

4. REGIONAL DEVELOPMENT SCENARIO

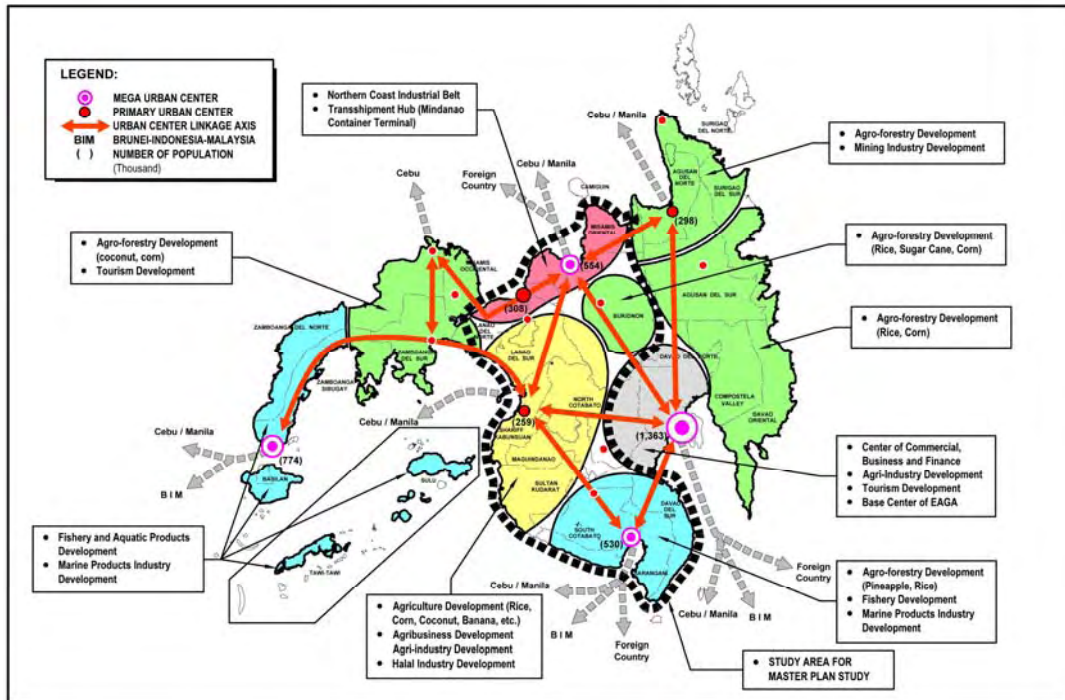
4.1 Regional Development Direction

Taking into account the present economic performance, accumulation of facilities, land uses, potential of land among others, the overall Mindanao regional development concept is formulated as shown in the figure below.

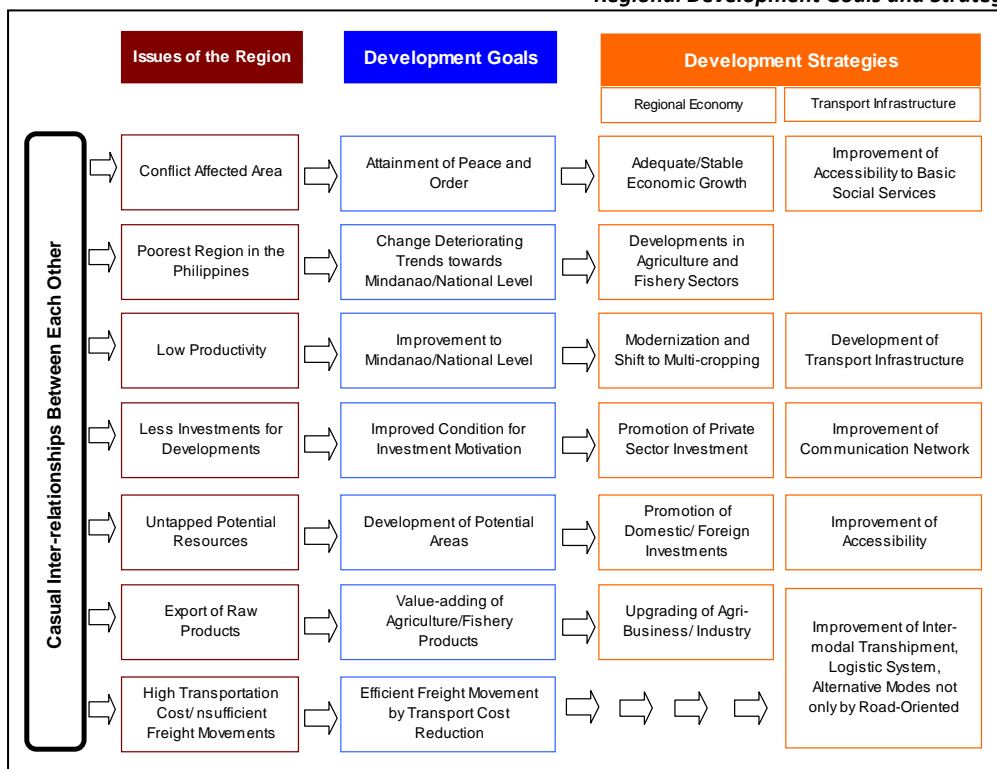
4.2 Regional Development Objectives and Strategy

Based on the review of several existing national/regional plans and development issues, regional development goals and strategies were established as shown in the figure below.

Overall Mindanao Regional Development Concept



Regional Development Goals and Strategy



4.3 Future Socio-economic Framework

a.) Population

The total populations of the Study Area are estimated to be 15.1million in 2015 (1.2 times of 2007), 16.9million in 2020 (1.34 times) and 18.7million in 2025 (1.49 times), respectively as shown in the table below.

Future Population

Region / Province	2007	2015	2020	2025
ARMM	4,120,795	5,022,700	5,625,500	6,235,400
Basilan	408,520	501,400	539,900	598,400
Lanao del Sur	1,138,544	1,338,300	1,468,300	1,627,500
Maguindanao	710,829	946,200	1,098,500	1,217,600
Shariff Kabunsuan	562,886	699,900	778,500	862,900
Sulu	849,670	970,700	1,055,500	1,169,900
Tawi-Tawi	450,346	566,200	684,800	759,100
Region X (Study Area only)	3,339,464	3,968,300	4,409,300	4,887,400
Bukidnon	1,190,284	1,430,400	1,623,000	1,799,000
Lanao del Norte	846,329	966,500	1,033,100	1,145,100
Misamis Oriental	1,302,851	1,571,400	1,753,200	1,943,300
Region XII	5,125,877	6,143,800	6,844,900	7,587,000
North Cotabato	1,121,974	1,753,800	1,917,700	2,125,700
Sarangani	475,514	742,800	817,800	906,500
South Cotabato	1,296,796	2,107,700	2,411,300	2,672,700
Sultan Kudarat	675,644	1,055,600	1,166,600	1,293,100
Cotabato City	259,153	483,800	531,400	589,100
Study Area Total	12,586,136	15,134,800	16,879,700	18,709,800

Population growth rates in the past and projected are shown in table below.

Population Growth Rates

Region	Actual Growth Rate (%)				Study Team's Assumption		
	1980-1990	1990-1985	1995-2000	2000-2007	2007-2015	2015-2020	2020-2025
ARMM	2.99	2.32	3.48	5.66	2.51	2.29	2.08
Region X	2.36	2.60	1.98	1.81	2.18	2.13	2.08
Region XII	3.37	3.48	2.65	2.46	2.29	2.19	2.08
Study Area Total			2.67	3.23	2.33	2.21	2.08
Philippines Total	2.35	2.48	2.15	2.15	2.08 (by NSC based on 2000 census)		

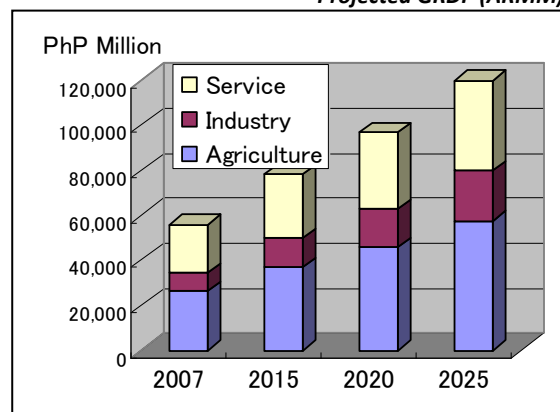
b.) Gross Regional Domestic Product (GRDP)

An assessment was carried out based on the assumption that all of the Study Area will be developed in the future in accordance with the proposed development scenarios. The results are summarized in the table below and also shown in the succeeding figures.

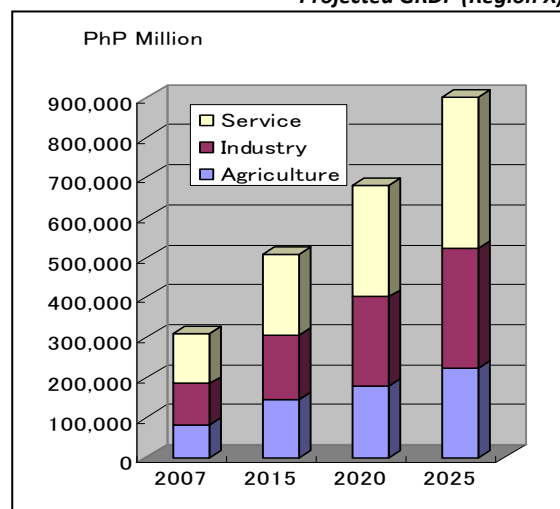
Projected GRDP By Region (PhP Million)

ARMM	2007 2015 2020 2025				Comparison Composition	
	2007	2015	2020	2025	2025/2007	in 2025 (%)
Agriculture	26,315	37,078	46,025	57,616	2.19	47.4
Industry	8,320	12,539	16,615	22,200	2.67	18.3
Service	21,248	28,684	34,471	41,780	1.97	34.4
Total	57,890	78,300	97,110	121,597	2.10	100.0
Region X						
Agriculture	81,478	143,640	179,629	223,327	2.74	24.6
Industry	102,686	162,611	221,499	300,005	2.92	33.0
Service	126,021	201,208	277,966	385,449	3.06	42.4
Total	310,186	507,459	679,094	908,781	2.93	100.0
Region XII						
Agriculture	86,944	129,013	168,886	218,688	2.52	41.1
Industry	72,432	101,051	125,629	159,854	2.21	30.1
Service	60,945	90,697	116,495	153,136	2.51	28.8
Total	220,322	320,761	411,009	531,679	2.41	100.0

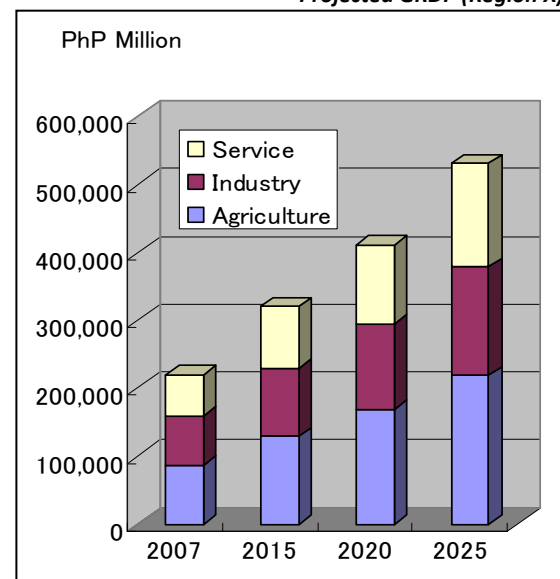
Projected GRDP (ARMM)



Projected GRDP (Region X)



Projected GRDP (Region XII)



5. ARMM ROAD SECTOR OVERVIEW

5.1 Legal Framework

a.) ARMM

The Autonomous Region in Muslim Mindanao (ARMM) was established by Republic Act (RA) No. 6734, dated 1 August 1989, also known as the Organic Act for ARMM.

RA 6734 was amended by RA 9054, dated 31 March 2001, to strengthen and expand the Organic Act. Under RA 9054, the province of Basilan and the city of Marawi were added to ARMM. Presently, ARMM is composed of the five provinces of Basilan, Lanao del Sur, Maguindanao, Sulu, and Tawi-Tawi, and the city of Marawi.

b.) DWPH-ARMM

The powers and responsibilities of ARMM pertaining to infrastructure programs and projects within the ARMM 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:

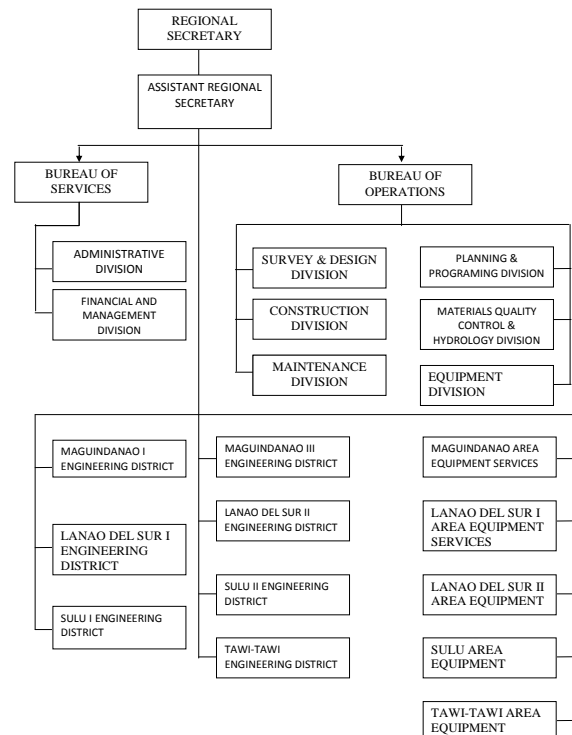
- Undertake and evaluate the planning, design, construction and works supervision for the infrastructure projects whose location and impact are confined within ARMM.
- Undertake the maintenance of infrastructure facilities within ARMM and supervise the maintenance of such local roads and other infrastructure receiving financial assistance from the national government.
- Ensure the implementation of laws, policies, programs, rules and regulations regarding infrastructure projects as well as all public and private physical structures within ARMM.
- Provide technical assistance related to their functions to other agencies within ARMM, especially LGUs.

- Coordinate with other National and Regional Government departments, agencies, institutions, and organizations, especially LGUs within ARMM in the planning and implementation of infrastructure projects.
- 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.
- 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.

5.2 Organizational Structure of DPWH-ARMM

DPWH-ARMM is headed by a Regional Secretary and assisted by a lone Assistant Regional Secretary. The Bureau of Operations is the technical group in the Regional Office proper that is directly involved in infrastructure development. The Bureau of Services on the other hand provides the administrative and financial services in support of the regional operations.

DPWH-ARMM Organizational Chart



5.3 Budgetary Framework

a.) Main Sources of ARMM Funds

The Regional Government has the power to create its own sources of revenues and to levy taxes, fees and charges, subject to the provisions of the Constitution and the Organic Act (RA 9054, Article IX, Section 1).

The sources of revenues of the Regional Government include, but are not limited to, the following (Article IX, Section 8):

- Taxes, except income taxes, imposed by the Regional Government.
- Fees and charges imposed by the Regional Government.
- Taxes, fees or charges for the registration of motor vehicles and for the issuance of licenses and permits for driving, except tricycles which shall be registered with the city/municipality.
- Shares and revenues generated from the operation of public utilities within the region.
- Appropriations, shares in the internal revenue taxes, block grants, and other budgetary allocations, coming from the national government.
- Block grants from economic agreements or conventions entered into or authorized by the Regional Assemble, donations, endowments, foreign assistance, and other forms of aid, subject to the pertinent provisions of the Constitution.

b.) National Government Funds for Infrastructure in ARMM

ARMM derives most of its funds for infrastructure programs and projects from the National Government – particularly from (i) the General Appropriations Act (GAA) which is authorized yearly by Congress and (ii) the Special Funds from the Motor Vehicle User’s Charge (MVUC) under RA 8794.

Table below summarizes the appropriations from 2006 to 2009, broken down into Personal Services (PS), Maintenance and Other Operating Expenses (MOOE), and Capital Outlays (CO). Also shown (in parentheses) are the appropriations for the infrastructure components of MOOE and CO.

Appropriations in the GAA (2006-2009) In Php Million

Category	2006	2007	2008	2009	2009 Breakdown	2009/ 2008
PS	4,456.4	5,075.1	5,144.7	6,173.6	66.7%	20.0%
MOOE	1,338.0	2,148.7	2,164.0	1,893.4	20.5%	-12.5%
MOOE for infra	(180.6)	(210.2)	(215.2)	(221.7)	(2.4%)	(3.0%)
Capital Outlays (CO)	846.8	1,420.5	1,022.7	1,182.0	12.8%	15.6%
CO for infra	(650.0)	(650.0)	(650.0)	(1,000.0)	(10.8%)	(53.8%)
Total	6,691.2	8,644.3	8,331.5	9,249.0	100.0%	11.0%

c.) GAA Capital Outlays under the ARMM Budget

Under the ARMM budget in the GAA, regular lump-sum appropriations have been authorized yearly from 2006 to 2009 for “Infrastructure Projects for the Implementation of DPWH-ARMM” in the amount of PhP 650.00 million. The budget for infrastructure however sharply increases from PhP 650.000 to PhP 1,000.0 million in 2009.

d.) Capital Outlays under DPWH-National Budget in GAA

Under its regular infrastructure program funded from the GAA, DPWH-National has been providing funds for, and is directly implementing, the construction/improvement of national roads in ARMM. This involves mainly foreign-assisted projects which are partly financed by loans from the Japan International Cooperation Agency (JICA), Kuwait Fund, and Saudi Fund, where the loan agreements specified that DPWH-National would be the implementing agency. DPWH-National has also provided funding for locally-funded national road construction projects in ARMM, mostly through Congressional Allocations (CA) which also financed local roads, flood control, water supply, and other local projects identified by the Congressmen concerned.

e.) Maintenance Funds for Infrastructure in ARMM

The maintenance of national roads and other infrastructure in ARMM is funded from two sources: (i) ARMM budget in the GAA and (ii) DPWH-National budget from the MVUC special funds.

f.) Maintenance Funds under ARMM Budget in GAA

Under the ARMM budget in the GAA, funds for the maintenance of roads and other infrastructure are provided under the item for Maintenance and Other Operating Expenses (MOOE) for the “implementation of infrastructure programs and projects (RDPWH).” These amounted to PhP 180.6 million in 2006, which modestly increased to PhP 221.7 million in 2009.

Annual Allocation for Maintenance of National Roads from GAA-ARMM (2006-2008)

District	Allocation, Php	EMK
Maguindanao	14,162,000	206.2
Shariff Kabunsuan	19,677,000	286.4
Lanao del Sur I	18,807,100	273.8
Lanao del Sur II	25,435,250	370.3
Marawi City	2,204,350	32.1
Sulu I	11,239,550	163.6
Sulu II	5,357,350	78.0
Tawi-Tawi	13,699,000	199.4
Total, ARMM	110,581,600	1,609.8

g.) Maintenance Funds under ARMM Budget from MVUC

DPWH-National provides funds from the Motor Vehicle User's Charge or MVUC (RA 8794) for the maintenance of national roads in ARMM as well as in the regular regions of DPWH-National.

DPWH-National Allotment of MVUC Funds for Maintenance of National Roads in ARMM (2006-2008)

	Amount in Php 1,000		
	2006	2007	2008
Basilan	31,556	8,819	10,693
Sulu	42,659	17,960	28,784
Maguindanao I	17,581	23,275	6,977
Maguindanao II	1,887		6,535
Lanao del Sur I	27,924	16,937	17,405
Lanao del Sur II	2,634	7,951	18,700
Tawi-Tawi	7,691	23,780	19,010
Marawi City	503	1,603	1,642
Total, ARMM	132,435	107,265	109,746

5.4 Road Project Implementation

The general rule in implementing road and other infrastructure projects of ARMM is provided in Section 6 of the Regional Public Works Act (PWA) which prescribes that all projects funded from appropriations authorized in the PWA shall be implemented by *either administration, public bidding, negotiated contract, or memorandum of agreement with local government unit, at the option of the project proponent, but the awards shall, in all cases, be made in a manner most advantageous to the government.*

Hence, the mode of implementation varied depending upon the recommendations of the project proponents – viz., ARMM officials for Regional Impact Projects (RIPs), Provincial Governors with Municipal Mayors for Provincial Impact Projects (PIPs), and ARMM Assemblymen for District Impact Projects (DIPs). The implementation modes included the following:

a.) Regional Impact Projects

- by administration by the DPWH-ARMM Construction Division, which, in some cases contracted private firms to provide portions of the required equipment, materials, and labor; or
- through MOAs with Provincial/Municipal Governments. In turn, these LGUs undertook the work by administration or by contract.

b.) Provincial Impact Projects

PIPs were carried out mostly through MOAs with Provincial/Municipal Governments, which undertook the work by administration or by contract.

c.) District Impact Projects

- by contract supervised by the DPWH-ARMM Construction Division or DEO;
- by administration by the DPWH-ARMM Construction Division, which sometimes contracted private firms to provide portions of the required equipment, materials, and labor; or
- through MOAs with Provincial/Municipal Governments, which undertook the work by administration or by contract.

5.5 Road Maintenance System

a.) Road Maintenance Bodies in ARMM

DPWH-ARMM has full responsibility for the maintenance of national roads and bridges.

Road Classification and Responsible Organization

Road Maintenance Classification	Responsible for Road Maintenance
National Road	DPWH-ARMM
Provincial Road	Provincial Government
City Road	City Government
Municipal Road	Municipal Government
Barangay Road	City or Municipal Government

b.) Allocated Maintenance Budget

The annual maintenance budget allocated to DEOs and AESOs is about 110 Million Pesos. The budget allocated to each of the eight (8) DEOs is about 10 Million Pesos to 25 Million Pesos depending on the National Road length.

c.) Annual Maintenance Work Program (AMWP) System

Generally, the draft Annual Maintenance Work Program (AMWP) is prepared by the DEO and AESO. The draft AMWP is integrated and reviewed by the Maintenance Division and Equipment Division in DPWH-ARMM headquarter, and they are responsible for seeking approval from the Regional Secretary.

d.) Implementation System of Road and Bridge Maintenance

Lately, the execution of maintenance works is carried out only by Maintenance by Administration (MBA) system although in the early years of the department, Maintenance by Contractor (MBC) was also utilized. The District Engineering Office (DEO) and the Area Equipment Service Office (AESO) have full responsibility over the execution of maintenance on the National Roads.

e.) Manpower in Maintenance Organization

The total number of DPWH-ARMM staff is 605 of which 127 are working in Regional Office headquarters and 20 to 70 staffs are working in each of the eight (8) offices of DEO depending upon the National Road maintenance length

required. About 15 to 40 staffs are working in each of the five (5) offices of AESO.

The Maintenance Division (MD) and Equipment Division (ED) in DPWH-ARMM headquarters are fully responsible of the road and bridge maintenance in good cooperation with DEO and AESO. The MD has seven (7) Engineers.

Number of Staff in DEOs and AESOs

	Staff at DEO	Staff at AESO
1) Shariff Kabunsuan	41	-
2) Maguindanao	32	41
3) Lanao del Sur (I)	73	37
4) Lanao der Sur (II)	20	-
5) Sulu (I)	75	41
6) Sulu (II)	45	-
7) Tawi-Tawi	59	14
8) Basilan	-	-

f.) Condition of Equipment in Area Equipment Service Office (AESO)

Major equipments that can be operated for the execution of maintenance works are mainly (i) dump-truck, (ii) bulldozer, (iii) vibrator, and (iv) concrete mixer. The workable equipments are very few. Major equipments are also waiting for repair for quite a long time. There is an extreme shortage in the number and type of equipments in each office of AESO. However, they cannot procure new maintenance equipments due to shortage of maintenance budget.

5.6 Database for Planning and Management

a.) Planning Database

The current database for national roads in DPWH-ARMM is deemed inadequate for planning and management of roads which considerably hampered the quality of work done by the regional planning staff.

- The road inventory for national roads consists mainly of Road Diagrams and Bridge Lists (RDBL) prepared by DEOs, following the old DPWH-National format.
- The RDBL, if properly prepared, would serve as a basic reference on the existing features and conditions of roads and bridges. It would be a useful, although not sufficient, input in preparing plans and programs for road improvement and maintenance.
- RDBL data, however, are not always accurate or complete and complete input data are seldom provided in the RDBL. DPWH-National

has already replaced the RDBL by the computerized Road and Bridge Information Application (RBIA) system.

- Some data on the condition of national roads are provided by DEOs to the DPWH-ARMM Maintenance Division, following the subjective ratings (good, fair, poor, bad) previously used by DPWH-National. DPWH-National has already replaced this method by the more objective and precise International Roughness Index (IRI) and Visual Road Condition (ROCOND) rating systems.
- Reliable traffic data needed for planning are not available.
- The planning database, as well as planning tools, of DPWH-National has been modernized and is supported by information and communication technology (ICT) systems. The DPWH-National database, however, has not included ARMM since the latter became autonomous.

b.) Maintenance Database

The existing database for roads described above is essentially used by both planning and maintenance staff. The programming and management of maintenance works on national roads in ARMM is greatly hindered by the following weak characteristics of the database, particularly as they relate to maintenance.

- The existing road inventory data are old and the data system which is largely provided by the RDBL is inadequate, as mentioned. Precise and up-to-date information on the actual conditions of the roads is wanting.
- Reliable information on bridge elements (span, pier, abutment), attributes (e.g., for span - deck, main members, secondary members, etc; for pier/abutment - main structure, foundation, scour protection, etc.), and condition (degree of deterioration) is scarce.
- There is no effective and regular system for inspecting roads and bridges, assessing conditions, identifying defects/damages and their degree of severity, and monitoring the changes in conditions over time. The data would be necessary in planning and costing appropriate repair, maintenance, or rehabilitation works.
- Records of "as-built" drawings of road, bridges and other structures are not systematically kept. Much less are these drawings updated to reflect the series of improvement and repair works done.

6. ROAD DEVELOPMENT LEVEL OF ARMM

6.1 Road Length

The length of surveyed national roads under the ARMM is about 891 km of which 71% are in good/fair condition. National road density of ARMM is the lowest in the country and less than ½ of national average.

Note: Road Density =
$$\frac{L}{\sqrt{P \times A}}$$

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

6.2 Pavement Type

ARMM's pavement ratio of 76.8% is slightly higher than the national average (71.5%), and the highest among Regions in Mindanao. Map showing pavement type of national roads in ARMM and in Regions X and XII is presented in the following page.

6.3 Pavement Condition

Paved national roads of ARMM have the following condition: 71.1% (good/fair), 22.3% (poor/bad) and 6.6% were not covered by the survey for security reasons.

National Road Length and Road Density of Each Region (2008)

Region		Population in Thousand (2007)	Land Area (sq.km.)	Road Length (km)	Road Density
Philippines (DPWH-National)		88,545	309,771	29,370	0.177
LUZON	NCR	11,553	620	1,032	0.386
	CAR	1,521	19,422	1,846	0.340
	Region I	4,546	13,013	1,610	0.209
	Region II	3,051	28,229	1,765	0.190
	Region III	9,721	22,015	2,032	0.139
	Region IV-A	11,743	16,873	2,404	0.171
	Region IV-B	2,560	29,621	2,185	0.251
Region V	5,110	18,156	2,197	0.228	
VISAYAS	Region VI	6,844	20,794	2,880	0.241
	Region VII	6,399	15,886	2,036	0.202
	Region VIII	3,913	23,251	2,372	0.249
MIN-DANAO	Region IX	3,230	17,047	1,218	0.164
	Region X	3,952	20,496	1,682	0.187
	Region XI	4,157	20,357	1,447	0.157
	Region XII	3,829	22,513	1,304	0.140
	Region XIII	2,293	21,478	1,358	0.194
ARMM (DPWH-ARMM)	4,121	33,511	891	0.076	

Pavement Ratio of National Road (2008)

Region		Total Road (km)	Paved Road (km)	Unpaved Road (km)	Pavement Ratio
Philippines		29,370	21,006	8,364	71.5%
LUZON	NCR	1,032	1,032	0	100.0%
	CAR	1,846	659	1,187	35.7%
	Region I	1,610	1,449	161	90.0%
	Region II	1,765	1,227	538	69.5%
	Region III	2,032	1,771	261	87.2%
	Region IV-A	2,404	2,063	341	85.8%
	Region IV-B	2,185	1,008	1,177	46.1%
Region V	2,197	1,587	610	72.2%	
VISAYAS	Region VI	2,880	2,176	704	75.6%
	Region VII	2,036	1,745	291	85.7%
	Region VIII	2,372	1,929	443	81.3%
MIN-DANAO	Region IX	1,218	836	382	68.6%
	Region X	1,682	1,170	512	69.6%
	Region XI	1,447	910	537	62.9%
	Region XII	1,304	814	490	62.4%
	Region XIII	1,358	629	729	46.3%
ARMM (DPWH-ARMM)	891	684	207	76.8%	

Pavement Type of National Roads



Road Condition Map



6.4 Number and Condition of Bridges in the ARMM

The total number of bridges along the national roads of the ARMM is 173. During the survey, some of the bridges were not visited due to security reasons which were marked as “unknown”. For the evaluation on the structural soundness of the bridges, the following were recorded: 4.6% (good), 64.7% (fair), 17.3% (poor), 8.7% (poor) and 4.6% (unknown).

As mentioned, the survey covered some strategic provincial roads and 16 bridges were recorded. Most of the bridges are Bailey type (75%) indicating that they are just temporary bridge.

Number of bridges to be replaced or rehabilitated is shown in the bottom table. The number of bridges judged to be “poor” in structural soundness and needs “major repair” is 24 bridges.

Bridges along National Roads

	Name of Province	Total No. of Bridge	RC	PC	STEEL	BAILEY	UN-KNOWN	Total
MAIN LAND	Lanao - I	35	27	1	3	4	0	35
	Marawi	5	1	2	1	1	0	5
	Lanao - II	26	24	0	1	1	0	26
	SK	23	15	1	4	3	0	23
	Mag - II	32	25	1	4	2	0	32
	Sub-total	121	92	5	13	11	0	121
ISLAND	Basilan	20	7	3	4	6	0	20
	Sulu-I	24	11	0	5	2	6	24
	Sulu-II	4	4	0	0	0	0	4
	Tawi-Tawi	4	2	1	0	1	0	4
	Sub-total	52	24	4	9	9	6	52
Total		173	116	9	22	20	6	173
Ratio			67%	5%	13%	12%	3%	100%

Bridges along Provincial Roads

	Name of Province	Total No. of Bridge	RC	PC	STEEL	BAILEY	UN-KNOWN	Total
MAIN LAND	Lanao - I	0	0	0	0	0	0	0
	Marawi	0	0	0	0	0	0	0
	Lanao - II	0	0	0	0	0	0	0
	SK	16	4	0	0	12	0	16
	Mag - II	0	0	0	0	0	0	0
	Sub-total	16	4	0	0	12	0	16
ISLAND	Basilan	0	0	0	0	0	0	0
	Sulu-I	0	0	0	0	0	0	0
	Sulu-II	0	0	0	0	0	0	0
	Tawi-Tawi	0	0	0	0	0	0	0
	Sub-total	0	0	0	0	0	0	0
Total		16	4	0	0	12	0	16
Ratio			25%	0%	0%	75%	0%	100%

Bridges to be Replaced or Rehabilitated

Reasons for Replacement	National Road			Provincial Road			Total
	Mailand	Island	Sub-total	Mailand	Island	Sub-total	
Temporary Bridge	13	9	22	22	0	12	34
"Bad" Structural Soundness	12	3	15	0	0	0	15
1-Lane Bridge	1	1	2	1	0	1	3
Load limit of 10 tons or less	7	1	8	0	0	0	8
Over flow at Girder Level	7	1	8	0	0	0	8
Number of bridges which have one of the above defects	35	14	49	12	0	12	61
Bridges Needed Major Repair	18	6	24	-	-	-	24

7. PRESENT AND FUTURE TRAFFIC DEMAND

7.1 Present Traffic Condition

High traffic volume was observed to concentrates in neighboring areas of large cities such as Cagayan de Oro City, Iligan City, and General Santos City. The traffic volume ranges between 4,000 and 7,500 in each location. On the other hand, AADT counted at the locations in neighborhood of Cotabato City is almost 1,500.

Traffic Volume in the Study Area (AADT)



7.2 Future Traffic Demand

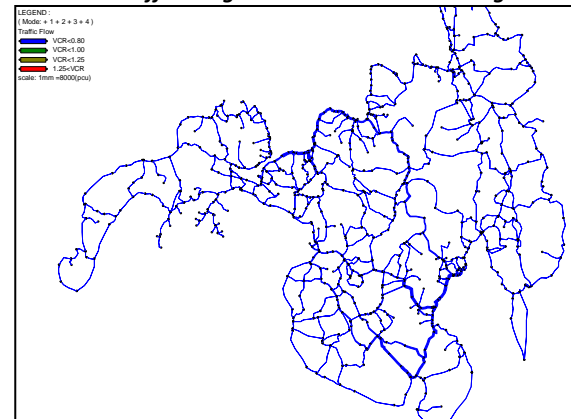
Traffic demand forecast attempts to quantify the amount of travel on a road network. Demand for transportation is estimated based on socio-economic activities. Supply of transportation is represented by the characteristics of road network. Below are the cases estimated by simulation. Congestion in the figures is (vehicle capacity ratio) represented by red color.

- Existing Case assigns the existing OD matrix on the existing highway network.
- Do-Nothing Case assigns the future OD matrix on the existing highway network.
- Master Plan Case assigns the future OD matrix on the future highway network (Master Plan network). This can check whether the master plan network meets the future travel demand and whether the mobility benefits of road users are maintained in the future.

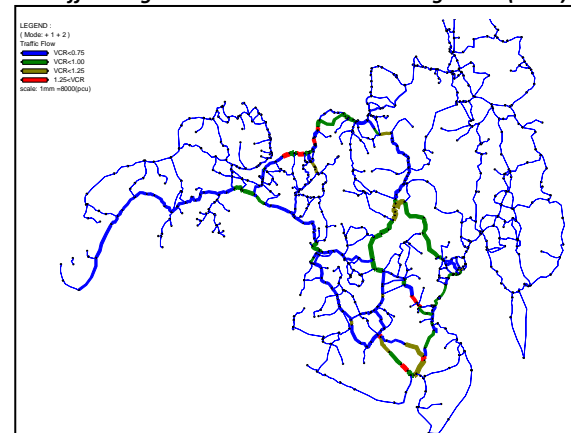
The impacts of road improvement through the Master Plan are:

- Total travel distance of 'Master Plan Case' indicates 22.0 million pcu*km while 'Do Nothing Case' is about 23.7 million (7% of wasteful detour travel may be improved).
- Travel time will improve by 23% (330.6 thousand for 'Master Plan Case' and 429.6 thousand for 'Do Nothing Case').
- Average travel speed indicates an improvement of about 20% (66 km/hr thousand for 'Master Plan Case' and 55.2 km/hr for 'Do Nothing Case').

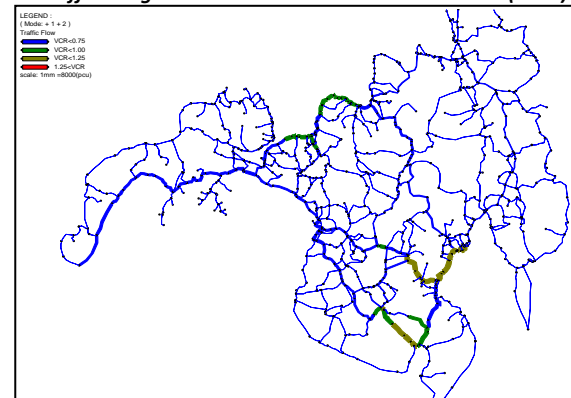
Traffic Assignment Simulation "Existing Case"



Traffic Assignment Simulation "Do-Nothing Case" (2025)



Traffic Assignment Simulation "Master Plan Case" (2025)



8. ROAD MAINTENANCE IMPROVEMENT PLAN

8.1 Road Maintenance Problems and Issues

Maintenance of National Roads in the ARMM has not been fully executed due to several problems and issues regarding implementation system.

a.) Road Maintenance Budget Problems and Issues

The total Annual Maintenance Budget allocated to ARMM is about PhP 220,357,000 while total National Road length to be maintained is about 951 km. Therefore, annual maintenance budget per km is about PhP 230,000/km. Results of the estimated maintenance cost were compared with the 2008 maintenance. Ideal road maintenance budget needs to be 2 or 3 times more than the 2008 budget.

Comparison of Budget and Maintenance Cost

	(a) Budget in 2008 (GAA+MVUC)	(b) Estimated Maintenance Cost			
		Gravel Road	PCC in Fair Condition	PCC in Bad Condition	PCC in Very Bad Condition
Budget / Maintenance Cost (per Km/Year)	231,711	799,000	454,000	562,000	776,000
b/a	-	3.4	2	2.4	3.3

b.) Road Maintenance Equipments Problems and Issues

There are only one or two Road Graders and Dump Trucks in each AESO and most of them are non-operational. Based on the conditions of maintenance equipment, the problems and issues are as follows:

- There is an extreme shortage in the number of operational maintenance equipments and spare parts.
- An increase in the number of non-operational maintenance equipments is expected when the existing budget conditions is continued.
- Proper implementation of road maintenance is not conducted due to shortage in the number of operational maintenance equipments and spare parts.
- Proper road maintenance may be carried out by providing additional maintenance equipments which may be rented from private companies.

c.) Manpower Problem and Issues

The average age of DEO staff is observed to be 47 to 48 years old while AESO's is about 46 to 47, quite higher compared with private companies. Basing from the data, about 35% of the total staff will be retired from service after 10 years. Consequently, about 50% will be retired in 20 years time, thus technology transfer on maintenance works to younger generation becomes important. Taking into account the above

conditions, the problems and issues of maintenance manpower are as follows:

- Staffs aged 40 years old and above occupy a major proportion of the total number of DEO and AESO staff, which is about 77%.
- Within 20 years, over 50% of total number of staffs will be retired.
- Technology transfer on road maintenance method to younger generation is important in order to ensure proper maintenance.

d.) Road Maintenance Implementation Organization Problem and Issues

Sufficient road and bridge inspection survey and the preparation of database have not been conducted. Therefore, effective planning and programming, scheduling and design works for road maintenance implementation becomes difficult. Considering the above mentioned conditions, the problems and issues for maintenance organization structure are pointed out as follows:

- The numbers of staff and organizational structure for road and bridge inventory survey are very weak. Therefore, there is no sufficient condition data.
- The numbers of staff and organizational structure for the preparation of database activities are very weak. Therefore, there is no sufficient road condition data by database.
- The number of staff and organizational structure for the preparation of planning and design are very weak. Therefore, it is very difficult to prepare the proper plan and program.

8.2 Road Maintenance Improvement Scenarios

a) Planning Goal and Policy

In the long run, sufficient road maintenance activities save overall road development cost as well as contribute to increase the economic benefits. Considering the importance of road maintenance works, the **“Creation or Establishment of Sustainable Maintenance System”** is identified as the planning policy and goal in this maintenance study.

b) Identification of Maintenance Implementation Scenario

The road maintenance improvement scenarios are identified based on the solution to the existing problems and issues as well as in consideration of the planning policy and goal of maintenance systems mentioned above.

The major problems and issues are summarized in the table as well as their corresponding solutions. Considering the existing maintenance problems

and issues, four (4) scenarios are identified as shown in the figure and in the table.

Relationship between Maintenance Problems and Scenarios

	Major Problems & Issues	Solutions	Scenario
Budget	Limited Budget	Proper prioritization of maintenance activities	Scenario 1
	No drastic increase expected	Selection of activity	
	Limited activities	Prepare basic data	
	Bad pavement condition		
Manpower	Imbalance of staff age	Reformation of staff	Scenario 2
	No technology transfer		
	Weak technical capability		
Maintenance Equipment	Decreasing No. of equipment in operational condition	MBC system introduced	Scenario 3
	Decreasing No. of spare parts	Decrease of MBA	
	Limited Budget		
	No expect procurement		
Organization	Decreasing No. of equipment	Restructuring	Scenario 4
	Decreasing No. of staffs		

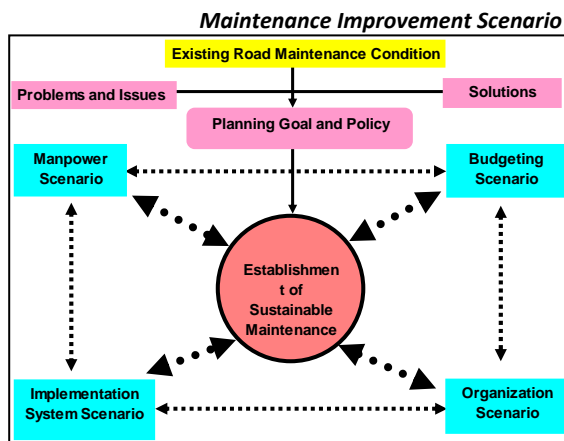
Approach 1: Within two (2) years, the road and bridge inspection works/ activities and the preparation of database activities on the road and bridge condition are reinforced as priority maintenance works.

Approach 2: During the ten (10) year period, the routine maintenance activities are reinforced/ increased gradually as the main activities for road maintenance.

Approach 3: During the ten (10) year period, the periodic maintenance activities are restrained/ decreased gradually, in accordance with the allocated maintenance budget and a decrease in the number of maintenance equipment operated.

▪ **Scenario 2: Reformation of Maintenance Manpower**

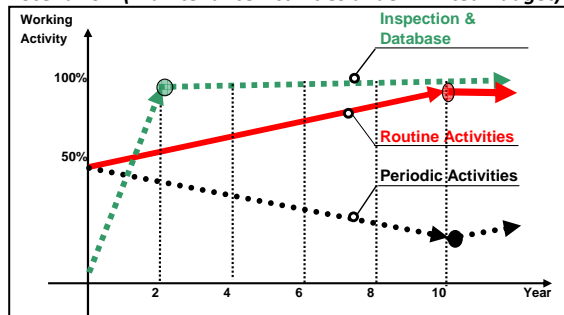
The composition of age group of staff is unbalanced and considering the maintenance technology transfer aspects, maintenance activities, and maintenance budget allocation, the following reformation of maintenance manpower conditions are proposed (see Figure below for the general image).



Scenario 1: Maintenance Activities under Limited Maintenance Budget

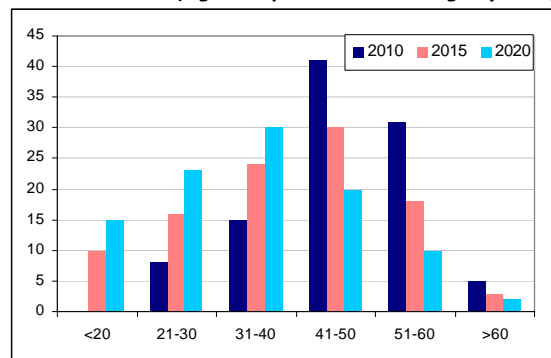
Considering the socio-economic conditions, existing road conditions, historical maintenance activities, and maintenance budgeting condition of ARMM, the following three (3) approaches for implementation of maintenance activities under the limited budget allocation are proposed.

Scenario 1 (Maintenance Activities under Limited Budget)



- (i) At present, the average age of staffs in EDO and AESO is estimated to be about 47 to 48 years old. The average age of staff will need to be decreased gradually.
- (ii) By year 2015, the average age of DEO and AESO staffs is reformed to about the early 40's age bracket.
- (iii) By year 2020, the average age of DEO and AESO staffs is reformed to about the late 30's age bracket.

Scenario 2 (Age Composition Percentage by Year)

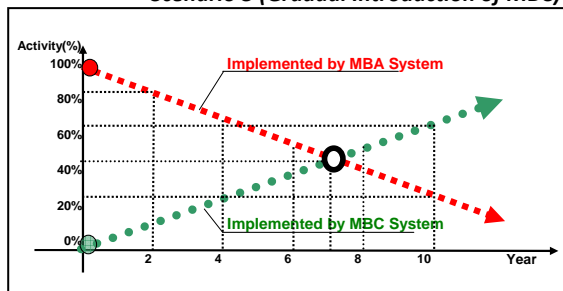


▪ **Scenario 3: Implementation System of Maintenance Activities**

Since there is very limited number of operational maintenance equipments in the AESOs, the number of operational maintenance equipments and spare parts is expected to gradually decrease. Taking into account the number of maintenance equipment and their conditions, the following four (4) reformations of maintenance implementation system are proposed (see Figure below for the general image).

- (i) The percentage share of MBA is to be decreased gradually.
- (ii) The percentage share of MBC is to be increased gradually.
- (iii) During the ten (10) year period, 50% of total maintenance activities are implemented by MBA and the remaining 50% by MBC system.
- (iv) During the fifteen (15) year period, 30% of total maintenance activities are implemented by MBA system and the remaining 70% are MBC.

Scenario 3 (Gradual Introduction of MBC)



▪ **Scenario 4 : Restructuring of Maintenance Implementation Organization**

National road maintenance works for a total road length of 995 km has been implemented by a total of 345 staffs of seven (7) DEOs and 133 staffs of the four (4) AESOs. In the future, the total number of staffs needed for the whole implementation of maintenance works may be increased gradually. Considering above mentioned conditions, the following four (4) approaches for the restructuring of organization are proposed;

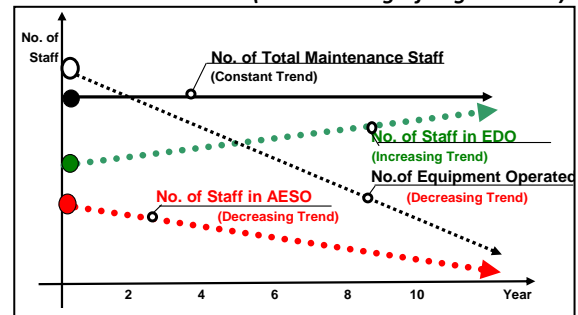
Approach 1: The total number of staff needed for the overall maintenance works in the future is kept at constant.

Approach 2: The numbers of staff in DEO is to be increased gradually, according to the reinforcement of maintenance activities in the future.

Approach 3: The numbers of staff in AESO is to be decreased gradually, in accordance with the decrease in the number of maintenance equipments and increase of MBC.

Approach 4: The number of staff taken out from the AESO is to be transferred to the DEO, in accordance with the above mentioned approaches.

Scenario 4 (Restructuring Of Organization)



8.3 Priority of Maintenance Activities

Since the maintenance budget is far below the actual requirements and maintenance level proposed by the Study could not be achieved, DPWH shall select priority maintenance activities focusing on the following aspects:

- Maintenance of paved carriageways shall be given top priority to protect past capital investment.
- Road maintenance of roads serving higher traffic volume shall be given higher priority than those serving less traffic.
- Maintenance of gravel/earth roads in very bad condition shall be given the lowest priority which is usually beyond economically maintainable condition. Instead, DPWH-ARMM should plan the capital investment for such roads to fundamentally improve the condition.
- Among routine maintenance works, cleaning of pipe-culverts, box-culverts and side ditches shall be given top priority, so that the pavement can be protected.
- Frequency of shoulder maintenance, roadside features and traffic/guide signs can be reduced.

9. CAPACITY DEVELOPMENT PLAN

9.1 Assessment of Present Capacity and Optimum Level of Capacity to be Attained and Assessment of Capacity Gap

This summarizes the preliminary analysis of (a) the present institutional capacity, including observed weaknesses and constraints, of DPWH-ARMM in undertaking the different core and support processes involved in the development and

management of national/regional roads in the region, (b) the suggested optimum level of institutional capacity that DPWH-ARMM needs to attain to perform those processes efficiently in the context of regional development objectives and plans, and (c) the resulting gap in capacity which should be bridged.

Present Capacity	Optimum Capacity to be Attained	Capacity Gap
<p>1. Planning</p> <ul style="list-style-type: none"> Lack of focus on core programs – medium-term projects not clearly related to each other and to regional dev. strategy; annual programs diffused to numerous local projects Low priority on asset preservation – overshadowed by construction projects Preoccupation with project pro-grams of work – little attention to broader road network planning Lack of systematic road network planning - to produce long/ medium-term and annual plans to meet development and preservation needs within budget constraints Inadequate road project preparation (FS) and prioritization – objective technical and economic criteria wanting; most personnel lacking FS skills Disconnect between plans/ programs and budgets – medium -term plans/programs not related to medium-term expenditure framework; projects in medium-term programs not reflected in annual budgets which have very few national/regional projects Weak database – especially road inventory and conditions and traffic counts; database relies on Road Diagram and Bridge List (RDBL) which gives incomplete/ old/inaccurate/unverified data; road condition data based on subjective ratings 	<ul style="list-style-type: none"> Focus on core programs and major final outputs – with strategic regional impact; first priority to asset preservation, then rehabilitation, improve-ment, and new construction; atten-tion to natl/ regl roads; local projects devolved to LGUs Rational road planning system – process-based and needs-oriented at all stages (strategic analysis to annual programs); integrated planning of network devt and asset preservation; participation of key stake-holders; adapting or linked with tested modern IT planning systems - e.g., DPWH-National HPM process, with RBIA, RTIA, PMS, HDM-4, BMS, MYPS, RMMS, TARAS; operational at Regional Office (RO) proper and DEOs Disconnect project preparation (FS) – for candidate road projects identified thru the proposed planning system; operational at RO proper and DEOs Harmonized plans/programs and budgets – with forward estimates for existing/approved programs, plus new projects from the planning process, within budget ceilings Adequate computerized database - incl road/bridge attributes and conditions, traffic, costs, etc; preferably linked to DPWH-National database (RBIA, RTIA, BMS); DPWH-ARMM able to do road and traffic surveys to generate info; database operational at RO proper and DEOs Strong staff competency on above - at RO proper and DEOs 	<ul style="list-style-type: none"> Focus on core programs and major final outputs – with strategic regional impact Rational road planning systems - national/regional roads process-based and needs-oriented at all stages; integrated planning of network devt and asset preservation; participation of key stake-holders; adapting or linking up with tested modern planning systems - e.g., DPWH-National HPM process and tools; Enhanced project preparation (FS) – for candidate projects Harmonized plans/programs and budgets – with forward estimates and new projects from the planning system, within ceilings Adequate computerized database – incl. surveys; preferably linked to DPWH-National database Strong staff competency on above
<p>2. Design</p> <ul style="list-style-type: none"> Limited staff and equipment – 10 personnel and 1 total station in Survey and Design Division vs hundreds of projects; limited soil investigations Uncertain quality of survey data and design – inadequate survey data affects the quality of design; thus, the integrity and performance of the structures is compromised 	<ul style="list-style-type: none"> Adequate design preparation and appraisal – in-house surveys and designs and supervision of contracted surveys/designs; at Survey and Design Division and DEOs Outsourcing of surveys and designs – esp. for larger/complex projects Access to DPWH-National design software – e.g., Civil3D and STAAD Strong staff competency on above - at RO proper and DEOs 	<ul style="list-style-type: none"> Enhanced design preparation and appraisal Outsourcing of surveys and designs Access to DPWH-National software Strong staff competency on above
<p>3. Construction</p> <ul style="list-style-type: none"> Unclear basis for selection of implementation mode – mainly based on proponent's preference Inadequate staff and equipment for const. by administration – most works actually 	<ul style="list-style-type: none"> Construction by contract as general mode – works by admn only when bidding fails. Adequate construction supervision on all projects – with min. defects, delays, 	<ul style="list-style-type: none"> Construction by contract as general mode Adequate construction supervision on all projects - with min. defects, delays, overruns

<p>contracted</p> <ul style="list-style-type: none"> • Strained capacity for const. supervision – meager staff vs numerous projects; most staff lacking training; no operations manual • Insufficient monitoring – no independent validation 	<p>overruns; use of operating manuals; capacity at RO proper and DEOs. Local projects devolved to LGUs, and national roads devolved from DPWH-National</p> <ul style="list-style-type: none"> • Effective monitoring – with CSO partner; at RO proper and DEOs • Adequate staff competency on above - at RO proper and DEOs 	<ul style="list-style-type: none"> • Effective monitoring –with CSO • Enhanced staff competency on above
<p>4. Maintenance</p> <ul style="list-style-type: none"> • Limited maintenance funding – programmed Php 220 million is 35% of needs. • Sub-optimal allocation and use of funds – not based on needs assessment; use of old EMK and judgment on allocating lump sums to road sections • Insufficient database – old/ incomplete/inaccurate data; subjective condition ratings; unverified data • Inadequate inspection and work programs – no system and manual; most staff lack skills • Preponderance of maintenance by administration – meager in-house equipment and staff for admn work; limited exposure and skills on MBC • No truck overloading controls – no weighbridges and load data 	<ul style="list-style-type: none"> • Sufficient and sustained funding level to cover maintenance needs - as top budget priority, based on life-cycle network analysis using rational planning systems • Efficient allocation and use of maintenance funds – based on needs, using RMMS, HDM-4, BMS • Reliable database for maintenance - incorporated in the overall database (item 1); DPWH-ARMM DEOs, under supervision of Maint. Division, able to do road/bridge attributes and conditions surveys to provide info for the database • Effective inspection and work programs – using modern systems and manuals; operational at RO proper and DEOs • Maintenance by contract (MBC) as dominant mode – including LTPBMCs; proficiency in planning and supervising MBCs/LTPBMCs at RO proper and DEOs • Effective vehicle load controls – sufficient weighbridges and strict enforcement of load limits • Good quality of roads – on the entire network of national/regional roads • Adequate staff competency on above - at RO proper and DEOs 	<ul style="list-style-type: none"> • Sufficient and sustained funding level to cover maintenance needs - as top budget priority • Efficient allocation and use of maintenance funds – based on needs, using RMMS, HDM-4, BMS • Reliable computerized database – incorporated in the overall database; DPWH-ARMM capable of road/ bridge attributes and conditions surveys to provide info for the database • Enhanced inspection and work programs – using modern systems and manuals • MBC as dominant mode – incl LTPMC; capacity for planning and supervising MBCs incl LTPBMCs • Effective vehicle load controls – sufficient weighbridges and strict enforcement of load limits. • Good quality of roads – on the entire network of national/regional roads • Enhanced staff competency on above
<p>5. Support Systems</p> <ul style="list-style-type: none"> • Financial management: conventional budgeting and accounting systems; internal audit unit needs strengthening • Procurement - Basic capacity per RA 9184; manually operated • Human resource management (HRM): low productivity at 2.7 km/worker; too centralized at 21%-79% distribution of RO proper-field personnel • Equipment management: only 71 units (36 operational) for 974 km 	<ul style="list-style-type: none"> • Financial management: use of eNGAS at RO proper and DEOs; internal audit units at RO proper and DEOs able to do systems and risk-based audits • Procurement: continuous training at RO proper and DEOs; computerized contractors' registry, eligibility check and cost estimation; posting bid docs at website; use of procurement manual • HRM: Rationalization based on above core programs and realigned functions; 40% increase in km/ worker productivity; RO-field personnel distribution at 10%-90% • Equipment management: liquidation or phase-out of equipment (with separation pay) since work is mostly to be done by MBC 	<ul style="list-style-type: none"> • Financial management: use of eNGAS; internal audit units able to do systems and risk-based audits. • Procurement: continuous training; computerized contractors' registry, eligibility check, and cost estimation; posting bid docs at website; use of procurement manual • HRM: Rationalization based on above core programs and realigned functions; increase in km/ worker productivity; reduction of RO-field personnel distribution • Equipment management: liquidation or phase-out of equipment (with separation pay) since work is mostly to be done by MBC

9.2 Capacity Development Scenarios

To bridge the gap between the present institutional capacity and the suggested optimum level of capacity of DPWH-ARMM in road development, it is essential to adopt a phased program to build up the institutional capacity to eventually reach the optimum level for the key

processes of road development and management. This program could be initially reflected in terms of snapshot visions or scenarios of the institutional capacity that must be in place and operational at DPWH-ARMM by the end of two target years - 2012 and 2015 - as depicted in table.

Scenario by End-2012	Scenario by End-2015
<p>1. Planning</p> <ul style="list-style-type: none"> • Focused mainly on core programs and major final outputs – with strategic regional impact; first priority to asset preservation, followed by rehabilitation, improvement and new construction; programs contain not more than 30% allocation for local projects • Rational road planning systems – operational at ARMM RO proper with links to DEOs: process-based, needs-oriented at all stages, integrating network development and asset preservation needs; with full participation of key stakeholders; adapting or linked with modern IT planning systems and tools - e.g., DPWH-National HPM process, incl. RBIA, RTIA, PMS, HDM-4, BMS, MYPS, RMMS, TARAS. • Adequate project preparation (FS) – for candidate projects identified from the proposed planning system; proficiency at RO proper for major projects • Harmonized plans/programs and budgets - with 80% match, including forward estimates and new projects from the planning system • Adequate computerized database – operational at RO proper, linked to DPWH-National database. RO proper and DEOs capable of conducting road and traffic surveys for the database. • Strong staff competency on above 	<p>1. Planning</p> <ul style="list-style-type: none"> • Focused fully on core programs and major final outputs - with strategic regional impact; first priority to asset preservation, followed by rehabilitation, improvement and new construction; programs contain not more than 10% allocation for local projects • Rational road planning systems – operational at RO proper and DEOs • Adequate project preparation (FS) – proficiency at RO proper for major projects, and DEOs for smaller projects • Harmonized plans/programs and budgets – with 100% match • Adequate computerized database - operational at RO proper and DEOs, linked to DPWH- National. RO proper and DEOs capable of conducting road and traffic surveys for database. • Strong staff competency on above
<p>2. Design</p> <ul style="list-style-type: none"> • Adequate design preparation and appraisal – in-house and contract supervision capability at Survey and Design Division • Outsourcing of surveys and designs –for 60% of the projects • Access to DPWH-National design software – by RO proper • Strong staff competency on above 	<p>2. Design</p> <ul style="list-style-type: none"> • Enhanced design preparation and appraisal – in-house and contract supervision capability at Survey and Design Division and DEOs • Outsourcing of surveys and designs – for 90% of the projects • Access to DPWH-National design software –by RO proper and DEOs • Strong staff competency on above
<p>3. Construction</p> <ul style="list-style-type: none"> • Construction by contract as general mode – for 70% of projects • Adequate construction supervision – with minimum defects, delays, overruns, for 70% of the projects • Effective monitoring – with CSO partner – at RO proper, covering major projects • Adequate staff competency on above 	<p>3. Construction</p> <ul style="list-style-type: none"> • Construction by contract as general mode –for 90% of projects • Adequate construction supervision - with minimum defects, delays, overruns – for 90% of the projects • Effective monitoring – with CSO partner – at RO proper and DEOs, covering all projects • Adequate staff competency on above
<p>4. Maintenance</p> <ul style="list-style-type: none"> • Funding level for road maintenance - covering 70% of the needs • Efficient allocation and use of maintenance funds - based on needs, using RMMS, HDM-4, BMS – with 75% match between program and actual allocation • Reliable computerized database (incorporated in overall database) - operational at RO proper, with DEOs, under supervision of Maint. Division, able to conduct road/bridge attributes/condition surveys for the database • Effective inspection and work programs – at RO proper and DEOs, covering 75% of the roads • Maintenance by contract (MBC) as dominant mode – for 60% of the works including LTPBMCs • Effective vehicle load controls – 60% of required weighbridges operational with strict enforcement of load limits • Good quality of roads – on 70% of the network based on ROCOND/IRI • Adequate staff competency on above 	<p>4. Maintenance</p> <ul style="list-style-type: none"> • Funding level for road maintenance - covering 100% of the needs • Efficient allocation and use of maintenance funds - based on needs, using RMMS, HDM-4, BMS – with 95% match between program and actual allocation • Reliable computerized database (incorporated in overall database)- operational at RO proper and DEOs, with DEOs conducting road/bridge attribute/condition surveys for the database • Effective inspection and work programs – at RO proper and DEOs, covering 100% of roads • MBC by contract as dominant mode – for 90% of the works including LTPBMCs • Effective vehicle load controls – 90% of required weighbridges operational with strict enforcement of load limits • Good quality of roads – on 90% of the network based on ROCOND/IRI • Adequate staff competency on above

<p>5. Support Systems</p> <ul style="list-style-type: none"> Financial management: eNGAS operational at RO proper; RO internal audit unit able to do systems and risk-based audits Procurement: 70% of BAC/TWG/Secretariat members trained; computerized contractors' registry, eligibility check, and cost estimation system operational at RO proper; bid docs posted at website; procurement manual used Human resource management (HRM): 60% implementation of rationalization plan based on core programs and realigned functions; 20% increase in km/ worker productivity; 15%-85% distribution of RO-field personnel Equipment management: liquidation or phase-out of 60% of equipment (with separation pay) since work is mostly by MBC 	<p>5. Support Systems</p> <ul style="list-style-type: none"> Financial management: eNGAS operational at RO proper and DEOs; RO and DEO internal audit units able to do systems and risk-based audits Procurement: 95% of BAC/TWG/Secretariat members trained; computerized contractors' registry and eligibility check, and cost estimation system operational at RO proper and DEOs; bid docs posted at website; procurement manual fully used HRM: 90% implementation of rationalization plan based on core programs and realigned functions; 40% increase in km/ worker productivity; 10%-90% distribution of RO-field personnel Equipment management: liquidation or phase-out of 90% of equipment (with separation pay) since work is mostly by MBC
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9.3 Priority Areas for Institutional Capacity Development

DPWH-ARMM reviewed the scenarios by the Study and identified and ranked ten priority areas for institutional development.

Area	Rank
a.) Road Database (Road Bridge and Information Application or RBIA)	1
b.) Traffic Database (Road Traffic Information Application or RTIA)	2
c.) Bridge Management System (BMS)	3
d.) d. Multi-Year Programming and Scheduling (MYPS)	4
e.) Pavement Management System/Highway Development and Management Version 4 (PMS/HDM-4)	5
f.) Maintenance Planning and Programming	6
g.) Road Network Planning System (DPWH Highway Planning Manual)	7
h.) Computerized Road Design Systems	8
i.) Budgeting within Organizational Performance Indicator Framework (OPIF) and Medium-Term Expenditure Framework (MTEF)	9 and 10
j.) Project Preparation: Feasibility Studies	9 and 10

systems under priority areas (c) to (j), using the database installed in Stage I.

- **Stage III (2014-2015):** This will involve the enhancement of the database and planning systems established in Stages I and II.

9.4 Programming of Institutional Capacity Development

Based on these ten priority areas, the Institutional Capacity Development (ICD) Plan for DPWH-ARMM will be implemented in three stages:

- **Stage I or Short-Term Program (2010-2011):** This will cover the development and installation of an operational database for roads and road traffic – i.e., priority areas (a) and (b) above. This is because an accurate and reliable database is fundamental to effective road planning and management.
- **Stage II (2012-2013):** This will involve the adaptation and application of road planning

10. ROAD NETWORK DEVELOPMENT MASTER PLAN

10.1 Possible Investment Capital

c.) Past Capital Investment

Past capital investment for the road sector is shown below.

DPWH-National

- Quite high growth rate for the road sector investment was recorded from 2005 to 2009 at 40.7% per annum.
- Allocation to Region X, Region XII and Road Project within ARMM
 - Region X (1.8% - 6.1% of National Road Budget)
 - Region XII (0.7% - 4.3% of National Road Budget)
 - ARMM (1.3% - 3.6% of National Road Budget)

DPWH-ARMM

- Allocation to infrastructure has been constant and no increase was made from 2006 to 2008.
- Allocation to a road sector from infrastructure budget is decreasing.
- Allocation of infrastructure budget to a road sector of mainland provinces ranged from 36% to 38%.

d.) Estimate of Possible Investment for the Study Area

Based on the past trend, capital investment was estimated on the following assumptions;

DPWH-National

- DPWH-National's capital investment for the road sector will increase by 5% to 10% per annum.
- Allocation of DPWH-National's road budget to Region XII and ARMM through DPWH-National
 - Region X (5.1%)
 - Region XII (4.5%)
 - ARMM (1.5%)

DPWH-ARMM

- Infrastructure budget will increase by 5% to 10% per annum.
- Allocation from infrastructure budget to a road sector will be as follows;
 - Mainland Provinces (38%)
 - Island Provinces (32%)

Adopting conservative assumptions, i.e. DPWH-National's budget will increase at 5% per annum, and ARMM's infrastructure budget will increase at 5% per annum, possible investment for road sector on the Study Area are shown in the bottom table.

Past Investment for Road Sector

Unit: Million Pesos

		2005	2006	2007	2008	2009	Average Annual Growth Rate (%)			Remarks
							05-09	06-09	06-08	
DPWH-National	TOTAL	19,193 (100%)	24,884 (100%)	31,127 (100%)	45,962 (100%)	75,428 (100%)	40.7%	44.7%	35.9%	
	Region X	829 (4.3%)	701 (2.8%)	569 (1.8%)	1,879 (4.1%)	4,622 (6.1%)	53.7%	87.5%	63.7%	
	Region XII	235 (1.2%)	183 (0.7%)	1,238 (4.0%)	1,995 (4.3%)	2,207 (2.9%)	75.0%	129%	230%	
	Projects within ARMM (National Road)	-	328 (1.3%)	568 (1.8%)	1,653 (3.6%)	1,179 (1.6%)	-	-	124%	Basically for Foreign-assisted Projects within ARMM
Infrastructure and Road Budget from GAA Allocation to ARMM Government	Infrastructure		-	650 (100.0%)	650 (100.0%)	650 (100.0%)	-	-	-	0%
	Mainland	National Road	-	0	12	0	-	-	-	-
		Local Road	-	246	237	232	-	-	-	-
		Total	-	246 (38%)	249 (38%)	232 (36%)	-	-	-	-2.9%
	Island Provinces	National Road	-	23	10	0	-	-	-	-
		Local Road	-	167	198	143	-	-	-	-
		Total	-	190 (29%)	208 (32%)	143 (22%)	-	-	-	-13.2%
	Total	National Road	-	23	22	0	-	-	-	-
		Local Road	-	413	435	375	-	-	-	-
		Total	-	436 (67%)	457 (70%)	375 (58%)	-	-	-	-7.3%

Estimated Possible Investment for Road Sector

(Unit: Million PhP)

		2011-2015	2016-2020	2021-2025
DPWH-National	Region X	21,900	27,900	35,600
	Region XII	19,700	25,200	32,100
	Projects for ARMM	6,600	8,300	10,700
ARMM Government	Mainland Provinces	1,433	1,829	2,334

10.2 Road Network Development Scenario

a.) Issues

Road network development issues were identified as follows:

ISSUES

- **Road Density**
Road Density is the lowest in the country, only ½ of the other areas of the Philippines.
- **Pavement Ratio**
Pavement ratio is slightly higher than the DPWH-National's level. However, there are still 207 km of national road remains unpaved.
- **Road Condition of Paved Roads**
Paved road condition in ARMM is much better than those of DPWH-National, but still 152 km of paved roads are in bad/very bad condition.
- **Missing Link**
There are 7 missing links, thus wide areas remain inaccessible, and people are forced to make a long detour. Hence, there are many areas with accessibility problems.
- **Road Maintenance**

Road maintenance needs to be strengthened, but fund is limited.

b.) Strategies

Road network development strategies in relation to visions were established as shown below;

VISION

- Road Network for Universal development of all areas which contributes to peace building
- Road Network for Agro-fishery development and Poverty Reduction
- Road Network for smooth mobility

STRATEGY

- Increase Road Density
 - Improve Provincial Roads to National Road Standards
 - Construction of new roads, but selectively
- Eliminate missing links
- Improvement of gravel/earth roads to paved roads
- Rehabilitation of paved roads in bad/very bad condition
- Preservation of existing road assets by intensified road maintenance
- Improvement of Farm-to-Market roads

c.) Targets

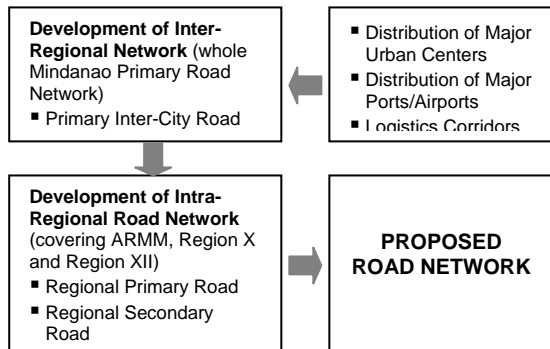
Road network development targets were established as shown below;

	Present	By 2015	By 2025
Road Density (including upgrading of Provincial Roads)	0.076	0.085 (+100 km)	0.095 (+120)
Pavement Ratio	76.8%	80% (+30 km)	95% (+130 km)
Road in Good/Fair Condition	71.1%	80% (+65 km)	95% (+130 km)
Number of Missing Link	7	5 (remove 2 missing links)	0 (remove 5 missing links)
Temporary Bridges/ Bridges Need Replacement	35	25 (10 bridge replacement)	0 (25 bridge replacement)

10.3 Proposed Future Road Network

a) Procedure to Develop Future Road Network

Procedure to develop future road network is illustrated below.



Primary Inter-City Road

- Major road which connects Mega Urban Centers, Primary Urban Centers, Secondary Urban Centers, and major ports and airports to each other.
- Major road which functions as a logistic corridor in Mindanao Island.
- Major road which provides access to Nautical Highway.

Regional Primary Road

- Major road which links Primary Inter-city Road each other.
- Important road within the Region to form regional physical framework for even development.

Regional Secondary Road

- Major road which links Primary Inter-city Roads and Regional Primary Roads each other
- Functions as collector/distributor road.

b.) Primary Inter-city Road Network in Mindanao

Urban centers are dependent on each other for their economic and social activities. Inter-Regional Road Network should be planned to connect important urban centers. Urban centers were classified into 3 categories.

URBAN CENTERS CLASSIFICATION

Mega Urban Center	Population over 500,000 with base port and/or port
Primary Urban Center	Population between 200,000 and 500,000
Secondary Urban Center	Population between 100,000 and 200,000 and Provincial capital with population less than 100,000

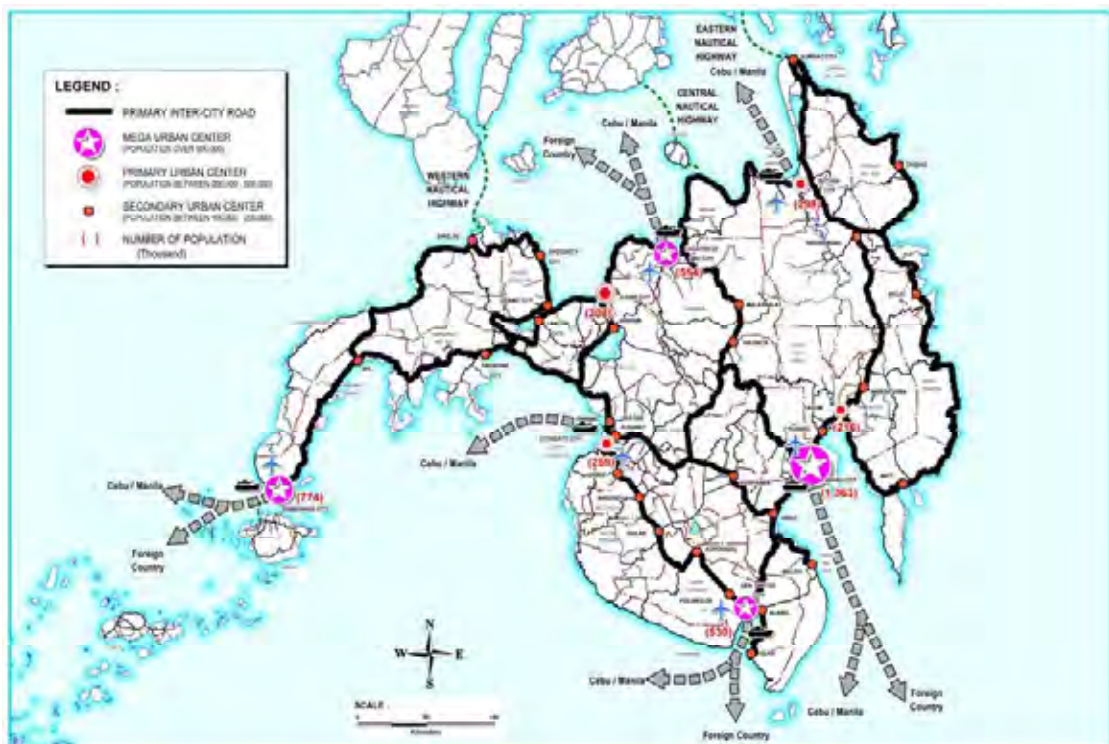
c) Regional Primary and Secondary Roads

Basic concepts to form Regional Primary and Secondary Road Network are as follows:

- To form flexible road networks around Cotabato City by linking three Primary Inter-city Roads with each other.
- To form an alternative route to connect Cotabato City with General Santos City.
- To form major links to connect two Primary Inter-city Roads with each other.

d) Proposed Road Network

Proposed road network comprising of Primary Inter-city Road, City Road, Regional Primary Road and Regional Secondary Road was formulated as shown in Figure 10.3-1.



Inter-city Road Network and Distribution of Urban Centers in Mindanao

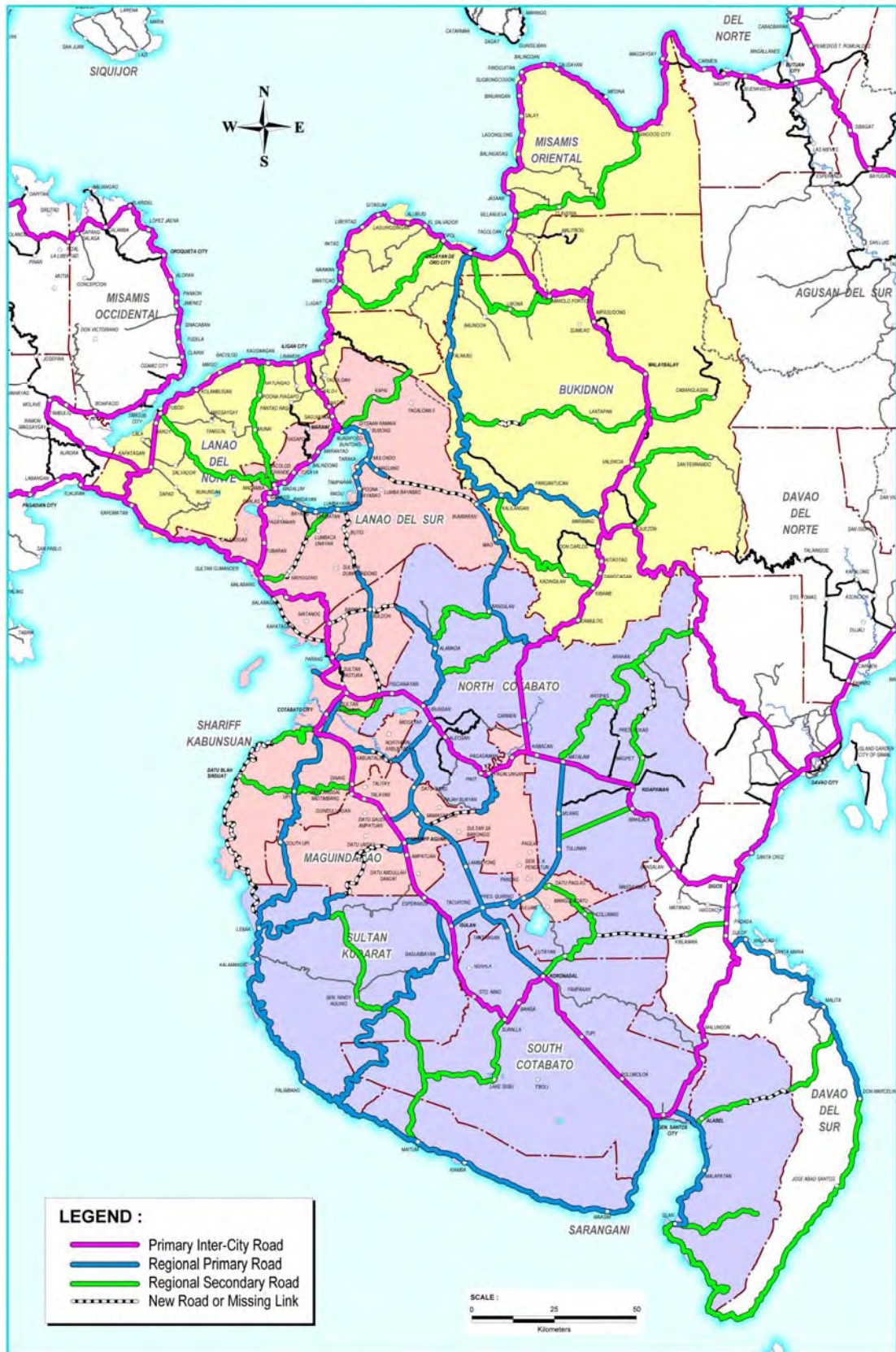
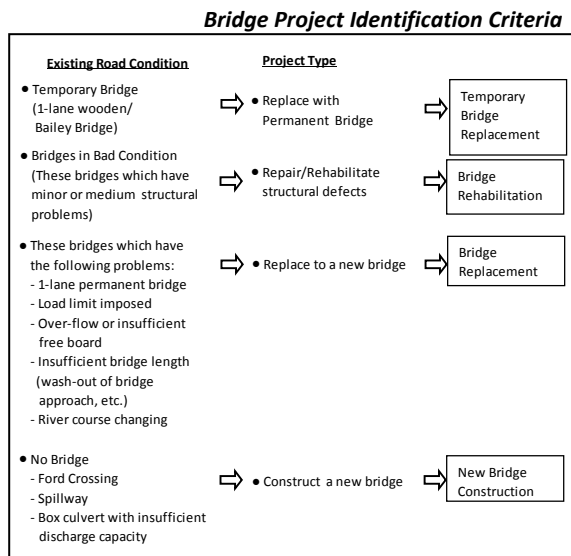
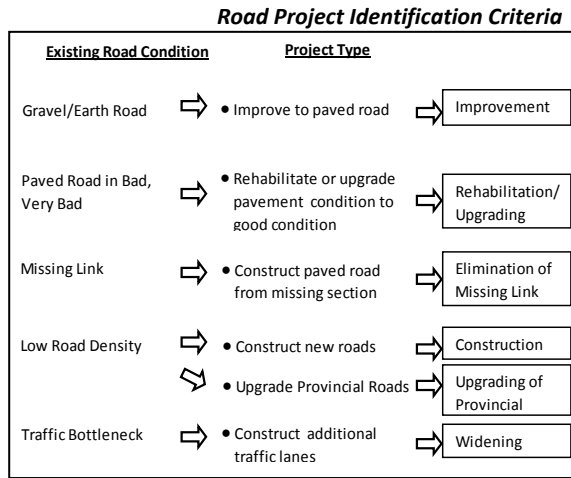


Figure 10.3-1 Proposed Road Network for ARMM, Regions X and XII

10.4 Project Identification

Project Identification criteria were established as follows;



10.5 Project Prioritization

The Study Team had a series of discussions with DPWH-ARMM Counterpart Team and jointly developed the following project prioritization criteria.

Evaluation Items	Weight
1) Road Class	5
2) Degree of Inconvenience/Problem	15
3) Economic Return	25
4) Contribution to Agricultural Development	15
5) Type of Work	25
6) Environmental Impact	5
7) Synergy Effect to Other Related Projects	5
8) Consistency to Regional Development Plan	5
TOTAL	100

Project implementation priority of ARMM, Region X and Region XII is shown in Table 10.5-1, Table 10.5-2, and Table 10.5-3 respectively.

10.6 Project Implementation Schedule

Implementation schedule of all projects was prepared based on the following;

- Implementation priority of projects
- On-going projects
- Road projects of which a feasibility study is on-going
- Implementation schedule of a road which connect 2 or 3 regions (i.e. ARMM and Region X or ARMM and Region XII, etc.,) is also planned that road sections in both Regions is constructed at the same time.

Implementation schedule of projects under the ARMM, Region X and Region XII are presented in Table 10.6-1, Table 10.6-2 and Table 10.6-3 respectively.

10.7 Short-Term Development Plan

Short-Term Development Plan is prepared taking into account the set of criteria discussed before. Map of the short-term development plan is shown in Figure 10.7-1.

10.8 Medium-Term Development Plan

After identifying projects fall under the short-term development plan, medium-term development plan is then prepared and the projects are shown in Figure 10.7-2.

10.9 Long-Term Development Plan

The long-term development plan is also prepared and this is shown in Figure 10.7-3.

Table 10.6-2 Implementation Schedule of Road Projects (Region X)

Road No.	Road Name	Road Class				Road Length (km)	Project Cost (Mill. PHP)	Implementing Schedule																			Remarks																		
		Primary	Regional	National	Secondary			On-going			Short Term					Middle Term					Long Term																								
								2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025																					
PI-1(1)	Butuan-Cagayan de Oro-Iligan-Tubod Road (Butuan-Cagayan de Oro Sec.)	X				121.3	2,817.9							A4																															
PI-2	Sayre Highway	X				136.9	3,298.3				A3																																		
PI-1(3)	Butuan-Cagayan de Oro-Iligan-Tubod Road (Iligan-Tubod Sec.)	X				68.7	1,595.8							A4																															
PI-5	Iligan-Marawi Road	X				22.1	604.7							A4																															
PI-1(2)	Butuan-Cagayan de Oro-Iligan-Tubod Road (Cagayan de Oro-Iligan Sec.)	X				81.2	1,886.2							A4																															
PI-4	Davao-Bukidnon Road	X				59.3	1,427.7														B3																								
PI-6	Tubod-S.N. Dimaporo Road	X				23.6	548.7							B1																															
PI-3	Maramag-Kibawe-Kabacan Road	X				45.1	1,085.5				A3																																		
PI-8	Cotabato-Marabang-Lanao Del Norte Road	X				27.4	636.9							B1																															
PI-7	Kapitagan-R.Magsaysay Road	X				13.3	308.9							B1																															
Total Cost by Term (Million PHP) (Primary Inter-City Road)									F/S	D/D	Const.	Total		F/S	D/D	Const.	Total		F/S	D/D	Const.	Total		F/S	D/D	Const.	Total																		
									198.0	396.1	3,984.2	4,578.3		51.3	102.5	8,125.9	8,279.7		0.0	0.0	1,352.6	1,352.6																							
RP-2	Wao-Killangan Road	X				7.1	151.5														B3																								
RP-1	Cagayan de Oro-Talakag-Maramag Road	X				165.8	4,061.0														B3																								
Total Cost by Term (Million PHP) (Regional Primary Road)									F/S	D/D	Const.	Total		F/S	D/D	Const.	Total		F/S	D/D	Const.	Total		F/S	D/D	Const.	Total																		
									0.0	0.0	0.0	0.0		73.9	147.8	0.0	221.7		0.0	0.0	3,990.8	3,990.8																							
RS-4	Tagum-Bukidnon Road	X				61.7	0.0																																On-going						
RS-5	Kallangan-Kibawe Road	X				56.4	1,285.3														B3																								
RS-2	Cagayan de Oro-Manolo Fortich Road	X				54.7	1,213.4																		C5																				
RS-8	Ganassi-Tubod Road	X				23.0	483.7																															F/S On-going							
RS-1	Gingog-Villanueva Road	X				71.9	1,575.3																		C5																				
RS-6	Cagayan de Oro-Manticao Road	X				60.0	1,367.9																		C5																				
RS-7	Kauswagan-Munai-Madalum Road	X				25.0	569.9																		C3																				
RS-3	Mindanao East-West Lateral Road	X				127.9	2,997.8																															F/S On-going							
Total Cost by Term (Million PHP) (Regional Secondary Road)									F/S	D/D	Const.	Total		F/S	D/D	Const.	Total		F/S	D/D	Const.	Total		F/S	D/D	Const.	Total																		
									60.6	121.1	3,299.9	3,481.5		22.5	45.1	0.0	67.6		82.9	165.8	5,695.5	5,944.2																							
Ground Total (Million PHP)									F/S	D/D	Const.	Total		F/S	D/D	Const.	Total		F/S	D/D	Const.	Total		F/S	D/D	Const.	Total																		
									258.6	517.2	7,284.0	8,059.8		147.7	295.4	8,125.9	8,569.1		82.9	165.8	11,038.8	11,287.6																							
Estimated Possible Investment Amount									21,900.0						27,900.0						35,600.0																								

Note: F/S : F/S D/D : D/D : Tendering C : Construction
Project Cost of On-going Project is not Included

Table 10.6-3 Implementation Schedule of Road Projects (Region XII)

Road No.	Road Name	Road Class			Road Length (km)	Project Cost (Mill. PHP)	Implementing Schedule																		Remarks
		Primary Inter-City Road	Regional Primary	Regional Secondary			On-going	Short Term					Middle Term					Long Term							
								2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	
PI-4	Gen. Santos-Cotabato Road	X			134.6	3,125.6	A2																		
PI-1	Davao-Cotabato Road	X			55.4	1,286.2	A2																		
PI-5	Davao-Digos Road	X			39.0	906.1	A2																		
PI-2	Cotabato-Digos Road	X			58.0	1,295.9	A2																		
PI-3	Maramag-Kibawe-Kabacan Road	X			48.6	1,129.8	A3																		
Total Cost by Term (Million PHP) (Primary Inter-City Road)						F/S	D/D	Const.	Total	F/S	D/D	Const.	Total	F/S	D/D	Const.	Total								
						135.9	271.7	7,217.2	7,624.8	0.0	0.0	118.9	118.9	0.0	0.0	0.0	0.0								
RP-4	Midsayap-Datumang Road	X			13.1	0.0																			On-going
RP-9	Gen. Santos-Glan-Kaipagan Road	X			51.2	0.0																			On-going
RP-12	Cotabato-Upi-Kalamansig Road	X			39.0	0.0																			On-going
RP-8	Koronadal-Tacurong-Midsayap Road	X			36.5	751.5	A5																		
RP-7	Buluan-Islan Road	X			22.7	447.5	A5																		
RP-6	Kidapawan-Aia Road	X			48.4	953.2	A5																		
RP-3	Kabuntalan-Midsayap Road	X			15.0	343.5	A5																		
RP-10	Gen. Santos-Kiamba-Kalamansig Road	X			221.7	5,096.9																			F/S On-going
RP-2	Wao-Carmen Road	X			35.0	923.0	B1																		
RP-1	Udungan-Buldon-Matanog Road	X			17.5	461.5	B3																		
RP-11	Isulan-Palimbang Road	X			75.1	1,889.9	C4																		
RP-13	Magnoy-Lebak Road	X			49.3	1,404.2	B2																		
RP-5	Pagalungan-Mamasapano Road	X			15.0	452.4	C2																		
Total Cost by Term (Million PHP) (Regional Primary Road)						F/S	D/D	Const.	Total	F/S	D/D	Const.	Total	F/S	D/D	Const.	Total								
						133.2	266.4	4,828.7	5,228.3	48.9	97.8	4,036.9	4,183.7	40.3	80.6	3,190.8	3,311.7								
RS-9	Gen. Santos-Glan-Kaipagan Road	X			54.3	0.0																			On-going
RS-6	Koronadal-Cumbio-Datu Paglas Road	X			30.0	570.3	B2																		
RS-5	Tulunang-Maklala Road	X			25.0	475.3	B2																		
RS-10	Saralla-Lake Sebu-Maitum Road	X			75.1	1,592.2	B2																		
RS-3	Matalam-Roxas Road	X			50.0	1,139.9	B3																		
RS-2	Carmen-Libuagan Road	X			25.0	569.9	C2																		
RS-1	Banilan-Alamada Road	X			25.0	569.9	C2																		
RS-11	Sultan Kudarat-South Cotabato Link Road	X			90.0	1,711.0	C4																		
RS-4	Kidapawan-Arakan-Davao Road	X			75.4	1,966.8	B2																		
RS-8	Lais-Alabel Road	X			32.6	807.9	C4																		
RS-7	Padada-Kiblawan-Cumbio Road	X			25.0	776.5	B2																		
RSn-1	Tapian-Lebak Road	X			20.0	579.5	C4																		
Total Cost by Term (Million PHP) (Regional Secondary Road)						F/S	D/D	Const.	Total	F/S	D/D	Const.	Total	F/S	D/D	Const.	Total								
						0.0	0.0	0.0	0.0	111.6	223.3	3,270.7	3,605.6	72.5	145.0	6,943.2	7,160.7								
Ground Total (Million PHP)						F/S	D/D	Const.	Total	F/S	D/D	Const.	Total	F/S	D/D	Const.	Total								
						269.1	538.1	12,045.9	12,853.1	160.6	321.1	7,426.5	7,908.2	112.8	225.6	10,134.0	10,472.4								
Estimated Possible Investment Amount						19,700.0			25,200.0			32,100.0													

Note: F/S : Feasibility Study ; D/D : Detailed Design ; : Tendering ; Construction

Project Cost of On-going Project is not Included

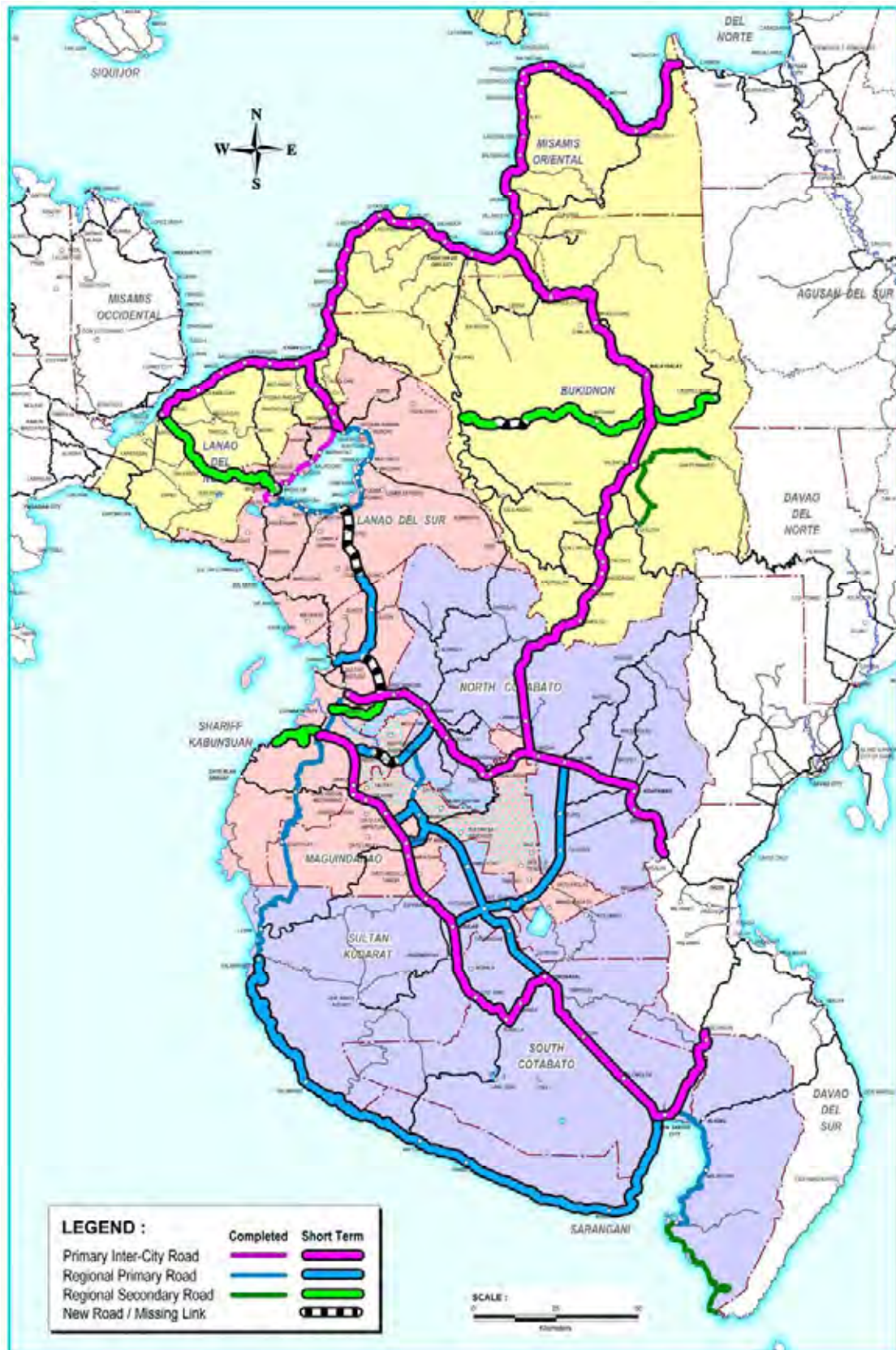


Figure 10.7-1 Proposed Short-Term Projects (2011-2015)

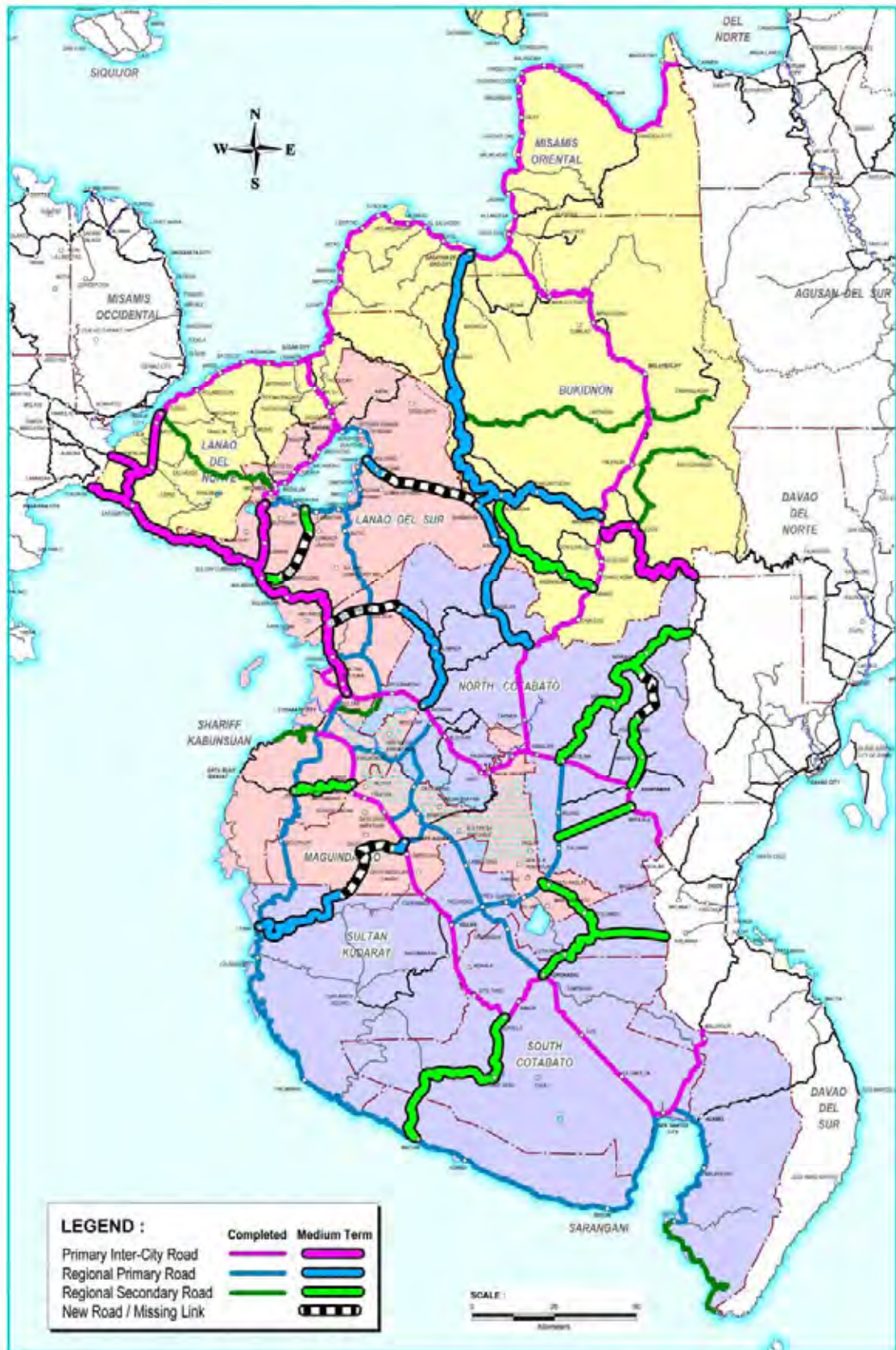


Figure 10.7-2 Proposed Medium Term Projects (2016-2020)

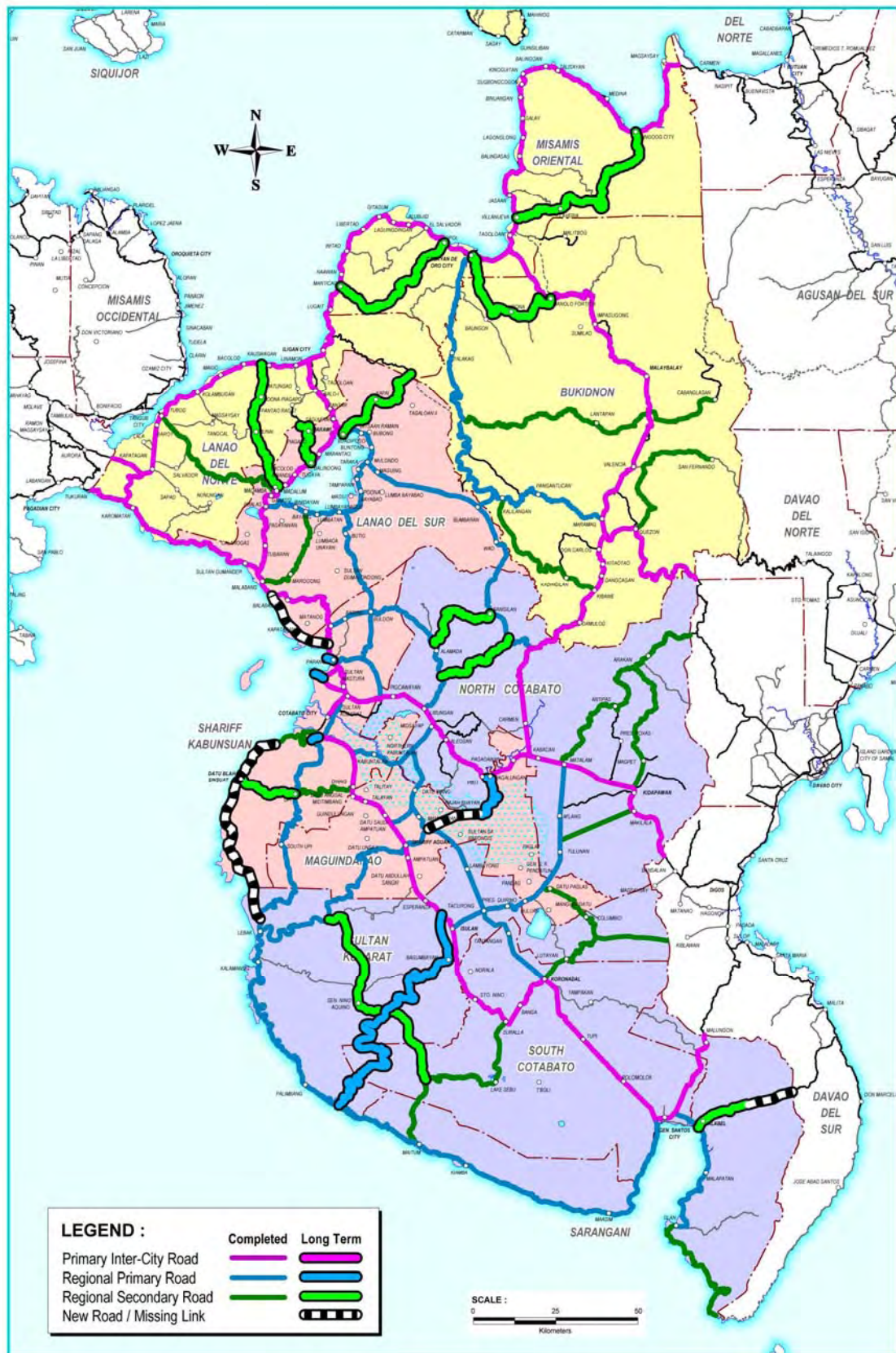


Figure 10.7-3 Proposed Long Term Projects (2021-2025)

10.10 Evaluation of Master Plan

a) Improvement of Traffic Condition

When the Master Plan is realized which is composed of the short, medium and long-term development plans, major improvement in traffic condition are:

- **Travel time improvement**
In 2025, travel time saved will be 32,600 hours per day.
- **Total capacity**
In 2025, traffic capacity of roads increased by 1.2 times.
- **Average Travel Speed**
In 2025, average travel speed will be improved by 1.3 times

b) Environmental Assessment

Proposed projects were grouped into six (6) types and scoping of each type of project is summarized in the table below.

Summary of Scoping

Type of Project	Overall Rating	Project No.		
		ARMM	Region X	Region XII
1-1 • Improvement of existing gravel road to paved road • No ROW acquisition • Outside protected area	B (Some Impact Expected)	SK-8, Mp-3, L1p-1, L2-4, L2p-3, SKp-2, SKp-3, SKp-4, SKn-4 (9 projects)	RP-1, RP-2, RS-1, RS-2, RS-5, RS-6, RS-7, RS-8 (8 projects)	RP-2, RP-3, RP-7, RP-8, RP-10, RP-11, RP-13, RS-1, RS-2, RS-3, RS-5, RS-6, RSn-1 (13 projects)
1-2 • Improvement of existing gravel road to paved road • No ROW acquisition • Inside protected area	B (Some Impact Expected)	MP-2, Mn-1, L1-3 (3 projects)	-	-
2-1 • Rehabilitation of existing paved road • No ROW acquisition • Outside protected area	D (No Impact Expected)	L1-1, MC-1, L2-2, SK-9, SK-1, SK-7, M-3, Mp-1, MC-3, MC4~MC8, SK11 (14 projects)	PI-1 (1), (2), (3), PI-2, PI-3, PI-4, PI-5, PI-6, PI-7, PI-8 (10 projects)	PI-1, PI-2, PI-3, PI-4, PI-5 (5 projects)
2-2 • Rehabilitation of existing paved road • No ROW acquisition • Inside protected area	B (Some Impact Expected)	L2-2(1), M-4 (2 projects)	-	-
3-1 • Elimination of missing link or new road construction • Outside protected area	A (Serious Impact Expected)	SKn-2, SKn-5, L2p-2, L2n-1, SKn-6, SKp-5 (6 projects)	RS-3 (1 project)	RP-1, RS-4, RS-7, RS-8, RS-11 (5 projects)
3-2 • Elimination of missing link or new road construction • Inside protected area	A (Serious Impact Expected)	L1-4, L2p-1 (2 projects)	-	RP-5, RP-6, RP-10 (3 projects)

Rating:

- A : Serious impact is expected
- B : Some impact is expected
- C : Extent of impact is unknown
- D or No Mark : No impact is expected

c) Economic Evaluation

The following items are considered as economic benefits in the Master Plan: Saving in Vehicle

Operating Cost (VOC), Saving in Travel Time Cost (TTC), and Saving in Operation and Maintenance Expense.

▪ **Vehicle Operating Cost**

A total VOC of the whole road network was calculated using VOC unit and estimated traffic volume. Then, the benefit of the projects in 2015, 2020, and 2025 was computed by the comparison of “with” case and “without” case.

▪ **Travel Time Saving**

According to the 2008 DPWH data, the time value per work hour is 419 pesos on those in a passenger car and 105 pesos for other modes. Based on the roadside OD survey result, business trips account for 69.6%, commuting to work places and commuting back home 6.5%.

▪ **Saving of Operating and Maintenance (O&M) Expense**

The O&M expense of gravel or earth roads is higher by about 1.8 times compared with that of concrete pavement. The saving of the O&M expense in the Master Plan is calculated by the reduction amount in the annual O&M expense by paving gravel or earth roads.

▪ **Evaluation Result (EIRR)**

The overall EIRR was estimated at 24%. According to NEDA’s criteria, the threshold value to judge the economic feasibility of a project is 15% in the Philippines. Thus, this Master Plan is concluded to be highly feasible from the economic point of view.

EIRR	24.2%
NPV (R=15%)	7,026.5
B/C (R=15%)	1.34

11. SELECTION OF PRIORITY PROJECTS FOR PRE-FS

11.1 Selection Criteria

Selection Criteria of roads for pre-feasibility study was established as follows;

- i. Implementation priority shall be high, i.e. within the 10th ranking.
- ii. Roads shall be located in the areas with less security problems, so that various surveys necessary for pre-F/S can be safely undertaken.
- iii. Roads which can be a model project for the agri-fishery development support.
- iv. Road projects which can be implemented easily and fast, i.e. no ROW acquisition, no serious environmental impacts and easy for funding (or project scale shall be reasonable for funding).

11.2 Proposed Roads for Pre-FS Study

Based on the selection criteria, the following two (2) roads were proposed for pre-feasibility study due mainly to criteria (ii) above;

- Pinaring-Simsiman Road
- Tamontaka-Tapiian Road

Half of the Pinaring-Simsiman Road is located in the municipality of Sultan Kudarat, Maguindanao and the remaining section is situated in the municipality of Pigcawayan, North Cotabato. Tamontaka-Tapiian Road on the other hand is located in the municipality of Datu Odin Sinsuat (Maguindanao Province). The two roads are shown in the location map.

Pinaring-Simsiman Road

- Provincial Road with gravel surface. To convert a Provincial Road to a national road standard is one of the major strategies to improve road density in the area.
- Implementation priority is rated 8th among 36 projects.
- The road serves for wide rice fields, corn fields and other agricultural land use areas, thus this project can be a good model road development which vitally supports an agricultural development, particularly for rice and corn production increase.
- Project area has less security problem.
- No ROW and no relocation of families is required.
- Project cost was estimated at 513 Million Pesos which is reasonable scale for funding.
- Seven (7) sub-projects under ARMM Social Fund Project have been implemented along the road. Synergy effect of this road project with ARMM Social Fund Sub-projects can be expected.

Tamontaka-Tapiian Road

- Provincial Road with gravel surface. To convert a Provincial Road to a national road standard is one of the major strategies to improve road density in the area.
- Implementation priority is ranked 9th among 36 projects.
- The road serves for wide corn and coconut fields. The project can be a good model of road development which vitally supports an agricultural development, particularly corn and coconut production increase.
- Project area has less security problems.
- No ROW acquisition and no relocation of families required.
- Project cost was estimated at 510 Million Pesos which is reasonable scale for funding.
- One sub-project under ARMM Social Fund Project was implemented.
- The road passes along the nice beach. Some beach resort facilities have been developed, thus the project provide access to beach leisure facilities for citizens of Cotabato City.



Location Map of Proposed Roads for Pre-FS

12. PRE-FS OF SELECTED PROJECTS

12.1 Objectives of the Projects

The objectives of the two roads are the following:

Pinarig-Simsiman Road

- To provide an all-weather road to assure transportation of people and agricultural in-puts and out-puts throughout a year for agricultural development.
- To provide an easier access to basic social and health facilities which are mostly located in Cotabato City.
- To provide an alternative route to Cotabato City – Davao City Road.
- To achieve higher agricultural production, particularly palay and corn which will increase farmers’ income and eventually contribute to poverty reduction

Tamontaka-Tapiian Road

- To provide an all-weather road to assure transportation of people and agriculture and fishery inputs and outputs throughout the year for agri-fishery development.
- To provide an easier access to basic social and health facilities which are mostly located at Cotabato City.
- To provide an easier access to beach resorts which are major recreation spots for residents of Cotabato City citizens.

12.2 Design Policy

Design policies adopted were as follows;

- New road right-of-way acquisition shall be avoided as much as possible.
- Existing road alignment, both horizontal and vertical alignments, shall be followed as much as possible to achieve above policy. Design standards shall be relaxed where required to achieve this policy.
- Existing PCC pavement sections and bridges shall be utilized as much as possible when they are judged to perform their functions.

12.3 Outline of the Projects

Shown in the following tables is basic information of the two roads.

Pinarig - Simsiman Road

Road length	20.1 km.
Already paved section by PCC pavement	1.7 km.
Section to be improved	18.4 km.
Number of bridges	5 bridges
Bridges to be maintained	4 bridges
Bridge to be replaced	1 bridge (Salam Bridge No. 1, L = 23 m)
Road condition	Gravel section becomes frequently impassable after heavy rain
Barangay roads to be improved	13 Barangay Roads (L = 42 km.)

Tamontaka-Tapiian Road

Road length	20.4 km
Already paved section by PCC pavement	4.4 km.
Section to be improved	16.0 km
Number of bridges	6 bridges
Bridges to be maintained	5 bridges
Bridge to be replaced	1 bridge (Salam Bridge No. 1, L = 25 m)
Road condition	Gravel section becomes frequently impassable after heavy rain
Barangay roads to be improved	20 Barangay Roads (L = 24 km.)

Pinarig-Simsiman Road



Tamontak-Tapiian Road



Bridge to be replaced along Pinarig-Simsiman Road



Cornfield along Pinarig-Simsiman Road



12.4 Design Standard

a.) Road

Based on DPWH's Design Guidelines, Criteria and Standards, the geometric design standards were established as shown in the table.

		Unit	Main Road with ADT400-1000 at Rolling (at Mountainous)	Barangay Road with ADT 200 or less at Rolling (at Mountainous)	
Design Speed		kph	60 (40)	40 (30)	
No. of Lanes		Lane	2	1	
Lane Width		M	3.05x2	4.0	
Shoulder Width		m	1.0 ¹	1.0	
Horizontal Alignment	Min. Radius	m	120 (50) ²	55 (30)	
	Max. Super elevation	%	6 %	-	
Vertical Alignment	Max. Gradient	%	6% (8%) ³	8% (10%)	
	Min. Radius	Sag	m	1000 (450)	450 (250)
		Crest	m	1400 (450)	450 (250)
Min. Stopping Sight Distance		m	70 (40)	40 (40)	
Pavement Cross Fall	PCC	%	1.5%	-	
	Gravel	%	-	2.5%	

b.) Bridge

Bridge design criteria adopted were as follows;

- DPWH Standard cross section of bridge shall be applied.
- For Codes and Standards, the following will be utilized:
 - AASHTO Standard Specifications for Highway Bridges, Sixteenth Edition, 1996.
 - National Structural Code of the Philippines, Volume II, Bridges, 2nd Edition, 1997.
 - Specifications for Highway Bridges, Part IV, 2002, Japan Road Association.
 - Seismic design shall be done in accordance with the provisions of Division I-A "Seismic Design" of the 1996 AASHTO Standard Specification for Highway Bridges and DPWH Department Order No. 75, Series of 1992, re: DPWH Advisory for Seismic Design of Bridges

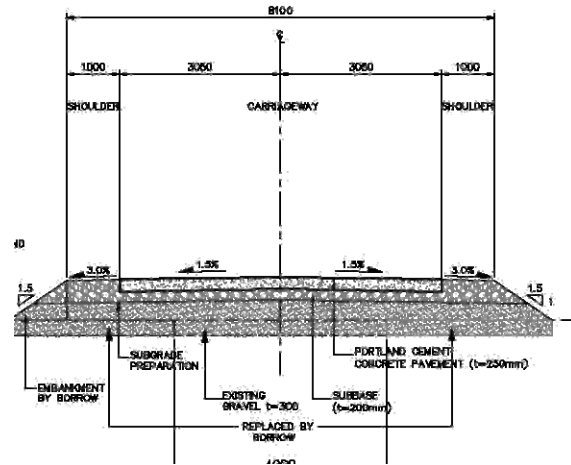
12.5 Typical Cross-section of Road

A normal cross fall of 1.5% was used for the traveled way all throughout the PCC pavement and 3.0% shoulders. Superelevation was computed in accordance with the design guidelines used for this project.

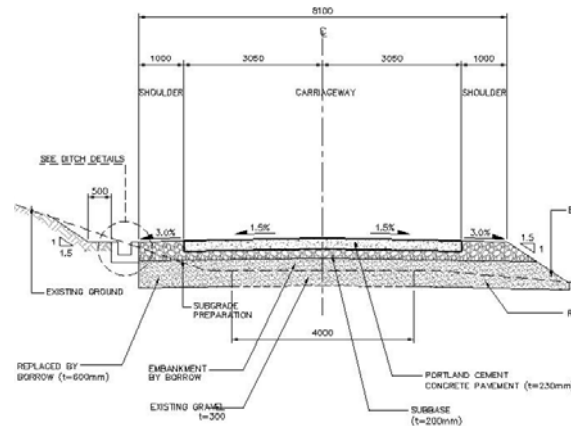
The angles of slopes are based on the stability requirements but the designer used a slope 1.5:1 for embankment and cut considering there was a

limited space. Typical cross-sections are shown in the figures below.

Embankment Section



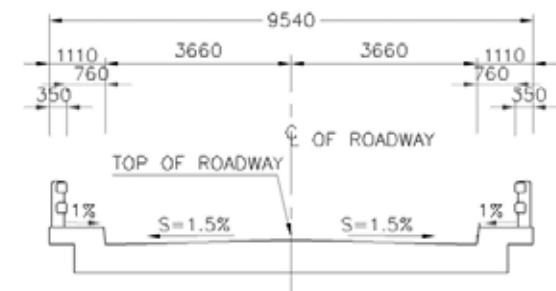
Cut and Embankment Section



12.6 Typical Cross-section of Bridge

DPWH Standard cross section of bridge shall be applied as shown below.

Cross Section of Two-lane Bridge



12.7 Project Cost Estimate

a.) Construction Cost

Estimated construction cost for Pinaring-Simsiman Road and Tamontaka-Tapia Road is around PhP 609 Million and PhP 522 Million respectively.

Estimated Construction Cost (Pinaring-Simsiman Road)
(Unit: Million PhP)

ITEM/DESCRIPTION	Total	Foreign	Local	Unskilled Laborer	Taxes
Part A Facilities for the Engineer	13.95	7.89	3.69	0.48	2.37
Part B Other General Requirement	13.95	7.89	3.69	0.48	2.37
Part C Earthworks	99.25	55.52	23.77	1.18	19.96
Part D Subbase and Base Course	20.14	10.74	6.27	0.06	3.13
Part E Surface Course	298.06	175.93	73.77	13.36	48.36
Part F Structures	16.08	7.60	6.00	0.58	2.48
Part G Drainage & Slope Protection Structure	31.48	13.18	13.13	0.81	5.17
Part H Miscellaneous	27.66	15.77	7.19	0.43	4.70
Part I Dayworks	9.30	5.26	2.46	0.32	1.58
Part J Provisional Sums	9.30	5.26	2.46	0.32	1.58
Part K Physical Contingencies	69.76	39.45	18.44	2.40	11.87
Grand Total	608.93	344.49	160.87	20.42	103.57

Estimated Construction Cost (Tamontaka-Tapiian Road)
(Unit: Million PhP)

ITEM/DESCRIPTION	Total	Foreign	Local	Unskilled Laborer	Taxes
Part A Facilities for the Engineer	11.98	6.73	3.25	0.41	2.00
Part B Other General Requirement	11.98	6.73	3.25	0.41	2.00
Part C Earthworks	64.65	36.06	16.43	0.73	12.16
Part D Subbase and Base Course	17.03	9.08	5.30	0.05	2.65
Part E Surface Course	255.83	150.77	63.56	11.30	41.50
Part F Structures	26.08	12.60	9.25	0.85	4.23
Part G Drainage & Slope Protection Structure	35.84	15.89	13.94	0.86	6.01
Part H Miscellaneous	23.25	13.25	6.05	0.36	3.95
Part I Dayworks	7.99	4.49	2.17	0.28	1.33
Part J Provisional Sums	7.99	4.49	2.17	0.28	1.33
Part K Physical Contingencies	59.91	33.66	16.27	2.07	9.98
Grand Total	522.53	293.75	141.64	17.60	87.14

b.) Engineering Service Cost

The cost for engineering services is estimated as shown in the table below based on the manning schedule proposed by the Study.

Engineering Services (Pinaring-Simsiman Road)

(Unit: Million PHP)

DESCRIPTION	Total	Foreign	Local	Unskilled Laborer	Taxes
Detailed Design	25.37	12.64	10.99	1.10	1.74
Tender Assistance	10.74	6.80	3.42	0.56	0.52
Construction Supervision	60.84	24.78	31.43	3.67	4.63
Grand Total	96.95	44.22	45.84	5.33	6.89

Engineering Services (Tamontaka-Tapiian Road)

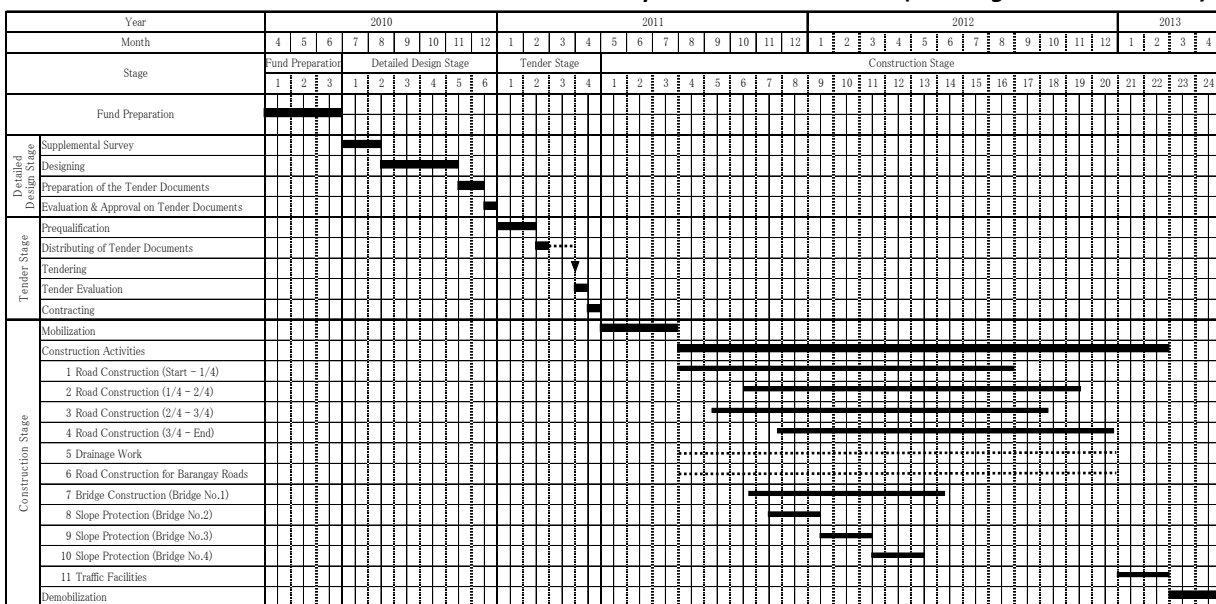
(Unit: Million PHP)

DESCRIPTION	Total	Foreign	Local	Unskilled Laborer	Taxes
Detailed Design	25.37	12.64	10.99	1.10	1.74
Tender Assistance	10.74	6.80	3.42	0.56	0.52
Construction Supervision	56.69	23.45	28.97	3.37	4.27
Grand Total	92.80	42.89	43.38	5.03	6.53

12.8 Implementation Schedule

The overall implementation schedule for Pinaring-Simsiman Road is shown in the figure below while the Tamontaka-Tapiian Road's implementation schedule is available in the succeeding page.

Implementation Schedule (Pinaring – Simsiman Road)



Implementation Schedule (Tamontaka-Tapiian Road)

Year	2010												2011												2012												2013	
Month	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2			
Stage	Fund Preparation			Detailed Design Stage						Tender Stage			Construction Stage																									
Fund Preparation	█																																					
Detailed Design Stage	Supplemental Survey	█																																				
	Designing	█		█																																		
	Preparation of the Tender Documents	█		█		█																																
	Evaluation & Approval on Tender Documents	█		█		█																																
Tender Stage	Prequalification	█																																				
	Distributing of Tender Documents	█		█																																		
	Tendering	█		█																																		
	Tender Evaluation	█		█																																		
	Contracting	█		█																																		
Construction Stage	Mobilization	█																																				
	Construction Activities	█																																				
	1 Road Construction (Start - 1/4)	█																																				
	2 Road Construction (1/4 - 2/4)	█																																				
	3 Road Construction (2/4 - 3/4)	█																																				
	4 Road Construction (3/4 - End)	█																																				
	5 Drainage Work	█																																				
	6 Road Construction for Barangay Roads	█																																				
	7 Bridge Construction (Bridge No.1)	█																																				
	8 Slope Protection (Bridge No.2)	█																																				
	9 Slope Protection (Bridge No.3)	█																																				
10 Slope Protection (Bridge No.4)	█																																					
11 Traffic Facilities	█																																					
Demobilization	█																																					

12.9 Barangay Survey Results

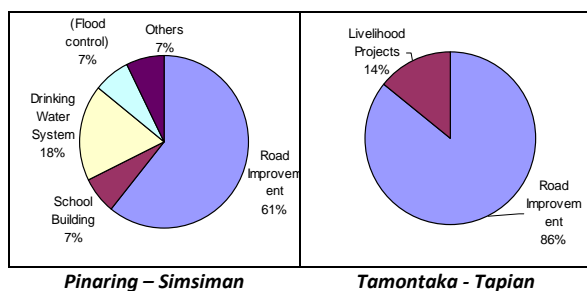
Three types of survey (Barangay Consultation Meeting, Household Interviews, Interview with Barangay Captains) were carried-out to get a better understanding on the socio-economic conditions of the people that are likely to be affected/benefit by/from the development of the two roads (28 barangays along Pinaring – Simsiman Road and 7 barangays along Tamontaka – Tapiian Road).

a.) Perception Survey (Consultation Meeting)

▪ **Barangay Needs**

Barangays under the Pinaring-Simsiman road have the following top priorities: 61% of the barangays chose road improvement as top priority needs, 18% selected drinking water system and others chose school building, dyke and others (e.g. livelihood projects).

Barangays crossed by the Tamontaka – Tapiian road on the other hand chose road improvement (86%) and livelihood projects (14%).



▪ **Impact of Poor Road Condition**

Barangay people who attended the consultation meeting were asked on the negative impact/difficulties caused by poor road condition. Answers most mentioned include: (i) delay in transporting their farm produce, (ii) high transportation cost, (iii) difficulty of students in attending their schools, (iv) low income due to the high transport cost, (v) difficulty in bring patient to hospital, and (vi) poor business opportunities

▪ **Perceived Benefits from Road Improvement**

In terms of perceived benefits that could be derived from road improvement, the barangay people believed that improvement of their road would translate into increase in their income due to a decrease in transportation costs for farm produce. They also believed that it would open other business opportunities such as tourism (beach resorts) and car rentals (since there would be large group of people going to the beach resorts). Some also cited that road improvement would give easy access to NGOs which can provide various social services such as supply of farm inputs, clothing, foods and others.

▪ **Social Acceptability of Road Improvement**

When asked if road improvement is acceptable, a very high 100% agreement of barangay people was obtained from both roads. It is important to note that the people, particularly the male population also requested that they be given a chance to participate during project implementation as hired laborers or any other type of job that would suit

them. They also committed to help provide security to the equipments to be used as well as to personnel who will be assigned during the construction period.

b.) Socio-economic Condition

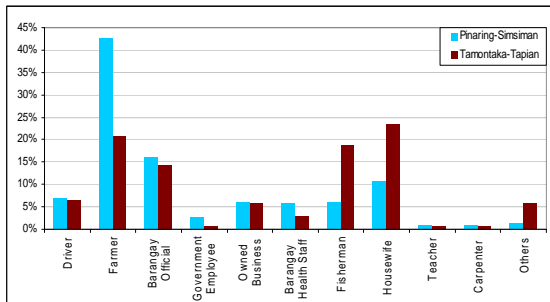
▪ **Demography**

The total population of barangays under the influence of the Pinarang – Simsiman road is about 61,000. This figure represents 34% of the population living in the municipalities of Sultan Kudarat and Pigcawayan. On the other hand, barangays covered by the Tamontaka – Tapian road is about 18,000 which represent 18% of the total population of Datu Odin Sinsuat Municipality.

▪ **Occupation**

The occupation of barangay people living the influence area of the two FS roads is shown in the figure below. Farming (43%) and working as barangay official (16%) have a share of more than half in the Pinarang – Simsiman road indicating that the area is suited for agricultural activities. Barangays closer to Liguasan Marsh have their livelihood relied mostly on fishing. For the barangay people living along the Tamontaka - Tapian road, most people captured by the survey are housewives (24%), farmers (21%), fishermen (19%) and barangay officials (19%). Fishermen have a substantial share since these barangays are along a shoreline.

Occupation of Barangay People



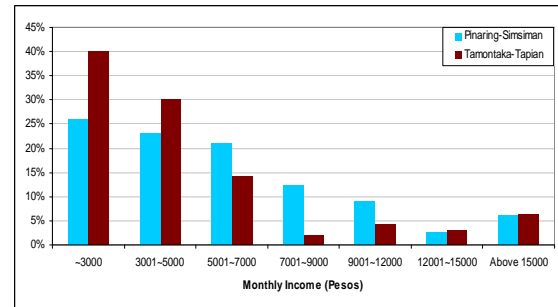
▪ **Monthly Income**

According to the figure from the National Statistics Coordinating Board (NSCB), the average annual family income in the ARMM region in 2006 is 88,632 pesos which is equivalent to 7,386 pesos per month. This means that family income of most families living the FS roads is way below that average in the ARMM region as shown in the figure.

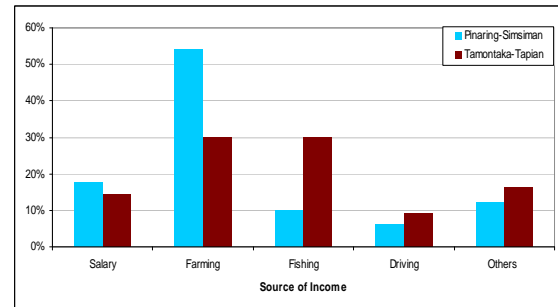
▪ **Source of Income**

Most of the families are earning their income from farming, fishing, driving and salary from their government positions such as barangay official.

Family Income

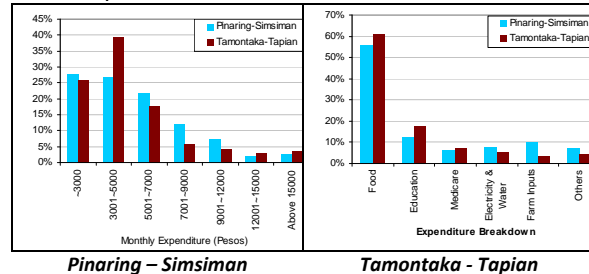


Source of Income



▪ **Family Expenditure**

Large number of families has monthly expenditure from the range of 3,000 pesos to 7,000 pesos. These expenditures are mostly spent for foods (56% for Pinarang – Simsiman and 61% for Tamontaka – Tapian) and followed by those spent for education, medicine, electricity and water, and farm inputs.

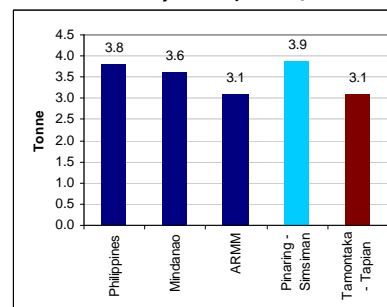


c.) Agricultural Production

▪ **Palay Production**

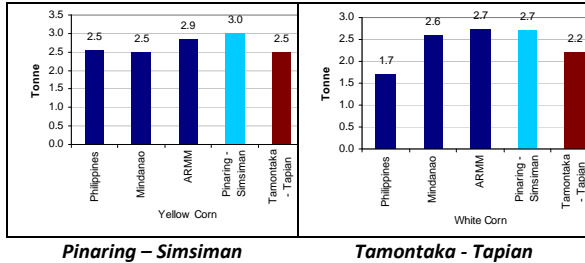
The national average of palay yield per hectare is 3.8 indicating that Pinarang-Simsiman has a higher yield (3.9). Rice paddy in Tamontaka – Tapian however has a lower yield which is just the same to the average of ARMM as reflected in the figure.

Palay Yield (Tonne/Hectare)



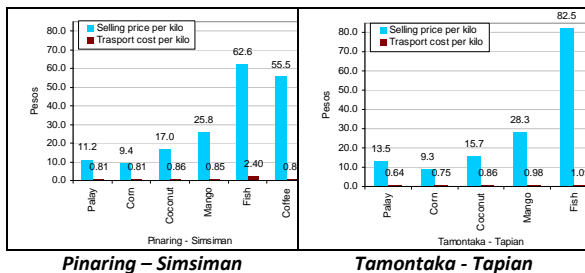
▪ Corn Production

Yield per hectare for both yellow corn and white corn is shown in the figures below. Corn fields along the Pinarig – Simsiman road have a higher yield than to those located in Tamontaka – Tapian road.



▪ Transportation Cost of Agri-fishery Produce

The share of transportation cost on agricultural produce and fisheries of barangays along the Pinarig – Simsiman road is as follows: 7% for palay, 9% for corn, 5% for coconut, 3% for fish and 4% for coffee. Shifting to Tamontaka – Tapian road, the following figures are arrived: 5% for palay, 8% for corn, 5% for coconut, 3% for fish and 4% for coffee.



12.10 Environmental Impacts

a.) Pinarig – Simsiman Road

As mentioned, there is no road ROW accusation is expected but still, some disruptions on social activities and environment are expected. Predicted impacts and mitigation measures during pre-construction and construction phases are summarized in the following tables.

b.) Tamontaka – Tapian Road

Predicted impacts and mitigation measures during pre-construction and construction phases are summarized in the following tables.

Predicted Impacts and Measures during Pre-Construction and Construction Phase (Pinarig – Simsiman Road)

Predicted and Assessed Impacts	Rating	Proposed Mitigating Measures
ROW Acquisition	No	Detailed design shall follow the design policy not to require ROW acquisition.
Involuntary Resettlement	No	Detailed design shall follow the design policy not to require involuntary resettlement.
Increase in noise level	B	Schedule equipment move-in to blend with regular non-peak hour-daytime vehicular traffic; no night time movements Provide barriers in work areas where use equipment with high noise power level is expected
Slope modification	B	Minimize land modification; follow established design consideration
Decreased public/community access to or through the area	B	Minimize obstruction to areas Provide alternative access in the event total road closure is necessary
Disruption of service utilities and infrastructures	B	Coordinate with appropriate utility firms prior to project implementation Ensure prompt and proper relocation of utility lines
Demolition of structures	B	Minor only; mainly fences and extensions. Proper notification of, and compensation to owners of affected structures
Construction wastes	B	Construction wastes such as unsuitable soils, demolished box culvert materials, etc., shall be dumped at the location specified by the Engineer
Noise due to pile driving	B	Pile driving shall be undertaken only during daytime.
Dust caused by construction work	B	Prior to the start of the work activities, proper measures such as watering shall be undertaken to minimize dusting
Increased housing requirement for transient workers, and project management staff	B	Provide temporary bunkhouse on site or rent houses in neighboring communities if housing requirements cannot be accommodated in the locality where the project is located
Traverse areas with historical significance	No	Coordinate with Local Cultural and Historical Affairs Commission to ensure proper handling of archaeological finds, if any
Increased hazards due to construction activities	B	Provide safety equipment and appropriate warning signs along the route Provide alternative use of the construction yard/staging area once the project demobilizes Clear construction debris, form works and equipment and remove all obstructions Minimize construction clutter, manage construction debris properly and provide barriers to reduce eye sores Screen laborers (particularly if they come from other localities other than the project area) to prevent possible spread of HIV / AIDS. This can be done by requiring applicants to submit blood tests (for HIV detection) prior to hiring.
Cutting trees	B	Cutting trees shall be minimized, and transplanted. If cutting trees is inevitable, new trees in double number shall be planted.

Rating:
 A: Serious Impact is expected
 B: Some impact is expected
 C: Extent of impact is unknown
 No: No impact is expected

Predicted Impacts and Mitigation Measures During Operation Phase (Pinarig – Simsiman Road)

Predicted and Assessed Impacts	Rating	Proposed Mitigating Measures
Increase of traffic accident	B	Traffic regulatory signs, warning signs shall be properly maintained to be always visible. If necessary humps, to reduce vehicle speed, shall be installed.
Localized flooding	B	Side ditches and pipe / box culverts shall be always cleaned so as to properly function.
Travel cost increase	B	Paved carriageway shall be properly maintained so as to provide smooth travel.
Obstruction at bridge opening	B	Obstruction at the bridge opening shall be always removed to assure smooth water flow at bridge sites.
Disorderly urbanization	B	Concerned LGUs shall strictly enforce the zoning ordinance along the road

Rating:
 A: Serious Impact is expected
 B: Some impact is expected
 C: Extent of impact is unknown
 No: No impact is expected

Predicted Impacts and Measures during Pre-Construction And Construction Phase (Tamontaka – Tapian Road)

Predicted and Assessed Impacts	Rating	Proposed Mitigating Measures
ROW Acquisition	No	• Detailed design shall follow the design policy not to require ROW acquisition
Involuntary Resettlement	No	• Detailed design shall follow the design policy not to require involuntary resettlement
Increase in noise level	B	• Schedule equipment move-in to blend with regular non-peak hour-daytime vehicular traffic; no night time movements • Provide barriers in work areas where use equipment with high noise power level is expected
Slope modification	B	• Minimize land modification; follow established design consideration
Decreased public/community access to or through the area	B	• Minimize obstruction to areas • Provide alternative access in the event total road closure is necessary
Disruption of service utilities and infrastructure	B	• Coordinate with appropriate utility firms prior to project implementation • Ensure prompt and proper relocation of utility lines
Demolition of structures	B	• Minor only; mainly fences and extensions. Proper notification of, and compensation to owners of affected structures
Construction wastes	B	• Construction wastes such as unsuitable soils, demolished box culvert materials, etc., shall be dumped at the location specified by the Engineer
Noise due to pile driving	B	• Pile driving shall be undertaken only during day time
Dust caused by construction work	B	• Prior to the start of the work activities, proper measures such as watering shall be undertaken to minimize dusting
Increased housing requirement for transient workers, and project management staff	B	• Provide temporary bunkhouse on site or rent houses in neighboring communities if housing requirements cannot be accommodated in the locality where the project is located
Traverse areas with historical significance	No	• Coordinate with Local Cultural and Historical Affairs Commission to ensure proper handling of archaeological finds, if any
Increased hazards due to construction activities	B	• Provide safety equipment and appropriate warning signs along the route • Provide alternative use of the construction yard/staging area once the project demobilizes • Clear construction debris, form works and equipment and remove all obstructions • Minimize construction clutter, manage construction debris properly and provide barriers to reduce eye sores • Screen laborers (particularly if they come from other localities other than the project area) to prevent possible spread of HIV / AIDS. This can be done by requiring applicants to submit blood tests (for HIV detection) prior to hiring.
Cutting trees	B	• Cutting trees shall be minimized, and transplanted. If cutting trees is inevitable, new trees in double number shall be planted.

Rating: A: Serious Impact is expected
B: Some impact is expected
C: Extent of impact is unknown
No: No impact is expected

Predicted Impacts and Mitigation Measures during Operation Phase (Tamontaka – Tapian Road)

Predicted and Assessed Impacts	Rating	Proposed Mitigating Measures
Increase of traffic accident	B	• Traffic regulatory signs, warning signs shall be properly maintained to be always visible. If necessary humps, to reduce vehicle speed, shall be installed.
Localized flooding	B	• Side ditches and pipe / box culverts shall be always cleaned so as to properly function.
Travel cost increase	B	• Paved carriageway shall be properly maintained so as to provide smooth travel.
Obstruction at bridge opening	B	• Obstruction at the bridge opening shall be always removed to assure smooth water flow at bridge sites.
Disorderly urbanization	B	• Concerned LGUs shall strictly enforce the zoning ordinance along the road, particularly beach resorts development shall be properly controlled.

Rating: A: Serious Impact is expected
B: Some impact is expected
C: Extent of impact is unknown
No: No impact is expected

12.11 Economic Evaluation

a.) Economic Benefit Calculation

By improving the two roads, the motivation for production of farmer increases and productivity improves. Specifically, the following benefits are expected.

- The productivity of the roadside area on Tamontaka - Tapian Road is relatively low in Mindanao or ARMM area, and improvement in productivity by improvement of the road

can be expected. For example, supposing productivity improves even to the Mindanao average, 16% (Palay) and 18% (White Corn) of productivity increase will be expected.

- According to the estimate of VOC, VOC of a rigid truck with 2-axle decreases by about 65% by paving a road (travel speed rises from 20km/h to 50km/h, and VOC decreases in 56.0 Pesos/km to 19.45 Pesos/km).
- The rate of the transportation cost occupied 7 to 9% of shipment cost; transportation cost will decrease by 5 to 6% by improvement of the two roads. This will increase farmer's income and could help in reducing poverty in the area.
- If road is improved, the product damage in transit will decrease, and it will lead to increase of commodity value.
- The agricultural productivity of farmers can be expected to increase by about 40 to 60%. An increase of 40% means: 164 million pesos per annum along Pinaring-Simsiman Road area and 156 million pesos per annum along Tamontaka-Road.

b.) Cost-Benefit Analysis

The results of cash flow analysis with costs and benefits per annum are shown in the table below. These results indicated that each road project is economically feasible enough to execute.

	EIRR	NPV (Mil. PhP) (R=15%)	B/C (R=15%)
Pinaring – Simsiman Road	18.4	113.6	1.27
Tamontaka – Tapian Road	19.8	139.3	1.37

12.12 Conclusion

It was concluded that two road projects are technically, environmentally and economically feasible. It is recommended that two road projects should be implemented at the earliest possible time.

13. TECHNOLOGY TRANSFER

a.) Major Areas of Technology Transfer

In the course of the Study, various seminars/workshops were undertaken focusing on the following:

- How to undertake Road/Bridge Inventory and Condition Survey
- Results of Road/Bridge Inventory and Condition Survey and how to utilize them
- How to undertake traffic surveys
- Present issues and how to improve institutional weaknesses
- Present issues and how to improve road maintenance
- Environmental Impact Assessment (EIA) Systems
- How to prepare Road Network Development Master Plan

JICA-assisted “ARMM Human Capacity Development Project” has been conducted in parallel with this Study. The human capacity development project covers general procedures and methodology for each stage of the road project development cycle while this Study focused on the more concrete topics which were considered important and useful for road development planning, institutional improvement and maintenance improvement.

b.) Seminars/Workshops Undertaken

List of seminars/workshops undertaken in the course of the Study are shown in the table.

Date	Topics	Presenter	Participants
Oct 15, 2008	Presentation of Inception Report	▪ Mr. M. Kiuchi ▪ Mr. T. Encarnacion	120
Nov 12,13, 2008	How to Accomplish Road/Bridge Inventory and Condition Survey Formats including dry-runs	▪ Mr. T. Tsuchida	17
Mar 11 2009	How to undertake traffic surveys and analysis	▪ Dr. N. Sinarimbo	26
Mar 11 2009	EIA system of the Philippines and JICA	▪ Ms. A. Herrera	26
Mar 13 2009	Institutional Weakness and Constraints	▪ Mr. T. Encarnacion	25
May 6, 2009	Traffic Demand Forecast Methodology and Outcome	▪ Mr. M. Ishiya	21
May 25, 2009	Proposed Institutional Improvement and Reinforcement	▪ Mr. T. Encarnacion	36
May 26, 2009	Results of Road/Bridge Inventory and Condition Survey	▪ Mr. A. Okazaki	30
May 26, 2009	How to undertake IEE	▪ Ms. A. Herrera	30
May 28, 2009	Road Maintenance Problems and How to Evaluate Priority of Maintenance Work	▪ Mr. K. Tsuzuki	14
Jun 6, 2009	How to Prepare Road Network Master Plan	▪ Mr. M. Kiuchi	20
Jun 17, 2009	Project Prioritization Criteria and Method	▪ Mr. M. Kiuchi	20
Oct 28,29 2009	Joint Inspection on Pre-F/S Roads (How to undertake road/bridge inspection)	▪ Mr. M. Kiuchi ▪ Ms. A. Herrera	6

c.) Observations from the Seminars / Workshops

The following were observations obtained from the seminars/workshops;

- All participants were quite serious in learning something from the JICA Study Team.
- They actively joined to express their opinions/suggestions in consideration of DPWH-ARMM conditions.
- Most participants came from DPWH-ARMM Headquarter and a few participants came from District Engineering Offices since seminars/workshops were held at DPWH-ARMM Headquarter.
- It is believed that they have learned basic knowledge, such as how to undertake field surveys, how to identify projects, how to prioritize projects, what are the weaknesses of their institutional arrangements, what are the problems of road/bridge maintenance, etc. What is important from now on is that they will practice what they have learned from this Study. They should actively seek opportunities to practice what they have learned.
- What they have learned under this Study is rather limited to the planning aspects. Next step will be the actual implementation of the projects. This Study could not cover technology transfer for the project implementation. It is hoped that in the course of project implementation proposed by the Master Plan, they would seek opportunities to be involved in the project implementation with some guidance of international experts.

14. RECOMMENDATIONS

a.) Peace Building

Peace building is the most important issue in the Study Area. Without attainment of peace in the region, people will continue to suffer from unstable life, harsh economic conditions, poverty and further deterioration of infrastructure. The National Government, the ARMM Government and the MILF should make all efforts to reach peace agreement at the earliest possible time.

On the part of a road sector, road network development should be planned that universal area development can be achieved to erase hostility among people.

b.) Realization of the Master Plan

The Master Plan was prepared. The next step is to plan how to realize the Master Plan. Proposed projects, institutional reinforcement, road maintenance improvement measures, etc., should be included in the forthcoming ARMM Medium-term Regional Development Plan to show ARMM Government's strong will to implement the Master Plan and steadily implement them.

The following should also be undertaken:

- ARMM Government relies on its fund from the National Government. Now it has technical basis such as road projects, institutional improvement measures, road maintenance improvement, etc., to request funds for those to the National Government. All kinds of efforts should be exercised to obtain more funds from the National Government.
- In order to get more funds from the National Government, the DPWH-ARMM should show good performance. Planned and budgeted projects should be completed as scheduled.

c.) Coordination with DPWH-National

Much closer coordination with DPWH-National should be made and technical assistance from DPWH-National should be sought, particularly on the following;

- **Road/Bridge Database and HDM-IV Analysis**
DPWH-ARMM's road/bridge database should be integrated with DPWH-National, and HDM-IV analysis which will be the basis of allocation of MVUC fund should be undertaken for roads within ARMM. Although DPWH-National is, at present, rather reluctant to do so because of difficulty to examine data reliability owing to peace and order

situation of the region, DPWH-ARMM should continue to discuss it with DPWH National.

▪ **Foreign-Assisted Projects within ARMM**

Foreign-assisted projects within ARMM are implemented by DPWH-National. Implementation arrangement should be discussed with DPWH-National so that engineers of DPWH-ARMM can be involved in the implementation of foreign-assisted projects within ARMM. These projects will provide good opportunities for DPWH-ARMM staff to be trained.

▪ **Implementation of Road Projects which Extends Beyond ARMM Boundary**

Many road projects proposed under the Master Plan extend beyond ARMM boundary and ends in Region X or Region XII. Implementation of such projects should not be planned by DPWH-ARMM alone but with close coordination with DPWH-National.

d.) Farm-to-Market Road Improvement

ARMM is the poorest region in the country and has the highest rate of poverty. The dominant industry in the Region is agro-fishery thus road sector should support agro-fishery development so as to increase farmers and fishermen's income. Whenever a national or a provincial road improvement is planned, farm-to-market road improvement should also be included in the project.

e.) Institutional Reinforcement

Institutional weaknesses have been discussed in the course of the Study and roadmap for institutional reinforcement was proposed by the Master Plan. Priority areas for institutional capacity development identified were as follows:

- Road database
- Traffic database
- Bridge management system
- Multi-year programming and scheduling
- Pavement management system
- Maintenance planning and programming
- Road network planning system
- Computerized road design system
- Budgeting within organizational performance indicator framework
- Project preparation: Feasibility Study

Since DPWH-National has already developed the above systems, DPWH-ARMM should coordinate with DPWH-National for technical assistance.

f.) Road Maintenance Improvement

The Study recommended the following;

- Gradual shifting from Maintenance By Administration (MBA) to Maintenance By Contract (MBC) due to difficulty of renewal of equipment.
- Much emphasis to be given to routine maintenance activities at least for next 10 years due to limited maintenance budget.
- Gradual shifting of manpower from Area Equipment Service Offices (AESO) to District Engineering Offices (DEO) in line with shifting to MBC.
- Road maintenance level and priority of maintenance activities to maximize usage of limited maintenance budget.

Above recommendations should be realized by the DPWH-ARMM.

g.) Implementation Of Pre-F/S Road Projects

Pre-feasibility study of two (2) road projects was undertaken under this Study. DPWH-ARMM should exert all efforts to realize these projects. All possible funding sources should be tapped for the realization of the projects. DPWH-ARMM should also make them as good opportunities for

the on-the-job training to learn about project implementation.

Concerned LGUs' endorsements for the project should be secured and a certificate of non-coverage (CNC) should be obtained from DENR.

h.) Feasibility Study of Projects Proposed for the Short-Term Period

Feasibility studies of projects proposed for the short-term period (2011-2015) should be undertaken at the earliest possible time since it is the first step to realize the Master Plan.

i.) Environmental Impact Assessment

Projects for eliminating missing links and new roads construction are expected to create serious environmental impacts. EIA for those types of projects should be carried out and possible mitigation measures should be planned and implemented.

j.) Updating of Road/Bridge Database

Road/bridge database covering road/bridge inventory and condition survey results should be updated annually.

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