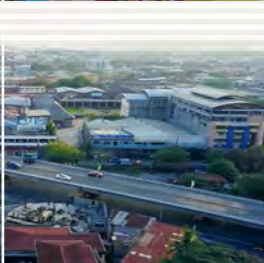
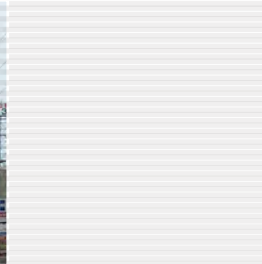




Republic of the Philippines  
National Economic and Development Authority (NEDA)  
City Government of Davao

# Davao City Infrastructure Development Plan and Capacity Building Project

**Final Report**  
Summary



**IM4Davao**  
Infrastructure Modernization for Davao City

June 2018

Japan International Cooperation Agency

ALMEC Corporation  
Oriental Consultants Global Co., Ltd.  
EX Research Institute Ltd.



EI
JR
18-077

**Japan International Cooperation Agency (JICA)  
National Economic and Development Authority (NEDA)  
City Government of Davao**

**DAVAO CITY INFRASTRUCTURE  
DEVELOPMENT PLAN AND  
CAPACITY BUILDING PROJECT**

**IM4Davao**

*Infrastructure Modernization for Davao City*

**FINAL REPORT  
SUMMARY**

**JUNE 2018**

**ALMEC Corporation  
Oriental Consultants Global Co., Ltd.  
EX Research Institute Ltd.**

**Exchange Rate**

USD1 = JPY112.1575

PHP1 = JPY2.2279

Average of JICA Rate from  
January 2017 to February 2018

## TABLE OF CONTENTS

<b>EXECUTIVE SUMMARY .....</b>	<b>ES-1</b>
<b>1 INTRODUCTION .....</b>	<b>1-1</b>
<b>2 EXISTING CONDITIONS AND ISSUES IN DAVAO CITY .....</b>	<b>2-1</b>
2.1 Socio-Economic Condition of Davao City .....	2-1
2.2 Natural Environment.....	2-2
2.3 Urbanization and Land Use.....	2-3
2.4 Transport Infrastructure and Services.....	2-6
2.5 Other Urban Infrastructure and Services .....	2-7
<b>3 DEVELOPMENT FRAMEWORK.....</b>	<b>3-1</b>
3.1 Development Visions and Strategies .....	3-1
3.2 Davao City Urban Structure .....	3-2
3.3 Demographic Framework.....	3-3
3.4 Future Land Use Plan .....	3-3
<b>4 DEVELOPMENT PLAN FOR ECONOMY, INDUSTRY AND INVESTMENT.....</b>	<b>4-1</b>
4.1 Priority Industry Sectors .....	4-1
4.2 Potential Investment Projects by District.....	4-4
4.3 Tourism Development Corridor Project Featuring Davao’s History and Agriculture.....	4-5
<b>5 DEVELOPMENT PLAN FOR TRANSPORT .....</b>	<b>5-1</b>
5.1 Traffic Database Development and Analysis .....	5-1
5.2 Traffic Demand Forecast.....	5-2
5.3 Road Network and Road Transport Plan .....	5-6
5.4 Extension of the Davao City Diversion Road.....	5-10
5.5 Davao Riverside Boulevard Development Project.....	5-12
5.6 Traffic Management Improvement and Traffic Control Center.....	5-14
5.7 Public Transport System Plan .....	5-18
5.8 Davao City Mass Transit Line (Phase 1).....	5-20
5.9 Gateway Development Plan.....	5-21
<b>6 DEVELOPMENT PLAN FOR URBAN SERVICES.....</b>	<b>6-1</b>
6.1 Water Supply Development Plan .....	6-1
6.2 SCADA System and NRW Reduction Program .....	6-3
6.3 Wastewater Management Plan .....	6-5
6.4 Sewerage System (Phase 1) Project.....	6-7
6.5 Solid Waste Management Plan .....	6-9
6.6 Davao City Waste Eco Park Project.....	6-11



<b>7</b>	<b>EVALUATION, MANAGEMENT AND MONITORING OF DAVAO CITY INFRASTRUCTURE DEVELOPMENT PLAN .....</b>	<b>7-1</b>
7.1	Financial Analysis .....	7-1
7.2	Economic Analysis .....	7-3
7.3	Strategic Environmental Assessment.....	7-4
7.4	Environment Management Entities .....	7-6
7.5	Environment Management Plan.....	7-7
7.6	Monitoring Plan.....	7-8
<b>8</b>	<b>CAPACITY DEVELOPMENT .....</b>	<b>8-1</b>
8.1	Needs and Gaps.....	8-1
8.2	Capacity Development Activities .....	8-4
8.3	Lessons from the Kitakyushu Model .....	8-7
<b>9</b>	<b>CONCLUSIONS AND RECOMMENDATIONS .....</b>	<b>9-1</b>
	<b>Appendix</b>	
	Counterpart List.....	A-1

## LIST OF TABLES

Table 2.1	Demographic Trend in Davao City .....	2-1
Table 2.2	Priority Industry Sectors of Davao City .....	2-2
Table 2.3	Water Quality at Downstream of Davao River in 2016.....	2-3
Table 2.4	Registered Vehicles in Davao City, 2011 – 2016 .....	2-7
Table 2.5	Coverage of Current Urban Services .....	2-8
Table 3.1	Population Forecast in Davao Region (2015–204) .....	3-3
Table 3.2	Demand of Urban Lands by District (Year 2045: ha) .....	3-4
Table 4.1	Potential Investment Projects by District.....	4-4
Table 4.2	Implementation Plan of the Five Tourism Core Facilities .....	4-7
Table 5.1	Summary of Traffic Assignment Results .....	5-4
Table 5.2	Summary of Railway Demand Forecast.....	5-6
Table 5.3	Development Plan for Road Network and Road Transport.....	5-8
Table 5.4	Estimated Cost of Davao Riverside Boulevard with Associated Developments .....	5-14
Table 5.5	Current Situation of Traffic Control System in Davao .....	5-15
Table 5.6	Davao City Traffic Management Improvement and Traffic Control Center Project .....	5-15
Table 5.7	Facilities and Equipment for Traffic Control Center .....	5-16
Table 5.8	Development Phases of Davao City MT Line .....	5-19
Table 5.9	Development Plan for Public Transport System .....	5-19
Table 5.10	Cost of Davao City MTL – Phase 1.....	5-21
Table 6.1	Development Plan for Water Supply .....	6-2
Table 6.2	Development Plan for Wastewater Management.....	6-7
Table 6.3	Development Plan for Solid Waste Management .....	6-10
Table 7.1	Davao City Infrastructure Development Plan Projects.....	7-1
Table 7.2	Summary of Sources of Investment Program .....	7-2
Table 7.3	Estimated Financing Envelop of the National Government and Davao City.....	7-2
Table 7.4	Summary of Congressional District Consultation Meetings .....	7-5
Table 7.5	Priority Programs/Activities with Timeframe.....	7-8
Table 7.6	Monitoring Framework for Project Checking.....	7-9
Table 8.1	Self-Assessment of Capability for Various Planning Subjects, Davao City .....	8-2
Table 8.2	Summary of Activities of Sector-Focused Capacity Development.....	8-4

## LIST OF FIGURES

Figure 1.1	Administrative Districts of Davao City.....	1-2
Figure 2.1	Location of Drainage Problems in Davao City.....	2-3
Figure 2.2	Urbanization Trend of Davao City.....	2-4
Figure 2.3	Existing Land Use of Davao City (2017) .....	2-5
Figure 2.4	Urbanization Trend of Davao City in 1985 - 2015 .....	2-5
Figure 2.5	Main Traffic Flow in Davao City .....	2-6
Figure 3.1	4 Development Strategies .....	3-1
Figure 3.2	Davao City Spatial Development Strategy .....	3-2
Figure 3.3	Comparison of Population Density by Barangay (left: Year 2015, right: Year 2045).....	3-3
Figure 3.4	Land Use Map of 2017 .....	3-5
Figure 3.5	Davao City Urban Land Use Plan (Year 2045).....	3-6
Figure 4.1	Location Map of Tourism Development Corridor Projects .....	4-5
Figure 4.2	Perspective of Madayaw Travellers' Facility.....	4-6
Figure 4.3	Layout Plan of Kadayawan Cultural Village.....	4-6
Figure 5.1	Major Reasons Not to Use Potential Alternative Modes.....	5-1
Figure 5.2	Person Trip Patterns, 2017 .....	5-2
Figure 5.3	Daily Motorized Trips .....	5-2
Figure 5.4	Traffic Assignment Results on Existing Network and Existing Network Plus 2 Ongoing Road Projects .....	5-3
Figure 5.5	Traffic Assignment Results on New Road Projects .....	5-5
Figure 5.6	Traffic Assignment Results on Railway Network .....	5-6
Figure 5.7	Present and Future Road Network Patterns for Davao City .....	5-8
Figure 5.8	Future Road Network for Davao City.....	5-9
Figure 5.9	Davao City Diversion Road Extension Route.....	5-10
Figure 5.10	Conceptual Road Construction Plan in Langub Section .....	5-11
Figure 5.11	Davao Riverside Boulevard Project Coverage (area surrounded by red line) .....	5-12
Figure 5.12	Current Conditions and Development Concept of Davao River Areas .....	5-13
Figure 5.13	Conceptual Image of Davao Riverside Boulevard .....	5-14
Figure 5.14	Control Room of Tokyo Traffic Control Center.....	5-17
Figure 5.15	Railway Network Plan for Davao City.....	5-19
Figure 5.16	Phase 1 Alignment of Davao City Mass Transit Main Line.....	5-20
Figure 6.1	Davao City Bulk Water Supply Project .....	6-2
Figure 6.2	Schematic Diagram of SCADA System for DCWD .....	6-4
Figure 6.3	Sewerage System Development Plan for Davao City .....	6-6
Figure 6.4	Davao City Coastal Road (left) and Sewerage Plant (right) at Magsaysay Park .....	6-8
Figure 6.5	Image of Sewerage Treatment Plant (half underground type) .....	6-8
Figure 6.6	Aerial Perspectives of Sewerage Treatment Plant.....	6-8
Figure 6.7	Projected Waste Stream in 2045 (conservative case) .....	6-10
Figure 6.8	Layout Plan of Davao City Waste Eco Park .....	6-12
Figure 6.9	Development Perspectives of Waste Eco Park.....	6-12
Figure 7.1	Boundary of Congressional Districts .....	7-5
Figure 7.2	Meeting Photos.....	7-5
Figure 7.3	Environment Management Entities in Davao City .....	7-7
Figure 7.4	Environmental Management Plan for Davao City .....	7-8
Figure 8.1	Framework of the Kitakyushu Model .....	8-8
Figure 8.2	Historical Relationship Between Environmental Improvement and Economic Development in Kitakyushu City.....	8-8
Figure 8.3	Bridges across Murasaki River (above) and Kitakyushu Eco Town and Eco Town Center (below).....	8-10

## ABBREVIATIONS

3R	reduce, reuse and recycle
ADB	Asian Development Bank
AGR	annual growth rate
AGT	automated guideway transit
AI	artificial intelligence
ASEAN	Association of Southeast Asian Nations
BAWASA	Barangay Water & Sanitation Associations
BCCAD	Barangay and Cultural Communities Affairs Division
BERDE	Building for Ecologically Responsive Design Excellence
BOD	biochemical oxygen demand
BPO	business process outsourcing
BRT	bus rapid transit
CAO	City Agriculturist's Office
CBD	central business district
CCIP	City Commodity Investment Plan
CCTV	closed-circuit television
CDIA	The Cities Development Initiative for Asia
CDP	Comprehensive Development Plan
CDRRMO	City Disaster Risk Reduction and Management Office
CENRO	City Environment and Natural Resources Office
CEO	City Engineers' Office
CHO	City Health Office
CIO	City Information Office
CLUP	Comprehensive Land Use Plan
CM	construction management
CPDO	City Planning and Development Office
CREBA	The Chamber of Real Estate & Builders' Associations, Inc.
CTOO	City Tourism Operations Office
CTTMO	City Transport and Traffic Management Office
CY	calendar year
DA	Department of Agriculture
DATC	Davao Agriculture Trading Center
DCCCII	Davao City Chamber of Commerce and Industry Inc.
DCIPC	Davao City Investment Promotion Center
DCUTCLUS	Davao City Urban Transport cum Land Use Study
DCWD	Davao City Water District
DENR	Department of Environment and Natural Resources
DFC	Davao Food Complex
DICT	Davao International Container Terminal
DILG	Department of the Interior and Local Government
DMA	district metered area
DOST	Department of Science and Technology
DOT	Department of Tourism
DOTr	Department of Transportation
DPWH	Department of Public Works and Highways
DREAM	Disaster Risk and Exposure Assessment for Mitigation
DSWD	Department of Social Welfare and Development
DTI	Department of Trade and Industry
EAGA	East ASEAN Growth Area
EIA	environmental impact assessment
EIRR	economic internal rate of return
EMB	Environmental Management Bureau

EN	existing network
EV	electric vehicle
FIRR	financial internal rate of return
FS	feasibility study
GDP	gross domestic product
GIS	geographic information system
GVA	gross value added
HIS	household interview survey
HLURB	Housing and Land Use Regulatory Board
HMI	Human Machine Interface
HUDCC	Housing and Urban Development Coordinating Council
ICT	information and communication technology
IEC	information, education, communication
IM4Davao	Infrastructure Modernization for Davao City
IMAG	Infrastructure Monitoring Advisory Group
IP	indigenous people
IRA	internal revenue allotment
IRE	independent review engineer
ISF	informal settlement family
IT	information technology
ITR	Interim Report
JICA	Japan International Cooperation Agency
JPY	Japanese Yen
JTIR	Japan Tourism and Investment Roadshow
JV	joint venture
KPO	knowledge process outsourcing
LEED	Leadership in Energy and Environment Design
LGU	local government unit
LRT	light rail transit
LRTA	Light Rail Transit Authority
LTFRB	Land Transportation Franchising and Regulatory Board
LTO	Land Transportation Office
MGB	Mines and Geosciences Bureau
MOA	Memorandum of Agreement
MPN	most probable number
MRF	material recovery facility
MRT	mass rapid transit
MTL	mass transit line
NAMRIA	National Mapping and Resource Information Authority
NCIP	National Commission on Indigenous Peoples
NDC	National Development Company
NEDA	National Economic and Development Authority
NEDA CO	National Economic and Development Authority Central Office
NEDA XI	National Economic and Development Authority Region XI
NGO	non-government organization
NHA	National Housing Authority
NIPAS	National Integrated Protected Areas System
NRW	non-revenue water
NSSMP	National Sewerage and Septage Management Program
NSWMC	National Solid Waste Management Commission
OD	origin–destination
ODA	official development assistance
OJT	on-the-job training
OSM	Open Street Map
P2P	point-to-point

pcu	passenger car unit
PDCA	plan-do-check-act
PDP	Philippine Development Plan
PET	polyethylene terephthalate
PEZA	Philippine Economic Zone Authority
PHIVOLCS	Philippine Institute of Volcanology and Seismology
PHP	Philippine Peso
PNR	Philippine National Railways
pphpd	passengers per hour per direction
PPP	public-private partnership
PPR	Progress Report
PSA	Philippine Statistical Authority
PSSCC	Public Safety and Security Command Center
PUB	public utility bus
PUD	planned unit development
PUV	public utility vehicle
R&D	research and development
R.A.	Republic Act
RDC	Regional Development Council
RE	renewal energy
ROW	right of way
RTD	round table discussion
SCADA	Supervisory Control and Data Acquisition
SEA	strategic environmental assessment
SWM	solid waste management
TCC	traffic control center
TEU	twenty-foot equivalent unit
TIEZA	Tourism Infrastructure and Enterprise Zone Authority
TOD	transit-oriented development
TOR	terms of reference
TRIP	three-year rolling investment plan
TSS	total suspended solids
UDCC	Urban Development Coordinating Council
UP Mindanao	University of the Philippines Mindanao
UPS	uninterruptible power supply
USAID	United States Agency for International Development
USD	United States Dollar
VA	value analysis
VC	value chain
V/C	vehicle per capacity
VE	value engineering
WSS	water supply system
WTE	waste-to-energy

## ***Executive Summary***

### **INTRODUCTION**

Davao City is the premier city of the third largest metropolitan area in the Philippines. The city has a population of 1.6 million as of 2015 and a large territorial land of 2,440km<sup>2</sup> but the existing urban areas account for only 7% of its land. The concentration trend of the population and the city's economic activities on a dominant urban center causes the city to face serious urban problems brought about by rapid urbanization and disorderly development.

Davao City formulated its Comprehensive Land Use Plan (CLUP) 2013-2022. However, it has not firmly guided urban development activities toward the given land use plan. Also, the city has yet to prepare a concrete long-term plan to develop its urban infrastructure based on this CLUP.

It is in the above context that the National Economic and Development Authority (NEDA) requested the Japan International Cooperation Agency (JICA) to update Davao City's CLUP and prepare its urban infrastructure development plan together with developing the capacity of the NEDA and Davao City in preparing, evaluating, implementing and managing the urban infrastructure development plan.

This JICA assisted project is titled as the Davao City Infrastructure Development Plan and Capacity Building Project. The project is nicknamed 'IM4Davao (Infrastructure Modernization for Davao)'. The IM4Davao's project objectives are two-fold:

- (i) To develop an urban infrastructure development plan for Davao City with a priority project list, which will ultimately improve the city's competitiveness, safety from disasters, and general urban conditions; and
- (ii) To support the planning and implementation of infrastructure development effectively and efficiently through capacity enhancement of the NEDA and the City Government of Davao.

### **DEVELOPMENT FRAMEWORK**

The Regional Physical Framework Plan 2015–2045 envisages that Davao City will continue to drive regional development and reach a population of over 3.2 million in 2045. The IM4Davao project has estimated a barangay-level population, in line with land use planning where transport infrastructure led urban development is embodied in the plan, in addition to the existing urban areas.

By 2045, Davao City will have approximately 57% or 1.9 million of its population employed. There is a structural shift in employment where the share of primary sector workers will dip from 36% of employed population in 2015 to 18% in 2045. Secondary and tertiary sector workers, on the other hand, will increase their share of the total employed population from 16% to 23% and 48% to 59%, respectively.

An analysis on available land for urban development took into account areas that are habitable such as those with slopes less than 18%, not prone to disasters, not along water bodies, not within protected areas and land not already occupied by large-scale public and institutional facilities. Davao City has a vast land area but only 23% has been classified as habitable. With its current population of 1.6 million, only 7% of its total land is urbanized.

For future development, lands for residential, infrastructure and daytime activity use (i.e., work, schools, commercial and entertainment areas) were estimated based on proximity to urban

centers and future trunk roads. Some development constraints were also considered such as water bodies and forest lands. An additional 14,000 ha. will be needed to accommodate the growing population and activities of the city in 2045.

The city has taken on a typical mono-centric urban structure, with the Poblacion laid out as its urban core. Today, the city center has expanded to encompass the districts of Agdao, Buhangin and Talomo. The city now intends to realize a multi-nodal spatial development which will transform the present mono-centric to a poly-centric urban structure. This will promote a balanced development to downplay the negative effects of urban development.

Davao City's urban structure towards 2045 is to be led by transport infrastructure development integrated with its land use plan. Considerations will be given to strong land use controls and urban growth management with density control and strengthened urban functions. The transport network will be planned to direct growth of the city.

Designated subcenters will have to attract a higher daytime population by providing more places for work, schools, commerce, business and entertainment. Great care will be paid to control urbanization from encroaching into protected areas.

**Table ES1 IM4Davao's Development Framework**

	Present Conditions		Year 2045	
	Number	(%)	Number	(%)
Nighttime Population (persons)	1,632,991 <sup>1/</sup>	-	3,285,400	-
Total Employment (persons)	683,177 <sup>1/</sup>	(100.0)	1,863,426	(100.0)
Primary	243,424	(35.6)	335,593	(18.0)
Secondary	107,787	(15.8)	424,135	(22.8)
Tertiary	331,965	(48.6)	1,103,699	(59.2)
Urban Lands (ha)	14,057 <sup>2/</sup>	-	28,190	-

Source: 1/ PSA 2015 Census

2/ As of 2017 by IM4Davao Team

## INFRASTRUCTURE DEVELOPMENT PLAN

### Development Strategies

Davao City is a strategically important city that is expected to perform key regional, national and international roles. It is the center for Davao Region's government administration and is a premier hub for education, industry, commerce, trade, services, tourism and recreation, and investments in the region and in Mindanao. The city is also seen as a major international gateway and an economic center of the East ASEAN Growth Area (EAGA) for manufacturing and service industries.

In order to satisfy these roles, Davao City needs to prioritize infrastructure development as a driver of urban development to guide investments in housing, commercial, business, manufacturing and tourism. The IM4Davao Project proposes the 4D Strategy to achieve the city's ultimate goal of infrastructure modernization:

- ◆ Dynamic Development – robust city center with a poly-centric urban structure, provision of high standard infrastructure
- ◆ Distinguishable Development – unique agro-industry and advanced urban services, resilient urban management and livable urban environment
- ◆ Diversified Development – preservation of tribal/traditional culture and lands, promotion of



highlands to islands tourism

- ◆ Decentralized Development – LGU capacity building and stakeholders' involvement, bankable city administration

Guided by this strategy, the project developed an urban infrastructure development plan covering 7 sectors, namely: (1) roads and road traffic management, (2) public transport, (3) gateways, (4) water supply, (5) wastewater management, (6) solid waste, and (7) industrial development support. A set of proposed projects have been identified in each sector for implementation in the short (until 2022), medium (2023-2030), and long (2031-2045) terms.

## **Roads and Road Traffic Management**

In order to promote suburb development and decongest the city center, the current incomplete ladder pattern of road network should be developed as a triple ladder pattern. Currently, two trunk road projects are ongoing, namely the Davao City Bypass Road Project (28.8 km) and the Davao City Coastal Road Project (18.3 km). When Davao City Diversion Road is extended to Toril, the proposed triple ladder pattern will become a reality.

The project length of the Diversion Road Extension is 15.9 km, consisting of new road sections (11.5 km in total) and widening of the existing road sections (4.4 km in total). Due to technical difficulty, the road extension was once suspended in the 1990s. The project's history should be duly reviewed when arranging for project implementation so as to overcome the difficulty by the state-of-art technologies in construction method and project structure, particularly pertaining to the construction of a tunnel and the series of bridges and viaducts on the missing link in Barangay Langub.

In addition to the Diversion Road Extension Project, 3 new trunk road projects and several secondary road projects have been identified to strengthen the road network of the city to meet traffic demand in 2045. The new trunk roads include Davao Riverside Boulevard, Talomo-Calinan Bypass Road and Buhangin-Bunawan Bypass Road.

The Davao Riverside Boulevard Project (11.0 km along the Talomo side riverbank and 7.5 km along the Poblacion side riverbank) will be developed together with the Davao River improvement and flood control.

In view of the gravity of the current traffic congestion, Davao City placed "Transport Plan and Traffic Management" as an important agenda. It is in this connection that CTTMO has decided to establish a traffic control center (TCC). To ensure a sustainable and effective operation of the TCC, the present traffic system will be upgraded and a new TCC will be built.

## **Public Transport**

It is imperative to replace the public utility vehicles (PUVs), consisting of jeepneys and multi-cabs, with the more modern, safe, comfortable and efficient public utility buses (PUBs) as the main actor of the road-based public transport in Davao City. However, taking both the growing population (to be a city of 3 million) and the increase in private vehicles into account, the impact of this modal shift in road transport may not be dynamic in changing urban structure and personal movement.

Rail network service will be able to take a more important role in the city's transport system in the integration of the transport system with urban development, particularly with the new urban centers. Japan's and other countries' experiences show that a Transit-Oriented Development (TOD) is a practical way to foster new urban centers together with trunk road network development.

In Davao City, the Mindanao Railway project is ongoing to provide inter-city rail service. In addition, the Davao City Mass Transit Line project, a new intra-urban railway for passenger movement, is proposed. There is a greater opportunity for both the system to combine as an integrated railway network. The Mass Transit Line will consist of a main line (18 stations, 25.8 km) and branch lines (9 stations, 16.4 km). Phase 1 (15.0 km) of the main line will target to operate by 2024.

## **Gateways**

Davao International Airport will be expanded to meet increasing air traffic demand in the short to medium-term. The initiative includes the expansion of the terminal, construction of a new terminal and extension of the existing taxiway. In the long-term, the second regional airport will be selected and its role demarcation with Davao International Airport will be adequately set.

Sasa Port will serve mainly for domestic shipping with necessary management improvement and equipment installation.

Since Davao City has no suitable candidate sites for a new gateway airport and seaport, unless large-scale reclamation is allowed, a long-term gateway development agenda must be elaborated under the context of Metro Davao.

## **Water Supply**

DCWD supplies water to 61% of the population in Davao city, as of 2015, by individual house connection services. In the rural areas, water supply is carried out by the Barangay Water & Sanitation Associations (BAWASAs) and private associations in the barangay.

DCWD started a bulk water supply project in joint venture with the private sector. The project is to create a weir in the Tamugan River to draw and supply water to its service areas. The bulk water supply project would entirely replace DCWD's water supply from production wells to just one water source, reduce extraction of ground water and save on power.

Current NRW level in DCWD is about 30% and is expected to worsen with the expansion of the water supply network. In order to reduce NRW, the DCWD will establish the District Metered Area (DMA) system and will apply the Supervisory Control and Data Acquisition System (SCADA) to control/manage the water supply distribution system effectively. The DCWD has a plan to strengthen the NRW Management Division and reduce NRW level to 20% in 2045.

With the afore-mentioned concerted efforts, DCWD will expand its served population from 1 million persons in 2015 to 2.5 million (75% of the population) in 2045.

In the rural areas, water supply is not an individual house connection system (Level III) but a Point Source System (Level I) and Communal Faucet System or Stand Post (Level II). It is anticipated that population increase in the rural areas will not be large but the improvement of the water supply service is important.

## **Wastewater Management**

Davao City has no wastewater management system installed yet for domestic water. In many cases, night soil from toilets flow into the septic tanks. The untreated gray water from the septic tanks is discharged into roadside ditches or drainages. If this situation does not change in the future, the quality of water in water bodies will deteriorate with the increase in population. Today, water-borne diseases are a frequent occurrence. Also, contamination of river water quality by fecal coliform is already a serious environmental problem in Davao City.

DCWD is accelerating the preparation and startup of the septage service. The urban areas will be

covered by septage service with 4 septage plants until 2025.

Since the septage service only removes BOD of human excretion to some extent, the removal rate is still low. The septage service thus has a poor capability of removing BOD pollution load in domestic wastewaters (blackwater and graywater) compared with sewerage treatment. Therefore, it will be an interim solution until the establishment of a sewerage system, considered to be the gold standard for wastewater management, has been completed.

The IM4Davao project proposes that the future urban area of the city be divided into 6 districts and a sewage treatment plant be built in each district. First, Davao City is to prepare a detailed plan for the sewer system. After that, the city starts the construction of the sewer system until the completion of the whole system is in 2045.

The first sewerage plant is proposed to serve 'Area A' covering Poblacion and Agdao. The proposed site is partly on Magsaysay Park and the rest on the reclamation structure between Magsaysay Park and the causeway, which is to be constructed to accommodate the Davao City Coastal Road. The first plant project includes a double-layered type of structure with half-underground type sewage treatment plant and interceptor sewer line (7.3 km in total). When the rooftop of the sewage treatment plant will be made higher than the coastal road and will be open to the public as part of the Magsaysay Park, the plant can ensure that the citizens will have a view of the sea from the park regardless of the causeway offshore.

## **Solid Waste Management**

Davao City has been strengthening street sweeping and continuous waste collection with collaborated efforts from the citizens. Davao City has also been trying waste source segregation, waste composting at MRFs, 3R (Reduce, Reuse and Recycling) promotion, bio-diesel fuel production from edible oil, the preparation of Waste-to-Energy project in a positive manner in order to reduce the amount of waste to be treated.

The IM4Davao project has formulated the solid waste management plan for 2045 on a long-term perspective. Daily generated waste amount is calculated to be 1,602 tons per day in 2045, and almost all the waste will be collected by CENRO. The components of the waste treatment consist of disposal of waste in the current landfill, Waste-to-Energy process and disposal of ash from the Waste-to-Energy facility in a landfill, composting in MRFs and other waste recycling.

To facilitate the above efforts and provide environmental education for the citizens, Davao City Waste Eco Park is proposed. The park includes a visitor center, experiment center, ecological garden, recycling estate, WTE facility, MRF, biogas plant and others. In the concept, the park would have the function of waste segregation and treatment, reuse and recycling at just one place. It would also provide a first-hand experience, on the real solid waste treatment process to the citizens.

## **Industry Development Support**

In the IM4Davao project, the development of priority industrial sectors, which are the economic mainstays of Davao City, are discussed and projects are proposed by administrative district in view of the land use plan. The priority industrial sectors are (1) agriculture and agro-industry, (2) information and communication technology (ICT), (3) tourism, (4) industries to promote a low carbon society, and (5) industries to facilitate transport mobility and logistics.

With particular attention to (1) and (3) above, the IM4Davao Project proposes developing a tourism corridor on Davao's history and agriculture, the core of which will be Toril District. The route from the District extends to Calinan District and the foot of Mt. Apo. The following five major facilities are

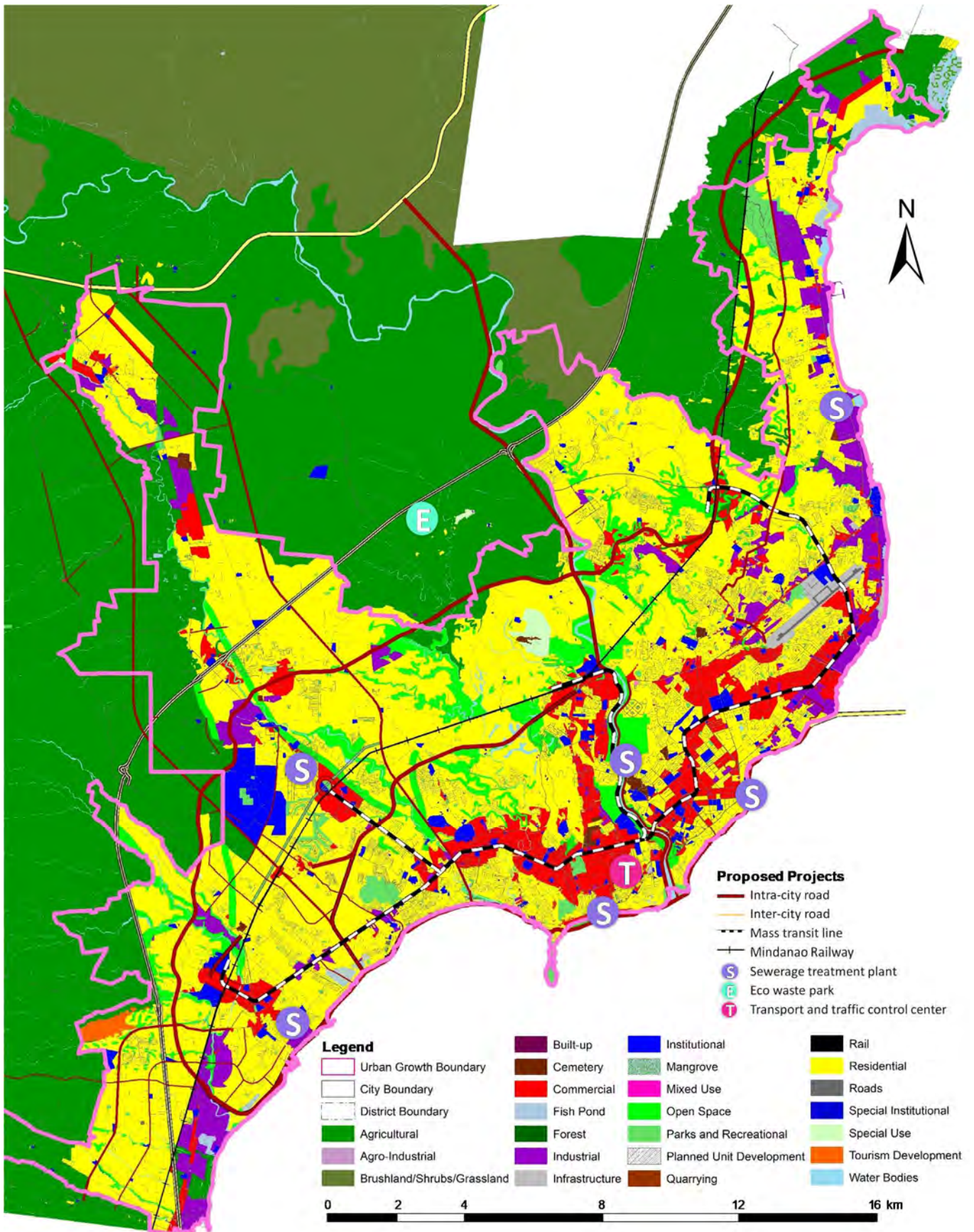
proposed along the corridor:

1. Farm/Agri-tourism circuit including the Davao Agriculture Trading Center (5 ha) and the proposed Davao Food Complex (20 ha) both in Toril;
2. Kadayawan Cultural Village (10.2 ha) in Eden;
3. Little Tokyo (20.2 ha) in Mintal;
4. Madayaw Travellers' Facility in Los Amigos; and
5. Davao Pioneer Museum in Calinan

**Table ES2 Davao City Infrastructure Development Plan**

	Short-term (-2022)	Medium-term (2023-2030)	Long-term (2031-2045)
Road*	<ul style="list-style-type: none"> <li>• Davao City Bypass Road</li> <li>• Davao City Coastal Road</li> <li>• Secondary Roads between Bypass Road and Diversion Road</li> <li>• Traffic Control Center</li> </ul>	<ul style="list-style-type: none"> <li>• Extension of Davao City Diversion Road</li> <li>• Davao River Boulevard</li> <li>• Secondary Roads to serve newly urbanized areas</li> </ul>	<ul style="list-style-type: none"> <li>• Talomo – Calinan Bypass Road</li> <li>• Buhangin – Bunawan Bypass Road</li> <li>• Secondary Roads to serve newly urbanized areas</li> </ul>
Public Transport*	<ul style="list-style-type: none"> <li>• Public Transport Modernization (trunk bus system)</li> <li>• Construction of Mass Transit Line Phase 1 (Talomo – JP Laurel, 15km)</li> </ul>	<ul style="list-style-type: none"> <li>• Construction of Mass Transit Line Phase 2 (Toril ~6.6km)</li> </ul>	<ul style="list-style-type: none"> <li>• Construction of Mass Transit Branch Lines (Airport to Mudiang St., Davao Riverside to Davao Central St., Bukidnon Road to Mintal) depending on demand</li> </ul>
Gateways	<ul style="list-style-type: none"> <li>• Improvement of Sasa Port facilities and equipment</li> <li>• Extension of taxiway and existing terminal at Davao International Airport</li> </ul>	<ul style="list-style-type: none"> <li>• Construction of Second Terminal at Davao International Airport</li> </ul>	<ul style="list-style-type: none"> <li>• Preparation of a Second Regional Airport</li> </ul>
Water Supply	<ul style="list-style-type: none"> <li>• Commencement of surface water supply from Tamugan Weir to most of DCWD service areas</li> <li>• Establishment of SCADA system for all WSS in DCWD</li> <li>• DMA establishment and NRW reduction management including leakage detection</li> <li>• Capacity building and training for NRW reduction management</li> </ul>	<ul style="list-style-type: none"> <li>• Expansion of the Rural Water Supply system for BAWASAs and associations in Barangays such as drilling well, construction of the elevated water tank for distribution and provision of the distribution pipe materials</li> <li>• Capacity building and training for rural water supply system management</li> </ul>	<ul style="list-style-type: none"> <li>• Development of new water sources, such as surface water and deep wells, for future sustainable water supply system.</li> <li>• Expansion of the water supply system to the unserved areas in order to increase the ratio of population served by up to 75%</li> </ul>
Wastewater Management	<ul style="list-style-type: none"> <li>• Installation and operation of septage plants</li> <li>• Preparation for the sewerage system project</li> </ul>	<ul style="list-style-type: none"> <li>• Construction and operation of Area A sewerage system</li> <li>• Preparation and construction of Area B and Area C sewerage systems</li> <li>• Preparation of Area D, E and F sewerage system</li> </ul>	<ul style="list-style-type: none"> <li>• Construction and operation of the rest of sewerage systems (D,E,F)</li> </ul>
Solid Waste Management	<ul style="list-style-type: none"> <li>• A new Integrated SWM Plan (2018-2027)</li> <li>• Rehabilitation of New Carmen Sanitary Landfill Site</li> <li>• New Sanitary Landfill in operation (Phase I)</li> <li>• MRF pilot plant project: Plan / Design / Procurement / Operation (with Monitoring) of MRF</li> <li>• Preparation of Davao City Waste Eco Park</li> </ul>	<ul style="list-style-type: none"> <li>• WTE first plant operation</li> <li>• Increase in waste collection rate; 80% up</li> <li>• MRF (middle class capacity) in operation</li> <li>• Operationalization of Davao City Waste Eco Park</li> </ul>	<ul style="list-style-type: none"> <li>• New Sanitary Landfill in operation (Phase II)</li> <li>• WTE second plant operation (600 t/d)</li> <li>• MRFs (middle class capacity, several sites) in operation</li> <li>• Completion of Davao City Waste Eco Park</li> </ul>
Industry Development Support	<ul style="list-style-type: none"> <li>• Davao Agriculture Trading Center/Davao Food Complex</li> <li>• IT Parks/Centers</li> <li>• Little Tokyo</li> <li>• Kadayawan Cultural Village</li> </ul>		

Note: \* excluding regional/intercity highways and railways  
 Source: IM4Davao Team



Source: IM4Davao Team

**Figure ES1 Land Use Plan cum Infrastructure Development Plan for Davao City 2045**



## EVALUATION, MANAGEMENT AND MONITORING

For the IM4Davao development program, the largest investment source will be from the national government particularly for the transport infrastructure. The city government financing will be mainly tapped for projects on solid waste management, traffic management and industry development support (such as for tourism). DCWD is expected to invest on water supply and wastewater management within their financial capability based on collected revenues. Various PPP arrangements will become a conduit for private sector investment in infrastructure development such as bulk water supply, solid waste management, railway and airport and seaport gateways.

**Table ES3 Summary of Sources of Investment Program**

Period of Implementation	Summary of Investment Requirements (PHP million)					
	Total	National Government	Davao City Government	DCWD and other SOEs	Donor Grant	PPP/JVA/PS
2018-2022	98,397	19,024	1,806	3,699	1,090	72,779
2023-2030	87,527	50,282	377	23,672	2,250	10,947
2031-2045	109,100	57,923	0	25,864	0	25,313
TOTAL	295,024	127,228	2,183	53,235	3,340	109,038

Source: IM4Davao Team

The financial envelopes of the national budget and Davao City budget have been estimated based on the recent budget allocation in infrastructure investment. The results show PHP1.5 trillion of the national budget to Region XI and PHP35 billion of the city budget from 2018 to 2045.<sup>1</sup> The comparison between the investment requirement and the financial envelop reveals that there are adequate resources from the national government budget as well as the city government budget from 2018 to 2045. Private investments are assumed to be easily mobilized if the projects are financially viable or if structured in a bankable manner.

Strategic Environmental Assessment (SEA) has been applied in the planning process of the IM4Davao Project. There were several consultations with various stakeholders from the LGU, including the council representatives, NEDA XI, NEDA CO, and representatives from various national government agencies in the city. Consultations took place not only with the decision makers, but also with the direct beneficiaries and affected parties during meetings with local leaders and residents at the congressional districts as well as at meetings with the IP groups in Davao City.

The environment management plan for Davao City has been prepared which is structured with the goal to 'ensure ecological integrity, clean and healthy environment'. The four strategies of the plan are: (i) the effective coordination and strict law enforcement, (ii) maintaining and improving environmental quality, (iii) enhancing natural resource conservation, and (iv) environment friendly infrastructure. There are various programs and activities proposed under these strategies.

One institutional approach is to guide all public and private investments for urban development towards green development by way of a green infrastructure code and a green building code using green technologies. The adoption of a green infrastructure code and building code, following standards that are already in place, is recommended for Davao in the form of local ordinances.

<sup>1</sup> An assumption of 2.3% pro-rated share of Region XI in infrastructure investment based on the allocation for fiscal year 2018 is used to estimate the national budget envelop. Under the 'Build-Build-Build Program', the government has targeted an increase in infrastructure spending from 5.4% in 2017 to 10% of GDP by 2030. The Davao City's Development Fund accounts for 30% of the city budget. 40% of the development fund will be used for infrastructure in the estimation.

The IM4Davao Development Plan will be periodically monitored every 4 to 5 years by a joint monitoring team of NEDA XI and Davao City, e.g. in the target year and its intermediate years of 2022 (short-term target year), 2026, 2030 (medium-term target year), 2035, 2040 and 2045 (long-term target year). The monitoring will use the plan–do–check–act cycle (the PDCA cycle) which is a four–step model commonly used in business to provide a helpful framework for thinking about the interactive nature of planning, implementation, monitoring and evaluation, as well as plan updating and revisions.

## **CAPACITY BUILDING**

At the beginning of the IM4Davao project, the team conducted the capacity development assessment survey among the project counterpart personnel including CPDO and other offices of Davao City Government, NEDA Region XI, Infrastructure Staff of NEDA CO and other relevant national government agencies and local agencies in relation with Davao City.

They made a self-assessment of their capabilities in various planning subject to be used during the project. After the self-assessment and related discussions, the capacity building assistance to improve the offices/division's capability for infrastructure planning, implementation and management were identified.

In order to address the identified needs and gaps, the IM4Davao project has conducted the following 3 capacity development methods:

- (1) Sector-focused and topic-focused trainings were undertaken covering (i) value engineering/value analysis, (ii) transport demand and network assignment, (iii) domestic wastewater management, (iv) solid waste management, (v) environmental management, (vi) investment promotion, (vii) handling unsolicited proposals, (viii) GIS training, (ix) socio-economic framework and (xi) strengthening the implementation of the Davao City CLUP. Each training was done for one day or a couple of days depending on the training program. The number of participants ranged from up to 30 per training program.
- (2) Workshops on delivering intermediate reports were conducted for the Progress Report on May 11-12, 2017 and for the Interim Report on October 12-13, 2017. During the workshops, intermediate project outputs were presented and discussed among Davao City Government, DCWD, NEDA and other related national government agencies, the private sector, local academe and donor agencies. In addition, the project introductory workshop was held on February 20, 2017 and the project final seminar was convened on April 24, 2018. The size of participants ranged from 100 to 200.
- (3) Japan Invitation Programs were conducted twice during the course of the project from May 23 to 31, 2017 (12 participants) and from April 15 to 21, 2018 (8 participants). The invited participants acquired knowledge and expertise about urban infrastructure development in Tokyo and Kitakyushu, Japan.

Davao City has an environment sister agreement with Kitakyushu City who has developed the Kitakyushu Model as a technical cooperation tool to strengthen local governments' practical skills in Asia for designing and planning green infrastructure systems. In the course of the IM4Davao project, the Kitakyushu Model was frequently used as reference for better understanding of urban infrastructure development and urban environment management. The team has identified that some experiences of the Kitakyushu Model show particular implications to Davao City's urban development. They are (i) integrated river improvement and infrastructure provision along the Murasaki River, (ii) dissemination of environmental education among the citizens and (iii) promotion of local recycling industries.

## CONCLUSIONS AND RECOMMENDATIONS

The IM4Davao Development Plan Project has mainly produced two outputs, the urban land use plan towards 2045 and the infrastructure development plan for the transport, water supply, wastewater management, and solid waste management sectors for implementation. It is recommended for the Davao City Government to authorize the inclusion of the major project outputs in their legal documents such as the CLUP and CDP.

The long list of projects consisting of 75 projects with an aggregated amount of PHP 295 billion has been prepared during the project period. It is recommended that all the proposed projects be implemented under adequate timeframe such as short-term (2018-2022), medium-term (2023-2030) and long-term (2031-2045).

For project implementation, adequate implementation modalities have been considered by project. Needless to say, the greater contribution of the central government is crucial for prime infrastructure development. The private sector is an important player in some 'big ticket' projects in the form of various PPP schemes. The Davao City Government is required to take an active coordinator's role in both infrastructure provision and urban development activities.

It is of utmost importance that infrastructure should be provided at the right time and at the right place. To minimize adverse effects of infrastructure development, environmental management is another concern. The team conducted a strategic environment assessment (SEA) to elaborate the packages of infrastructure projects with policymakers, counterpart agencies and local stakeholders. An environment management plan has been prepared to address this issue.

The Project has prepared a set of priority projects including (1) Extension of Davao City Diversion Road, (2) Davao Riverside Boulevard, (3) Davao City Mass Transit Main Line, (4) Sewerage System (Phase 1), (5) Davao City Waste Eco Park, (6) Traffic Management Improvement and Control Center, (7) SCADA System and NRW Reduction Program, and (8) Tourism Corridor Development Featuring Davao History and Agriculture. All the projects were elaborated with fresh and unique ideas as fruits of the collaboration with the counterpart personnel. It is recommended that these priority projects be implemented according to their respective implementation plans.

On the mechanism to follow through the CB activities initiated by the project, the following are suggested:

- ◆ Conduct post-capacity assessment within one year of project termination to evaluate the effectiveness of the trainings conducted; and
- ◆ Based on the training process evaluation, sustaining follow-up activities and institutionalizing capacity development are required.

On the institutional arrangement to coordinate, monitor and evaluate the implementation of IM4Davao Development Plan, the following are proposed:

- ◆ Expand the roles and functions of existing multisectoral group, ad hoc committee and/or set up a new one at the NEDA RO level for promoting mutually beneficial undertakings of different stakeholders in areas related to project prioritization for funding by the national government vis-a-vis projects identified in the IM4Davao Development Plan.
- ◆ The IM4Davao Development Plan must be regularly reviewed and updated every 4-5 years. A joint force of NEDA XI and the Davao City Government will undertake it via the PDCA cycle.
- ◆ The afore-mentioned results will be incorporated in the Three-year Rolling Infrastructure Program (TRIP) of the national government and sectoral government agencies and other relevant development plans.



# 1 INTRODUCTION

## 1) Background

1.1 Davao City is the premier city of the third largest metropolitan area in the Philippines. The city has a population of 1.6 million as of 2015 and a large territorial land of 2,440km<sup>2</sup> but the existing urban areas account for only 7% of its land. The concentration trend of the population and the city's economic activities on a dominant urban center causes the city to face serious urban problems brought about by rapid urbanization and disorderly development.

1.2 Davao City formulated its Comprehensive Land Use Plan (CLUP) 2013-2022. However, it has not firmly guided urban development activities toward the given land use plan. Also, the city has yet to prepare a concrete long-term plan to develop urban infrastructure based on this CLUP.

1.3 It is in the above context that the National Economic and Development Authority (NEDA) requested the Japan International Cooperation Agency (JICA) to update Davao City's CLUP and prepare its urban infrastructure development plan together with developing the capacity of the NEDA and Davao City in preparing, evaluating, implementing and managing the urban infrastructure development plan.

1.4 The urban infrastructure development plan will be the basis for updating the city's CLUP and for preparing the Comprehensive Development Plan (CDP), both of which are legally required to be formulated by all LGUs in the Philippines.

1.5 This JICA assisted project is titled as the Davao City Infrastructure Development Plan and Capacity Building Project. The project is nicknamed 'IM4Davao (Infrastructure Modernization for Davao)'.

## 2) Project Objectives

1.6 The IM4Davao's project objectives are two-fold:

- (i) To develop an urban infrastructure development plan for Davao City with a priority project list, which will ultimately improve the city's competitiveness, safety from disasters, and general urban conditions; and
- (ii) To support the planning and implementation of infrastructure development effectively and efficiently through capacity enhancement of the NEDA and the City Government of Davao.

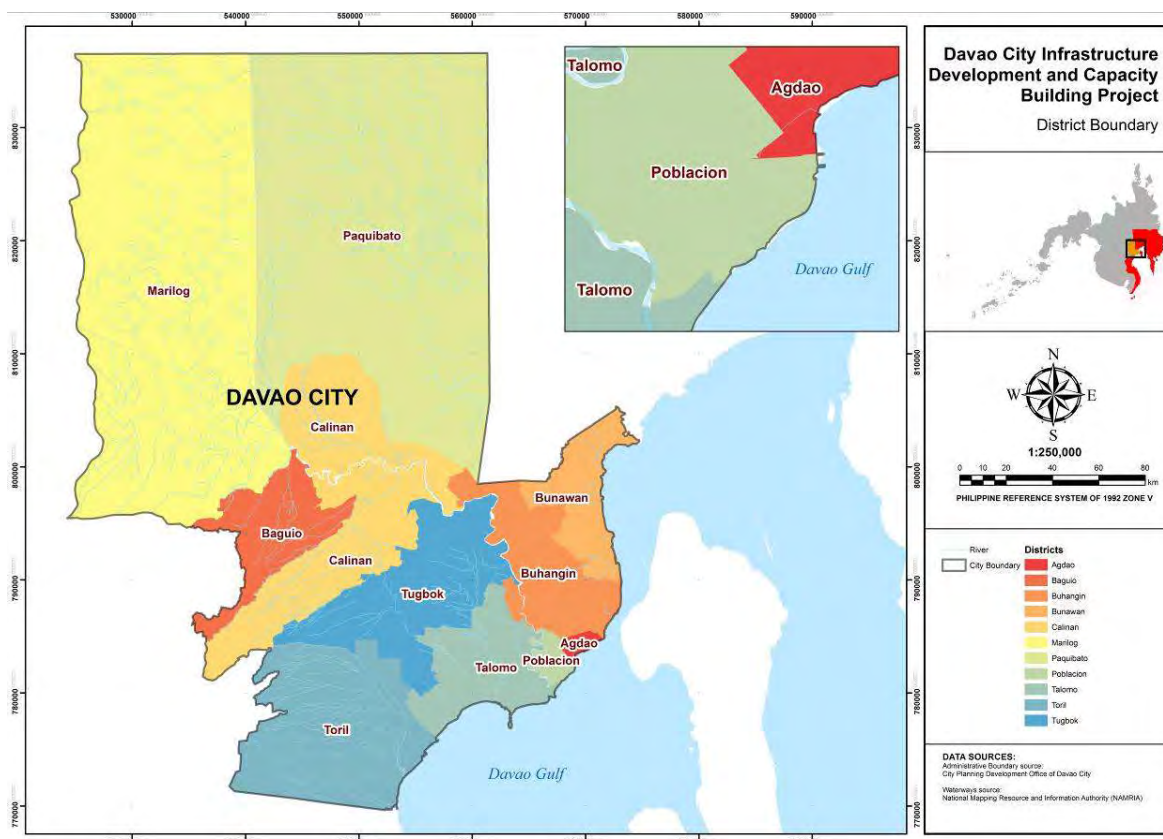
## 3) Project Area and Scope

1.7 While the coverage of the plan is the entire Davao City (Figure 1.1), information collection, situation analysis, and coordination includes the rest of the Davao Region (Region XI) and other adjacent areas when necessary.

1.8 To meet the first project objective, the project covers city and land use planning, transport infrastructure and service (public transport), water supply, wastewater management, solid waste management, environment management and industry development/investment promotion.<sup>1</sup>

---

<sup>1</sup> However, flood control related infrastructure such as rivers and drainage is out of the project scope since JICA intends to conduct a separate study project for flood control in Davao City.



Source: IM4Davao Team based on Davao City CPDO Data.

**Figure 1.1 Administrative Districts of Davao City**

#### 4) Project Outputs

1.9 The deliverables of IM4Davao are as follows:

- (i) An urban infrastructure development plan for Davao City which focuses on land use, roads, urban transportation, water supply, solid waste management, and others, and with the short-term target year of 2022, the mid-term target year of 2030 and the long-term target year of 2045;
- (ii) A set of proposed priority projects based on the prepared urban infrastructure development plan, which will serve as references for the annual and midterm investment plans of Davao City;
- (iii) Recommendations to implement the proposed urban infrastructure development plan;
- (iv) Enhanced capacities of the NEDA CO and the NEDA XI in evaluating and managing urban infrastructure development plans; and
- (v) Developed capacities of the Davao City LGU in formulating and implementing the urban infrastructure development plan.

1.10 In relation to (ii), the following criteria is set for selecting IM4Davao priority projects:

- ◆ Importance and urgency of relevant sector plan and Davao city-wide development;
- ◆ Possibility to launch the project by 2022 but implementation is yet to be decided;
- ◆ Economic benefits are justifiable and are expected to be immediately realized within its timeframe; and
- ◆ Technically, financially, environmentally and socially manageable project during construction and operation phases.

## 2 EXISTING CONDITIONS AND ISSUES IN DAVAO CITY

### 2.1 Socio-Economic Condition of Davao City

2.1 Davao City is located in the heart of Metro Davao, which is composed of seven LGUs (Davao City, Tagum City, Panabo City, Samal City, Digos City, and the municipalities of Carmen and Sta. Cruz). The city leads the socio-economic development of Metro Davao and accounts for 65% of its population.

2.2 Davao City's population grew at a rate of 2.8%/year and reached 1.6 million in 2015. The population density throughout the city is still very low but is getting higher at the urban center (i.e., Poblacion and Agdao Districts). The day-time and night-time population ratio of the Poblacion District is also high. This means that the day-time population has concentrated in Poblacion District. Although development in the urban center is progressing faster than other areas, informal settlers are seen occupying government lands and areas along river banks and coastal areas. It is estimated that the number of informal settlers in the urban center is more than 20,000 people<sup>1</sup>.

**Table 2.1 Demographic Trend in Davao City**

Congressional District	Administrative District	Area (ha)	No. of Population			AGR (%/year)		Population Gross Density (person/ha)			Day-time Pop./ Night-time Pop.
			2000	2010	2015	'00-'10	'10-'15	2000	2010	2015	
1	Poblacion	1,138	133,639	156,450	174,121	1.59	2.16	117	168	172	1.35
	Talomo	8,916	284,100	382,652	418,615	3.02	1.81	32	43	47	0.89
2	Agdao	593	91,397	99,406	102,267	0.84	0.57	154	168	172	0.91
	Buhangin	9,508	193,519	256,959	293,118	2.88	2.67	20	26	30	0.97
	Bunawan	6,694	97,641	103,615	152,102	0.60	7.98	15	15	23	0.97
	Paquibato	66,242	35,270	39,698	44,763	1.19	2.43	0.5	0.6	0.7	0.96
3	Baguio	19,023	24,379	30,384	33,873	2.23	2.20	1	2	2	1.04
	Calinan	23,236	67,077	81,844	92,075	2.01	2.38	3	4	4	1.01
	Marilog	63,800	42,736	45,125	52,201	0.55	2.96	0.7	0.7	0.9	0.98
	Toril	29,459	108,054	133,452	148,522	2.13	2.16	4	5	5	0.92
	Tugbok	15,391	69,304	91,622	121,334	2.83	5.78	5	6	8	0.97
Davao City		244,000	1,147,116	1,421,207	1,632,991	2.17	2.82	5	6	7	0.99

Source: Population Census, Department of Education, Office of Education in Davao City, HIS (JICA, 2017)

2.3 The main industries in Davao City are the agro-business, ICT-BPO (Business Process Outsourcing) and tourism. The main agricultural products are coconuts, bananas, durians, pineapples and pomelos. Among them, banana became one of the main export products and its plantation area and yield has increased. The tourism sector is also doing well. The number of tourists doubled in the last six years, and reached 1.9 million people in 2016. However, the number of foreign tourists decreased in 2015 – 2016, and it is expected to decrease further due to the declaration of Martial Law in 2017.

2.4 Regarding ICT-BPO, in the 2016 annual survey of the top 100 outsourcing destinations in the world, Tholons (a services globalization and investment advisory firm) ranked Davao City 66th worldwide. In addition, 17 IT centers/parks are registered with PEZA.

2.5 For the characteristics and potential of industrial development in Davao City, a

<sup>1</sup> Assumed from the building structure based on Satellite image and street view of google map

comprehensive plan is formulated by NEDA XI and a working group was formed composed of the central government, LGUs and private sector. Nine preferential industrial clusters were selected to be developed in Davao City as summarized in Table 2.2.

**Table 2.2 Priority Industry Sectors of Davao City**

Primary Sector	Secondary Sector	Tertiary Sector
Banana / Coconut / Cacao / Rubber / Abaca / Durian / Poultry	(Processing of Agricultural Products)	ICT / Tourism / Renewable Energy

Source: The Davao Region Industry Clusters Roadmaps (2014-2030, RDC XI)

2.6 Although Davao City is the third largest metropolitan area in the Philippines, Metro Manila, Region III and Region VI-A shares 67% of GDP. It is expected, however, that the socio-economic standing of Davao City will continue to develop as the center of the Mindanao Island. The centers for the secondary and tertiary industries, for now, are few but the city still has vast lands. It is necessary to invite new industries. For the primary industry, the development potential is not fully tapped due to the lack of access roads and logistic facilities.

## 2.2 Natural Environment

2.7 **Preservation of Natural Environment:** The main issues are that the protected areas designated under R.A. 7586 are occupied by the informal settlers as well as illegal tourism related facilities were built in those areas.

2.8 **Environmental Pollution:** According to the existing monitoring results, the air quality is within the environmental standards. However, there is a concern that the air quality would deteriorate in the near future due to the increase of the number of registered vehicles. For the water quality, the water quality assessment report was issued on six rivers including Davao River and Talomo River in 2016. TSS and fecal coliform exceeded the environmental standards at many of the sample sites. This is because human and animal wastes drain into the rivers without treatment. (Table 2.3)

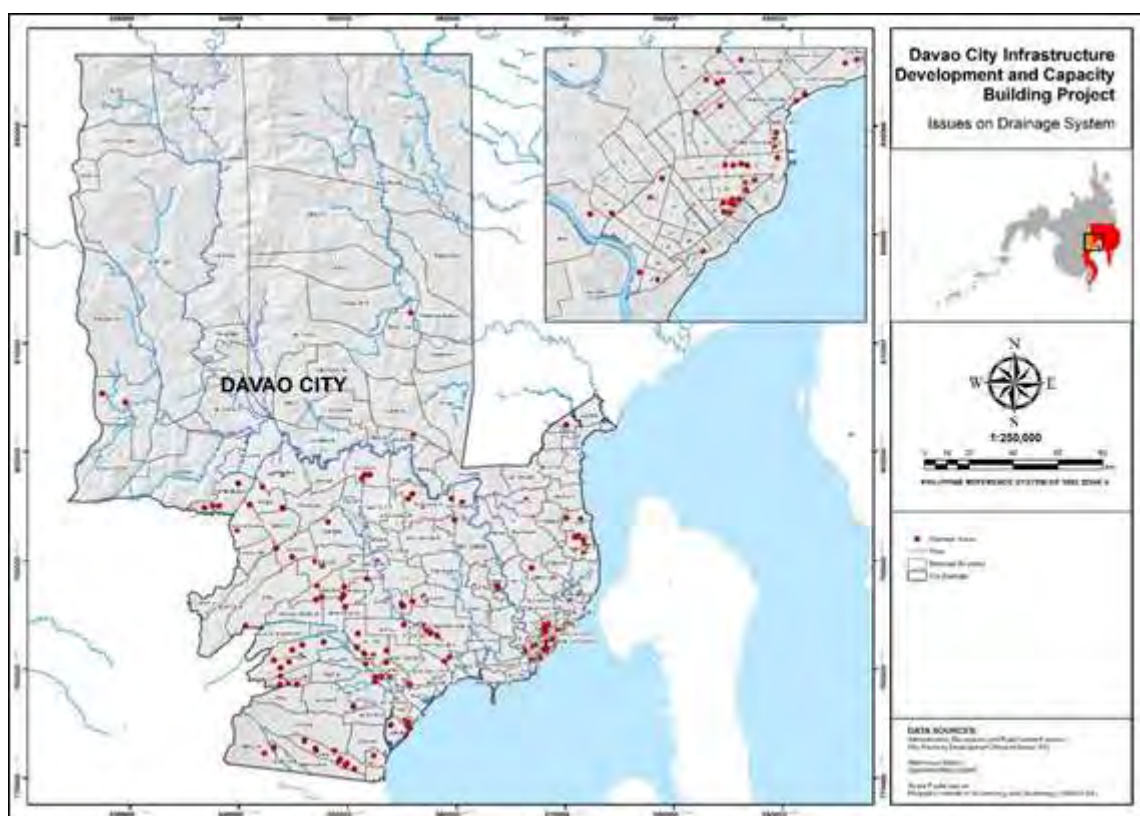
2.9 **Natural Disasters:** The major natural disasters in Davao City are earthquake, landslides and floods. Based on the hazard maps prepared by DOST (Department of Science and Technology) and MGB (Mines and Geosciences Bureau), about 430,000 people (25% of the total population) lives in the high-hazard areas of landslides or floods.

2.10 In 1998, flash floods and floods occurred and covered a wide area. It was concluded that these floods occurred due to urban sprawl. Damages caused by floods still continue to be experienced in the urban center until now due to the lack of drainage system. In this project, it is identified that 158 sites have drainage problems based on the outreach meetings participated by the barangay captains and representatives (Figure 2.1). Considering only the flood records after 2010, there were flooding at the downstream of Davao River and flooding of Matina River. It is obvious that flood management is an urgent issue.

**Table 2.3 Water Quality at Downstream of Davao River in 2016**

Parameter	Minimum	Maximum	Average	Water Quality Criteria for Class B
Temperature (°C)	27.0	32.0	28.8	26-30
pH	7.6	8.9	8.3	6.5-8.5
Dissolved Oxygen (mg/L)	3.4	9.4	6.9	5.0 (minimum)
BOD (mg/L)	0.2	5.5	1.3	5
Total Suspended Solids (mg/L)	3	940	141	65
Fecal Coliform (MPN/100 ml)	2,000	5,400,000	107,562 (Geomean)	100
Nitrates-N (mg/L)	0.89	29.23	11.83	7
Phosphates-P (mg/L)	0.11	2.03	0.80	0.5
Lead (mg/L)	<0.01	0.15	0.02	0.01
Cadmium (mg/L)	<0.003	0.006	0.003	0.003
Copper as Dissolved Copper (mg/L)	<0.001	0.04	0.01	0.02
Zinc (mg/L)	<0.001	0.06	0.03	2

Source: Water Quality Assessment Report (CY 2016) Davao River.



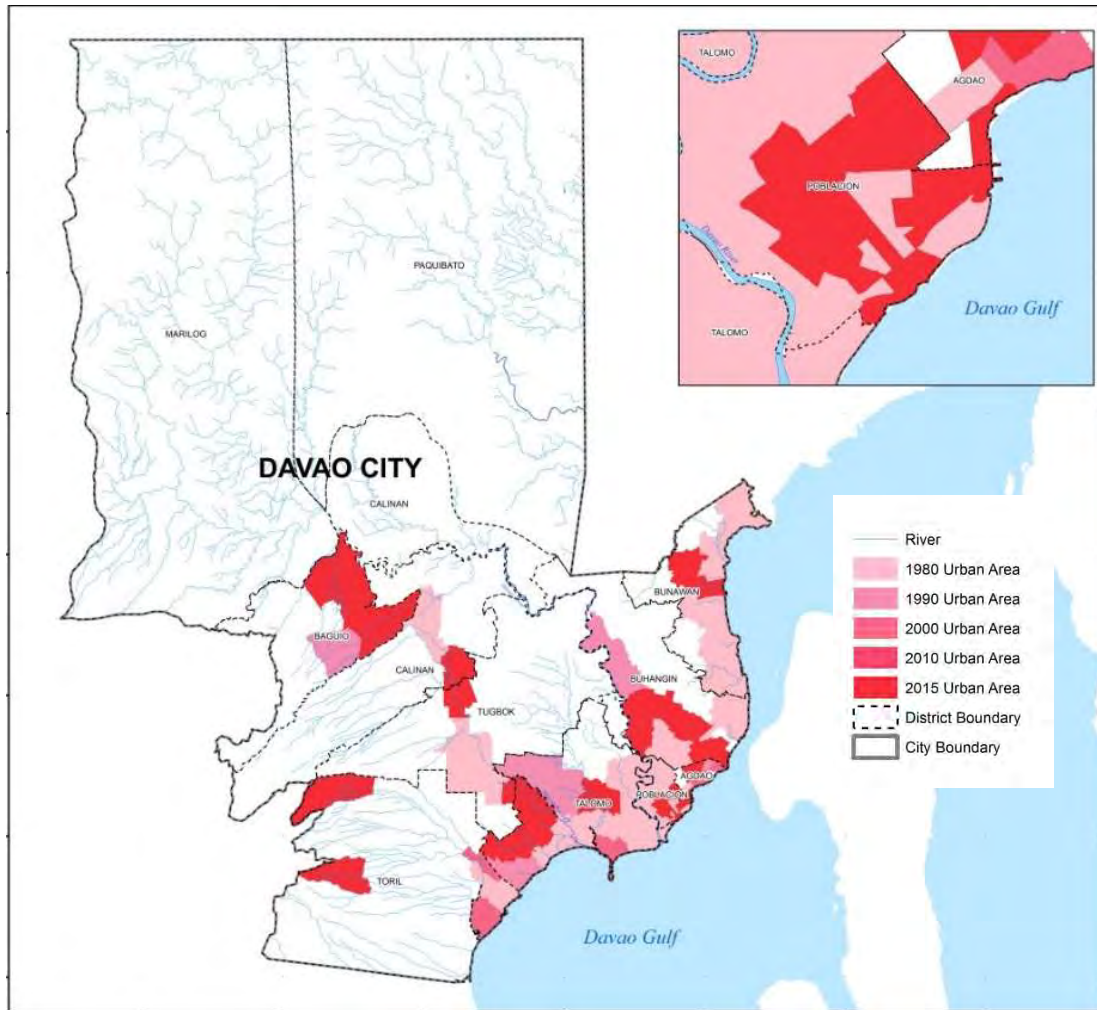
Source: Prepared by IM4Davao Team based on the results of outreach meetings

**Figure 2.1 Location of Drainage Problems in Davao City**

## 2.3 Urbanization and Land Use

2.11 The urbanization of Davao City is steadily pushing on. As the number of urban barangays increased, the share of urban population increased from 58% in 2000 to 73% in 2015. The urban areas are concentrated on the flat areas, particularly along the coastal areas, Davao-Bukidnon Road and Mandug Road (Figure 2.2). It was expected that the Davao-Panabo Bypass, which is under project detailed engineering design stage, would contain the urban sprawl, but the urban areas already expanded further north than this Bypass road.

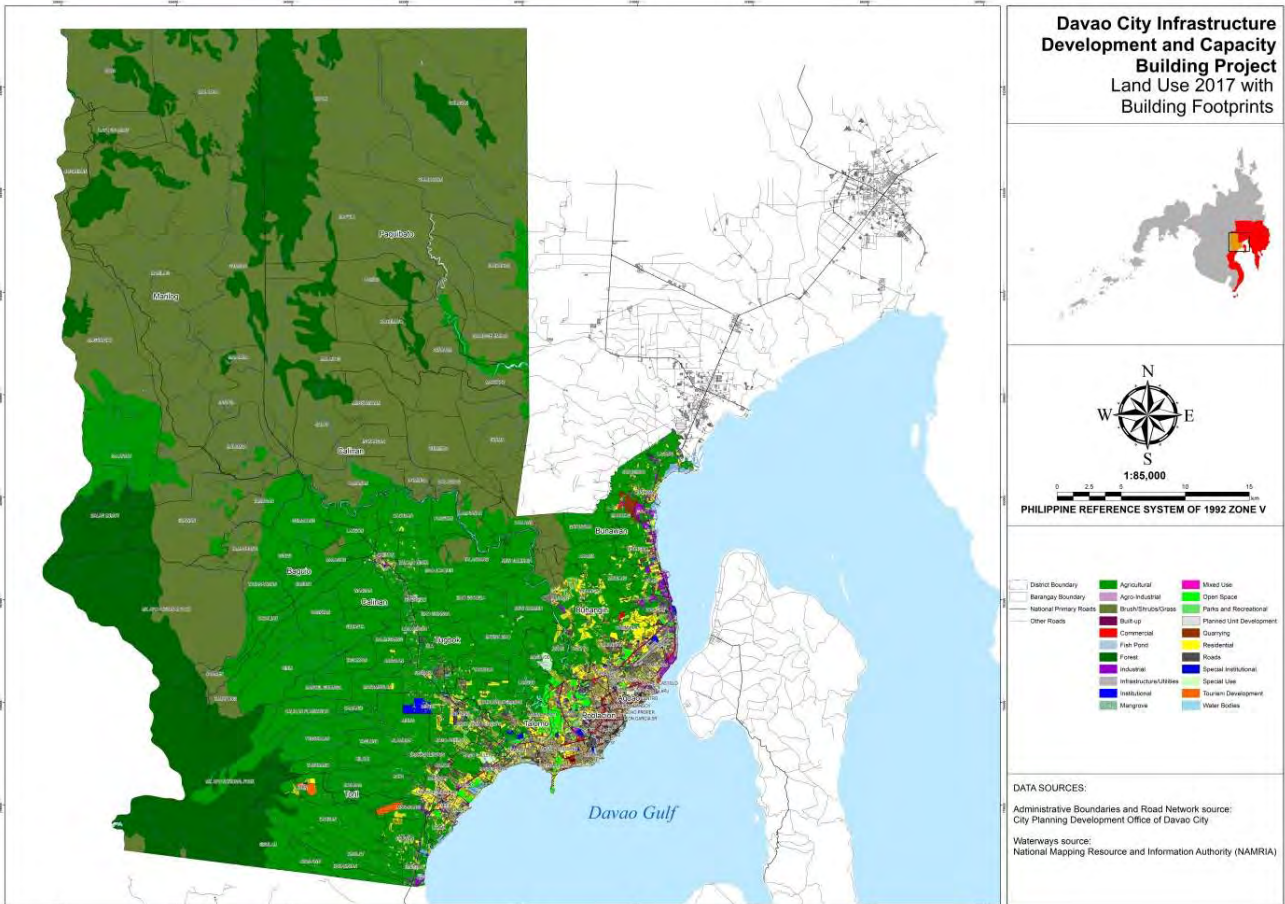




Source: Prepared by IM4Davao Team based on the population data of PSA

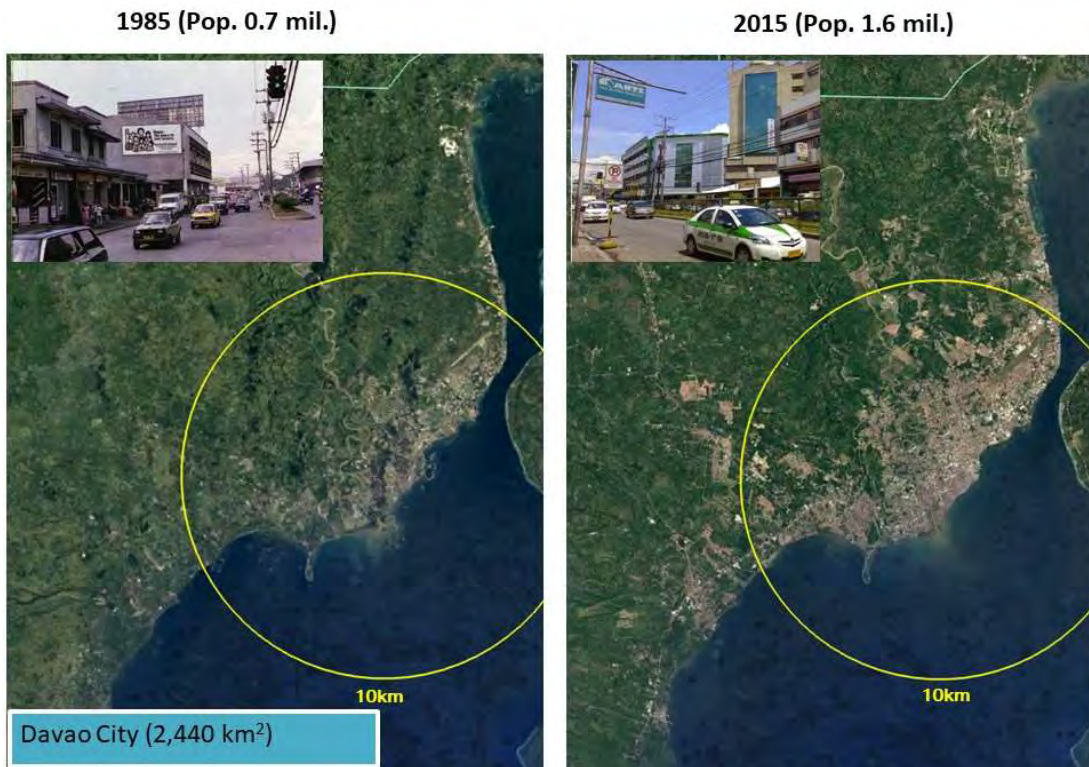
**Figure 2.2 Urbanization Trend of Davao City**

2.12 Davao City has a total land area of 244,000 ha of which, 7.2% (15,772 ha) is occupied by urban use while the remaining lands are mainly agricultural and forest lands. The commercial and business lands are located along the main roads and the industrial lands are concentrated at the coastal areas. It is noticeable that the residential areas are scattered in the sub-urban areas. Furthermore, low-income families and informal settler families are identified at the areas where residential development is prohibited (e.g. areas along the water bodies). In addition, the parks and recreational areas, greeneries and open spaces are very limited similar to Metro Manila and Metro Cebu.



Source: IM4Davao Team

**Figure 2.3 Existing Land Use of Davao City (2017)**



Source: Prepared by IM4Davao Team using Google Earth

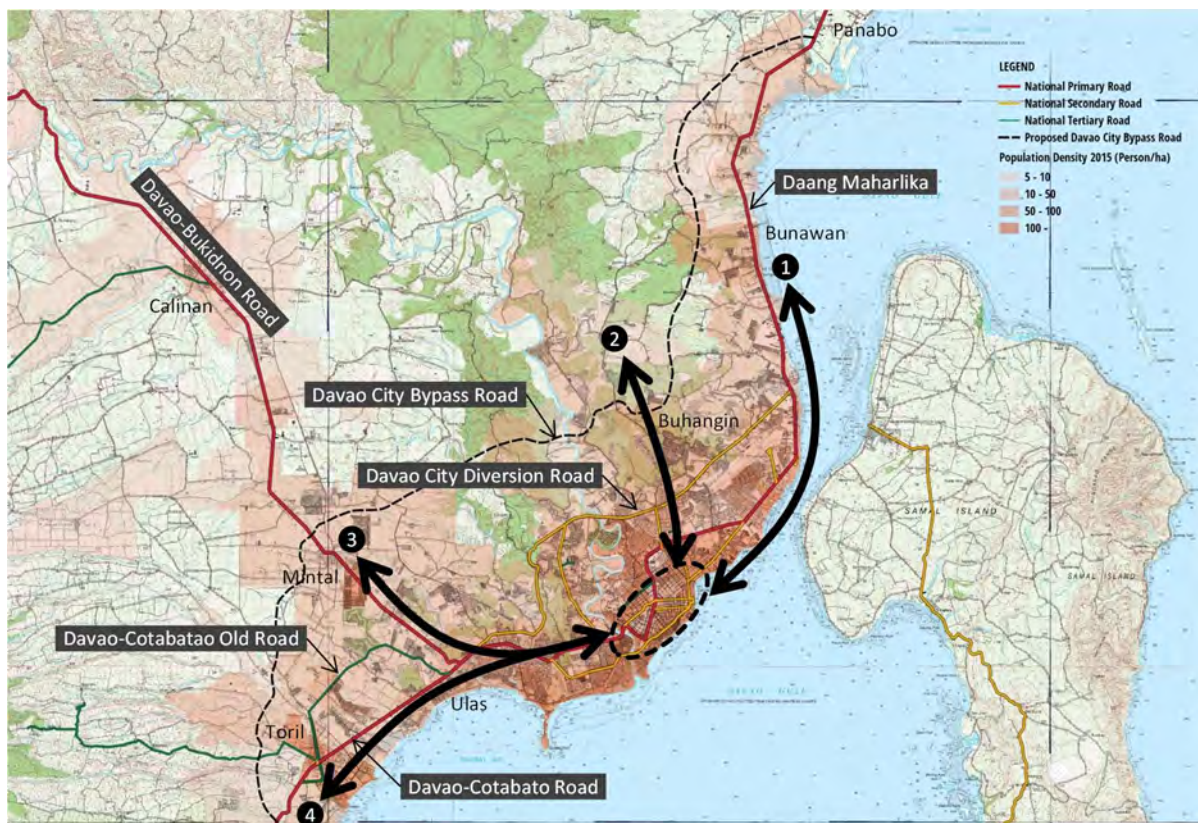
**Figure 2.4 Urbanization Trend of Davao City in 1985 – 2015**



## 2.4 Transport Infrastructure and Services

2.13 As mentioned in **Chapter 2.1 Socio-Economic Condition of Davao City**, the current spatial structure is a monocentric pattern with the Poblacion and Agdao Districts forming the core. Meanwhile, industrial development is concentrating on Bunawan and Buhangin Districts in the north-east where the airport and ports are located. The road network supporting this monocentric structure of the city is an incomplete ladder structure with the national highways (Davao-Cotabato Road and Davao-Panabo Road) and Davao Diversion Road. Due to the lack of the main road network, economic activities and residential development have concentrated along these particular national highways.

2.14 Diversion Road has played a role of an alternative road of Davao-Panabo Road along the coastal areas since 1990, and it was effective in decongesting the traffic along Davao-Panabo Road for some time. However, due to the increase in traffic volumes, traffic congestion along Davao-Panabo Road is becoming a serious issue again. In order to solve this traffic, a truck ban was enforced since 2017. Traffic congestion along Davao-Bukidnon Road is also becoming worse, so that the widening of this road is ongoing. In the south, Matina Junction, where Bukidnon Road and Cotabato Road are intersecting, is the most congested section.



Source: IM4Davao Team

**Figure 2.5 Main Traffic Flow in Davao City**

2.15 The number of vehicles in Davao City has been increasing as similar to other cities in the Philippines, and it increased 1.5 times between the period 2012 to 2016. The number of vehicles increased not only because of economic growth but also due to the lack of an efficient public transport system. The public transport system in Davao City consists of the road-based transport (bus, jeepney, Filcab, GT Express (shared large taxi), taxi and tricycle) and ferry. Regarding the former, the number of intra-city bus routes is few,



and more than 7,000 jeepneys have the main role for intra-city transport. The lack of bus services contributes to traffic congestion and poor quality of public transport services. Buses have better occupancy performance of limited road space as against the present modes on city streets.

**Table 2.4 Registered Vehicles in Davao City, 2011 – 2016**

	2011	2012	2013	2014	2015	2016
No. of Registered Vehicles	132,213	153,632	165,967	157,299	188,388	200,593

Source: LTO

2.16 The Transport and Traffic Management Office was established in Davao City to mitigate traffic congestion. This office manages the traffic signals and CCTV, enforces the truck ban, introduces one-way schemes, and manages the on-road parking. However, there is no traffic control center to centralize all traffic management efforts.

2.17 Davao City also functions as an international gateway of the Mindanao Region with its international ports and airport. There are two ports, namely Sasa Port and Santa Ana Warf. Recently, port performance has shown a dramatic decrease in volumes handled (i.e., 500,288 TEU/year in 2012 to 304,795 TEU/year in 2016) after opening of the private container ports (DICT: Davao International Container Terminal) in Panabo City. Also, Sasa Port has main problems such as shallow water depth, limited berthing space, and congested port access roads. It is most probable, therefore, that DICT and another upcoming deep water port in Tagum City will take the lead in the port system of the Davao Region in future.

2.18 For the airport, Francisco Bangoy International Airport has one runway with a length of 3,000m. The runway capacity is around 200,000 in terms of the number of aircraft movements while traffic was still 23,512 in 2014. The current runway capacity is sufficient until 2040 but the number of passengers already exceed the capacity of the passenger terminal. It is required that the taxiway be extended and terminal facilities be expanded to maximize the runway capacity.

## 2.5 Other Urban Infrastructure and Services

2.19 The service coverage of water supply, sewerage and solid waste collection is shown in Table 2.5. Water supply and solid waste collection covers most of the urban areas but there is no sewerage system in the city. The issues of each urban infrastructure and service are as follows;

- (i) Water supply: The current service is only from deep wells, and some wells do not comply to the environmental standard of water quality. Considering the future population, there will be a shortage of water resources unless the surface water source will be developed. The non-revenue water (NRW) is very high with more than 30%.
- (ii) Sewerage: Development of the wastewater treatment system in the urban areas is an urgent issue. It is essential to provide the city with a septage service in the short-term, a combined sewer-cum-rain water drainage system and wastewater treatment plants in mid- and long-term.
- (iii) Solid waste management: For the short-term, a new final disposal site needs to be developed. In order to improve the urban environment by reducing the amount of solid wastes, other actions also need to be considered, including waste to energy (WtE),

material recovery facility (MRF) and 3R activities (reduce, reuse and recycle).

**Table 2.5 Coverage of Current Urban Services**

	<b>Water Supply</b>	<b>Sewerage</b>	<b>Solid Waste Collection</b>
Coverage (No. of Barangay)	114 out of 182	none	112 out of 182

Source: Davao City

### 3 DEVELOPMENT FRAMEWORK

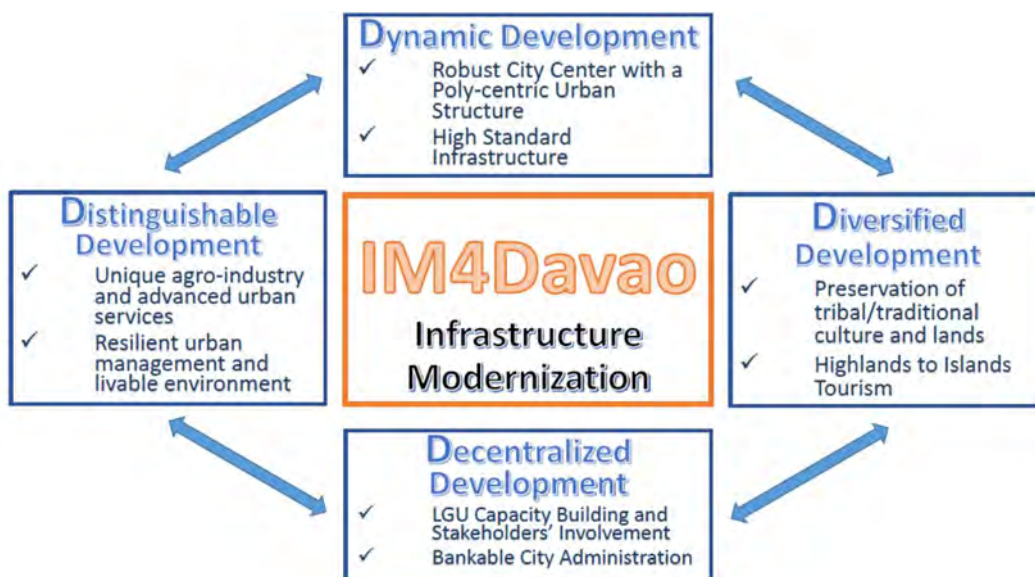
#### 3.1 Development Visions and Strategies

3.1 There are several high-level development planning documents which guide the urban development of Davao City in a hierarchical manner, including the National Physical Framework Plan 2016-2045 and the National Spatial Strategy, the Mindanao Spatial Strategy/Framework Plan 2015-2045, and the Davao Region Spatial Framework 2015-2045. All the documents designate Davao City as a strategically important city to perform the following roles:

- International role: a major international gateway and an economic center of the East ASEAN Growth Area (EAGA) for manufacturing and service industries;
- National role: Mindanao's premier commercial hub and center for education and health service as well as manufacturing and service investment destination and tourism destination; and
- Regional role: the regional center of Region XI for regional government administration, education, commercial, trading and services, recreation and industry. Transport and communication infrastructure from the city connects throughout the region.

3.2 Davao City, as the largest city in Mindanao Island, has a crucial role in the "Build-Build-Build Program" of the present Administration. Also, with President Duterte as a strong advocate of a federalism type of government, there is a possibility for a regional self-rule. This is in keeping to the President's promise that regions outside Metro Manila will receive a fair share of budgets from the national government. Davao City's role will be enhanced in many aspects particularly in its political and financial status in the region and Mindanao as a whole, when federalism becomes a reality.

3.3 In order to satisfy the above-mentioned roles of the city, it is absolutely imperative that infrastructure development is done one step ahead of urban development to guide investments in housing, commercial, business, manufacturing and tourism. The IM4Davao project proposes four strategies towards its ultimate goal of infrastructure modernization to amplify the selected nickname as illustrated in Figure 3.1.



Source: IM4Davao Team

**Figure 3.1 4 Development Strategies**

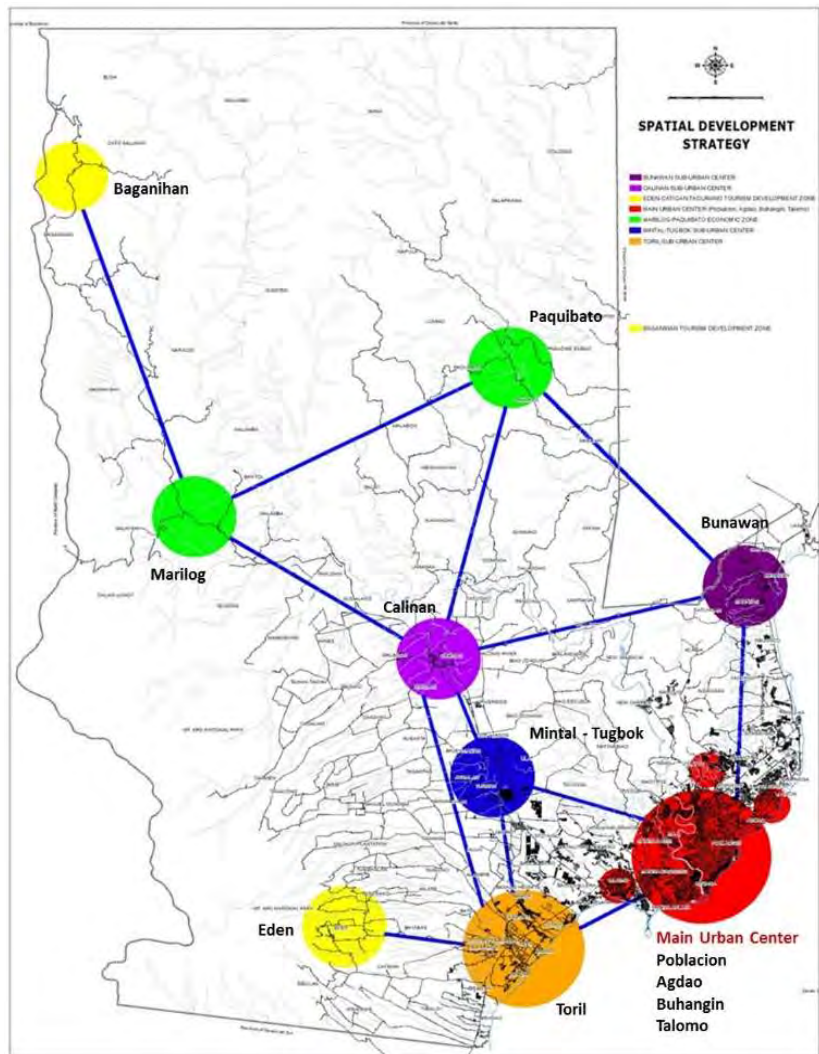
### 3.2 Davao City Urban Structure

3.4 Within its huge territory, Davao City has historically formed a single urban center; the Poblacion District. The city center functions have further accumulated in the Poblacion through the years and gradually spilt over to the adjacent districts of Agdao and Talomo for the large-scale commercial investments and to Buhangin for the seaport and airport related investments. However, the districts of Toril, Mintal and Calinan, all of which are designated as the second city centers, have lagged behind in light of the recent urban development momentum except for housing investment.

3.5 The spatial development strategy of Davao City clearly directs to a poly-centric urban structure (Figure 3.2).

The shift from a mono-centric structure to a poly-centric one will greatly benefit the citizens and their communities since they will have their own centers with unique features and traffic congestion will be mitigated. The city’s spatial development strategy still reflects Toril as the second city center. Bunawan, Mintal-Tugbok and Calinan will become urban centers with unique localities. In the rural and mountainous areas, the centers for agriculture and tourism are planned.

3.6 To pave the way for realizing such a poly-centric urban structure, IM4Davao Project has produced an integrated land use and infrastructure development plan where 8 urban districts have their own centers well connected to the rest of the city with prime transport infrastructure.



Source: Davao City

**Figure 3.2 Davao City Spatial Development Strategy**

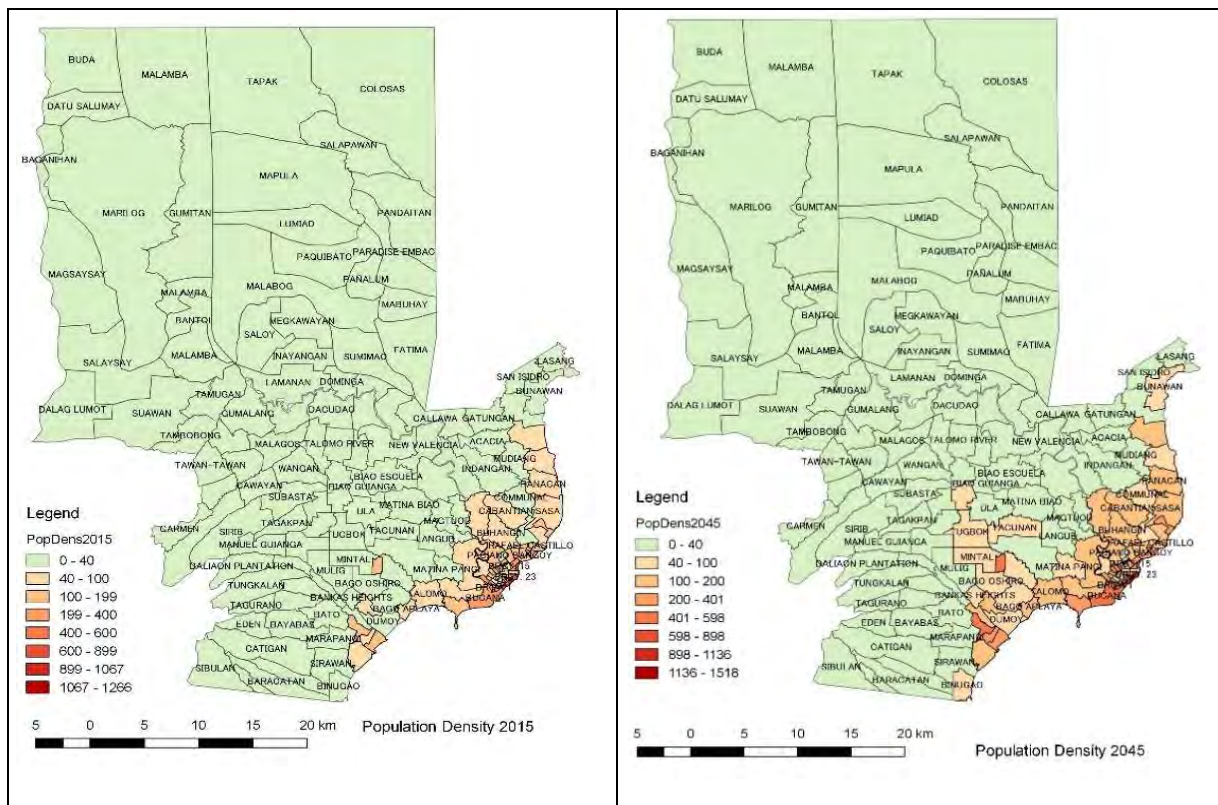
### 3.3 Demographic Framework

3.7 The Regional Physical Framework Plan 2015–2045 envisages that Davao City will continue to drive regional development and reach a population of over 3 million in 2045 (Table 3.1). The project has estimated a barangay-level population in line with land use planning where transport infrastructure led urban development is embodied in the plan in addition to the existing urban areas (Figure 3.3).

**Table 3.1 Population Forecast in Davao Region (2015–204)**

Province/City	2015	2025	2035	2045
1 Compostela Valley	745,855	885,712	1,048,977	1,242,336
2 Davao del Norte	1,066,461	1,356,028	1,724,214	2,192,372
3 Davao del Sur	929,471	1,064,087	1,218,197	1,394,627
4 Davao Oriental	557,516	646,775	750,323	870,446
5 Davao City	1,629,045	2,058,190	2,600,382	3,285,400
Davao Region	4,926,686	5,988,649	7,279,518	8,848,635

Source : Regional Physical Framework Plan 2015–2045, the NEDA XI



Source: IM4Davao Team

**Figure 3.3 Comparison of Population Density by Barangay (left: Year 2015, right: Year 2045)**

### 3.4 Future Land Use Plan

3.8 In order to prepare the future land use plan, the demand for additional urban lands was first estimated based on the projected future population for target year 2045. As a result, an additional urban lands of 14 thousand hectares was determined to be necessary to realize the proposed spatial structure and accommodate the projected future population (Table 3.2). This means that the magnitude of future urbanization until 2045 is at about the same scale as the existing urban lands.



**Table 3.2 Demand of Urban Lands by District (Year 2045: ha)**

District	Urban Lands in 2015 (A)	Demand of Additional Urban Lands in 2045				Comparison		District Area (C)
		Residential	Infrastructure	Working Places, Public Facilities, Educational Facilities	Total (B)	(B)/(A)	(B)/(C)	
Bunawan	1,772	1,016	300	127	1,443	0.81	0.22	6,694
Buhangin	3,601	1,249	449	776	2,473	0.69	0.26	9,669
Agdao	526	27	35	0	62	0.12	0.10	593
Poblacion	1,082	-60	103	0	43	0.04	0.04	1,138
Talomo	4,160	2,202	774	868	3,845	0.92	0.43	8,970
Toril	1,524	1,956	568	525	3,048	2.00	0.16	18,963
Tugbok	1,119	1,617	411	471	2,499	2.23	0.16	15,230
Calinan	273	480	45	196	721	2.64	0.03	25,916
Davao City	14,057	8,487	2,685	2,962	14,133	1.01	0.06	244,000

Source: IM4Davao Team

3.9 The following data were used as the building blocks for the land use map:

- Land Use Suitability tables formulated by the IM4Davao Team
- Future road and rail transport projects collected from various agencies
- Hazard Data collected from various sources:
  - Landslide (MGB)
  - Storm surge (DREAM)
  - Earthquake (PHIVOLCS)
  - Flood (DREAM/MGB)
- Topographic Data from NAMRIA
- Road Data from DPWH, Davao CPDO, OSM
- Land use map of 2017 developed by IM4Davao Team (Figure 3.4)

3.10 For the preparation of the land use planning work, the IM4Davao Team have analyzed and evaluated all the lands within the city utilizing the GIS. It concluded that the lands, which are suitable for urban development including the existing urban areas, amounts to 56 thousand hectares or 23% of the total area. This estimation excludes steep lands, low and wetlands, inland water bodies, the lands on fault lines, watersheds, forest and the Ancestral Domains. Judging from the remaining suitable lands for urbanization, Davao City will still own a large space for further urbanization after 2045, which is quite a different situation than the restricted land availabilities of Metro Manila and Metro Cebu.

3.11 Within the suitable lands for urban development, distribution of future industrial, commercial and residential areas were further determined using GIS operation and analysis. Land suitability analysis basically consists of the following steps:

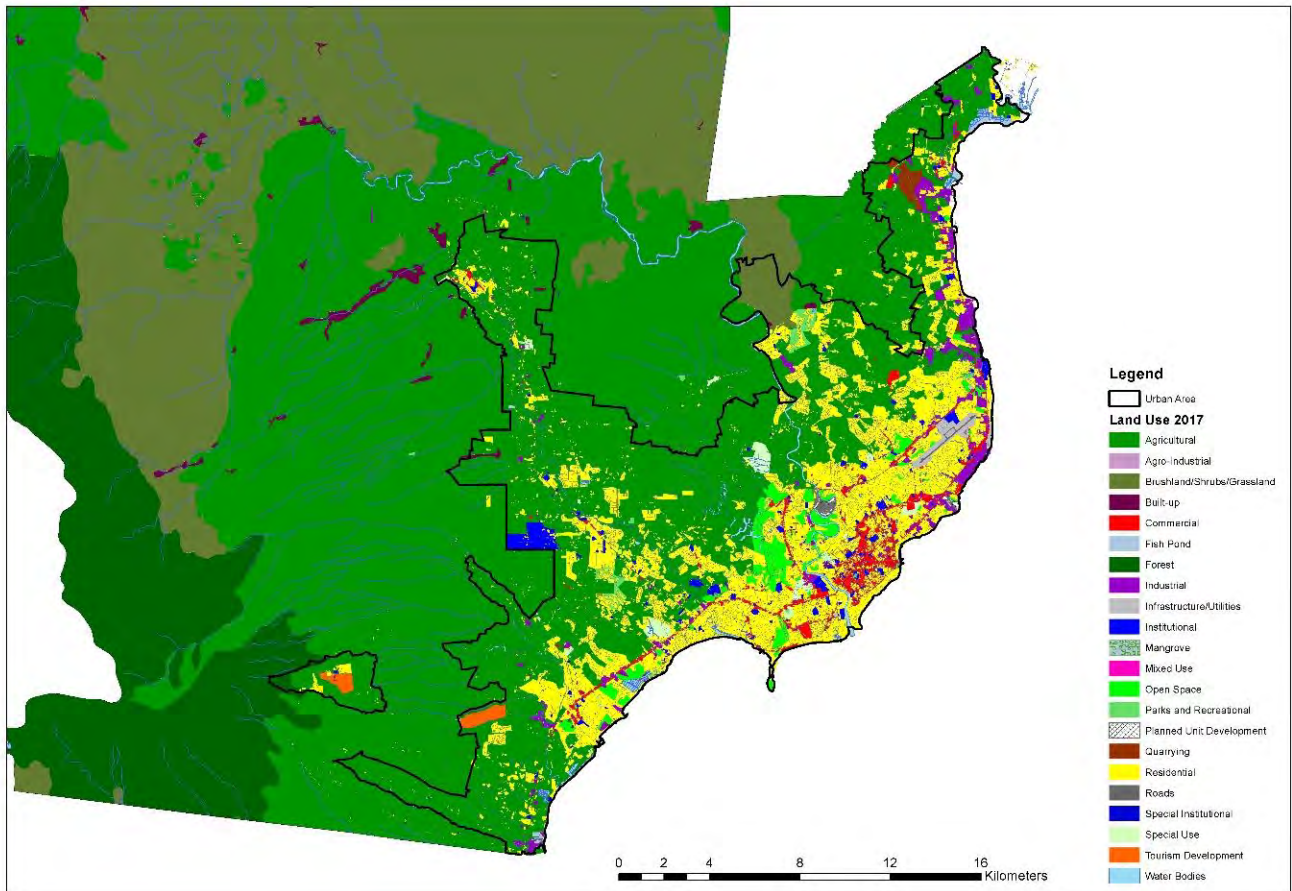
Step 1. Identifying categories and factors used for the suitability analyses

Step 2. Applying weights to each category and grades to each factor to be used in the analysis

Step 3. Preparation of GIS layers for each factor

Step 4. Overlay analyses using GIS to come up with suitability ratings

Step 5. Interpreting results of the suitability ratings, if the results do not satisfy the objectives of the analysis, the process is repeated from step 2



Source: IM4Davao Team

**Figure 3.4 Land Use Map of 2017**

3.12 The categories and factors used for the suitability analyses include existing land use type, land use type of surrounded areas, proximity to transport network and gateway, proximity to protection area, slope level and hazard level of natural disasters.

3.13 The results of the analyses for each land use in 2045 were then overlaid to come up with the draft land use plan of 2045. Further, these results underwent several iterations by the IM4Davao Team before finalizing the plan considering comments coming from the different experts of the IM4Davao Team. In the iteration process, parks/recreational and institutional lands were further considered based on the distribution of residential areas. The map showing the projected land uses in 2045 is given in Figure 3.5.





## 4 DEVELOPMENT PLAN FOR ECONOMY, INDUSTRY AND INVESTMENT

### 4.1 Priority Industry Sectors

4.1 In this Chapter, the directions of development of priority industrial sectors, which are the economic mainstays of Davao City, are discussed and projects are proposed by administrative district in view of the land use plan. The priority industrial sectors are (1) agriculture and agro-industry, (2) information and communication technology (ICT), (3) tourism, (4) industries to promote a low carbon society, and (5) industries to facilitate transport mobility and logistics.

#### 1) Agriculture and Agro-industry

4.2 Davao City should continue capitalizing on its strength and competitive advantage of having huge tracts of fertile land and the right climate suitable for agriculture. Some 67,000 ha of its land are devoted to agriculture and further expansion of production areas can be made using its 110,000 ha of grassland and pasture areas. It can produce a wide variety of agricultural commodities in areas suitable for tropical and semi-temperate to temperate crops because of the availability of high elevation, low temperature, and low and high temperature agricultural sites. Aside from maintaining its traditional agricultural sectors, such as banana, coconut, major fruits (e.g., mango, durian, pineapple, and pomelo), livestock, fish and seafoods, the city should also focus on further developing these agricultural products beyond their traditional fresh markets. This means adding value to these commodities through processing for both the domestic and export markets. The city also has promising prospects to continue developing its industries for initially the following agribusiness subsectors identified in the Davao City Commodity Investment Plan (CCIP) 2015-2018: (i) cacao, (ii) Cardava banana, (iii) cassava, (iv) abaca, and (v) rubber. This requires addressing technical, financial and institutional constraints confronting these sectors across their respective value chains (VCs).

4.3 **Cacao.** Cacao production in Davao City continues to surge in recent years (from 1,386 tons in 2010 to 2,781 tons in 2014). Most of the smallholder cacao farms are located in the Calinan, Baguio, Marilog, Tugbok and Paquibato areas, with Calinan serving as the main trading center. The City Agriculturist's Office (CAO) estimates that annual production volume can be maximized up to approximately 12,000 tons by utilizing the appropriate lands of current plain and forests for cacao production. Thus, cacao will continue to be a major agribusiness industry in the city in the medium to long term, especially in light of the huge production shortfall of cacao beans worldwide. All of the cacao VC players and enablers are present in the city, including key institutional users/ buyers for international brands such as Mars Chocolate and popular Belgian brands. To realize the city's vision of becoming the "chocolate capital of the Philippines," industry stakeholders should continue focusing their efforts on boosting production volume, improving quality, expanding domestic and export marketing of cacao beans and cacao-based products, and attracting investments in cacao-based manufacturing facilities (e.g., chocolate factories) and promoting cacao industry-themed tourism (e.g., chocolate park or museum).

4.4 **Cardava Banana.** In Davao City, while the majority of banana farmers and companies have grown the Cavendish variety, which are normally exported without processing, the production volume of Cardava bananas has also increased from 18,019

tons in 2010 to 25,717 tons in 2014. The Cardava variety, which is suitable for processing into a variety of products (e.g., chips, fiber, powder, flour, and syrup), is grown by mostly small farmers in Tugbok, Toril, Calinan, and Bunawan areas, in contrast to the Cavendish variety which is grown by multinational companies and big investors. The city is home to most of the banana chip producers/ processors who market their products for both domestic and export markets. The development directions for the industry are to further increase production volume, increase farm gate prices and export prices, improve quality, address the banana plant disease problem through R&D and better farm management practices, and develop higher value-added processed products for domestic and export consumption. To achieve the twin objectives of improving farmers' incomes and adding value to their products, the establishment of Cardava banana processing factories (e.g., banana flour, chips, etc.) should be encouraged in areas near the farm lands.

**4.5 Other High Value Crops.** While Davao City is still a relatively minor producer of other crops like cassava, abaca and rubber, the huge domestic and export markets for agro-industrial processed products from these crops, as well as the vast potential agricultural lands suitable for them (especially in the Marilog, Paquibato, Toril, Baguio, and Calinan areas), present bright investment opportunities for developing these industries. Thus, production of these crops should be encouraged to support the requirements of processing plants that can be established near the production areas. Growers should also be supported with the necessary production and post-harvest technology and processing equipment, financial and marketing assistance, and agricultural support infrastructure (e.g., irrigation and farm-to-market roads).

**4.6 Agricultural Marketing and Processing Estates.** With its strong agri-based economy, it is only logical for Davao City to develop facilities that will support agricultural production, processing and marketing. Two of such facilities are the Davao Agricultural Trading Center (DATC, 5 ha) and the Davao Food Complex (DFC, 20 ha) located in Daliao, Toril District. The DATC, which will start operations in June 2018, is expected to improve farmers' incomes through a more organized and cost-effective wholesale marketing system. The DFC, which is targeted for completion in 2020, will probably be the city's first agri-based food manufacturing estate and also one of its agro-tourism destinations. The establishment of facilities for testing and analysis of such products should be included to satisfy product safety requirements and others. While these facilities are expected to contribute to its goal of establishing a stronger value-added agro-processing industry, there is still a need for Davao City to identify and develop more manufacturing estates and ecozones for the growing number of agro-industrial locators in the city.

## 2) ICT

**4.7** Davao City was ranked the 66<sup>th</sup> top business process outsourcing destinations worldwide in 2016. Although the city is far behind Metro Manila (ranked 2<sup>nd</sup>) and Cebu City (ranked 7<sup>th</sup>), it is already home to 17 IT parks/ IT centers (8 of which are still under development) registered with the Philippine Economic Zone Authority (PEZA). The ICT sector is expected to continue growing in the coming years, although some argue that traditional and labor-intensive call centers may become obsolete and, instead, the Knowledge Process Outsourcing (KPO), which fully utilizes robots and artificial intelligence (AI), would be dominant by the mid-2020s.

**4.8** While still retaining its dominant role in the voice BPO sector, Davao City should strengthen its position in the non-voice and KPO sector especially considering the future

trends in AI, etc. Thus, it is advisable for the ICT industry to nurture specialists (especially younger ones) in AI and other high technology fields through collaboration with local universities and research institutes. Meanwhile, IT parks/ centers should be further developed in the urbanized and fast urbanizing centers and sub-centers of the city (e.g., Poblacion, Talomo, Buhangin, Toril).

### **3) Tourism**

4.9 The number of tourist arrivals in the city has increased remarkably from 740,000 in 2011 to a record-breaking 2.0 million in 2017. Of this, however, only 10% is comprised of foreign tourists. The low share of foreigners is attributable partly to their anxiety about the safety of Mindanao and partly to the limited number of world-class hotels and MICE (meetings, incentives, conventions and exhibitions) facilities, international direct flights, and tourism programs peculiar to Mindanao.

4.10 In the short to medium term, Davao City should strengthen its “Islands to Highlands” tourism program experience by further developing a variety of destinations that highlight its land and marine natural resource endowments, agri-based industries, rich history and ethnic cultures, and historical and cultural ties with neighboring countries (e.g., Japan, Indonesia, Malaysia, China). It should continue efforts to attract investments in world-class accommodation and convention facilities, parks, museums, cultural village, retirement facilities, health and wellness facilities, education and sports, etc. as well as tourism infrastructure such as transport terminals, signages, Madayaw Travelers' Facility, etc. To create a synergy between the city's agricultural and tourism sectors, an agro-tourism circuit that will bring visitors around farms/ plantations, the DATC and DFC, chocolate museum, and indigenous peoples' (IP) communities should also be considered.

### **4) Industries to Promote a Low Carbon Society**

4.11 Although its citizens have been participating, albeit invariably and in limited scale, in its cleanliness and beautification, waste disposal and recycling, renewable energy (RE) use, and climate change mitigation campaigns, the city envisions to sustain its development by striving to become a low-carbon society in the near future by attracting environmental industries that utilize state-of-the-art technologies.

4.12 Davao City has made efforts to introduce RE sources (i.e., hydro and solar power projects) in recent years, although these projects are small-scale. In particular, solar power has great potential for future utilization. If solar-powered battery charging stations could be developed across the city, electric vehicles (EVs) could become more popular. Meanwhile, the city has embarked, on an experimental basis, the use of used cooking oil for biofuel diesel for government vehicles. If proven successful, this initiative should be expanded to large-scale utilization. The city is also pursuing a WTE project that would hopefully be sustained and further expanded in the near future.

4.13 When it comes to solid waste management, Davao City may become the country's most advanced and well-known LGU for 3R (Reduce, Reuse, and Recycle) program if a potential recycling industrial park is developed in the Tugbok District and a range of recycling businesses can be attracted to the park (e.g., automobile wrecking/scraping, recycling of construction waste, medical waste, used paper, aluminum and steel, etc.).

## 5) Industries to Facilitate Transport Mobility and Logistics

4.14 The transport and logistics sectors play a major role in Davao City's economy and environment and generate a great number of employment. However, since outmoded technologies and poor management have imposed a large load on the environment, it is proposed that new modes of sustainable and environment-friendly transport mobility and logistics services should be introduced in the city. For instance, jeepneys still play a major role in the city's public road transportation, with more than 7,000 jeepneys currently operational. However, if they were replaced by modern buses that are more efficient in using road space and more environment-friendly, thousands of jobs would be lost. In this case, retraining programs for employment should be provided such as training displaced jeepney drivers how to drive special vehicles used in the port-related facilities, warehouses, construction sites, etc.

4.15 If investments in the city's airport and ports continue to increase, it is expected that the focus of cargo transport may shift from the bulk transport of agricultural commodities to the high value-added and small-volume products that are used in the urban economy. To keep up with these logistics needs and to facilitate related investments, it is proposed that logistics parks and estates, including the "Distri-park" in which small-volume cargoes are managed by computerized systems, should be established in areas proximate to the airport and ports such as in Buhangin and Bunawan.

### 4.2 Potential Investment Projects by District

4.16 When it comes to the industry investment plans for the city's districts, the differences of the areas should be considered in terms of demography, economic features and their respective roles and contributions to the city's current and future economy. Table 4.1 presents a summary of the investment plans by district.

4.17 Being the highly urbanized and densely populated areas, Poblacion, Talomo and Agdao should focus on strengthening their roles as the commercial, business, financial and urban tourism hubs of the city. The realization of a low-carbon society in these highly urbanized areas is an important goal.

4.18 The Districts of Buhangin and Bunawan still have large underdeveloped lands. They have an advantage of proximity to regional gateway ports and the Davao International Airport. It is also proposed that, in addition to IT parks/ centers, industrial and logistics estates should be suitably located in these areas.

4.19 The other districts are characterized by the dominance of agriculture, including Paquibato, Baguio, Calinan, Marilog, Toril and Tugbok. These are the production areas for the city's important agricultural crops, with large potential for further expansion of farms and plantations. They also have a rich pre-war history and legacy and are homes to various farms and nature resorts. Toril and Marilog also have large IP communities. These areas should continue to be developed for agri-based industries as well as agro-tourism.

**Table 4.1 Potential Investment Projects by District**

District	Potential Investment Projects
Poblacion	IT Park/ Center, ICT/AI Education Facility, Urban Hotels, Tourism (MICE and Chinatown), Low-Carbon City Development, Transport Modernization
Talomo	IT Park/ Center, ICT/AI Education Facility, Technical Skills Training Center
Agdao	Transport Modernization, Agricultural Equipment Fabrication
Buhangin	IT Park/ Center, Industrial Estate, Logistics Estate

District	Potential Investment Projects
Bunawan	Agro-Processing/ Manufacturing Estate, Light to Medium Industrial Estate, Industrial Estate, Logistics Estate, Integrated Transport Terminal, Processing of Cardava Banana
Paquibato	Farm Mobile Cable System, Cacao Nursery, Cardava Banana Collection Center, Cassava Processing Center, Abaca Processing Center
Baguio	Improvement of FMRs, Cacao Nursery, Agro-Tourism Circuit
Calinan	Cacao/Chocolate Processing Zone, Chocolate Museum, Cacao Nursery, Processing of Cardava Banana, Rubber Tree Nursery, Agro-Tourism Circuit, Davao Pioneer Museum
Marilog	Farm Mobile Cable System, Cacao Nursery, Rubber Tree Nursery, Satellite Consolidation Centers for Fruits and Vegetables, Cassava Processing Center, Abaca Processing Center, Agro-Tourism Circuit
Toril	Agro-industry Hub (DATC/DFC in Daliiao), Processing of Cardava Banana, IT Park/ Center, Kadayawan Cultural Village (Eden), Agro-Tourism Circuit
Tugbok	Cardava Banana Nursery, Cacao Nursery, Processing of Cardava Banana, R & D Park, Madayaw Travelers' Facility (Los Amigos), Little Tokyo (Mintal), Agro-Tourism Circuit, Recycling Industrial Estate

Source: IM4Davao Team

### 4.3 Tourism Development Corridor Project Featuring Davao’s History and Agriculture

4.20 Davao City has given priority to tourism development and made efforts to develop a tourism program unique to the city. The IM4Davao Project proposes developing a tourism corridor on Davao’s history and agriculture. As shown in Figure 4.1, the core of the corridor is Toril District. The route diverges from the Toril District and extends to Calinan District and to the foot of Mt. Apo. The following five major facilities are proposed along the corridor.

**(a) Farm/ Agro-Tourism Circuit (Toril District)** – The total area of the DATC and the DFC is 25 ha, and they are expected to become the center of the circuit. Observation tours, exhibitions and agriculture-related events will be held in these facilities. The circuit will also include other farm and agri-based sites.

**(b) Little Tokyo** – Mintal was a major agricultural and residential area of Japanese immigrants in the pre-war period. Some Japanese-built facilities still remain as reminders of those days. TIEZA has commissioned the preparation of Tourism Master Plan of Barangay Mintal to develop the area as the “Little Tokyo of Pre-War Philippines.” The project will develop facilities in a 20.2 ha land owned by the LGU including signages, a Visitor Information Center and Museum, parking lots, paved roads, transportation facilities, toilets, etc.



Source: IM4Davao Team

**Figure 4.1 Location Map of Tourism Development Corridor Projects**



(c) **Davao Pioneer Museum** – The Philippine-Japan Historical Museum in Calinan was established by Japanese volunteers in 1994 and is being managed by the Philippine Nikkei-Jin Kai, Inc. In the museum, old relics, Japanese World War II vintage books, pamphlets, and other materials are displayed for public viewing. However, since the building of the museum is too small and has deteriorated, it is proposed to construct a new building and related facilities (to be renamed Davao Pioneer Museum).



Source: IM4Davao Team

**Figure 4.2** Perspective of Madayaw Travelers' Facility

(d) **Madayaw Travelers' Facility** – As part of the farm/ agro-tourism circuit, Madayaw Travelers' Facility (Figure 4.2) is proposed to be developed in Los Amigos. Located along the Davao-Bukidnon road, it will offer tourists a nice view of Mt. Apo. The facility will have parking lot, comfort rooms, tourist information center, souvenir shop, restaurant, etc. Drivers/ customers can stop by the Madayaw Travelers' Facility not only

to take a rest but also to enjoy shopping and eating local agricultural and marine products.

(e) **Kadayawan Cultural Village** – Currently, the various ways of living and culture of Davao City's 11 ethnic tribes are showcased in the Cultural Village in Magsaysay Park in downtown area. While it has become a popular visitor destination, the village is constrained by the lack of space and resources to further develop it. It is proposed to develop the Kadayawan Cultural Village on the City Government's 10.2-ha land in Eden, Toril District. The proposed village will include a multi-purpose amphitheater, a cultural village showcasing the houses and living traditions of the 11 tribes, prayer areas, restaurants, souvenir shop, parking spaces, comfort rooms, etc. (Figure 4.3).



Source: IM4Davao Team in collaboration with Davao CTOO.

**Figure 4.3** Layout Plan of Kadayawan Cultural Village

4.21 **Implementation Plan.** The relevant agencies, project costs, area of development of five facilities pertaining to tourism development are summarized in Table 4.2.

**Table 4.2 Implementation Plan of the Five Tourism Core Facilities**

Name	Relevant Agencies and Stakeholders	Project Costs (PHP mil.)	Area of Development
Farm/ Agro-Tourism Circuit	Davao City Government (DCG), DOT, DA, DTI, NDC, JV partner and land owners	10	About 10 destinations to initially participate in the circuit.
Little Tokyo	DCG, Barangay Mintal, DOT, TIEZA	687	20.2 ha
Davao Pioneer Museum	DCG, DOT, Philippine Nikkei-Jin Kai, Inc. (Japanese Society)	17	The area on which the current museum is located is 1,405 m <sup>2</sup>
Madayaw Travelers' Facility	DCG, DPWH, DOT, DA, DTI	17	6,410 m <sup>2</sup>
Kadayawan Cultural Village	DCG, DOT and National Commission on Indigenous People (NCIP)	367	10.2 ha

Source: IM4Davao Team

4.22 **Social Considerations.** All the 5 tourism core facilities are designed to benefit local communities and industries. The balance between commercialization and local culture particularly among IPs should be carefully considered. The proposed project must conform with relevant laws such as Cultural Heritage Law, Indigenous People's Rights Act, National Integrated Protected Areas System Act, among others. The core facilities may induce related private investments. Clear strategies or action plans to address illegal tourism practices/facilities in protected areas designated under the NIPAS should be prepared in advance.

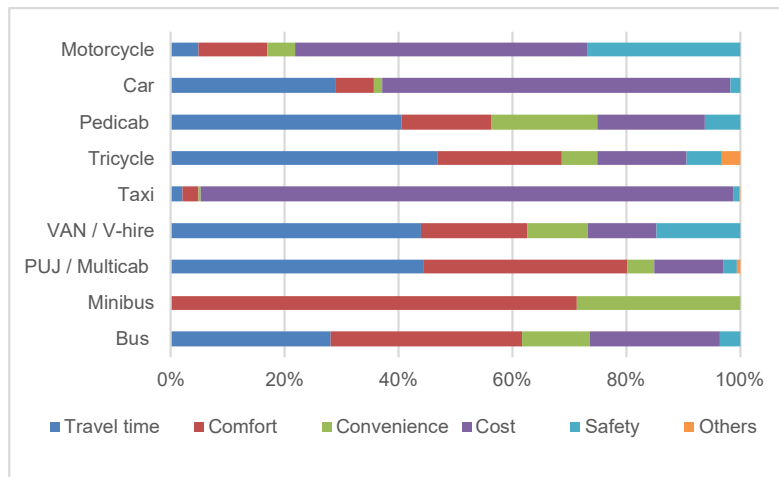
4.23 For tourism development, tourism facilities and transport infrastructure should be developed in a harmonized manner. In the IM4Davao Project, Toril is designated as the second city center and thus new infrastructure will be planned such as the Davao City Diversion Road Extension Project and the Davao City Mass Transit Line Project to strengthen the connection with the Poblacion in addition to improving existing infrastructure. Furthermore, two new highways are planned along the proposed two tourism corridors of Toril-Mintal/Calinan and Toril-Eden, which are the Talomo-Calinan Bypass Road Project and the Marapangi-Sirawan-Tibuloy Bypass Road Project, respectively.

## 5 DEVELOPMENT PLAN FOR TRANSPORT

### 5.1 Traffic Database Development and Analysis

5.1 Several traffic surveys were conducted to understand the latest traffic conditions of Davao City and develop a traffic database for the project, including cordon line survey, screen line survey, traffic count survey at major intersections, and passenger interview survey at public transport terminals. The following were the major findings:

- The largest border traffic volume of the city is on the border with Panabo City, i.e. 37,000 passenger car units (PCU) or 167,000 persons. The border point with Sta. Cruz recorded 74,000 persons while 3,000 persons were counted at the Bukidnon border. The interisland ferry services, on the other hand, transported 16,000 passengers to/from the city and the islands of Samal and Talikud.
- The screen line survey counted passengers and vehicles on all river crossing points across Davao River, including five bridges and one ferry service. The results showed 174,000 PCU or 560,000 persons moving across the river daily.
- Within the city center, the largest numbers of passenger cars and PUVs (jeepneys and multicabs) were counted along JP Laurel Street. In the case of taxis, the largest number was counted at the entrance of Davao International Airport.
- The passenger interview survey at public transport terminals covered 1,137 samples. Passengers' preferences for possible alternative modes of transport were analyzed. It is noteworthy that many respondents negatively rated the bus and minibus services because of lack of comfort (Figure 5.1). Since the current services are provided by old fleets, it is expected that people's impressions will change when new fleets with air-conditioning are introduced.



Source: IM4Davao Team based on the Terminal Interview Survey 2017

**Figure 5.1 Major Reasons Not to Use Potential Alternative Modes**

5.2 The Cities Development Initiative for Asia (CDIA) project developed a traffic database for Davao City using results of its traffic surveys and person OD data from the home interview survey conducted in 2015. The person trip data of CDIA, however, included a limited number of trips using passenger cars. As such, to adjust the passenger car traffic along the screen line (Davao River), the number must be expanded by 8.3 times. But then the adjusted OD matrix could not replicate the overall passenger car traffic flows



within the city. To solve this issue, an additional home interview survey was conducted by the IM4Davao Project among only passenger car owning households in January 2018. The revised OD matrix enables the replication of all kinds of traffic flows within the city. Figure 5.2 shows the present personal trip patterns by using public transport or private vehicles separately. It indicates that person trips by public transport are more concentrated with the city center while private vehicle flows are more diversified.

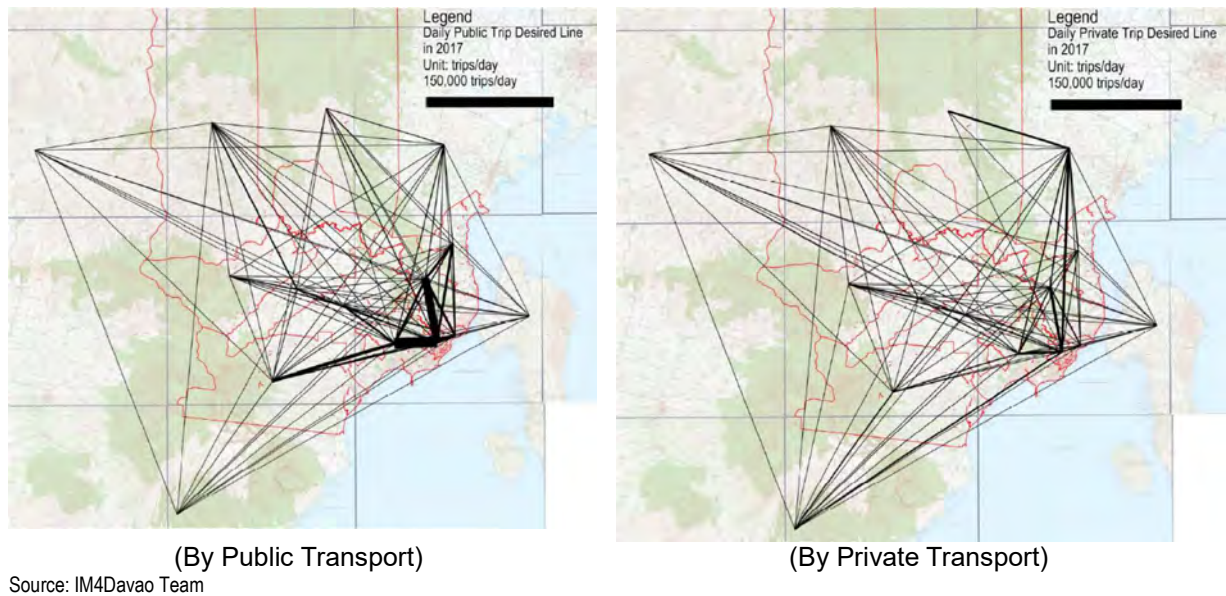


Figure 5.2 Person Trip Patterns, 2017

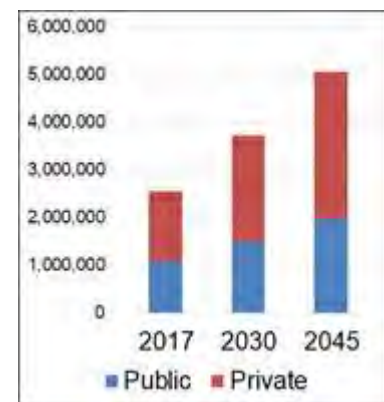
## 5.2 Traffic Demand Forecast

### 1) Preparation of Future OD Matrices

5.3 The OD matrices for 2017, 2030, and 2045 contain motorized trips totaling 2.6 million, 3.7 million, and 5.1 million, respectively. In the forecast, the shares of the private vehicles will increase from 57% in 2017 to 61% in 2045, due to population growth in the suburbs (Figure 5.3).

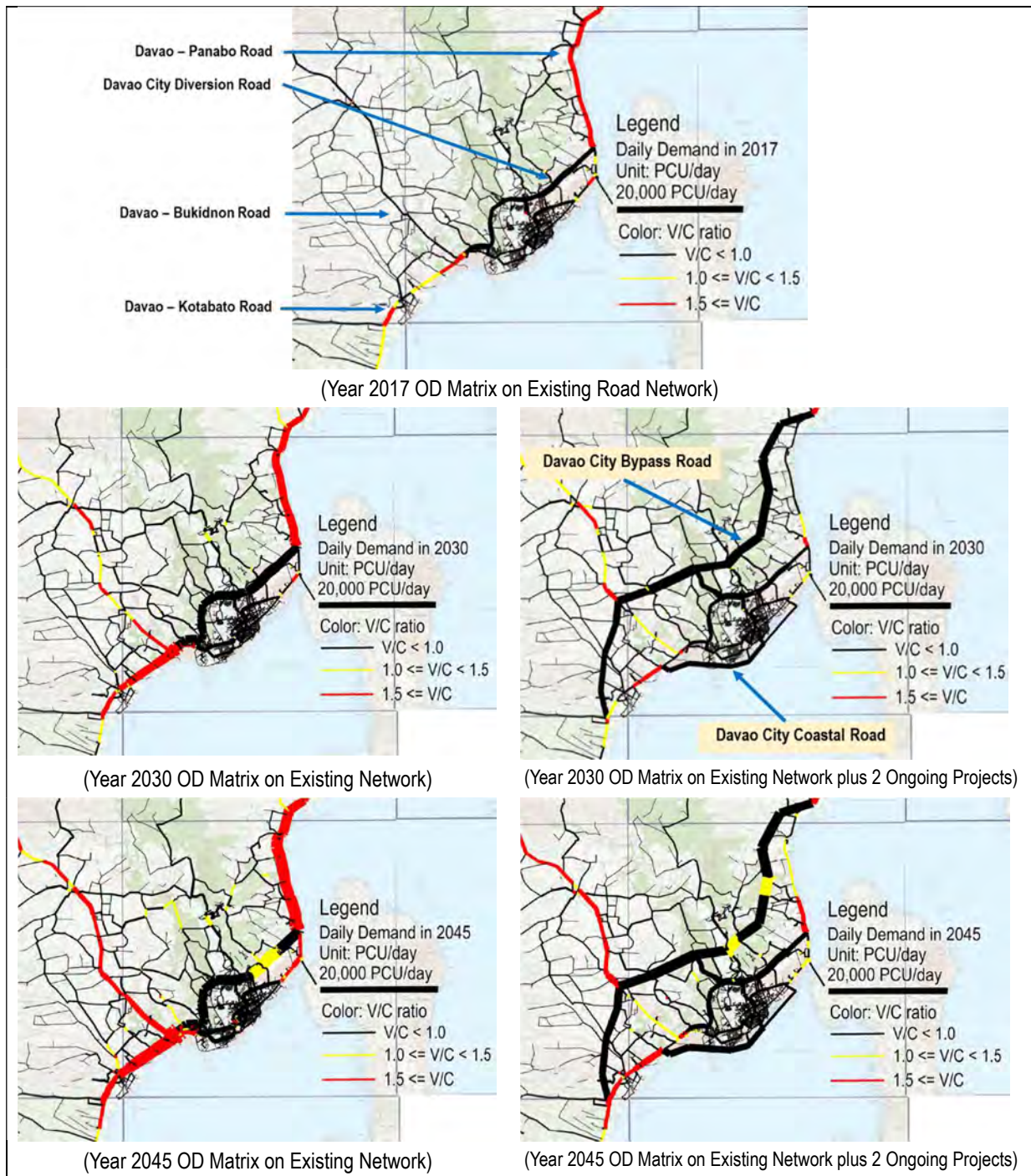
### 2) Demand Forecast of Road Network

5.4 **Existing road network.** For analyzing the capacity of the existing road network, traffic assignment exercises were undertaken using three OD matrices (i.e., 2017, 2030, and 2045). Under the 2017 OD matrix, traffic exceeds the current capacity on two coastal trunk roads (i.e., Davao – Cotabato Road and Davao – Panabo Road). When the 2030 OD matrix is assigned to the existing road network, current road congestion would become severe. Moreover, Davao-Bukidnon Road would suffer from daily congestion. Therefore, intercity traffic movement could not be maintained. Finally, assigning the 2045 OD matrix on the existing road network revealed that even the diversion road would become congested at a long section and minor inland roads would become bottlenecks (Figure 5.4).



Source: IM4Davao Team

Figure 5.3 Daily Motorized Trips



Source: IM4Davao Team

**Figure 5.4 Traffic Assignment Results on Existing Network and Existing Network Plus 2 Ongoing Road Projects**

5.5 **Ongoing road projects.** Davao City has two ongoing trunk road projects. These are the Davao City Coastal Road Project and the Davao City Bypass Road Project. In the road network subject to traffic assignment, short access roads (tertiary road level) are planned to connect with the proposed bypass road to improve road scarcity in the affected barangays. Assignment results using the 2030 OD matrix shows that the two projects would greatly alleviate traffic congestion in the city but they will not provide additional road capacity between the coastal and the inland areas. Therefore, Davao-Bukidnon Road would be seriously congested. Assignment results using the 2045 OD matrix indicate that

the congested sections in 2030 would be exaggerated and some sections on the Davao City Bypass Road would be congested (Figure 5.4).

**5.6 New road projects.** The traffic assignment results revealed that there would be four bottleneck corridors/zones after the completion of the two ongoing trunk road projects. With road capacity analysis, the bottlenecks are categorized into (i) lack of 'coast to coast' capacity, and (ii) lack of 'coast to inland' capacity. The countermeasures against these likely bottlenecks in the future are as follows (Figure 5.5):

- The countermeasure for the lack of 'coast to coast' road capacity at the Buhangin – Bunawan Corridor is the Buhangin – Bunawan Bypass project (15 km);
- The countermeasure for the lack of 'coast to inland' capacity at the Davao River Zone is the Davao Riverside Boulevard project (11 km);
- The lack of 'coast to inland' capacity at the Talomo – Calinan Corridor could be addressed by the Talomo – Calinan Bypass project (22 km); and
- The countermeasure for the lack of 'coast to coast' capacity at the Talomo – Toril Corridor is the Davao City Diversion Road Extension project (16 km including existing road 4.5 km).

**5.7 Implementation timing of new road projects.** Although all the above four new projects must cope with ROW acquisition and resettlement issues, the degree of implementation difficulty varies among these projects. A logical comparison indicates that a relatively early implementation of the Davao Riverside Boulevard and the Davao City Diversion Road Extension is possible by 2030. For the former, the areas around the river are mostly public lands and with the urgent intent of improving the river as a flood control measure, the road project can become a reality. The Diversion Road Extension, on the other hand, has to contend more with technical issues, rather than ROW acquisition and resettlement issues, due to its hilly terrain alignment. Therefore, an international bidding for the selection of a construction contractor is required. The other two projects will be implemented by 2045.

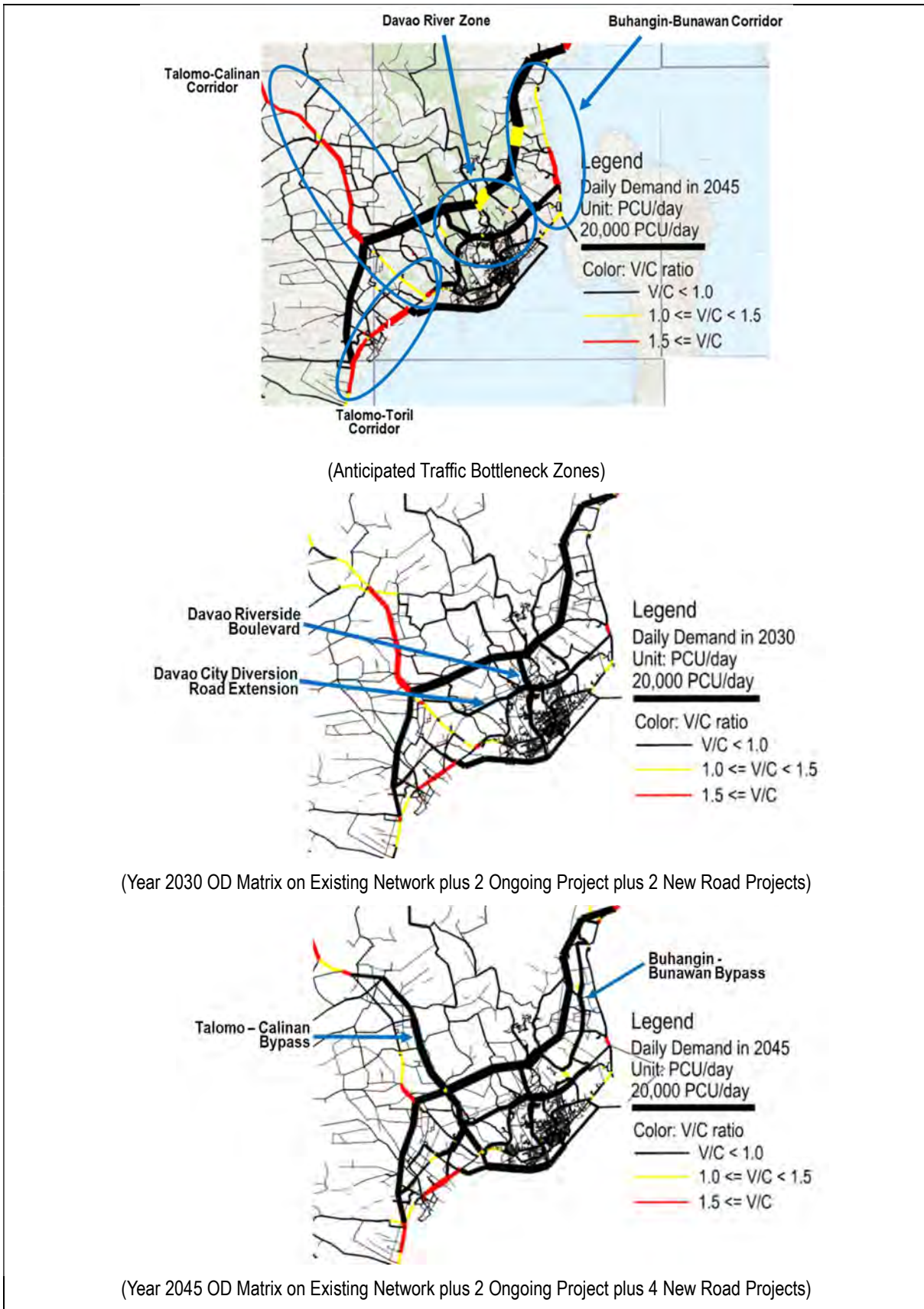
**5.8 Impact of new road projects.** Under the 2030 OD matrix, modest traffic congestion impact can be observed at Davao – Panabo Road and Davao – Bukidnon Road between Talomo and Mintal. With the two new road projects, network traffic speed would increase by 0.8 km/hour. Under the 2045 OD matrix, all four new road projects would be able to solve almost all anticipated traffic congestions (Figure 5.4) with network traffic speed increasing by 2.9 km/hour. Only this network would be able to keep an average network traffic speed of over 20 km/hour (Table 5.1).

**Table 5.1 Summary of Traffic Assignment Results**

	Existing Network (EN)			(EN) + 2 Ongoing Projects		(EN) + 2 Ongoing + 2 New	(EN) + 2 Ongoing + 4 New
	2017	2030	2045	2030	2045	2030	2045
PCU x KM	3,747,240	5,990,504	7,614,168	6,158,261	7,805,902	6,168,612	7,808,361
PCU x Hour	215,810	361,174	533,559	286,216	417,401	276,015	361,141
Average Speed	17.4	16.6	14.3	21.5	18.7	22.3	21.6

Source: IM4Davao Team





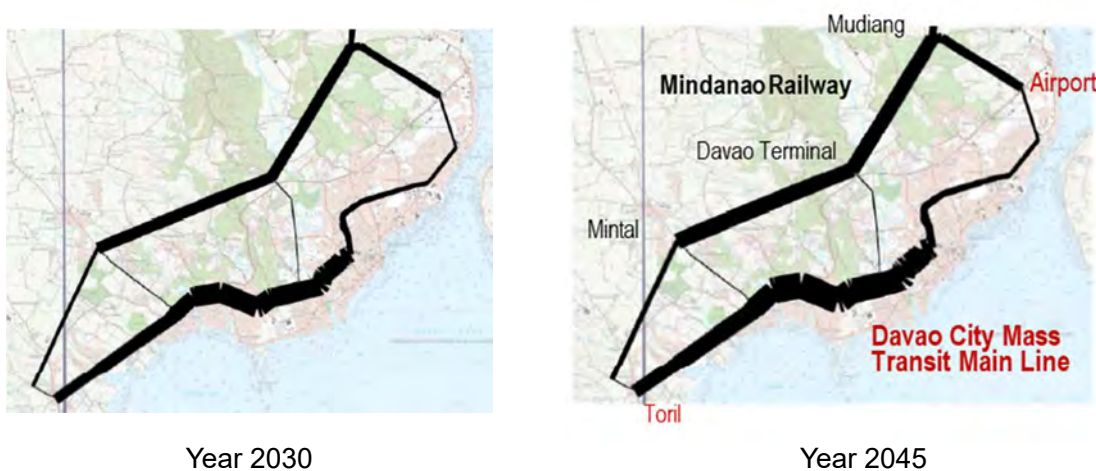
Source: IM4Davao Team

**Figure 5.5 Traffic Assignment Results on New Road Projects**

### 3) Demand Forecast of Railway Network

5.9 Davao City's rail network is a combination of an inter-city rail (Mindanao Railway) and an urban rail (Davao City Mass Transit Line). The former is under plan preparation by the national government while the latter is proposed by the project team. Traffic assignment results under the OD matrices of 2030 and 2045 show that urban rail would carry 249,000 passengers and 326,000 passengers per day, respectively, on the main line (Table 5.2). A large demand is shown between Agdao and Toril through Poblacion and Talomo.

5.10 These numbers are deemed attractive to consider a railway investment. The branch lines show small demand as they would be passing through currently underdeveloped areas. The maximum number of passengers on a given section would be 265,000 across Davao River. It is considered one planning indicator when selecting and designing a suitable urban rail system.



Source: IM4Davao Team

**Figure 5.6 Traffic Assignment Results on Railway Network**

**Table 5.2 Summary of Railway Demand Forecast**

	Year 2030		Year 2045	
	000 Pax/Day	000 PaxKm/Day	000 Pax/Day	000 PaxKm/Day
Davao City Mass Transit Main Line	249	2,792	326	3,693
- Branch to Mudiang	70	339	95	456
- Branch to Davao Terminal	4.5	16	6	21
- Branch to Mintal	2.7	12	3	15
Max Pax Section (Davao River)	202	-	265	-
Mindanao Railway (within Davao City)	157	-	218	-

Source: IM4Davao Team

### 5.3 Road Network and Road Transport Plan

#### 1) Existing Conditions and Issues

5.11 Surprisingly, there is no road network plan for Davao City as well as for Metro Davao. Currently, the road network planning concern is connectivity for the entire Mindanao Island. So, a hierarchical and functional road network plan must be formulated. The planning area of the IM4Davao Project is only Davao City but a hierarchical and

functional road network plan was produced for the city which openly connects to other areas in Mindanao.

5.12 The road network in Davao City has been formed by three national highways, namely: Davao-Panabo Road, Davao-Cotabato Road, and Davao-Bukidnon Road. In the 1990s, the Davao City Diversion Road was widened and it became one of the city's major thoroughfares.

5.13 Inland roads in Davao City are less developed than those on the coastal areas. About 60% of the inland roads have not been paved yet and a total of 1,500 km of roads need to be improved. Many urban sprawl areas are observed at inland areas. Subdivisions are sprouting up and are just connected to the trunk roads without contributing to road network development.

5.14 In recent years, daily traffic congestions occur along the three national highways. Efforts to widen the road are being carried out, but most of the roadside areas have already been developed. A new highway that will help mitigate congestion in existing national roads is needed as part of the city road network while serving the new urban areas. This role will be played by the ongoing Davao City Bypass Road project. The extension of Davao City Diversion Road is a significant long-term project to meet the same objective.

5.15 The increasing population is escalating urbanization in Davao City. Considering natural conditions such as rivers and steep slopes, the road network plan should be integrated with the land use plan that defines the suitable developable lands for new urban areas.

5.16 The CBD of Davao City covers the area from Poblacion to Agdao Districts. It is necessary to avoid through traffic to the CBD and to re-design the road space for pedestrians and public transport.

5.17 In Davao City, CCTVs are used to monitor the roads for security purpose. Traffic management in the city now still has many aspects to strengthen such as synchronized signal control, traffic information provision, etc. Thus, traffic management improvement deserves priority attention.

## 2) Development Plan

5.18 **Short-Term Development Plan (Until 2022):** The two ongoing trunk road projects, Davao City Bypass Road project and Davao City Coastal Road project, will be mostly completed in the next four years (Table 5.3). To meet strong development needs in the suburbs, secondary roads will be developed particularly between the bypass road and the Davao City Diversion Road.

5.19 In order to cope with traffic congestions at peak hours, a traffic control center that will manage traffic flows along roads as well as at major intersections and provide road traffic information to the road users in real time, will be established under CTTMO.

5.20 **Medium-Term Development Plan (2023-2030):** The Davao City Diversion Road will be extended across the hilly terrains to Toril. Then the triple-ladder shape road concept will be completed (Figure 5.6). The Davao Riverside Boulevard will be constructed after improving the Davao River to mitigate the flood hazard including riverbanks construction which will strengthen the connection between the coastal area and the inland area at the middle of the city. Secondary roads will be continuously developed to support orderly suburban development.



5.21 **Long-Term Development Plan (2031-2045):** During this period, there will be two new road projects, namely: Talomo-Calinan Bypass Road and Bunawan-Buhangin Bypass Road. Both roads will provide new frontiers for urban development in the districts of Buhangin, Bunawan, Tugbok and Calinan. Related secondary roads will be constructed.

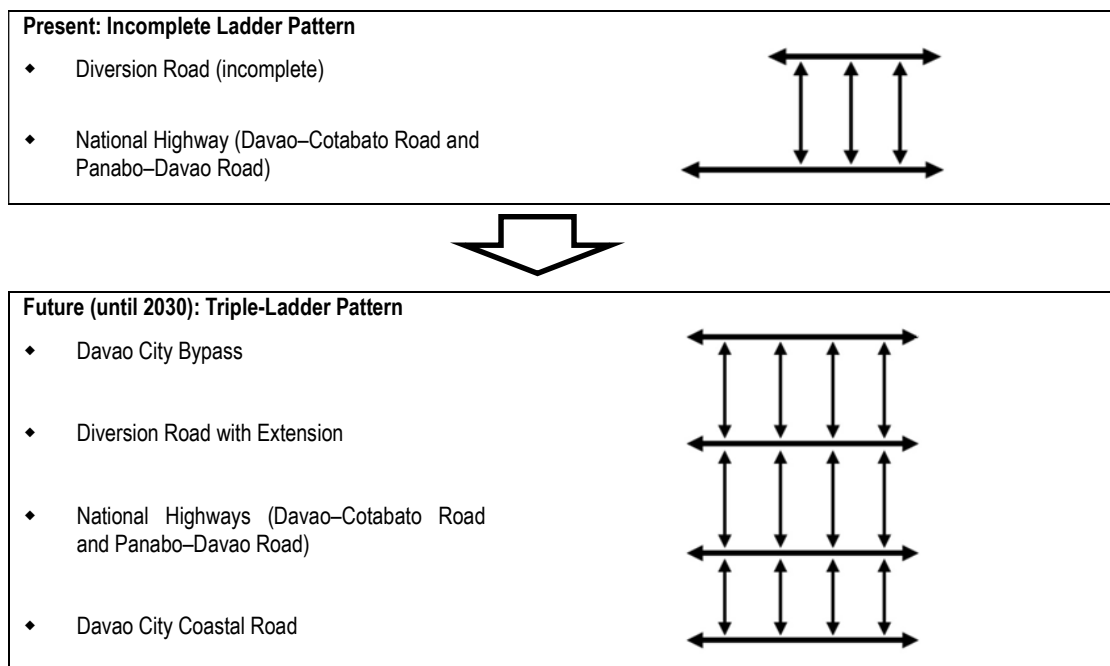
5.22 The project has also taken note of three identified inter-city infrastructure projects by the regional and national governments that will have profound impact on the city when implemented. They are (i) Metro Davao Expressway which will stretch from Tagum to Digos as an access control toll road, (ii) Calinan-Panabo Highway which will take a shortcut between Calinan and the Panabo circumferential road, and (iii) Davao City-Samal Bridge, connecting with the Davao City Coastal Road. Due to limited traffic database for areas outside of the city, demand forecast cannot cover the above routes and, thus, an implementation schedule cannot be recommended. They are, however, deemed strategically important for Davao City to further connect with its neighboring provinces.

**Table 5.3 Development Plan for Road Network and Road Transport**

Planning Term	Projects, Programs and Activities
Short-Term (until 2022)	<ul style="list-style-type: none"> <li>• Completion of Davao City Bypass Road</li> <li>• Completion of Davao City Coastal Road</li> <li>• Secondary routes between Davao City Bypass Road and Davao City Diversion Road</li> <li>• Establishment and operationalization of Davao City Traffic Control Center</li> </ul>
Medium-Term (2023-2030)	<ul style="list-style-type: none"> <li>• Extension of Davao City Diversion Road to Toril</li> <li>• Construction of Davao Riverside Boulevard together with river improvement</li> <li>• Secondary roads to serve newly urbanized areas</li> </ul>
Long-Term (2031-2045)	<ul style="list-style-type: none"> <li>• Construction of Buhangin – Bunawan Bypass Road</li> <li>• Construction of Talomo – Calinan Bypass Road</li> <li>• Continuous secondary road development</li> </ul>

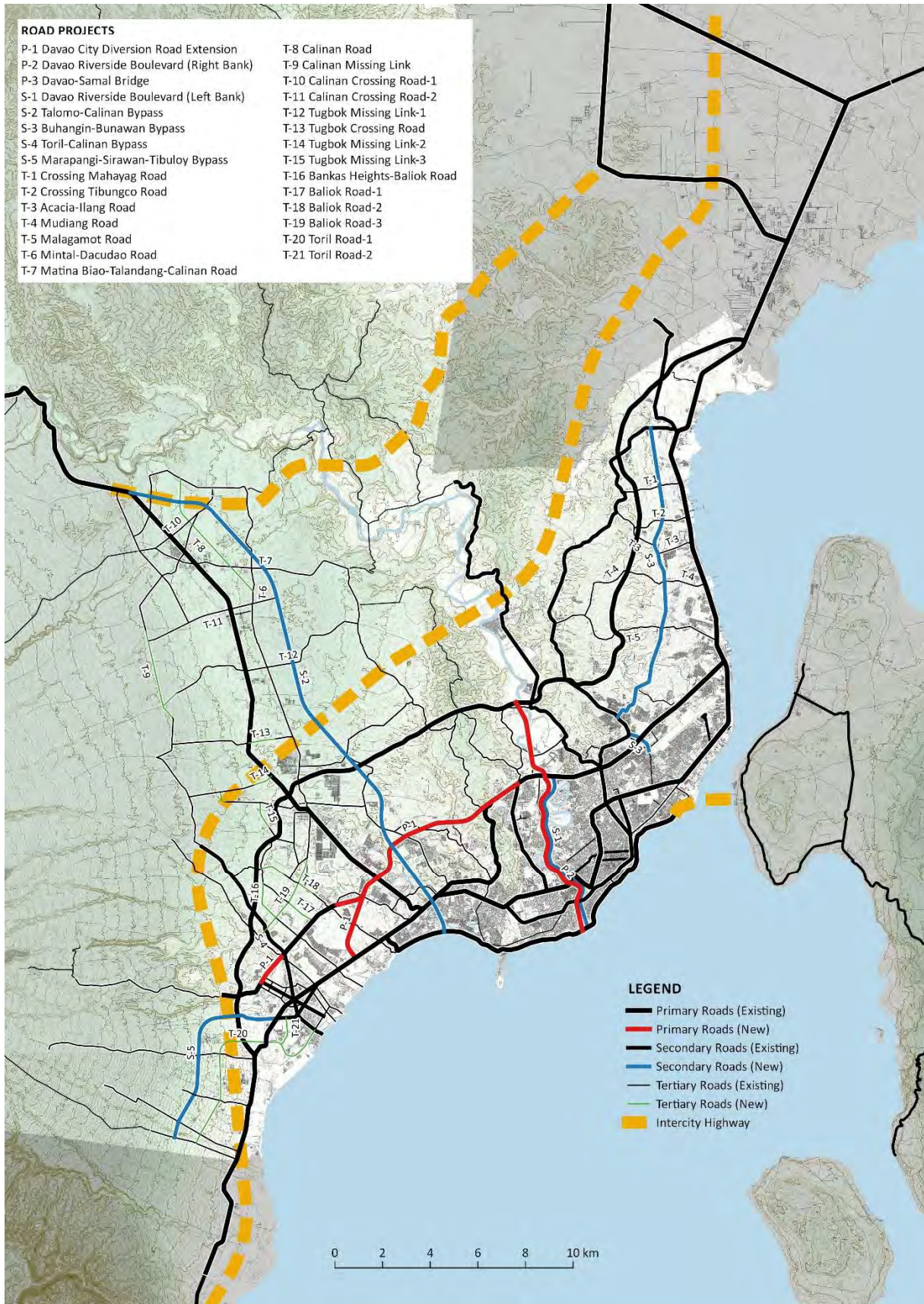
Source: IM4Davao Team

5.23 The abovementioned road projects are illustrated in Figure 5.7.



Source: IM4Davao Team

**Figure 5.7 Present and Future Road Network Patterns for Davao City**



Source: IM4Davao Team

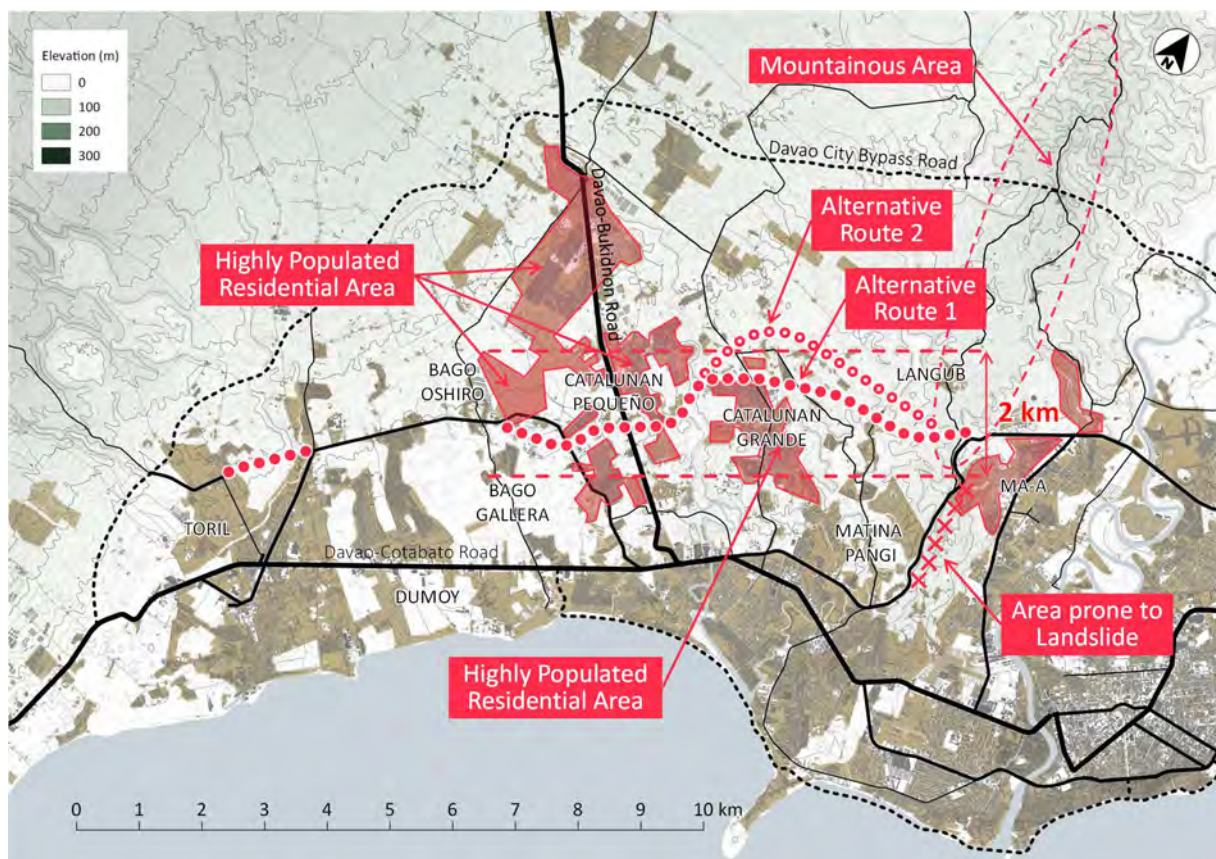
Figure 5.8 Future Road Network for Davao City



## 5.4 Extension of the Davao City Diversion Road

5.24 The Davao City Diversion Road was constructed through Japan's ODA and the road has functioned to divert traffic from the city center, to serve as a main access to Davao International Airport, and to support roadside development and in the suburbs. However, the hilly terrains in Langub hindered road construction. Hence, the road shifted from Ma-a to Matina Pangí but it becomes steep in this section and sometimes slope collapse accidents happen during heavy rain. Drivers must drive carefully in this section. The Davao City CLUP is prioritizing to extend the diversion road to Toril.

5.25 The project road length is 15.9 km, consisting of a new road (11.5 km) and widening of the existing road (4.4 km). There is a missing link of 10 km between the diversion road and Libby Road (Davao-Cotabato Old Road). Among several possible routes (Figure 5.9), the shortest route that avoids existing housing areas is selected (Alternative 1). If detoured to the low lands, there is no vacant land for the project. A detoured route can be found at the mountain side but the terrain conditions become more severe for road construction and, therefore, does not merit to select this alternative route.



Source: IM4Davao Team

**Figure 5.9 Davao City Diversion Road Extension Route**

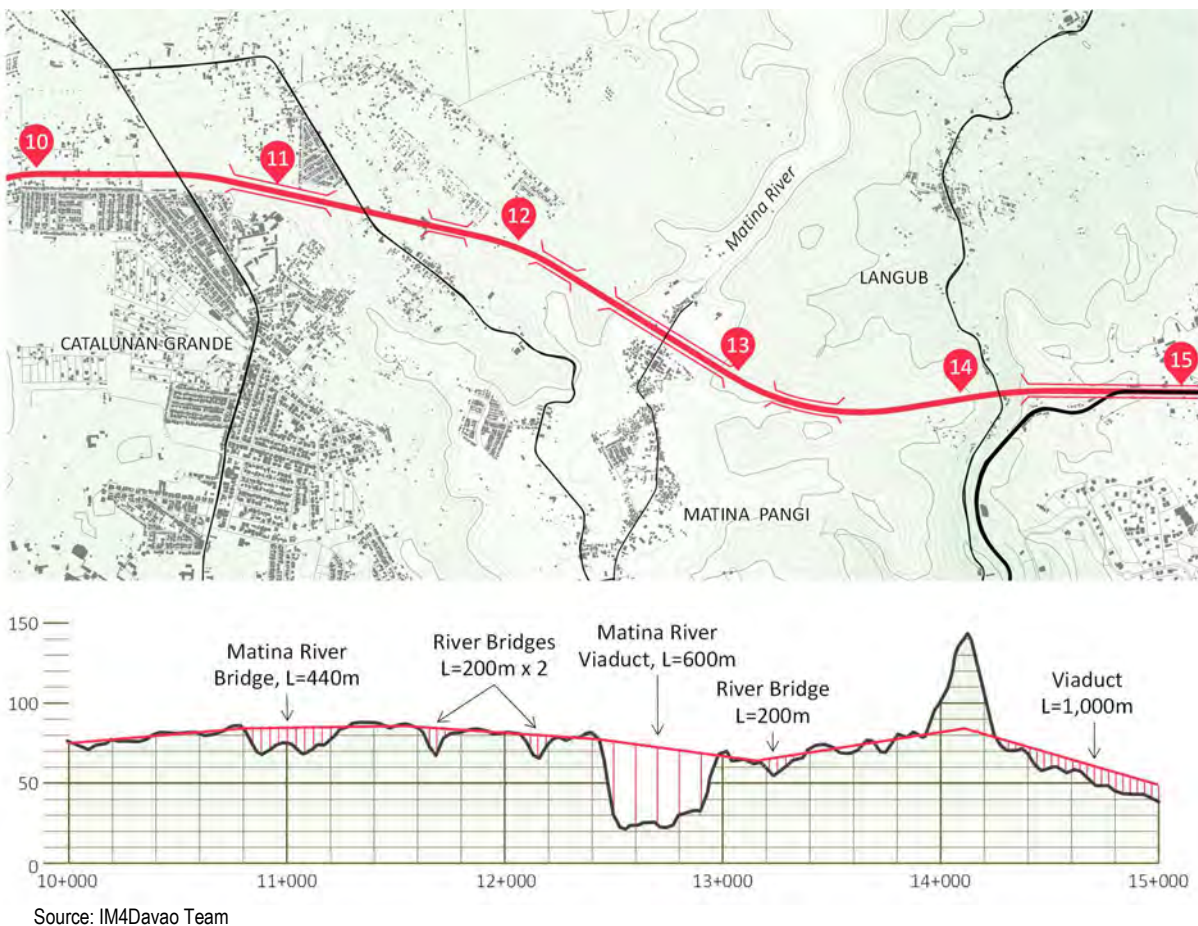
5.26 **Conceptual Design.** In the missing link, a series of bridges (4.0 km in total) and tunnel (400 m) are designed to ensure stable driving on the route (Figure 5.10).

5.27 **Implementation Plan.** The project cost is estimated as PHP 9.1 billion in total, consisting of PHP 1.2 billion for earthwork, PHP 5.8 billion for bridges, PHP 1.1 billion for tunnel construction, PHP 0.6 billion for consultancy services and PHP 0.4 billion for contingency. The estimated project period for this DPWH project is seven years including

the construction period (36 months). Due to technical difficulty, the road extension was once suspended in the 1990s. The project history should be duly reviewed when arranging for project implementation. In order to overcome the technical difficulty in the construction of a series of tunnel, bridges and viaducts on the missing link in Langub, a capable contractor with sufficient track record of undertaking similar projects must be procured.

**5.28 Environmental Considerations.** The proposed road extension will traverse the watersheds of Matina River, Talomo River and Lipadas River. The area is primarily agricultural, residential, and industrial (i.e., small-scale industries). Furthermore, the area is critical for siltation and landslide. There are some springs and DCWD resources within the project's alignment so careful attention should be paid to avoid water pollution during and after the project. The project plan may include alternative water supply service.

**5.29** The road ROW passes through eight barangays. Presently these are mostly agriculture lands and the Davao City CLUP categorizes the area as middle density housing area. There is no land of the Ancestral Domain type. According to CPDO, there are around 200 households that will be affected by the project. There will be partial loss of income from agricultural activities but the project-affected people will benefit with the increase in mobility and increase in values of their land. Clear guidelines and consultations for ROW acquisition must be set for smooth consensus building and resettlement.



**Figure 5.10 Conceptual Road Construction Plan in Langub Section**



## 5.5 Davao Riverside Boulevard Development Project

5.30 **Background:** This project is a combination of the improvement of Davao River and road project with the objective of mitigating the flood hazard of the Davao River as well as reinforcing the vertical (north-south) directional road network of the city and provide higher interconnectivity with horizontal (east-west) directional roads. Unique to this project is the protection of the Davao riverine through the modification of the river flow as an integral part of the road development.

5.31 Davao River is the third largest river in Mindanao which stretches 180 kilometers from the mountains of Bukidnon down to Davao Gulf. As reported in the Davao River Situational Report, the key problems within the Davao River Watershed are river pollution, water drainage and surface runoff, river bank erosion, soil erosion, flooding, health impacts of pesticide use and lack of implementation of existing laws. Modifying the flow of the river has been adopted in some parts of the country to address many of the mentioned problems.

5.32 The Davao Riverside Boulevard Development project site will cover a land area of about 1,070ha. Currently, the Davao River meanders through mainly residential areas and open spaces.



Source: IM4Davao Team prepared using Google Earth

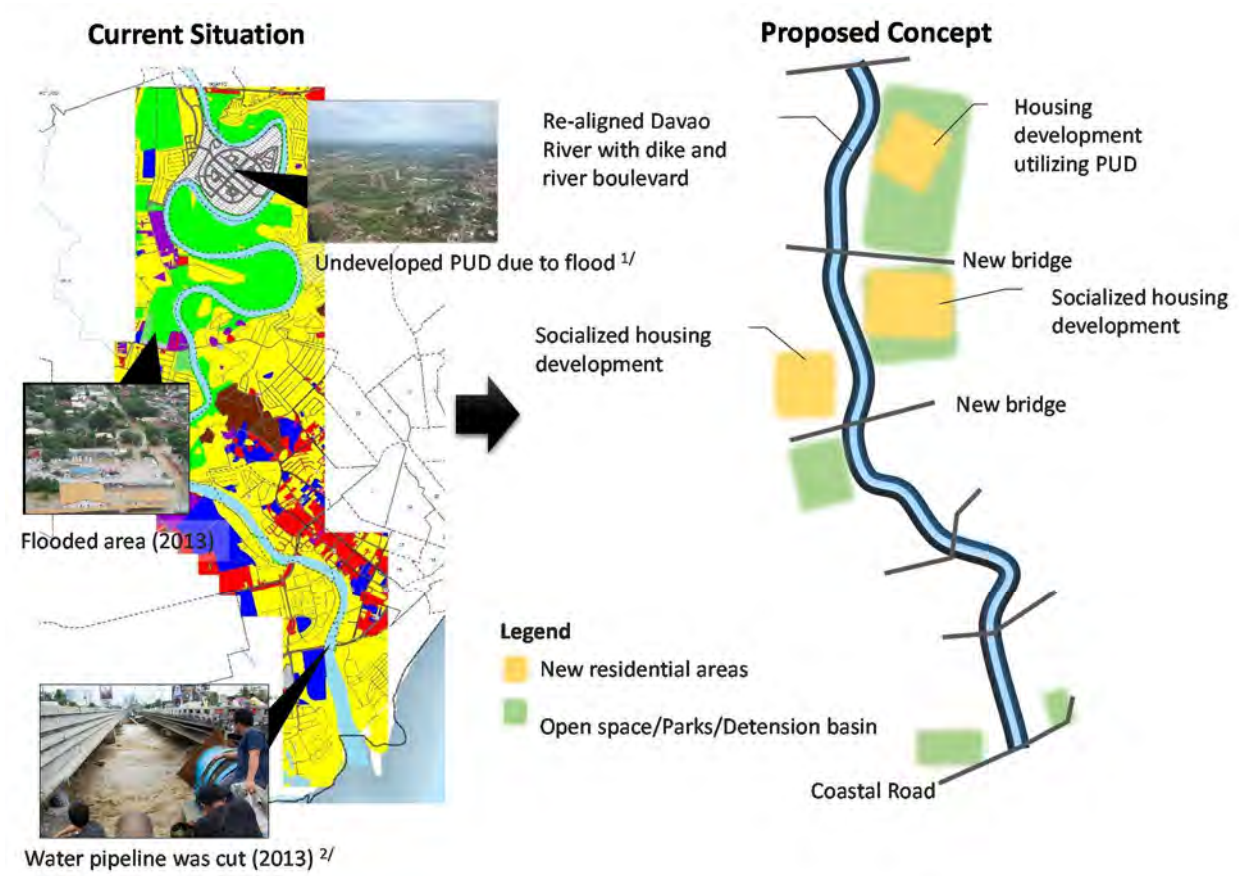
**Figure 5.11 Davao Riverside Boulevard Project Coverage  
(area surrounded by red line)**

5.33 **Project Components:** The details of the project components are discussed below.

- (i) **Davao Riverside Boulevard Improvements:** The goal of this component is to modify the present strong swerve-meandering river to a slight curving configuration and to develop the dike road along the modified river (Figure 5.12). Benefits of this project component is not only to lessen the possible risks of flooding, but also to create the additional urban land in the city center, to provide bypass road connecting the

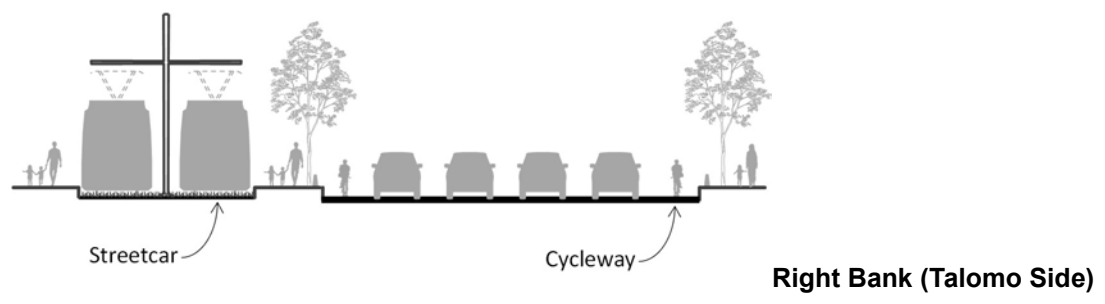
on-going Coastal Road and the existing Diversion Road, and to promote more integrated land use development at both sides of the river. The proposed dike roads are as follows (Figure 5.13):

- 11.0 km on the right bank (Talomo side); and,
- 7.5 km on the left bank (Poblacion side)



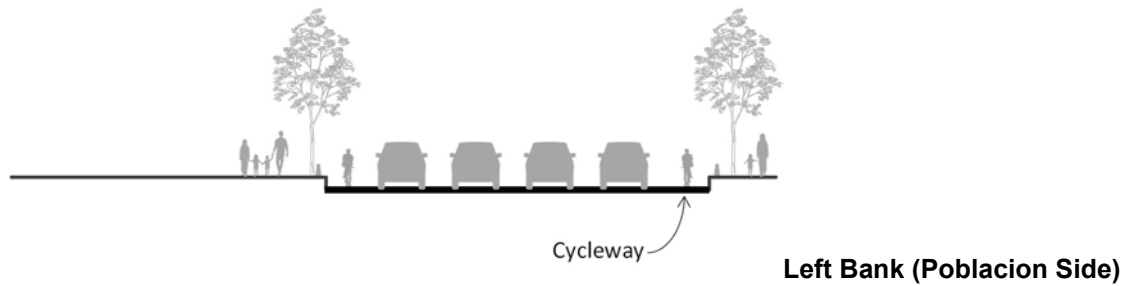
Source: IM4Davao Team

**Figure 5.12 Current Conditions and Development Concept of Davao River Areas<sup>1</sup>**



<sup>1</sup> Engr. Sean Ligtvoet, DOST XI: The riverside area suffered from severe river overflow flooding in 2013. Since then, most of the informal settlers left their make-shift houses while some opted to stay on the second floor of their dwellings during nighttime. DOST will conduct a small investment project for sani-embankment on the site. Elsie Mae A. Solidum, Assistant Regional Director, DOST XI: The PUD was established there long time ago but there are still a few houses standing.





Source: IM4Davao Team

**Figure 5.13 Conceptual Image of Davao Riverside Boulevard**

- (ii) **Provision of Socialized Housing Area:** Since about 1,200 ISFs reside in the high flood risk areas along Davao River, they have to be relocated. To be able to keep their existing community and access to their means of livelihood, it is desirable to relocate on-site. For this, newly created open space, after realigning the Davao River, can be utilized.
- (iii) **Creation of Open Space/Recreation Area:** The needs for the development of parks and recreational areas is very high in Davao City. The average parks and recreational areas per person in Davao City is higher than the minimum requirement recommended by HLURB (1.0 m<sup>2</sup>/person), but it is still very low compared to other cities in the world. Therefore, it is a good opportunity to develop more parks and recreation areas using the open spaces created by the road project and river modification.

5.34 **Project Cost:** In order to estimate the cost of the projects, more in-depth studies for each component are required. Therefore, just for cost reference, provided in the table below are costs calculated using similar projects in other cities.

**Table 5.4 Estimated Cost of Davao Riverside Boulevard with Associated Developments**

Item	Estimated Cost (PhP million)	Reference Cost
Dike Road	12,060	PHP7,730 million for right bank (Talgo side) and PHP4,330 million for left bank (Poblacion side)

Source: IM4Davao Study Team

5.35 **Implementation Bodies:** It will take a concerted effort of varied implementation bodies to realize the project with all of the associated components. Implementation bodies include the Department of Public Works and Highways (DPWH), Housing and Urban Development Coordinating Council (HUDCC), National Housing Authority (NHA), and the Davao City LGU.

## 5.6 Traffic Management Improvement and Traffic Control Center

5.36 **Background:** With its serious traffic congestion, Davao City placed “Transport Plan and Traffic Management” as an important agenda of the current mayor’s term (2016-2018). CTTMO has decided to establish a traffic control center. There is one control room in Davao which is operated by Public Safety and Security Command Center (PSSCC), but it is mainly used for security purposes and accident reporting instead of traffic control. There are 65 traffic signals at major intersections, 17 roadside CCTVs, and

18 underground car sensors that have been installed and are being managed by an American traffic engineering company. Table 5.5 summarizes the condition and problems in the current traffic control system in the city.

5.37 **Project Contents:** To ensure its sustainable and effective operation, the Davao City Traffic Center Project is designed for six tasks, as listed in Table 5.6. Therefore, the proposal is to upgrade the present traffic system and to build a new traffic control center. The city can also consider another alternative, that is, use the current equipment but change to the Japanese system. From past JICA project experience, it is possible to transfer the system, but a well-organized and continual training program is required. The project period is three years.

**Table 5.5 Current Situation of Traffic Control System in Davao**

Function	Item	Current Condition	Problem
Information Collection	Car Sensor	18 underground car sensors at 64 major intersections	<ul style="list-style-type: none"> <li>Frequently cut by road construction</li> <li>Not enough car sensors</li> <li>Jeepneys stop before the signals for loading and unloading passengers to hinder data collection</li> </ul>
	CCTV	Installed at 17 intersections and PSSCC monitors	<ul style="list-style-type: none"> <li>Not enough CCTVs</li> </ul>
	Interconnection	Wireless with several repeaters in the city	<ul style="list-style-type: none"> <li>Building and trees are obstacles</li> <li>Necessary to change to underground system</li> </ul>
	Accident Report System	Ambulance and traffic accidents are reported to 911 Center, then relayed to CTTMO traffic police. PSSCC also monitors. When PSSCC notices traffic problems through CCTVs, it will inform CTTMO to check the sites.	<ul style="list-style-type: none"> <li>CTTMO does not receive accident information, so traffic police are instructed by 911 center and PSSCC</li> </ul>
Information Processing	Traffic Control	Control system, monitor, computers are operating	<ul style="list-style-type: none"> <li>CTTMO is agency-in-charge, but now operated by PSSCC, and mainly used for accident report and enforcement via CCTVs</li> <li>Lack of signal operation technicians in PSSCC</li> </ul>
Information Provision	ICT Boards, Traffic Radio	None	<ul style="list-style-type: none"> <li>Road users cannot receive traffic information to avoid congestion</li> </ul>
Signal Control	Traffic Signal	At 65 intersections	<ul style="list-style-type: none"> <li>Wires in signal utility box are easily interrupted by rain and flood</li> <li>Traffic police tend to switch the signal to "flash" and control the traffic manually</li> </ul>
	Traffic Signal Control Computer	Type 170E Controller	<ul style="list-style-type: none"> <li>Because car sensors cannot collect real-time traffic data, hard to synchronize signal system</li> </ul>
Maintenance Management		Managed by an American traffic engineering firm	<ul style="list-style-type: none"> <li>Contract problem between Abratique and LGU</li> </ul>

Note: City Transport and Traffic Management Office (CTTMO), Public Safety and Security Command Center (PSSCC)

Source: IM4Davao Team

**Table 5.6 Davao City Traffic Management Improvement and Traffic Control Center Project**

Project Content		Implementing Organization
Task 1	<b>Preparation of Traffic Management Plan</b>	CTTMO
Task 2	<b>Implementation of Traffic Management Plan</b>	CTTMO
	(a) public transport usage promotion	
	(b) public transport stop/terminal management	
	(c) on-street parking policy	
Task 3	<b>Construction of Traffic Control Center</b>	Davao City
	(a) tender preparation	
	(b) facilities/equipment procurement	
	(c) civil work	
Task 4	<b>Installation of Traffic Control System</b>	Davao City
	(a) tender preparation	
	(b) traffic network system procurement	
	(c) traffic signal system procurement	

Project Content		Implementing Organization
	(d) traffic information system procurement	
	(e) civil work and installation	
Task 5	<b>Personnel Training</b>	
	(a) operation technician training	CTTMO
	(b) maintenance technician training	
	(c) employment system reform	Davao City
Task 6	<b>Traffic Enforcement</b>	CTTMO

Sources: IM4Davao Team

(i) Task 1: Preparation of Traffic Management Plan

5.38 It is suggested for the city and CTTMO to establish traffic management plans in the beginning to prepare the comprehensive project. When necessary, Davao City and CTTMO will use external resources for the plan preparation.

(ii) Task 2: Implementation of Traffic Management Plan

5.39 The traffic management plan is the basic process in the beginning to maximize the working function of the TCC and must continue annually. The following major programs are proposed: Public transport usage promotion, Public transport stop/terminal management, On-street parking policy, and Public traffic education.

(iii) Task 3: Construction of Traffic Control Center

5.40 Davao City has to prepare the tender document for contractors to design the TCC. The necessary facilities and materials are listed in Table 5.7. There is a vacant lot of around 183 m<sup>2</sup> next to CTTMO which can be used as the potential site for the Davao City Traffic Control Center.

**Table 5.7 Facilities and Equipment for Traffic Control Center**

	Room	Facilities/Equipment	Functions	Remarks
1	Control Room	Video Wall, Control Desk, Broadcast/Radio Desk	Traffic condition monitor, signal control monitor, traffic info report	100 m <sup>2</sup>
2	Server Room	Main Server, Signal Control Workstation, HMI: Human-Machine Interface (HMI) Workstation, Front-end Processor, Centralized CCTV System, Network Memory Device, Communication Device	Signal control and monitor, car sensor data processing, CCTV control, operation and maintenance records	50-100 m <sup>2</sup> (depends on device and future plan)
3	Power Room	Generator, UPS	Steady power supply	50 m <sup>2</sup>
4	Workshop	Measurer, Tool, Commodity	Maintenance, regular check, commodity management	50 m <sup>2</sup>
5	Administrative Office	System Monitor	Administrative work	30-50 m <sup>2</sup>

Sources: IM4Davao Team based on JICA's recent TCC project in another country.

5.41 Figure 5.14 shows an example of the control room of the Tokyo Traffic Control Center. Generally, the TCC can collect and analyze information in and around the city to control the traffic flow and the volume, and then disseminate the data to drivers in order to ensure road safety and smooth traffic flow.



Sources: Tokyo Metropolitan Police Department

**Figure 5.14 Control Room of Tokyo Traffic Control Center**

(iv) Task 4: Installation of Traffic Control System

5.42 After Task 1: Traffic Management Plan, CTTMO will decide to either reuse it in the new TCC or to buy a brand-new software package. The necessary devices include (a) Traffic Network System Equipment, (b) Traffic Signal System Equipment, and (c) Traffic Information System Equipment.

(v) Task 5: Personnel Training

5.43 CTTMO will design and conduct a complete training program to let TCC operators be familiar with the system.

(vi) Task 6: Traffic Enforcement

5.44 CTTMO should cooperate with the LTFRB regional office and has to conduct strict enforcement of traffic regulations near busy intersections to prevent jeepneys from loading and unloading passengers as well as disregarding the traffic signal functions.

5.45 **Implementation Modality:** The estimated cost for Davao City TCC: procurement and design cost is USD8.3 million while construction cost will depend on the local market. The process for the whole project will take 3 years including detailed design for 8 months and civil works for 16 months, system transfer and personnel training for 1 year, and continued traffic enforcement as well as traffic management plan.

5.46 In a recent disclosure by NEDA CO, the "Safe Philippine Project Phase 1" of the Department of Interior and Local Government (DILG) has been approved in January 26, 2018. This project involves the installation of city surveillance systems to various cities including Davao City. Therefore, some components of this TCC project for the city can be linked to DILG's initiative.

## 5.7 Public Transport System Plan

### 1) Existing Conditions and Issues

5.47 Around 1,000 units of public utility buses (PUB) are registered at LTO Region XI. But most of them serve inter-city traffic. According to LTFRB Region XI, there are 7,475 public utility vehicles (PUV) consisting of jeepneys and multicabs. Each unit can accommodate 12-20 passengers. Ordinary PUV design which requires passengers to use the rear side for their boarding and alighting is dangerous and their non-airconditioned service is not comfortable. There is no incentive for the public transport service providers to improve their service since LTFRB has a policy restricting fare increases. The number of PUV units decreased by 29% from 2006 (10,591 units) to 2016 (7,475 units). Davao City's vehicle population, on the other hand, is sharply increasing.

5.48 According to LTFRB, the number of PUV franchise routes is 131 at the end of 2016 and all the routes terminate at Roxas Avenue in the CBD. Due to the city's mono-centric urban structure, queuing up of PUVs in the CBD during morning and evening peak hours are among the causes of traffic congestion.

5.49 The ADB project team conducted the Public Transport Modernization Project in Davao City since 2017. The initial project concept is to introduce a trunk bus system with some hundreds of modern buses and with the replacement of some thousands of PUVs. The project may improve road space utilization but PUV rationalization is a socially sensitive issue. Project implementation will face difficulty.

5.50 Davao City has experienced some transport planning studies particularly in relation with mass transit system. In 2011, an ADB study recommended BRT system but it has not been implemented due to difficult consensus building for the BRT to have an exclusive use of part of the trunk road space. In recent years, Korean and Chinese firms showed their interest in urban rail such as a monorail and submitted their proposals to the Davao City Government but no agreement has been made so far.

### 2) Development Plan

5.51 It is imperative to transform PUV to PUB as a main actor of road based public transport in Davao City. Taking both growing population and registered vehicles into account, impact of the modal shift within road transport may not be dynamic in changing urban structure and personal movement.

5.52 Rail network service will be able to take a more important role in the city's transport system in the integration of transport system with urban development, particularly with the new urban centers. Japan and other countries' experiences show that a Transit-Oriented Development (TOD) is a practical way to foster new urban centers together with trunk road network development.

5.53 In Davao City, the Mindanao Railway project initiative is ongoing and is intended to provide inter-city rail service. Likewise, the Davao City Mass Transit Line project, a new intra-urban railway is proposed to provide fast and scheduled urban transport service within the city. Both rail systems will be combined as an integrated city railway network (Figure 5.15).

5.54 In accordance with the railway traffic demand forecast in Section 5.2, the Davao City Mass Transit Line will be developed within the timeframe shown in Table 5.8.

**Table 5.8 Development Phases of Davao City MT Line**

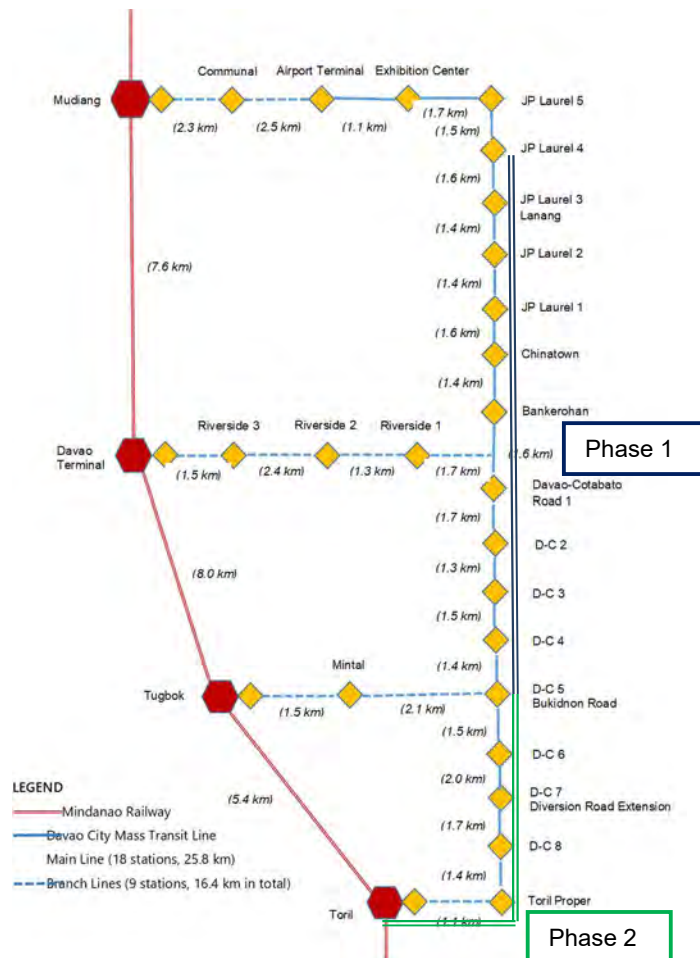
	2018 - 24	2025 - 30	2031 - 35	2036 - 40	2041 - 45
Phase 1	█				
Phase 2 (Toril)		█			
Spur Line 1 (Airport)			█		
Spur Line 2 (Central)				█	
Spur Line 3 (Mintal)					█

Source: IM4Davao Team

**Table 5.9 Development Plan for Public Transport System**

Planning Term	Projects, Programs and Activities
Short-term (until 2022)	<ul style="list-style-type: none"> <li>• Modernization of Road-based Public Transport</li> <li>• Construction of Davao City Mass Transit Main Line Phase 1 (Talomo – JP Laurel, 15km)</li> </ul>
Mid-term (2023-2030)	<ul style="list-style-type: none"> <li>• Operationalization of Davao City Mass Transit Main Line Phase 1 (Talomo – JP Laurel, 15km)</li> <li>• Construction of Davao City Mass Transit Main Line Phase 2 (Toril – Talomo, 6.6 km)</li> </ul>
Long-term (2031-2045)	<ul style="list-style-type: none"> <li>• Operationalization of Davao City Mass Transit Main Line Phase 2 (Toril – Talomo, 6.6 km)</li> <li>• Construction and Operationalization of Davao City Mass Transit Branch Lines (Airport to Mudiang, Davao Riverside to Davao Terminal St., Bukidnon Road to Mintal) depending on demand</li> </ul>

Source: IM4Davao Team



Source: IM4Davao Team

**Figure 5.15 Railway Network Plan for Davao City**

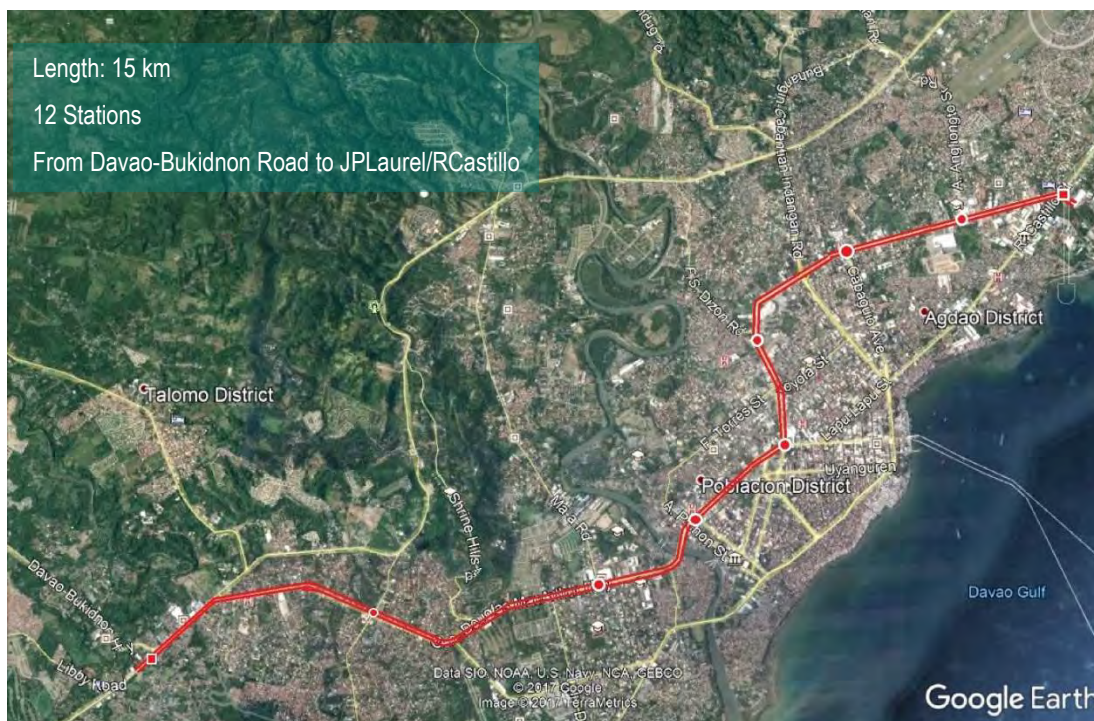


## 5.8 Davao City Mass Transit Line (Phase 1)

5.55 The 1st phase starts from the intersection of Bukidnon-Davao Road and Davao City Diversion Road and ends at the intersection of JP Laurel and R Castillo Street. This 15km alignment captures the districts with densest population for both nighttime and daytime (Figure 5.16).

5.56 The development of the network is dictated by demand. The demand forecast per day from Section 5.2 with conversion into passenger per hour per direction (pphd) indicates that the largest demand section between Poblacion and Talomo would carry 20,350 (pphd) in 2045.

5.57 If a detailed FS would be conducted and fast tracked in 2019, the proposed section could be operational in 2024, at the earliest, taking the necessary procedures (project approval, PPP tender –design build, concession agreement, selection of IRE/CM, construction and operation) into account.



Source: IM4Davao Team

**Figure 5.16 Phase 1 Alignment of Davao City Mass Transit Main Line**

5.58 When selecting a global AGT system, the indicative cost for Phase 1 is shown in Table 5.10. The addition of railcars in the future will follow the demand forecasts made in Section 2. There are more candidate systems which have their own pros and cons for the Phase 1 project, including elevated MRT, monorail and elevated LRT. For instance, elevated MRT requires larger capital investment while it has greater adoptability to increased ridership.

**Table 5.10 Cost of Davao City MTL – Phase 1**

Project Components	Cost (2019-2023)	2030	2045
Viaduct	9,000		
Stations	3,600		
System Works (electro-mech)	12,168		
Depot	2,080	312	416
Railcars	2,917	1,856	11,138
Right-of-Way	2,576		
Engineering Services	3,234		
Total (in PHP Million)	35,575	2,168	11,554
Total (in USD million)	684.1	41.7	222.2

Source: IM4Davao Study Team

5.59 Learning from the lessons of Metro Manila’s urban railway system, the recommended modality for Davao’s Urban Mass Transit Line is hybrid PPP - wherein part of the capital cost is shouldered by the government and the balance by the private sector (which shall also assume responsibilities for operations and maintenance). Ideally, the cost of the civil works (viaducts, stations, depot) and ROW should be shouldered by the government. The private concessionaire can then invest in the balance (i.e., for system works, railcars, and ticketing system).

5.60 Normally, the DOTr (or its attached agencies – LRTA and PNR) acts as the Implementing Agency – by virtue of its charter and as a channel of national government funding. It can be presumed that the city government does not have the resources to finance the project, but could contribute the land (for depot). The ideal option for Davao City is to create a new public transport authority for the system; this can also be mandated to modernize road based public transport, e.g. acting the host institution for the ADB-funded transport modernization project. In this sense, the formation of a Davao City Transport and Traffic Authority is worth discussing.

## 5.9 Gateway Development Plan

5.61 **Airport.** Davao International Airport will be expanded to meet increasing air traffic demand in the short to medium-term, including terminal expansion and new terminal construction and extension of the existing taxiway. In the long-term, the second regional airport will be selected and its role demarcation with Davao International Airport will be adequately set.

5.62 Davao International Airport is currently accessible mostly by private cars and taxis. In line with airport terminal expansion, its intermodal transfer function will be enhanced by a new rail station connecting with not only the city center but also Tagum (to the north) and Digos (to the south) within Metro Davao as well as a new bus terminal for route buses and P2P bus services.

5.63 **Port.** Sasa Port will serve mainly for domestic shipping with necessary management improvement and equipment installation.

5.64 Since Davao City has no suitable candidate sites for a new gateway airport and seaport, unless large-scale reclamation is allowed, a long-term gateway development agenda must be elaborated under the context of Metro Davao.

## **6 DEVELOPMENT PLAN FOR URBAN SERVICES**

### **6.1 Water Supply Development Plan**

#### **1) Existing Conditions and Issues**

6.1 The Davao City Water District (DCWD) supply water to 61% of the population in Davao city as of 2015 by individual house connection services. In the rural areas, water supply is carried out by the Barangay Water and Sanitation Associations (BAWASAs) and private associations in Barangay supply water. However, it is not an individual house connection system (Level III) but a Point Source System (Level I which serves an average of 15 households with people having to fetch water from up to a 250-meter distance) and Communal Faucet System or Stand Post (Level II which is a piped system with communal or public faucets usually serving 4-6 households within a 25 m distance). Water sources of both services are from deep wells. An analysis of the water service areas shows that a considerable number of residents still rely on individual wells, rainwater harvesting and public water faucets for their water needs.

6.2 The DCWD currently faces the following issues: (i) Insufficient water quantity, (ii) Poor water quality, and (iii) Non-revenue water (NRW) is about 30% as of 2016.

6.3 Issues on rural water supply are as follows: (i) Limited water supply in some areas, (ii) Unpredictable water supply during a drought or a sustained hot weather, (iii) Non-potable water in some areas and non-compliance with regular water testing, (iv) Non-payment of water bills by some members, and (v) Lack of regular training and monitoring.

#### **2) Development Plan**

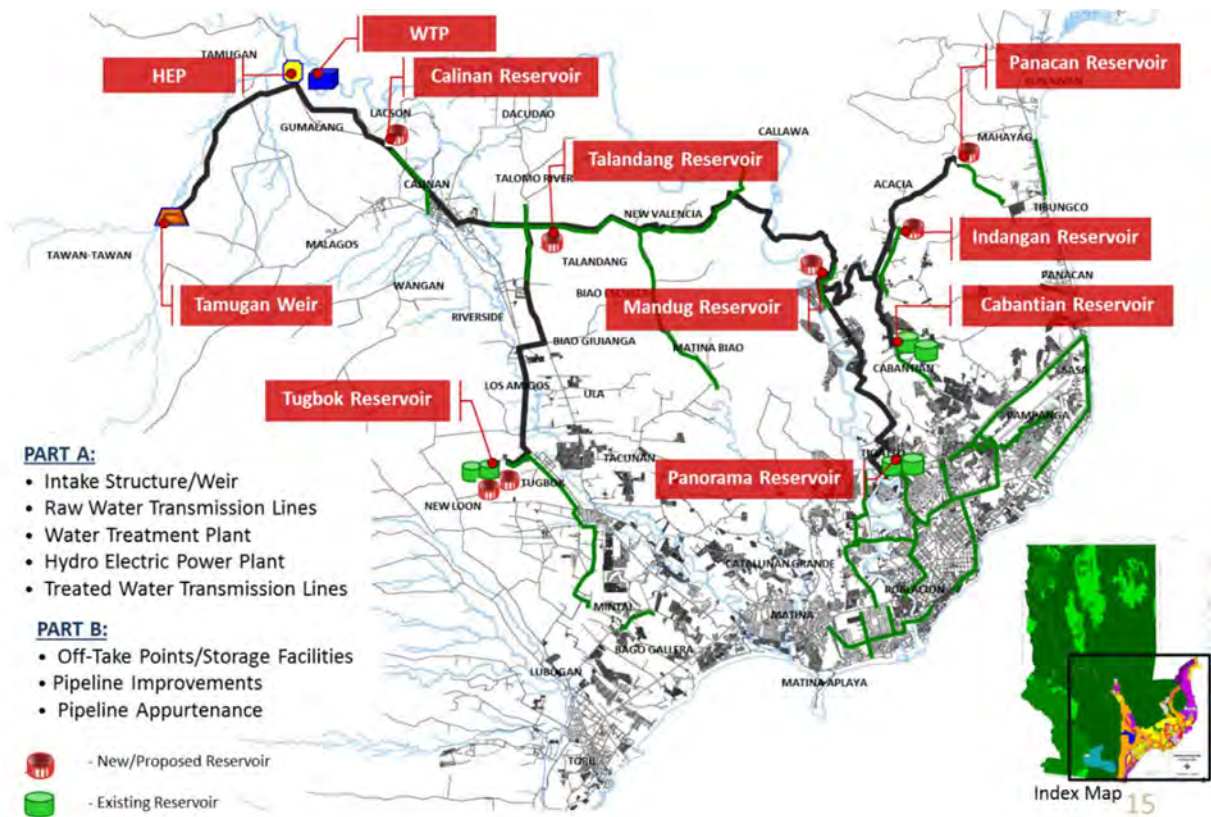
6.4 DCWD started a bulk water supply project in joint venture with two private companies. The project is to create a weir in the Tamugan River to draw and supply water to the service areas. The water supply from this source will start in 2021 and the planned volume of water is 300,000 m<sup>3</sup>/day. Production volume of DCWD as of 2015 is at 275,000 m<sup>3</sup>/day from 62 production wells. Hence, the bulk water supply project would entirely replace DCWD's water supply from production wells to just one water source, reduce extraction of ground water and save on power. (Figure 6.1)

6.5 DCWD will expand its served population from 1 million persons in 2015 to 2.95 million (90% of the population) in 2045. And DCWD has a plan to develop Lipadas River same as Tamugan River and will use the existing deep wells effectively and will develop the new water sources in future.

6.6 Current NRW level in DCWD is about 30% and is expected worsen with the expansion of the water supply network. In order to reduce NRW, the DCWD will establish the District Metered Area (DMA) system and will apply the Supervisory Control and Data Acquisition System (SCADA) to control/manage the water supply distribution system effectively. The DCWD has a plan to strengthen the NRW Management Division (with 37 personnel as of 2017) and reduce NRW level 20% in 2045.

6.7 It is anticipated that population increase in the rural areas will not be large but the improvement of the water supply service is important. It is recommended that the capacity of the staff and stakeholders be enhanced for the management of their water supply.

6.8 Table 6.1 shows the development plan for water supply from the short, medium and long-term planning horizons. During the short-term until 2022, the Tamugan River Bulk Water Project is a big ticket project for Davao City. In order to support the bulk water project effectively, a combination of SCADA system with NRW reduction or equipment installation with technical assistance is selected as one of the IM4Davao priority projects.



Source: DCWD

**Figure 6.1 Davao City Bulk Water Supply Project**

**Table 6.1 Development Plan for Water Supply**

Planning Term	Projects, Programs and Activities
Short-term (until 2022)	<ul style="list-style-type: none"> <li>• Commencement of surface water supply from Tamugan Weir to almost all DCWD service areas</li> <li>• Establishment of SCADA system for all WSS in DCWD</li> <li>• DMA establishment and NRW reduction management including leakage detection</li> <li>• Capacity building and training for NRW reduction management</li> </ul>
Medium-term (2023-2030)	<ul style="list-style-type: none"> <li>• Expansion of the Rural Water Supply system for BAWASAs and other associations in barangays such as drilling wells, construction of the elevated water tanks for distribution and provision of the pipe materials</li> <li>• Capacity building and training for rural water supply system management</li> </ul>
Long-term (2031-2045)	<ul style="list-style-type: none"> <li>• Development of new water sources, such as surface water and deep wells for a sustainable water supply system.</li> <li>• Expansion of the water supply system to the unserved areas in order to increase the population served ratio by up to 90%</li> </ul>

Source: IM4Davao Team

## 6.2 SCADA System and NRW Reduction Program

6.9 **Background:** The DCWD water supply network system consists of 62 production wells, 17 reservoirs and water transmission/distribution pipeline. Demand for water is increasing and an expansion of the service area is required. DCWD is developing its water source to include an intake from the Tamugan weir starting 2021 and improve its production in order to cope with the increase in demand in the future.

6.10 As mentioned above, the DCWD water supply system will be drastically changed in a few years. The DCWD will be required not only to increase its service area but also to improve its water supply services. Improvement of water supply services is to utilize limited water appropriately based on the water demand and to improve NRW level (30% as of 2016). And in order to reduce NRW volumes, it is recommended firstly, to establish the DMA and introduce the SCADA system to gather data for flow, valve status, and reservoir water level and to control all water supply facilities at the control center.

6.11 DCWD has already started to establish DMA in 2008. Taking this into consideration, the establishment of the SCADA system and capacity development for NRW reduction are proposed as an IM4Davao priority project.

6.12 **SCADA System:** SCADA system is the tool for comprehensive data acquisition through which important decisions would be based upon. This system can control/gather data (i) Flow rate of outlet of water source, and outlet and inlet of the reservoir, and flow rate of inlet of DMA, (ii) Water level in the reservoir, and (iii) Pressure at the inlet of DMA. The schematic diagram is shown in Figure 6.2.

6.13 SCADA system is an indispensable system for improvement of water supply services. Therefore, the DCWD has a plan to establish an initial Toril SCADA system in 2018. The three production wells and two reservoirs shall be included in the initial Toril SCADA system. It is recommended that the remaining water supply facilities will be included in the comprehensive coverage of SCADA system up to 2020 before the completion of the Bulk Water Supply System.

6.14 **NRW reduction by DMA establishment:** The steps of NRW reduction by DMA approach are as follows; (i) Completion of Mapping system, (ii) Establishment of DMA at around from 1,500 house connections to 3,000 house connections and the minimum night flow rate shall be measured, (iii) When the minimum night flow rate will increase leakage from the pipeline may occur and the exact location of leakage point should be detected by the use of acoustic rod and electronic leakage detector and the broken pipe should be replaced.

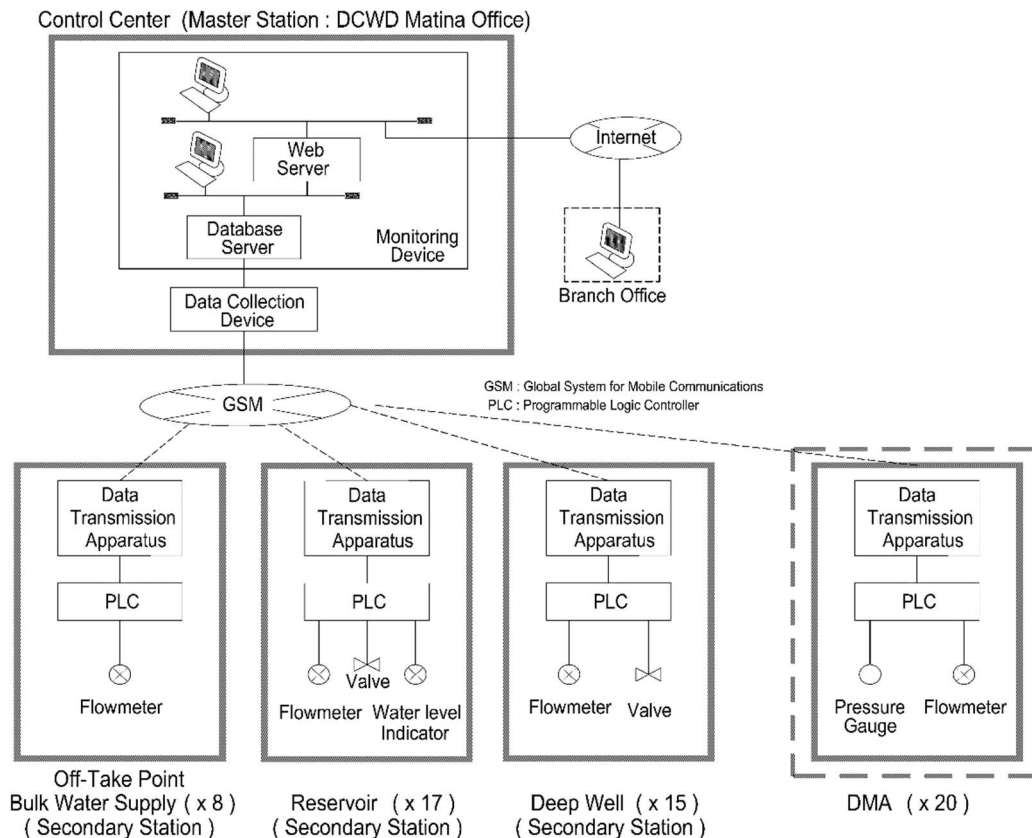
6.15 In order to execute the approach (iii) above, DCWD staffs are required to undergo capacity building or training for better operation of the related equipment for leakage. The contents of the capacity building include management of DMA, control of inner pressure of pipeline, improvement of leakage detector and control of the flow rate, replacement and repair of the pipeline, asset management, training at the site, and arrangement of the data base. Electronic ground microphone, leak noise logger-correlator, leak noise correlation and thermal imaging devices are required for leak detection. Support to improve DCWD staff's capacity is indispensable and can be carried out with external technical assistance.

6.16 **Impact of the proposed project:** The SCADA system is a tool for comprehensive data acquisition such as water flow rate, water pressure, and water level in the reservoir and can assist the DCWD staff in their daily operation and maintenance work. And with the



analysis/result of SCADA system, NRW reduction can be easily executed. Both the SCADA system and NRW reduction are linked with each other and, as such, implementation will have to be simultaneously executed to effectively assist in the water supply operation.

6.17 NRW reduction has a beneficial effect in terms of the following: (i) Conserving water resources, (ii) Improving supplied water quality, (iii) Saving expense for water supply, and (iv) Reducing road accidents caused by leakage of the pipes. Land acquisition and resettlement are not necessary for executing this project.



Source: IM4Davao Team

**Figure 6.2 Schematic Diagram of SCADA System for DCWD**

**6.18 Implementation Plan:** Two events will affect the installation of the full-scale SCADA system. They are (i) the completion of initial Toril WSS SCADA system, and (ii) the commencement of the bulk water supply project. Provided that both will be done on schedule, the proposed SCADA system will start in late 2019. If fast tracked, the system will cover the entire DCWD service areas until 2021. The capacity development of NRW reduction will be undertaken during the same period. The estimated project cost is JPY1,073 million (or PHP505 million) for the entire SCADA system.

## 6.3 Wastewater Management Plan

### 1) Existing Conditions and Issues

6.19 According to the HIS (Household Interview Survey) of this project, 93.7% of the respondent families have set up septic tanks but about 60% of the households have never done any desludging and about 20% answered that they do not know when it was done. Therefore, in many households, there is insufficient management of the septic tank. So it is anticipated that soil contamination and discharge to the drain pipe are widely occurring. As a result, water-borne diseases are a frequent occurrence. For example, of the total HIS respondents (2,014 families), the diseases that afflicted them in the past year were diarrhea (377), skin diseases (75), cholera (59), typhoid fever (46), and amebic dysentery (31). Also, contamination of river water quality by fecal coliform is already serious environmental problem in Davao City.

6.20 DCWD conducted a feasibility study on septage service in 2013 with USAID assistance. As a result, a project was proposed dividing the city area into 4 districts and for the septage service to start in the short term. DCWD is preparing for this project and is securing an agreement from the city council through a MOA, but the project has not started yet.

6.21 In addition, DPWH is promoting the National Sewerage and Septage Management Program (NSSMP) for major cities such as Davao City. In the NSSMP, sewer water is drained together with rainwater through a combined sewer system and treated in a sewage treatment plant.

### 2) Development Plan

6.22 DCWD is accelerating the preparation and starts up of the septage service. It will be 100% septage service coverage in the city by 2025.

6.23 Septage service is a system for properly processing sludge from septic tanks. Although the current system only removes BOD of human excretion, the removal rate is still low. Therefore, even with the start of the septage service, the current situation will not be remarkably improved. As it is, the ability to remove BOD pollutant load due to domestic wastewater (night soil and gray water) is remarkably lower than sewage treatment system.

6.24 Based on these current conditions, in order to conserve the water quality of public waters and improve the living environment, it is necessary to remarkably reduce the pollutant load caused by domestic wastewater. Introduction of the sewer system is necessary for the medium to long-term periods.

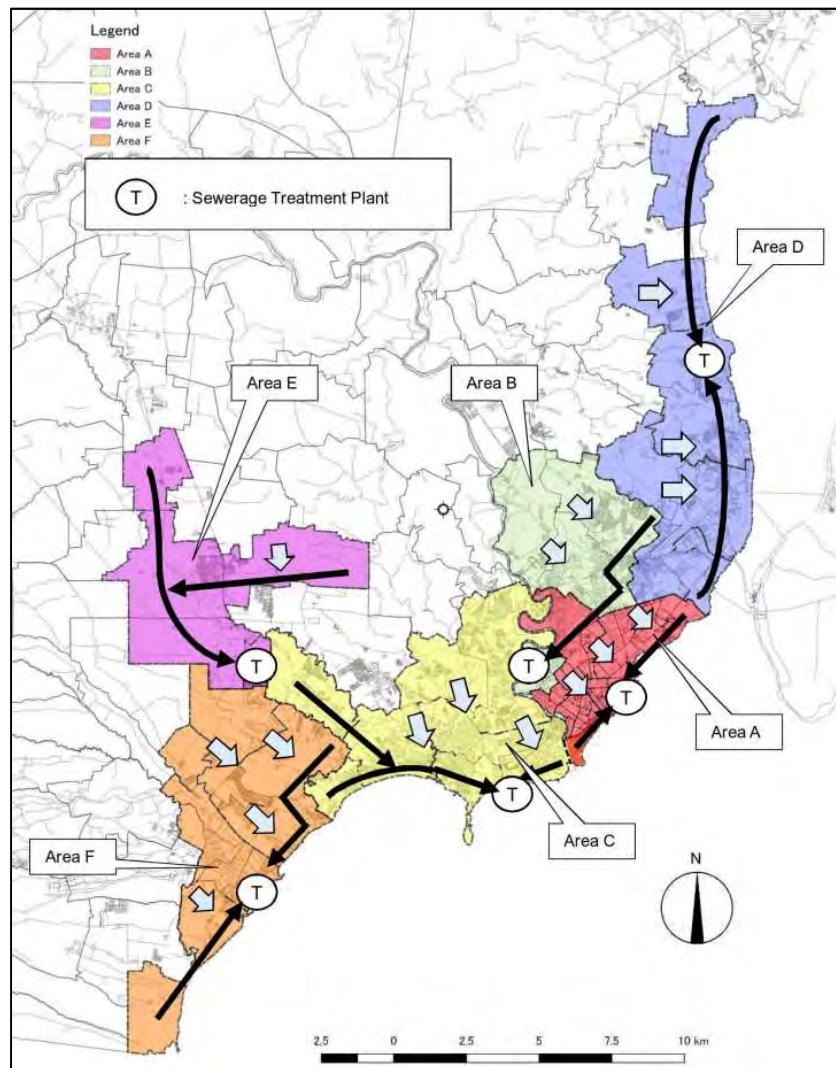
6.25 The IM4Davao project proposes that the future urban area of the city be divided into 6 districts and a sewage treatment plant be built in each district. (Figure 6.3). First, Davao City is to prepare a detailed plan for the sewer system. After that, the city starts the construction of the sewer system. The first sewage treatment plant starts operation in 2028, and the completion of the whole system is in 2045.

6.26 Introduction of a two-layered structure of the sewerage treatment plant is possible to include a roof deck as a public park. The sewer line is constructed for each sewage treatment area. Should it proves difficult to cut open the ground in the existing urban area, a jacking construction method can be applied.

6.27 Table 6.2 shows the development plan for wastewater management from the short,

medium and long-term project viewpoints. During the short-term until 2022, DCWD is expected to construct and operate part of the 4 septage plants. The sewerage plant site selection, on the other hand, is more difficult than the septage plant since it must be located at a low land area near a treated water discharge point such as the riverside and coastline. Therefore, plant site location must be determined first in the system planning. The first sewerage plant location for the 'Area A' covering the Poblacion and Agdao districts will be planned as one of the IM4Davao priority projects.

6.28 There will be a transitional period from septage services (4 septage plants to be operational in 2025) to sewerage services (6 sewerage plants to be operational by 2045). Compared with sewerage plants with fixed network of sewers, septage plants are more flexible in changing their service areas due to the mobility of the septage collection vehicles. Since urban expansion will be progressively occurring during the transitional period in Davao City, septage service will have to be expanded to cover some of the newly developed areas while, at the same time, areas in the urban core will have to be shifted from septage to sewerage service. Ultimately, all the urban areas in 2045 will be serviced by the proposed sewerage system.



Source: IM4Davao Team

**Figure 6.3 Sewerage System Development Plan for Davao City**

**Table 6.2 Development Plan for Wastewater Management**

Planning Term	Projects, Programs and Activities
Short-term (until 2022)	<ul style="list-style-type: none"> <li>• Installation and operation of septage plants</li> <li>• Preparation of sewerage system development (Area A)</li> </ul>
Medium-term (2023-2030)	<ul style="list-style-type: none"> <li>• Construction and operation of Area A sewerage system</li> <li>• Preparation and construction of sewerage systems for Areas B and C</li> <li>• Preparation of sewerage systems for Areas D, E and F</li> </ul>
Long-term (2031-2045)	<ul style="list-style-type: none"> <li>• Construction and operation of sewerage systems for Areas D, E and F</li> </ul>

Source: IM4Davao Team

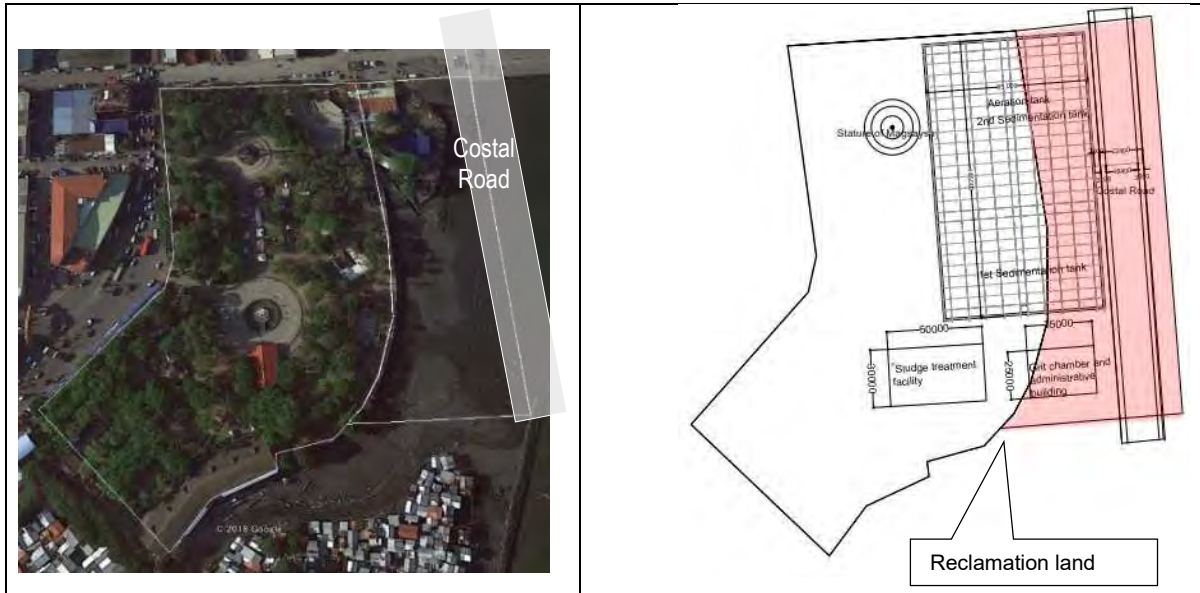
## 6.4 Sewerage System (Phase 1) Project

6.29 Area A covers Poblacion and Agdao districts of the city center. Generally, a suitable location of a sewage treatment plant is where sewage flow using gravity to the treatment point. Therefore, with this limitation, the suitable land for Area A would be in the vicinity of Magsaysay Park or the informal residential area. Installation of the plant in Magsaysay Park would entail providing an open space for the citizens above the sewerage treatment plant. Meanwhile, the detailed design of the Davao City Coastal Road project is currently ongoing, which entails the construction of a causeway road on the seaside in front of the Magsaysay Park. As it turns out, the view from the park to the sea is lost in this plan.

6.30 **Development content:** Construction of a double-layered type of structure with half-underground type sewage treatment plant and interceptor sewer line (7.3 km in total). The plant will serve a population of 370,000 people with a treatment capacity of 100,000 m<sup>3</sup>/day.

6.31 As shown in the Figure 6.4, the sewage treatment plant uses a part of the park lots and the rest uses the space between the coastal road. In the development design, the causeway of the coastal road passes through the sea side of the sewage treatment plant. The rooftop of the sewage treatment plants will be made higher than the coastal road and will become part of the Magsaysay Park. This ensures the citizens a view of the sea from the park.

6.32 **Business plan:** The project entity in the sewage treatment plant is DCWD. DCWD can receive 50% of construction cost from DPWH through the NSSMP. On the other hand, as a project, the structure of the sewage treatment plant is integrated with the coastal road and it also functions as part of the park. Therefore, if the structure is built as a DPWH project (Coastal Road Project and Magsaysay Park Landfill Expansion Project), the project cost burden of DCWD can be reduced by about 25%. Since the coastal road project aims to open in 2022, establishing a business scheme of Magsaysay Park sewage treatment plant is an urgent task. The construction cost of the “Area A” sewage treatment system is estimated at PHP14.7 billion.



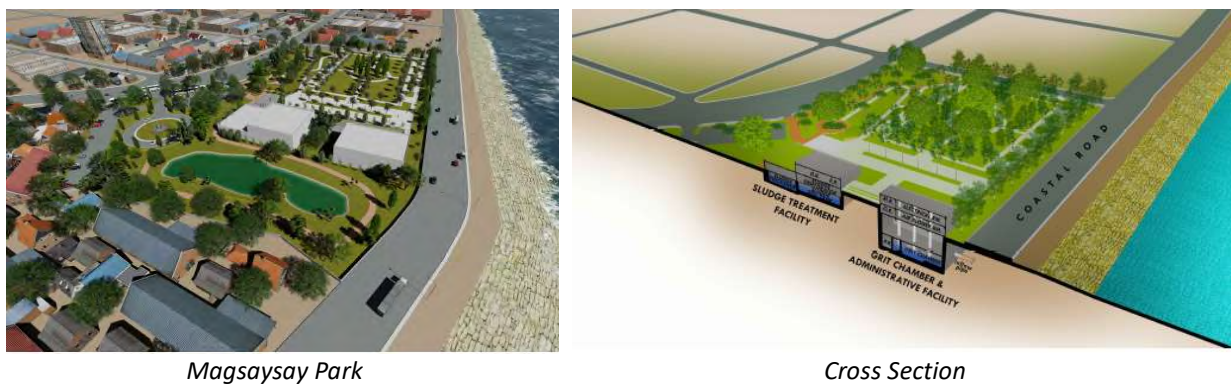
Source: IM4Davao Team

**Figure 6.4 Davao City Coastal Road (left) and Sewerage Plant (right) at Magsaysay Park**



Source: IM4Davao Team

**Figure 6.5 Image of Sewerage Treatment Plant (half underground type)**



Source: IM4Davao Team

**Figure 6.6 Aerial Perspectives of Sewerage Treatment Plant**



## 6.5 Solid Waste Management Plan

### 1) Existing Conditions and Issues

6.33 Davao City has been strengthening street sweeping and continuous waste collection with efforts from its citizens. According to the HIS of the project, cleanliness of the neighborhood scored 49.4% of satisfied and highly satisfied answers. However, it also scored 7.9% of unsatisfied and highly unsatisfied answers. Davao City has also been trying waste source segregation, waste composting at MRFs, 3R (Reduce, Reuse and Recycling) promotion, bio-diesel fuel production from edible oil and the preparation of Waste-to-Energy project in a positive manner in order to reduce the amount of waste to be treated.

6.34 Solid waste collected by CENRO is 68% of the total generated amount of the waste in the city, and the rest of the waste is treated and disposed of by residents themselves. For the purpose of the environment preservation, the collection rate should be increased. Although Davao City is implementing kitchen waste composting by installing MRFs, the MRFs can only treat 1 ton of waste per day. In the meantime, recycling has handled 54 tons per day (6% of the total amount), which has worked as one of main components for the solid waste management system. The recycling system is supported by the informal sector collecting the recyclables.

6.35 Davao City has only one sanitary landfill in Barangay New Carmen. It has started operation since 2010, and the remaining service life of the landfill is supposed to be about 6 years. However, waste collection trucks congest both the areas around and inside the landfill site due to the poor and narrow roads there. To solve the problem, road pavement and widening are necessary. The installation of working space for the trucks are necessary as well. There are also problems such as waste accumulation of 10m high and littering waste all around.

### 2) Development Plan

6.36 According to the 10 year plan of Davao City ENRO<sup>1</sup>, the generated waste in the city will increase from 835 tons per day in 2017 to 1,209 tons per day in 2027. In order to manage the waste, the 10 year plan mentioned to implement the rehabilitation of the current landfill, construct a new landfill, enhance MRF promotion and install a Waste-to-Energy facility in compliance with the NSWMC Resolution No. 669 in 2016<sup>2</sup>.

6.37 While other cities (i.e., in Metro Manila and Metro Cebu) are confronting the shortage of land for landfills, Davao City is already preparing 2 potential sites for sanitary landfills. And the city has secured the budget for MRFs, waste trucks and heavy equipment for landfill work implemented in the fiscal year 2017-18. Solid waste management is treated as a priority in the development policy of the city.

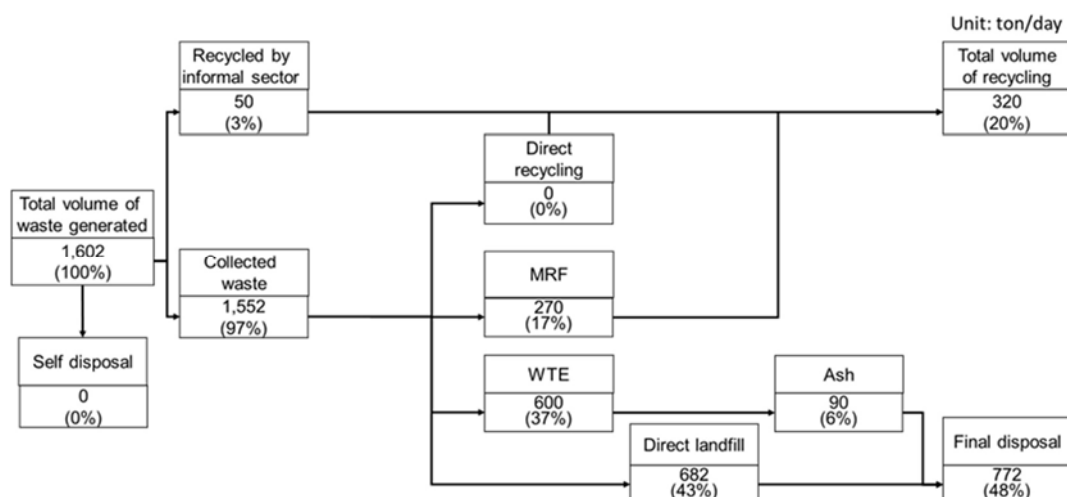
6.38 In the project, solid waste management plan for 2045 is formulated on a long-term perspective. Daily generated waste amount is calculated to be 1,602 in 2045, and almost all the waste will be collected by CENRO. The components of the waste treatment consist of disposal of waste in the current landfill, Waste-to-Energy process and disposal of ash from the Waste-to-Energy facility in a landfill, composting in MRFs and other waste

---

<sup>1</sup> '10-year Integrated Solid Waste Management Plan of Davao City' (2018-2027)

<sup>2</sup> 'Adopting the Guidelines Governing the Establishment and Operation of Waste-to-Energy Technologies for Municipal Solid Wastes'

recycling. (Refer to Figure 6.7)



Source: IM4Davao Team

**Figure 6.7 Projected Waste Stream in 2045 (conservative case)**

6.39 The role of each component depends on the policy, the amount of the investment for the related facilities, the economic rationality and the social acceptability of Davao City. For example, strengthening of MRF function would lead to increase of recycling rate. In the Philippines, there is a policy to install MRFs in all barangays. However, MRFs with a small capacity seem labor-intensive, thus an MRF with a big capacity is necessary in order to treat the 20% of waste generated in the whole city. Direct disposal at a landfill and disposal of ash generated from a Waste-to-Energy facility have a trade-off relationship. The more plants are installed, the less area is necessary for the landfills in a long-term basis.

6.40 In the project, in addition to the components mentioned above, Waste Eco Park is proposed as a center for environmental education for the citizens. In the property, if a Waste-to-Energy facility and an MRF with a big capacity is centralized and environmental and recycling based institutes are located in the same property, the park would have the function of waste segregation, treatment, reuse and recycling at just one place. The park would be also expected to increase the effectiveness of space utilization, which could make waste transfer system simpler and more effective.

6.41 The development plan for SWM has been prepared where sanitary landfill, MRF, WTE and waste eco park are scheduled. Amongst these, Davao City Waste Eco Park is further looked into as one of the IM4Davao priority projects. The environment education and eco park concept has gestated among the Davao City counterparts during the project, particularly influenced by relevant experience during the study tour in Kitakyushu City.

**Table 6.3 Development Plan for Solid Waste Management**

Planning Term	Projects, Programs and Activities
Short-term (until 2022)	<ul style="list-style-type: none"> <li>• A new Integrated SWM Plan (2018-2027)</li> <li>• Rehabilitation of New Carmen Sanitary Landfill Site</li> <li>• New Sanitary Landfill in operation (Phase 1)</li> <li>• MRF Pilot Project: plan, design, procurement, operation (with monitoring) of MRF</li> <li>• Preparation of Davao City Waste Eco Park</li> </ul>
Medium-term (2023-2030)	<ul style="list-style-type: none"> <li>• WTE first plant operation</li> </ul>

Planning Term	Projects, Programs and Activities
	<ul style="list-style-type: none"> <li>• Increase in waste collection rate; 80% up</li> <li>• MRF (middle class capacity) in operation</li> <li>• Operationalization of Davao City Waste Eco Park</li> </ul>
Long-term (2031-2045)	<ul style="list-style-type: none"> <li>• New sanitary landfill site in operation (Phase 2)</li> <li>• WTE second plant in operation (600 t/d)</li> <li>• MRF (middle class capacity, several sites) in operation</li> <li>• Completion of Davao City Waste Eco Park</li> </ul>

Source: IM4Davao Team

## 6.6 Davao City Waste Eco Park Project

6.42 Solid waste management is one of the prioritized policy of Davao City to be an environmental city, which has been strengthened through the cooperation with Kitakyushu City. The latter has provided the enthusiasm and enlightenment through the sharing of knowledge about solid waste management to the citizens. Therefore, the planned Waste Eco Park facility is for the education on solid waste management and for a first-hand experience on the real solid waste treatment process.

6.43 The park can enhance the synergy effect in service provision and technical modification by centralization of waste management related facilities. And the park is designed to implement a more rational and more effective waste transfer plan by networking with New Carmen landfill site located nearby.

6.44 The site for Waste Eco Park is located in Barangay Biao Escuela, which is approximately 2 km from the current New Carmen sanitary landfill. The project has two location sites to acquire: total of 13 hectares (Figure 6.8).

- ◆ Visitor center: it has educational functions and environmental museum for visitors. It can also provide easy-understanding words and show how the solid waste management in Davao City shall be. Educational material and visual aids are provided in similar to that of Kitakyushu Eco Town Center and Environment Museum.
- ◆ Experiment Center: research and development for solid waste management is implemented in cooperation with institutes in the eco park and locally-based universities. There can be cooperation with universities in the Philippines and overseas universities.
- ◆ Ecological garden: it is an open space in the eco park. There are plants and flowers grown using the compost and recycled material.
- ◆ Recycling estate: various kinds of environment-related institutes and recycling institutes are attracted from outside of Davao City and overseas countries. Waste collected in the city are used to be sorted and segregated for their products.
- ◆ Waste-to-Energy facility: Waste is combusted and heat from the combustion is recovered to supply the power needs of the park. This facility is the second Waste-to-Energy facility in the city.
- ◆ Material Recovery Facility: MRF with a big capacity with the latest technology is installed for composting. Rejects from the composting process can be used for the institutes in the recycling estate.
- ◆ Biogas Plant: Half of the waste in Davao City is biodegradable. The waste is used not only in the MRF but in a biogas plant to produce methane gas or other flammable

gases.

- ◆ Parking lot: Parking lot is installed for workers in the park and visitors.
- ◆ Flood control reservoir: Since land development makes the land potential weaker, a flood control reservoir is installed for heavy rains.



Source: IM4Davao Team

**Figure 6.8** Layout Plan of Davao City Waste Eco Park



*Aerial View of Waste Eco Park*



*Spot View of Visitor Center*

Source: IM4Davao Study Team

**Figure 6.9** Development Perspectives of Waste Eco Park

**6.45 Implementation Plan:** The project owner is Davao City that has the land. And participants from private sector are expected to operate various functions in the project. Installation and operation on a PPP scheme will be effective for the project with the Waste-to-Energy Facility, the Material Recovery Facility and the biogas plant. As for the Visitor Center, operation can be outsourced although ownership of the land is retained by the city. The estimated costs to be borne by the city government is PHP220 million, including land development, Visitor Center and Experimental Center and setting up of a Recycling Estate for tenants.

6.46 For the schedule of the project, a conceptual plan and a feasibility study should be conducted first to expound on the project contents and the project scheme, and then land development will start in 2022. The Visitor Center and the Experimental Center will be installed in the beginning of the construction stage as public based facilities. These will aim to be recognized as a comprehensive waste management center in order to enhance the investment from the private sector. In 2030, the waste complex, except the Waste-to-Energy Facility, will be completed.



## 7 EVALUATION, MANAGEMENT AND MONITORING OF DAVAO CITY INFRASTRUCTURE DEVELOPMENT PLAN

### 7.1 Financial Analysis

7.1 Table 7.1 summarizes the list of proposed projects for Davao City, which are programmable for implementation in the short-term (till 2022), mid-term (2023 to 2030) and long term (2031 to 2045). The list contains both the committed/pipeline projects of the national government as well as new projects as proposed by the IM4Davao Team.

**Table 7.1 Davao City Infrastructure Development Plan Projects**

	Short-term (-2022)	Medium-term (2023-2030)	Long-term (2031-2045)
Road *	<ul style="list-style-type: none"> <li>Davao City Bypass Road</li> <li>Davao City Coastal Road</li> <li>Secondary Roads between Bypass Road and Diversion Road</li> <li>Traffic Control Center</li> </ul>	<ul style="list-style-type: none"> <li>Extension of Davao City Diversion Road</li> <li>Davao River Boulevard</li> <li>Secondary Roads to serve newly urbanized areas</li> </ul>	<ul style="list-style-type: none"> <li>Talomo-Calinan Bypass Road</li> <li>Buhangin-Bunawan Bypass Road</li> <li>Secondary Roads to serve newly urbanized areas</li> </ul>
Public Transport	<ul style="list-style-type: none"> <li>Public Transport Modernization (trunk bus system)</li> <li>Construction of Mass Transit Line Phase 1 (Talomo – JP Laurel, 15 km)</li> </ul>	<ul style="list-style-type: none"> <li>Construction of Mass Transit Line Phase 2 (Toril ~6.6 km)</li> </ul>	<ul style="list-style-type: none"> <li>Construction of Mass Transit Branch Lines (Airport to Mudiang St., Davao Riverside to Davao Central St., Bukidnon Road to Mintal) depending on demand</li> </ul>
Gateways	<ul style="list-style-type: none"> <li>Improvement of Sasa Port facilities and equipment</li> <li>Extension of taxiway and existing terminal at Davao International Airport</li> </ul>	<ul style="list-style-type: none"> <li>Construction of Second Terminal at Davao International Airport</li> </ul>	<ul style="list-style-type: none"> <li>Preparation of a Second Regional Airport</li> </ul>
Water Supply	<ul style="list-style-type: none"> <li>Commencement of surface water supply from Tamungan Weir to most of DCWD service areas</li> <li>Establishment of SCADA system for all WSS in DCWD</li> <li>DMA establishment and NRW reduction management including leakage detection</li> <li>Capacity building and training for NRW reduction management</li> </ul>	<ul style="list-style-type: none"> <li>Expansion of the Rural Water Supply system for BAWASAs and associations in Barangays such as drilling well, construction of the elevated water tank for distribution and provision of the distribution pipe materials</li> <li>Capacity building and training for rural water supply system management</li> </ul>	<ul style="list-style-type: none"> <li>Development of new water sources, such as surface water and deep wells, for future sustainable water supply system.</li> <li>Expansion of the water supply system to the unserved areas in order to increase the ratio of population served by up to 75%</li> </ul>
Wastewater Management	<ul style="list-style-type: none"> <li>Installation and operation of septage plants</li> <li>Preparation for the sewerage system project</li> </ul>	<ul style="list-style-type: none"> <li>Construction and operation of Area A sewerage system</li> <li>Preparation and construction of Area B and Area C sewerage systems</li> <li>Preparation of Area D, E and F sewerage system</li> </ul>	<ul style="list-style-type: none"> <li>Construction and operation of the rest of sewerage systems (D,E,F)</li> </ul>
Solid Waste Management	<ul style="list-style-type: none"> <li>A new Integrated SWM Plan (2018-2027)</li> <li>Rehabilitation of New Carmen Sanitary Landfill Site</li> <li>New Sanitary Landfill in operation (Phase I)</li> <li>MRF pilot plant project: Plan / Design / Procurement / Operation (with Monitoring) of MRF</li> <li>Preparation of Davao City Waste Eco Park</li> </ul>	<ul style="list-style-type: none"> <li>WTE first plant operation</li> <li>Increase in waste collection rate; 80% up</li> <li>MRF (middle class capacity) in operation</li> <li>Operationalization of Davao City Waste Eco Park</li> </ul>	<ul style="list-style-type: none"> <li>New Sanitary Landfill in operation (Phase II)</li> <li>WTE second plant operation (600 t/d)</li> <li>MRFs (middle class capacity, several sites) in operation</li> <li>Completion of Davao City Waste Eco Park</li> </ul>
Industry Development Support	<ul style="list-style-type: none"> <li>Davao Agriculture Trading Center/Davao Food Complex</li> <li>IT Parks/Centers</li> <li>Little Tokyo</li> <li>Kadayawan Cultural Village</li> </ul>		

Note: \* excluding regional/intercity highways  
Source: IM4Davao Team

7.2 The schedule of the investment requirements of the above list is summarized in Table 7.2. It is evident that the financing framework is a combination of national government appropriation, city government appropriation, funding from corporate budgets of the state-owned enterprises and PPP sources. In the program, the largest investment source will be from the national government particularly for transport infrastructure. The city government financing will be mainly tapped for projects on solid waste management, traffic management and industry development support (such as for tourism). DCWD is expected to invest on water supply and wastewater management within their financial capability based on collected revenues. NDC, on the other hand, has offered their land as equity for a joint-venture for an agro-processing estate. Various PPP arrangements will become a conduit for private sector investment in infrastructure development such as bulk water supply, solid waste management, railway and airport and seaport gateways.

**Table 7.2 Summary of Sources of Investment Program**

Period of Implementation	Summary of Investment Requirements (PHP million)					
	Total	National Government	Davao City Government	DCWD and other SOEs	Donor Grant	PPP/JVA/PS
2018-2022	98,397	19,024	1,806	3,699	1,090	72,779
2023-2030	87,527	50,282	377	23,672	2,250	10,947
2031-2045	109,100	57,923	0	25,864	0	25,313
TOTAL	295,024	127,228	2,183	53,235	3,340	109,038

Source: IM4Davao Team

7.3 The financial envelop which combines the national budget with Davao City budget during the planning period until 2045 is estimated in Table 7.3.

7.4 The Duterte Administration is undertaking the “Build, Build, Build Program” or a focus on infrastructure investment. The government has targeted an increase in infrastructure spending from 5.4% in 2017 to 10% of GDP by 2030. To estimate the national budget envelop, an assumption of 2.3% pro-rated share of Region XI on the infrastructure budget based on the allocation for fiscal year 2018 is used.

7.5 The Davao City’s Development Fund accounts for around 30% of the city budget including IRA (Davao City’s share: 0.77%) and local taxes. The Study Team assumes 40% of the development fund will be used for infrastructure.

**Table 7.3 Estimated Financing Envelop of the National Government and Davao City**

Period of Implementation	Estimated Financing Envelop (PHP million)		
	Total	National Government	Davao City Government
2018-2022	135,955	131,872	4,083
2023-2030	297,157	288,619	8,538
2031-2045	1,087,584	1,065,145	22,439
TOTAL	1,520,696	1,485,636	35,060

Source: IM4Davao Team

7.6 The comparison between the investment requirement and the financing envelop reveals that there are adequate resources from the national government budget as well as the city government budget from 2018 to 2045. With regards to DCWD resources, its retained earnings of about PHP5 billion will be adequate to support financing of the water supply projects, but it is not certain, without in-depth financial analysis, if it will have

enough resources to capitalize 50% of the sewerage project. Private investments are assumed to be easily mobilized if the projects are financially viable or if structured in a bankable manner.

## 7.2 Economic Analysis

7.7 The key principle followed in the preparation of the Davao City Infrastructure Development Plan till 2045 is the integration of the planning for economic and urban development, and infrastructure facilities. Both are inextricably linked; infrastructure facilities can catalyze economic development or can steer urban development towards the desired strategic direction. On the other hand, infrastructure investments should be carefully prioritized and timed so that the economic benefits from the use of scarce resources are optimum.

7.8 This study has at best done demand analysis or determined the need for the facilities on the basis of basic service standard, environment protection or climate change adaptation. Without the conduct of project specific feasibility analysis, however, the project team is not in the position to provide quantitative estimates in terms of the economic or financial rates of return. Therefore, the discussion here focuses on the rationale for the interventions based on logical responses to needs or catalysts to development targets.

7.9 **Transport Projects.** The city is growing rapidly but fortunately still has time to plan and execute for a more organized and synergistic development. The transportation projects are designed to be used as the catalyst to transform the present monocentric growth trend to a polycentric growth pattern, thereby reinforcing the city's structure plan. The recommendation is to support the development of new urban centers with differentiated core functions, linked by an integrated transportation network and public transport system. Conventional economic benefits of transportation projects from vehicle operating cost savings, travel time savings will be complemented by multiplier effects of enabled and improved economic activities in the city as well as in the regional economy. The impact of the introduction of a higher capacity public transportation such as the rail-based service is known to have positive economic benefits but the project will have to be carefully weighed on an environmental standpoint as well during the project feasibility stage.

7.10 **Water Supply Projects.** The biggest investment in the sector is the new bulk water supply project under a joint venture arrangement between DCWD and a private company. Its major benefits include: protection of the long-term security of Davao's groundwater sources; savings on power cost reduction of well operations; improved water quality and expansion of piped water supply. The NRW management project together with the SCADA system will provide tangible benefits from realized revenues from recovered water as well as environment benefits from minimizing water leakage.

7.11 **Wastewater Management Projects.** The proposed projects are intended to address the worsening water pollution and thus threats to health conditions by water-borne disease among the citizens. Septage management will be an interim solution until the establishment of a sewerage system, which is considered to be the gold standard for wastewater management. The septage project is both highly economically and financially viable. The FS report for Davao City indicates 76% of EIRR and 20% of FIRR, respectively. There is still no estimate of the economic returns of the particular sewerage project. However, based on experience of similar projects globally, the ratio of economic

benefits to cost is as high as 3:1. Sewerage systems are the only means to reduce pollution load by as much as 90%.

**7.12 Solid Waste Management Projects.** Davao City is dubbed as the city of cleanliness attesting to its continuous effort of orderly garbage disposal and collection. This sector has many opportunities to enjoy the synergy effect between attracting investments for energy-saving and environmentally sound projects, and enhancing solid waste management technologies and services. Investment conduits will be for the recycling estate, biodiesel fuel plant, biogas plant, MRF and WTE plant. These projects can greatly contribute to the city's environment while becoming an important segment in the city's economy.

**7.13 Projects for Fostering Local Economy and Industry.** Currently, the agriculture sector's gross value added is the lowest compared to other economic sectors yet it employs 243 thousand workers or 36% of the city's labor population. It has vast unrealized potentials that can be tapped with critical assistance to improve productivity, value addition and market access. The positive impact of value addition in the city's economy, through agro-industry investment, is particularly shown in agribusinesses such as the cacao and chocolate processing, cardava banana flour processing, abaca processing and other food processing.

**7.14** The tourism sector has contributed to the services sector's GVA of 51%. Davao intends to attract more quality tourists to increase tourist receipts. It also intends to develop tourism circuits that showcase the city's uniqueness from the islands to highlands featuring nature, culture and history.

### **7.3 Strategic Environmental Assessment**

**7.15** Strategic Environmental Assessment (SEA) has been utilized worldwide in recent years. Broadly, the rationale of SEA is to ensure that environmental considerations are taken into account at the onset of any planning and provide information to the higher levels of decision-making, including policies, plans and programs. In the Philippines, SEA has been attempted to be included in the draft bill on "An Act to Establish the Philippine Environmental Assessment System". The draft bill is intended to cover both SEA for policies, plans and programs and EIA for projects.

**7.16** SEA has been applied in the planning process of the IM4Davao Project. The process requires a number of steps that are organized sequentially and tailored by sector purpose. Under the IM4 Davao Project, there were several consultations with various stakeholders from the LGU, including the council representatives, NEDA XI, NEDA CO, and representatives from various national agencies in city.

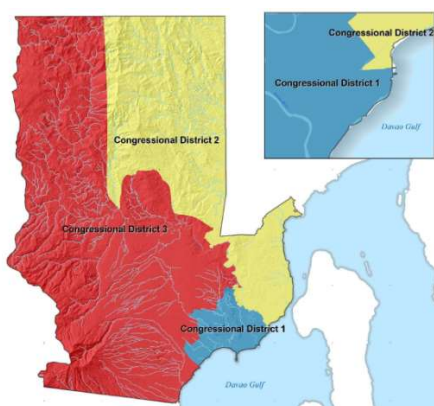
**7.17** Consultations took place not only with the decision makers, but also with the direct beneficiaries and affected citizens. It was through the local consultation meetings with local leaders and residents at the congressional districts that feedbacks, comments, and concerns regarding the IM4Davao projects and programs were solicited. The results of the meetings are summarized in Table 7.4 and Figure 7.1 shows the boundary of congressional districts of the city.

**7.18** After reviewing the meeting records, the IM4Davao projects and programs are broadly divided into citywide concerns and local concerns. More precisely, the participants showed similar comments and concerns about the Davao City Mass Transit Line, solid waste management related projects and sewerage system while they revealed local

issues and concerns on road projects and water supply system. Currently, water supply development is an urgent local agenda. DCWD’s piped water service reaches all the barangays in District 1 but the service is limited in District 2, even in the urbanized areas. Some local representatives in the district opted to collaborate with other water suppliers in tapping water from the Davao River. In District 3, expansion of the piped water service was also a keen concern among the local representatives. To cite the urgency of the situation, the example of Tugbok District was mentioned where acute urbanization is occurring but 40% of the district barangays do not have access to water.

7.19 Recognizing the importance of the Indigenous People (IP) and their ancestral lands in Davao City, several consultation meetings were held with the tribes of Matigsalog, Obu-Manuvu, Bagobo-Klata, Bagobo Tagabawa, Ata and Kagan. The meetings recorded important information of the IP groups’ conditions, problems and challenges.

7.20 Most of the IP groups revealed similar crucial issues such as inconvenient access to water, poor farm to market roads, no electricity, poor access to hospitals and medical services and weak educational support. The Bagobo-Klata tribe, living near urban areas in the districts of Talomo, Tugbaok and Calinan, raised land issues such as encroachment of large-scale banana plantation to the ancestral domain. The Kagan tribe, living along the Davao River and the Lipadas River, mentioned their experiences with floods, riverbank and coastal erosion and decreased fish catch volumes.



**Figure 7.1 Boundary of Congressional Districts**



**Figure 7.2 Meeting Photos**

**Table 7.4 Summary of Congressional District Consultation Meetings**

Projects and Programs	Feedback and Comments	Emerging Issues and Concerns
Extension of Davao City Diversion Road	<ul style="list-style-type: none"> <li>▪ In favor</li> <li>▪ Good for traffic decongestion</li> <li>▪ Provide alternative route</li> </ul>	<ul style="list-style-type: none"> <li>▪ Relocation site of the affected families</li> <li>▪ Many trees will be cut</li> </ul>
Buhangin - Bunawan Bypass Road (District 2 only)	<ul style="list-style-type: none"> <li>▪ Expedite</li> <li>▪ Good because it will ease up traffic on the main highway</li> </ul>	<ul style="list-style-type: none"> <li>▪ Right of way</li> <li>▪ Affected household needs relocation site and structural support</li> <li>▪ Informal settlers</li> </ul>
Calinan – Panabo Road (District 3 only)	<ul style="list-style-type: none"> <li>▪ In favor</li> <li>▪ Can easily go to one’s destination</li> </ul>	<ul style="list-style-type: none"> <li>▪ Water source can be affected</li> <li>▪ Relocation site of the affected families</li> <li>▪ Many trees will be cut</li> </ul>
Davao City Mass Transit Line	<ul style="list-style-type: none"> <li>▪ Better and more useful than jeepneys</li> <li>▪ Not Necessary</li> </ul>	<ul style="list-style-type: none"> <li>▪ Involvement of LTFRB</li> <li>▪ Capacity of the energy sector to provide a sustainable supply of energy</li> <li>▪ Displacement of driver’s livelihood due to transport modernization</li> </ul>



Projects and Programs	Feedback and Comments	Emerging Issues and Concerns
Rehabilitation of New Carmen Landfill	<ul style="list-style-type: none"> <li>▪ Urgent</li> <li>▪ In favor of orderly garbage disposal</li> <li>▪ Need because the existing landfill is full</li> </ul>	<ul style="list-style-type: none"> <li>▪ Might affect health if the project delayed</li> <li>▪ No livelihood of scavengers</li> <li>▪ Strict implementation of segregation</li> </ul>
New Sanitary Landfill	<ul style="list-style-type: none"> <li>▪ Necessary</li> <li>▪ In favor</li> <li>▪ Develop the area with road</li> </ul>	<ul style="list-style-type: none"> <li>▪ Location</li> <li>▪ Air pollution (odor)</li> <li>▪ Health Issue of the residents nearby</li> <li>▪ Leachate into bodies of water</li> <li>▪ Should accommodate until 20 years</li> </ul>
SWM Modernization	<ul style="list-style-type: none"> <li>▪ Currently lack of implementation with no enforcer</li> <li>▪ In favor</li> </ul>	<ul style="list-style-type: none"> <li>▪ Implementation of the law</li> <li>▪ No proper segregation of wastes</li> <li>▪ Medical waste</li> </ul>
Waste to Energy	<ul style="list-style-type: none"> <li>▪ Need a machine to segregate our waste to clean energy</li> <li>▪ A big help to people</li> <li>▪ This facility must be available in a developed city like Davao City</li> </ul>	<ul style="list-style-type: none"> <li>▪ Concern on cost of the project</li> <li>▪ Odor/fluid</li> <li>▪ Right process</li> <li>▪ Waste reduction for landfill</li> <li>▪ Proper monitoring</li> </ul>
Davao Riverside Boulevard and River Improvement	<ul style="list-style-type: none"> <li>▪ Dredging of silted and shallow river</li> <li>▪ Building of dikes</li> <li>▪ Beautification of the city</li> <li>▪ Tree planting along the river banks</li> </ul>	<ul style="list-style-type: none"> <li>▪ Informal Settlers Resettlement</li> </ul>
Sewerage Plant	<ul style="list-style-type: none"> <li>▪ Start Immediately</li> <li>▪ Expensive</li> <li>▪ Need more studies and public information</li> <li>▪ In favor</li> <li>▪ Help in sustaining cleanliness in our environment</li> <li>▪ the program is good for the betterment of the people's health and animals</li> </ul>	<ul style="list-style-type: none"> <li>▪ Willingness of the people to pay the services/utility.</li> <li>▪ Sea level rise; the proposed area of the sewerage plant is below sea level.</li> <li>▪ Need to locate the plant far from houses</li> </ul>
Investment for Sustainable Water Supply	<ul style="list-style-type: none"> <li>▪ In favor</li> <li>▪ As soon as possible</li> <li>▪ Can help many people</li> <li>▪ Currently slow water supply</li> <li>▪ Not enough supply of water</li> <li>▪ Regular water interruptions</li> </ul>	<ul style="list-style-type: none"> <li>▪ Improved access and distribution of potable water</li> <li>▪ Strengthening BAWASA (capacity building and funding)</li> <li>▪ Sustainability of water supply system</li> <li>▪ Expansion of plantations</li> </ul>

Note: The number of local representatives and dates of the consultation meetings: District 1 - 49 persons on 16 November, 2017; District 2 - 44 persons on 10 November 2017; District 3 - 54 persons on 14 November 2017  
 Source: IM4Davao Team

## 7.4 Environment Management Entities

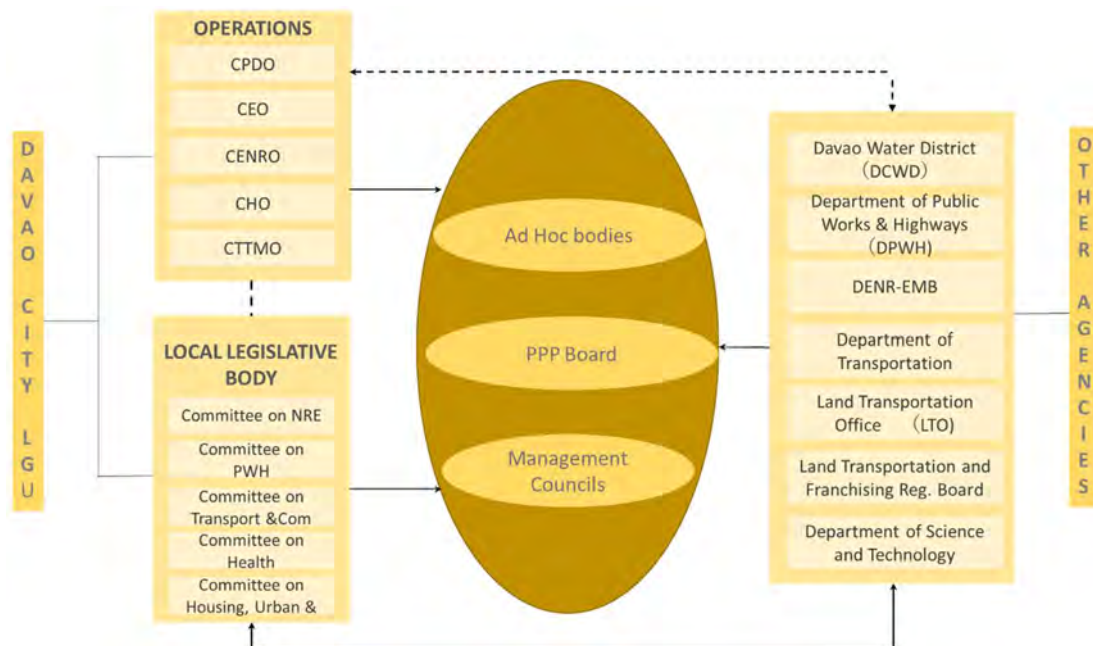
7.21 For any and all infrastructure undertakings in the city, the function for addressing environment issues in the city rests with the City Government of Davao, the national government agencies charged with protecting the environment, the project implementing agencies and other relevant bodies. These entities, depending on the type of project, would converge as part of the ad hoc bodies, the PPP board and management councils to, among others, manage environmental concerns related to projects to be implemented or being implemented (Figure 7.3). Hence, the identification of the project stakeholders would depend on the type of planned infrastructure project.

7.22 In many cases, limited expertise and capacity lead to the delay of consensus building and decision for necessary environment management action. The consequence of the delay only further exacerbates the environmental issues. It is the project team's observation that the septage management is one of such case in Davao City<sup>1</sup>.

<sup>1</sup> The city government issued an ordinance on septage and sewerage management system in 2010 and approved the Implementing Rules and Regulations (IRR) in 2013. DCWD conducted the FS on septage management with

7.23 Social consideration is another aspect for critical attention of any infrastructure project since most of the development projects in Davao City must deal with resettlement issues, particularly of the informal settlers. The city government has created the Infrastructure Monitoring Advisory Group (IMAG), which requires all affected barangays to be part of the IMAG when addressing issues on the right-of-way and informal settlers during project implementation. A practical IMAG operation is desirable.

7.24 For effective environment management, capacity development of individual organizations and close coordination among them are highly necessary.



Source: IM4Davao Team

**Figure 7.3 Environment Management Entities in Davao City**

## 7.5 Environment Management Plan

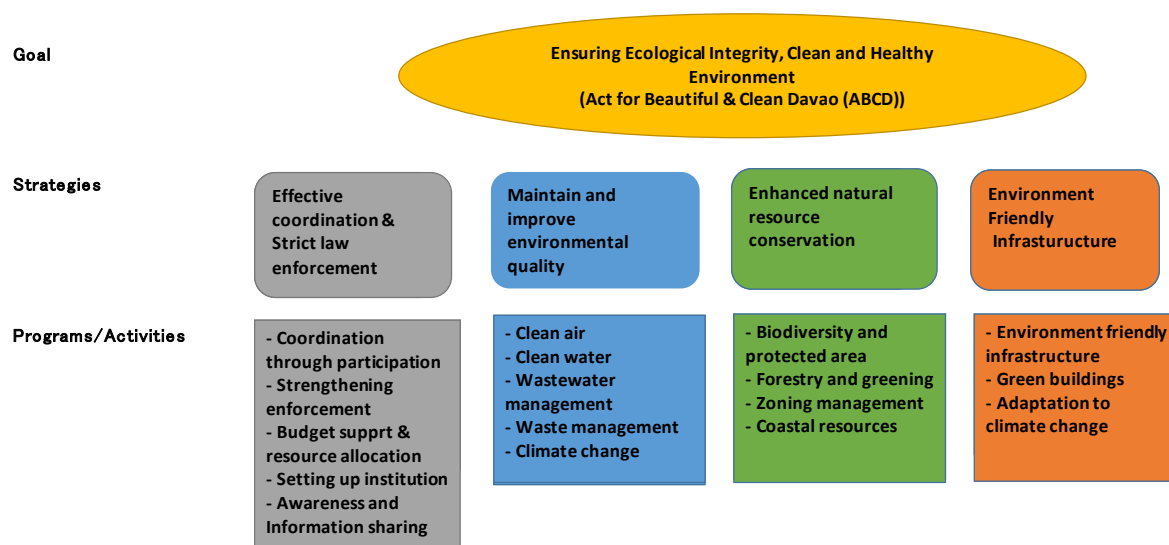
7.25 The environment management plan for Davao City is structured with the goal to 'ensure ecological integrity, clean and healthy environment'. The four strategies of the plan are: (i) the effective coordination and strict law enforcement, (ii) maintaining and improving environmental quality, (iii) enhancing natural resource conservation, and (iv) environment friendly infrastructure. There are various programs and activities proposed under these strategies as shown in Figure 7.4. The prioritized programs/activities are listed in Table 7.5.

7.26 One institutional approach is to guide all public and private investments for urban development towards green development by way of a green infrastructure code and a green building code using green technologies. A green infrastructure code may include permeable paving systems on road sidewalk and ground car parking, greenery shaded bus/jeepney stops and any infrastructure which must be designed with planting. A green building code may encourage any public buildings and large-scale private buildings to use green building designs in compliance with the BERDE and/or LEED<sup>2</sup> as well as other

technical assistance from the USAID in 2013 and prepared the draft MOA. However, the City Council Committee on Environment and Natural Resource challenged the draft MOA instead of approving it in 2017.

<sup>2</sup> BERDE (Building for Ecologically Responsive Design Excellence) is developed and managed by the Philippine Breen Building Council while LEED (Leadership in Energy and Environment Design) is by the US Green Building

international standards. The adoption of a green infrastructure code and building code, following standards that are already in place, is recommended for Davao City in the form of local ordinances.



Source: IM4Davao Team

**Figure 7.4 Environmental Management Plan for Davao City**

**Table 7.5 Priority Programs/Activities with Timeframe**

Programs/activities	Implementation Timeframe
<b>1. Effective coordination and strict law enforcement</b>	
♦ Facilitating detailed GIS mapping to clarify the zoning boundary and present land use	Short-term and continuing
♦ Mobilizing non-government human resources as guards on environment	Short-term and continuing
♦ Approving and implementing the Green Infrastructure Ordinance and the Green Building Ordinance	Short-term and continuing
♦ Setting up Environment Museum	Short-term
<b>2. Maintaining and improving environmental quality</b>	
♦ Collecting air and water pollution source information and computerizing to electronic inventory	Short-term
♦ Good maintenance of the air monitoring equipment and increasing the number of air monitoring station	Short-term
♦ Construction of sewerage treatment system and septage treatment system	Short-term
♦ Construction of waste management facility	Short-term
<b>3. Enhanced natural resource conservation</b>	
♦ Strengthening enforcement such as increasing forest guards	Short-term
♦ Expansion of the national greening program	Short-term and long-term
♦ Clarifying the border of area and zoning on GIS map	Short-term
♦ Establish forest land use plan	Long-term
<b>4. Environment Friendly Infrastructure</b>	
♦ Implementing environmental management plan in project construction and operation stage	Short-term and long-term
♦ Monitoring environmental performance of buildings	Long-term

Source: IM4Davao Team

## 7.6 Monitoring Plan

7.27 The IM4Davao Development Plan will be periodically monitored every 4 to 5 years by a joint monitoring team of NEDA XI and Davao City, e.g. in the target year and its

intermediate years of 2022 (short-term target year), 2026, 2030 (medium-term target year), 2035, 2040 and 2045 (long-term target year).

7.28 The monitoring will use the plan–do–check–act cycle (the PDCA cycle) which is a four–step model commonly used in business to provide a helpful framework for thinking about the interactive nature of planning, implementation, monitoring and evaluation, as well as plan updating and revisions. Just as a circle has no end, the PDCA cycle should be repeated periodically for continuous performance improvement and capability enhancement.

7.29 In the PDCA cycle, ‘check’ will be done in terms of project outputs and project outcomes. Project outputs will be gauged from various aspects of project implementation and operation such as the magnitude of development including land use transformation, infrastructure provision and its service delivery, affected and/or benefitted people, and affected natural environment. Project outcomes will be assessed from a set of performance indicators (refer to Table 7.6).

7.30 In the PDCA cycle, ‘act’ will be duly set after the process of ‘check’. On the periodical monitoring occasions, the IM4Davao Development Plan will be reviewed to be a more plausible plan. Since infrastructure project implementation is often hampered by the issues of ROW and resettlement, funding and technical matters during construction and operation, reviewing points may include more socially acceptable and environmentally sustainable infrastructure planning, reallocation of financial sources and re-arrangement of project implementation bodies among public and private sectors and use of external resource/assistance.

**Table 7.6 Monitoring Framework for Project Checking**

Sector	Project Outputs	Project Outcomes (Performance Indicators)
Urban Development / Urban Land Use	<ul style="list-style-type: none"> <li>◆ Land use transformation in compliance with the urban land use plan</li> <li>◆ Population change by barangay</li> <li>◆ New buildings by type</li> </ul>	<ul style="list-style-type: none"> <li>◆ A poly-centric urban structure</li> <li>◆ Disaster resilient urban areas such as extent of flood prone areas</li> </ul>
Industry, Business and Investment	<ul style="list-style-type: none"> <li>◆ Progress of IM4Davao Projects</li> <li>◆ Development of industrial, commercial and business areas</li> </ul>	<ul style="list-style-type: none"> <li>◆ New employment opportunities by large industries</li> <li>◆ New investments</li> <li>◆ Inbound tourists to Davao City</li> </ul>
Transport	<ul style="list-style-type: none"> <li>◆ Progress of IM4Davao Projects</li> </ul>	<ul style="list-style-type: none"> <li>◆ Average vehicular travel speed</li> <li>◆ Road traffic accidents</li> <li>◆ Emission amounts from transport fleets</li> </ul>
Water Supply	<ul style="list-style-type: none"> <li>◆ Progress of IM4Davao Projects</li> </ul>	<ul style="list-style-type: none"> <li>◆ Coverage ratio of piped water</li> <li>◆ Non-revenue water ratio</li> <li>◆ Drinking water quality</li> </ul>
Wastewater Management	<ul style="list-style-type: none"> <li>◆ Progress of IM4Davao Projects</li> </ul>	<ul style="list-style-type: none"> <li>◆ River and coastal water quality</li> <li>◆ Patients of water related diseases</li> </ul>
Solid Waste Management	<ul style="list-style-type: none"> <li>◆ Progress of IM4Davao Projects</li> </ul>	<ul style="list-style-type: none"> <li>◆ Solid waste collection and segregation rates</li> <li>◆ Solid waste recycling rate</li> </ul>
Environmental Management	<ul style="list-style-type: none"> <li>◆ Progress of IM4Davao Projects</li> </ul>	<ul style="list-style-type: none"> <li>◆ Urban green coverage (infrastructure and buildings)</li> <li>◆ Air quality</li> </ul>

Source: IM4Davao Team

## 8 CAPACITY DEVELOPMENT

### 8.1 Needs and Gaps

#### 1) CPDO

8.1 The 1991 Local Government Code was a major step towards decentralization in the Philippines. Section 20(c) of the Code mandates each local government unit (LGU) to prepare a Comprehensive Land Use Plan (CLUP) to be enacted through a zoning ordinance. Sections 106 and 109 of the Code also mandate the preparation of a Comprehensive Development Plan (CDP) and its corresponding investment plans. These plans are expected to influence public and private sector investments that will contribute to sustainable socioeconomic development in the LGUs.

8.2 The City Planning and Development Office (CPDO) serves as the secretariat for the Legislative Council (that oversees the CLUP) and the Local Development Council (that oversees the CDP) and is tasked to perform all related development planning matters and coordinate planning processes.

8.3 Given its functions, the following are among the major capacity development needs and gaps of CPDO which were identified by the project:

- ◆ CPDO personnel possess the required basic technical capacity in planning, project evaluation and monitoring, GIS, etc., but with the emerging development and rapid changes in the development environment of the city (e.g., rapid population growth and urbanization), there is a need to upgrade their planning skills and knowledge to match the emerging demands and needs of the city.
- ◆ The lack of funding affects sustainable participatory approaches as mandated under the Code as well as the data collection and processing to update their respective plans.
- ◆ The lack of human resources pose some challenges to the CPDO. These include slow progress of work, suspension of project works, and contract time extension that result in increased costs of projects.
- ◆ Coordination with other sectoral, regional and national agencies also needs to be strengthened to allow sufficient exchange of data, ideas and expertise in the implementation of projects and programs.
- ◆ Despite its fiscal power to source out funds, the city is unable to enhance or is reluctant to explore potentials and opportunities to collaborate with the private sector in infrastructure development. As a result, the city has yet to swiftly act on the increasing number of unsolicited proposals it receives.

#### 2) Other Offices of Davao City Government

8.4 Some 19 officers from 8 offices and divisions of the city government participated in the capacity development assessment survey conducted by the IM4Davao project in March 2017. They made a self-assessment of their capabilities in various planning subjects to be used during the project (Table 8.1). After the self-assessment and related discussions, the capacity building assistance needed to improve the offices/division's capability for infrastructure planning, implementation and management were identified. They included the following:



- ◆ Technology upgrading/ updating (crops and fisheries, soils and water, agribusiness skills enhancement, ICT capacity upgrading, management);
- ◆ Provision of GIS equipment and technologies, IEC materials and training on GIS and data processing;
- ◆ Technical training for videographers, editors and writers;
- ◆ Marketing data analysis and interpretation, investment promotion; and
- ◆ Project monitoring and evaluation.

8.5 The respondents also suggested for personnel to be given fair salaries according to the functions they are presently performing, establishment of new office building and equipment, procurement of motor vehicles, and hiring of skilled personnel.

**Table 8.1 Self-Assessment of Capability for Various Planning Subjects, Davao City**

Subject	CPDO	CTTMO	CEO	DCIPC	CDRRMO	CIO	CAO	BCCAD
Coordination of city, provincial and regional planning	2	2	3	3	2	2	2	3
Land Use Planning	2	2	3	3	2	2	4	2
Transport Planning	2	2	3	5	3	2	2	2
Road Network Planning and Design	3	2	3	5	4	2	3	2
Water Supply/ Wastewater	3	2	3	5	3	2	4	2
Solid Waste Management	2	2	3	5	3	2	4	1
Climate Change Adaptation and Disaster Risk Management	2	2	3	5	2	2	2	1
Environmental Management	2	2	3	4	2	2	4	1
Social Development Planning	2	2	3	4	3	2	3	2
Local Economic Development	2	2	3	3	3	2	2	2
Financial Management	3	2	3	3	3	3	2	2
Financing Strategy and Structuring	2	2	3	3	3	2	3	2
Program/ Project Implementation Strategies	3	2	3	3	2	2	3	2
Project Management	2	2	3	2	2	3	3	2
Investment Promotion	2	2	3	2	3	2	3	2
Program/ Project Monitoring	2	2	3	2	3	2	3	2

Note: Capability ranking where 1 – very high, 2- high, 3 – fair, 4 – low, 5 – very low

CTTMO: City Transport and Traffic Management Office

CEO: City Engineer's Office

DCIPC: Davao City Investment Promotion Center

CDRRMO: City Disaster Risk Reduction and Management Office

CIO: City Information Office

CAO: City Agriculturist's Office

BCCAD: Barangay and Cultural Communities Affairs Division

Source: IM4Davao Team based on the Capacity Development Assessment Survey

### 3) NEDA RO-XI and NEDA CO

8.6 **NEDA RO-XI.** As Davao Region's premier socioeconomic and physical planning agency, NEDA XI provides the regional agencies, LGUs, business sector, and the general public an excellent and knowledge-driven service in the areas of planning and policy formulation, project development, investment programming and budgeting, planning and project monitoring and evaluation, and development research in the pursuit of attaining inclusive growth and development in the region.

8.7 During the capacity development assessment survey in March 2017, the respondents from NEDA XI clarified their planning system which was integrated in the financial resource management and budgeting system and other development

management functions. However, the planning system does not include infrastructure demand forecasting and technical assessment when proposing infrastructure projects.

8.8 Regarding the necessary capacity building assistance to further improve NEDA XI's ability for infrastructure planning, implementation and management, the following areas were suggested:

- ◆ Transport planning including integrated system management, road network planning and design, and railways;
- ◆ Water supply/wastewater management;
- ◆ Solid waste management;
- ◆ Value engineering and value analysis (VE/VA); and
- ◆ Geographic information system (GIS).

8.9 **NEDA CO.** The NEDA Central Office serves as the secretariat for preparing and overseeing implementation of the Philippine Development Plan (PDP 2017-2022) and assists the Infrastructure Committee and the Investment Coordination Committee in the approvals and budgeting of national infrastructure projects.

8.10 During the capacity development assessment survey, the IM4Davao Team recognized that several capacity development activities have been conducted to enhance the capacity of the Infrastructure Staff. They included the on-the-job capacity building on VE/VA of infrastructure projects, the training workshops on the Revised Implementing Rules and Regulations of Republic Act No. 9184 and other related matters such as TOR preparation, criteria formulation, contract review, price escalation and investment appraisal. There was also ADB's TA on Strengthening Evaluation and Fiscal Cost Management of PPP, which was concluded in December 2017. Every project FS under the NEDA-administered FS fund involves some Infrastructure Staff as counterpart personnel for capacity development and transfer of technology.

8.11 Under such situation, the Infrastructure Staff respondents suggested the following capacity building needs:

- ◆ Urban and regional planning;
- ◆ Training and workshops on prioritization of infrastructure projects such as wastewater and solid waste management;
- ◆ Forecasting of investment requirements for transport infrastructure projects; and
- ◆ Implementation-level and operational level strategies, local-level planning and implementation.

#### **4) Regional Government Agencies and Local Agencies in Davao City**

8.12 The same capacity development assessment survey was conducted among regional government agencies in Davao City and DCWD at the early part of the project. Most of the agencies rated their capacity level on all subjects specified as average, except for railways which was rated low.

8.13 Except for DENR and DCWD, other agencies opted not to provide any response regarding their capacity development needs. DENR mentioned 'FS preparation', 'VE/VA' and 'investment promotion' as their capacity development needs while DCWD respondents said they needed training on some engineering aspects for their better understanding and improved operation such as construction management, energy

efficiency design, hydraulic and leak test procedure and safety, and strategic planning on sanitation and water supply.

## 8.2 Capacity Development Activities

### 1) Context of the Project's Capacity Development Activities

8.14 The capacity development activities under this project were pursued guided by the existing policy reform agenda of the government in optimizing investments in major public infrastructure projects and programs in the country.

8.15 In this context and guided by the results of the capacity assessment survey, the capacity development activities were designed. The design envisioned to complement the "learning-by-doing" approach and support specific technical requirements of the counterpart agencies in the process of infrastructure planning, implementation and management.

### 2) Sector-Focused Capacity Development Activities

8.16 In this project, 10 sector-focused capacity building activities were conducted (Table 8.2). These are briefly described as follows:

**Table 8.2 Summary of Activities of Sector-Focused Capacity Development**

Activity Title/Topics	Date Undertaken	Target Agencies	Number of Participants per Meeting
(a) Value Engineering/Value Analysis (VE/VA)	Mar 15 & Sep 11, 2017	DC/NEDA	20, 15
(b) Transport Demand and Network Assignment in Identifying New Transport Projects	Apr 26 & 28, 2017	CTTMO	12
	Oct 25, 2017	NEDA-CO	14
(c) Domestic Waste Water Management	Jul 18 & Sep 27, 2017	DC/DCWD	27, 25
	Sep 29, 2017	NEDA-CO	14
(d) Solid Waste Management	Sep 27, 2017	DC/NEDA	25
	Sep 29, 2017	NEDA-CO	26
(e) Environmental Management	Oct 18, 2017	DC/NEDA	22
(f) Investment Promotion	Oct 26-27, 2017	DCIPC/ CTOO/ CAO/ CIO/ CPDO	21
(g) Handling Unsolicited Proposals	Nov 8-9, 2017	DC/NEDA	16, 12
(h) GIS Training	Nov 15-17, 2018	DC/NEDA	5, 7, 6
(i) Socio-economic Framework	Jan 16 & Feb 12, 2018	DC/NEDA	20, 25
(j) Strengthening the Implementation of the Davao City CLUP	Mar 22, 2018	DC/NEDA	30

Source: IM4Davao Team

- (a) **Value Engineering/Value Analysis (VE/VA).** The team conducted two VA briefings for project stakeholders: LGU counterparts, NEDA and other national government agency representatives. The first was an introduction to the concept, rationale for its use, benefits and basic process. The second briefing expounded the concept by providing case in point on the benefits of value analysis based on Japan and USA's experiences, as well as presenting a concrete example of VA done on a bridge project. The training demonstrated the analytical process in identifying the design that optimizes the value of the project at the most cost-effective level.
- (b) **Transport Demand and Network Assignment.** The capacity development on transport demand and network assignment for identifying new transport projects was conducted with the use of JICA STRADA software and the latest traffic database

which the project prepared. A combination of lectures and hands-on application were done in order for the participants to gain basic knowledge about transport network, OD matrix modifications, transport network modifications, traffic assignment, and assignment results analysis.

The program was conducted twice in Davao City and in NEDA CO. The two-day program was conducted for Davao City participants focusing on CTTMO staff in order for them to use the transport demand forecast model (software and database) in their routine planning work. The one-day program for NEDA CO in Manila, on the other hand, was designed to cater the needs of the Infrastructure Staff to learn how to appreciate traffic demand forecast results.

- (c) **Domestic Wastewater Management.** This program, conducted in Davao City through two roundtable discussions (RTDs) in July and September 2017, provided the opportunity to: (i) enhance knowledge in urban infrastructure processes related to domestic wastewater management; (ii) learn advanced approaches and recommended practices in responding to the infrastructure challenges in domestic wastewater, and (iii) gain knowledge and perspectives on Japanese experience in providing urban infrastructure services related to domestic wastewater management.

The same capacity development content was introduced at NEDA CO in a half-day training seminar in September 2017.

- (d) **Solid Waste Management.** The IM4Davao Team undertook a series of capacity building for CENRO, focusing on (i) technology for SWM including waste-to-energy, and (ii) preparation of an SWM plan. The summarized capacity development output was presented in a RTD in Davao City and in a half-day seminar at NEDA CO both in September 2017.

- (e) **Environmental Management.** A half-day workshop was conducted in October 2017 for project counterparts from Davao City, NEDA XI and NGOs in order to build capacity in the implementation of environmental management policy and measures. Local academic researchers also attended to facilitate group discussions. One of the salient results was an understanding of the importance of baseline data and its processing and storage so as to discuss and find solutions to significant environmental issues.

- (f) **Investment Promotion.** A two-day seminar-workshop was conducted to primarily meet DCIPC's training need—to understand the close relationship between investment promotion and spatial development planning and to improve their activities involving such. The participants came from DCIPC, CTOO, CAO, CPDO and CIO under the Davao City Government. A chief specialist of DTI XI joined the IM4Davao Team as a facilitator.

At the workshop, sharing of observations and suggestions on how to improve the conduct of investment missions particularly for Japan was facilitated based on experience in participating in the "Japan Tourism and Investment Roadshow" (JTIR) organized by DCIPC from October 15-21, 2017.

- (g) **Handling Unsolicited Proposals.** This is an emerging task for the Davao City Government. The city has taken steps in the right direction to develop its PPP program. The PPP Ordinance and the supervising body created have given the city a

jumpstart. However, it has to continue strengthening its capacity to manage PPP projects from conceptual stage to project turnover.

Specific to unsolicited proposals, the two-day seminar-workshop was conducted in November 2017 which covers: (i) Basic concept of PPP as a financing strategy, and (ii) Project development life cycle of unsolicited proposals including (a) Defining a complete proposal, (b) Evaluation of unsolicited proposals, (c) Risk analysis and management, (d) Negotiation strategy, (e) Managing the solicitation of comparative proposals, and (f) Post-award due diligence and contract monitoring.

- (h) **GIS Training.** The three-day training on GIS-based land use planning was conducted in November 2017. The activities mainly targeted NEDA and CPDO with the overall goal of enhancing their capacity to formulate plans and conduct analyses using GIS as a tool. These undertakings aimed to develop knowledge and skills to perform GIS analysis, update mapping data, and share GIS information. Participants were informed and exposed to mapping techniques such as suitability analysis and drone mapping.

During the training, a total of 18 participants were able to refresh their knowledge about GIS as a planning tool and participated in hands-on exercises that helped encourage the active engagement of the participants, thus making the learning more fun and interactive. The comprehensive reference materials provided can also ensure sustainable access to information and updates whenever necessary.

- (i) **Socio-economic Framework.** The capacity development seminar-workshop on socio-economic framework was conducted on two separate days with the involvement of resource persons as mentoring partners from the Philippine Statistical Agency (PSA) Region XI and the Housing and Land Use Regulatory Board (HLURB) on the first day. The second day was a workshop on data collection and sharing as generated by the various city offices in their operations and their utility for planning. The participants came from NEDA XI and 9 offices of Davao City which work with socio-economic data in their office routine.

On the whole, the participants gained an awareness of the different available data from within the city offices themselves. The importance of their contribution to the planning activities was impressed upon the participants. The sharing of data among the offices for CPDO's planning use was enhanced.

Insights were gained on upcoming activities that will add to the database to be tapped for planning. These are as follows: (i) Tax mapping is ongoing by the City Assessor showing ownership, land and building use, which will be completed in 2019; (ii) LGU data are being formed for possible integration with the national data; and (iii) Barangay survey of Davao City has reached a 94% participation rate.

- (j) **Strengthening the Effectiveness of the Davao City CLUP.** This seminar aimed to: (i) align the CLUP with the findings and recommendations of the JICA project; (ii) enhance the implementability of the CLUP; and (iii) strengthen Davao City's capacity to implement the CLUP. The meeting was attended by 30 participants consisting of Davao City Government Department Heads and representatives of selected National Government Agencies (NEDA, DPWH, DENR, DTI, DSWD, etc.), Davao Provincial Government, private business sector (Chamber of Commerce and Industry, CREBA, etc.), and community-based organizations/ NGOs / academe.



In terms of implementability, there was general consensus that the Davao City CLUP will be implemented at around 80%. It was reiterated that coordination between the Davao City Government and national government agencies be strengthened in order to enhance the implementation of the CLUP and CDP. Other suggestions were related to minimization of land use zoning violations, online development permit system, and in-depth analysis of intra-city migration into the city center.

### **3) Workshop on Delivering Intermediate Reports**

8.35 Two large-scale workshops were convened for delivering the Progress Report and the Interim Report of the project on May 11-12, 2017 and October 12-13, 2017, respectively. Each two-day workshop was attended by 85 and 87 participants in May and 118 and 90 participants in October, consisting of representatives from the following offices:

- ◆ Davao City Government and DCWD;
- ◆ National Government Agencies (NEDA CO, NEDA XI, DENR, DPWH, DOST, DILG, etc.);
- ◆ Private Sector and Local Academe (DCCCII, UP Mindanao, etc.); and
- ◆ Donor Agencies (JICA Team, JICA Philippine Office, ADB Team, etc.).

8.36 During the Progress Report Workshop, among the key results of agreements and consensus were in the areas of (i) barangay and district level identification of infrastructure services issues and concerns, and (ii) draft socio-economic framework and the future urban structure of Davao City in 2045. Future land use concerns were also highlighted in the participants' small group discussions as well as concerns on the national government projects that are in the pipeline which will affect Davao City.

8.37 At the Interim Report Workshop, many topics and issues were discussed after the presentations of resource persons and during the group discussions. They included, among others, the Metro Davao structure in relation to Davao City, land use zoning classification, degree of urbanization and densification with supporting infrastructure, preservation of prime agriculture areas and agro-forestry areas in the land use plan, cultural preservation and integration of the Ancestral Domain Areas into the land use plan, local transport authority and the city's role in urban rail development and operation, improvement of riverbanks of the Davao River, and disaster risk mitigation.

## **8.3 Lessons from the Kitakyushu Model**

### **1) The Kitakyushu Model**

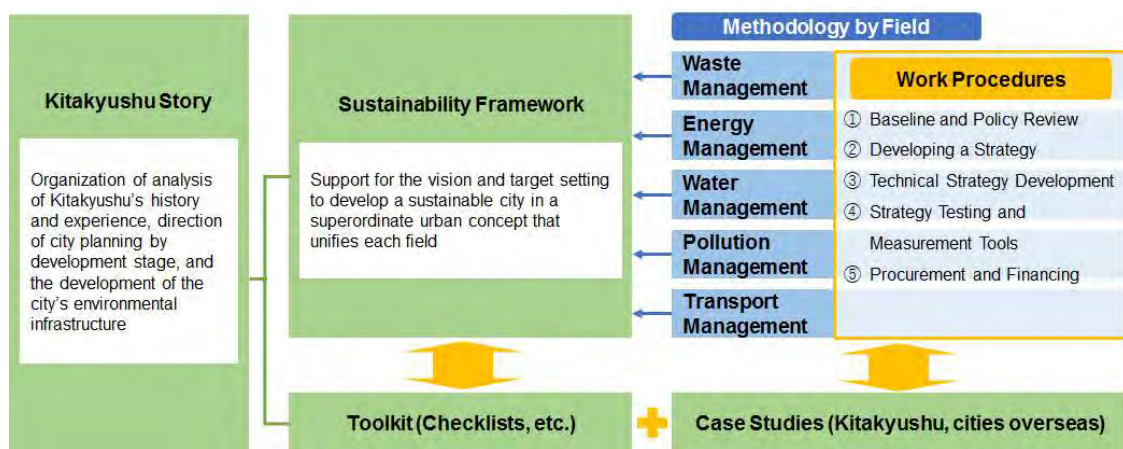
8.35 Kitakyushu is the northernmost city of Kyushu Island in Japan and has been an important hub for both land and marine traffic since the olden times. It is the gateway between Honshu and Kyushu, as well as an important port for international trade. The city was formed in 1963 with the merger of five independent cities, namely Kokura, Moji, Yahata, Tobata, and Wakamatsu. It is very much an industrial city that contributes to the manufacturing capabilities of Japan. It shares some similarities with Davao City, such as the city being located far away from the national capital, and having good international connections and an urban population of one million.

8.36 During its industrialization, Kitakyushu experienced serious environmental pollution. The city embarked on a program to address this and over the years until today, has successfully overcome environmental issues and is envisaged to be an environmental

capital of Asia. The Kitakyushu model was developed as a tool to strengthen local government administrators' practical skills for designing and planning works and to extend technical cooperation on green infrastructure systems with Asian cities.

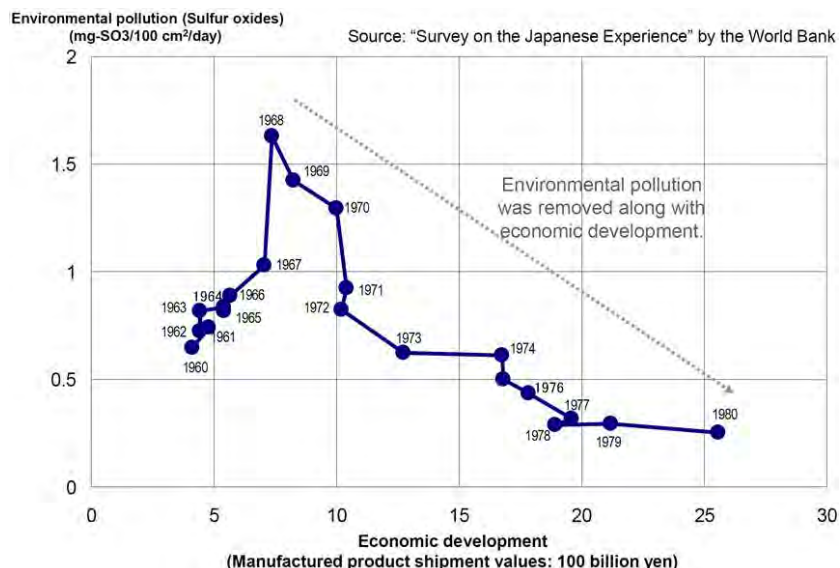
8.37 Figure 8.1 illustrates the framework of the Kitakyushu model that starts from the "Kitakyushu Story," to Sustainability Framework and Toolkit, and Methodology by Field. The sustainability framework, which enables comprehensive policy setting for designing green infrastructure, is an upper-level methodology that integrates five fields (waste management, energy management, water management, pollution management and transport management). All the methodologies by field are supported by respective case studies based on actual Kitakyushu experiences.

8.38 For example, Figure 8.2 historically proved the effectiveness of the Kitakyushu Model where environment pollution (indicated by sulfur oxide levels, the worst situation in 1968) was reduced in contrast with economic development.



Source: <http://asiangreencamp.net/eng/active3.html>

**Figure 8.1 Framework of the Kitakyushu Model**



Source: Kitakyushu City

**Figure 8.2 Historical Relationship Between Environmental Improvement and Economic Development in Kitakyushu City**

## 2) Implications on Davao City's Urban Development

8.39 **Integrated River Improvement.** The Murasaki River (20 km long with a catchment

area of 126 km<sup>2</sup>) runs through the middle of Kitakyushu City. In the past, the citizens suffered from the river's foul odor and frequent overflow floods.<sup>1</sup> Today, the river is beautiful and is no longer the cause for floods. During the river improvement project period from the 1960s to the 1980s, several measures were undertaken:

- ◆ Removal of garbage and cleaning up of the river in 1963;
- ◆ Introduction of a sewerage system along the river completed in 1987;
- ◆ Relocation of around 2,000 slum dwellers and 5 pig farms along the river to social housing units during the period 1965 to 1980;
- ◆ River improvement (expansion of river width and depth) against 100 years' rain probability; and
- ◆ Construction of bridges and riverside roads with beautification.

**8.40 Environmental Education.** Kitakyushu City has focused on nurturing a materials-cycle society through, among others, concerted efforts to provide environmental education to young children for them to cooperate in recycling materials or reducing waste. The city has two facilities for environmental education for children and adults, namely the Environmental Museum and the Eco Town Center. At the environmental museum, visitors can learn about the Kitakyushu Story and the current and future environmentally advanced cities from the exhibitions. At the Eco-Town Center, the 3R policy, recycling experience program, visitors' study tour of facilities related to the recycling activities of eco-town, etc. are carried out.

**8.41 Recycling Industries.** Kitakyushu City has also been encouraging environmental industries to contribute to the reduction of waste products. Many recycling-related industries are located in the seafront area of Kitakyushu Eco Town, including PET bottle recycling, home appliance recycling, car recycling, rare metal recycling, sludge recycling, office equipment recycling/reuse, used paper recycling, can recycling, and lamp recycling. It is noted that the activities of almost all companies in the eco-town cannot prosper without the relevant recycling laws and regulations in Japan.



Source: Kitakyushu City

**Figure 8.3 Bridges across Murasaki River (above) and Kitakyushu Eco Town and Eco Town Center (below)**

<sup>1</sup> The worst flood was recorded in 1953 which resulted in about 20 deaths, 312 injured, 228 houses collapsed, and 15,200 houses inundated above floor level.

### **3) Invitation Program to Japan**

8.42 As part of the project's capacity development activities, two invitation programs to Japan were designed and organized for invited participants to acquire necessary knowledge and awareness about urban infrastructure development in Japan. The cities of Tokyo, Osaka and Kitakyushu were selected for the first Japan Learning Tour while the second tour brought the participants to Tokyo, Tsukuba and Kitakyushu.

8.43 The first tour was conducted from May 23-31, 2017 with a delegation of 12 persons. Participants included 2 representatives from NEDA CO, 5 from NEDA XI Office, and 5 from the Davao City Government. The second tour was done on April 15-21, 2018 with a delegation of 8 persons. There were officially 4 participants from NEDA CO and 4 from the Davao City Government plus an additional interested joiner of 1 from the LTO Region XI and the 3 Presidential Security Guards for the First Daughter of the Philippines who happens to be the mayor of Davao City.

8.44 The tours brought the participants to relevant urban infrastructure which the project discussed and planned for Davao City, including the underground discharge channel in Tokyo for flood control, various urban rail systems (subway, AGT and monorail) in Tokyo and Kitakyushu, environmental education facilities, recycling estate and waste-to-energy plant in Kitakyushu, sewerage system and urban river improvement in Kitakyushu, suburban development such as new town and research park and traffic control center in Tokyo, and integrated waterfront development in Tokyo and Osaka.

## 9 CONCLUSIONS AND RECOMMENDATIONS

### 1) Conclusions

9.1 Davao City's population has doubled in the last quarter century but infrastructure development has not kept pace with the growing population. A number of infrastructure backlog issues need to be addressed.

9.2 The IM4Davao Development Plan Project is the second JICA-assisted project to prepare a comprehensive land use plan with a corresponding infrastructure development plan for Davao City. The first project, "Davao City Urban Transport cum Land Use Study (DCUTCLUS)," was conducted between 1980 and 1981. At that time, nearly four decades ago, Davao City had a population of only 0.4 million. The study prepared a land use plan and an urban transport development plan for the city to accommodate an additional one million people. However, many of the proposed projects of the study have not been implemented, such as the coastal road project.

9.3 In principle, the IM4Davao Development Plan Project has taken the same approach. The project team has set the socio-economic framework, (i.e., 3.3 million population in 2045), prepared the future land use plan, and identified the necessary infrastructure to support people's social and economic activities and guide investment towards urban development and economic development.

9.4 The IM4Davao Development Plan covers the transport, water supply, wastewater management, and solid waste management sectors. In regard to the 2030 Agenda for Sustainable Development adopted by world leaders in 2015 at the UN Summit, the IM4Davao Development Plan will greatly contribute to Goal 6: 'Ensure availability and sustainable management of water and sanitation for all', Goal 9: 'Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation', and Goal 11: 'Make cities inclusive, safe, resilient and sustainable'.

9.5 For project implementation, adequate implementation modalities have been considered by project. Needless to say, the greater contribution of the central government is crucial in prime infrastructure development. The private sector is an important player in some 'big ticket' projects such as bulk water supply, urban rail, and gateway operation in the form of various PPP schemes. The Davao City Government is required to take an active coordinator's role in both infrastructure provision and urban development activities.

9.6 It is of utmost importance that infrastructure should be provided at the right time and at the right place. To minimize adverse effects of infrastructure development, environmental management is another concern. The team conducted a strategic environment assessment (SEA) to elaborate the packages of infrastructure projects with policymakers, counterpart agencies and local stakeholders. An environment management plan has been prepared to address this issue.

9.7 The capacity building component of the IM4Davao Development Plan Project provided the counterpart agencies the technical know-how and the renewed foundation in conducting infrastructure planning. It has also created a venue that established the baseline particularly in terms of significant data, tools and processes for effective infrastructure development sector planning.

9.8 The activities initiated (i.e., workshops, meetings, roundtable discussions, focused



group discussions, consultations, seminars and trainings) during the entire duration of the project have directly and indirectly contributed to the enhancement of capacity and competence of the counterpart agencies in infrastructure planning and boosted their confidence in the overall development and management of infrastructure sector in Davao City.

9.9 The duration of the capacity building interventions and the overall corresponding design and concept of the project's capacity building component provided only the fundamentals to trigger further activities. Therefore, Davao City, with support from NEDA and other sector agencies, needs to develop and establish mechanisms that will sustain the gains and momentum created by the project.

## **2) Recommendations**

9.10 The IM4Davao Development Plan Project has mainly produced two outputs, the urban land use plan towards 2045 and the infrastructure development plan for the transport, water supply, wastewater management, and solid waste management sectors for implementation in the short, medium and long term. It is recommended for the Davao City Government to authorize the inclusion of the major project outputs in their legal documents such as the CLUP and CDP.

9.11 The long list of projects consisting of 75 projects with an aggregated amount of PhP 295 billion has been prepared during the project period. It is recommended that all the proposed projects be implemented under adequate timeframe such as short-term (2018-2022), medium-term (2023-2030) and long-term (2031-2045) by the appropriate implementing agency (ies) with adequate resources, e.g. national government fund, Davao City fund, PPP and other sources.

9.12 The Project has prepared a set of priority projects including (1) the Extension of Davao City Diversion Road, (2) Davao Riverside Boulevard, (3) Davao City Mass Transit Main Line, (4) Sewerage System (Phase 1), (5) Davao City Waste Eco Park, (6) Traffic Management Improvement and Control Center, (7) SCADA System and NRW Reduction Program, and (8) Tourism Corridor Development Featuring Davao History and Agriculture. Although some of these projects come from the CLUP priority project list, all the projects were elaborated with fresh and unique ideas as fruits of the collaboration with the counterpart personnel. It is recommended that these priority projects be implemented according to their respective implementation plans and also be used as references for the annual and medium-term investment plans of Davao City.

9.13 For some project implementation, social and environment considerations must be strongly applied. For instance, (1) the Extension of Davao City Diversion Road Project will require resettlement of affected persons presently engaged in agriculture. (2) the Davao River Improvement and Riverside Boulevard Project will require dealing with legal land owners as well as resettlement of affected informal settlers and IPs. (3) Kadayawan Cultural Village within the Tourism Corridor Development Project featuring Davao history and agriculture will also need to cope with IPs. All these projects will benefit the affected persons by providing better access, flood control and cultural preservation and tourism development. But careful attention should be paid to avoid or mitigate the projects' negative impacts with adequate measures, during construction and operation phases, such as just compensation, social housing and new job opportunities.

9.14 To ensure the continuous implementation of the IM4Davao Development Plan, the

operational linkages in development planning and urban management between and among the Davao City Government, NEDA Region XI, other concerned national agencies and other stakeholders should be further strengthened through regular consultations, sharing of information, and establishment of a common planning database.

9.15 The IM4Davao Development Plan must be regularly reviewed and updated by 4-5 years. A joint force of NEDA Region XI and the Davao City Government will undertake it by using the PDCA cycle.

9.16 On the mechanism to follow through the CB activities initiated by the project:

- Conduct post-capacity assessment within one year of project termination to evaluate the effectiveness of the trainings conducted and to measure the extent of the contribution of the project to capacity enhancement as well as to measure the level and areas of improved capacity of the counterpart agencies; and
- Revisit significant CB activities, particularly the following: (a) handling unsolicited proposals; (b) SE framework; (c) Advanced GIS; and (d) traffic management and demand forecasting. Based on the training process evaluation, sustaining follow-up activities are required to fully understand the concept and acquire the skills and knowledge for effective application of the tools.

9.17 On the capacity development framework to support implementation of the IM4Davao 2045:

- Institutionalize capacity development at the level of the Davao City Government in order to establish a comprehensive baseline of the City's capacity and competitiveness; and
- Conduct a training needs assessment focusing on the departments and divisions with high stakes in the implementation, management, as well as monitoring and evaluation of the IM4 Davao outputs.

9.18 On the institutional arrangement to coordinate, monitor and evaluate the implementation of IM4Davao 2045:

- Expand the roles and functions of existing multisectoral group, ad hoc committee and/or set up a new one at the NEDA RO level. This can serve as a forum for sharing information, promoting and expanding effective and mutually beneficial undertakings of different stakeholders in areas related to project prioritization for funding by the national government vis-a-vis projects identified in the IM4Davao 2045 and those included in the Three-year Rolling Infrastructure Program (TRIP) of the national government and sectoral government agencies.

## Appendix Counterpart List

### 1) Project Counterpart

National Economic and Development Authority Central Office	
Rolando G. Tungpalan	Undersecretary
Jonathan L. Uy	Assistant Secretary
Roderick M. Planta	Assistant Secretary
Ederlyn T. Norte	Senior Economic Dev't Specialist, IS
Gilbert V. Kintanar	Economic Development Specialist I, IS
Marianne Mae L. Mellizas	Infrastructure Staff
Ramakrishna J. Villanueva	Infrastructure Staff
Joseph Capistrano	Public Investment Staff
National Economic and Development Authority Region XI	
Maria Lourdes D. Lim	Regional Director
Priscilla R. Sonido	OIC-Asst. Regional Director
Mario M. Realista	Chief, PMED
Grace L. Magalona	Supervising Eco. Dev't Specialist, PMED
Gay Lihaylihay- Valledor	Econ. Development Specialist, PMED
Miguel S. Herrera III	Chief Eco. Dev't Specialist, PFPD
Alana O. San Pedro	Supervising Eco. Dev't Specialist, PFPD
Emily Jeanette R. Salvado	OIC-Chief, PDIPBD
Jaime P. Mallare	Senior Eco. Dev't Specialist, PDIPBD
Concepcion C. Anaud	Chief Admin. Officer, FAD
City Government of Davao	
Hon. Sara Z. Duterte	City Mayor
Zuleika T. Lopez	City Administrator
Tristan Dwight P. Domingo	Asst. City Administrator for Admin.
Mary F. Resma	Asst. City Administrator Office
Ivan C. Cortez	Officer-in-Charge, CPDO
Jose Froilan T. Rigor	Planning Officer, CPDO
Joseph Dominic S. Felizarta	Officer-in-Charge, CEO
Minerva C. Taculin	Engineer, CEO
Elisa P. Madrazo	Former Department Head, CENRO
Marivic L. Reyes	Department Head, CENRO
Lakandiwa S. Orcullo	Engineer, CENRO
Dindo S. Corda	Researcher, CENRO
Josephine J. Villafuerte	City Health Officer, CHO
Edwin E. Jacinto	CHO
Jefry M. Tupas	Officer-in-Charge, CIO
Regina Rosa D. Tecson	Officer-in-Charge, CTOO
Dionisio C. Abude	Officer-in-Charge, CTTMO
Roumel A. Peroy	Civil Engineer, CTTMO
Maria Lydia Alquizar	Mechanical Engineer, CTTMO
Eduardo B. Perez IV	CTTMB-TWG, CTTMO
Charlotte B. Parba	Executive Service Officer, CTTMO
Osmundo P. Villanueva Jr.	Officer-in-Charge, CLO
Lemuel G. Ortonio	Officer-in-Charge, DCIPC
Marilyn M. Hernandez	Economist III/ Unit Head, DCIPC
Rizalina Cordenillo	DCIPC
Jose B. Ong	BCCA Officer, BCCAD
Emmanuel R. Jaldon	Officer-in-Charge, DRRMO
Maria Christina S. Villegas	LDRRMO II, DRRMO
Rodrigo S. Bustillo	LDRRMO III, DRRMO
Leo Brian D. Leuterio	Officer-in-Charge, CAO
Agency in Davao	
Daniel T. Lim	Former President, DCCCII
Christine S. Guarde	Officer-in-Charge Planning, DCWD
Ronald Muñoz	Officer-in-Charge, DCWD
John Baynosa	PCS Officer, DCWD

### 2) JICA

JICA Headquarter	
Naomichi Murooka	Infrastructure and Peacebuilding Department
Maki Morikawa	Infrastructure and Peacebuilding Department
Kenichi Kobayashi	Infrastructure and Peacebuilding Department
Remi Sekiguchi	Southeast Asia and Pacific Department
JICA Philippines	
Tetsuya Yamada	Senior Representative
Keisuke Fukui	Chief, Economic Growth Section
Takayuki Tomihara	Project Formulation Adviser
Chihiro Baba	Representative, Economic Growth Section
Patrick Adams San Juan	Economic Growth Section

### 3) JICA Project Team

JICA Project Team	
Ken Kumazawa	Team Leader
Chika Watanabe	Land Use Planner
Gloria E. Sato	Institutional and Human Resource Specialist
Nathaniel von Einsiedel	Institutional and Human Resource Specialist
Kosei Mikami	Urban Infra Dev't Method Specialist
Osamu Higashi	Former Urban Infra Dev't Method Specialist
Rene Santiago	Urban Transport Facilities Specialist
Hiroyuki Morimoto	Road Planner
Shimao Hidaka	Water Supply Specialist
Hiroshi Kato	Wastewater and Sewerage Specialist
Yukihisa Sakata	Solid Waste Management Specialist
Joel F. Cruz	GIS/ Disaster Management Specialist
Taisuke Watanabe	Environmental Management Planner
Nobuko Shimomura	Environmental and Social Considerations/ Public Involvement Specialist
Lynn Sison	Socio-economic Framework Specialist
Hiromichi Hara	Industrial Development/ Investment Promotion Specialist
Alma Porciuncula	Economic and Financial Analysis Specialist
Tetsuo Horie	Traffic Demand Forecast Specialist
Chen-Wei Li	Project Coordinator/ Traffic Survey Specialist
Local Support	
Ronald G. Sison	Industrial Development / Investment Promotion Specialist
Jesse B. Manuta	Environment Management, SEA Specialist
Rosalinda Tomas	Environment Management, SEA Specialist
Lourdes Simpol	Environment Management, SEA Specialist
Luis Pacana	Agribusiness Development Specialist
Melissa Cardenas	Pollution Management Specialist
Pauline Don J. Hernandez	GIS Specialist
Trisha Leigh Lunas	GIS Specialist
Xervy Veloso	Drone Operator
Karen Hulleza-Luna	Technical Assistant
Cheeryl Secuya-Andresio	Technical Assistant
Sheila Rose Gayramara	Technical Assistant
Charis Joy Corgeo	Secretary, Technical Assistant
Transport and Traffic Planners Inc. (TTPI)	Traffic Surveys, Household Interview Survey, Public Transport Interview Survey
Orient Integrated Development Consultants, Inc. (OIDCI)	Person Trip Survey for Car-Owned Households
DGtal Creatives Inc.	Video Production

