Ministry of Transport
The Republic of the Union of Myanmar

The Survey Program for the National Transport Development Plan in the Republic of the Union of Myanmar

Final Report

September 2014

JAPAN INTERNATIONAL COOPERATION AGENCY

Oriental Consultants Co., Ltd.
International Development Center of Japan
ALMEC Corporation

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Exchange rate used in this Report

USD	1.00 = JPY	99.2
USD	1.00 = MMK	970.9
MMK	1.00 = JPY	0.102

(As of October, 2013)

Project Location Map

Source: Road, Railway (MIMU, Rivised by MYT-PLAN), Sea port, River port (MYT-PLAN), River, Cities, Administrative Boundary (MIMU)

MYT-PLAN

0 50 100 200 300 Km

The Survey Program for

the National Transport Development Plan

in the Republic of the Union of Myanmar

A grand design for the transport sector at the dawn of new and modern era of transport development in Myanmar

Final Report

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Abbreviations

AADT	Annual Average Daily Traffic
ABC	ASEAN Broadband Corridor
ACMECS	Ayeyarwaddy-Chao Praya-Mekong Economic Cooperation Strategy
ADB	Asian Development Bank
AEC	ASEAN Economic Community
AFAFGIT	ASEAN Framework Agreement on the Facilitation of Goods in Transit
AFAFIST	ASEAN Framework Agreement on the Facilitation of Inter-State Transport
AFAMT	ASEAN Framework Agreement on the Multimodal Transport
AFTA	ASEAN Free Trade Agreement
AHN	ASEAN Highway Network
ASAM	ASEAN Single Aviation Market
ASEAN	Association of South East Asian Nations
BIMSTEC	Bay of Bengal Initiative for Multi-Sectorial Technical and Economic Cooperation
BOO	Build-Own-Operate
BOOT	Build-Own-Operate-and-Transfer
BOT	Build-Operate-and-Transfer
BTO	Build-Transfer-Operate
B/C	Benefit - Cost Ratio
CBD	Central Business District
CBTA	Cross-Border Trade Agreement
CDC	Community Development Committee
CDZ	Central Dry Zone
CEPT	Common Effective Preferential Tariff Scheme
CIQ	Custom Immigration and Quarantine
CSO	Central Statistical Office
CWR	Child to Women Ratio
DCA	Department of Civil Aviation, MOT
DHSHD	Department of Human Settlements and Housing Development, MOC
DMA	Department of Marine Administration, MOT
DME	Distance Measuring Equipment
DPW	Department of Public Works, MOC
DWIR	Directorate of Water Resources and Improvement of River Systems, MOT
ECD	Environmental Conservation Department
EIA	Environmental Impact Assessment
EIRR	Economic Internal Rat of Return
EPA	Economic Partnership Agreement
EPU	Economic Planning Unit, Malaysia
ERIA	Economic Research Institute of ASEAN and East Asia
EU	European Union
FCF	Fixed Capital Formation
FDI	Foreign Direct Investment
FESR	Framework for Economic and Social Reform
FIL	Foreign Investment Law
FIRR	Financial Internal Rate of Return
FTA	Free Trade Agreement
FTZ	Free Trade Zone
GAD	General Administration Department
GDP	Gross Domestic Product
GFCF	Gross Fixed Capital Formation
GIS	Geographic Information System
GMIAL	GMR Male International Airport Pvt. Ltd.
GMS	Greater Mekong Sub-region
GOM	Government of Myanmar
GRDP	Gross Regional Domestic Product
HIA	Hanthawaddy International Airport
IBRD	International Bank for Reconstruction and Development
ICAO	International Civil Aviation Organization
ICOR	Incremental Capital-Output Ratio
IDP	Internally Displaced Population
IEE	Initial Environmental Examination
ILS	Instrument Landing System
IMF	International Monetary Fund
IMO	International Maritime Organization
IRR	Internal Rate of Return
ISV	Inland Steam-vessels Act
ITS	Intelligent Transport System
IWT	Inland Waterway Transport, Myanmar
JICA	Japan International Cooperation Agency
KBA	Key Biodiversity Area
KLMR	Kuala Lumpur Metropolitan Region
LAGS	Liquids, Aerosols and Gels
LSPs	Logistics Service Providers
MACL	Maldives Airport Company Ltd.
MAFLAFS	ASEAN Multilateral Agreement on the Full Liberalization of Air Freight Service
MAFLPAS	ASEAN Multilateral Agreement on the Full Liberalization on Passenger Air Services
MCDC	Mandalay City Development Committee
MCDV	Myanmar Comprehensive Development Vision
MDGs	Millennium Development Goals
MES	Myanmar Engineering Society
MEZ	National Myanmar Economic Zone
MHA	Malaysia Highway Authority
MIA	Mandalay International Airport
MIC	Myanmar Investment Commission
MICT	Manila International Container Terminal
MNPED	Ministry of National Planning and Economic Development, Myanmar
MOC	Ministry of Construction, Myanmar
MOECAF	Ministry of Environmental Conservation and Forestry, Myanmar
MOT	Ministry of Transport, Myanmar
MPA	Myanma Port Authority, MOT
MPAC	Master Plan on ASEAN Connectivity
MPPA	Million Passenger Per Annum
MR	Myanma Railways, MRT
MRT	Ministry of Rail Transportation, Myanmar
MSSR	Mono-pulse Secondary Surveillance Radar
NCDP	National Comprehensive Development Plan
NDC	Nay Pyi Taw Development Committee
NIA	Nay Pyi Taw International Airport
NPV	Net Present Value
NSDF	National Spatial Development Framework
ODA	Official Development Assistance
PPP	Public-Private Partnership
PSP	Private Sector Participation
ROMT	Rehabilitate-Operate-Maintain-Transfer

RTAD	Road Transport Administration Department
SAR	Special Autonomous Region
SAR	Search and Rescue
SCA	Societe Concessionaire de l'Aeroport
SESAR	Single European Sky Air Traffic Management Research Program
SEZ	Special Economic Zone
SIZ	Special Industrial Zones
SKRL	Singapore-Kunming Rail Link
SOE	State Owned Enterprise
SPC	Special Purpose Company
TAZ	Traffic Analysis Zone
TFR	Total Fertility Ratio
TOD	Transit Oriented Development
TPD	Transport Planning Department, MOT
TTR	Transit Transport Routes
UNESCAP	United Nations Economic and Social Commission for Asia and Pacific
UNFCCC	United Nations Framework Convention on Climate Change
VOC	Vehicle Operating Cost
VOR	VHF Omni directional Radio-Range
VTS	Vessel traffic service
YCDC	Yangon City Development Committee
YIA	Yangon International Airport

Chapter 1 Introduction

1.1 MYT-Plan Goals and Objectives

Under the capable leadership of His Excellency President U Thein Sein, Myanmar is strengthening its economic policies to take advantage of the social and economic growth potential of an open market economy. While the transport sector has a key role in fostering this economic growth, advancing social development, especially in terms of the infrastructure, will also be needed to capitalize on regional trade opportunities. These policy reforms are important to realizing this growth potential, but success will also require the coordinated and sustained upgrading of the country's transport infrastructure, facilities, and skilled human resources.

To support domestic reforms in the transport sector, Myanmar is leveraging its role as host nation for the ASEAN Summit in 2014 and is looking forward to 2015, when the ASEAN Community will be economically integrated. Myanmar is eager to seize upon the growth opportunities provided by integration. The scale of growth in the region and the increase of foreign investment possibilities and infrastructure financing are helping in this regard. Myanmar's strategic location in the ASEAN region, its proximity to Bangladesh, China, India, Laos and Thailand, leave no doubt that Myanmar will play an important role in generating significant levels of regional GDP in the future. However, the possibilities for such growth mean that development of the country's transport sector should be an infrastructure priority, that will require investment in international airports, deep sea ports, inland waterways, strategic rail and highway networks and improvements in cross-border infrastructure and regional connectivity.

Against this backdrop, the Myanmar National Transport Master Plan (MYT-Plan) is designed to provide guidance for a long-term investment program that will help the Government achieve its economic growth targets by 2030. In addition, this Master Plan will provide guidelines that are adaptable to other industrial sectors and to private investment, to assist with investment planning and decision making for a variety of transport sector projects.

In this way, the Master Plan will influence the transport sector's development, by presenting a set of comprehensive policies relevant to all modes of transport, as well as development strategies for specific modes like road/road transport, rail, air, maritime and inland waterway, as well as the associated projects and activities that can help these modes achieve the Vision and its Objectives.

The Master Plan is designed to be read in conjunction with Myanmar's National Comprehensive Development Plan (NCDP), which describes the country's development vision and strategic goals. This transport Master Plan has been prepared with the NCDP in mind and will be updated in conjunction with the achievement of national development objectives, guided by the NCDP.

1.2 Structure of the Transport Master Plan

The Myanmar National Transport Master Plan includes both policy and infrastructure components, which include planning elements designed to work within the National Comprehensive Development Plan's existing planning frameworks. These components include:

- Reference to related international frameworks (e.g. Brunei Action Plan, etc.)
- Demographic analysis and a demographic framework, including population projections
- Economic growth scenarios to forecast economic performance and prerequisites
- A National Spatial Development Framework
- A financial framework, indicating the levels of investment required as well as sector constraints
- An environmental framework to maintain and preserve Myanmar's natural and environmental assets for future generations
- A traffic demand forecast

These infrastructure and policy components recommend corridor-based infrastructure to overcome issues that hamper growth in the transport sector, such as a lack of coordination between the three transport agencies when projects are planned and implemented and weak investor commitment to spatial planning guidelines. To address these and other issues, the Master Plan recommends a set of transport infrastructure projects for development corridors, which will require a coordinated effort, by the relevant ministries for implementation.

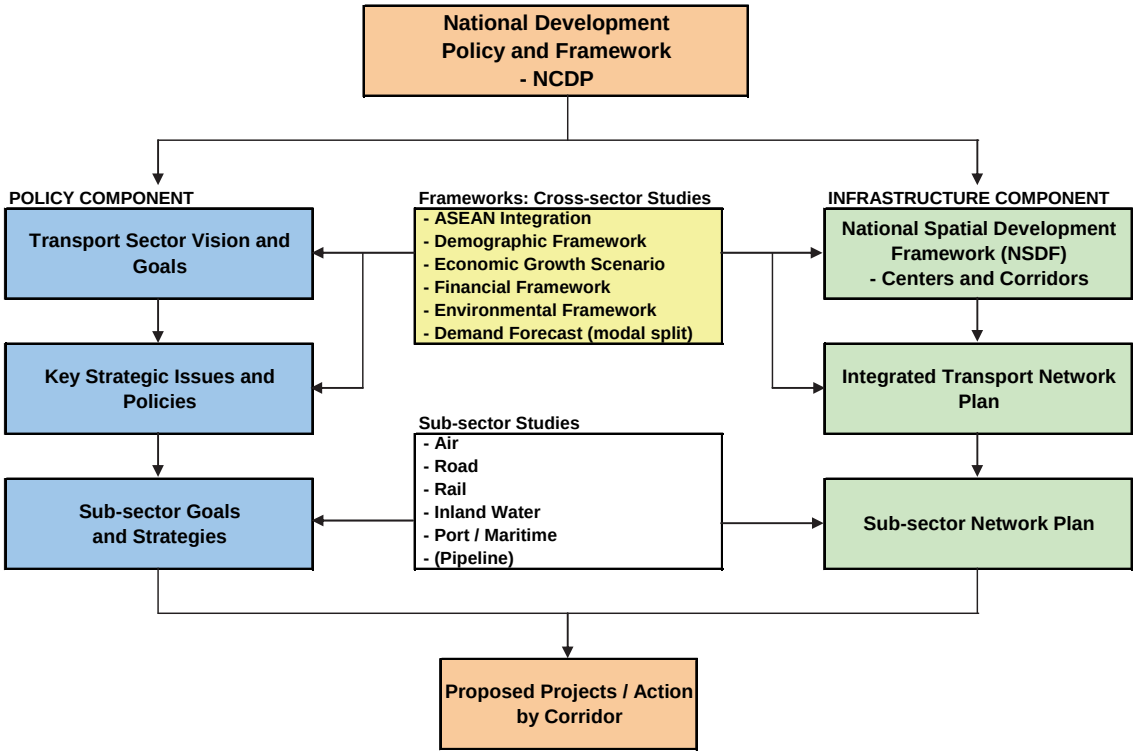


Figure 1.1 Structure of the Master Plan

1.3 Structure of the Report

This Master Plan Report's 11 Chapters contain the elements needed to develop an Action Plan to implement the transport sector's vision to 2030. The Report begins with an Introduction that notes the opportunity and growth potential in Myanmar, if the transport sector is reformed and strengthened with legislative support. The balance of the Report, Chapters 2 through 11, include analysis, findings and recommendations that describe a path that can secure a positive future for Myanmar's transport sector.

Chapter 2 is a critical first step in realizing this future as it establishes the Socio-Economic Framework, used to supply analysis for the transport demand forecast and other elements of the MYT-Plan. This analysis is also needed to support the demand forecasts and policy strategies in later Chapters. The Socio-Economic Framework uses a cohort change methodology to analyze current demographic trends and future population estimates, both nationally and at state/region levels.

The Socio-Economic Framework also includes analysis of Myanmar's Gross Domestic Product (GDP) trends at the national and state/region levels, including forecasts through to 2040. These future GDP and Gross Regional Domestic Product (GRDP) forecasts consider a number of important factors, including future population growth, necessary levels of investment to achieve certain levels of GDP growth (e.g. fixed capital formation), and the transportation experiences of Myanmar's peer countries in the ASEAN region, including Japan.

A Macro Economic Framework in Chapter 2 includes analysis of Public Private Partnerships in Myanmar's transport sector. These agreements, between government and the private sector, are critical to achieving the necessary investment levels for Myanmar's transport sector. This Chapter provides an overview of PPPs, description of the regulations that facilitate private investment in Myanmar, a comparative overview of PPP projects in peer countries, as well as a way forward in applying PPP principles to MYT-Plan recommended investments.

Chapter 3 presents an Environmental Framework, including the environmental legal system that is currently under development in Myanmar. The Environmental Conservation Law, which is the core law for protecting and enhancing Myanmar's environmental sustainability, was issued in March 2012.

The Ministry of Environmental Conservation and Forestry (MOECAF) is currently preparing Environmental Conservation Rules, Environmental Impact Assessment (EIA) Procedures and environmental quality standards, with assistance from the Asian Development Bank (ADB). As of May 2013, Environmental Conservation Rules had been submitted to the President's Office and are expected to be enacted shortly, however, Conservation Rules and EIA Procedures will require longer implementation periods.

Chapter 4 describes the scope of the National Spatial Development Framework (NSDF) and includes an overview of Government Ministries and Agencies involved in spatial planning and related legislation. The Chapter also summarizes the key objectives and policies of relevant Ministries and Agencies with an interest in land development, based on employment, economic activity, agriculture and agro-industries, industry and industrial zones, Special Economic Zones (SEZ), tourism and the environment. The Chapter also analyses aspects of urbanization, via the proposed distribution of future populations at the state/region and Traffic Analysis Zone (TAZ) levels.

This analysis provides the basis for a NSDF in Myanmar. The NSDF will include a spatial development framework to support the MYT-PLAN, which will guide future transport investment at the national and state/regional levels. The NSDF will also inform key transport

sector stakeholders about linkages and connectivity among their own plans, policies and programs so these stakeholders can improve coherence and efficiently in implementing their plans, policies and programs.

Chapter 5 summarizes the current institutional framework, including the role of each Ministry and Agency related to the transport sector. This Chapter forms the base for the possible future re-organization or re-arrangement of the transport sector's authorities responsible for planning and administration.

Chapter 6 describes the role of the ASEAN Transport Agreement and sector-wide Transport Action Plan and explores strategies and actions for all transport sectors listed in the Brunei Action Plan, including priority actions for the Myanmar Government to take by 2015.

Chapter 7 provides an overview of the Myanmar transportation sector, including roads and road transport, railway, inland waterways and maritime facilities, and aviation. Each of these transport sub-sectors includes a Technical Note with analysis of sector funding and private sector participation, planning and coordination, resources and policies needed to implement and maintain, and safety and environmental considerations.

Chapter 8 explains the MYT-Plan's demand forecast for the transport sector, developed from demand and transport analysis and the socio-economic framework. This analysis is also used for numerical calculations and the projects recommended in Chapter 10.

Chapter 9 provides an overview of the key transport sector issues in Myanmar's transport policies, citing analysis by the Asia Development Bank, and conducts a SWOT analysis (Strengths, Weaknesses, Opportunities, Threats) for the sector nationwide. This analysis identifies key areas for consideration in terms of planning, operations, institutions and regulatory environment, pricing and resource allocation, and human and environmental considerations. The Chapter also describes proposals for a comprehensive Transport Sector Vision.

Chapter 10 recommends transport component projects, based on the proposed corridor cluster development approach. These proposals are designed to achieve the planned transport sector Vision and Objectives.

Finally, Chapter 11 of the Report summarizes financing requirements over the next fifteen years (until 2030) and includes recommended actions for the actual implementation of the MYT-Plan.

The Myanmar National Transport Master Plan is a timely and important initiative that will support Myanmar's economic growth, through reform and improvement of its transport sector. However, it is a not a static document and is designed to be adapted to Myanmar's changing transport conditions. The Ministry of Transport will be responsible for updated and maintaining the accuracy of data contained in the Report, thus allowing the MYT-Plan to be a strategic and important tool for the transport sector for years to come.

Chapter 2 Socio-Economic and Financial Framework

This Chapter describes a Socio-Economic Framework that was developed for use throughout the Master Plan. It includes analysis for the transport demand forecast, which is needed to support the policy strategies in later Chapters.

Future population and employment growth in Myanmar will require additional transport services. As Myanmar's population and employment grows, there will be an increasing need to effectively manage the demand for transportation services and conduct advanced planning to ensure residents and employers can easily adapt to the enhanced services, before the expected population growth is in place.

This Socio-Economic Framework consists of two primary sections. The first is a comprehensive discussion of current trends and future population estimates. It uses the cohort change methodology to analyze current demographic, both nationally and at the state/region levels. The second section is a discussion of Gross Domestic Product (GDP) trends at these same levels, including forecasts through to 2040. This analysis includes influential factors like population growth, investment levels required to achieve certain levels of GDP growth (e.g. fixed capital formation), and the experiences of Myanmar's peer countries in the ASEAN region, including Japan.

The analysis includes possible alternative Fixed Capital Formation (FCF) scenarios in the transport sector relative to Myanmar's ASEAN peers, in order to identify the public investment capacity of the transport sector. The alternative FCF scenarios are compared to the total Fixed Capital Formation and government capital formation expenditure to determine the most appropriate alternative investment scenario for the transport sector. This Chapter also includes a section on the possible application of Public-Private Partnerships (PPP), needed to diversify transport investment in Myanmar.

The second section of this Chapter provides an overview of PPPs, existing regulations that facilitate private investment in Myanmar, a comparative overview of PPP projects in peer countries relative to possible projects in Myanmar, as well as a possible way forward in terms of how to apply PPP principles to investments recommended by the MYT-Plan.

Note that regional population and GDP forecasts are based on an assumed regional economic development scenario, which will be elaborated later in this section.

2.1 Demographic Framework

2.1.1 Analysis of Population Growth between 1990 and 2010

Population growth projections, based on available Government of Myanmar data beginning in 1990, were used to develop demand forecasts for transport services, the 16-year planning period

of the Master Plan, and the 10-year plan to 2040.

This Report makes estimates of Myanmar's demographic changes, at five-year intervals, between 1990 and 2010. Table 2.1 disaggregates this data by gender and age group and uses the results to develop Table 2.2, which illustrates the survival rates by gender and age group. For example, the survival rate of 5 to 9 year old males in 1990-95 (94.3%) is calculated by dividing the population difference between 5-9 year males in 1995 (2,501,000 persons) and 0-4 year old males in 1990 (2,652,000 persons) into the 0-4 year old population.

Table 2.1 Population by Gender and Age Bracket (Thousand Persons)

Age group	1990	1995	2000	2005	2010
Male					
0-4	2,652	2,769	3,050	3,278	2,933
5-9	2,398	2,501	2,759	3,020	3,044
10-14	2,317	2,428	2,531	2,768	3,001
15-19	2,233	2,296	2,456	2,538	2,881
20-24	2,017	2,102	2,312	2,449	2,749
25-29	1,737	1,894	2,110	2,299	2,557
30-34	1,464	1,667	1,900	2,097	2,331
35-39	1,188	1,411	1,669	1,886	2,091
40-44	932	1,192	1,408	1,652	1,832
45-49	759	965	1,181	1,384	1,573
50-54	671	801	945	1,149	1,299
55-59	593	664	772	905	1,060
60-64	478	538	623	721	822
65&+	776	999	1,191	1,394	1,550
Total of male	20,215	22,227	24,907	27,540	29,400
Female					
0-4	2,586	2,736	3,016	3,235	2,851
5-9	2,401	2,304	2,735	2,993	2,922
10-14	2,347	2,287	2,336	2,747	2,847
15-19	2,272	2,224	2,319	2,346	2,742
20-24	2,060	2,089	2,249	2,324	2,644
25-29	1,776	1,942	2,108	2,248	2,497
30-34	1,496	1,733	1,957	2,105	2,340
35-39	1,213	1,477	1,743	1,951	2,145
40-44	955	1,257	1,479	1,731	1,924
45-49	784	1,023	1,254	1,464	1,684
50-54	698	865	1,012	1,230	1,415
55-59	624	741	845	981	1,176
60-64	509	615	709	803	934
65-	850	1,224	1,456	1,698	1,936
Total of female	20,571	22,517	25,218	27,856	29,730
Total population	40,786	44,744	50,125	55,396	59,130

Source: Myanmar Statistical Yearbook 2011, Central Statistical Organization

Both Tables 2.1 and 2.2 highlight important features of Myanmar's population growth, including:

- The male and female populations under 4 years of age, gradually increased between 1990 and 2005; since then, this cohort has been in decline.
- Population estimates for all age groups, except those under 4 years old, grew continuously throughout the entire period, suggesting that survival rates have

exceeded 100% in some age groups, at different times. Normally, these outcomes cannot occur without in-migration from other countries and these data inconsistencies are likely attributable to inaccurate population estimates by census takers. As such, it was necessary to adjust survival rates to accurately estimate population forecasts.

- The survival rates for males and females are 99.8% (10-14 year olds) and 99.0% (35-39 year olds). Survival rates for both genders decline between 40 and 44 years but still remain relatively high (between 98.0 and 99.3%).

Myanmar's elderly population, those over the age of 65, has been steadily increasing over time, however the actual population growth rate has been in decline with both genders, as is described in Table 2.3.

Table 2.2 Survival Rate by Gender and Age Bracket (Unit: %)

Age group	1990-95	1995-00	2000-05	2005-10	Adjustment for population projection
Male					
5-9	98.8	99.9	99.8	98.2	98.2
10-14	100.2	100.2	100.1	99.8	99.8
15-19	99.8	100.2	100.1	101.0	99.8
20-24	98.8	100.1	99.9	102.0	99.9
25-29	98.7	100.1	99.9	101.1	99.9
30-34	99.2	100.1	99.9	100.3	99.9
35-39	99.3	100.0	99.9	99.9	99.9
40-44	100.1	100.0	99.8	99.3	99.3
45-49	100.7	99.8	99.7	98.8	98.8
50-54	101.1	99.6	99.5	98.4	98.4
55-59	99.8	99.3	99.1	98.0	98.0
60-64	98.1	98.7	98.6	97.6	97.6
Female					
5-9	97.7	100.0	99.8	97.5	97.5
10-14	99.0	100.3	100.1	98.8	98.8
15-19	98.9	100.3	100.1	100.0	99.8
20-24	98.3	100.2	100.0	103.0	99.9
25-29	98.8	100.2	100.0	101.8	99.9
30-34	99.5	100.2	100.0	101.0	99.9
35-39	99.7	100.1	99.9	100.5	99.9
40-44	100.7	100.0	99.9	99.7	99.7
45-49	101.4	100.0	99.8	99.3	99.3
50-54	102.0	99.8	99.6	99.2	99.2
55-59	101.2	99.5	99.4	98.9	98.9
60-64	99.7	99.1	99.0	98.8	98.8

Source: JICA Study Team

Table 2.3 Population Growth Rates for the Over-65 Age Bracket (Unit: %)

(Unit: %)

Gender	1990-95	1995-00	2000-05	2005-10
Male	5.2	3.6	3.2	2.1
Female	7.6	3.5	3.1	2.7

Source: JICA Study Team

Notably, the growth rates among Myanmar's elderly population have fallen by as much as two to three times over the last 20 years.

Table 2.4 illustrates changes in Myanmar's Child to Women Ratio (CWR) and Total Fertility Ratio (TFR) since 1990. This analysis is used as a measure of the 'demographic health' of Myanmar and hence, demand for future transport services. The ratios reflect fertility and morbidity rates and the likelihood that children born will reach adulthood, as well as family size. The CWR is the ratio of the number of children under 5 years to the number of women between the ages of 15 and 44 years of age. For 1990, the CWR (0.536) was calculated by dividing the number of males and females under the age of five (5,238,000 persons) by the number of females between the ages of 15 to 44 years of age (9,772,000 persons) during that same year. The TFR is the total average number of children a woman will bear during her lifetime. For the purposes of this Study, the TFR is calculated by multiplying the CWR by a factor of six, which represents the number of five-year age brackets between the ages of 15 and 44.

Table 2.4 Changes of Child Woman Ratio and Total Fertility Ratio since 1990

	1990	1995	2000	2005	2010
CWR	0.536	0.513	0.512	0.513	0.405
TFR	3.22	3.08	3.07	3.08	2.43

Source: JICA Study Team

Since 1990, both the CWR and TFR have been in continuous decline. In 1990, the CWR was at 0.536 and by 2010, the rate had dropped to 0.405, a decline of more than 32%. Since the CWR serves as the basis for the TFR, the TFR has also declined at the same rate. As a result, economic and long-range forecasts and growth estimates project slower growth for transport services.

2.1.2 Population Projections through 2040

Before carrying out the population projection, the following considerations are important to note:

1. For people between the ages of 5 and 64, the survival rate in 2010 is used to forecast each five-year age bracket. However, as some survival rates exceeded 100% in as described in the section 2.1.1, these survival rates have been adjusted as indicated in the right-most column in Table 2.2.
2. For people 65 years of age and above, the forecast assumes that the population growth rates in this age bracket will continue to decline, as described in Table 2.5.

Table 2.5: Forecast Population Growth Rates for the Over-65 Age Bracket, 2010-2040

(Unit: %)

Gender	2010-15	2015-20	2020-25	2025-30	2030-35	2035-40
Male	1.9	1.7	1.5	1.3	1.1	0.9
Female	2.5	2.3	2.1	1.9	1.7	1.5

Source: JICA Study Team

The most important factor in forecasting future population is the change in the number of births, which is expressed as a change in the CWR for purpose of this Study. The following three scenarios have been analyzed regarding the possible future changes in the CWR.

- High Growth Scenario: The CWR will maintain the 2010 level (0.405) through 2040 with an equivalent TFR of 2.43 for the duration of the forecast period.

- Middle Growth Scenario: The CWR will decrease by 0.02 every five years, declining from 0.385 in 2015 to 0.285 in 2040. Under this scenario, the TFR will decrease from 2.31 in 2015 to 1.71 in 2040.
- Low Growth Scenario: The CWR will decrease by 0.03 every five years, declining from 0.375 in 2015 to 0.225 in 2040. Under this scenario, the TFR will decrease from 2.25 in 2015 to 1.35 in 2040.

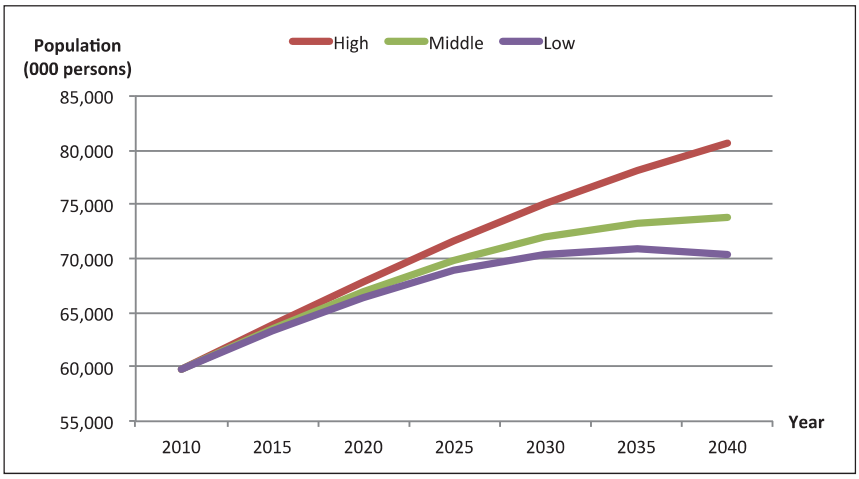
Table 2.6 Changes of Child Woman Ratio and Total Fertility Ratio in the future

Scenarios		Projection					
		2015	2020	2025	2030	2035	2040
High Growth	CWR	0.405	0.405	0.405	0.405	0.405	0.405
	TFR	2.43	2.43	2.43	2.43	2.43	2.43
Middle Growth	CWR	0.385	0.365	0.345	0.325	0.305	0.285
	TFR	2.31	2.19	2.07	1.95	1.83	1.71
Low Growth	CWR	0.375	0.345	0.315	0.285	0.255	0.225
	TFR	2.25	2.07	1.89	1.71	1.53	1.35

Source: JICA Study Team

Figure 2.1 illustrates the three alternative population growth scenarios based on the above parameters. In the High Growth scenario, Myanmar's population will grow at an average annual rate of 1.0% and number about 81 million people by 2040. In the Low Growth scenario, the population is expected to be 70 million, growing by about 0.5% annually. Notably, this scenario estimates that the population will peak at 71 million in 2035, and then begin to decline to 70 million by 2040.

The High Growth scenario assumes a constant CWR (and thus TFR) for a 30-year period, which will be very difficult to maintain owing to changing socio-economic conditions experienced in the face of expected rapid economic growth. At the same time, the Low Growth scenario assumes that the TFR will drop to extremely low levels, more commonly found in advanced nations like Japan. As such, and despite rapid economic development, it is unlikely that Myanmar will achieve a similar socio-economic profile to Japan. Given the identified weaknesses of these two scenarios, the Middle Growth scenario has been selected as the most likely option to serve as the baseline for the downstream planning work. Table 2.7 indicates the population projections by gender and age group for the Middle Growth scenario from 2015 to 2040.



Source: JICA Study Team

Figure 2.1 Alternative Population Growth Scenarios

Table 2.7 Population Projection by Gender and Age Group (Middle Scenario)

	2015	2020	2025	2030	2035	2040
Male						
0-4	2,788	2,809	2,782	2,685	2,535	2,365
5-9	2,879	2,737	2,758	2,731	2,635	2,488
10-14	3,039	2,875	2,733	2,753	2,726	2,631
15-19	2,995	3,033	2,869	2,727	2,748	2,721
20-24	2,879	2,993	3,031	2,867	2,725	2,746
25-29	2,746	2,875	2,989	3,027	2,863	2,722
30-34	2,556	2,744	2,874	2,988	3,026	2,862
35-39	2,329	2,554	2,742	2,872	2,985	3,023
40-44	2,076	2,312	2,535	2,723	2,851	2,964
45-49	1,810	2,051	2,284	2,504	2,689	2,816
50-54	1,548	1,781	2,018	2,248	2,465	2,647
55-59	1,273	1,517	1,746	1,978	2,204	2,416
60-64	1,035	1,243	1,481	1,704	1,931	2,151
65 +	1,703	1,853	1,996	2,129	2,249	2,363
Total Male Population	31,656	33,378	34,838	35,936	36,633	36,916
Female						
0-4	2,710	2,731	2,704	2,610	2,464	2,299
5-9	2,779	2,642	2,662	2,636	2,544	2,402
10-14	2,886	2,745	2,609	2,629	2,603	2,512
15-19	2,840	2,879	2,738	2,603	2,623	2,597
20-24	2,740	2,838	2,877	2,736	2,601	2,621
25-29	2,642	2,738	2,836	2,874	2,734	2,599
30-34	2,495	2,639	2,735	2,833	2,872	2,731
35-39	2,337	2,491	2,636	2,732	2,829	2,868
40-44	2,138	2,329	2,483	2,627	2,722	2,820
45-49	1,911	2,123	2,313	2,466	2,609	2,704
50-54	1,670	1,895	2,105	2,293	2,445	2,587
55-59	1,399	1,651	1,873	2,081	2,268	2,418
60-64	1,162	1,382	1,631	1,851	2,056	2,240
65 +	2,190	2,454	2,723	2,992	3,255	3,506
Total Female Population	31,898	33,537	34,925	35,962	36,624	36,902
Total Population	63,554	66,914	69,763	71,898	73,257	73,818
Annual population growth rate	1.5%	1.0%	0.8%	0.6%	0.4%	0.2%

Source: JICA Study Team

2.1.3 Population Forecast by Regions and States

In order to forecast future population distributions in line with the Middle Growth scenario outlined above, a series of key assumptions were established, largely pertaining to regional economic development prospects that consider when and why people migrate between Regions and States.

In the short term, between 2015 and 2025, major investments in infrastructure and industry in Yangon and southern Bago (and the ensuing economic growth) will be incentives that can attract large numbers of migrants from surrounding areas.

In the medium term (i.e. after 2025) it is expected that new investments will shift most rapid economic growth away from Yangon and accelerate migration to the Mandalay metropolitan area (including Sagaing City), as well as to designated Special Economic Zones (SEZ) such as Kyaukphyu (Rakhine State) and Dawei (Tanintharyi Region), where the bulk of these investments are expected to be made. Table 2.8 identifies the changes to region/state-wise populations, from 2012 to 2030.

Table 2.8 Population Forecast by Regions and States from 2012 to 2040

Regions/States	2012	2015	2020	2030	2040
Kachin State	1,616	1,721	1,820	1,935	1,973
Kayah State	365	391	424	450	460
Kayin State	1,855	1,986	2,151	2,401	2,496
Chin State	571	597	630	656	666
Sagaing Region	6,654	6,864	7,029	7,179	7,236
Tanintharyi Region	1,755	1,886	2,051	2,301	2,396
Bago Region	6,125	6,361	6,691	7,261	7,507
Magway Region	5,730	5,914	6,013	6,113	6,151
Mandalay Region	7,423	7,685	7,949	8,370	8,617
Mon State	3,193	3,324	3,489	3,846	3,998
Rakhine State	3,370	3,501	3,666	4,016	4,130
Yangon Region	7,170	7,617	8,739	10,445	11,015
Shan State	5,779	5,963	6,128	6,378	6,473
Ayeyarwaddy Region	8,205	8,520	8,685	8,864	8,902
Naypyitaw Council Territory	1,164	1,269	1,434	1,684	1,779
Total	60,976	63,600	66,900	71,900	73,800

Source: Population Department, Ministry of Immigration and Population (2012) and JICA Study Team

2.2 Macro-Economic Framework

2.2.1 Economic Context within ASEAN and the GMS

Myanmar is a member of two important organizations that encourage regional coordination and cooperation in a wide variety of social and economic fields. The Association for Southeast Asian Nations (ASEAN) was established in 1967 to advance economic growth, social progress, cultural development, and the protection of peace and stability in the region. There are currently ten member countries in ASEAN including Brunei, Cambodia, Indonesia, Laos, Malaysia, Myanmar, the Philippines, Singapore, Thailand, and Vietnam.

Early in the development of ASEAN, a Common Effective Preferential Tariff Scheme (CEPT) was adopted to promote the free flow of goods between member nations. In 1992, a more comprehensive scheme was adopted, known as the ASEAN Free Trade Agreement (AFTA). As

the number of members grew and the needs of member countries changed, the organization developed an ASEAN Economic Community (AEC), which is scheduled to be implemented in 2015. The primary objectives of the AEC are to create:

- A single market and production base
- A highly competitive economic region
- A region of equitable economic development
- A region fully integrated into the global economy

Table 2.9 indicates economic integration among four regional trade regimes: ASEAN Economic Community, the European Union (EU), an Economic Partnership Agreement (EPA), and a regional Free Trade Agreement (FTA). The AEC promotes deeper economic integration, further that the FTA but not as much as the EU's economic regime. The AEC includes no common external tariff system and its liberalization of services, trades, investment, free movement of labor and competitive environment are lower than those of the EU. The depth of economic integration under AEC could be called "FTA plus", or close to the common form of the EPA. Even so, it is expected that the production network of the ASEAN Economic Community would be strengthened and deepened, with the freer movement of goods and investment.

Table 2.9 Comparison of Coverage Area Among AEC, EU, EPA and FTA

Items	AEC	EU	EPA	FTA
Elimination of tariff	A	A	A	A
Common external tariff	C	A	C	C
Elimination of non-tariff barrier	A	A	B	B
Liberalization of service trade	B	A	B	C
Standardization and cross certification	B	A	B	C
Free flow of labor	B	A	B	C
Trade facilitation	A	A	A	B
Free flow of investment	A	A	B	C
Government procurement	C	A	B	C
Intellectual property rights	A	A	A	C
Competition policy	B	A	B	C
Harmonization of tariff system	C	B	C	C
Regional cooperation	A	A	A	C
Common currency	C	A	C	C
Limitation of sovereignty	C	B	C	C

Note: A: Covered, B: Partly covered, C: Not covered
Source: "What is ASEAN Economic Community –reading AEC blueprint- " International Trade and Investment, No. 72 Summer 2008

ASEAN has established an "AEC Blueprint" that outlines the necessary steps and actions that each member nation must take to prepare for AEC implementation in 2015. While the Myanmar government is working to prepare for this implementation, a "Mid-term Review of the Implementation of AEC blueprint" was prepared by the Economic Research Institute of ASEAN and East Asia (ERIA) in October 2012 and advises that the government still faces major challenges in the lead up to implementation. The Review identified challenges that include the need for a range of efficiencies, include in: institutions that handle financial services, trade facilitation, investment promotion and facilitation, standards and conformance systems, mutual recognition arrangements, intellectual property rights legislation, agricultural development, small and medium enterprise promotion, etc.

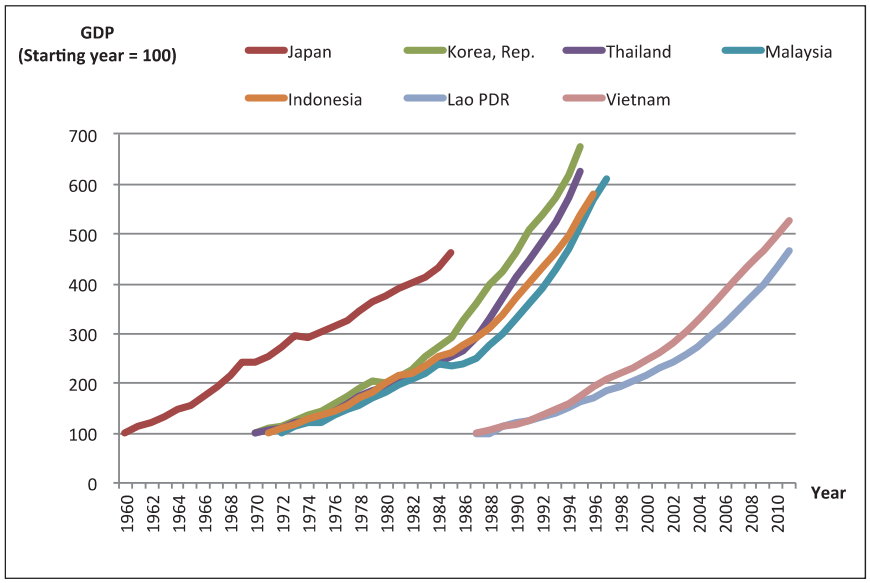
ASEAN member countries are supportive of initiatives that bring people, goods, services and capital closer together to create more competitive and resilient regions. As such, and in order to support the AEC, member countries drafted a "Master Plan on ASEAN Connectivity (MPAC)" in 2010. The Master Plan aims to increase economic growth by promoting investment in key infrastructure projects in the ASEAN region, including completion of the ASEAN Highway Network (AHN) and the creation of an ASEAN Broadband Corridor (ABC), both of which will be very important to Myanmar's economic growth success in the future.

A second regional coordination initiative, the Greater Mekong Subregion (GMS), exists within ASEAN. Established in 1992 by the Asian Development Bank (ADB), the GMS consists of Cambodia, Laos, Myanmar, Thailand, and Vietnam as well as Yunnan Province and the Guangxi Special Autonomous Region (SAR) in southern China. The ADB has continuously supported a wide range of policies and investments that encourage social and economic development within the region. With respect to Myanmar, the most important GMS initiative to date is the Cross-Border Trade Agreement (CBTA), which promotes the integration of production and supply chain processes in the region and is designed to facilitate intra-regional flows of goods and the designation of key Economic Corridors that connect major cities and economic centers within the GMS, four of which are partially (or wholly) located in Myanmar.

2.2.2 Economic Growth Scenarios

In 2011, Myanmar's Government began enacting a wide range of political and economic reforms, which have helped Myanmar position itself as the last frontier in Asia for important foreign investment, owing to the country's large population and vast natural resources. As the Government's reformation process continues, most Western nations, including the United States and European Union, have been lifting, and in some cases completely removing economic sanctions, which are generating robust economic activity in the country. As more reforms are undertaken, Myanmar will become an even more attractive investment destination leading to strong and rapid economic development. Supporting this notion is a recent ADB report entitled "Myanmar in Transition" that describes how "Myanmar could grow at 7%–8% per year for a decade or more and raise its per capita income to $2,000–$3,000 by 2030." In addition to the ADB report, Myanmar's President H.E. U Thein Sein has set a target of annual GDP growth rate at 7.7% per year, for the current five-year development plan.

In order to determine whether such rapid, long-term growth is feasible, this Report includes analysis of economic growth in peer Asian countries, including the Republic of Korea, Thailand, Malaysia and Indonesia and Vietnam. By observing 25-year cycles of rapid growth, the analysis suggests that these peer countries experienced GDP growth rates of between five and seven times (relative to the base year); this is described in Figure 2.2. Based on this analysis, it is highly probable that Myanmar has the potential to achieve such rapid economic development over the next three decades.



Source: JICA Study Team

Figure 2.2 25-Year Economic Growth Trends in Peer Asian Countries

In order to estimate Myanmar's future Gross Domestic Product, the following three alternative economic growth scenarios have been considered, which are also described in Table 2.10 and Figure 2.3.

- Scenario 1 - High Growth
  This scenario is based on the GDP growth target identified by H.E. President U Thein Sein, which seeks to achieve long-term annual GDP growth of at least 7.7% per year. The scenario assumes that annual growth will reach 7.7% by 2015 and continue growing at the same rate through 2035. It is expected that new and ongoing Foreign Direct Investment (FDI), public and private investment in infrastructure and additional future private investment will help sustain this growth. In this scenario, Myanmar's GDP will increase by about six times by 2035.

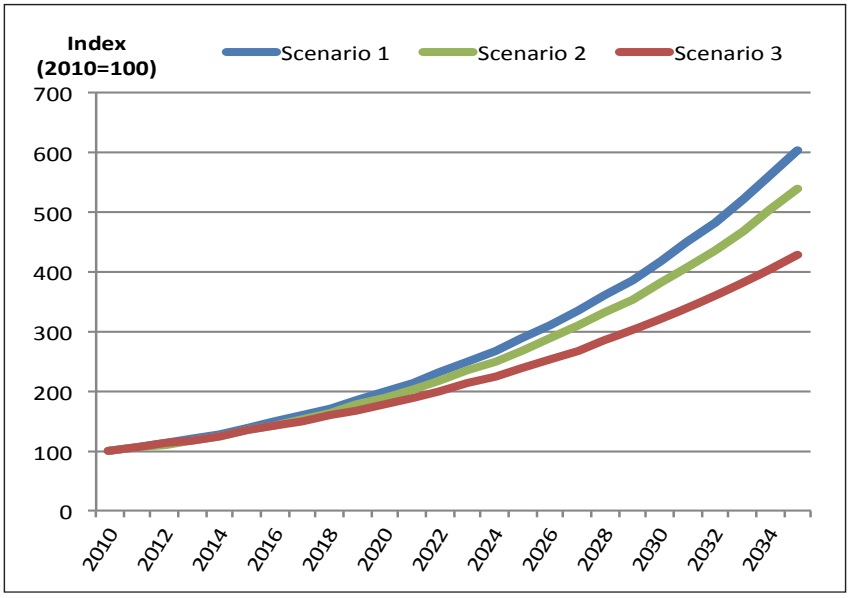
- Scenario 2 - Medium Growth
  In this scenario, the GDP growth rate will increase to 7.2% by 2015, 0.5% lower than in the High Growth scenario and sustained at this level from 2014 to 2035. At this rate of growth, GDP will double every ten years, but fall slightly behind the six-fold growth experienced in some peer countries.

- Scenario 3 - Low Growth
  This scenario is based on the IMF's debt sustainability analysis of Myanmar in 2011. In the IMF analysis, annual GDP growth rates from 2014 to 2031 were set at 6.0%. The Report's analysis assumes this level of growth will be maintained through 2035. As 6.0% future annual growth is similar to economic growth since 2010, this scenario can also be considered the "trend line" scenario.

Table 2.10 Annual GDP Growth Scenarios (Unit: %)

Scenarios	2010	2011	2012	2013	2014	2015-35	Annual average growth rate 2011-35
1) High	5.3	5.3	6.3	5.9	6.5	7.7	7.5
2) Medium	5.3	5.3	6.3	5.9	6.5	7.2	7.0
3) Low	5.3	5.3	6.3	5.9	6.0	6.0	6.0

Source: figures from 2010 to 2013 come from the IMF 2011 Article IV Consultation Report (IMF Country Report No.12/104), and figures from 2014 and 2015-35 are calculated by JICA Study Team



Source: JICA Study Team

Figure 2.3 Economic Growth Scenarios

In order to find a practical GDP growth scenario, the analysis calculated the necessary amount of Gross Fixed Capital Formation (GFCF)[1] required to achieve the GDP growth targeted in each scenario. This analysis uses an Incremental Capital-Output Ratio (ICOR), calculated using the following formula:

$$ICOR = \frac{increase\ in\ capital}{increase\ in\ GDP} = \frac{investment/GDP}{increase\ in\ GDP/GDP}$$

$$= \frac{percentage\ of\ investment\ \ to\ GDP}{GDP\ growth\ rate}$$

The calculations suggest that Myanmar's ICOR is 3.1 during the period between 2008 and 2010, as indicated in Table 2.11 below.

[1] Gross Fixed Capital Formation is the total investment consisting of both private sector and public sectors. It includes public investment, investment in plant and equipment, housing investment, etc.

Table 2.11 Annual Myanmar's ICOR from 2008 to 2010 (Unit: %)

Year	GDP Growth Rate	Share of Fixed Capital Formation
2008	5.5	12.9
2009	3.6	14.7
2010	5.1	16.8
Average of 2008-10	4.7	14.8
Myanmar's ICOR	-	3.1

Source: GDP growth rate is extracted from IMF World Economic Outlook Database October 2012, Share of fixed capital formation is extracted from ADB Key Indicators 2012

As indicated in Table 2.12, the ICOR levels tend to gradually increase over time. This increase is inversely related to slowing GDP growth rates. For example, Thailand's ICOR increased from 2.4 in 1961-65 to 7.2 in 2006-10, while Malaysia's ICOR increased from 2.4 in 1961-65 to 4.9 in 2006-10. Both countries experienced rapid economic growth in the early and middle part of the period, but as time passed, GDP growth started to slow down (in real terms) and this has led to increasing ICOR levels.

Based on regional experience, it is expected that Myanmar's ICOR will gradually increase over time. For the purpose of this Report, the analysis assumes that Myanmar's ICOR will increase from 3.1 in 2010 to 5.0 in 2035.

Figure 2.4 illustrates the necessary amount of GFCF for each scenario, for the period 2011 to 2035. Table 2.13 indicates the share of GFCF to GDP in 2010, 2020 and 2030, and the cumulative amounts from the period between 2014 and 2030. At present, the ratio of GFCF to GDP in Myanmar is the lowest among its East and Southeast Asian peer countries, standing at only 16.8% in 2010. In order to reach the growth target, the following levels of GFCF are required:

- Scenario 1 - High Growth
  It is necessary to increase the GFCF to GDP ratio to 28.9% in 2020 and 35.0% by 2030.
- Scenario 2 - Medium Growth
  It is necessary to increase the GFCF to GDP ratio to 27.0% in 2020 and to 32.7% by 2030.
- Scenario 3 - Low Growth
  It is necessary to increase the GFCF to GDP ratio to 22.5% by 2020 and to 27.3% by 2030.

One of the major challenges facing Myanmar is how to rapidly increase GFCF, in the short term.

Table 2.12 Changes in GDP Growth Rate and ICOR in Selected Asian Countries (Unit: %)

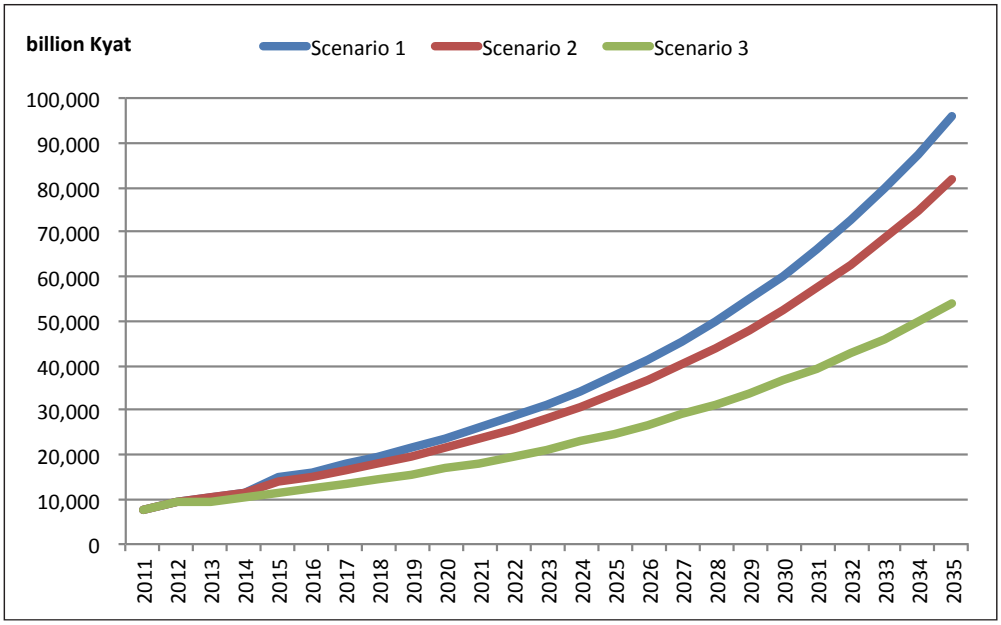
	Japan		Korea, Rep.		Thailand		Malaysia		Indonesia		Cambodia		Lao PDR		Vietnam	
	GDPGR	ICOR	GDPGR	ICOR	GDPGR	ICOR	GDPGR	ICOR	GDPGR	ICOR	GDPGR	ICOR	GDPGR	ICOR	GDPGR	ICOR
1961–65	9.4	3.4	5.9	2.3	7.2	2.4	6.9	2.4								
1966–70	9.2	3.6	10.6	2.3	9.2	2.5	6.1	2.7								
1971–75	4.6	7.5	7.6	3.2	5.8	4.0	7.2	3.3								
1976–80	4.4	7.1	7.0	4.3	8.0	3.2	8.6	2.9								
1981–85	4.3	6.7	7.8	3.7	5.4	5.1	5.2	6.4	5.7	4.2						
1986–90	5.0	6.0	9.7	3.3	10.3	3.1	6.9	3.9	7.1	3.7						
1991–95	1.4	20.7	7.8	4.8	8.6	4.7	9.5	4.1	7.9	3.4						
1996–00	0.9	31.0	4.6	7.2	0.6	43.5	5.0	6.4	1.0	25.0	7.3	2.0			7.0	3.8
2001–05	1.2	19.1	4.5	6.4	5.1	4.9	4.8	4.8	4.7	4.4	9.4	1.9	6.2	3.1	7.5	4.3
2006–10	0.4	62.0	3.8	7.5	3.6	7.2	4.5	4.9	5.7	4.9	6.7	2.7	8.0	3.7	7.0	5.0

Note: Figures of Japanese ICOR after 1991 and Thai and Indonesian ICOR between 1996-00 are extremely high due to extreme economic slowdowns. The reason for the economic slowdown in Thailand and Indonesia was the Asian Financial Crisis, in Japan the cause was the collapse of the bubble economy and subsequent deflation.
Source: JICA Study Team

Table 2.13 Required Ratio of GFCF to GDP and Accumulated GFCF Amounts

Scenarios	2010	2020	2030	Accumulated amount 2014-2030 (trillion Kyat)
Scenario 1	16.8%	28.9%	35.0%	536
Scenario 2	16.8%	27.0%	32.7%	481
Scenario 3	16.8%	22.5%	27.3%	359

Source: figure in 2010 is from World Economic Outlook database; other figures are prepared by JICA Study Team.



Source: JICA Study Team

Figure 2.4 Required Amount of Gross Fixed Capital Formation to Achieve GDP Growth Targets

To encourage growth, the MYT-Plan selected the most practical and preferred GDP growth scenario from a combined assessment of GFCF and future population projections, which are the two most important inputs for economic growth. The 4th column of Table 2.13 shows how the required 2030 GFCF in Scenarios 1 and 2 are approximately double the ratio for 2010. This required rapid GFCF increase will be a major challenge for Myanmar, however other Asian countries that have experienced rapid economic growth have also recorded such high percentages.

Future population growth however, is strongly related to labor inputs and can have an impact on future economic growth. As indicated in the last row of Table 2.7, it is expected that the annual population growth rate will be less than 1.0% after 2020. In the short and medium term, it is expected that the labor population will increase, due to the mobilization of redundant workers in rural areas. However, the long-term effects of absorbing the redundant laborers into the workforce are expected to be small.

Considering the above, the Report estimates that Scenario 2, which targets more moderate economic growth with 7.0% of annual average growth rate from 2011 to 2035, is the most appropriate scenario for subsequent planning work.

2.2.3 Gross Regional Domestic Product by Regions and States

Myanmar's Gross Regional Domestic Product (GRDP) was last calculated in 2010 by the Department of Planning, within in the Ministry of National Planning and Economic Development (MNPED). Using these data in conjunction with regional economic development scenarios and the aforementioned population and macroeconomic growth forecasts, the MTY-Plan estimated the distribution of GDP by Region and/or State through 2030, which is described in Table 2.14.

Table 2.14 Distribution of GRDP by Regions / States (Billion Kyat)

Region/State	2012	2015	2020	2030
Kachin State	1,097	1,317	1,858	3,467
Kayah State	172	227	345	667
Kayin State	829	1,033	1,503	3,583
Chin State	154	182	253	542
Sagaing Region	5,508	6,320	7,731	12,320
Tanintharyi Region	1,679	2,084	3,260	7,280
Bago Region	4,027	4,700	6,581	14,124
Magway Region	4,631	5,171	6,582	9,660
Mandalay Region	5,186	6,245	9,302	21,364
Mon State	2,063	2,502	3,560	7,580
Rakhine State	1,856	2,244	3,420	7,676
Yangon Region	10,294	13,710	21,705	47,162
Shan State	3,373	3,753	4,929	9,185
Ayeyarwaddy Region	5,465	6,267	7,772	12,597
Naypyitaw Council Territory	581	810	1,280	3,290
Total	46,915	56,565	80,081	160,497

Source: JICA Study Team

2.2.4 Projection of Fixed Capital Formation in the Transport Sector

This Report identifies future investment needs in the transport sector by comparing the level of GFCF to total national investment capacity (total GFCF) in Asian countries. Table 2.15

describes the proportion of GFCF in the transport sector to GDP and to the total GFCF in selected Asian countries in 2003. The proportion to GDP figures have been extracted from a report entitled "Enhancing Regional Cooperation in Infrastructure Development Including that Related to Disaster Management" published by UNESCAP in 2006. The proportion of total GFCF has been calculated by JICA using GDP and GFCF data from the IMF's "World Economic Outlook Database."

Table 2.15 Proportion of GFCF in the Transport Sector to GDP and to Total GFCF

(Unit: %)

Country	Proportion to GDP	Proportion to total GFCF
Bangladesh	1.1	4.6
Cambodia	1.0	4.5
China	4.0	9.7
India	2.3	8.8
Indonesia	1.3	5.1
Mongolia	2.1	7.1
Thailand	3.9	15.6
Vietnam	6.0	16.9

Source: Figures of proportion of the FCF in the transport sector to GDP are extracted from "Enhancing Regional Cooperation In Infrastructure Development including that Related to Disaster Management," by UNESCAP, and proportion to the total FCF is calculated by JICA Study Team

Table 2.15 lists ASEAN countries and proportion of GFCF. These countries can be classified in three distinct groups, based on the proportion of transport sector GFCF to total national GFCF; these are:

- Group 1 – Low Investment (around 5%): Cambodia (4.5%), Bangladesh (4.6%) and Indonesia (5.1%).
- Group 2 – Medium Investment (around 10%): Mongolia (7.1%), India (8.8%) and China (9.7%).
- Group 3 – High Investment (around 15%): Thailand (15.6%) and Vietnam (16.9%).

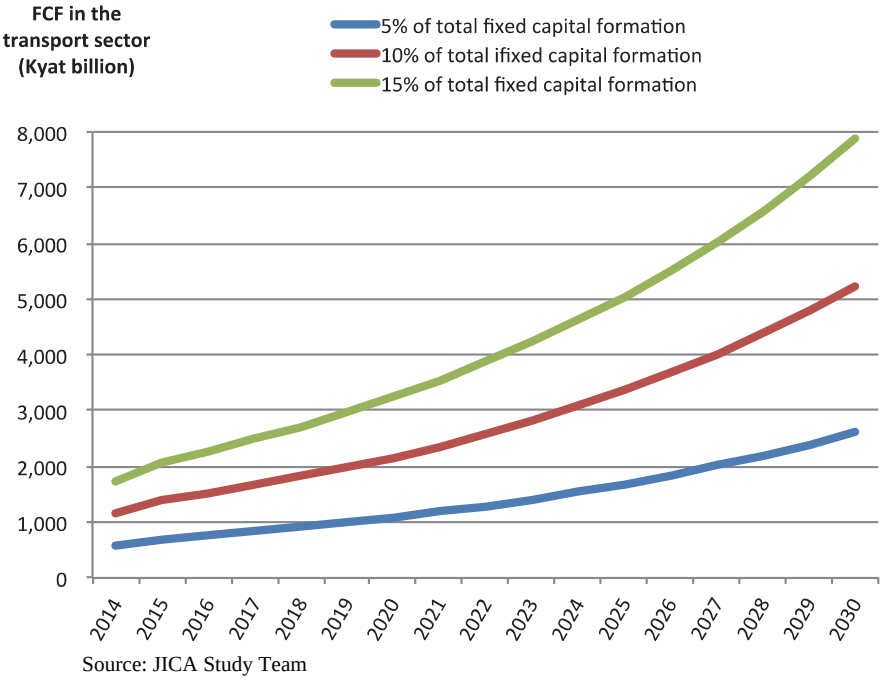
Table 2.16 describes recent changes in a wide range of economic indicators, including GFCF in the Transport Sector (Column 5) and total national GFCF (Column 6). Column (6) describes the proportion of Transport GFCF to Total GFCF indicates a steady decline in transport investment is evident. For example, in FY2004-05 and FY2005-06, while Nay Pyi Taw was under construction, the Transport GFCF to Total GFCF ratio reached 12.8% and 14.4% respectively. However, since most of the work in Nay Pyi Taw is now finished, this ratio has been declining and has held steady around 5% in recent years. Based on the lack of major transport investments in the last five years, this Report places Myanmar in Group 1 (Low Investment countries).

Figure 2.5 illustrates three possible transport sector investment scenarios, based on the aforementioned three peer country groups between 2014 and 2030. The Low Investment Scenario assumes that the ratio of Transport Sector GFCF (investment) will be 5% of total national GFCF under the GDP growth scenario 2. The second scenario assumes that this ratio will be 10% of national GFCF, in line with the Medium Investment country group. The third scenario assumes a ratio of 15%, in line with the High Investment countries like Thailand and Vietnam.

Table 2.16 Proportion of GFCF in the Transport Sector to Total GFCF and to GCE in Myanmar (Billion Kyat)

Fiscal Year	Nominal GDP	Total Fixed Capital Formation	Government Expenditure	Government Capital Expenditure	Fixed Capital Formation in the Transport Sector	Transport to Total GFCF (5)/(2) (%)
(0)	(1)	(2)	(3)	(4)	(5)	(6)
2004-05	9,078.9	1,207.5	1,693.0	733.5	154.3	12.8
2005-06	12,286.8	1,867.6	2,353.9	906.5	269.3	14.4
2006-07	16,852.8	2,359.4	3,693.5	1,274.0	177.7	7.5
2007-08	23,336.1	3,710.4	4,901.5	1,890.0	255.9	6.9
2008-09	29,233.3	5,057.4	5,314.9	2,033.6	244.3	4.8
2009-10	33,894.0	7,151.6	6,260.6	2,840.8	381.7	5.3
2010-11	39,846.7	10,081.2	7,506.9	3,575.3	352.3	3.5

Source: Myanmar Statistical Yearbooks 2010 and 2011, Central Statistical Organization



Source: JICA Study Team

Figure 2.5 Alternative Transport Sector Investment (GFCF) Scenarios

In order for Myanmar to maintain a 5% share of Transport GFCF to total GFCF, the amount of investment required in 2014 would be 576 billion Kyat, which then rises to approximately 2.6 trillion Kyat by 2030. In the Medium investment scenario (10% ratio), the levels of required investment will increase to 1.2 trillion Kyat in 2014 and 5.3 trillion Kyat in 2030. If Myanmar targets the High investment scenario (15% ratio), the investment requirement will increase to 1.7 trillion Kyat in 2014 and 7.9 trillion Kyat in 2030. Table 2.17 shows the cumulative amount of required investment (GFCF) in the transport sector between 2014 and 2030.

Table 2.17 Cumulative Required Transport Investment (GFCF) by Scenario from 2014 to 2030

Ratio of Transport GFCF to total GFCF	Cumulative Required Investment (billion Kyat)
5%	24,034
10%	48,068
15%	72,103

Source: JICA Study Team

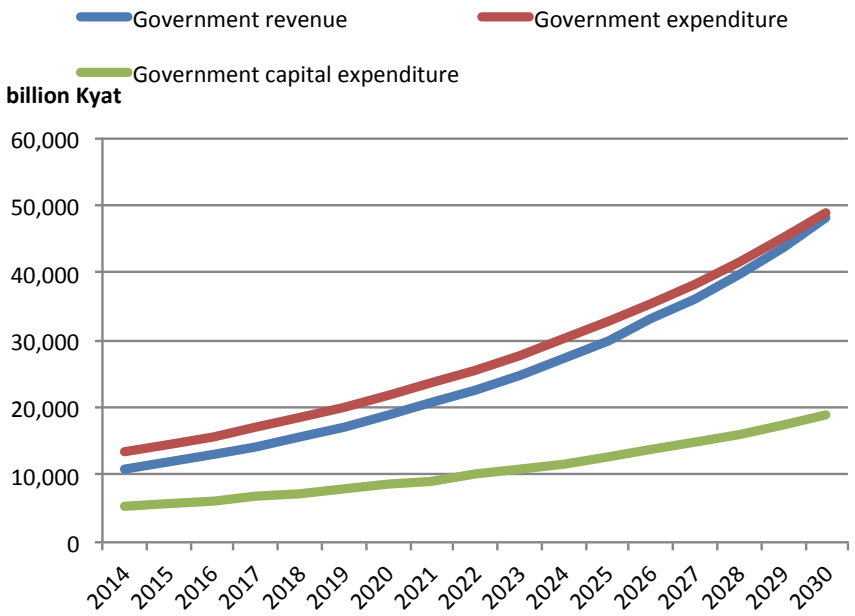
2.2.5 Funding Capacity of the Public Sector

In order to determine the appropriate amount of GFCF required in the transport sector, it is important to analyze and understand the impact of such investment on government expenditure and government capital expenditure.

Figure 2.6 illustrates government revenue, government expenditure and capital expenditure projections for the period between 2014 and 2030. These figures have been calculated using Table 2 of the IMF's "Myanmar Staff-monitored program" which was published in January 2013. According to the projections, Myanmar's budget deficit will amount to 5.0% of GDP in 2014 and decrease to 0.6% of GDP in 2030. During this same period, the proportion of government capital expenditure to total government expenditure will decrease from 39.5% in 2014 to 38.4% in 2030.

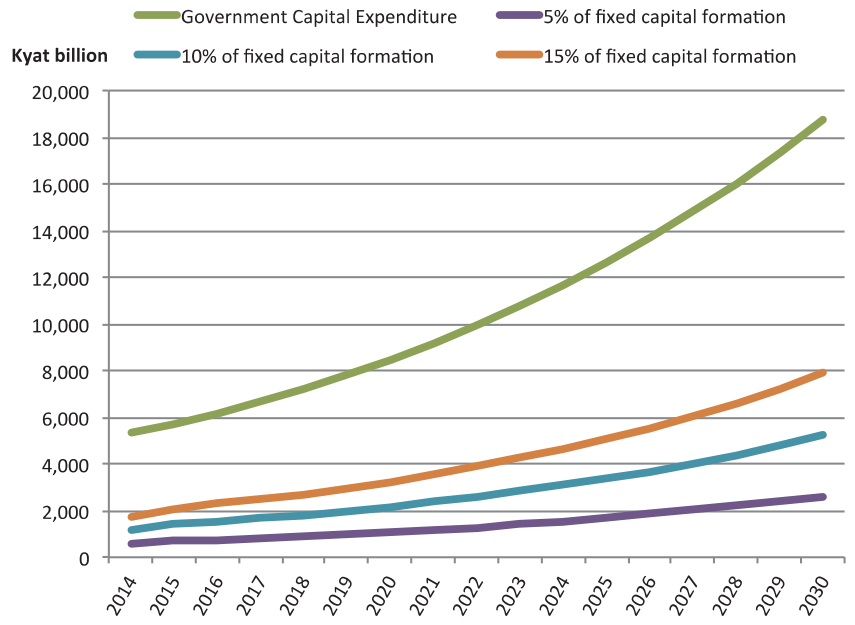
Figure 2.7 plots the government capital expenditure projections through to 2030, against the three transport investment scenarios under the GDP growth scenario 2 to illustrate the relationship of GCE to required levels of GFCF. If Myanmar continues to allocate 5% of total GFCF to the transport sector, the proportion of transport GFCF to GCE will be 10.9% in 2014, and gradually increase to 14.0% in 2030. To maintain the 10% ratio outlined in the Medium investment scenario, the level of required investment (GFCF) will amount to 21.8% of GCE in 2014, increasing to 27.9% by 2030. To maintain the 15% ratio required in the High investment scenario, the figures grow to 32.6% in 2014, which in turn increases to 41.9% in 2030.

In addition to the transport sector, Myanmar's Government must also invest in other infrastructure sectors, including power generation, transmission, and distribution, water supply and sanitation, telecommunications, etc. This Report has determined that these critical sector investments will require that the ratio of transport sector GFCF to total GCE be limited to around 30%. As a result, this analysis recommends that the Government increase the transport GFCF ratio from its current level of 4-5% to 10% as soon as possible and to make every effort to maintain this level through 2030. If the Government is successful, the cumulative investment required between 2014 and 2030 will be about 48 trillion Kyat, as noted in Table 2.17.



Source: Calculated by JICA Study Team from parameter of
IMF's "Myanmar Staff-Monitored Program (IMF Country Report No. 13/13)"

Figure 2.6 Government Revenue, Expenditure and Capital Expenditure Projections



Source: JICA Study Team

Figure 2.7 Projection of GCE and Alternative Transport GFCF Scenarios

2.2.6 Addressing the Need for External and Private Capital Investment in Transport

According to the IMF's report entitled "Myanmar Staff-Monitored Program", Myanmar's national deficit is set at 5% of GDP. The report suggests that half of this deficit, which is expected to be 1.3 trillion Kyat (1.6 billion USD) in 2014, will be financed by foreign sources, including soft loans from international donors. These loans are a viable option for the Government to secure some of the needed financing for transport sector projects.

To achieve these required levels of investment, it will also be necessary to encourage investment from private sources, both foreign and domestic. One way to achieve this is to permit private investors to hold a 100% investment in certain projects or to arrange new investments through PPP agreements. Another option for financing is via domestic and foreign private financial resources. There is evidence to suggest that both private investments and PPP's are already underway in Myanmar's transport sector. However, implementing new PPP projects, especially large-scale transport projects, could be hampered with no existing legislation or regulations to govern PPP arrangements. Section 2.3 describes the current status and future potential of PPP projects in Myanmar.

2.3 Public-Private Partnerships in Myanmar's Transport Sector Development

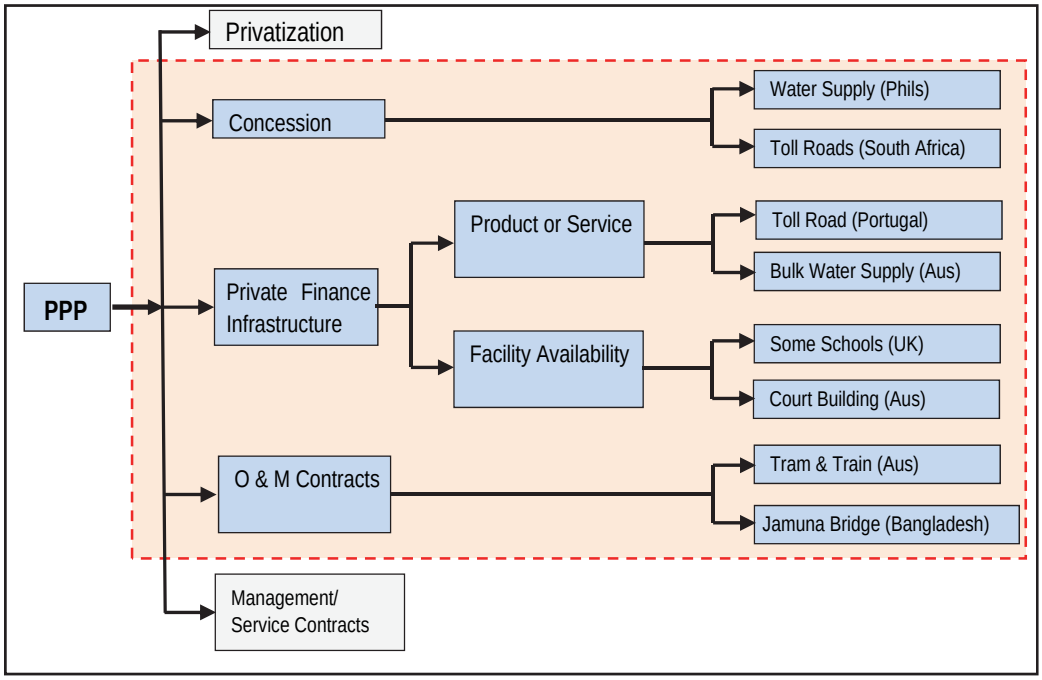
This section outlines the issues related to Public-Private Partnerships (PPP) as instruments to develop the transport sector in Myanmar, despite the country not actively encouraging PPP agreements, but instead viewing the involvement of the private sector as foreign investment. This Chapter includes a short definition of PPPs and an explanation of the several PPP variants. The Chapter concludes with a proposed direction for Myanmar and the PPP, after examining its potential in the five transport sub-sectors.

2.3.1 Different Forms of PPP

(1) PPPs defined

A Public-Private Partnership (PPP) is defined as "a mutually-beneficial collaboration between public and private sectors, built on the expertise of each, in developing a country's (public goods) infrastructure, through the appropriate allocation of resources, risks, and rewards." A related description of the PPP is that it "involves a contract between a public-sector authority and a private party, in which the private party provides a public service or project and assumes substantial financial, technical and operational risks in the project. The cost of using the service is born by the users of the service, in full or in part. Government contributions to a PPP may be in kind, cash, tax break, or revenue subsidies for a fixed period."

As shown in Figure 2.8 below, Private Sector Participation (PSP) includes a broader scope, as compared to the PPP, although the two terms are often used interchangeably. Privatization, as well as service contracts, are legitimate forms of private sector participation, but generally considered beyond the PPP field.



Source: PPIAF/World Bank, "Public-Private Partnerships Units: Lessons for their Design and Use in Infrastructure", (Oct 2007)

Figure 2.8 Typical PPP Approaches

(2) PPP Modalities

There are a number of PPP modalities, depending on an agreement's allocation of responsibility between the private and public sector; this is shown in Table 2.18 below. In the Build-Own-Operate (BOO) and Build-Operate-and-Transfer (BOT) privatization models, the private sector assumes the commercial or market risk (i.e. traffic volume or usage may differ from original expectations). However, in the Design-Build model, the private party assumes no commercial risk and is compensated, regardless of traffic. The service contract modality requires the least amount of responsibility and investment from the private party, because the asset or facility is built and financed by the government. The private sector operates and maintains the facility for a fee, which can be fixed or variable, depending on performance.

In the case of transport facility operation, such as railways and toll roads, financially viability is not always assured, especially when tariffs are set too low and traffic is also very low. In many developing countries, fares charged to passengers are often not sufficient to cover operating costs. Private sector investors tend not to risk capital on long-term BOO or BOT contracts, when their ability to adjust the fares is uncertain. The choice of PPP modality therefore, hinges on the specific circumstances surrounding the project.

Figure 2.9 illustrates when a particular modality is appropriate. A project that shows high profitability is suitable for a BOT or BOO modality and the risk exposure to the public sector partner is reduced considerably, provided it is long term (e.g. 25 years). Conversely, when the profit margins are very low or recorded as losses, the appropriate modalities are of the maintenance type or service contracts of short terms (e.g. 1-3 years), where the majority of risk remains with the government; this is very close to a conventional public sector implementation.

Table 2.18 PPP Modalities and Risk Allocation

Modalities	Operation & Maintenance	Commercial Risk	Capital Investment	Asset Ownership	Typical Duration
Build-Own-Operate	▲	▲	▲	▲	20-30 years
Build-Operate-Transfer	▲	▲	▲	▲■	20-30 years
Build-Transfer	■	■	▲	■	10-25 years
Build-Lease-Transfer	▲■	■	▲	▲	15-25 years
Design-Build	■	■	■	■	1-3 years
Design-Build-Maintain	▲■	■	■	■	1-5 years
Management Contract	▲■	▲■	■	■	3-5 years
Typical Concession	▲	▲	▲■	■	20-30 years
Divestiture/Privatization	▲	▲	▲	▲	Indefinite
Service Contract	▲■	■	■	■	1 year
LEGEND ▲ Private Sector ■ Public Sector					

Source: CTI / JICA, "Preparatory Survey for PPP Infrastructure Development Projects in RP", November 2010

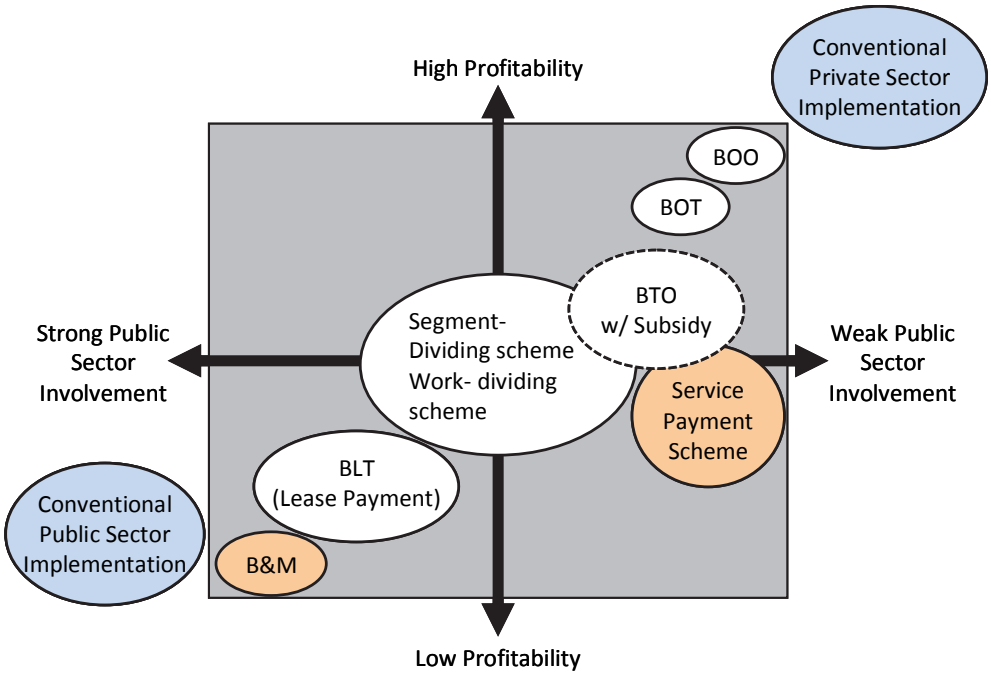


Figure 2.9 PPP Modality, Risk Sharing, and Profitability

2.3.2 PPP Possibilities in Myanmar

(1) Indicative PPP Targets for Myanmar

The Government of Myanmar has embraced the PPP as a strategy to expand and modernize its transport sector and one that can help promote the ambitious target of 7.7% annual growth in GDP for the next 5 years. To achieve this growth target and lift itself out of poverty and least developed status, Myanmar must make its own investment equivalent to 30% or more of its GDP. This will not be an easy task, given its low starting base of about 16% of GDP. The country is also hampered by a low tax effort (estimated at 4.1%, the lowest among ASEAN countries) and a domestic savings rate of less than 13% of GDP. Thus, the investment deficit is wide, in both the public and private sectors. As a result, the country must turn to foreign capital to cover the investment gap, which may come in the form of Foreign Direct Investment (FDI) and Official Development Assistance (ODA) from multilateral and bilateral institutions such as JICA, ADB and the World Bank.

In terms of the transport sector, the Government aims to increase investment to approximately 9% of GDP, which may be high given historic Government expenditures on transport have averaged 1% of GDP in the last five years. In comparison, peer Asian countries have averaged 2%-8% over the same period.

(2) Legal framework and ongoing exercise

Myanmar has no current laws specifically relating to PPP/PSPs for the infrastructure sector. The various Ministries involved in PPPs are using the Foreign Investment Law (FIL) of January 2013 as legal basis, which replaced previous regulations drafted in 1988. Ministries' use of the FIL is reasonable, as there is a shortage of local capital and skills. However, this also locks out foreign investors from PPP projects. As a result, this Report cannot determine which law applies to past contracts labeled as PPPs that involve local companies, such as those for the Nay Pyi Taw International Airport and the Mandalay-Lashio-Muse Highway.

The FIL permits foreign investment up to 100 percent, through joint ventures, or pursuant to a contract, with the latter applying to a PPP contract between a private company and a public agency. Similar to other businesses, the law requires infrastructure investment to be conducted through companies formed under the existing Myanmar law on companies. This also requires approval and the granting of an investment permit from the Myanmar Investment Commission (MIC), which includes the following features:

- Basic "guarantees" against nationalization
- Repatriation of invested capital and profits, may be remitted in the same currency upon expiry of the term of the investment contract
- Long-term leases of up to 50 years, extendable twice for further 10-year periods (i.e. to a maximum of 70 years)
- Enforcement of the "dispute settlement mechanism" in joint venture and investment agreements
- Tax holidays of five years, extendible to ten years as well as exemption from certain customs duties

The FIL also includes a list of areas where investment is prohibited or restricted. In terms of the transport sector, the Law limits foreign investment to a maximum of 80 percent of a joint-venture for infrastructure development and construction as well as air transportation

services, which may also apply to companies involved in an infrastructure project. These regulations include explicit provisions for air transport services, such as prior governmental approval and a recommendation required from the Ministry of Transport in the selling and marketing of air transportation services. This may affect the planned privatization of Myanma Airways.

The issuance of an investment permit includes a commitment to complete construction of new infrastructure project within an approved timetable, subject to a reasonable extension. If the time limits are exceeded for reasons other than force majeure, the Commission can cancel the investor's permit, without compensation. Transfer of interests in projects is also permitted, subject to approval, which can also be withheld.

A general overview of the sub-sectors is shown in Table 2.19, however, this analysis does not include consideration of the economic regulator or which government entity has authority to approve tariffs involved in concessionaire charges.

Table 2.19 Summary of Situation by Transport Sub-Sector

	AIR TRANSPORT	INLAND WATER	ROAD	RAILWAY	SEAPORT
OWNERSHIP					
Ministry	Min. of Transport (MOT)	Min. of Transport (MOT)	Min. of Construction (MOC)	Min. of Rail Transport (MORT)	Min. of Transport (MOT)
Infrastructure	Dept of Civil Aviation	Directorate of Water Resources & Improvement of River Systems	Department of Public Works	Myanma Railways (MR)	Myanma Port Authority (MPA)
Services	Myanma Airways (airline)	Inland Water Transport (IWT)	Road Transport Enterprise	Myanma Railways (MR)	Myanma Five Star Line
DEMAND					
Passengers	3.6 million domestic pax in 2012; 2.0m international pax	22 million pax in 2011	No information. Traffic on expressway is nil	67.6 million pax in 2011; using 248 pax-trains/day	No Data
Freight	No Data, Likely to be negligible	4.7m tons of cargo in 2011	Traffic survey is on-going at key corridors	3.3m tons in 2011; using 21 freight trains/day	No Data
SUPPLY	30 Domestic Airport	6,650 km of navigable rivers; 5 river network	142,395 km of roads; of which 18,740 are national	About 5,865 km route length	9 ports under MPA
	3 International Airport	More than 400 rivercrafts owned by IWT	39,241 km under the MOC	386 locomotives	No data on number of vessels
		Two jetties: Yangon & Pathein. No fixed structure in other river ports	432,504 vehicles + 1.9m MCs in 2011	1,252 pax coaches	
			Buses of various sizes, mostly private operated	3,311 freight wagons	
REGULATION	In all the transport sub-sectors, it is unclear which government body approves or decides the tariff or rates to be charged by users. This issue is critical in PPP contracts.				
PRIVATE SECTOR PARTICIPATION					
Plans	Corporatization of Myanma Airways with subsequent privatization	Private company interested in developing Pathein port to handle rice	Privatization of 82 roads (~4,590kms) is in the pipeline	To offer development of the Yangon suburban & circular lines to private sector	Development of deep seaport on the Andaman Coast. 4 candidate sites (Thilawa, Dawei, Sittwe, Kyaukphyu)
Current activities	Tendering is on-going for the development of 3 int'l airports (Yangon, Hanthawaddy, Mandalay) under PPP	No information	On-going privatization of road construction and maintenance; probably maintenance service contract		No information
Past & Present	Pioneer Aerodrome Services Ltd has 30-year O&M contract for Yangon Airport terminal, plus 60-year contract on Naypyidaw	Private operators are reportedly active in barging, leasing some of the river crafts from the government	It was claimed that the Mandalay-Lacio-Muse Highway was built on BOT basis at 30 year concession	Sleeper factory is private	No information
	Export cargo terminal under Mingalardon Cargo Services Co. Ltd		60 roads (5,655kms) said to be contracted to 28 private companies		

Source: JICA Study Team

(3) Possibilities for PPPs in Myanmar Transport

This Report identified the following assessments from the transport sector summary in Table 2.19.

Toll Roads – There will be limited opportunity for PPPs in the road sector, despite reports that several BOT projects are ongoing or completed. Available information suggests that these agreements are primarily service contracts or out-sourced construction works, fully financed by the government, as opposed to user fees from motorists to defray costs. Essentially, Myanmar has a very low motorization rate, about 7.5 vehicles per 1,000 people, which is lowest among ASEAN countries and less than one-half that of Laos, as well as low household incomes. These two indicators point to the limited-viability of toll roads via a PPP. The country's average GDP per capita, expressed in purchasing power parity, is only 47% that of Laos, 40% of Vietnam and 14% of Thailand.

Railways – The poor condition of the existing track infrastructure, even on the most-travelled segments (Yangon-Mandalay), plus the apparent lack of reforms from traditional railway stakeholders may be inhibiting PPPs in the sector, a situation that can be difficult to overcome in the near term. International experience indicates that a nation's railway sector can include PPPs if measures are taken to restructure, split or reform services and operations. This may also be the case for Myanma Railways. A detailed study should be completed regarding the operations and businesses of Myanma Railways, in order to identify services (such as freight) and sections (such as Yangon-Mandalay and Yangon Circular Rail) that can be unbundled and privatized, if this approach is deemed viable.

Inland Waterways – The prospect for PPPs in the development of river ports is less viable than with railways or roads, due to the fact that users are able to bypass ports and load/unload on landing points along the riverbanks, thereby avoiding port charges. Moving bulk cargo on waterways is more economical if it originates and is destined for points along the river. Such advantages do not exist for break bulk commodities. Traffic is dependent on the navigability of waterways, which in turn, is also subject to changes in climate and the ability of government to train and maintain the waterway infrastructure. Alternatively, private entities may engage in ferry and barging services.

Seaport – Based on international experience, PPP agreements and foreign investment are possible in the development and operation of container terminal ports, provided the port functions as the main gateway and the country is open to international trade flows. At the time PPP agreements are negotiated, companies may require sole provider assurances, until a certain threshold volume is reached. For a PPP to succeed, however, a prior feasibility study will be required. In addition, agreement would also be needed to define the obligations (such as roads, land, and civil works) for the Government.

Airport – Myanmar's airport industry may be the first industry to make use of the PPP approach due, in part, to the Government's eagerness to pursue simultaneous tenders for three international airports, each with a concession period of 30 years. The three projects, however, have significant differences in their risk profiles and investment scales. Yangon International Airport (YIA) is a brown-field project, therefore less risky, with existing traffic patronage and substantial asset base already in place. Its success will depend on an arrangement by the Department of Civil Aviation (DCA) with regard to the market to ensure YIA does not lose its international traffic when the new Hanthawaddy Airport (HIA) is built. YIA may also infringe on the existing 30-year contract with Pioneer Aerodrome Services Ltd. HIA is a green-field project with no history of demand and having a very small asset base. In addition, HIA suffers from lack of road access and is 77 kilometers from the city. Among the three projects up for

tender, Mandalay International Airport (MIA) appears to have the least risk. Demand forecasts for MIA show the airport has unused runway and terminal capacities. As a result, the concessionaire will not require large upfront investments. However, MIA's market is not as significant as that of the other airports.

2.3.3 PPP Processes in Myanmar

If Myanmar is to achieve its desired social and economic growth and development targets, the transport infrastructure must improve and expand. In addition, the Government must encourage investment diversification to include other sectors such as health, education, rural development, etc. This, however, could leave the Government short of investment funds for transport infrastructure, due to competing demands on its budget.

If gaps continue to exist between the scale of required investment in the transport sector and the capacity of Government to mobilize funds from existing domestic sources, four options are available for the Government to bridge this gap:

- Raise taxes and/or improve tax collection efforts
- Secure more funds from ODA sources (e.g. JICA, ADB, IBRD, and other bilateral funders)
- Develop innovative financing schemes
- Attract private sector investments via Public-Private Partnerships (PPP)

The remainder of this Chapter focuses on the PPP option, with some analysis of innovative financing schemes as well. The Chapter reviews the projects that have already been contracted, as well as those on the current PPP agenda, and suggests measures about how to build from these earlier efforts and sustain PPP initiatives.

(1) The Challenge

As discussed earlier in this Chapter, the total required investment for transport infrastructure is estimated at 48 trillion Kyat from 2014-2030. This amount represents an increase from 1,155 billion Kyat in 2014 to 5,251 billion Kyat in 2030 in terms of government capital expenditure in the transport sector. Against these required investments is the current Government investment in the sector, which was 381.7 billion Kyat in 2009/10 and 352.3 billion Kyat in 2010/11. This demonstrates how addressing the gap between the need/demand for efficient transport infrastructure and the available financial resources is one of the major issues for Myanmar, now and in the future.

For many countries, one of the most common alternative financial resources possible is private investment. As indicated in Table 2.20, Myanmar's neighboring countries are already inviting private investment to partner on transport infrastructure. These investments can be grouped into three levels of private financing, in terms of % of private financing: 20 to 30% (Cambodia and Malaysia), 3 to 5% (China and Indonesia) and 1 to 2% (Thailand and Vietnam).

In Myanmar, there are currently very few projects in the PPP pipeline, except for the major projects planned for three airports, noted above. As mentioned, Myanmar does not yet have specific legislation regarding PPPs, and is using the existing Foreign Investment Law for these partnerships, despite the law being only generally applicable and not ideal for infrastructure. As well, Myanmar does not yet have basic principles for demarcation between public sector and private sector in law. Finally, Myanmar does not yet have a rating from international credit rating agencies, due to its long years of economic insularity. Domestic sources of long-term

capital appear also to be in short supply. Myanmar will need time to develop appropriate legislation and institutional capacity to attract and capitalize on possibilities with PPPs. In addition, private investment alone is not sufficient to fill the gap between transport infrastructure demand and available government financial resource. Other financing will be needed to develop transport infrastructure, such as external financial supports (both grants and soft loans) from development partners.

Table 2.20 Investment Targets in the Transport Sector

	Cambodia	China	India	Indonesia	Thailand	Vietnam
(1) Percentage of transport investment in total investment (average of 2003-05)	5.0%	9.5%	7.6%	5.2%	14.2%	16.9%
(2) Percentage of private investment in transport sector in total investment (average of 2000-2012)	1.5%	0.3%	1.4%	0.2%	0.1%	0.3%
(3) Percentage of private investment in transport investment (2)/(1)	30.0%	3.2%	18.4%	3.8%	0.7%	1.8%

Source: JICA Study Team

According to investment projections provided by the Socio-Economic Framework (Chapter 2), the percentage of government budget deficit to GDP will decrease from 5.0% in 2014 to 0.6% in 2030. The annual average budget deficit amount will increase from 2.656 trillion Kyat in 2014 to 2.951 trillion in 2020, and then decrease to 947 billion Kyat in 2030. The financial resources of development partners could likely finance most of Myanmar's financial deficit until 2020. After 2020, the government financial deficit will be financed by both of the development partners and private investors.

(2) Positive Starts but not without Risk

PPPs are not new to Myanmar. In fact, the government has tried the scheme in port development, road improvements, and airport transport infrastructure, despite not having appropriate legislation to support this type of investment.

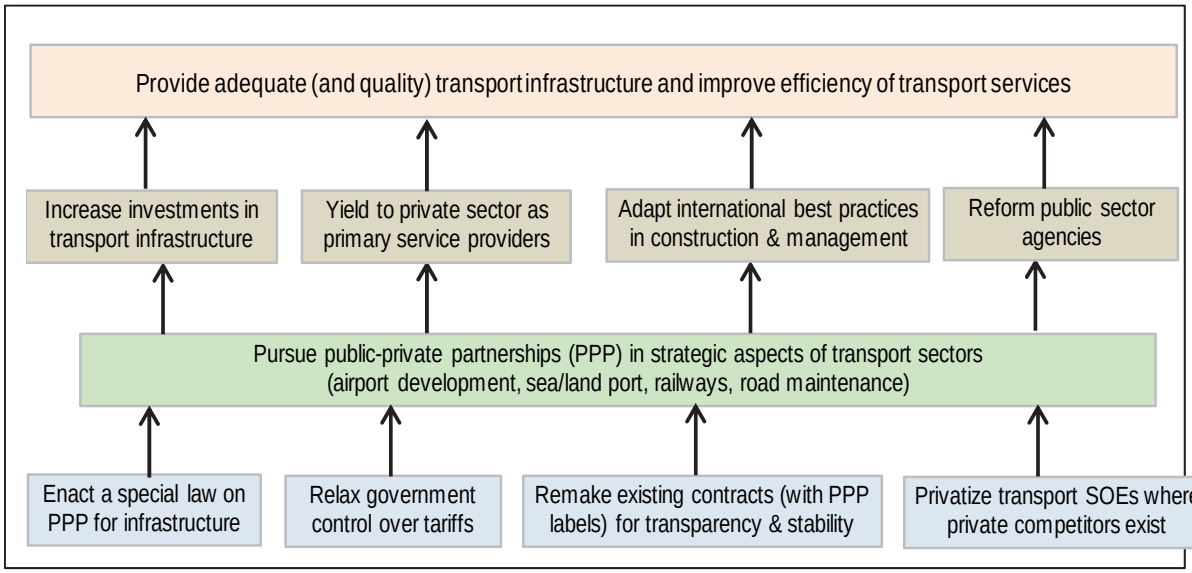
In the past, the Government has stated that it embraces a policy that encourages private sector participation in the development of transportation linkages under international cooperation frameworks such ASEAN, GMS, ACMECS and BIMSTEC.2 This position is echoed in official reports from the Department of Public Works on 61 road projects implemented under BOT schemes since 1996. The development of Thilawa port by Hutchison Port Holdings also involved private sector, although details are not available. The new international airport at Nay Pyi Taw was built with a combination of bilateral loans and a PPP. The most recent demonstration of the PPP policy, its most ambitious to date, was the tendering for the three international airports of Yangon, Hanthawaddy and Mandalay.

[2] Statement of Deputy Minister of MOC of the Union of Myanmar at the Ministerial Conference on Public-Private Participation for Infrastructure Development in Asia and the Pacific, October 2007, Seoul, Korea.

(3) An Enabling Environment for PPPs

The possibility of the PPP to contribute to the achievement of transport development objectives may be illustrated by way of a means-ends tree (Figure 2.10). In addition to PPPs being a means to increase investment, they can also provide Myanmar with a means to acquire necessary technologies and management skills, which normally take time and training to develop in-house.

Governments may achieve skills and technological advantage more rapidly by outsourcing, something the PPP may also facilitate. The Department of Civil Aviation used this approach when they issued the Request for Proposal for the three airports. A key objective of this process allowed for the private sector to be engaged on operation and maintenance of the airport, achieving a higher standard of quality than what was possible under Government operation.



Source: JICA Study Team

Figure 2.10 Means-Ends Tree for PPP in Myanmar Transport Sector

As demonstrated in the above Figure, successful PPPs require an enabling environment to succeed. This Report recommends the following strategies to the Government to sustain PPPs in Myanmar:

- Enact a special law to support PPPs – The Foreign Investment Law (FIL) that is currently being used is not adequate for this purpose. Infrastructures are long-term physical assets that cannot be withdrawn once built, and therefore require a legal foundation for stable and long-term service. These assets include activities traditionally provided by government and classified as public utilities in most countries, whereas the FIL is focused on economic activities, generally outside the domain of the public sector.
- Liberalize government control over transport tariffs – The Government of Myanmar has historically held firm on tariffs of various transport enterprises, potentially set artificially low so as to be cost-effective for the people. The government control over tariffs stems from the interests to view infrastructure as public goods. But in addition to supporting public goods, PPPs place infrastructure under commercial regimes that must be managed efficiently in order to recoup investment. In this case, the market often determines price. The shortage of road-based public transport would likely

reduce significantly if fare-setting becomes more flexible. Investors in infrastructure are reassured when they see opportunities to adjust tariffs, in accordance with market conditions and the changing cost of operations. While the Government has the responsibility to monitor if tarrif charges are reasonable, concessionaires may not find this acceptable as there is currently no mechanism to contest Government decisions. Private investors may worry if the regulatory environment is uncertain, as regulators could force unreasonable or unprofitable rate changes. To mitigate against this, an objective formula for future adjustments should be included in the service contract. Alternatively, or in addition, the Concession Agreement could specific a neutral arbitrator, to which an appeal can be made.

- Review existing contracts with BOT labels – This would primarily affect the 61 road contracts of the Department of Public Works (DPW) which are essentially road maintenance contracts with some features of BOT. Because they involve private sector participation, these BOT privatization models can be considered for Myanmar, though the existing service contract terms and conditions would need to be clarified. This is needed because at this early stage, when vehicle traffic is low, the private contractor has little incentive to oppose changes or amendments to the existing contract. In later years, when traffic increases and toll collections become substantial, the contractor may resist changes more strongly, which could prove costly.
- Privatization of State-Owned-Enterprises (SOEs), where private competitors exist – The Government of Myanmar has many agencies (and state-owned enterprises) that are engaged in various transport services, the most notable example is Myanma Airways. With several private operators already in the airline market, the Government may not need to provide services. If a service is required for reasons other than economics, the Government could contract to have that service provided by a private carrier, at a potentially lower cost. In the past, some governments' involvement in a marketplace has stifled innovation and competiveness. Opening the market up to private sector engagement can encourage private and foreign investment. A similar approach may be appropriate for the inland waterway and road-based public transport sectors. Myanmar has experience with this in the past, when it privatized more than 90 state-owned businesses in 2008, about 300 SOEs in 2009, 100 in 2010, and 76 more in 2011. Under the Ministry of Transport, 4 enterprises. including Inland Water Transport, Myanmar Port Authority, Shipyards, and Myanma Airways are said to be under consideration.

(4) Review of Road Projects

Where Myanmar is active in PPPs, the Government sees most success in the road sector. There, the private sector has stimulated road development and supplemented government investment. They have been involved in the construction and rehabilitation of selected roads since 1996; these PPPs are best described as Build, Operate and Transfer (BOT) concessions. As of March 2013, a total of 61 40-year contracts with 29 private companies were in place, covering approximately 5,585 km of roads.

This Report reviewed a number of these contracts, which showed that the contracts covered existing national highways in need of rehabilitation, widening, repair and/or improvements with a maintenance component included. The legal basis for these contracts is the Citizens Investment Law, and thus limited to domestic entities. These contracts are most similar to a simple Rehabilitate-Operate-Maintain-Transfer (ROMT) model, with the following features:

- Historically, all of Myanmar's roads were built with government funding. These typically included sections of major highways with predictably high traffic volumes and therefore can be considered as 'brown fields' projects, with a lower market risk.
- Nearly all road projects were launched through an unsolicited proposal process, with the initiative proposed by a private sector proponent, rather than being requested by the Government. In a few cases, alternatives to the private sector proposals were sought by the DPW before approval by the Minister of Construction. However in all cases, endorsement by the Regional and State Ministers remained mandatory.
- The proponent prepared the cost estimate and assembled the necessary funding for the rehabilitation and improvement works; this is considered private risk capital.
- There is no viability assessment on the part of the Government as to future traffic, revenues or expenses. These viability assessments are considered business decisions by the proponent.
- The contracts contain a wide range of provisions during the initial stage of construction/repair works, but the contractor has little responsibility for maintenance during the 40-year life of the contract.
- For a Rehabilitate-Operate-Maintain-Transfer (ROMT) scheme with little investment, a 40-year term is somewhat long, especially with a provision for up to three 5-year extensions, for a total of 55 years. The difficulty with the ROMT scheme is compounded by the absence of provisions on impact of future changes in the locality and on the network.
- Revisiting or revising the terms of a contract during the 40-year period has not been considered, despite the fact that many changes are possible during that period (e.g. construction of an alternate road that could alter traffic, emergence of traffic generators after the tollgate and therefore avoiding tolls, government installation of an intersecting road that might inadvertently create an exit/entry point, and collection leakages). These are just a few of the many possible scenarios that could change financial viability upward or downward.
- Toll collection for these contracts is essentially an open system as the highway cannot be enclosed. It requires the installation of weighing machines able to apply the tariff calculated on vehicle-weight miles. Cars are deemed to fall below the threshold weight and charge the minimum. Residents in the catchment area are permitted to access the road free-of-charge, on the assumption that local traffic does not pass the tollgate anyway. The exemption from toll payment is wide (e.g. national heroes, local residents, high government officials), thus making toll collection porous.
- There is no force majeure clause after road completion and the assumption is that the contractor will absorb all costs such as damage caused by floods or earthquakes and other factors during the 40-year operating life.
- Termination requires that certain conditions be satisfied, which generally reference events that happen during construction. Denial or withdrawal of consent by the Regional and State Chief Minister is noted in the BOT regulations of the DPW and may apply throughout the entire life of the contract. Contracts are therefore vulnerable to changes at the local level.
- The Ministry of Construction (MOC) posts monthly audits of toll collections, as well as reports on visual inspections of road quality. This is supplemented by monthly

status reports, submitted by the contractor. The MOC audits are used to determine tax liability and as basis for adjustments in toll tariffs.

- Tariffs are decided by the Cabinet and may be influenced by a number of special interests, as opposed to market conditions.
- Taxes are paid by the contractor, ranging from 0% during the first 3 years and 5% up to the 10th year, rising to 20% on the 34th year onwards. This is relatively high, if applied on gross toll, and is likely to be passed on to motorists.
- Performance Bonds during the operating period are not mentioned in the contracts.

Procurement Methods

This Report's analysis found that Myanmar's road contracts assign risk to the private contractor, while a lack of pre-defined standards on what constitutes maintenance allows the contractor a great deal of flexibility in this regard. Also, the long contract period (between 40 and 55 years) provides the contractor multiple opportunities to recover their small investment, especially when traffic volumes have grown. Procurement models vary, and several of the most common are described here:

1) In-house construction and maintenance – In this, the oldest procurement model, the government plans, designs, finances, builds, and maintains the road with its own workforce and equipment. There is no private sector involvement, except for the supply of some materials.
2) Conventional procurement with privatized construction – This is the most common model, in which government plans, designs, and finances the road development, then hires and pays a private entity to construct and maintain the road.
3) Road maintenance by contract – This type of maintenance contract enhances the efficacy of the preceding model, with a private company engaged to perform the maintenance works. This saves the government from employing a large workforce and investing in maintenance equipment. The contract period is short, between 5 years and 10 years, because there is little investment or risk capital on the part of the contractor. There are two variations to this contract:
    a) Contract terms are tailored to the amount of work being measured and paid for on agreed rates for different work items. Payments are based on the amount of works and services executed.
    b) Performance-based Road Management and Maintenance Contracts, which define a minimum set of conditions for road, bridge, and traffic assets that must be met by the contractor, as well as other services such as the collection and management of asset inventory data, call-out and attendance to emergencies, and response to public requests, complaints and feedback. Payments are based on how well the contractor manages to comply with the performance standards defined in the contract.
4) Turnkey Contract – This expands the role of the private contractor, to include design and financing. The completed facility is turned over to the road agency, which then undertakes to pay the contractor in lump sum or in agreed instalments over several years. This model can also be classified as a PPP of the Build-Transfer variety. A variation is the BTO where the contractor assumes maintenance obligation on the assets built. Ownership of the road asset is transferred to the government immediately upon

completion of construction. Traffic or commercial risk is minimal, if it is not assumed by the government.

5) BOT – This contract model is used when the private concessionaire plans, designs, finances, builds, operates and maintains the road (typically with limited access, to ensure full capture of traffic) over a long term period (20-30 years). At the end of the concession, the concessionaire transfers everything to the Government. In this case, traffic or commercial risk is assumed by the private sector. From the toll collections, the contractor hopes to recover its investments in the project, which leads to long contract periods and the freedom of the concessionaire to adjust tariffs.

Toward Better Roads

To achieve well-maintained roads, there are two options for the DPW-MOC:

1. Revise the existing contracts to make them conform to ROMT models
2. Transform existing contracts into performance-based maintenance contracts (i.e. model 3b in preceding section)

The first option would address the deficiencies mentioned above, such as a mechanism for recovery of the initial project cost, with a life of 20 years or less. Depending on the annual revenues collected against investment and the agreed rate of return on invested capital, this option would also address other deficiencies including: toll adjustment formula, treatment of unforeseen changes in the catchment area during operation, performance bonds after construction, and force majeure. However, a threshold volume of Annual Average Daily Traffic (AADT) should be met, before such an arrangement is made to avoid the premature imposition of high tolls that could depress traffic and lead to economic losses.

This option can be made more appealing to contractors, through such means as granting revenue opportunities in addition to tolls or grants for exclusive right to re-fuelling stations along the highway or by setting up of a roadside stations similar to the famous “Michi no eki” of Japan.

The second option would restrict these agreements to road maintenance, rather than network expansion. Performance standards, response times and penalties for non-compliance would be defined for pavements, shoulders and drainage systems. Tolls could still be collected, but should be simplified into fixed amounts by vehicle class (e.g. light, medium, heavy) rather than predicated on weighing scales. Should the total toll collections fall short of standard cost by agreed work item, the Government could commit to bridge the gap in exchange for a larger share in case of excess. At present, the terms are such that the private contractor collects all the monies with only a general commitment to maintenance.

For new roads, the Government can include a 5-year maintenance contract for the contractor who first builds the road. This is similar to a warranty on the completed works and would ensure construction quality, without the need to set up a Quality Inspection/Audit Team in the Government. As the contractor is aware that it must maintain the road (at its expense during the first 5 years after completion), the contractor has an incentive to build the infrastructure to a high standard, in order to minimize subsequent maintenance expenses.

Under the procurement models 1 and 2, the road agency typically deploys a Quality Audit Team that inspects works during construction and ensures compliance with design specifications. This procedure may be compromised either by corruption (e.g. the Audit Team is bribed to ignore defects) or by the contractor avoiding responsibility (e.g. blaming failures or defects on faulty design or the Audit Team).

Performance-based contracts would be most appropriate for new and old roads. These contracts could yield the following benefits:

- Broaden the range of private sector participation (PPP) in the road sector
- Reduce maintenance costs through the application of more effective and efficient technologies and work procedures
- Provide transparency for road users, road administrations and contractors with regard to the conditions roads have to be maintained
- Improve control and enforcement of quality standards
- Improve overall road conditions and road user satisfaction
- Creating a performance culture, the government also establishes an environment for a world-class and competitive construction industry

Myanmar can learn from many countries that have adopted Performance Contracts in road maintenance3. Cost reductions have been seen in Australia, the United States and New Zealand. In Latin America, road conditions have notably improved on roads that are being maintained under the new contracting scheme.

(5) PPPs at Myanmar's Airports

The Yangon International Airport was the first of Myanmar's airports to be managed by a private company, a consortium headed by Pioneer Aerodrome Services Ltd. As part of the management agreement, the company was required to improve the existing international terminal building. Although the 30-year concession period was not up for renewal, a new bidding process for the airport's expansion and redevelopment was launched in February 2013. Subsequently, tenders for management services at Myanmar's Mandalay and Hanthawaddy airports were also issued.

Nay Pyi Taw International Airport (NIA)

Myanmar's newest airport opened in 2011 and involved the private sector from its inception, making it Myanmar's first airport built on the PPP module. The significant feature of this PPP is the extent to which the Government provided viability gap funding. As a 'green field' project with unreliable traffic volumes, the NIA will require government support to ensure the cost-effective operation.

This Government support was financed from the national budget and covered the cost of the land development, runway, air navigation facilities (e.g. ILS, VOR/DME) and runway lighting (e.g. edge, approach light, PAPI). The balance (approximately 80%) of the project cost was to be financed and built by the private concessionaire. The Government secured a loan from a China Exim Bank to fund a private company to construct the taxiway, apron, terminal building, control tower, fuel farm, car park and other facilities. Servicing of the loan was transferred to the Special Purpose Company (SPC) and therefore carries with it a sovereign guarantee.

The term of this concession is 30 years but it includes an option for renewal and an additional 30-year period. If renewed, the SPC could then apply up to 2 times for 10-year extensions, effectively extending the concession for a maximum of 50 years. The BOT concession was

[3] One source is http://www.performance-based-road-contracts.com/.

signed on 28 May 2011 and could theoretically expire in 2086.

The concession permits the SPC to impose and collect all fees and charges, on the airport's landside as well as the airside. However, the SPC is required to pay a pre-set land rent.

Airport tenders for three major airports

Building on the perceived PPP success of the NIA, the DCA sought to tender management and servicing of the 3 remaining airports in Myanmar, Yangon (YIA), Mandalay (MIA), and Hanthawaddy (HIA). While the scale of these investments and their commercial risks vary greatly between airports (Table 2.21) their term sheets share the following features:

- There is no government subsidy or funding support4, inclusive of loan guarantee, other than the land which is valued and provided as government equity in the respective airport SPC
- The SPC enjoys full assumption and control over revenues from landside and airside activities, including cargo-handling
- The concession period runs for 30 years, with options to extend for 10 years plus a final 10 years (ie. maximum 50 years)
- The DCA and Government retain responsibility for operation of the air traffic control, CIQ, airport security, meteorological service, emergency and rescue service – firefighting services, however, rest with the SPC
- Land rentals are paid to the government
- The DCA holds a seat in the board of directors and has a minority share in the respective SPCs, corresponding to the value of their land contribution

Table 2.21 – Selected Features of the 3 Airports

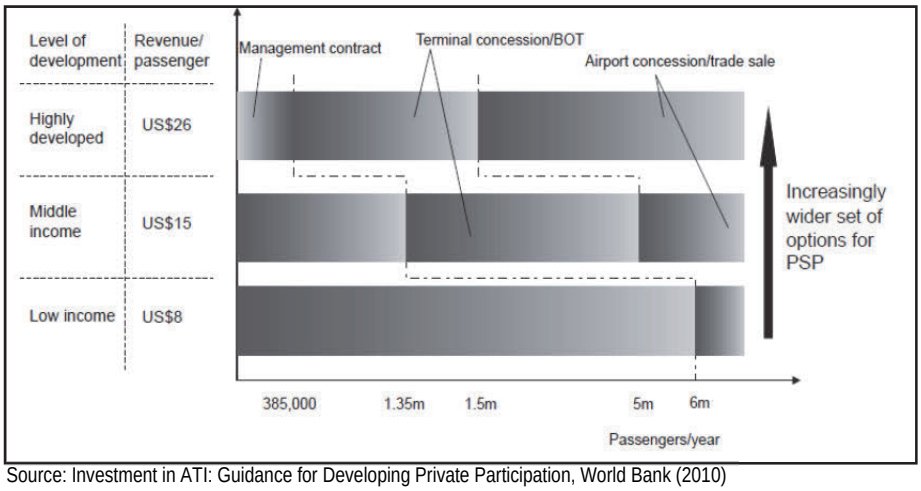
Airport	Investment Scale	Add-on Facilities	Current Traffic	Demand in 2030	Distance from City
Yangon	Medium, incremental	Domestic Terminal	3,069	6,000	18 km, N
Hanthawaddy	High & Lumpy	Runway, Terminal, etc	0	17,214	77km, NE
Mandalay	Low, incremental	Rehab w/expansion	574	3,752	30km, SW

Certain features of both the HIA and NIA illustrate their important similarities. Both were largely purpose built at scale, although some civil works were already on-site as a result of discontinued earlier works; these works are appraised at US$102 million. The other two airports, MIA and YIA are building on already established traffic and functional facilities, hence, their investment is incremental. The analysis finds that HIA may have difficulty to be cost-effective, especially with competition from YIA. HIA may seek concession terms similar to those of the NIA, where the Korean ExIm Bank provides the loan facility on a government-to-government basis. Mandalay has sufficient capacity at present, and therefore expansion can be deferred until demand becomes critical.

[4] Incheon won the tender in August 2013, with three other consortia led by Singapore's Changi Airport Planners, France's Vinci Airport and Japan's Taisei Airport selected as backups. However, negotiations with Incheon never materialized and now all four consortia are being asked to resubmit their financial proposals. ODA Loan can be applied in the re-tender proposal.

Local Airport Improvements

The DCA plans to invite private investors to upgrade 30 (of 69) domestic airports to improve safety, capacity and operational efficiency. It is likely that this policy change is as a result of recent budget constraints in the central government. Additionally, it may be difficult to administer private investor participation for all of the 30 airports, as opposed to selecting a few airports in areas having development potential, such as a tourism industry.



Source: Investment in ATI: Guidance for Developing Private Participation, World Bank (2010)

Figure 2.11 – Diagnostic Tool for Air Transport Infrastructure

Negotiating Capacity and Risk

In the simultaneous PPP concession tendering of Myanmar's 3 international airports, the Government has demonstrated its assertiveness for the PPP as a means to realize strategic objectives in the transport sector. This move has attracted international attention to Myanmar's potential, which extends beyond infrastructure. Though this move is bold, it is not without significant risk, especially for a low-income country with passenger traffic of less than 5 million a year. Additionally, this move reveals a weakness that should be addressed to improve its chances for success.

The concession tenders require proponents to draft the concession agreements. This effectively leaves important concession issues to be negotiated behind closed doors, clouding transparency and leaving critical issues at the discretion of the negotiators. Experience from other sectors in other parts of the world suggests that the concession tendering process in Myanmar is potentially unbalanced, with the private sector better resourced to advocate its position and the Government, often with less ability to access negotiating expertise, assuming a disproportionate level of risk.

Policy Context

Yangon metropolitan area's projected demand, as prepared by DCA, is vulnerable to changes in government economic policy, on aviation rights (e.g. freedoms of the air), and on adoption of less restrictive "open skies" agreements with other countries. The DCA is aware of these potential vulnerabilities and is responding by splitting air traffic between YIA and HIA. YIA will operate as a domestic airport with some regional (ASEAN, and short-haul) flights for the national airline, with a cap on capacity of 6 million passengers per annum (mppa). All international flights, beyond this threshold will be diverted to HIA, which shall handle

long-haul flights. Free-market environment, such as "open skies", would be welcome to HIA, MIA, and NIA. However, Myanmar's government has barred this type of liberalization in the aviation industry.

(6) Institutional Changes

As indicated in Figure 2.11, institutional reforms made before PPP implementation are preferred. Though in Myanmar's case, the typical sequence of reforms may have to be reversed, beginning with institutional changes after a PPP is implemented. PPPs effectively change the role of government, from service deliverer to that of regulator and policy implementer. By converting the DCA into the Myanmar Airport Authority (e.g. the Thai model) the Government is using the success of the PPP while changing DCA responsibilities under the concession.

Myanmar is continuing with its strong pursuit of PPPs by drafting changes to aviation sector legislation, which will be submitted to the Attorney General's Office before it is approved by the Cabinet and sent to Parliament for enactment into law. This Report recommends that the DCA exercise care that the provisions of this planned law continue to encourage a stable PPP platform in the country, especially in terms of economic regulations. While this is immediately relevant to air transport, institutional reforms for road, rail, IWT, and maritime industries should also be considered to ensure these industries are hospitable to PPP concessions.

This Report finds that Myanmar should draft special PPP laws that can establish a common framework for economic regulation and regulatory governance. This law would be vital to strengthen the use of PPPs in other transport sectors and critical to enlarging the share of PPP in the total transport investments of the country. While there is no draft of such a law as yet, it is recommended that a common set of rules and procedures or guidelines on PPP (within the ambit of the Foreign Investment Law and Citizens Investment Law) be issued. The DCA is now experienced with the PPP model and can share lessons with other agencies. The DPW may be one priority department for this experience, having the most numerous BOT projects but having weaker concession contracting.

In other industries, Myanmar can also seek to incorporate PPPs. Concessions and other PPP instruments may be viable in the following projects or sectors: (a) deep sea port for ocean shipping; (b) dry or land ports inland on the Asian Highway and Myanma Railways; (c) selected features in the railway sector, which would require the re-structuring or unbundling of Myanma Railways; or (d) IWT port with property development. Due to Myanmar's current low level of motorization, PPPs for expressways may not be viable for some time, due to low traffic volumes on the Yangon-Nay Pyi Taw-Mandalay Expressway. The installation and operation of weighing-stations (to enforce axle load limits on trucks) may also be suitable candidate for PPP execution.

(7) Other Non-Traditional Financing

While PPPs offer many important positive effects, they are also unpredictable in terms of assured levels of regular funding to supplement capital budgets. Variations from year to year may be very high and, unlike funding from the Treasury and ODA where annual flows can be forecast accurately and variations are low from year to year, the PPP is less certain. As well, success with these arrangements involves the efforts of two parties (public and private) to convert a planned project into an actual investment.

As a result, this Report recommends that the Government explore additional financial options in developing its infrastructure, including PPP models. One innovative and emerging form of

financing are "Diaspora Bonds"[5] targeted at the potentially large number of overseas workers that Myanmar may have and leveraging the remittances already flowing to the country. For example, India has raised US$11 billion from this source and African countries are also tapping this important source of funding. A side benefit for Myanmar is that, along with the access to steady new funding, Diaspora Bonds may help improve ratings on the country's sovereign debt.

Another source, which is non-recurring but could be substantial given the high land prices in Yangon, is the opportunity afforded by the transfer of the capital from Yangon to Nay Pyi Taw. If not yet committed, those lands and properties that have become vacant or under-utilized could be sold or securitized to generate funds for infrastructure.

Lastly, for the road sector, the Government could ensure efficient and stable payments to private road contractors via a "road user fund", dedicated to road maintenance.

[5] Seliatou Kayode-Anglade and Nana Spio-Garbrah, " Diaspora Bonds: Some Lessons for African Countries", African Development Bank (Dec 2012).

Chapter 3 Environmental Framework

3.1 Institutional Framework

3.1.1 Environmental Policy, Strategy and Legal Framework

In Myanmar, environmental legal systems are still in development. The Environmental Conservation Law, the core law for protecting and enhancing environmental sustainability in Myanmar, was issued in March 2012 after significant consultation. The Ministry of Environmental Conservation and Forestry (MOECAF) then prepared Environmental Conservation Rules, Environmental Impact Assessment (EIA) Procedures and environmental quality standards with the assistance of the Asian Development Bank (ADB). In June 2013, the Cabinet approved the Environmental Conservation Rules. These new environmental laws and rules are important for Myanmar, but they will require a significant amount of time to implement successfully. The Government is now planning EIA procedures and capacity building for officials to implement the EIA.

3.1.2 Overarching Framework

In brief, the following three initiatives are the major policy frameworks for environmental management in Myanmar:

a) The National Environmental Policy regulates the environment "wealth of the nation" and places environmental protection as the highest priority.

b) Myanmar Agenda 21 was developed in 1997 to steer a process of sustainable land use management and recognizes the important role of the Environmental Impact Assessment (EIA). It calls for public participation with a particular focus on "those most affected by (the) decisions."

c) The National Sustainable Development Strategy (NSDS) sets out strategies and areas for development with an aim to achieving sustainable natural resource management, integrated economic development and sustainable social development.

3.1.3 Environmental Management Legislation

Environmental Conservation Law

The principal law governing environmental management in Myanmar is the Environmental Conservation Law, which was issued in March 2012 (The Pyidaungsu Hluttow Law No. 9/20/2130rh). This law stipulates which government bodies are responsible for environmental conservation, as well as their roles and responsibilities. The law affects environmental and social impact assessments as well as water, air, land, noise, vibration and solid waste qualities, though the law does not provide specific standards to be met. In the context of project development, it is important to note that the law adopts the stance of a polluter/beneficiary pays principle, as it requires that project promoters be responsible for covering all environmental and

social costs generated by the project. The law serves as the basis for establishing the Environmental Conservation Department (ECD) under MOECAF, both of which will be explained later in this Chapter. Supporting the Environmental Conservation Law are two legal arrangements, the Environmental Conservation Rules and EIA Procedures.

Environmental Conservation Rules

Environmental Conservation Rules are designed to provide a platform for the Environmental Conservation Law, with more specific and practical rules and guidelines, including EIA procedures and environmental quality standards. However, only limited data is available with regard to the content of the Rules.

EIA Procedures and Environmental Quality Standards

The EIA Procedures describe the conditions under which an EIA is required and the steps to be followed in conducting and assessing the EIA. Under the Procedures, the Ministry, as the Executing Agency, strikes an EIA Review Committee to provide recommendations from an environmental point of view, and whether to approve EIA reports or not. Membership in the EIA Review Committee is determined by the Minister of MOECAF but must include experts from industry, academia, and civil society, as well as government officials. The EIA includes an environmental management plan and a social impact assessment report.

The EIA Procedures may also if the Ministry determines this is required. The Procedures may also require the application of the "precautionary principle" and address climate change; however, the Procedures will not include a Strategic Environmental Assessment.

The EIA Procedures require that EIAs follow a specific process and while it is yet to be enacted, draft document and results of interviews with ECD staff members indicate that the EIA process in Myanmar will generally include these elements:

a) All development projects in Myanmar will be subject to an environmental screening process through which projects will be assessed to determine if they require an environmental review and, if so, at which level (i.e. IEE or EIA).

b) An EIA will include an environmental management plan and a social impact assessment report.

c) Public participation will be required, when deemed necessary, for the Initial Environmental Examination (IEE), Environmental Impact Assessment (EIA), and preparation of an Environmental Management Plan (EMP).

d) The project's executing agency will form an EIA Review Committee, which will supply recommendations to the Ministry of Environmental Conservation and Forestry (MOECAF) from an environmental standpoint and whether to approve the EIA reports. The MOECAF Minister is empowered to make the final decision based on this recommendation. The review period is 50 days for an IEE and 90 days for an EIA.

e) Members of the EIA Review Committee will be selected by the Minister of MOECAF and will include experts from industry, academia, and civil society, as well as government officials.

f) Involuntary resettlement is managed by respective regional governments and will not be included in the EIA Procedures.

g) Costs involved in conducting EIA are to be covered by the project proponent.

h) The EIA can be carried out in Myanmar only by firms that are registered under ECD/MOECAF.

3.1.4 Other Laws Concerned with the Natural and Social Environment

Myanmar's other environment-related laws and regulations are described in Table 3.1.

Table 3.1 Environmental Laws and Regulations

Name of the Legislation (year issued)	Features
Environmental Conservation Law	・ The principal law governing environmental management in Myanmar issued in March 2012
Environmental Conservation Rules	・ A platform to bridge the Environmental Conservation Law with more specific and practical rules and guidelines, including EIA Procedures and environmental quality standards. The Environmental Conservation Rules was approved by the Cabinet in June 2013.
EIA procedures	・ MOECAF has prepared a draft EIA guideline with support from ADB in late 2013, which is under review by the Presidential Office as of May 2014.
Other Laws Concerned	
(Natural Environment)	
The Protection of Wildlife and Conservation of Natural Areas Law (1994)	・ Designates national parks and other protected areas to be: Scientific Reserve; National Park Marine National Park; Nature Reserve; Wildlife Sanctuary; Geo-physically Significant Reserve; or Other Nature Reserve as designated by the Minister ・ Specifies those acts that are prohibited and subject to fines
Myanmar Forest Policy (1995)	・ Shows the general orientation of the government in terms of sustainable management of forest resources and their responsible development for socio-economic purposes
The Forest Law (1992)	・ Concerns itself with implementing Forest and Environmental Conservation Policy
(Social Environment)	
Land Acquisition Act	・ Stipulates that the government holds the right to expropriate land, provided that compensation is provided to the original land owner ・ States that no private ownership of land is permitted and that all land must be leased from the Union State
The Land Nationalization Act (1953)	・ With some exceptions, stipulates that all types of agricultural land are owned by the President ・ Indicates that, in the case of a breach of regulations, even land exempted from government confiscation may be forfeited to the country without compensation ・ States that the President reserves the right to decide the crops to be gown on agricultural lands
Farmland Bill (2011)	・ Calls for suitable compensation and indemnity in the case of repossession of farmland, in the interest of the Union State
Farmland Rules (2012)	・ Stipulates farmers' right to work on farmland ・ States that when farmlands are converted to different land uses, based on the interest of the State or Public, the State or Public must provide compensation to farmers, without delay

Source: JICA Study Team

3.1.5 Government Bodies Responsible for Environmental Management

The government body with primary responsibility to ensure and promote the soundness of the environment in Myanmar is MOECAF, although other Ministries (e.g. Ministry of Agriculture and Irrigation, Ministry of Livestock and Fisheries) also share a certain level of responsibility. MOECAF was reformed in September 2011 from the Ministry of Forestry to be the focal point and coordinating agency for environmental management. While Myanmar law does not specify the full scope of MOECAF's role regarding environmental governance, responsibility of its predecessor (i.e. Ministry of Forestry) is stipulated in the Forest Policy (1995) as forestland management, environmental protection, timber extraction and forest policy in Myanmar. Since then, there has been only one modification to the structure of the Ministry, which is the notable addition of ECD established in October 2012 and based on Environmental Conservation Law. ECD is the department responsible for managing the EIA process in Myanmar. The role of MOECAF in environmental conservation can therefore be considered greater than before.

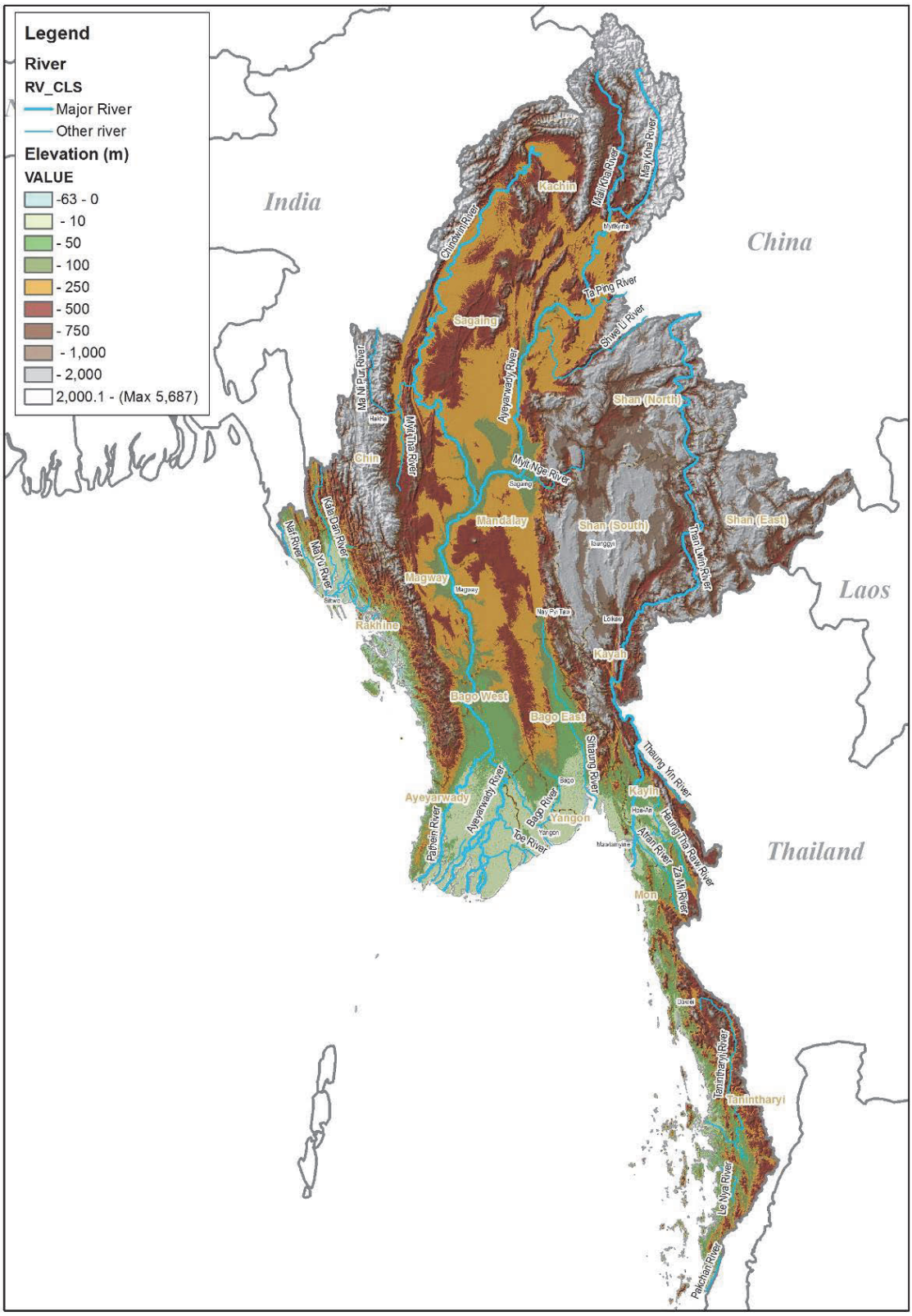
3.2 Existing Status of the Environment in Myanmar

3.2.1 Natural Environment

Topography, Geography and Hydrology

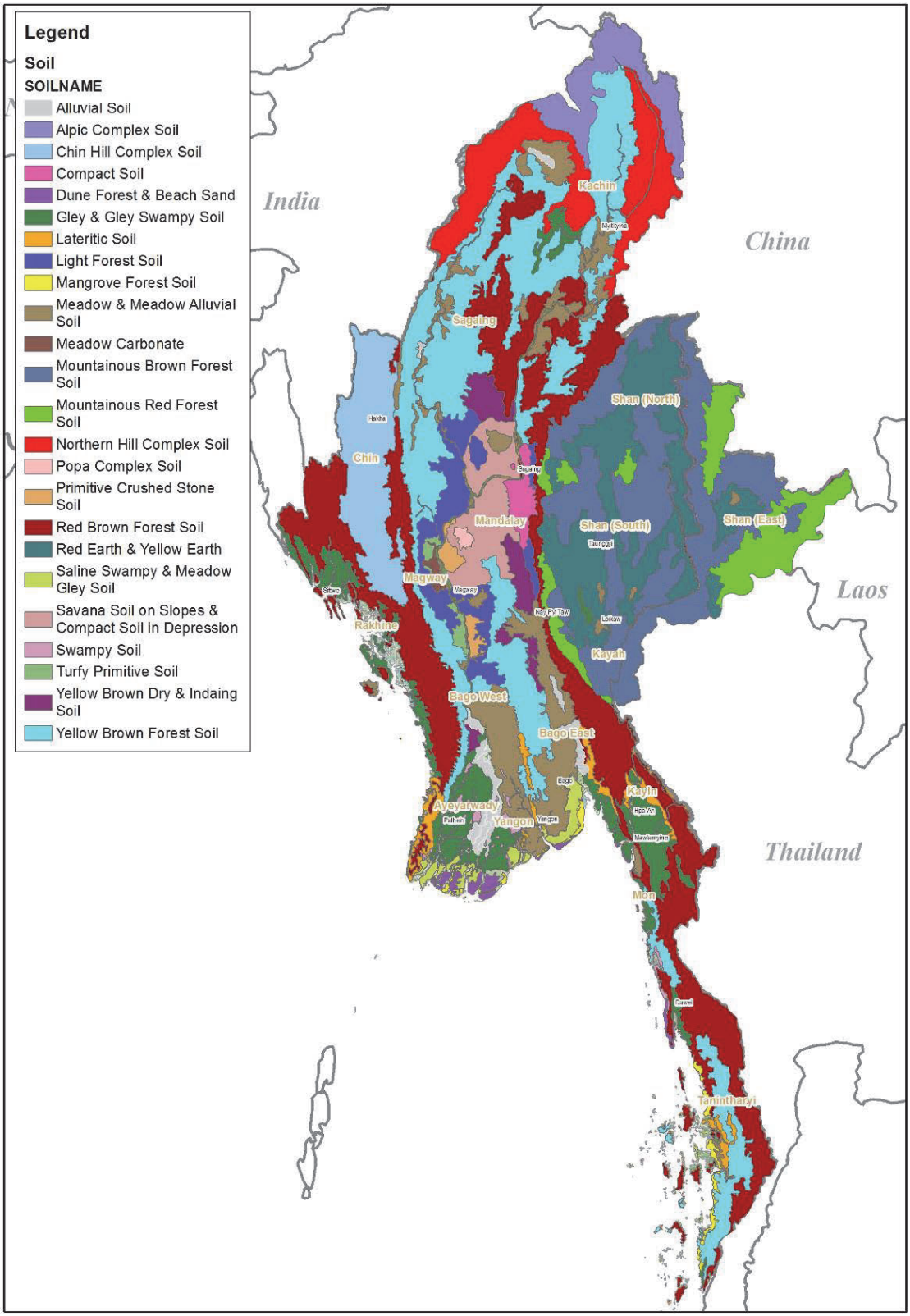
Myanmar is characterized by a variety of topographic features including mountain ranges in the north, east and west, and a long coastal strip in the south, as shown in Figure 3.1. Steep mountainous ranges traverse the entire western border of Myanmar with India and Bangladesh. Their average elevation is approximately 1,800 meters and the highest point is the top of Mt. Hkakaborazi, reaching 5,881 meters above sea level.

Myanmar has five main rivers: Ayeyarwaddy, Chindwin, Salween, Sittaung and Tenasserim, the longest of which is the 2,170 kilometer long Ayeyarwaddy River, which runs through the country into the Gulf of Martaban.



Source: SRTM (left) and Agricultural Atlas

Figure 3.1 Topographic and Hydrological Features

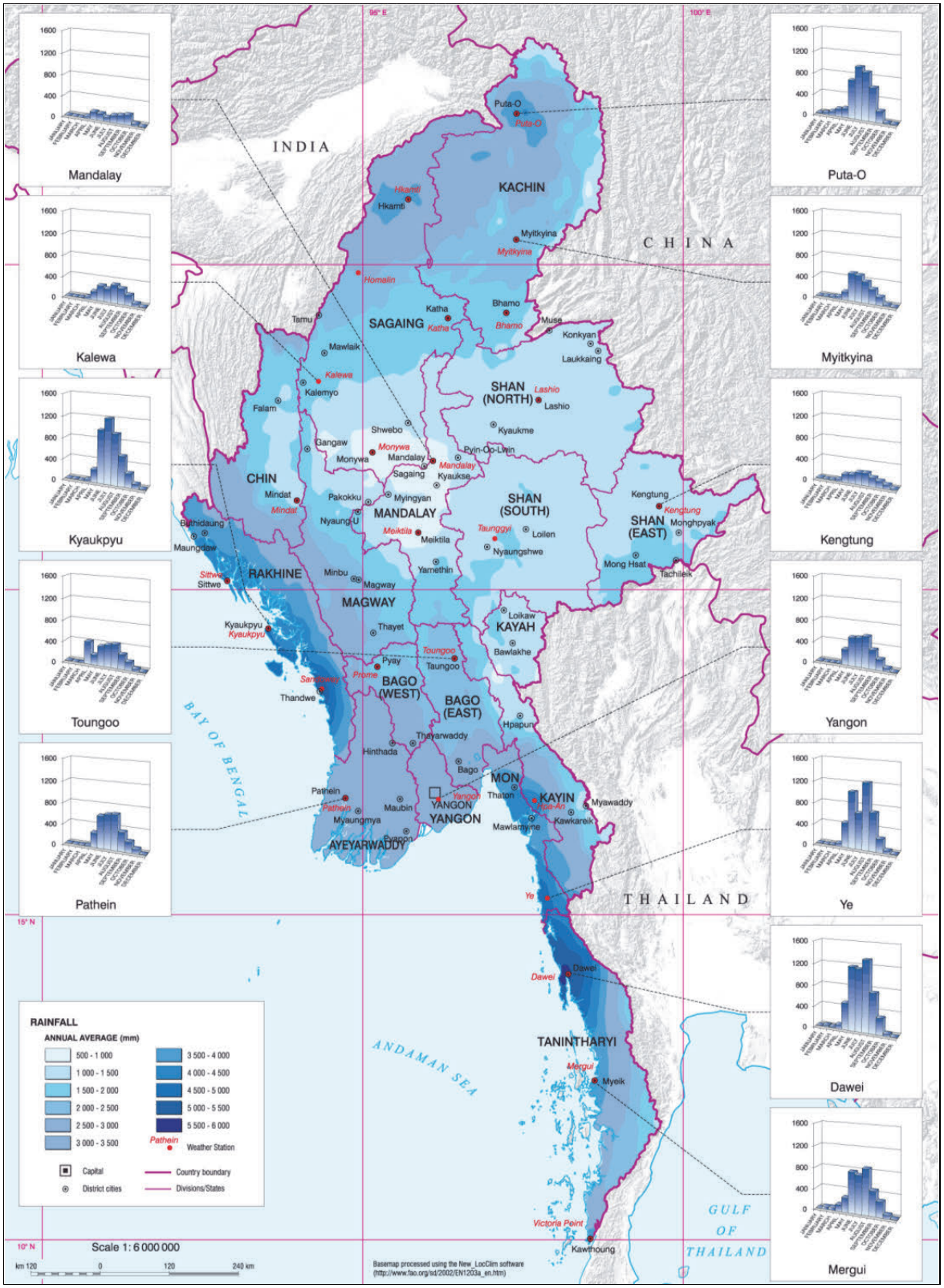


Source: FAO

Figure 3.2 Geographical Condition

Climate

Myanmar has a tropical monsoon climate, which is characterized by a rainy season (May to September) and a dry season (October to April). There are significant variations in precipitation between the central region, where annual rainfall is less than 800 millimeters in the Tanintharyi Region to more than 5,000 millimeters in northern Rakhine State. The country has average temperature ranges from 38°C to 42°C in summer (March and April) and 10°C to 16°C in winter (November to February). Figure 3.3 describes average precipitation levels in Myanmar.

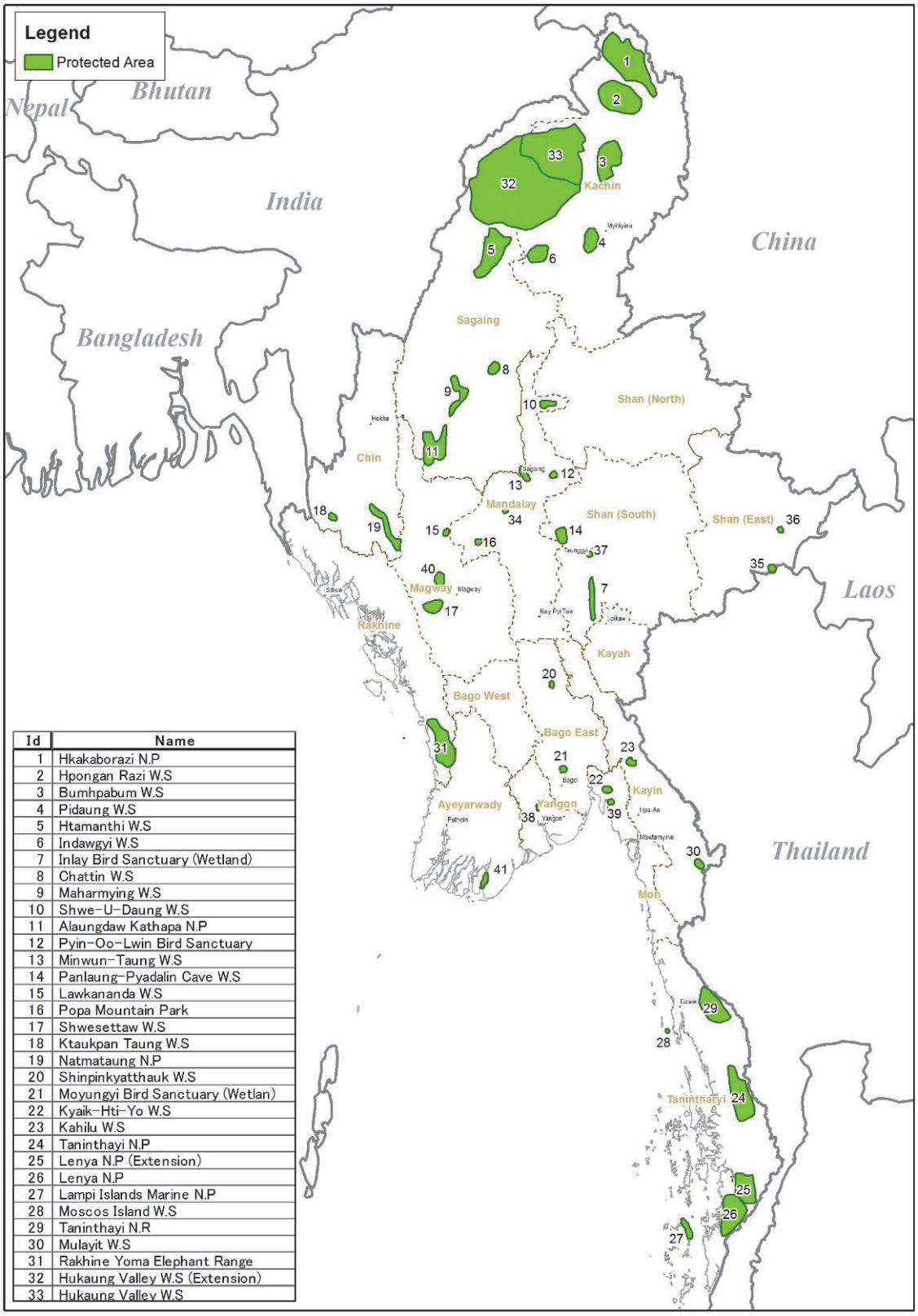


Source: Agricultural Atlas, FAO

Figure 3.3 Average Precipitation in Myanmar

Ecosystem - Biodiversity

Sometimes referred to as the "last frontier of biodiversity in Asia" (BEWG 2011), Myanmar is endowed with rich plant life and numerous animal species. Many critically endangered wildlife species have been found in Myanmar, including over 300 identified mammal species, 7,000 plant, 425 reptile and amphibian species, 310 fish species and 1,027 bird species. However, a recent increase in the illegal trade of animal and plant life along with uncontrolled development is beginning to seriously degrade much of Myanmar's rich biodiversity, prompting the Government to designate certain areas as protected, in order to safeguard natural resources (Figure 3.4).



Id	Name
1	Hkakaborazi N.P
2	Hpongan Razi W.S
3	Bumhpabum W.S
4	Pidaung W.S
5	Htamanthi W.S
6	Indawgyi W.S
7	Inlay Bird Sanctuary (Wetland)
8	Chattin W.S
9	Maharmying W.S
10	Shwe-U-Daung W.S
11	Alaungdaw Kathapa N.P
12	Pyin-Oo-Lwin Bird Sanctuary
13	Minwun-Taung W.S
14	Panlaung-Pyadalin Cave W.S
15	Lawkananda W.S
16	Popa Mountain Park
17	Shwesettaw W.S
18	Ktaukpan Taung W.S
19	Natmataung N.P
20	Shinpinkyatthauk W.S
21	Moyungyi Bird Sanctuary (Wetlan)
22	Kyaik-Hti-Yo W.S
23	Kahilu W.S
24	Taninthayi N.P
25	Lenya N.P (Extension)
26	Lenya N.P
27	Lampi Islands Marine N.P
28	Moscos Island W.S
29	Taninthayi N.R
30	Mulayit W.S
31	Rakhine Yoma Elephant Range
32	Hukaung Valley W.S (Extension)
33	Hukaung Valley W.S

Source: MOECAF

Figure 3.4 Protected Areas in Myanmar, Existing and Proposed

Ecosystem - Forests

According to MOECAF, nearly 50% of Myanmar is covered by forest, of which 27% is closed canopy forest (see Figure 3.5). The majority of these large, densely forested areas are found in the boarder areas of Kachin State in the north, along the national border with India and Bangladesh in the west (particularly south towards the Bay of Bengal) and in Tanintharyi Region in the south.

According to Khin Htun of FAO (2009), the annual rate of Myanmar's deforestation was 6.9% between 1990 and 2000, 3.7% between 2000 and 2005 and 10.3% between 1990 and 2005. Timber is one of the major export commodities for Myanmar in last two decades. In the lowlands of the central and southern areas, on the other hand, the main drivers of deforestation include forest conversion, charcoal production and fuel wood collection. Deforestation also has a significantly negative impact on local communities' living conditions, as people are dependent on forest resources, directly in terms of charcoal and wood fuel and indirectly by their reliance on the ecosystem and wildlife.

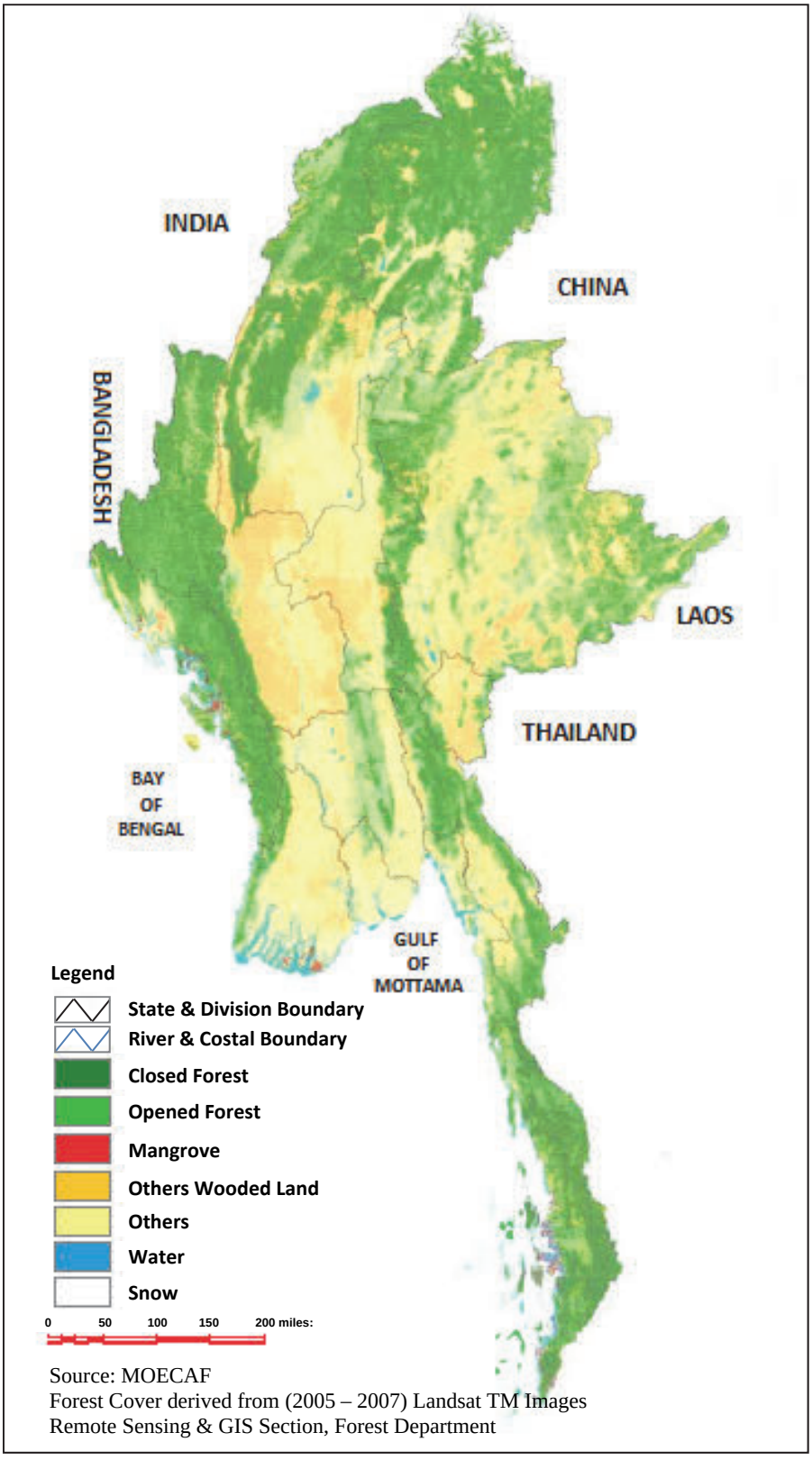


Figure 3.5 Forest Cover in Myanmar

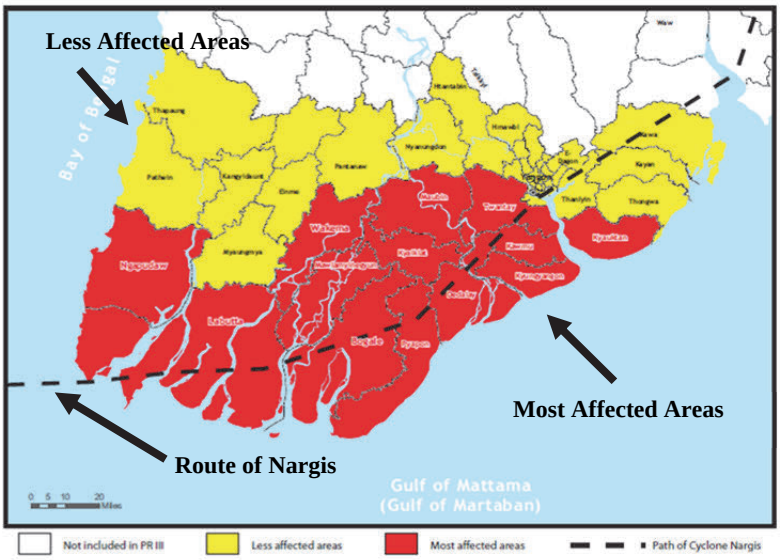
Ecosystem – Coastal Areas

Myanmar's 2,276 kilometer coastline extends from the Bengal Bay to the Andaman Sea, which has a large inter-tidal mud flat with mangrove forests and shrubs. The coastal area provides habitat for large numbers of animals, and has wide mangrove forests. It is reported that over 20% of the mangrove forests have been lost between 1990 and 2000.1

Natural Disasters

Myanmar experiences four types of recurring natural disasters that are relevant to existing and future transport infrastructure development, including: cyclones, flooding, earthquakes and landslides.

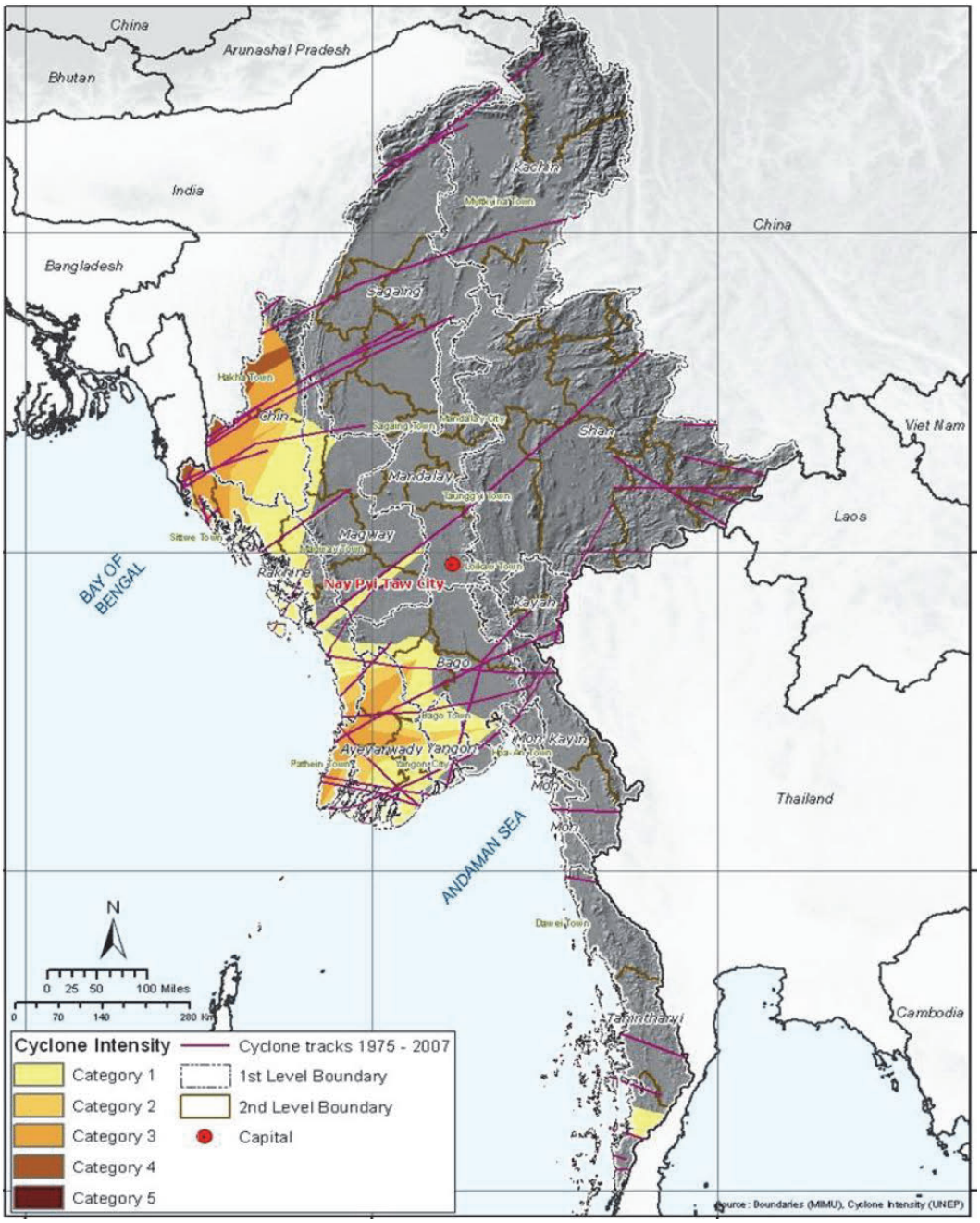
Cyclones: Measured in terms of their magnitude of damage, including loss of life, cyclones are considered the most significant natural disaster occurring in Myanmar and generally follow a southwest-to-northeast trajectory. The most significant cyclone in Myanmar was Cyclone Nargis, which passed the southern delta area in 2008 and caused the widespread destruction of built structures and farmland and caused more than 100,000 deaths. Cyclone Nargis was the single most destructive natural disaster in Myanmar's history and, in addition to tragic loss of life, also resulted in dramatic economic losses. The number of missing and dead had been reported to reach 140,000 in Ayeyarwaddy Delta region alone, with an additional estimated 2.4 million people losing homes and livelihoods. Figure 3.6 describes the areas most affected by Cyclone Nargis. Similarly, in 2010, Cyclone Giri passed the middle of Maynmar causing considerable destruction. More than 260,000 people were affected and at least 45 died. At least 17,500 acres of agricultural land and nearly 50,000 acres of aquaculture ponds were also damaged.



Source: Post Nargis Periodic Review III

Figure 3.6 Areas Affected by Cyclone Nargis

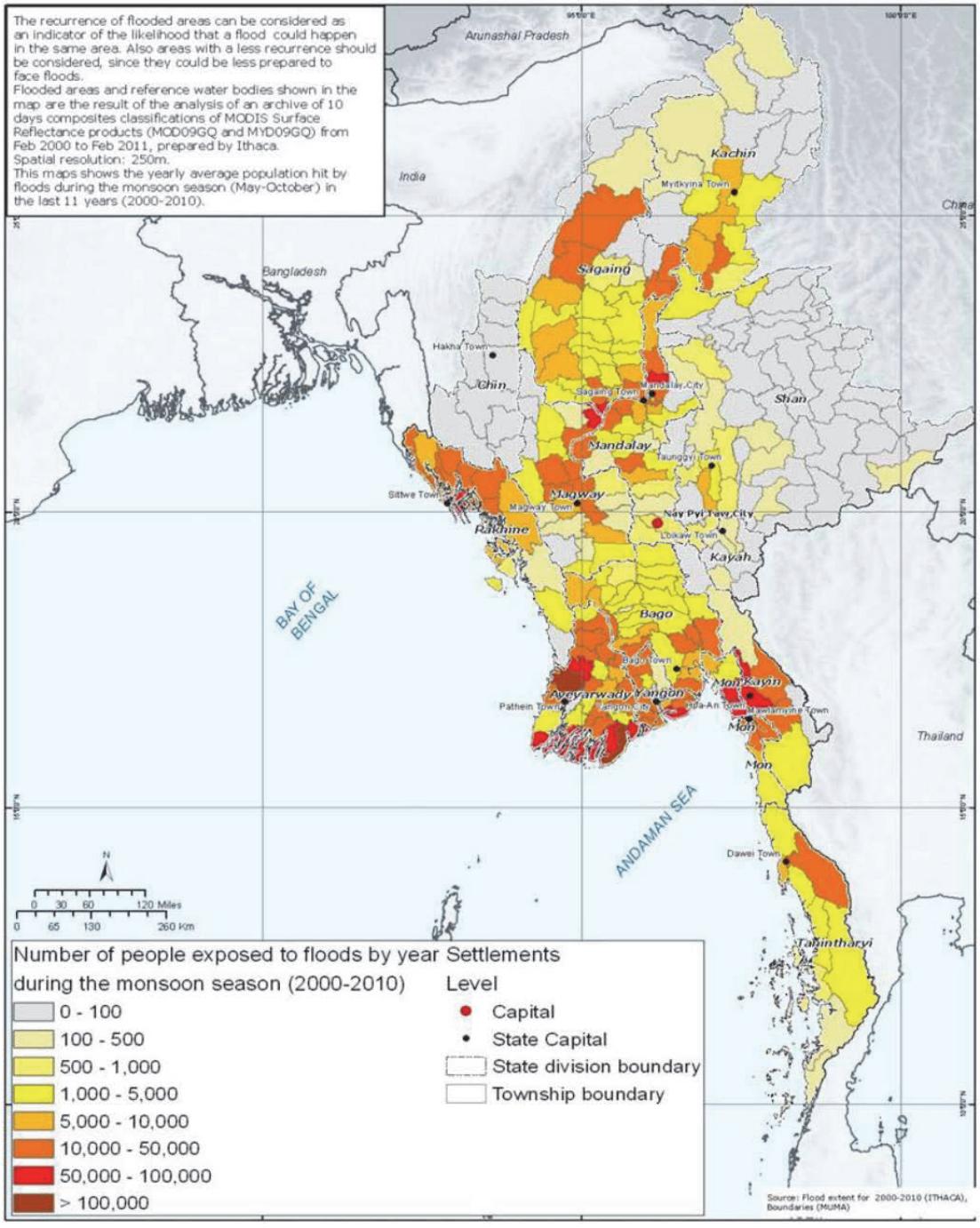
1 Leimgruber *et al.* 2004 cited in Birdlife International 2005



Source: MIMU

Figure 3.7 Cyclone Intensity

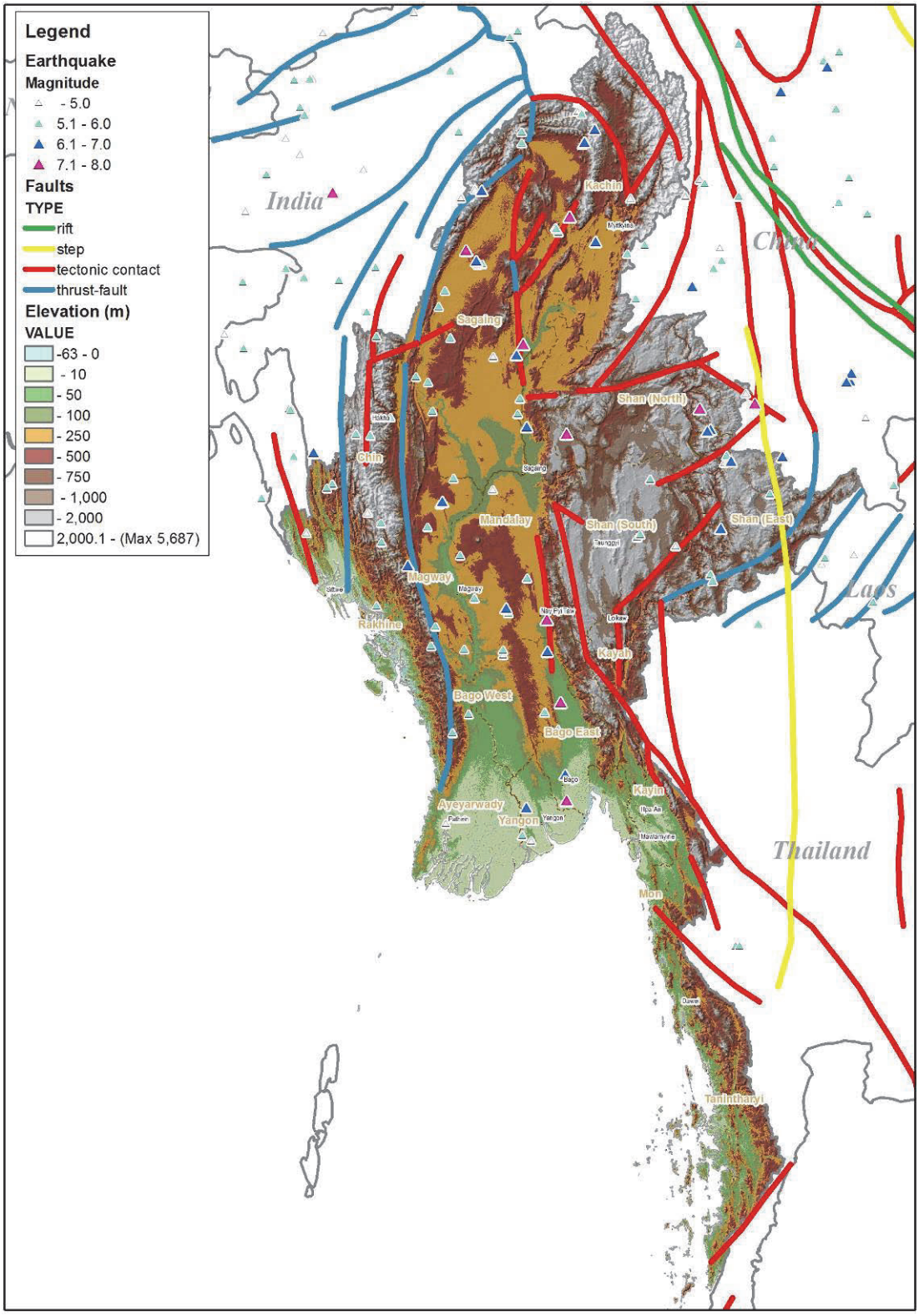
Flooding is another major natural disaster that takes place frequently in Myanmar, predominantly during the rainy/monsoon season. Figure 3.7 illustrates the intensity of past cyclones (one of the major causes of flooding) in each geographical area and Figure 3.8 indicates those populations most exposed to floods. In 2012, Myanmar's southern delta area was severely flooded with Ayeyarwaddy Region most affected where approximately 50,000 people were displaced and more than 100,000 acres of agricultural land, houses and road infrastructure were damaged.



Source: MIMU

Figure 3.8 Populations exposed to floods

Earthquakes occur with some frequency as Myanmar is relatively more prone to earthquakes than other Indochina countries. In November 2012, a magnitude 6.8 earthquake struck the north part of the country. The most affected areas were Mandalay and Sagaing Regions where at least 16 people were killed, 52 injured and over 400 houses, 65 schools and around 100 religious buildings were damaged. As shown in Figure 3.9, active faults run from north to south in the western mountainous area with some passing through the center of Myanmar.



Source: MIMU

Figure 3.9 Active Faults and Seismic Centers in Myanmar

Landslides occur in Myanmar, particularly during the rainy season in the Western Ranges and the Eastern Highlands and on the banks of Ayeyarwaddy River and its tributaries in the central lowlands. A combination of steep slopes, heavy rain and unstable soil conditions are the main causes of landslides but they can also be triggered by earthquakes. Transportation infrastructure, and roads in particular, are often affected by landslides. In September 2004, a large-scale landslide took place along the Kale-Kalewa road near Kale-City, Sagaing Region, destroying the road and bridges for 30 kilometers (Kyaw Hhun 2010). Damage to residential areas, on the other hand, is generally limited because of low population densities in the areas susceptible to landslides. Nevertheless, there have been incidences such as in Tanintharyi Region where houses and primary schools were buried by soil in 1999 (Kyaw Hhun 2010). Table 3.2 describes major landslides in Myanmar over the last century.

Table 3.2 Major Landslides in Myanmar

Year	Location	Name and Type	Triggering Process	Impact
1912	North of Taunggyi	Maymyo Landslide	Earthquake	Serious Landslides and Ground Cracks
1946	Tagaung	Landslides	Earthquake	380 acres of Crop Damage
1991	Tagaung	Landslides	Earthquake	Buildings Destroyed
1999	Western Slope of Tanintharyi Range	Landslides	Torrential Rain	Buried Villages
2001	Nansang	Subsidence	Heavy Rain	Two Circular Graven 50-feet in Diameter Appeared
2003	Taungdwingyi	Landslides	Earthquake	Some Slopes and Railroads along the Western Bago Yoma Failed
2004	Kalewa-Kale Road	Chaungkyin Landslides	Heavy Rain	Bridges and 30 km of the Main Road Destroyed
2008	Mogoke	Mogoke Landslides	Heavy Rain / Excavation	11 People Killed
2009	Kyauktaw-Ann Road	Kyauktaw Landslides	Heavy Rain	120 km of Main Road Destroyed

Source: Kyaw Hhun (2010)

3.2.2 Social Environment and Development

In Myanmar, nearly 75% of the population lives in rural areas and approximately the same number of people rely on agriculture for their livelihoods. In areas where the Myanmar maintains records, 40 to 60 % of the famers are dependent on small farm cultivation, holding land of less than five acres (BEWG 2011).

Development and Land Ownership

Both statutory and customary land ownership laws exist in many rural areas. In general, customary laws are practiced in the uplands where the majority of ethnic groups reside, while statutory laws are followed more in the lowlands (BEWG 2011). Since most natural resources such as forests, minerals, and oil and gas exist in upland areas, social tensions and conflicts are frequently reported between local farmers and Government authorities, as customary rights over resources on occupied lands are not yet recognized by statute.

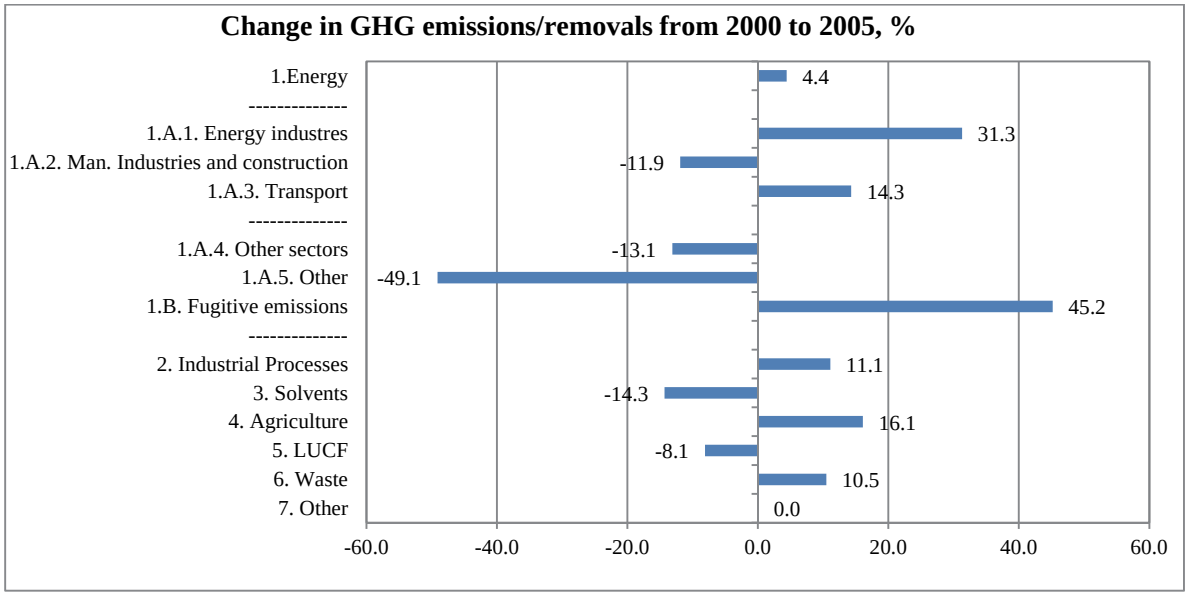
Development and Ethnic Conflicts

Myanmar is one of the most ethnically diverse countries in Asia. Most of the foreign direct investment is located in peripheral areas, where ethnic groups are prevalent. During the past decade, much of this investment relates to natural resources and the oil and gas, hydropower, and mining sectors specifically. A number of conflicts have been reported in the past in these areas, between the Government and armed indigenous groups. At present, the Government has cease-fire agreements with many of these groups but there are still many highly sensitive areas where the risk of conflict around development projects remains high. Descriptions of two potentially significant social problems that could accompany development projects are:

- Hydropower Projects: In Myanmar, there are an estimated 48 hydropower projects planned, in construction, or existing along major rivers including the Salwee, Jrhaniwin, Ayeyarwaddy, Chindwin, and Sillaung rivers, as well as their tributaries (BEWG 2011). Dam construction can be accompanied by the forced relocation of local communities, without consideration for appropriate relocation measures or sites being provided. According to some reports, people have been forced to relinquish traditional customs and/or accept poorer living conditions. In addition, water degradation can be associated with some of these projects and can adversely affect human health and accelerate the prevalence of diseases like malaria and dengue.
- Oil and Gas Extraction Projects: According to reports, pipeline construction in the late 1990s resulted in serious human rights abuses and considerable environmental destruction (BEWG 2011). Potentially negative impacts of oil and gas project development include: militarization of nearby areas, involuntary relocation of people with little or no compensation, confiscation of agricultural lands, forced labor for the construction of military camps and infrastructure, sexual abuse, land clearing, etc.

3.3 Climate Change

Myanmar ratified the United Nation Framework Convention on Climate Change (UNFCCC) in 1994 as a non-Annex I Party. UNFCCC requires these Parties to make initial national reports on greenhouse gas emissions and reduction. Myanmar conducted its first GHG inventory study with the assistance of ADB in 1997. Figure 3.10 illustrates the change in the world's GHG emissions and reductions between 2000 and 2005. Global GHG emissions from the transportation sector increased by 14.3%, suggesting that transportation sector development and investment can contribute largely to reducing GHG emissions.



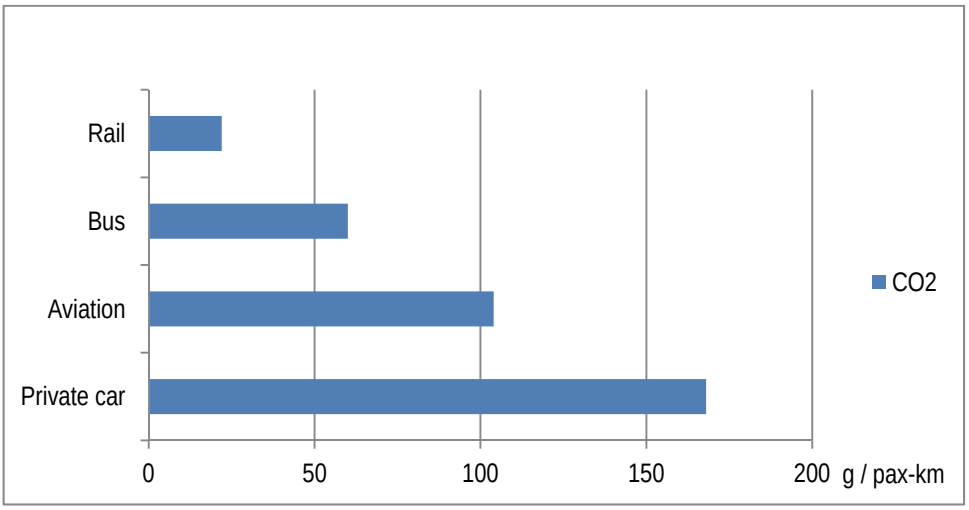
Source: Climate Change Secretariat, United Nations, 2007

Figure 3.10 Changes in Global GHG Emissions and Reductions between 2000 and 2005

In the transportation sector, the following activities can contribute to reducing emissions and hence, mitigating climate change.

Modal shift

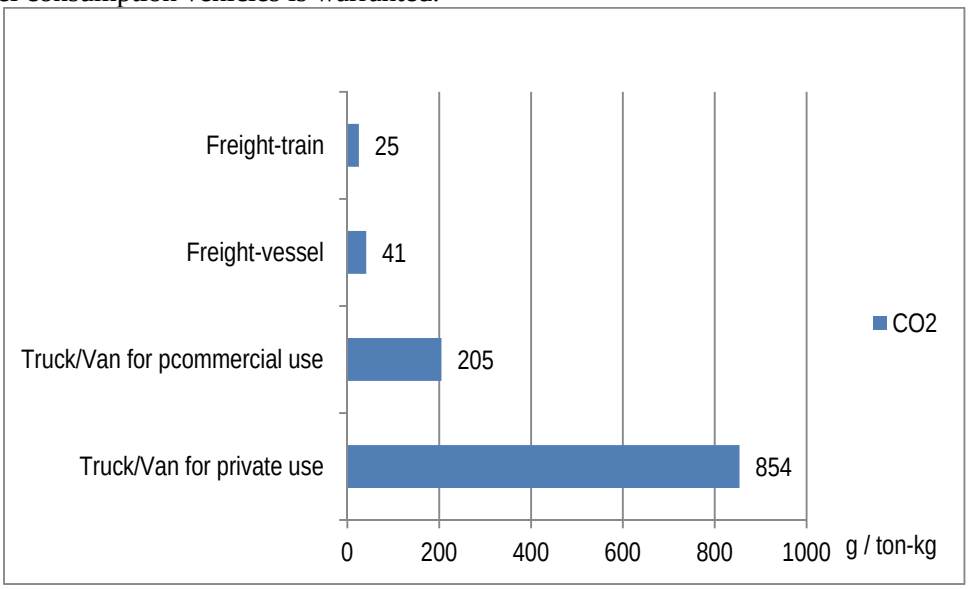
Trains and buses are generally considered more effective in reducing GHG emissions than private vehicles, as shown in Figure 3.11, suggesting that a shift to lower-fuel consumption vehicles is warranted.



Source: Ministry of Land, Infrastructure, Transport and Tourism, Japan (2012)

Figure 3.11 Estimated CO_2 Emissions by Transport Mode (passenger transport)

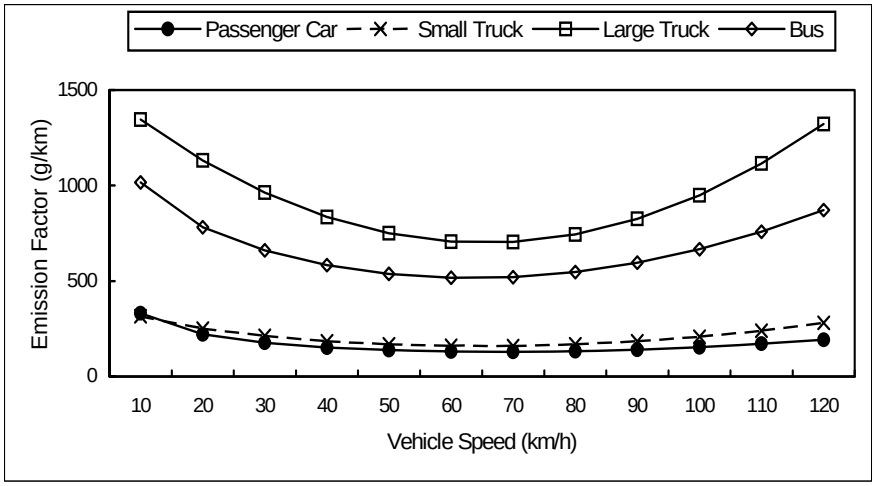
For freight transportation on land, trains and buses are generally considered more effective in reducing GHG emissions than private vehicles, as shown in Figure 3.12, suggesting that a shift to lower-fuel consumption vehicles is warranted.



Source: Ministry of Land, Infrastructure, Transport and Tourism, Japan (2012)

Figure 3.12 CO_2 Emission Factors by Vehicle Type (freight transportation)

Proper traffic flow management: Traffic congestion leads to an increase in CO^2 emissions and generates air pollution. Figure 3.13 describes the relationship between CO^2 emissions and vehicle speed.



Source: Osaki, *et al.*, Fuel Consumption and Emission Factors of Carbon Dioxide for Motor Vehicles.

Figure 3.13 CO_2 Emission Factors by Vehicle Type and Speed

3.4 Environmental Suitability Analysis

3.4.1 Purpose of Environmental Suitability Analysis

Strategic Environmental Assessment (SEA) provides a methodology not only for evaluating the impact of policies, plans and programs on the environment, but also for addressing the impact of environmental change on policies, plan and program. It may thus offer a useful framework for effectively mainstreaming climate change adaptation into policy-making processes at the national level.

The MYT-Plan Strategic Environmental Assessment (SEA) includes an environmental suitability analysis and provides recommendations that identify areas where proposed transport infrastructure projects should be situated, in order to mitigate negative social and environmental impacts. In addition, this analysis can be used as a tool to conduct environmental management in the implementation of the Master Plan.

The suitability analysis addresses two aspects of natural disasters: a socio-ecological aspect and a risk aspect. The socio-ecological aspect determines environmental features that are of high ecological or social value and should be preserved (e.g. rich forests and biodiversity). The risk aspect determines level of risk for natural disasters and which impacts should be prioritized for action (e.g. cyclones, floods, earthquakes and landslides).

An additional tool for the suitability analysis is a natural disasters' spatial analysis, which:

- Identifies areas that are environmentally vulnerable and determines constraint factors on development planning so activities for conservation can be applied
- Guides the development of the national transport master plan from the standpoint of environmental conservation, disaster prevention and economic improvement

3.4.2 Methodology

(1) Scoping for Selection of Key Environmental Issues

The MYT-Plan includes environmental analysis from a review of available literature, environment-related policies, plans, and legislation, as well as interviews with researchers and other stakeholders. From this research, this Report identifies a number of major environmental constraints to transportation infrastructure development. As the scope of this study is the whole country, those environmental conditions that do not affect a large spatial area (e.g. cultural heritage sites) were excluded due to the relatively minor effect that point data on a map has in terms of a national-level transportation planning. Similarly, conflict zones and areas with land mines were also excluded because conditions in those areas can change dramatically in the near future, given the current political climate. In addition, reliable and comprehensive information is lacking for these locations.

A stakeholder workshop to determine priority environmental issues was held on 20 May, 2013 in Nay Pyi Taw. One of the objectives of this workshop was to reach consensus on the selection of key environmental issues to be analyzed and to inform environmental considerations in the design of the Master Plan. The workshop revealed particular issues that warrant special attention in planning processes, which can also be used to identify areas with high agricultural productivity, including:

I. Environmental Sensitivity

Evaluations of natural resource conservation may be conducted using two approaches. The

"environmental related legal framework" is a legal approach for the protection and conservation of natural resources. This often-used approach relates to national Protected Area Systems (PASs), which are identified and designated for protection, due to their unique, endangered, or sensitive ecosystem status. The Myanmar Government (MOECAF) has registered such areas and started the process of establishing guidelines for natural resources management in these areas.

Another approach is to highlight ecological hotspots evaluated by land cover (e.g. forest area) and Key Biodiversity Areas (KBAs). KBAs represent the most important sites for biodiversity conservation worldwide.

II. Natural Disaster Risks
Another factor used to evaluate levels of environmental risk is natural disasters. Based on MYT-Plan research and consultation with line governments and stakeholders, the following four disasters were selected as most relevant to transport sector development: flood-prone areas, landslide-prone areas, earthquake-prone areas, and cyclone-prone areas.

III. Economically important areas

Myanmar has enjoyed high productivity in its agricultural sector. The following typical agricultural products are relevant to the transport sector: rice, beans (black and green gram, pigeon pea and soy bean), sugarcane and rubber.

(2) Methodology – Preparatory Work

The locations of the above-noted high priority areas are, in many cases, not readily identifiable, as determining probable locations of these important areas requires analysis of a number of related data. However, analysis for the MYT-Plan was successful in determining priority areas and their locations for the Master Plan. This analysis included assigning scores to thematic maps, according to level of constraint or potential, which ranged from 0 to 3 (level 3 representing the highest potential/constraint). These thematic maps were then integrated to develop scoring maps. The scoring maps' constraint level scores were calculated by aggregating scores from three areas, as shown in Table 3.3. Finally, scoring maps were developed and show results of the analysis and indicating classifications. This approach is presented in detail via two GIS maps (Figure 3.13). The first map illustrates six particular environmental issues containing risk from natural disasters. These issues are identified for each area on the map and include their potential severity. This second map indicates the social and economic costs required to develop transportation infrastructure in such areas.

Table 3.3 Parameters for Evaluating Constraint / Potential

Parameters	Type of Data and Data Sources
Environmental Sensitivity	
Protected area systems	Location of designated protected area, wildlife sanctuary, etc. (MOECAF)
Reserved or public reserved forest	Location of designated reserved and public reserved forest (MOECAF)
Land cover	Land cover map (FAO)
Biodiversity	Key biodiversity area map (MOECAF)
Natural Disaster Risks	
Flood	Monsoon season flooding occurrence between 200 and 2010 (MIMU)
Landslide Slope Rainfall Soil condition Active Fault	 SRTM （Shuttle Radar Topography Mission), NASA/JPL, DLR, ASI Annual and seasonal rainfall in methodological stations (FAO) Multi-Hazard Risk Assessment (MHRA) and Nargi-affected areas, Hazard risk and Vulnerability Assessment Report (UNDP) Distance for active faults, Multi-Hazard Risk Assessment(MHRA) and Nargi-affected areas, Hazard risk and Vulnerability Assessment Report (UNDP)
Earthquake	Seismic zone map of Myanmar (Tint Lwin Swe)
Cyclone	Cyclone Intensity between 1975 and 2007 (MIMU)
Economically important areas	
Agricultural Production Rice Beans Sugarcane Rubber	 Annual Agricultural Production at district levels

Source: JICA Study Team

The second map indicates overall levels of constraint against transport sector development that exists in different parts of the country. Although this map does not indicate why a particular area indicates a high (or low) constraint level, it can be useful as a first screening of potential projects to determine the degree to which the project site is prone to environmental considerations.

This Report uses these two maps to shape environmental conservation analysis and develop recommendations for the transportation Master Plan. The thematic maps and associated scoring / rankings are listed in Table 3.4.

Table 3.4 List of Maps Developed

Thematic Maps		Scoring / Ranking Map	
Protected area systems	Environmental related legal framework	Natural Resources Constraint	Natural resources and disaster constraint (Consolidated suitability)
Reserved or public reserved forest			
Land cover	Ecological hotspots		
Biodiversity			
Flood		Disaster Prone	
Landslide 1)			
Earthquake			
Cyclone			
Rice			Agricultural production potential
Beans			
Sugarcane			
Rubber			

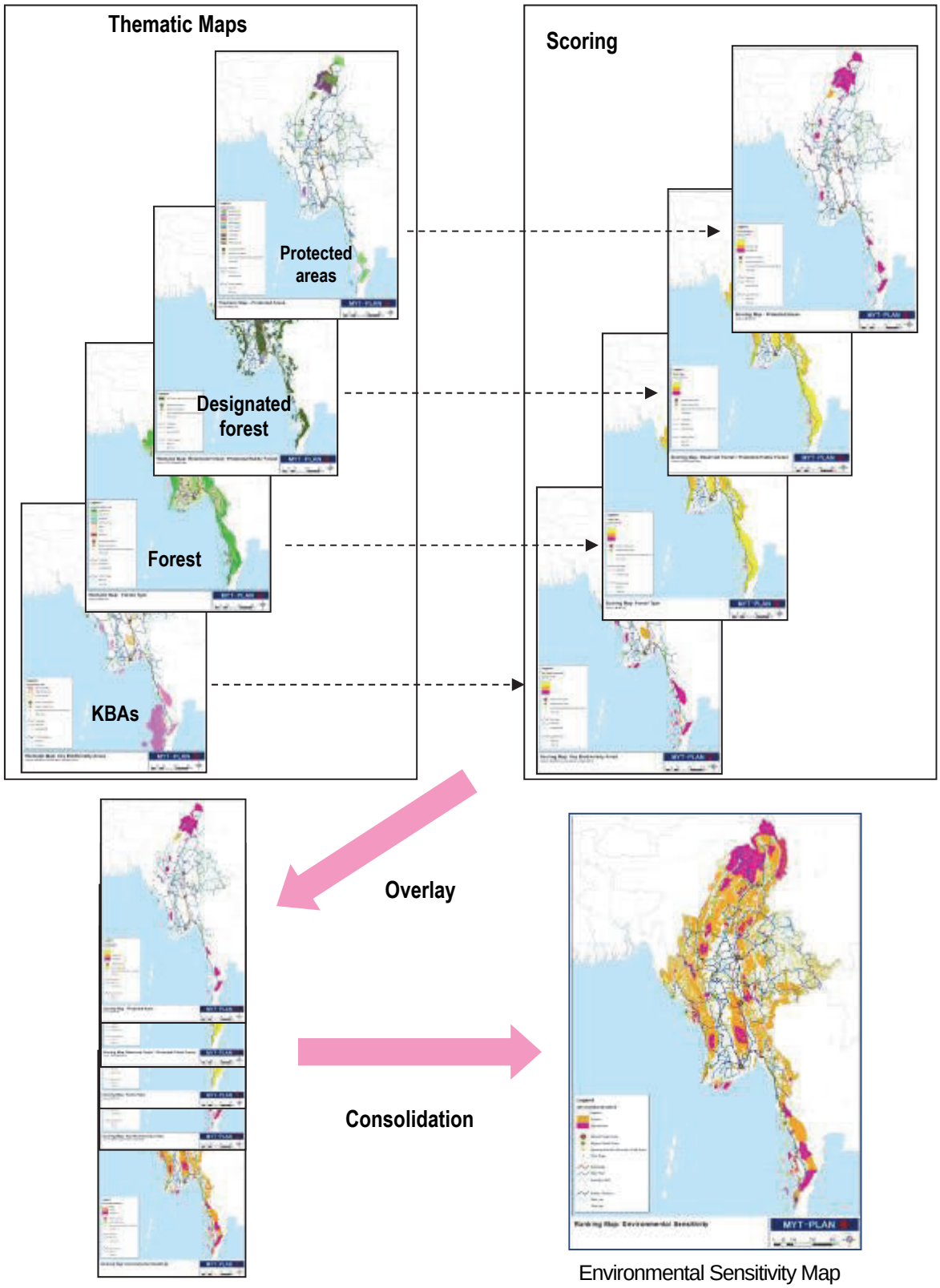
Notes: 1) developed by combining slope, rainfall, soil condition and active faults.
Source: JICA Study Team

Finally, the following ranking maps were also integrated.

Table 3.5 Types of Ranking Map and their Classifications

Types of Ranking Map		Classifications		
1	Environmental sensitivity	Available	Sensitive	Very Sensitive
2	Risk on natural disaster	Low	Medium	High
3	Consolidated sustainability	Suitable	Marginally Suitable	Unsuitable
4	Agricultural production potential	Low	Medium	High

Source: JICA Study Team



Source: JICA Study Team

Figure 3.13 Approach for GIS Mapping (Example of Environmental Sensitivity)

The MYT-Plan uses a Strategic Environmental Assessment (SEA) and the following scoring and ranking methods (A: Environmental Sensitivity Analysis, B: Risk Analysis of Natural Disasters, C: Consolidated Sustainability Analysis, and D: Suitable Agriculture) to inform the environmental analysis.

A Environmental Sensitivity Analysis

A-1 Environment-related legal framework)

Environmental Features	Level of Constraint				Weight	Remarks
	0 (low)	1	2	3 (high)		
a. protected areas	no		yes (proposed site)	yes (existing site)	2	Different weight was assigned PAs that are protected by law and those that are not
b. reserved forest or protected public forest	no		yes		2	

A-2 Ecological hotspots

Environmental Features	Level of Constraint				Weight	Remarks
	0 (low)	1	2	3 (high)		
a. forest type	others	open- and closed-canopy [2] forests		mangrove forest	1	Apply to Mon and Thanintharyi state
	others	open-canopy forest	closed-canopy forest	mangrove forest	1	Apply to other region
b. biodiversity	others	low priority areas	medium priority areas	high priority areas	1	

Environmental Sensitivity Total Score = (A-1) x 2 + (A-2)

Total Score	0-3	4-6	7-12 + PAs
Constraint Level	1 (Available)	2 (Sensitive)	3 (Very sensitive))

B Risk Analysis of Natural Disasters

B-1 Flood-prone

Environmental Features	Level of Constraint				Weight	Remarks
	0 (low)	1	2	3 (high)		
Monsoon season flooding recurrence between 2000-2010	Others		At least 10 days of flooding during monsoon season	At least 100 days of flooding during monsoon season	1	

[2] Closed-canopy forests include large area of rubber plantation and hence were given the same level of constraints as open-canopy forests in Mon state and Thanintharyi state.

B-2 Landslide

Environmental Features	Level of Constraint				Weight	Remarks
	0 (low)	1	2	3 (high)		
a. slope (degrees)	X<30	30≦X<45	45≦X<50	60≦X	1.0	Steepest slope in a 90m by 90m area is shown in a 10km by 10km area
b. total rainfall during peak season (Jun-Aug; mm)	X<500	500≦ X<1,500	1,500≦X<2,500	2,500≦X	0.7	
c. geology	hard rock; hard and soft rock	soft rock	alluvial land		1.0	
d. distance from active faults	others	X<50km			1.0	

B-3 Earthquake

Environmental Features	Level of Constraint				Weight	Remarks
	0 (low)	1	2	3 (high)		
a. seismic zones[3]	I (minor damage)	II, III (moderate to high damage)	IV (severe damage)	V (very severe damage)	1.0	

B-4 Cyclone

Environmental Features	Level of Constraint				Weight	Remarks
	0 (low)	1	2	3 (high)		
a. intensity of past cyclones in each area[4]	others	Category 1	Category 2-3	Category 4	1.0	

Risk on Natural Disaster Total Score = (B-1) +(B-2) x (3/9) + (B-3) + (B-4)

Total Score	0-4	5-7	7-12
Constraint Level	1 (Low)	2 (Medium)	3 (High)

[3] Zone I (minor damage) : MMI VIII, pga 0.2-0.3g; Zone II and III (moderate to high damage); MMI V-VII, pga 0.075-0.2g; Zone IV (severe damage): MMI VIII, pga 0.2-0.3g; Zone V (very severe damage): MMI IX, pga 0.3g-

[4] Classification based on MIMU and UNEP

C Consolidated Sustainability Analysis

Consolidated Sustainability

Total Score* = A** + B
*: double score in the PAs (3 to 6)
**: If score of environment-related legal framework is "0", the level is set as "1 (Sustainable)".

Total Score	1-2	3-5	6-9
Constraint Level	1 (Suitable)	2 (Marginally suitable)	3 (unsuitable)

D Suitable Agriculture

D. Areas with high agricultural productivity

Environmental Features[5]	Level of Productivity				Weight	Remarks
	0 (low)	1	2	3 (high)		
a. Rice production (1,000t)	others		1,000≦X<2,000	2,000≦X	1.0	
b. Bean production (1,000t)	others	90≦X<170	170≦X		1.0	Black gram, Green gram, Pigeon pea, Soy bean
c. Sugarcane production (1,000t)	others	300≦X<600	600≦X		1.0	
d. Rubber production (1,000t)	others	1.7≦X<3.5	3.5≦X		1.0	

(Suitable agricultural areas) Total Score = a. + b. + c. + d.

Total Score	0-1	2-3	4
Constraint Level	1	2	3

[5] Source: FAO Digital Atlas

3.4.3 Results of Spatial Analysis and Development Concept

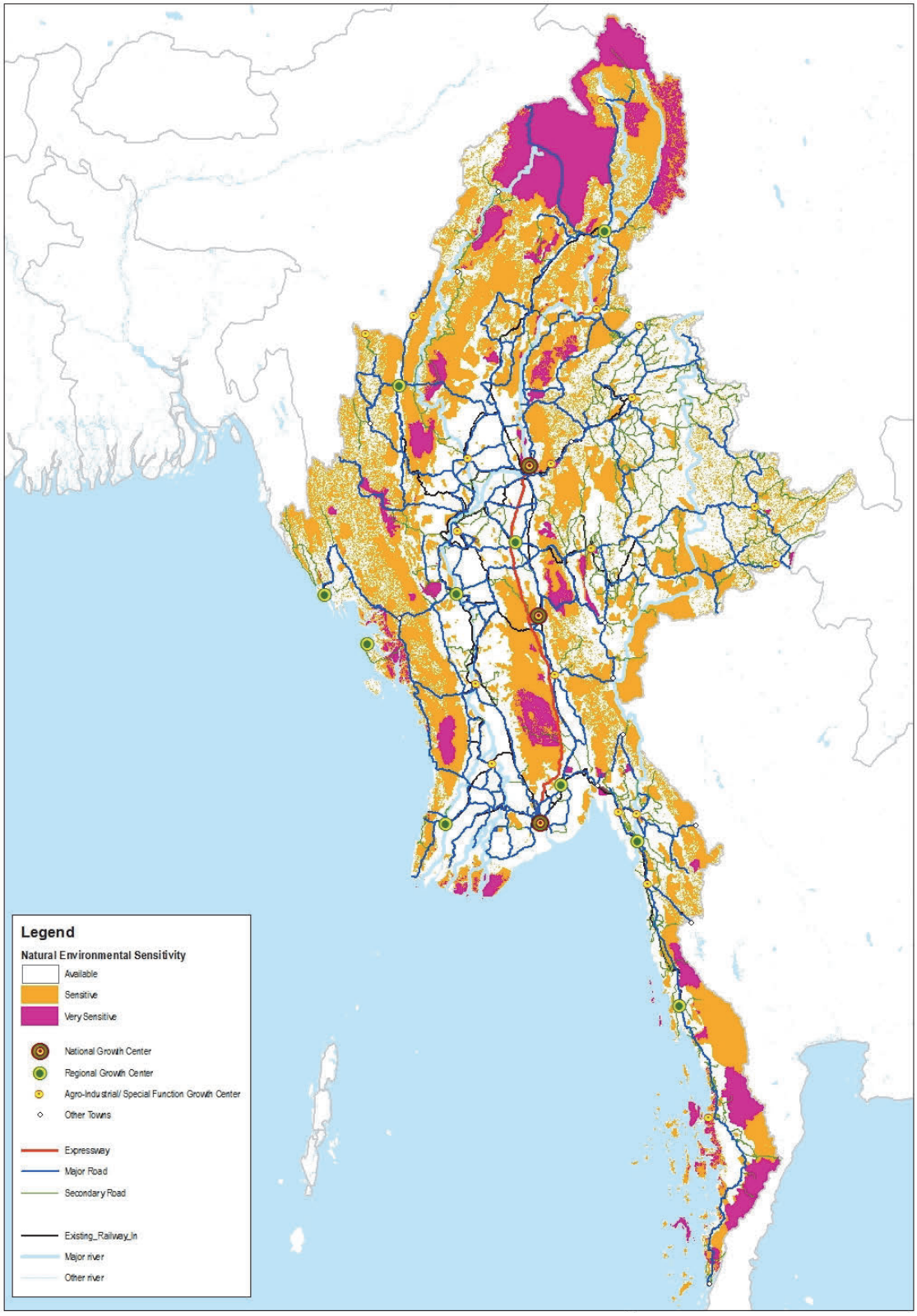
(1) Environmental Sensitivity Analysis

The MYT-Plan conducted environmental sensitivity analysis on Myanmar's natural resources, as shown in Figure 3.14. The study area was categorized into three zones of sensitivity (Not Sensitive, Sensitive and Very Sensitive). For each sensitivity zone, Table 3.6 indicates the relevant environmental sensitivity, in terms of transportation sector.

Table 3.6 Transportation Development and Environmental Sensitivity

	Not Sensitive	Sensitive	Very Sensitive
Percentage of sensitive land in Myanmar (%)	50.0	38.8	11.2
Description of the Area	Those areas where the environmental sensitivity is determined low or nominal	Those areas where the environmental sensitivity is determined significant, but not high Includes high priority KBAs (e.g. closed canopy forest)	Those areas where the environmental sensitivity is determined to be very high
Analysis	Fewer restrictions needed for project planning. Activities that are likely to degrade natural resources will require impact mitigation measures	These areas will require impact mitigation measures. These areas shall be also given special attention for environmental sensitivity	These areas will require special attention under legal instruments that ensure strict conservation. Projects should be avoided in these areas. New projects should be prohibited Only rehabilitation / improvement of existing infrastructure are acceptable. Special measures must be taken not to degrade natural environmental conditions Designated protected areas are required
Examples of acceptable or unacceptable types of projects, and consideration points	Any project but efforts included to minimize adverse impacts.	Large-scale development projects that occupy large areas shall be avoided as much as possible. The location with least environmental impacts must be selected. Alternatives, which can minimize adverse impacts, shall be examined. Project must include specific environmental management strategies including natural resources restoration plan (e.g. re-forestation)	Rehabilitation of existing roads / railways Necessary roads for implementation of nature conservation activities Community access roads for persons who reside in the area Projects should not trigger a development which will likely change land use along the corridor (e.g. commercial / town development, railway station, logistics center) Projects occupying large areas are not acceptable.

Source: JICA Study Team



Source: JICA Study Team

Figure 3.14 Environmental Sensitivity Analysis

(2) Risk Analysis for Natural Disasters

The MYT-Plan risk analysis of natural disasters, as shown in Figure 3.14, was categorized into three risk zones (Low, Medium, High), each describing the planned zoning and environmental sensitivity in terms of transportation development, as explained in Table 3.7. The analysis of zoning impact on natural resources is shown in Figure 3.15. As with the environmental sensitivity analysis, the study area was categorized into three zones.

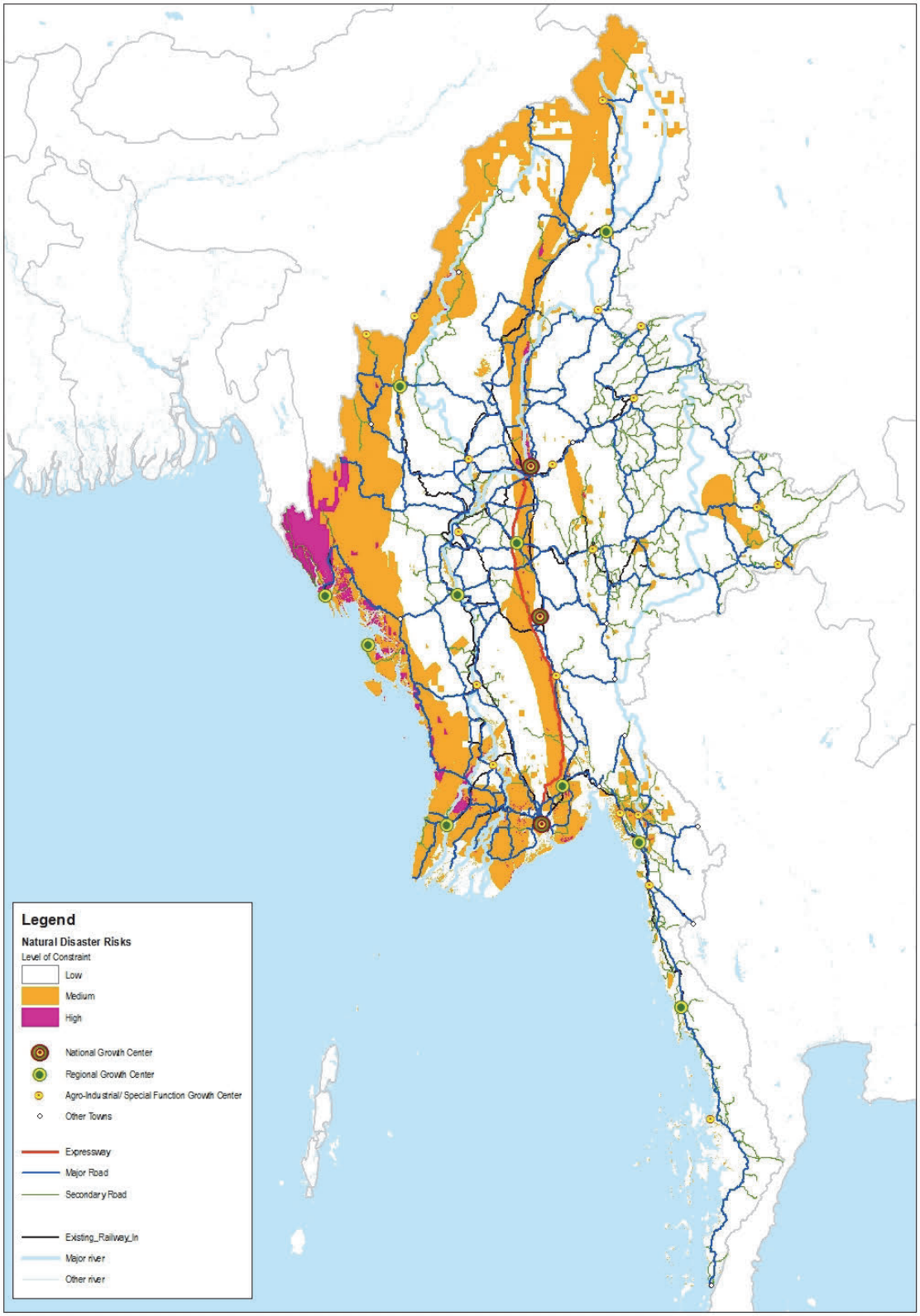
It is noteworthy that projects should be designed to not only mitigate against natural disasters but also to avoid accelerating damage to the natural environment, thereby reducing the chances of triggering disasters. For example, large-scale land clearance in sloped areas can precipitate landslides, and river dredging or reclamation can change river flow patterns, leading to floods as well as erosion and sedimentation.

Table 3.7 illustrates the various zoning areas and possible impacts from natural disasters prevention in the transportation development policy are explained in Table 3.7.

Table 3.7 Transportation Development and Risk of Natural Disasters

	Low	Medium	High
Percentage of disaster prone land in Myanmar (%)	70.5	27.3	2.2
Description of Area	Those areas that are likely exposed by no more than one natural disaster annually Additionally, small but disaster-prone areas are included (e.g. flood prone areas along upper Ayeyarwaddy River, regional landslide areas in Mon, Kayin State).	Those areas in high seismic zones and/or cyclone zones Areas experiencing more than one natural disaster annually	Those areas including western coastal area, which are suffering from high risk of cyclones and earthquakes Some small areas in southern delta area show risk of floods and cyclones. Cyclones can worsen damage caused by flooding
Analysis	Fewer restrictions needed for project planning.	These areas will require proper mitigation measures In addition, environmental improvement / restoration plans are recommend to be included in project (e.g. reforestation to reduce chances of landslides)	These areas have a risk of significant damage from multiple disasters Project planning and design will include measures to mitigate damage to surroundings, to reduce chances of natural disaster
Examples of acceptable or unacceptable types of project, and consideration points	Any project but efforts included to mitigate damage from disasters	These projects will include reasonable efforts to mitigate damage from disasters	The projects will include significant disaster mitigation measures (e.g. dyke road, station / logistics center used for shelter in case of disaster).

Source: JICA Study Team



Source: JICA Study Team

Figure 3.15 Risk Analysis of Natural Disasters

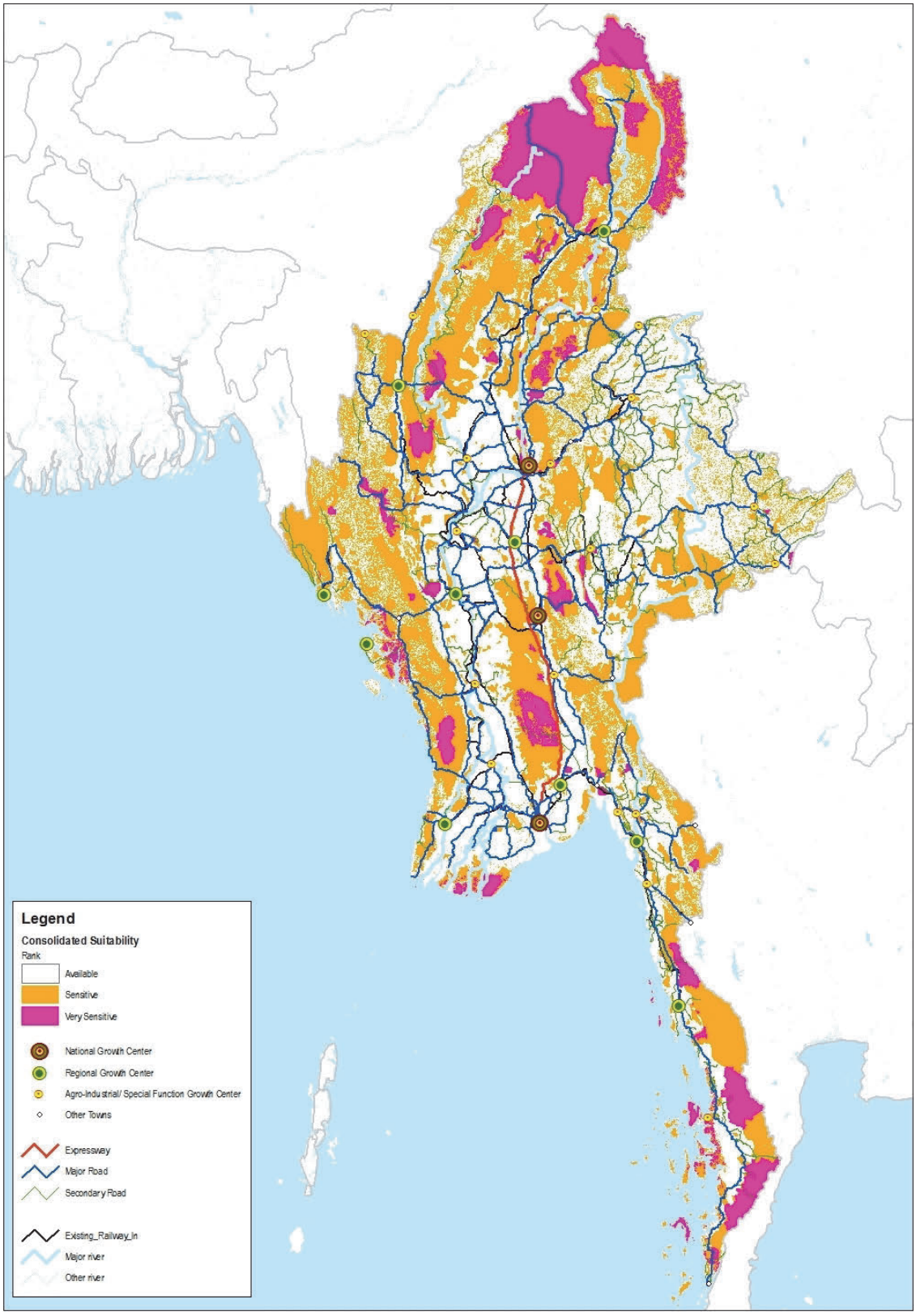
(3) Consolidated Suitability Analysis

The MYT-Plan analysis consolidated the environmental sensitivity with the disaster analysis, resulting in the findings presented in Table 3.8.

Table 3.8 Transportation Development and Consolidated Environmental Sustainability

	Suitable	Usable, subject to local conditions	Unsuitable
Percentage of disaster prone land in Myanmar (%)	48.8	40.0	11.1
Description of Area		These areas' environmental value is moderate, consisting of forest, low / medium KBAs, etc. However, these areas are prone to risks from natural disasters	These areas are predominantly highly sensitive environmental zone
Concept	Fewer restrictions needed for project planning Any impacts which likely degrade natural resources shall be mitigated Adequate disaster prevention plans will be required	These areas will require proper mitigation measures given conservation concerns Disaster prevention measures will be developed for projects	These areas should not be available for project development. Disaster prone physical structures will be strictly prohibited Changing environmental features (thereby increasing chances of disaster damage) is likewise prohibited
Examples of acceptable or unacceptable project types and consideration points	Any project but efforts included to mitigate damage to the environment and activities that exacerbate damage from natural disasters	These projects will not include large-scale development that encompasses a large area, in order to conserve natural resources Project must provide for specific environmental management, including a natural resources restoration plan (e.g. reforestation) is indicated Location with the least likelihood of negative environmental impacts must be selected	Rehabilitation of existing roads / railways Necessary roads for implementation of nature conservation activities Community access roads for persons who reside in the area Projects should not trigger a development which will likely change land use along the corridor (e.g. commercial / town development, railway station, logistics center) Projects occupying large areas are not acceptable. Necessary roads for implementation of natural conservation activity. Projects designed for disaster prevention are acceptable

Source: JICA Study Team



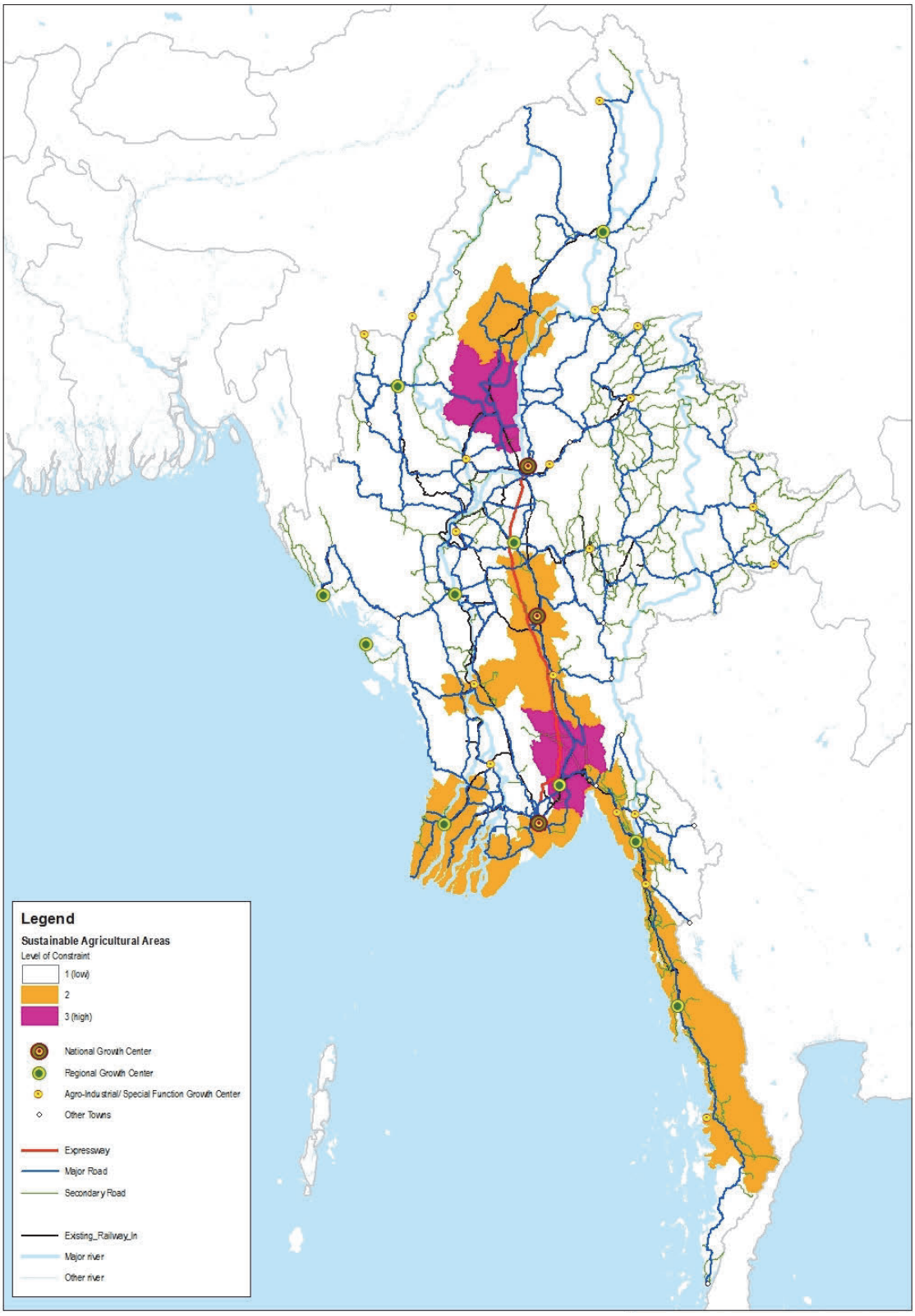
Source: JICA Study Team

Figure 3.16 Consolidated Suitability Analysis

(4) Economic Potential (Agricultural Production)

The MYT-Plan analysis includes agricultural production and findings are described in Figure 3.17. Those areas that have high agricultural productivity may require transportation infrastructure improvements. Figure 3.17 also highlights three areas that have higher potential for agricultural production, including:

- The Southern delta along the Ayeyawaddy River, which is rich in rice production; rice is one of the most important export crops for Myanmar's economy
- The central dry area where various agricultural products are cultivated; beans are a major export from this area, rice is also harvested
- The South-eastern area with its small but lucrative production of rubber; it is mostly produced in Mon State, Kayin State and Tanintharyi Region



Source: JICA Study Team

Figure 3.17 Economic Potential (Agricultural Production)

3.5 Rapid Environmental Evaluation of the proposed projects

3.5.1 Method of Evaluation

The MYT-Plan analysis conducted a rapid evaluation of the environmental and disaster factors for probable projects; the approach taken is described below.

(1) Key Environmental Factors

The key environmental factors that are most likely to cause negative environmental impacts are identified and described below:

A. Pollution

(1) Air pollution and noise disturbance

(2) Water quality

(3) Waste

B. Natural Environment

(4) Ecosystem: including legal systems for the designation of protected areas, forest, KBAs, etc. The ecosystem impact may be evaluated by environmental sensitivity analysis.

(5) Disaster: evaluated through risk analysis of natural disasters, geographic, topographic, and hydrological figures.

Impacts on the natural environment (ecosystem and disaster) were spatially evaluated, based on the environmental suitability analysis (see section 3.4.3).

C. Social Environment

(6) Land acquisition and resettlement

(7) Local issues, including local economy, community conflict, etc.

(8) Rights, including access rights to water, children, women, disabilities, etc.

(2) Scoring Method

The above-noted impacts were evaluated using the following three evaluation factors, namely "magnitude", "duration" and "extent".

Table 3.9 Evaluation Factors

Evaluation Factors	Score			
	0	1	2	3
Magnitude	No or less	Small	Medium	Significant
Duration	-	During construction activities only	Several years	Long
Extent	-	At the construction site only	Local	Wide

(3) Scoring and Overall Evaluation

An overall score is calculated using the eight environmental factors (above) in the following formula:

Overall Score = (1) + (2) + (3) + (4) x 2 + (5) + (6) x 2 + (7) + (8)

It should be noted that values of "(4) ecosystem" and "(6) land acquisition and resettlement" are doubled. These factors are considered more important (via the SEA stakeholder meeting) as they carry more risk of objection and greater potential for project delays.

Finally, the overall evaluation for each proposed project is rated below:

Table 3.10 Classifications on Evaluation Results

Classification	Overall Score
Significant	Total score >= 50
Moderate	49 >= Total score >= 42
Rare	41 >= Total score, but not 0
No impact	Total score = 0

(4) Summary of Rapid Evaluation

The results of the rapid environmental evaluation for proposed projects are summarized in Table 3.11.

Table 3.11 Rapid Environmental Evaluation for the Proposed Projects

Sector	Corridor	Project ID	Location	Project Description	Environmental Impact Evaluation									
					Pollution			Natural Environment		Social Environment			Total Score	Overall
					(1) Air Quality / Noise Disturbance	(2) Water Quality	(3) Waste	(4) Ecosystems	(5) Disaster	(6) Land Acquisition / Resettlement	(7) Local Issues	(8) Rights		
Aviation	A1,B1,H1,K1	A001	Yangon International Airport	Improvement	5	5	5	5	5	6	3	2	47	Moderate
	A1,B1	A002	Hanthawaddy International Airport	Improvement	5	5	5	5	5	6	3	2	47	Moderate
	A2,A3,C1,D1, K2	A003	Mandalay International Airport	Improvement	5	5	5	5	5	6	3	2	47	Moderate
	E1,L2	A004	Heho International Airport	Improvement	5	5	5	5	5	6	3	2	47	Moderate
	K2,D1	A005	Nyaung U International Airport (Alt. Pakokku)	Improvement	5 (5)	5 (5)	5 (5)	5 (5)	5 (5)	6 (6)	4 (3)	2 (2)	48 (47)	Moderate (Moderate)
	Other	A006	Thandwe International Airport	Improvement	5	5	5	5	5	6	3	2	47	Moderate
	E1	A007	Tachileik Airport	Improvement	5	4	4	4	5	5	3	2	41	Rare
	A3	A008	Myitkyina Airport	Improvement	5	4	4	4	5	5	3	2	41	Rare
	E1	A009	Sittwe Airport	Improvement	5	4	4	4	6	5	3	2	42	Moderate
	B2,J2,J3	A010	Dawei Airport (International)	Improvement	5	4	4	4	5	5	3	2	41	Rare
	J2,J3	A011	Myeik Airport	Improvement	5	4	4	4	5	5	3	2	41	Rare
	J3	A012	Kawthoung Airport	Improvement	5	4	4	4	5	5	3	2	41	Rare
	Other	A013	Putao Airport	Improvement	5	4	4	4	5	5	3	2	41	Rare
	E1	A014	Ann Airport	Improvement	5	4	4	4	6	5	3	2	42	Moderate
	E1	A015	Kyaukphyu Ariport	Improvement	5	4	4	4	6	5	3	2	42	Moderate
	C1	A016	Lashio Airport	Improvement	5	4	4	4	6	5	3	2	42	Moderate
	E1	A017	Kengtung Airport	Improvement	5	4	4	4	5	5	3	2	41	Rare
	A3	A018	Bhamo Airport	Improvement	5	4	4	4	5	5	4	2	42	Moderate
	L1,L2	A019	Loikaw Airport	Improvement	5	4	4	4	5	5	4	2	42	Moderate
	D1	A020	Monywar Airport	Improvement	5	4	4	4	5	5	4	2	42	Moderate
	B1,B2,J1	A021	Mawlamyine Airport	Improvement	5	4	4	4	5	5	4	2	42	Moderate
	D1	A022	Kalay Airport	Improvement	5	4	4	4	5	5	4	2	42	Moderate
	J3	A023	Bokpyinn Airport	Improvement	5	4	4	4	5	5	4	2	42	Moderate

Sector	Corridor	Project ID	Location	Project Description	Environmental Impact Evaluation									
					Pollution			Natural Environment		Social Environment			Total Score	Overall
					(1) Air Quality / Noise Disturbance	(2) Water Quality	(3) Waste	(4) Ecosystems	(5) Disaster	(6) Land Acquisition / Resettlement	(7) Local Issues	(8) Rights		
	E1	A024	Mong-Hsat Airport	Improvement	5	4	4	4	5	5	4	2	42	Moderate
	D1	A025	Hommalin Airport	Improvement	5	4	4	4	5	5	4	2	42	Moderate
	D1	A026	Kanti Airport	Improvement	5	4	4	4	5	5	4	2	42	Moderate
	H1	A027	Pathein Airport	Improvement	5	4	4	4	5	5	4	2	42	Moderate
	E1,G2,K1,K2	A028	Magway Airport	Improvement	5	4	4	4	5	5	3	2	41	Rare
	K1,K2,D1	A029	Kyauktu Airport	Improvement	5	4	4	4	5	5	3	2	41	Rare
	Other	A030	Coco Island Airport	Improvement	5	4	4	4	5	5	3	2	41	Rare
	Other	A031	Soft Component	Technical assistance	0	0	0	0	0	0	0	0	0	No impact
	Other	A032	Soft Component	Technical assistance	0	0	0	0	0	0	0	0	0	No impact
Road	B1	R001	Thaton – Eindu – Kawkareik – Myawaddy Road	Improvement	4	4	3	6	5	6	3	2	45	Moderate
	J1	R002	Three Pagoda Pass	Improvement	4	4	3	6	5	6	3	2	45	Moderate
	B2,J3	R003	Thanbyuzayat – Dawei – Myeik – Kawthonng Road	Improvement	4	4	3	5	5	6	3	2	43	Moderate
	E1	R004	Taunggyi – Loilim – Kyaington Road	Improvement	4	4	3	5	6	6	3	2	44	Moderate
	E1	R005	Kyaington – Mongla Road	Improvement	4	4	3	5	5	6	3	2	43	Moderate
	D1	R006	Monywa - Pale - Gangaw – Kalaymyo Road	Improvement	4	4	3	5	5	6	3	2	43	Moderate
	A3	R007	Shwebo – Myitkyina Road	Improvement	4	4	3	5	6	6	3	2	44	Moderate
	E1	R008	Minbu – Ann – Kyauktaw – Sittwe Road	Improvement	4	4	3	5	6	6	3	2	44	Moderate
	A1, A2	R009a	Bago – Mandalay Road	Improvement, widening	4	4	4	5	6	8	4	2	50	Significant
	A1, A2	R009b	Yangon - Bago Road	Improvement, widening	4	4	4	5	6	8	4	2	50	Significant
	K1	R010	Yangon – Pyay - Mandalay Road	Improvement, widening	4	4	4	6	5	8	4	2	51	Significant
	D1,K1,H1	R011	Monywa – Pathein Road	Improvement	4	4	3	5	5	6	3	2	43	Moderate
	C1	R012	Mandalay – Lashio – Muse Road	Improvement	4	4	3	5	5	6	4	2	44	Moderate

Sector	Corridor	Project ID	Location	Project Description	Environmental Impact Evaluation									Overall
					Pollution			Natural Environment		Social Environment			Total Score	
					(1) Air Quality / Noise Disturbance	(2) Water Quality	(3) Waste	(4) Ecosystems	(5) Disaster	(6) Land Acquisition / Resettlement	(7) Local Issues	(8) Rights		
	A3	R013	Mandalay – Thabeikkyin – Tagaung – Bhamo Road	Improvement	4	4	3	6	6	6	4	2	47	Moderate
	L2	R014	Thibaw – Loilem Road	Improvement	4	4	3	6	6	6	3	2	46	Moderate
	J2	R015	Dawei – Phunamron Road	Improvement	4	4	3	5	6	6	3	2	44	Moderate
	B1,B2	R016	Payagyi – Mawlamyaine - Thanbuzayat Road	Improvement	4	4	3	5	5	6	3	2	43	Moderate
	D1	R017	Monywa – Yargyi – Kalewa Road	Improvement, widening	4	4	4	5	5	8	4	2	49	Moderate
	H1	R018	Yangon – Pathein Road	Improvement	4	4	3	5	6	6	3	2	44	Moderate
	L1	R019	Taunggyi – Loikaw – Hpapun – Pha an Road	Improvement	4	4	3	5	5	6	4	2	44	Moderate
	J3	R020	Tanintharyi – Mawtaung Road	Improvement	4	4	3	7	5	6	4	2	48	Moderate
	B1	R021	Gyaing (Kawkareik) Bridge	Improvement	4	5	4	5	5	6	3	2	45	Moderate
	Urban	R022	New Thaketa Bridge	Improvement	4	5	4	5	6	6	3	2	46	Moderate
	Urban	R023	Bago Bridge	Improvement	4	5	4	5	5	6	3	2	45	Moderate
	B1	R024	Don Tha Mi and Naung Lon Bridge	Replacement	4	5	4	5	5	7	3	2	47	Moderate
	B1	R025	Gyaing (Zarthapyin) Bridge	Replacement	4	5	4	5	5	6	3	2	45	Moderate
	B2	R026	Atran Bridge	Replacement	4	5	4	5	5	6	3	2	45	Moderate
	A2	R027	2 bridges on Yangon-Mandalay Road	Replacement	4	5	4	5	5	6	3	2	45	Moderate
	H2	R028	Hinthata Bridge	Replacement	4	5	4	5	5	6	3	2	45	Moderate
	D1	R029	Yaw Chaung (Yepyar) Bridge	Replacement	4	5	4	5	5	6	3	2	45	Moderate
	D1	R030	Yaw Chaung (Ohn Taw) Bridge	Replacement	4	5	4	5	5	6	3	2	45	Moderate
	Urban	R031	Dala Bridge	Replacement	4	5	4	5	5	6	3	2	45	Moderate
	H1	R032	Hlaing River Bridge	Replacement	4	5	4	5	5	6	3	2	45	Moderate
	C1	R033	New Goat twin Viaduct	Replacement	4	5	4	5	5	6	3	2	45	Moderate
	J3	R034	Tha Mouk Bridge	Replacement	4	5	4	5	5	6	3	2	45	Moderate
	Urban	R035	Wataya Bridge	Replacement	4	5	4	5	5	6	3	2	45	Moderate
	D1	R036	Chindwin (Kalaywa) Bridge	Replacement	4	5	4	5	5	6	3	2	45	Moderate

Sector	Corridor	Project ID	Location	Project Description	Environmental Impact Evaluation									
					Pollution			Natural Environment		Social Environment			Total Score	Overall
					(1) Air Quality / Noise Disturbance	(2) Water Quality	(3) Waste	(4) Ecosystems	(5) Disaster	(6) Land Acquisition / Resettlement	(7) Local Issues	(8) Rights		
	H1	R037	Thetkal Thoung Bridge	Replacement	4	5	4	5	5	6	3	2	45	Moderate
	B2	R038	Thanlwin (Chaungsone) Bridge	Replacement	4	5	4	5	5	6	3	2	45	Moderate
	B1	R039	Chaungnitkwa Bridge	Replacement	4	5	4	5	5	6	3	2	45	Moderate
	Urban	R040	Thanlwin (Tarsotpha) Bridge	Replacement	4	5	4	5	5	6	3	2	45	Moderate
	A1	R041	Yangon - Mandalay Expressway	Improvement	4	4	3	5	6	6	3	2	44	Moderate
	B1	R042	Yangon City - Thilawa Port Expressway	Improvement, widening	4	4	4	5	5	6	3	2	44	Moderate
	B1	R043	Yangon City - Hanthawaddy - Existing Expressway	New construction	4	4	4	5	5	7	3	2	46	Moderate
	A2,A3	R044	Mandalay Circular Expressway	Improvement	4	4	4	5	6	7	4	2	48	Moderate
	Other	R045	Road to Sittwe Port	New construction	4	4	4	5	6	6	3	2	45	Moderate
	G2	R048	Loikaw - Magway Road	Improvement	4	4	4	7	6	5	4	2	48	Moderate
	G1	R049	Hapasawing - Pyay Road	Improvement	4	4	4	7	6	5	4	2	48	Moderate
Railway	A1, A2	RW001	Yangon - Mandalay	Improvement	4	4	5	4	6	5	3	2	42	Moderate
	A3	RW002	Myohaung-Myitkyina	Improvement	4	4	5	5	6	6	3	2	46	Moderate
	B1	RW003	Bago-Mawlamyine	Improvement	4	4	5	4	5	6	3	2	43	Moderate
	K1	RW004	Yangon-Pyay	Improvement	4	4	5	4	6	6	3	2	44	Moderate
	H1	RW005 a	Yangon-Pathein	Improvement	4	4	5	4	6	6	3	2	44	Moderate
	H1	RW005 b	Bridge	New Construction	4	5	5	5	6	7	3	2	49	Moderate
	D1	RW006	Myohaung-Monywa	Improvement	4	4	5	5	6	6	3	2	46	Moderate
	E1	RW007	Pyawbwe-Shwenyaung	Improvement	4	4	5	5	6	6	3	2	46	Moderate
	A1	RW008	Bago-Hanthawaddy	New construction, extension	5	5	5	5	6	8	4	2	53	Significant
	A1	RW009	Yangon - Hanthawaddy	New construction, extension	4	4	5	5	6	8	4	2	51	Significant

Sector	Corridor	Project ID	Location	Project Description	Environmental Impact Evaluation									
					Pollution			Natural Environment		Social Environment			Total Score	Overall
					(1) Air Quality / Noise Disturbance	(2) Water Quality	(3) Waste	(4) Ecosystems	(5) Disaster	(6) Land Acquisition / Resettlement	(7) Local Issues	(8) Rights		
	Other	RW010	Togyaung-Thilawa	Improvement	4	4	5	5	6	7	4	2	49	Moderate
	Other	RW011	Naypyitaw - Bagan	Improvement	4	4	5	5	6	6	4	2	47	Moderate
	A1	RW013	Yangon MR ICD	New construction	5	5	6	4	5	8	4	2	51	Significant
	A3	RW014	Mandalay MR ICD	New construction	5	5	6	4	4	8	4	2	50	Significant
Sea Port	A1,B1,H1,K1	PT001	Yangon Port (Thilawa)	Improvement	4	5	4	6	6	5	4	2	47	Moderate
	A1,B1,H1,K1	PT002	Yangon Port (Post Thilawa)	Improvement	4	5	4	6	6	5	4	2	47	Moderate
	A1,B1,H1,K1	PT003	Yangon Port (Post Thilawa)	Improvement	4	5	4	6	6	5	4	2	47	Moderate
	A1,B1,H1,K1	PT004	Offshore Yangon River (Deep Seaport)	New construction	4	6	4	6	6	6	4	2	50	Significant
	A1,B1,H1,K1	PT005	Offshore Yangon River (Deep Seaport)	New construction	4	6	4	6	6	6	4	2	50	Significant
	B2, J2, J3	PT006	Dawai Port	Port construction	5	6	6	6	5	7	4	3	55	Significant
	E1	PT011	Sittwe Port	Improvement	4	4	4	6	5	5	4	2	45	Moderate
	Other	PT013	Yangon Port Channel	Navigation safety instrument	2	2	3	4	5	2	5	2	31	Rare
	Other	PT014	Navigation	River mouth improvement	2	2	3	4	5	2	5	2	31	Rare
	Other	PT015	Law & Regulation	Technical assistance	0	0	0	0	0	0	0	0	0	No impact
	Other	PT016	Soft Component	Technical assistance	0	0	0	0	0	0	0	0	0	No impact
	Other	PT017	Yangon-Thilawa Port	Technical assistance	0	0	0	0	0	0	0	0	0	No impact
IWT	F1,F2	IW001	Mandalay Port	Improvement	4	4	5	6	6	6	4	2	49	Moderate
	F1	IW002	Yangon Port	Improvement	4	4	5	6	6	7	4	2	51	Significant
	F1	IW003	Bhamo Port	Improvement	4	4	4	7	6	6	4	2	50	Significant
	F1,F2	IW004	Pakkokku Port	Improvement	4	4	4	6	6	6	4	2	48	Moderate
	F1	IW005	Magway Port	Improvement	4	4	4	6	6	6	4	2	48	Moderate
	F2	IW006	Monywa Port	Improvement	4	4	4	6	6	6	4	2	48	Moderate

Sector	Corridor	Project ID	Location	Project Description	Environmental Impact Evaluation									
					Pollution			Natural Environment		Social Environment			Total Score	Overall
					(1) Air Quality / Noise Disturbance	(2) Water Quality	(3) Waste	(4) Ecosystems	(5) Disaster	(6) Land Acquisition / Resettlement	(7) Local Issues	(8) Rights		
	F2	IW007	Kalewa Port	Improvement	4	4	4	6	6	6	4	2	48	Moderate
	F1	IW009	Yangon - Mandalay	Navigation	3	5	4	6	6	3	4	2	42	Moderate
	F1	IW010	Mandalay - Bhamo	Navigation	3	5	4	7	6	3	4	2	44	Moderate
	F2	IW011	Monywa - Upstream	Navigation	3	5	4	6	6	3	4	2	42	Moderate
	F1	IW012	Ayeyarwady Delta	Navigation	3	5	4	6	6	3	4	2	42	Moderate
	F1	IW015	Yangon - Mandalay	Navigation	3	5	4	6	6	3	4	2	42	Moderate
	F1	IW016	Mandalay - Bhamo	Navigation	3	5	4	7	6	3	4	2	44	Moderate
	F2	IW017	Monywa - Upstream	Navigation	3	5	4	6	6	3	4	2	42	Moderate
	F1	IW018	Ayeyarwady Delta	Navigation	3	5	4	6	6	3	4	2	42	Moderate
	Urban	IW021	Dalla Shipyard	New construction	3	4	5	6	5	4	3	2	42	Moderate
	F1,F2	IW022	Mandalay Shipyard	Upgrading	3	4	5	6	5	4	3	2	42	Moderate
	F1	IW025	Ayeyarwady Delta	Navigation	3	5	4	6	6	3	4	2	42	Moderate
	Other	IW030	Service	Technical assistance	0	0	0	0	0	0	0	0	0	No impact
	Other	IW032	Soft Component	Technical assistance	0	0	0	0	0	0	0	0	0	No impact
	Other	IW033	Soft Component	Technical assistance	0	0	0	0	0	0	0	0	0	No impact
	Other	IW034	Soft Component	Technical assistance	0	0	0	0	0	0	0	0	0	No impact
	Other	IW035	Soft Component	Technical assistance	0	0	0	0	0	0	0	0	0	No impact
	Other	IW036	Soft Component	Technical assistance	0	0	0	0	0	0	0	0	0	No impact

Total Score = (1) + (2) + (3) + (4)x2 + (5) + (6)x2 + (7) + (8)
Significant Total Score = >50
Moderate Total Score = 42 to 49
Rare Total Score = 1 to 41
No impact Total Score = 0
Source: JICA Study Team

Chapter 4 National Spatial Planning Framework

4.1 Overview

4.1.1 Background

This Chapter provides an introduction to the National Spatial Development Framework (NSDF), its scope and an overview of those Government Ministries and Agencies involved in spatial planning and legislation related to spatial development. It also summarizes the key objectives and policies of relevant land development Ministries and Agencies in terms of employment and economic activity, such as agriculture and agro-industries, industry and Industrial Zones, Special Economic Zones and tourism.

The Chapter also outlines aspects of urbanization, using projected distributions of future population at the state/region and Traffic Analysis Zone (TAZ) levels, which led to the proposal for a National Spatial Development Framework (NSDF). The NSDF will develop a land development framework to support the Myanmar National Transport Development Plan (MYT-PLAN), which will guide future transport investment at the national and state/regional levels. The NSDF will also inform key transport sector stakeholders about linkages between their own plans, policies and programs so that they can implement them more efficiently.

4.1.2 Planning Horizon

(1) Timescale

The planning horizon for this study is the year 2030. This horizon is based on current tools like the "Existing Context 2012" and a "Committed Projects Map" covering the period 2012- 2015, which includes the current land use conditions plus known Government projects under construction or committed (i.e. with approval/funding in place). The NSDF Strategy Map has been prepared also with the time horizon of 2030, though the focus and intent of the strategy is more important than its particular time horizon, which could change from what is currently planned.

(2) Monitoring and Updating

The NSDF should be revisited every five years and adjusted and updated when relevant by the Ministry of Construction's (MOC) Department of Human Settlements and Housing Development (DHSHD), Ministry of Environmental Conservation and Forestry, Ministry of Agriculture and Irrigation and Ministry of Home Affairs in consultation with other key stakeholders, including state/regional governments and City Development Committees (CDCs). Population and other related socio-economic data should be monitored and updated periodically by the Central Statistical Organization (CSO) of the Ministry of National Planning and Economic Development (MNPED) and other relevant Agencies.

4.1.3 Purpose of the National Spatial Development Framework

The purpose of the NSDF is to bring together the key spatial policies and programs of the major transport sector stakeholder Ministries, Agencies and private sector organizations with an interest in strategic land development. In this way, it is expected that the national, state/regional and CDC stakeholders will be able to understand how departmental plans, policies and programs can work together and where there are gaps, allowing stakeholders to plan in more efficient and integrated ways for future implementation. To fulfill stakeholder expectations, the NSDF should be:

- Complementary with the Myanmar National Transport Development Plan
- Consistent with the DHSHD's Concentrated Decentralization Development Strategy and MNPED's National Comprehensive Development Plan (NCDP)
- Balanced in terms of enabling growth in urban and rural regions and states
- Focused on key growth centers to optimize investment funds and community benefits
- Multi-centric to improve access to a range of employment opportunities and social and community facilities
- To optimize utilization of land and natural resources for sustainable development and environmental conservation

In order to achieve these aims, the MYT-Plan developed the following key objectives for the preparation of the NSDF. The objectives are to:

- Complement the Myanmar National Transport Development Plan (MYT-Plan), DHSHD's Concentrated Decentralization Development Concept and MNPED's NCDP
- Identify strategic transport network/facility linkages between key cities/activity hubs
- Develop a hierarchy of centers and related economic, social and community facilities and services
- Provide a focus for future public and private sector urban development and related transport investments
- Assist Government Agencies and international donor agencies to formulate priority transport projects for investment and implementation

4.2 National Economic and Social Policy Framework

4.2.1 Framework for Economic and Social Reforms (FESR)

In June 2012, H.E. President U Thein Sein announced the second phase of the Government's Framework for Economic and Social Reform (FESR) strategy, setting a high economic growth rate target (in per capita GDP) by the end of the five year Plan. The President also announced four economic policies to guide the future economic and social development of the country:

- Development of agriculture and overall development
- Balanced and proportionate growth in regions and states
- Inclusive growth for the entire population

- Emergence of reliable statistics and improvement of statistical systems

The policies are framed to achieve macro-economic stability, quick-wins to 2015 for inclusive growth and sectoral and structural reforms for sustainability.

The NSDF and related Transport Vision 2030 must be consistent with the FESR and the four economic policies, as well as with other national and regional programs and plans, in particular, the National Comprehensive Development Plan (NCDP) being prepared by the Ministry of National Planning and Economic Development (MNPED). In relation to this strategic policy and plan framework, an inclusive and equitable growth vision was developed by Government to steer the future long-term development of the country, which is *"To become a modern developed nation that meets the aspirations of its people for a better life."*

4.2.2 National Comprehensive Development Plan 2011-2030 (NCDP)

The Ministry of National Planning and Economic Development (MNPED) is now drafting the National Comprehensive Development Plan (NCDP) for 2011-2030 to reflect the new Government's priorities and major reforms; the NCDP is scheduled for release in 2014. The NCDP includes people-centered development priorities derived from the Government's Framework for Social and Economic Reforms. It is being prepared with consultation at village, township and district levels as well as with expert advice from state/regional and national level stakeholders.

The NCDP is being designed to provide the development policy framework for Township Development Plans, District Development Plans, State and Regional Development Plans as well as Urban Development Plans. The NCDP will include an interim roadmap that sets short/medium term directions for state and regional programs and projects. The roadmap will set a broad, long-term strategic direction for Development Plans that includes reforms needed to deliver quick wins. In summary, the NCDP goals focus on:

1. Improving the living standard of the entire population
2. Increasing per capita GDP
3. Promoting public utilities and social sector development such as transportation, water and sanitation, electric power, education, health and social security etc.
4. Creating job opportunities
5. Conserving natural resources
6. Achieving the Millennium Development Goals (MDGs) and other human development objectives by 2015
7. Fully implementing economic integration with ASEAN, in accordance with its ASEAN Economic Community (AEC) 2015 schedules

4.2.3 Myanmar Comprehensive Development Vision (MCDV)

The Myanmar Comprehensive Development Vision (MCDV) provides guidance on future national development in relation to ASEAN policies and programs and is being developed by the Economic Research Institute for ASEAN and East Asia (ERIA). The MCDV is a long-term development vision incorporating growth strategies for economic policies, infrastructure and human resource development (HRD) plans, industrial sector-wise growth paths, region and state development master plans etc. In summary, the MCDV:

- Envisages Myanmar's development over 20 years, the same timeframe as with the NSDF
- Intends to become a comprehensive reference for the Myanmar economy, now and for the future

Consistent with the FESR and the NCDP, the MCDV's objective is human-centered development through growth strategies that are high-growth and globally linked, inclusive and balanced, and green and sustainable.

4.2.4 Regional Transport Integration: ASEAN and GMS

In 2004, the ASEAN International Transport Forum adopted the ASEAN Transport Action Plan 2005-2010 and approved 48 Action Plans covering sea transport, land transport, transport facilitation and air transport. These Action Plans included development of road and railway networks and cross border transport facilitates. In 2005, the Forum signed the "ASEAN Framework Agreement on Multimodal Transport" to accelerate regional integration. According to this agreement, the Asian Highways road network was to be improved and expanded in Indochina (Thailand, Cambodia, Vietnam and Laos). Subsequently in 2010, the 17th ASEAN Summit adopted the Master Plan on ASEAN Connectivity (MPAC) and proposed strategies and actions to improve regional connectivity within ASEAN. MPAC defined 15 priority projects as part of its roadmap to 2015 (the target year for ASEAN integration) with Myanmar selected host nation for the ASEAN summit in 2014.

In Myanmar, the regional transport network and system improvement plans are becoming increasingly important, due to a growing number of cross-border transport facilities, brought on by implementation of the ASEAN Framework Agreement on Multimodal Transport, as well as general infrastructure improvements and services for land transport, and increased private sector participation. However, improvements to the road network are needed to complete missing links, reduce delays due to capacity bottlenecks and fully establish cross border transport facilities. When these improvements are implemented, the MYT-Plan and the related NSDF should emphasize the importance of regional connectivity with neighboring countries, such as Thailand, India and China, ensure updated policies and programs to develop and complete strategic transport networks. These improvements are proposed for the Greater Mekong Sub region (GMS) including the East-West Economic Corridor and the North - South Economic Corridor.

4.3 Institutional and Legislative Aspects

4.3.1 Overview of Institutions Involved in National Spatial Development

(1) Myanmar Government Institutions

Myanmar's State Constitution, which was ratified and promulgated by a national referendum in May 2011, defines Myanmar's administrations in terms of seven Regions, seven States and the Government territories. States and regions are further divided into districts, which consist of townships that include towns, village-tracts and wards (village-tracts are groups of adjacent villages). All levels of government fall under the jurisdiction of the Myanmar Government, though states and regions have local authorities like Chief Ministers, other Ministers and Advocate Generals. Legislative authority resides with the State Hluttaw or Regional Hluttaw, and includes elected civilian members and representatives of the Armed Forces.

(2) Institutions involved in National Spatial Development Planning

National public works projects are normally carried out by the Ministry of Construction (MOC) in partnership with other Governmental organizations. Individual line Ministries carry out specific projects following requests from regions, states or other local administrative jurisdictions. The MOC has two main executive Departments:

1) Public Works, which generally plans and implements infrastructure such as roads, bridges, airfields and buildings
2) Human Settlements and Housing Development (DHSHD), which plans and implements urban development and housing, and is one of the responsible agencies for national spatial development planning and the preparation of national physical development plans. The Urban and Regional Planning Division, based in Nay Pyi Taw, is the planning authority within DHSHD (refer to Figure 4.1).

Historically, DHSHD works to support the country's physical and social infrastructure by planning, managing and implementing:

- Urban development and redevelopment projects incorporating planning for water supply and sanitation
- New town and satellite town developments
- Various types of housing development including affordable housing, public and rental housing, sites and services and slum and squatter upgrading schemes
- Industrial zone development
- State owned and urban land, especially in Yangon
- Joint venture investment zones

In addition to DHSHD, the Department of General Administration under Ministry of Home Affairs and the Department of Land Record and Settlements within the Ministry of Agriculture and Irrigation also has responsibility for spatial and land use planning and land management. Furthermore, the Ministry of Agriculture and Irrigation and the Ministry of Environmental Conservation and Forestry have responsibility for land use planning outside urban areas whilst the Ministry of the Development of Border Areas and National Races has particular functions and responsibilities for border areas.

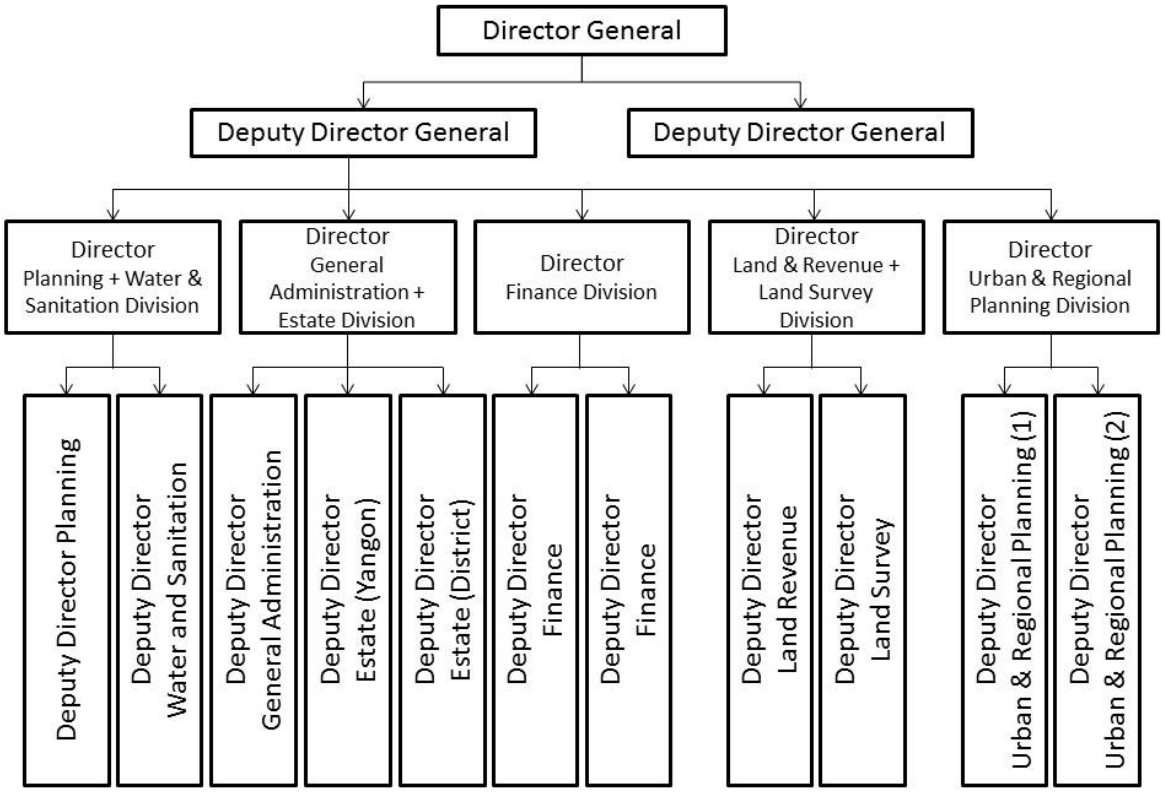
Presently, the MOC is restructuring in line with the Government's Reform Strategy to focus more on policy making, planning, controlling, guiding, regulating and monitoring urban and regional development and construction. Consistent with the MOC's shift in function and responsibilities, the role of the DHSHD is also being re-structured from that of "Provider" (of housing) towards "Facilitator" (of urban development) and "Enabler and Regulator". As this shift occurs and the MOC/DHSHD moves toward adopting the role of regulator and they aim to promote capacity building, the public sector urban planning and development functions must continue and be upgraded, for which appropriate budgetary allocation would be needed.

The future responsibilities of the DHSHD will include the following services:

- Drawing up the National Spatial Development Plan incorporating an Urban Development Policy and National Housing Policy, an integrated urban network system (National Urban System Plan), and a comprehensive land use plan making

effective utilization of resources, consistent with the emerging National Comprehensive Development Plan (NCDP). (The Union Government assigned the Land Allocation and Utilization Scrutinizing Committee in collaboration with Ministry of Environmental Conservation and Forestry for the task of developing a National Land Use Policy. Now this policy is in draft-stage and National Land Law based on this national land use policy will be enacted as the legal basis to guide all other existing land legislation in Myanmar in a harmonized manner.)

- Assisting the regional and state governments and City Development Committees (CDCs) as required, with activities such as urban planning/human settlement planning. For this assistance to be effective, strengthening the capacity of the respective Urban Planning and Housing Development Departments at region and state level will be required to help prepare urban and regional development and city/town development plans (i.e. concept plans, structure plans and local plans/detailed guidance for major cities), as well as providing advice and assessing development permit applications.
- Improving access to basic social services in urban and rural areas such as shelter, education, health, potable water, and creating a livable environment while protecting the natural environment from exploitation.
- Establishing and modifying planning laws and regulations, including the Condominium Law the Town and Country Planning Law (Urban and Regional Planning Law), Underground Water Act, and Housing Development Law (update of 1951 National Housing and Building Act). In this regard, DHSHD will participate in promulgation of Spatial Planning Law together with other in-line ministries.
- Assisting the Union Government to establish a national (union level) spatial planning system in collaboration with in-line ministries such as Ministry of National Planning and Economic Development, Ministry of Home Affairs, Ministry of Agriculture and Irrigation, Ministry of Environmental Conservation and Forestry and City Development Committees.



Source: DHSHD

Figure 4.1 Organization of the Department of Human Settlements and Housing Development (DHSHD)

(3) Institutions with Responsibilities in Urban and Regional Planning

For Yangon city area, Yangon Regional Government and Yangon City Development Committee (YCDC) are the relevant administrative organizations with responsibility for urban and regional planning. Yangon Region consists of 44 townships, 33 of which form the four districts that make up the City of Yangon. Each township is administered by an executive officer of the General Administration Department (GAD) who authorizes city beautification measures and infrastructure investment. The YCDC is a Development Committee prescribed by the City of Yangon Development Law 1990. The Committee is not defined in the Constitution and its legal status is different from that of regions and states, being technically independent of the Government. The Committee is able to raise its own revenues through tax collection, fees, licenses and property development.

Since World War II, Yangon's urban expansion was supported by new town development and sites and services projects by the public sector, mostly by the Ministry of Construction. After the enactment of the 1990 YCDC Law, responsibilities for urban development were split between MOC/DHSHD and YCDC. Currently, the demarcation of responsibilities for development planning between the two organizations can be broadly considered as follows:

- YCDC and DHSHD manages urban land
- Private sector land is administered by YCDC, whereas DHSHD manages Government-owned land

In YCDC, the Department of City Planning and Land Administration is responsible for urban planning, though initially the Department was involved in land administration issues. In order to strengthen the urban planning capacity of the department, the Urban Planning Division (UPD) was established with the following technical sections:

- Land Use and Environmental Planning
- Urban Sociology, Economics and Population Studies
- Infrastructure and Urban Amenities Planning
- Urban Transportation and Road Network Planning

In addition to Yangon, two other cities have launched Development Committees. The Capital City of Nay Pyi Taw is under the direct administration of the President and the Constitution prescribes Nay Pyi Taw Development Committee (NDC) as the responsible organization for its administration. By virtue of Order No. 3: Conferring Powers Relating to Land Administration (2007), the Committee is responsible for administering all lands within the Nay Pyi Taw development area.

The City of Mandalay Development Law (2002) notes that the Mandalay City Development Committee (MCDC) is responsible for development works and functions within the City of Mandalay. Its functions and duties are broadly similar to those of YCDC.

(4) Summary of Key Issues

The following key findings are relevant for national spatial development planning:

a) At the national level, the DHSHD has historically carried out urban planning and development functions within Myanmar but is now changing its role to a national policy-maker and regulator, while leaving the responsibility of formulating and implementing regional and urban plans to regional/state governments and the CDCs.

b) The CDCs are the implementation agencies for urban planning in Yangon city area, Mandalay city area and Nay Py i Taw administrative capital area and are administered by the CDC laws and related regulations. Yangon and Mandalay Regional Governments also have responsibility for regional planning functions as established under the new Constitution

c) Currently, as the various levels of Government administration responsible for regional and urban planning are undergoing a transitional phase, the demarcation of responsibilities between the DHSHD other related Government ministries/agencies and the state/regional governments and the CDCs must be further clarified, as some overlapping functions appear to be present. This appears to be the case with the national planning regulator and the primary implementation body of urban planning in Yangon, Mandalay and Nay Pyi Taw. As well, linkages between the DHSHD and the CDCs should be clarified, their coordination strengthened and their human resource capacity upgraded.

d) With regard to the functions and roles of the three CDCs, in relation to future citywide spatial development planning, the following improvements are recommended:

- Formalization of City Development Plans as they are brought forward and approved as the official development planning and control tools in Yangon, Nay Pyi Taw and Mandalay.
- Introduction/updating and legalization of respective planning bylaws and regulations.

- Improvement of development control procedures including development permit assessment procedures, appeals mechanisms and inspection/enforcement.
- Significant upgrading in training programs and related resource enhancements to improve the capacity in the urban and regional planning sector of Government at all relevant levels (national, regional and the CDCs).

4.3.2 Legal and Regulatory Framework

(1) Key Provisions in the Constitution

Key provisions in the State Constitution related to urban planning and land management include:

- The Government is the ultimate owner of all lands and natural resources in the Union (Section 37).
- The Government guarantees the right to ownership and use of property (Section 372).
- All citizens have a duty to assist the Government in preserving and safeguarding cultural heritage and the environment, supporting human resource development and protecting and preserving public property (Section 390).
- The Region or State Hluttaw (Congress) has the right to enact laws for its jurisdiction, in whole or in part, and to matters such as town and housing development as prescribed in Schedule Two of the Region or State Hluttaw Legislative List (Section 188).
- The Union Government is responsible to enact necessary law to supervise extraction and utilization of State-owned natural resources by economic forces (Section 37-b).

(2) Laws and Regulations related to National, Regional, and Urban Planning

Currently, Myanmar has no urban and regional planning legislation in law. However, with the adoption of the new Constitution, a number of relevant laws and regulations are being prepared, enacted or modified that may serve this purpose. In this context, the DHSHD is preparing a Town and Country Planning Law (Urban and Regional Planning Law), which will be submitted to Congress, while the MOC is believed to be preparing a uniform Building Code to supplement current building controls from the safety and urban planning perspective. The preparation of this draft Building Code will be entrusted to the Association of Myanmar Architects and Myanmar Engineering Society (MES).

In the interim, a number of historic laws and regulations are still being used for urban planning, land management and housing including:

a) Land Acquisition Act (1894) – This Act stipulates that the Government can acquire land if it is deemed to be in the interest of the public. Religious lands such as pagodas, stupas, shrines and cemeteries are not subject to Government acquisition.

b) State's Housing Rehabilitation and Town and Country Development Board Act (1951) – After World War II, a large number of people moved from the countryside to the cities and towns and housing was in short supply. This Act was promulgated to solve the shelter problem through town and village development projects and public housing rehabilitation projects. It enabled town and village development, supervision of public housing rehabilitation, management and improvement of land management and other related

activities on a nationwide basis.

c) Urban Rent Control Act (1952, amended in 1960) – This Act regulated rents in urban areas to affordable levels but in so, it discouraged basic maintenance and upgrading of rental properties by most property owners.

d) City of Yangon Development Law (1990), Development Committees Law (1993), City of Mandalay Development Law (2002) and Order no. 3 Conferring Powers Relating to Land Administration (2007) – These laws and regulations enabled the Yangon, Mandalay and Nay Pyi Taw City Development Committees (CDCs) to carry out development works in their respective territories, including drawing up plans and carrying out town planning, laying down policy, giving guidance and carrying out the following:

- New town and land settlement projects
- Civil projects including:
  - Construction, repair, demolition and re-settlement of squatter buildings and squatter wards
  - Construction and maintenance of gardens, parks, playgrounds, recreation centers
  - Construction and maintenance of roads, bridges, street lighting
  - Construction and maintenance of reservoirs, water supply and pipelines
  - Construction and maintenance of buildings under the charge of the Committee
- Granting permission for the construction of private buildings within the Development Committee boundary limit and supervision thereof
- With the approval of the Ministry of Home Affairs, granting permission for the construction and supervision of private buildings in rural areas outside the Development Committee boundary limit, specified by notification
- Demarcation and re-demarcation of the territorial limits of each City's development area, drawing up development work bylaws in accordance with existing laws and rules and administration of lands

The 1993 Development Committees Law also prescribes planning functions for each state/region, supervised by the CDCs and submitted to the Director General of the Department of the General Administration, Ministry of Home Affairs, as follows:

- Scrutinizing short-term and long-term projects drawn up and submitted by the Committee
- Supervising budgets for development works
- Coordinating development functions to ensure conformity with relevant laws, rules, bylaws and directives
- Inspecting works, buildings, proceedings, documents and accounts relating to the Committee

e) Development of Border Areas and National Races Law (1993) – This law relates to Myanmar's border areas, as determined by the State Law and Order Restoration Council. The objectives of border development are to develop border area economic, social, and infrastructure development and to manage ethnic relations, in ways that do not challenge or diminish the Government's authority, solidarity or sovereignty over the lands. In addition,

the Law aims to preserve the culture, literature and customs of Myanmar's indigenous peoples and different ethnic groups.

The Council has formed a Central Committee to guide the development of border areas and Myanmar's people, using the following duties and powers:

- Developing policy to implement the above objectives
- Validating, supervising and assisting with the implementation of long-term and short-term master plans, drawn up by the Ministry of the Development of Border Areas and National Races, and submitted through the Works Committee
- Implementing priority development works in the border areas
- Carrying out measures to maintain the culture, literature and customs of Myanmar's ethnic groups
- Maintaining security, law and order and regional peace and security, in order to encourage development works in the border areas
- Identifying development areas that should be expanded

f) Farmland Law (2012) – This is a new law that came into effect in August 2012 under the new Constitution. This law is to be accompanied by Farmlands bylaws and vacant, fallow and virgin lands management bylaws, to be approved by the Government. The Farmland Law enables all farmers across the country to enjoy land use rights through a land registration process.

g) Planning and Development Regulations – Currently, planning law in Myanmar does not clearly define permitted and restricted land uses. The process for converting and developing agricultural land requires a farmland development permit to be submitted by a developer to the Central Board for Farmland Management, which is headed by the Government Minister of the Ministry of Agriculture and Irrigation. The application must include details of the crops that have been planted and the size of the agricultural land to be converted.

h) Other Regulations concerned with Land Management – The Lower Burma Town and Village Land Manual (1898), The Lower Burma Land Revenue Manual, The Burma Boundaries Manual (1927), The Burma Land Record Manual (1946) and Unmovable Property Act (1987).

In terms of urban planning and infrastructure, there are a number of bylaws in effect in YCDC that were enacted between 1995 and 2001. The bylaw on Town Planning and Land Use (No 3/2001) includes the following provisions:

- Formulating City Development Plans
- Managing land use, in accordance with City Development Project/Plan
- Managing land and land acquisitions, buying and transferring land and relocation of squatters and trespassers and appeals

(3) Summary of Key Issues

The MYT-Plan's review of the legal and regulatory framework for national spatial planning, identified the following key issues:

a) For transparency and social equity reasons, urban and regional planning institutions must regulate the means by which individuals, community groups and companies pursue their

property rights towards the overall benefit of the nation. The formulation of a Town and Country Planning Law (Urban and Regional Planning Law) and related Regulations is currently underway at the national level by the MOC/DHSHD. Donors or international development partners should be invited to assist in this process.

b) The Regulations should incorporate planning and design guidance such as Planning Policy Statements (PPS) to guide permit applications for key land use developments such as residential, industrial and commercial use. Regulations should also include advice on best practice building design and the preparation of urban design guides for use by permitting authorities at relevant levels of Government, together with consistent and regularly updated advice on their implementation.

c) A national land use policy is drawn (second draft) by Ministry of Environmental Conservation and Forestry. In addition to the MOC/DHSHD, other relevant Ministry stakeholders including the Ministry of Agriculture and Irrigation, the Ministry of National Planning and Economic Development and the Ministry of Border Affairs should also be involved in the formulation of a national land use policy. In this context, the Government has established a Land Allocation and Utilization Security Committee for urban development and investment projects to formulate land utilization policy in line with laws, rules and regulations. In effect, each Government Ministry and Region/State Government will have to submit their proposals for land allotment and utilization for urban development and other development projects.

d) At the local government level, the Yangon, Mandalay and Nay Pyi Taw CDCs are supported by various development laws and bylaws. While these provide a general framework for urban planning implemented at the local level, the actual regulations are neither well established nor well publicized to the general public. To improve awareness and enhance transparency in the permit process, the regulations for building control and permit approvals should be clearly identified and publicized, information about their relevance to particular developments should be made available to prospective developers and individuals and feedback from their usage regularly monitored and updated.

4.4 Sector Plans, Policies and Programs

This section summarizes the relevant plans, policies and programs of sectors related to national spatial development planning and transport investment. More information about these initiatives can be found in individual sector chapters later in this report.

4.4.1 Urban and Regional Development

(1) Urban and Regional Development Policies and Programs

Highlights of the Government's social and economic reform programs relating to urban planning and development include the following:

a) Government Ministries are urged to draw up sector-wide development plans, while the Region/State Governments are instructed to draft regional development plans, urban development plans and rural development plans.

b) The Myanmar Government is reviewing and drawing up a 30-year National Development Plan, which will become a Comprehensive Development Plan through the following (plans):

- Rural Development and Poverty Alleviation Plan
- Human Resources Development Plan
- Investment Plan
- Trade Sector Development Plan
- Industrial Development Plan
- Financial and Currency Sector Development Plan
- Regional plans
- Sector-wide Plans

Specific policies and policy actions that will guide development plans are not yet complete, but the MOC/DHSHD's vision and objectives (described below) are clear about the need for sector and regional development plans.

Vision

- To develop an urban network system that contributes towards balanced and sustainable development of settlements throughout the country, and
- To upgrade living standards and provide adequate housing for all citizens.

Objectives

- To draft and implement a National Spatial Development Plan that will support and implement the National Comprehensive Development Plan (NCDP).
- To set up a planning process that will serve as a foundation for the drafting of regional/state, township, town/city and rural spatial development plans, to include concept plans, structure plans, urban development plans and village development plans.
- To prepare policies that strengthen and reform the MOC/DHSHD.
- To provide adequate and affordable housing for people through sustainable ways.
- To establish housing finance mechanisms that will support house ownership, promote construction industry development and implement proper housing delivery systems in a transparent manner (through pilot projects).

In terms of programs and priorities for transport sector development, the DHSHD has established the following policy actions:

- Conducting feasibility studies for urban infrastructure on the regional road network and economic corridors and connecting to neighboring countries.
- Carrying out a periodic National Housing Census.
- Coordinating, cooperating with, guiding and monitoring regions and states in their implementation of pilot urban slum infrastructure upgrading schemes (e.g. water supply, electricity, sanitation, drainage, etc.) through foreign aids, grants and technical assistance.
- Increasing housing production through pilot projects in Ayeyarwon, Yadanar and Yangon (over 10,000 housing units).

- Implementing low-income affordable housing pilot projects in cooperation with the private sector and in accordance with regional priorities.

(2) Socio-Economic Development Policies and Programs

Housing Sector

In Myanmar, 90% of the people live in timber and bamboo-structured housing. Since 1958, the DHSHD has provided subsidized housing and improvement schemes including public rental housing, sites and services, slum and squatter upgrading and low cost housing development, especially in Yangon. About 200,000 land plots serviced with basic infrastructure have been provided over a 20-year period. The most extensive housing scheme was the 'hut to apartment' housing projects, targeting people living in slum and squatter areas. Approximately 12,600 households have benefited from 32 of these housing schemes.

The DHSHD also manages housing estates in Yangon and other towns in the country, under Public Rental Housing schemes. Since 1960, 10 housing estates in Yangon and additional 34 estates in other regions and states have been established. Currently, the Department owns 20,000 rental units, which were built and sold to the public from 1989 to 2009. It is now introducing an estate renewal program in Yankin Estate in Yangon, modeled on Yankin Palm Village completed in 2009, which is the largest housing estate redevelopment project. In the housing sector, public private partnerships have been widely and successfully adopted, especially in the shelter/housing sector. Other area-wide development projects include land readjustment or whole area development schemes and urban land densification.

Under the new Constitution, the President has set guidelines and policies to raise the quality of life for Myanmar's people, especially for civil servants, by making available affordable housing, especially for the low-medium income group in Yangon and other cities. In accordance with the new policy direction, 1 million new houses will be built over the 20-year period (2011-2030) with additional pilot affordable housing schemes being developed. The approach will improve access to basic social services in both urban and rural areas, including education, health and potable water and shelter. The Dagon Seikkan housing project, which plans to provide 18,000 units for low-income target groups, is an example of such pilot projects. This DHSHD initiative is part of an overall concept to deliver more appropriate housing in the country by promoting new technology in mass production of housing, upgrading the quality of construction industry by substitution of innovative and cost effective building materials and promotion of their production locally as well as setting their norms and standards and mobilizing private sector participation in housing development.

Urban Development

The quantity and quality of urban housing and infrastructure is a key indicator of development in a modern nation. In Myanmar, the DHSHD is cooperating with other departments and agencies to implement new projects in urban areas, new towns and industrial zones by providing basic infrastructure (e.g. communications, power, transportation and irrigation for flood and erosion control). Mixed-used development consisting of condominiums, commercial buildings and shop houses managed by DHSHD, has signaled the success of private participation in the urban development process.

Urban area development projects have been developed to enhance the general appearance of urban areas. To meet the needs of the city's residents for recreation and leisure facilities, as well as to enhance the image of the City of Industry (Hlaing Tharyar), Pan Hlaing Golf and Country Club has been developed as a joint venture project between DHSHD and Yangon Nominees Co. Ltd. The Golf Course Project includes an 18-hole golf course to international standards along

with a housing project. Moreover, Pan Hlaing (2) Golf Course coupled with Star City Condominium Project in Thanlyin near Thilawa SEZ are also under construction.

The DHSHD has also leased land for service apartments and hotels on a Build-Operate-Transfer (BOT) basis including MiCasa Serviced Apartments, Sakura Serviced Apartments, Mingalar Garden Hotel and Governor's Residence Hotel etc. The Department has also managed land and building rental for foreign embassies in Myanmar.

4.4.2 Economic Development and Employment

(1) Background

The MYT-Plan analysis finds that a strong set of guidelines for spatial development will follow with Myanmar's integration into the ASEAN. As such, the Myanmar National Transport Development Plan (and the related National Spatial Development Framework) must be consistent with the ASEAN and other ASEAN country strategic land use and transport policies and programs.

To assist in this process, various agencies, including the Economic Research Institute for ASEAN and East Asia (ERIA), are developing strategic plans and programs, such as the Myanmar Comprehensive Development Vision (MCDV). The MCDV will identify major economic development corridors where future investment can maximize economic and social benefits in regions that have advantageous locations. Some of these corridors already exhibit economic growth characteristics where strategic-level transport networks and facilities have been established or are in the process of being upgraded (e.g. main highway and railway corridors with connections to major ports and airports). In and around these corridors, clusters of industry and commercial activities can also be found with connections to regional/state administrative capitals or border towns with specialized services and facilities.

Although these regions are likely to benefit more than others in the short term, benefits are likely to spill over to wider catchments in the long term. By pursuing development along these corridors, future transport investment can support the growth of regional and state activity hubs and their mainly agricultural hinterlands, so that travel and transport patterns of passengers and cargos may be refocused accordingly. For some key cities already well-established within or adjacent to the corridors such as Yangon, Mandalay, Nay Pyi Taw, Bago and Mawlamyine, further (transport) investments will serve to reinforce and enhance their roles as key activity hubs in the spatial development framework. In particular, the importance of Mandalay should be recognized as it lies at the intersection of several corridors, making it an important future transport and development activity hub. In the future Bago, Dawei and Kyaukphyu will also become more strategically important as Government investments in new airports and ports start to mature.

The development policies in terms of economic corridors should not only address transportation, but also consider the development of strategic employment-generating land use activities such as industrial zones (manufacturing) and Special Economic Zones within and adjacent to them. The development of social and community infrastructure such as health facilities, schools and community centers by Government agencies should follow.

The Transport Vision in 2030 should consider these spatial and structural changes. However, the development of these economic corridors present technical challenges, especially to improve accessibility to rural regions, including management of road quality, hilly areas that constrain implementation, increased traffic flows, etc. More studies and data are therefore needed before the potential of these economic corridors can be harnessed.

(2) Agricultural and Agro-Industry

The amount of land under agricultural production has expanded during the last two decades, but there is a relatively high level (8% of the national territory) that is arable but underutilized – this land could be reclaimed and put to more productive use. Table 4.1 indicates that in 2011-2012, some 55% of the total area of Yangon Region was under cultivation, in Mandalay Region the total was 60% and in Ayeyarwaddy Region the total was 62%. This is partly due to the proximity of good quality agricultural land close to the major markets for agricultural products, which also represents a significant constraint in terms of land available for future development.

In 2009, the IMF estimated that agriculture contributed nearly 43% of Myanmar's GDP and around 38% in 2011-2012. The sector will continue to be a main source of employment for the foreseeable future, though the share of employment in agriculture will likely decline as GDP per capita increases. In the long term, the industrial/manufacturing and services sectors will need to create more jobs to meet increasing demand from displaced agricultural workers. However, this is likely to be a slow transformation process, with the decline in agriculture's share of employment being slower than that of GDP's share, given the experiences of Myanmar's neighbors (e.g. even Thai agriculture absorbed about 40% of total employment in 2009).

Table 4.1 Total Agricultural Cultivation by Region / State, 2011-2012

No.	Region State	Area (Square Mile)	Population ('000)	Cultivated Acres ('000)	Percentage
1	Kachin State	34,379.22	1,598	1,433.7	4.2
2	Kayah State	4,529.56	360	584.5	12.9
3	Kayin State	11,730.85	1,836	1,457.9	12.4
4	Chin State	13,906.97	563	362.7	2.6
5	Sagaing State	36,178.72	6,598	9,719.3	26.9
6	Taningtharyi Region	16,735.56	1,734	1,441.2	8.6
7	Bago Region	15,214.13	6,067	6,494.9	42.7
8	Magway Region	17,305.32	5,677	8,098.8	46.8
9	Mandalay Region	11,925.95	7,353	5,923.5	49.7
10	Mon State	4,747.76	3,165	2,128.8	44.8
11	Rakhine State	14,200.08	3,339	1,914.6	13.5
12	Yangon Region	3,967.85	7,097	2,195.9	55.3
13	Shan State	60,155.23	5,720	4,820.9	8.0
14	Ayarwadi Region	13,525.88	8,124	8,419.5	62.3
15	Naypyitaw Concil Territory	2,724.76	1,153	592.9	21.8
	Total	261,227.84	60,384	55,589.1	21.3

Source: UN FAO

Myanmar's agriculture is no longer rice-dominated and is now more diversified as the share of paddies in sown acreage has continuously declined since the 1960s. The share of pulses increased in the 1990s due to exports, mainly to India, but stagnated in the first decade of the 2000s. Oilseeds (e.g. groundnuts, sesame) have declined in sown acreage over the last two decades due to palm oil imports from Malaysia and Indonesia. Other crops such as rubber, sugarcane, cotton, maize, fruit and vegetables have continuously increased since the 1960s, while livestock and fisheries also have huge potential.

The MYT-Plan analysis suggests that a future Agriculture Strategy related to spatial development planning should be developed and include:

- Productivity enhancement and broadened economic activities along the value chain.
- Improvements in access to land uses, land tenure security and land development by the private sector and foreign agri-business entrepreneurs.
- Protecting equity access to lands for small and medium farmers for their sustainable livelihood.
- Encouraging responsible expansion of lands and development of agricultural lands.
- Adopting agricultural land settlement scheme for rural landless, returnees from migration and internally displaced population (IDP) for any causes of political unrest and armed conflicts in ethnic areas.

(3) Industry

Industrial Sector and Industrial Zone Development

Myanmar is said to be a resource-rich country, based on the availability of oil and natural gas, hydro-electric power, wood products, jade and gems, copper, lead, tin, coal, limestone, etc. Although export of these resources leads to foreign exchange income, Myanmar is not maximizing this potential and foreign exchange income is low. For example, while exports of natural gas earned US$3.1 billion in 2008, this translated to only about US$50 per capita. On the other hand, Myanmar imported diesel and gasoline costing more than US$1.0 billion in 2010 and the country suffers from serious shortages of electricity, even though Bangkok benefits from the export of natural gas from Myanmar. The IMF estimated that in 2009, the industrial sector contributed 19.8% of GDP while in 2011-2012, a significant increase to about 27% was predicted.

Since 1985, 18 Industrial Zones have been established throughout the country with the aim of consolidating existing scattered industries, improving cooperation and linkages between industries and enabling industrial development assistance as necessary. In addition to a number of zones in and around Yangon, there are also industrial zones in Mandalay Region (Mandalay, Meiktila and Myingyan), Sagaing Region (Kale and Monywa), Magway (Pakokku and Ye Nan Chaung), Shan State (Taunggyi), Bago (Pyay), Ayeyarwaddy (Myaung Mya, Hinthada and Pathein), Mon State (Mawlamyine), and Tanintharyi Region (Myeik).

In order to create more job opportunities, increase the availability of sites for industry and extend private sector and FDI development opportunities, seven additional zones are planned in outskirt and border areas including Yadanar in Mandalay Region, in Nay Pyi Taw, Hpa-an, Hpapun and Myawaddy in Kayin State, Phone Nar Kyun in Rakhine State and Nan-on in Shan State.

The types of industry that are being promoted include:

- Large-scale Special Industrial Zones (SIZ/SEZ) (Dawei, Mawlamyine, Kyaukphyu, South Yangon-Thilawa).
- Small and Medium Enterprises (Outskirts of major urban areas).
- International/Cross Border Trading (FTZ) (Thailand: Tachileik, Myawaddy etc., China: Muse, Bhamo etc., India: Tamu, Bangladesh: Maung Taw etc.).
- Tourism-based (Bagan, Inle Lake, Andaman Islands).
- Resource-based industries (Fishery processing, Agro-based).

In spatial development terms, more than 40% of large-scale private factories are located in Yangon, with 20.7% being located in Mandalay (2009). Approximately 60% of large private factories are found in just two major cities. The MYT-Plan's analysis suggests that it is likely that Yangon and Mandalay will continue to form the country's major industrial activity hubs for the short and medium term, pending major investment and expansion elsewhere (e.g. in the SIZs/SEZs-see below).

At the same time, pro-poor industries will need to be promoted to absorb not only the growing urban labor force in major cities and state/regional capitals, but also as a result of the rural-urban drift that will take place as workers move out of the agricultural sector in search of an urban lifestyle and a perceived better quality of life. In the future, the industrial sector will need improved physical infrastructure such as electricity generation and distribution, better connectivity and logistics by waterway, road and rail transport and to a lesser extent air transport, telecommunications, and the successful establishment of technical centers and institutions, modern industrial zones and SEZs.

Special Economic Zone Planning

In promoting a market-oriented economy, Myanmar is encouraging investments in Special Economic Zones (SEZ) to operate high tech industries and businesses through the Myanmar Special Industrial Zone Law (2011). A National Myanmar Economic Zone (MEZ) strategy has been drawn up with the assistance of Japan Overseas Development Corporation (JODC); Thilawa near Yangon, Dawei in Tanintharyi Region and Kyaukphyu in Rakhine State are to be developed as priority SEZs for short-term implementation.

Thilawa SEZ covers about 2,400ha of land and is located in Thanlyin township in Yangon Region some 18km from Yangon port and 30km from downtown Yangon. Its aim is to develop a Free Trade Zone (FTZ) for export processing and promotion including an IT software and R & D area, commercial area, wholesale area, residential area, health care and hospital area, education area and administrative area.

The Dawei SEZ on the river Dawei in Tanintharyi Region is being planned and implemented by the Myanmar Port Authority in joint venture with Italian Thai Company and is to include a deep sea port, Dawei–Kanchanaburi (Thailand) highway and railway corridor and an industrial estate on 250 sq km of land. The construction of a gas pipeline to Kanchanaburi province also offers potential for commercial and residential development in that area.

The Kyaukphyu SEZ is being planned at a natural harbor at Kyaukphyu city in Rakhine to improve transit linkages between Yangon, Chittagong and Calcutta as well as acting as a focus for improved linkages with Kunming (China) oil via a 1,060km long pipeline expected to be completed during 2013. Proposed construction of railway lines and upgrading of the existing airport are also planned to meet international standards.

(4) Services and Tourism

In 2009 the IMF estimated that the services sector including tourism contributed 37.3% of GDP and in 2011-2012, around 35% of the total was predicted. Priority actions in the tourism sector include:

- To develop identified hotel zones and encourage the construction of hotel projects.
- To improve travel routes and transportation for travelers.
- To develop attractive tourist destinations.
- To develop quality tourism services.

- To develop communication technology and systems.
- To develop easy and effective monetary practices.
- To provide technical assistance and education for human resource development in hotels and tourism.
- To communicate and cooperate with local and foreign investors and international organizations for tourism developments.

(5) Rural Areas and Border Development

Rural Areas

Poverty is not only widespread in rural areas, but rural areas account for almost 85 % of total poverty in Myanmar. Myanmar's poverty incidence in 2010 was about twice as high in rural areas compared with urban areas.

Poverty is multi-dimensional because its measurement includes both income needed for basic needs but also human, physical, political, and social capital as means to earning income. An integrated rural development approach is being adopted to improve the economic and social life of Myanmar's rural poor through interaction with donor agencies, though there has been limited analysis to date of the nature of rural poverty and performance of rural development in different States/Regions.

Consistent with the Government's new Social and Economic Reform agenda, the approach focuses on supporting people-centered rural development planning, which emphasizes gender equality by promoting:

- Women in development for achieving Millennium Development Goals (MDG 3 - equality between men and women is crucial to reducing poverty).
- Long-term economic, social and political stability of rural communities on a self-help basis with employment generation programs.
- The establishment of a pattern of growth and emerging employment opportunities by improving the factors of backward and forward linkages that influence agro-based industry and/or non-farm sector development.

Myanmar plans to drastically reduce national poverty incidence from 32 per cent in 2005 to 16 per cent in 2015 through a variety of poverty reduction programs being implemented in all regions and states, which includes development in the agricultural sector, livestock and fisheries, small-scale rural-based industry development, socio-economic development in rural areas, rural energy, and environmental conservation.

Border Areas

Myanmar is surrounded by wealthy countries and shares a number of characteristics with its neighbors. Border area development can take advantage of some of these similarities, especially as Myanmar currently lacks basic infrastructure in these areas, such as electricity, internet, etc. that are necessary for industrial development. Myanmar's border economic zones can make use of the infrastructure of neighbor countries when exporting labor and inputs. Border area development can also help Myanmar contribute to the production networks of ASEAN and reap the benefits from improved connectivity.

Border area development is attractive because of its potential for social progress resulting from human resource development, it is also important for balanced growth. Special

Industrial/Economic Zones (SIZ/SEZ) or other similar mechanisms should be considered at selected border areas to attract companies and focus investment on infrastructure, improved administrative procedures and support for human resource development.

Border zones are also important for the tourism industry. Moreover, as these areas are often the first places seen by regional visitors and tourists when they enter the country, they should offer a positive impression and act as Myanmar's gateway. To ensure effective development of these border economic areas, they must be attractive places for neighboring countries' industry. Increasing social stability, demonstrating good governance, committing to trade openness, enforcing justice, are all critical for border area development.

Future border area development programs related to spatial planning should consider the following aims and issues:

- Socio-economic life of the rural population (livelihood support programs)
- Health improvement issues (water quality, sanitation and hygiene)
- Infrastructure development (rural feeder roads/bridges, inter-district roads and bridges, electricity and water supply)
- Education and vocational training
- Cultural and heritage values of the national races

Possible locations for these enhanced border towns include Myawaddy, Kengtung/Tachileik, Muse and Tamu.

4.4.3 Environment

In the past, more than 50% of Myanmar's land area was covered with forests. Due to population increases, over-exploitation of timber, unsustainable investment and development programs, the forest cover is gradually decreasing and by 2010, forest coverage amounted to 46.9 % of the total land area.

Myanmar's environment policies are aimed at achieving harmony and balance in terms of the environment through the integration of environmental considerations into the development process. Environmental protection should always be a primary objective when promoting development. Key environmental objectives ascribed to the Ministry of Environment Conservation and Forestry are discussed later in this section.

4.4.4 Transport

The key Ministries in Myanmar's transport sector include the Ministry of Transport, the Ministry of Rail Transportation (MRT) and the Ministry of Construction(MOC), as well as the following Departments and Agencies: Department of Civil Aviation (DCA), the Department of Marine Administration (DMA), Directorate of Water Resources and Improvement of River Systems (DWIR), Myanma Port Authority (MPA), Inland Water Transport (IWT), Transport Planning Department (TPD), Road Transport Administration Department (RTAD) and Myanma Railways (MR). The objectives and policies of each sub sector are described in this Report's relevant Chapters.

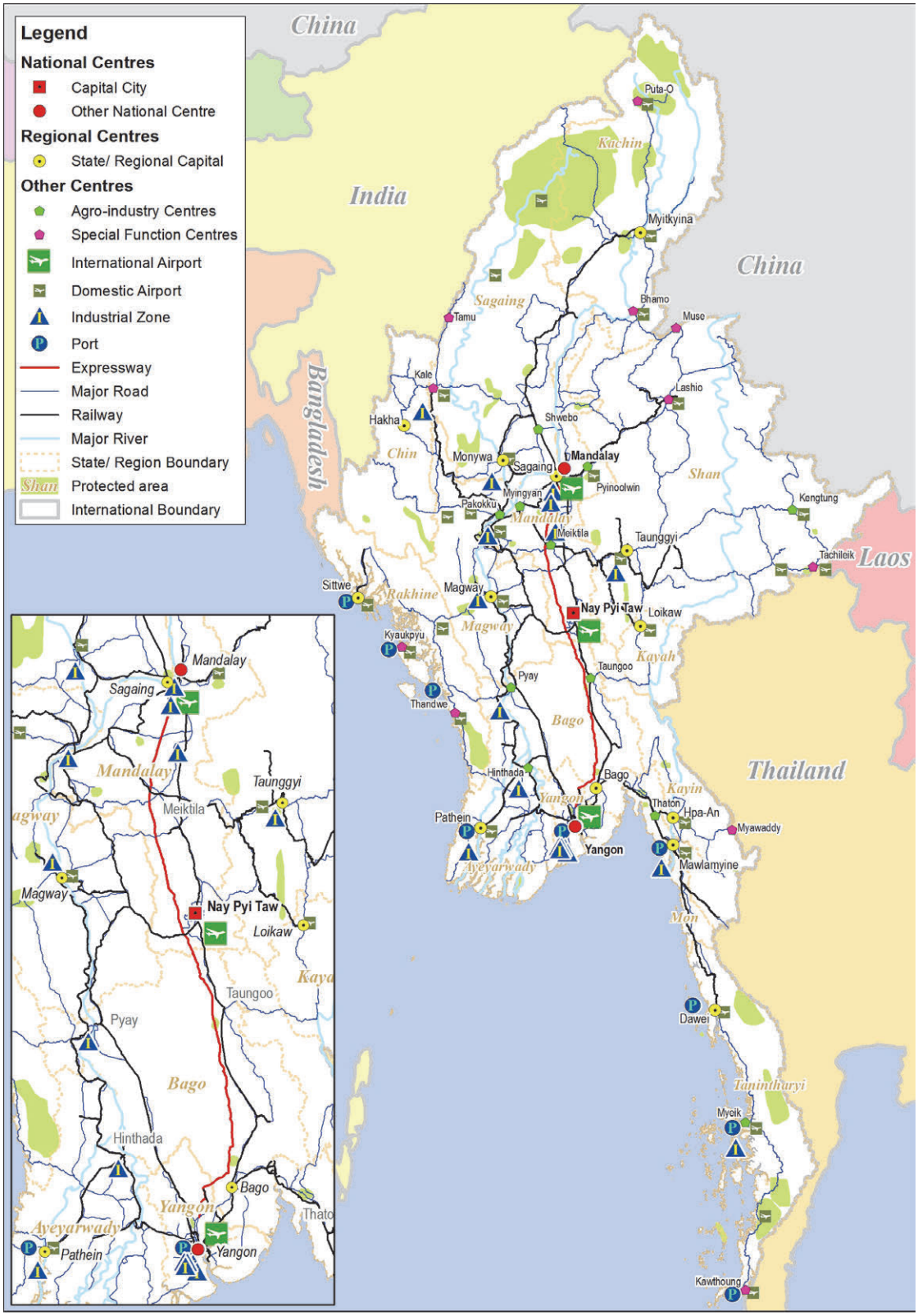
4.5 National Spatial Development Framework

This section summarizes relevant plans, policies and programs of those sectors with an interest in national spatial development planning and transport investment.

4.5.1 Present Development and Urbanization Trends

The Spatial Development Framework should be developed using current conditions and projected social, economic, environmental, etc. changes for the short and medium terms. This includes existing land use and transport developments as well as investments in major projects that are either under construction or committed and programmed by the Government for future implementation. Linked with future growth in population and GDP, these developmental activities will have a major influence on how the urban development pattern of the country will evolve over the next 20 years or so, and the most likely directions of that growth.

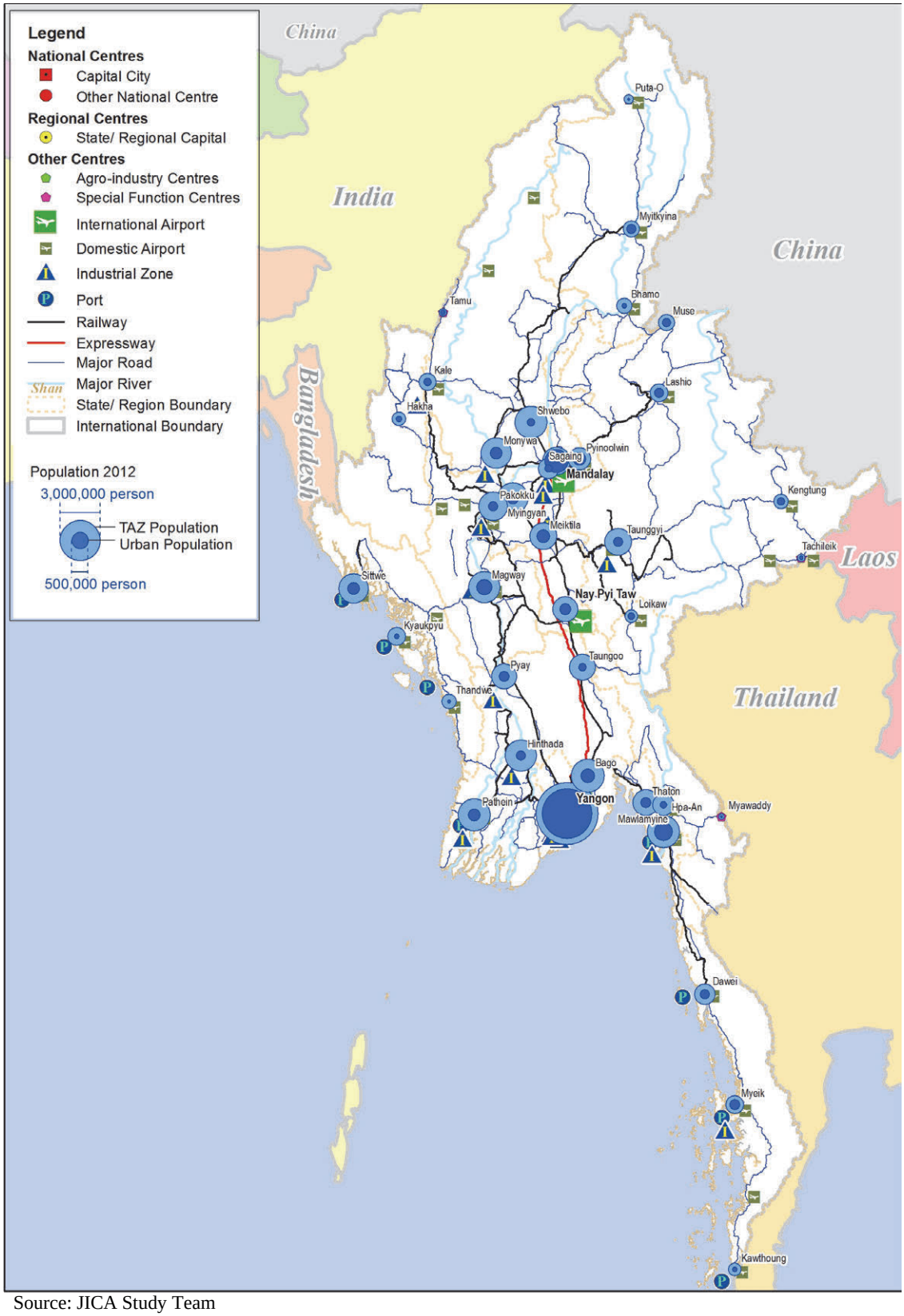
In 2012, Myanmar had an estimated population of 61 million, of which about one third or 20.3 million was urbanized. In general, seven regions in the central core of the country have high population densities, while the seven states that form the border areas are sparsely populated (refer to Figure 4.2, Existing Context).



Source: JICA Study Team

Figure 4.2 Existing Context

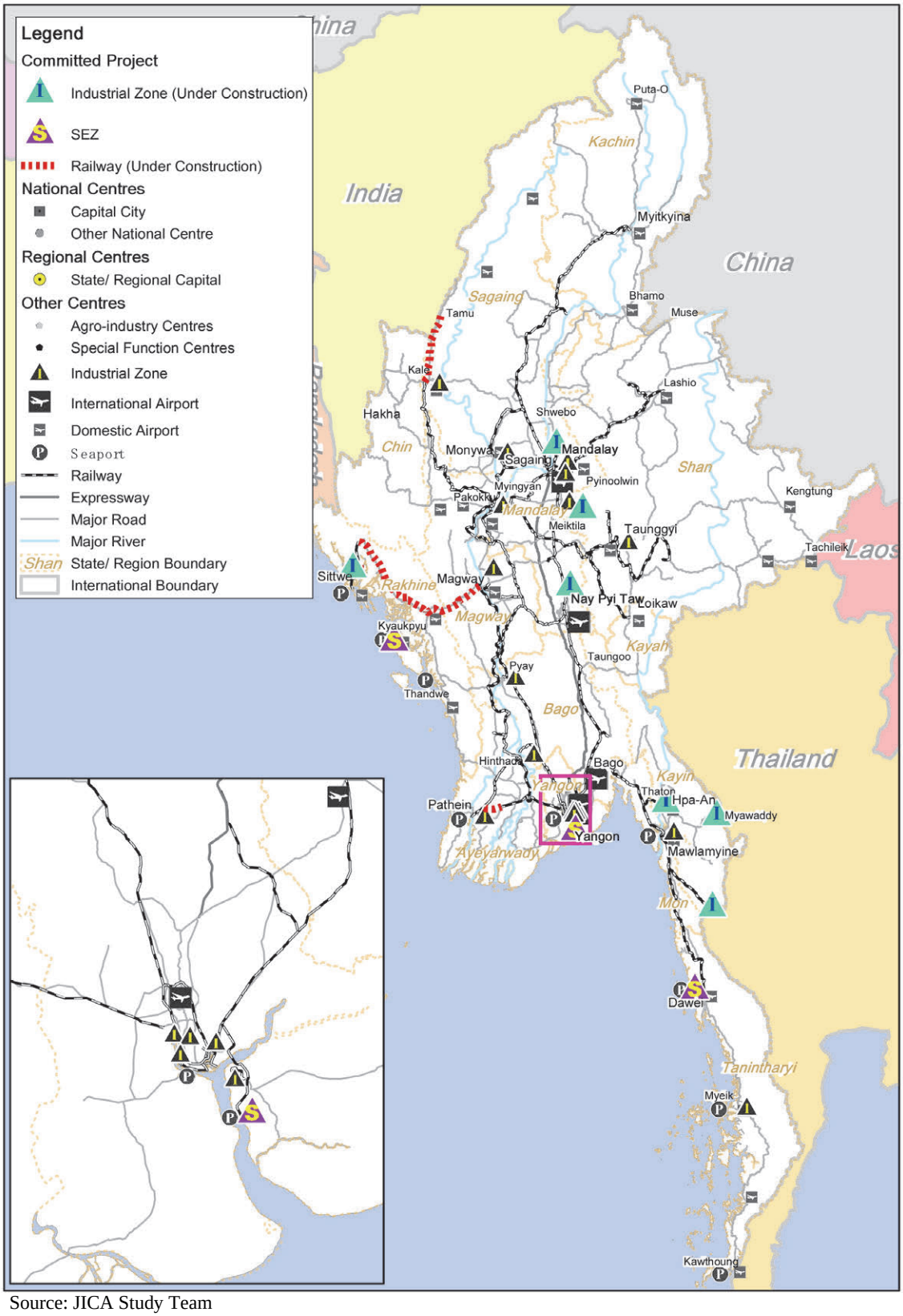
Currently, Yangon city region has a population of about 8.8 million. The Ayeyarwaddy Delta forms its hinterland and accounts for the second largest population (about 14%) in the country. The second largest city is Mandalay with about 1.5 million people. Mandalay is surrounded by the Central Dry Zone (CDZ), comprised of 11 districts within three regions (i.e. Mandalay, Sagaing and Magway) and including about 18% of total population. The country's capital city, Nay Pyi Taw, has an urban population of about 0.4 million and a rural population of 0.7 million. In addition, there are 30 towns with populations over 0.1 million and over 300 smaller towns. On the other hand, the Ayeyarwaddy Delta and CDZ have large numbers of poor. The state of Rakhine, and particularly the northern districts are also densely populated and have a high poverty ratio (refer to Figure 4.3).



Source: JICA Study Team

Figure 4.3 Urban Population 2012

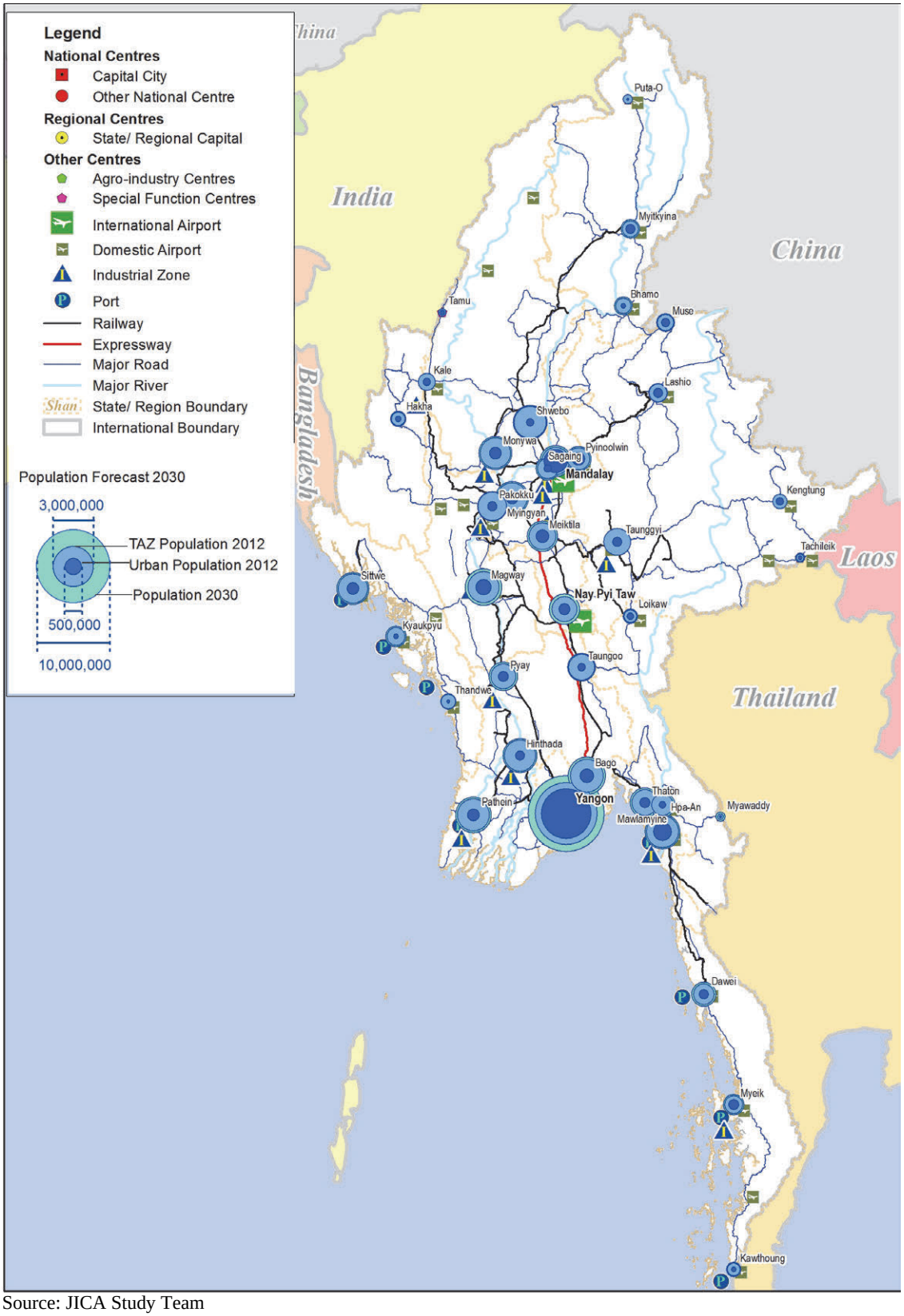
From a strategic development perspective, the Yangon/Mandalay (north-south) transport and development corridor is likely to continue to be an important component of the country's future socio-economic evolution. The further development of specialized administrative and logistic functions and support services at the national capital Nay Pyi Taw will add strength to this developmental axis. However, rapid economic growth resulting from changes in political and economic policies has also led to urbanization pressures and has strained the urban development process, especially around Yangon. In addition, Yangon and Mandalay have the largest industrial sectors in Myanmar with more than 40% of large-scale private factories located in Yangon and a further 21% being located in Mandalay (2009). Combined, these cities contain more than 60% of large private factories in Myanmar. Projects such as the proposed development of Hanthawaddy international airport and the SEZs at Dawei, Kyaukphyu and Thilawa could affect these patterns in selected cities and regions (refer to Figure 4.4).



Source: JICA Study Team

Figure 4.4 Committed Projects 2015

The DHSHD estimates that 37% of Myanmar's 76 million people will live in urban areas by 2030, according to current economic growth rates. Yangon city is forecast to grow from about 5 million to 8 million people by 2030. With a current average household size of 4.7 persons, this growth will require an additional 3.2 million new houses or about 175,000 new units per annum to meet demand. This demand does not include those units likely to be required due to urban regeneration and housing redevelopment/improvement schemes. At the TAZ level, which may be considered equivalent to a city region as it includes both urban and rural areas of each traffic zone, MYT-Plan forecasts indicate that Yangon could reach 12.6 million people by 2030, with Mandalay/Sagaing city region reaching 2.9 million people and Nay Pyi Taw reaching a population of 1.7 million (refer to Figure 4.5).



Source: JICA Study Team

Figure 4.5 Population Forecast 2030

In order to better plan and manage the urban growth in and around Yangon city, the DHSHD has prepared a draft Yangon City Concept Plan (Vision 2040), which describes the city as the economic hub of the country and promotes it as the focus of inland and international ports, as a green and healthy city, as a multi-ethnic city of heritage, culture and tourism and a city of education and knowledge. Building on this Vision, the YCDC is drafting a City Development Concept Plan and Infrastructure Improvement Plan and is preparing a Greater Yangon Strategic Plan, with the support of the DHSHD and JICA. This Plan will embody the principles of comprehensive urban planning, sustainable development of heritage conservation and urban renewal integrated with recreation and green zones and improved infrastructure services.

Similarly, the DHSHD is preparing a Concept plan for the Greater Mandalay Plan to guide future growth in Myanmar's second largest city, in association with the Mandalay CDC. Nay Pyi Taw has a well-developed transport infrastructure system (e.g. major highways, railway and international airport) with considerable spare capacity and is ideally located to absorb and support future Government administrative and specialized commercial and leisure growth opportunities.

In contrast, outside the three large cities, four regions (Yangon, Ayeyarwaddy, Mandalay and Magway) account for more than half of the population who are living in poverty. In these regions, pro-poor policies and activities will need to be promoted to support the growth of agro-industrial and agri-business clusters, for which programs aimed at improving farm to market roads, public health infrastructure programs and inland waterways will need to be prioritized. As such, a key challenge for the preparation and implementation of an effective National Spatial Development Framework and National Transport Plan is to identify the different development potentials of each state, region, major city and town, and match these to the levels of existing and likely future capacity (investment) in strategic transport networks and facilities to ensure an optimum distribution of benefits.

4.5.2 The Draft National Spatial Development Framework (NSDF)

(1) Method Statement

Based on the international, national, regional and city development policies and the transport networks and facilities outlined above, a National Spatial Development Framework (NSDF) has been designed to assist decision-makers to determine priorities for future transport investment. Key building blocks of the Draft NSDF include:

- Synthesis of regional (i.e. international/ASEAN/Asian/GMS) and national transport sector strategies, policies and programs including economic corridors concepts.
- Identification of existing and committed international, national and regional highway/railway corridors and strategic transport facilities (i.e. ports, airports, rail stations and interchanges) within the framework laid down under the item above.
- Identification of specialist centers that exhibit commitment to urbanization and investment in terms of transport networks and facilities. The MYT-Plan reviewed the centers' current and future (year 2030) potential in terms of functions and services, based on population, density criteria and other attributes like proximity to urban centers, ports, airports, railway hubs, industrial zones/SEZs, border towns, tourism hubs.

- Analysis of the centers' role within the Department of Human Settlements and Housing Development's Concentrated Decentralization Strategy and Ministry of National Planning and Economic Development's National Comprehensive Development Plan.

In order to identify how these centers relate to each other in the hierarchy, activity hubs were selected on the basis of four main criteria:

- The estimated population in 2012 in each of 71 urban centers, as defined by the Department of Human Settlements and Housing Development of the Ministry of Construction
- The proportion of the urbanized (urban center) population in each Traffic Analysis Zone (TAZ), as defined by the JICA study team, based on the above DHSHD work
- The predicted (study team) TAZ population in 2030
- The estimated population density in each TAZ in 2030

In addition, two other criteria were taken into account:

- The function of the urban center as a State or Regional Capital
- The attributes of the city/town/center (as outlined above) in relation to its function as a border town, port and/or airport, or railway hub and/or industrial zone/SEZ hub or tourism hub (or having a combination of these)

(2) Hierarchy of Centers

Table 4.2 describes the criteria and results of the urban centers selection process for the NSDF.

Figure 4.6 illustrates the concept of a 4-level centers hierarchy (national, regional, agro-industrial and special function) and the typical range of functions and services they provide or can be expected to provide in the future.

Table 4.2 Selection of Activity Hubs

City/Town Reference Number	Traffic Analysis Zone (TAZ)					Selection Criterion				Criteria Achievement:				
	Name	Reference Number/ Attribute	Population Estimate 2012	Density P/sq.km 2012	Area km2	Urban Pop >100,000 2012	Urban/TAZ Pop>20% 2012	TAZ Pop. >500,000 2030	TAZ Density >75pop/sq.km 2030	4	3	2	1	0
National Centres														
	Yangon N	*47*	*1,937,869*	*417.3*				*3,082,000*						
	Yangon E	*48*	*2,454,529*	*6812.3*				*3,468,000*						
	Yangon S	*49*	*1,568,679*	*331.4*				*2,183,000*						
	Yangon W	*50*	*1,208,735*	*16853.4*				*1,713,000*						
1	Yangon	47-50SAPRIT	7,169,812	730.9	9,809	4,654,126	64.9	10,446,000	1,064.9	Yangon				
2	Mandalay	33SARIT	1,446,957	1584.0	913	1,062,569*	73.4	1,841,000	2,015.3	Mandalay				
3	Nay Pyi Taw	40SARI	1,164,299	164.6	7,072	249,362	21.4	1,684,000	238.1	Nay Pyi Taw				
Regional Centres														
4	Bago	24SR	2,112,954	158.8	13,308	362,922*	17.2	2,592,000	194.8		Bago			
5	Hpa-an	7SAI	915,953	126.1	7,262	92,333	10.1	1,172,000	161.3			Hpa-an		
6	Taunggyi"	51SI	1,401,821	57.9	24,232	161,668*	11.5	1,336,000	55.1			Taunggyi/Kalaw		
7	Sittwe	43SAP	1,611,505	141.0	11,426	281,367*	17.5	1,888,000	165.2		Sittwe			
8	Myitkyina	1SAR	523,072	14.9	35,165	157,170	30.1	677,000	19.3		Myitkyina			
9	Dawei	21SAPIT	811,093	58.3	13,901	154,655	19.1	1,105,000	79.5		Dawei			
10	Mawlamyine	41SAPRI	1,941,904	317.3	6,120	641,326*	33.0	2,231,000	364.5	Mawlamyine				
11	Pathein	64SAPRI	1,950,863	186.6	10,455	254,553	13.1	2,349,000	224.7		Pathein			
12	Loikaw	5SA	308,972	46.8	6,603	93,808	30.4	392,000	59.4				Loikaw	
13	Magway	28SA	1,892,467	195.8	9,663	450,509*	23.8	2,451,000	253.6	Magway				
14	Falam^	11S	337,841	20.8	16,271	62,808*	18.6	420,000	25.8					Falam/Hakha
15	Sagaing	13S	784,548	320.0	2,452	105,082	13.4	1,005,000	409.9		Sagaing			
Agro-industry Centres														
16	Monywa	15SAI	1,780,212	176.9	10,061	276,902	15.6	2,025,000	201.3		Monywa			
17	Pyinoolwin	34	946,936	113.2	8,367	323,109*	34.1	1,138,000	136.0	Pyinoolwin				
18	Meiktila	39I	1,375,698	237.7	5,789	313,646*	22.8	1,674,000	289.2	Meiktila				
19	Pakokku	31ARI	1,559,972	187.7	8,310	155,209	9.9	1,638,000	197.1		Pakokku			
20	Pyay	26I	1,228,977	161.3	7,617	187,507	15.3	1,525,000	200.2		Pyay			
21	Myingyan	36I	1,732,053	266.1	6,508	282,240*	16.3	2,017,000	309.9	Myingyan inc. Bagan				
22	Hinthada	65RI	1,814,695	259.0	7,007	166,225	9.2	2,127,000	303.6		Hinthada			
23	Shwebo	14	1,903,318	128.8	14,871	118,659	6.2	2,190,000	147.3		Shwebo			
24	Taungoo	25R	1,266,025	118.6	10,678	104,546	8.3	1,394,000	130.5		Taungoo			
25	Thaton	42	1,251,166	241.6	5,179	205,512*	16.4	1,615,000	311.8		Thaton			
26	Kale	17ABRI	547,515	63.5	8,625	119,676	21.85	438,000	50.8			Kale		
27	Lashio	54AR	633,971	49.0	12,946	182,482	28.78	674,000	52.1		Lashio			
Special Function Centres														
28	Kengtung	60A	427,846	39.6	10,803	111,494	26.1	406,000	37.6			Kengtung		
29	Myeik	22API	622,737	14.5	42,936	196,062	31.5	802,000	18.7		Myeik			
30	Bhamo	3B	439,870	40.5	10,864	44,719	10.2	580,000	53.4				Bhamo	
31	Puta-o	4AB	165,545	5.9	27,865	12,707	7.7	155,000	5.6					Puta-o
32	Myawaddy	8BI	63,671	20.1	3,165	14,214	22.32	166,000	52.4				Myawaddy	
33	Tamu	18B	102,050	52.3	1,951	41,910	41.07	86,000	44.1				Tamu	
34	Kawthoung	23ABP	321,428	25.9	12,424	53,862	16.8	394,000	31.7					Kawthoung
35	Kyaukpyu	45API	593,287	65.2	9,106	41,406	6.98	811,000	89.1			Kyaukpyu		
36	Thandwe	46APT	398,577	37.8	10,540	26,043	6.53	442,000	41.9					Thandwe
37	Muse	55B	486,384	65.2	7,456	140,913*	28.97	644,000	86.4	Muse				
38	Tachileik	62AB	105,251	26.5	3,968	31,523	29.95	173,000	43.6				Tachileik	
39	Nyaung-U^^	37ART	369,983	253.6	1,459	63,318	17.11	293,000	200.8				Nyaung-U	

Notes: * TAZ includes population in adjacent Townships; " TAZ includes Kalaw; ^ TAZ includes Hakha; ^^TAZ includes Bagan

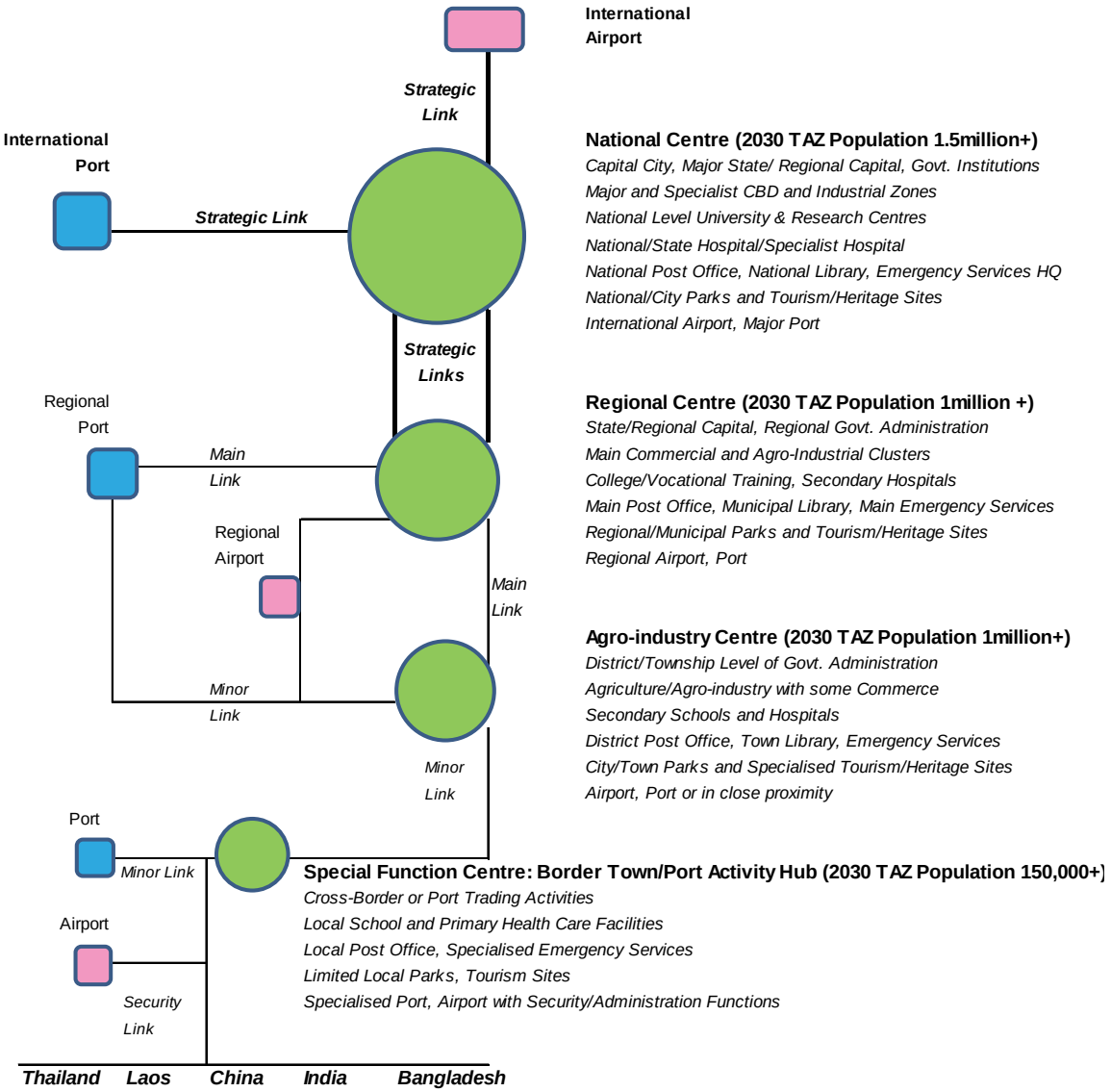
Attribute: A: Airport; B: Border Town; P: Port; ; R: Railway Hub; S: State/Regional Capital; I: Industrial Zone/SEZ; T: Tourism Hub

Sources: Ministry of Construction, Department of Human Settlements and Housing Development, 2013

Ministry of National Planning and Economic Development, Central Statistical Organization, 2012

Consultant's Estimates, 2013

Source: JICA Study Team



Notes:
General Priority for Transport Network Investment: 1. Strategic Link, 2. Main Link, 3. Minor Link
Security Link will normally take precedence

Source: JICA Study Team

Figure 4.6 Hierarchy of Centers Concept

At the primary level in the hierarchy are the national strategic centers Yangon, Mandalay and Nay Pyi Taw where major concentrations of population, economic activity and transport investment already exist and where future investment to increase capacity in highways, railways, ports and airports is being committed or planned. These centers also provide strategic locations for identifiable commercial zones or CBDs and separate clusters of industrial activities with potential for the establishment of SEZs to attract FDI. They are also the prime centers of national Government administration institutions, national universities and hospitals and research centers. In the case of Yangon and Mandalay, they perform a role as tourism hubs both for their regions and for the south and north of the country as a whole, supported by national/city parks,

heritage sites and international airports and ports.

At the secondary level are the regional cities that have grown up at strategic locations where the inter-connection of highways, railways and/or rivers has formed important transport activity nodes. In these centers, clusters of commercial and industrial activities are found, and state/regional-level government administration, education and health, and other social and emergency services provided. In some locations regional tourism and heritage sites are located nearby and regional airports and ports have been developed to serve the wider area.

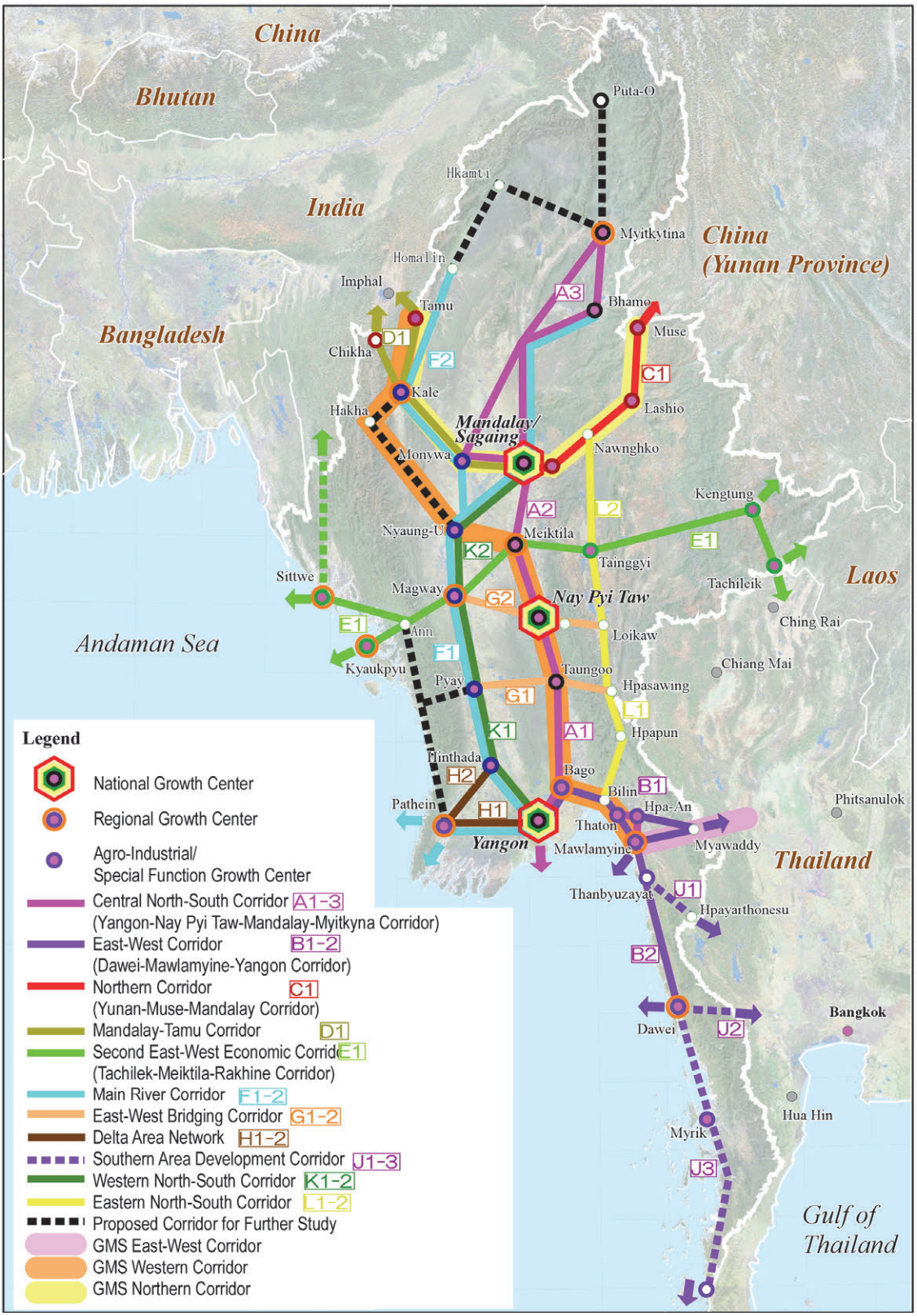
At the tertiary level there are major concentrations of population and agro-industrial activities that provide services for their mainly rural and agricultural catchments. Commercial activities are often related to the agricultural economic base of the area. Local markets for farm produce, livestock and agri-businesses as well as small scale repair and maintenance workshops including for farm vehicles and equipment are clustered in these locations. District and township level administrative functions and services are provided and lower levels of health and education, and social and community services and facilities are being supplied with support from the national and regional governments. In some small airports, these centers support the provision of Government and business services to the local community.

At the lowest level in the centers' hierarchy are border towns and other special function settlements that provide a more localized or specialized function because of their particular location at the national/international border or because they have grown up around a domestic port or other transport hub. Some specialized administrative and security/emergency services are provided depending on the particular function of the center. These specialized centers and port towns have often evolved in response to Government investments in infrastructure (e.g. port or handling equipment improvements or dredging), as well as cross-border trading conditions and market demand from neighboring countries.

These centers vary in size depending on their historical roles and the level of Government and private sector investment in specialized facilities and services, including activities that are based on agricultural and agro-industrial products being moved around and in and out of the country. Some Government social and community services are provided but typically, they lack a full range of facilities, due to their specialized functions and predominant workforce-based demographic and economic profile.

(3) National Spatial Development Framework Map

Figure 4.7 illustrates the centers and the hierarchy of strategic linkages that provide a focus for prioritizing future transport sector investments and the foundation for the 2030 National Spatial Development Framework.



Source: JICA Study Team

Figure 4.7 Selected Centers and Related Hierarchy of Strategic Linkages

The NSDF incorporates strategic activity hubs, based on nationally-important cities, regional/state capital cities and other main urban centers/concentrations of population and economic activity such as industrial zones and Special Economic Zones (SEZs), agro-industrial based centers. Other key cities/towns that provide more specialized functions (e.g. port activities, rail transport hubs, airports and national/international tourism hubs, and/or important border trade towns) are also identified.

The NSDF also includes strategic transportation networks, including ASEAN/trans-national highway and railway corridors, Asian Highways, Myanmar national expressways and other major roads, railways and major rivers with an inland waterway function, which are required to underpin and strengthen the transport (and thereby economic) linkages between the strategic activity hubs. The major constraints for development include environmentally-sensitive areas, such as protected wildlife sanctuaries and national parks, and protected state and other forest zones.

In relation to the above key activity hubs and main transport networks/interchanges and facilities, future major land use development should be guided and encouraged, and permit applications for a mix of uses. This includes Transit Oriented Development (TOD), which should be permitted to capitalize on available or committed transport systems and infrastructure capacity. In this context, Figure 4.8 shows that about 65.7 million population (urban = 30.1 million, rural = 35.6 million) is likely to benefit from improved accessibility as a result of further transport investments in the strategic corridors over the next 20 years or so (refer to

In relation to the strategic environmental constraint and vulnerability areas suggested by the suitability analysis, major new land use and transport development should not be encouraged and new projects should not normally be permitted, unless these are in the national interest.

The National Spatial Development Framework (the balanced mix of economic activity hubs, strategic transport networks and facilities and major environmental protected areas) can therefore provide a useful and robust tool that will assist decision-makers in determining priorities for future transport investment decisions.

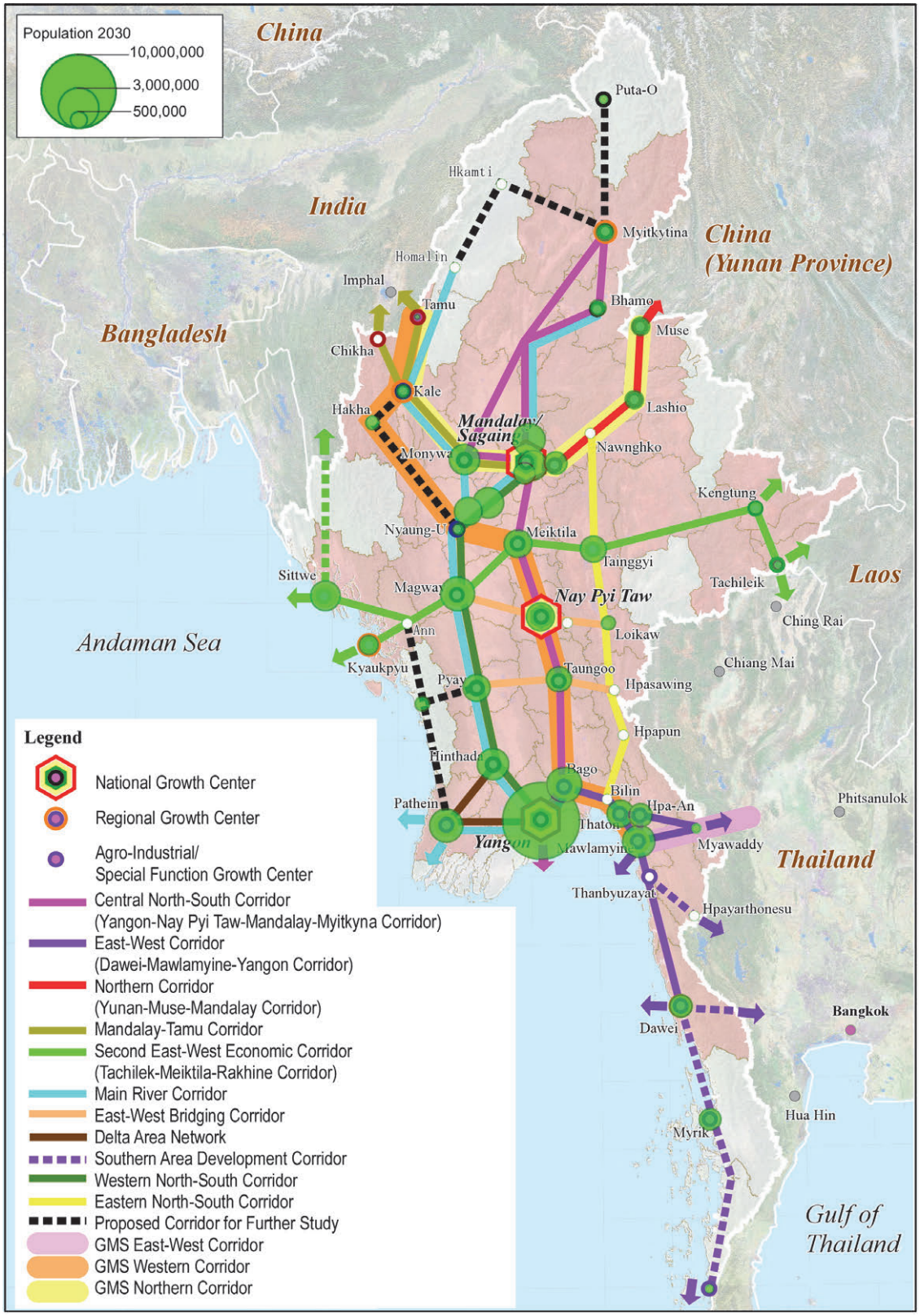


Figure 4.8 Populations with Access to Strategic Corridors, 2030

Chapter 5 Institutional Framework

This Chapter describes Myanmar's institutional framework and relevant government authorities for the transport sector. The organizational structure, functions and policies of each Department are listed. While the MYT-Plan recommends policies, strategies and actions to improve sector performance, it does not propose institutional changes to existing government organizations.

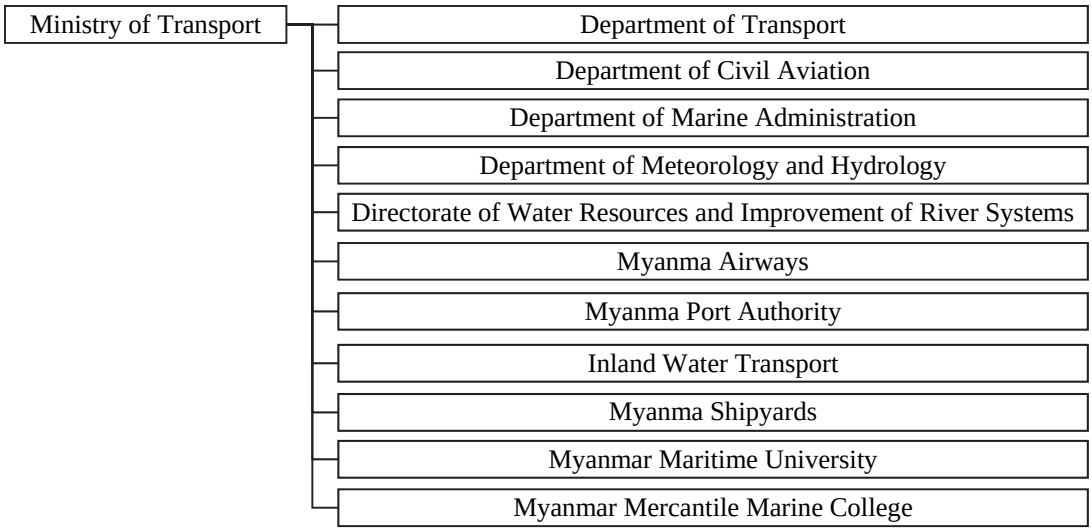
There are three ministries that are responsible for the development of major transport infrastructure, namely:

- The Ministry of Transport (MOT)
- The Ministry of Rail Transportation (MRT)
- The Ministry of Construction (MOC)

5.1 Ministry of Transport

Departments and organizations under the Ministry of Transport (MOT) include:

- Department of Transport (DOT)
- Department of Civil Aviation (DCA)
- Department of Marine Administration (DMA)
- Department of Meteorology and Hydrology (DMH)
- Department of Water Resources and Improvement of River System (DWIR)
- Myanma Airways (MA)
- Myanma Port Authority (MPA)
- Inland Water Transport (IWT)
- Myanma Shipyards (MS)
- Myanma Maritime University (MMU)
- Myanmar Mercantile Marine College (MMMC)



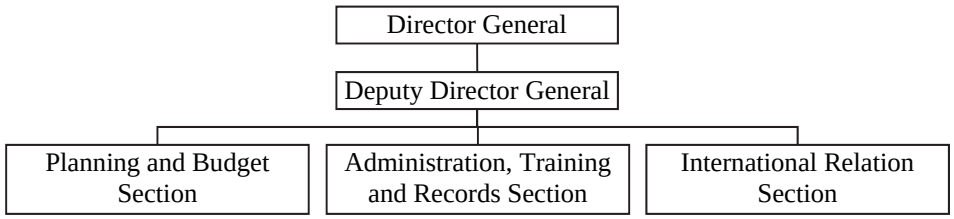
Source: MOT

Figure 5.1 Organization of MOT

5.1.1 Department of Transport (DoT)

1) Organization

The organizational structure of the Department of Transport is shown in Figure 5.2, below.



Source: MOT

Figure 5.2 Organization of DOT

2) Objectives

- To formulate transport policies and monitor the impacts of policy initiatives
- To ensure that approved transport policies are reflected in the laws and regulations governing the sector
- To monitor transport costs, prices and the efficiency of the transport system
- To cooperate in the development of action plans of international and regional organizations (eg. ASEAN, BIMSTEC, ACMECS, GMS)
- To promote efficient human resources development, related to the transport sector

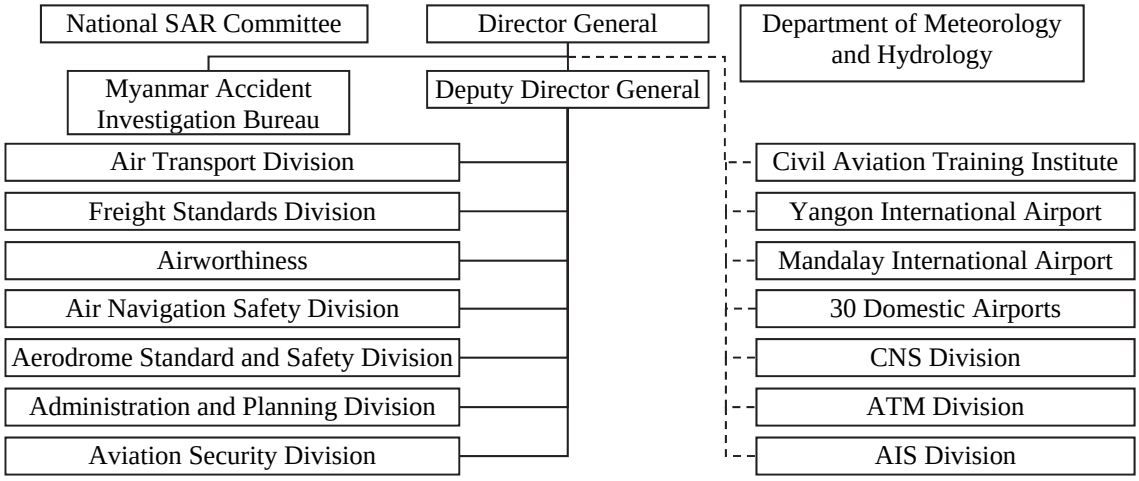
3) Functions

- Establishing high reporting standards for the implementation of long and short term plans, undertaken by the Departments and Enterprises sections, under the Ministry
- Monitoring Ministry GDP growth rates, which are estimated by the states
- Scrutinizing projects financed by foreign loans and the foreign exchange income of transport Departments and Enterprises
- Consulting the administration and archives of Departments, Enterprises, Universities and Institutes, under the Ministry of Transport
- Assuming responsibility to cooperate with international and regional organizations for all action plans in the transport sector

5.1.2 Department of Civil Aviation (DCA)

1) Organization

The organizational structure of the Department of Civil Aviation is shown in Figure 5.3, below.



Source: MOT

Figure 5.3 Organization of DCA

2) Policies

The Department of Civil Aviation's mandate is to ensure the safe, smooth and secure operation of domestic and international air transport, in compliance with the rules and procedures of Myanmar's Aircraft Act and the standards and recommended practices of the ICAO. The DCA undertakes its functions according to the following policies:

- Safe operation
- Regular flights
- Economical operation
- Efficient operation
- Secure operation

3) Services

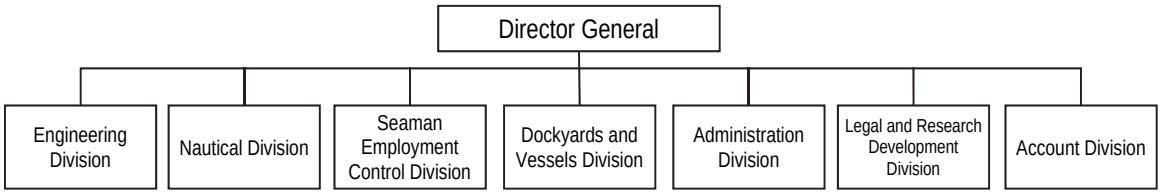
- Air traffic services
- Communication and radio navigation facilities
- Licensing of pilots and aircraft maintenance engineers and flight checks
- Construction, maintenance and management of airports
- Airworthiness control
- Issuing permits and licenses to domestic and international airlines
- Concludes bilateral air agreements
- Relations with ICAO and other international organizations
- Training of civil aviation personnel

5.1.3 Department of Marine Administration (DMA)

1) Organization

The Department of Marine Administration includes seven administrative sub-divisions, as follows:

- Engineering Division
- Nautical Division
- Seaman Employment Control Division
- Dockyards and Vessels Division
- Administration Division
- Legal and Research Development Division
- Account Division



Source: MOT

Figure 5.4 Organization of DMA

2) Policies

- To ensure that national ships conform to safety standards, safe practices and standards of competence for their marine personnel
- To promote human resources development, manpower planning and the optimum utilization of such manpower, in the maritime sector

- To improve the safety record of vessels registered in Myanmar
- To improve life saving efforts for those in distress at sea and protect the marine environment

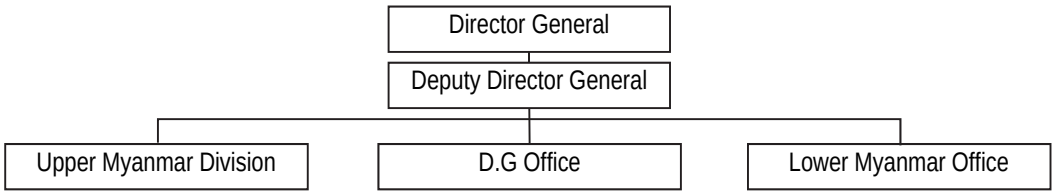
3) Functions

- Advise authorities on the implementation of updated conventions and codes concerning maritime affairs
- Registration of inland powered vessels
- Examine and register all types of new powered vessels
- Conduct examinations and issue certificates of competency for Deck Officers and Engineer Officers
- Conduct examinations and issue certificates of competency for coastal and inland Masters, Mates, Chief Engineers and Engine Drivers
- Inspect inland powered vessels (cargo, fishing and schooner) and issue penalties and fines for vessels that contravene rules and regulations, as prescribed by the Inland Steam-vessels Act
- Investigate accidents when they arise, such as collisions in waterways
- Recruit and train new seafarers and issue certificates of competency, exemptions, clearance and registration
- Ensure the rights and welfare of seaman are respected
- Arrange bareboat charters to increase foreign investment

5.1.4 Department of Meteorology and Hydrology (DMH)

1) Organization

The organizational structure of the Department of Meteorology and Hydrology is shown Figure 5.5, below.



Source: MOT

Figure 5.5 Organization of DMH

2) Objectives

- To take precautionary measures against and to minimize the effects of natural disasters
- To promote safety, comfort, efficiency and regularity of air, land (rail and road), sea and inland water transportation

- To promote agriculture and food production
- To assist in all national projects
- To support environmental protection and the sustainable production of natural resources
- To undertake international collaboration in the fields of research and public awareness and education on various aspects of meteorology, hydrology and seismology

3) Services

- Meteorological services to the aviation sector
- Meteorological and hydrological services for shipping and inland water transport
- Meteorological services to the agricultural sector
- Hydrological services
- Seismological services
- Provide lectures for:

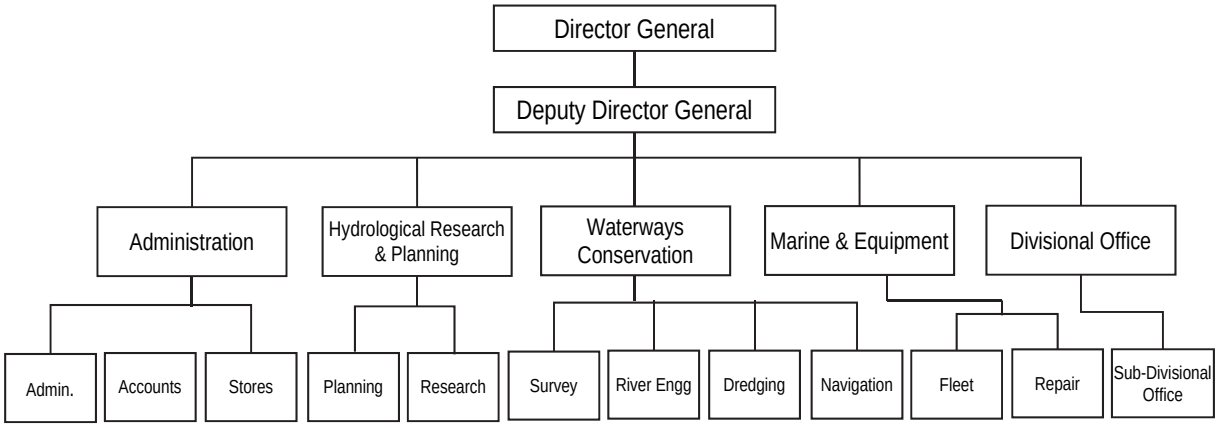
- Defense Service Technical Academy
- Myanmar Maritime University
- Institute of Marine Technology
- Military Meteorological Unit
- Air Traffic Controller Course
- Air Transport Pilot License Course
- Departmental Training Courses
- Natural Disaster Prevention Course

Since the 1993-94 academic year, DMH had offered degrees of B.Sc.(Honors) Meteorology and B.Sc.(Honors) Hydrology to university honors students, in collaboration with Yangon and Dagon Universities.

5.1.5 Directorate of Water Resources and Improvement of River System (DWIR)

1) Organization

The organizational structure of the Directorate of Water Resources and Improvement of River System is shown Figure 5.6, below.



Source: MOT

Figure 5.6 Organization of DWIR

2) Objectives

- To improve navigation channels and stabilize inland river ports
- To protect against riverbank erosion
- To cooperate with other organizations in the demarcation of dangerous water levels
- To utilize the river water year round for domestic and agricultural purposes
- To protect border rivers against bank erosion
- To preserve long-term performance of cross-river bridges, from a river engineering point of view
- To manage activities that prevent river water pollution
- To ensure adequate water depth to maximize vessel loading capacity

3) Functions

a) Hydrographic Survey Section

- Channel surveying and mapping
- Surveying and technical advice for waterways adjacent to cross-river bridges
- Engineering and technical advice for the construction of cross-river bridges

b) River Engineering Section

- Construction of river training structures to achieve adequate water depth
- River bank protection
- River training and bank stabilization for the long-term performance of cross-river bridges
- Bank protection of border rivers

- Utilize the river water year round for agricultural purposes

c) Dredging Section

- Dredging, where river water flow is constrained
- Bend cutting for improvement of waterways and erosion protection
- Dredging to improve approach channels for pump irrigation
- Dredging for new navigation channels

d) Navigation Selection

- Provision of navigation aids
- Promulgation of navigation warning
- Snag removing
- Monitoring and marking of approach channels for cross-river bridges, according to seasonal changes
- Administration of Twantay canal navigation

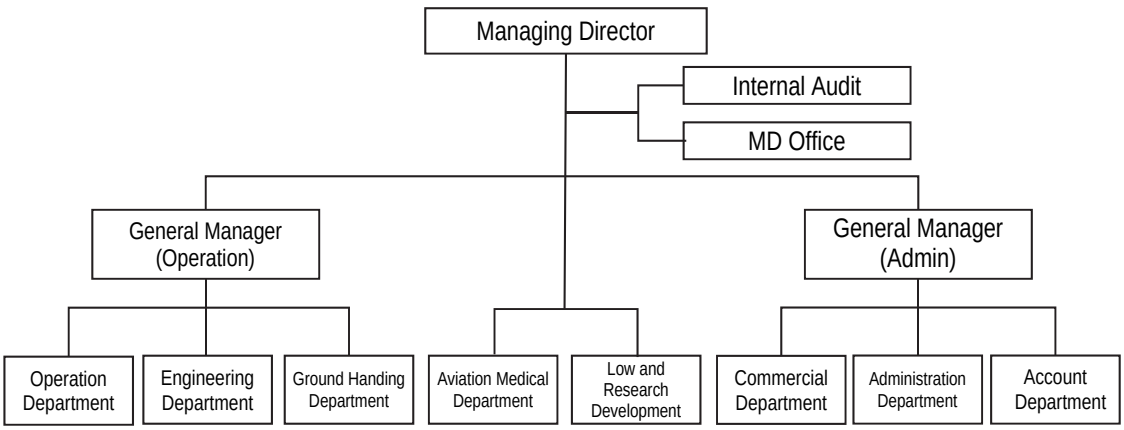
e) Hydrological Research and Planning Department

- Establish data banks to support river training works
- Predict Least Available Depth, along the inland rivers
- Execute research for river training activities
- Monitor environmental impact of changes in water quantity and quality
- Develop yearly, monthly and daily data for water level hydrographic envelopes

5.1.6 Myanma Airways (MA)

1) Organization

The organizational structure of Myanma Airways is shown Figure 5.7, below.



Source: MOT

Figure 5.7 Organization of MA

2) Services

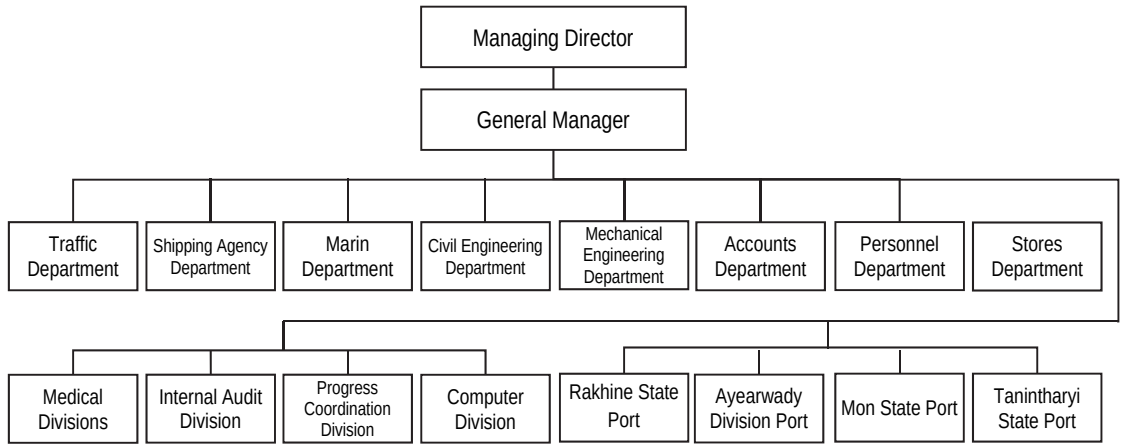
In 1948, the "Union of Burma Airways" was established and began to fly domestic scheduled services. The airline was reformed as a board under the Union of Burma Airways Acts of 1952. In 1972 the airline was again reorganized as "Burma Airways Corporation". In 1989, when Burma was officially renamed Myanmar, the airline was retitled “Myanma Airways”. The airline operated international scheduled flights from 1950 until 1993, when Myanmar Airways International Co. Ltd. was created by a joint venture between MA and a foreign investor. Currently, the airline operates domestic service only; its main base is Yangon International Airport.

The MOT intends to privatize MA step by step; the next step toward privatization would see Myanma Airways become a corporate unit.

5.1.7 Myanma Port Authority (MPA)

1) Organization

The organizational structure of the Myanma Port Authority is shown Figure 5.8, below.



Source: MPA

Figure 5.8 Organization of MPA

2) Objectives

To provide required services (loading, discharging, storage of cargo, receipt and delivery of transit cargo, etc.) for vessels calling to all ports on Myanmar, within a minimum turn around time.

3) Functions

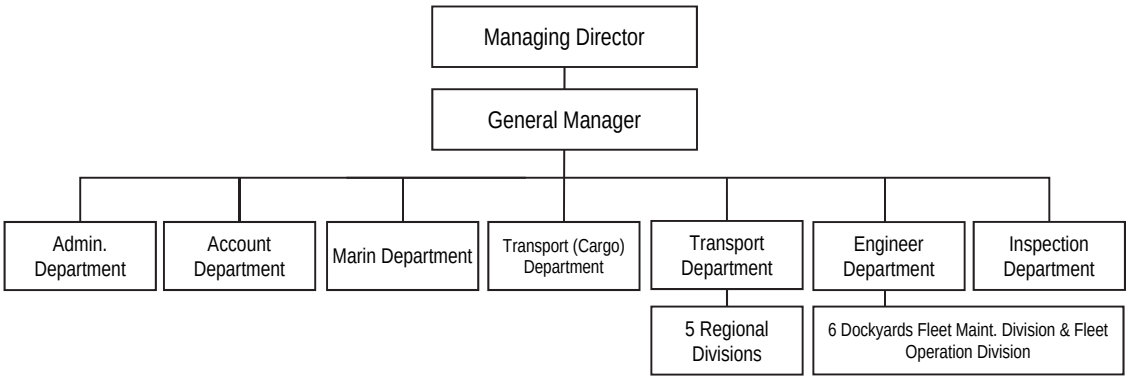
- Pilotage
- Container and General Cargo Handling and Storage
- Diving Service
- Tug Service
- Shipping Agency Service
- Fire Fighting

- Port Security
- Fresh Water Supply
- Ship Repairs

5.1.8 Inland Water Transport (IWT)

1) Organization

The organizational structure of Inland Water Transport is shown Figure 5.9, below.



Source: IWT

Figure 5.9 Organization of IWT

2) Responsibility

- Provide public passenger and cargo transport services using domestic inland waterways
- Own, maintain and repair ships for inland water transport
- Own, operate and maintain public shipyards

5.1.9 Myanma Shipyards (MS)

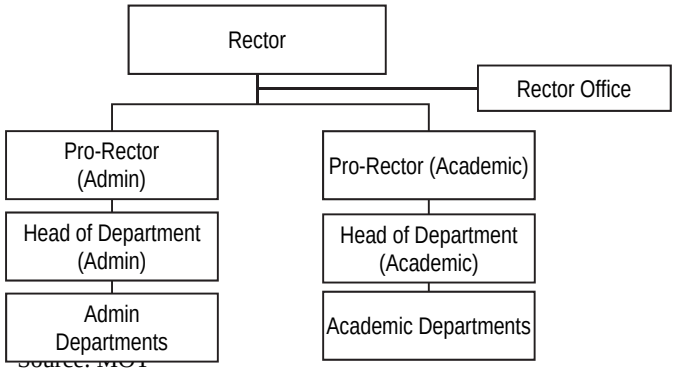
1) Functions

MS is capable of building seagoing, coastal and inland water vessels of up to 2,000 tons dwt, in accord with international classifications. MS is capable of repairing seagoing, coastal and inland water vessels of up to 12,000 dwt in their slipway yard and a newly built dry dock. MS has facilities capable of machining steel up to 40 ft. long and 10 ft. in diameter and casting steel up to 2 tons melt weight.

5.1.10 Myanma Maritime University (MMU)

1) Organization

The organizational structure of Myanma Maritime University is shown Figure 5.10, below.



Source: MOT

Figure 5.10 Organization of MMU

2) Objectives

The aims of the University are as follows:

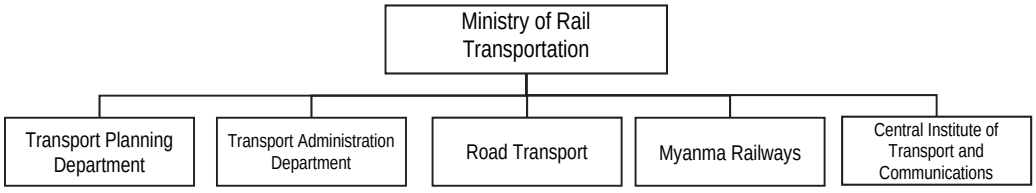
- To contribute towards modernization and development of the State, by the maritime industry
- To nurture the ethical, skillful and reputable maritime experts
- To teach science and technology contributing to the maritime profession
- To make plans and arrangements for the perpetual development of the maritime industry
- To know and comply with the provisions and standards prescribed by the International Maritime Organization
- To carry out necessary research for the development of the maritime industry

The goals of MMU are to use a scientific and practical approach as follows:

- Develop a Comprehensive Maritime Education System for the nation
- Establish an effective Maritime Education and Training program for the international maritime community
- Prepare and develop a clear link between practical skills and management techniques

5.2 Ministry of Rail Transportation

Ministry of Rail Transportation (MRT) includes five departments, as shown in Figure 5.11, below.



Source: MRT

Figure 5.11 Organization chart of Ministry of Rail Transportation

5.2.1 Transport Planning Department (TPD)

1) Objectives and Duties

- To scrutinize plans, budgets and financial affairs of organizations under the Ministry of Rail Transportation and to compile and prepare summaries for the Ministry
- To coordinate the transportation of cargo
- To inspect operational accounts and social welfare works of departments and organizations under the guidance of the Minister
- To act as the focal point for implementing the tasks of ASEAN, Greater Mekong Subregion (GMS), and the BIMST-EC land transport activities, such as the ASEAN Framework Agreement on the Facilitation of Goods in Transit, the Agreement on Inter-State Transport and GMS Cross-Border Agreements

2) Responsibility

- To coordinate and arrange the transportation of State and cooperative goods, etc. with State, cooperative and privately-owned vehicles
- To coordinate and arrange the smooth flow of passenger transport, in accordance with relevant authorities

5.2.2 Road Transport Administration Department (RTAD)

1) Responsibilities

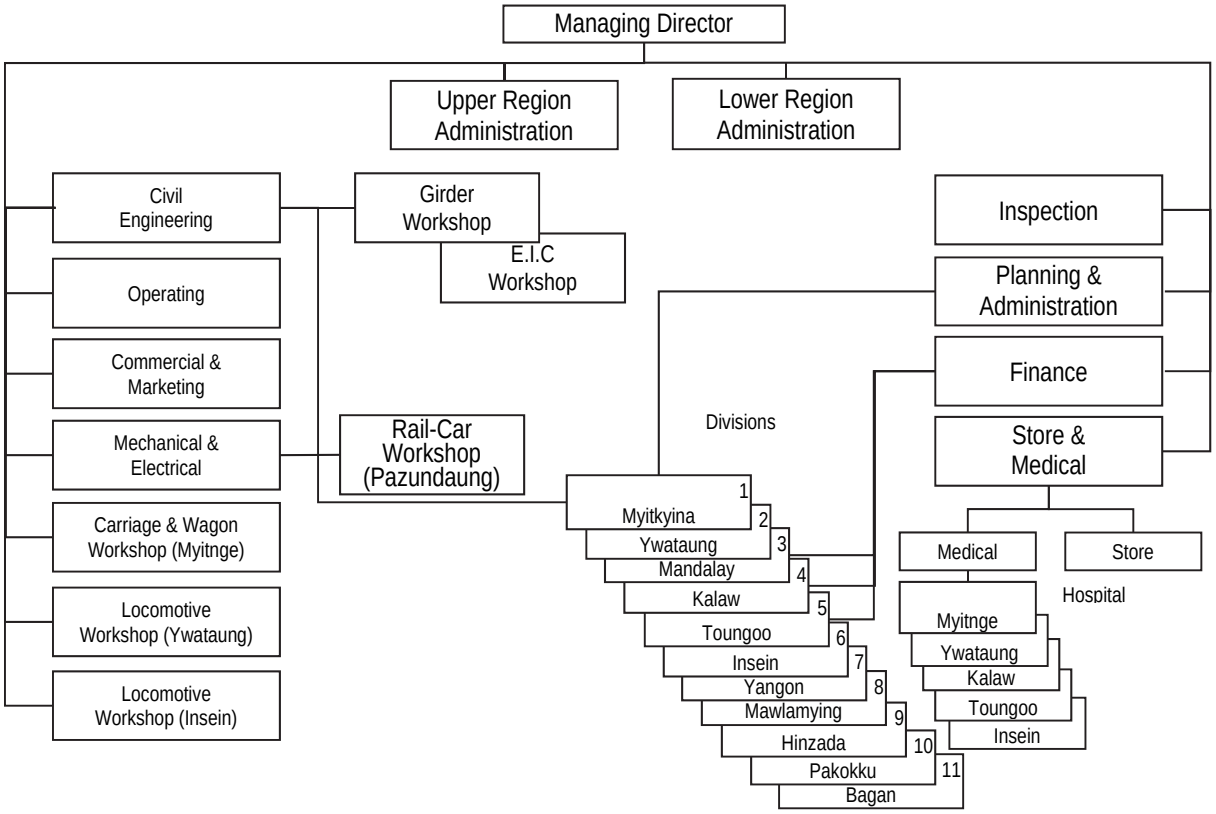
The four main responsibilities of the Road Transport Administration Department are as follows:

- Vehicle inspection and registration for road worthiness, in accordance with the laws and regulations
- Driving tests and issuing of driving licenses, in accordance with the laws and regulations
- Issuing road user traffic regulations for road safety measures
- Levying taxes and revenues for the State, in accordance with laws and regulations

5.2.3 Myanma Railways (MR)

1) Organization

The organizational structure of Myanma Railways is shown Figure 5.12, below.



Source: Facts about Myanma Railways

Figure 5.12 Organization of MR

5.3 Road Transport

1) Responsibility

- Ensure open competition, prevent the development of monopoly situations and develop adequate safety policies
- Provide transport services dutifully to safeguard the sovereignty of the State, border area development, State-run development projects, State-sponsored ceremonies and other transport services as required by the State
- Participate in the domestic production of motor vehicles, spare parts and major-repair of the MR fleet

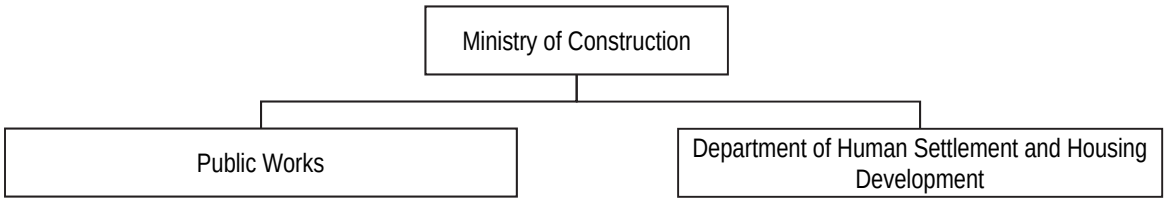
5.4 Central Institute of Transport and Communications

The Central Institute of Transport and Communications provides training and certification for officials and service staff from the Departments and Corporations under the Ministry of Rail Transportation, such as: Myanma Railways, the Road Transport Corporation, the Department of Transportation (Plan), the Department of Transportation and Communications and the Central Institute of Transport and Communications. Training courses are conducted to fulfil the following objectives:

- To train service personnel to be skilled in their trades, in accordance with the procedures in their Manuals, and to keep abreast of modern techniques
- To train service personnel to be skilled in management and to make use of their abilities in the performance of their duties
- To nurture the transport sector's human resources so that they will be able to raise the standard of their all-round transportation tasks.

5.5 Ministry of Construction

The organizational structure of the Ministry of Construction is shown Figure 5.13, below.



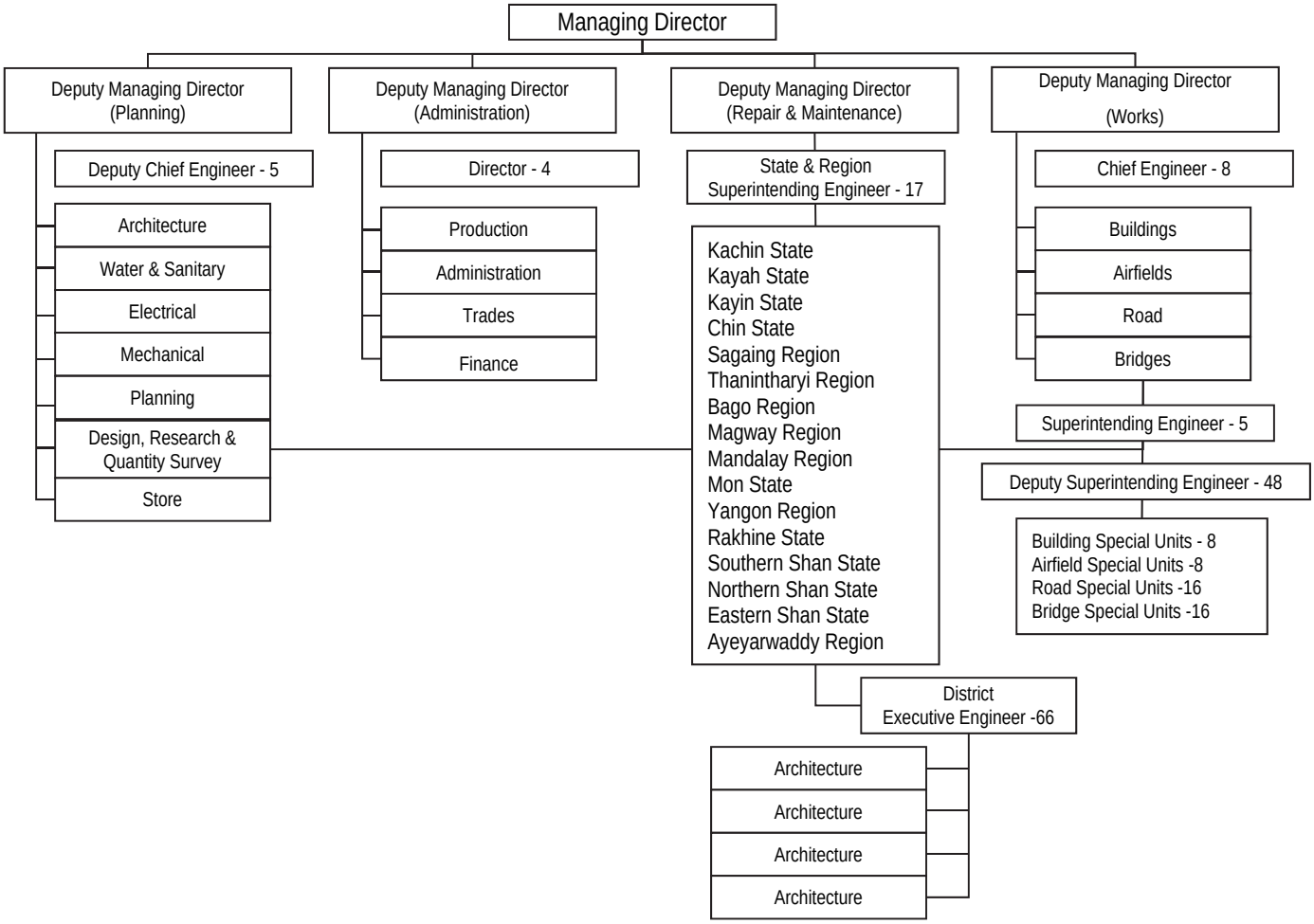
Source: MOC

Figure 5.13 Organization of MOC

5.5.1 Public Works

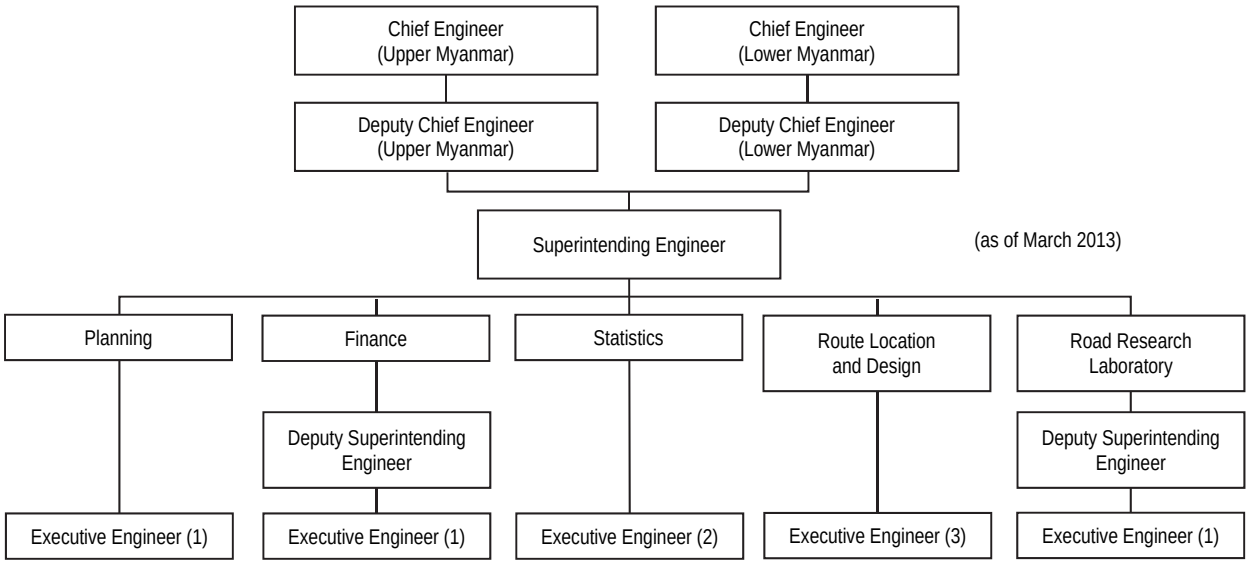
Public Works (PW), which was established in 1965 and is governed together with Department of Human Settlement and Housing Development (DHSHD) under the Ministry of Construction (MOC), is the main organization that administers road and bridge operations and developments in Myanmar. PW has its headquarters in Nay Pyi Taw and regional offices in each State and Region. The Department consists of four sections: planning, administration, maintenance and works and employs more than 23,000 staff, including 16,000 engineers and skilled technicians. PW is managed by a management board that is chaired by a Managing Director, in collaboration with three Deputy Managing Directors. There are eight Chief Engineers and five Deputy Chief Engineers who operate the divisions at headquarter level. There are also four supporting divisions headed by four Directors, who are non-technical senior administrative officers.

Unlike other developed countries, subcontracting the private sector to design and construct transportation infrastructure is not common practice in Myanmar, with most design, cost estimate and construction of roads and bridges executed by PW. PW's construction works follow the annual construction plan and are carried out by special units deployed in the regions that include mechanical units that provide equipment for each construction project. The regional office has the responsibility for maintenance of the national and regional road and bridge network. The regional government assumes the cost of maintenance work for regional roads. Materials and equipment distributed to each construction unit and regional office is based on the annual implementation plan, established by the central government. The Road Research Laboratory (RRL) and Soil Research Laboratory (SRL) located in Yangon have responsible for material tests and borehole investigations.



Source: Department of Public Works, Ministry of Construction (MOC)

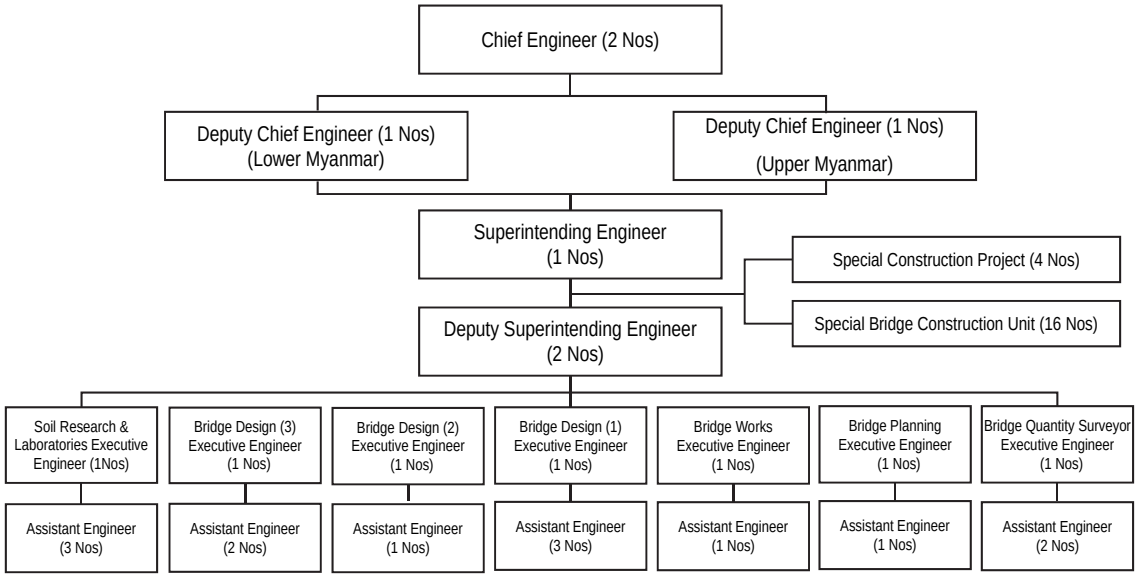
Figure 5.14 Public Works Organization Chart



Assistant Engineer	(22)	Surveyor Grade I	(8)	Draftsman Grade I	(8)	Research Assistant Grade I	(4)	Section Clerk	(4)
Junior Engineer Grade I	(2)	Surveyor Grade II	(16)	Draftsman Grade II	(16)	Research Assistant Grade II	(12)	Senior Clerk	(8)
Junior Engineer Grade II	(10)	Surveyor Grade III	(20)	Draftsman Grade III	(8)	Research Assistant Grade III	(15)	Junior Clerk	(16)
Junior Engineer Grade III	(12)	Surveyor Grade IV	(15)	Chainman	(16)	Research Assistant Grade IV	(19)	Head Worker	(17)
Junior Engineer Grade IV	(10)	Surveyor Grade V	(5)	Junior Typewriter	(8)	Research Assistant Grade V	(9)	Worker	(21)
Computer Staff	(8)	Assistant Computer Staff	(4)			Office Assistant	(3)	Guard	(4)

Source: Department of Public Works, Ministry of Construction (MOC)

Figure 5.15 Road Sector Organization Chart



1	B.C	(-)	11	Assistant Computer Programmer	(2)	21	Typist	(2)
2	Draft Man (1)	(2)	12	Draft Man (3)	(4)	22	Head Worker	(7)
3	Branch Clerk (1)	(3)	13	J.E (3) Civil	(5)	23	Office Helper	(1)
4	Computer Programmer	(7)	14	U.D	(4)	24	Security	(1)
5	Skill (2) (Test)	(5)	15	Accountant (3)	(2)	25	Labour	(12)
6	J>E (2) Civil	(8)	16	Skil (4) (test)	(7)			
7	Skil (2) (soil Sample)	(5)	17	Skil (4) (Soil Sample)	(10)			
8	Draft Man (2)	(2)	18	J.E (4) Civil	(11)			
9	Draft Man (2)	(4)	19	Draft Man (4)	(7)			
10	Accountant (2)	(1)	20	L.D	(5)			

Source: Department of Public Works, Ministry of Construction (MOC)

Figure 5.16 Bridge Sector Organization Chart

Table 5.1 Road and Bridge Construction Unit

Road construction unit		Bridge construction unit	
Group	Location	Group	Location
1G	Shan State	1G	Yangon Region
2G	Ayeyarwady Region	2G	Bago Region
3G	Magway Region	3G	Nay Pyi Taw
4G	Ayeyarwady Region	4G	Magway Region
5G	Nay Pyi Taw	5G	Ayeyarwady Region
6G	Kachin State	6G	Mon State
7G	Bago Region	7G	Magway Region
8G	Rakhine State	8G	Rakhine State
9G	Kayin State	9G	Shan State
10G	Sagaing Region	10G	Sagaing Region
11G	Chin State	11G	Sagaing Region
12G	Chin State	12G	Ayeyarwady Region
13G	Mandalay Region	13G	Yangon Region
14G	Kachin State	14G	Mandalay Region
15G	Yangon Region	15G	Kachin State
16G	Tanintharyi Region	16G	Tanintharyi Region

Source: Department of Public Works, Ministry of Construction (MOC)

Chapter 6 ASEAN Transport Agreement and Action Plan

6.1 Background

6.1.1 ASEAN Transport Agreements

An efficient, secure and integrated transport network in ASEAN is vital to realizing the full potential of regional economic integration, as well as enhancing the attractiveness of the region, its tourism and as an investment destination. An integrated transport network is also vital for narrowing the current development gaps in the region. This task was set as the goal for the cooperation and integration of the ASEAN transport sector in the 1992 Framework Agreement on Enhancing ASEAN Economic Cooperation, which is reaffirmed in the ASEAN Economic Community Blueprint and the Roadmap for the ASEAN Community adopted by the ASEAN Leaders in 2009. To achieve this goal, cooperation and integration of the ASEAN transport sector has been guided by a series of action plans. These include: the ASEAN Plan of Actions in Transport and Communications 1994-1996, the Transport Action Agenda and Successor Plans of Actions 1996-1998 and 1999-2004 and the ASEAN Transport Action Plan 2005-2010 that covers land, air, and maritime transport, and transport facilitation.

6.1.2 Action Plan

The ASEAN Strategic Transport Plan 2011-2015, also referred to as Brunei Action Plan, provides the main reference that guides ASEAN transport cooperation and integration in between 2011 and 2015. Based on a comprehensive assessment of the transport context in ASEAN, the Brunei Action Plan identifies strategic actions to be implemented to support the goals of the ASEAN Economic Community by 2015, as well as the priority of enhancing regional connectivity identified in the Master Plan on ASEAN Connectivity.

The following analysis highlights strategies and activities of the transport sectors listed in the Brunei Action Plan and identifies priority actions that the Myanmar Government should implement by 2015.

6.2 Transport Agreement and Action Plan

6.2.1 Land Transport

The main goal for land transport is to establish a safe, efficient, environmental-friendly and integrated regional land transport system to promote trade and tourism within ASEAN and with neighboring countries. In the region, priority is given to the completion of the ASEAN Highway Network and the Singapore – Kunming Rail Link (SKRL), so land transport infrastructure can contribute to the development of economic corridors. The role that railways and inland waterway play in terms of climate and environmental benefit is increasingly understood in ASEAN. This is demonstrated in the seven strategic goals and actions set for the land transport sector in the 2010 Brunei Action Plan.

1. Accomplish the implementation of the SKRL project
2. Complete the ASEAN Highway Network
3. Reduce road fatalities by 50% in ASEAN Member States by 2020
4. Establish efficient and integrated inland waterway transport (IWT) network
5. Develop Intelligent Transport System (ITS)
6. Enhance human, technical and institutional capacity in ASEAN Member States
7. Establish a sustainable, energy efficient and environmental-friendly transport system

6.2.2 Road

According to the ASEAN Highway Network Project, the ASEAN road network designates 23 roads into five types: Primary, Class I, Class II, Class III and Below Class III. In total, these road types represent about 38,400 km of the highway network. As of 2008, Class III's two-lane roads distance totaled about 35% of the total highway length and the Below Class III amounted to approximately 15% of total highway length. The 2010 Brunei Action Plan identified 17 priority road improvement projects to improve the ASEAN Highway Network. The recommended projects include:

1. Upgrade Below Class III roads on Transit Transport Routes (TTR) by 2012
    - Lao PDR: AH12 (293 km) and AH 15 (98 km)
    - Myanmar: AH1 (781 km), AH 2 (593 km) and AH3 (93 km)
    - Indonesia: AH25 (141.55 km)
2. Construct other missing link sections on the AHN
    - Myanmar: AH 112 (60 km) and AH 123 (141 km)
3. Upgrade other Below Class III roads
    - Viet Nam: AH13 (215.5 km) by 2011 and AH132 (160 km) by 2012
    - Indonesia: AH150 (1762.3 km) and AH151 (611.9 km)
    - Lao PDR: AH131 (96 km) and AH 132 (126 km)
    - Myanmar: AH111 (239 km) and AH112 (1085 km)
    - Malaysia: AH150 (40 km)

In Myanmar, the 2010 Brunei Action Plan identified some 3,000 km of road for priority improvement projects, though some of these road sections were already upgraded under the BOT scheme. However, the condition of most of the road sections proposed for improvement is still poor and progress for these sections is much needed.

Figure 6.1 ASEAN Highway Route Map

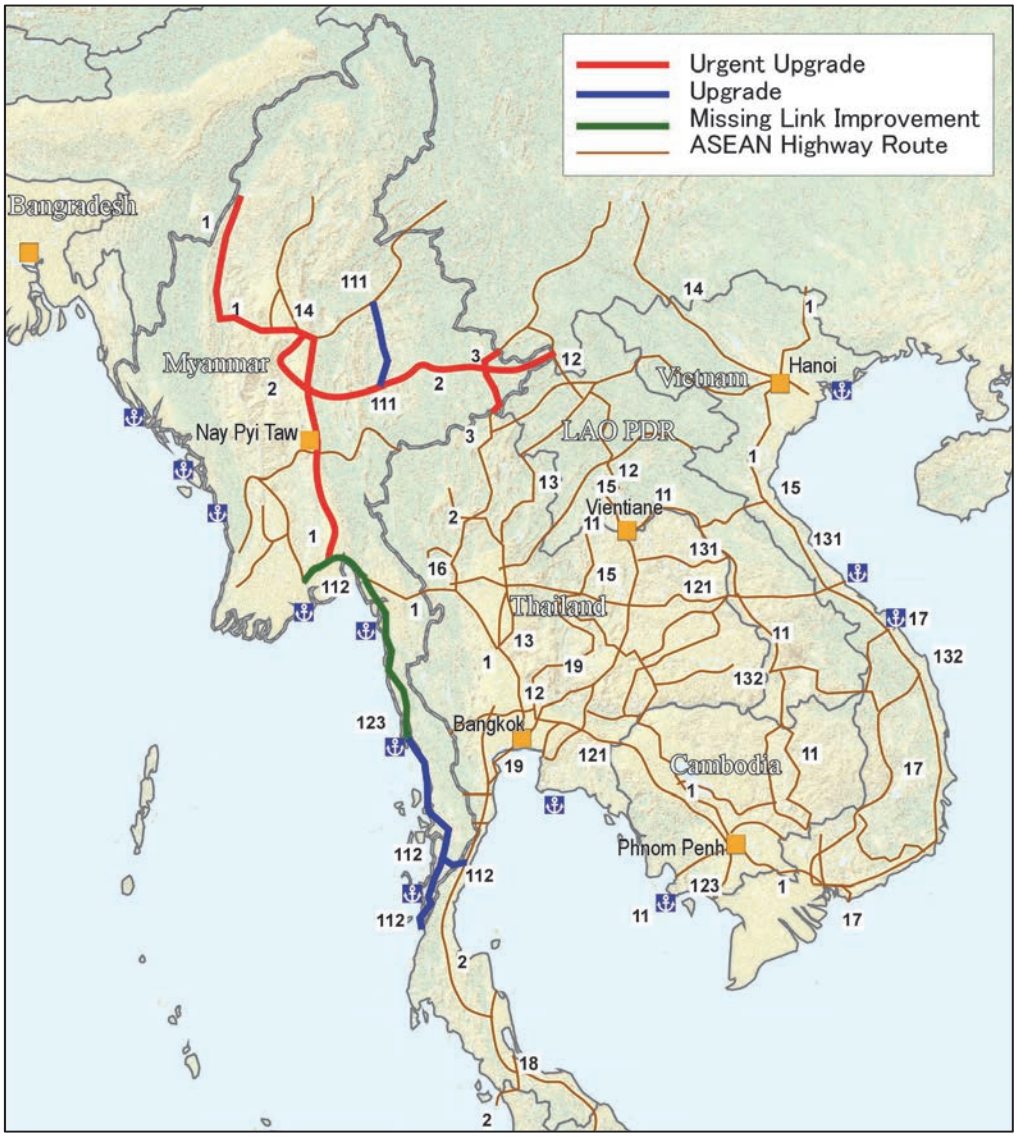


Figure 6.2 Road Improvement Projects in Myanmar proposed in 2010 Brunei Action Plan

The following table summarizes the road projects proposed and agreed to in the Brunei Action Plan and how the Myanmar Government plans to complete the projects in 2015.

Table 6.1 List of Actions Proposed for Road Sector in Brunei Action Plan

Strategies	Actions
1. Complete the ASEAN Highway Network	• Complete the ASEAN Highway Network by constructing the missing link and upgrading to Class III or better • Identify and develop a network of ASEAN dry ports, in accordance with existing ASEAN initiatives such as the ASEAN Highway Network and the SKRL • Install common road signs and route numbering system in all designated routes with priority on Transit Transport Routes • Conduct a feasibility study on the bridges connecting mainland and archipelagic Southeast Asia
2. Reduce the road fatalities by 50% in ASEAN Member States	• Formulate the ASEAN Regional Road Safety Strategy Plan 2012-2020 and National Road Safety Strategic Plan 2012-2020 by 2012 and their implementation
3. Develop Intelligent Transport System (ITS)	• Formulate the ITS Master Plan by 2013 and its implementation • Implement the ITS Capacity Building Program in order to develop ITS

Source: ASEAN (2010) Brunei Action Plan 2011-2015

6.2.3 Rail

ASEAN Member States agree that the critical rail transport project, listed in the action plan and agreed to by ASEAN Member States, is the Singapore – Kunming Rail Link (SKRL). For the Rail Link, the ASEAN Connectivity Master Plan proposed two routes: an eastern line (passing though Thailand, Cambodia and Vietnam), a western line (passing through Thailand and Myanmar), and each of these lines connected, once the eastern line is complete. To successfully complete the work needed for the SKRL, a number of needed infrastructure (missing links) were identified and recommended for completion in the 2010 Brunei Action Plan. These projects include:

- Cambodia: Poipet – Sisophon (48km) by 2013
- Thailand: Aranyaprathet – Klongluk (6km) by 2014
- Cambodia: Phnom Penh – Loc Ninh (255km) by 2015
- Viet Nam: Loc Ninh – Ho Chi Minh (129km) by 2020
- Viet Nam: Mu Gia – Tan Ap – Vung Ang (119km) by 2020
- Lao PDR: Vientiane – Thakek – Mu Gia (466km) by 2020
- Myanmar: Thanbyuzayat – Three Pagoda Pass (111 km) by 2020
- Thailand: Three Pagoda Pass – Nam Tok (153km) by 2020

Source: ASEAN (2010) Brunei Action Plan 2011-2015

Figure 6.3 Railway Projects proposed in 2010 Brunei Action Plan

In addition, the Brunei Action Plan recommended a feasibility study and preliminary design for the railway spur line between Kanchanaburi and Dawei. This is currently underway by Italian Thai Development Pcl, the former concessionaire of the port and industrial development project in Dawei. Table 6.2 summarizes the rail sector projects proposed and agreed to in the Brunei Action Plan and their priority; it also notes those that should be implemented by the Myanmar Government by 2015.

Table 6.2 List of Actions Proposed for Rail Transport in Brunei Action Plan

Strategies	Actions
1. Complete the implementation of SKRL (Singapore-Kunming Rail Link) Project	• Construct the missing link sections and spur lines of SKRL • Supplementary upgrading work in ASEAN Member States to support SKRL • Formulate a strategy for a seamless operation of SKRL by 2013 • Mobilize financial resources and technical assistance from external partners, either on a bilateral basis or with the coordination of ADB, to support the complementation of SKRL in accordance with the agreed deadline • Study the possibility of extending the SKRL to Surabaya, Indonesia • Conduct a feasibility study and preliminary design for the railway spur line between Kanchanaburi and Dawei

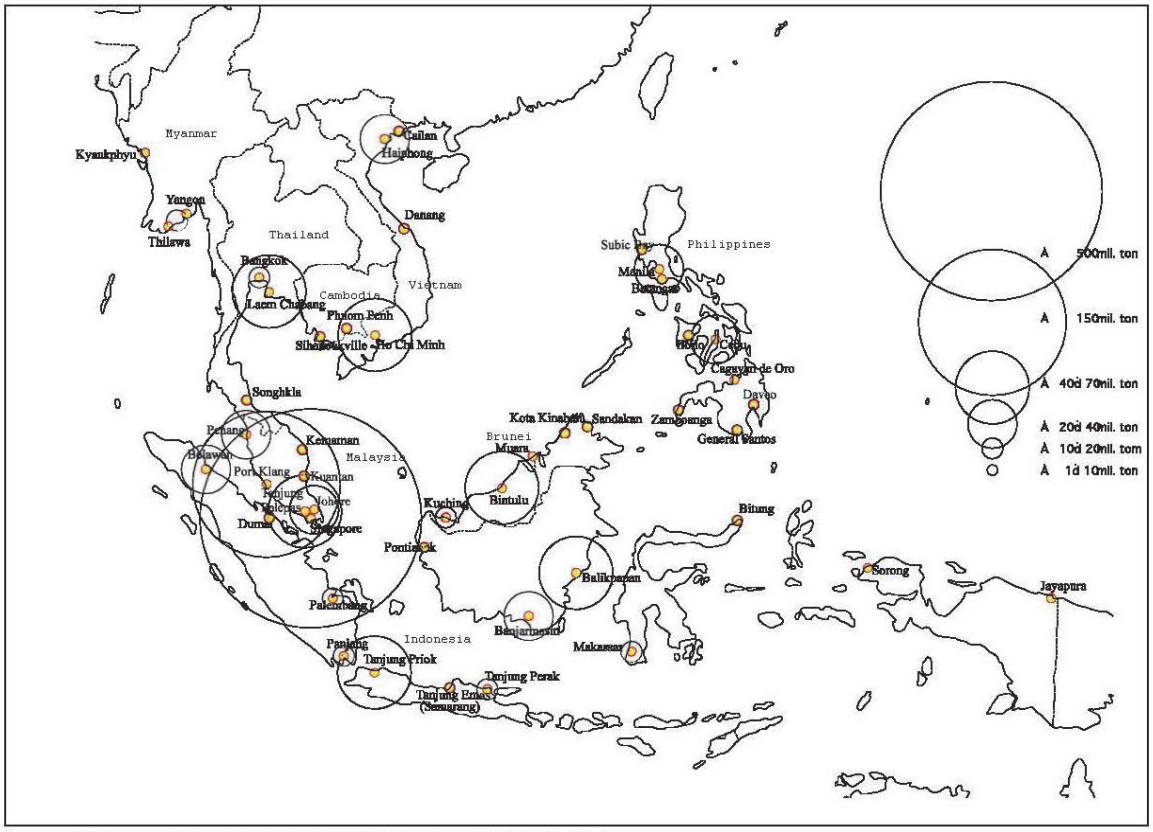
Source: ASEAN (2010) Brunei Action Plan 2011-2015

6.2.4 Maritime and Port Facilities

The main goal for the maritime transport sector is to establish an integrated, competitive and seamless maritime transport network, paying particular attention to promoting maritime safety and security, and developing ports that are environmentally sustainable and user friendly. The sector's three specific goals are:

- Accomplish an integrated, efficient, and competitive maritime transport system
- Develop safety navigation system and establish an advanced maritime security system in line with international standards
- Complete the Eco-Port and ensure environmental-friendly shipping

ASEAN has designated 47 ports as the main trans-ASEAN network ports, as shown in the Figure 6.4, including several in Myanmar, including the Yangon Port, Thilawa Port and Kyaukpyu Port. The Myanmar Government faces a number of challenges in providing efficient shipping network services in these three ports. For example, the efficient handling of cargo depends on the capacity of ships calling at the ports, also on cargo handling capacity, land transport and logistics capacity, customs and administrative clearance procedures.



Source: ASEAN (2010) Master Plan on ASEAN Connectivity

Figure 6.4 47 Designated Main Ports identified in the ASEAN Connectivity Master Plan

Table 6.3 summarizes the maritime/port-related projects proposed and agreed in the Brunei Action Plan, which should be prioritized and those that should be implemented by the Myanmar Government by 2015.

Table 6.3 List of Actions Proposed for Maritime/Port Development in the Brunei Action Plan

Strategies	Actions
1. Develop an integrated, efficient and competitive maritime transport system	• Develop an ASEAN Single Shipping Market by 2015 • Enhance the capacity of 47 Designated Ports by 2015 • Establish efficient and reliable shipping routes, including RORO connections between mainland and archipelagic Southeast Asia, and strengthen the linkages with global and domestic routes by 2015 • Establish and enhance the Cruise Corridors by 2015
2. Develop safety navigation system and establish advanced maritime security system in line with international standards	• Review ASEAN Near Coastal Voyage Limits as part the required Standards of Training, Certification and Watch-keeping Convention by 2012 • Enhance Search and Rescue (SAR) capability through combined air and maritime SAR exercises by 2015 • Develop human resources to strengthen port and shipping operations, including the introduction of advanced technologies for navigation safety, maritime security and environmental preservation
3. Accomplish the Eco-Port and environmentally-friendly shipping	• Enhance Eco-port activities in cooperation with IMO and promote the negotiation and implementation of relevant IMO initiative conventions.
4. Establish an efficient and integrated inland water transport system	• Formulate a regional plan for developing an inland water transport network in ASEAN by 2012, and begin implementation thereafter

Source: ASEAN (2010) Brunei Action Plan 2011-2015

6.2.5 Air

Among ASEAN Member States, including Myanmar, the liberalization of the air transport service has become a central feature of liberalization measures and is being deployed across the region to allow for open sky transport service between ASEAN cities. In 2004, ASEAN countries agreed to a roadmap for the integration and liberalization of air transport services in the air travel sector. To achieve these sector reforms, Transport Ministers signed a Multilateral Agreement on the Full Liberalization of Air Freight Service (MAFLAFS) in 2009 as well as a Multilateral Agreement on Air Service. In 2010, Ministers signed a Multilateral Agreement on the Full Liberalization of Passenger Air Services (MAFLPAS).

The Brunei Action Plan (2011-2015) also proposed air transport strategies and actions and an Implementation Framework of the ASEAN Single Aviation Market was adopted at the 17th ASEAN Transport Minister Meeting in December 2011. Key elements of the ASEAN Single Aviation Market (ASAM) are summarized in Table 6.2. With regard to the market access, Myanmar has already ratified all protocols of MAFLAFS and MAFLPAS. Among the remaining elements to be implemented, the following are priorities for the Myanmar Government: (i) airport user charges, (ii) aviation safety, (iii) aviation security, and (iv) air traffic management.

Table 6.4 Key Elements in Implementation Framework
of the ASEAN Single Aviation Market

Subject	Measures
Market Access	
Charters	• Liberalize charters on international routes, which are not served by scheduled airlines -consider others on a case-by-case basis
Ownership and Control	• Work towards adoption of the principal place of business and effective regulatory control criteria in the designation of airlines of ASEAN Member States • Commence discussions on further liberalization of ownership and control of airlines of ASEAN Member States, including the concept of an 'ASEAN Community Carrier'
Tariffs	• Work towards no filing of tariffs
Commercial Activities	• Provisions for commercial activities to be liberalized, except where there are existing contractual obligations • Services to be provided on a non-discriminatory basis • Provisions for commercial activities to be liberalized, as existing contractual obligations phase out
Competition Law	• To be governed by ASEAN all-sector approach
Consumer Protection	• To be governed by ASEAN all-sector approach
Airport User Charges	• To be established in line with ICAO principles and guidelines
Dispute Resolution	• To be governed by the ASEAN Enhanced Dispute Settlement Mechanism
Dialogue Partners Engagement Mechanism	• Further strengthen engagement with Dialogue Partners in the development of the ASEAN air transport sector, while maintaining ASEAN's centrality as the primary driving force • Conclude Air Transport Agreements with China by 2010, India, the ROK and possibly other Dialogue Partners, not later than 2015 • Consider concluding Air Transport Agreements with other partners
Aviation Safety	• Align regulatory capability and safety standards with ICAO SARPs • Identify priority areas for human resource development and training related to aviation safety • Develop a mutual recognition instrument (i.e. Mutual Recognition of Aviation Related Certification Agreement) • Develop an inventory of standards to facilitate the preparation of Mutual Recognition of Aviation Related Certification Agreement • Establish a framework to share ramp inspection information among ASEAN Member States • Establish mutually agreed minimum standards and capabilities for the purpose of possible mutual recognition • Commence mutual recognition for selected components of the following priority areas of: • • air operator certification • • aircraft airworthiness (approved maintenance organization) • • flight crew/engineer licensing • in accordance with the Mutual Recognition of Aviation Related Certification Agreement instrument • Conclude Mutual Recognition of Aviation Related Certification Agreement for remaining safety areas • Develop and implement a 'common rules' framework, which comprises a common set of ASEAN-wide aviation safety rules • Establish an appropriate ASEAN aviation safety setup

Subject	Measures
Aviation Security	• Share information on latest trends and developments in aviation security, including the experiences and knowledge of the use of technology • Leverage existing aviation security points of contact and networks of ASEAN Member States to facilitate information sharing among Member States • Identify areas for capacity building by ASEAN Member States • Leverage existing capacity building mechanisms such as those offered by the ICAO Asia and Pacific Regional Office, as well as new mechanisms • Align aviation security measures with ICAO Standards • Develop practical, harmonized and cost effective aviation security measures • Harmonize areas such as screening technology and processes for screening of liquids, aerosols and gels (LAGS), passenger pre-board screening, air cargo and supply chain security • Enable ASEAN to engage other regional entities to better facilitate air travel to ASEAN and onward to other destinations.
Air Traffic Management	• Develop an inventory of air traffic management or share information for the purpose of gap analysis • Identify and endorse key enabling technologies and initiatives for regional implementation • Support ICAO's efforts and implementation plan for air traffic management in the Southeast Asia Region • Enhance training for the identified key technologies and initiatives • Continue to support ICAO's efforts and implementation plan for air traffic management in the Southeast Asia Region • Track European Union's 'Single European Sky Air Traffic Management Research Programme (SESAR)' and Federal Aviation Administration's next Generation Air Transportation System (NextGen) and other regional concepts/developments • Adapt concepts/framework/technologies and/or identify new building blocks that may be essential for harmonization of air traffic management procedures • Explore options for an ASEAN Air Traffic Management Harmonization Master Plan. • Integrate some of these initiatives together with the other stakeholders such as IATA, CANSO, ICAO, etc. • Review the key elements/building blocks and work towards full harmonization of air traffic management procedures. • Seek to comply with the interoperability of air traffic management requirements together with the rest of the Asia-Pacific region.

Source: ROADMAP FOR THE ECONOMIC ELEMENTS OF THE ASAM

6.2.6 Transport Facilitation

The main goal of transport facilitation is to establish an integrated, efficient and globally competitive multimodal transport system to enhance connectivity within ASEAN and with a rest of the world. The aim is also to pursue "green logistics" for environment preservation. The following four specific goals place prime importance on the transport facilitation framework in the Brunei Action Plan. The goals include issues covering three transport sectors: land, air and maritime transport.

- Establish integrated and seamless multimodal transport system
- Enhance the competitiveness of ASEAN Logistics Industry
- Establish safe and secure inter-state transport system
- Develop environment-friendly logistics

Table 6.5 summarizes the actions, related to transport facilitation, proposed in the Brunei Action Plan, which should be prioritized and implemented by the Myanmar Government, which has already ratified several.

Table 6.5 List of Actions Proposed for Transport Facilitation in Brunei Action Plan

Strategies	Actions
1. Establish integrated and seamless multimodal transport system to make ASEAN the transport hub in the region	• Fully operationalize three ASEAN Framework Agreements on transport facilitation • Implement initiatives to facilitate inter-state passenger land transportation • Conduct studies on potential multimodal transport corridors to empower parts of ASEAN to function as land bridges for global supply routes • Complete the East West Economic Corridor • Promote the Mekong India Economic Corridor as a land bridge • Produce a comparative study between EU and ASEAN region for development of efficient transport system by 2013 and its adoption • Promote the usage of transport terms and practices related to multimodal transport, including INCOTERMS (International Commercial Terms)
2. Enhance the competiveness of ASEAN logistics industry	• Develop and upgrade skills and build capacity for MOTs (multimodal transport operators) and LSPs (logistics service providers) through joint training and workshops • Establish national/regional centers of training centers, national skill certification systems and common core curriculum • Identify and develop the ASEAN logistics network and formulate the necessary infrastructure development requirements
3. Establish safe and secure inter-state transport system	• Share and apply appropriate technologies of information systems for promotion of supply chain security initiatives
4. Develop environmental-friendly logistics	• Develop green logistics through increase in logistics management efficiency and utilization of environmentally -friendly transport modes, fuel, fleets, supporting logistics facilities

Source: ASEAN (2010) Brunei Action Plan 2011-2015

Building on the example of the ASEAN Framework Agreements on Transport Facilitation, ASEAN has introduced a number of transport facilitation initiatives over the years to create an efficient logistics and multimodal transport system for the seamless movement of goods, connecting land, maritime, and air transport. These initiatives include:

(a) ASEAN Framework Agreement on the Facilitation of Goods in Transit (AFAFGIT)

(b) ASEAN Framework Agreement on Multimodal Transport (AFAMT)

(c) ASEAN Framework Agreement on the Facilitation of Inter-State Transport (AFAFIST)

Table 6.6 summarizes the status of the ASEAN Transport Facilitation Agreement ratification. Myanmar already acceded to the AFAFGIT in 1998 and signed 7 Protocols between 2002 and 2011. The Government is now required to implement transport facilitation measures such as: designation of transit transport routes and facilities, types and quantity of road vehicles, technical requirements of the vehicles, motor insurance, etc.

Table 6.6 Status of Ratification of ASEAN Transport Facilitation Agreement

Protocol Number	Subjects	Brunei	Cambodia	Indonesia	Laos	Malaysia	Myanmar	Philippine	Singapore	Thailand	Vietnum
1	**Designation of Transit Transport Routes and Facilities**	Ratified 19-10-09	Ratified 27-10-09	Signed 8-2-07	Signed 8-2-07	Signed 8-2-07	Signed 8-2-07	Ratified 13-11-07	Signed 8-2-07	Ratified 22-6-11	Ratified 10-10-07
2	**Designation of Frontier Posts**	Not Signed	Not Signed	Not Signed	Not Signed	Not Signed	Not Signed	Not Signed	Not Signed	Not Signed	Not Signed
3	**Types and Quantity of Road Vehicles**	Ratified 5-9-04	Ratified 9-5-07	Ratified 23-6-00	Ratified 19-1-00	Ratified 24-7-09	Ratified 21-8-00	Ratified 25-11-99	Ratified 2-5-06	Ratified 19-4-10	Ratified 15-11-99
4	**Technical Requirements of Vehicles**	Ratified 6-9-04	Ratified 9-5-07	Ratified 23-6-00	Ratified 19-1-00	Ratified 24-7-09	Ratified 21-8-00	Ratified 25-11-99	Ratified 2-5-06	Ratified 19-4-10	Ratified 15-11-99
5	**ASEAN Scheme of Compulsory Motor Vehicles Insurance**	Ratified 8-9-02	Ratified 30-1-02	Ratified 30-7-02	Ratified 6-11-02	Ratified 26-3-02	Ratified 16-10-03	Ratified 22-9-03	Ratified 29-8-02	Ratified 8-1-03	Ratified 2-7-01
6	**Railways Border and Interchange Stations**	Signed 16-12-11	Signed 16-12-11	Signed 16-12-11	Signed 16-12-11	Signed 16-12-11	Ratified 3-2-14	Signed 16-12-11	Signed 16-12-11	Ratified 3-9-12	Signed 16-12-11
7	**Custom Transit System**	Not Signed	Not Signed	Not Signed	Not Signed	Not Signed	Not Signed	Not Signed	Not Signed	Not Signed	Not Signed
8	**Sanitary and Phytosanitary Measures**	Ratified 7-8-10	Ratified 23-5-03	Ratified 31-12-02	Ratified 9-5-01	Ratified 10-8-10	Ratified 10-10-02	Ratified 26-11-09	Ratified 30-3-06	Ratified 23-8-03	Ratified 29-3-01
9	**Dangerous Goods**	Ratified 30-3-04	Ratified 9-5-07	Ratified 24-8-03	Ratified 19-5-03	Signed 20-9-02	Ratified 25-4-03	Ratified 5-5-03	Ratified 12-9-07	Signed 20-9-02	Ratified 15-11-02

Source: MORT, TPD