal, more importantly the risk allocation and management.

Table 14.5 Possible Projects for PPP Scheme Application and Options

Project	PPP Scheme
Mananga Dam Bulk Water Supply Project	Build-operate-transfer or joint venture arrangement (availability payment)
Septage Management Project	Build-operate-transfer or joint venture arrangement (availability payment)
BRT (Bus Rapid Transit) System	Lease-operate-transfer (concession agreement)
Urban Railway Project	Build-operate-transfer or Lease-operate-transfer (concession agreement)
High Capacity Roads and Bridges	Build-operate-transfer (concession agreement)
Solid waste facilities	Build-operate-transfer (concession agreement)

Source: JICA Study Team.

14.24 There are several modalities for PPP arrangements, but there are two basic types of payment schemes to the private proponent: availability payments and concession. In an availability payment, the government party agrees to buy the minimum volume of output or service for a mutually agreed price as stated in the contract. So in this case the government party concerned is the institutional (or wholesale) buyer and is obligated to

"buy" whether or not there is a need or demand for the output or service. Say for example in a bulk water supply project, the government undertakes to buy a minimum volume X m^3 of water per day at PHP Y per m^3, therefore the government party effectively takes on the market risk. In a concession agreement the private proponent is authorized to sell the output or service directly to the end user and charge a fee or tariff therefore. The tariff is usually stated in the contract (in most cases it is the financial bid parameter), as well as the conditions and formula for adjustment during the life of the contract.

14.25 PPP arrangements thrive in an enabling environment with competitive and transparent procurement rules, clear and reasonable economic regulatory guidelines, rational risk allocation and practicable mitigation measures, and reliable enforceability of contract provisions.

14.26 While not a perfect system, the Philippines has the fundamental structures in place for PPP contracting. There are three legal bases that can be used, the first two of which, with clearly defined implementing rules and regulations, namely:

Table 14.6 Legal Basis of PPP

Legal Basis	Who can use it?
RA 7718 or the BOT Law	National government agencies, government owned and controlled corporations and local government units
Joint Venture Guidelines	Government owned and controlled corporations
RA 7160 or Local Government Code	Joint venture or cooperative agreement for LGUs

Source: JICA Study Team.

14.4 Project Packages (Anchor Programs and Flagship Projects)

1) Anchor Programs

14.27 Mega Cebu roadmap is consisted of 7 sub-roadmaps. Each sub-roadmap has corresponding proposed projects which should not be implemented by individual LGUs alone since metropolitan coordination grants and gains implementing power.

14.28 Considering the too many stakeholders for each sub-roadmap projects, those projects are required to focus on the implementation. Based on the implementation perspective, several high priority roadmap projects are rearranged into 14 anchor programs and proposed in the followings.

(a) Investment Promotion by a Mega Cebu Investment Board (MCIB) through Cebu Branding

14.29 It is focusing to establish Cebu branding centering MCIB, to conduct a study of regional development by medical welfare and tourism, to conduct a study on industrial zone development, and so on. Coordination with the other areas in Province of Cebu is required.

- **Stakeholders:** Member organizations of the Chamber of Commerce, private sectors (from priority sectror such as tourism, etc.), 13 LGU, Province of Cebu, DTI, DOTC, PEZA, NEDA, MCDCB, etc.
- **Primary Responsible Organization:** Cebu Province which has recently established Investment Promotion Center and DTI

(b) Urban Greening (Completion of 'Green Loop', etc.)

14.30 Adaptation of urban greening should be facilitated to any urban development

projects. Urban rivers should be managed comprehensively from the river source to the river mouth. The Green Loop Project will be implemented as a symbol project.

- **Stakeholders:** Private Sectors (i.e. developer, etc.), NGO, 13 LGU, Province of Cebu, DENR, DPWH, NEDA, MCDCB, etc.
- **Primary Responsible Organization:** DPWH in charge of road widening and re-arrangement and DENR in charge of open space design, greening and street furniture.

(c) Operationalization of Mega Cebu Spatial Plan

14.31 Balanced urban development of land uses and infrastructures must be implemented based on the spatial plan which will be the basis of instructions and approvements of the private development. The spatial plan should be managed based on utilization of GIS database. Periodical training should be conducted targeting to monitor difference of actual and planned utilization and to update periodically.

- **Stakeholders:** 13 LGU, Province of Cebu, DOST, HLURB, NEDA, MCDCB, etc.
- **Primary Responsible Organization:** MCDCB which will organize a Technical Research and Planning Unit for managing the Mega Cebu Spatial Plan

(d) Urban Fringe Highway Network Development (Circumferential Road, etc.)

14.32 To improve the bypass function of the existing arterial roads and guide the planned development of new urban areas, 3 sections of the urban fringe highway (Second Cebu North Road, Outer Circumferential, Second Cebu South Road) should be constructed with consideration to the environment.

- **Stakeholders:** NGO, 13 LGU, Province of Cebu, DPWH, DENR, NEDA, MCDCB, etc.
- **Primary Responsible Organization:** DPWH

(e) Mactan Link Development

14.33 The roadmap proposed 3 links consisted from the Mactan North Dual-mode Bridge, a road bridge connecting south Mactan and Cebu City and a railway link which will be considered in long-term. The first Mactan Bridge is deteriorated severely and requires much considerations on the security.

- **Stakeholders:** Relating LGU, Province of Cebu, MCIAA, DPWH, DOTC, NEDA, MCDCB, etc.
- **Primary Responsible Organization:** DPWH and DOTC in the case of rail bridge

(f) Mass Transit Network Development (MRT/LRT/BRT)

14.34 Following the implementation of the committed BRT project in Cebu City, a comprehensive mass transit network should be developed based on BRT/LRT/MRT network and alternative modes of jeepny and bus.

- **Stakeholders:** NGO, road users, 13 LGU, Province of Cebu, DPWH, DOTC, LTFRB, NEDA, MCDCB, etc.
- **Primary Responsible Organization:** DOTC

(g) Gateway Development (Airport, Seaport)

14.35 Infrastructure developments should be conducted to expand the capacity of the airport and the ports as a gateway of Metro Cebu, transfer a part of the port function and strengthen accessibility of the airport and the ports

- **Stakeholders:** Member organizations of the Chamber of Commerce, airport and port users, relating LGU, Province of Cebu, DOTC, DPWH, CPA, MCIAA, NEDA, MCDCB, etc.
- **Primary Responsible Organization:** DOTC, CPA and MCIAA

(h) Integrated Road Traffic Management and Bottleneck Clearance

14.36 An integrated traffic control center to deal with metropolitan road traffic should be established to implement unified traffic signal cycle management, monitoring and assessment of actual road situations, and disseminate realtime information to the users.

- **Stakeholders:** Road users, 13 LGU, Province of Cebu, DPWH, DOTC, LTFRB, LTO, NEDA, MCDCB, etc.
- **Primary Responsible Organization:** MCDCB which will create a new urban service unit with participating LGUs, and with support from DPWH

(i) Surface Water Resource Development

14.37 A paradigm shift to utilize surface water resources by dam construction should be realized to eliminate the demand supply gap of potable water services and deal with the solt water intrusion to the underground waters.

- **Stakeholders:** NGO, MCWD, other public and private water distributers in Metro Cebu, 13LGU, Province of Cebu, DPWH, DENR, NEDA, MCDCB, etc.
- **Primary Responsible Organization:** MCWD and related LGUs

(j) Urban Septage / Sewerage Service

14.38 Considering the current situation of the limited urban sewage services, a system should be established to expand those services starting from septage treatment and to spread sewerage treatment widely.

- **Stakeholders:** NGO, MCWD, other public and private water relating companies in Metro Cebu, 13LGU, Province of Cebu, DPWH, DENR, NEDA, MCDCB, etc.
- **Primary Responsible Organization:** MCWD and other water works/districts

(k) Comprehensive Flood Control

14.39 A comprehensive flood control should be conducted by clearing and repairing the rivers and waterways, and managing the water resource areas.

- **Stakeholders:** NGO, 13LGU, Province of Cebu, DPWH, DENR, NEDA, MCDCB, etc.
- **Primary Responsible Organization:** participating LGUs with support from DPWH

(l) Metropolitan Solid Waste Management

14.40 An individual solid waste management system by LGUs should be shifted to a metropolitan wise management system such as Metro Manila.

- **Stakeholders:** NGO, 13LGU, Province of Cebu, DENR, DOST, NEDA, MCDCB,

etc.

- **Primary Responsible Organization:** MCDCB which will create a new urban service unit with participating LGUs

(m) Advanced Energy Management System

14.41 An advanced smart energy management system will be investigated in SRP, and good practices shall be adopted to the other areas of Metro Cebu.

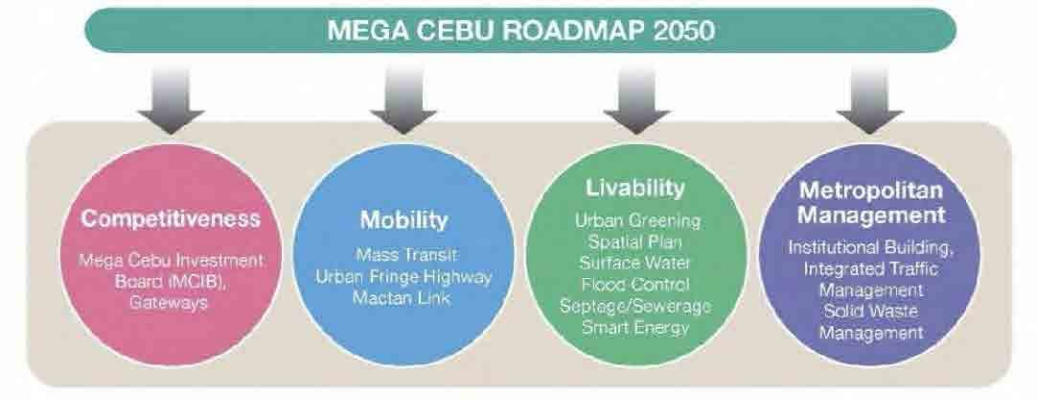
- **Stakeholders:** NGO, member companies in SRP, Energy Solution Companies, Relating LGU, Province of Cebu, VECO, DOST, NEDA, MCDCB, etc.
- **Primary Responsible Organization:** Cebu City with an energy solution company

(n) Institutional Building of Metropolitan Governance

14.42 The function of MCDCB should be strengthened and transferred to the new organization which has the responsibility to the metropolitan governance.

- **Stakeholders:** 13LGU, Province of Cebu, DILG, NEDA, MCDCB, etc.
- **Primary Responsible Organization:** MCDCB

14.43 Those anchor programs are grouped into four (4) strategies under the Mega Cebu Vision 2050: (i) competitiveness through facilitation of people and goods movement and investment, (ii) mobility by metropolitan transport network, (iii) livability by environmentally sustainable urban management, and (iv) strengthening of metropolitan management capacity.



Source: JICA Study Team.

Figure 14.3 Anchor Programs under Mega Cebu Policy Initiatives

2) Mega Cebu Perspectives to be guided by the Roadmap

14.44 In this section, the Mega Cebu Roadmap is assessed from different viewpoints, mainly from development beneficial.

Table 14.7 Roadmap's Interpretation in Development

	Present	Future (2030, 2050)	Roadmap
Population	2.55 million in 2010	4.99 million in 2050	Approx. 8,000 ha lands are planned for new housing areas
Employment	1,071 thousand in 2010	2,097 thosand in 2050	Approx. 4,000 ha lands are planned for new commercial/business/industry areas
Trunk Road	Mostly 2-4 lanes without alternative roads	All over 4-lane roads with alternative routes	Urban fringe highway network (95 km in total) and others
Road Congestion	Many congestion points during peak hours	Road congestions will be slightly improved.	Integrated road traffic management and bottleneck clearance
People Movement	Largely by jeepneys (35%) and increasing motorcycles (22%)	More public transport users particularly urban rail (20%)	LRT/MRT network (116 km and 63 stations in total)
Water Supply	227 thousand m^3 in 2013	797 thousand m^3 in 2050	3 dams, further underground water exploitation and other measures
Septage/Sewerage	Almost no service	Urban septage services by 2030, urban sewerage services by 2050	7 septage plants and 10 sewerage plants
Flood Control	Many prone areas	Almost no flood areas along rivers except for coastal low lands	Cleaning of rivers and drains, River improvement and rain water storage facilities
Smart Energy	Very few application of smart energy technologies	Promotion of smart SRP development Smart technology transfer to other areas	Introduction of smart energy technologies to SRP
Metropolitan Management	MCDCB forums and workshops MCDCB's road requirements to DPWH	Promotion and supervision of the roadmap projects by MCDCB (particularly at Technical Research Unit) Transfer to new metropolitan organization	All the Roadmap planning contents are related

Source: JICA Study Team.

3) Flagship Projects

14.45 The projects which is recommended for early implementation until 2017 with assistance or initiative of the national government is referred to as the flagship projects. Ten flagship projects are selected from the short-term projects (2015–2020) of the roadmap[30]. That include three projects for immediate implementation, four new projects for the study on project preparation, two projects which have been committed already and one project for institutional enhancement.

(1) Master Plan Study and Feasibility Study (FS) on Mass Transit Network Development (MRT/LRT/BRT) in Metro Cebu

(2) Update of the Cebu Province Development Master Plan

(3) Construction of the Mactan North Dual-mode Bridge

(4) Construction of Mananga II Dam

(5) Construction and Networking of Septage Plants

(6) FS on Area Traffic Control in Metro Cebu

(7) A Comprehensive Solid Waste Management Master Plan for Metro Cebu

[30] Steering Committee for ITR3 of the Study in 29 January 2015.

(8) FS on Sea Gateway Port Construction (Committed by DOTC)

(9) A Comprehensive Study for a Metro Cebu Integrated Flood and Drainage System Master Plan (Committed by DPWH)

(10) Establishment of Technical Research Unit to MCDCB and Its Capacity Development

14.46 The flagship projects have the following characteristics:

(i) One of the flagship project for new study (referring to the number 1 above) is prioritized to the one which requires the highest investment, that is a mass transit system. Development of this system is required to form an urban framework strategically together with the functions as an integrated system and project feasibility.

(ii) To achieve a sustainable development of Metro Cebu, coordination with urban and rural areas in the other areas of Province of Cebu and utilization of the resource of agricultural area, industrial area and tourism area are indispensable. The Study on Cebu Integrated Area Development Master Plan was conducted in 1994 by JICA – NEDA, however, most of the proposed projects have not been implemented yet. Therefore, an update of the Cebu Province Development Master Plan (referring to the number 2 above) is proposed to accelerate the implementation of the former master plan projects.

(iii) The three projects for immediate implementation (referring to the numbers 3, 4, 5 above) have high importance and urgency. The capacity of the existing Mactan Bridge which is linking Mandaue City and north of Mactan Island is expected to be full in 2020. Moreover, considering the age of the bridge, construction of an alternative bridge is required urgently. Construction of the Mananga II Dam is the most critical project for sustainable development of Metro Cebu to deal with the water problem and a paradigm shift of water resource from underground water to surface water. Construction of a network of septage plants has been firmly agreed by all LGUs when the Study was started. It was prioritized by both JICA and Cebu City and selected for the flagship project.

(iv) The other two flagship projects for new study (referring to the numbers 6, 7 above) are focusing on area traffic control and solid waste management. Those are the governmental services to be provided metropolitan-wide over beyond the boundaries of LGUs, for example MMDA in Metro Manila. The implementation plan should be designed according to the progress of MCDCB's reform to a metropolitan government and with close coordination between LGUs.

(v) The two committed projects for port and drainage (referring to the numbers 8, 9 above) are selected as flagship projects because implementation of those projects play an important role in the roadmap.

(vi) Since its establishment in 2011, MCDCB worked as a unique organization lead by a NGO and helped in the participation of LGUs during the Roadmap Study. However, its institutional set up still does not possess enough technical capacity to be an implementing body of various proposed projects. Therefore, to begin the institutional reinforcement of MCDCB, it is proposed that a technical research unit be established to implement their capacity to develop projects (referring to the number 10 above). In addition, they have to be responsible for the analysis and update of GIS database which was developed in the Study.

PART III

15 SELECTION OF SHORT-TERM PRIORITY PROJECTS

15.1 There is a huge backlog in infrastructure development for Metro Cebu which degrades people's lives and the metropolitan economy since the 2000s. In this connection, some key projects were identified for early implementation to jump-start MCDCB's initiatives for the Mega Cebu Vision 2050.

15.2 MCDCB and JST held discussions with the LGUs, the national government agencies, the civil society, and the private sector regarding short-term priority projects that were selected based on project selection criteria at three meetings January to March 2014.

15.3 Some 50 projects were identified in the long project list in key sectors of this study (public transport, road network, water supply, sewerage and drainage, and solid waste management) from which 23 projects were short-listed or prioritized. Pre-feasibility studies (pre-FS) were conducted for the six JST-recommended projects that are included in the priority list. Of the six projects, a comment was raised on the Mandaue–Mactan North Dual Mode Bridge regarding the necessity of looking into the development opportunities of a railway project in tandem with the bridge project. As such, it was for this purpose that the JST additionally examined the Cebu–Mandaue–Lapu-Lapu Automated Guideway Transit (AGT-CML) Line Project.

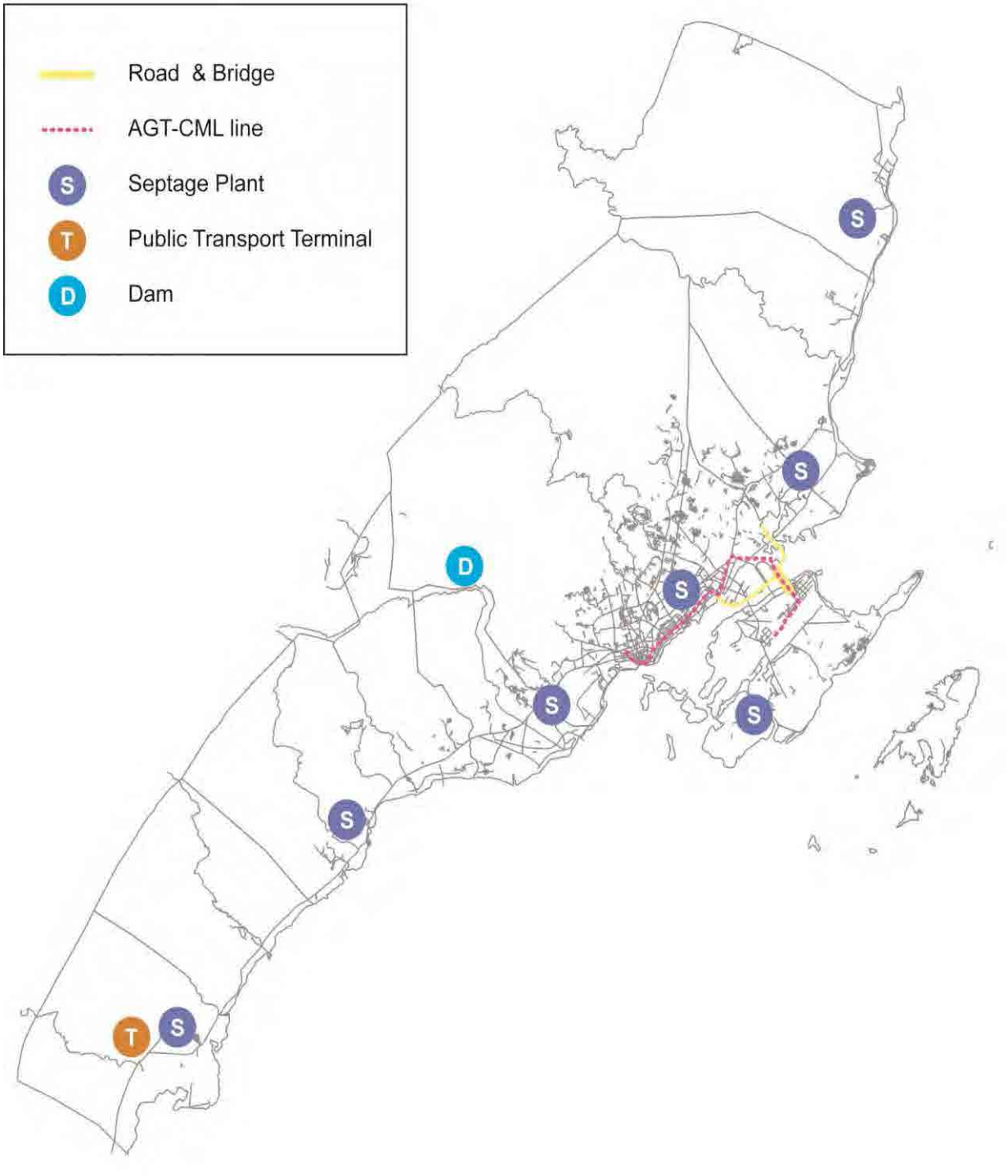
15.4 All seven projects can be grouped into those projects that have to be implemented and supported by the national government and those projects to be done by local or metropolitan initiatives as follows:

(a) National Government's Implementation or Its Strong Support

- Mandaue–Mactan North Dual-mode Bridge
- AGT–CML Line
- The Mananga Dam II
- Development of Septage Treatment Plants and their Network

(b) The projects for Metropolitan Initiatives)

- Public Transport Terminal
- Small Reservoirs and Booster Pumps
- Segregation of Solid Waste and Reduction Support



- Mandaue–Mactan North Dual-mode Bridge
- AGT-CMLLine
- Mananga Dam II
- Septage Treatment Plants and their Network
- Public Transport Terminal
- Small Reservoirs and Booster Pumps
- Segregation of Solid Waste and Reduction Support

Source : JICA Study Team.

Figure 15.1 Project Sites Subject to Pre Feasibility Studies

16 MANDAUE–MACTAN DUAL-MODE BRIDGE

16.1 Project Summary

16.1 Because there are the Mactan Cebu International Airport (MCIA), three industrial estates, and a number of international hotels in Mactan Island, a good connection between Mactan Island and Cebu Island is a serious concern to the Mega Cebu economic activity. Though currently the two bridges accommodate the traffic flows between the two Islands, the average travel speed on the 1st Mactan Bridge is below 20 km per hour and the heavy traffic causes traffic congestion on the bridge. It is predicted that daily traffic volume in 2020 would exceed 100,000 vehicles per day and serious traffic congestion is expected on the two bridges every day. Therefore, it is necessary to construct one more bridge before then.

16.2 The First Mactan Bridge, constructed in 1972, is dilapidated. Since 1990, large vehicles have been prohibited from crossing the bridge due to its weak structure. Since structure weakness is obvious even by ocular survey, the bridge should theoretically be closed for full rehabilitation. However, the Second Mactan Bridge cannot cope with the present inter-island traffic alone. As a practical solution, a new bridge will be constructed as soon as possible and the old bridge will be carefully operated while partly undergoing repair and maintenance. When a new bridge is available, the old bridge can be closed for full rehabilitation or replacement at the responsible agency's discretion.1

16.3 The Cebu Container Port is planned to be relocated to Tayud, Consolacion by DOTC. Mandaue City is planning to develop the Mandaue Coastal Scenic Road along the Opon Strait and around Cansaga Bay. A link between the new bridge and the Mandaue Coastal Scenic Road could provide a good access road between proposed new port in Consolacion and Mactan Industrial area (MEPZ) to support smooth traffic flows. In addition, that connection will be a bypass route between northern Cebu Island and Mactan Island without entering the urban center of Mandaue City where heavy traffic congestion always occurs.

16.4 MCIA received 7.0 million passengers in 2014. With the second terminal construction by PPP scheme, the users of CIA are estimated to increase by 20 million persons. Recently motorcycles are rapidly increasing on the two Mactan bridges. In the survey conducted in February 2014, the traffic volume of motorcycle was 45,000 vehicles per day. It is assumed that most of them are the commuters who are not satisfied with the road-based public transport services.

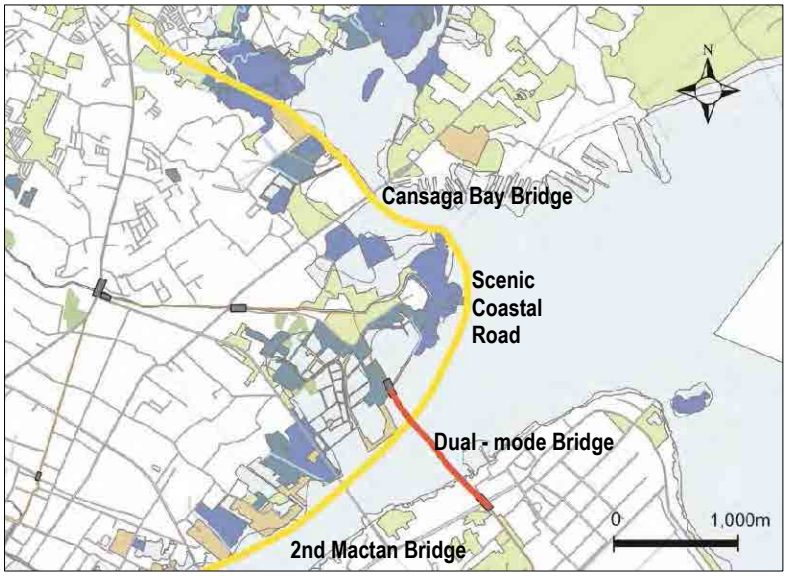
16.5 In this project, a dual made bridge, which is combined with road and automated guideway transit (AGT) system, is proposed to connect the section between MCIA, MEPZ to Cebu CBD for targeted airport passengers and commuters whose opportunity cost is generally higher, since AGT has advantages in on-time operation. The pre-FS on the AGT system is reported in the next chapter.

16.6 A high strength boltless steel truss with steel box girder bridge is recommended as the main bridge structure. Since it is boltless, the bridge can be constructed for a short period on site while saving maintenance cost through a longer interval of periodic

[1] DPWH Central Visayas Office will start to repair the First Macatan Bridge in 2015. It costs PHP154 million. Only one vehicle lane will be operated during repairing works. Following work volumes from 2016 are still uncertain.

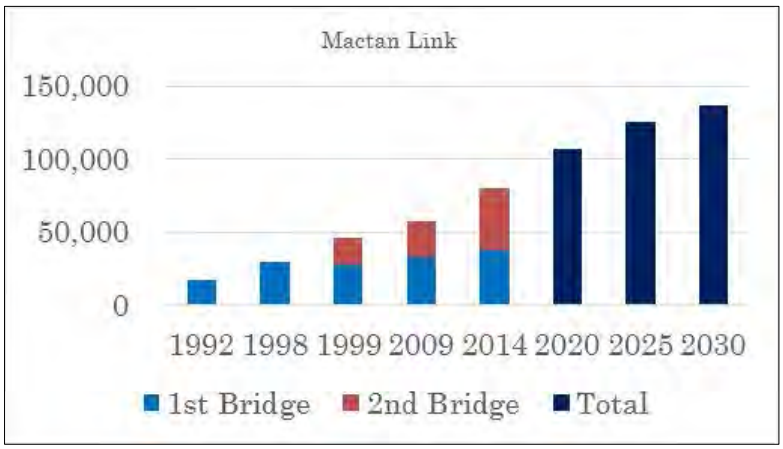
maintenance. The construction cost of the dual mode bridge is lower than the construction of separate bridges for road and AGT. The bridge structure also satisfies the requirement for aviation height restriction of 45 meters.

16.7 The location of the dual mode bridge is proposed at the point 900 meters toward north from the 2nd Mactan Bridge as suggested in the High Standard Highway Master Plan (2010) by DPWH.



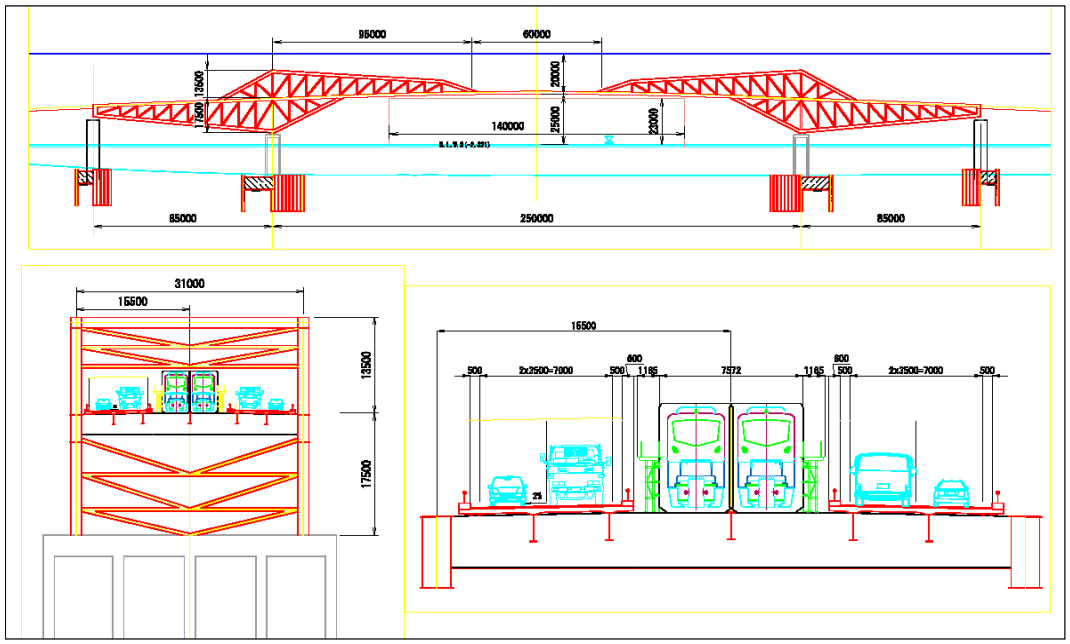
Source: JICA Study Team.

Figure 16.1 Dual-Mode Bridge and Scenic Coastal Road



Source: JICA Study Team.

Figure 16.2 Estimated Traffic Demand of Mactan Link



Source: JICA Study Team.

Figure 16.3 Main Bridge Design by High Strength Boltless Steel Truss with Steel Box Girder

16.2 Project Implementation Plan

16.8 The construction cost is estimated at PHP12.8 billion (main bridge PHP5.5 billion, approach bridge and ramps at three locations PHP4.1 billion, and Scenic Coastal Road PHP3.2 billion).

16.9 Land acquisition is necessary only for the Lapu-Lapu side and this will cost PHP85 million. The total project costs including maintenance cost is estimated at JPY35.8 million.

16.10 The dual-mode bridge of road and AGT could reduce the space for the bridge and cost of the land acquisition. The cost of the dual-mode structure would mean a reduction of about 12% construction cost as compared to the case if both structures would be built separately.

16.11 This project is eligible for JICA STEP loan which stands for Special Terms for Economic Partnership through best use of advanced technologies and know-how of Japanese firms. STEP's preferential conditions to the Middle Income Countries including the Philippines are interest rate of 0.1%, repayment period of 40 years, and grace period of 10 years.

16.12 The project implementation plan is shown in Table 16.1. The project will start preparatory study in 2015 and the bridge will be opened to traffic in 2021.

Table 16.1 Implementation Schedule of the Dual-Mode Bridge Project

	2015	2016	2017	2018	2019	2020	2021
JICA Preparatory Study							
NEDA Approval							
Loan Agreement		▲					
Procurement of Consultant for D/D							
D/D and Tender Document							
Tendering (PQ & Bidding)							
Construction							
Operation							

Source: JICA Study Team.

16.3 Economic Evaluation

16.13 The project's economic impact is assessed without the rail bridge portion. The project cost and its operation and maintenance (O&M) cost in economic terms are PHP 10,216 million and PHP739 million, respectively. The main economic benefits of the project emanate from the savings owing to the reduction in vehicle operating cost (VOC) and value of travel time (VTT). Comparing the situations 'with'' or "without" the project, project benefits will accrue over the project period, i.e., PHP51 million per day in 2030.

16.14 As a result, the project yields an Economic Internal Rate of Return (EIRR) of 19%, which is higher than the hurdle social discount rate set by NEDA of 15%. In other terms, net project value (NPV) and benefit/cost (B/C) ratio are calculated at PHP2,025 million and 1.43, respectively.

16.4 Environmental and Social Considerations

1) Resettlement

16.15 According to Mandaue City, no private land is reported around the proposed bridge and along the proposed Mandaue's Scenic Coastal Road between the Cansaga Bay Bridge and the Second Mactan Bridge. These situations were confirmed by ocular survey.

16.16 There is a community of informal settlers around the proposed bridge in Lapu-Lapu City. Among them, 10 households are to be relocated by the project. The 270-m long existing road from the coastline to Quzon National Highway needs to be widened by 10 meters. The road is faced by the sites of shopping mall and veneer factory.

16.17 The project can bolster the local economy by creating employment opportunities for the local residents during construction and operation. A positive impact rate is given.

2) Land Use Transformation

16.18 Mandaue City plans the Scenic Coastal Road together with a reclamation for Mandaue's Global City Project of 131 ha. Since the proposed bridge project includes part of the scenic costal road, it can accelerate reclamation and urban development from water areas, wetlands and underutilized lands to commercial and business, residential, agro-industry, tourism and protected mangroves. Therefore, the project will have a significant impact on the area.

16.19 On the other hand, limited changes will be brought about by the project in Lapu-Lapu City because adjacent lands are mostly urbanized. Lapu-Lapu City expects that the bridge project will stimulate the development move of the city's north reclamation project (400 ha). But the impact is uncertain due to a considerable distance of over 2 km between the proposed bridge and the proposed reclamation.

3) Effect on the Protected Area

16.20 There are extensive mangrove habitations around the proposed bridge in Mandaue City. Although the city plans a water amenity park, it may be in violation of the related environmental rules and regulations pertaining to cutting down massive mangroves.

16.21 Bridge construction may have an adverse impact to the marine environment. Such environmental effects may also extend beyond the project's completion.

16.5 Some Considerations for Implementation

16.22 The pre-FS concludes that the new bridge be prepared toward the year 2020 to avoid traffic congestion at the Second Mactan Bridge. Taking the dilapidated condition of the First Mactan Bridge into account, the project is urgently needed. The project obtains local support from the two cities of Mandaue and Lapu-Lapu. Social and natural impacts are not serious.

16.23 A dual-mode bridge can enjoy construction cost reduction when no considerable time lag occurs between road and rail. If rail operation falls behind road operation by 10 years or more, the advantage of cost reduction may be lost due to depreciation of the infrastructure. Without a viable rail project in the short-term, therefore, an exclusive road bridge should be constructed.

16.24 As there is a lack of expertise for the construction of a dual-mode bridge in the Philippines, it is suggested that the project be undertaken by a consultant and construction firms with knowledge of dual-mode bridges abroad.

16.25 There is also a move to construct a toll bridge and its approach viaduct/causeway between Cebu City and Cordova although the project stands 9 km away from the proposed dual-mode bridge. As the anticipated traffic demand in these areas are different from each other, the toll bridge cannot work as an alternative to the First Mactan Bridge. It is thus suggested that the proposed dual-mode bridge be constructed regardless of this private-sector led toll bridge between Cebu City and Cordova.

17 AGT-CML LINE

17.1 Project Summary

17.1 Of the Metro Cebu's population of 2.55 million in 2010, 61% are concentrated in the three cities of Cebu, Mandaue and Lapu-Lapu. Under the balanced development scenario suggested by this Roadmap Study, the three cities' population will still account for 51% or 2.52 million in 2050.

17.2 At present, daily traffic congestions mostly occur within the three cities. But most of developmental lands have been urbanized and therefore limited spaces are available for road construction and widening. It is imperative that rail-based transport system should be developed within the three cities in order to provide fast and scheduled public transport services regardless of road traffic congestions.

17.3 Among the three core cities of Cebu, Mandaue and Lapu-Lapu, inter-city traffic demand largely differs. As the results of the screenline traffic survey in 2014 revealed, 892 thousand commuters move across the border of Cebu City and Mandaue City daily while 318 thousand use the two bridges between Mandaue City and Lapu-Lapu City. Thus, as traffic demand fluctuates between these three cities, only one kind of mass transit system would prove to be inadequate in servicing both the corridors.

17.4 The Mega Cebu Roadmap 2050 therefore suggests several rail lines, including a Mass Rail Transit (MRT) stretching along the Cebu Island coastline (75 km in total, divided into three operating lines to meet different demand segments and localities), one Light Rail Transit (LRT) line to connect the three cities particularly MCIA at the end, and one more MRT connecting Cebu City and the middle and southern parts of Mactan Island. (Refer to Section 9.3 of this report.)

17.5 Traffic assignment exercises under different transport networks and different O-D matrices show that a set of new road projects will not be sufficient to maintain a good level of service for road traffic conditions in 2030. In addition, two rail lines will be necessary such as one MRT Line between Consolacion and Talisay and one LRT connecting the three cities. Otherwise, road conditions would be much worse than the existing situations. (Refer to Section 14.2 of this report.)

17.2 Alignment and Transport System

17.6 The largest traffic generation / attraction facility in the northern part of Mactan is the MCIA. In 2015, the new airport concessionaire will start to construct the second passenger terminal in order for MCIA to serve 20 million passengers annually or 55 thousand passengers daily on the average. Three industrial estates are located nearby the airport where 80 thousand workers commute. If a mass transit takes a share of 30% or about half of public transport demand in the major corridors until 2030, one LRT route may be enough between Mandaue and Lapu-Lapu.

17.7 Although there are several types of LRT systems, the study selected the Automated Guideway Transit (AGT). AGT is popular for airport access transport in the world with the following technical advantages reported:[2]

[2] From the presentation document by the Japan Transportation Planning Association at Cebu City in January 28, 2014.

(i) Environmentally friendly operation such as less air pollution than jeepneys and buses, since they are electric powered, and less noise and vibration than MRT, as they use rubber tyres;

(ii) Safe operation in an emergency case such as earthquake, heavy rains and floods and strong winds and, thus, operation without a driver is possible;

(iii) Simple system structure without catenary lines for electricity supply;

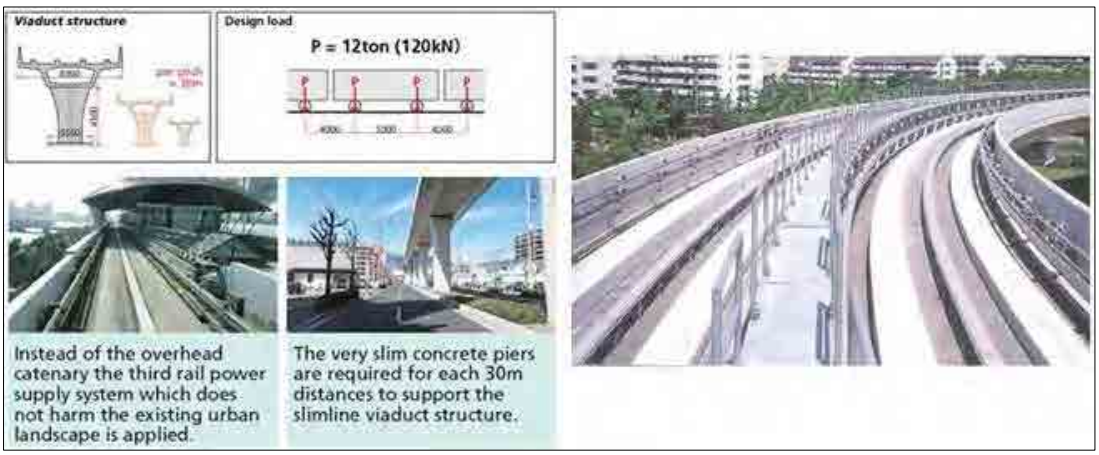
(iv) Better maneuverability in a tight radius (turning radius of 30 meters, much shorter than the MRT at 160 meters); and

(v) Easy to change train configuration to meet peak and off-peak demands even within the same day unlike monorail.

17.8 The selected AGT alignment is Ouano Avenue between Cebu City and Manduae City since Cebu North Road is suitable for the heavier MRT Central Line which connects consecutive MRT lines to the north and to the south. The AGT alignment will connect with the forerunner project of the Cebu City BRT at the corner of N. Bacalso Avenue and Osmena Boulevard. It will also connect with the MRT Central Line at the same intersection and another intersection of Cebu North Road and UN Avenue in Mandaue City in order to allow convenient transfers of public transport users.

17.9 A rail bridge is necessary between Mandaue City and Lapu-Lapu City. To serve MCIA and industrial estates nearby, two crossing points are convenient; a new rail bridge along the First Mactan Bridge and a new dual-mode bridge 900 meters north from the Second Mactan Bridge. The old bridge is dilapidated and large vehicles over 5 tons are no longer allowed to cross. Unless the old bridge is fully rehabilitated, putting up a new rail bridge parallel to this old bridge is not a sound and safe option. A new dual-mode bridge is, therefore, selected.

17.10 A depot site (6 ha) will be prepared near the proposed dual-mode bridge in Mandaue City.[3]



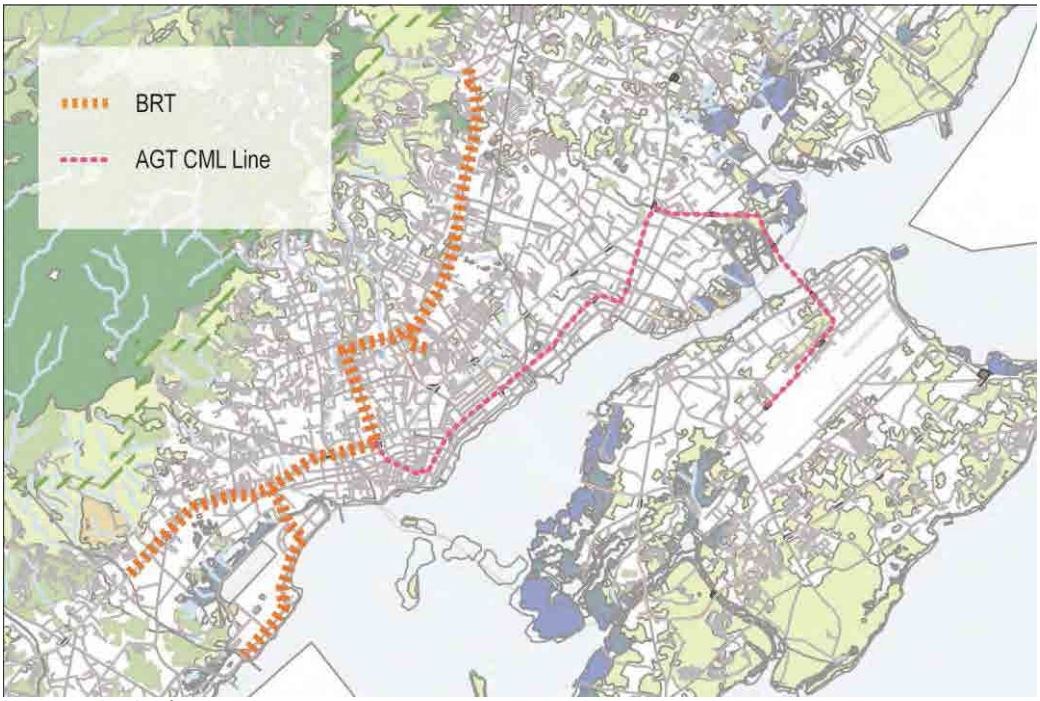
Source: JICA Study Team.

Figure 17.1 AGT Carriageway and Station

[3] The Mandaue's City Development Council (chaired by the Mayor) on February 20, 2015 decided to promote the Mandaue–Mactan North Dual-mode Bridge and the AGT-CML Line and allocate a depot site of 6 ha near the bridge.

Source: Mitsubishi Heavy Industries for both the above figures.

Figure 17.2 Internal Layout of AGT Railcar



Source: JICA Study Team.

Figure 17.3 Alignment of AGT-CML Line

17.3 Traffic Demand Forecast

17.11 A simulation was made – on the basic assumption that the AGT Line gets top priority and is built first to function as a major trunk rail line – instead of merely an airport feeder service particularly between Cebu City Center and Mandaue City Center until the MRT Central Line is introduced.

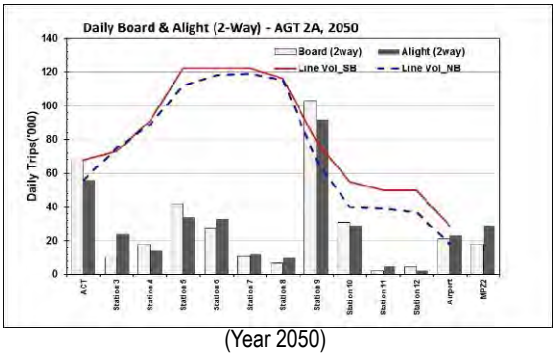
17.12 Table 17.1 shows the ridership on the AGT Line and the other two lines in the urban core, using a fare of PHP20 plus 0.50/pax-km. As expected, the daily demand on the AGT Line started high; 207 thousand passengers in 2021, 222 thousand passengers in 2030 and 363 thousand passengers in 2050.

Table 17.1 Daily Ridership by Station on AGT-CML Line, Year 2030 and 2050

Station Name	Distance (km)	Year 2030				Year 2050			
		Board (2way)	Alight (2way)	Line Vol_SB	Line Vol_NB	Board (2way)	Alight (2way)	Line Vol_SB	Line Vol_NB
ACT, Cebu	1.48	41,000	24,000	41,000	24,000	68,000	56,000	68,000	56,000
Independence Park	1.58	25,000	24,000	55,000	37,000	10,000	24,000	73,000	75,000
Station 3	1.10	10,000	11,000	65,000	47,000	18,000	14,000	91,000	89,000
Station 4	1.62	10,000	7,000	75,000	54,000	42,000	34,000	122,000	112,000
Station 5, Mandaue	1.51	9,000	13,000	81,000	64,000	27,000	33,000	122,000	118,000
CICC	1.41	7,000	3,000	87,000	66,000	11,000	12,000	122,000	119,000
Station 7	1.30	5,000	4,000	86,000	64,000	7,000	10,000	116,000	115,000
MC Briones	1.81	61,000	70,000	60,000	47,000	103,000	92,000	79,000	67,000
Station 9	1.90	9,000	9,000	53,000	40,000	31,000	29,000	55,000	40,000
Depot	1.37	1,000	1,000	52,000	39,000	2,000	5,000	50,000	39,000
MPZ1, Lapu-Lapu	1.66	13,000	29,000	27,000	30,000	5,000	2,000	50,000	37,000
Airport	2.42	10,000	10,000	18,000	21,000	21,000	23,000	29,000	18,000
MPZ2		21,000	18,000			18,000	29,000		
Total Pax		222,000	223,000			363,000	363,000		

Source: JICA Study Team.
Note: Fare level – PHP20 plus PHP0.5/km.

(Year 2030)



(Year 2050)

Source: JICA Study Team.

Figure 17.4 Station Loadings and Line Volumes (2030 and 2050)

17.4 Economic and Financial Evaluation

17.13 The AGT-CML Line is estimated to cost USD819 million while its economic value is translated to USD815 million. When the financial cost is divided by route length and maximum transport capacity, the cost index is USD2,848. The cost performance is competitive among the similar urban rail systems in other cities. In this sense, the Cebu City BRT is considered costly because the cost index of USD2,513 does not include existing road infrastructure.

Table 17.2 Capital Cost of AGT-CML Line

Item No.	Particulars	Financial Cost (USD million)	Economic Cost (USD million)	
1	Civil Works	322.1	341.4	Foreign content ~30%
	Viaduct [a/]	252.9	260.5	
	Stations	65.0	67.0	
	Depot Building	4.2	4.3	
2	Rolling Stock (Trains)	270.0 [b/]	295.7	RS=USD113 M for Case 1-B; RS=USD104 M for Case 2-B
3	Electromechanical System			Foreign content~95%
	Signalling & Telecommunications	96.0	114.2	
	Power System	15.0	17.8	
	Depot equipment	5.8	6.9	
	Other E&M	15.2	18.1	
4	AFCS (Smart card ticketing)	5.0	6.0	
5	Right-of-Way / Land	13.4	13.4	
6	Taxes	99.6	0	VAT and import taxes
	Total (in USD)	818.6	814.7	

[a/] Excludes the cost of bridge across Mactan, but include viaduct & track cost.
[b/] For 30 train-set of 6-car/train; Urbanismo-22, manufactured by MHI

Source: JICA Study Team.

Table 17.3 Selected Cost Indices of Mass Transit Projects

	Project/Line	Length (km)	Cost/km (USD million)	Capacity (pphpd)	Cost/km/pphpd
1	Cebu AGT: Case 1-A	19.16	42.7	15,000	2,848
2	Manila LRT 1–South Extension	11.7	106.8	32,000	3,337
3	Manila LRT 2	13.8	54.3	24,700	2,198
4	Kuala Lumpur Monorail	8.6	36.0	2,800	12,857
5	Mumbai Monorail Phase 1	19.54	22.0	9,000	2,444
6	Macau AGT	20.2	69.3	14,200	4,880
7	Cebu BRT	21	10.1	4,000	2,513

Source: JICA Study Team.

17.14 After fare revenues and operational expenses are analyzed, farebox revenue (fare revenues – operational expenses) would be positive every year with PHP583 million in 2030 and PHP1,478 million in 2050. If initial capital costs are included, however, the project Financial Internal Rate of Return (FIRR) shows a negative figure of -1.4%. The poor commercial viability of rail project is not surprising. Most rail projects rarely pay for themselves as proven in the heavily subsidized LRT / MRTs of Metro Manila. In the Philippines, rail project formation is done through negotiation between the government (DOTC) and the private sector in terms of a share of project capital cost and an operation subsidy formula.

17.15 Recent rail projects in Metro Manila provide some unit valuations for simple economic analysis. The EIRR values for the AGT-CML Line is 17.4% at increasing unit benefits (i.e., increasing through the years). The figure proves that the project is economically viable.

17.5 Environmental and Social Considerations

17.16 The AGT-CML Line does not require new ROW acquisition because the alignment is over the existing roads and the river buffer zone of Butuanon River. A depot site (6 ha) is planned near the proposed dual-mode bridge in Mandaue City. Currently, the site is on grass and wetlands and uninhabited. The site will be developed in conjunction with the Mandaue's Scenic Coastal Road and the Riparian Environmental Improvement Project along Butuanon River.

17.17 Due to its simple and elevated structure, the AGT-CML Line would not give any adverse impact on the natural environment. Rubber tyres could mitigate noise and vibration to a large extent. Many passengers would shift from road vehicles such as jeepneys, motorcycles and cars to the AGT to avoid traffic congestion. Therefore, this modal shift could contribute to lower carbon emission in the metropolis.

17.18 During the construction period, road traffic control would be undertaken on the AGT alignment for safe and efficient construction activities. Traffic congestion would be worse temporarily. In addition, noise and dust would be generated from the construction site. On the other hand, during the AGT operation, existing jeepney routes would be reorganized to avoid competition and road traffic would be reduced. As a result, road traffic flow would be improved.

17.19 Finally, many foreign cities which introduced the AGT systems have experienced urban environmental improvement and beautification. Metro Cebu can expect the same development effect.

Source: JICA Study Team.

Figure 17.5 Yokohama's AGT on Seaside Line

17.6 Some Considerations for Implementation

17.20 The AGT-CML Line is designed to serve two major corridors in Metro Cebu: Cebu City to Mandaue City, and Mandaue City to Lapu-Lapu City. It is designed to meet the demand of the latter corridor as a transport system. Traffic demand forecast shows the highest traffic sections along Ouano Avenue in Mandaue City.

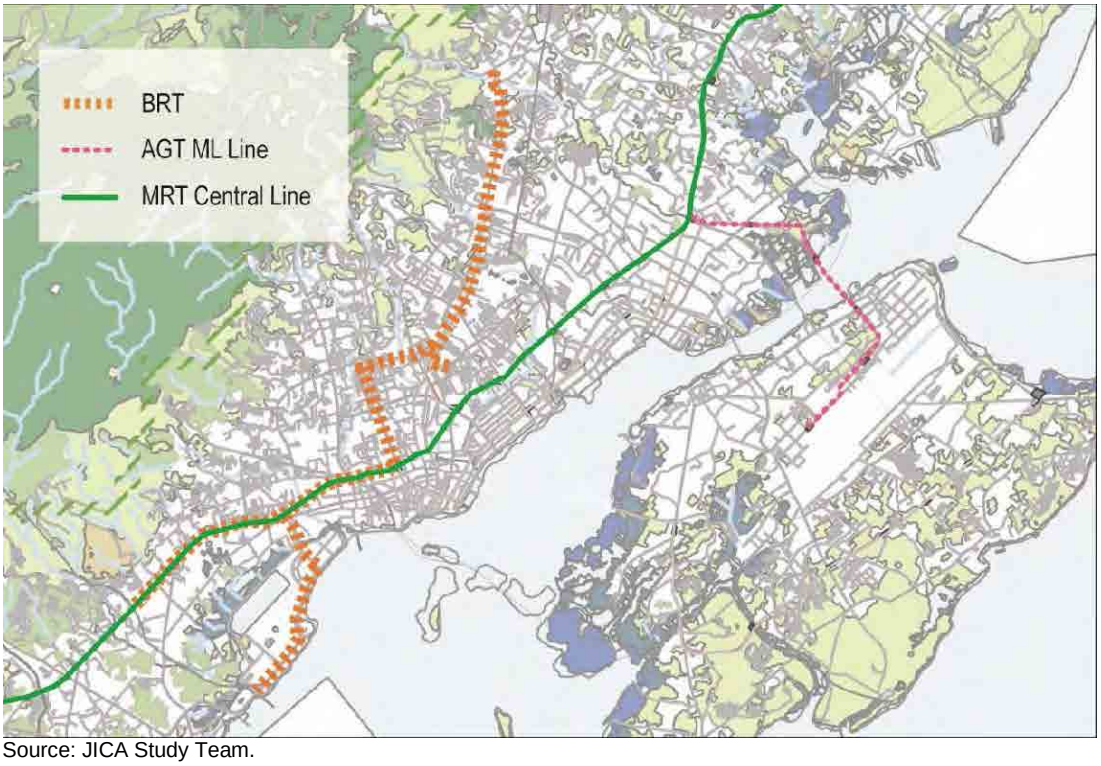
17.21 The assumption behind traffic demand forecast is to develop the AGT-CML Line first in the early 2020s and the MRT Central Line (Consolacion–Talisay City) by 2030. In fact, the MRT Central Line has double capacity than the AGT–CML Line and thus requires more than double the investment, e.g., USD1,774 million. If the MRT Central Line would be delayed in development, the AGT–CML Line must cope with a passenger load above its designed capacity. As a result, heavily crowded situations may happen like LRT / MRTs services in Metro Manila.

Source: JICA Study Team.

Figure 17.6 Typical Scene of Overcrowding on Metro Manila's Urban Rails

17.22 When both the AGT-CML Line and the MRT Central Line are in operation, the two lines will run in parallel between Cebu City and Mandaue City with a space of less than 1 km. Metro Manila's experience shows each station's catchment area is more or less within a 500-meter radius by walk. Therefore the two lines will be able to provide highly accessible rail services under competitive environment.

17.23 The idea of constructing the two lines together is worth considering although it requires a huge investment of approximately USD2.6 billion. In order to reduce construction cost, one idea is for the AGT-ML Line to be a feeder line of the MRT Central Line to MCIA. With this idea, rail services between Cebu City and Mandaue City would be downgraded. But it could cut the total construction cost by USD200–300 million provided that additional investment for capacity expansion of the MRT Central Line could be included.



Source: JICA Study Team.

Figure 17.7 The Case of Early Construction of the MRT Central Line with the AGT-ML Line

17.24 In the Philippines, there is almost no possibility of purely private investment in urban rail due to the low tariff setting. However Metro Cebu will not be able to maintain people's mobility at the present level without an urban rail network in the future. A more detailed study is necessary to design an overall rail network including the AGT line with a doable PPP scheme.

17.25 This pre-FS has been conducted to check project viability of the proposed dual-mode bridge. As a result, it is understood that the AGT-CML Line expects a considerable ridership and accordingly, mitigate road congestions. It is an important project from the local economy's viewpoint. Since the dual-mode bridge can save both bridge space and construction cost compared with two separate bridges, it is concluded to be a favourable bridge plan.

17.26 Finally, project implementation schedule of the AGT-CML Line is given in the table below.

Table 17.4 Implementation Schedule of the AGT-CML Line

	2015	2016	2017	2018	2019	2020	2021
Feasibility Study							
Detailed Engineering Design							
PPP Arrangement							
Construction							
Commercial Operation							

Source: JICA Study Team.

18 THE DEVELOPMENT OF MANANGA II DAM PROJECT

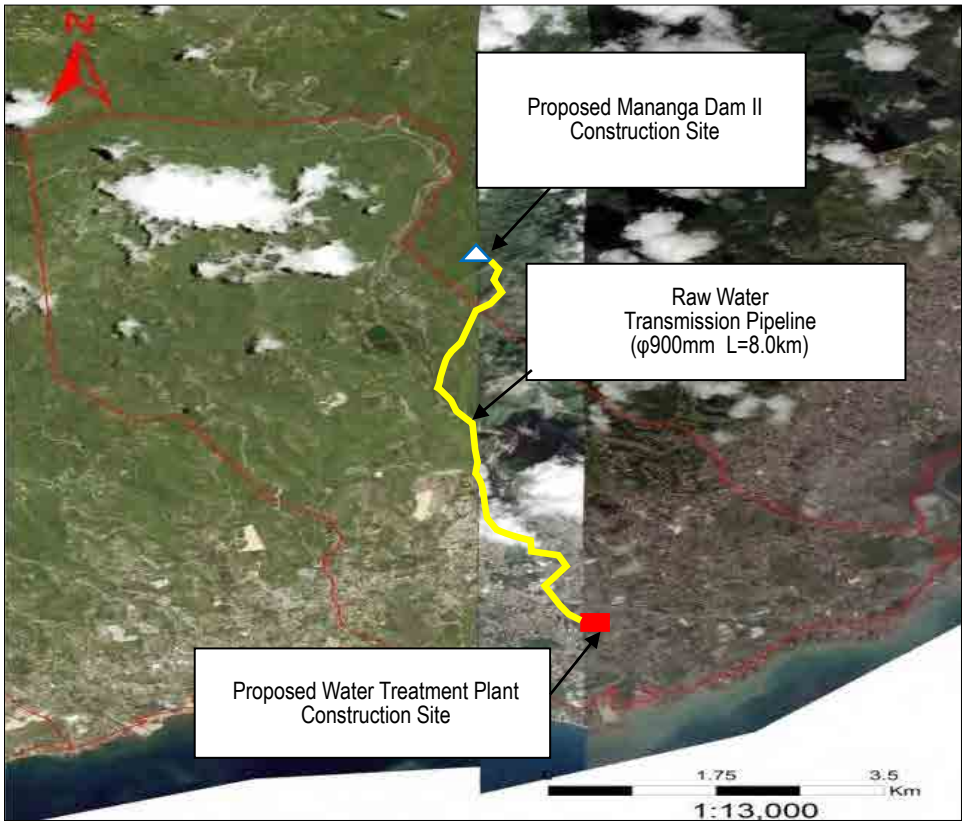
18.1 Background and Project Necessity

18.1 Water supply is one of the critical development constraints in Metro Cebu. Even in the best case scenario where the pipelined projects for additional water sources are realized, water shortage is still expected to occur by 2020. The Study Team examined several potential new water sources and recommended the immediate development of the Mananga II Dam project to ensure sufficient water supply beyond 2020.

18.2 Description of Mananga Dam II Project

18.2 The development of the Mananga River as a new source of water supply has been repeatedly studied over the last 30 years. This study recommends the construction of a 76 m-high dam, which is expected to yield 68,000 m^3/day. The location of the Mananga II Dam is 1.0 km upstream near Camp IV (km 19) in Barangay Buot-Taup in Cebu City. Figure 18.1 shows the location of Mananga II Dam.

18.3 The estimated project costs for the Mananga II Dam Project is approximately PHP4.8 billion including land acquisition[4]. Table 18.1 gives the breakdown of this project cost.



Source: JICA Study Team.

Figure 18.1 Location of Mananga II Dam

[4] Cost of preliminary studies and resettlement are not included.

Table 18.1 Project Cost of Mananga II Dam

Category	Cost Component		Total Amount (million JPY)	Total Amount (million PHP)
	Foreign Currency (million JPY)	Local Currency (million PHP)		
1. Construction Cost	3,060	2,410	9,586	3,540
2. Price Escalation	306	241	959	354
3. Contingency	153	121	481	178
4. Engineering Services	306	241	959	354
5. Land Acquisition (8ha)	0	280	758	280
6. Administrative Cost	0	72	196	72
Total	3,825	3,365	12,939	4,778

Source: JICA Study Team.

18.4 The construction cost includes renewal of the equipment of the existing water treatment plant, which is estimated to cost PHP517 million and a useful life of 15 years. The annual operating and maintenance cost assumed is 3% of the construction cost, equivalent to PHP106 million per year.

18.5 Project development is scheduled to start in 2015; construction is scheduled from 2017 to 2022, including detailed design from 2017–2018; and operation will start in 2023. The implementation schedule is shown in Table 18.2.

Table 18.2 Implementation Schedule of Mananga Dam Project

No.	Item	Year	Financial Cost (mil. PHP)	2015	2016	2017	2018	2019	2020	2021	2022
1	Preliminary Studies (Hydrologic al analysis, geographical survey, F/S etc.)	2	-	←	→						
2	Preparation for design and bidding	2.5	354			71	142	142			
3	Construction(price escalation, contingency and admin cost are included)	3	4,144						663	1,782	1,699
4	Purchase of Land for water treatment plant (8 ha)		280					280			
5	Total (2+3+4)		4,778								

Source: JICA Study Team.

18.3 Financial and Economic Evaluation

1) Economic Evaluation

18.6 In order to evaluate whether the project deserves investment of public monies from the viewpoint of national economy, an economic analysis was conducted by using the discounted cash flow analysis.

(1) Basic Assumptions

18.7 The basic assumptions used in the economic analysis are the following:

(i) Project evaluation period is 30 years including construction and operation period;

(ii) Financial costs of the projects were converted to economic costs using the standard conversion factor (SCF) of 85%.

(iii) Economic benefit adopted the value from the willingness-to-pay (WTP) of

beneficiaries. The amount is calculated by a formula that the number of beneficiaries (households) is multiplied by the amount of WTP per household. The amount of WTP is assumed at PHP500/month (or PHP6,000/year) per household based on the result of WTP survey conducted by the JICA Study Team in 2014. The number of households who are to benefit from the project and total economic benefits are summarized in the following table.

Table 18.3 Total Benefit in Benchmark Year

('000PHP)

Year	WTP (A)	No. of Household (B)	Total Benefit (C)=(A)x(B)
2023	6.0	148,827	892,962
2030	6.0	154,545	927,270
2040	6.0	154,545	927,270
2050	6.0	154,545	927,270

Source: JICA Study Team.

18.8 Another benefit that may be expected is the savings generated by households in switching from drinking bottled water to tap water since water supply is from a reliable source. The WTP survey shows that 35% of respondents spend PHP100–200 per month for bottled water and 51% spending more than PHP200. However, since more detailed analysis is necessary to estimate the savings, these were not included in the quantified benefits.

18.9 The Social Discount Rate (SDR) applied is 15%.

(2) Results of the Economic Evaluation

18.10 The Economic Internal Rate of Return (EIRR) of the project is 16.2%, which is slightly higher than the SDR of 15%, rendering the project economically feasible. It should be noted, however, that the quantified project benefits is conservative using values from the WTP only and nothing more.

Table 18.4 Results of Economic Evaluation

EIRR (%)	NPV ('000 PHP)	B/C
16.2%	186,258	1.08

Source: JICA Study Team.

(3) EIRR Sensitivity Analysis

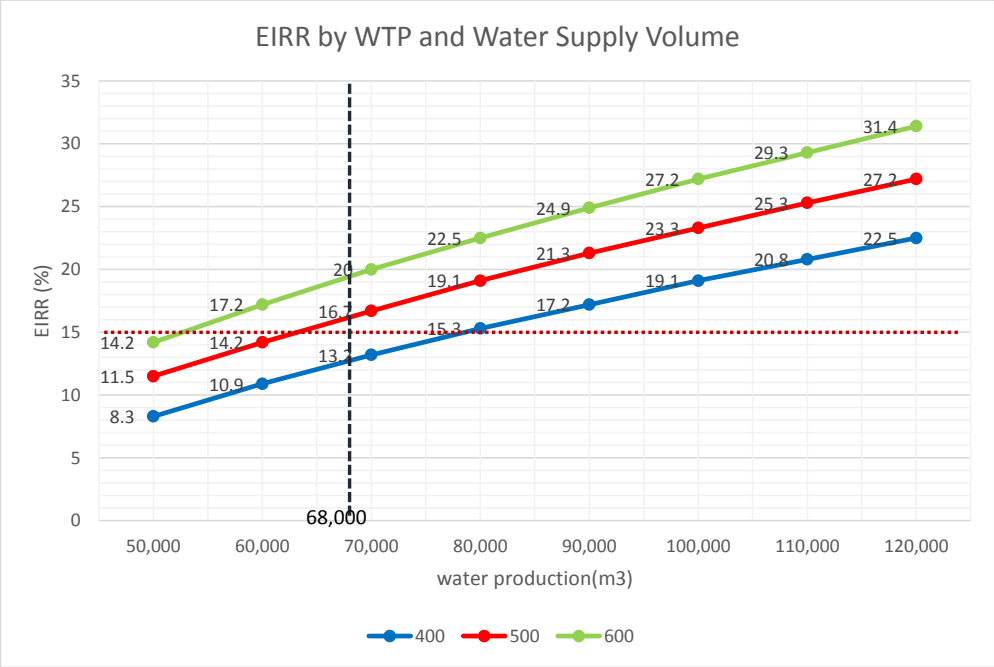
18.11 The Study Team also conducted a sensitivity analysis where the level of costs and benefits of the project may change. The result of the analysis is summarized in Table 18.5 showing that a decrease in cost by 10% will drive up the EIRR to 18% but an increase in cost will precariously bring the EIRR slightly below the SDR hurdle rate.

Table 18.5 Sensitivity Analysis (Cost and Benefit), (%)

Changes in total benefit \ Changes in total cost	-10%	0%	+10%	＋20%
0	18	16.2	14.7	13.3
-10	16.2	14.5	13.1	11.8

Source: JICA Study Team.

18.12 The Study Team also conducted a sensitivity analysis assuming changes in WTP unit price between PHP400 and PHP600 and changes in water supply volume between 5,000 m^3/day and 120,000 m^3/day. Figure 18.2 shows the results.



Source: JICA Study Team.

Figure 18.2 EIRR by WTP and Water Supply Volume

2) Financial Analysis

18.13 The Study Team carried out the incremental discounted cash flow analysis. Basic assumptions are as follows:

(1) Basic Assumptions

(i) Project evaluation period is 30 years from 2017 to 2046 including the construction and operation period.

(ii) Project cost: total project cost is approximately PHP4.8 billion. O&M cost is 3% of the construction cost, or equivalent to PHP106 million per year.

(iii) Revenue is calculated by a formula that water production volume x unit price. It is assumed that water production volume is 68,000 m^3/day and NRW is 10%.

(iv) Unit price; base rate is 22.9 peso/m^3 (the current MCWD average unit price). As a result of the WTP survey, the amount of additional willingness-to-pay is PHP100/month per household. Based on this, WTP based unit price is PHP30 [5]. Total annual revenue of benchmark year by tariff is presented in the following table.

[5] On the assumption that the average monthly consumption is about 15m^3, the average additional willingness- to-pay is PhP7/m^3. Therefore, the Study Team used PhP30 (22.9+7=29.9) /m^3 as the tariff consumers are willing to pay.

Table 18.6 Total Revenue in Benchmark Year

Year	Revenue (PHP/m^3)	
	Tariff at 22.9	Tariff at 30
2023	611,082,003	800,544,109
2030	708,411,523	928,050,031
2040	952,045,850	1,247,221,637

Source: JICA Study Team.

(v) Financing Structure; 30% equity at 15% rate of return and 70% at 9% interest rate with tenor of 15 years.

(vi) Weighted Average Cost of Capital (WACC) is at 10.80%.

(2) Results of Financial Analysis

18.14 The Study Team computed the FIRR using 2013 tariffs and WTP tariff level. In case of 2013 tariffs, the FIRR is below WACC but when WTP is considered, the FIRR goes up to 13.07% which is higher than WACC. This means that the WTP tariff of PHP30 per m^3 makes the project financially feasible. The results are summarized in Table 18.7.

Table 18.7 Financial Analysis Results for Mananga Dam II Project

Tariff (PHP/m^3)		FIRR (%)	NPV (PHP)
P_0:	22.9	9.63	39,463,424
P_1:	30.0	13.07	1,943,498,766

Source: JICA Study Team.
Note: P0 is the 2013 tariffs while P1 refers to the WTP-based tariff.

(3) FIRR Sensitivity Analysis

18.15 Sensitivity analysis was conducted using WTP tariff level. Even under the scenario where the cost (CAPEX) increases by 20%, the FIRR stays slightly higher than the WACC, which makes the project still financially viable. The results are summarized in Table 18.8.

Table 18.8 Result of Sensitivity Analysis, (%)

Changes in total revenue \ Changes in total cost	-10%	0%	+10%	＋20%
+10	15.73	14.38	13.21	12.19
0	14.35	13.07	11.96	10.99
-10	12.89	11.68	10.63	9.71
-20	11.33	10.20	9.21	8.35

Source: JICA Study Team.

Note: Only capex is included

3) Financing Strategy

18.16 The implementing agency has two options in funding the project: (i) pure public financing or (ii) Public Private Partnership.

(1) Pure Public Financing

18.17 The traditional way is for the implementing agency to fund the project from its balance sheet. Usually the Implementing Agencies (IA) is required to put up 10% equity and the rest can be sourced from debt financing. Sources for the latter and

current indicative terms are shown in Table 18.9.

Table 18.9 Financing Sources and Indicative Terms

Water District	Provincial Government
Local Water Utilities Administration (LWUA) • Interest Rate- about 9% per annum • Tenor- 25 years • Collateral - none required; step-in rights in case of default *LWUA has resource constraints. Availability of funds adequate for the project's capital requirements should be ascertained first.	Municipal Development Fund Office (MDFO) • Interest Rate- about 9% per annum • Tenor 15–20 years • Collateral - IRA Intercept *MDFO has adequate resources, however the amount of the loan will be based on the Province's borrowing capacity
Government Financial Institutions (GFI) for Relending of ODA Funds • Interest Rate- 9.5 -10% p.a. • Tenor - 15–20 years • Collateral - assignment of revenues; make an arrangement with LWUA to take over for and in behalf of the lender	
Private Financial Institutions (PFI) • Interest Rate- usually offers a variable rate, with a one-time option to fix the rate; current 90-day rate is at 3.7% to 4.7% p.a. • Tenor - 10 years (if funded through Phil. Water Revolving Fund, Development Bank of the Phils. or MDFO can provide the liquidity cover) • Collateral - assignment of revenues; may secure guarantee cover from LGU Guarantee Corp. or other providers	

Source: JICA Study Team.

(2) Public-Private Partnership (PPP)

18.18 The other option is to implement the project through a PPP arrangement, a financing and procurement strategy that involves a long-term contract between the government implementing agency and a private proponent. Depending on the financial viability of the project, the private sector involvement can include full cost financing, design, construction, operation and maintenance. Government can provide a viability gap fund (VGF) or employ credit enhancements for private sector financing; in effect subordinating public resources to that of the private sector's full cost recovery. Notwithstanding government support, PPP arrangement still offers significant benefits to the implementing agency, particularly, relief from burden of financing, sharing of risks and access to technology, management expertise and efficiencies from private sector operation.

(3) Recommendations on Financing Strategy of Mananga II Dam

18.19 The project is a good candidate for a PPP arrangement, given the following considerations: it is best operated using commercial principles; the project is financially viable; dam technology is tried and tested therefore making technical risks predictable and mitigate-able; and generally other project risks can also be identified and managed with relative ease. Moreover, the project can draw lessons learned from precedents on PPP bulk water supply projects.

18.20 The financial analysis anchors the recommendations on the PPP structure for the project. Admittedly the financial analysis is preliminary and expectedly has a margin of error. If in the more in-depth analysis the subsidy requirement becomes substantial and the implementing agency does not have the resources therefore, the implementing agency may consider applying for national government support. This scenario is not far-fetched. Recent programs demonstrate that there are no legal impediments to getting direct national government support. For example, under the

SALINTUBIG Program [6] (targeting waterless municipalities, defined as-- with less than 50% of the population having access to safe water supply), water districts operating in waterless municipalities are entitled to grants or highly concessional financing, on-grant or on-lent by LWUA.

18.21 The national government support is best programmed under the DPWH. DPWH has on-going capital investment programs for local water supply and sanitation projects. DPWH is administering the National Sewerage and Septage Management Program (NSSMP) which may provide up to 40% grants for sewerage projects in highly-urbanized cities and an infrastructure fund for basic services supporting tourism growth areas. Given the economic significance of Metro-Cebu it should not be difficult to rationalize national government support.

18.22 The BOT Law offers the most robust enabling provisions and flexibility in creatively structuring the project. Thus, an implementing agency can structure and implement the project more efficiently and easily using BOT Law.

18.4 Environmental and Social Considerations

1) Resettlement

18.23 The barangays that will be partly inundated due to the project are Buot-Taop and Pamutan in Cebu City ad Camp 4 in Talisay City. The number of houses/ buildings that will be inundated is about 2727. This project is assumed to have impacts on many local people in the area during the construction period. At this moment, a resettlement plan has not yet been prepared and no report has identified project impacts on the local people due to resettlement and operation of a dam.

18.24 The inundated area is located in the Central Cebu Protected Landscape (CCPL) and is categorized as highly susceptible to landslides. Therefore, following the Urban Development and Housing Act (RA 7279), LGUs must prepare a list of beneficiaries and land inventory, and provide relocation or resettlement sites with basic services and facilities and access to employment opportunities sufficient to meet the basic needs of the affected families.

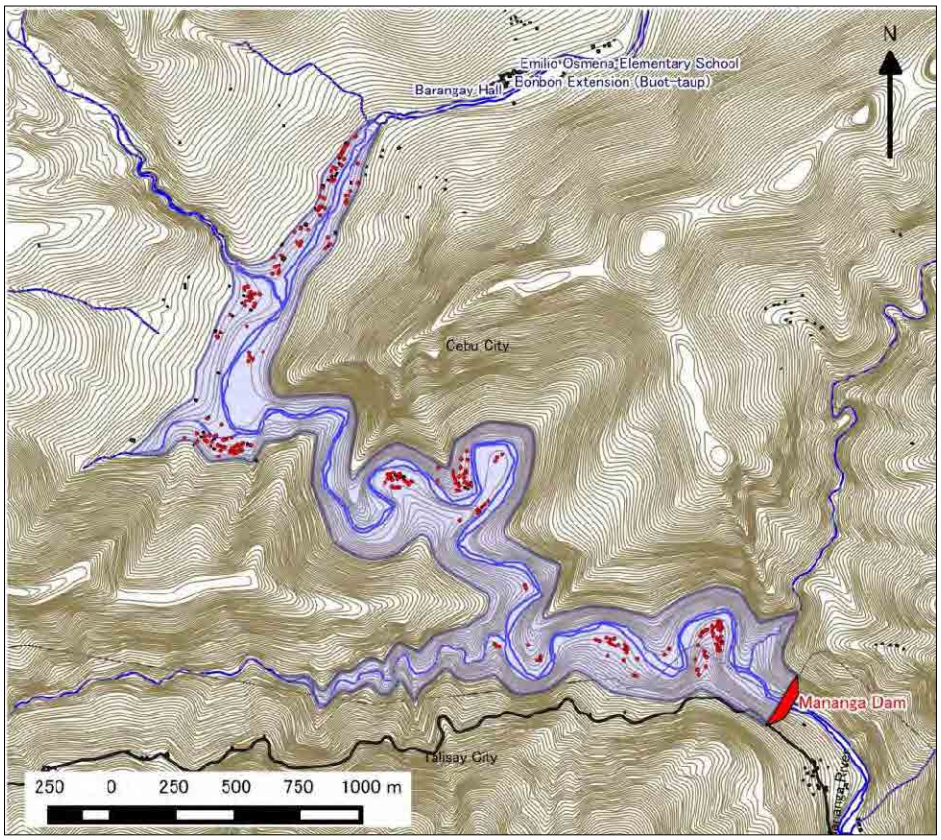
18.25 However, the Cebu City government has prioritized housing development for the informal settlers of the lowland urban areas where calamities and natural disasters are more pronounced. Thus, affected households in the inundated areas upland are not included in this development scheme. Talisay City counted 63 families in Camp 4 as socialized housing beneficiaries, but did not start to implement the actual relocation plan.

(1) Impact on Means of Livelihood

18.26 The income sources of the affected population are most likely dependent on farming the land (i.e., fruits and floriculture), production of charcoal, and quarrying services for sand and gravel. This project will significantly affect their means of livelihood. Therefore, a sound resettlement action plan needs to be prepared to provide specific measures to compensate for the loss brought about by Mananga II Dam project.

[6] SALINTUBIG Program is an identified program of the DILG to help address the Millennium Develop Goal of providing access to safe and potable water

[7] This figure was estimated by GIS data. Census is yet to be done.



Source: JICA Study Team.

Figure 18.3 Inundated Area for Mananga Dam II 73 m Height

18.27 Positive socio-economic impacts are the generation of employment opportunities and the improved water supply to a larger number of people. With the estimated yield of 68,000 m3/day, the dam can provide the needs of roughly over 450,000 people

18.28 Many household expressed positive willingness-to-pay for the stable water supply service in the WTP survey which indicates that the project generates socio-economic benefits. As such, it is necessary to hold sufficient consultations with the local people to address their economic and social benefits as well.

(2) Change of Land Use

18.29 The construction of the dam will change the land use of the area affecting not only the livelihood of the residents but will also have a great impact on the biological diversity of the place as well. However, if this project regulates the agricultural activities of the local people, it may facilitate enhancement of the biological diversity in the protected area.

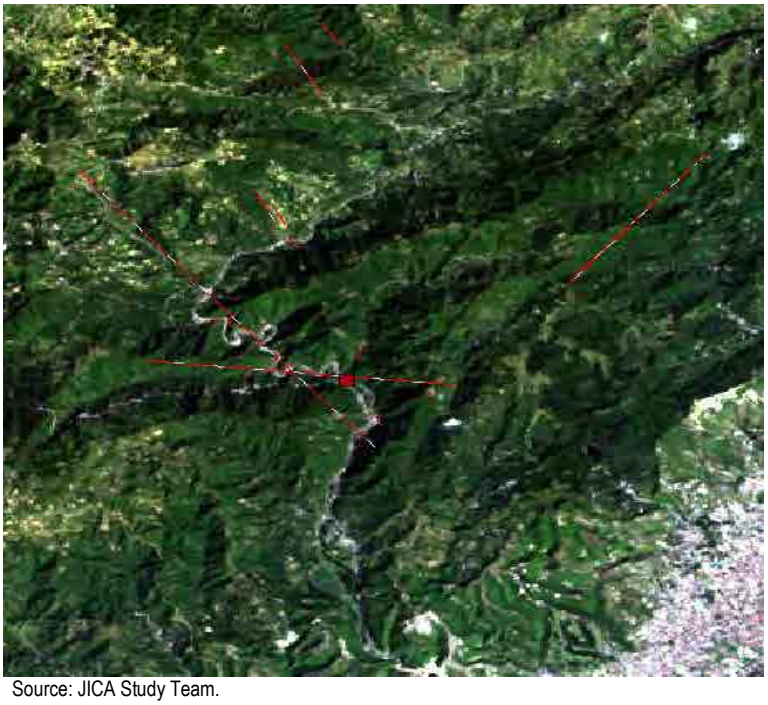
(3) Risks

18.30 Due to the development of Mananga II Dam, the number of water borne diseases and accidents may increase. These kinds of risks need to be considered in the environmental risk management plan of the project. In addition, the dam may negatively affect the downstream water flow rate which will affect the population in the downstream areas.

2) Environmental Considerations

18.31 The survey done by Mines Geosciences Bureau (MGB) to understand the risk of landslides, floods, etc. already identified the barangays of Buot-Taup and Pamutan (Cebu), and Camp 4 (Talisay) as highly susceptibility to these risks. Cebu City prepared the local shelter plan in Sinsin in order to promote relocation from those areas to a less risky area. These studies done by the government have to be studied further.

18.32 According to our satellite image, lineaments are identified in Mananga area Aigure 18.4, which are also subject to ground verification. Both the Electrowatt (1991) and the Bechtel (2001) feasibility studies exhibited preliminary background (environmental setting) and assessment of environmental impacts. However, these preliminary studies or Initial Environmental Evaluation (IEE) are no longer relevant given changes in environmental conditions. It is the understanding among stakeholders that the Environment Impact Assessment (EIA) study and acquiring the Environmental Compliance Certificate (ECC) will be undertaken prior to the implementation of the project.



Source: JICA Study Team.

Figure 18.4 Lineaments in Mananga Dam Area based on the Satellite Image

18.5 Implementation Plan

1) Institutional Arrangement

(1) Legal Basis

18.33 The following legal bases identify which agencies have the mandate to implement the dam project.

Table 18.10 Related Laws for Water Supply Projects

Laws	Contents
Presidential Decree 198	• Establishment of Water District (WD) and Local Water Utilities Administration • Roles of WD: development of water sources, transmission and distribution of water to consumers, sewerage and septage management services • Financing of WD: financial support by the national government, bond issuance, PPP etc.
Republic Act 7160 / Local Government Code	• Authority of the LGU for the provision of public services including water supply and sanitation. • LGUs can provide public services using PPP (modalities defined by JV contract /BOT Law) • Provinces also has the authority to incur financial obligations through direct credit or bond issuance to fund such projects or enter into PPP arrangements using the LGU Code or the BOT Law.
Presidential Decree 1067/ Water Code of the Philippines	• The Water Code governs the ownership, appropriation, utilization, exploitation, development, conservation and protection of water resources. • Dam development requires the approval of Department of Public Works and Highways (DPWH) and National Water Regulatory Board (NWRB).

Source: JICA Study Team.

18.34 Laws in relation to project implementation such as procurement and institutional arrangement for infrastructure development are summarized in the following table.

Table 18.11 Related Laws for Procurement and Institutional Arrangement of Infrastructure Development Projects

Laws	Contents
Presidential Decree 9184 Government Procurement Reform Act	• Bid standardization and regulation on government procurement process for goods, services, infrastructure projects and consulting services, selection and terms of contract. • Specification of criteria such as lowest price bid and within budget.
Republic Act 7718 BOT Law	• Policy relating to PPP schemes for infrastructure project implementation with provisions for procurement . • Guidelines for proponent requirements including approval and support by the government, bidding, selection, contract and turn-over to government.
Executive Order 423	• Provisions for joint ventures with private and government agencies. • Implementation guidelines including processes from procurement and JV contract to government approval.

Source: JICA Study Team.

(2) Options on Institutional Arrangement

18.35 Given the afore-mentioned agency mandates, the following three are options for the institutional arrangements on the execution of the project:

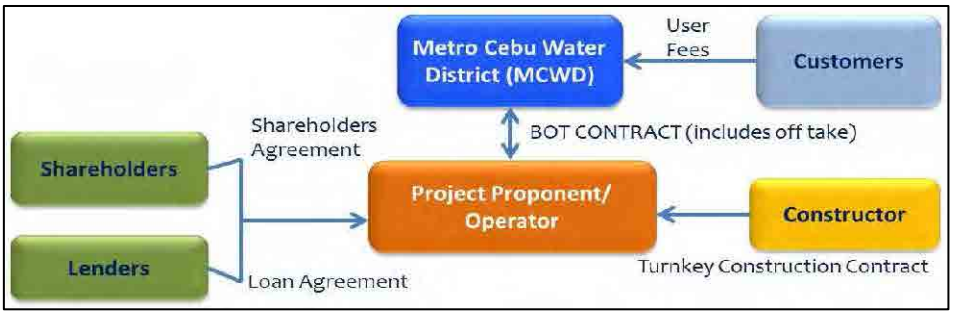
(i) by Metro Cebu Water District (MCWD);

(ii) by the LGU (e.g., Cebu City or Provincial Government); and

(iii) Joint implementation of MCWD and LGU.

18.36 The following figures indicate the implementation structure of the three options.

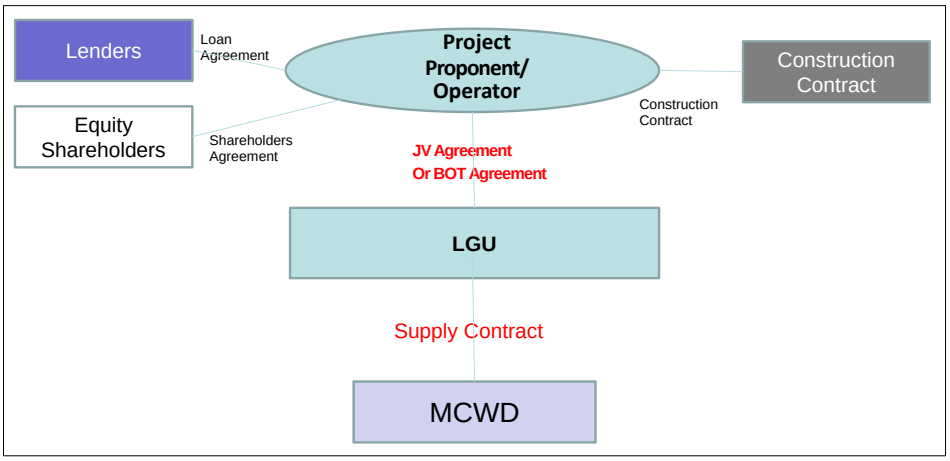
(i) Implementation by MCWD



Source: JICA Study Team.

Figure 18.5 Sample Contract Arrangement for MCWD

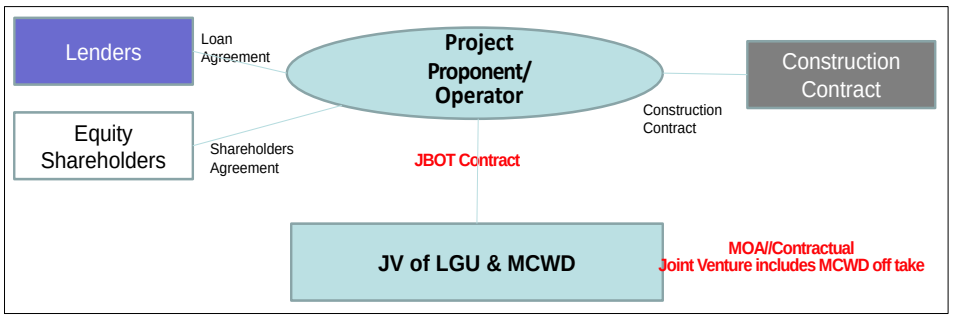
(ii) Implementation by LGU



Source: JICA Study Team.

Figure 18.6 Sample Contract Arrangement for the Province

(iii) Joint Venture by MCWD and LGU



Source: JICA Study Team.

Figure 18.7 Structure of a PPP Agreement with JV Partnership of Province and MCWD

18.37 The Table 18.12 summarizes the advantages and disadvantages of the three options for the implementation arrangement.

Table 18.12 Advantages and Disadvantages of the Three Options

Implementing Agency	Pros	Cons
By MCWD	• Most simple and expedient, having two contracting parties only; and MCWD being the direct user of the output. • MCWD has financial and technical capability to manage project risks. • May use BOT Law or JV Guidelines for GOCCs.	• Will split MCWD attention between the bulk water supply project and expansion of distribution network. • Should it be necessary, MCWD will bear viability gap fund solely.
By the LGU (e.g., Cebu City or Provincial Government)	• LGU in a better position to arrange for relocation of affected households. • Allows MCWD to focus on the expansion of distribution network. • May use BOT Law or JV arrangement under the Local Government Code.	• Will require two separate but integral agreements; one for the bulk water development and the other, the supply contract with MCWD. • Supply contract with MCWD will be procured separately. • Should it be necessary, LGU will bear viability gap fund solely.
Joint venture of MCWD and LGU	• Risks are shared between MCWD and LGU. • LGU in a better position to arrange for relocation of affected households. • In case viability gap fund is necessary, MCWD and LGU will share the cost.	• Will require two related. agreements: MOA between the LGU and MCWD and the PPP agreement with private proponent. • BOT Law is the common legal basis. Should the MCWD and LGU opt for JV guidelines, LGU has to pass an ordinance adopting the provisions of JV Guidelines for GOCCs.

Source: JICA Study Team.

18.38 From the options presented above, the joint venture of MCWD and LGU appears to be the most advantageous considering shared risks and the LGUs approval for relocation of affected households, which in the past was a major hurdle in implementing the project

18.39 The roles of other stakeholders such as The Metro Cebu Development Coordinating Body (MCDCB) are summarized below:

Table 18.13 Roles and Responsibilities of Concerned Agencies

Concerned Agency		Roles and Responsibilities
MCDCB		• Helping with the advocacy for the project, particularly, fostering social acceptance from displaced communities, coordination of requisite actions for right of way acquisition, and lobbying for viability gap funding from the national government should it be necessary. • Assisting the implementing agency with facilitation of decisions, inputs, approvals from the various stakeholders and approving authorities, such as the Regional Development Council and Investment Coordination Committee. • At execution stage, serving as the stakeholders' monitor to ensure the project implementation is on track.
LGU	Talisay	• Some barangays that will be submerged because of the dam • It is necessary for it to cooperate in promoting social acceptability of the project.
	Danao, Naga, Carcar, San Fernando	• May be buyers of the output. • If so it is necessary to get their financial commitment for the minimum off-take volume.
National Government	DPWH	• Being the source of the subsidy from the national government.
	NWRB	• Being the focal agency that can rationalize the water resource allocation. • Having the power to require closure of wells if they are over extracted or if saline intrusion is imminent.

Source: JICA Study Team.

2) Implementation Schedule

18.40 Feasibility Study of the Mananga II Dam development will commence in 2015, and at the same time, land acquisition will be implemented. Design and preparation of tender documents are scheduled to be conducted from 2017 to 2019. By 2019, land for water treatment plant will be procured and the construction work is planned to begin in 2020. Then, the operation will start in 2023. The following figure shows the implementation:

Table 18.14 Implementation Schedule

No.	Work Item	Year	2015	2016	2017	2018	2019	2020	2021	2022	2023
1	Studies (Hydrogic analysis, geographical survey, F/S etc.)	2	←	→							
2	Design /Preparation for Bidding	2.5			←	—	→				
3	Construction	3						←	—	→	
4	Land for water treatment plant (8 ha)						↔				
5	Resettlement		←	—	—	—	→				
6	Operation										→

Source: JICA Study Team.

19 DEVELOPMENT OF A NETWORK OF SEPTAGE TREATMENT PLANTS

19.1 Background and Project Necessity

19.1 In Metro Cebu, it is estimated that 90% of the households have septic tanks. The rest of the population, that is mostly living along rivers and creeks discharge their wastewater directly into these bodies of water without any form of treatment. However, even households that have septic tanks do not get primary treatment either because the septic tanks are not designed properly (e.g., with open bottom) or are not functioning properly because they are not desludged regularly, or both. Wastewater from domestic sources contributes significantly to pollution load, compared to agriculture or industrial wastes[8]. Moreover, industrial and even commercial establishments are required to establish on-site primary treatment plants. Compliance compared to households is better since they are monitored more closely by the Environment Management Bureau (EMB).

19.2 Currently, there are four desludging companies operating in Metro Cebu but it is likely that the sludge is not treated and disposed properly. The only public sewerage in Cebu City is currently not operational. This is because the only company which used the sewerage constructed their own wastewater treatment facility and the sewerage duct facility is not functioning since the operation and maintenance was not conducted properly. A pilot plant financed by JICA is currently operated using a lagoon of the sewerage facility.

19.3 The Environmental Management Bureau (EMB) has classified water bodies into nine classes according to their intended beneficial usage and water quality standard to be maintained. Class A to AA require the minimum treatment to meet the drinking water standard. Other classes from B to SD are not fit for drinking water but for economic use.

19.4 EMB is conducting a regular monitoring of several rivers and coastal water such as Butuanon River in Mandaue City (Class D), Guadalupe River in Cebu City (Class B or C), Hilutungan Channel in Mactan Island (Class SB).

19.5 Areas where Butuanon River and Guadalupe River are flowing are industrial areas with high population density. Both rivers are highly polluted while others are not as contaminated as the two but efforts to reduce pollution to satisfy the national standard are required. For an area that relies primarily on groundwater–estimated 90% of water supply source–it is imperative to control water pollution.

19.6 The best method for wastewater treatment is the sewerage system, which has about 90% efficiency in pollution load reduction. However, a centralized sewerage system is unlikely to be feasible across Metro Cebu in the near future given the high capital cost and the difficulty in laying new pipes in densely built-up areas. Hence in the immediate future, the practical intervention would be septage management, which entail regular desludging of septic tanks (3–5 years based on DOH standard) and treatment of the septage prior to disposal of the water and bio-solid. Regular desludging of septic tanks, can maintain up to 50% pollution reduction efficiency. Besides, cost wise, the estimate is only around PHP2,000–3,000 per household, compared to about PHP90,000 per household for a sewerage system.

[8] Sources of Water Pollution (BOD Loading): National Average 48% Domestic; 27% Agricultural; 15% Industrial based on the World Bank, 2003 Philippine Environment.

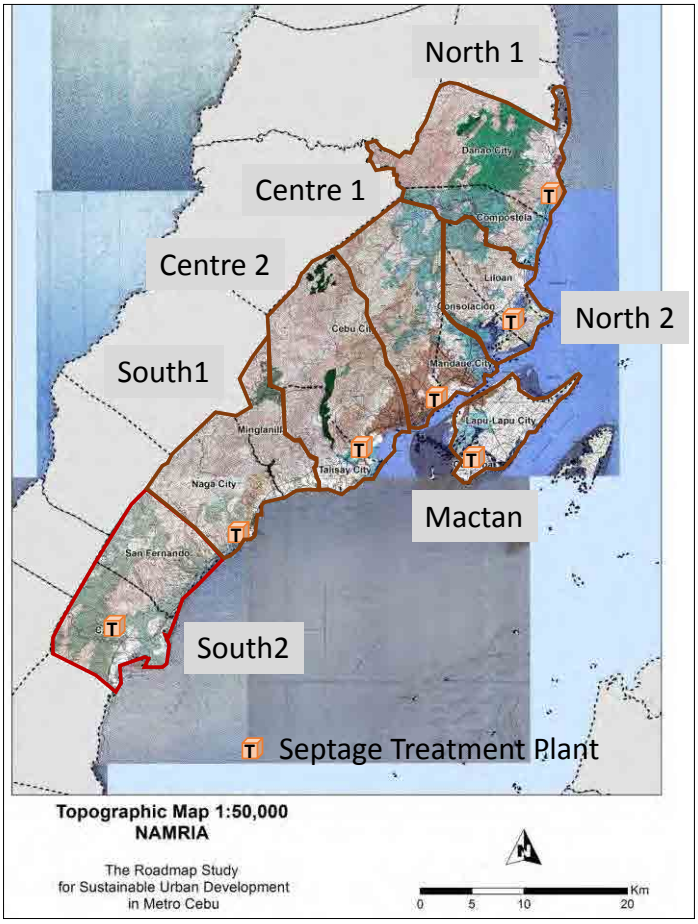
19.2 Project Description and Cost

19.7 Metro Cebu Water District (MCWD) has prepared a feasibility study (FS) in 2012 with assistance of USAID for a septage management program to serve 90% of the constituents within its franchise area but it has not been implemented mainly for lack of political support. The JICA Study Team reviewed this FS and proposes to expand coverage to the entire Metro-Cebu area (including areas outside the franchise area of MCWD).

19.8 The Septage Plants and Networking project proposes to build seven septage treatment facilities in two in Cebu City and one each in Mactan, Danao City, Naga City, Carcar City and Liloan. During the consultation meeting of MCDCB, member LGUs agreed to prepare their respective Septage ordinances to support septage management services with technical guidance of MCWD. MCWD was enjoined to set up a technical and knowledge management center.

19.9 At the initial stage of project development, the septage treatment facilities are expected to treat approximately 1,300–1,400 m^3/day of septage generated by around 852,000 households in Metro Cebu. This will require a total of 98 trucks to collect and transport the septage to the treatment plants.

19.10 By 2030, the population and the number of households would have increased, and with it the volume of septage generated. By then, the septage treatment facilities will need to process 1,795 m^3/day of septage generated by over a million households. This would require the use of 127 trucks.



Source: NAMRIA. JICA Study Team.

Figure 19.1 Clustering of Septage Treatment Facilities

Table 19.1 Summary of Septage Treatment Plant (TP) Project in the First Stage

Area	Population (No.)	Households (No.)	Septage Volume (m^3/day)	Required Number of Trucks	LGU Coverage	Estimated Cost (TPs and Trucks) ('000 PHP)
North 1	289,689	63,446	102	7	Danao City, Compostela	105,163
North 2	389,424	87,744	141	10	Liloan, Consolacion	146,759
Center 1	917,708	212,149	341	24	Northern part of Cebu City, Mandaue	354,103
Center 2	910,486	201,851	324	23	Southern part of Cebu City, Talisay	337,594
Mactan	612,884	140,076	225	16	Lapu-Lapu City, Cordova	234,431
South 1	395,538	86,959	140	10	Naga City, Minglanilla	145,815
South 2	294,100	59,765	96	8	Carcar City, San Fernando	104,848
Total	3,809,829	851,990	1,369	98		1,428,713

Source: JICA Study Team.

Table 19.2 Summary of Septage Treatment Plant (TP) Project in the Second Stage

Area	Population (No.)	Households (No.)	Septage Volume (m^3/day)	Required Number of Trucks	LGU Coverage	Estimated Cost (TPs and Trucks) ('000 PHP)
North 1	389,126	85,231	137	10	Danao City, Compostela	143,725
North 2	551,781	124,321	200	14	Liloan, Consolacion	207,239
Centre 1	1,156,341	267,523	430	30	Northern part of Cebu City, Mandaue	445,439
Centre 2	1,133,891	251,156	404	28	Southern part of Cebu City, Talisay	417,506
Mactan	830,709	189,920	305	22	Lapu-lapu City, Cordova	319,106
South 1	542,635	119,293	192	13	Naga City, Minglanilla	197,082
South 2	388,503	78,947	127	10	Carcar City, San-Fernando	136,167
Total	4,992,986	1,116,391	1,795	127		1,866,264

Source: JICA Study Team.

19.11 The estimated costs of the project are given in Table 19. 3 and Table 19. 4.

Table 19.3 Project Cost of Phase I (in 2016)

Unit: '000PHP

Area	Septage Treatment Plants			Collection Trucks
	Civil	Equipment	Total	
North 1	20,450	55,928	76,378	28,785
North 2	28,270	77,368	105,638	41,121
Centre 1	68,360	187,053	255,413	98,690
Centre 2	65,040	177,976	243,016	94,578
Mactan	45,140	123,497	168,637	65,794
South 1	28,020	76,674	104,694	41,121
South 2	19,260	52,691	71,951	32,897
Total	274,540	751,187	1,025,727	402,986
Total excl. Mactan	229,400	627,690	857,090	337,192

Source: JICA Study Team based on Feasibility Report on MCWD Septage Management Program.

Table 19.4 Project Cost of Phase II (in 2030)

Unit: '000PHP

Area	Septage Treatment Plants			Collection Trucks
	Civil	Equipment	Total	
North 1	27,460	75,144	102,604	41,121
North 2	40,060	109,610	149,670	57,569
Centre 1	86,210	235,866	322,076	123,363
Centre 2	80,930	221,437	302,367	115,139
Mactan	61,200	167,440	228,640	90,466
South 1	38,440	105,185	143,625	53,457
South 2	25,440	69,606	95,046	41,121
Total	359,740	984,288	1,344,028	522,236
Total excl. Mactan	298,540	816,848	1,115,388	431,770

Source: JICA Study Team based on Feasibility Report on MCWD Septage Management Program.

Table 19.5 Construction and Truck Re-fleeting Cost Schedule

Unit: '000PHP*

Year	SpTP			Collection Trucks	Remarks
	Civil	Equipment	Total		
2016	229,400	627,690	857,090	168,596	
2017				84,298	
2018				84,298	
2026				168,596	Replacement of collection trucks
2027				84,298	Ditto
2028				84,298	Ditto
2030	298,540	816,848	1,115,388		Replacement and increasing capacity
2036				215,885	Replacement of collection trucks
2037				107,943	Ditto
2038				107,943	Ditto
2046	298,540	816,848	1,115,388		Replacement

Source: JICA Study Team based on Feasibility Report on MCWD Septage Management Program.
* Cost of Mactan is excluded.

19.12 The PPP option can be made more attractive by tapping the national government grant program for sanitation projects, in particular, the National Sewerage and Septage Master Plan (NSSMP9) under DPWH administration. The current policy is to provide 40% grant for sewerage projects of highly-urbanized cities (HUCs) such as Cebu City. However, because there are no takers, DPWH is currently revising its grant policy to expand eligibility to other cities and to allow other interventions such as septage management.

19.13 The NSSMP states the appropriate process for septage management service -- how to collect, treat and dispose the sludge-- and it presents the DOH guideline for sludge management to be complied with. The NSSMP further recommends existing water districts to partner with the LGU and share the responsibility of providing the service. For example, Dumaguete City and the Water District jointly implemented the project; in Baliwag, the Water District implemented the project and the city supported it with an ordinance mandating proper construction of septic tanks and regular desludging. In the same vein, the Clean Water Act recommends that in areas where there are water districts, they should

[9] NSSMP Main Report Final Draft November 11, 2010 (DPWH, ADB).

implement the sewerage or septage management.

19.14 In this regard, MCWD can play a leading role in implementing the metro-wide septage management project, which requires a network of plants serving strategic clusters of communities. A proper management system with rational delineation of the roles and responsibilities among LGUs and MCWD will ensure an effective and efficient metropolitan-wide development.

19.3 Economic and Financial Evaluation

1) Economic Evaluation

(1) Basic Assumptions

(i) Project evaluation period covers 30 years including the construction period and operation period of the infrastructures;

(ii) The useful life of civil works is 50 years while that of the equipment is 15 years;

(iii) Financial costs of the projects were converted to economic costs using the standard conversion factor (SCF) of 85%;.

(iv) Beneficiaries are households in Metro Cebu except Mactan area where the septage treatment plant is committed by MCWD;

(v) Economic benefits considered were health, water and tourism cost savings based on the estimates of the study on "Economic Impacts of Sanitation in the Philippines (2008)" by the Water and Sanitation Program (WSP). The estimated total per capita economic costs in 2014 due to poor sanitation is PHP1,357.37. Total benefits by benchmark year are given below.

Table 19.6 Total Benefits by Benchmark Year

Year	Economic Benefits per Household (A) ('000PHP)	No. of Household (B) (No.)	Total Benefit (C)=(A)x(B) ('000PHP)
2017	5.8	527,937	3,293,185
2020	5.7	605,781	3,471,087
2030	5.4	764,524	4,150,968
2040	5.4	871,811	4,733,480

Source: JICA Study Team.

(2) Result of Analysis

18.41 The project EIRR is 357.6%, much higher than the 15% SDR, indicating that the project is economically feasible.

Table 19.7 Result of Economic Analysis

EIRR (%)	NPV ('000 PHP)	B/C
357.6	18,978	10.6

Source: JICA Study Team.

(3) Sensitivity Analysis

18.42 Sensitivity analysis was conducted by changing cost between 0% and +50% and changing revenues between -50% and 0%. The results are summarized in the following table. Under the worst case scenario, EIRR is still over 100%.

Table 19.8 Sensitivity Analysis, (%)

Changes in Total Cost / Changes in Total Revenue	0%	+30%	＋50%
0	357.6	270.5	231.7
-30	244.3	183.4	156.3
-50	168.8	125.4	106.1

Source: JICA Study Team.

2) Financial Analysis

19.15 The JICA Study Team used the incremental discounted cash flow analysis to assess the financial viability of the septage management project.

(1) Basic Assumptions

(i) Project evaluation period covers 30 years including the construction period and operation period of the infrastructures;

(ii) The useful life of civil works is 50 years while that of the equipment is 15 years;

(iii) Assumed annual inflation rate over the project life is 3%, which is the target inflation rate set by the Philippine government from 2015–2016;

(iv) The weighted average cost of capital (WACC) is 10.80%;

(v) Beneficiaries are households in Metro Cebu except Mactan area where the septage treatment plant is committed by MCWD;

(vi) Revenue is calculated by the following formula: water consumption per month x unit price for septage management service;

(vii) Unit price base rate is PHP3 /m^3; and

(viii) Financing Structure: 30% equity at 15% of rate of return and 70% at 9% of interest rate with tenor of 15 years.

(2) Result of Analysis

18.43 The project FIRR is 12.89%, which is higher than 10.80% WACC indicating that the project is financially feasible.

Table 19.9 Result of Financial Analysis

FIRR (%)	NPV ('000 PHP)
12.89	442,720

Source: JICA Study Team.

(3) Sensitivity Analysis

18.44 Sensitivity analysis was conducted by changing cost between -10% and +20% and changing revenues between -20% and +10%. The results are shown in Table 19.10.

Table 19.10 Sensitivity Analysis, (%)

Changes in Total Cost / Changes in Total Revenue	-10%	0%	+10%	＋20%
+10	16.87	14.73	12.89	11.29
0	14.92	12.89	11.14	9.60
-10	12.89	10.96	9.28	7.78
-20	10.74	8.89	7.25	5.77

Source: JICA Study Team.

19.4 Environmental and Social Considerations

1) Social Acceptance

19.16 The government agency that will implement the project is expected to procure the land areas for the treatment plants and secure other necessary right of way. The acquisition/change of ownership of the property is not expected to have any significant issues. However, it will be useful to have community consultations to obviate “not in my backyard (NIMBY)” attitude. For example, in Cordova, the community did not resist the project after explaining to them the importance of the project as well as informing them of the benign effect of having such a facility even in a built up neighborhood. Planting trees and ornamental plants can beautify the plant and scrubbers can be used to avoid bad odor.

2) Impact to the Local Economy, Livelihood and Quality of Life

19.17 There will be moderate positive impacts from the construction phase as people will be hired. The STP will have significant positive impacts once it is operational as this would result to improved water and sanitation levels, which eventually leads to better economic and health stability for the Cebuanos.

3) Land Use Patterns

19.18 There could be moderate to minor adverse impacts to land values of the surrounding properties, as people will not buy or develop properties near the STP. However these can be mitigated by information campaign about the insignificant impact of such a facility in the neighborhood.

19.5 Project Implementation Schedule

19.19 The new septage treatment plant will be constructed in 2016 and will start operation in 2017. Expansion of the plant is planned in 2030. The collection trucks will also be procured for the first three years and replaced every ten years. The project implementing body is the Metropolitan Cebu Water District (MCWD). Table 19.11 shows the implementation schedule of the project.

19.20 The project is one of the potential PPP projects, and can be undertaken using the build-operate-transfer scheme. The PPP option, not only relieves MCWD of the full financial burden, it will also obviate the need to put up a full complement of engineers and other experts necessary to run the operations and maintain the facility and trucks.

Table 19.11 Implementation Schedule of Septage Plants and Network Development

	Item	2015	2016	2017	2018	2019	2020
	Set up the implementation body of Septage Plants Management Center						
	Set up detail action plan of respective components						
	Local consultation, awareness raising for importance of Septage Management						
1	Implement Mactan,						
2	Prepare for bidding of the Central 1,2						
3	Implement Central 1, 2						
4	Prepare for bidding of the North and South Plants						
5	Implement North and South Plants						

Source: JICA Study Team.

20 METROPOLITAN INITIATIVE'S PROJECTS

20.1 Public Transport Terminals

1) Necessity of the Project

20.1 Public transport terminals work as an impetus to road-based public transport by way of: (i) Collecting many types of public transport vehicles to different destinations and from different origins; (ii) Providing convenient transfer to other public transport vehicles and routes; (iii) Allowing bigger public transport vehicle units; and (iv) Mitigating road traffic congestion due to avoidance of roadside parking.

20.2 In Metro Cebu, the Cebu South Bus Terminal was opened in 1992 and the Cebu North Bus Terminal in 1994, both by the Metro Cebu Development Project (MCDP). However, there are no bus/PUJ terminals along the Cebu North Road and along the Cebu South Road. On these corridors, public transport users, mainly from jeepneys, board and alight on roadsides. This is a common practice but it causes congestion and also discourages bus usage.

20.3 The JST discussed the improvement of public transport terminals with stakeholders during the outreach meetings and other consultation meetings held with the local government units (LGUs) as follows:

(a) **Mandaue City:** The issues and problems for improvement of the North Cebu Bus Terminal in Mandaue City were made known. However, no land acquisition for drastic improvement of the terminal but minor improvement was suggested until the maintenance of the terminal is transferred from Cebu City to Mandaue City in 2021.

(b) **Minglanilla Municipality:** The LGU is developing a new municipal center. A public transport terminal is designed beside a new public market. A small scale public transport terminal focusing on tricycle would be opened in April 2014.

(c) **Carcar City:** The city has recently prepared a new city center plan which includes a public transport terminal of about 1.2 ha. Carcar City and JST have agreed to conduct a pre-FS for transport improvement of the proposed Carcar New City Center.

2) Carcar Public Transport Terminal Project

20.4 A new public transport terminal is located in the core facility of the New City Center zone (34.7 ha), which includes the city hall, public market, sport complex, commercial facilities, park, and a walkway.

20.5 To divert public vehicle traffic, a diversion road from the Cebu South Road to the public transport terminal will be constructed. The city hall area, where much of the century-old architecture is located, would be preserved as a heritage zone.

20.6 According to a DOTC survey in 2010, the public transport volume counted in the city is composed of the following:

(i) 635 provincial buses passing through Carcar for routes between the southeastern part of Cebu Island and Cebu City;

(ii) 81 public utility buses (PUB) connecting Carcar City with Cebu City;

(iii) 25 public utility jeepney (PUJ) for the inter-city passenger transport services; and

(iv) approximately 500 tricycles operating as intra-city public transport service.

20.7 The construction cost of the proposed public transport terminal is estimated at PHP141 million. Taking the experience of MCDP into account, the three-year timeline is adequately set.

Source: JICA Study Team.

Figure 20.2 Location of Carcar City Center

Source: JICA Study Team.

Figure 20.1 Image of Public Transport Terminal in Carcar City

3) Economic Analysis

20.8 The total cost for the proposed terminal facility for Carcar City is PHP141 million. This places the estimated economic cost of the project at PHP120 million. The project implementation schedule for the terminal is for construction to start in 2017 and for the terminal to start operation in 2018. The project implementing body is the City of Carcar. Annual operating and maintenance cost of this project was assumed to be 5% of capital cost based on the experience of similar terminal in Cebu City.

20.9 Similar to any transport infrastructure, the unit VOCs and VOTs were used in the estimation. The unit VOCs were based on the average operating costs of a representative set of vehicles commonly used in the Philippines. The project yielded an EIRR of 38 %, which proves the project as viable. Besides other parameters, other qualitative benefits are city center development and enhanced traffic safety due to less roadside parking, etc.

Table 20.1 Preliminary Results of the Economic Valuation for Public Transport Terminal

EIRR (%)	NPV ('000 PHP)	B/C Ratio
38%	212,000	2.30

Source: JICA Study Team's estimates.

4) Environmental Analysis

20.10 The city must prepare an inventory of existing residents and buildings and a necessary resettlement plan since the Carcar New City Center (which include the public transport terminal) affects existing residences and establishments in the area. Taking some opponents to the city's land acquisition plan into account, information disclosure and adequate procedure are important.

20.11 The overall goal of the Carcar New City Center cum Public Transport Terminal is for the attainment of sustainable development and improvement of the quality of life of the Carcarons would make the project influencing major positive social and environmental impacts by changing the existing congested and uncontrolled urban area into a more defined, orderly and sustainable urban land use.

20.12 The public transport terminal will have negative moderate impacts on air quality during construction. However, during operations it will have positive impacts on air quality as it reduces emissions of GHGs through the lessening of roadside parking and traffic congestions.

5) Some Considerations for Implementation

20.13 The Carcar New City Center Project is the city's project and thus the city must be responsible for entire coordination and acquisition of infrastructure and public facilities' lands. In regard to public transport terminal, it is designed not only for Carcarons but also for southern Cebuano and tourists. It is significant to develop it as a metropolitan facility.

20.14 Metro Cebu experienced construction of bus terminals and public markets by MCDP in the 1990s where MCDPO managed yen loan and local fund for infrastructure and public facilities. The size of the Carcar Public Transport Terminal is suitable to mobilize such a multi-project fund if it is available.

20.2 Project for Construction of New Water Supply Facilities (Reservoirs, Pump Stations, Well Developments)

1) Background and Necessity of the Project

20.15 One of key issues in relation to water supply in Metro Cebu is the serious water shortage in the near future. By 2020 demand and supply balance is projected to be deficit in MCWD franchise area as well as whole Metro Cebu area. Therefore, water supply capacity in Metro Cebu needs to be urgently expanded. Based on JICA report "The Study for Improvement for MCWD Water Supply and Sanitation in Metro Cebu in the Republic of Philippines" issued on August, 2010, the following strategies were identified to improve the service:

- To increase water supply volume to meet water demand in 2015.
- To apply gravity water supply system and install elevated water tanks
- To establish distribution block water supply system.
- To make an efficient installation of reservoirs to improve unbalanced water supply in each distribution block and
- To construct transmission pipes and distribution pipelines in accordance with the distribution block.

2) Project Outline and Cost

(1) Allocation for Water Sources and Water Supply

20.16 With due consideration to the localities, 6 distribution blocks are proposed, to be named CLC (acronym of the LGUs of Consolacion, Lilo-an and Compostela), Casili (Mandaue), Talamban (northern Cebu), Tisa (southern Cebu), Lagtang (Talisay), and Mactan (Lapu-lapu and Cordova), taking into consideration the following:

(i) The local demand density (2015)

(ii) The location and capacity of existing reservoirs

(iii) present hydraulic capacity of distribution pipeline network

(iv) the LGU boundaries

20.17 Water demand of each distribution block in 2015 is estimated in Table 20.2

assuming 25% of NRW in 2015 and 17% of NRW in 2030.

Table 20.2 Distribution Block (DB) Demand

Area Distribution	Dec-08	2015	2030
	With NRW (30%)	With NRW (25%)	With NRW (17%)
CLC	13,701	19,261	31,943
Casili	23,491	40,323	63,858
Talamban	50,154	58,173	73.521
Tisa	52,986	60,956	75,831
Laglang	9,219	18,301	31,607
Mactan	18,836	38,136	68,104

Source: JICA. The Study for Improvement of Water Supply and Sanitation in Metro Cebu (2010).

(2) Improvement of Water Supply Facilities

20.18 The proposed overall project components of the New Water Supply Facilities Project are summarized as follows based on the above-mentioned necessity and objectives:

(i) Well Development;

(ii) 63 wells, with an estimated volume of water of 41,500 m^3/day, will be developed in total in Casili (Mandaue) and Talamban (northern Cebu);

(iii) Reservoir Development;

(iv) New reservoirs will be constructed taking into consideration of efficient installation of reservoirs to establish a distribution block system and improve unbalanced water supply in each distribution block; and

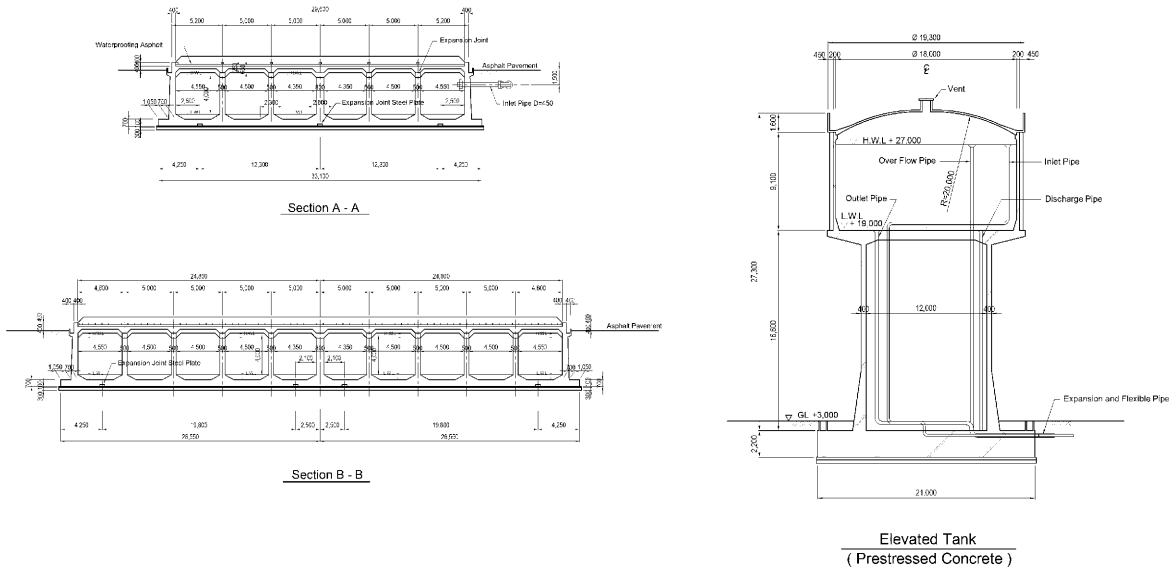
(v) Transmission and Distribution Pipeline: the transmission pipes between reservoirs will be rearranged in accordance with demand of each block and distribution pipelines will be constructed according to the plan of efficient installation of reservoirs.

20.19 The proposed components of the new water supply facilities are shown in the Table 20.3. The designs of a typical reservoir and elevated water tank are shown in Figure 20.3.

Table 20.3 Proposed Components of New Water Supply Facilities

Item	Description	Unit	Quantity
1	Well Intake Facilities Construction (250 mm, depth 150 m)	Well	63
2	Reservoir (V=10,000 m^3)	Site	2
3	Reservoir (V=5,000 m^3)	Site	1
4	Elevated Water Tank (V=2,000 m^3)	Site	2
5	Raw Water Pipeline (100 mm and 150 mm)	m	31,500
6	Transmission Pipeline (400 mm and 800 mm)	m	26,800
7	Inter-reservoir Pump Station	Site	2
8	Main Distribution Pipeline (300 mm to 700 mm)	m	32,200
9	Secondary Distribution Pipeline (75 mm to 200 mm)	m	37,000
10	Flow Meter installation	Site	6

Source: JICA Study Team.



Source: JICA Study Team.

Figure 20.3 Typical Reservoir and Typical Elevated Water Tank

(3) Project Cost and Operation / Maintenance Cost

20.20 The construction cost is estimated at JPY4.8 billion (approximately PHP1.78 billion; well JPY400 million, reservoir JPY770 million, elevated water tank JPY320 million, pump station JPY220 million, distribution pipeline JPY3.07 billion, and flow meter installation JPY9 million).

20.21 The land acquisition cost would be JPY210 million (approximately PHP0.78 billion), which is required for construction of reservoir and elevated water tank. The total project cost would be JPY6.3 billion (approximately PHP2.3 billion) including the project management cost.

20.22 The operation and maintenance cost is estimated as 2% of project cost which is JPY1,260 million (approximately PHP470 million).

3) Economic Evaluation and Financial Analysis

20.23 This section presents the economic and financial evaluation of the development of new water supply facilities.

(1) Economic Evaluation

20.24 Assumptions and the results of analysis are the following:

(a) **Assumptions**

(i) Project evaluation period covers 30 years between 2016 and 2045 including the construction period and operation period of the infrastructure;

(ii) Financial cost is converted into economic cost using the standard conversion factor (SCF) of 85%;

(iii) Economic benefit is derived from the Willingness- to-Pay (WTP). The amount is calculated by a formula that is the number of beneficiaries (household) multiplied by the amount of WTP per household. The amount of WTP is PHP500 /month per household based on the result of the WTP survey

conducted by the JICA Study Team. The number of beneficiaries and total economic benefits are given in the Table 20.4; and

(iv) Social Discount Rate (SDR) applied is 15%. .

Table 20.4 Estimated Economic Benefits by Benchmark Years

Year	No. of Beneficiaries (Households)	Economic Benefit ('000 PHP)
2022	90,340	542,041
2030	94,318	565,908
2040	99,538	557,500

Source: JICA Study Team.

(b) **Economic Evaluation**

20.25 EIRR of the project is 18.8%, which is higher than the SDR of 15%, indicating that the project is economically feasible.

Table 20.5 Result of Economic Evaluation

EIRR (%)	NPV (PHP)	B/C
18.8	346,642	1.3

Source: JICA Study Team.

(c) **Sensitivity Analysis**

20.26 The result of sensitivity analysis is summarized in the following table. Even in the case of a 20% increase in project cost, EIRR is still over 15% as long as there are no reductions in the economic benefits (i.e. base case benefits).

Table 20.6 Sensitivity Analysis

		Cost		
		Base	10% up	20% up
Benefit	Base	18.8	17.3	16.0
	10% down	17.2	15.7	14.5
	20% down	15.4	14.1	12.9

Source: JICA Study Team.

(2) Financial Analysis

20.27 Assumptions and the result of the analysis are as follows:

(a) **Assumptions**

(i) Project evaluation period covers 30 years between 2016 and 2045 including the construction period and operation period of the infrastructure:

(ii) Project cost and operation/maintenance cost; the total project cost is JPY 6.3 billion (approximately PHP2.3 billion) and operation/maintenance cost is JPY 126 million (approximately PHP47 million);

(iii) Revenue is calculated by a formula that is water production volume x unit price. The water production volume is 41,500 m^3/day assuming a NRW of 10%;.

(iv) Unit price is at base rate is PHP23/m^3 (the current MCWD average unit price);

(v) Financing Structure assumes 30% equity at 15% of rate of return and 70% at 9% of interest rate with tenor of 15 years; and

(vi) WACC is 10.80%.

(b) **Result of Financial Analysis**

20.28 The project FIRR is 12.84%, which is higher than 10.80% WACC indicating that the project is financially feasible.

Table 20.7 Result of Financial Analysis

FIRR (%)	NPV ('000 PHP)
12.84	1,141,829

Source: JICA Study Team.

(c) **Sensitivity Analysis**

20.29 The result of sensitivity analysis is summarized in the following table. In case of 20% increase in project cost or 20% decrease in revenue, FIRR is lower than WACC.

Table 20.8 Sensitivity Analysis

		Cost		
		Base Case	10% Increase	20% Increase
Benefit	Base Case	12.84	11.65	10.60
	10% decrease	11.53	10.38	9.36
	20% decrease	10.11	9.00	8.02

Source: JICA Study Team.

4) Environmental and Social Considerations

20.30 If the capacity is within 10,000 m^3, it is possible to avoid negative environmental and social impacts. However, conditions at the location should be carefully considered and when developing the facilities, management policies and guidelines of a protected area must be followed since the reservoir is assumed to be located in the Central Cebu Protected Landscape (CCPL). Depending on the scale of the reservoir, an Initial Environmental Evaluation (IEE) may need to be implemented.

5) Implementation Plan

20.31 The feasibility study for the new water supply system development will commence in 2015, and detailed design and work preparation is scheduled to be conducted from 2016 to 2018. The construction work is planned to begin in 2018 and then the operation will start in 2022. The following table shows the implementation schedule.

Table 20.9 Implementation Schedule

Item	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	↔	2050
Preparatory Studies (F/S etc.)	◆	◆											
Detailed Design and Preparation for Biding		◆	◆	◆									
Construction (including bidding)				◆	◆	◆	◆	◆					
Operation								◆	◆	◆	◆	◆	◆

Source: JICA Study Team.

20.3 Enhanced Waste Reduction and Recovery Program（WRRP）

1) Background

20.32 Public health and environment are guaranteed by sound solid waste management based on technology and consideration of environment. Fundamentally, respective LGUs are primary responsible for solid waste management. In order to control growing solid waste properly, it is necessary to have joint efforts by "Metro Cebu" considering the mid-long term vision. For this purpose, drafting the comprehensive master plan targeted for the overall Metro Cebu should be prepared shortly. At the same time, the following program comprising of seven components focusing generation, collection and transportation process of solid waste is proposed. The basic purpose of this overall program focuses the community based activities, and raises awareness of respective households towards solid waste management and living environment:

(a) Community-based 3R / Waste segregation program (CB3Rs)

(b) Improving collection and transport system (CTS)

(c) Promotion of market oriented recycle business

(d) Formulating guidelines for improving collection and transportation

(e) Study for Construction, and upgrading the operation and maintenance of City-Wide MRF

(f) Upgrading of existing composting facilities

(g) Introduction of Waste Management Buy-Back Recycling System for electric products, etc. and Construct the Centers

20.33 This program complies with the RA 9003 which stipulates responsibility of LGUs on solid waste management and aims to decrease the waste from generation point and by recycling for reducing the burden of final disposal sites as well as proper management. This law also stipulates to convert existing final disposal site to sanitary landfill by February 2006. While a solid waste management board was established by province, city, and municipality respectively, and draft a plan under this legal framework, there is no metropolitan organisation / council for collective SWM. Smaller LGUs face difficulties to comprehend technical issues stipulated in the RA9003. Consequently, it is difficult to comply strictly with RA9003 under insufficient capacity and human resources. The Cebu Provincial Solid Waste Management Plan does not include highly urbanized cities such as Cebu, Mandaue, and Lapu-lapu for they are cities independent from Cebu Province. For this reason, the province cannot lead and rationalise the metro-wide solid waste management. This leads to a lack in coordination of planning area-wide final disposal sites and waste transportation routes.

20.34 Continued discussions on waste management in an area-wide perspective under the MCDCB, especially under the environmental committee, are expected. These discussions have acknowledged the importance of strengthening linkages among LGUs, to build a platform, and to publicize committedly on solid waste management. The LGUs have already requested to share their best practices and adoptable technologies.

Source: JICA Study Team.

Figure 20.4 Solid Waste Management Plan by Policy Level in the Philippines

20.35 Solid Waste Management Technologies introduced by Japan are enumerated in the table below.

Table 20.10 Major Solid Waste Management Technology brought by Japanese Organizations

Management System	Description
Takakura Composting Method	Takakura Compost, known as the one of the best practice to produce compost from the biowaste, has been introduced in households of Cebu and Mandaue cities. A compost center has been established to serve as a model for communities, with an example adopted by the barangay MRF in Cebu City.
Plastic Waste Recycling System	This system transforms recently disposed soft plastic waste into plastic boards. As it is estimated that 15.61% of the city's total waste is plastic, this is expected to decrease 78t of waste and reduce dumping. • This forms part of Component (3) Promotion of market oriented recycle business
Electronic Waste Recycle Project	By introducing Japanese treatment technology, disposal of electronic wastes can be corrected and solve hazardous waste management. • This forms part of Component (3) Promotion of market oriented recycle business
Recycle System of Refuse Derived Fuel	This project established a MRF in Inawayan final disposal sites to convert plastic wastes into fluff fuel, which can be used as alternative fuel for the operations of cement companies and other domestic industries. • This forms part of Component (5) Establishing the area-wide MRF

Source: JICA Study Team.

Source: JICA Study Team.

Figure 20.5 Takakura Method Compost in Talamban, and Plastic Fuel in Inawayan MRF in Cebu City

20.36 These technologies and demonstration will benefit not only Cebu City but the wider region as well. However, such activities will be limited without the support of international donors. After a review of the abovementioned activities in terms of their acceptance in the local community and confirming their appropriate implementation, wide dissemination of

these technologies and management is recommended through the proposed program.

2) Implementation Plan and Project Cost

20.37 This program comprises soft and hard components. Following indicative costs are excluding maintenance cost for the current existing duties and cover the entire Metro Cebu. While it excludes the current duties budgeted by individual LGU, it includes the budget to be shouldered by 13 LGUs to participate in this program. The program aims to start in 2015 to 2016, and will conduct the activities expansively and continuously by 2020. The cost is indicative by all means, and is estimated for activities of first a few years to get them on track.

Table 20.11 Indicative Cost of Enhance the Waste Reduction and Recovery Program

Proposed Projects / Programs		PHP (mil)
Enhance the Waste Reduction & Recovery Program		287.0.
1	Community-based 3R / Waste segregation program (CB3Rs)	106.6
2	Improving collection and transport system (CTS)	41.0
3	Promotion of market-oriented recycle business	12.3
4	Formulating guidelines for improving collection and transportation	4.1
5	Study for Construction, and upgrading the operation and maintenance of City-Wide MRF	12.3
6	Upgrading of existing composting facilities	57.4
7	Introduction of Waste Management Buy-Back Recycling System for electric products, etc. and Construct the Centers	53.3

Source: JICA Study Team.

3) Environmental and Social Considerations

20.38 Since this program does not include a large-scale investment nor land use change, requirement of ECC is not expected. However, this will be required when the program extends to establish MRF and compost plants for the purpose of segregation and reduction. It is also necessary to assess the cost of technology considering human resources, capacity of LGU, and benefit of environmental returns. Further, technology or management process should be assessed carefully as some might bring negative effects to specific citizens.

4) Implementation Plan

20.39 All sub-component projects are expected to start in year 2015 to 2016. Participation of the community is encouraged by promoting public awareness on waste reduction through barangay-based activities. First, an area-wide council such as Metro Cebu Solid Waste Management Council needs to be established. The council, together with MCDCB, will then coordinate among LGUs in detail and strengthen linkages as well as promote information sharing. Drafting Action Plans and Supervision of Management: MCDCB.

(a) **Implementing Bodies:** Cebu Provincial Government and all 13 LGUs

(b) **Participation:** Barangay, CBO, NGO, Waste collectors / haulers. junk dealers, MRF operators, educational institutes, medical / sanitary institutions, and other related organizations.

19.21 The implementation schedule will be as follows.

Table 20.12 Implementation Plan for Enhancement of Solid Waste Reduction Program

	Item	2015	2016	2017	2018	2019	2020
	Preparatory Actions: • To study an institutional setting and a detailed action plan of respective components; • Local consultation, awareness raising for importance of segregation practices in barangay levels						
1	Community-based 3R program (CB3Rs)						
2	Improving collection and transport system (CTS)						
3	Promotion of market oriented recycle business						
4	Formulating guidelines for improving collection and transportation						
5	Study for Construction, and upgrading the operation and maintenance of City-Wide MRF						
6	Upgrading of existing composting facilities						
7	Introduction of Waste Management Buy-Back Recycling System for electric products, etc. and Construct the Centers						

Source: JICA Study Team.

20.40 Fundamentally, the solid waste management master plan will identify the effective and feasible projects by elaborating the sustainable and applicable technology as well as encourage the active participation of the local community. Drafting the master plan must be done in tandem with the implementation of the program. Furthermore, establishment of an area-wide council is prerequisite to promote linkage and information sharing.