The Republic of the Philippines
Bangsamoro Transition Commission (BTC)
Bangsamoro Development Agency (BDA)

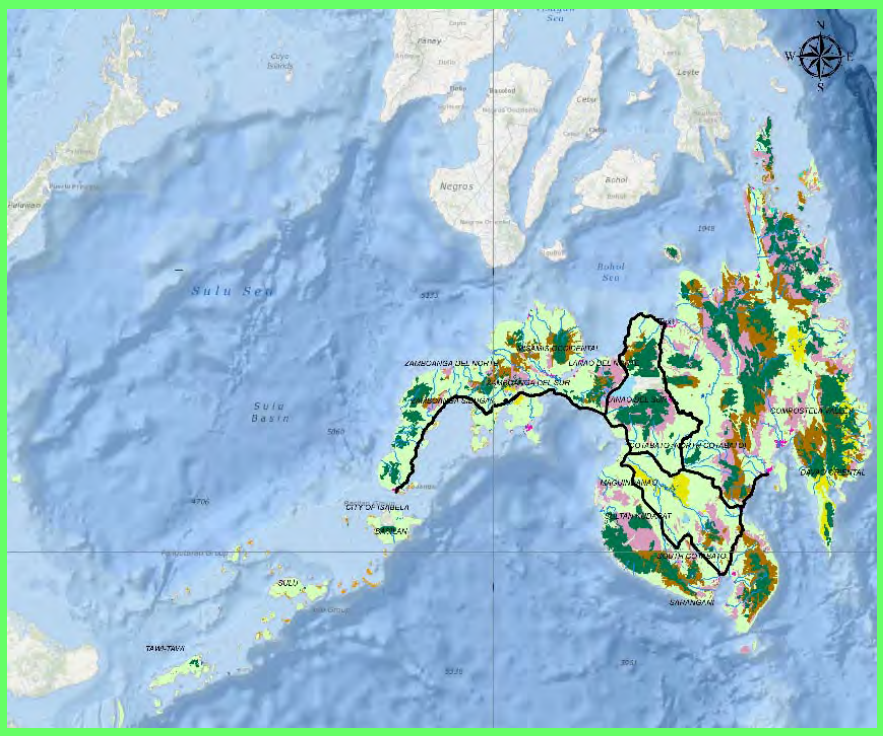
Japan International Cooperation Agency
(JICA)

Comprehensive Capacity Development Project for the Bangsamoro

Development Plan for the Bangsamoro

Final Report

Sector Report 2: Infrastructure



April 2016

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Source of GIS map on the cover: JICA Study Team (base map by U.S. National Park Service).

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Currency Equivalents (average Interbank rates for May–July 2015)
US$1.00=PHP 45.583
US$1.00=JPY 124.020
PHP 1=JPY 2.710
Source: OANDA.COM, http://www.oanda.com

Comprehensive Capacity Development Project for the Bangsamoro

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Abbreviations

AAD	annual average daily traffic
AAGR	average annual growth rate
AAIIBP	Al-Amanah Islamic Investment Bank of the Philippines
A&D	alienable and disposable
AC	advisory circular
ACC	Area Control Center
ACSR	aluminum conductor steel reinforced
ADB	Asian Development Bank
AFB	association of farmer beneficiaries
AFMA	Agriculture and Fisheries Modernization Act
AFP	Armed Forces of the Philippines
AHFF	agriculture, hunting, forestry, and fishery
AJD	Agrarian Justice Delivery
AMARDI	Al Mujahidun Agro Resources and Development Inc.
AO	Administrative Order
ARB	agrarian reform beneficiary
ARBO	ARB organization
ARC	agrarian reform community
ARCDSP	ARC Development Support Project
ARCCESS	ARC Connectivity and Economic Support Services
ARG or ARMM-RG	ARMM Regional Government
ARMM	Autonomous Region in Muslim Mindanao
ARMM HELPS	ARMM Health, Education, Livelihood, Peace and Governance and Synergy (Program)
ARMMIARC	ARMM Integrated Agricultural Research Center
ASEAN	Association of South East Asian Nations
ASPBI	Annual Survey of Philippine Business and Industry
AT	Agricultural technician
ATI	Agricultural Training Institute
ATM	air traffic movement
ATM	automated teller machines
AWG	American wire gauge
BASELCO	Basilan Electric Cooperative
BASULTA or BaSulTa	Basilan, Sulu, and Tawi-Tawi
BBAC	Bangsamoro Business Advisory Council
BBL	Bangsamoro Basic Law
BCT	Bangsamoro Core Territory
BDA	Bangsamoro Development Agency
BDH	berthing/deberthing hours
BDP	Bangsamoro Development Plan
BFAR	Bureau of Fisheries Aquatic Resources
BHC	Barangay Health Center
BIAF	Bangsamoro Islamic Armed Force
BIFF	Bangsamoro Islamic Freedom Fighters
BIMP-EAGA	Brunei-Indonesia-Malaysia-Philippines East ASEAN Growth Area
BIW	Bangsamoro Investment Window
BLGU	Barangay Local Government Unit
BLMI	Bangsamoro Leadership and Management Institute
BLMO	Bangsamoro Land Management Office
BOD	board of directors
BOI	Board of Investment
BPO	business process outsourcing
BS	Bachelor of Science
BSP	Central Bank of the Philippines [Bangko Sentral ng Pilipinas]
BSWM	Bureau of Soils and Water Management
BTA	Bangsamoro Transition Authority
BTB	boom truck with bucket
BTC	Bangsamoro Transition Commission
BTD	boom truck with digger
BuB or BUB	bottom-up budgeting
CA	College of Agriculture
CA	compulsory acquisition
CAAM	Conflict Affected Areas of Mindanao
CAAP	Civil Aviation Authority of the Philippines
CAB	Comprehensive Agreement on Bangsamoro
CADT	certificate(s) of ancestral domain title
CAGR	compound annual growth rate
CALABARZON	Cavite, Laguna, Batangas, Rizal, and Quezon
CALT	certificate(s) of ancestral land title
CARD	Center for Agricultural and Rural Development
CARL	Comprehensive Agrarian Reform Law
CARP	Comprehensive Agrarian Reform Program
CARPER	CARP-Extension with Reforms
CASELCO	Cagayan De Sulu Electric Cooperative
CBCRM	community-based costal resource management
CBFM	Community-Based Forest Management (Program)
CBFMA	community-based forest management agreement
CBO	Cotabato (Awang) Airport
CCA	climate change adaptation
CCCH	Coordinating Committee for Cessation of Hostilities
CCDP or CCDP-B	Comprehensive Capacity Development Project for the Bangsamoro
CCT	conditional cash transfer
CDA	Cooperative Development Authority
CD-CAAM	Community Development in CAAM
CDOCCI	Cagayan de Oro Chamber of Commerce and Industry
CDP	Comprehensive Development Program
CDP-ELA	Comprehensive Development Plan-Executive Legislative Agenda
CDRRMC	City Disaster Risk Reduction and Management Council
CDS	cooperative development staff

CEB	Cebu Pacific Air
CEC	cation-exchange capacity
CEPALCO	Cagayan Electric Power and Light Company
CIF	cost, insurance, and freight
CIS	communal irrigation system
CLOA	certificate(s) of landownership award
CLPC	Cotabato Light and Power Company
CLT	certificate(s) of land transfer
CLUP	comprehensive land use plan
CMO	central management office
COSUCECO	Cotabato Sugar Central Corporation
CP	core project
CPO	Cotabato Project Office
CSO	civil society organization
CSR	corporate social responsibility
DA	Department of Agriculture
DA-BAR	Department of Agriculture's Bureau of Agricultural Research
DA-RFO	DA-Regional Field Office
DAF	Department of Agriculture and Fisheries
DAO	Department Administrative Order
DAR	Department of Agricultural Reform
DBM	Department of Budget and Management
DBP	Development Bank of the Philippines
DCCCII	Davao City Chamber of Commerce and Industry, Inc.
DD	detailed design
DDP	Distribution Development Plan
DED	detailed engineering design
DENR	Department of Environment and Natural Resources
DILG	Department of Interior and Local Government
DLPC	Davao Light and Power Company
DME	Distance measuring equipment
DOF	Department of Finance
DOJ	Department of Justice
DOLE	Department of Labor and Employment
DOST	Department of Science and Technology
DOT	Department of Tourism
DOTC	Department of Transportation and Communications
DPWH	Department of Public Works and Highways
DRIMS	Dynamic Response Intelligent Monitoring System
DRRM	disaster risk reduction and management
DRRMCEP	DRRM Capacity Enhancement Project
DSWD	Department of Social Works and Development
DTI	Department of Trade and Industry
DTI-EMB	DTI Export Marketing Bureau
DUs	distribution utilities
DVOR	Doppler VHF omnidirectional range
EA	environmental assessment
EC	electric cooperative
ECA	environmentally critical area
ECC	environmental clearance certificate
ECP	environmentally critical project
EEZ	exclusive economic zone
EIA	environmental impact assessment
EIAM	Environmental Impact Assessment and Management (Division)
EIRR	economic internal rate of return
EIS	environmental impact statement
EMB	Environmental Management Bureau
EO	Executive Order
EPIRA	Electric Power Industry Restructuring Act
ERC	Energy Regulatory Commission
ESWM(P)	Ecological Solid Waste Management (Plan)
EU	European Union
EWS	early warning system
FAA	Federal Aviation Administration
FAB	Framework Agreement on Bangsamoro
FAD	fish aggregating devices
FAO	Food and Agriculture Organization
FDI	foreign direct investment
FFWS	flood forecasting and warning system
FGD	focus group discussion
FIA	federation of irrigators' associations
FIDA	Fiber Industry Development Authority
FIES	Family Income and Expenditure Survey
FIT	farmers information technology
FIT	feed-in-tariff
FMB	Forest Management Bureau
FMR	farm-to-market road
FNRI	Food and Nutrition Research Institute
FS	feasibility study
FTZ	free trade zone
GAA	General Appropriations Act
GDE	grading and balling establishment
GDP	gross domestic product
GEM	Growth with Equity Mindanao (Program)
GIS	geographical information system
GIZ	German Society for International Cooperation [Deutsche Gesellschaft für Internationale Zusammenarbeit]
GM	genetically modified
GMP	good manufacturing practice
GPBP	Grassroots Participatory Budgeting Program
GPH	Government of the Philippines
GPPB	grassroots participatory planning and budgeting
GRDP	gross regional domestic product
GRP	gross regional product
GSR	Green Super Rice
HACCP	hazard analysis and critical control points
HDI	human development index
HEART	Humanitarian Emergency Action Response Team
HF	high frequency
HI	horizontal inequality
HIPC	halal industry promotion center
HVC	high-value crops

HVCDP	High Value Crops Development Program
IA	irrigators' association
IAC	inter-agency committee
IATA	International Air Transport Association
ICAO	International Civil Aviation Organization
ICT	information and communication technology
ICTSI	International Container Terminal Services, Inc.
IDP	internally displaced people
IEC	information and education campaign
IEE	initial environmental examination (or evaluation)
IFAD	International Fund for Agricultural Development
IFMA	Integrated Forest Management Agreement (Program)
IFSAR	interferometric synthetic aperture radar
ILO	International Labour Organization
ILPC	Iligan Light and Power Company
IMEM	Interim Mindanao Electric Market
IMT	international monitoring team
IP	indigenous people
IPA	Investment Promotion Agency
IPC	Investment Promotion Center
IPP	independent power producer
IPRA	Indigenous People Rights Act
IRA	internal revenue allotment
IRI	International Roughness Index
IRSG	International Rubber Supply Group
IT	information technology
IWRM	integrated water resources management
J-BIRD	Japan-Bangsamoro Initiatives for Reconstruction and Development
JAKIM	Department of Islamic Development Malaysia
JETRO	Japan External Trade Organization
JICA	Japan International Cooperation Agency
JNC	Joint Normalization Committee
JOL	Jolo Airport
JST	JICA Study Team
JV	joint venture
KBA	key biodiversity area
KOICA	Korea International Cooperation Agency
L	length
LAD	land acquisition and distribution
LAMP	Land Administration and Management Project
LAMPCO	Linabu Agrarian Multi-Purpose Cooperative
LASURECO	Lanao Del Sur Electric Cooperative
LBP	Land Bank of the Philippines
LCA	local conservation area
LCL	less than full container load or less container load
LDRRMC	Local DRRM Council
LDRRMF	Local DRRM Fund
LGU	local government unit
LGUOUs	LGU-owned utilities
LiDAR	light detection and ranging
LMB	Land Management Bureau
LMIP	Leyte-Mindanao Interconnection Project
LOA	length overall
LRA	Land Registration Authority
LTI	Land Tenure Improvement
Magelco or MAGELCO	Maguindanao Electric Cooperative
MAO	Municipal Agriculture Office
MASL	meter(s) above sea level
MC	moisture content
MDGs	Millennium Development Goals
MEDP	Missionary Electrification Development Plan
MEP	Mindanao Energy Plan
MF	microfinance
MFI	microfinance institution
MGB	Mining and Geo-science Bureau
MHPP	mini-hydro power plant
MICC	Matling Industrial and Commercial Corporation
MILF	Moro Islamic Liberation Front
MIS	Management Information Service
MIMAROPA	Mindoro, Marinduque, Romblon, and Palawan
MINDA or MinDA	Mindanao Development Authority
MLGU	municipal local government unit
MMAA	Muslim Mindanao Autonomy Act
MMDA	Metropolitan Manila Development Authority
MMHCBI	Mindanao Muslim Halal Certification Board Inc.
MNLF	Moro National Liberation Front
MOA	memorandum of agreement
MOOE	maintenance and other operating expenses
MPA	marine protected area
MPC	multi-purpose cooperative
MPDC	Municipal Planning and Development Coordinator
MRB	Mindanao River Basin
MRBIMDMP	MRB Integrated Management and Development Master Plan
MRCC	Mindanao Regional Control Center
MRDP	Mindanao Rural Development Program
MRF	material recovery facility
MSME	micro, small, and medium enterprises
MSU	Mindanao State University
MSU-IIT	MSU-Iligan Institute of Technology
MSU-LNCAT	MSU-Lanao National College of Arts and Trade
MSU-TCTO	MSU-Tawi-Tawi College of Technology and Oceanography
NADA	Needs Assessment Design Analysis
NAIA	Manila Ninoy Aquino International Airport
NAMRIA	National Mapping and Resource Information Agency
NAPC	National Anti-Poverty Commission
NASA	National Aeronautics and Space Administration
NCIP	National Commission on Indigenous Peoples
NCMF	National Commission on Muslim Filipinos

NCR	National Capital Region
NDCC	National Disaster Coordinating Council
NDRRMC	National Disaster Risk Reduction and Management Council
NEA	National Electrification Administration
NECP	non-environmentally critical project
NEDA	National Economic Development Authority
NFA	National Food Authority
NGA	National Grains Authority
NGCP	National Grid Corporation of the Philippines
NGO	non-governmental organization
NGP	National Greening Program
NIA	National Irrigation Administration
NICCEP	National Industrial Cluster Capacity Enhancement Project
NIPAS	National Integrated Protected Areas System
NIS	national irrigation system
NLUC	National Land Use Commission
NOAH	Nationwide Operational Assessment of Hazards
NPC	National Power Corporation
NPC-SPUG	NPC-Small Power Utility Group
NREL	National Renewable Energy Laboratory
NREP	National Renewable Energy Program
NSO	National Statistics Office
NWFP	non-wood forest product
NWRC	National Water Resources Council
OBOR	optimum berth occupancy rate
OCD	Office of Civil Defense
OCT	original certificate(s) of title
ODA	official development assistance
OECD	Organization for Economic Cooperation and Development
OFID	OPEC Fund for International Development
OIC	Organization of Islamic Cooperation
OPAg	Office of the Provincial Agriculturist
OPAPP	Office of the Presidential Advisor on the Peace Process
OPEC	Organization of Petroleum Exporting Countries
OPV	Office of the Provincial Veterinarian
OPV	open-pollinated variety
ORG	Office of the Regional Governor
OSCC	Office for Southern Cultural Communities
OTOP	one town one product
PA	protected area
PAG	private armed group
PAGASA	Philippine Atmospheric, Geophysical and Astronomical Services Administration
PAL	Philippine Airlines
PAMANA	Philippine Development Program and Framework for Peace and Development [Payapa at Masaganang Pamayanan]
PAMB	Protected Area Management Board
PAO	Provincial Agriculture Office
PAPI	precision approach path indicator
PB	Power Barge
PCA	Philippine Coconut Authority
PCAARRD	Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development
PCB	power circuit breaker
PCC	Philippine Carabao Center
PCC	Portland cement concrete
PCCI	Philippine Chamber of Commerce and Industry
PCDP	Provincial Comprehensive Development Plan
PCIC	Philippine Crop Insurance Corporation
PCN	pavement classification number
PD	Presidential Decree
PDP	Philippine Development Plan
PDPFP	Provincial Development and Physical Framework Plan
PEIS	Philippine Environmental Impact Statement
PENRO	Provincial Environment and Natural Resources Office
PERF	Production Economic Research Fund
PEZA	Philippine Economic Zone Authority
PFDA	Philippine Fisheries Development Authority
PhilFIDA	Philippine Fiber Development Authority
PHIVOLCS	Philippine Institute of Volcanology and Seismology
PICRI	Philippine Industrial Crops Research Institute
PIOUs	private investor-owned utilities
PMO	project management office
PO	people's organization
PP	Presidential Proclamation
PPA	Philippine Ports Authority
PPP	public private partnership
PRA	Philippine Retirement Agency
PRDP	Philippine Rural Development Program
PRTC	Philippine Rubber Testing Center
PSA	Philippine Statistics Authority
PSALM	Power Sector Assets and Liabilities
PSC	project steering committee
PSE	Philippine Stock Exchange
PTA	Parent-Teacher Association
PTB	passenger terminal building
PTF-MRBRD	Presidential Task Force on MRB Rehabilitation and Development
RA	Republic Act
RBCO	River Basin Control Office (of DENR)
R&D	research and development
RAED	Regional Agricultural Engineering Division
RBOI	Regional Board of Investment
RC	reinforced concrete
RCC	regional control center
RCM	rice crop manager
RDC	regional development council
RDE	research, development, and extension

RDRRMO	Regional DRRM Office
REDPB	Regional Economic and Development Planning Board
RE	renewable energy
REZA	Regional Economic Zone Authority
RGDP	regional gross domestic product
RHU	Rural Health Unit
RIS	River Irrigation System
RNS	National Route Numbering System
RPMA	Regional Ports Management Authority
ROPAX or RoPax	roll-on/roll-off passenger
RORO or RoRo	roll-on/roll-off
ROW	right-of-way
RPDO	Regional Planning and Development Office
RWY	runway
SB	Small Business
SEA	strategic environmental assessment
SERD-CAAM	Socio-economic Restoration and Development of Conflict-affected Areas in Mindanao
SEP-CDP	Socio-Economic Profile-Comprehensive Development Program
SEZ	special economic zone
SGCP	State of the Grid in China
SIASELCO	Siai Electric Cooperative
SME	small and medium-sized enterprise
SMS	short message system
SOCSKSARGEN	South Cotabato-Sultan Kudarat-Saranggani-General Santos City
SPUG	small power utilities group
SRA	Sugar Regulatory Administration
S/S or SS	substation
SSIPs	small-scale irrigation projects
SUCs	State Universities and Colleges
SULECO	Sulu Electric Cooperative
SV	supervision
SWIMP	small water impoundments with multipurpose potential (or small water impounding project)
SWISA	small water irrigation system association
TAWELCO	Tawi-Tawi Electric Cooperative
TCP	Technical Cooperation Project
TCT	transfer of certificate of title
TDP	transmission development plan
TESDA	Technical Education and Skills Development Authority
TIKA	Turkish Cooperation and Coordination Agency
TISP	Transition Investment Support Plan
T/L	transmission line
TMS	Technical Management Services
TP	turboprop
TransCo	National Transmission Corporation
UAS	Upi Agricultural School
UN	United Nations
UNCTAD	United Nations Conference on Trade and Development
UNEP	United Nations Environment Programme
UNHCR	United Nations High Commissioner for Refugees
UNICEF	United Nations Children's Fund
USAID	United States Agency for International Development
USDA	United States Department of Agriculture
USM	University of Southern Mindanao
USMARC	USM Agricultural Research Center
VAT	value added tax
VCA	value chain analysis
VHF	very high frequency
VLT	voluntary land transfer
VOS	voluntary offer to sell
VPA	vehicle parking area
VSU	Visayas State University
VTT	Value transformation training
WASH	Water, Sanitation and Hygiene (programs by UNICEF)
WB	World Bank
WDIL	wind direction indicator light
ZAM	Zamboanga International Airport
ZAMBASULTA	Zamboanga, Basilan, Sulu, and Tawi-Tawi

Unit of Measurement

Area	
m^2	square meter
km^2	square kilometer
ha	hectare (= 10,000 m^2)
Energy	
W	watt
kW	kilowatt
kWh	kilowatt-hour
MW	megawatt
GWh	gigawatt-hour
kV	kilovolt
MVA	megavolt-ampere
Length	
mm	millimeter
cm	centimeter
ft	foot or feet
m	meter
LM	linear meter
km	kilometer
Time	
sec, s	second
min	minute
hr	hour
yr	year
Weight	
µg	microgram
mg	milligram
kg	kilogram
t	ton (=1,000 kg)
DWT	deadweight tonnage
GRT	gross register tonnage
GT	gross tonnage
kTOE	kilo ton of oil equivalent
MT	metric ton
Volume	
L	liter
m^3	cubic meter (= 1,000 liter)
Other	
°C	degree Celsius
%	percent
mil.	million
MPa	megapascal
mps	meter per second

Currency

JPY	Japanese yen
PHP	Philippine peso
US$ or USD	United States dollar

CHAPTER 1 ROAD ADMINISTRATION

1.1 Road Administration System

Administration of roads in the Philippines is classified into five categories as shown in Table 1.1: *National Road*, *Provincial Road*, *City Road*, *Municipal Road*, and *Barangay Road*. National roads are administered by DPWH-National, but those within Bangsamoro are administered by DPWH-ARMM, based on RA 9054 (Organic Act) and other existing laws (e.g., EO No. 426 dated October 12, 1990).

Table 1.1 Administrative Road Classifications

Classification	Responsible agency
National Road	DPWH-National (except ARMM) DPWH-ARMM (within ARMM)
Provincial Road	Provincial government
City Road	City government
Municipal Road	Municipal government
Barangay Road	City/Municipal government

Source: The Study on Infrastructure (Road Network) Development Plan for the ARMM, JICA, 2010.

1.2 Functional Road Classifications

The functional road classification of the Country's national road was re-classified by DPWH in November 2014 through Department Order No. 119 (D.O. No. 119). Under this new functional classification, national roads are classified into three: Primary Road, Secondary Road and Tertiary Road (Figure 1.1). Likewise, the National Route Numbering System (RNS) was introduced to simplify and rationalized navigation along the network.

Under this new system, national roads categorized as Primary Road and Secondary Road are assigned with route number. No route number is assigned to National Roads classified as Tertiary as these perform local transport functions. The backbone of the entire network is Route Number 1 which originates in Laoag City, Ilocos Norte and terminates in Zamboanga City in Mindanao. Through combination of road and nautical highway, this route effectively links the three major islands of the Country: (Luzon, Visayas and Mindanao). In Mindanao, this road which passes through the Bangsamoro area connects the major urban centers of Surigao, Davao, General Santos, Cotabato, and Zamboanga (Figure 1.2).

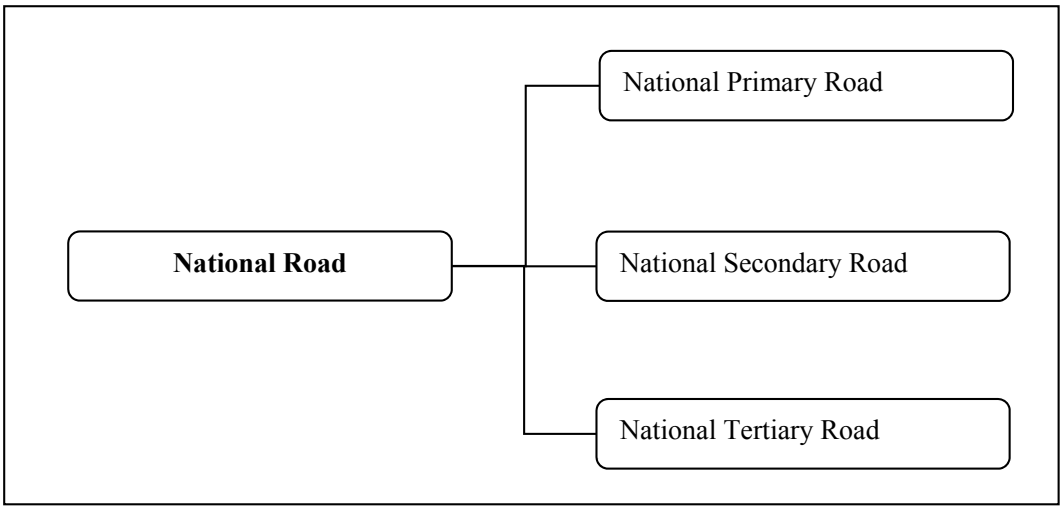


Figure 1.1 Functional Road Classifications

Source: Road Numbering System, DPWH, 2014 (www.dpwh.gov.ph)

Figure 1.2 Functional Road Classification Map of Mindanao by DPWH

CHAPTER 2 AGENCIES INVOLVED IN ROAD DEVELOPMENT IN BANGSAMORO

2.1 Function and Organization Structure of DPWH-ARMM

Currently, DPWH-ARMM is responsible for highways, flood control and water resource development systems, and other public works within the Bangsamoro. The powers and responsibilities of ARMM pertaining to infrastructure programs and projects within the Bangsamoro territory may be gleaned from the provisions of RA 9054 (Organic Act) as well as other existing laws, including Executive Orders (EO) No. 426, dated 12 October 1990, EO 125, dated 16 September 2002, and EO 125-A, dated 29 November 2002, of the President of the Philippines, and the Local Government Code (LGC). These powers and responsibilities are exercised by DPWH-ARMM headed by the Department Secretary under the supervision of the Regional Governor.

Pursuant to EO 426, DPWH-ARMM is responsible for highways, flood control and water resource development systems, and other public works within ARMM and shall perform the following responsibilities:

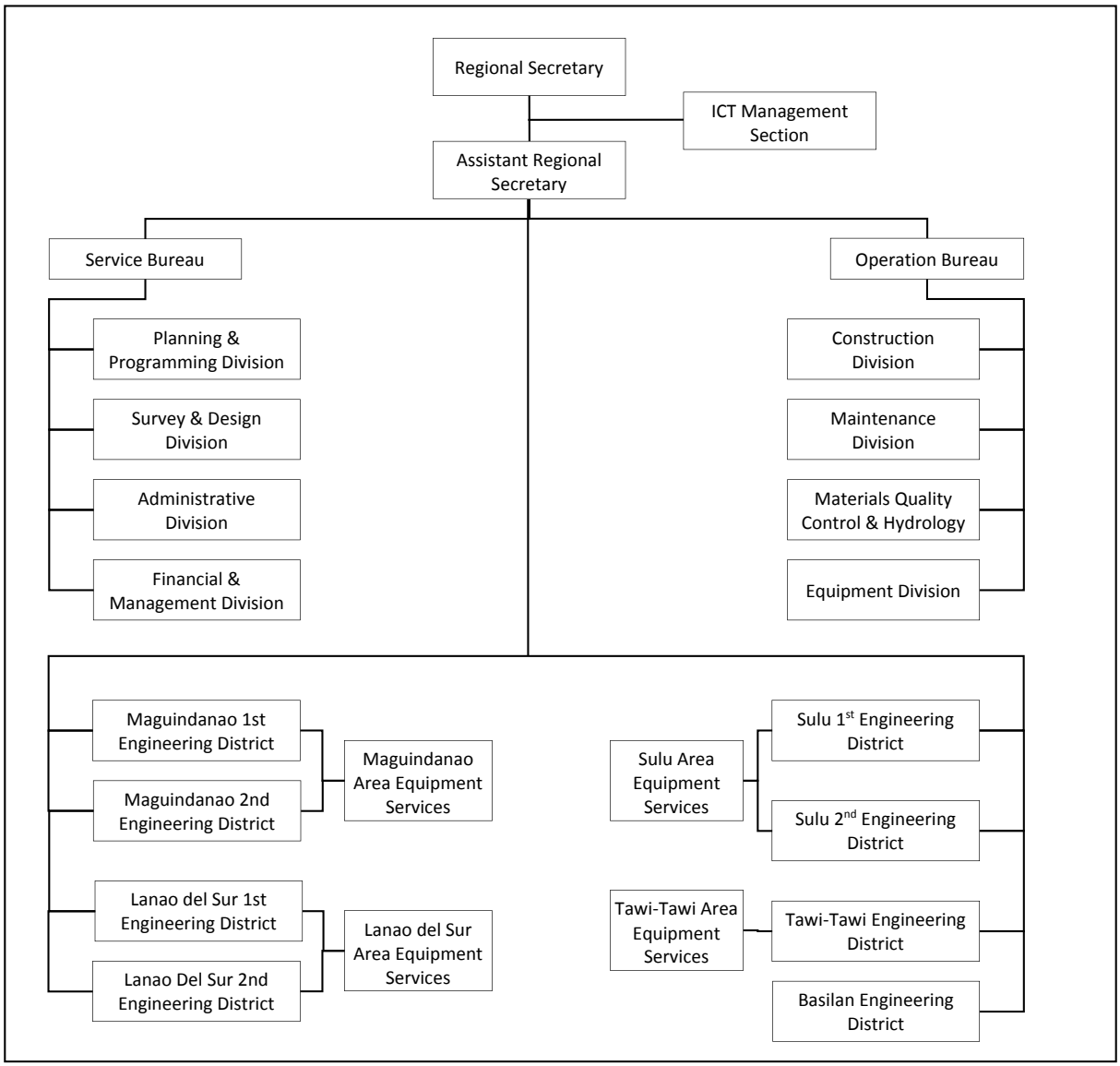
(1) Undertake and evaluate the planning, design, construction and works supervision for the infrastructure projects whose location and impact are confined within ARMM.
(2) Undertake the maintenance of infrastructure facilities within ARMM and supervise the maintenance of such local roads and other infrastructure receiving financial assistance from the national government.
(3) Ensure the implementation of laws, policies, programs, rules and regulations regarding infrastructure projects as well as all public and private physical structures within ARMM.
(4) Provide technical assistance related to their functions to other agencies within ARMM, especially LGUs.
(5) Coordinate with other National and Regional Government departments, agencies, institutions, and organizations, especially LGUs within ARMM in the planning and implementation of infrastructure projects.
(6) Conduct continuing consultations with the local communities, take appropriate measures to make the infrastructure services of the Regional Government responsive to the needs of the general public and recommend such appropriate actions as may be necessary.
(7) Perform such other related duties and responsibilities within ARMM as may be assigned or delegated by the Regional Governor or as may be provided by law.

DPWH-ARMM is headed by a Regional Secretary appointed by the ARMM Governor. The organizational set-up is illustrated in Figure 2.1. The Office of the Regional Secretary is composed of the Secretary and Assistant Regional Secretaries. The field offices, particularly the eight District Engineering Offices (DEOs), each headed by a District Engineer, who reports directly to the Secretary. Attached to the DEOs are four Area Equipment Services (AESs), as follows:

- Lanao del Sur Area Equipment Services (shared by Lanao I and Lanao II)
- Maguindanao Area Equipment Services (shared by Maguindanao I and Maguindanao II)
- Sulu Area Equipment Services (shared by Sulu I and Sulu II)
- Tawi-Tawi Area Equipment Services

2.2 Budgetary Framework

In recent years, the budget for infrastructure in the Bangsamoro area has increased substantially. For instance, infrastructure budget in 2012 was about PHP 1.09 billion but this amount increased by 38% in 2013 to the amount of PHP 1.5 billion and by 97% in 2014 to the amount of PHP 2.97 billion. This upward trend in infrastructure budget continued and in 2015, the biggest increase was observed in the amount of PHP 10.08 billion which represent 239% increase compared to the previous year (Table 2.1). Overall, DPWH-ARMM is implementing projects worth of PHP 10.13 billion after inclusion of PHP 51.5 million road projects in support to peace by OPAPP.



Source: Sec. Emil Sadain (September 3, 2014).

Figure 2.1. DPWH-ARMM Organizational Structure

Table 2.1 Past and Present Budget of DPWH-ARMM, 2012-2015

(Unit: PHP '000)

Component	2012*	2013*	2014*	2015†
A. Personal services (PS)	205,159	198,293	194,256	
B. Maintenance and other operating expenditures (MOOE)	176,712	275,380	317,289	
C. Capital outlays (regular infrastructure)	1,096,630	1,510,181	2,971,000	10,083,000
Total DPWH-ARMM budget	1,478,501	1,983,854	3,482,545	10,083,000
PAMANA (Roads to Peace)‡			2,052,400	51,500‡
Total	1,478,501	1,983,854	5,534,945	10,134,500

*Based on the presentation by Sec. Emil Sadain of DPWH-ARMM., September3, 2014; †DPWH-ARMM infrastructure projects (CY 2015), National Expenditure Program; ‡National government program that extends intervention to isolated, hard-to-reach, and conflict-affected communities, ensuring that they are managed by OPAPP and not left behind.

Source: National Expenditure Program FY 2015 by DBM.

2.3 Priority Investment Programs/Projects (2014–2015)

The priority projects of DPWH-ARMM in 2014 are shown in Table 2.2. The bulk of the infrastructure budget is allocated to development of local roads which is about 65.4%. Funds dedicated for

development of port, water supply and drainage/canal combined for 26.7%. Aside from regular infrastructure program of DPWH-ARMM, OPAPP is also implementing numerous local road projects in support of the peace process amounting to about PHP 2.0 billion.

Table 2.2 Summary of DPWH-ARMM Priority Investment Programs/Projects, 2014

Programs/Projects (2014)	ARMM infra budget			OPAPP projects (Roads to Peace)		
	Projects (n)	Length (km)	Amount (PHP mil.)	Projects (n)	Length (km)	Amount (PHP mil.)
National roads (repair, rehab, reblocking)	18	14.923	241.299 (8.1%)	-	-	-
Local roads	107	179.55	1,944.10 (65.4%)	34	205.24	2,052.40
Bridges	13	-	124.42 (4.2%)	-	-	-
Ports	17	-	288.52 (9.7%)	-	-	-
Water supply	30	-	264.07 (8.9%)	-	-	-
Drainage/canal improvements	12	-	59.01 (2.0%)	-	-	-
Other structures	9	-	49.581 (1.7%)	-	-	-
Total	206	226.04	2,971.00 (100%)	34	205.24	2,052.40

Source: 2013 DPWH-ARMM Accomplishment Report, Presentation of Sec. Emil Sadain during 11th Expanded Cabinet Meeting, Dec. 21-22, 2013, Waterfront Hotel, Davao City.

For the 2015 budget, of the PHP 10.03 billion fund allocated for infrastructure, PHP 8.10 billion is allocated to road network improvement which represents 80% of the budget as shown in Figure 2.2. Distribution of infrastructure budget, among the five provinces revealed that Basilan Province has the highest share at 31% and followed by Sulu Province with a share of 24%. The share of the rest of provinces is depicted in Figure 2.3.

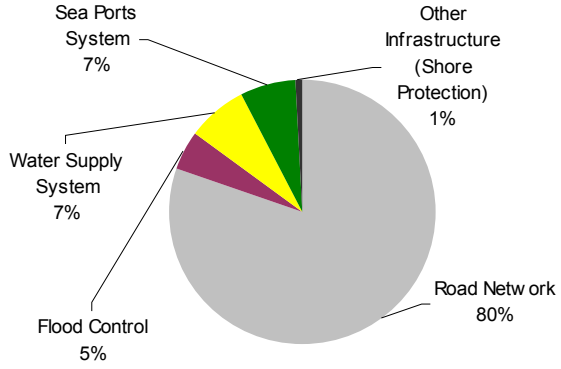


Figure 2.2 Distribution of 2015 Budget by Infrastructure

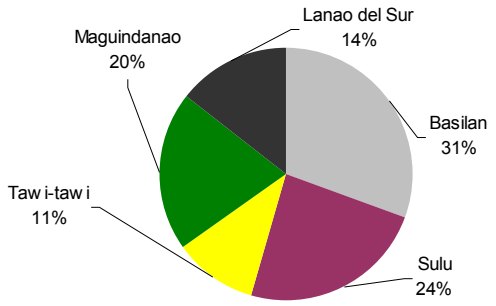
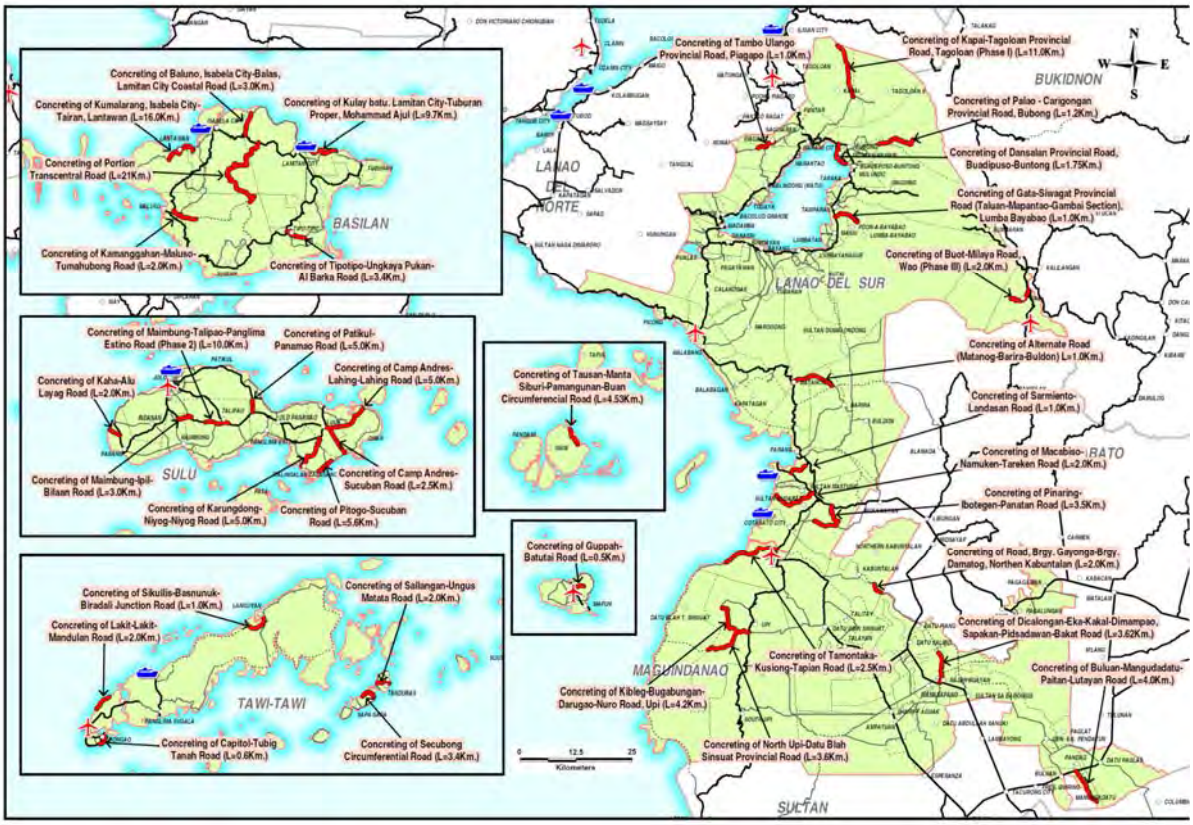


Figure 2.3 Distribution of 2015 Budget by Province

The bulk of the budget for road infrastructure (62.7%) is dedicated to road surface upgrading from gravel/earth to concrete pavement of major roads (i.e., national and provincial roads) as presented in Table 2.3. When these projects are completed, a total of 274.76 km of paved road will be added to the network of the region. Improvement work for local roads (i.e., projects in support for recovery of communities affected by man-made and natural calamities, tourism development, etc.) involves surface upgrading from gravel/earth to concrete surface. A total of 230.55 km of local roads is subject to this improvement. Figure 2.4 shows the locations of major road projects by DPWH, and these road projects are summarized in Table 2.3.



Note: Only major road projects shown.

Source: DPWH-ARMM's Infrastructure Projects (CY 2015) data.

Figure 2.4 Major Road Infrastructure Projects of DPWH-ARMM for 2015

Table 2.3 Details of DPWH-ARMM Road Projects, 2015

	Major road projects			Local road projects			Bridges	
Province	(n)	(km)	(PHP mil.)	(n)	(km)	(PHP mil.)	(n)	(PHP mil.)
Basilan	10	64.58	1123.60	36	76.60	966.95	4	80.00
Sulu	42	84.67	1587.93	30	41.99	340.49	1	30.00
Tawi-Tawi	17	21.95	438.99	24	26.70	376.41	19	127.00
Maguindanao	29	64.88	1207.12	18	41.61	445.12	2	97.20
Lanao del Sur	31	38.69	721.16	35	43.64	480.40	7	84.00
Total	129	274.76	5078.80	143	230.55	2609.37	33	418.20

Source: DPWH-ARMM Infrastructure Projects (CY 2015), National Expenditure Program, DPWH-ARMM.

2.4 Road Development Programs

DPWH-ARMM has launched several programs aimed to facilitate rapid improvement of the road network in the Bangsamoro. This includes the following.

2.4.1 Rapid Infrastructure Development Assistance (RIDA) for ARMM

The objectives of Rapid Infrastructure Development Assistance for ARMM are

- Rapid and inclusive growth,
- Zero backlog on ARMM infrastructure, and
- Quality infrastructures and services.

The targets in improving the roads of ARMM are as follows:

- **National road:** the target of DPWH-ARMM is 100% fully paved national roads by 2015. Of the total 992.87 km of national road, only 179.67 km are not yet paved.

- **Provincial road:** the target in 2015 is that at least 54.32% of the roads will be funded for upgrading. The next target is 100% paved provincial roads by 2016 and beyond. Of 1,343.95 km, only 277.77 km are paved and the remaining 79% are not yet paved.
- **Municipal road:** the target in 2015 is that 45.82% of the municipal road will be funded for upgrading. The next target is to pave 100% of the road by 2016 and beyond. Currently, of the 2,100 km road length, only 420 km is paved leaving about 1,680 km of road length unpaved.

2.4.2 Expanded ARMM Roads Mapping and Management System (E-ARMM System)

The E-ARMM system is a database system containing all roads information (national, provincial and local) in ARMM, their connectivity and conditions (i.e., pavement type) and other infrastructure facilities within the ARMM.

2.4.3 Creation of Information and Communication Technology (ICT) Division

On the institutional side, the proposal by DPWH-ARMM to create the Information and Communication Technology (ICT) Division was approved by the Department of Budget and Management (DBM) on 25 July 2014. The ICT Division with 19 technical personnel is geared towards upgrading the systems and enhancement of the operations of the existing Management Information Service (MIS) to cover wider supervision of areas in the field of engineering and Management Information Technology.

CHAPTER 3 ROAD NETWORK IN BANGSAMORO

The road network in Bangsamoro is depicted in Figure 3.1 for the mainland provinces and Figure 3.2 for the island provinces. The two figures show the network connectivity of national and provincial roads as well as the condition of pavement (paved or unpaved). Detailed analysis of the region's roads follows in the succeeding sections.

3.1 Road Length and Road Density

The Bangsamoro area has a total road length of 891 km in 2007 and increased to 993 km in 2013 which represents about 3% of the total national road. It is the only region in the Country where its national road is less than 1,000 km. In terms of road density which was calculated supply of road taking into account land area and population of a region, the Bangsamoro region has the lowest road density (0.10) among the 17 regions and way below the Mindanao average (0.17) and not even half of the National average (0.25). A supply of new 800 km of road is necessary for Bangsamoro to achieve the Mindanao average. Table 3.1 presents the road density of the Country by region.

Table 3.1 National Road Length and Road Density by Region

Region		Population (10^3, 2010)	Land area (km^2)	Road length (km)			Road density‡	
				2007	2013	Difference (2013-2007)	2007	2010
Philippines (DPWH-National)		92,338	309,771	29,370	42,621	13,251	0.18	0.25
Luzon*	NCR	11,856	620	1,032	1,141	109	0.39	0.42
	CAR	1,617	19,422	1,846	2,185	339	0.34	0.39
	Region I	4,748	13,013	1,610	1,655	45	0.21	0.21
	Region II	3,229	28,229	1,765	1,890	125	0.19	0.20
	Region III	10,138	22,015	2,032	2,343	311	0.14	0.16
	Region IV-A	12,610	16,873	2,404	2,462	58	0.17	0.17
	Region IV-B	2,745	29,621	2,185	2,285	100	0.25	0.25
	Region V	5,420	18,156	2,197	2,344	147	0.23	0.24
Visayas	Region VI	7,102	20,794	2,880	2,990	110	0.24	0.25
	Region VII	6,800	15,886	2,036	2,294	258	0.20	0.22
	Region VIII	4,101	23,251	2,372	2,511	139	0.25	0.26
Mindanao (average)†		21,968	135,402	7,900	9,261	1,361	0.14	0.17
Mindanao	Region IX	3,407	17,047	1,218	1,622	404	0.16	0.21
	Region X	4,297	20,496	1,682	1,923	241	0.19	0.20
	Region XI	4,469	20,357	1,447	1,668	221	0.16	0.17
	Region XII	4,110	22,513	1,304	1,541	237	0.14	0.16
	Region XIII	2,429	21,478	1,358	1,514	156	0.19	0.21
	ARMM (DPWH-ARMM)	3,256	33,511	891	993	102	0.08	0.10

*Data on Luzon and Visayas as of November 09, 2013
†Data on Mindanao as of December 03, 2013.

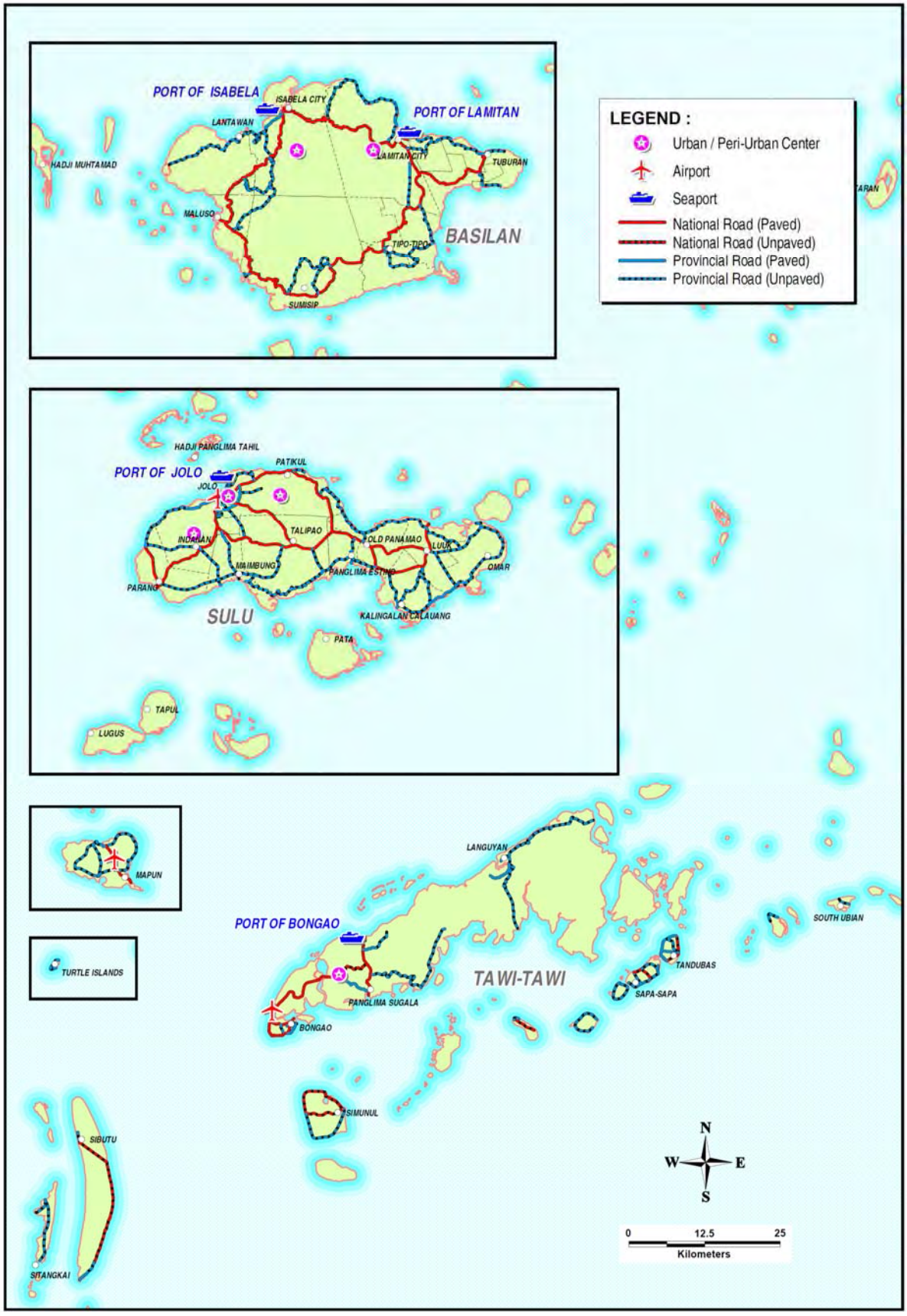
Source: DPWH Atlas, 2013 for road data and Philippine Statistics Authority for population.

‡ $\text{Road Density} = \frac{L}{\sqrt{P \times A}}$

L : Road Length (km)
P : Population in 1,000
A : Land Area in sq. km

Source: Data from BDP1, DPWH's e-ARMM, JICA's 2010 ARMM Infra Masterplan.

Figure 3.1 Present Road Network of Bangsamoro: Mainland Provinces



Source: ibid.

Figure 3.2 Present Road Network of Bangsamoro: Island Provinces

3.2 Pavement Rates

The pavement rates of national roads by region are presented in Table 3.2. The paved portion of Bangsamoro's national roads increased from 76.8% in 2007 to 81.9% in 2013. The increase corresponds to 50.62 km, increasing the paved national road length from 762.3 km in 2007 to 813.0 km in 2013. It should be noted, however, that the pavement rate in Bangsamoro is still below the national average of 83%.

Table 3.2 Pavement Rates of National Roads by Region, 2013

Region		Total (km)	Paved (km)	Unpaved (km)	Pavement rate (%)	
					2007	2013
Philippines (DPWH-National)		33,219.5	27,585.9	5,633.6	71.5	83.0
Luzon	NCR	1,140.9	1,140.9	-	100.0	100.0
	CAR	2,184.8	1,304.5	880.3	35.7	59.7
	RegionI	1,655.5	1,595.0	60.4	90.0	96.4
	RegionII	1,889.5	1,578.9	310.7	69.5	83.6
	RegionIII	2,343.3	2,207.8	135.5	87.2	94.2
	RegionIV-A	2,462.0	2,276.4	185.5	85.8	92.5
	RegionIV-B	2,285.1	1,590.6	694.5	46.1	69.6
	RegionV	2,344.1	2,047.4	296.7	72.2	87.3
Visayas	RegionVI	2,989.9	2,736.0	253.9	75.6	91.5
	RegionVII	2,293.6	2,095.3	198.4	85.7	91.4
	RegionVIII	2,510.6	2,291.9	218.7	81.3	91.3
Mindanao	RegionIX	1,567.5	1,088.0	479.6	68.6	69.4
	RegionX	1,898.3	1,416.2	482.1	69.6	74.6
	RegionXI	1,662.4	1,185.9	476.5	62.9	71.3
	RegionXII	1,521.3	1,093.2	428.1	62.4	71.9
	RegionXIII	1,478.4	1,125.1	353.3	46.3	76.1
	ARMM (DPWH-ARMM)	992.6	813.0	179.6	76.8	81.9

Source: DPWH Atlas, 2013 except data from ARMM which was obtained from DPWH-ARMM.

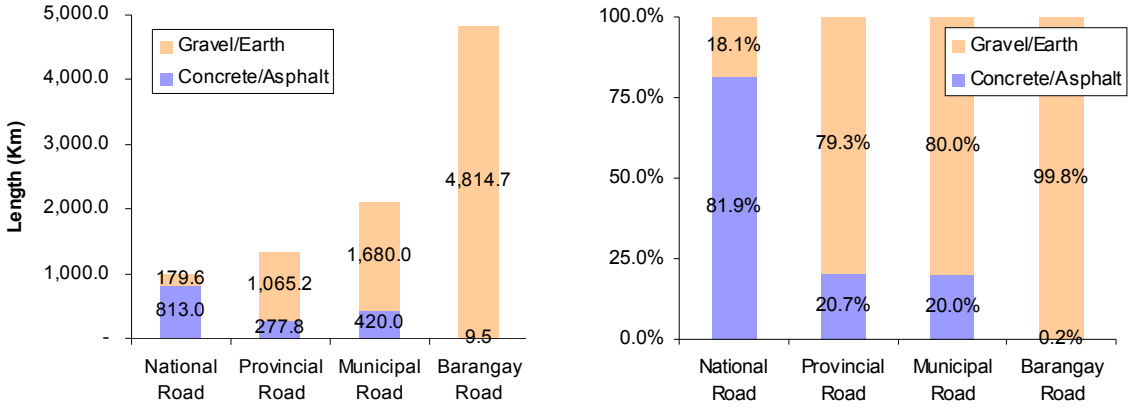
A closer look at the ARMM's roads as shown in Figure 3.3 reveals the following (as indicated in Table 3.3):

- National roads: Most roads surfaced with concrete (81%) and only 18% surfaced with gravel and earth, accounting for about 180 km.
- Provincial roads: Only 21% with concrete and asphalt surface and the remaining 79% with gravel and earth surface, which corresponds to 1,680 km.
- Municipal roads: Only 20% with concrete or asphalt surface and the rest about 1,680 km with gravel or earth surface.
- Barangay roads and farm-to-market roads (FMRs): Only 0.2% surfaced with concrete or asphalt surface and the remaining 4,814 km with gravel or earth surface.

Table 3.3 Pavement Surface of ARMM's Roads

Level	Concrete	Asphalt	Gravel & earth	Total (km)
National Road (km)	802.62	10.35	179.62	992.59
	81%	1%	18%	100%
Provincial Road (km)	277.52	0.25	1,065.18	1,342.95
	21%	0%	79%	100%
Municipal Road (km)	420	-	1,680.00	2,100.00
	20%	-	80%	100%
*Barangay Road (km)	9.51	-	4814.72	4,824.23
	0.2%		99.8%	100.0%
Total	1,509.65	10.60	7,739.52	9,259.77
	16.3%	0.1%	83.6%	100%

Source: DPWH-ARMM, 2014 except with * where data was taken from ARMM Regional Development Plan Medium Term Update, 2013.



Source: DPWH-ARMM, 2014 except with barangay data which was culled from ARMM Regional Development Plan Medium Term Update, 2013.

Figure 3.3 ARMM's Road Type, Road Length, and Pavement Type

By disaggregating further the data by provincial level, the following characterized the road network of Bangsamoro (Table 3.4 and 3.5 and Figure 3.4 and 3.5):

- Lanao del Sur has the longest national road length with a total of 306.53 km. Of the length, only 14% has either earth or gravel surface. Provincial roads in Lanao del Sur has a length of 396.34 km, of which 42% is unpaved.
- Maguindanao has the second longest national road length of 282.26 km. Of this only 6% is unpaved. Provincial roads in Maguindanao are mostly unpaved (90% of the total 427.55 km).
- Basilan has the third longest national road length with a total of 153.87 km, of which only 18% is yet to be paved. Basilan's provincial roads are similar to Maguindanao's with 89% of the total 172.65 km still surfaced with gravel or earth.
- Sulu has a total of 135.12 km of national roads, of which 20% is still surfaced with gravel or earth. Provincial roads in Sulu are mostly surfaced with earth or gravel, accounting for almost 200 km. Paved provincial roads have a length of about 16 km.
- Tawi-Tawi has a total of 115.10 km of national roads, of which 46% is paved and the rest is still surfaced with gravel or earth. This province has the longest national road length with gravel or earth surface.

Table 3.4 Pavement Types of ARMM's National Roads by Province

No.	Province	Roads			Bridges		Total road & bridge length (km)
		Paved (km)	Unpaved (km)	Total (km)	No.	Length (km)	
1	Basilan	125.87	28	153.87	35	1.02	154.89
		82%	18%	100%			
2	Sulu	107.5	27.62	135.12	29	0.24	135.36
		80%	20%	100%			
3	Tawi-Tawi	52.64	62.46	115.1	10	0.4	115.5
		46%	54%	100%			
4	Maguindanao	264.6	17.66	282.26	58	2.62	284.88
		94%	6%	100%			
5	Lanao del Sur	262.59	43.92	306.52	78	2.44	308.96
		86%	14%	100%			
Total		813.2	179.66	992.87	210	6.72	999.59
		82%	18%	100%			

Source: DPWH-ARMM, 2014.

Table 3.5 Pavement Types of ARMM's Provincial Roads by Province

No.	Province	Roads			
		Paved (km)	Unpaved (km)	Total (km)	Proposed new (km)
1	Basilan	18.35	154.3	172.65	58.9
		11%	89%	100%	
2	Sulu	16.1	200.3	216.4	-
		7%	93%	100%	
3	Tawi-Tawi	19.5	110.51	130.01	82.8
		15%	85%	100%	
4	Maguindanao	44.12	383.43	427.55	108.8
		10%	90%	100%	
5	Lanao del Sur	230.94	165.4	396.34	-
		58%	42%	100%	
Total		329.01	1,013.94	1,342.95	250.5
		24%	76%	100%	

Source: ibid.

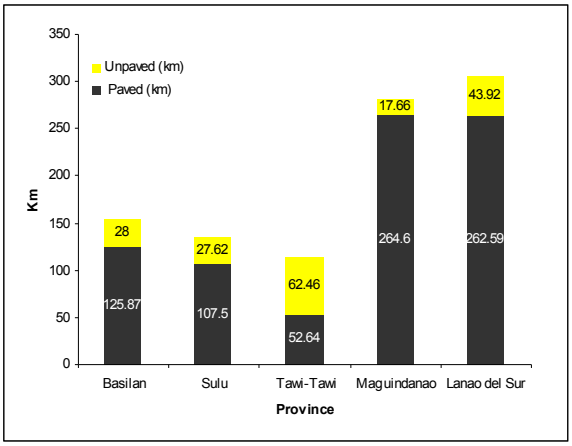


Figure 3.4 Pavement Types of National Roads within ARMM

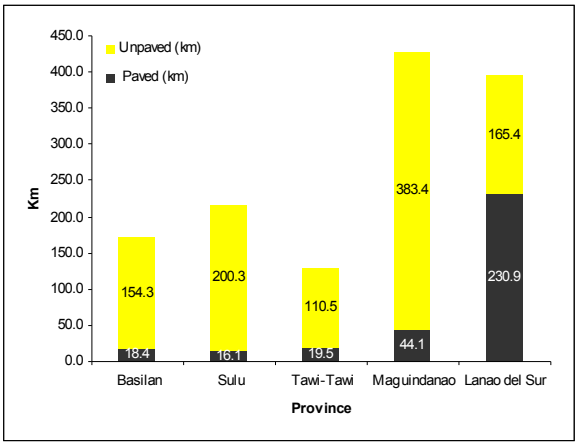


Figure 3.5 Pavement Types of Provincial Roads within ARMM

3.3 Road Condition

A road surface condition survey was undertaken by the JICA Study Team from February to October 2015 using the Dynamic Response Intelligent Monitoring System (DRIMS) to measure the International Roughness Index (IRI) of roads in the region. DRIMS was developed by the Bridge and Structures Laboratory at the University of Tokyo and this was the first time the equipment was utilized in the Philippines. The equipment gives estimated IRI of the road as a result of measuring and calculating acceleration according to vehicle motion.

Based on this survey, the length of the national road in bad condition thus required immediate intervention is about 180 km which represents 20.7% of the total length of the national road (Table 3.6). Those in poor condition accounts for 281.45 km. Roads in good and fair condition represent 47.2% of the entire network which correspond to 412.60 km. Maps showing the IRI values of the national road network are shown in Figure 3.6 (1/2) and Figure 3.6 (2/2).

As indicated in Table 3.7, paved provincial roads in good and fair condition in the region are limited to 84.60 km, representing about 23.2% of the total length of paved provincial roads. Lack of maintenance of these roads led to the poor condition of large section of the provincial road as indicated in the table below where more than 50% of the network is in bad condition. This is significantly high compared to road in bad condition along the national road which is just 20% of the network. Maps showing the IRI value of the provincial road network are available in Figure 3.7 (1/2) and Figure 3.7 (2/2).

Table 3.6 Road Condition of Paved National Roads

	Condition	Good	Fair	Poor	Bad	Total
	IRI range	3<IRI	3<IRI<5	5<IRI<7	7>IRI	
Mainland	Maguindanao (km)	5.35	73.75	104.20	106.99	290.29
	Lanao del Sur (km)	41.15	131.35	76.85	32.50	281.85
	Subtotal (km)	46.5	205.1	181.05	139.49	572.14
	(%)	8.1	35.8	31.6	24.4	100.0
Island	Basilan	14.90	73.95	41.50	16.10	146.45
	Sulu	3.15	57.55	44.55	13.45	118.70
	Tawi-Tawi	0.55	10.90	14.35	11.60	37.40
	Subtotal (km)	18.60	142.40	100.40	41.15	302.55
	(%)	6.1	47.1	33.2	13.6	100.0
	Total	65.10	347.50	281.45	180.64	874.69
	(%)	7.4	39.7	32.2	20.7	100.0

Note: IRI = International Roughness Index

Source: JICA Study Team.

Table 3.7 Road Condition of Paved Provincial Roads

	Condition	Good	Fair	Poor	Bad	Total
	IRI range	3<IRI	3<IRI<5	5<IRI<7	7>IRI	
Mainland	Maguindanao (km)	0.70	38.70	44.00	25.80	109.20
	Lanao del Sur (km)	-	6.40	24.30	120.20	150.90
	Subtotal (km)	0.70	45.10	68.30	146.00	260.10
	(%)	0.3	17.3	26.3	56.1	100.0
Island	Basilan	1.00	9.20	10.60	15.30	36.10
	Sulu	4.20	21.90	11.50	11.90	49.50
	Tawi-Tawi	-	2.50	5.40	11.20	19.10
	Subtotal (km)	5.20	33.60	27.50	38.40	104.70
	(%)	5.0	32.1	26.3	36.7	100.0
	Total	5.90	78.70	95.80	184.40	364.80
	(%)	1.6	21.6	26.3	50.5	100.0

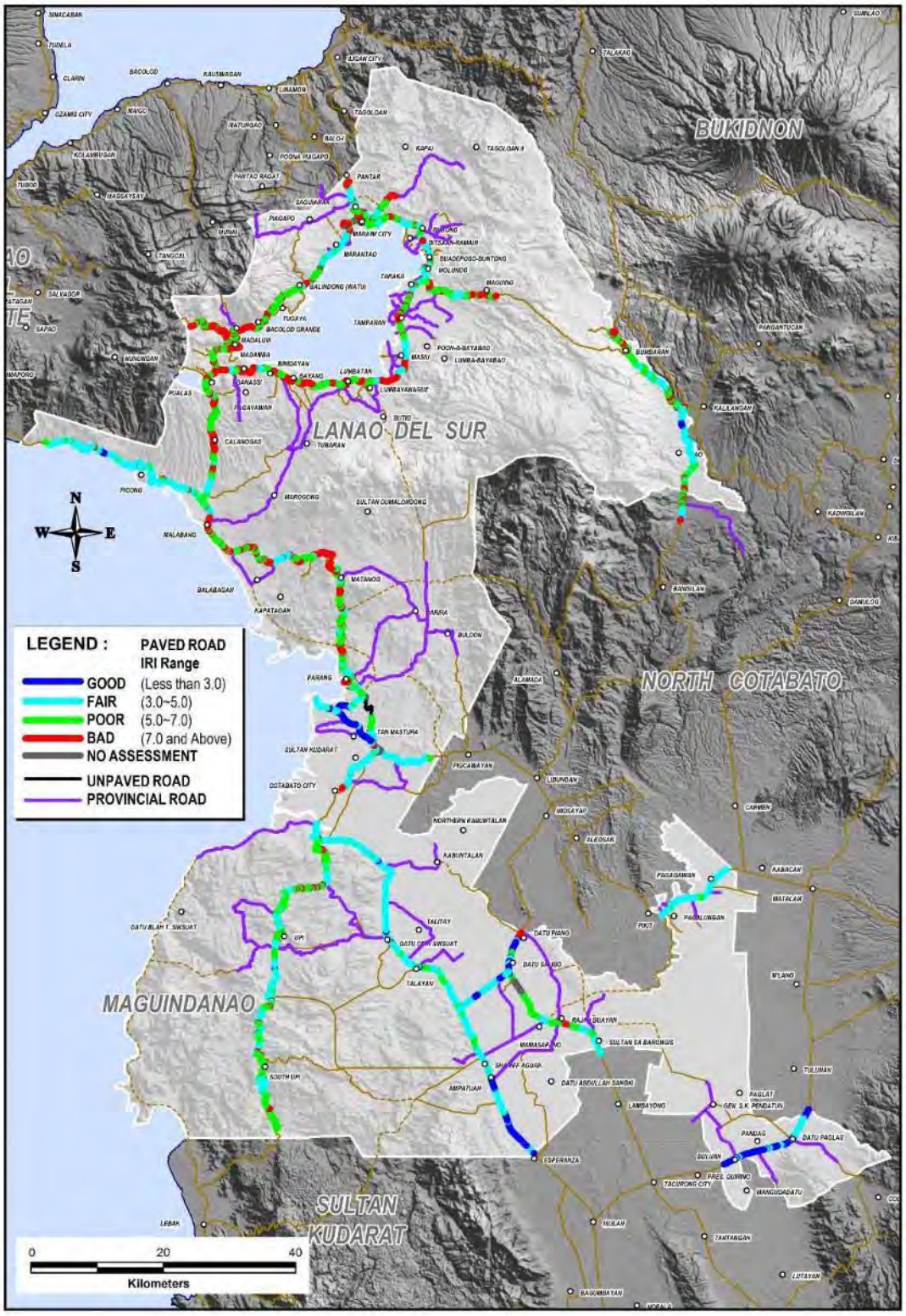
Source: ibid.

The Infrastructure (Road Network) Development Plan for the ARMM, supported by JICA, identified five missing links and six new roads as critical sections to complete the primary and secondary road network of Bangsamoro (Table 3.8). The lack of these roads affect accessibility to large area of the region and people are forced to take a long detour. Hence, there are many areas with accessibility problems in Bangsamoro. As indicated in Figure 3.8, the presence of missing links in the Bangsamoro region is notable compared to the neighboring regions.

Table 3.8 Missing Link Roads and Their Lengths

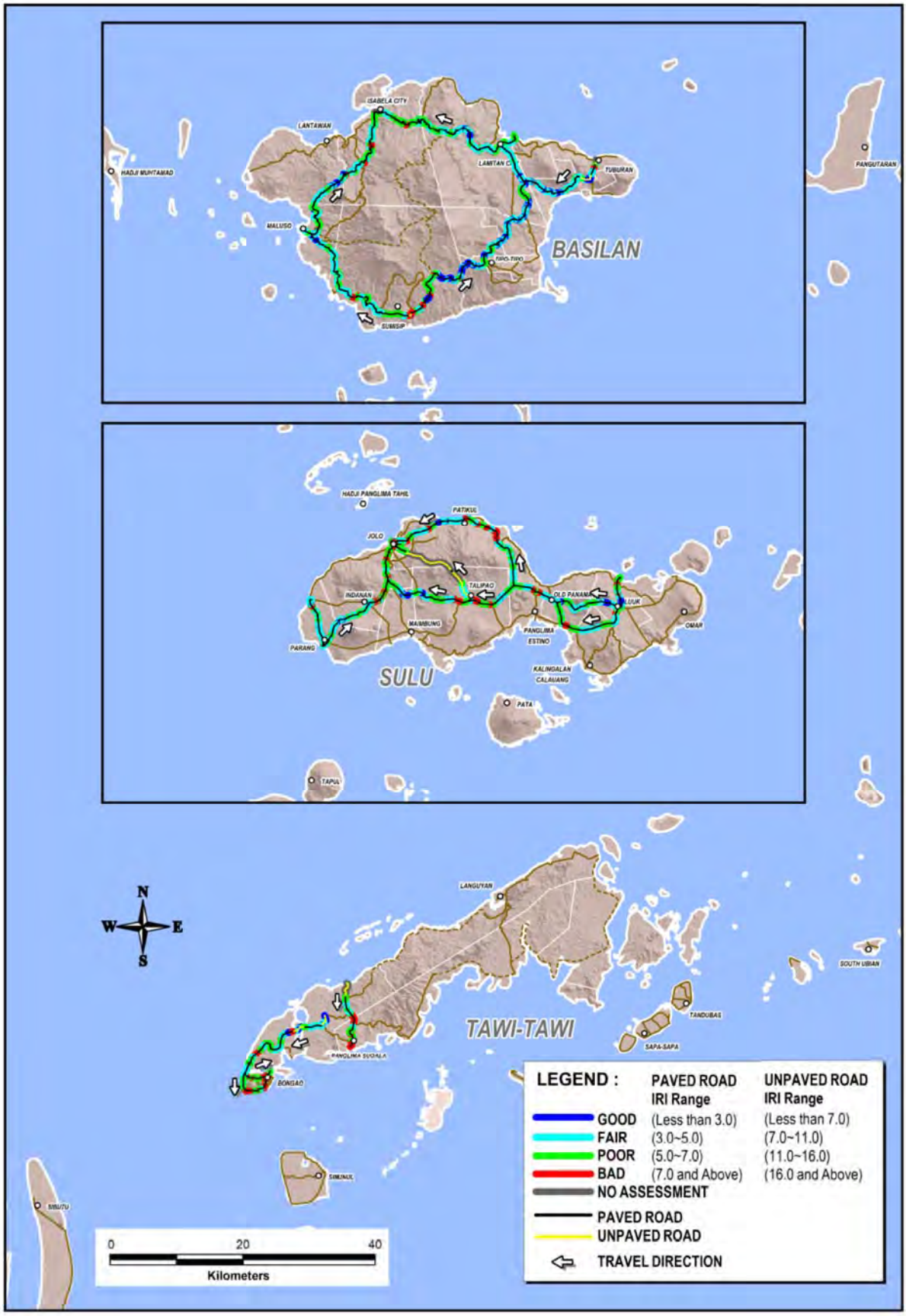
Road name	Length (km)	Road class
Missing Links	155.4	
1. Molundo–Wao Road	30.4	Regional Primary Road
2. SK Border–Butig–Lumbayanague Road	25.0	Regional Primary Road
3. Malabang–Marogong–Tubaran–Bayang Road	25.0	Regional Secondary Road
4. Tapian–Lebak Road	50.0	Regional Secondary Road
5. Maganoy–Lebak Road	25.0	Regional Primary Road
New Road (Mainland)	110.7	
1. Parang–Balabagan Road	30.0	Regional Secondary Road
2. Matanog–Alamada Road (Matanog–Buldon section)	20.0	Regional Primary Road
3. Matanog–Alamada Road (Buldon–Alamada section)	15.0	Regional Primary Road
4. Manuangan–Parang Road	20.0	Regional Secondary Road
5. Midsayap–Datu Piang Road	20.0	Regional Primary Road
6. Molundo–Wao (part of Molundo–Wao missing link)	5.7	Regional Primary Road

Source: The Study on Infrastructure (Road Network) Development Plan for the ARMM, JICA, 2010.



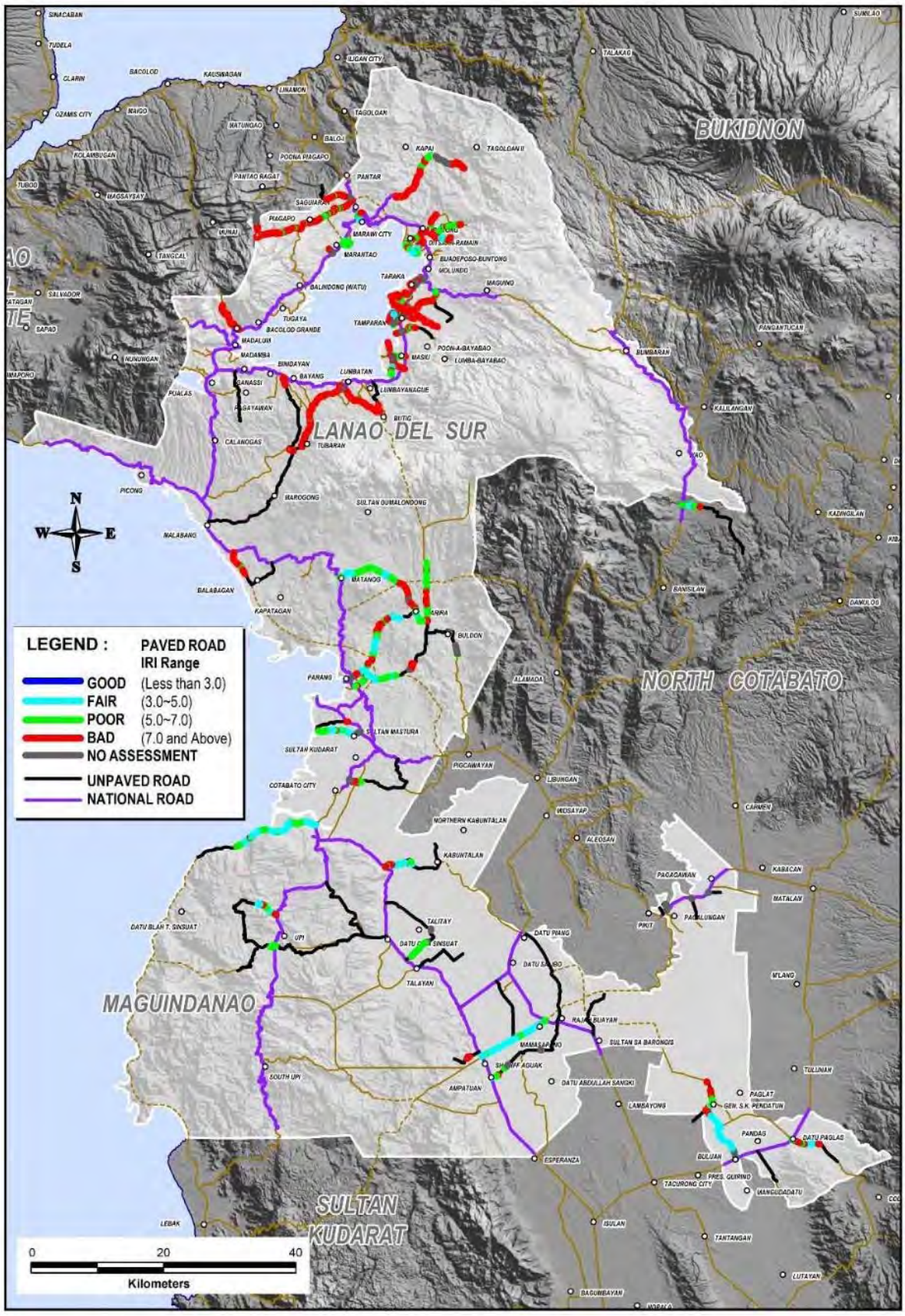
Source: JICA Study Team DRIMS Survey February–October 2015.

Figure 3.6 Surface Condition of National Road of Bangsamoro (1/2): Mainland Provinces



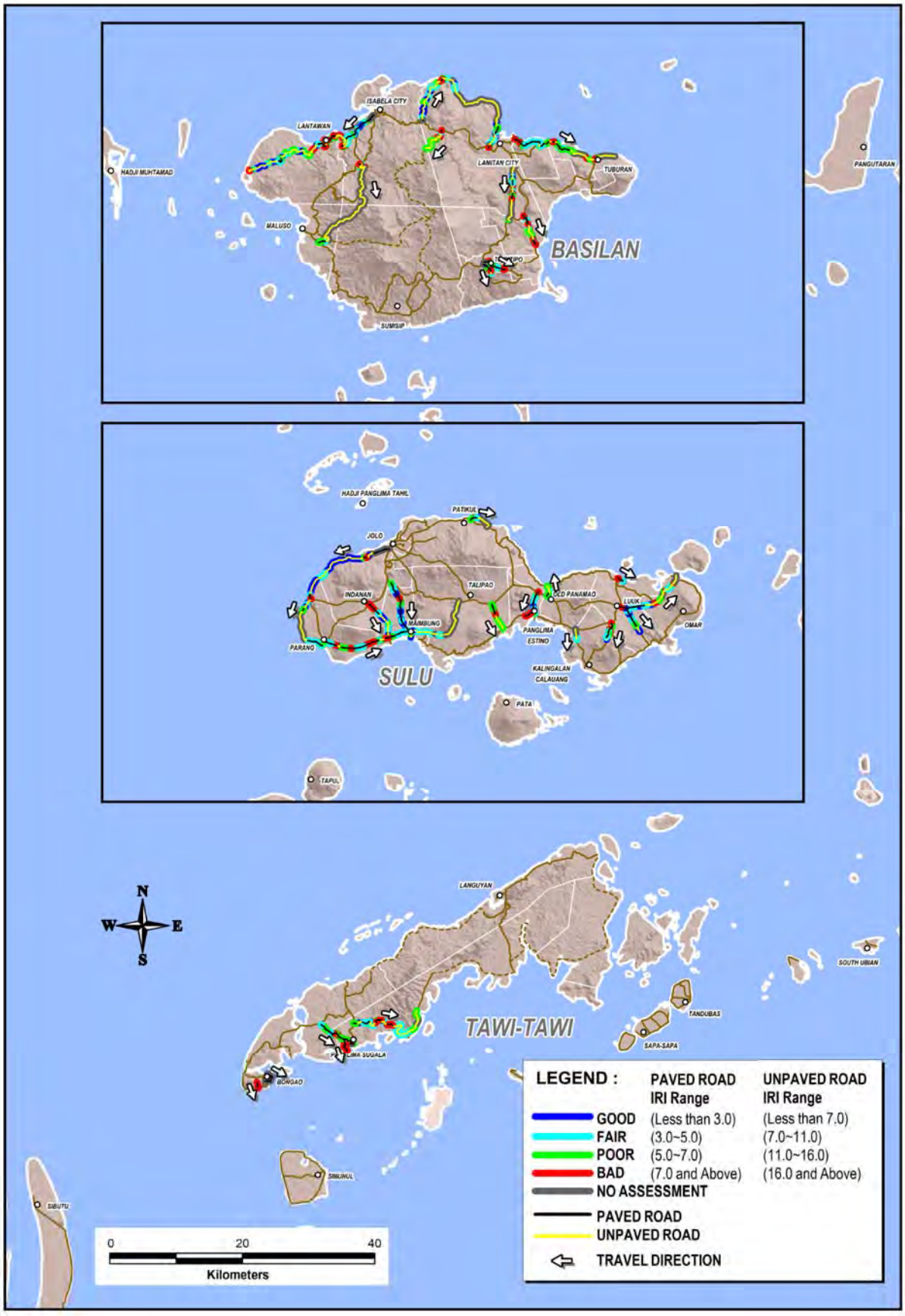
Source: ibid.

Figure 3.6 Surface Condition of National Road of Bangsamoro (2/2): Island Provinces



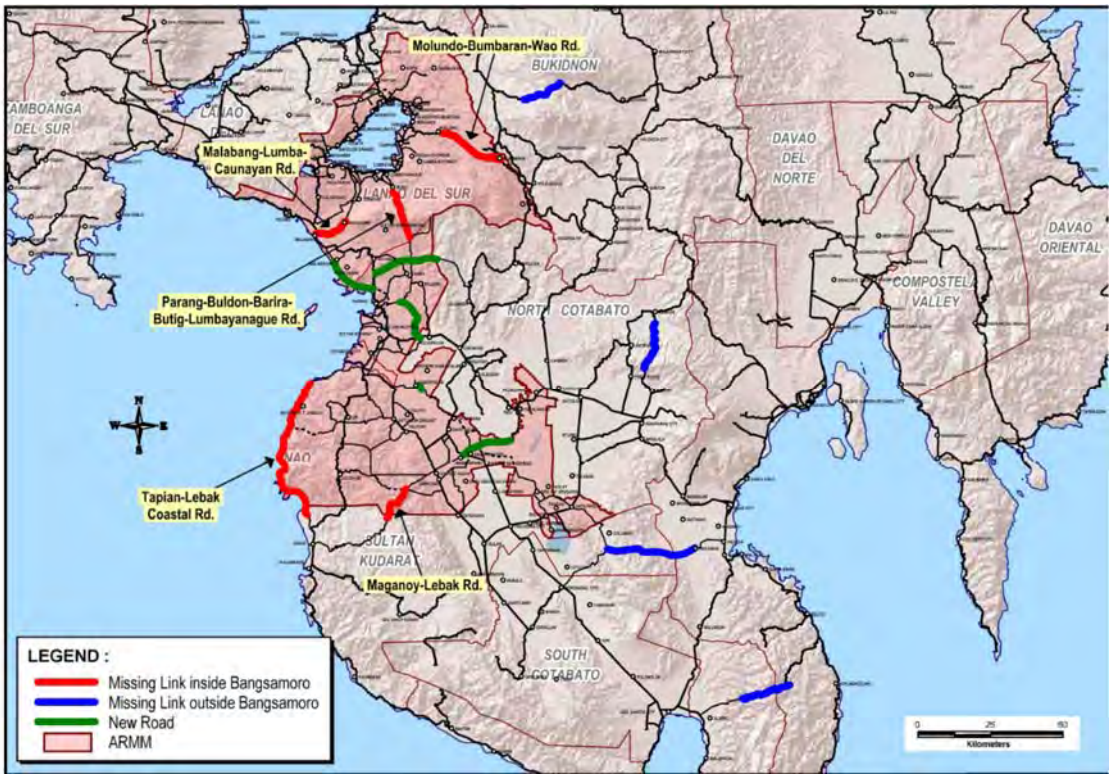
Source: ibid.

Figure 3.7 Surface Condition of Provincial Road of Bangsamoro (1/2): Mainland Provinces



Source: ibid.

Figure 3.7 Surface Condition of Provincial Road of Bangsamoro (2/2): Island Provinces



Source: ibid.

Figure 3.8 Missing Links in Bangsamoro Network and Surrounding Regions

3.4 Traffic Volume

The traffic volume on the major roads of Bangsamoro is presented in Table 3.9 and depicted in Figure 3.9. Data were taken from the regular traffic count survey of DPWH-National. Since DPWH National is not undertaking traffic survey inside the Bangsamoro region, the 2008 survey data by the JICA study were used as base data to estimate current traffic in Bangsamoro. Annual growth rate of DPWH data (2008–2014) was used as guide to estimate growth rate inside the study area. Based on these traffic data, the following were observed:

- Cotabato–Marawi corridor's traffic volume is about 1,500 vehicles per day, Cotabato–Davao corridor is about 3,200 and Cotabato–Gen. Santos is about 2,200.
- If traffic growth is taken as an indicator to recent progress in the area, arterial roads of major cities of Bangsamoro (Cotabato City and Marawi city) have a lower growth (between 1% and 4% annually) than arterial roads of Davao City and Gen. Santos which have an annual traffic growth of 5% to 16% annually.

Table 3.9 Traffic Volume in Bangsamoro and Surrounding Areas

(Unit: No. of vehicles)

	Road name	2008 AADT (DPWH)					2014 AADT (DPWH)				
		Car	Jeep	Bus	Truck	Total	Car	Jeep	Bus	Truck	Total
Mainland Mindanao	Digos–Makar Rd.	1,118	1,050	356	2,857	5,381	4,813	1,429	637	595	7,474
	Cotabato–Marbel Rd.	972	189	95	243	1,499	1,161	1,846	350	390	3,747
	Sarangani–SK Coastal Rd.	327	295	193	39	854	191	625	108	33	957
	Cotabato–Marbel Rd.	1,957	2,241	11	304	4,513	384	448	75	143	1,050
	Midsayap–Marbel Rd.	1,693	561	124	642	3,020	3,345	536	195	715	4,790
	Butuan City–CDO-Iligan Rd.	4,037	2,455	308	748	7,548	1,112	1,544	566	1,025	4,247
	Sayre Highway	1,118	1,050	356	2,857	5,039	1,235	968	415	485	3,104
	Kibawe–Kadingilan Rd.	554	57	46	92	749	135	80	-	188	403
	Sayre Highway	2,557	600	542	1,110	4,809	1,746	2,055	679	707	5,187
	Davao–Cotabato Rd. (Jct. Digos)	1,592	494	178	1,138	3,402	1,175	1,677	313	321	3,486
	Cotabato City Circ. Rd.	3,320	2,590	743	1,119	7,772	2,390	1,380	246	358	4,373
	Davao–Cotabato Rd. (Sultan	1,736	358	272	656	3,022	1,279	1,304	187	438	3,208

	Road name	2008 AADT (DPWH)					2014 AADT (DPWH)				
		Car	Jeep	Bus	Truck	Total	Car	Jeep	Bus	Truck	Total
	Kudarat–Pigcawayan)										
	Ozamis City-Oroquieta City Rd.	2,243	275	226	631	3,375	1,460	1,138	255	220	3,073
	Linamon-Zamboanga Rd.	1,202	436	859	635	3,132	966	1,429	634	489	3,518
	Misamis O.–Ma Cristina Rd.	5,054	3,872	5	517	9,448	6,195	4,712	1,183	831	12,921
	Pagadian–Zamboanga City Rd.	2,851	379	482	1,187	4,899	1,785	1,625	641	626	4,678
	Iligan City–Marawi City Rd.	3,134	598	13	248	4,157	3,414	367	-	268	4,049
	Maramag–Maradugao Rd.	621	114	58	243	1,036	642	683	222	220	1,767
	JICA's ARMM Infrastructure Masterplan data						Estimated by JICA Study Team				
	Marawi–Saguiaran Rd.	3,163	734	-	259	4,156	4,112	954	-	337	5,403
	Balindong–Marantao Rd.	1,728	944	-	109	2,781	2,246	1,227	-	142	3,615
	Maguing–Molundo Rd.	381	579	-	113	1,073	495	753	-	147	1,395
	Calanogas–Pagayawan Rd.	97	260	-	15	372	126	338	-	20	484
	Tukuran–Karumatan Rd.	226	167	-	73	466	294	217	-	95	606
	Labangan–Tukuran Rd.	378	208	5	110	701	491	270	7	143	911
	Cotabato–Parang Rd.	783	432	1	153	1,369	1,018	562	1	199	1,780
	Cotabato–Polloc Rd.	191	63	-	143	397	248	82	-	186	516
	Cotabato–Kusiong Rd.	31	111	-	61	203	40	144	-	79	264
	Cotabato–Upi Rd.	113	35	-	164	312	147	46	-	213	406
	Upi–Lebak Rd.	61	2	-	40	103	79	3	-	52	134
	Cotabato–DOS Rd.	891	609	38	155	1,693	1,158	792	49	202	2,201
	Midsayap–Datu Piang Rd.	144	129	-	108	381	187	168	-	140	495
	Ampatuan–Esperanza Rd.	611	334	29	136	1,110	794	434	38	177	1,443
	Tacurong–Lambayong Rd.	488	149	-	172	809	634	194	-	224	1,052
	Kabacan–Pagalungan Rd.	1,410	379	122	323	2,234	1,833	493	159	420	2,904
	Carmen–Kabacan Rd.	689	480	35	282	1,486	896	624	46	367	1,932
	Kitaotao–Dangcagan Rd.	897	233	129	420	1,679	1,166	303	168	546	2,183
	Maramag–Quezon Rd.	997	81	70	469	1,617	1,296	105	91	610	2,102
	Magpet–Kidapawan Rd.	715	104	216	29	1,064	930	135	281	38	1,383
	Tacurong–Pres. Quirino Rd.	1,321	536	66	450	2,373	1,717	697	86	585	3,085
	Gen. Santos–Polomolok Rd.	2,629	1,232	201	656	4,718	3,418	1,602	261	853	6,133
	Bansalan–Makilala Rd.	2,386	1,034	140	915	4,475	3,102	1,344	182	1,190	5,818
	Gen. Santos–Malungon Rd.	2,759	683	243	343	4,028	3,587	888	316	446	5,236
	Balabagan–Malabang Rd.*	676	259	1	92	1067	879	485	1	172	1,536
Island Provinces	Isabela–Lamitan Rd.	1,208	345	309	677	2,539	1,570	449	402	880	3,301
	Isabela–Maluso Rd.	923	317	117	522	1,879	1,200	412	152	679	2,443
	Pasiagan–Patikul Rd.	546	414	-	592	1,552	710	538	-	770	2,018
	Jolo–Indanan–Parang Rd.	114	455	-	391	960	148	592	-	508	1,248
	Jolo–Talipao Rd.	80	689	-	127	896	104	896	-	165	1,165
	Nalil-Bongao Rd.	84	103	-	41	228	109	134	-	53	296
	Sanga Sanga–Bongao Rd.	110	93	-	52	255	143	121	-	68	332

*2003 JICA data ARMM Infrastructure (Road Network) Development Plan, 2010.

Source: DPWH National Road Traffic Survey Program 2014; JICA's ARMM Infrastructure (Road Network) Development Plan, 2010.

3.5 Freight Transport in Bangsamoro

3.5.1 Polloc Port and other alternative Ports for Bangsamoro

The Polloc Port's operations have considerable influence on how the freight transport in Bangsamoro is moved. Over the years, the level of port operation has shrunk. This has resulted in shippers in Bangsamoro changing to other ports in Mindanao, particularly the Sasa Port of Davao, ports of Cagayan de Oro (Cagayan de Oro port and Mindanao International Container Terminal), and the Makar Wharf of General Santos (Figure 3.10). This was confirmed by a 2009 survey on major agro-industries in the Bangsamoro (e.g., Lamsan, La Frutera, and Matling) as part of the Study on Infrastructure (Road Network) Development Plan for the ARMM by JICA. The survey results revealed that most of these firms used multiple ports outside Bangsamoro to ship their products. Of all the ports in Mindanao, the ports of Davao, Cagayan, and General Santos were preferred alternatives.

Unless operation of the Polloc Port is significantly improved, shippers in Bangsamoro will be forced to take the route of bringing their cargoes to any of the ports above. In terms of distance, the Makar Wharf of General Santos City and the Iligan Port are the closest (Table 3.10). However, the former has the advantage of passing through more peaceful areas which could explain the preference for the Makar Wharf.

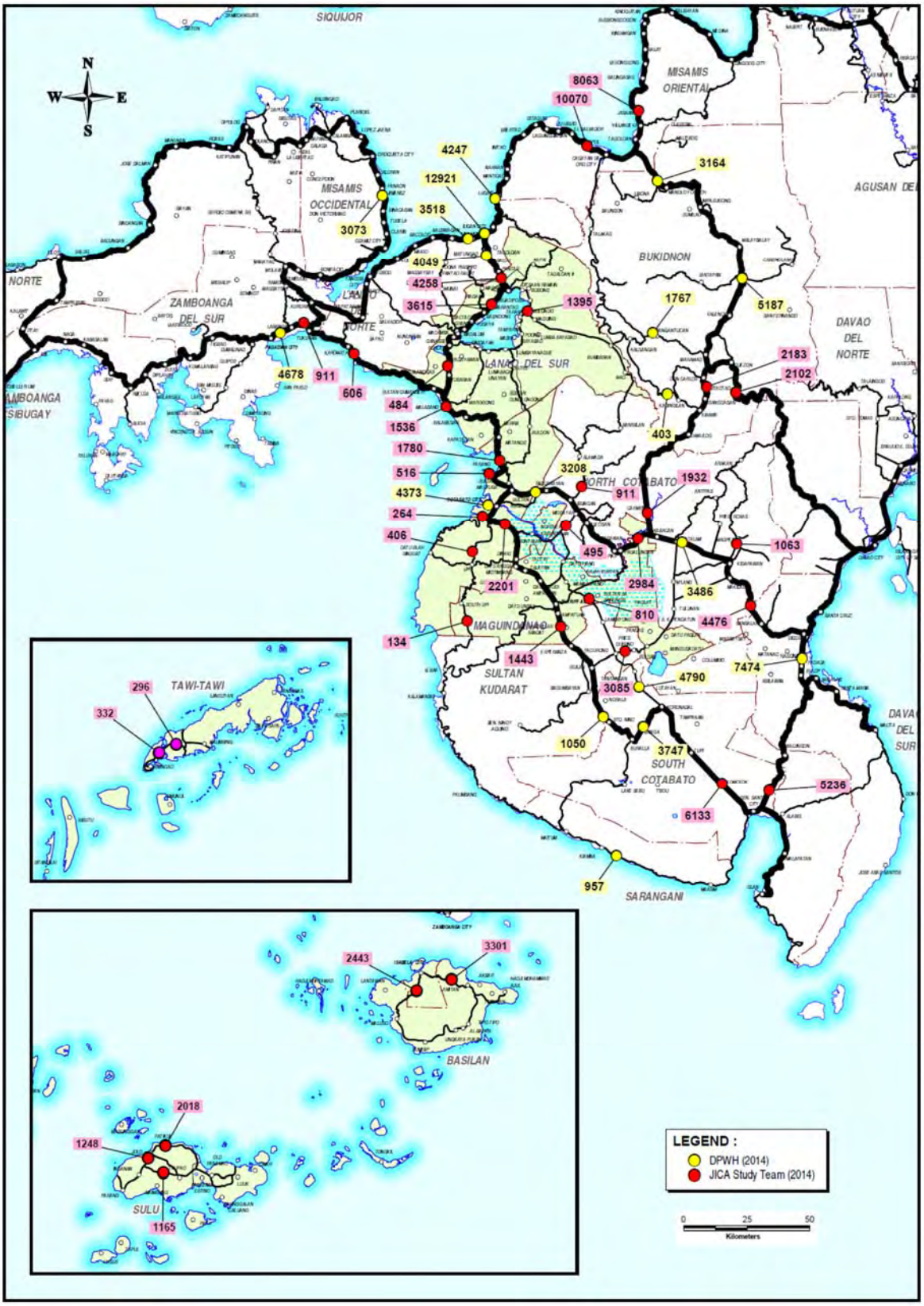
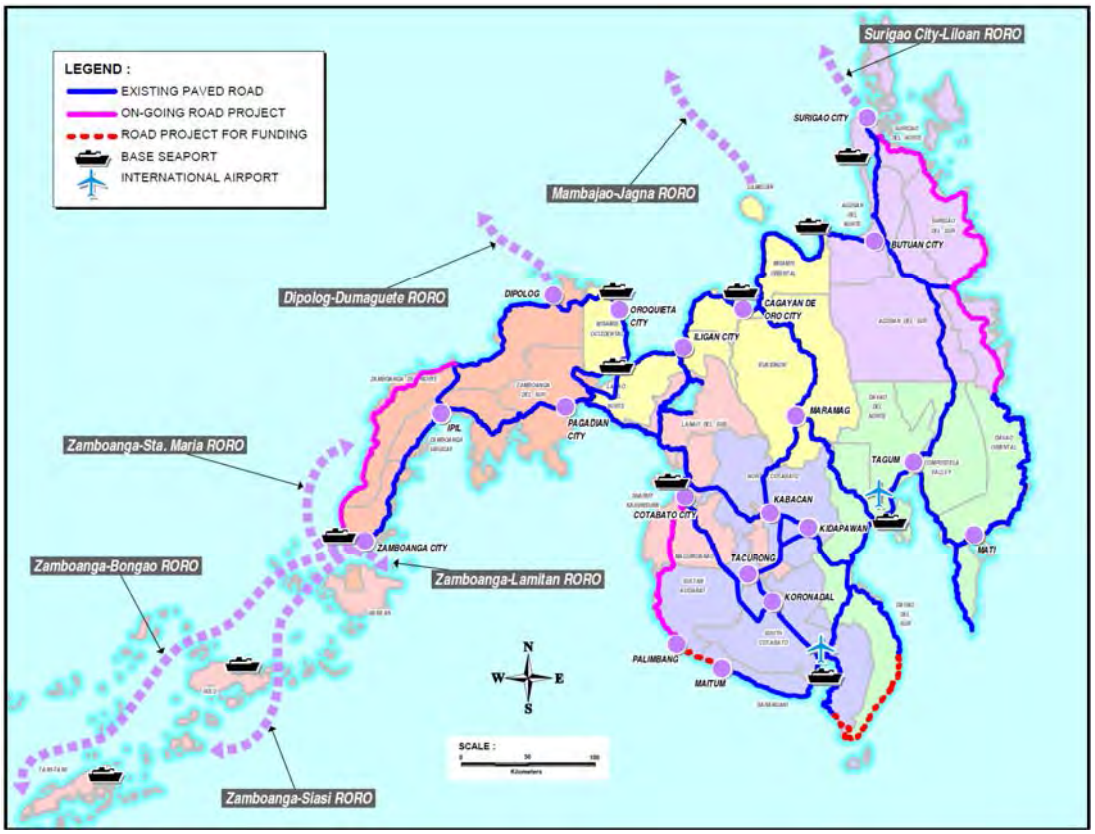


Figure 3.9 Traffic Volume in Bangsamoro and Surrounding Regions



Source: Prepared by the JICA Study Team based on the MINDA's Economic Corridor.

Figure 3.10 Locations of Alternative Ports for Bangsamoro

Table 3.10 Distances of Alternative Ports from Cotabato City

Port	Distance* from Cotabato
i. Macabalan Port and Mindanao Container Terminal, Cagayan de Oro City	250 km (via Narciso Ramos Highway) 320 km (via Kabacan-Kibawe Road)
ii. Iligan Port, Iligan City	185 km (via Narciso Ramos Highway)
iii. Ozamis Port, Ozamis City	220 km (via Narciso Ramos Highway)
iv. Sasa Port, Davao City	220 km (via Cotabato–Davao road)
v. Makar Wharf, General Santos City	185 km (Tacurong–Koronadal Road)

*Estimated based on Google map.

3.5.2 Road conditions leading to alternative ports

The arterial roads linking Bangsamoro to alternative ports are presented in Figure 3.11. Most of the roads are two-lane highway with some4-lane sections. The surface conditions of these roads are illustrated in Figure 3.12. Table 3.11 presents assessments of the following roads:

Table 3.11 Summary of Road Conditions Leading to Alternative Ports

Road link	Assessment
Cotabato–Davao Road (to Sasa Port; L=220 km)	- Two-lane highway with some sections having 4-lane particularly between Digos City and Davao City. - Traffic congestion is observed at the road sections passing the town centers such as in Libungan, Midsayap, Pikit, Kidapawan due to mixing of local traffic and through traffic and also inside Davao city before Sasa Port. - Road condition is particularly poor in the municipalities of Pikit, Pagagawan and Pagalungan.
Cotabato–Gen. Santos Road (to Makar	- Two-lane highway with some sections having 4-lane. However, the section from Isulan to Gen. Santos is a 4-lane highway with the exception of some short sections.

Road link	Assessment
Wharf; L=185 km)	- Flow of traffic is generally good with the exception of road section passing inside Tacurong and Koronadal due to mixing of local traffic and through traffic. - Road condition is generally good with the exception of Isulan-Sto. Nino-Suralla section and Koronadal-Tupi section.
Cotabato–Cagayan de Oro via Narciso Ramos Highway (to Cagayan de Oro Port and Mindanao Container Terminal; L=250 km)	- Two-lane highway until Iligan City. Four-lane highway is just observed inside Cagayan de Oro City. - Traffic flow is generally good except the section passing Marawi City, Iligan City and Cagayan de Oro City. - Road condition is generally poor from Parang to Marawi where large pot holes and serious pavement cracks are observed. - Road alignment is also poor resulting in sharp curves that are not suitable to large trucks. - This highway has a security concern as well
Cotabato–Cagayan de Oro via Kibawe Road (to Cagayan de Oro Port and Mindanao Container Terminal; L=320 km)	- Most sections are two-lane highway with some sections having 4-lane - Traffic flow is generally good with the exceptions to the section passing major towns such as Libungan, Pikit, Maramag, Valencia City, etc. - Freight destined to Cagayan de Oro Port (Macabalan Wharf) passes the city center, thus traffic congestion is experienced - Road condition is better than the shorter Narciso Ramos Highway route - This route is also passing a more peaceful areas

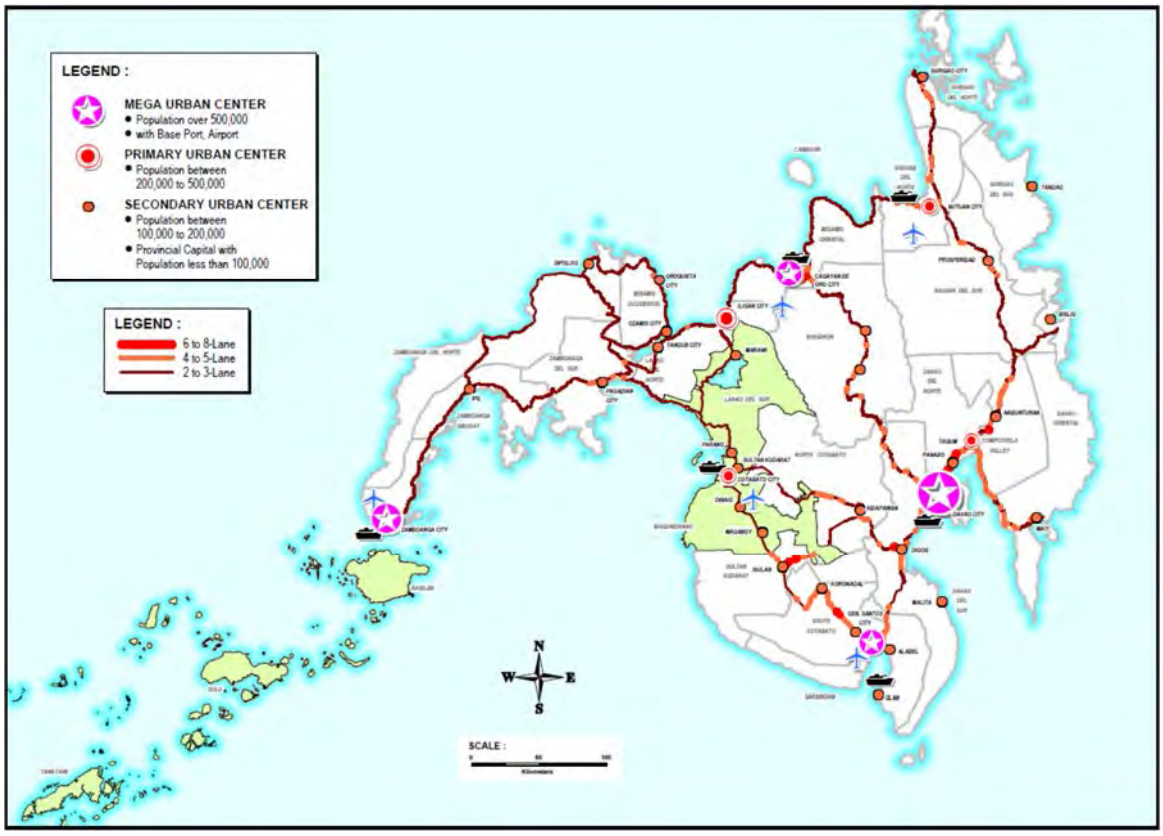
3.5.3 Exit port and freight movement of agroindustry products in Bangsamoro

The exit port of products produced by agroindustry firms operating in the Bangsamoro region was clarified through interviews carried out by agroindustry experts of the JST with these firms. In some cases interview with people knowledgeable of the subject as well as review of relevant studies were carried out. Based on the above, the freight flow was clarified as shown in Figure 3.13. The following were observed:

- Most of the agri-industries in Bangsamoro are using ports of Davao and Panabo to ship out their products. Ports of Cagayan de Oro and General Santos are preferred by some.
- As far as agroindustry in Bangsamoro is concerned, users of Polloc Port seem to be limited to a very few firms such as Lamsan Trading, Philippine Trade Inc. and perhaps other small-scale firms.
- Routes used to transport products by these agri-industries are as follows (Figure 3.12):
  - Wao and Bumbaran area to Davao (Wao-Kibawe-Carmen-Kidapawan-Digos-Davao),
  - Malabang area to Davao (Malabang-Parang-Simuay-Kidapawan-Digos-Davao),
  - Malabang area to General Santos (Malabang-Parang-Cotabato-Isulan-Tacurong-Gen. Santos),
  - Datu Paglas and Buluan area to Davao (Buluan-Datu Paglas-Makilala-Digos-Davao), and
  - Talayan and Datu Abdullah Sangki area to Davao (Isulan-Tacurong-Datu Paglas-Makilala-Digos-Davao).

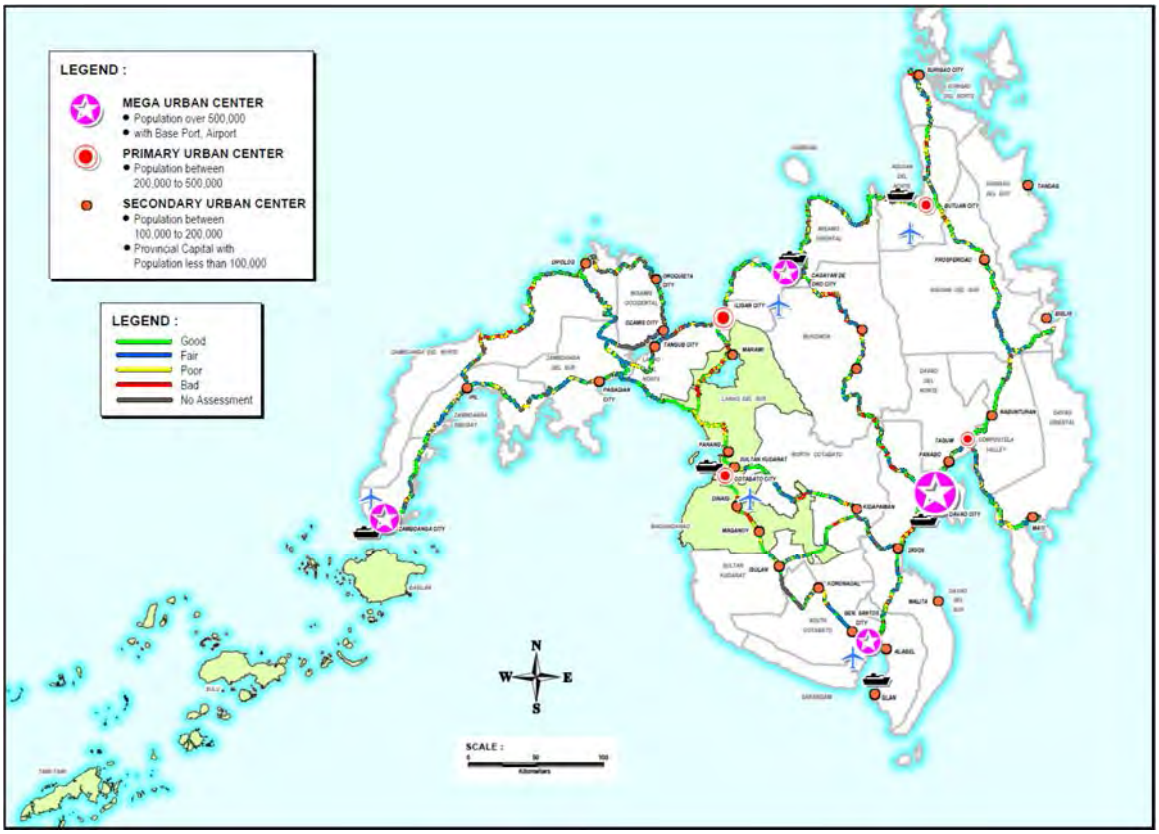
The final destinations of agroindustry products from Mindanao including those coming from the Bangsamoro were also identified through review of the Mindanao Logistics Infrastructure Network Study by the JICA undertaken in 2014:

- Banana Cavendish: Japan (50%) and the rest to China, South Korea, the Middle East (particularly Iran) and other smaller markets,
- Coconut products/oil: USA (24%), Europe (25%) and the rest distributed to other countries,
- Pineapples: major markets and their approximate shares are Japan (55%), Korea (16%), New Zealand (4%), Middle East (9%), among others,
- Mango-Carabao: China, Japan, and others, and
- Palm Oil: Cebu and Manila for further refinement.



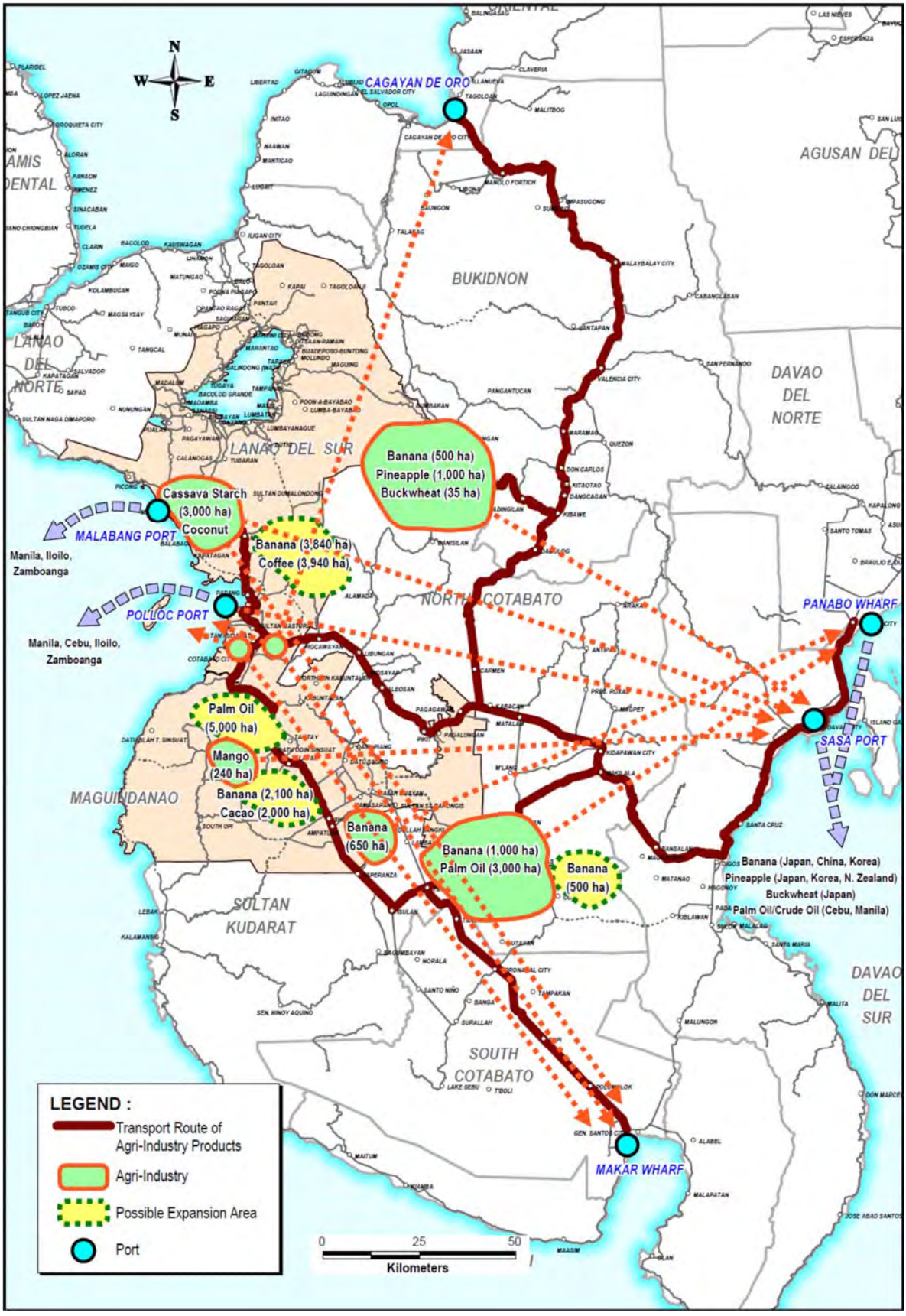
Source: DPWH data (2014) and NSCB data.

Figure 3.11 Number of Lanes of Mindanao's Arterial Roads



Source: DPWH Road Condition Data and NSCB data.

Figure 3.12 Road Conditions of Mindanao's Arterial Roads



Source: Interview survey and secondary data.

Figure 3.13 Exit Ports and Transport Routes of Agroindustry Products in Bangsamoro

The current flow of freight from these agroindustry firms appears to be irrational considering that the Polloc Port is very close to the locations of these firms. However, the Polloc Port at present simply cannot offer services required by the industry. This situation indicates at least two disadvantages to the Bangsamoro region: It deprives the region of (1) business opportunity that could result in a number of jobs created and (2) additional income that could be generated from the use of the port services.

In the future, it is reasonable to expect that if the Polloc Port could provide the same level of services (coupled with facility requirements of these agroindustry firms) with the ports in Davao, Cagayan de Oro, and General Santos, freight traffic from Bangsamoro would be gradually shifted back to the Polloc Port. The renewed interest of the private sector in investing in the agroindustry in Bangsamoro offers an opportunity for the Polloc Port management to harmonize its development/improvement with the needs of these firms. Such prospective investments include banana and coffee plantations located in the municipalities of Barira and Buldon with a total area of close to 8,000 ha. Likewise, the private sector is also interested in developing oil palm plantations in Datu Odin Sinsuat Municipality, oil palm, banana and cacao plantations in Talayan Municipality, and another banana plantations in Buluan and Datu Abdullah Sangki Municipalities. Combining all these new investments together will cover about 12,500 ha, indicating that substantial freight traffic will be generated requiring port services for their export.

3.5.4 Infrastructure and Logistics challenges in Mindanao

The issues and bottlenecks, especially transport infrastructure constraints, that affect transport and distribution of agri-fishery in Mindanao have been clarified in a JICA-assisted study, the Survey on Mindanao Logistics Infrastructure Network. Most of these findings are applicable to the Bangsamoro region. These challenges were categorized into infrastructure and logistics, including the following:

(1) Infrastructure challenges
- Poor FMRs
- Fast deterioration of the roads due to heavy loads
- Incomplete DPWH Arterial North-South Backbone and East-West Lateral Road System that promote competition between ports
- Ports are currently not well designed to cater to agri-products though in the long-run, ports should be able to handle containers
- Arterial roads are in many sections inadequate ‘container highways’ (i.e., pavement not designed for heavy loads, limited number of lanes, no climbing lanes, no direct routes to ports, non-all weather sections)
- Use of inefficient port equipment and practices (e.g., pallets instead of containers, straight instead of articulated trucks, RoPAX instead of RoRo ships (using quayside gantry cranes), straight instead of articulated trucks, etc.)
- Worsening traffic condition in Cagayan de Oro and Davao cities will constrain expanded usage of the PPA base and the Sasa Port, respectively

(2) Logistics challenges
- Immature freight forwarding industry leading to low LCL and backload rates
- High transport cost by RoRo due to the low backloads
- Shipping companies not too flexible and nimble enough to address the needs of shippers (e.g., high rentals of reefer vans, insufficient supply of fruit vans, livestock vans, and reefer vans)
- Low utilization of agri-financing windows catering to associations and cooperatives for loans to be used in consolidation facilities
- Unpopularity of the use of containers, trailers, and prime movers as transport modes

3.6 Summary of Road Issues and Logistics Issues

Based on the initial assessment of the road development in the region as well as freight transport operation, the following issues have been identified:

(1) Road density

The Bangsamoro region's road density (0.10) remains the lowest in the Country, which is not even a half of the national average (0.25). Another 800 km of national roads is necessary to reach the average of Mindanao (0.17), and a further addition of 800 km is in order to reach the national average.

(2) Pavement rate

The pavement rate of national roads in the region improved from 76.8% in 2007 to 81.9% in 2013. However, this is still below the national average of 83%. To reach the national level, paving another 179 km of national roads with gravel or earth surface is necessary.

Provincial roads in the region are mostly gravel- or earth-surfaced, which account for 79% (1,680 km) of the total length. This remains a major development issue to be addressed in the coming years.

Municipal roads are also mostly surfaced with gravel or earth (80% of the total or 1,680 km).

Barangay roads and FMRs are also mostly surfaced with gravel or earth (4,824 km of which only 0.2% has gravel surface).

(3) Road condition of paved national road

This will be confirmed after the road surface condition survey currently undertaken by another study team using DRIMS.

(4) Missing links

There are five missing links (155.4 km in total length), which prevent access to wide area in the region. Likewise, these missing links affect mobility of communities in these areas.

(5) Freight transport

Major challenges in freight transport are the poor condition of FMRs, secondary roads (provincial roads), and artery roads connecting Marawi and Cotabato; and the limited operation of the Polloc Port (which has led agroindustry firms in Bangsamoro to use alternative ports outside Bangsamoro).

CHAPTER 4 REVIEW OF RELEVANT POLICIES, PLANS AND PROJECTS FOR ROAD SECTOR

4.1 BDA's Bangsamoro Development Plan: Phase 1

A review of the Bangsamoro Development Plan (Phase 1) was carried out to confirm the strategic direction/investment as far as infrastructure development is concerned. During the transition, the strategy for roads and bridges will be to: (a) sustain current efforts to improve national roads through rehabilitation, reconstruction, upgrading, and maintenance; (b) address the most immediate and most un-served needs/gaps, especially at the barangay or community level by paving FMRs and building new ones; and (c) develop capacity in infrastructure planning, feasibility preparation, project supervision/management, and monitoring and evaluation for infrastructure staff. Table 4.1 shows the strategies the plan intends to pursue. It appears that the plan's primary concern is the strengthening of infrastructure system of the region. This is in recognition of the poor state of infrastructure which significantly hampered efforts to bring to another level the socioeconomic condition of the region. Key to this overall effort to redress the region's infrastructure is rehabilitation of FMRs that would directly benefits the poor.

Table 4.1 BDP Infrastructure Strategies and Project Types

Target strategy	Project type
a. Infrastructure to connect to economic growth centers	National, provincial roads and bridges; airports and seaports; telecommunications
b. Infrastructure to support production	Farm-to-market roads (FMRs), irrigation facilities, small landing ports, energy requirements for economic activity
c. Infrastructure for access/social justice	Access roads, household electrification (especially off-grid) for far-flung areas
d. Infrastructure to support security and normalization outcomes	Investments for the six priority camps and other requirements targeted for normalization
e. Infrastructure for climate-resilience, DRRM	Flood control, retrofitting of existing infrastructure

Source: Bangsamoro Development Plan – Integrative Report, May 2014, BDA.

The project implementation arrangement was also touched by the plan. It was envisioned that during the transition period, national road projects will be implemented by the Department of Public Works and Highways (DPWH), while provincial and municipal road projects will be done by DPWH-ARMM. Barangay road and FMR projects shall be implemented by the Department of Agriculture (DA), Department of Agriculture and Fisheries (DAF)-ARMM, Department of Agrarian Reform (DAR), and DAR-ARMM (Table 4.3).

Table 4.2 Project Implementation Arrangement

Project type	Implementing agency
National Road Projects	DPWH National
Provincial Road Projects Municipal Road Projects	DPWH-ARMM
Barangay Road Projects FMR Projects	Department of Agriculture (DA) Department of Agriculture and Fisheries (DAF)-ARMM Department of Agrarian Reform (DAR), and DAR-ARMM.

Similarly, a review on the projects recommended for infrastructure (road) by the Transition Development Plan by JICA was carried out to see how these projects would fit in the overall plan and to confirm if any of these projects are funded by the National Government or Donor Institution for 2015 or 2016. The recommended projects for the short term (2015–2016) are presented in Table 4.3. It was envisaged that in the short-term, priority should be given to address the main bottlenecks of connectivity including the poor condition of FMRs as well as incomplete and unpaved national roads and main arterial roads which led to low productivity and limited income opportunities for rural communities. Location of these projects is depicted in Figure 4.1.

Table 4.3 Proposed Projects for Transitional Plan Period

No.	Road	Road length (km)
1	Davao–Cotabato Road (reblocking)	8.8
2	Marbel–Ala–Cotabato Road (reblocking)	4.0
3	SK Border–Butig–Lumbayanague Road	31.0
4	Maganoy–Sultan Sa Barongis Road (Provincial Road)	13.5
5	Datu Saudi Ampatuan Road (Provincial Road)	9.0
6	Manuangan–Parang Road	20.0

Source: Transitional Development Plan, 2014, JICA-PhilKoe International, Inc.

The list of road projects was then compared to the road projects by DPWH-ARMM funded for their 2015 budget. After cross checking, it was found out that identified projects in the Transition Plan are not in the list of 2015 priority projects of DPWH-ARMM. However two projects proposed by the BDP 1 for medium term/long term were included in the 2015 projects of DPWH-ARMM. These are:

- Concreting of alternative road (Matanog–Barira–Buldon in the Province of Maguindanao) (L=1.0 km and budget is PHP 20 million), and
- Concreting of Lakit lakit–Mandulan road, Bongao in the Province of Tawi-Tawi (L=2.0 km and budget is PHP 24 million)

It should be noted that the 2015 budget of DPWH-ARMM covers only 1 km of the 9 km unpaved sections of Matanog–Barira–Buldon.

4.2 ARMM's Regional Development Plan: Medium Term Update (2013–2016)

The updated Regional Development Plan of the ARMM identified a couple of road projects critical to support social and economic development activities of the region. The projects are grouped into two based on the source of fund: (i) projects for funding by the Regional Government and (ii) projects for funding by the National Government or Official Development Assistance (Figure 4.2).

Priority projects to be funded by the ARMM are as follows:

i.) Completion of trans-central road (Sulu),
ii.) Jolo island circumferential road (162 km), and
iii.) Sanga- Sanga-Saldang road (16 km).

Priority projects for funding by the National Government or Official Development Assistance (ODA) are as follows:

i.) Lake Lanao circumferential road (118.7 km),
ii.) Concreting of Semba-Linek-Kusiong road (25 km),
iii.) Lumbatan-Marogong-Tubaran-Malabang road (40 km),
iv.) Completion of Basilan circumferential road (86.2 km),
v.) Completion of Cotabato City east diversion road (11.8 km),
vi.) Concrete Paving of Molundo-Wao road (42 km),
vii.) Concreting of Midsayap-Dulawan-Makar road, and
viii.) Concrete Paving of Ganassi – Tubod road (12 km).

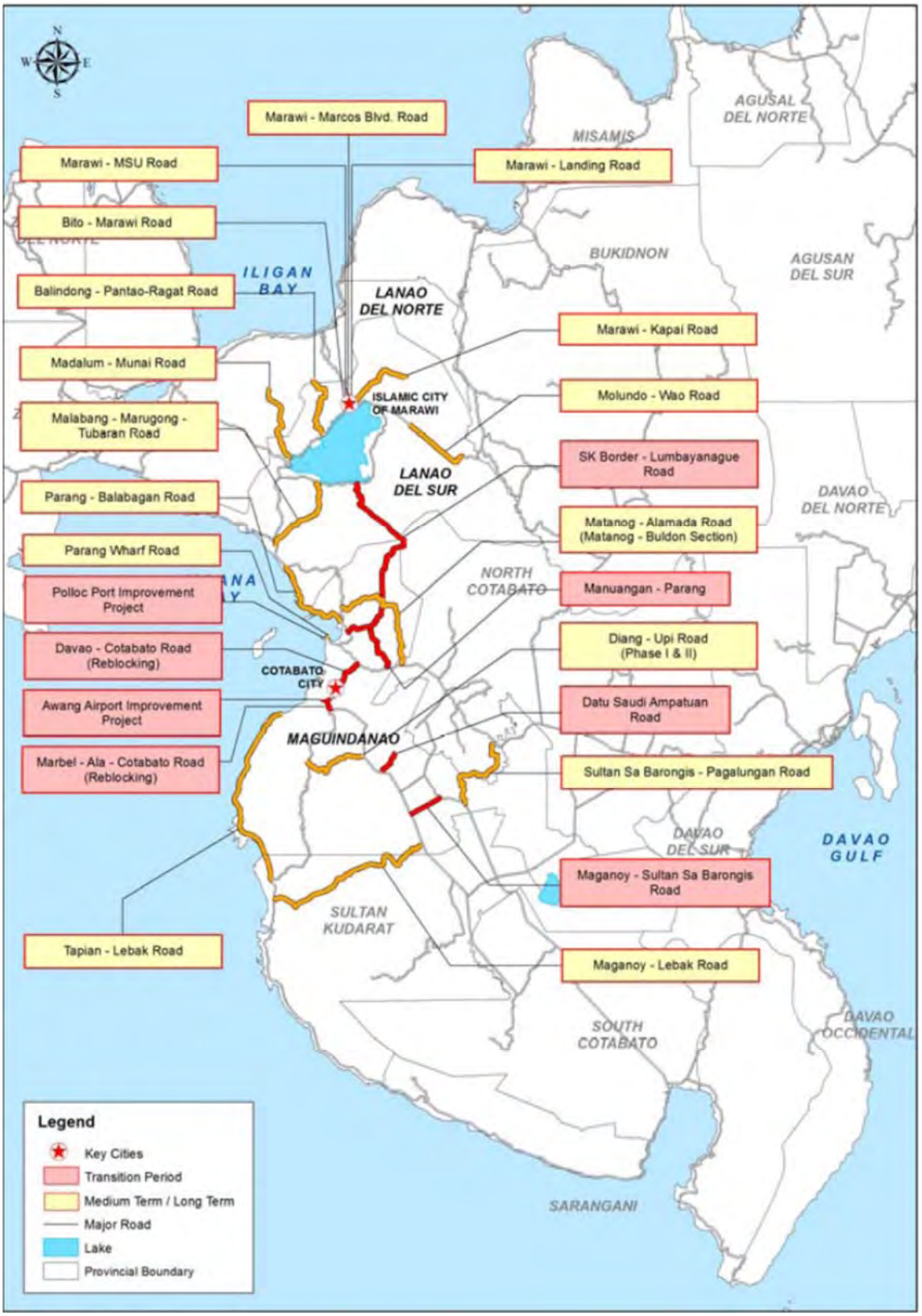


Figure 4.1 Locations of Proposed Transitional Period Projects (1/2): Mainland Provinces

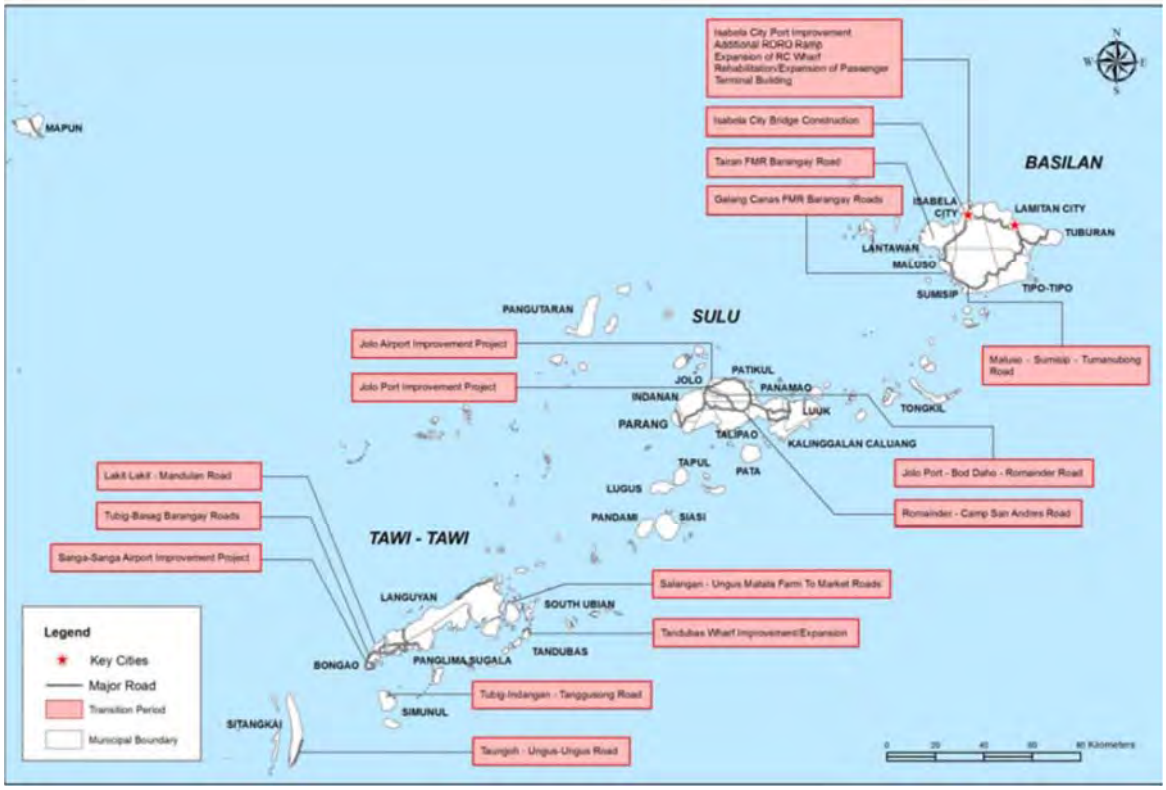
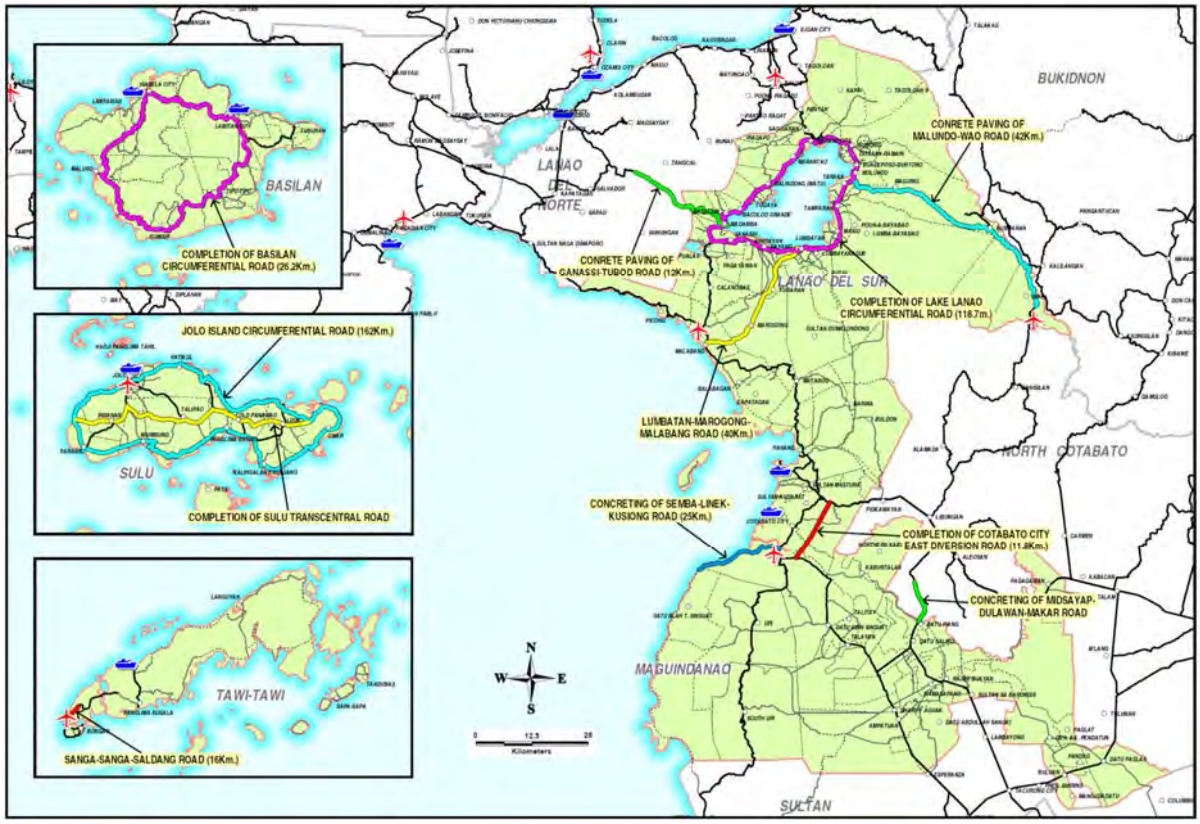


Figure 4.1 Locations of Proposed Transitional Period Projects (2/2): Island Provinces



Source: ARMM's RDP data.

Figure 4.2 Proposed Road Projects in ARMM's RDP (2013–2016)

4.3 Asian Highway (Mindanao Section)

The Asian Highway (AH) has a strong influence to the future development of the Bangsamoro as it cuts through the heart of its territory. The Asian Highway network which was initiated in 1959 is a regional transport cooperation initiative among countries in Asia and Europe and the United Nations Economic and Social Commission for Asia and the Pacific (ESCAP) aimed at enhancing the efficiency and development of the road infrastructure in Asia, supporting the development of Euro-Asia transport linkages and improving connectivity for landlocked countries.

According to ESCAP, the Asian Highway network now comprises over 141,000 km of roads passing through 32 member countries. The network extends from Tokyo in the east to Kapikule, Turkey in the west and from Torpynovka, Russian Federation, in the north, to Denpasar, Indonesia in the south. The Philippines is part of this regional cooperation where the identified route has a total length of 3,379 km that traverses from Laoag City in the north passing Metro Manila, moving further south to Bicol then to Visayas and enters Mindanao via Surigao City (Lipata) down to Davao City and continues to General Santos City before swinging back north to Cotabato City and ends at the International Port of Zamboanga City (Table 4.4 and Figure 4.3).

Table 4.4 Characteristics of AH26's Sections in Mindanao

Section	Total length (km)	Surface type (km)			Surface condition (%)				
		Concrete	Asphalt	Gravel	Good	Fair	Poor	Bad	No rating
Lipata to Davao City	398.79	198.96	199.83	-	42.0	20.9	27.4	14.3	32.6
Davao City to Gen. Santos	144.48	63.38	80.98	0.12	12.4	10.0	12.8	16.8	1.8
Gen. Santos to Zamboanga	513.86	444.51	54.34	15.02	20.4	54.7	51.2	28.1	27.3
(Jct. Calinan) Davao City to CDO City	292.39	71.32	221.06	-	25.2	14.3	8.6	40.8	38.2
Total	1,349.52	778.17	556.21	15.14	100.0	100.0	100.0	100.0	100.0

Note: Surface condition is based on 2012 Road Condition Data of DPWH

Source: Presentation of DPWH Assistant Secretary, Catalina Cabral, titled "Asian Highway (AH 26)" to UNESCO, 2013.

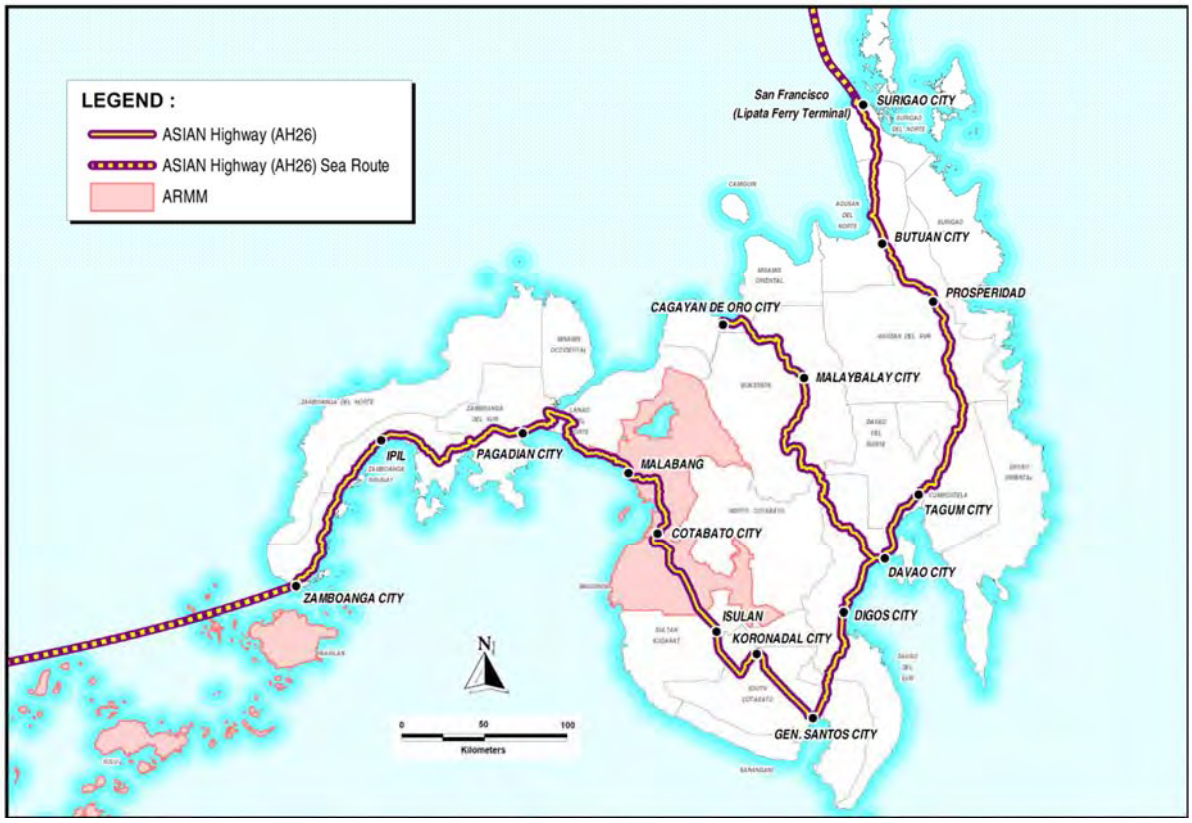
AH26 (route number given to the Philippines) is being developed as prime connector to other highways in neighboring countries to facilitate a smoother handling of trade and commerce in the region. To complete this connection, a dedicated sea route is necessary. Mindanao has two: port of Surigao City and port of Zamboanga City.

The entire stretch of AH26 in Mindanao is 1,349.52 km and connects the cities of Surigao, Davao, General Santos, Cotabato, Pagadian, and Zamboanga. Another branch of AH26 connects Davao City to Cagayan de Oro City. The efforts by DPWH to upgrade the AH26 to bring the network in conformity with Asian Highway classification and design standards will at the very least improve the horizontal and vertical curve of the highway linking Cotabato City to Marawi City which prevents the highway to function correctly. This highway is Bangsamoro's primary corridor. Likewise, current efforts by the DPWH on AH26 indicate that there's an intention to elevate the network to Class I. An ADB-assisted study is currently ongoing (TA-8574 PHI: Improving National Roads for Inclusive Growth in Mindanao Project) which tries to explore feasibility of widening from two-lane into four-lane the road from Lanao to Pagadian to Zamboanga. Most of these sections are part of the AH26. At present, four-lane (Class 1) sections of AH26 stands at 13.3% (Table 4.5).

Table 4.5 Classification of Asian Highway

Classification	Description	Pavement type
Primary	Access controlled motorway	Asphalt or cement concrete
Class I	4 or more lanes highway	Asphalt or cement concrete
Class II	2 lanes	Asphalt or cement concrete
Class III	2 lanes (narrow)	Double bituminous treatment

Source: Asian Highway Standards, ESCAP 1995.



Source: DPWH data.

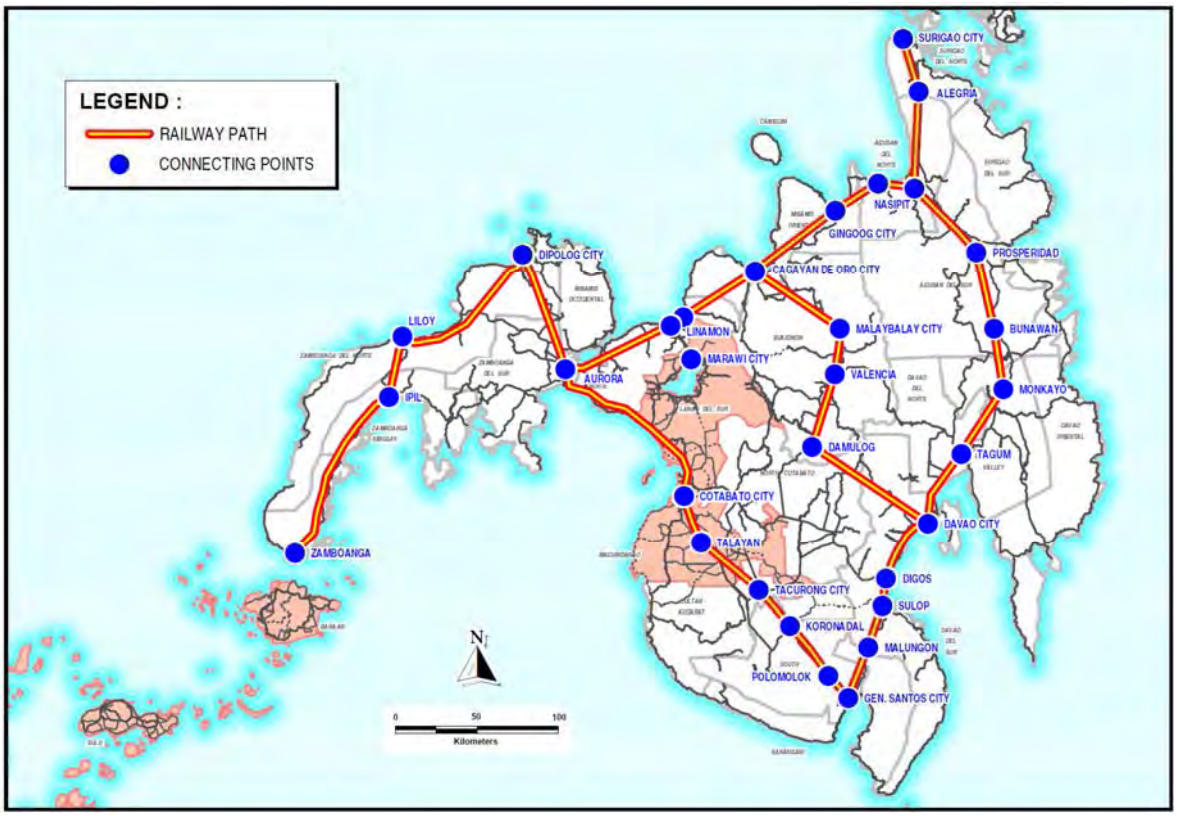
Figure 4.3 Asian Highway's Section in Mindanao

4.4 Mindanao's Railway Plan

There is a wide clamor to build a Mindanao circumferential railway system, but it has not been realized due to its substantial investment requirement that puts to question its economic feasibility. Nonetheless, short run railways in high traffic areas are being seriously considered such as the Cagayan–Iligan corridor. A feasibility study on an 82.5 km railway from Cagayan de Oro to Iligan has been completed and reviewed for possible external financing.

The Mindanao Development Authority (MinDA)-initiated plan, Mindanao 2020 Peace and Development Framework Plan (2011–2030), envisions that construction of Mindanao's first railway will start by 2016 and operation will commence in 2020. Phase I is expected to run between Cagayan and Iligan with an estimated budget of PHP 57,733 million and to be financed through PPP.

Since the priority lines are outside Bangsamoro and financing and implementation plans are not yet clear, the impact of this project on the Bangsamoro development seems to be minimal. The planned railway route and stations are shown in Figure 4.4.



Source: Data from BDP1.

Figure 4.4 Mindanao Railway Plan

CHAPTER 5 DEVELOPMENT STRATEGIES FOR ROAD SECTOR

The issues and challenges to overcome to establish a well-functioning road network that respond to the socio-economic development needs of Bangsamoro have been identified in the previous section. At the outset, the road network is not complete leaving wide area inaccessible. Likewise, the narrow and poor condition and alignment of Narciso Ramos Highway affects transport of agri-products from this agricultural corridor. Further, the limited operation of Polloc Port forced shippers in the Bangsamoro region to truck out their cargoes either to General Santos, Davao or Cagayan de Oro. The issues, objectives and strategies to pursue in establishing plan for the road sector are illustrated in Figure 5.1.

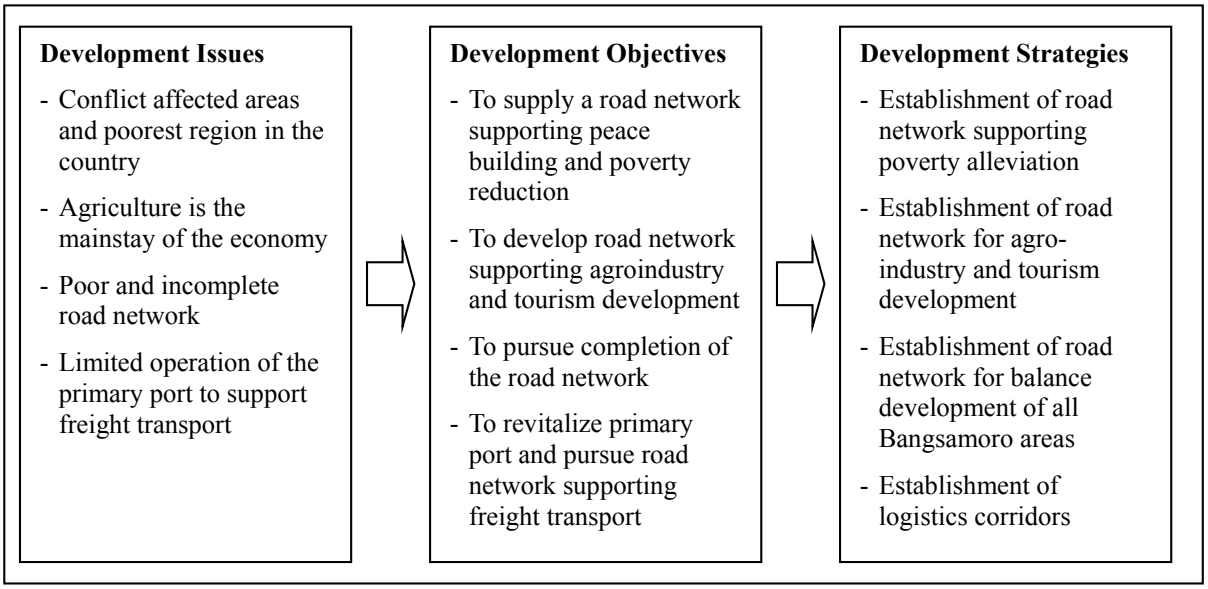


Figure 5.1 Development Issues, Objectives and Strategies for Road Sector

5.1 Development Objectives

The development objectives and their requirements in the road sector can be further described as follows:

(1) To supply a road network supporting peace building and poverty reduction encompassing
- Roads supporting development of MILF camps,
- Roads providing access to areas with high poverty incidence, and
- Roads facilitating easy access to services such as hospitals, government centers, and markets.

(2) To develop road network supporting agroindustry and tourism development covering
- Roads providing access to agricultural potential areas,
- Roads connecting agricultural production areas to agri-processing centers to market centers and to ports and airports, and
- Roads supporting access improvement to tourism sites.

(3) To pursue completion of the road network covering
- Roads serving as missing links in the network and can contribute to development of agroindustry and
- New roads identified as critical in the road network.

(4) To revitalize primary port and pursue road network supporting freight transport encompassing
- Roads linking ports and airports to agricultural production areas and agri-processing centers,
- Strengthening of roads linking the Bangsamoro region to alternative ports in Mindanao, and
- Roads that support strengthening of primary urban functions.

5.2 Development Strategies

5.2.1 Establishment of a road network supporting poverty alleviation

One of the development issues to be addressed in the Bangsamoro is the widespread poverty primarily caused by armed conflicts that has been part of the social landscape for decades and shortage of infrastructure supply like roads. Figure 5.2 identified the locations of municipalities having the highest poverty incidence (i.e., more than half of the population). Some of the areas experiencing extreme poverty happened to be hosting some of the missing links as shown in Figure 3.7 earlier. Elimination of these missing links coupled with program addressing the poor condition of FMRs will significantly contribute in the overall effort to alleviate poverty in the region. Thus, the following strategies should be pursued:

- Rehabilitation and strengthening of primary roads down to FMRs, particularly those located in the poverty areas to provide reliable means of transportation; and
- Exploration of the suitability of labor-based approaches to construction of FMRs and other roads, and maintenance of provincial, municipal, and FMRs to provide employment opportunities to the socially deprived.

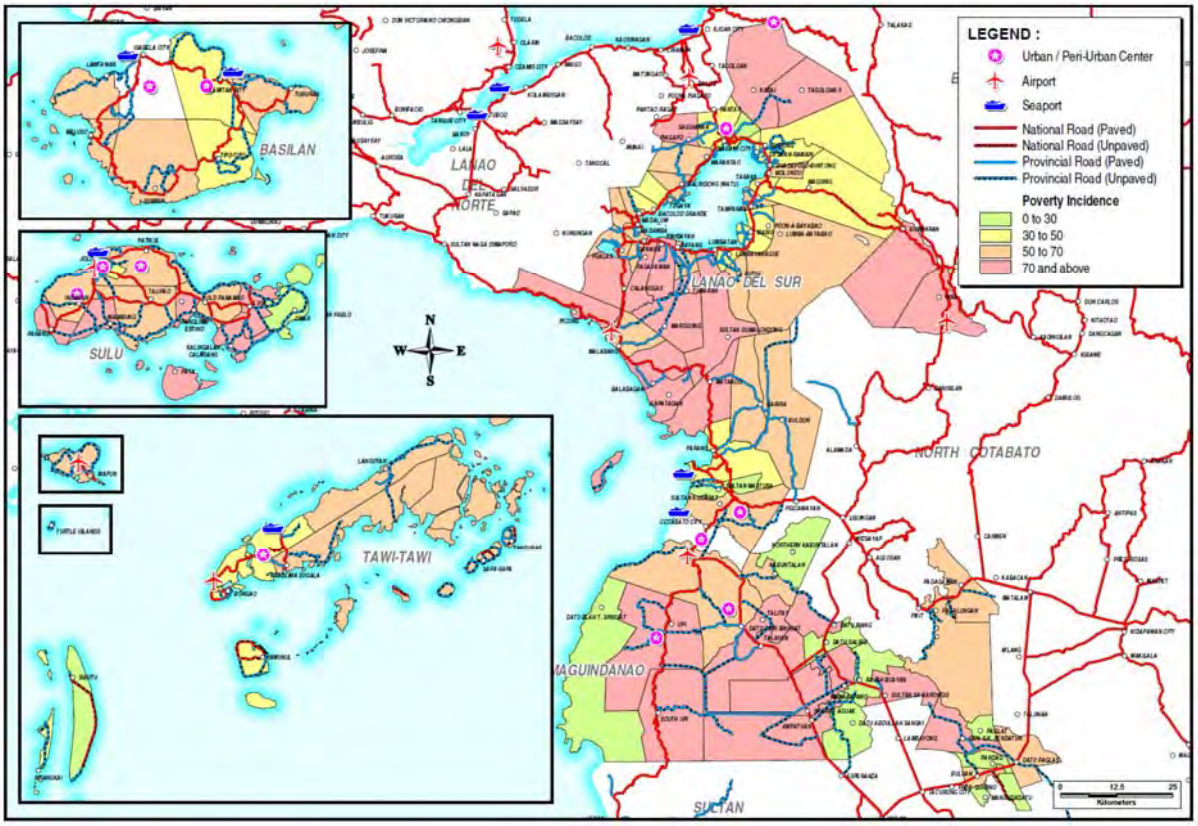
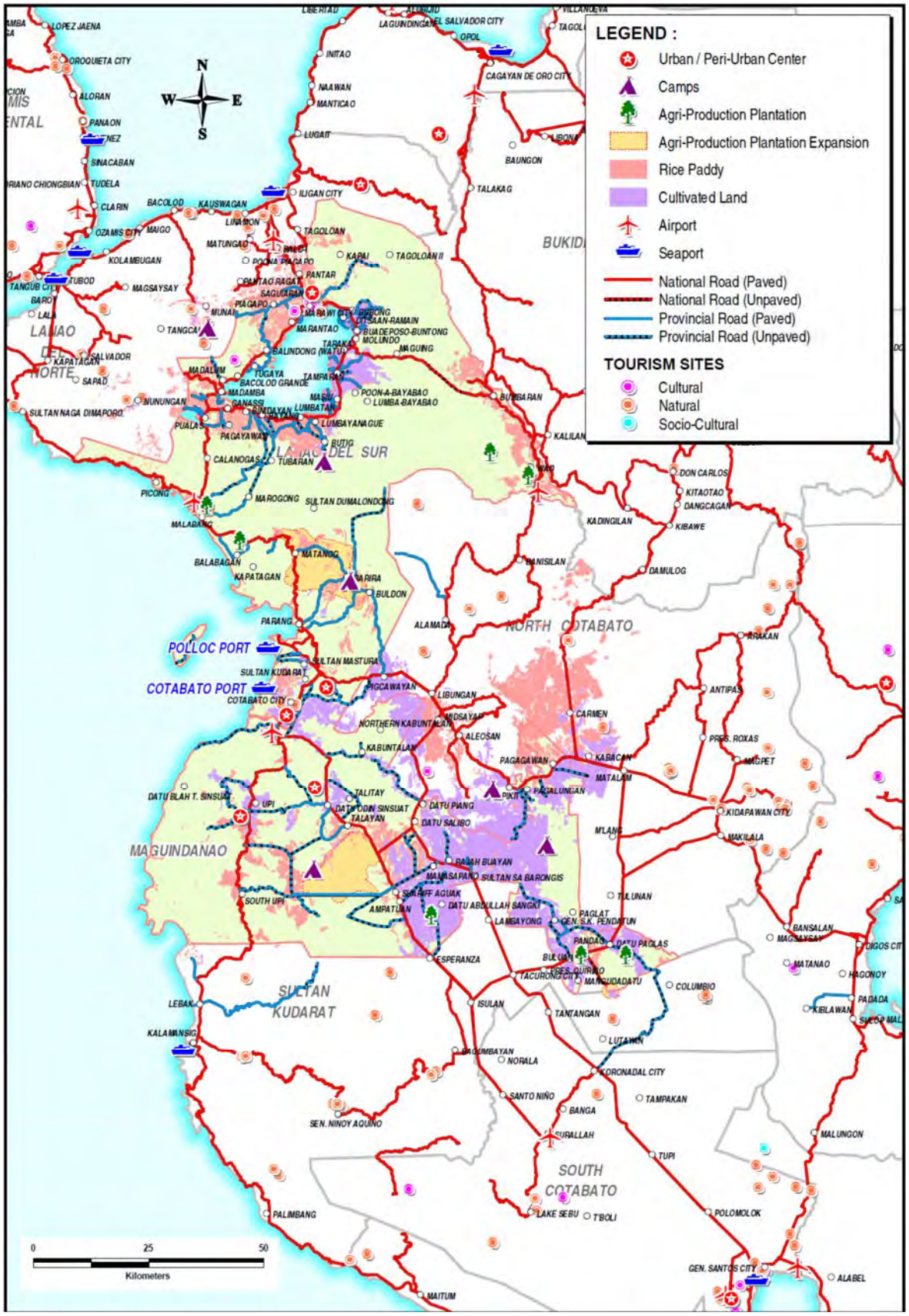


Figure 5.2 Poverty Incidence (2012) and Present Road Network

5.2.2 Establishment of a road network for agroindustry and tourism development

One of the strategies being pursued in the plan to energize the economy of the region is the promotion of agri-industries with comparative advantage. An interview survey conducted by the agroindustry experts of the JICA Study Team revealed that efforts by the private sector to expand their investment in the Bangsamoro composed of banana, coffee and cacao are in advance stage. The locations of these newly planned plantations are indicated in Figure 5.3.



Source: Interviews by the agriculture experts of the team and various maps.

Figure 5.3 Locations of Existing Agroindustry, Possible Expansion, and Road Network Condition

Currently, access roads of these areas identified for agroindustry development are in poor conditions, and major upgrading of existing roads as well as construction of new roads are necessary to provide reliable means of transportation. Likewise, areas along the Cotabato–Marawi road have potential to become agricultural growth area, and thus strengthening of this corridor as well as upgrading of its secondary roads (provincial, municipal and FMRs) is vital. These efforts should be extended as well to roads leading to rice paddies and cultivated lands. The following strategies therefore will be pursued:

- Strengthening of Cotabato–Marawi road to serve future growth of agriculture and agroindustry processing plants along this corridor;
- Rehabilitation of FMRs leading to rice paddies and cultivated areas. Or in cases where access roads are not present, construct new FMRs connecting to rice paddies and cultivated areas; and
- Development of tourism infrastructure along the corridor and strengthening access roads leading to tourism sites.

5.2.3 Establishment of a road network for balance development of all areas

As mention, one of the issues affecting development of the Bangsamoro region is the absent of access roads to some potential areas. This lack of roads isolates the communities and hold back development in the area. Likewise, produces by the farmers are greatly harmed by high transportation cost further aggravating the little income they could get. Further, these missing links of the network affect law enforcement. The following strategy will therefore

- Eliminate identified missing links to attain balanced development of the Bangsamoro region and
- Pursue realization of the identified new roads necessary for the whole network of Bangsamoro to function effectively.

5.2.4 Establishment of logistics corridors

(1) Definition of logistics corridors

A logistics corridor can be defined as a transport link formed to serve as major trunk route between terminals and play an important role for an effective transport of cargoes and passengers (Figure 5.4). The transport corridor often traverses a number of major urban centers and is composed of road, ports at both terminals of the link, trade facilities, major telecommunication link, power grid and alike. The terminal of a transport link is commonly composed of major urban center, sea port, inland container depot (ICD), economic zone, and other major industrial activities.

(2) Identified logistics corridors in Bangsamoro

In the Bangsamoro area, there are at least three roads that have potential to become logistics corridor and critical to strengthen to support revitalization of Polloc Port (Figure 5.5). Once the port is revitalized, the intention is not only to capture back the lost traffic to other ports but also offer a reasonable alternative to both domestic and international port cargoes produced outside the Bangsamoro region. These are: (i) Cotabato–Marawi–Iligan–Cagayan de Oro which referred as Northern Corridor (ii) Cotabato–Kidapawan–Davao which referred as Central Corridor and (iii) Cotabato–Koronadal–General Santos which referred as Southern Corridor (Figure 5.4). The Cotabato–Kabacan–Kibawe–Cagayan de Oro might serve as an alternative route for the Northern Corridor. The outline of these identified logistics corridors is presented below (see Table 5.1 for the summary).

a. **Northern Corridor:** This corridor traverses from central to north of Mindanao originating from Cotabato City and passing the major towns of Parang, Malabang, and the cities of Marawi, Iligan before linking up to Cagayan de Oro City. This corridor has high potential for agricultural growth due to suitability of soil and availability of large agricultural land. The road condition, however, is currently poor in terms of road surface and alignment. This road is not yet suitable for container traffic due to many sharp curves that make large cargo transport difficult.

   The alternative route to the Northern Corridor is via Kabacan and Kibawe. This corridor follows the

Cotabato–Davao road before move north in the city of Kabacan to follow Sayre Highway passing the cities of Valencia and Malaybalay until it hit the city of Cagayan de Oro.

b. **Central Corridor:** This corridor moves from west to east passing the thriving municipalities of Sultan Kudarat, Pigcawayan, Midsayap, Pikit, Kabacan, and the cities of Kidapawan and Digos. This corridor is passing through the Mindanao's largest plain and produces most of the region's rice supply. The road condition is generally good and there is an ongoing effort by DPWH to widen the road carriageway from two-lanes to four-lanes.

c. **Southern Corridor:** This corridor links the Bangsamoro area to the flourishing city of General Santos passing the major towns of Datu Odin Sinsuat, Shariff Aguak, Esperanza, Isulan, and the cities of Tacurong and Koronadal. A newly identified site for banana and cacao plantations is along this corridor in the town of Talayan. The road condition in this corridor is generally good and efforts by DPWH for expansion from two-lane to four-lane have been ongoing for years.

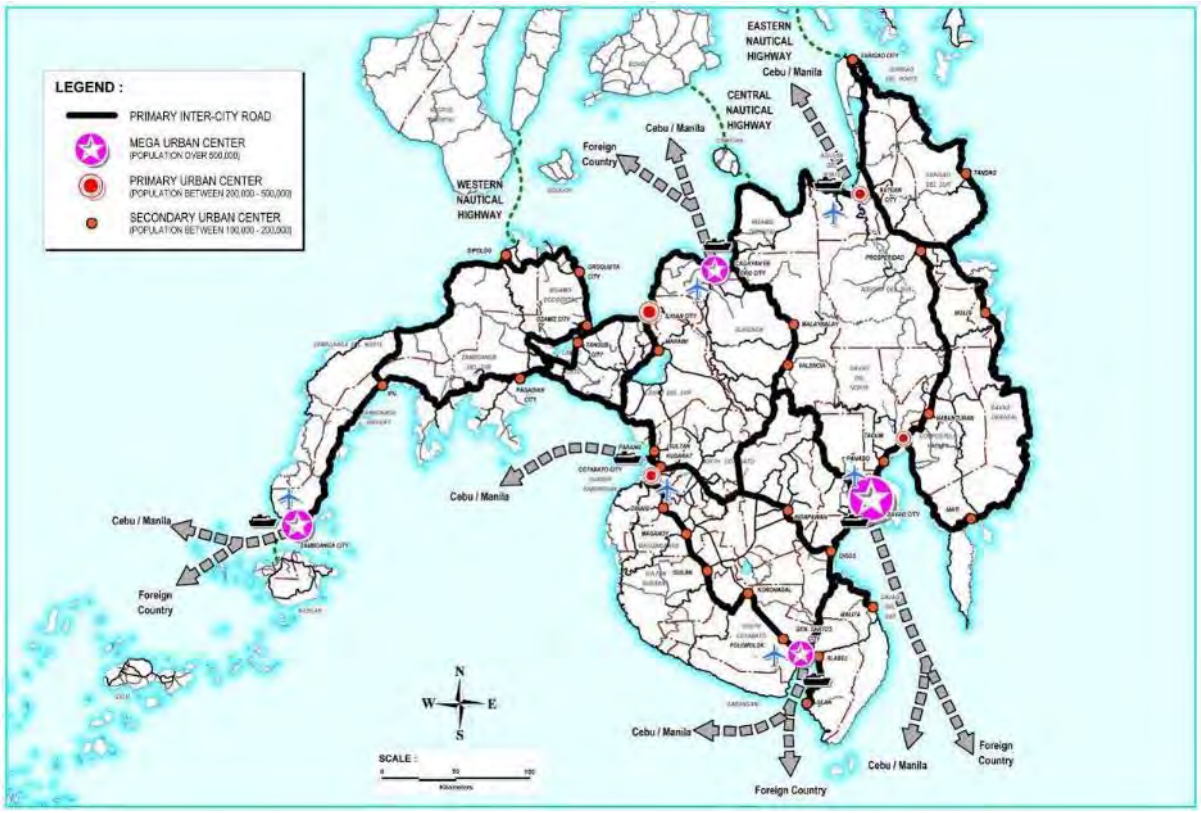


Figure 5.4 Inter-city Road Network of Mindanao as Logistics Corridor

Table 5.1 Key Components of the Three Logistics Corridors

Corridor	Trunk road			Port	Airport
	From	via	To		
a. Northern Corridor	Cotabato City	Marawi	Cagayan de Oro City	Macabalan Port and Mindanao Container Terminal	Laguindingan International Airport
		Carmen			
b. Central Corridor	Cotabato City	Kidapawan	Davao City	Sasa Port	Davao International Airport
c. Southern Corridor	Cotabato City	Koronadal	Gen. Santos City	Makar Wharf	Gen. Santos International Airport

Note: There are three international airports in Mindanao (airports of Davao and Gen. Santos and Zamboanga); airports of Cotabato City and Cagayan de Oro city are classified as Principal Class 1

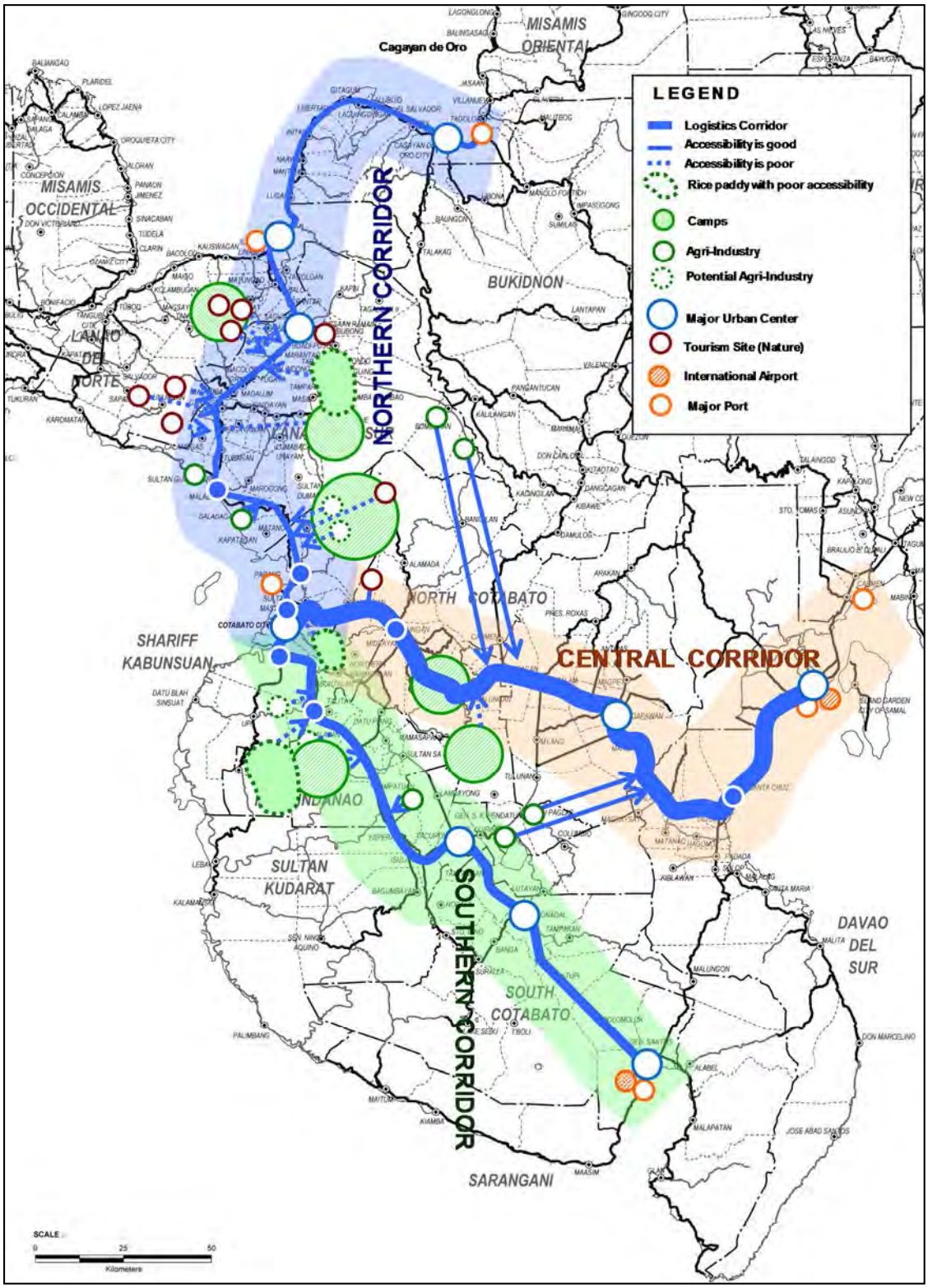


Figure 5.5 Possible Logistics Corridor for Bangsamoro

(3) Strategies for development of logistics corridors

The first strategy in developing logistics corridor is to strengthen the physical link that connects say two major urban centers (e.g., Cotabato City–Marawi City). The second strategy is promotion of the corridor as investment area (e.g., tourism area, agricultural growth corridor, and economic zone), which could be considered as further elevating the corridor into economic corridor. Accumulation of economic activities along the corridor both attracts and generates freight and passenger traffic. The success of

logistics corridor will depend on its ability to attract investments. Attracting investment, in turn, largely depends on ability to provide appropriate infrastructure and policies to facilitate movement of people and freight. Thus the following will be pursued:

- Strengthening of the three identified corridors by upgrading of pavement and widening of lane. This strategy supports strengthening of linkages among major urban areas as well as strengthening linkages between indigenous industries and export industries to ports and airports; and
- Improvement of logistics corridors by strengthening links to agricultural areas and primary processing plants.

CHAPTER 6 DEVELOPMENT PLAN FOR ROAD SECTOR

6.1 Procedure for Formulation of Road Sector Development Plan

Figure 6.1 illustrates the procedure to formulate a development plan for the road sector. Both road sector issues and other development issues were considered in establishing development objectives and strategies. The proposed road network is then assembled taking into account both the development objectives and development strategies.

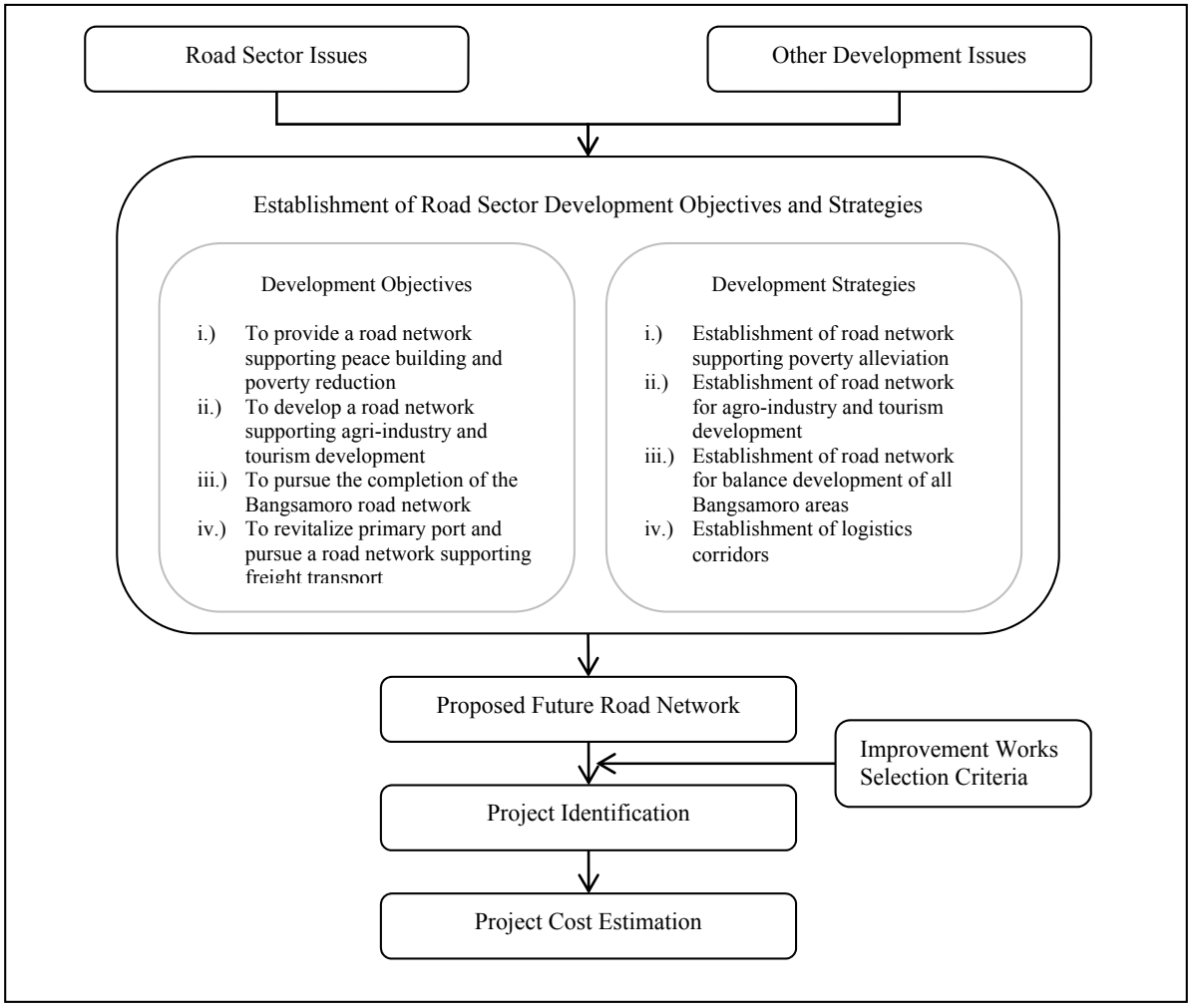


Figure 6.1 Procedures for Formulation of Road Sector Development Plan

6.2 Proposed Future Road Network

6.2.1 Procedure to develop future road network

The procedure to develop the future road network of the region (mainland provinces) is illustrated in Figure 6.2. Aside from the development issues identified in the earlier section, it is equally important to take into account distribution of urban centers and accumulation of critical infrastructure for movement of people and goods such as ports and airports. The same procedure is applied for development of future road network of island provinces. The difference is the lack of necessity to identify primary inter-city road (Step 2 in the figure) which serves as primary link of Bangsamoro to other regions in Mindanao. For island provinces, port and airport functions as the primary link to other regions.

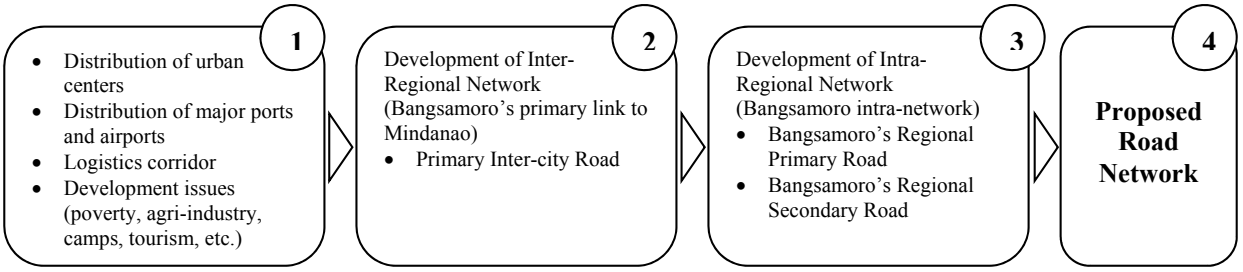


Figure 6.2 Procedure to Develop Future Road Network of Bangsamoro

The three road functional classifications shown in Figure 6.3 are further clarified.

(1) Primary inter-city road
- A major road which serves as the primary link of the Bangsamoro region to other regions in Mindanao,
- A major road connecting at least two major urban centers and both ends of the road has a major port and airport, and
- A major road has the potential to function as logistics corridor not only for the Bangsamoro region but also for the island of Mindanao.

(2) Regional primary road
- A major road which serves as the primary link within the Bangsamoro region (intra-regional road),
- A major road connecting two primary inter-city roads, and
- A major road providing access to primary processing center (agroindustry).

(3) Regional secondary road
- A major road which functions as collector/distributor road in the road network of Bangsamoro,
- A major road connecting regional primary road and regional secondary road, and
- A major road connecting to camps, tourism sites, agricultural areas, areas with high poverty incidence, etc.

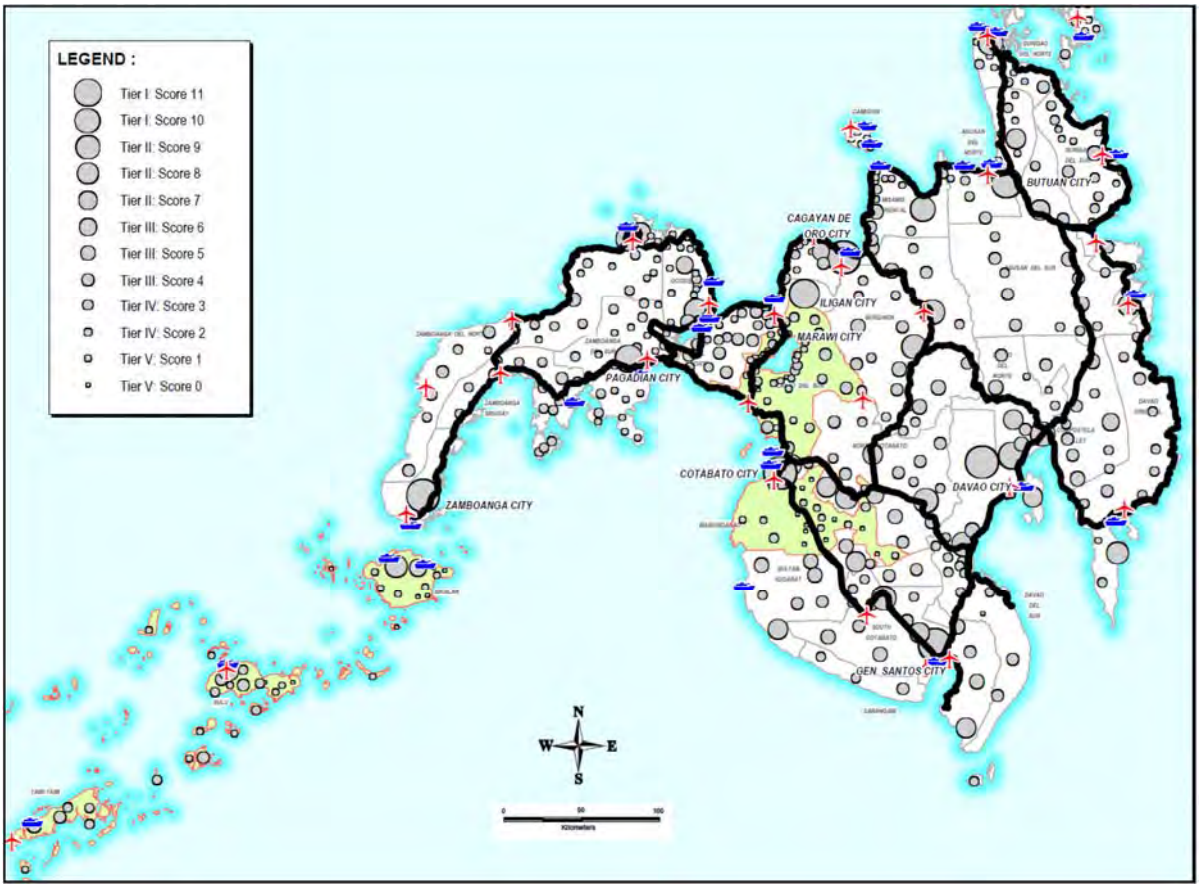
6.2.2 Primary inter-city road network in Mindanao

The urban hierarchy in Mindanao has been clarified and reflected in Table 6.1. Seven cities were classified under Tier I which gather highest score taking into account population, population growth, income class, and city category. In the Bangsamoro region, Marawi City has the highest score at 8, followed by Sultan Kudarat and Isabela City at 7.

Table 6.1 Profiles of Tier I Cities

City	Population 2010	Pop. change (2010/00)	Income class	Category*
Butuan City (Capital)	309,709	1.18	1st	HUC
Cagayan de Oro City	602,088	1.31	1st	HUC
Cotabato City	271,786	1.66	3rd	ICC
Davao City	1,449,296	1.30	1st	HUC
General Santos City	538,086	1.31	1st	HUC
Iligan City	322,821	1.13	1st	HUC
Zamboanga City	807,129	1.35	1st	HUC

*HUC=Highly Urbanized City; ICC=Independent Component City



Source: JICA Study Team.

Figure 6.3 Primary Inter-city Road Network of Mindanao and Distribution of Towns

6.2.3 Regional primary and secondary roads

The basic concept for the development of regional primary roads and regional secondary roads are as follows (Figure 6.4):

- To form a flexible network around the Greater Cotabato City by linking three primary inter-city roads that would eventually form a ring road;
- To form a flexible network around Marawi City by linking two primary inter-city roads and a regional secondary road to support systematic urban expansion by providing a bypass trunk road;
- To form an alternative routes from Cotabato City to General Santos City and Marawi City; and
- To strengthen the Cotabato-Marawi logistics corridor by providing bypass road around Parang Municipality which in turn would strengthen access to Polloc Port.

6.2.4 Proposed road network for Bangsamoro

The proposed road network for the Bangsamoro region is shown in Figure 6.5 for the mainland provinces and Figure 6.6 for the island provinces. Figure 6.7 and Figure 6.8 show the locations of missing links and new roads necessary to construct to realize the proposed network. Likewise, Figure 6.9 clarifies the resources of Bangsamoro that will be opened up if the proposed projects are pursued.

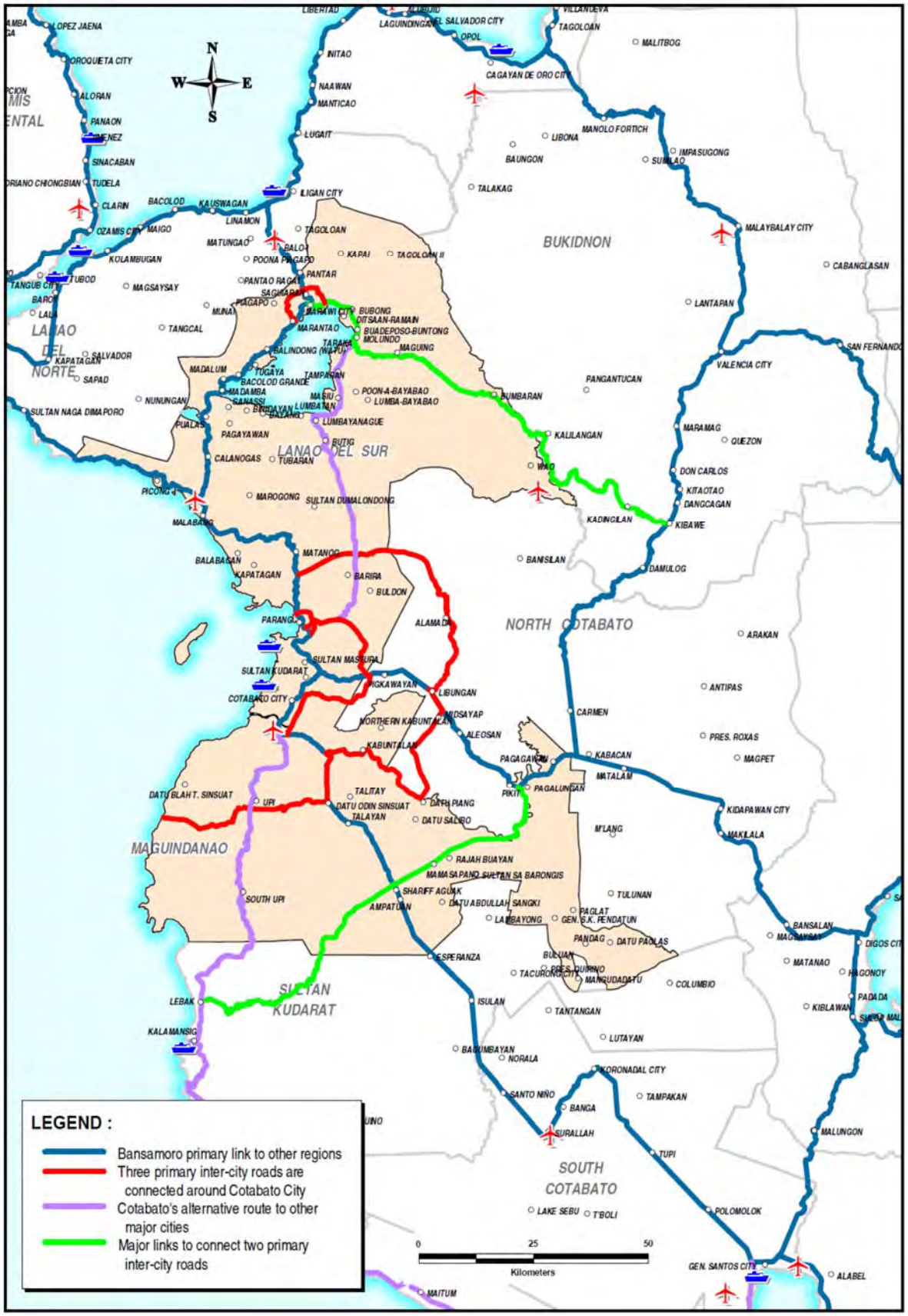


Figure 6.4 Basic Concept of Regional Primary Roads and Secondary Roads

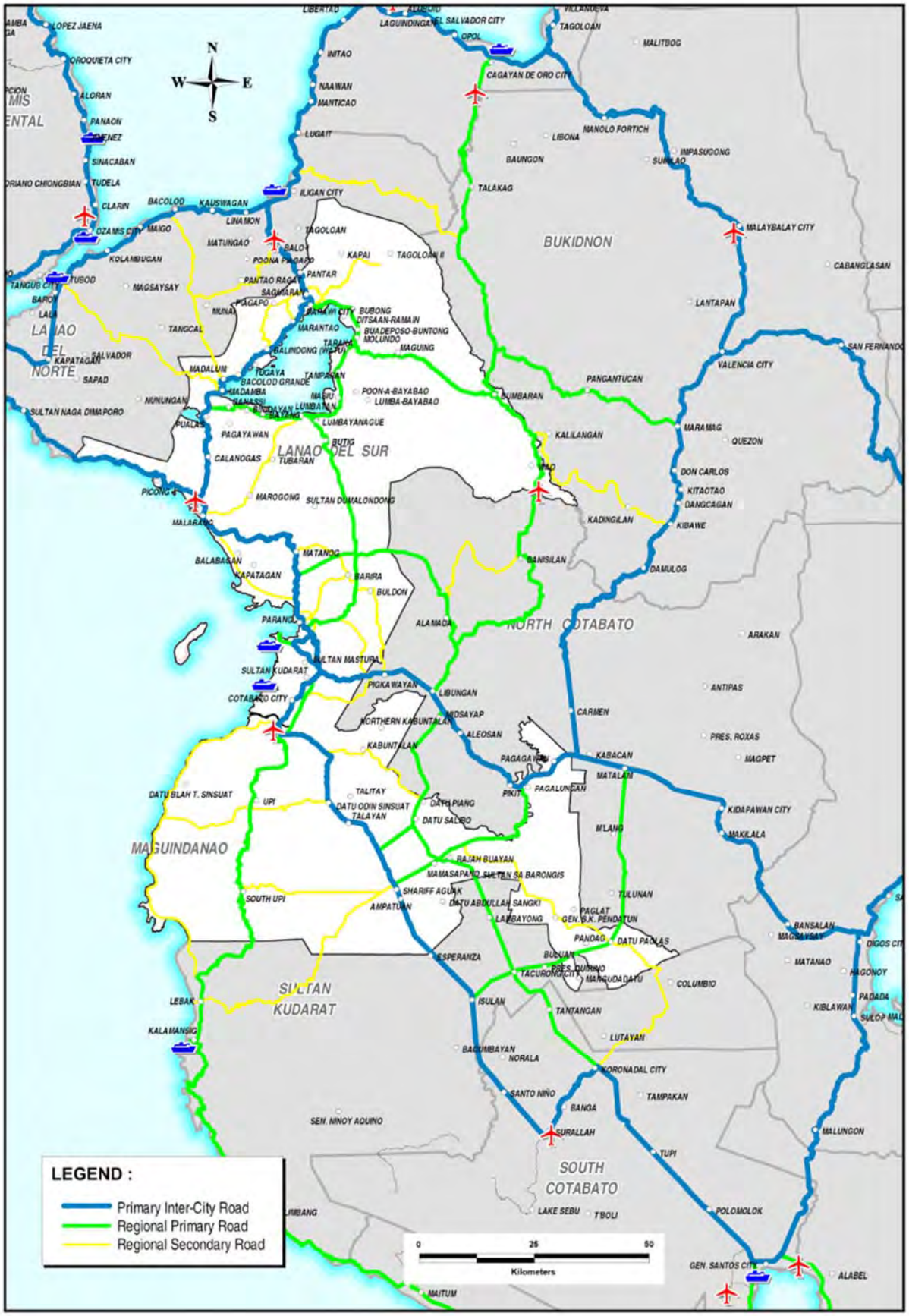


Figure 6.5 Proposed Bangsamoro Road Network: Mainland Provinces

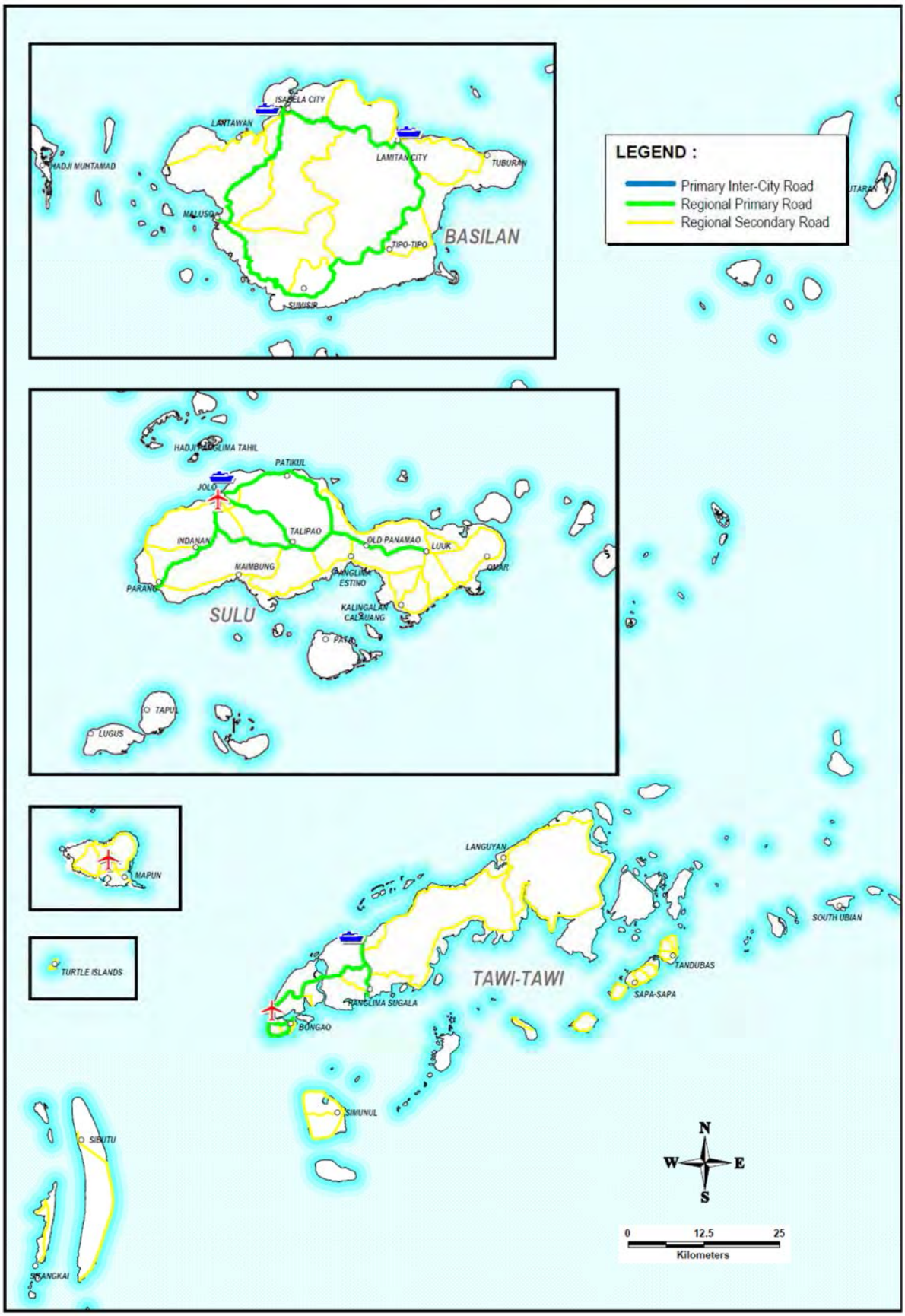


Figure 6.6 Proposed Bangsamoro Road Network: Island Provinces

Figure 6.7 Existing Condition of Proposed Bangsamoro Road Network: Mainland Provinces

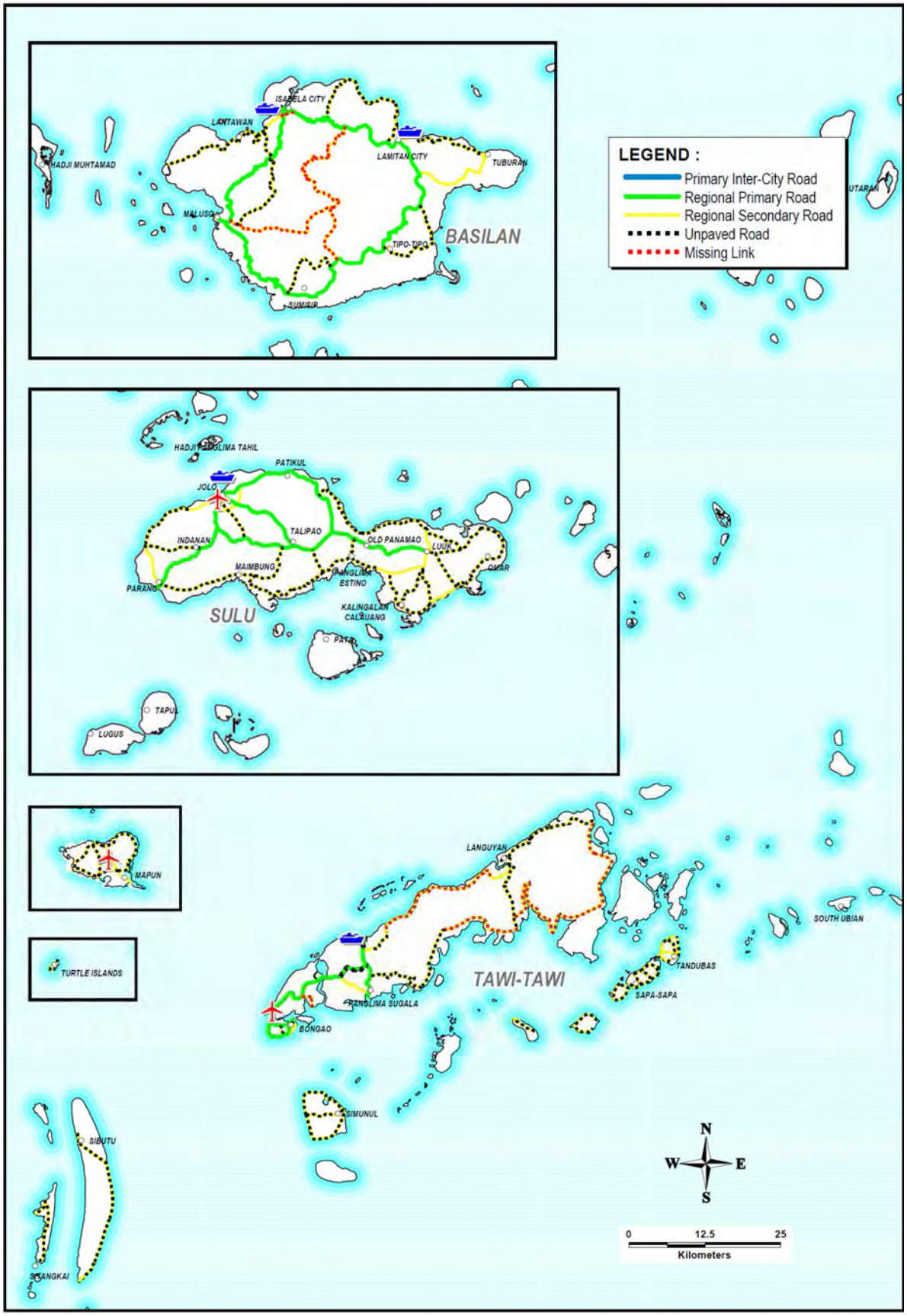


Figure 6.8 Existing Condition of Proposed Bangsamoro Road Network: Island Provinces

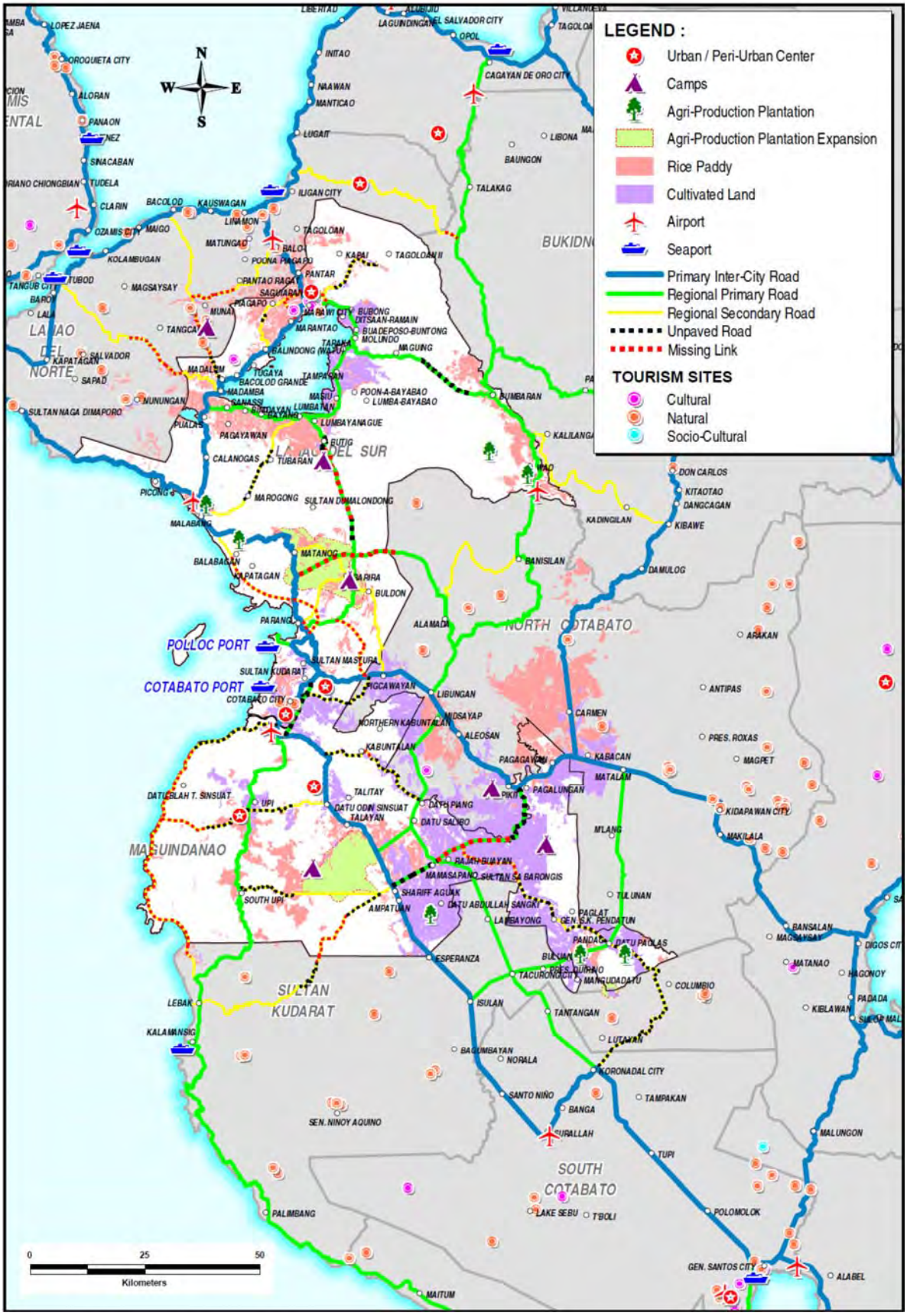


Figure 6.9 Proposed Bangsamoro Road Network with Region's Resources

6.3 Project Identification

6.3.1 Project identification criteria

Typical measures to usual issues and problems often observed in a road network are presented in Table 6.2. The measures are classified into (i) road network improvement, (ii) road capacity enhancement, (iii) road rehabilitation, and (iv) road surface upgrading.

Table 6.2 General Measures to Road Sector Issues

Road sector current issues	Measures
1. Poor/Incomplete Road Network 1.1 Missing links 1.2 Lack of bridge connection 1.3 Poor road alignment	1. Road network improvement 1.1 Construction of new road 1.2 Construction of new bridge 1.3 Road alignment improvement
2. Insufficient road capacity (traffic congestion/ traffic bottleneck) 2.1 Traffic congestion	2. Road capacity improvement 2.1 (a) Widening of existing roads 2.1 (b) Construction of bypass 2.1 (c) Segregation of through traffic from local traffic
3. Road in poor condition 4.1 Deterioration of paved road surface	3. Road rehabilitation 4.1 Pavement rehabilitation
4. Road in gravel surface 4.1 National/Provincial road in gravel surface	4. Road surface upgrading 4.1 Upgrade road surface into paved surface

Table 6.2 is used to establish criteria to identify potential road projects to ensure a systematic way of selecting projects. Based on the above table, the project identification criteria were established as illustrated in Figure 6.10. The five types of project are: (i) surface upgrading, (ii) pavement rehabilitation, (iii) elimination of missing links, (iv) road widening and (v) construction of bypass/ring road.

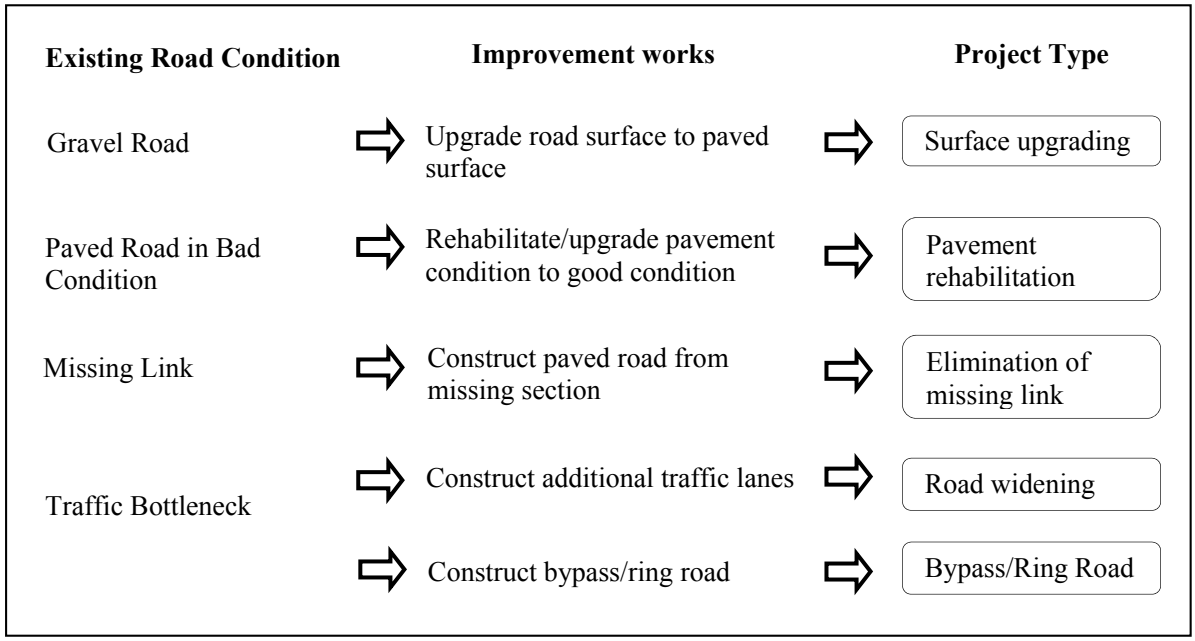


Figure 6.10 Project Identification Criteria

6.3.2 Identified projects

About 1,271 km of roads is involved in the identified projects. The locations of these projects are presented in Figure 6.11 for the mainland provinces and Figure 6.12 for the island provinces. Another group of roads with a total length of 129 km outside of Bangsamoro (in the provinces of Lanao del Norte, North Cotabato, and Sultan Kudarat) was also identified as important project to complete the missing links originating from the Bangsamoro region (Figure 6.13).

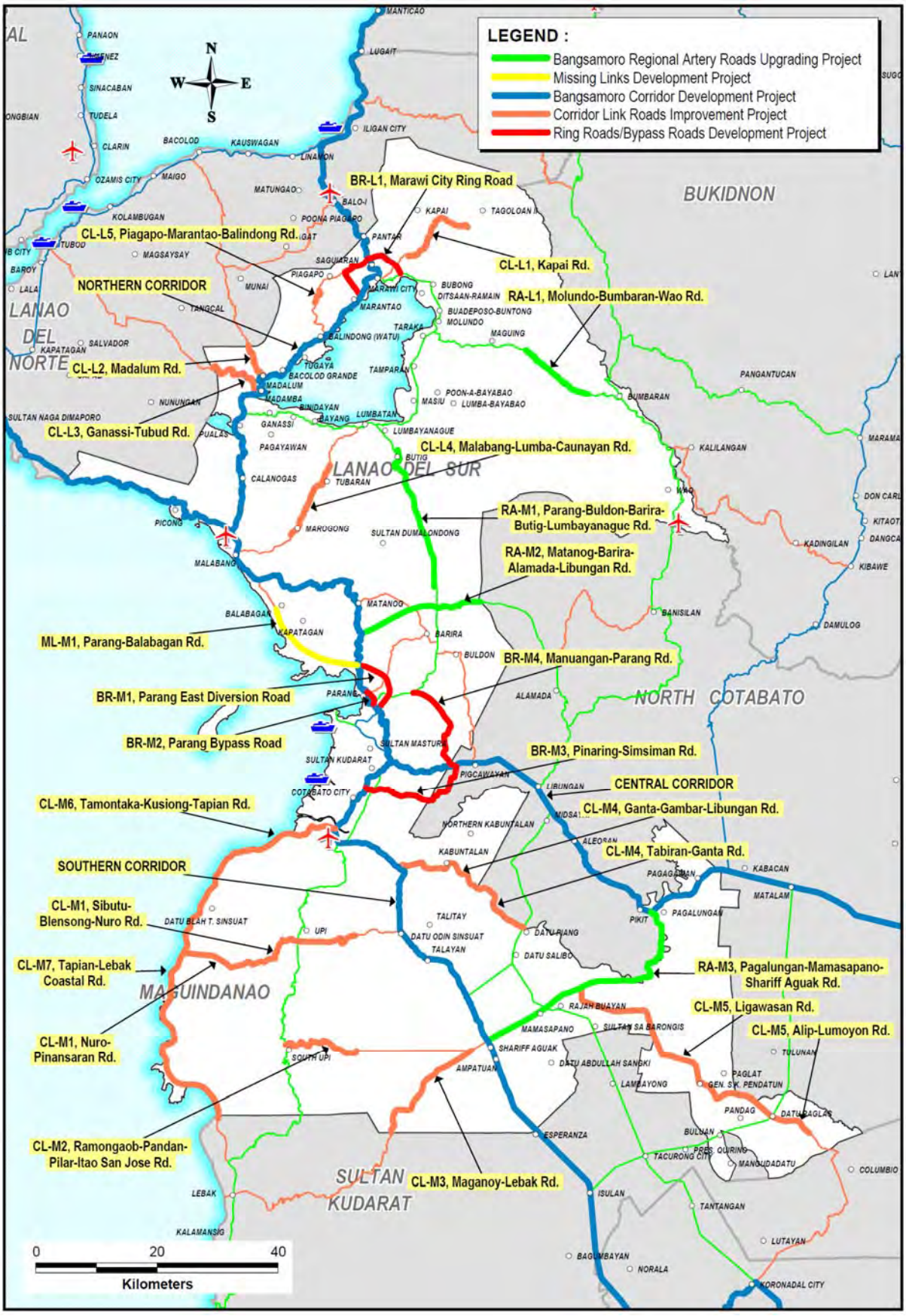


Figure 6.11 Locations of Identified Projects: Mainland Provinces

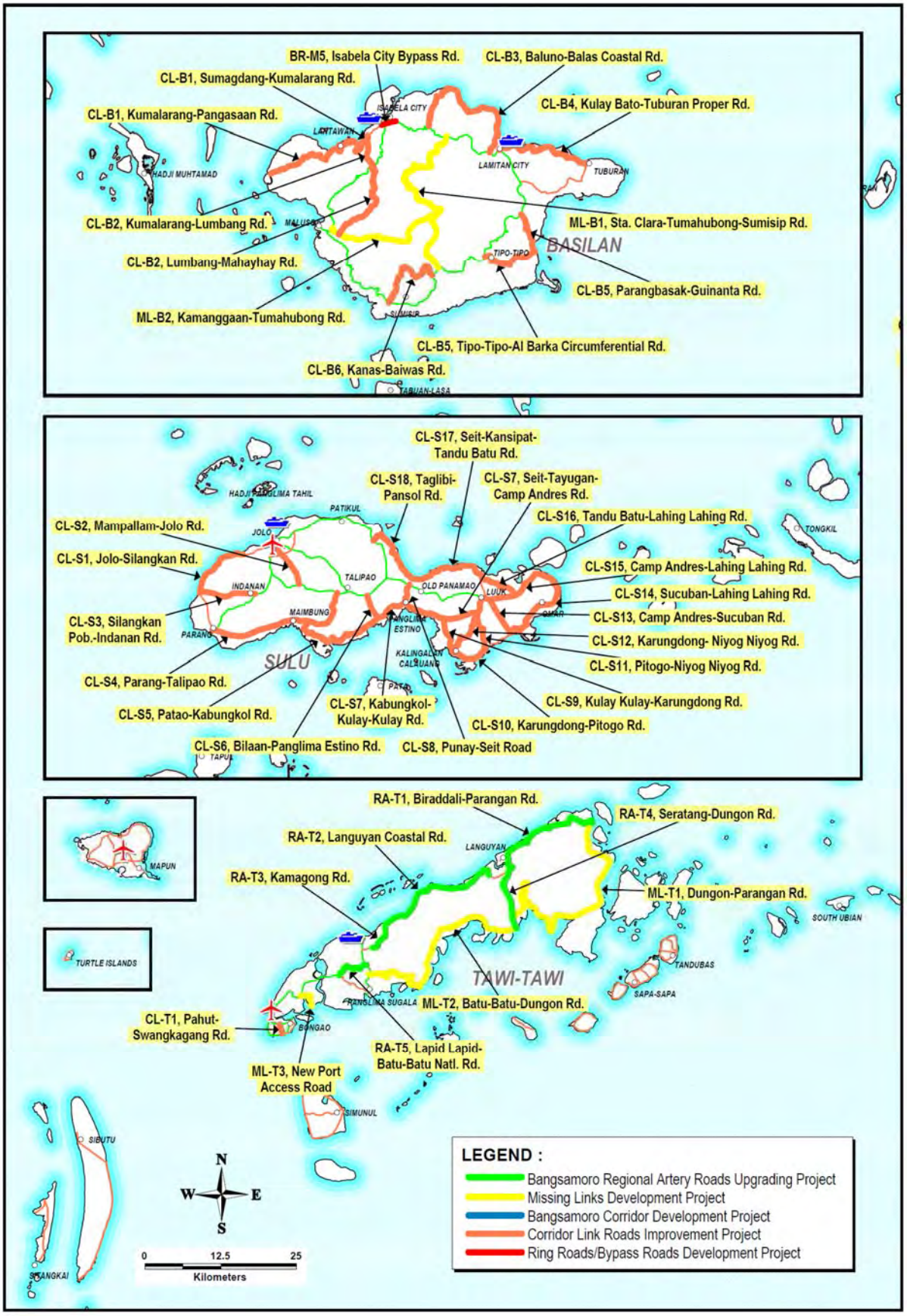


Figure 6.12 Locations of Identified Projects: Island Provinces

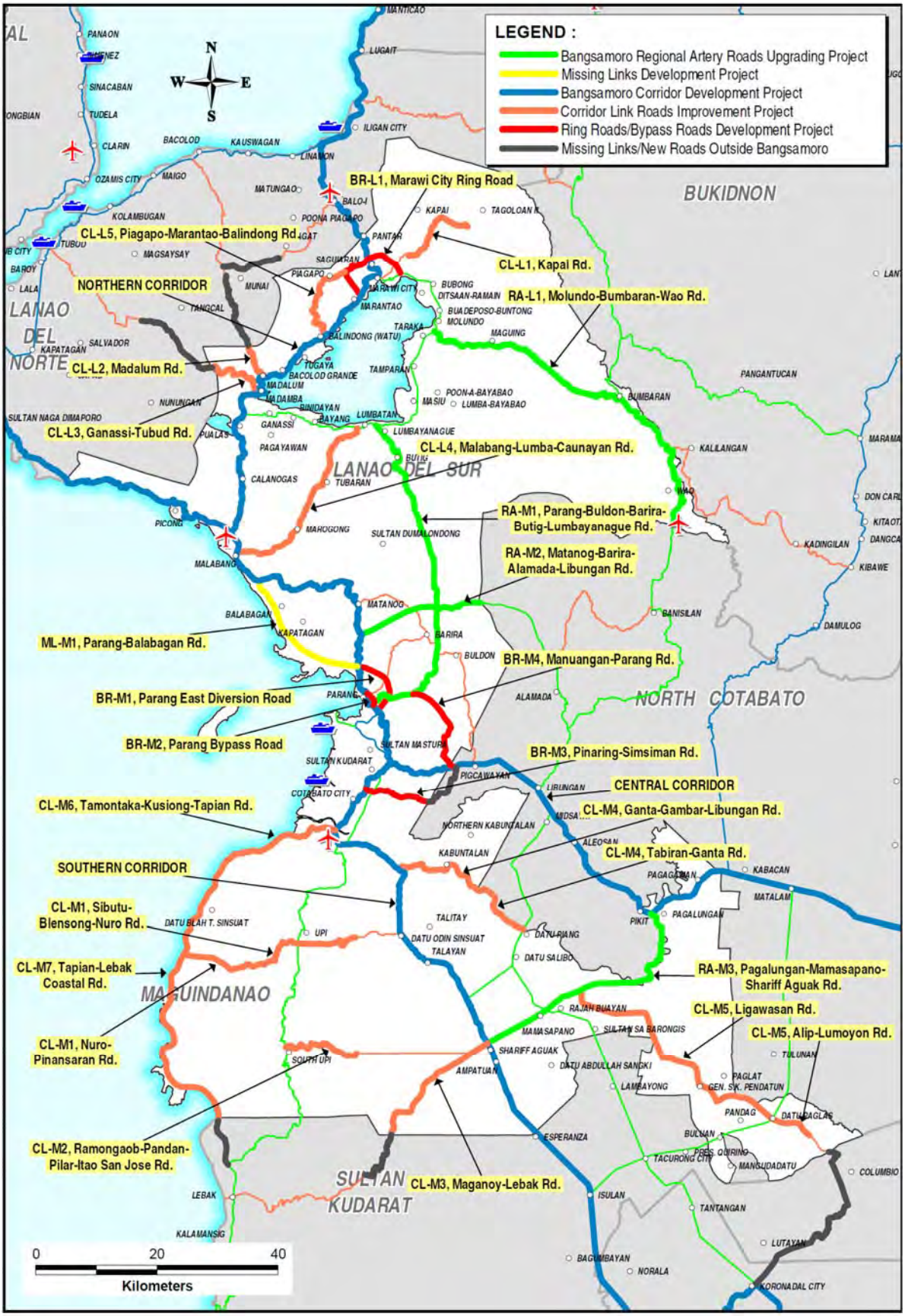


Figure 6.13 Locations of Missing Links outside Bangsamoro Region

The identified projects are grouped into five to fit into the regional development plan. The grouping is as follows: (1) Artery Roads Upgrading Project, (2) Missing Links Development Project, (3) Corridor Development Project, (4) Corridor Link Roads Improvement Project, and (5) Ring Roads/Bypass Roads Development Project.

The Corridor Development Project involved upgrading of 262 km of road inside the Bangsamoro and 292 km in the neighboring regions to complete the proposed three economic corridors. The combined length is about 700 km, of which 21% (144 km) have four lanes or more.

Table 6.3 Summary of Identified Projects and Type of Improvement Works

Project Type	INSIDE BANGSAMORO						OUTSIDE BANGSAMORO						Grand Total for Road to be improved (km)
		Type of Works (km)						Type of Works (km)					
	Road Length (Km)	New Construction	Surface Upgrading	Rehabilitation	Reconstruction	Total Length to be improved	Road Length (Km)	New Construction	Surface Upgrading	Rehabilitation	Reconstruction	Total Length to be improved	
a. Bangsamoro Regional Artery Roads Upgrading Project	250.2	79.4	93.9	-	7.5	180.8	-	-	-	-	-	-	180.8
b. Missing Links Development Project	168.8	136.4	23.8	-	8.5	168.8	-	-	-	-	-	-	168.8
c. Bangsamoro Corridor Development Project	267.6	-	-	-	13.7	13.7	-	-	-	-	-	-	13.7
d. Corridor Link Roads Improvement Project	692.1	93.2	478.3	-	120.5	692.1	168.4	120.3	23.8	-	-	144.1	836.2
e. Ring Roads/Bypass Roads Development Project	69.9	41.2	19.6	-	2.5	63.3	9.1	-	9.1	-	-	9.1	72.4
`Total	1,448.5	350.2	615.7	-	152.7	1,118.6	177.6	120.3	32.9	-	-	153.2	1,271.8

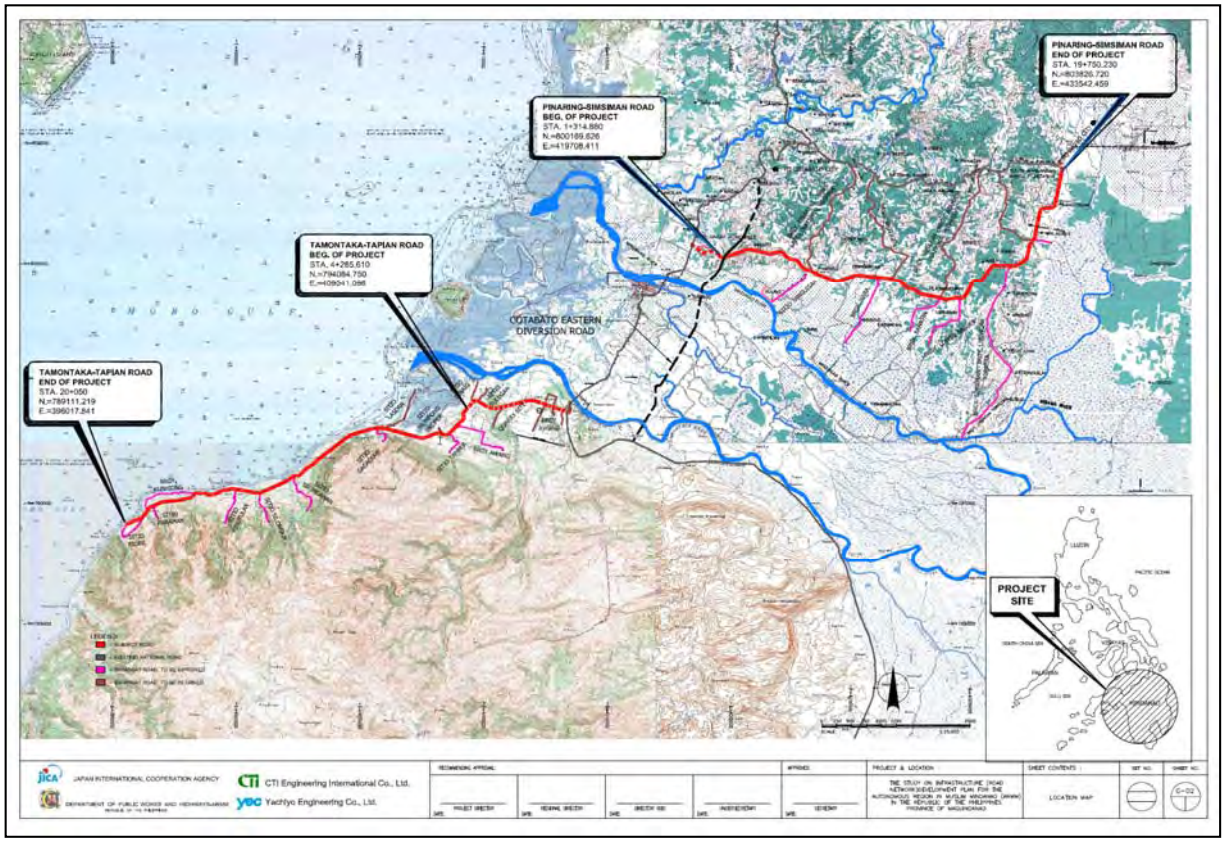
6.3.3 Approach to FMRs

The dominant industry in the region is agri-fishery, and thus the road sector should be planned in a way that it supports the agri-fishery industry. This can be done by adopting a new approach in road development in which whenever a national road or provincial road or other type of trunk roads is planned, FMR improvement is included in the project. Labor-based road rehabilitation and maintenance technology should be pursued.

The master plan has identified 80 road projects, and during the project preparation, improvement of FMRs should be included in the scope of work to ensure their inclusion in the feasibility study (FS). The results of FS indicate the specific FMR to be improved in each road project. Figure 6.14 is an example (output) of an FS that included FMRs in the scope of work. In the two road projects implemented in the JICA study (2010), it was observed that for every 10 km trunk road, the length of FMRs to be improved was about 8 km. This is roughly 45% of all the roads linked to the trunk road (and 55% to unproductive areas or in some cases already funded). Assuming that every 10 km of a trunk road has 8 km of FMRs, the estimated length of FMRs to be improved is about 884 km. This ratio should be revised if new figures appear as more feasibility studies are undertaken. Table 6.4 indicates estimated lengths of FMRs for improvement by province.

Table 6.4 Estimated Length and Construction Cost of FMRs to Be Improved per Province

Province	Road length (km)	Road to improve (km)	Estimated length of FMR	Construction cost (PHP)	Engineering services (PHP)	Total cost (PHP)
Lanao	325.4	138.6	110.9	1,716,682,464	240,335,545	1,957,018,009
Maguindanao	515.2	375.3	300.2	4,647,479,904	650,647,186	5,298,127,090
Basilan	228.1	228.1	182.5	2,825,000,928	395,500,130	3,220,501,058
Sulu	201.9	201.9	161.5	2,499,883,776	349,983,729	2,849,867,505
Tawi-Tawi	178.0	161.1	128.9	1,994,690,880	279,256,723	2,273,947,603
Total	1,448.5	1,105.0	884.0	13,683,737,952	1,915,723,313	15,599,461,265



Note: FMRs in pink = recommended for improvement; FMRs in brown = not recommended for improvement

Source: The Study on Infrastructure (Road Network) Development Plan for the Autonomous Region in Muslim Mindanao (ARMM), JICA, 2010.

Figure 6.14 Example of FS of Two Provincial Roads Which Includes FMRs

The average construction cost for an FMR in the ARMM by the Department of Agriculture's Philippine Rural Development Project is PHP 11.5 million/km. Using this figure as a basis, the total construction cost (including direct, overhead, profit, contingency, and VAT) of the 884 km FMRs is about PHP 13.68 billion. Engineering services such as FS, detailed design, and supervision are assumed to be undertaken during the improvement plan for the main trunk road to which these FMRs are connected. If the engineering services are undertaken separately, estimated cost for the 884 km is about PHP 1.92 billion, which would bring the total cost to PHP 15.60 billion.

Taking into account the importance of peace-building and job-creation, which demand immediate attention after combatants return to civilian life, labor-based road construction and maintenance methods should be applied to FMRs works. JICA has recently completed two-pilot projects in the municipalities of Sultan Mastura (Maguindanao) and Matungao (Lanao del Norte) using such labor-based technology. The two projects were successful and useful examples for future projects involving the labor-based technology. From this experience, *Basic Manual for Road Rehabilitation and Maintenance by Labor-Based Technology* was produced. In this manual, the technology is defined as "the construction technology utilizing the participation of the community as labor force supplemented with light equipment such as compactors to ensure the quality of construction works". The manual established correct procedure in terms of (i) road standards (ii) construction methodology, (iii) work supervision and monitoring, (iv) community organization for its involvement, and (v) other important aspects of construction works. It is envisioned that a considerable portion of work force would come from the community and combatants under the overall supervision of a municipal engineer.

Source: *Basic Manual for Road Rehabilitation and Maintenance by Labor-Based Technology*, JICA, 2015

Figure 6.15 FMR Rehabilitation in Sultan Mastura of Maguindanao Using Labor-based Technology

6.4 Standard Design

6.4.1 Design standard

The minimum design standard for DPWH-National roads, which defines highways by traffic volume, is presented in Table 6.5. In the present study, the recommended design standard to each road class is as follows:

Road class	AADT Range
Primary Inter-city Road	> 2,000
Regional Primary Road	1,000–2,000
Regional Secondary Road	400–1,000

6.4.2 Proposed typical cross sections

The proposed typical road sections by road class and work type are presented in Figure 6.16 through 6.19, which are as follows:

- Proposed Typical Cross Section for New Road Construction (Figure 6.16),
- Proposed Typical Cross Section for Road Surface Upgrading–Gravel/Earth Road to PCC Paved Road (Figure 6.17),
- Proposed Typical Cross Section for Rehabilitation of Existing PCC Paved Road assuming 30% for re-blocking with overly 50 mm (Figure 6.18), and
- Proposed Typical Cross Section for Reconstruction of Existing PCC Paved Road assuming base failure and PCC 230 mm (Figure 6.19).

6.5 Project Cost Estimate

6.5.1 DWPH funded projects 2015

Identified projects with funding from the 2015 budget of DPWH are removed from the list if the entire section is covered by the available budget. If not, section without fund is included in the list.

6.5.2 Construction cost estimate

Based on the Cost Estimates for Work Item of Projects by DPWH (as of February 2014), road construction cost per km of road and type of work were estimated as shown in Table 6.6.

Table 6.5 Minimum Design Standard of Philippine Highways

			400–1000		1000–2000		> 2000	
Av. daily traffic on opening	< 200	200–400	Minimum	Desirable	Minimum	Desirable	Minimum	Desirable
Design speed (km/h)								
Flat topography	60	70	70	90	80	95	90	100
Rolling topography	40	50	60	80	60	80	70	90
Mountainous topography	30	40	40	50	50	60	60	70
Radius (m)								
Flat topography	120	160	160	280	220	320	260	350
Rolling topography	55	85	120	220	120	220	160	280
Mountainous topography	30	50	50	80	80	120	180	160
Grade (%)								
Flat topography	6.0	6.0	5.0	3.0	4.0	3.0	4.0	3.0
Rolling topography	8.0	7.0	6.0	5.0	5.0	5.0	5.0	4.0
Mountainous topography	10.0	9.0	8.0	6.0	7.0	6.0	1.0	5.0
Pavement width (m)	4.0	5.5; 6.0	6.10		6.70		6.70	7.30
Shoulder width (m)	0.50	1.00	1.50	2.00	2.50	3.00	3.00	
Right-of-way width (m)	20	30	30		30		60	
Super elevation (m/m)	0.10 (max)		0.10 (max)		0.10 (max)		0.10 (max)	
Non-passing sight distance (m)								
Flat topography	70	90	90	135	115	150	135	160
Rolling topography	40	60	70	115	70	115	90	135
Mountainous topography	40	40	40	60	60	70	70	90
Passing sight distance (m)								
Flat topography	420	490	490	615	560	645	615	675
Rolling topography	270	350	420	560	420	560	490	615
Mountainous topography	190	270	270	350	360	420	420	490
Type of surfacing	Gravel, crushed gravel, or crushed stone bit, preservative treatment, single or double bit, surface treatment, bituminous macadam pavement		Bituminous macadam pavement, dense or open graded plant mix surface course, bituminous concrete surface course		Bituminous concrete surface course		Bituminous concrete surface course, portland cement concrete pavement	
Road Class			Proposed Standard for Regional Secondary Road		Proposed Standard for Regional Primary Road		Proposed Standard for Primary Inter-city Road	

Source: *Design Guidelines, Criteria and Standards*, Bureau of Design, DPWH.

6.5.3 Engineering cost

Engineering cost was estimated based on the past experiences as shown below:

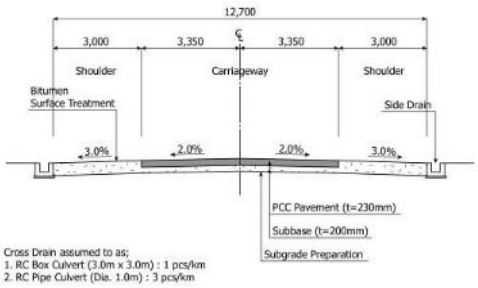
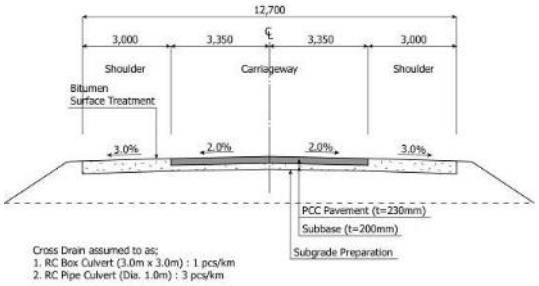
- Feasibility study (2% of construction cost),
- Detailed design (4% of construction cost), and
- Construction supervision (8% of construction cost).

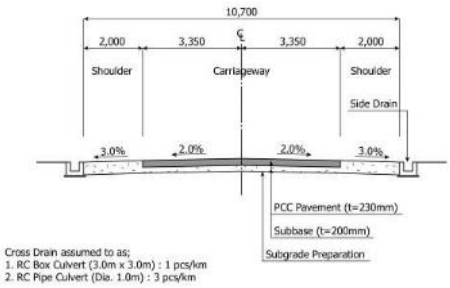
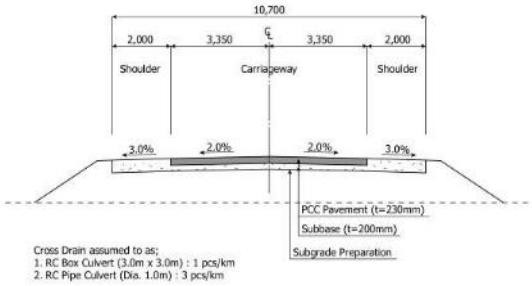
6.5.4 Cost of ROW acquisition and resettlement of affected families

The cost of right-of-way (ROW) acquisition and resettlement of affected families was estimated based on experiences by DPWH-ARMM and DPWH Region XII. The unit price is between PHP 150 and 200 per m^2. For planning purposes, the upper bracket is adopted:

- Unit price of ROW acquisition and resettlement of affected families: PHP 200 per m^2
- Width of ROW to be acquired: 30 m

The unit cost per km for ROW acquisition and resettlement of affected families is, therefore, set at PHP 6.0 million per km.

Primary Inter-City Road	
Urban Area	CS111
	
Flat Area	CS112
	

Regional Primary Road	
Urban Area	CS121
	
Flat Area	CS122
	

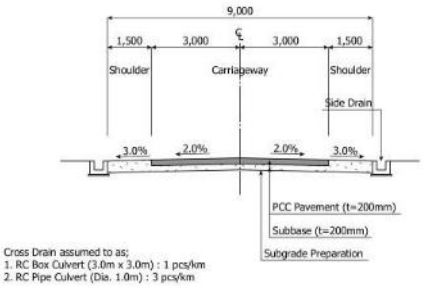
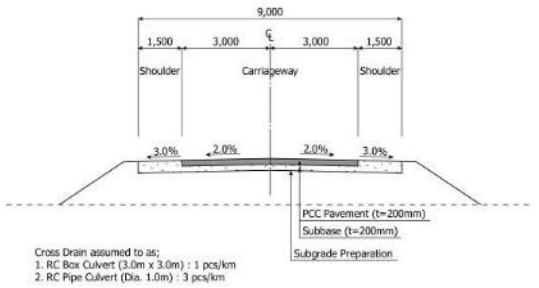
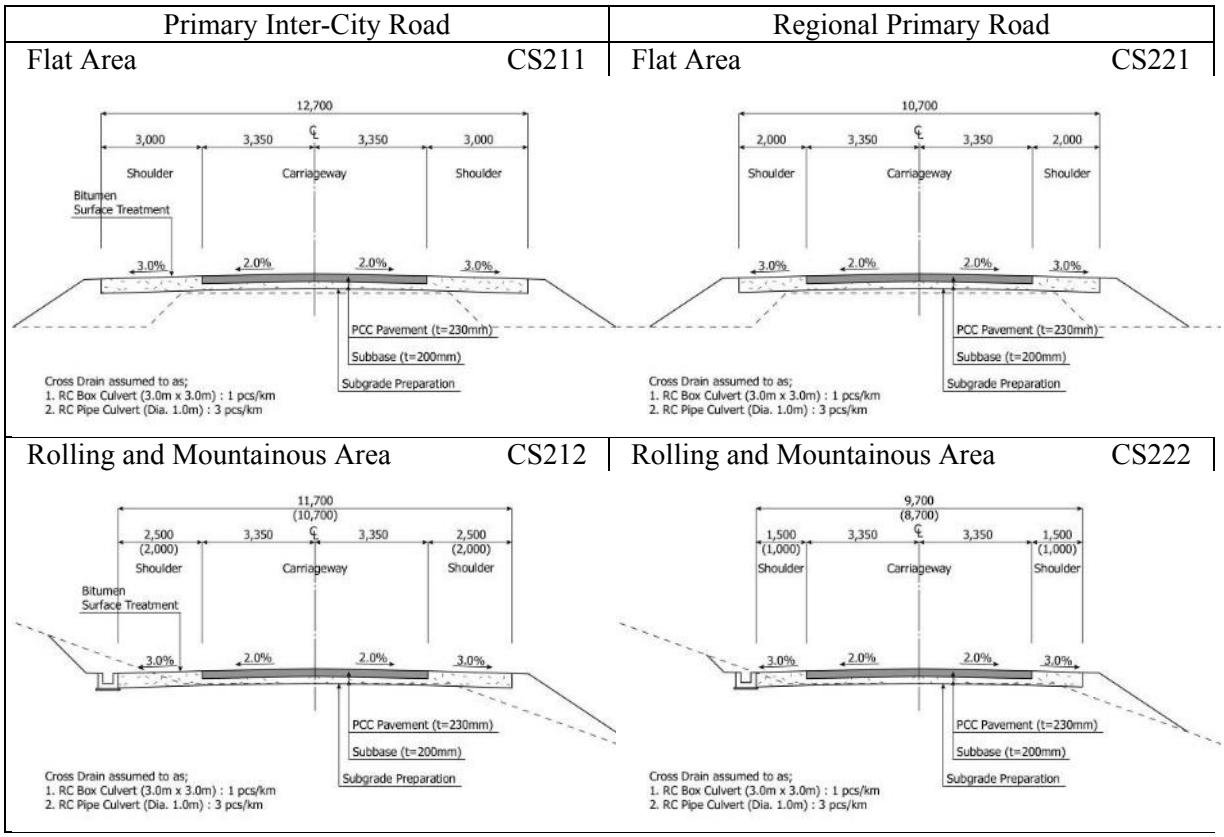
Regional Secondary Road	
Urban Area	CS131
	
Flat Area	CS132
	

Figure 6.16 Proposed Typical Cross Section for New Road Construction



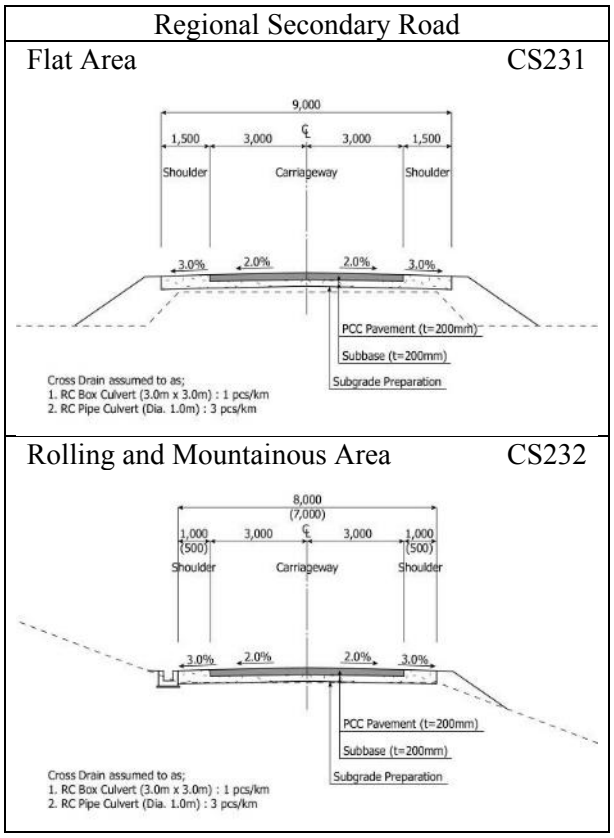
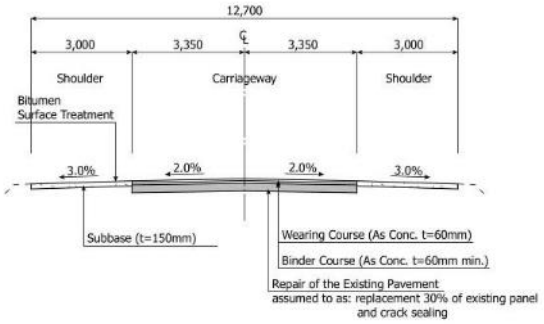
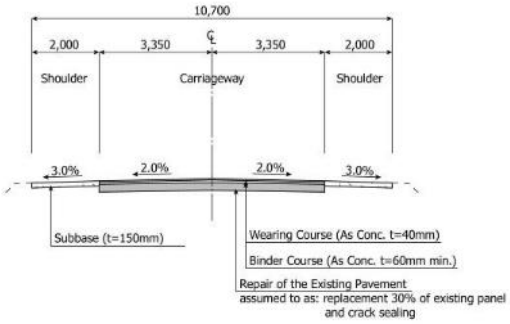
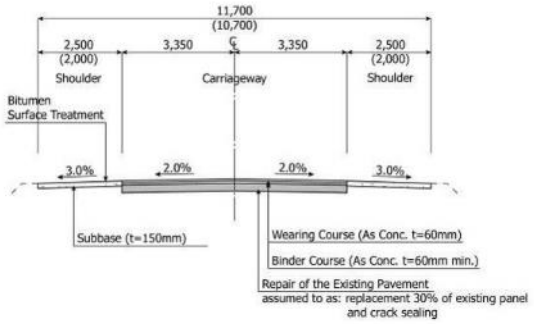
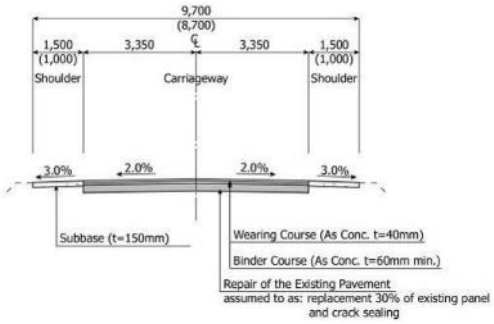
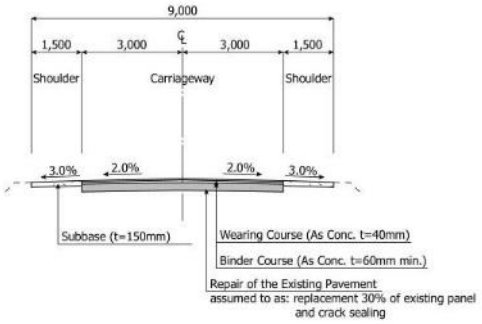
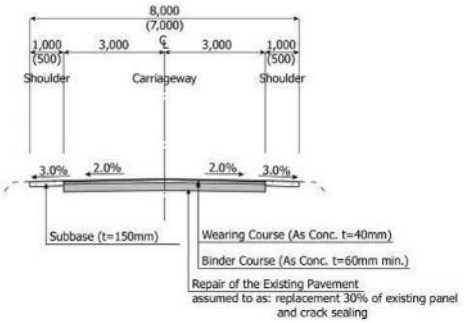


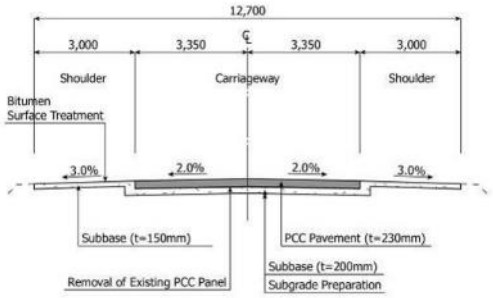
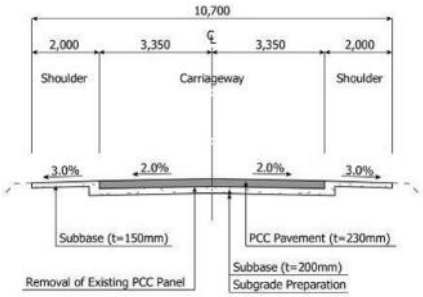
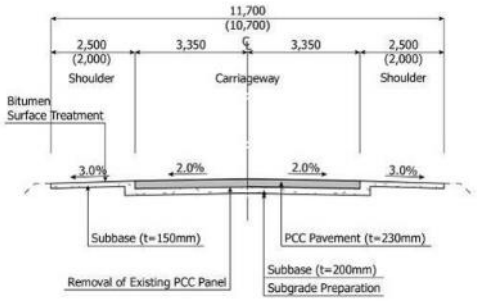
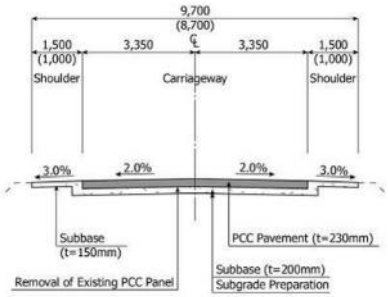
Figure 6.17 Proposed Typical Cross Section for Road Surface Upgrading (Gravel/Earth Road to PCC Paved Road)

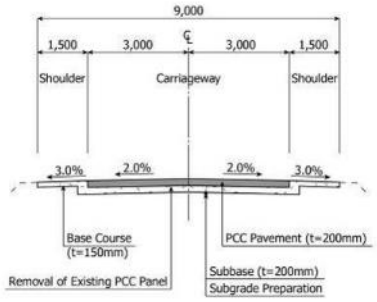
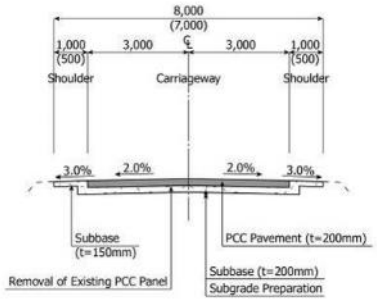
Primary Inter-City Road	Regional Primary Road
Flat Area CS311	Flat Area CS321
	
Rolling and Mountainous Area CS312	Rolling and Mountainous Area CS322
	

Regional Secondary Road
Flat Area CS331

Rolling and Mountainous Area CS332


(Assumption: 30% for re-blocking with over 50 mm)

Figure 6.18 Proposed Typical Cross Section for Rehabilitation of Existing PCC Paved Roads

Primary Inter-City Road	Regional Primary Road
Flat Area CS411	Flat Area CS421
	
Rolling and Mountainous Area CS412	Rolling and Mountainous Area CS422
	

Regional Secondary Road
Flat Area CS431

Rolling and Mountainous Area CS432


(Assumption: Base failure and PCC 230mm)

Figure 6.19 Proposed Typical Cross Section for Reconstruction of Existing PCC Paved Roads

Table 6.6 Road Construction Cost

(Unit: PHP 1,000)

Case	Road Class	Area	Cost per Km											
			Construction Cost						Engineering Services			Land Acquisition, Compensation	Sub-Total	Total
			Direct Cost	Overhead	Profit	Contingency	VAT	Sub-Total	F/S	D/D	S/V			
			Total	6.00%	6.00%	5.00%	12.00%		2.00%	4.00%	8.00%			
New Construction	Primary Inter-City Road	Urban	25,750	1,545	1,545	1,288	3,090	33,218	664	1,329	2,657	6,000	10,650	43,868
		Flat	25,000	1,500	1,500	1,250	3,000	32,250	645	1,290	2,580	6,000	10,515	42,765
		Rolling	27,500	1,650	1,650	1,375	3,300	35,475	710	1,419	2,838	6,000	10,967	46,442
		Mt.	28,750	1,725	1,725	1,438	3,450	37,088	742	1,484	2,967	6,000	11,193	48,281
	Regional Primary Road	Urban	23,635	1,418	1,418	1,182	2,836	30,489	610	1,220	2,439	6,000	10,269	40,758
		Flat	22,946	1,377	1,377	1,147	2,754	29,601	592	1,184	2,368	6,000	10,144	39,745
		Rolling	25,241	1,514	1,514	1,262	3,029	32,560	651	1,302	2,605	6,000	10,558	43,118
		Mt.	26,388	1,583	1,583	1,319	3,167	34,040	681	1,362	2,723	6,000	10,766	44,806
	Regional Secondary Road	Urban	19,800	1,188	1,188	990	2,376	25,542	511	1,022	2,043	6,000	9,576	35,118
		Flat	19,223	1,153	1,153	961	2,307	24,797	496	992	1,984	6,000	9,472	34,269
		Rolling	21,145	1,269	1,269	1,057	2,537	27,277	546	1,091	2,182	6,000	9,819	37,096
		Mt.	22,106	1,326	1,326	1,105	2,653	28,516	570	1,141	2,281	6,000	9,992	38,508
Road Surface Upgrading (Gravel/Earth surface to Concrete surface)	Primary Inter-City Road	Flat	17,500	1,050	1,050	875	2,100	22,575	0	903	1,806	0	2,709	25,284
		Rolling	19,250	1,155	1,155	963	2,310	24,833	0	993	1,987	0	2,980	27,813
		Mt.	20,125	1,208	1,208	1,006	2,415	25,962	0	1,038	2,077	0	3,115	29,077
	Regional Primary Road	Flat	16,062	964	964	803	1,927	20,720	0	829	1,658	0	2,487	23,207
		Rolling	17,669	1,060	1,060	883	2,120	22,792	0	912	1,823	0	2,735	25,527
		Mt.	18,472	1,108	1,108	924	2,217	23,829	0	953	1,906	0	2,859	26,688
	Regional Secondary Road	Flat	13,456	807	807	673	1,615	17,358	0	694	1,389	0	2,083	19,441
		Rolling	14,802	888	888	740	1,776	19,094	0	764	1,527	0	2,291	21,385
		Mt.	15,475	928	928	774	1,857	19,962	0	798	1,597	0	2,395	22,357
Rehabilitation of Existing PCC Paved Road (Assumption: 30% for reblocking with overly 50mm)	Primary Inter-City Road	Flat	17,200	1,032	1,032	860	2,064	22,188	0	888	1,775	0	2,663	24,851
		Rolling	18,920	1,135	1,135	946	2,270	24,406	0	976	1,952	0	2,928	27,334
		Mt.	19,780	1,187	1,187	989	2,374	25,517	0	1,021	2,041	0	3,062	28,579
	Regional Primary Road	Flat	15,787	947	947	789	1,894	20,364	0	815	1,629	0	2,444	22,808
		Rolling	17,366	1,042	1,042	868	2,084	22,402	0	896	1,792	0	2,688	25,090
		Mt.	18,155	1,089	1,089	908	2,179	23,420	0	937	1,874	0	2,811	26,231
	Regional Secondary Road	Flat	13,225	794	794	661	1,587	17,061	0	682	1,365	0	2,047	19,108
		Rolling	14,548	873	873	727	1,746	18,767	0	751	1,501	0	2,252	21,019
		Mt.	15,209	913	913	760	1,825	19,620	0	785	1,570	0	2,355	21,975
Reconstruction of Existing PCC Paved Road (Assumption with base failure and PCC 230mm)	Primary Inter-City Road	Flat	17,500	1,050	1,050	875	2,100	22,575	452	903	1,806	0	3,161	25,736
		Rolling	19,250	1,155	1,155	963	2,310	24,833	497	993	1,987	0	3,477	28,310
		Mt.	20,125	1,208	1,208	1,006	2,415	25,962	519	1,038	2,077	0	3,634	29,596
	Regional Primary Road	Flat	15,072	904	904	754	1,809	19,443	389	778	1,555	0	2,722	22,165
		Rolling	16,579	995	995	829	1,990	21,388	428	856	1,711	0	2,995	24,383
		Mt.	17,333	1,040	1,040	867	2,080	22,360	447	894	1,789	0	3,130	25,490
	Regional Secondary Road	Flat	15,072	904	904	754	1,809	19,443	389	778	1,555	0	2,722	22,165
		Rolling	16,579	995	995	829	1,990	21,388	428	856	1,711	0	2,995	24,383
		Mt.	17,333	1,040	1,040	867	2,080	22,360	447	894	1,789	0	3,130	25,490

Note: Rolling terrain = cost factor of 10%; Mountainous terrain = cost factor of 15%

Source: DPWH's Cost Estimates for Work Item of Projects (as of February 2014).

6.5.5 Estimated cost of identified projects

The estimated cost for identified road projects is about PHP 38.93 billion as indicated in Table 6.7. Projects are classified as follows with their corresponding cost:

a. Cost estimates for Bangsamoro Regional Artery Roads Upgrading Project (Table 6.8),
b. Cost estimates for Missing Links Development Project (Table 6.9),
c. Cost estimates Bangsamoro Corridor Development Project (Table 6.10),
d. Cost estimates for Corridor Link Roads Improvement Project (Table 6.11 through Table 6.14), and
e. Cost estimates for Ring Roads/Bypass Roads Development Project (Table 6.15)

The estimated cost for projects outside of the Bangsamoro is provided in Table 6.16. The estimated cost is about PHP 6.20 billion.

Table 6.7 Cost Summary of Identified Projects

Project Type	Road Length (Km)	Type of Works				Const Cost	Engineering Services			Land Acquisition, Compensation	Total
		New Const	Road Surface Upgrading	Rehabilitation	Reconstruction		F/S	D/D	S/V		
		(km)	(km)	(km)	(km)	(PhP Mil)	2%	4%	8%	(PhP Mil)	(PhP Mil)
a. Bangsamoro Regional Artery Roads Upgrading Project	250.2	79.4	93.9	0.0	7.5	6723.4	134.5	268.9	537.9	476.3	8141.0
b. Missing Links Development Project	168.8	136.4	23.8	0.0	8.5	5436.8	108.7	217.5	434.9	818.5	7016.4
c. Bangsamoro Corridor Development Project	267.6	0.0	0.0	0.0	13.7	332.8	0.0	13.3	26.6	0.0	372.8
d. Corridor Link Roads Improvement Project	692.1	93.2	478.3	0.0	120.5	16847.9	337.0	673.9	1347.8	559.3	19765.9
e. Ring Roads/Bypass Roads Development Project	69.9	41.2	19.6	0.0	2.5	2809.4	56.2	112.4	224.8	247.3	3632.2
Total	1448.5	350.2	615.7	0.0	152.7	32150.3	636.3	1286.0	2572.0	2101.4	38928.3

Table 6.8 Cost Estimate for Bangsamoro Regional Artery Road Upgrading Projects

Project Type	Code	Road Name	Road Type	Road Length (Km)	Type of Works				Const Cost	Engineering Services			Land Acquisition, Compensation	Total
					New Const	Road Surface Upgrading	Rehabilitation	Reconstruction		F/S	D/D	S/V		
					(km)	(km)	(km)	(km)	(PhP Mil)	2%	4%	8%	(PhP Mil)	(PhP Mil)
a. Bangsamoro Regional Artery Roads Upgrading Project	RA-L1	Malundo-Bumbaran-Wao Rd	RPR	69.7	0.0	14.8	0.0	2.4	693.1	13.9	27.7	55.4	0.0	790.1
	RA-M1	Parang-Buldon-Barira-Butig-Lumbayanague Rd.	RPR	25.6	17.1	8.5	0.0	0.0	972.0	19.4	38.9	77.8	102.4	1210.5
	RA-M2	Matanog-Barira-Alamada-Libungan Rd	RPR	21.2	21.2	0.0	0.0	0.0	912.4	18.2	36.5	73.0	127.0	1167.1
	RA-M3	Pagalungan-Mamasapano-Sharief Aguak Rd	RPR	43.8	17.4	26.4	0.0	0.0	1416.5	28.3	56.7	113.3	104.2	1719.0
	RA-T1	Biraddali-Parangan Road	RSR	26.0	0.0	22.8	0.0	3.2	1206.0	24.1	48.2	96.5	0.0	1374.9
	RA-T2	Languyan Coastal Road	RSR	23.8	23.8	0.0	0.0	0.0	916.5	18.3	36.7	73.3	142.8	1187.6
	RA-T3	Kamagong Road	RSR	5.9	0.0	3.9	0.0	1.9	147.5	2.9	5.9	11.8	0.0	168.1
	RA-T4	Seratang-Dungon Road	RSR	11.3	0.0	11.3	0.0	0.0	300.2	6.0	12.0	24.0	0.0	342.3
	RA-T5	Lapid-Lapid-Batu-Batu Road	RPR	9.3	0.0	6.2	0.0	0.0	159.1	3.2	6.4	12.7	0.0	181.4
		Sanga-Sanga-Lapid-Lapid Road	RPR	13.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		Sub-total		250.2	79.4	93.9	0.0	7.5	6723.4	134.5	268.9	537.9	476.3	8141.0

Note: RPR=Regional Primary Road; RSR=Regional Secondary Road

Table 6.9 Cost Estimate for Missing Links Development Projects

Project Type	Code	Road Name	Road Type	Road Length (Km)	Type of Works				Const Cost	Engineering Services			Land Acquisition, Compensation	Total
					New Const	Road Surface Upgrading	Rehabilitation	Reconstruction		F/S	D/D	S/V		
					(km)	(km)	(km)	(km)	(PhP Mil)	2%	4%	8%	(PhP Mil)	(PhP Mil)
b. Missing Links Development Project	ML-M1	Parang-Balabagan Road	RSR	23.6	17.6	0.0	0.0	6.0	809.3	16.2	32.4	64.7	105.5	1028.1
	ML-B1	Sta. Clara-Tumahubong-Sumisip Road	RSR	38.5	38.5	0.0	0.0	0.0	1482.6	29.7	59.3	118.6	231.0	1921.1
	ML-B2	Kamanggaan-Tumahubong-Sumisip Road	RSR	20.4	20.4	0.0	0.0	0.0	785.6	15.7	31.4	62.8	122.4	1018.0
	ML-T1	Dungon-Parangan Road	RSR	42.0	42.0	0.0	0.0	0.0	1617.4	32.3	64.7	129.4	252.0	2095.8
	ML-T2	Batu-Batu-Dungon Road	RSR	40.8	14.4	23.8	0.0	2.6	610.3	12.2	24.4	48.8	86.3	782.0
	ML-T3	New Port Access Road	RSR	3.6	3.6	0.0	0.0	0.0	131.7	2.6	5.3	10.5	21.3	171.4
		Sub-total		168.8	136.4	23.8	0.0	8.5	5436.8	108.7	217.5	434.9	818.5	7016.4

Note: ML=Missing link

Table 6.10 Cost Estimate for Bangsamoro Corridor Development Projects

Project Type	Code	Road Name	Road Type	Road Length (Km)	Type of Works				Const Cost	Engineering Services			Land Acquisition, Compensation	Total
					New Const	Road Surface Upgrading	Rehabilitation	Reconstruction		F/S	D/D	S/V		
					(km)	(km)	(km)	(km)	(PhP Mil)	2%	4%	8%	(PhP Mil)	(PhP Mil)
c. Bangsamoro Corridor Development Project	CD-N	Cotabato-Marawi-Iligan-Cagayan de Oro	PICR	157.3	0.0	0.0	0.0	13.3	323.1	0.0	12.9	25.8	0.0	361.8
	CD-C	Cotabato-Kidapawan-Digos-Davao	PICR	31.4	0.0	0.0	0.0	0.3	7.3	0.0	0.3	0.6	0.0	8.2
	CD-S	Cotabato-Koronadal-Gen. Santos	PICR	74.0	0.0	0.0	0.0	0.1	2.4	0.0	0.1	0.2	0.0	2.7
		Sub-total		262.7	0.0	0.0	0.0	13.7	332.8	0.0	13.3	26.6	0.0	372.8

Note: CD-N=Corridor Development (Northern Corridor); CD-C=Corridor Development (Central Corridor); CD-S=Corridor Development (Southern Corridor)

Table 6.11 Cost Estimate for Corridor Link Roads Improvement Projects (1/4): Lanao

Project Type	Code	Road Name	Road Type	Road Length (Km)	Type of Works				Const Cost	Engineering Services			Land Acquisition, Compensation	Total
					New Const	Road Surface Upgrading	Rehabilitation	Reconstruction		F/S	D/D	S/V		
					(km)	(km)	(km)	(km)	(PhP Mil)	2%	4%	8%	(PhP Mil)	(PhP Mil)
d. Corridor Link Roads Improvement Project	CL-L1	Marawi-Kapai Road	RSR	17.4	0.0	10.8	0.0	6.6	388.0	7.8	15.5	31.0	0.0	442.3
	CL-L2	Madalum Road	RSR	7.4	0.0	7.4	0.0	0.0	165.4	3.3	6.6	13.2	0.0	188.6
	CL-L3	Ganassi-Tubud Road	RSR	11.4	0.0	3.3	0.0	8.1	252.9	5.1	10.1	20.2	0.0	288.3
	CL-L4	Malabang-Lumba-Caunayan Road	RSR	27.6	0.0	12.9	0.0	14.7	972.7	19.5	38.9	77.8	0.0	1108.8
	CL-L5	Piagapo-Marantao-Balindong Road	RSR	17.4	0.0	2.5	0.0	14.9	385.9	7.7	15.4	30.9	0.0	439.9
		Makir-Sibutu Road	RSR	14.0	0.0	14.0	0.0	0.0	313.0	6.3	12.5	25.0	0.0	356.8

Note: CL-L=Corridor link Lanao

Table 6.12 Cost Estimate for Corridor Links Development Projects (2/4): Maguindanao

Project Type	Code	Road Name	Road Type	Road Length (Km)	Type of Works				Const Cost	Engineering Services			Land Acquisition, Compensation	Total
					New Const	Road Surface Upgrading	Rehabilitation	Reconstruction		F/S	D/D	S/V		
					(km)	(km)	(km)	(km)	(PhP Mil)	2%	4%	8%	(PhP Mil)	(PhP Mil)
d. Corridor Link Roads Improvement Project	CL-M1	Sibutu-Blensong-Nuro Road	RSR	14.0	0.0	14.0	0.0	0.0	313.0	6.3	12.5	25.0	0.0	356.8
		Nuro-Pinansaran Road	RSR	10.5	10.5	0.0	0.0	0.0	404.7	8.1	16.2	32.4	63.1	524.4
	CL-M2	Ramongaob-Pandan-Pilar-Itao San Jose Road	RSR	15.6	0.0	15.6	0.0	0.0	347.6	7.0	13.9	27.8	0.0	396.3
		Lipongo-Sayap-Ahan Road	RSR	18.9	0.0	0.0	0.0	18.9	419.4	8.4	16.8	33.5	0.0	478.1
	CL-M3	Maganoy-Lebak Road	RSR	24.4	12.5	8.8	0.0	3.1	747.2	14.9	29.9	59.8	75.1	926.8
	CL-M4	Ganta-Gambar--Libungan Road	RSR	12.3	2.5	9.8	0.0	0.0	316.3	6.3	12.7	25.3	15.2	375.8
		Tabiran-Ganta Road	RSR	16.2	0.0	16.2	0.0	0.0	362.0	7.2	14.5	29.0	0.0	412.6
	CL-M5	Ligawasan Road	RSR	44.5	17.7	26.8	0.0	0.0	1126.6	22.5	45.1	90.1	106.0	1390.3
		Alip-Lumoyon Road	RSR	7.2	0.0	7.2	0.0	0.0	139.2	2.8	5.6	11.1	0.0	158.7
	CL-M6	Tamontaka-Tapian Road	RSR	13.0	0.0	13.0	0.0	0.0	290.6	5.8	11.6	23.3	0.0	331.3
	CL-M7	Tapian-Lebak Coastal Road	RSR	50.0	50.0	0.0	0.0	0.0	1925.4	38.5	77.0	154.0	300.0	2495.0

Note: CL-M=Corridor link Maguindanao

Table 6.13 Cost Estimate for Corridor Links Development Projects (3/4): Basilan

Project Type	Code	Road Name	Road Type	Road Length (Km)	Type of Works				Const Cost	Engineering Services			Land Acquisition, Compensation	Total
					New Const	Road Surface Upgrading	Rehabilitation	Reconstruction		F/S	D/D	S/V		
					(km)	(km)	(km)	(km)	(PhP Mil)	2%	4%	8%	(PhP Mil)	(PhP Mil)
d. Corridor Link Roads Improvement Project	CL-B1	Sumagdang-Kumalarang Road	RSR	7.9	0.0	4.1	0.0	3.7	175.3	3.5	7.0	14.0	0.0	199.9
		Kumalarang-Pangasaan Road	RSR	29.8	0.0	28.3	0.0	1.5	664.8	13.3	26.6	53.2	0.0	757.9
	CL-B2	Kumalarang-Lumbang Road	RSR	4.7	0.0	4.7	0.0	0.0	105.6	2.1	4.2	8.4	0.0	120.4
		Lumbang-Mahayhay Road	RSR	26.8	0.0	24.0	0.0	2.8	598.6	12.0	23.9	47.9	0.0	682.4
	CL-B3	Baluno-Balas Coastal Road	RSR	19.4	0.0	18.4	0.0	1.0	432.4	8.6	17.3	34.6	0.0	492.9
	CL-B4	Kulay Bato-Tuburan Proper Road	RSR	18.1	0.0	14.5	0.0	3.6	403.8	8.1	16.2	32.3	0.0	460.4
		Lamitan-Tuburan Road	RSR	16.3	0.0	0.0	0.0	16.3	361.3	7.2	14.5	28.9	0.0	411.9
	CL-B5	Parangbasak-Guinanta Road	RSR	12.3	0.0	6.3	0.0	6.0	267.3	5.3	10.7	21.4	0.0	304.7
		Tipo-Tipo-Al Barka Circumferential Road	RSR	10.4	0.0	7.6	0.0	2.8	223.9	4.5	9.0	17.9	0.0	255.3
	CL-B6	Kanas-Baiwas Road	RSR	21.3	0.0	21.3	0.0	0.0	475.3	9.5	19.0	38.0	0.0	541.8

Note: CL-B=Corridor link Basilan

Table 6.14 Cost Estimate for Corridor Links Development Projects (4/4): Sulu and Tawi-Tawi

Project Type	Code	Road Name	Road Type	Road Length (Km)	Type of Works				Const Cost	Engineering Services			Land Acquisition, Compensation	Total
					New Const	Road Surface Upgrading	Rehabilitation	Reconstruction		F/S	D/D	S/V		
					(km)	(km)	(km)	(km)	(PhP Mil)	2%	4%	8%	(PhP Mil)	(PhP Mil)
d. Corridor Link Roads Improvement Project	CL-S1	Jolo-Silangkan Road	RSR	18.0	0.0	11.4	0.0	6.6	390.1	7.8	15.6	31.2	0.0	444.7
	CL-S2	Mampallam-Jolo Road	RSR	7.8	0.0	7.8	0.0	0.0	167.3	3.3	6.7	13.4	0.0	190.7
	CL-S3	Silangkan Pob.-Indanan Road	RSR	9.6	0.0	9.6	0.0	0.0	205.3	4.1	8.2	16.4	0.0	234.0
	CL-S4	Parang-Talipao Road	RSR	25.4	0.0	25.4	0.0	0.0	493.8	9.9	19.8	39.5	0.0	562.9
	CL-S5	Patao-Kabungkol Road	RSR	19.0	0.0	19.0	0.0	0.0	369.4	7.4	14.8	29.6	0.0	421.1
	CL-S6	Bilaan-Panglima Estino Road	RSR	4.3	0.0	4.3	0.0	0.0	92.0	1.8	3.7	7.4	0.0	104.8
	CL-S7	Kabungkol-Kulay-Kulay Road	RSR	10.4	0.0	10.4	0.0	0.0	221.5	4.4	8.9	17.7	0.0	252.6
		Seit-Tayuagan-Camp Andres Road	RSR	2.4	0.0	0.0	0.0	2.4	52.4	1.0	2.1	4.2	0.0	59.8
	CL-S8	Punay-Seit Road	RSR	5.0	0.0	5.0	0.0	0.0	97.2	1.9	3.9	7.8	0.0	110.8
	CL-S9	Kulay Kulay-Karungdong Road	RSR	6.0	0.0	6.0	0.0	0.0	128.3	2.6	5.1	10.3	0.0	146.3
	CL-S10	Karungdong-Pitogo Road	RSR	5.3	0.0	5.3	0.0	0.0	113.3	2.3	4.5	9.1	0.0	129.2
	CL-S11	Pitogo-Niyog Niyog Road	RSR	6.4	0.0	6.4	0.0	0.0	137.4	2.7	5.5	11.0	0.0	156.6
	CL-S12	Karungdong-Niyog Niyog Road	RSR	9.2	0.0	8.0	0.0	1.2	197.7	4.0	7.9	15.8	0.0	225.4
		Pitogo-Sucuban Road	RSR	5.4	0.0	0.0	0.0	5.4	119.7	2.4	4.8	9.6	0.0	136.4
	CL-S13	Camp Andres-Sucuban Road	RSR	6.4	0.0	6.4	0.0	0.0	136.9	2.7	5.5	10.9	0.0	156.0
	CL-S14	Sucuban-Lahing Lahing Road	RSR	16.5	0.0	16.5	0.0	0.0	352.8	7.1	14.1	28.2	0.0	402.2
	CL-S15	Camp Andres-Lahing Lahing Road	RSR	10.2	0.0	9.4	0.0	0.8	218.7	4.4	8.7	17.5	0.0	249.4
	CL-S16	Tandu Batu-Lahing Lahing Road	RSR	11.3	0.0	11.3	0.0	0.0	241.6	4.8	9.7	19.3	0.0	275.5
	CL-S17	Seit-Kansipat-Tandu Batu Road	RSR	10.8	0.0	10.8	0.0	0.0	231.0	4.6	9.2	18.5	0.0	263.3
	CL-S18	Taglibi-Pansol Road	RSR	12.5	0.0	12.5	0.0	0.0	267.1	5.3	10.7	21.4	0.0	304.5
	CL-T1	Pahut-Swangkagang	RSR	1.7	0.0	1.7	0.0	0.0	36.0	0.7	1.4	2.9	0.0	41.1
		Sub-total		692.1	93.2	478.3	0.0	120.5	16847.9	337.0	673.9	1347.8	559.3	19765.9

Note: CL-S=Corridor link Sulu

Table 6.15 Cost Estimate for Ring Road/Bypass Development Projects

Project Type	Code	Road Name	Road Type	Road Length (Km)	Type of Works				Const Cost	Engineering Services			Land Acquisition, Compensation	Total
					New Const	Road Surface Upgrading	Rehabilitation	Reconstruction		F/S	D/D	S/V		
					(km)	(km)	(km)	(km)	(PhP Mil)	2%	4%	8%	(PhP Mil)	(PhP Mil)
e. Ring Roads/Bypass Roads Development Project	BR-L1	Marawi City Ring Road	RSR	16.7	9.7	6.9	0.0	0.0	522.6	10.5	20.9	41.8	58.4	836.3
	BR-M1	Parang East Diversion Road	RSR	11.3	11.3	0.0	0.0	0.0	434.8	8.7	17.4	34.8	67.7	563.4
	BR-M2	Parang Bypass Road (small)	RSR	2.5	2.5	0.0	0.0	0.0	94.5	1.9	3.8	7.6	14.7	122.5
	BR-M3	Pinaring-Simsiman Road	RSR	20.1	0.0	17.6	0.0	2.5	431.8	8.6	17.3	34.5	0.0	492.2
	BR-M4	Manuangan-Parang Road	RSR	17.0	17.0	0.0	0.0	0.0	631.2	12.6	25.2	50.5	102.1	821.6
	BR-B1	Isabel City Bypass Road	RSR	2.4	0.7	1.7	0.0	0.0	835.7	16.7	33.4	66.9	4.4	957.1
		Sub-total		69.9	41.2	26.2	0.0	2.5	2950.5	59.0	118.0	236.0	247.3	3793.1

Note: BR=Bypass Road

Table 6.16 Cost Estimate for Road Projects outside Bangsamoro

Project Type	Code	Road Name	Road Length (Km)	Type of Works				Construction Cost	Engineering Services			Land Acquisition, Compensation	Sub-Total
				New Const	Road Surface Upgrading	Rehabilitation	Reconstruction		F/S	D/D	S/V		
				(km)	(km)	(km)	(km)	(PhP Million)	2.00%	4.00%	8.00%	(PhP Million)	
d. Corridor Link Roads Improvement Project	CL-L2	Madalum Road	38.1	14.3	23.8	0.0	0.0	548.7	11.0	21.9	43.9	85.5	711.1
	CL-L3	Ganassi-Tubud Road	40.2	15.9	0.0	0.0	0.0	612.7	12.3	24.5	49.0	95.5	793.9
	CL-M3	Maganoy-Lebak Road	46.3	46.3	0.0	0.0	0.0	1782.2	35.6	71.3	142.6	277.7	2309.4
	CL-M5	Alip-Lumoyon Road	40.2	40.2	0.0	0.0	0.0	1547.3	30.9	61.9	123.8	241.1	2005.0
	CL-M7	Tapian-Lebak Coastal Road	3.7	3.7	0.0	0.0	0.0	142.5	2.8	5.7	11.4	22.2	184.6
		Sub-total	**168.4**	**120.3**	**23.8**	**0.0**	**0.0**	**4633.3**	**92.7**	**185.3**	**370.7**	**721.9**	**6003.9**
e. Ring Roads/Bypass	BR-M3	Pinaring-Simsiman Road	9.1	0.0	9.1	0.0	0.0	177.1	3.5	7.1	14.2	0.0	201.9
		Sub-total	**9.1**	0.0	9.1	0.0	0.0	177.1	3.5	7.1	14.2	0.0	**201.9**
		GRAND TOTAL	**177.6**	120.3	32.9	0.0	0.0	4810.4	96.2	192.4	384.8	721.9	**6205.8**

6.5.6 Project cost summary

As presented in Table 6.17, the estimated cost of the projects identified in the plan is about PHP 66.36 billion. Cost per project type is indicated in the table below. The total cost of projects inside the Bangsamoro is about PHP 52.62 billion and of those outside the Bangsamoro (road projects that terminate in the neighboring regions) is about PHP 6.22 billion. The cost estimate on FMRs that branch out from the trunk road is about PHP 13.69 billion.

Table 6.17 Road Projects Cost Summary

	Cost (PHP million)	
Project	Inside Bangsamoro	Outside Bangsamoro*
Artery roads upgrading project	8,141.0	
Missing links development project	7,016.4	
Corridor development project	372.8	
Corridor link improvment project	19,765.9	6,003.9
Ring roads/bypass roads development project	3,632.2	201.0
FMRs	13,683.73†	
Total	52,612.03	6,205.8
Grand Total (Inside + Outside Bangsamoro)	66,357.81	

*Continuation of project roads originating in Bangsamoro and beyond the Bangsamoro boundary.
†If construction engineering services are undertaken separately, estimated cost for the 884 km FMRs is about PHP 1.92 billion, bringing the total cost from PHP 13.683 billion to PHP 15.60 billion. Consequently, the grand total will be PHP 68.27 billion.

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Abbreviations, Unit of Measurement, and Currency

(Refer to Sector Report 2-1: Road Transport, pp. 1-v through 1-x.)

CHAPTER 1 PORT SYSTEM AND WATER TRAFFIC

1.1 Philippine Port Development Strategy

The Philippine Development Plan (PDP) 2011–16 was formulated by the National Economic Development Authority (NEDA) through coordination and collaboration with all the related organizations. They include all departments/agencies of the National Government, government-owned and controlled corporations (GOCC's), government financial institutions, and State Universities and Colleges (SUCs) in identifying and prioritizing key programs and projects.

As one of the specific outputs in the PDP, the Study on the Master Plan for the Strategic Development of the National Port System in the Republic of the Philippines was conducted by Department of Transportation and Communications (DOTC) supported by JICA in January 2004. The Philippine Port System Strategy was drawn up in the study as shown in Table 3.1. Strategic ports in Mindanao covering Davao, Cagayan de Oro, Zamboanga, and General Santos have been selected as the international ports out of nine ports in the Philippines to be a major window to the global market that will be developed until 2024. This means that Mindanao is considered very important in the sea transportation network especially for transportation of agricultural and marine products.

The Philippines port system strategy is summarized in Table 1.1.

1.2 Existing Ports Network in Mindanao

The existing ports network in Mindanao is shown in Figure 1.1. The ports are classified as follows:

1) Base ports, mainly the major ports operated by PPA,
2) Terminal ports with less activities operated by PPA,
3) Secondary ports,
4) Private ports, and
5) Fishing ports.

Administratively, PPA is mandated to develop commercial ports all over the Philippines as well to regulate private ports and control port tariffs. Other small municipal ports are operated by LGU's.

1.3 Cargo, Passenger Traffic and Ship Calls of Major Ports in Mindanao

There are four major ports around the Bangsamoro region: Davao, General Santos, Zamboanga, and Cagayan de Oro. Figures 1.2, 1.3, and 1.4 show the historical change in cargo throughput, passenger traffic, and ship calls for the four major ports, respectively.

The average annual growth rate (AAGR) of cargo throughput of the Davao port is 5.7%, which is the most remarkable compared to 2.1% to 5.0% for the other major ports as shown in Figure 1.2.

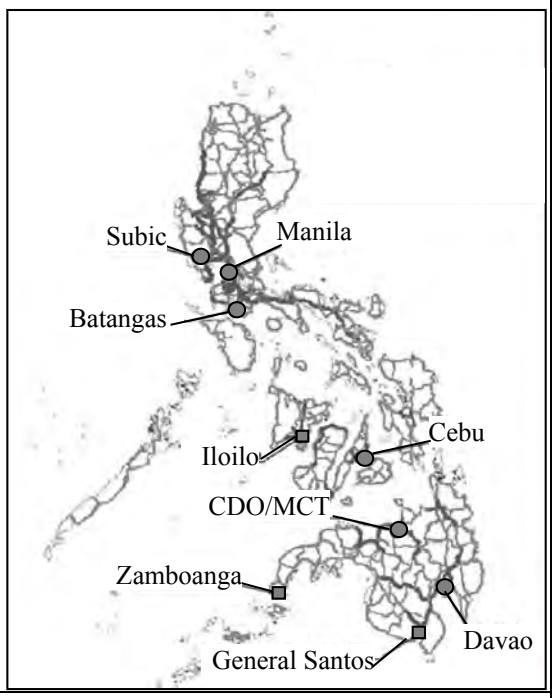
The AAGR for passenger traffic of Zamboanga port decrease by 3.9%. The AAGR for Cagayan de Oro, General Santos and Davao are -1.8%, -14.4% and -18.5% respectively as shown in Figure 1.3. The decrease in the number of passengers is due to the conversion from sea to air transportation by low cost carriers (LCC).

Number of ship calls in Zamboanga decreased drastically while cargo throughput slightly increased. This means that ship size calling at the Zamboanga port has become larger progressively. For the other three ports, number of ship calls still maintain the similar levels, but cargo throughput increased as ship size calling at these ports is also increasing. These tendencies are common in the Philippines and worldwide as well.

Table 1.1 Philippine Port System Strategy

<table>
<tr><td>Mission</td><td colspan="2">1. Establishment of a fast, economical, reliable and safe maritime transport network accelerating the development of national economy
2. Formation of maritime transport bases to support regional society</td></tr>
<tr><td rowspan="5">Planning Strategies</td><td colspan="2">Establishment of a nationwide port development plan coordinated with the plans of various port management public corporations</td></tr>
<tr><td colspan="2">Port classification

LEGEND
International Gateway Port
Principal International Trade Port
2 Lane Nat'l Roads
4 Lane Nat'l Roads

 
</td></tr>
<tr><td colspan="2">Principles for planning</td></tr>
<tr><td>1) Establishment of nationwide maritime transport</td><td>1) Concentrated Development of Specific International Container Gateway Bases
2) Improvement of Domestic Container Transport Efficiency
3) Development of Facilities for Break Bulk and Bulk Cargo
4) Port Planning at the Greater Capital Region
5) Formation of Major Corridors</td></tr>
<tr><td>2) Formation of maritime transport bases to support regional society</td><td>1) Enhancing the Mobility of People and Goods in the Region
2) Securing Transportation Bases to Support Daily Life in Remote Islands
3) Supporting Social Reforms</td></tr>
<tr><td>Strategic development port</td><td>Investment in long term development plan (2004–2024); about 150 billion pesos
Investment in short term development plan (2004–2009); about 41 billion pesos</td></tr>
<tr><td>Management and Operation</td><td colspan="2">Modification of port administration as well as improvement of port management/operation
- Establishment of National Plan for Port Development (NPPD) Council
- Increasing cargo handling efficiency
- Appropriate port tariff setting</td></tr>
<tr><td>Investment and Financing</td><td colspan="2">Investment scheme and proper financial resource allocation for feasible port development
- Proposed financial policies for public port development
- Acceleration of private sector participation to port projects</td></tr>
</table>

Source: The Study on the Master Plan for the Strategic Development of the National Port System in the Republic of the Philippines.

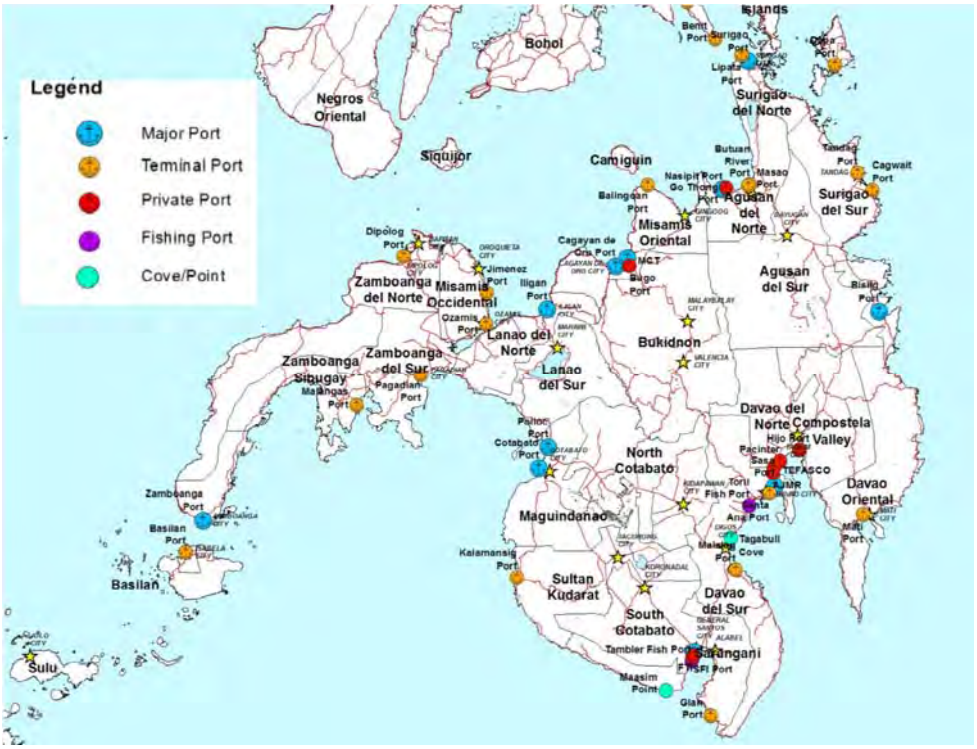


Figure 1.1 Existing Ports in Mindanao

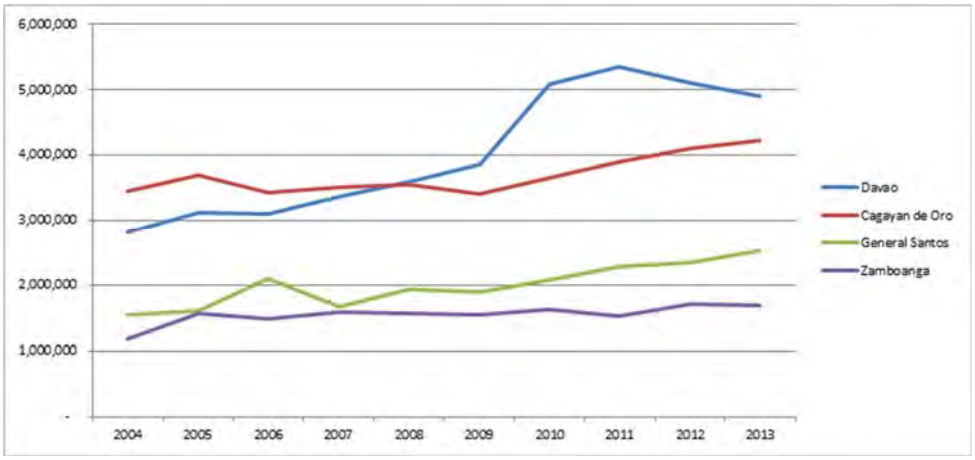


Figure 1.2 Cargo Throughput for Davao, Cagayan de Oro, General Santos, and Zamboanga

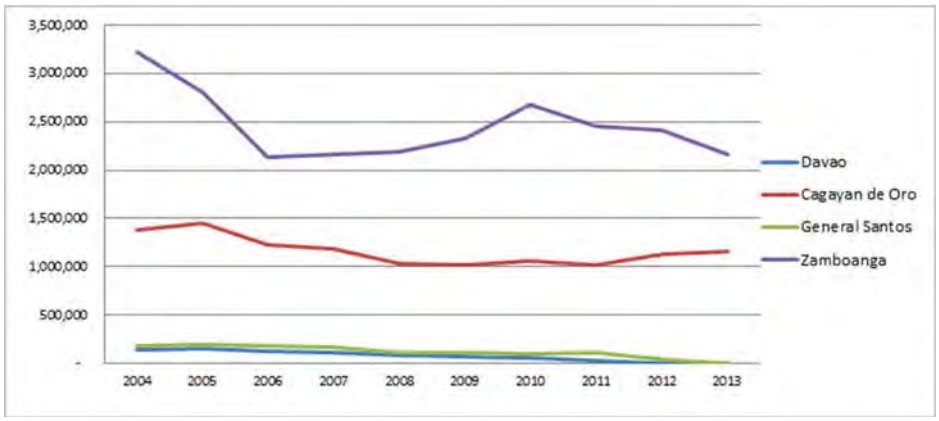


Figure 1.3 Passenger Traffic for Davao, Cagayan de Oro, General Santos, and Zamboanga

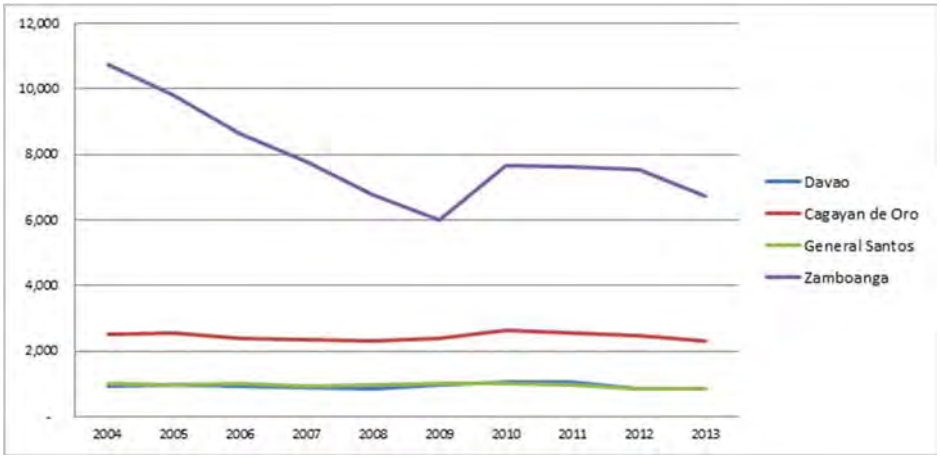


Figure 1.4 Ship Calls for Davao, Cagayan de Oro, General Santos, and Zamboanga

CHAPTER 2 EXISTING PORTS NETWORK IN BANGSAMORO

2.1 Overview

The port network in the Bangsamoro includes 13 major ports under the Regional Economic Zone Authority (REZA), 11 Regional Ports Management Authority (RPMA) and the Philippine Ports Authority (PPA) as shown Figure 2.1 (Final Report; Survey on Mindanao Logistics Infrastructure Network, Volume 1 Main Report, January 2014, Applied Planning and Infrastructure, Inc.).

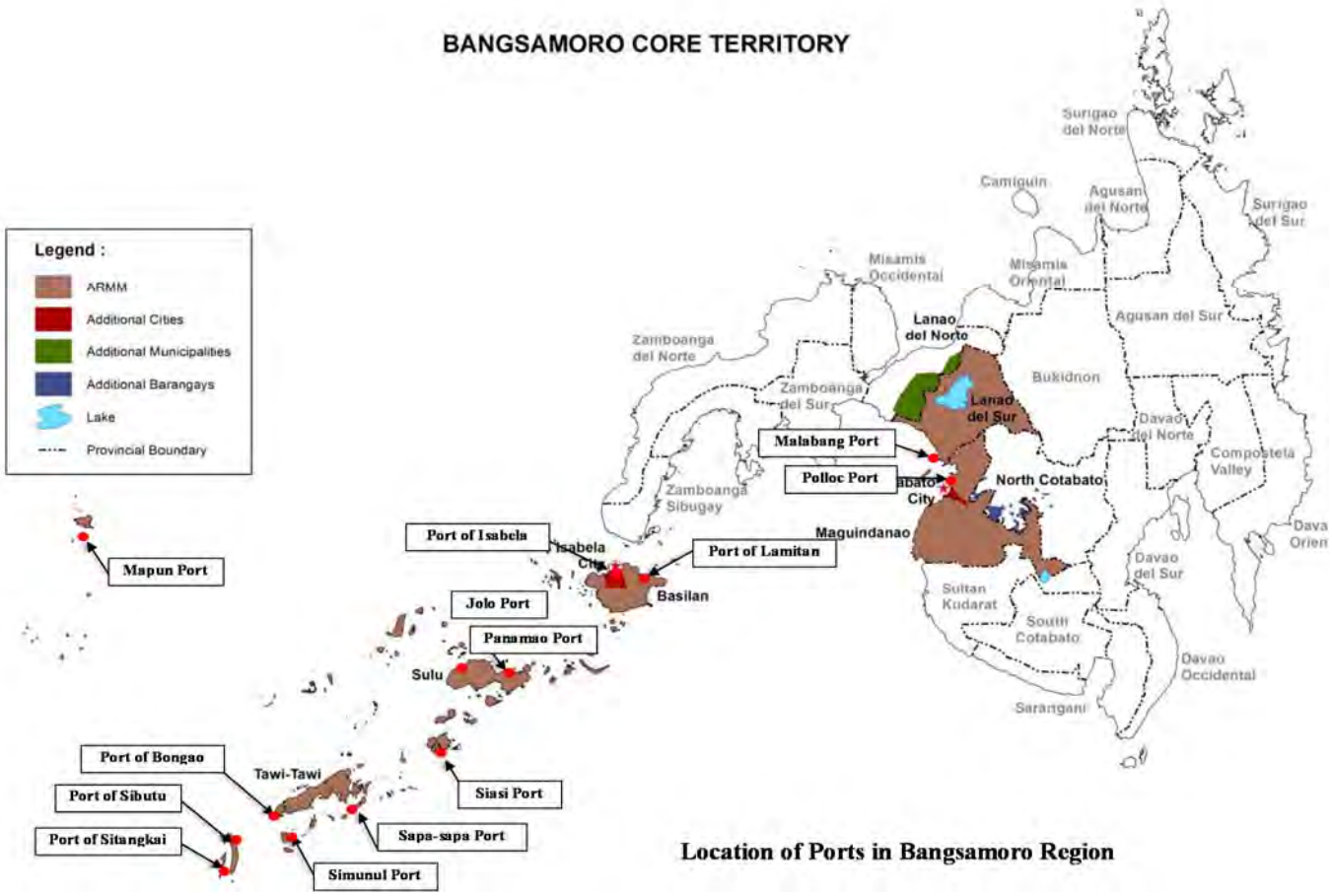


Figure 2.1 Existing Ports in Bangsamoro

2.2 Cargo, Passenger Traffic and Ship Calls at Major Ports in Bangsamoro

The historical change of cargo throughput, passenger traffic and ship calls for the major ports are shown in Figures 2.2 through 2.4. Cargo throughput for Isabela and Cotabato gradually decreased from 2004 to 2013, but that of Bongao and Lamitan increased as indicated Figure 2.2. The largest cargo handling volume in 2013 in the Bangsamoro is at the Polloc port. There are no data available for the Polloc port from 2006 to 2012, but the data from 1995 to 2003 are available as attached in Appendix A. According to this record, the maximum cargo throughput of the Polloc port was 742,923 ton in 1992.

The passenger traffic volume has not basically changed, except Isabela and Lamitan, as shown Figure 2.3. Considering the population of Basilan is around 300,000, passenger traffic of 1.2 million is quite large. This reflects active economic transactions between Isabela and Zamboanga as well as students commuting from Basilan to Zamboanga.

The number of ship calls in Isabela decreased once but drastically increased in 2010 as shown in Figure 2.4. Ship calls for the other ports gradually decreased or unchanged, the cargo volume of the other ports also unchanged. This implies that economic activities around these ports were stagnant during

this period. Cargo throughput of Bongao rapidly increased more than the number of ship calls, implying the ship size has become larger recently.

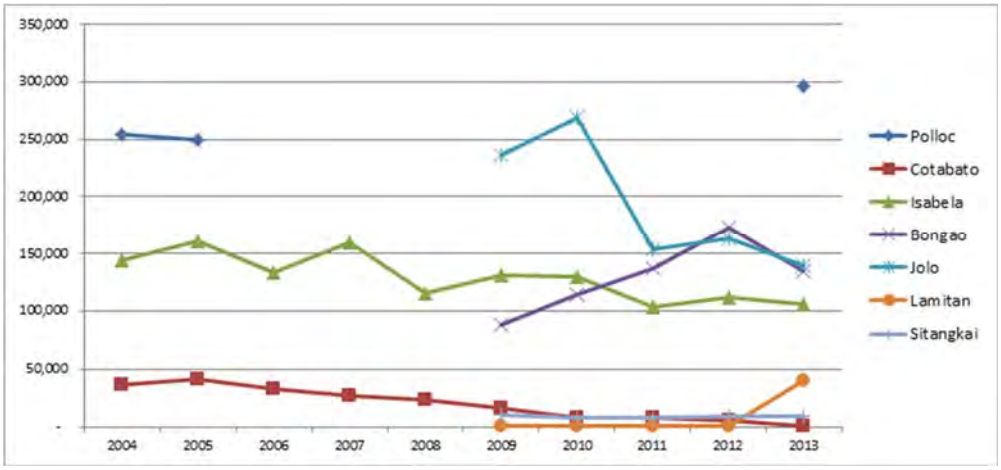


Figure 2.2 Cargo Throughput for Major Ports in Bangsamoro

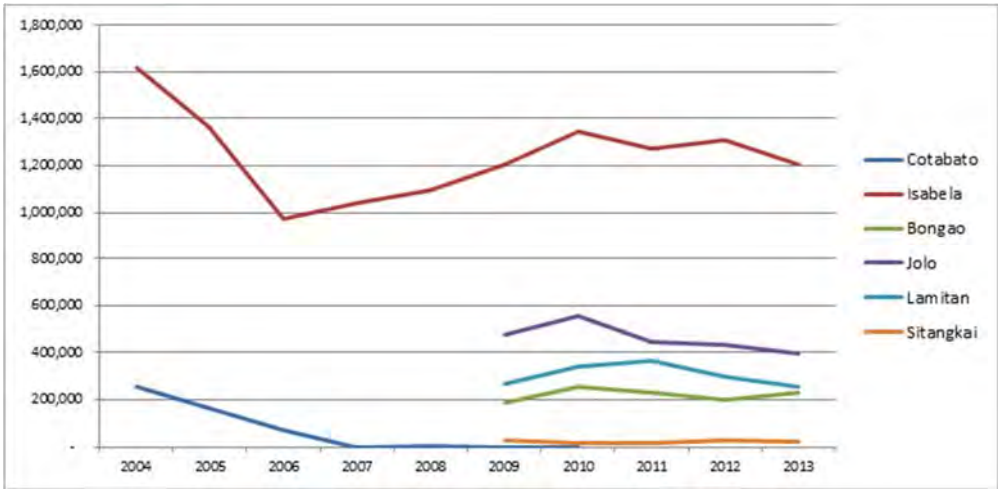


Figure 2.3 Passenger Traffic for Major Port in Bangsamoro

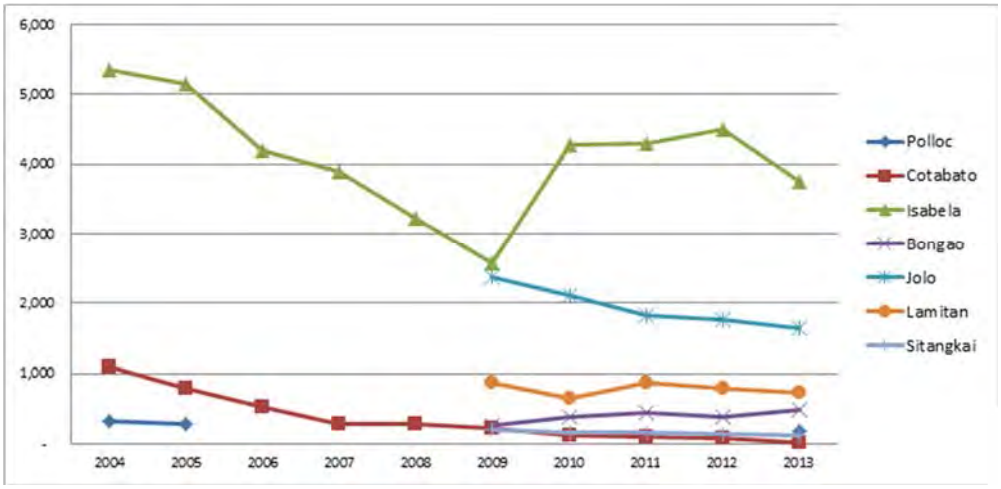


Figure 2.4 Ship Calls for Major Port in Bangsamoro

2.3 Characteristics of Major Ports in Bangsamoro

Basic data and information collected for the ports in the Bangsamoro region are summarized in Table 2.1. All major ports are managed by REZA, RPMA, and PPA except small ports managed by LGUs. The Polloc port has the largest volume handled among the ports in Bangsamoro, about 300,000 ton per annum followed by Bongao and Isabela. Isabela has the largest volume of passenger traffic and the main origin and destination are Zamboanga, followed by Jolo and Bongao. The Polloc port has the most modern and developed port facilities among all ports including berth, apron, backup area building facilities, port access, etc. There are designated Freeport and Ecozone located behind the port.

All the ports are operated by private operators including cargo handlers. Privatization of operations and management of the port facilities has been promoted in the world even for small ports in order to establish a more efficient operation and keep competitive power among other ports. Advantages of privatization include efficiency of the system operation, responding to demand promptly and in an innovative manner under the absolute criterion of profit making.

There are feasibility studies (FSs) for the Polloc, Bongao, Jolo, Sitangkai, and Isabela ports development. These ports are considered of high potential to be developed by PPA, ADB, and ARMM. These FSs will be discussed later. According to the available information, cargoes handled at these ports are copra, banana, rice, sugar, flour of agricultural product, fresh/dried fish, shell and seaweeds of marine product, general cargo, bottled cargo of consumable materials and cement, plywood, log, and equipment of construction materials.

Table 2.1 Summery of Characteristics of Ports in Bangsamoro

Name of Port	Body/ Owner	Cargo throughput	Passenger Traffic	Ship call	Berthing Facility Length and depth	Other facility	Backup area	Building Facility	Operator	Operating Shipping Company	Main Commodity
Polloc	REZA	296,354t in 2013	0	181 in 2013	Marginal wharf 400m (-10.5m), Lighter dock 67m(-3m)	Anchorage, area for private warehouse 75,645m2, parking area 23,364m2	Open storage area 42,940m2	Transit shed 2x 5,980m2, PTB 600 persons, Amenity Bldg. 760m2, Barter trade bldg. 900m2	Lamsan (PTC) till 2022	Lorenzo shipping corp., Philippine Span Asia Carrier Corp	OUT: Corn 95,289t, River sand 63,076t, Plywood 5,622t, Rolling cargo 2,142t, IN: Iron steel 52,243t, Corn 44,832t, Rice 16,578t
Bongao	RPMA	125,331t in 2013	223,522 in 2013	392 in 2012	Main wharf 139x9m(-6 to 7m), RORO 24x9m(-8m), Fast craft 21x9m(-4.5 to 5m)	Causeway20x10m, Channel 680m(-15.3 to 18m), B. Dolphin2set	None	MPTB35x12m	3K Corporation	Aleson Shipping Lines, Ever Shipping Lines	OUT: Seaweeds, Copra, Live fish/Octopus, Dried fish, Sea shells
Jolo	RPMA	157,027t in 2013	459,826 in 2013	1,746 in 2013	Total berth length 585m	Coast buard, BFAR, SULU Barter Trade, Ice plant	1.0ha	ADM, PTB, Ticketing office, Gate house	Piyagsulutan, INC.	Katrafar shipping lines, Aleson shipping lines, Ebenezer Shipping Lines	IN: Cement, Salt, Flour, Sugar, Fresh eggs, Dress chicken, Lard/Margarine OUT: Copra, Seaweeds, Abaca, Charcoal, Dried fish, Fresh fish
Siasi	RPMA	276 May 9 to31, 2013	4,064 May 9 to31, 2013	20 May 9 to31, 2013	Main wharf 65m, RoRo ramp 15x10m	Gate house	None	Terminal Management office	SIASI Arrastre and Stevedoring Services	Magnolia Shipping Lines, Ever Shipping Lines	IN: Cement, Flour, Sugar OUT: Copra, Dried fish
Sitangkai	RPMA	10,526t in 2013	26,466 in 2013	150 in 2013	Main wharf 60m (3.02m depth), Maneuvering area (6.03m)	Rock causeway	60mx36m	Terminal Management office, CHO office, PCG Detachment, Warehouse	Anakmoslem Multi-Purpose Cooperative	Aleson Shipping Lines	OUT: Seaweeds, Copra, Dried fish, Sea shells
Isabela	PPA	106,195t in 2013	1,203,187 in 2013	3,745 in 2013	209x9m(-5m) in 2000, Extension to 300m in 2014	Seawall 275, Rock bulkhead 235m	Open storage area 1,242m2	Passenger terminal 91m2, Temporary storage 12m2, ADM 80m2	Basilan Dockhandlers Corp.	Aleson Shipping Lines	Out; Copra, General cargo, In; Bottled cargo, Petroleum product, Palay/Rice, Cement
Lamitan	RPMA	39,965t in 2013	255,908 in 2013	740 in 2013	Total berth length 82m	Causeway 50m	None	Passenger terminal bldg.	Lamitan Dockholder, INC.		Out: Copra, rubber, fish, banana In: rice, sugar, fish, equipment
Mapun	RPMA	8,664t in 2013	4,857 in 2013	246 in 2013	Pier (30m x 11.5m) Piles for 30m extension are installed at site	None	None	None	Tripler Muti-Purpose Cooperative	Charter only	OUT: Copra, Dried fish

2.4 Other Small Ports in Bangsamoro

In addition to the major ports in Bangsamoro, there are small ports under LGUs according to the information from RPMA as listed below. There are no available data and information such as cargo volume, passenger traffic, size of port facility, ancillary facilities, etc. for the region.

A. Sulu
   a. Banguingui, Municipality of Tongkil
   b. Pata, Municipality of Pata
   c. Maimbung, Municipality of Maimbung
   d. Poblacion, Poblacion Parang, Parang
   e. Tando Bato Port, Tando Bato, lunk
   f. Pangutaran
   g. Panamao Port, Brgy. Su'uh
B. Tawi-Tawi
   a. Port in Balimbing, Panglima Sugala
   b. Port in Sapa-sapa, Poblacion
   c. Chinese Pier, Municipality of Bongao
   d. Ubol Simunul
   e. Tubig Indangan
   f. Nusa Simunul
   g. Languyan
C. Basilan
   a. Sub-Port of Maluso, Municipality of Maluso
D. Malaban
   a. Sub-Port of Malabang, Municipality of Malabang

2.5 Existing Port Facilities of Each Port

2.5.1 Polloc port

(1) General information of Polloc port

Basic information on facilities at the Polloc port is summarized below.

Location:	Lat. 07° 21' 22", long. 124' 113'E
Port limits:	Entrance to Bay
Navigational approach:	Mariga Bato Point
Entrance channel:	Parang Channel
Turning basin:	Polloc Anchorage
Description:	RC structure, general purpose marginal wharf with two lighter docks on both sides, handling conventional and containerized cargo
Area:	129 ha
Pilotage:	Compulsory pilotage for all vessels 100 GRT and above
Total berth length	
a. Marginal wharf:	400 LM
b. Lighter dock:	67 LM
Draft Limitation	
a. Main wharf:	Depth 10.5 m
b. Lighter dock:	Depth 3.0 m
c. Anchorage:	No draft limitation
d. Transit shed 01:	5,980 m^2
e. Transit shed 02:	5,980 m^2
Total backup area	
a. Open storage:	42,940 m^2
b. Private warehousing:	75,645 m^2

c. Parking area: 23,364 m^2

Engineering/navigational aids

a. Beacon light: 1
b. Service roads: 127, 836 m^2
c. Buoys: 1 pilot station
d. Weighbridge: 52 tons
e. Passenger terminal bldg.: Capacity 600 passengers
f. Amenity bldg.: 760 m^2
g. Public restrooms: 48 m^2 x 2
h. Water resource facility: Capacity 1,060 m^3
i. Barter trade center bldg.: 900 m^2

(2) Advantages for natural and physical environmental

The Polloc port has high potential as a major port with respect to construction, operation and management, and it is considered one of the best ports in the Philippine considering the following.

Wind

According to the wind rose analysis for South Cotabato taken from the daily data for the period 1971–2000, 43.5% of the time the wind direction comes from the south with 43.4% ranging from 1 to 4 m per second (mps), 0.1% in the range of 5–8, and 0.0% greater than 8 mps. The prevailing wind direction throughout the year is south followed by north direction with 99.2% ranging from 1 to 4 mps.

Wave

No wave behavior data from direct measurement is available in South Cotabato, but according to the available information no significant wave has occurred to prevent the port operation throughout the year. It should be considered that the port and marine structure is given adequate protection from destructive waves related to cyclonic activities. The Polloc port is protected topographically from the southwest monsoon wave and sheltered from the west wave by the Bongo Island facing the port area.

Current

The current outside the Molo Gulf is 0.01–0.02 knot based on PAGASA. The tidal current in front of the Polloc harbor is north to south during flood tide and south to north during ebb tide based on the available chart. It is expected that velocity in front of the Polloc harbor is small in view of the local topography.

Water depth of the approach to the port

Water depth around the Polloc port is suitable for ship anchorage and maneuvering for docking to the berth. Water depth can reach 4,000 m at 80 km to southwest from the Polloc port, and 400 m within 7 km near the port and the depth of Polloc harbor in front of the berth is 40 m.

Accessibility to the port

The Polloc port is accessible by land from Cotabato City through a 13 km modern four lanes (two lanes partially) concrete pavement.

Siltation issues

There are no siltation issues as no major river exist around the port and no littoral drift from outside of the Polloc harbor.

(3) Current conditions of the port facilities

Berth structure

The main berth structure is generally fine despite more than three decades of service operations after its completion in 1977 except damage/deterioration. However, the following are found by inspection on the structure and facilities.

a. All upper portions of the steel pipes supporting concrete deck have been corroded and some of concrete cover is peeled off and re-bars are corroded (Photos 1–7). It is very important to repair pile heads immediately to protect them from the re-bar corrosion.


Photo 1: Corroded upper portions of piles


Photo 2: Exposed and corroded re-bars

b. All rubber fenders are either broken or totally damaged.


Photo 3: Totally damaged


Photo 4: Broken fender

c. Many bollards are totally damaged but several new bollards are installed on the wharf


Photo 5: Damaged bollard


Photo 6: New bollard

d. Concrete cover on the concrete beam of the deck slab is peeled off and re-bar is corroded.


Photo 7: Corroded re-bar

Even with proper design, reinforced concrete structures in the coastal zone normally undergo a process of deterioration as illustrated in Figure 2.5. At the initial stage, re-bars in concrete are statically corroded. The expansion of corrosion causes small cracks of concrete and some rust gradually appears

on the surface at the next stage. Width of concrete cracks is widening and rust on the concrete surface is widely expanded on the surface at the third stage. At the final deterioration stage, stripping of concrete cover is found at many locations to expose re-bars, which are corroded. The deterioration/damage of pile heads and concrete beams investigated above are assessed as the final deterioration stage.

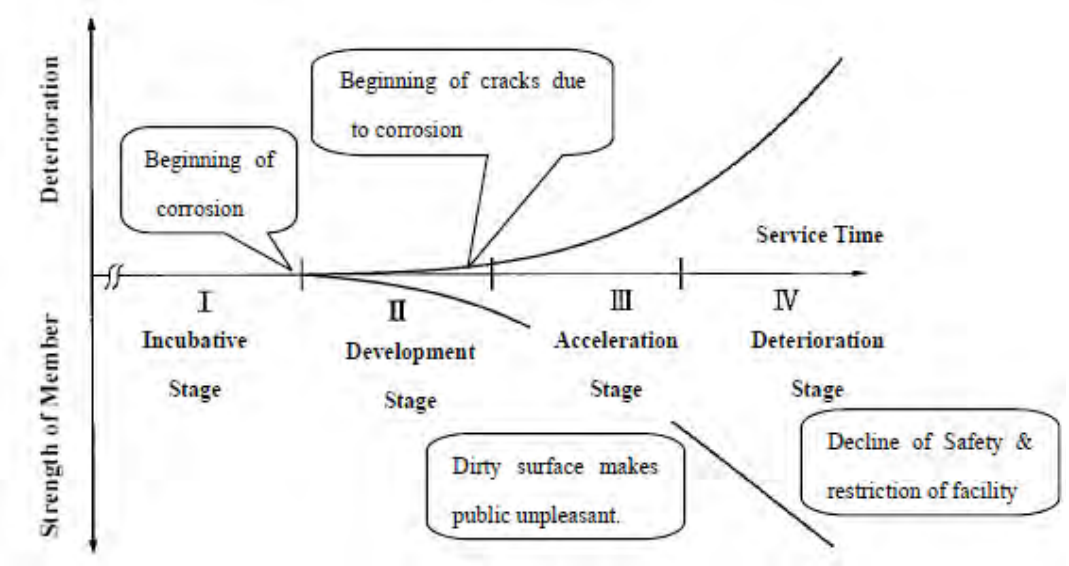


Figure 2.5 Process of Concrete Deterioration

Water depth in front to the berth

Based on the hydrographic survey in front of the wharf, average water depth below LWL is -10.7 m, which is more than design depth of -10.5 m but the shallowest point is -8.5 m and about 10% of survey points are shallower than -9.5 m. The shallow area is located at the north and south ends of the wharf. Although the maximum draft of present calling vessel of full container of 1,500 DWT is 5.0 m, water depth of -10.5 m shall be maintained as the original design depth in order to accommodate larger vessels as soon as possible.

Two transit sheds and other buildings

Floor concrete of transit shed has been repaired due to the crack and loose concrete at many locations (Photo 8). According to the inspection, concrete cover of re-bars is too small and less than the design (Photo 9).

Photo 8: Removed concrete surface

Photo 9: Re-bar arrangement

Water supply

There exists a water supply system, which takes water 3.9 km from the port. The water pipelines are damaged and deteriorated. The deep well and the right of way along the regional road are very narrow (Photos 10 and 11).


Photo 10: Existing deep well


Photo 11: Narrow right of way

(4) Existing port layout plan

The existing port layout plan is shown in Figure 2.6. Container cargoes are loaded/unloaded on the apron and transported to the container stack yard behind two transit sheds by a trailer (Photos 12–13). After several dwelling days at the container yard, the containers are loaded/unloaded on trucks by the land cranes (Photo 14). River sand from the Simuay River is stockpiled at the back yard temporarily and is loaded to a bulk barge (Photo 15) and transported to the Sulu archipelago for the construction materials.


Photo 12: Container handling


Photo 13: General cargo handling


Photo 14: Bulk cargo handling

Photo 15: Liquid bulk handling

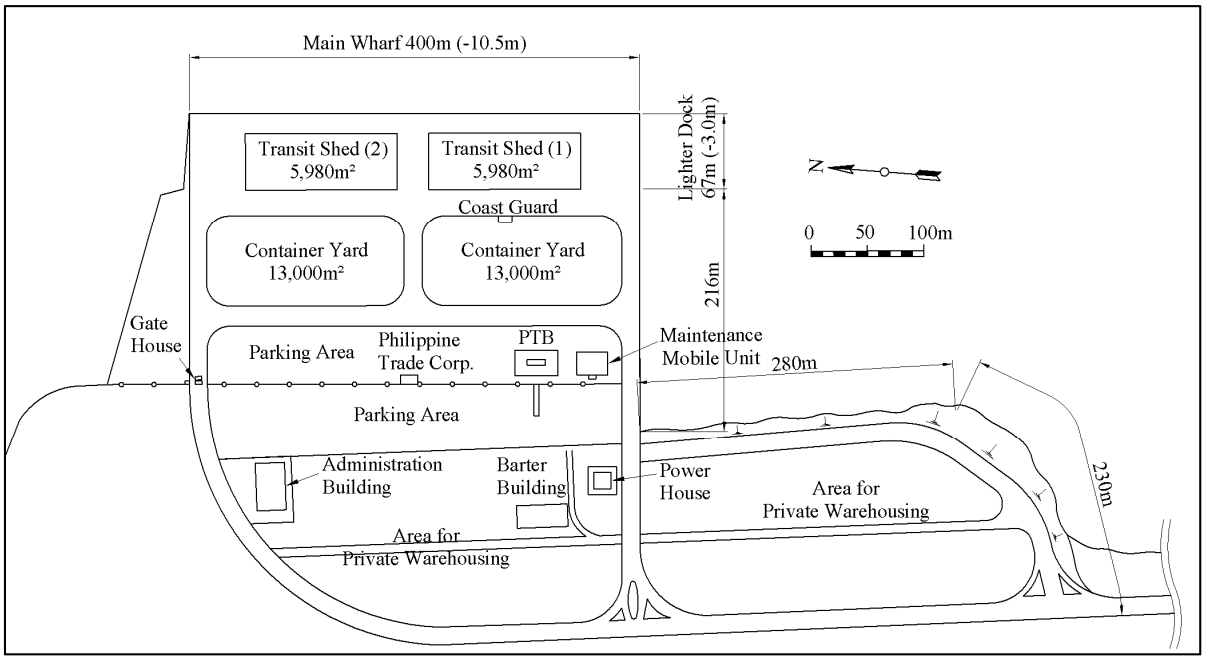


Figure 2.6 General Layout Plan of Existing Polloc Port

2.5.2 Bongao, Jolo, Sitangkai, and Isabela ports

(1) Overview

A feasibility study on the Bongao, Jolo, and Sitangkai ports was conducted in the Intermodal Transport Development Project (ITDP) supported by Asian Development Bank (ADB) in September 2006. The Bongao and Jolo ports are expected to become important sub-hub ports connecting numerous smaller nearby island ports to other ports in the Sulu Archipelago as well as the regional hub of Zamboanga and west Mindanao. For this purpose, improvement and expansion of port facilities are planned in order to increase the port capacity. The Sitangkai port can function as a maritime linkage between remote islands and the sub-hub for Zamboanga and to BIMA-EAGA as well by improvement of the port facilities.

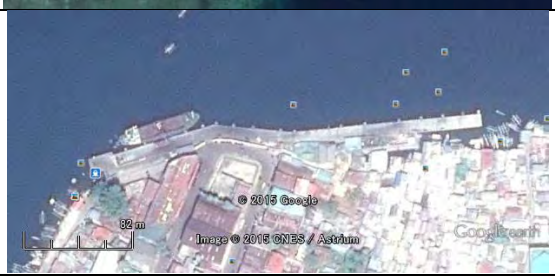
The handling volume at the port of Isabela decreased in 2000 due to the limited work area, low operating hours, and limited back-up area in the port. In view of this, PPA conducted the FS of transferring the existing port to an alternative site, about 1 km from the town, where a modern seaport would be established for economic growth of the entire Basilan Island.

(2) Present port facilities

Present port layout, magnitude of the port facilities, cargo and passenger traffic are summarized in Table 2.2. The Jolo port is the largest port handling largest cargo traffic among the four ports, but the Isabela port handles the largest passenger traffic volume at present.

Table 2.2 General Layout of Bongao, Jolo, Sitangkai, and Isabela Ports

	Port Layout	Major Port Facilities	Traffic Volume
Bongao		- Main wharf 139 m - RORO 24 m - Fast craft 21 m - MPTB 35 x 12 m	Cargo: 125,331t in 2013 Passenger: 223,522 in 2013

	Port Layout	Major Port Facilities	Traffic Volume
Jolo		- Total berth length 585 m - A part of wharf (left) has been improved based on FS	Cargo: 157,027t in 2013 Passenger: 459,826 in 2013
Sitangkai		- Main wharf 60 m	Cargo: 10,526t in 2013 Passenger: 26,446 in 2013
Isabela		- General cargo berth length 280 m - RORO berth 20 x 12 m	Cargo: 106,195t in 2013 Passenger: 1,203,187 in 2013

(3) Cargo/passenger traffic and shipcall forecast

Cargo and passenger traffic and shipcalls at the Bongao, Jolo, Sitagkai, and Isabela ports for 2020, 2030, and 2036 was estimated by ADB in 2006 and by PPA in 2000 as summarized in Table 2.3. The cargo throughput at both Bongao and Jolo in 2013 was 140,000 ton/year, but the AAGR of Bongao at 5.1% is higher than that of Jolo which is 3.2% only. For passenger traffic, the AAGRs of Bongao and Jolo are 7.2% and 6.2%, respectively. Based on this, the Bongao port should be given slightly more priority than the Jolo port for development.

Table 2.3 Results of Cargo and Passenger Traffic and Shipcall Forecast for Bongao, Jolo, Sitangkai, and Isabela Ports

Port		2020	2030	2036
Bongao	Cargo	283,912	377,256	447,470
	Passenger	776,554	1,032,034	1,224,073
	Shipcall	4,788	6,362	7,546
Jolo	Cargo	192,995	253,055	297,660
	Passenger	1,078,922	1,426,169	1,677,703
	Shipcall	3,509	4,601	5,412
Sitangkai	Cargo	59,934	96,790	129,217
	Passenger	180,260	239,564	284,142
	Shipcall	856	1,383	1,846
Isabela	Cargo	435,800	530,000	
	Passenger	1,931,000	2,212,000	
	Shipcall	8,490	9,129	

Note: Values of 2020 and 2030 for Isabel are those of 2017 and 2022, respectively.

(4) Proposed development

The proposed development works for the Bongao, Jolo and Sitanagkai ports are shown in Table 2.4. The proposed Isabela port is a totally new port recommended at 1 km from the town proper.

Table 2.4 Proposed Development According to FS

Scope of work for Bongao	Major SOW of Jolo	Major SOW of Sitangkai
Expansion of Back-up area Rehabilitation of existing pier Reclamation for motor launch berth PTB, Cargo shed, etc. Utilities (Water, Power, etc.)	Banca landing quay Motor launch berth Fast craft berth Conventional berth PTB, cargo shed, etc. Utilities (water, electricity, etc.)	Expansion of wharf PTB, ADM, etc. Utilities (water, electricity, etc.)

(5) Economic analysis

According to existing tariff structure, the proposed development of the ports is not feasible. Therefore, the revenue sources such as dockage, wharfage, arrastre, stevedoring, etc. shall be increased to cover operation and maintenance cost as well as construction cost as well.

	Bongao	Jolo	Sitangkai	Isabela
Total cost for development (PHP)	428,621,000	673,720,000	179,292,000	220,000,000
Base case of EIRR (%)	30.7	19.9	32.0	41.5

(6) Master plan of Isabela and Jolo ports

The master plan of Isabela according to the FS is shown in Figure 2.7. The master plan includes 1st Phase development and 2nd Phase development for the target year of 2008 and 2022, respectively. The port facilities for the general cargo and passenger vessels in one area and fast craft vessels in the other area are separately provided. The berthing for the fast craft vessels are exclusively for their use. The close storage facilities or transit sheds shall be provided behind the wharf with a wide road. A passenger terminal building and parking area for vehicles are provided behind the fast craft berth.

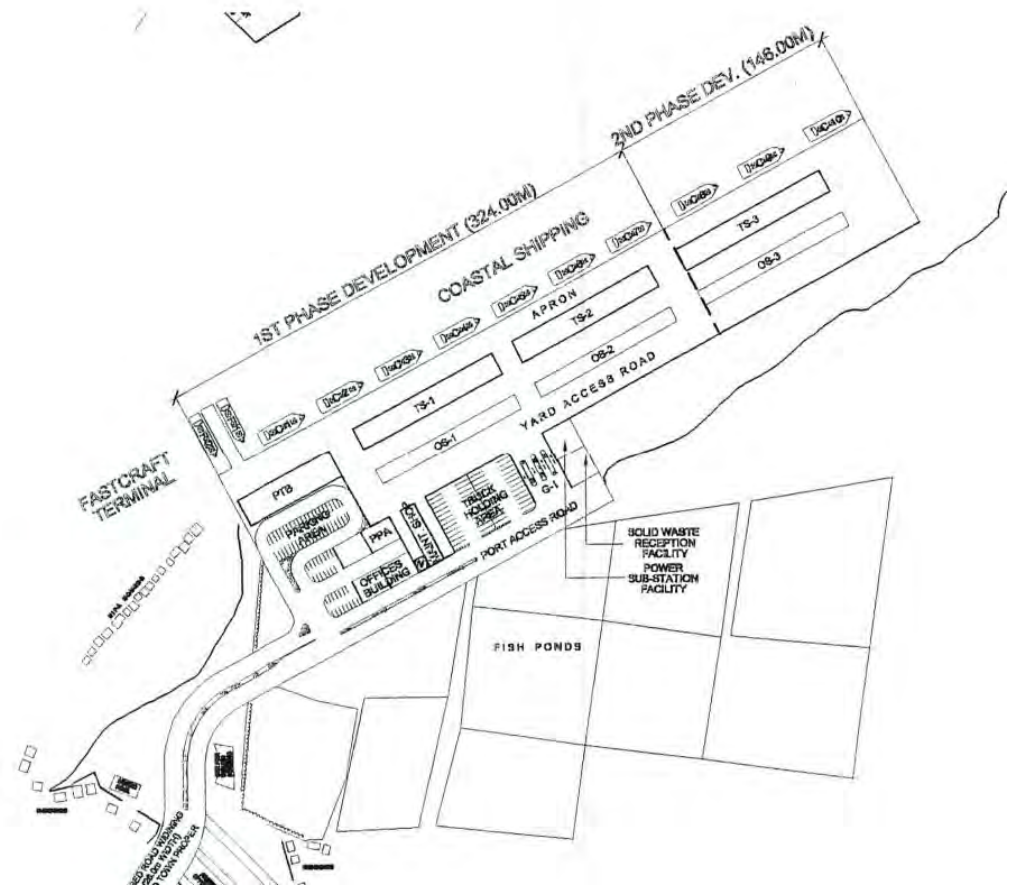


Figure 2.7 Master Plan of New Isabela Port

Besides the ADB FS described above, PPA prepared a master plan of the Jolo port as indicated in Figure 2.8. The berths are allocated to motorized bancas, fast craft, RORO, conventional vessels, and liners. Motorized banca berths are provided for transport to/from the surrounding islands, and other berths for cargo and passenger transport to/from the surrounding islands and the sub-hub ports of Bangsamoro.

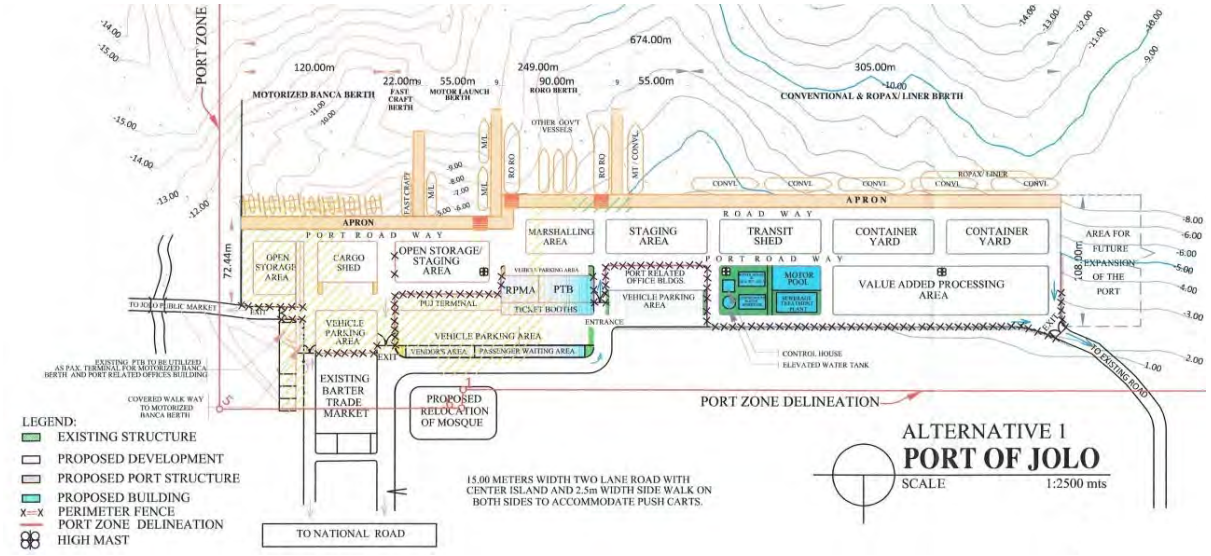


Figure 2.8 Master Plan of Jolo Port

(7) Cargo handling on the berths at Jolo port

Of the ports of Bongao, Jolo, Isabela, and Sitangkai, the Jolo port is the busiest port at present. At the Jolo port, all cargoes are temporary stacked on the berth prior to loading onto ships. The narrow berths are occupied by the cargoes, and there is no space for port vehicles to pass. This causes inefficient performance and low productivity in cargo handling at the Jolo port.

Appendix A: Historical Data on Cargo and Passenger Traffic at Existing Polloc Port

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Decrease	GR (%)
1. Total Cargo Throughput (MT)	742,923	504,840	525,115	704,633	559,981	606,043	570,875	414,789	347,000	452,370	322,105	361,505	284,486	249,788	454,845	2.05
a. Domestic	712,610	481,035	484,733	552,613	459,679	496,567	471,622	340,540	284,887	371,396	264,448	296,795	233,564	205,076	347,527	1.35
Inbound	274,418	180,714	198,934	243,401	206,195	222,424	250,834	152,897	127,914	166,757	118,737	133,261	104,870	92,079	151,322	2.26
Breakbulk	19,840	39,502	33,549	50,997	89,805	97,400	109,364	66,657	55,770	72,706	51,769	58,102	45,723	40,146	10,851	3.94
Bulk	254,578	53,742	63,279	79,299	0	0	0	0	0	0	0	0	0	0	79,299	
Containerized	0	87,470	102,106	113,105	116,390	125,024	141,470	86,240	72,144	94,051	66,968	75,159	59,147	51,933	61,172	4.37
Outbound	438,192	300,321	285,799	309,212	253,484	274,143	220,788	187,643	156,973	204,639	145,711	163,534	128,694	112,997	196,205	1.08
Breakbulk	313,983	123,904	111,525	108,855	95,418	103,078	83,016	70,554	59,022	76,944	54,787	61,489	48,389	42,487	66,368	0.67
Bulk	117,666	10,665	6,493	17,016	0	0	0	0	0	0	0	0	0	0	17,016	
Containerized	6,543	165,752	167,781	183,341	158,066	171,065	137,772	117,089	97,951	127,695	90,924	102,045	80,305	70,510	112,821	6.75
b. Foreign	30,313	23,805	40,382	152,020	100,302	109,476	99,253	74,249	62,113	80,974	57,656	64,710	50,923	44,712	107,308	5.14
Import	26,396	10,151	30,490	120,694	76,443	82,659	75,631	56,578	47,330	61,702	43,934	49,309	38,803	34,071	86,623	5.29
Breakbulk	22,479	10,151	30,490	120,694	76,443	82,659	75,631	56,578	47,330	61,702	43,934	49,309	38,803	34,071	86,623	5.11
Bulk	3,917	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Containerized	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Export	3,917	13,654	9,892	31,326	23,859	26,817	23,622	17,671	14,783	19,272	13,722	15,401	12,120	10,641	20,685	4.64
Breakbulk	3,917	13,654	9,892	31,326	23,859	26,817	23,622	17,671	14,783	19,272	13,722	15,401	12,120	10,641	20,685	4.64
Bulk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Containerized	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
c. Transit cargo	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Domestic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Inward	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Outward	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Foreign	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Import	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Export	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
d. Foreign (transshipment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
2. Passenger Traffic (n)	76,728	124,526	149,196	159,501	299,492	300,593	--	--	--	--	--	--	--	--	159,501	1.62
Disembarking	39,981	58,837	74,297	77,212	140,659	141,279	0	0	0	0	0	0	0	0	77,212	1.53
Embarking	36,747	65,689	74,899	82,289	158,833	159,314	0	0	0	0	0	0	0	0	82,289	1.61

CHAPTER 3 DEMAND FORECAST FOR BANGSAMORO PORTS

3.1 Historical Growth of Traffic at Polloc Port

As presented in Table 3.1, the growth rate of the cargo traffic at the Polloc port keep on declining at any given period. The latest data recorded were for 2005. From that period onward, no data have been recorded. Since no major improvement has been made to the port during the recent years, the declining number of -6.3% per year was applied to estimate the 2014 and 2015 cargo traffic.

Table 3.1 Growth Rate of Traffic at Polloc Port

Particulars	AAGR (1992–1997)	AAGR (1992–1999)	AAGR (1992–2005)	AAGR (2000–2005)
Cargo and Passenger Traffic				
1. Total Cargo Throughput	-3.99%	-7.99%	-7.49%	-6.36%
a. Domestic	-6.97%	-10.01%	-8.51%	-6.36%
Inbound	-4.11%	-8.02%	-7.50%	-6.36%
Breakbulk	37.47%	18.90%	5.16%	-6.36%
Bulk				
Containerized				-6.36%
Outbound	-8.95%	-11.41%	-9.23%	-6.36%
Breakbulk	-19.97%	-19.21%	-13.31%	-6.36%
Bulk	-100.00%	-100.00%	-100.00%	
Containerized	92.08%	51.00%	18.51%	-6.36%
b. Foreign	29.28%	13.65%	2.82%	-6.36%
Import	25.65%	11.51%	1.84%	-6.36%
Breakbulk	29.75%	14.10%	3.02%	-6.36%
Bulk				
Containerized				
Export	46.92%	24.01%	7.40%	-6.36%
Breakbulk	46.92%	24.01%	7.40%	-6.36%
Bulk				
Containerized				
c. Transit Cargo				
Domestic				
Inward				
Outward				
Foreign				
Import				
Export				
d. Foreign (Tran-shipment)				
2. Passenger Traffic	31.40%			
Disembarking	28.72%			
Embarking	34.09%			

3.2 Projected Cargo Traffic for Bangsamoro

Cargo traffic for Bangsamoro is expected to reach 4.8 million ton in 2019, 5.4 million ton in 2022 and further increase to 7.7 million ton in 2030 (Table 3.2).

Table 3.2 Projected Cargo Traffic Volume for Mindanao and Bangsamoro

	Mindanao Total (1,000 ton)				Bangsamoro (1,000 ton)			
Commodity	2013	2019	2022	2030	2013	2019	2022	2030
Total	25,310	32,980	37,770	54,850	3,730	4,790	5,440	7,740
Inbound	13,100	18,600	22,200	35,600	1,600	2,300	2,800	4,400
Outbound	12,300	14,400	15,600	19,300	2,100	2,500	2,700	3,300

3.3 Cargo Traffic Shares of Island Provinces Ports

Assuming that the five ports captured all the port cargo traffic in the island provinces, the share of ports from island provinces would be as follows: 12.5% in 2019, 13.7% in 2022 and 13.3% in 2030. It is assumed then that the remaining cargo traffic has its origin/destination in the mainland and ship out/in via the Davao, Cagayan de Oro, General Santos, and Polloc ports.

Table 3.3 Bangsamoro Port Traffic and Island Provinces Ports Traffic

Port	2013 (ton)	2019 (ton)	2022 (ton)	2030 (ton)
Bangsamoro total	3,730,717	4,785,359	5,438,968	7,741,208
1. Isabela Port	114,653	129,118	145,240	170,172
2. Bongao Port	182,709	253,363	348,384	538,728
3. Jolo Port	167,795	196,880	230,528	285,291
4. Lamitan Port	4,747	5,473	6,300	7,616
5. Sitangkai Port	9,428	12,490	16,444	23,928
Share of ports in island provinces (%)	12.8	12.5	13.7	13.3

3.4 Cargo Traffic Projection for Polloc Port

The latest available data of cargo traffic at the Polloc port are for 2005 (249,788 MT). From 2000 to 2005, the cargo traffic was estimated by applying an annual rate of -6.3%. Since no major improvement was effected since then, it is fairly reasonable to assume that the decrease continued from 2005 to the present time. Assuming that is the case, the 2014 cargo traffic was about 138,232 MT (see Appendix B for details).

Table 3.4 Projecting Current Cargo Traffic at Polloc Port

(Unit: MT)

	1992	1999	2000	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
AAGR	AAGR=-7.9%		AAGR=-6.3%		Projected (growth rate -6.36%)									
Total Cargo	742,923	414,789	347,000	249,788	233,894	219,012	205,077	192,028	179,810	168,369	157,656	147,625	138,232	129,436

3.5 Share of Polloc Port in Total Cargo Traffic of Bangsamoro

The share of the Polloc port and the island provinces in the total port traffic generated in and attracted to the Bangsamoro region was 16.8% in 2013 (Table 3.5). Of that, the Polloc port's share was only 4%. Given this, it can be assumed that more than 80% of the cargo traffic enter and exit the ports of Davao, General Santos, and even Cagayan de Oro.

Table 3.5 Cargo Traffic Volume at Ports in Bangsamoro and Their Shares, 2013

Port	2013 (MT)	Share (%)
Bangsamoro total	3,730,717	100
1. Polloc	147,625	4.0
2. Isabela	114,653	3.1
3. Bongao	182,709	4.9
4. Jolo	167,795	4.5
5. Lamitan	4,747	0.1
6. Sitangkai	9,428	0.3
Island provinces total	479,333	12.8
Polloc and island provinces total	626,957	16.8

3.6 Growth of Cargo Traffic

The annual growth rates of cargo traffic in the Bangsamoro region are assumed to be 4.2% for 2013–2019, 4.4% for 2019–2022, and 4.5% for 2020–2022. The Polloc port's share in 2013 is estimated to be about 4.0% of the total Bangsamoro cargo traffic as shown in Table 3.6. If at least 5% of the total

cargo traffic is to pass through the Polloc port in 2019, traffic volume must increase by 8.4% annually taking 2013 as the base year. This will bring the share of the Polloc port and the island provinces in the total cargoes passing through Bangsamoro ports to 17.5%.

If the Polloc port's share in the Bangsamoro cargo traffic increases to 10% by 2019, the traffic volume must grow at an annual rate of 31.5% (Table 3.7). Such increase is possible if the needs of shippers are met and all the plantations in Bangsamoro planned for expansion will use the Polloc port instead of the Davao port or the General Santos port.

It should be noted that a 10% share of all the cargoes at Bangsamoro ports in 2022 means 543,897 MT (Table 3.8). The Polloc port once handled a traffic volume of 742,923 MT in 1997. Thus, the port capacity is not an issue. Inbound and outbound cargoes to/from Bangsamoro are mostly from outside of the region.

Table 3.6 Share of Ports in Total Bangsamoro Cargo Traffic for 2013, 2019, 2022, and 2030

Port	2013 (%)	2019 (%)	2022 (%)	2030 (%)
1. Polloc (target share)	4.0	5.0	10.0	15.0
2. Isabela	3.1	2.7	2.7	2.2
3. Bongao	4.9	5.3	6.4	7.0
4. Jolo	4.5	4.1	4.2	3.7
5. Lamitan	0.1	0.1	0.1	0.1
6. Sitangkai	0.3	0.3	0.3	0.3
Island provinces total	12.8	12.5	13.7	13.3
Polloc and island provinces total	16.8	17.5	23.7	28.3

Table 3.7 Projected Growth in Cargo Traffic at Ports in Bangsamoro for 2013–2030

Port	2013–19 (% p.a.)	2019–22 (% p.a.)	2022–30 (% p.a.)
Bangsamoro total	4.2	4.4	4.5
1. Polloc	8.4	31.5	9.9
2. Isabela	2.0	4.0	2.0
3. Bongao	5.6	11.2	5.6
4. Jolo	2.7	5.4	2.7
5. Lamitan	2.4	4.8	2.4
6. Sitangkai	4.8	9.6	4.8
Island provinces total	3.7	7.7	4.0
Polloc and island provinces total	4.9	15.6	6.8

Table 3.8 Cargo Volume at Ports in Bangsamoro for 2013, 2019, 2022, and 2030

Port	2013 (ton)	2019 (ton)	2022 (ton)	2030 (ton)
Bangsamoro total	3,730,717	4,785,359	5,438,968	7,741,208
1. Polloc	147,625	239,268	543,897	1,161,181
2. Isabela	114,653	129,118	145,240	170,172
3. Bongao	182,709	253,363	348,384	538,728
4. Jolo	167,795	196,880	230,528	285,291
5. Lamitan	4,747	5,473	6,300	7,616
6. Sitangkai	9,428	12,490	16,444	23,928
Island provinces total	479,333	597,325	746,896	1,025,735
Polloc and island provinces total	626,957	836,593	1,290,793	2,186,916

3.7 Future Passenger Traffic

The only passenger traffic data available for the Polloc port are for the period between 1992 and 1997. During this period, the annual growth rate was 31.4%. Assuming that this trend continued, the traffic volume in 2013 would have been about 24 million. This may not be a reasonable estimate. The existing and projected passenger traffic are presented in Table 3.9.

Table 3.9 Existing Data and Projections on Passenger Traffic

	Existing Data					
	1992	1993	1994	1995	1996	1997
Passenger Traffic (n)	76,728	124,526	149,196	159,501	299,492	300,593
- Disembarking	39,981	58,837	74,297	77,212	140,659	141,279
- Embarking	36,747	65,689	74,899	82,289	158,833	159,314
Growth Rate (%/year)						
Passenger Traffic		62	20	7	88	0
- Disembarking		47	26	4	82	0
- Embarking		79	14	10	93	0

	Projections					
	1998	2013	2019	2022	2030	AAGR (92–97)
Passenger Traffic (n)	394,988	23,749,738	122,261,240	277,398,295	2,465,720,028	31.40%
- Disembarking	181,854	8,024,062	36,497,493	77,839,029	586,618,489	28.72%
- Embarking	213,629	17,408,306	101,203,370	244,013,697	2,550,735,864	34.09%
Growth Rate (%/year)		1998–2013	2013–19	2019–22	2022–30	
Passenger Traffic		31	31	31	31	
- Disembarking		29	29	29	29	
- Embarking		34	34	34	34	

Appendix B: Detailed Projections of Polloc Port Cargo Traffic

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
AAGR	7.9%								6.3%					
1. Total Cargo Throughput (MT)	742,923	504,840	525,115	704,633	559,981	606,043	570,875	414,789	347,000	452,370	322,105	361,505	284,486	249,788
a. Domestic	712,610	481,035	484,733	552,613	459,679	496,567	471,622	340,540	284,887	371,396	264,448	296,795	233,564	205,076
Inbound	274,418	180,714	198,934	243,401	206,195	222,424	250,834	152,897	127,914	166,757	118,737	133,261	104,870	92,079
Breakbulk	19,840	39,502	33,549	50,997	89,805	97,400	109,364	66,657	55,770	72,706	51,769	58,102	45,723	40,146
Bulk	254,578	53,742	63,279	79,299	0	0	0	0	0	0	0	0	0	0
Containerized	0	87,470	102,106	113,105	116,390	125,024	141,470	86,240	72,144	94,051	66,968	75,159	59,147	51,933
Outbound	438,192	300,321	285,799	309,212	253,484	274,143	220,788	187,643	156,973	204,639	145,711	163,534	128,694	112,997
Breakbulk	313,983	123,904	111,525	108,855	95,418	103,078	83,016	70,554	59,022	76,944	54,787	61,489	48,389	42,487
Bulk	117,666	10,665	6,493	17,016	0	0	0	0	0	0	0	0	0	0
Containerized	6,543	165,752	167,781	183,341	158,066	171,065	137,772	117,089	97,951	127,695	90,924	102,045	80,305	70,510
b. Foreign	30,313	23,805	40,382	152,020	100,302	109,476	99,253	74,249	62,113	80,974	57,656	64,710	50,923	44,712
Import	26,396	10,151	30,490	120,694	76,443	82,659	75,631	56,578	47,330	61,702	43,934	49,309	38,803	34,071
Breakbulk	22,479	10,151	30,490	120,694	76,443	82,659	75,631	56,578	47,330	61,702	43,934	49,309	38,803	34,071
Bulk	3,917	0	0	0	0	0	0	0	0	0	0	0	0	0
Containerized	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Export	3,917	13,654	9,892	31,326	23,859	26,817	23,622	17,671	14,783	19,272	13,722	15,401	12,120	10,641
Breakbulk	3,917	13,654	9,892	31,326	23,859	26,817	23,622	17,671	14,783	19,272	13,722	15,401	12,120	10,641
Bulk	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Containerized	0	0	0	0	0	0	0	0	0	0	0	0	0	0
c. Transit Cargo	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Domestic	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Inward	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Outward	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Foreign	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Import	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Export	0	0	0	0	0	0	0	0	0	0	0	0	0	0
d. Foreign (transshipment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Particulars	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
AAGR	6.36% (projected)									
1. Total Cargo Throughput (MT)	233,894	219,012	205,077	192,028	179,810	168,369	157,656	147,625	138,232	129,436
a. Domestic	192,027	179,809	168,368	157,655	147,624	138,231	129,436	121,200	113,488	106,267
Inbound	86,220	80,734	75,597	70,787	66,283	62,066	58,117	54,419	50,956	47,714
Breakbulk	37,592	35,200	32,960	30,863	28,899	27,060	25,338	23,726	22,217	20,803
Bulk	-	-	-	-	-	-	-	-	-	-
Containerized	48,629	45,535	42,637	39,924	37,384	35,005	32,778	30,693	28,740	26,911
Outbound	105,807	99,075	92,771	86,868	81,341	76,165	71,319	66,781	62,532	58,553
Breakbulk	39,784	37,252	34,882	32,663	30,584	28,638	26,816	25,110	23,512	22,016
Bulk	-	-	-	-	-	-	-	-	-	-
Containerized	66,024	61,823	57,889	54,206	50,757	47,527	44,503	41,671	39,020	36,537
b. Foreign	41,867	39,203	36,709	34,373	32,186	30,138	28,220	26,425	24,743	23,169
Import	31,903	29,873	27,973	26,193	24,526	22,966	21,505	20,136	18,855	17,656
Breakbulk	31,903	29,873	27,973	26,193	24,526	22,966	21,505	20,136	18,855	17,656
Bulk	-	-	-	-	-	-	-	-	-	-
Containerized	-	-	-	-	-	-	-	-	-	-
Export	9,964	9,330	8,736	8,180	7,660	7,172	6,716	6,288	5,888	5,513
Breakbulk	9,964	9,330	8,736	8,180	7,660	7,172	6,716	6,288	5,888	5,513
Bulk	-	-	-	-	-	-	-	-	-	-
Containerized	-	-	-	-	-	-	-	-	-	-
c. Transit Cargo	-	-	-	-	-	-	-	-	-	-
Domestic	-	-	-	-	-	-	-	-	-	-
Inward	-	-	-	-	-	-	-	-	-	-
Outward	-	-	-	-	-	-	-	-	-	-
Foreign	-	-	-	-	-	-	-	-	-	-
Import	-	-	-	-	-	-	-	-	-	-
Export	-	-	-	-	-	-	-	-	-	-
d. Foreign (transshipment)	-	-	-	-	-	-	-	-	-	-

CHAPTER 4 PROPOSAL OF PRIORITY PROJECTS

4.1 Cargo and Passenger Traffic of Bangsamoro Ports

The future cargo and passenger traffic at the ports in Bangsamoro reported in Chapter 3 is summarized in Table 4.1.

Table 4.1 Future Port Traffic at Ports in Bangsamoro (2015–2030)

Port	Item	2015	2019	2022	2030
Polloc	Cargo (MT)	432,598	921,197	1,060,318	1,542,860
Isabela	Cargo (MT)	119,285	129,118	145,240	170,172
	Passenger	1,365,269	1,443,345	1,568,013	1,752,480
Bongao	Cargo (MT)	203,746	253,363	348,384	538,728
	Passenger	213,974	233,434	265,623	316,135
Jolo	Cargo (MT)	282,950	314,769	368,564	456,118
	Passenger	471,158	524,141	613,720	759,511
Lamitan	Cargo (MT)	4,978	5,473	6,300	7,616
	Passenger	332,271	384,245	476,015	636,577
Sitangkai	Cargo (MT)	10,355	12,490	16,444	23,928
	Passenger	28,576	32,037	37,941	47,691

4.2 Polloc Port

4.2.1 Overview

The Polloc port was constructed by Nam Kwang Construction Company, Ltd. in 1977 funded by ADB. Port operation was started by PPA in March 1980 and transferred to DOTC-ARRM. Operation and management of the Polloc Freeport was started in 2010 by REZA. As mentioned in Chapter 2, the Polloc port has high potential as a major port with respect to construction, operation and management, and it is one of the best ports in the Philippines.

4.2.2 Existing system of the port operation

The study of the port operation of the Polloc port is based on available actual statistical data obtained from REZA. There are no data available for the Polloc port from 2006 to 2012, but data from 1995 to 2003 are available as attached in Appendix A. The latest record of cargo throughput at the Polloc port in 2013 was 296,354 tons.

1) Berth length: 400 m
2) Ship call: 181 ships
3) Ship size: 2,000 GT container ship
4) Vessel waiting time: Once a month
5) Forklift: 2 units
6) Truck chassis: 6 units
7) Reach stacker: 2 units (new)

For port operation, productivity is the primary concern for the production and any service activities. This could be measured in many ways, as in the manufacturing and services sectors, but the bottom line always is to produce more at the least possible cost. Indicators of productivity in port operation are used to measure the proficiency and ability to serve the port's constituents. These are as follows.

(1) Indicators of output

The major indicators of output are the annual berth throughput, ship output and gang output. The annual berth throughput measures the total volume of cargo handled at the berth yearly. As indicated above, no data are available for the Polloc port from 2006 to 2012. The ship output indicator measures

the rate at which cargo is handled to and from a vessel at a berth. It is expressed in one of three ways, depending on the time period used to measure the weight of cargo handled such as working hour, ship-hour at berth and lineal meter of berth. These records, however, are not available for the Polloc port.

(2) Indicators of service

There are many indicators that can be used to measure the quality of service that a port provides for its users (shippers, importers, ship owners), but the most commonly used indicator is ship turnaround time, i.e., the total time spent by a particular vessel in the port.

(3) Indicators of utilization

Indicators of utilization are measures of how intensively berth facilities and resources are used. There are two important indicators in this group: berth occupancy (the proportion of time a berth is occupied by vessels) and capacity utilization (the proportion of actual traffic to either the optimum capacity using optimum berth occupancy rate (OBOR) or maximum capacity using 100% OBOR. Berth occupancy effectively indicates the level of demand for port services. It can be measured over various time intervals, and is normally expressed as a percentage:

Berth occupancy rate = {(Ship calls)(Average LOA)(Spacing factor)(Average service time)(100)}/{(Available berth length)(Days/year)(Hours/day)}

High berth occupancy causes quality of service to decline. It is signals for congestion, and there is a danger that ships have to queue for a berth. The other extreme, low berth occupancy (45% or less in the case of general cargo berth) indicates that resources are being underused.

Berth occupancy is an indicator to be used with caution- aiming for high values may be very dangerous (in terms of congestion delays), while low values may be uneconomic (in terms of return on investment). Research and experience have shown that, at a general cargo berth, berth occupancy values within the range of 40% to 70% are perhaps the optimum.

(4) Indicators of efficiency

Indicators of efficiency, as measured by the cost per ton of cargo, are determined from a cost-based study. It is analogous to time utilization, but in this case, it involves prorating the cost among the contributory port facilities and related services.

There are no available data for the Polloc port to measure the port performance by the four indicators described above, therefore, it is recommended to apply general indicators for port development. For reference, tonnage per lineal meter of berth specified in UNCTAD standard will be examined in the next paragraph.

Tons/Lineal meter of berth = Total tonnage/Berth length

4.2.3 Cargo handling capacity of representative ports in Mindanao and Manila ports

In order to determine the required scale of the plan for future cargo traffic, it is necessary to determine the present cargo handling capacity of the port. Port capacity is generally calculated in terms of the volume of cargo. Since port capacity varies according to the types of the cargo, size of lot, size of the berth, methods of loading and unloading, etc., it is often represented simply as the volume of cargo handled at the port.

To assess the handling volume per lineal meter for busy and increasing handling volume of cargo, the Davao, General Santos, Zamboanga and Manila North Harbor ports were selected and the ton/lineal meter was calculated together with ratio of container cargo. Generally, if container cargo is increased, the handling volume of cargo is increased as well due to the efficiency of the movement of cargo. The result of the calculation is indicated in Table 4.2.

The present handling ton/lineal meter at the Polloc port is 296,354 tons/400 m = 740 ton/m which indicates under-utilization of the port and port facilities. According to the statistic of cargo throughput of the Polloc port in 2013, percentage of container cargo is 47% which is less than that of the Zamboanga

port. Based on the above, the port capacity of Polloc port is estimated at 2,000 ton/m/year considering the increase in the containerization of cargos handled at the port in the future.

Table 4.2 Tons per Lineal Meter of Berth in Mindanao and Manila

	Davao	Zamboanga	General Santos	Manila North Harbor
Ton/LM	3,925	1,503	3,154	2,581
Ratio of Container (%)	88	57	83	80

4.2.4 Present conditions for new development for Polloc port

(1) Fuel oil depot

Based on the REZA information, DS3 Management started the construction of an oil supply facility in the Polloc port in May 2015. The information is summarized as follows (Figure 4.1).

1) DS3 will invest in the Polloc port with strong Philippines based fuel supply
2) Initially floating storage will be used to provide immediate storage
3) Once fuel volumes have grown, storage tanks will be built in the eco-zone of Polloc port; the proposed size of the tanks is two 8 million liters tanks for diesel oil and one 5 million liter tank for gasoline for a total of 21 million liters.
4) By providing local storage, the serious logistical problems of delivering fuel by road from Davao will be removed.
5) Local fuel price will be reduced, which will promote economic growth with larger fuel usage

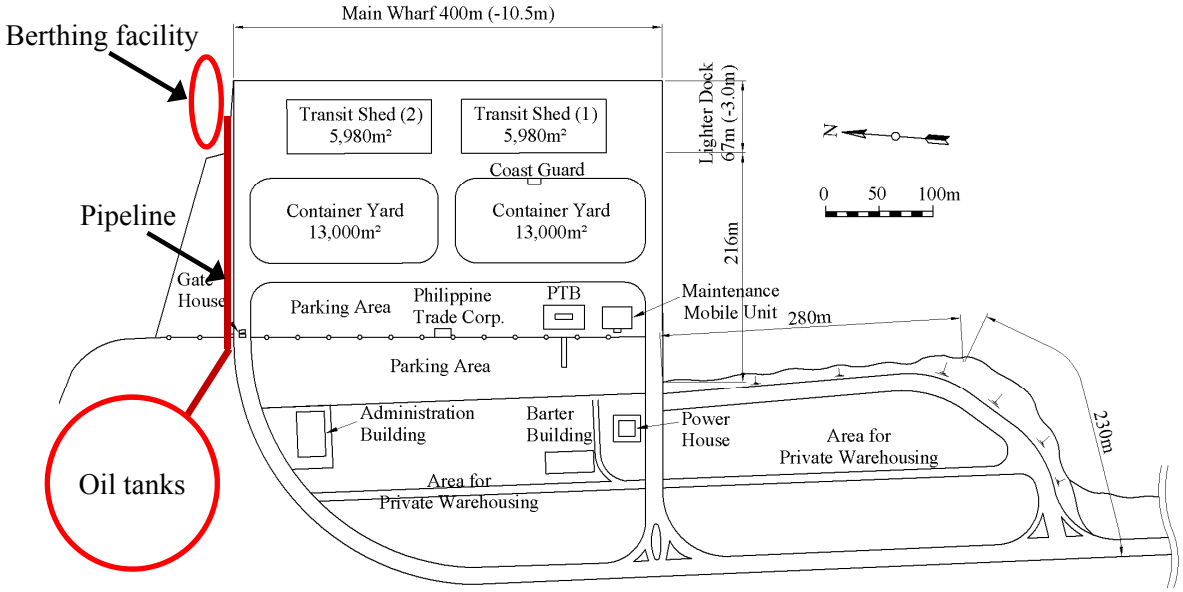


Figure 4.1 Schematic Drawing of Oil Handling and Deposit at Polloc Port

(2) Corn import from Indonesia

The import of 40,000 tons of corn from Indonesia for the LAMSAM corn starch company started in June 2015. The port operator LAMSAM purchased a pneumatic unloader for corn unloading from ship to truck (Photo 16).

Photo 16

(3) RORO ramp

REZA prepared a RORO ramp construction plan (Photos 17 and 18). Objectives of the RORO ramp (12 m x 20 m) are as follows:

1) RORO transportation will become part of the Strong Nautical Highway of the Philippines and included in the Western Mindanao RORO link.

2) RORO will enhance mobility and improve linkages between islands, provide access to markets or activity centers, and support different business sectors in ARMM.

3) The delivery of basic goods and farm produce is made easier, economical and efficient as travel time to and from destinations as well as transportation costs are considerably reduced.

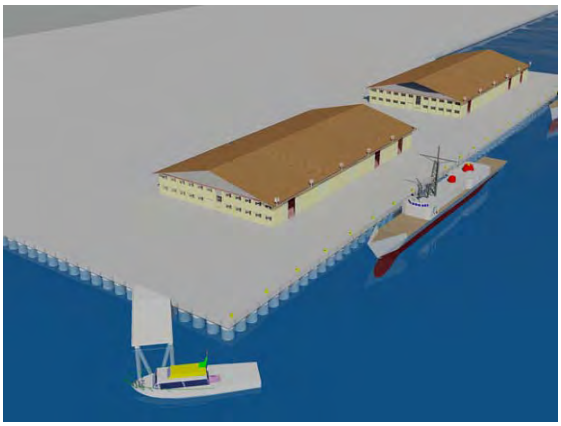


Photo 17

Photo 18

(4) Latest cargo volume handled in Polloc port

The latest statistic of cargo volume handled in the Polloc port is indicated in Table 4.3. According to the above data, increase of the cargo volume is significant in recent years.

Table 4.3 Latest Data on Cargo Volume at Polloc Port (2013–2015)

Year	2013	2014	2015
Cargo throughput (ton)	296,351	358,111	433,380
Growth ratio (%)	-	20.8	21.0

Note: Cargo throughput in 2015 estimated from January–June data.

4.2.5 Proposed port development

(1) Required number of berths

The number of berths required to handle a given volume of cargo differs greatly depending on the nature of the port, kind of cargos, cargo handling facilities, etc. There are several methods in determining the berth length. For the rough estimate of the required total length of berth, the unit productivity method is mainly used as below.

Unit productivity = (Converted cargo volume)/(Converted berth length)
= 700–1,100 t/m
(1,000ton/m for general cargo and 2,000 ton/m for container to be used for calculation.)

The adjusting rates for bulk and general cargo and containers are 0.5 and 1.0, respectively, and the adjusting rate for berth is as shown in Table 4.4.

Table 4.4 Relation of Water Depth and Berth Length

Water depth of berth	Converted berth length
2.10–3.90 m	1/3 x berth length
4.00–7.40 m	2/3 x berth length
7.50 m ≤	Berth length

Projections of cargo volume and required berth lengths at the Polloc port for 2019, 2022, and 2030 are summarized in Tables 4.5 through 4.8.

Table 4.5 Cargo Forecast for Polloc Port in 2019, 2022, and 2030

Polloc port	Year	2019	2022	2030
	Cargo (MT)	921,197	1,060,318	1,542,860

Table 4.6 Required Berth Length for General Cargo at Polloc Port in 2019, 2022, and 2030

Year	Cargo throughput (ton)	Required berth length* (m) [a]	Existing berth length (m) [b]	Required extension of berth [a]-[b]
2019	460,599	230	200	30
2022	530,159	265	200	65
2030	771,430	386	200	186

*Assuming that general cargo accounts for 50% of total throughput.

Table 4.7 Required Berth Length for Container Cargo in 2019, 2022, and 2030

Year	Cargo throughput (ton)	Required berth length (m) [a]	Existing berth length (m) [b]	Required extension of berth [a]-[b]
2019	460,599	230	200	30
2022	530,159	265	200	65
2030	771,430	386	200	186

*Assuming that container cargo accounts for 50% of total throughput.

Table 4.8 Required Berth Length for General and Container Cargo in 2019, 2022, and 2030

Year	Cargo throughput (ton)	Required berth length (m) [a]	Existing berth length (m) [b]	Required extension of berth [a]-[b]	Proposed extension of berth (m)
2019	921,197	460	400	60	0
2022	1,060,318	530	400	130	200
2030	1,542,860	772	400	372	200

(2) Required transit shed area

The transit shed area required to handle the cargo volume is determined by the following:

Transit shed area = (VET x RF x 2.2)/SD

VET = (DT x ET x PF)/365

Where

VET: Volume within a dwell time
DT: Design traffic volume
ET: Dwell time
PF: Peak factor
RF: Re-stowing factor
SD: Stacking density (1.0–1.50 MT/m^2 for general cargo)

Transit shed area = (DT x ET x PF x RF x 2.2)/(SD x 365)
= (771,430 x 25% x 5 x 1.12 x 1.05 x 2.2)/(1.5 x 365)
= 4,556 m^2 (existing shed 11,960 m^2)

No additional transit shed is necessary.

(3) Required open storage

The open storage area required is calculated as follows:

Open storage area = (VET x RF x 2.0)/SD
VET = (DT x ET x PF)/365

Where

VET: Vol. within a dwell time
DT: Design traffic volume
ET: Dwell time
PF: Peak factor
RF: Re-stowing factor
SH: Stacking density (1.0–1.50 MT/m^2 for general cargo)

Open storage area = (DT x ET x PF x RF x 2.0)/(SD x 365)
= (771,430 x 55% x 5 x 1.12 x 1.05 x 2.0)/(1.5 x 365)
= 9,113 m^2
= 9,200 m^2 (using existing open yard)

(4) Required container yard

The container yard necessary to store and handle the expected volume of containers is determined as follows:

Ground slots = (VET x RF x 2.0)/SH
VET = (DT x ET x PF)/365

Where

VET: Volume within a dwell time
DT: Design traffic volume
ET: Dwell time
PF: Peak factor
RF: Re-stowing factor
SH: Stacking height

Ground slots = (DT x ET x PF x RF x 2.0)/(SH x 365)
= (771,430 x 5 x 1.12 x 1.05 x 2.0)/(1.0 x 365)
= 24,854 m^2
≈ 25,000 m^2

(5) Medium/long-term development plans for Polloc port

The construction of the wharf including the aforementioned expansion and construction of the berth and other facilities will be completed by 2030 as presented in Table 4.9. The medium- and long-term development plans for 2022 and 2030 are indicated by Figures 4.2 and 4.3 based on the required facilities described above.

Table 4.9 Completion of Port Facilities at Polloc Port by 2022 and 2030

	2022	2030
Completion of wharf construction	200 m	200 m
Completion of container yard		25,000 m^2

(6) Cost estimate on Polloc port development

The costs of the medium- and long-term development plans for 2022 and 2030 are estimated and summarized in Table 4.10.

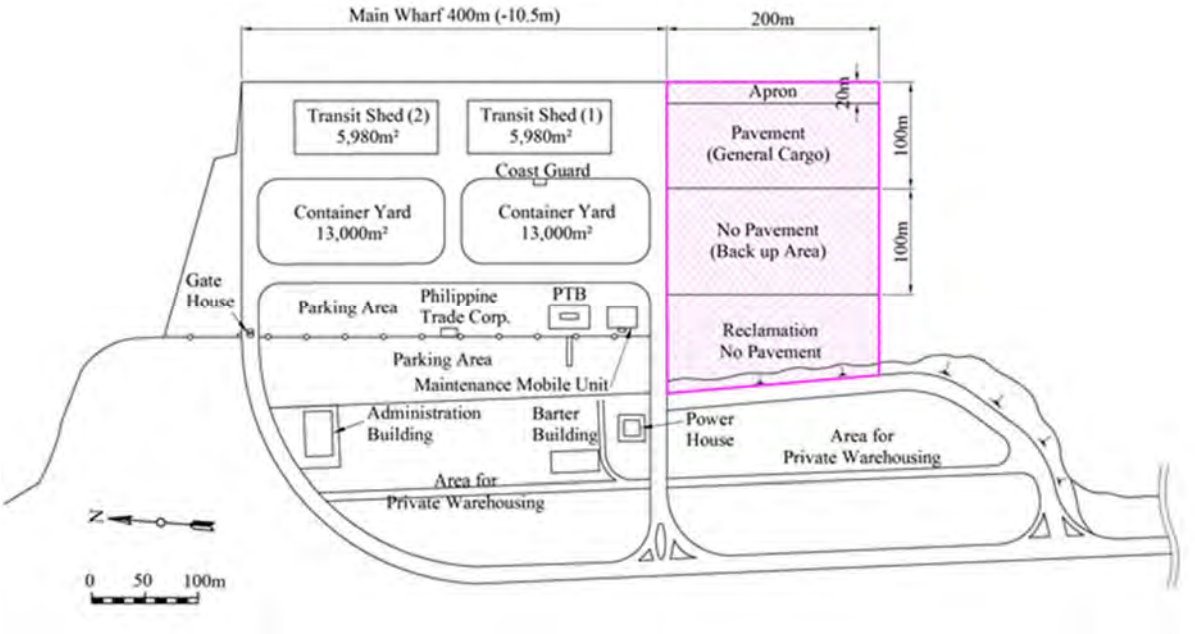


Figure 4.2 Polloc Port Development Plan by 2022

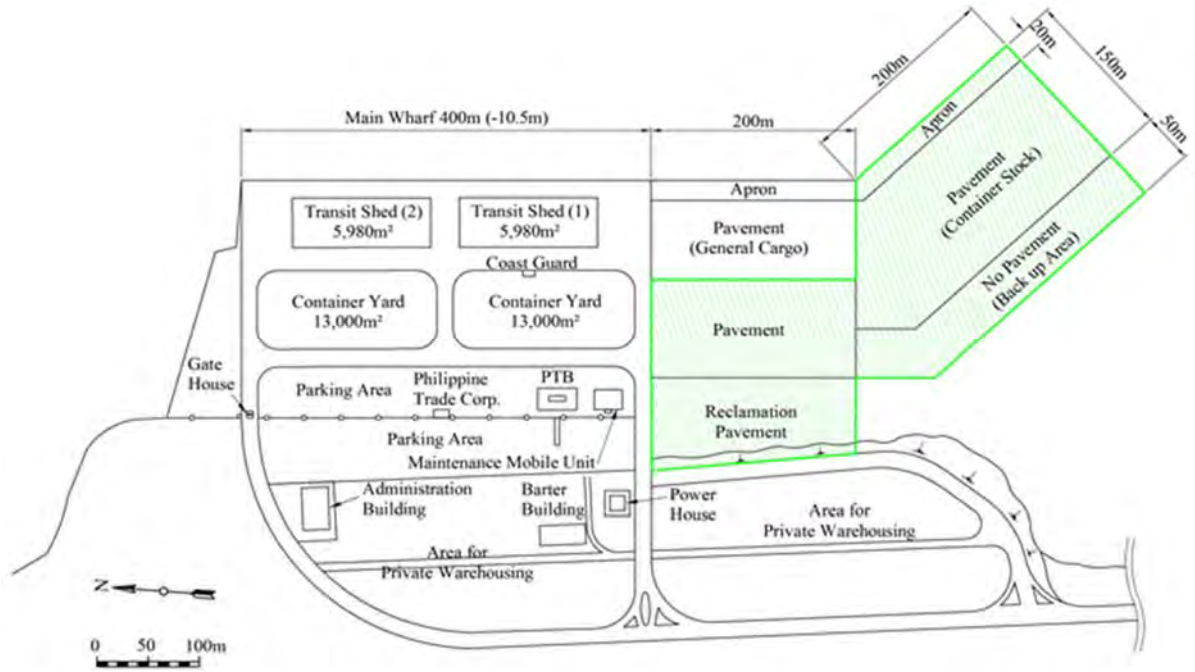


Figure 4.3 Polloc Port Development Plan by 2030

Table 4.10 Estimated Polloc Port Construction Costs for 2022 and 2030

(Unit: US$)

	2022			2030		
Cost component	Local portion	Foreign portion	Total	Local portion	Foreign portion	Total
A. Construction	10,616,806	7,940,070	18,556,876	14,214,224	10,659,147	24,873,371
1. Preparation works	580,000	1,270,000	1,850,000	580,000	1,270,000	1,850,000
2. Dredging and reclamation	2,614,500	560,500	3,175,000	2,956,500	596,000	3,552,500
3. Berth construction	5,168,650	2,741,050	7,909,700	5,168,650	2,741,050	7,909,700
4. Yard construction	1,431,150	682,350	2,113,500	4,402,875	1,923,375	6,326,250
5. Other expenses	782,506	1,926,170	2,708,676	1,021,199	2,513,722	3,534,921
6. Equipment procurement	40,000	760,000	800,000	85,000	1,615,000	1,700,000
B. Contingency and taxes	3,129,704	952,808	4,082,513	4,619,471	1,598,872	6,218,343
1. Physical contingency	530,840	397,003	927,844	710,711	532,957	1,243,669
2. Price escalation	743,176	555,805	1,298,981	1,421,422	1,065,915	2,487,337
3. Taxes and duties	1,855,688	0	1,855,688	2,487,337	0	2,487,337
C. Consulting services	467,633	1,019,144	1,558,778	626,809	1,462,554	2,089,363
Total project cost (A+B+C)	14,214,144	9,984,022	24,198,166	19,460,504	13,720,573	33,181,077

4.2.6 Urgent improvement plan

Due to the minimal maintenance since 1977, after the completion of port facilities, the fender system and bollards need to be replaced, the water supply system should be rehabilitated, and the soil deposit in front of the wharf should be removed. A detailed investigation should be conducted before the implementation of the improvement of these works. Damaged fenders and bollards are shown in Photos 19 and 20). A rough cost estimate of fenders and bollards replacement is presented in Table 4.11.

Photo 19: Damaged Fenders

Photo 20: Damaged Bollards

Table 4.11 Estimated Cost of Fenders and Bollards Replacement

	Estimated cost (US$)
Fenders	656,000
Bollards	115,500
Total	771,500

4.2.7 Institution of Polloc port

The Polloc port was constructed in 1977 funded by ADB and started its operation in March 1980 by RPMA until 2010. By virtue of MMAA No. 154 and Proclamation No. 1 dated May 15, 2010, the Polloc port was transferred to REZA as the Polloc Freeport and Ecozone as shown on the right. The organization of the Polloc port is composed of the port Manager and Divisions of Resource Management, Port Services, Planning, Business and Investment, Port Police and Engineering Services as shown in Figure 4.4. The Polloc port is operated by a private operator, PTC. However, a new operator of Lamsan Trading will continue the port operation until 2022.

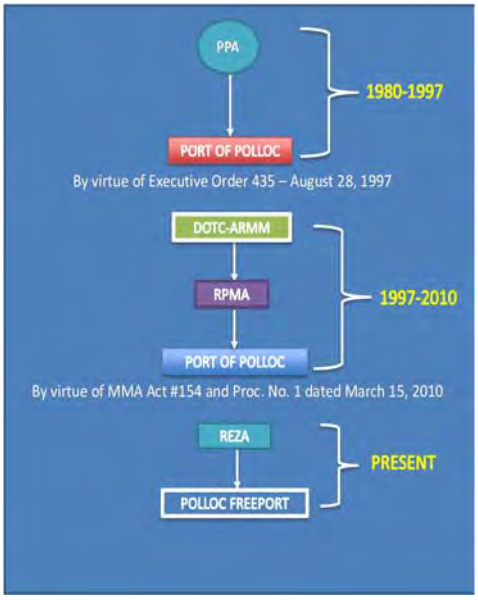


Figure 4.4 Existing Organization of Polloc Port (REZA)

4.2.8 Necessity of cargo and passenger traffic between Polloc and BaSulTa

Cotabato City with its surroundings is envisioned to be the capital of Bangsamoro. With the port and other means of transportation, it is a central location for the transfer of goods and people to and from the nearby main islands, namely, Basilan, Sulu, and Tawi-Tawi. In addition, the Polloc port will be along a trunk line for marine transportation with the three main islands, which may constitute the fundamental infrastructure development to support economic and social activities.

In addition, small islands which are located near the three main islands shall be interconnected to the main islands by feeder lines. The inter-connection between Isabela and Zamboanga is also very important for three main islands. Figure 4.5 shows the schematic flow of marine transportation among all ports in Bangsamoro considering the volume and origins and destinations.

Conventional type ships or RORO ships are commonly used in the Philippines to transport cargos and passengers. The BaSulTa area is rich in agriculture and fishery resources and it also has the potential to establish an agri-industrial center for the processing of agriculture and fishery products. There is a plan to develop the Bongao port into an international seaport and a gateway for trade with Indonesia of BIMP-EAGA.

4.2.9 Development plan of new Cotabato port

The new Cotabato port (Timaco port) was proposed by the defunct Metro Cotabato Regional Agro-Industrial Center. The proposed Timaco port development was denied by the Regional Planning and Development Office (ARMM NEDA) because of the existing and nearby Polloc port only 25 km away.

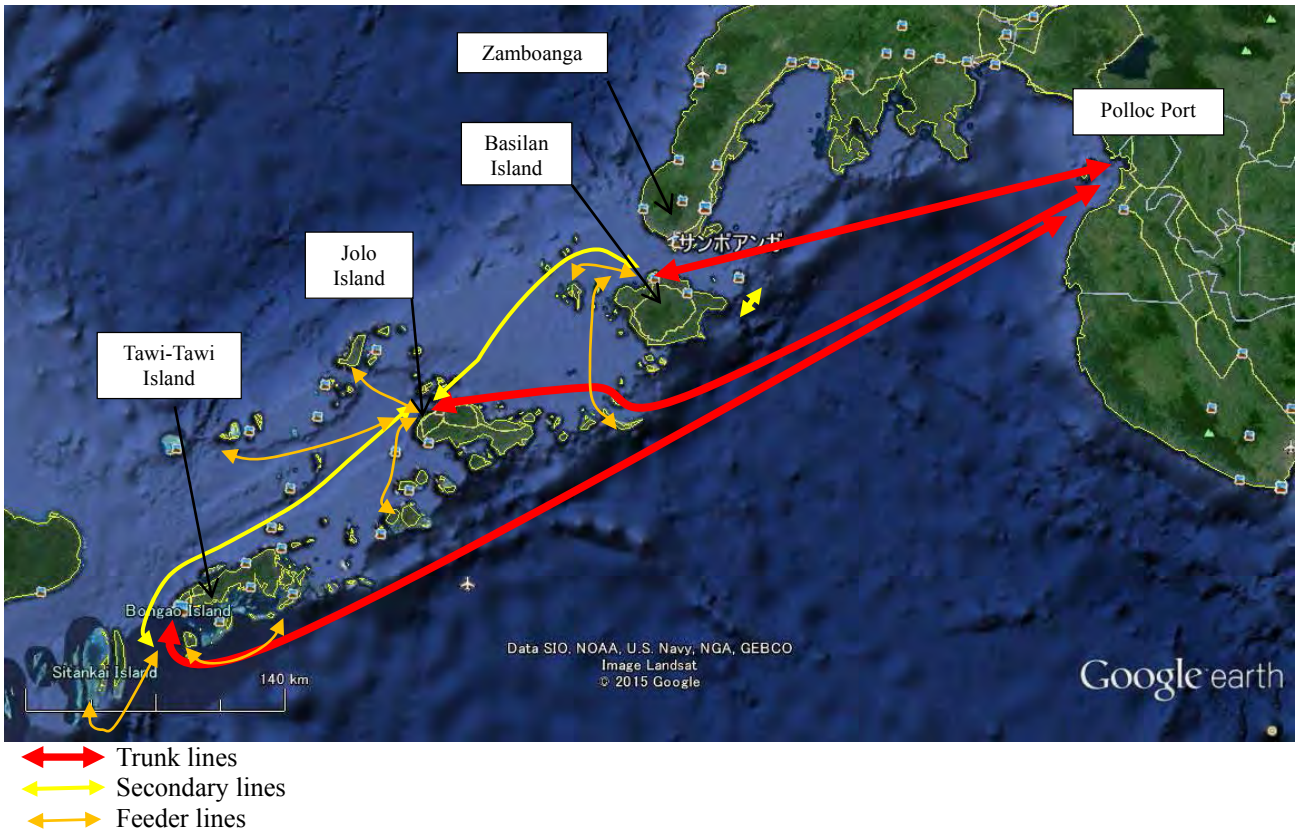


Figure 4.5 Cargo and Passenger Traffic between Polloc and BaSulTa

The incumbent Congresswoman of Cotabato still supports the development for the Timaco port and made a request to MINDA for its implementation. MINDA endorsed the request on the condition that it is approved by the PPA Board and the results of the assessment of conflict between the Polloc port and the Timaco port, under process financed by USAID, should be reflected.

4.3 Bongao Port

Tawi-Tawi is one of the most remote island provinces in the Philippines. Its residents are highly dependent on the maritime travel because of the remoteness of the islands. The Bongao port is an important sub-hub connecting numerous smaller nearby island ports to other ports in the Sulu archipelago as well as the regional hub of Zamboanga. An improved Bongao port will strengthen the economic linkage between Tawi-Tawi and Zamboanga City and to BIMP-EAGA.

4.3.1 Present conditions of Bongao port

According to statistics of the Bongao port, cargo throughput was 125,331 tons per year in 2013 and the total length of cargo berth is 163 m. The productivity of the Bongao port is 770 ton/m/year. Considering the lack of backup area and very narrow apron of 9 m, it is assumed that the existing port facility is almost saturated in its capacity. The total ship calls to the Bongao port was 392 in 2012 and the average ship size is 400 GT. The berthing time of the ships was 6 to 12 hours/call for loading and unloading. Calling ports to and from the Bongao port are Zamboanga, Iligan, Sitangkai, Siasi. The main commodities handled in the port are seaweeds, copra, live fish and octopus, dried fish, and sea shells.

4.3.2 Urgent expansion of the port

In order to mitigate the congestion at the Chinese pier, 130 m berthing space through the reclamation of 3,800 m^2 and cargo marshalling area, which would mainly serve motor launches (wooden hulled vessels

with GRT ranging from about 60 to 125 tons) and some conventional vessels (steel-hulled vessels with GRT about 100 tons), should be provided. The expansion of the port will help to decongest the Chinese pier. The Chinese pier would then be better able to accommodate inter-island provincial traffic which uses smaller vessels.

Transit sheds will also be constructed to provide storage space for cargo. An additional small passenger terminal will be constructed to serve vessels at the reclaimed area. Perimeter fences and gates will be constructed to allow for better security. A lighting system will be built to allow for better operations at night. These improvements are expected to increase the capacity of the port while improving efficiency, security and safety. The improvement plan is indicated in Figure 4.6.

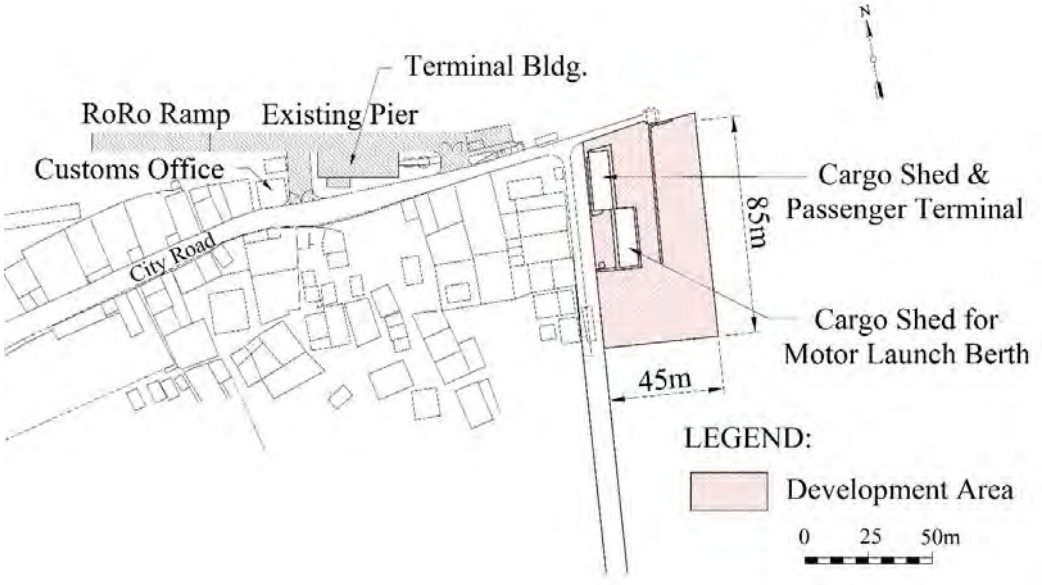


Figure 4.6 General Plan of Urgent Expansion of Bongao Port

Rough cost estimate for the urgent expansion of the Bongao port is as presented in Table 4.12.

Table 4.12 Rough Cost Estimate for Urgent Expansion of Bongao Port

(Unit: US$)

Cost component	Local portion	Foreign portion	Total
A. Construction	1,656,202	1,095,067	2,751,269
1. Preparation works	136,000	284,000	420,000
2. Dredging and reclamation	76,680	8,520	85,200
3. Berth construction	661,260	421,260	1,082,520
4. Yard construction	268,383	132,643	401,025
5. Other expenses	286,379	151,145	437,524
6. Equipment procurement	227,500	97,500	325,000
B. Contingency and taxes	473,871	131,408	605,279
C. Consulting services	161,775	69,332	231,107
Total project cost (A+B+C)	2,291,847	1,295,807	3,587,655

4.3.3 Cargo and passenger forecast

Estimated cargo volume and passenger traffic at the Bongao port for 2019, 2022, and 2030 are presented in Table 4.13.

Table 4.13 Cargo Forecast for Bongao Port in 2019, 2022, and 2030

Bongao port	Year	2019	2022	2030
	Cargo (MT)	253,363	348,384	538,728
	Passengers	233,434	265,623	316,135

4.3.4 Proposed port development

(1) Required number of berths

The number of berths required to handle a given volume of cargos differs greatly depending on the nature of the port, kind of cargo, cargo handling facilities, etc. There are several methods in determining the number of berth length. For the rough estimate of the required total length of berth, the unit productivity method is mainly used as below.

Unit productivity = (Converted Cargo volume)/(converted berth length)
= 700–1,100 t/m

The adjusting rate for bulk and general cargo is 0.5, and the adjusting rate for berth is presented in Table 4.4 (see the subsection 4.2.5 for the Polloc port). The required berth length at the Bongao port for the target year of 2019, 2022, and 2030 is projected as presented in Table 4.14.

Table 4.14 Required Berth Length at Bongao Port in 2019, 2022, and 2030

Year	Cargo throughput (ton)	Required berth length (m) [a]	Existing berth length (m) [b]	Required extension of berth [a]-[b]	Proposed extension of berth (m)
2019	253,363	189	163	26	0
2022	348,384	260	163	97	200
2030	538,728	402	163	239	100

(2) Required transit shed area

The transit shed area required to handle the expected volume of cargos is calculated as follows:

Transit shed area = (VET x RF x 2.2)/SD
VET = (DT x ET x PF)/365
Where
VET: Volume within a dwell time
DT: Design traffic volume
ET: Dwell time
PF: Peak factor
RF: Restowing factor
SD: Stacking density (1.0–1.50 MT/m^2 for general cargo)
Transit shed area = (DT x ET x PF x RF x 2.2)/(SD x 365)
= (538,728 x 25% x 5 x 1.12 x 1.05 x 2.2)/(1.5 x 365)
= 3,182 m^2
≈ 3,200 m^2

(3) Required open storage

The open storage area required is calculated as follows.

Open storage area = (VET x RF x 2.0)/SD
VET = (DT x ET x PF)/365
Where
VET: Vol. within a dwell time
DT: Design traffic volume
ET: Dwell time
PF: Peak factor
RF: Restowing factor
SD: Stacking density (1.0–1.50 MT/m^2 for general cargo)
Open storage area = (DT x ET x PF x RF x 2.0)/(SD x 365)
= (538,728 x 55% x 5 x 1.12 x 1.05 x 2.0)/(1.5 x 365)
= 6,364 m^2
≈ 6,400 m^2

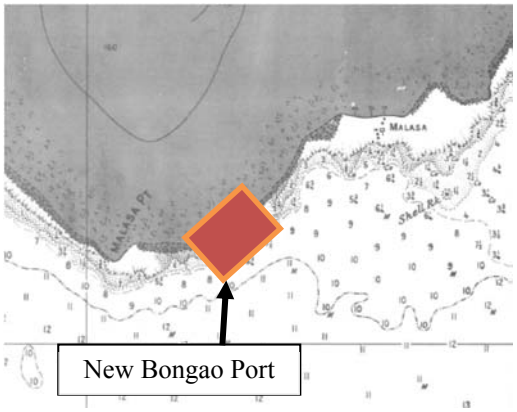
(4) Development plan for new Bongao port

The construction of the wharf including the aforementioned expansion and construction of the berth and other facilities will be completed by 2030 as presented in Table 4.15.

Table 4.15 Completion of Port Facilities at Bongao Port by 2022 and 2030

	2022	2030
Completion of wharf construction	200 m	100 m
Completion of transit shed	1,600 m^2	1,600 m_2
Completion of open storage area	3,200 m^2	3,200 m^2

The provincial government plans to implement the Tawi-Tawi ecozone agri-industrial project with 83 ha in Barangay Marasa of Bongao Municipality. Due to the narrow passage and shallow water depth and the lack of space for expansion at the existing Bongao port, a new Bongao port will be constructed in this project area as illustrated in Figure 4.7.



Location Plan of New Bongao Port

Key Map of Barangay Marasa

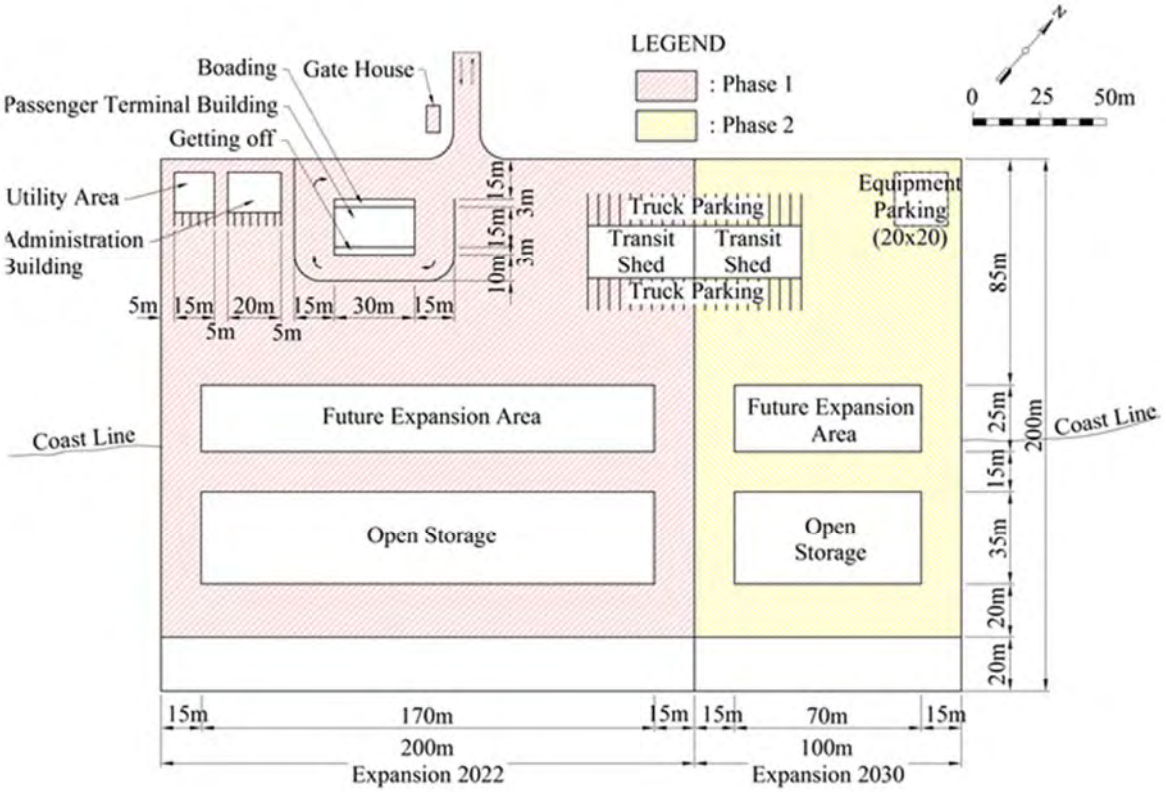


Figure 4.7 General Layout Plan of New Bongao Port for Year 2022 and 2030

(5) Cost estimate on new Bongao port construction

A summary of cost estimates for the Bongao port development is presented in Table 4.16.

Table 4.16 Estimated Bongo Port Construction Costs for 2022 and 2030

(Unit: US$)

	2022			2030		
Cost component	Local portion	Foreign portion	Total	Local portion	Foreign portion	Total
A. Construction	8,642,198	8,294,967	16,937,165	4,140,292	4,057,868	8,198,160
1. Preparation works	242,000	498,000	740,000	144,000	286,000	430,000
2. Dredging and reclamation	1,255,950	165,300	1,421,250	648,000	72,000	720,000
3. Berth construction	1,530,400	2,545,600	4,076,000	695,450	1,169,050	1,864,500
4. Yard construction	3,472,700	1,560,300	5,033,000	1,720,250	773,250	2,493,500
5. Building construction	1,255,100	537,900	1,793,000	504,000	216,000	720,000
6. Other expenses	836,048	2,037,867	2,873,915	398,592	971,568	1,370,160
7. Equipment procurement	50,000	950,000	1,000,000	30,000	570,000	600,000
B. Contingency and taxes	2,730,780	995,396	3,726,176	1,316,651	486,944	1,803,595
C. Consulting services	533,521	1,244,882	1,778,403	482,052	206,594	688,645
Total project cost (A+B+C)	11,906,499	10,535,245	22,441,744	5,938,995	4,751,406	10,690,401

4.4 Jolo Port

The port of Jolo is the main entry port via the sea to the province of Sulu. It is protected on the northwest by the islands of Cabucan, Marongas and Pangasinan, and on the east by the mountainous range on the island. The port has adequate water and land frontage for the development of port facilities and port oriented industries. According to the feasibility studies and the formulation of a master plan for selected ports in Southern Mindanao conducted in April 2012 by PPA ("the FS in Southern Mindanao" hereinafter), the superstructure of the pier has deteriorated and reinforcing bars have been exposed which are severely corroded. The concrete piles above water have cracks, and many reinforcing bars are rusted completely (Photos 21 and 22).

Photo 21: Superstructure

Photo 22: Piles

4.4.1 Present condition of Jolo port

According to the statistics of the Jolo port, cargo throughput at the port is 157,072 tons in 2013 and the total length of the cargo berth is 585 m. The productivity of the Jolo port is only 268 ton/m/year. The one of reasons for under-utilization of the port is the considerable deterioration of the port facilities. Urgent rehabilitation of the berthing facility should be undertaken for handling of increased cargo volume and safety of the port operation. The total ship calls to the Jolo port in 2013 was 1,746, the average ship size was 321 GT and the average berthing time of the ships was 16 hours per call for loading and unloading as recorded in 2009 and 2010. The calling ports to and from the Jolo port are Zamboanga, Sandakan, Bongao, Sitangkai, Siasi, and Luuk. The main commodities handled at the port are cement, food (inbound), copra, seaweeds, abaca, charcoal, and dried/fresh fish (outbound).

4.4.2 Cargo and passenger forecast

Based on the FS in Southern Mindanao, cargo throughput and passenger traffic are estimated and presented in Table 4.17. In the present study, cargo and passenger traffic is estimated as presented in Table 4.18.

Table 4.17 Cargo Forecast for Jolo Port Based on FS in Southern Mindanao

Year	Motor launch cargo (t)	RoRo cargo (t)	Conventional cargo (t)	Liner/RoPax (t)	WHV cargo (t)	Total cargo (t)	Passengers (n)
2011	26,886	72,592	169,381		8,856	277,715	621,690
2012	28,012	75,634	176,478		9,227	289,351	649,355
2013	29,186	78,803	159,969	23,903	9,614	301,475	678,251
2014	30,409	82,104	165,551	26,026	10,016	314,106	708,433
2015	31,683	85,545	171,268	28,336	10,436	327,268	739,959
2016	33,011	89,129	177,115	30,852	10,873	340,980	772,887
2017	34,394	92,863	183,090	33,592	11,329	355,268	807,281
2018	35,835	96,754	189,186	36,574	11,804	370,153	843,205
2019	37,336	100,808	195,398	39,821	12,298	385,661	880,727
2020	38,901	105,032	201,719	43,357	12,814	401,823	919,920
2025	50,151	128,243	233,263	65,970	15,733	493,360	1,143,648
2030	64,508	156,578	264,493	100,856	19,317	605,752	1,421,786

Table 4.18 Cargo Forecast for Jolo Port in 2019, 2022, and 2030

	Year	2019	2022	2030
Jolo Port	Cargo (MT)	314,769	368,564	456,118
	Passengers	524,141	613,720	759,511

The difference in both forecasts by the FS in South Mindanao is due to the decrease in cargo and passenger traffic between 2010 and 2013; specifically the cargo throughput decreased from 268,268 tons in 2010 to 153,769 tons in 2011, 98,835 tons in 2012 and 157,027 tons in 2013. It is considered that the Jolo port still has the potential cargo volume of 268,268 tons in 2015 after the normalization of Bangsamoro, and therefore, the decreasing cargo volume from 2011 to 2013 is not taken into account.

The estimated cargo throughput by vessel type for the target years is summarized in Table 4.19.

Table 4.19 Estimated Cargo Volume by Vessel Type at Jolo Port in 2019, 2022, and 2030

Year	Motor launch cargo (t)	RoRo cargo (t)	Conventional cargo (t)	Liner/RoPax (t)	WHV cargo (t)	Total cargo (t)
2019	30,473	82,278	159,480	32,501	10,037	314,769
2022	35,681	96,339	186,736	38,056	11,753	368,564
2030	48,573	117,900	199,157	75,942	14,545	456,118

4.4.3 Proposed port development

The required capacities of facilities are calculated based on the types of vessels calling such as RoRo passenger/cargo type, RoPax passenger/cargo vessels, fast craft type, motor launches, the motorized banca/wooden hulled passenger/cargo vessels and the conventional cargo vessels. The requirements of berths in 2030 are calculated for each vessel type are calculated below.

(1) RoRo berth

Number of berth (NOB) = (Design traffic)/(Gross productivity [{8,760 x ABOR} - BDH])
Where:

NOB: Number of berth
DT: Design traffic
GP: Gross productivity considering the effects of berthing/deberthing hours (BDH)
NOB = 117,900/(22.83 x (8760 x 0.51)

= 1.15 berths

(2) Conventional berth

NOB = 199,157 /(10.09 x (8760 x 0.65) Berth length 4 x 1.1 x 55 = 242 m
= 3.47 berths

(3) Liner/RoPax berth

NOB = 75,942 /(68.21 x (8760 x 0.47) Berth length 1 x 1.1 x 95 = 104.5 m
= 0.27 berths

(4) Motor launch

NOB = 48,573 /(7.99 x (8760 x 0.55) Berth length 1 x 1.1 x 35 = 39 m
= 1.26 berths

(5) Motorized banca/WHV (wooden hulled vessel)

NOB = 14,545 /(0.63 x (8760 x 0.67) Berth length 4 x 1.1 x 15 = 66 m
= 3.93 berths

(6) Transit shed

Transit shed area = (DT x ET x PF x RF x 2.2)/(SD x 365)
= (456,118 x 25% x 5 x 1.12 x 1.05 x 2.2)/(1.5 x 365)
= 2,694 m^2 (≈ 2,700 m^2)

(7) Open storage

Open storage area = (DT x ET x PF x RF x 2.0)/(SD x 365)
= (456,118 x 55% x 5 x 1.12 x 1.05 x 2.0)/(1.5 x 365)
= 5,388 m^2 (≈ 5,400 m^2)

(8) Container slots

Ground slots = (DT x ET x PF x RF x 2.0)/(SH x 365)
= (75,942 x 5 x 1.12 x 1.05 x 2.0)/(1.0 x 365)
= 2,446 m^2 (≈ 2,500 m^2)

The number of berths required in 2019, 2022, and 2030 is presented in Table 4.20. Considering the berth arrangement, one finger pier will not be constructed by 2019 as indicated in Figure 4.8.

Table 4.20 Required Number of Berths at Jolo Port in 2019, 2022, and 2030

Year	RoRo berth (n)	Conventional berth (n)	Liner/RoPax berth (n)	Motor launch (n)	Motorized banca/WHV (n)	Fast craft (n)
2019	1	3	1	1	3	1
2022	1	4	1	1	4	1
2030	1	4	1	1	4	1

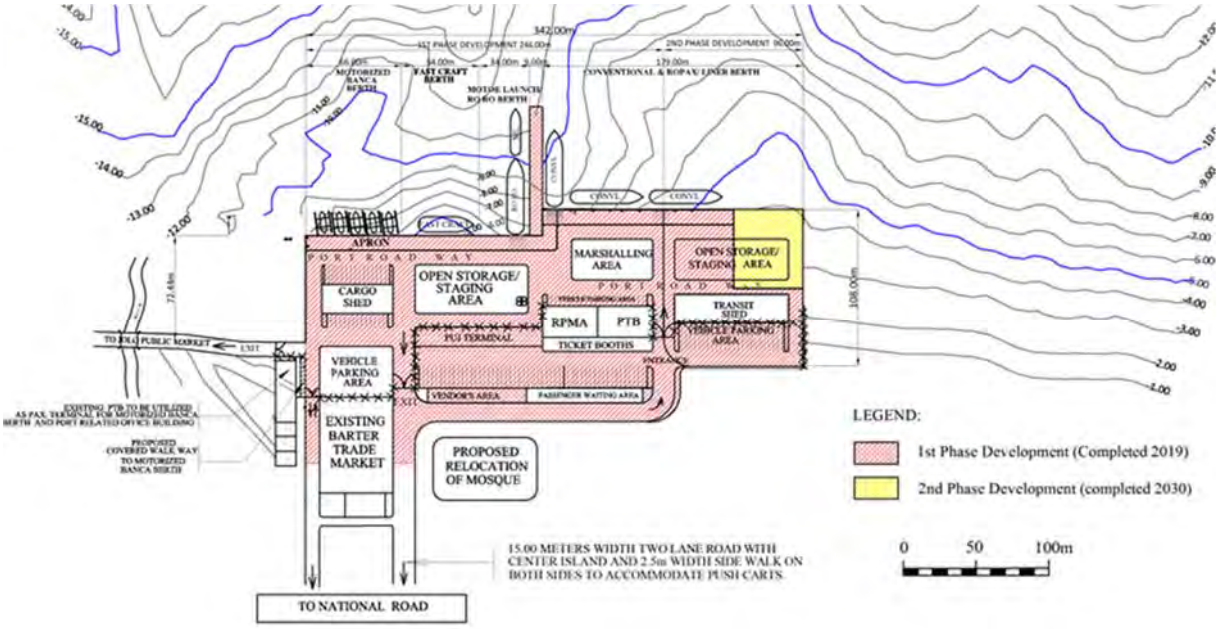


Figure 4.8 General Layout Plan of Jolo Port for 2019 and 2030

4.4.4 Rough cost estimate

Rough cost estimates of the Jolo port development for 2030 are summarized in Table 4.21.

Table 4.21 Rough Cost Estimates of Jolo Port Development for 2030

Cost component	Amount (US$)
A. General expenses	339,284
B. Marine works	9,573,925
- Reclamation	1,603,885
- Finger pier	1,108,919
- RC wharf (piles) L=152 m	1,843,714
- RC wharf (RC sheet piles) L=138 m	2,511,035
- Retaining wall	1,674,304
- RoRo ramp (1 & 2)	478,580
- Revetment	156,647
- Demolition works	196,842
C. Civil works	2,611,171
D. Building works	2,332,565
E. Utilities	723,530
Subtotal (construction cost)	15,580,476
F. Contingency and taxes	3,428,305
- Physical contingency	779,024
- Price escalation	1,090,633
- Taxes and duties	1,558,648
G. Consulting services	1,246,438
Total project cost (A+B+C+D+E+F+G)	20,255,218

4.5 Isabela Port

The port of Isabela handled only domestic cargo traffic up to the present. The traffic cargo volume handled at this port as compared to the port of Zamboanga was very much smaller and most of the cargo traffic was transported to and from the port of Zamboanga. From 1980 to 1997, the cargo volume and passenger traffic is indicated as shown in Table 4.22.

Table 4.22 Cargo Volume and Passenger Traffic at Isabela Port (1980–1997)

Year	1980	1984	1985	1986	1987	1988	1989	1990
Cargo (MT)	115,723	107,005	102,807	109,681	110,069	116,336	138,972	153,198
Passengers	533,193	292,442	295,541	298,800	299,244	817,877	620,479	615,434

Year	1991	1992	1993	1994	1995	1996	1997
Cargo (MT)	116,781	119,312	137,114	160,223	187,210	175,072	198,793
Passengers	506,877	496,033	618,324	571,283	653,776	708,189	731,111

The cargo volume at the port in the past years was characterized by fluctuation. The trend in 1980 to 1985 was downward and decreased steadily to only 102,807 tons, which is equivalent to a negative growth rate of 2.34% per year. The cargo traffic started increasing in 1986 and for the period from 1885 to 1997, the trend was increasing at an average rate of 5.65% per year although the cargo volume went down in 1991. This decrease in volume may have been due to in the effect of the oil price increase in December 1990 and the power crisis that started in 1991. However, in spite of the decrease of volume, the trend for this period was a positive growth. The record of maximum volume in this period is 198,793 tons in 1997.

On the other hand, the port of Isabela handled 533,193 passengers in 1980. The number of passengers has increased to 731,111 in 1997. The average growth rate of passengers handled by the port was only 1.87% per year. The number of passengers went down to 292,442 in 1984, and decreased at the rate of 11.13% per year. However, the number increased in the succeeding years at the rate of 15.80% per year from 1985 to 1990 and by 2.49% per year from 1990 to 1997. The largest number of passengers recorded in this period was 817,877 in 1988, but the largest number of passengers until 2013 was 1,618,837 in 2004.

4.5.1 Present conditions of Isabela port

According to statistics of the Isabela port, cargo throughput was 106,195 tons in 2013 and the total length of the cargo berth is 300 m. The productivity of the Isabela port is only 354 ton/m/year. One of the reasons for the under-utilization of the port is the considerable cargo throughput decrease from 150,000 tons in 2004 to 100,000 tons in 2013 and the lack of a backup area behind the wharf. The total ship calls to the Isabela port was 3,745 in 2013, the average ship size was 283 GT and the average berthing time of the ships was 15 hours/call for loading and unloading in the record of 1980 to 1997.

The calling ports to and from the Isabela port are Zamboanga, Jolo and Bongao. The main commodities handled in the port are bottled cargo, petroleum products, palay/rice, cement (inbound), and copra and general cargo (outbound). In addition, deterioration of the port facilities was found in the feasibility study with the master plan port package V port of Isabela, Basilan in 2000 by PPA (FS PPA 2000). Urgent rehabilitation of the berthing facility should be undertaken for the handling of increased cargo volume and safety of the port operation. Typical damages are shown in Photos 23 and 24.

Photo 23: Peeled concrete cover and exposed re-bars

Photo 24: Badly damaged concrete pile of deck

4.5.2 Cargo and passenger forecast

Estimated cargo volume and passenger traffic at the Isabela port for 2019, 2022 and 2030 are indicated in Table 4.23.

Table 4.23 Cargo Forecast for Isabela Port in 2019, 2022, and 2030

Isabela port	Year	2019	2022	2030
	Cargo (MT)	129,118	145,240	170,172
	Passengers	1,443,345	1,568,013	1,752,480

4.5.3 Proposed port development

Estimated cargo throughput in 2030 is 170,172 tons per year which is smaller than the recorded maximum cargo throughput of 198,793 tons in 1997. The total berth length in 2000 was only 209 m but the berth length has been extended up to 300 m as of 2015. This means the present port capacity will be increased to more than 198,793 tons to accommodate the estimated cargo throughput in 2030. Also, the passenger forecast of 1,752,480 in 2030 is almost the same as the maximum record of the passengers of 1,618,837 in 2004. Therefore, expansion of the port facilities will not be necessary for the Isabela port. As mentioned above, however, urgent rehabilitation of the wharf structure such as concrete slab and piles should be made immediately for the handling of increased cargo volume and safety of the port operation. In addition, the apron width for the loading/unloading of cargo is very narrow at present and this causes the low productivity, and so it is recommended to expand the backup area to stack the incoming cargo temporarily from outside in order to load at night time.

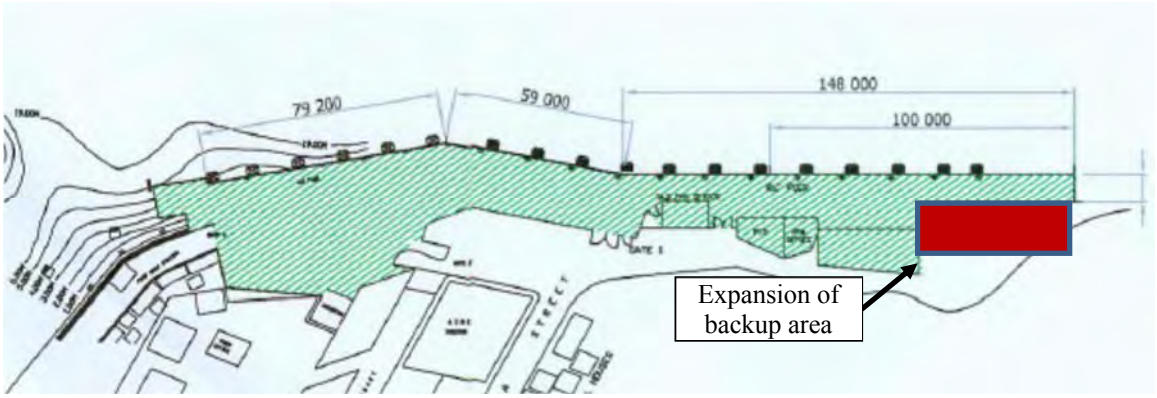


Figure 4.9 General Layout Plan of Isabela Port

4.5.4 PPA expansion plan and land acquisition by Provincial Government

A new port construction is proposed in the northern area based on the cargo throughput of 530,000 tons per year in the FS PPA 2000 as shown in Figures 4.10 and 4.11. For the new port, the provincial government purchased the land for the new port construction area south of Isabela City (Photo 25).

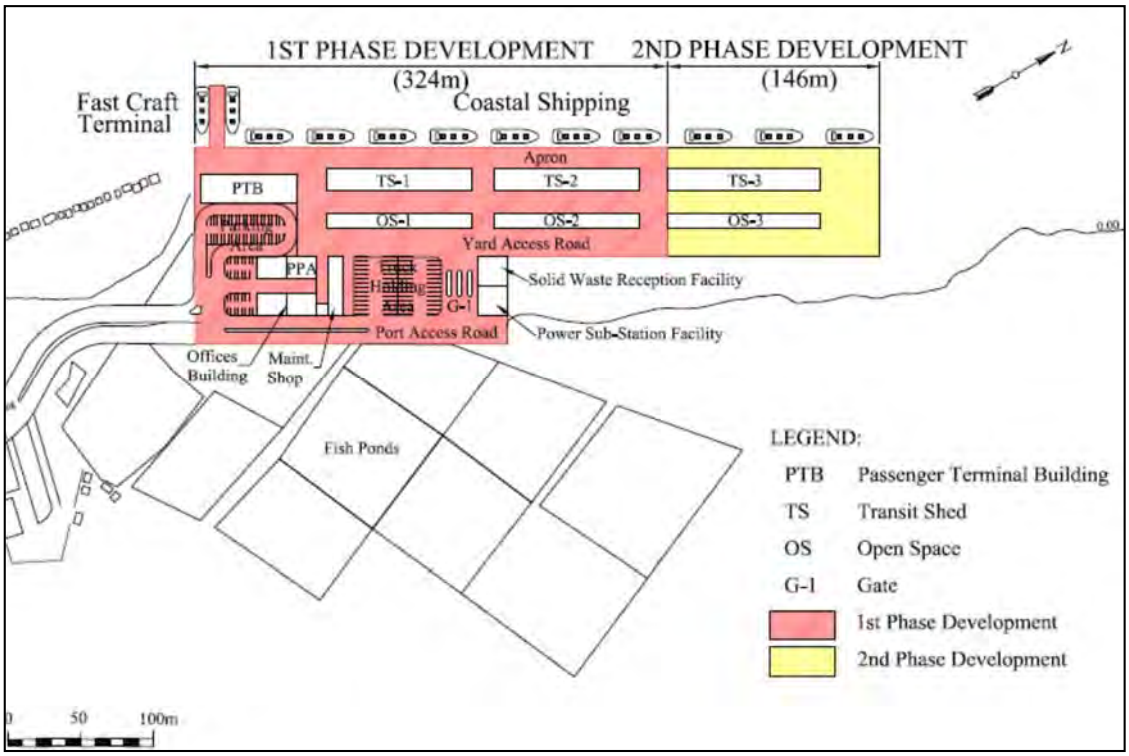


Figure 4.10 General Plan of New Isabela Port

Figure 4.11 Location Map of Proposed New Port

Photo 25: Land purchased by Provincial Government