Ministry of Transport and Communications
The Republic of the Union of Myanmar

DATA COLLECTION SURVEY ON NATIONAL LOGISTICS IN THE REPUBLIC OF THE UNION OF MYANMAR

FINAL REPORT

VOLUME 1 : MAIN TEXT

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Abbreviations

AAGR	Average Annual Growth Rate
ADB	Asian Development Bank
ACTS	ASEAN Customs Transit System
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 Multimodal Transport
AH	Asian Highway
AIS	Aeronautical Information System
ASEAN	Association of South East Asian Nations
AEC	ASEAN Economic Community
ASW	ASEAN Single Windows
BAP	Brunei Action Plan
BBL	Barrel
CBD	Central Business District
CBP	Cross Border Point
CBTA	Cross Border Trade Agreement
CBTI	Cross Border Trade Infrastructure
CLMV	Cambodia Laos Myanmar Vietnam
CREC	China Railways Engineering Corporation
DCA	Department of Civil Aviation
DOSA	Discussion-Oriented Organizational Self-Assessment.
DMA	Department of Marine Administration
DMH	Department of Meteorology & Hydrology
DWIR	Directorate of Water Resources and Improvement of River Systems
DWT	Dead Weight Tonnes
ECDIS	Electronic Chart Display Information System
EIA	Environment Impact Assessment
EIRR	Economic Internal Rate of Return
EWEC	East West Economic Corridor
FAO	Food and Agriculture Organization
FDI	Foreign Direct Investment
FIRR	Financial Internal Rate of Return
FRP	Fiberglass Reinforced Plastics
GDP	Gross Domestic Products
GIS	Geographical information System
GMS	Greater Mekong Sub-region
GPS	Global Positioning System
GRT	Gross Registered Tonnage
HIA	Hanthawaddy International Airport
HLV	Heavy Loaded Vehicle
HS	Harmonized System Code
ICD	Inland Container Depot
IMT	India-Myanmar-Thailand
IWT	Inland Water Transport
JICA	Japan International Cooperation Agency
JIFFA	Japan International Freight Forwards Association
JIT	Just-In-Time
KLTSP	Kuala Lumpur Transport Strategic Plan
KOICA	Korea International Cooperation Agency
LNG	Liquefied Natural Gas
LOA	Length Overall
LOLO	Lift-on Lift-off
LPG	Liquefied Petroleum Gas
MACCS	Myanmar Automated Cargo Clearance System
MCS	Mingaladon Cargo Services Public Co,. Ltd.
MIA	Mandalay International Airport
MIC	Myanmar Investment Commission
MIDV	Myanmar Industrial Development Vision
MITT	Myanmar International Terminals Thilawa
MJAS	MC-Jalux Airport Services Co, Ltd.
MJTD	Myanmar Japan Thilawa Development
MMH	Multimodal Freight Logistics Hub
MOU	Minutes of Meeting
MLIT	Ministry of Land, Infrastructure, Transport and Tourism of Japan
MMEA	Myanmar Maritime Engineer Association
MMMC	Myanmar Mercantile Marine College
MMU	Myanmar Mercantile University
MOC	Ministry of Construction
MOTC	Ministry of Transport and Communications
MPA	Myanma Port Authority
MPPA	Million Passengers Per Annum
MR	Myanma Railways
MS	Myanma Shipyard
MTZ	Myawaddy Trade Zone
NH	National Highway
NIA	Naypyitaw International Airport
NPO	Non-Profit Organization
NTMP	National Transport Master Plan
O-D	Origin – Destination
ODA	Official Development Assistance
OSS	One Stop Station
PPP	Public Private Partnership
RITES	Rail India Technical and Economics Services
RORO	Roll-on Roll-off
RTDA	Road Transport Administration Department
SCI	Shipping Corporation of India
SEZ	Special Economic Zone
SIA	Social Impact Assessment
SKRL	Singapore Kunming Railway Link
SPV	Special Purpose Vehicle
SME	Small Medium Enterprise
SMIDB	Small and Medium Industrial Development Bank
STCW	International Convention of Training Certification for Seafarers
STOM	Senior Transport Officers Meeting
TEU	Twenty Footer Equivalent
THB	Thai Baht
TOEC	Transport Equipment Operation Cost
UN	United Nations
UNESCAP	United Nations Economic and Social Commission for Asia and Pacific
V/C	Volume Capacity Ratio
VHF	Very High Frequency Radio
VLCC	Very Large Crude Oil Carrier
VMI	Vendor Management Inventory
VTS	Voice Telecommunication System
YACL	Yangon Aerodrome Company Limited
YIA	Yangon International Airport
YUTRA	Yangon Urban Transport

EXECUTIVE SUMMARY

Geopolitical Importance: Myanmar is bordered by five neighboring countries: Thailand and the Lao PDR to the east; China to the northeast; India to the northwest; and Bangladesh to the west. The length of the border is approximately 4,600 km. Myanmar has special geopolitical importance. It lays at the intersection of three economic growth poles: comprised of China to the north, India to the west, and the ASEAN countries to the south. It is located in the middle of three very large consumption markets. The geographically notable feature of Myanmar is a vast gentle plain stretching through north to south within a horseshoe-shaped mountain range. The steep and long mountain ranges hamper the development of transport links with neighboring countries. The seacoast faces the Andaman Sea and the Bay of Bengal with the length of coastline around 2,000 km of shallow depth.

Underlying Development Policy Framework: The National Logistics Master Plan (NLMP) is in line with the parameters of the existing national plans and policies and is formulated to support and materialize these plans and policies.

1. **National Comprehensive Development Plan (NCDP):**
   The vision of NCDP is to build a new prosperous and inclusive Myanmar, a fully developed nation that is integrated into the global community. Development will proceed through agricultural modernization and labor-intensive industries then shift to high-tech industry led by continued FDI inflow to the manufacturing sector.
2. **National Spatial Development Framework (NSDF):**
   The NSDF functions to materialize the NCDP. Policy objectives are to sustain agricultural development, to foster industrialization, and encourage all-around development and inclusive growth for the entire population.
3. **Agriculture Development Policies (ADP):**
   Myanmar has a good potential for agricultural growth with its abundant land and water. Through the provision of proper infrastructure (irrigation, transport networks in rural areas) a more productive agricultural sector will be possible and this will stimulate job creation through increased agro-processing and trading activities and earnings of foreign exchange through increased exports of rice, beans, etc.
4. **Industrial Policy Paper - 2016:**
   The vision of the policy paper is to establish a new modern industrial nation and balanced regional development in Myanmar, transform outdated agricultural industries and to produce value-added products in order to reduce poverty and to improve GRDP in rural areas. It includes the establishment and upgrading of existing industries in the Industrial Zones, SEZs IZs and IZs located near the borders with neighboring countries.

5. **Myanmar Industrial Development Visions (MIDV) :**

   The MIDV aims to elaborate projections for Myanmar's staged industrial development that simultaneously achieve geographically balanced development, urban-rural synergy, and sustainable growth. The MIDV highlights that the cluster formation of manufacturing industry in urban areas is important in order to achieve well-balanced sustainable national development.

6. **National Exports Strategy (NES) :**

   This national strategy emphases to realize sustainable export-led growth and prosperity for emerging Myanmar. The NES has been prepared to increase the competitiveness of enterprises, improve the business environment for development and expand Myanmar's trade while contributing to poverty reduction.

7. **New Economic Policies (NEP):**

   The NEP sets the national reconciliation as the highest priority based on the policy that states just balancing of sustainable resource mobilization and allocation across regions and states. Financial sector to be reformed in order to sustainably provide capital to people, attract foreign direct investment to create a stable international business environment through greater regional cooperation and larger economic growth potential.

8. **National Transport Master Plan (NTMP):**

   The vision of the NTMP is to develop an efficient, modern, safe, and environmentally-friendly transport system in a coordinated and sustainable manner that embraces all transport modes for the benefit of the country and people of Myanmar. The NTMP was formulated with technical assistance from JICA and was approved by the Cabinet as the national development plan for transport in February 2014. The objectives of the NTMP are to provide guidance for investment in the transport sector to help Government achieve the economic growth targets by 2030.

Main Regional Cooperation Framework: The ASEAN Economic Cooperation and the ASEAN Strategic Transport Plan (ASTP) 2016-2025, also referred to as Kuala Lumpur Action Plan (KLAP) 2016-2025, is the main plan guiding ASEAN transport cooperation and integration up to 2025. As road transport will continue to dominate in future, it is important to accelerate implementation of the Asian/ASEAN Highway Network Project especially along the regional economic corridors to complete missing sections and improve the quality of road infrastructure aimed at developing smooth and quality freight transport and reinforcing the connectivity of the region as a whole, so as to reduce corridor travel times, and freight transport costs. In 2015 the ASEAN Economic Community (AEC) was formally established. Through the creation of the AEC, the intra-regional development of labor and intra-regional trade are expected to increase, which will contribute to the economic growth of countries within the region, including Myanmar. Under such a regional cooperation framework and the creation of enhanced connectivity, the good location of Myanmar has a potentiality to become a prime transport hub within Asia.

National Economy: GDP in 2016 amounted to US$ 64.4 billion. The forecast GDP growth rate to 2030 is 7.0% p.a. The economic structure of Myanmar has been changing rapidly since 2010 and the share of the secondary sector or manufacturing sector (expected to be the leading sector to accelerate economic growth in Myanmar) has been expanding gradually, and now accounts for some 10% of the total added value. According to the national policies of Myanmar such as NCDP, development will proceed through agricultural modernization and labor-intensive industries then shift to high-tech industry led by continued FDI inflow to the manufacturing sector otherwise a constant growth of the economy at 7 % per annum cannot be achieved. Since 2011 Myanmar has started to transform from a closed economy to an open economy and to be an active part of the chain within the global supply chain. Not only the manufacturing sector, but the tertiary sector or service sector - that is composed of transport, distribution, warehousing, wholesale, retailing, communication, construction, trade, finance, service etc. - will expand substantially, in parallel with the expansion of the secondary sector and a large number of jobs will be created throughout Myanmar. This development scenario can only be achievable smoothly by the provision of proper and appropriate transport infrastructure and logistics system as a foundation of economic growth.

Future Cargo Transport Demand: A Cargo Demand Forecast has been prepared for the long-term perspective: total cargo volume in 2030 is projected to reach 312 million tonnes (up from 169 million tonnes at present) or to increase by 1.8 times from the present. The volume of container or trade cargo volume will increase from around 1.5 million TEUs per year to around 5.1 million TEUs per year, an increase of around 3.4 times. The major link for freight transport will remain as the North-South axis (Yangon – Mandalay), however a new link especially for trade cargoes will be developed and upgraded to connect Yangon or Bago with the cross-border facilities being developed along the Thai border firmly. The major routes for transport of trade cargoes overlap with the major routes for the transport of domestic cargoes. (See the illustration below) Thus the improvement of transport / logistics infrastructure for trade cargo transport means the improvement of the links for domestic cargo transport also.

Transport Corridors (NTMP)

Major Links for Domestic Cargo Transit

Major Links for Trade and Domestic Cargoes

Major Logistics Sector Issues: The main issues identified within the logistics sector in Myanmar at present are:

- Present transport infrastructure capacity will not be able to meet with rapidly increasing domestic and trade cargo volumes and the standards need to be upgraded to meet with requirements of transport of valuable manufactured goods without damage.
- The current standards of roads, river ports, and domestic ports are unsuitable for transport and handling of fully loaded 40-ft containers, whose average weight is around 15 tonnes with a maximum of 30 tonnes.
- The freight transport cost in Myanmar is twice as high as the freight transport cost in either Thailand or Vietnam (Container transport cost between Yangon and Mandalay is around US$ 2.0 per km while US$ 0.9 per km). A rather lengthy average dwelling time for trucks and vessels (36 hours per trip for trucks plying between Yangon and Mandalay, accounting for a half of truck turnaround time, or 7 days voyage time for inland waterway vessels) and a relatively high labor cost for truck drivers results in high transport costs in Myanmar.
- The cargo load factor is quite low (on average 0.5) especially in rural areas or along links connecting urban and rural areas. This low cargo transport efficiency is a major cause of high transport costs.
- The capacity of truck terminals at major cities is almost saturated and cargo transport efficiency has been declining, due to traffic congestion inside truck terminals.
- The capacity of gateways for trade cargoes is insufficient at international ports and cross-border facilities thereby extending the cargo dwell time and increasing transport costs.
- Although the existing expressway is suitable for long haulage heavy freight transport linking Yangon and Mandalay it is currently not used for freight transport.
- Inland waterways transport (IWT), which can offer the lowest transport cost for the long hauling of bulky cargoes, has been developed historically in Myanmar. However it has not been utilized due to shortcomings in necessary infrastructure, such as river ports that are unable to handle cargoes using mechanical handling systems. If the necessary infrastructure of the inland waterways were properly developed, it will be transformed into an effective and convenient transport mean.
- Railway is the competitive transport mode for long haulage of bulky cargoes / containers with higher speed at lower transport cost in programmed operation. Myanmar's strength in the logistics is that the railway network is available in wide range of the country. However the railway has not been utilized due to substandard railway tracks and a lack of powerful locomotives. Once the railway main trunk infrastructure is improved, it will play an important

role for long haul cargo transport and the existing railway network spread over rural area will be activated.

- No multimodal freight transport is available due to an absence of logistics providers and a lack of logistics facilities that function as transport hubs.

Under such present conditions and taking into account the future cargo transport demand volumes as well as its pattern; the Study has been formulated. It will contribute to upgrade the existing cargo transport situation substantially and will create the foundation for development of a highly efficient and robust system in line with the national economic development policies and strategies spelled out in the various Masterplans and policies mentioned above.

The Vision for Logistics Sector Development in Myanmar aims to create an efficient, competitive and environmentally friendly logistics system in accordance with regional and international perspectives including the enhancement of multimodal transport for economic development and poverty reduction.

Main Strategy of the Study: Based on the result of a diagnostic analysis of the current physical distribution system in Myanmar, effective counter measures were defined and summarized in the NLMP in a holistic approach. It is of great importance that the role of each freight transport mode be clearly defined: such as inland waterways for transport of low-value and bulky domestic cargoes over long distances, to enhance agricultural activities along the major rivers that run through rural areas, coastal shipping for domestic cargoes along the coastline where road and railway networks are not properly connected; trucking and railway freight transport for rather high-value trade and domestic cargoes, to be transported within the shortest possible lead time.

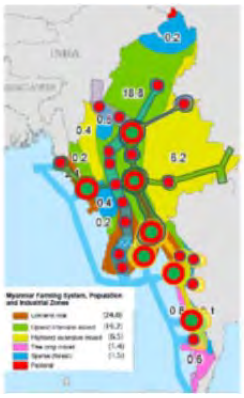
The regional linkages amongst neighboring countries are strengthened in the Indochina Peninsula in order to facilitate trade, to enhance regional economic integration and to develop logistics for better access into the global market. Furthermore, it is important that cargo transport infrastructure is designed and developed to create strong linkages between urban and rural areas, so as to enhance the development synergy in an equitable manner. Thereafter, the development of the required infrastructure for each cargo transport mode (i.e. for roads, railways, inland waterways, ports, airports, logistics facilities) will be carried out in an integrated manner so as to maximize the investment impact. However to achieve the strategic goals such as enhancement of connectivity, optimization of freight transport efficiency, facilitation of trade and social and environmental sustainability in an integrated manner a very large investment is needed. The total number of projects identified within the Study by 2030 is 167. The total development cost is estimated at US$ 41 trillion or MMK 26,290 billion.

Corridor Development Strategy: The corridor development strategy is formulated to maximize investment impact, through the concentration of investments in selected, prioritized and coordinated projects along the targeted corridors, thereby covering the whole nation and contributing to the development of Myanmar.

Resultant Corridor Based Logistics Infrastructure Development Plan: (See illustration below)

- The North-South Logistics Corridor: Linking the two major economic growth poles in Myanmar
- The Southeast Logistics Corridor: Linking with the GMS East-West Economic Corridor
- The Main River Logistics Corridor: Along the Ayeyarwaddy and Chindwin Rivers
- The Coastal Marine Logistics Corridor: Along the entire coast of Myanmar 1,700 km long
- The Myanmar-India Logistics Corridor; Linking with the North-East Region of India
- The Trans Myanmar Logistics Corridor: Horizontal crossing the central part of Myanmar

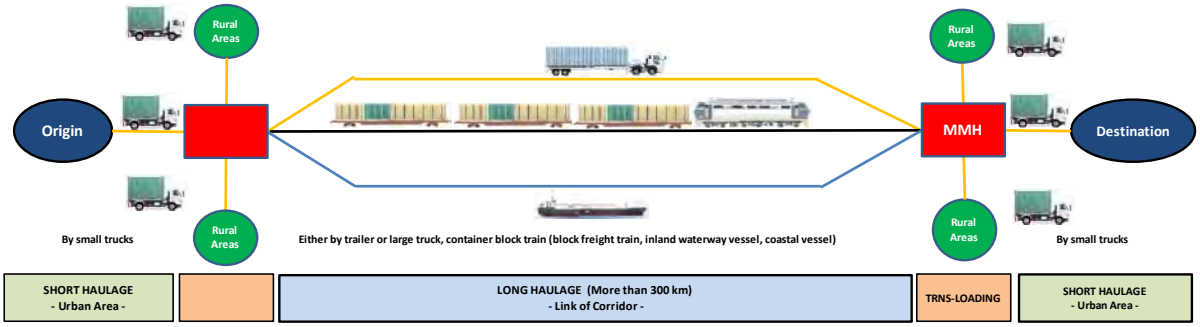
Transport Corridors (NTMP)



Agricultural Land Use and Industrial Clusters

Logistics Corridors

Establishment of Multimodal Freight Logistics Hubs (MMH): Furthermore, the terminal and intersection nodes along logistics corridors are designed to have a *hub-and-spoke* function, through the development of multimodal freight logistics hubs. In such a way, the synergy created by and between urban industrial areas and rural agricultural areas can be enhanced efficiently. The aim of establishing multimodal freight logistics hubs at strategic nodes is to connect various freight transport modes at strategic transport nodes (road transport, railway transport, inland waterway transport, marine transport, coastal shipping, air cargo transport) and to select most suitable cargo transport mode to ensure minimization of freight transport costs and lead times; as well as the optimization of investment impacts of both core projects (logistics facilities) and supporting projects (freight transport infrastructure) throughout Myanmar. The conceptual transport operation of a multimodal freight logistics hub is shown in the illustration below.



Foster Transport and Logistics Industries: The major players for freight transport and logistics services are private companies, except the railway freight operation undertaken by Myanmar Rail (MR) and the inland waterway transport operation undertaken by large-sized vessels of around 1,000 DWT by the Inland Waterway Transport (IWT). The total number of trucking companies operating large-sized trucks is around 400 and the number of inland waterway transport vessels is more than 4,000, with and average ship size of around 100 DWT. All of these companies fall under SME. The number of large size trucks is estimated to be around 118,000 units. As the cargo volume forecast is around 3 times the present volume, the number of trucks needed to cope with increased cargo transport demand will be around 330,000 units by 2030. Thus around 212,000 units need to be added on top of the existing fleer of large-sized trucks in less than 15 years. The investment requirement for trucks alone is estimated to be US$ 2.5 trillion or US$166 million per year, on average. Prevailing loan conditions of commercial banks to the SME is difficult for SME, because of the high interest rate (around 15%), the short amortization period (1 year) and the limited amount of loans (US$ 38,500 per average loan) and a mandatory of mortgage. An institutional lending scheme to the SME in the transport industry is to be developed. In this point of view, the transport capacity of the inland waterway, railway and coastal shipping are to be expanded as an alternative cargo transport means for trucking on road. At the same time the feeder roads are to be developed and linked with logistics corridors appropriately especially in the rural areas.

The funding needed for the implementation of the NLMP is substantial. MMK 7.4 trillion or US$ 5.4 billion for infrastructure development and MMK 6.5 trillion/or US$ 5.0 billion p.a. for replacement of aged trucks / vessels, as well as for fleet expansion up to 2030. A combination of national government budget, ODA and private investment (i.e. investment for PPP projects, expansion of transport / logistics businesses, etc.) is needed.

SUMMARY

1. Purpose of Final Report

This Final Report has been prepared with the following aims and objectives:

(i) Confirmation of vision and development strategies adopted for the National Logistics Master Plan (NLMP);
(ii) Presentation of lists of projects identified with priority for NLMP Study; and
(iii) Presentation of the outline of selected projects for their implementation as a short-term implementation program.

2. Economy and Structure

Socio-economic data available since the economy opened in Myanmar is somewhat limited. The average annual growth rate of GDP (in local currency units) is calculated as lying between 9 and 12% p.a., taking into account inflation. The Myanmar economy has thus grown at fairly high rate; higher than the ASEAN average. Myanmar has exported natural gas to neighboring countries, such as Thailand and China. This has been a major source of foreign exchange earnings. However the downturn of the energy market has influenced gas export revenues. If the revenue of gas exports is omitted from the trade value, trade in Myanmar has been in deficit over the past 5 years. Therefore, Myanmar needs to accelerate industrial development aiming at expanding gas export revenues as well as expanding agricultural and manufactured product exports to the international market.

The GDP in Myanmar in 2015 was US$ 64.8 billion and in 2016 it was US$ 67.3 billion. In the National Transport Master Plan, the future AAGR of GDP (between 2012 and 2030) was forecast at 7.0% p.a. This study adopts the same AAGR of GDP of 7.0% p.a. The total population of Myanmar in 2014 was 53.7 million, with and AAGR of about 1% p.a. However, the AAGR of urban population (some 13% of total population) is higher at some 4% p.a. The AAGR of GDP per capita to 2030 was forecast at 6.6%. The economic structure of Myanmar has been changing rapidly since 2010, which can be explained by the share of the total added value by economic sector. The share of the manufacturing sector expected to be the leading sector to accelerate economic growth in Myanmar has been expanding gradually. However, it accounts for around 9% of the total added value. The share of industry in the total value added is around 10%. When these two sectors are combined, the share of the manufacturing and the industrial sectors would be around 20%. The agricultural sector accounts around 40% of the total added value and the service sector follows at around 38% of total value added. Myanmar has only just started the long process to become an industrialized country. However, once the FDI inflow to the manufacturing sector in Myanmar is promoted substantially by the new economic policies, a rapid change of the economic structure may occur dynamically and would then form the basis for strong economic development and growth.

The geographically notable feature of Myanmar is a vast gentle plain stretching from north to south within a horseshoe-shaped mountain range. Myanmar is bordered by five neighboring countries: Thailand and the Lao PDR to the east; China to the northeast; India to the northwest; and Bangladesh to the west. The chain of steep mountain ranges that has created a horseshoe shaped natural defense wall has played an important role in defense and has made past contacts difficult with neighboring countries. The total length of the border with neighboring countries is approximately 4,600 km. These steep and long mountain ranges hamper the development of transport links with neighboring countries. The seacoast faces the Andaman Sea and the Bay of Bengal. The total length of the coastline is around 2,000 km. The water depth along the coastline is shallow in general terms thus international vessels even plying feeder links are forced to wait for sufficient tidal depth before enter ports. Due to its natural location, it is a challenge for Myanmar to develop gateway(s) having substantial and reliable handling capacities to accommodate international and regional cargo traffic.

Myanmar lies at the intersection of three economic growth poles: As Myanmar is located at the center of three economic growth poles, comprised of China to the north, India to the west, and the ASEAN countries to the south, it is in the middle of three very large consumption markets. From the perspective of international, or regional, logistics, the special geopolitical importance of Myanmar exists. If regulations for cross-border trade agreement (CBTA) and the infrastructure for cross-border trade (CBTI) are properly established, Myanmar could become a pivot or important transit country for trade and investment amongst the surrounding neighboring countries, as well as for global investors. The framework of the economic corridors formed in the Indochina Peninsula has been prepared mainly by the ADB and is based on the GMS development strategy. Mawlamyine of Myanmar and Da Nang of Vietnam are considered as the terminals of an economic corridor called the East West Economic Corridor (EWEC). The formulation of the logistics corridor development plan of Myanmar in the Economic Corridors that links major industrial areas of Myanmar, Thailand and Vietnam in the shortest possible distance in the Indochina Peninsula is recommended. Nevertheless, trade volumes in Myanmar are still smaller than those of neighboring Countries (excepting the trade volume of LAO PDR). A potential expansion of trade is considered as highly likely, as the current trend of trade cargo traffic growth with neighboring countries suggests. Trade cargo generation and attraction by Thailand and China affect the trade cargo volumes of Myanmar considerably.

3. Environmental and Social Considerations

Environmental Considerations

The EIA procedure approved by Union Government in November 2015 and officially launched in December 2015 with support of Asia Development Bank is regarded as significant milestone for the environmental sector of Myanmar and was heartily welcomed by private and public sectors.

About 300 mammal species, more than 1,114 birds, 370 reptiles and 1,800 plants are recorded in Myanmar, Amphibian (82) and Reptiles (279), Freshwater Fish Species (449) and Marine Fish Species (579), Coral (52) Butterflies (1014). More species could be added since new discoveries continue to be made every year. Important habitat types represented in Myanmar are forests, wetlands and the marine habitat. Eight different forest types are found in Myanmar: tropical evergreen forest, mixed deciduous forest, dry forest, deciduous dipterocarp forest, hill and temperate evergreen forest, tidal forest or mangrove forest, beach and dune forest, swamp forest (Tint, 1995). The tropical evergreen forest is mainly represented in Myanmar by the lowland wet evergreen forest, a lush vegetation forest dominated by high value commercial species like the evergreen Dipterocarpus species. The marine habitat, supporting a high biomass of fish and other aquatic organism, represents an important source of income for the country. Coral reefs are extensive on the southeast coast of Myanmar (fringing reefs and patch) and around the islands, extending further south into Thailand, covering 1,870 km², with the majority of coral reefs found in the Myeik Archipelago of the Tanintharyi Region.

The SEA study included environmental suitability analysis to grasp the potential impacts for proposed projects within the national logistics master plan, in order to mitigate negative environmental impacts in the earliest stage of the decision-making cycle. There are nine main types of disasters in Myanmar: 1) Cyclones, 2) Drought/Dry zones, 3) Earthquakes, 4) Fire, 5) Floods, 6) Forest Fires, 7) Landslides, 8) Storms, and 9) Tsunami. Severe cyclones tend to occur either during the pre-monsoon season from April to May or post-monsoon season from October to November. Cyclones have three destructive forces, namely: i) storm surge, ii) heavy rainfall, and iii) strong winds. 1,248 tropical storms formed in the Bay of Bengal during the period from 1887 to 2005, of which 80 storms (6.4% of the total) hit the Myanmar coast. In all, 12 cyclones caused severe damage in Myanmar mainly due to the accompanying storm surge, and the maximum death or missing toll was 138,373 caused by Cyclone Nargis in May 2008. Over the recent years, especially in monsoon season, flash floods cause landslides in the mountainous and hilly regions in the northern and central areas of the country. Significant landslides had been occurred in July–October 2015 and May 2016. Impacts on the natural environment (ecosystem and disaster) were spatially evaluated, based on the environmental suitability analysis. As a result of the overall evaluation for target projects, there was no project classified as ‘’A’’. Therefore, it is expected that no projects that will have a significant potential negative impact.

Social Considerations

Myanmar covers a surface of 676,553 km^2, divided into 7 States, 7 Regions and 1 Union Territory. Myanmar Statistical Yearbook (2016) which was published by Ministry of Planning and Finance, describe the total population is about 52.440 million. The population density was 78 persons per km^{2}in 2015-2016 and 70.79 % lives in rural areas while 29.21 in urban areas. Yangon Region has the largest population about 7.6 million and Kayah State the smallest about 0.3 million. Traffic accidents are a significant social problem in Myanmar. During 2015, traffic accidents in Myanmar

numbered 15,677 with 5,037 killed and 25,612 injured persons. Social Impact risk was carried by township level population data which fall in development project areas. Risk levels were categorized into 3 levels based on distribution of population. Some projects need to be analyzed in detail for social impact risk when they go beyond the planning stage.

The SEA study included social suitability analysis to grasp the potential impacts for proposed project of national logistic master plan, in order to mitigate negative social impacts in the earliest stage of decision-making cycle.

The following two studies were carried out:

(i) To review the potential negative impact on social issues from viewpoint of regional and sectoral characteristics.

(ii) To consider the key potential impacts on social issues and the mitigation measures.

The results of the study can be utilized for the preparation of environmental management plan in the implementation of each target project as a preliminary study of the EIA/IEE/EMP.

The risk analysis of social impacts was categorized into three risk zones (Low, Medium, High), each describing the planned zoning. The following factors which are likely to cause negative impacts, were identified for evaluation.

(i) Land acquisition and resettlement

(ii) Local issues, including local economy, community conflict.

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

In the result of the overall evaluation for target projects, there is no project classified as ‘A’’. Therefore, it is expected that there are no projects that are expected to have a significant potential negative social impact.

4. Development Policy Framework

The direction of strategies, policy recommendations, and Action Plans provided in the National Logistics Master Plan will be in line with the parameters of the existing national plans and policies, amongst which:

National Comprehensive Development Plan (NCDP): The plan period for the NCDP is 20 years. The NCDP’s policies focus on the transformation of Myanmar into a major trading production economy in ASEAN and promotion of FDI inflow particularly into the manufacturing sector so as to change the industrial structure significantly. To realize such changes, creation of an enabling environment and a strong enterprise base is quite important. This includes the reinforcement of domestic and international connectivity that would enhance economic integration with the regional and international markets. Consequently, the local economy will be enhanced and current economic disparities will be reduced. This implies that a reinforcement of

domestic, regional, international and domestic connectivity is to be enhanced and bottlenecks for freight transport are to be removed, to maximize the freight transport capacity, to ensure smooth and seamless freight transport to make Myanmar's export products competitive in regional and international markets. Special attention is to be focused on or around the cross-border economic zones. The NCDP's policies focus on strengthening public institutions and governance through reform and capacity building and fostering internationally competitive sectors and industries through the promotion of human resources development.

Agriculture Development Policies: These policies focus on the maximization of the agricultural potentiality of Myanmar, which is endowed with vast land and water resources under moderate climatic conditions, to provide food security first and then expand exports of agricultural products, such as beans and rice. ADP recognizes that Myanmar can be one of the leading rice exporting countries in the world. This requires the creation of multimodal freight transport, to reduce and rationalize transport costs for agricultural products aimed at the international market and to improve market access for farmers, especially in rural areas, with an aim of increased income for farmers. This implies that domestic and regional connectivity between farmlands and demand areas is to be reinforced for the transport of farm products, enabling the selection of the appropriate transport mode at multimodal hubs, in order to make farm products more competitive. The transport costs should be reduced by the modernization of truck terminals at major cities where farm products are collected and distributed to consumers. Thereafter, the facilities necessary for the enhancement of the export of rice and other farm products are to be developed and modernized.

Industrial Policy and Myanmar Industrial Development Visions (MIDV): The MIDV was formulated by the Ministry of Industry in August 2015. The Industrial Policy emphasizes the need to develop Myanmar's industrial sector to be the core of economic development, thereby transforming Myanmar from an agricultural based economy to an industrialized based economy. The development and upgrading of industrial zones is to be enhanced. This implies that access to existing and newly developed industrial zones - especially the Special Economic Zones - is to be reinforced and improved to ensure that such industrial zones are connected in the supply chain with regional and international hubs. The development of international ports and cross-border gateways are to be focused, to ensure the linkage with international markets.

The MIDV's strategy focuses on the formation of manufacturing industries in urban areas to achieve well balanced sustainable national economic development through an enhancement of industrial development by means of the promotion of FDI in the manufacturing / industrial sectors based on comparative advantages of Myanmar (its geographical location, competitive labor market, vast human resources, etc.) This implies that the development and reinforcement of major linkages between Yangon and Mandalay is to be enhanced, taking into account the reinforcement of feeder roads for regional development purposes, at the same time. Logistics infrastructure is to be improved to enable smooth and effective transport throughout the year, at

least transport / logistics cost, with the aim of further developing the comparative advantage of Myanmar. Utilization of local airports and arterial road networks is also a focus, to promote the export of traditional handicrafts and farm products as well.

National Spatial Development Plan (NSDP): The NSDP's policy focuses on the development of SEZ's at Dawei, Thilawa and Kyaukpyu as well as at the two growth poles, namely at Yangon and Mandalay. This implies that the linkages between these SEZs and trunk roads, major railways and/or trunk marine routes are to be reinforced and any bottlenecks are to be removed. Smooth freight transport in and around Yangon and Mandalay is to be ensured, to enhance economic activities and to avoid the development of traffic congestion at and around both of these cities.

Special Economic Zones and National Exports Strategy (NES): The NES's strategies focus on increasing the competitiveness of enterprises through an improvement of the business environment aimed at development and expansion of Myanmar's trade, while contributing to poverty reduction. The development and expansion of exports is recognized as the engine for an acceleration of economic development, which will accelerate the industrialization process. The export of rice, bean and pulse crops is emphasized. The markets are to be diversified and expanded, however such an expansion of the market can be accelerated by enhancement of the FDI inflow, especially to the manufacturing sector. This implies that the logistics system is to be modernized, improved and upgraded to the level of international standards. The connectivity with neighboring countries, regional and international markets is to be reinforced, to integrate Myanmar in the global supply chain. The linkages between trunk roads, railways and maritime routes; and Special Economic Zones- where the FDI for the manufacturing sector will be concentrated, should be developed without bottlenecks and smooth and effective freight transport operations should be ensured.

National Transport Master Plan and Transport Corridors: The National Transport Masterplan (NTMP) was formulated with technical assistance of JICA and approved by the Cabinet as the national development plan for the transport sector on 18th February 2014. The objectives of the NTMP are designed to provide guidance for a long-term investment program for the transport sector in general that will help the Government to achieve its economic growth targets by 2030. In addition, this Master Plan provides the guidelines that are adaptable to other industrial sectors for promotion of private investment, to assist the investment planning and decision making for a variety of transport sector related investment projects. The sector *Vision* spelled out in the NTMP is:

> ***"To develop an efficient, modern, safe, and environmentally-friendly transportation system in a coordinated and sustainable manner that embraces all transport modes for the benefit of the country and people of Myanmar."***

The key development strategy adopted for the preparation of the NTMP was the corridor-based transport infrastructure development strategy as spelled out in the NTMP 2014. This strategy is basically in line with the corridor development strategy prepared and presented by Asian Development Bank in 2010 for the Greater Mekong Sub-region Corridor Development Plans. The logistics corridor is considered as an upgrading of transport corridors and it is to be developed on top of the transport corridor in strategic manner with particular approach to transform the transport corridor to a logistics corridor, through the addition of several projects specifically designed for the development of logistics corridor.

The improvement of connectivity between major cities inside and outside Myanmar contributes to an expansion of trade and revitalization of economic activities amongst cities located on such networks. The improvement of such networks will expand the land area appropriate for the establishment of industries that would utilize the new potential of the relevant cities. Furthermore, the improvement of connectivity with neighboring Countries would not only ensure access to the markets for goods produced in Myanmar in other countries, but would also enable Myanmar to link with the global supply chain including neighboring countries for support and promotion of fragmentation of manufacturing processes, which will bring substantial benefits to Myanmar because this would further enhance the possibility of attracting new industries.

5. Regional Cooperation Frameworks

ASEAN Economic Cooperation: The Association of Southeast Asian Nations (ASEAN) made extraordinary progress since founded in 1967 by Brunei Darussalam, Indonesia, Malaysia, Philippines, Singapore, and Thailand- the so-called *ASEAN6*. It has been transformed into an increasingly well-regulated, dynamic and creative platform for trade and commerce across what may regard as the world's fastest-developing economic region. Vietnam (1995), Lao PDR (1997), Myanmar (1997), and Cambodia (1999), were all based on socialism until joining ASEAN, in the 1990's. The four countries joining ASEAN in the 90s are referred to as CLMV. At present ASEAN is composed of ten countries, including CLMV. Although the economic gap between ASEAN6 and CLMV has been wide, it is now narrowing. 2015 was a key milestone in the ASEAN integration agenda. By 2015, ASEAN become Asia's 3rd largest and the world's 7th largest market and is amongst the most advanced integrated markets. With a combined population of over 622 million, ASEAN has a vast consumer base, behind only China and India globally. Over 50% of ASEAN's population is under the age of 30, making up a large portion of the workforce.

The **ASEAN Strategic Transport Plan (ASTP)** 2011-2015, also referred to as **Brunei Action Plan (BAP)** 2011-2015 is the main plan guiding ASEAN transport cooperation and integration up to 2015. The ASTP identifies strategic actions to be implemented in the period 2011-2015 to support the realization of the AEC by 2015, as well as a new priority for enhancing regional connectivity identified in the Master Plan for ASEAN Connectivity (MPAC). The ASTP is also

formulated to reflect other ongoing developments in the world such as the changing economic landscape, due to emergence of new economic powers such as China and India, and growing global concerns over environment, climate change, safety and security.

The Singapore Kunming Railway Link (SKRL) project has been a priority agenda for ASEAN transport cooperation. The political motivation to complete the SKRL is high. It is expected to provide an alternative mode of land transport, which is more environment-friendly than road transport. The SKRL has rail two lines, the *Eastern Line* through Thailand, Cambodia and Vietnam, with a spur line between Lao PDR and Vietnam, and the *Western Line* through Thailand and Myanmar. The main tasks to be undertaken to achieve this goal are to complete the missing link sections, especially those linking between Cambodia with Vietnam and Cambodia with Thailand and Myanmar with Thailand, and to upgrade some sections to support the smooth operation of the whole of the SKRL.

The ASEAN Highway Network: Sustaining and supporting the rapid economic and social development in ASEAN presents a range of complex challenges for the land transport system. Providing the capacity to accommodate vastly increasing vehicles especially 2-3 wheelers, freight volumes and meet the personal mobility needs of burgeoning urban populations is in itself a daunting task. Considering that currently railways and inland waterway have a very limited role in ASEAN, it is likely that the road sector will continue its dominance in the forthcoming years. With such trend, it is vital to accelerate the implementation of the AHN Project, especially to complete the missing sections and improve the quality of road infrastructure in the AMSs as envisaged in the MOU on the ASEAN Highway Network (AHN) Project.

Transit Transport Routes (TTR): Considering the importance of TTR in enhancing the trade and economic growth in the AMSs, the highest priority is given to upgrade existing “below-Class III” sections of the TTR, total road length of which is 1,999.55 km in Indonesia, Lao PDR, and Myanmar, by 2012. The second priority is given to the construction of the missing links in Myanmar (201km), and upgrading of other “below-Class III” sections in Indonesia, Lao PDR, Malaysia, Myanmar, and Vietnam, with a total length of 4,536.7 km.

Implementation Progress of the Brunei Action Plan (BAP) 2011-2015:

Land Transport: The priority of the land transport program has been completion of the ASEAN Highway Network (AHN) and completion of the Singapore-Kunming Rail Link (SKRL) project. Currently, there are 2 (two) ongoing construction projects for SKRL missing link sections, i.e. Poipet - Sisophon and Aranyaprathet - Klongluk. The construction of Aranyaprathet - Klongluk Section, including the railway bridge connection between Cambodia and Thailand with funding from the Government of Thailand, was completed in August 2015.

SKRL: The construction of SKRL section from Phnom Penh to Tra Peang Sre (Cambodia/Vietnam border) is behind schedule and still seeking funds for project implementation.

On the SKRL sections from Lao PDR (Vientiane-Thakek-Mu Gia) to Vietnam (Mu Gia-Tan Ap-Vung Ang), ROK confirmed that the feasibility study on development of these railway lines had been approved by its National Assembly and would be announced soon. For the proposed construction of the SKRL network between Myanmar (Thanbyuzayat-Three Pagoda Pass) and Thailand (Three Pagoda Pass-Nam Tok), both Member States agreed to replace it with the railway line linking Dawei Port (Myanmar) to Kanchanaburi (Thailand). The supplementary upgrading work in Cambodia, Malaysia and Thailand to support SKRL has made good progress. Cambodia completed the Phase I rehabilitation project from Phnom Penh to Bat Deoung in March 2014 and will start the work on strengthening all railway bridges for the Bat Deoung - Sisophon (306 km) section in 2016.

Transport Facilitation: Operationalization of Protocol: The ASEAN Framework Agreement on the Facilitation of Goods in Transit (AFAFGIT) has been in force since 2000 however its full implementation relies on the operationalization of its protocols. The ASEAN Framework Agreement on the Facilitation of Inter-State Transport (AFAFIST) is ratified by and in force in Cambodia, Lao PDR, the Philippines, Thailand and Vietnam; while the ASEAN Framework Agreement on Multimodal Transport (AFAMT) is ratified by and in force in Cambodia, Myanmar, Lao PDR, the Philippines, Thailand and Vietnam. ASEAN Member States are striving to enact their domestic laws to fully operationalize AFAMT.

ASEAN Customs Transit System (ACTS): Given the importance of efficient cross border operations in the region to support the realization of AEC, significant efforts are required to minimize and eventually remove the barriers at national borders. To this end, the European Union (EU) through the ASEAN Regional Integration Supported by EU (ARISE) has extended technical assistance to ASEAN Member States which aims to make progress in removing barriers related to transport including preparation for and implementation of ASEAN transport facilitation agreements and other relevant initiative to facilitate movement of goods and passenger vehicles as well as implementation of connectivity initiatives. The activities under ARISE also include the ASEAN Customs Transit System (ACTS) pilot project, which is targeted for implementation in 2016.

KLTSP: The Kuala Lumpur Transport Strategic Plan aims to support the realization of the vision of the ASEAN Economic Community (AEC) 2025 which calls for a deeply integrated region that will contribute towards a highly cohesive ASEAN economy. In this regard, the KLTSP, which serves as a guiding regional policy document, outlines 30 specific goals, 78 actions and 221 milestones in the areas of air transport, land transport, maritime transport, sustainable transport and transport facilitation. The KLTSP was developed by the members of the Task Force on the Development of Successor ASEAN Strategic Transport Plan through consultation and with the inputs from the ASEAN Secretariat and all working groups, and sub-working groups under the ambit of STOM. The KLTSP has been built upon the achievements of the BAP 2011-2015 and

aligned with the following post-2015 vision for transport cooperation which was adopted by ASEAN Transport Ministers:

ASEAN Protocol for Logistics: ASEAN Transport Ministers agreed and concluded the ASEAN Sectoral Integration Protocol for the logistics services sector. The roadmap provides concrete actions that ASEAN Member Countries shall pursue to achieve greater and significant integration of logistics services in ASEAN, through progressive implementation of the measures, which include the liberalization of logistics services, enhancing competitiveness of ASEAN logistics services providers through trade and logistic services facilitation, expanding capability of ASEAN logistics service providers, human resources development, and enhancing multimodal transport infrastructure and investment.

Strategy and Action Plan for the Greater Mekong Sub-region (East-West Economic Corridor): The Strategy and Action Plan for the EWEC, as a means of consolidating planning and programming activities by government authorities and development partners, was prepared in 2010 by the Asian Development Bank. The EWEC vision is to create an economic corridor that will stimulate the type of economic growth that reduces poverty and raises the standards of living in the areas covered by the corridor.

6. Future Cargo Transport Demand

The cargo flow situation in terms of volume throughout the country as a whole has never been studied in Myanmar in the past. The forecast and perspective of cargo flow are studied and determined to prepare the logistics development plan on long-term perspective. The key drivers of cargo transportation demand forecast are future population and economic activities of country as a whole and each region and state as well as major cities and gateway. Future economic framework is determined to depend on “Myanmar National Transport Master Plan 2014 by JICA - NTMP”. Household expenditure is projected to increase more than 3 times over the 2015 value by 2030 due to the growth of both economy and population. With regard to current international cargo volumes**,** the share of trade value by transport mode is 60% by sea, 18% by land, 18% by pipeline and 4% by air. The largest share in the export value is by pipelines.

Cargo Demand Forecast: The total cargo volume in 2030 is projected to reach 312 million tonnes from 169 million tonnes at present, through the summation of each forecast cargo volume prepared in OD form. This projected volume includes intra cargo movements within region/State. The annual growth ratio is 4.0%. The cargo volume transported per day is projected to be 1.3 million tonnes per day in future, from 0.4 million tonnes per day at present. In the “Myanmar National Transport Master Plan 2014”, this was projected to be 0.972 million tonnes per day in 2030, however such differences in forecast daily cargo volumes might arise from a difference in zone size and the inclusion of cargo intrazonal flows with each in region/State. The cargo volume per capita grows to 8.0 tonnes in 2030 from 2.9 tonnes in 2015. There is still more potential of growth when the correlation with economic growth from other Developed Countries is

considered, especially if infrastructure and logistics systems are fully developed in future.

The import volumes of petroleum, fertilizer and cement are assumed to decrease in future, due to an increase in domestic production for these commodities. The total import cargo volume is projected to grow at an average annual growth rate of 9.8%. The total export cargo volume is projected to increase at an average annual growth rate of 11.2%, however the export volume of sand is assumed to decrease. It is assumed that the share of border trade volume will increase from 29% at present to about 44% in the future total for import and export cargo volumes.

7. Sector Issues

Logistics Sector Issues: The development of logistics services and communication technologies has revolutionized production and distribution processes, and has created the "global market". It is within this competitive environment that shippers and consignees require efficient logistics services that can move their goods at the right place, at the right time, in the right condition, and at the right price. The issues identified by sector are summarized below:

(i) The cargo transport cost is generally high;
(ii) The waiting time for customs clearance is very long at ports and CBPs;
(iii) The shortcomings in cargo transport infrastructure i.e. roads, railways, ports, inland water transport are significant;
(iv) There is a shortcoming of diversified links in logistics corridors, thus it is difficult to avoid the total blockage of trunk roads by natural calamity, etc.
(v) The shortcomings of logistics facilities such as truck terminals, dry ports, off-dock facilities, warehouses, etc. are significant; and
(vi) There is a lack of proper cargo transport regulations meeting with international / regional requirements.

8. Vision and Strategy

Logistics Development Vision and Strategy: The Vision for logistics sector development is to create logistic corridors that will form a basis for the creation of economic corridors, which will stimulate the type of economic growth that reduces poverty and raises the standard of living of areas covered by the corridor in general. Taking this into account, the Vision for the logistics sector development can be expressed concisely as the objectives below:

> ***"To create an efficient, competitive and environmentally friendly logistics system in accordance with regional and international perspectives including the enhancement of multimodal transportation for the economic development and the poverty reduction of Myanmar"***

Goals of National Logistics Development: The goals of the logistics corridors and networks are the following:

- To reduce and rationalize the cargo transport / logistics costs as well as the lead time for transport of goods;
- To reduce and rationalize the costs for all kinds of international trade and cross-border transactions;
- To increase competitiveness through economies of scale offered by international and cross-border investments that are based on value-added processes and which take advantage of the comparative advantages of different areas along the respective logistics corridors;
- To empower the private sector by promoting joint, financial, technological, marketing, production, and other collaboration in the areas covered by logistics networks;
- To reinforce the hub and spoke cargo transport functions throughout the Country through provision of proper and modern truck terminals and feeder road networks;
- To enhance urban and rural synergies by linking urban industrial areas with rural areas through the provision of effective freight transport and feeder road networks;
- To reduce poverty, support development of rural areas in general and border areas in particular; and
- To increase earnings and employment opportunities by generating quality jobs in a wide range of sectors.

Logistics Corridor Development Strategy: Development of logistics is important, linking regions in the country and neighboring countries in the Indochina Peninsula, facilitating trade, enhancing regional economic integration for better access into the global market. However, logistics is a relatively new development approach and policy in the countries located in the Indochina Peninsula. It is acknowledged that having an efficient logistics system in the Indochina Peninsula can help support the existing corridor's economic integration or to enhance and promote the integration of economies of the ASEAN Economic Community (AEC) to which Myanmar is a member country. The logistics development visions, strategy, policy and action plans for prioritized projects for respective sub-sectors of Myanmar will be prepared based on the corridor development approach for government authorities concerned and development partners.
Transport links should meet the following conditions:

- Forming of important and major cargo transport axis
- Handling of large volume of international and domestic freight flow
- Providing transport infrastructure and services for various modes of transport along a strategically selected transport link
- Linking major/important terminals and transport nodes.

The strategic development of transport nodes is essential to upgrade or to transform a transport corridor into a logistics development corridor. There are several kinds of transport nodes where public investments that would induce private sector investments in the logistics services are guided, as follows:

- Commercial nodes (major cities, industrial zones, etc.);
- Interchange nodes (interchange of highways, where many links cross each other, etc.);
- Multimodal nodes (where roads, railways, airports and / or seaports are situated).
- Gateway nodes (seaports, airports); and
- Border nodes (border crossing points on the national borders, etc.)

Such transport nodes need to be developed or upgraded to be logistics nodes in a strategic manner guided by the transport administration, aimed at enhancement of public and private investment relating to logistics services; such as customs facilities, warehouses, logistics parks, truck terminals, etc.

9. Corridor Based Logistics Infrastructure Development Plan

Logistics corridors were determined and agreed among the members of the Joint Coordination Committee in December 2016.

North-South Logistics Corridor: (a main Logistics Corridor linking landlocked provinces in China (Kunming) and Myanmar, as well as Thailand): This corridor is the main logistics corridor of Myanmar that forms an axis linking two economic growth poles in Myanmar namely; Mandalay and Yangon where the major industrial zones and the international gateway port exists. This route includes the three different transport modes: highway, expressway, and railway. This corridor is a part of the India-Myanmar-Thailand (IMT) trilateral highway as well.

Southeast Logistics Corridor: This Corridor is also a part of the IMT trilateral highway and a part of the GMS East-West Corridor (EWEC). It is designed to have three gateways or cross-border facilities to the east, along the national border with Thailand. The estimated cargo volume to be handled at the gateways along the national border with Thailand is quite large. However, all routes linking Myanmar with Thailand pass through mountainous areas. Therefore, the road width of this corridor link is limited because of geological conditions and because of the high cost of widening the road. The road in Myanmar, in mountainous areas with steep slopes, is vulnerable to natural hazards such as heavy rainfall. There are road closure risks such as landslide, collapse of bridges, ethnic conflict, etc. in this corridor. Therefore, the link between Myanmar and Thailand should be provided with alternative (diversified) routes as early as possible, to avoid total closure of this trade link. The transport mode of this route is limited only to the road transport at present but the existing railway can be utilized and extended further.

Main River Logistics Corridor: The Ayeyarwaddy River has been the most important river system of Myanmar, running 2,170 km throughout the country from north to south. Its river basin area is almost 411,000 km^2 and benefits some 40 % of the total population. The Chindwin River is a branch river of the Ayeyarwaddy River and plays an important role for the transport of cargo to mountainous and remote areas along this river. The Ayeyarwaddy Delta is the breadbasket of Myanmar and a major rice production area. Rice has been one of the most important export commodities and foreign exchange earners of Myanmar, after natural gas resources. Rice these days is exported to China and major transport means used for rice exports to China is inland waterway transport, using the Ayeyarwaddy River. This route includes the three different transport modes: inland waterway transport, highway and railway. The river ports can be developed as the core of hub linked closely with road and railway as the multimodal freight logistics hubs aiming at optimizing the transport efficiency at least cost.

Coastal Marine Logistics Corridor: This corridor is a maritime corridor linking local sea ports along the entire coast of Myanmar. The total length of the corridor along the coast is around 1,700 km, stretching from the border with Bangladesh to the west and the border with Thailand at the south eastern end of Myanmar. The eight (8) major local ports located within this corridor are; Sittwe, Kyaukpyu, Thandwe, Pathein, Mawlamyine, Dawei, Myeik, Kawthaung and one (1) international / local port at Yangon. The transport costs of coastal shipping are low compared with other transport modes, such as highways (trucking) or railways and this mode is suitable for the transport of bulky commodities, such as construction materials and grain, including rice, at a lower cost than land transport. In the rural areas along the coast of Myanmar, the economic level of the population lags behind the average of Myanmar and land transport access is poor, therefore coastal shipping for daily consumables is quite important for the population spread along the coast. The transport mode of this route is limited only to the coastal shipping. The local ports can be developed as the core of hub linked closely with road and railway as the multimodal freight logistics hub.

Myanmar-India Logistics Corridor (a part of the Logistics Corridor Linking India, Myanmar and Thailand that obliquely crosses Myanmar): When three logistics corridors namely Myanmar – India Logistics Corridor, North-South Logistics Corridor and South-East Logistics Corridor are joined together, this corridor can serve as an important regional link that connects Myanmar and India, China and Thailand by traversing Myanmar. The conclusion of the trilateral treaty among India-Myanmar-Thailand (IMT) making way for the IMT Highway provides seamless vehicular movement between SAARC and ASEAN Nations, enhancing trade, business, health, education and tourism between India, Myanmar and Thailand. The major transport mode of this route is road transport. However the inland waterway along the Chindwin River can be linked with the road system at the multimodal freight logistics hub of which core facility is a river port.

Trans Myanmar Logistics Corridor: This logistics corridor links Kyaukpyu Port or SEZ facing the Andaman Sea with the Chinese border to the east and the border with northern Thailand or Tachilek via Magway, Meiktila, Taunggyi, Heho in Shan State horizontally in the central part of Myanmar. This corridor traverses the central part of Myanmar from west to east and intersects the north-south axis. It is an important trunk route for the transport of agricultural products of Shan State that lacks a good access to Yangon and Mandalay. The landlocked western part of China (Yunnan Province of China: population: 50 million) has been looking for a deep sea port for their trade and assisted Myanmar to create the Kyaukpyu Port, which is possible to accommodate VLCC (Very large crude oil carriers of between 180,000 to 320,000 DWT) for import of crude oil shipped from Africa (South Sudanese crude oil) and onwards transit to Kunming, via the Trans-Myanmar Crude Oil Pipeline (Sino-Myanmar Pipeline), whose crude oil transmission capacity is around 25 million tonnes per year. The crude oil lifting facility was built at Maday Island, near the commercial port of Kyaukpyu, which has a water depth of more than 20 meters. The transport mode of this route is road transport of which terminal at west is the Kyaukpyu Port. At present the Kyaukpyu Port is used mainly for the transport of crude oil for China, however this port can be utilized further for domestic transport of Myanmar products. This oil and gas transmission line invested by the Chinese oil company is a part of the One Belt One Road (OBOR) strategy of the Government of China.

10. Proposed projects

Myanmar opens up to the world market: As the regional trade agreement in accordance with the framework of AEC is going to be completed by 2018, international freight traffic is expected to increase at a fairly rapid pace. Major goods being transported to Myanmar are manufactured goods, fuels and consumable goods. Goods being transported from Myanmar to the world market in general, especially to neighboring countries in particular, are mainly agriculture products at present. The freight volume of manufactured products and value-added agricultural products to the world market as well as transit cargo to and from China and Thailand will increase at a rapid speed once the logistics corridor are formed as planned. This is to be noted that the trade cargo of Myanmar transported to and from Thailand as its neighboring country of Myanmar is not only for the trade cargo with Thailand but includes the trade cargo exported or imported by Myanmar through Laem Chabang Port situated at south of Bangkok.

Integrated development of all relevant components constituting the transport and logistics sector: Upgrading will be needed not only for transport infrastructure but also for logistics and transport services, in an integrated manner. In addition, there will be a substantial change of road transport patterns when the regional road networks connecting China, Thailand and India via Myanmar (East-West Corridor and India-Myanmar-Thailand Corridor) will be completed. Furthermore, the operational mode of railway freight transport will change substantially, from the present conventional railway freight transport system to a container block train system. At

present most of cargo transport is done on ad hoc basis but not on regular basis in Myanmar. Once the container block train service will start, this will be the first regular freight service and it would become a model for the freight transport by other mode such as inland waterway transport. The container block train service will also enhance the containerization as well as palletization. Since the mechanical cargo handling system on a large scale will be started in the Inland Container Depots (ICDs) at both terminal of Yangon-Mandalay Line, this will become the model for mechanical cargo handling outside of the international container terminal. Furthermore this would enhance the business of logistics providers who will collect the cargo from the shippers and deliver the cargoes to the consignees in time as contracted. By 2023 the container block system will be commissioned, thus its supporting systems in views of both hard components and soft components are to be completed fully. In addition to the railway system, inland waterway transport and coastal shipping will play an important role for long distance haulage of low value and bulky cargoes especially along the agricultural areas, rural areas and coastal rural areas.

Number of the Proposed Projects: The total number of projects within the National Transport Master Plan for the period of 2014-2030 was 108. The criteria for prioritization of the projects and the weight of each element to evaluate the priority of projects were predetermined. In order to evaluate the priority of each project, a scoring method was adopted to evaluate each project quantitatively. This project prioritization method by scoring is applied for all projects listed in the NTMP for transport corridor development as well. 108 projects listed for the National Transport Master Plan (NTMP) and 59 new projects have been additionally proposed in this report. The projects for a short-term time frame were selected and identified to eliminate present bottlenecks on the important road network, inland waterways, local ports for coastal shipping and truck terminals to improve logistics performance as a whole. In tandem with the project appraisal and prioritization major menus were developed that would lead to improved logistics performance level of Myanmar.

11. Enhancement of Establishment of Multimodal Freight Logistics Hubs

The potential locations / nodes for the establishment of the Multimodal Freight Logistics Hubs have been identified. These Multimodal Freight Logistics Hubs are planned and designed to connect various freight transport modes at strategic transport nodes (road transport, railway transport, inland waterway transport, marine transport, coastal shipping, air cargo transport) to ensure minimization of freight transport costs and lead time; as well as the optimization of investment impacts of both core projects (logistics facilities) as well as supporting projects (freight transport infrastructure). The table below shows the locations and details of each of the Multimodal Logistics Hubs (MMH) that are proposed.

The transport industry in Myanmar is composed of road, rail, inland water transport, coastal shipping, and maritime transport and air transporters. Among these transporters, railway transport is undertaken by Myanmar Railway, which is a State-owned Enterprise (SOE), and a part of

inland water transport is undertaken by the Inland Waterway Transport (IWT) both of these are SOEs under the MOTC. The Myanmar Port Authority (MPA) undertakes the development and management of commercial ports.

Locations of Nodes for the Establishment of Multimodal Freight Logistics Hubs

MMH Ref No.	Type of Node				Location		Transport Mode Combined					
	Gateway	Commercial/ Industrial	River Port	Intersec-tion	City	Region	Ocean Going Ship	Road	Railway	Inland Water	Coastal Ship	Air
1	■	■			Yangon (Thilawa)	Yangon	O	O	O	O	O	O
2		■			Yangon	Yangon	O	O	O		O	O
3		■	■		Mandalay	Mandalay		O	O	O		O
4				■	Meiktila	Mandalay		O	O			
5		■	■		Mawlamyaing	Mon		O	O	O	O	
6	■				Kyaikami	Mon	O	O	O		O	
7		■		■	Bago	Bago		O	O			O
8		■	■		Pyay	Bago		O	O	O		
9		■	■		Magway	Magway		O	O	O		
10		■	■		Pathein	Ayeyarwaddy		O	O	O	O	
11		■	■		Hinthada	Ayeyarwaddy		O	O	O	O	
12		■	■		Monywa	Sagaing		O	O	O		
13	■	■			Dawei	Tanintharyi	O	O	O		O	O
14	■		■		Sittwe	Rakhain	O	O	O	O	O	O

Source: Survey Team

Government investments in the transport sector have largely concentrated on highways and new railways, whereas the operation of the transport network including maintenance, have been neglected. Particularly the lower-level road network has not been maintained sufficiently. Similarly, the private sector has invested little in the past. The transport industry has to cope with the following three challenges:

(i) Outdated trucking fleet;
(ii) Under-utilization of trucks; and
(iii) Low profit margins.

With the further liberalization of Myanmar, both economically and politically, an increased inflow of private sector investment can be expected. In fact, the first wave of investment can already be observed. This investment will have also a large impact on Myanmar's logistics, including the transport industry. A comparative development example can be found in Thailand.

12. Institutional Development at National Level

Ministry of Transport and Communications (MOTC): The administrative organizations mandated for transport and logistics development in Myanmar were analyzed. The development policies and projects proposed by each Department are assessed by the Policy, Legal Procedure & Inspection Bureau, and the Project & Statistics Bureau, respectively. MOTC will establish a new organization in charge of the planning of transport and logistics development. The MOTC, as the highest level authority concerned with the transport administration, needs to take responsibility for coordination and management functions that could coordinate between administration system and private business entities. Such coordination and management functions should be

strengthened by the MOTC, centrally authorized for logistics administration and development of infrastructure. The MOTC should have the capability to coordinate plans at the stage of plan formulation in an administrative way.

The Ministry of Construction (MOC): Department of Bridges (DOB) and the Department of Highways (DOH) in Nay Pyi Taw are responsible for the Government's administration of road and bridge development planning and design: The MOC is mainly responsible for the design, construction and maintenance of union highways and regional roads.

Inter-ministerial Coordination: During the course of the preparation of the National Logistics Master Plan, it is understood that the plan formulation, administration management and actual operation of the logistics system in Myanmar are exercised by each transport mode. For example, coordination mechanism is still weak among ministries and agencies involved in the development and improvement of the logistics system in the field of administration. The trade, transport and storage of goods by private entities exercised independently. The function to coordinate or collaborate businesses among private entities does not exist, neither amongst private entities nor the relevant Ministries.

13. Institutional Development Plan at the Local Government Level

Yangon City Development Committee (YCDC) is a Municipal Authority in Yangon that plays a central role in urban planning, development and management. It is responsible for service deliveries in Yangon City. The YCDC Department responsible for managing the Truck Terminals is the *Revenue Department*.

Mandalay City Development Committee (MCDC) manages Mandalay, consisting of seven townships, and is responsible for municipal service delivery and public works there. The same situation concerning the planning, development, improvement and management of truck terminals occurs in MCDC, as in Yangon. The establishment of a single Department mandated for planning, development, management and regulation of the operations of truck terminals is also necessary.

Truck Terminal Development and their Management: The existing truck terminal has been planned and developed by the YCDC, however all land lots and building lots (administration rooms, warehouses) have been sold to users (in most cases the traders of commodities). The common areas of the truck terminal used for truck parking and the internal road network, etc. is owned and maintained by the YCDC. This means that the truck terminal in Yangon is operated by private companies individually, but not in a collective way. Management by City or other administrative organizations might be required. Setting up a department within YCDC responsible for planning, development, implementation, regulating, and management of truck terminals is needed. However, personnel employed by the YCDC lack knowledge about the logistics businesses, including the trucking business. Thus the training of such personnel will be

carried out with technical assistance from either government or private bodies specialized in the field of logistics businesses.

14. Coordination between Public Sector and Private Sector

For the operation of the logistics system, the role of the Service Provider is to be undertaken by private entities and administrative organizations will take the role of the Regulator, to prepare the conditions that will ensure a sound and competitive business environment in the private sector to maximize cargo transport efficiency. This is to be basis for public-private role demarcation and collaboration.

Only six years have passed since Myanmar opened its economy to the World market and started to build linkage with the international supply chain. Under such circumstances, the best way to gain the knowledge and to attain an understanding of the essence of logistics system is to observe examples from real logistical activities and facilities in Asian countries having more advanced logistics system development such as Japan and Thailand. Based on such experience shared by concerned parties the DOSA is to be carried out to come up with effective plans designed for the capacity building program aimed at upgrading technical capacity, core capacity and providing an enabling environment. The development or improvement of the logistics system in Myanmar cannot be realized or plan objectives achieved if the effort is concentrated only on the development of infrastructure, which requires considerable investment. A roadmap and timeframe for logistics development is proposed in a step-wise concept.

15. Financial Modalities for the Implementation of the NLMP

The funding needed for the implementation of the NLMP up to 2030 is enormous. (MMK 7.4 trillion (or US$ 5.4 billion) up to 2030 for infrastructure development: and MMK 6.5 trillion (or US$ 5.0 billion each year) for replacement of aged trucks / vessels, as well as for the expansion of fleets up to 2030). A combination of national government budget, ODA and private investment (i.e. investment for PPP projects, expansion of transport / logistics businesses, etc.) is needed to fill the gap between available government budgets and the required investments. The enhancement of PPP projects and expansion of the funds to support SMEs engaging within the transport / logistics business is essential. The establishment of an institutional financing system for SMEs – especially for SMEs undertaking the transport / logistics business is necessary to ensure and maximize the investment impact.

CHAPTER-1 INTRODUCTION

1.1 Background of the Survey

During period of 2012-2014, the Japan International Cooperation Agency (JICA) in collaboration with the Government of Myanmar conducted "The Survey Program for the National Transport Development Plan". This Study formulated the transport development vision and transport development strategies for the target year of 2030. The Study recommended corridor-based transport infrastructure development as well as priority projects for prioritized economic corridors. The recommendation and proposals were approved by the Government of Myanmar and acknowledged as the National Transport Master Plan (hereinafter referred to as the "NTMP").

After the approval of the NTMP, various policies relevant to industrial development and socio-economic development have been formulated. Furthermore, the "Myanmar National Industrial Development Vision" was formulated, which was supported by the Government of Japan. In this vision, the strategy of the "urban-rural synergy" industrial development is based on the comparative superiority of Myanmar taking into account the availability of quality, competitive wage and abundant labor force, geographical superiority being close to markets and production centers.

In 2015, the Thilawa SEZ (Special Economic Zone), planned and developed in collaboration with the Government of Japan and private sector, was completed.

The cargo handling volume at Yangon Port including the Thilawa area has been increasing rapidly due to the rapid massive expansion of economic activities of Myanmar. It is anticipated that the future cargo traffic volume trend will continue at the same pace. This is problematic since the existing logistic system will not be able to handle the increasing cargo volumes. Most of the physical distribution networks and concerned facilities are already outmoded and antiquated especially in the rural areas, and where appropriate maintenance and upgrading on those facilities had not been implemented. It is noted that the degradation of the existing physical distribution system is hampering the industrial development in the rural areas. Narrowing of the economic gap between the urban areas and rural areas, and improvement of the physical distribution system and logistics system are considered as the most critical matters to be addressed for attaining the proper economic development of the country.

Under such circumstances, the logistics development plan in this report is vital to formulate the logistical foundation for smooth industrial development of Myanmar taking into account major factors such as: the perspective of industrial development and the projected cargo traffic/logistics demand, reinforcement of transport network, increase of the port and cargo handling capability at

coastal area, and reinforcement of the transit axis linking the major domestic market and major cities of the country. It is acknowledged by the government that the promotion and realization of transport and logistic infrastructures should be given the highest of priorities.

In preparing this report, series of Study has carried out to review existing reports, including data collection of related information concerning the industrial development from both aspects of improvement of the physical distribution system (mainly for transportation of domestic cargoes) and logistics (for transportation of international cargoes). Additional survey deemed necessary has also been carried out to confirm the development direction. Based on such development, recommendations are formulated for the preparation of the logistics system development concept covering preparation of the logistics system development policy, relative regulations, and design of the organization that is necessary for the improvement and modernization of the logistics systems in Myanmar.

1.2 Objectives of the Survey

The main objectives of the Study are to:

(i) Grasp current physical distribution / logistics system;
(ii) Forecast future cargo demand;
(iii) Examine and review the relevant programs and plans;
(iv) Identify logistics sector issues and examine the feasible measures;
(v) Design an effective approach to solve the identified issues in proposed projects; and
(vi) Recommend various measures to improve and modernize the logistics systems in Myanmar.

Through the execution of the Survey during the period since July 2016, various information and data related to the logistics system have been collected so as to achieve the objectives. The JICA Study Team collected valuable opinions and comments from the stakeholders including government agencies through the official coordination meetings in order to finalize this report.

It is recommended that a study would be formulated by the Government of Myanmar by utilizing of the results of the Survey.

1.3 Structure of Final Report

This report is organized into 17 chapters as follows.

CHAPTER-1	**INTRODUCTION**	
	Explanation of the structure of this report.	
CHAPTER-2	**ECONOMIC DEVELOPMENT FRAMEWORK**	
	Understanding the outline of changes of socio-economy, economic structure and trade. It identifies the peculiar conditions of Myanmar (geographic shape and location). Perspective of agriculture and industrial sectors are outlined.	Based on such conditions, various development policies are formulated as discussed in subsequent chapters.
CHAPTER-3	**VARIOUS DEVELOPMENT PLANS AND POLICIES**	
	Understanding of current comprehensive development plan and various plans covering development plans of agriculture sector, industrial sector, and trade sector.	These policies are taken into consideration for formulation of logistics master plan.
CHAPTER-4	**NATIONAL TRANSPORT MASTER PLAN**	
	This master plan for transport sector development was prepared with the technical assistance of JICA and authorized on 4th January 2014 as the government's transport sector master plan so called NTMP 2014.	The base of logistics master plan shall be the master plan especially prepared for transport infrastructure development.
CHAPTER-5	**REGIONAL COOPERATION FRAMEWORK**	
	Peculiar condition and one of the elements of comparative superiority of Myanmar economy is its geographical location. Myanmar can function as a pivot in amid of three giant immediate neighboring countries and AEC as a member country of AEC.	Factors of regional cooperation greatly impact Myanmar's economy especially industrial development as well as freight transit.
CHAPTER-6	**CARGO DEMAND FORECAST**	
	Precise O-D Table has not existed; thus, current O-D table for cargo traffic is prepared and future O-D table is prepared based on current O-D table taking into account various factors delineated from various plans and policies discussed in above chapters.	Rapid increase of cargo volumes is foreseen due to various factors. Cargo flow patterns are projected. The projected volume reflects to transport / logistic infrastructure development discussed in following chapters.
CHAPTER-7	**LOGISTICS SECTOR ISSUES**	
	Issues are identified in qualitative terms in general and quantitatively for particular issues. The significant issues identified are: 1. High transport and logistics cost 2. Insufficient capacity of transport infrastructure 3. Low cargo transport efficiency 4. Fragmentation of logistics business	Plausible measures are evaluated and proposed to address identified issues according to relevant sector strategies to realize the policies and deal with transport volume discussed in preceding chapters properly.
CHAPTER-8	**LOGISTICS DEVELOPMENT VISION AND STRATEGY UPTO 2030**	
	Vision is stated for the logistics sector as a whole and strategies are evaluated for cargo transport and logistics for each sub-sector.	Taking into account the economic policies and perspective of Myanmar, the development vision is determined.

CHAPTER-9	**CORRIDOR-BASED LOGISTICS INFRASTRUCTURE DEVELOPMENT PLAN**	
	In order to optimize the investment effect, the corridor development strategy is formulated. The major infrastructure projects are presented that forms each logistics corridor.	Projects that optimize the effects of investment to transport / logistics infrastructure are evaluated and identified with relevant executing agencies.
CHAPTER-10	**PROPOSED PROJECTS**	
	Projects forming the logistics corridors are identified and presented in priority. Prioritization of all projects including the projects listed in the National Transport Master Plan was carried out.	Based on logistics corridor development plan and strategies, projects are determined and prioritized.
CHAPTER-11	**MULTIMODAL FREIGHT LOGISTICS HUB**	
	Combination of projects identified and prioritized that forms the multimodal freight logistics hubs at important nodes are presented.	The formation of multimodal freight logistics hub is presented.
CHAPTER-12	**STRATEGIC ENVIRONMENT ASSESSEMENT**	
	Strategic Environment Assessment (SEA) on identified and prioritized projects is presented.	SEA is presented.
CHAPTER-13	**FREIGHT TRANSPORT AND LOGISTICS INDUSTRIES**	
	The present situation of private sector related to the freight transport and logistics operation is presented.	
CHAPTER-14	**INSTITUTIONAL DEVELOPMENT PLAN**	
	The institutional set up as a part of the implementation arrangement for smooth implementation of the master plan is presented.	Institutional development was studied taking into account the road map prepared taking into account current conditions.
CHAPTER-15	**LOGISTICS SECTOR DEVELOPMENT ROAD MAP**	
	Road map of master plan implementation is presented for overall development program and logistics corridor development program respectively. The action program for achievement of policy objectives is presented.	Road map of logistics system development up to 2030 is prepared and presented taking into account all elements discussed in preceding chapters.
CHAPTER-16	**FINANCIAL SCHEME**	
	Outline of needs of PPP financial modality as well as the institutional financing system to support SMEs engaging with transport / logistics businesses.	Financial schemes on the infrastructure development / improvement projects and for supporting SMEs.
CHAPTER-17	**LOGISTICS PERFORMANCE INDEX**	
	Outline of LPI such as the method of evaluation and present score of Myanmar is presented.	Various actions are presented to raise the level of Myanmar's present position.

Project profiles presenting brief summaries of each proposed project in this survey along with supplemental material regarding the port development plans are separately compiled as Volume 2 of this report.

CHAPTER-2 ECONOMIC DEVELOPMENT FRAMEWORK

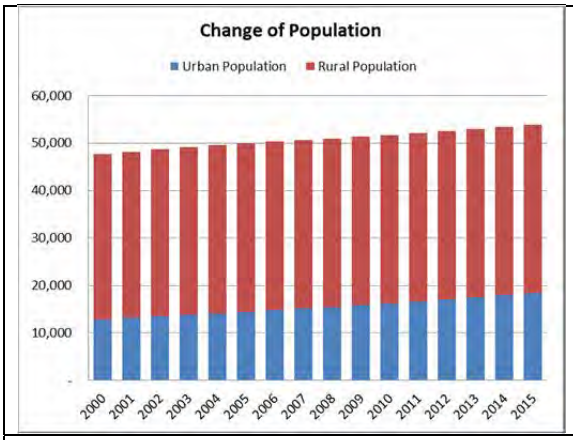
2.1 Cargo Demand Forecast based on Economic Perspective of Myanmar

An in-depth study on the total cargo flow volume of Myanmar has not been carried out in the past. Although various transport related studies have been carried out, these studies focused on passengers. In the Study the cargo flow volume forecast and pattern of cargo flow are studied and determined to prepare the base for the formulation of the logistics development plan on long-term basis. The cargo demand forecast has been carried out based on various factors of economy such as annual growth rate of GDP, growth rate of GDP per capita, economic structure, trade balance, trade partners, regional economy, trend of manufacturing industry in Asia, regional logistics networks, etc. as discussed in subsequent sections.

Socio-economic data with time series since the economy opened in Myanmar is rather limited. **Figure-2.1.1** shows changes in population between 2000 and 2015; and trade industry in value and volume between 2011 and 2015. Since the change in the statistical system has been underway, GDP data is limited; only in local currency units, on a current market price basis. The average annual growth rate of GDP in local currency units can be calculated, as lying between 9% - 12% p. a., taking into account the inflation rate for each year over the period 2010 – 2015. The Myanmar economy has grown at fairly high rate, above the ASEAN average.

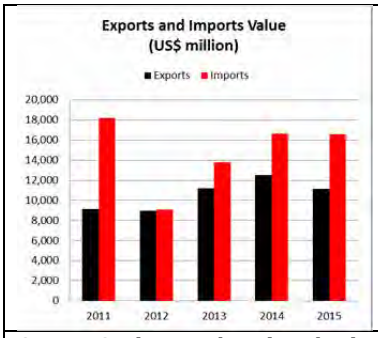
(1) Changes of Trade

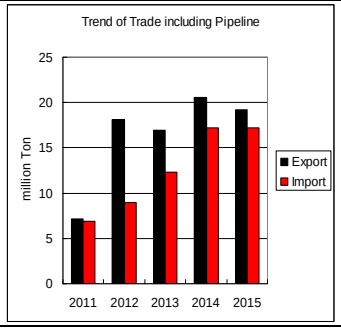
Myanmar has been exporting natural gas to neighboring countries such as Thailand and China. The gas has been a major source of foreign exchange earnings. However, the downturn of the energy market price has influenced gas export revenues. If the revenue of gas exports is omitted from the trade value, trade in Myanmar has been in deficit over the past five years. Therefore, Myanmar needs to accelerate industrial development aimed at expanding gas export revenues as well as expanding exports of non-energy products such as agricultural and manufactured product to the world market.

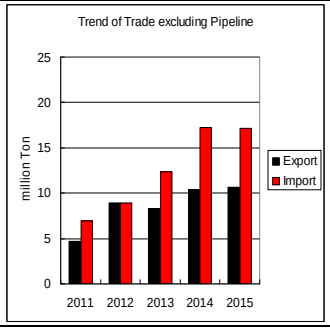


Source: Study Team based on the data available from the World Bank Data

Change of Population ('000)	Change of Merchandize Exports and Imports







Source: Study Team based on the data obtained from the Ministry of Commerce

Change of Exports and Imports in Value (US$ million)	Change of Exports and Imports Volume (including gas)	Change of Export and Import Volume (excluding gas)

Source: JICA Study Team based on the World Bank Data.

Figure-2.1.1 Change of Myanmar's Population and Trade

As shown in the graphs presenting the change of exports and imports volume excluding natural gas exports, the exports volume has not changed much but the value has been declining. In order to increase and expand the export value, Myanmar needs to accelerate the export of value added products such as manufactured goods and agricultural products that comply with the international standards with competitive price.

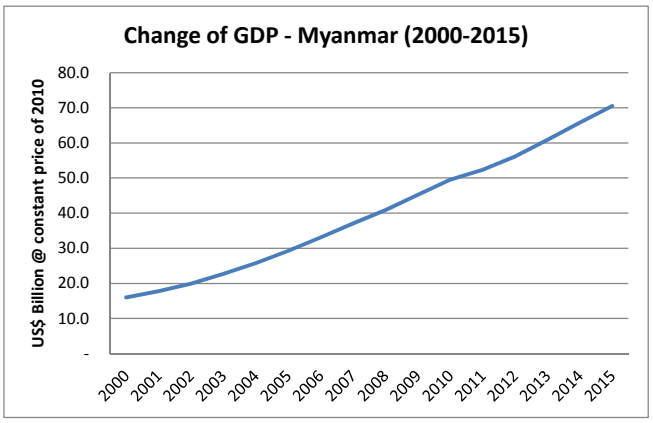
(2) GDP Growth

The GDP in Myanmar in 2016 was US$ 67.3 billion. In 2005, some 10 years earlier, GDP was US$ 29.3 billion, while the Average Annual Growth Rate (AAGR) within the ten-year period was 7.4%. In the National Transport Master Plan (NTMP), the future AAGR of GDP (between 2012 and 2030) was forecast at 7.0% p.a. **Table-2.1.1** shows the change of GDP over time. **Figure-2.1.2** illustrates the change in GDP in graphical form. This figure shows the constant and stable growth of the economy in terms of the GDP growth, and this is projected to continue at similar pace to that experienced over the past 11 years (around 7.0%) and the past 5 years (around 7.3% on average) respectively. In this Study, the AAGR of GDP was adopted as the same as presented and projected in the MYT-Plan (e.g. set at 7.0% to be consistent with the projection presented in NTMP).

Table-2.1.1 Change in Myanmar's GDP

Indicator	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	AAGR	
GDP (Current)	98.2	114.5	131.6	147.9	164.8	182.9	197.1	215.4	237.3	260.9	282.9		
GDP (US$ billion Constant 2010)	29.3	33.1	37.1	40.9	45.2	49.5	52.3	56.1	60.9	65.7	70.5	10-years	5-years
Annual Growth Rate of GDP		13.1%	12.0%	10.3%	10.6%	9.6%	5.6%	7.3%	8.4%	8.0%	7.3%	9.2%	7.3%

Source: Study Team based on available data from the World Bank Data



Source: Study Team based on the country data of the World Bank

Figure-2.1.2 Change of GDP of Myanmar (2000-2015)

(3) Population Growth

The total population of Myanmar in 2014 was 53.7 million and its AAGR in the past 10 years was 0.76%. According to the past trend of GDP and population, the AAGR of GDP per capita to 2030 is computed at 6.6%.

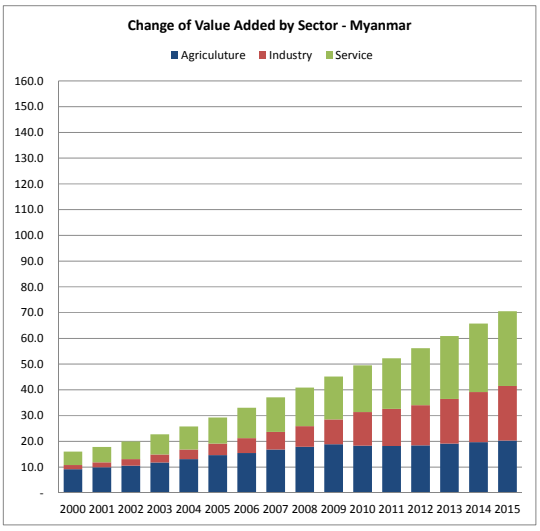
(4) Change of Economic Structure

The economic structure of Myanmar has been changing rapidly since 2010, which can be explained by the share of the total added value by economic sector, as shown in **Figure-2.1.3**. The share of the manufacturing sector[1] expected to be the leading sector to accelerate economic growth in Myanmar has been expanding gradually. However, it accounts for around 8~9% of the total added value. The share of industrial sector[2] in the total value added is around 10~11 %. When these two sectors are combined, the share of the manufacturing and the industrial sectors is around 18~20%. The agriculture sector accounts around 40% of the total added value (it has been the largest sector), and the service sector follows at around 38% of total value added. When the share of industry sector is compared with the one in Vietnam, the amount of Myanmar in 2010 is still lower than that of Vietnam in 1996, when Vietnam had just started the industrial development process, which was ignited by a rapid inflow of FDI to the manufacturing sector. From this point of view, Myanmar has only just started the long process to become an industrialized country. Therefore, the manufacturing sector is considered to be at an infant stage. However, once the FDI inflow to the manufacturing sector in

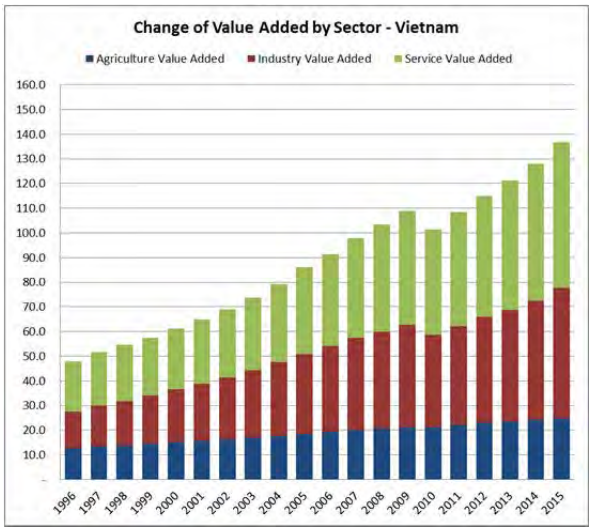
[1] Manufacturing means an agglomeration of industries engaged in chemical, mechanical, or physical transformation of materials, substances, or components in to consumer or industrial goods.

[2] Industrial sector means an agglomeration of industries engaged in production of products which can be utilized for construction and manufacturing industry.

Myanmar is promoted substantially, a rapid change of the economic structure may possibly occur dynamically and would then form the basis for strong economic development and growth.



Change of Value Added by Sector (2000-15) Myanmar



Change of Value Added by Sector (1996-2015) Vietnam

Source: Study Team based on data available from the statistics of the World Bank Data

Figure-2.1.3 Change of Economic Structure of Myanmar and Vietnam

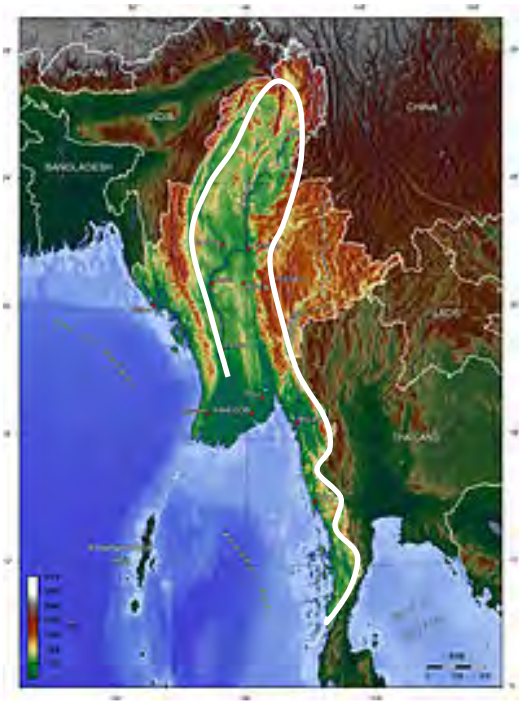
(5) Change of Trade Value

The annual export value in 2013 was around US$ 9.0 billion, while the annual import value was US$ 9.4 billion, respectively. 2013 was the first time in 8 years (from 2005 to 2013) that the total import value surpassed the total export value, as recorded in the statistics (source: World Bank Open Data). As the AAGR of the import value in the same period was 28.1% and the export value was 12.9%, respectively, it can be predicted that the import value will continuously surpass the export value from 2013 onwards toward 2030. In 2013, the import value was 6.2 times, the same in 2005 while the export value was 2.6 times, respectively. The total trade value in the same period expanded around 3.7 times. Thus trade has expanded at a high rate and is predicted to continue to grow in future. The annual growth rate of the total trade value is assumed to continue at the same annual growth rate; the total trade volume will expand by around 14 times in 2015.

(6) Notable Geographic Features of Myanmar

Myanmar is situated in between latitudes 10° and 28° North; and lies in the western part of South-east Asia. The geographically notable feature of Myanmar is a vast gentle plain stretching through north to south inside a horseshoe-shaped mountain range, as shown in **Figure-2.1.4** (the mountain range is indicated by a white line). Myanmar is bordered by five neighboring countries: Thailand and the Lao PDR to the east; China to the north-east; India to the north-west; and Bangladesh to the west.

The chain of steep mountain ranges that has created a horseshoe shaped defensive barrier to prevent invasion from outside has played an important role in defense and has made past contacts difficult with neighboring countries. The total length of the border with neighboring countries is approximately 4,600 km. These steep and long mountain ranges hamper the development of transport links with neighboring countries. The seacoast faces the Andaman Sea and the Bay of Bengal. The total length of the coastline is around 2,000 km. The water depth along the coastline is shallow in general terms (around - 6m) thus international vessels even plying feeder links are forced to wait for sufficient tidal depth before entering ports.



Source: Study Team based on website maps

Figure-2.1.4 Notable Geographical Features of Myanmar

Due to its natural location, it is a challenge for Myanmar to develop gateway(s) having substantial and reliable handling capacities to accommodate international and regional cargo traffic. The notable geographical feature strongly suggests the importance of the development of inland waterways transport, railway freight transport and coastal shipping, aimed at optimization and rationalization of transport efficiency, especially for the long-haul of low value and bulky commodities, aside from the transport of high-value containerized industrial commodities, as outlined below.

Inland Waterways Transport: The Ayeyarwaddy River system has been the mainstay for the agriculture activities and has played an important role for the transport of freight and passengers. However, the role of long-distance freight transport between Yangon and Mandalay has been substantially shifted from inland waterways transport to trucking in the recent past.

However, inland waterways transport is still used for the long-distance haulage of low-value and bulky cargoes and daily goods by rural people residing along the main river systems. If the transport capacity of inland waterways transport should decline further, due to the insufficient number and capacity of river ports located along the major river systems, a large volume of low-value and bulky cargoes would need to be transported by trucks. This is to be avoided, as much higher transport costs would be incurred for cargo transport, and the increased number of trucks would overload the highway system.

Railway Freight Transport: The flat and vast land stretching in the middle part of Myanmar is quite suitable for railway freight transport, plying between the two major economic growth poles of Yangon and Mandalay. In the past, railway freight transport has not been utilized efficiently, because of a lack of railway freight transport capacity and the insufficient capability of the railway track to sustain heavy freight transport volumes. However, a project for railway track improvement and upgrading has been carried out and is expected to be completed by 2023. Once the railway track is upgraded then the operation of container block trains will be commissioned on scheduled operations basis. The major commodity planned to be transported in future by the upgraded railway freight transport system will be containerized, high-value and industrial products, as well as some bulky cargoes such as petroleum / chemical products.

Coastal Shipping: Coastal shipping undertakes the transport of low-value and bulky cargoes as well as daily transport needs of people residing along coastal and rural areas, where road and railway connections are insufficient. Due to the insufficient cargo handling capacity of domestic ports, the transport efficiency of coastal shipping has been forced into decline. Once domestic port cargo handling capacities are increased, then the costs of coastal shipping, especially for low-value and bulky cargoes will become more reasonable. If the transport of such commodities needs to be undertaken by trucks, much higher freight transport costs would be incurred and the increased number of trucks will overload the highway system.

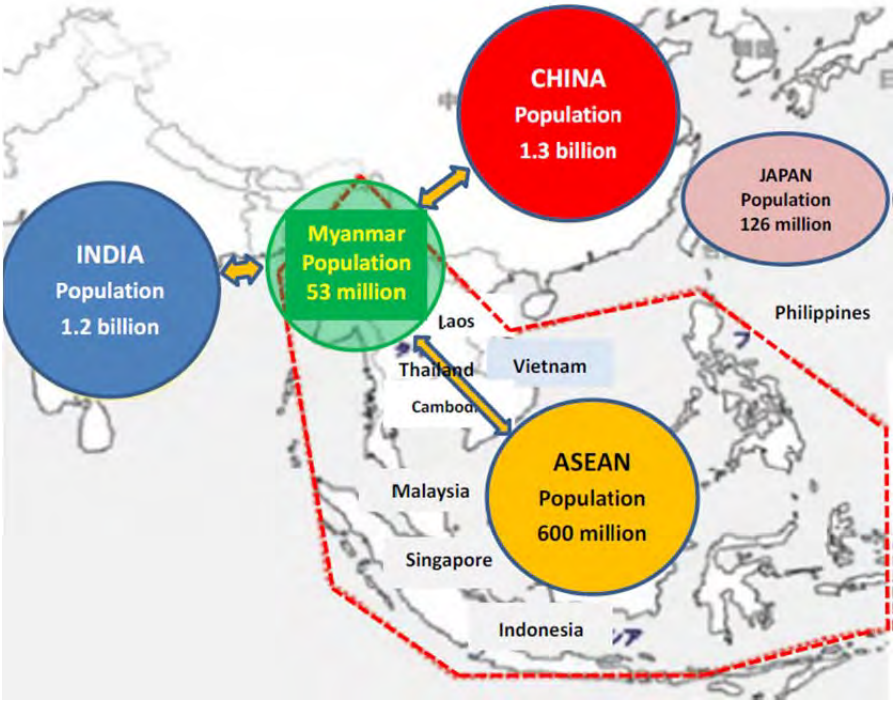
Trucking: At present trucking undertakes around 60% of total cargo transport volume and the most important freight transport mode and major trucking route is NH-1, linking Yangon and Mandalay. The existing highway is capable of handling freight transport the heavily loaded vehicles. The existing highway should be utilized for freight transport by trucks, to shorten trip time and to reduce transport costs.

(7) Myanmar lies at the Intersection of Three Economic Growth Poles

Myanmar is located at the center of three economic growth-poles comprised of China to the north, India and Bangladesh to the west, and the ASEAN countries to the south: hence, it is in the middle of three very large consumption markets.

Figure-2.1.5 illustrates the geographical position of Myanmar at the intersection of three economic growth centers. From the perspective of international, or regional, logistics, the special geopolitical importance of Myanmar is very high. If regulations for cross-border trade agreement (CBTA) and the infrastructure for cross-border trade infrastructure (CBTI) are properly established, and peace agreement between the government and ethnic minority groups become realized, Myanmar could become a pivot or important transit country for trade and investment amongst the surrounding neighboring countries, as well as for global investors.

In addition, Thailand, a neighboring country, is a center of the economy and the manufacturing industries of the Indochina Peninsula. It is moving ahead with transferring manufacturing points to neighboring countries that border with Thailand, due to the evolution of its industrial structure, soaring labor costs, decrease of young labors in Thailand, etc. The major Thai business establishments include around 8,968 companies of which 2,387 manufacturers are Japanese companies registered in Thailand as Thai corporations as of year 2016. This fact is referred to as "Thai plus one" amongst the Japanese Foreign Direct Investment (FDI) enterprises located in Thailand as Thai corporations.



Source: Study Team based on website map with population and GDP

Figure-2.1.5 Three Economic Growth Poles surrounding Myanmar

In addition to FDI movement in the Indochina Peninsula or ASEAN countries, the total population of Myanmar is around 52.4 million following Vietnam and Thailand. Myanmar has a large potential consumption market. Furthermore, the Bay of Bengal economic zone[3] to the west of Myanmar is about to develop, having a large population. Taking into account these movements and trends in the economy, the establishment of land, sea and air logistics links connecting neighboring countries and wider economic zones (i.e. Bengal economic zone, South Asian Association for Regional Cooperation (SAARC) countries) is considered to play an important role in the economic and industrial development of Myanmar.

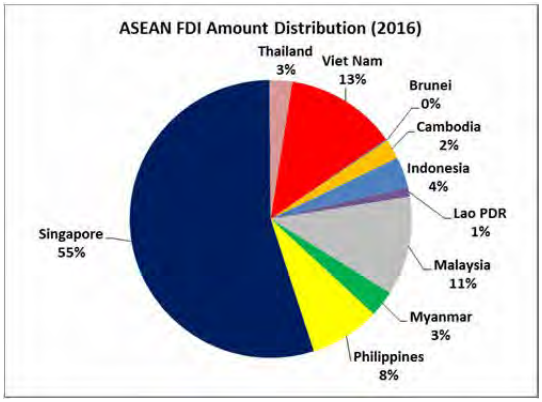
[3] The Bay of Bengal is fast becoming a key area of economic and strategic competition in the Indo-Pacific. It's the largest bay in the world and forms an important, if neglected, part of southern Asia. Bookended by India on its western side and Thailand to its east, with Bangladesh, Myanmar and Sri Lanka in between, this part of the Asian littoral hosts a huge population and is passed by some of the world's most important trading routes.（Source: Australian Strategic Institute)

(8) Movement of ASEAN Integration that Includes the Countries of the Indochina Peninsula

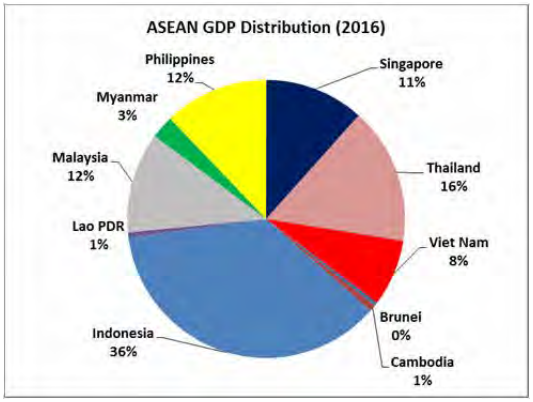
ASEAN is composed of 10 member countries, including Myanmar. Among these 10 member countries, five countries are situated in the Indochina Peninsula, namely Thailand, Vietnam, Lao PDR, Cambodia and Myanmar, and these are linked by international transport corridors and by land transport systems. Those countries joining ASEAN in the latter part of 1990's are called 'CLMV' standing for the acronym of the group of countries i.e. Cambodia, Lao PDR, Myanmar and Vietnam. **Figure-2.1.6** illustrates the distribution of population, GDP, trade amount, and accumulated FDI amount by ASEAN member countries and by the five countries located in the Indochina Peninsula, respectively.

The total population of ASEAN is around 688 million, of which 240 million is the total for the five countries. Myanmar is located at the western end of the Indochina Peninsula. The land transport links with countries bordering with Myanmar have not been developed well since Myanmar is surrounded by steep mountain ranges along its border. The annual growth ratio of total FDI amount registered in the countries of the Indochina Peninsula is higher than that of the ASEAN countries in total. It can be expected that the share of GDP and trade value of this part of ASEAN will expand gradually in future.

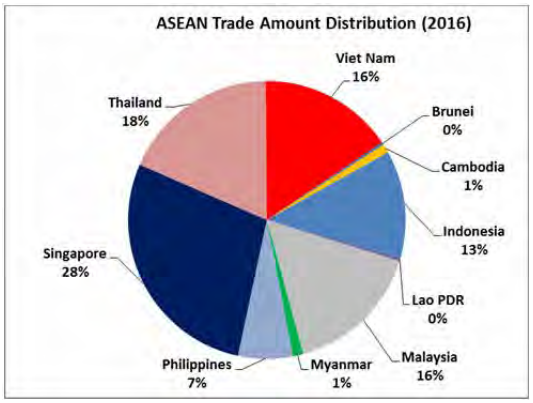
As shown in the following figures, especially the FDI amount of Thailand and Vietnam, the share of FDI amount is almost equal to the share of trade value. Judging from the size of economy, population, trade and FDI value, it can be seen that Thailand, Vietnam and Myanmar are the key players concerned in the economic development of this region. However, the trade value of Myanmar is considerably small when compared with Thailand and Vietnam, because the Myanmar economy started the liberalization only several years ago or since 2011. On the other hand, Myanmar has large opportunities to grow quickly, through enhancement of industrialization, subject to the provision of necessary infrastructure, such as a stable power supply and a well-established logistics system.



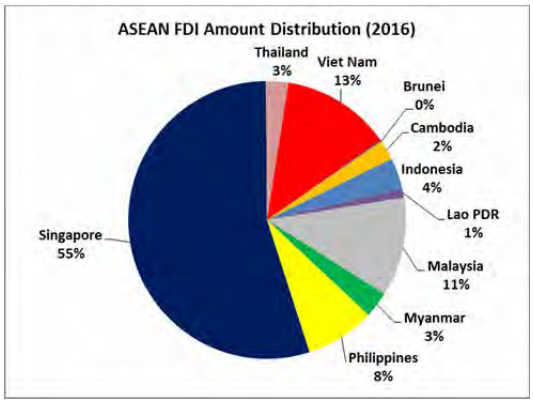
Population Distribution of ASEAN



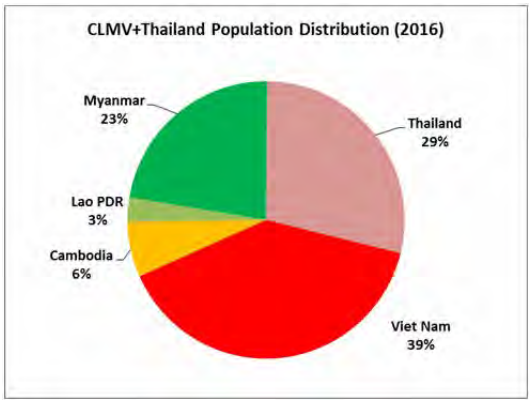
Distribution of GDP of ASEAN



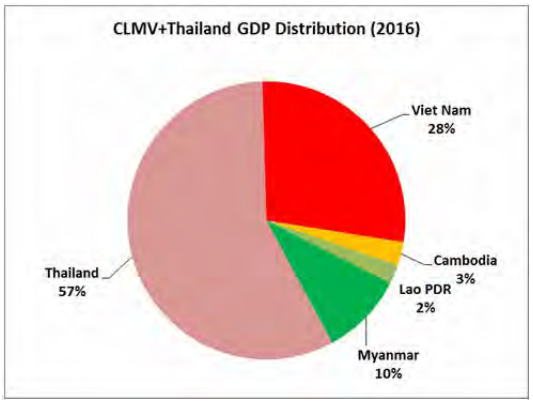
Trade Amount Distribution



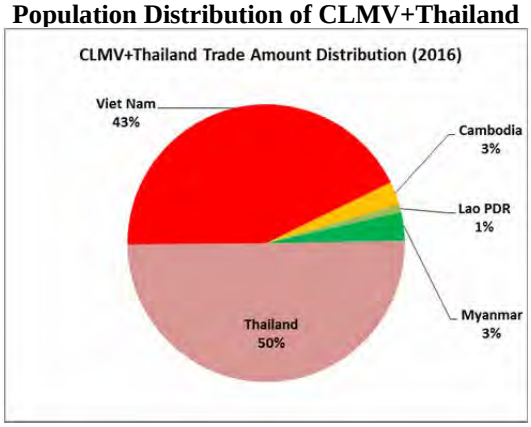
Accumulated FDI Amount Distribution



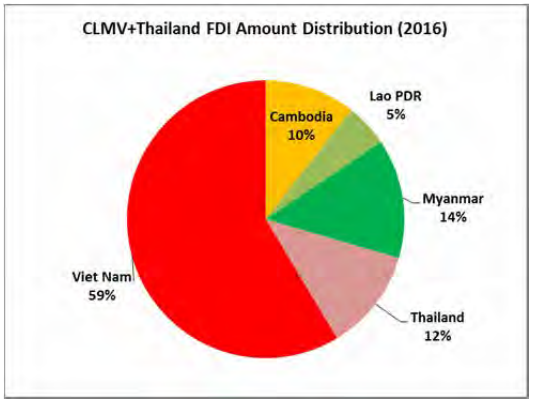
Population Distribution of CLMV+Thailand



GDP Distribution of CLMV+Thailand



Trade Amount Distribution of CLMV+Thailand



Accumulate FDI Amount of CLMV+Thailand

Source: JICA Study Team based on the data available from ASEAN Secretariat

Figure-2.1.6 Share of Population, GDP, Trade Value and FDI by Countries of ASEAN

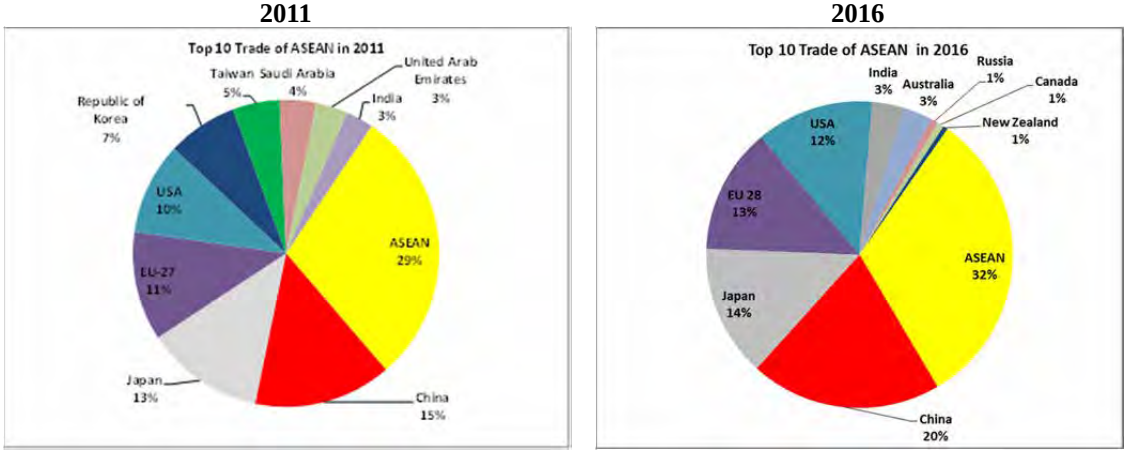
(9) Intra-regional Trade amongst the ASEAN Member Countries

The integration of ASEAN member countries was discussed very intensively among member countries of ASEAN since the joining of the CLMV, and finally the basic protocol was established and agreed on for economic integration and unification, to create and operationalize the ASEAN Economic Community (AEC) in October 2015. The establishment of the AEC is a major milestone in the region for the regional economic integration agenda in ASEAN, offering opportunities in the form of a huge market of US$2.8 trillion and over 622 million people. In 2014, AEC was collectively the third largest economy in Asia and the

seventh largest in the world.

Figure-2.1.7 illustrates the trade distribution of the top 10 trade partners of the AEC economy. As shown in these figures, the share of ASEAN countries in total accounts for around 30% and is the largest in the total trade value. This indicates that further expansion of intra-regional trade and strengthening the economic relations amongst ASEAN countries would be an engine of economic growth in this region. Thailand has grown dramatically since the middle of 1990s and now it is called *the Detroit of Asia.* The strong and wide variety of supporting industries for the automobile industry is making Thailand an industrial hub in Asia, especially in the Indochina Peninsula.

2011 **2016**



Top 10 Trade Partners of ASEAN Countries

Source: Study Team based on the data of ASEAN Secretariat 2013

Figure-2.1.7 Intra-regional Trade of ASEAN

(10) Thai Plus One Tendency

On the other hand, due to increase in the minimum legal wage in Thailand, greater political instability, damages to industrial zones due to natural hazards, etc., the major manufacturing firms of Thailand (mostly of Japanese origin) are aiming to transfer part of their manufacturing to neighboring countries such as Cambodia, the Lao PDR and Myanmar.

This trend of FDI is called “Thai plus One”. In fact, the tendency of Japanese companies to follow this investment direction has been growing year by year. Myanmar is considered as one of the best and most important locations and as an investment target country in the ASEAN region by private manufacturers in Japan. This FDI tendency of Thai registered manufacturing companies has been taking shape close to Thailand’s borders with Cambodia, the Lao PDR and so on. If Myanmar, which has a large population, is combined into the integration process of ASEAN countries located in the Indochina Peninsula, the economic exchange between Japan and Myanmar, as well as between Thailand and Myanmar will expand dramatically along with the FDI movement. Furthermore, it can be foreseen that the attracting factors for FDI for the manufacturing industry, such as lower wages, high quality

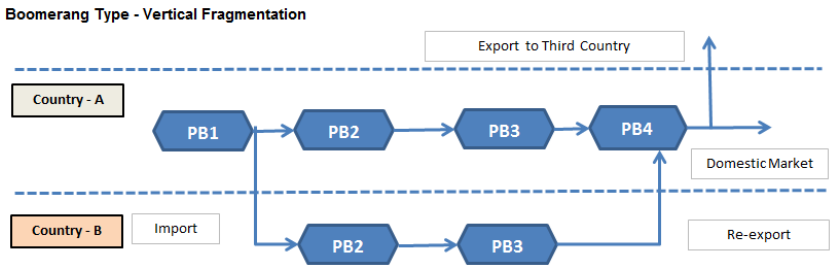
labor, fertile and rich soil, a large population of more than 50 million persons, rapid economic development, untouched resources, etc. will activate and enhance the FDI inflow toward the manufacturing sector. An increase of FDI towards the manufacturing sector will lead the industrial development, and it is possible that trade volumes and international container traffic volumes will increase accordingly.

(11) Change of Manufacturing Type

Rapid development of regional and global logistics services has made possible the fragmentation of the manufacturing process of parts and components of vehicles, electronic products, and other manufactured goods. Because of the availability of sophisticated logistics services developed by the logistics providers, the trade of intermediate goods, along with international specialization, has expanded rapidly in the past 10 years or more. Greater internationalization is leading to greater intra-company trade and manufacturing companies have been shifting from full-set type to internationalization type in this period.

The fragmentation of the manufacturing process became a major trend behind the internationalization of manufacturing industries, especially in Asian region. The trade of intermediate goods between industrial hubs in countries has been expanding rapidly. The volume of such trade expanded almost two times in the past five years and the share of East Asia accounts for almost 60% of the total intermediate goods traded in the World.

Figure-2.1.8 illustrates the structure of fragmentation of the manufacturing process. The inter-regional trade amongst ASEAN countries is significant, as discussed above. And inter-regional trade will expand further dynamically; because of the commissioning of regional economic integration will be enhanced further, due to the establishment of the ASEAN Economic Community (AEC) in 2015. Myanmar has been the member country of the ASEAN since 1997. The implementation of the AEC would accelerate the expansion of fragmentation amongst the countries located in the Indochina Peninsula, including Myanmar.



Source: Study Team
Note: PB means production block

Figure-2.1.8 Vertical Fragmentation of Manufacturing Process

For instance, the annual production volume of vehicles in Thailand is around 2.5 million units, resulting in Thailand being called the *Detroit of Asia*. The major players in automobile industries in Thailand are Japanese automobile manufacturers. Japan is the leading industrial

country expanding the fragmentation type of manufacturing for industrial products. At present Japanese branded cars are manufactured in Asia with very limited supply of parts or components from Japan directly, but through the supply network established amongst production points located in several countries in Asia or ASEAN member countries such as Thailand, Indonesia, the Philippines and Malaysia. Myanmar is a candidate county for such fragmented manufacturing process.

The import of intermediate goods such as parts and components for manufacturing vehicles, electronic products and other manufactured goods from Thailand or other supply source countries for these products, and the re-export of semi-completed products made from such imported materials to Thailand, or to other ASEAN countries, is considered the main factor behind a rapid increase of imports and exports of manufactured goods to and from Myanmar.

It can be assumed that such efforts to increase the level of function and performance of physical distribution and logistics systems to an international standard, to meet with rapidly increasing international cargo flow volumes will provide the foundation for the economic and industrial development in Myanmar in future. On the other hand, if the functions and efficiency of physical distribution and logistics remain inadequate, the willingness to invest by foreign manufacturing companies will be diminished. Based on these factors, the improvement or development of physical distribution and logistics systems in Myanmar is considered as one of the most important and imperative issues to be addressed.

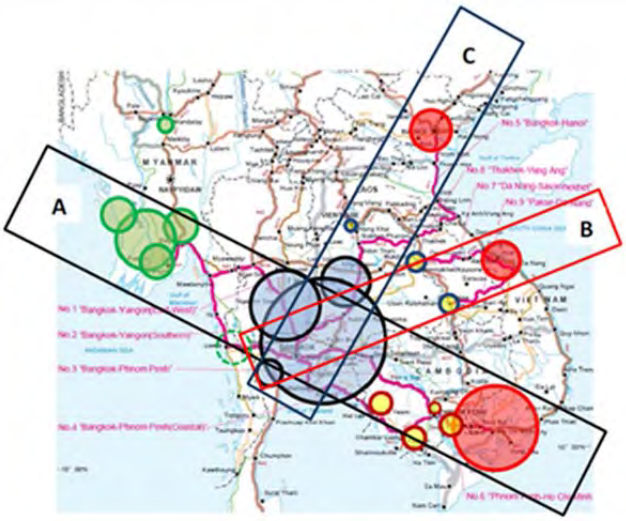
2.2 Economic Development Corridors in Indochina Peninsula

The framework of the economic corridors formed in the Indochina Peninsula has been prepared mainly by the ADB and is based on the GMS development strategy. **Figure-2.2.1** illustrates the economic corridors by zone in dotted lines. In this map, Mawlamyaine of Myanmar and Da Nang of Vietnam are considered as the terminals of an economic corridor called the *East West Economic Corridor,* in short EWEC. However, if the transport or logistics links function or could function further due to increased cargo traffic volumes generated by fragmentation of production blocks amongst manufacturers having manufacturing points in major cities of the countries, the shape of such a corridor would be a V shape, as illustrated in **Figure-2.2.2.**

The formulation of the logistics corridor development plan of Myanmar in such a V-shaped Economic Corridor image in the Indochina Peninsula is taken into account. Nevertheless, trade volumes in Myanmar are still smaller than those of neighboring countries. A potential expansion of trade is considered as highly likely, as the current trend of trade cargo traffic growth with neighboring countries such as China and Thailand suggests. In particular, the growth of the economy and trade in Vietnam in recent years can be considered as a reference to forecast the future of the Myanmar economy.

Source: ADB, Greater Mekong Sub-region Secretariat

Figure-2.2.1 Economic Corridors based on GMS Development Strategy of ADB



Source: Ministry of Land, Infrastructure, Transport and Tourism, Japan

Figure-2.2.2 Economic Corridors Functioning by Linking Poles of Industrial Estates Mass

Figure-2.2.3 shows the trade cargo flow volumes by link connecting the countries located in the Indochina Peninsula, as well as the major sources and markets in the World in 2012 and the projected cargo flow volume by link in future by 2030. As shown in these figures, trade cargo generation and attraction by Thailand and China affect the trade cargo volumes of Myanmar considerably.

Current Trade Cargo Flow Volume in 2012 | **Current Trade Cargo Flow Volume in 2030**

Source: Estimation by Study Team based on available trade data between countries in HS code, United Nations

Figure-2.2.3 Cargo Flow Volume in the Indochina Peninsula at Present and in 2030

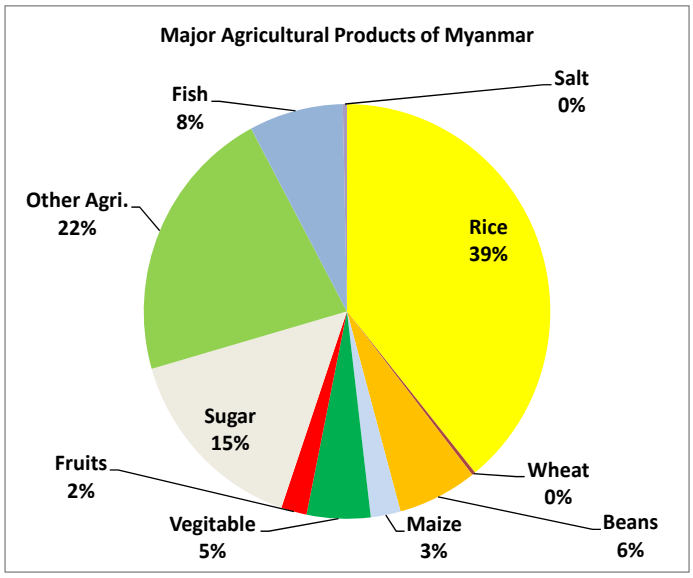
2.3 Economic Outlook and Opportunities by Economic Sector

(1) Agriculture Sector

1) General

Agriculture is the economic mainstay of Myanmar (30% of GDP, 14% of exports) and the main work of the population (53% of employment –Source: Agriculture Development Policy). The sub-total of value added of agricultural sector accounts for around 42% of the total value added and this is followed by the service sector (at 38%), the industry sector (at 11%) and the manufacturing sector (at 9%). Production volume of major agricultural

products in 2015: rice is the major crop in Myanmar and accounts for around 40% of the total agricultural production volume and is followed by sugar as shown in **Figure-2.3.1.**

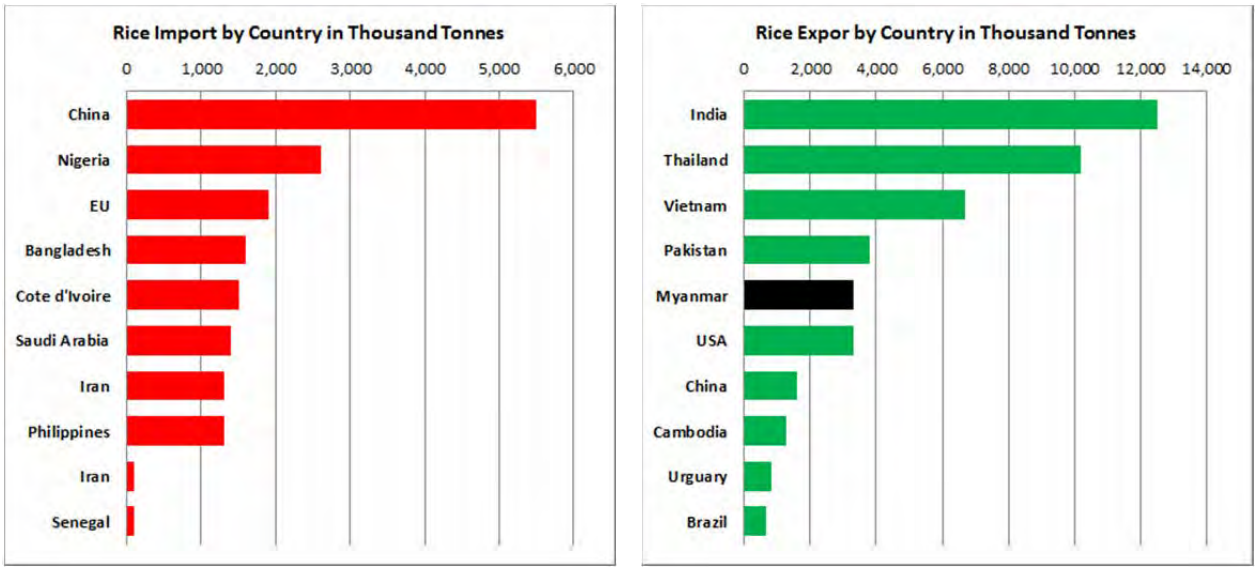


Source: Study Team based on various data

Figure-2.3.1 Major Agricultural Products

Rice Production and Export: Thanks to fertile soil, rich water resources, and vast plain land areas, especially in the delta area of the Ayeyarwaddy region, rice production in Myanmar has been the mainstay of the economy and its production volume is ranked at 7th in the world, amongst China, India, Indonesia, Bangladesh, Vietnam, Thailand, Philippines, Brazil, Japan, USA, Pakistan, and others. The total rice production of the world in 2015 was around 470 million tonnes (husked rice weight). The production in Myanmar was 26 million tonnes accounting for around 5.5% of total world production. However, productivity is low due to a lack of agricultural inputs (fertilizers, insecticides, etc.), rice mills, rice storage, farm equipment, irrigation, physical distribution systems for domestic distribution, and undeveloped logistics system for rice trade.

The rice export volume in 2015 was around 1.8 million tonnes, which ranked 6th in the world but in 2017 the rice export volume has increased to around 2.8 million tonnes, which ranked 5th in the world. Most of Myanmar rice is exported currently to China through the border gate in the north (Muse) by combination of the inland waterway transport and land transport. China and Nigeria are the biggest rice importers in the world. The demand for rice in the Western African countries has been increasing gradually; this is the current market for Thai rice exporters. **Figure-2.3.2** shows the top 10 countries of rice importing and exporting worldwide in 2017.



Rice Import Volume by Country in 2017 **Rice Export Volume by Country in 2017**

Source: Statista, Principal rice export / import countries worldwide in 2017/2018

Figure-2.3.2 Top 10 Rice Exporting and Importing Countries

Around 23% of the total rice production (26.3 million tonnes in 2015) or around 7.5 million tonnes of rice is produced in Ayeyarwaddy Region and the other regions / states situated at south-eastern part of Myanmar. In 2015, around 1.7 million tonnes of rice produced in the north, central and south region was exported to China and it increased to around 3.3 million in 2017. If there is an appropriate international port that is possible to handle rice exports to the world market, Myanmar will be able to export its rice to the world market further subject to the improvement of its quality which meets with the international standards and the logistics system including the upgrading of physical distribution system to collect and process the rice in major rice production areas in the country.

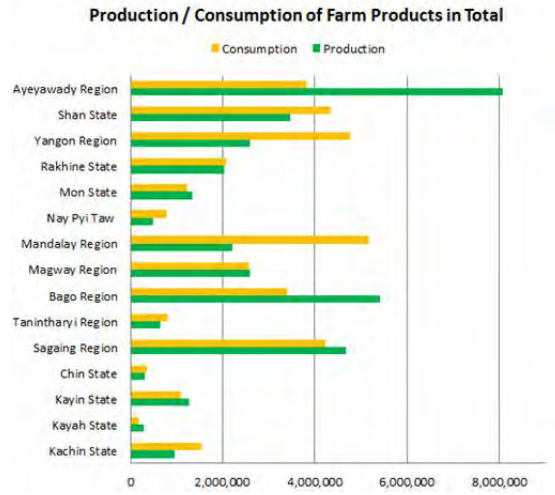
Bean and Pulse Export: The beans and pulses follow rice in terms of production and export volumes. The production volume of beans and the export volume in 2015 were 4.3 million tonnes and 1.7 million tonnes, respectively. The major destination for beans is India. Beans are mostly used for the production of edible oil, for which demand has been expanding fast, especially in China.

Both production and exports of vegetables and fruits with a high value are expanding. Especially, fruits with a higher value than grain are sent for export. However, the loss of value occurs often because these high value farm products are perishable during storage and transport of the products to ports and to importers. Some Japanese firms have been trying to improve such a situation by introduction of cold-chain systems, using cold stores for storage and refrigerated vans for transport. These modern logistics system for perishable goods would be utilized further for storage and transport of fruits and fresh marine products.

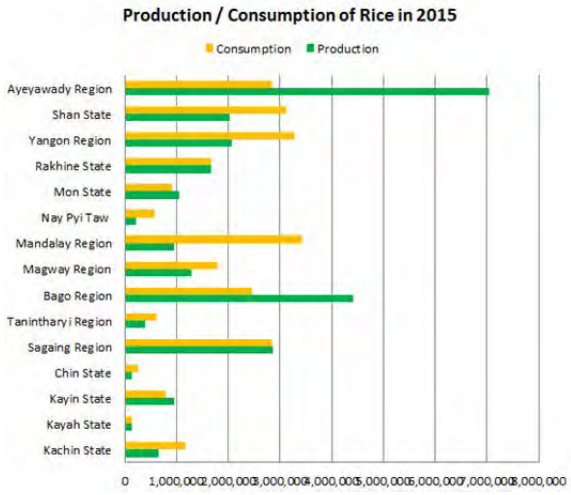
2) Current Production and Consumption of Farm Products

Figure-2.3.3 shows the present production and consumption volumes for major farm products such as rice, beans, vegetables, fruits, onions, etc. by regions / states. If one kind of farm product produced in the area surpasses its demand, volume (surplus area) is distributed to another area where the production volume of same farm product is not sufficient to meet with its demand (deficit area), to fill the deficit. Accordingly, the farm products are transported from the surplus areas to the deficit areas. This is regarded as the cargo transport demand. The consumption of farm products by one region or state can be estimated by applying an average consumption volume of subject farm product per capita multiplied by the size of population. If the consumption volume is not covered by the production volume for one item in the country, these farm products are needed to be imported from abroad, through either a gateway seaport or a cross-border point along the national border. At present the main farm product imported is wheat; its volume is a mere 190,000 tonnes p.a. However, in future, import volumes of wheat are expected to increase due to an expansion of consumption of bread by the population and production of processed food, such as instant noodles, etc. that has been experienced in various Asian countries, such as Vietnam.

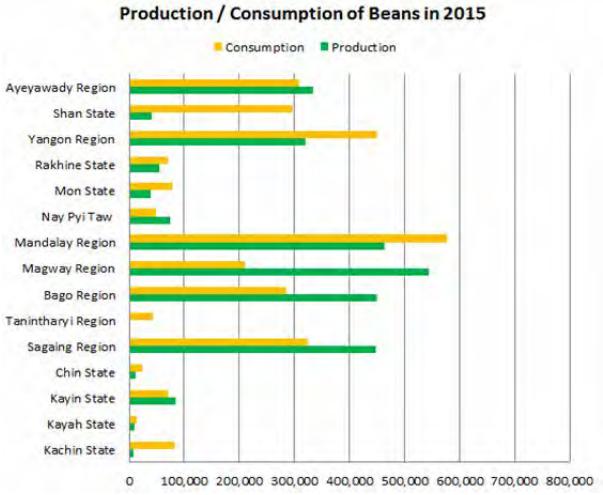
Figure-2.3.3 below shows the production and consumption volume per year estimated by region and state in 2015. As shown in this figure, there are surplus areas and deficit areas of each major farm product.



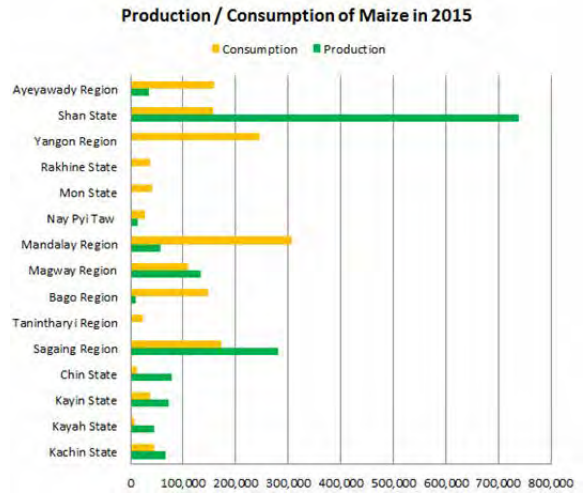
(Farm Products in Total)



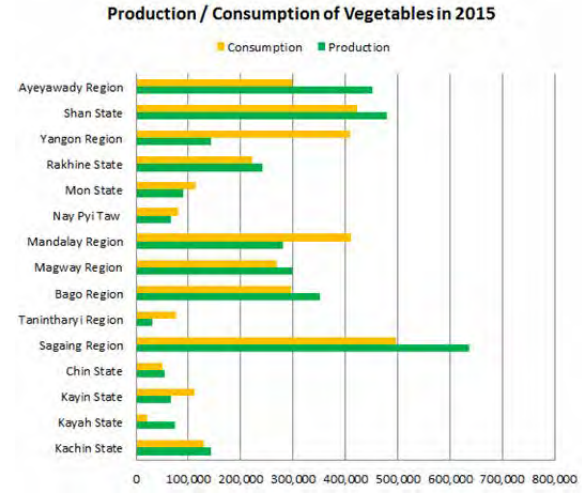
(Rice)



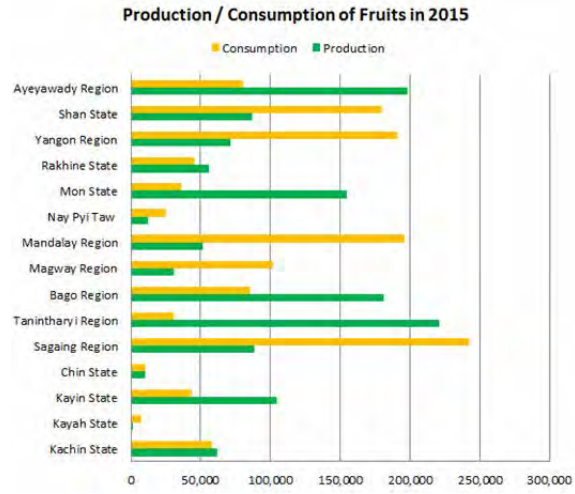
(Beans)



(Maize)



(Vegetables)

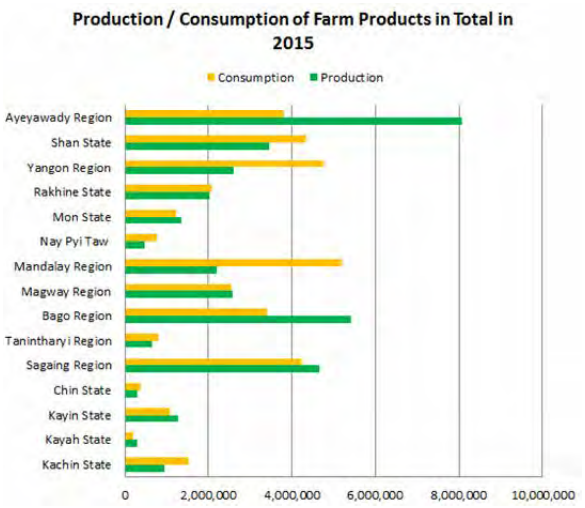


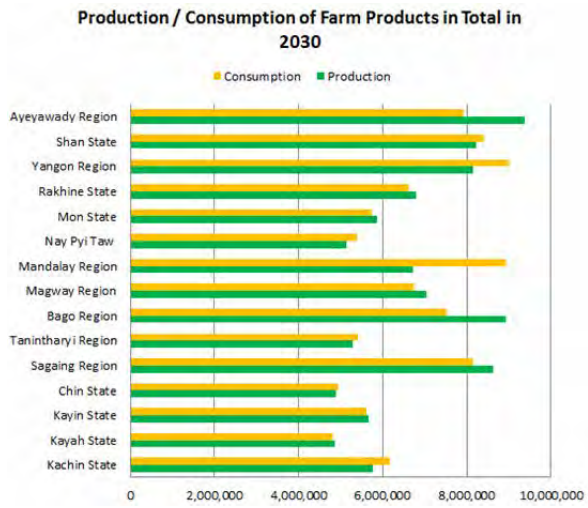
(Maize)

Source: Study Team based of Agricultural Statistics and FAOSTAT

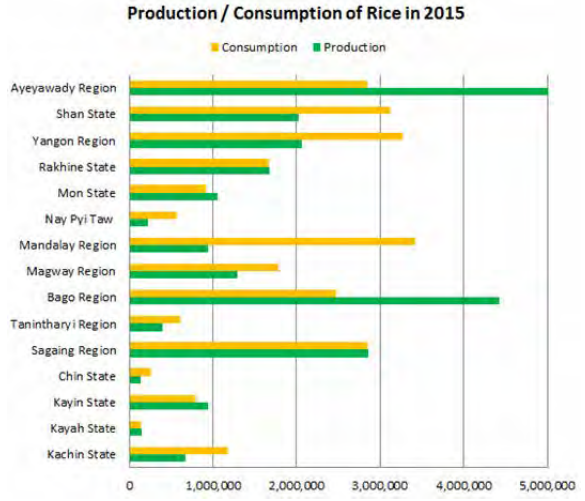
Figure-2.3.3 Production and Consumption Volume of Major Crops by Region / State in 2015

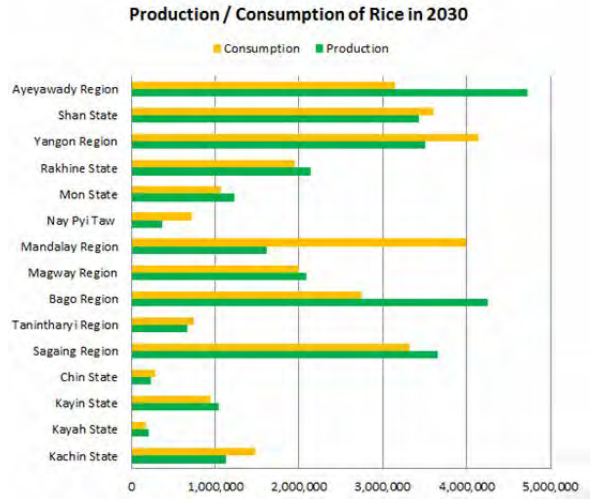
Figure-2.3.4 shows the projected production and consumption volume of major crops by region / state in 2030.



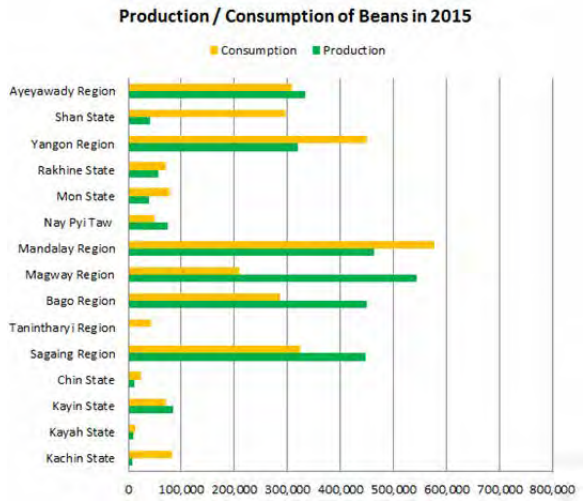


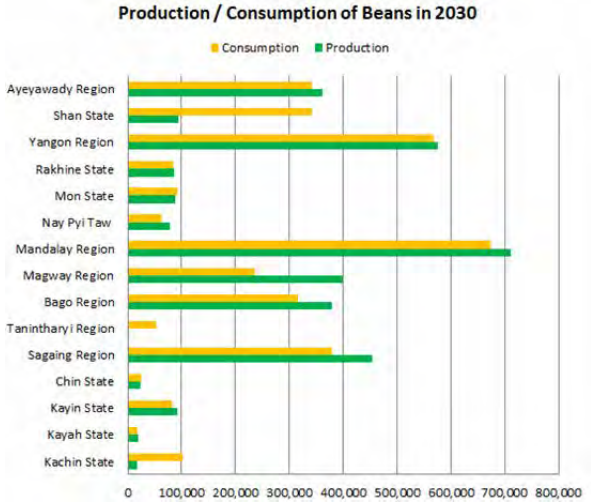
(Farm Products in Total)



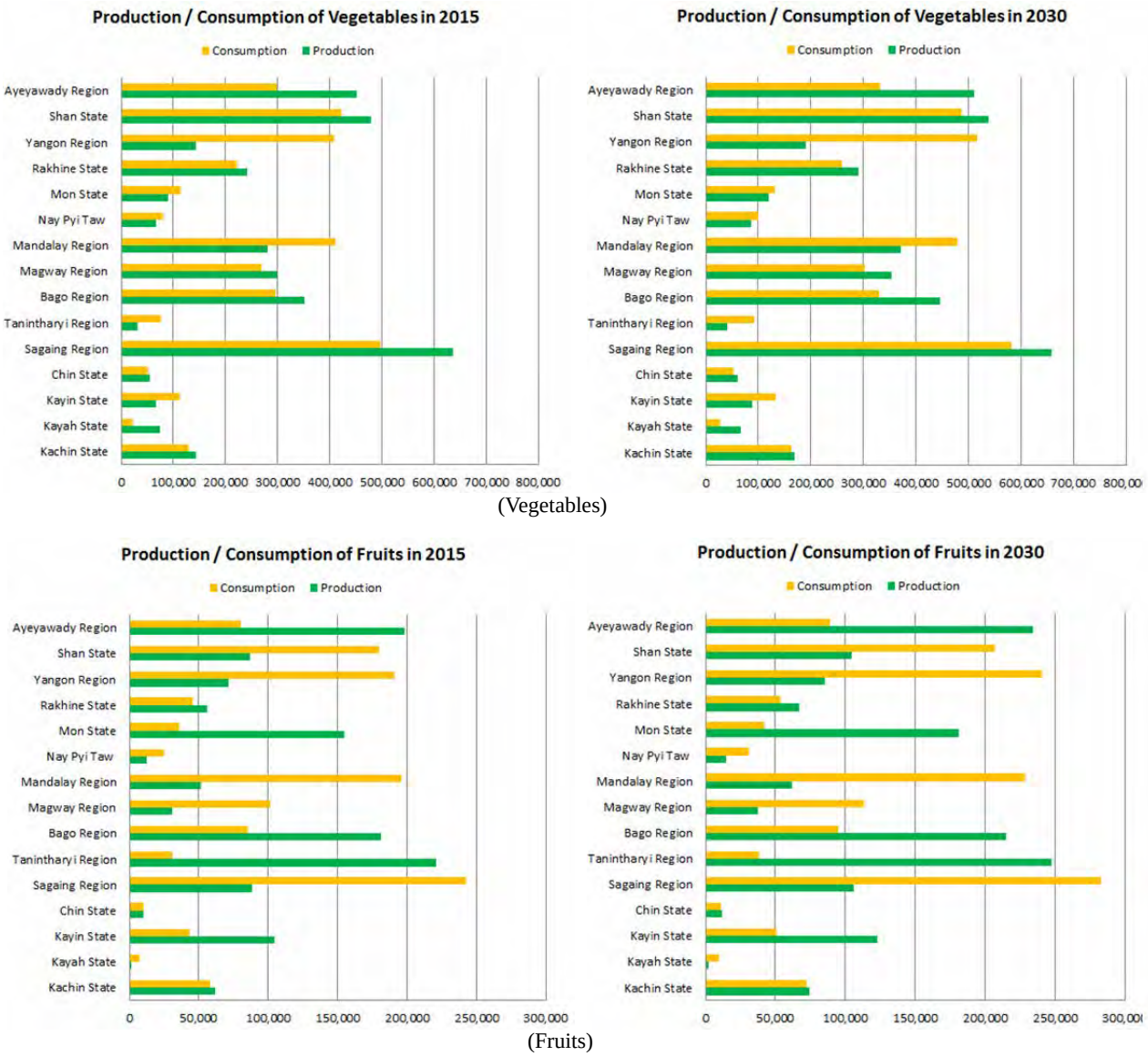


(Rice)





(Beans)



(Vegetables)

(Fruits)

Source: Study Team based of Agricultural Statistics and FAOSTAT

Figure-2.3.4 Production and Consumption Volume of Major Crops by Region / State in 2030

The commodities of which production volume surpass the consumption volume are assumed to be transported to the regions/states where the same commodity does not meet with the requirement for consumption, thereby leading to the transport of commodities. Therefore, the estimation of production / consumption volume of each commodity by region / state is important to estimate and to forecast the cargo transport volume.

3) Shortcoming in View of Logistics

Agriculture has been traditionally the mainstay of the economy in Myanmar. Substantial potential for sustainable and stable growth of the agricultural sector exists. However, the linkages or connectivity between producers / farmers (in rural areas) and the market (in urban areas) is weak and this hampers the sound and optimum development of the agricultural sector. Low-value products such as construction materials need to be transported

by cheaper modes such as railway and inland water transport. Generally, there is large amount transport demand for these products which is suitable for railway and inland water transport.

4) Opportunities

Before World War II, Myanmar (then Burma) was the top rice exporting country in the world and exported around 1.0 million tonnes of rice to British India. Myanmar could revive as one of the top-class rice exporting countries, subject to: improvement of quality of rice meeting international standards, an increase of rice production, provision of a smooth and efficient cargo transport system at the right price, and the availability of a deep sea ports that can accommodate handy-size bulk carriers, at minimum for exporting the rice to Africa and the Middle East countries. The export of beans and pulses should follow increased rice export volumes. Maize production volumes should also increase to meet with ever growing demand in China, as well as for fodder for livestock. Vegetables, fruits and marine products including fish will also be able to export to regional and world markets when the cold chain system and transport of such commodities under controlled temperature is improved.

The agriculture activities in the rural areas can be enhanced by introduction and development of ago-industries for various farm products that would create the job opportunities in the rural areas especially when both physical distribution system for transporting domestic cargoes and logistics system for trade cargoes are improved and developed.

(2) Manufacturing Sector

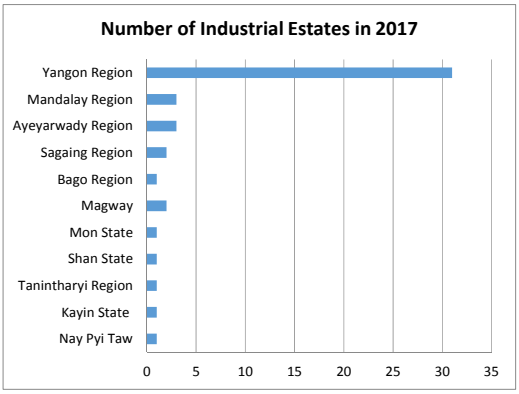
1) General

As shown in the above figure, the share of the manufacturing sector in the total value added amount was around 9%; considered as at the infant stage still. The country has just opened up its economy to the World and started to welcome FDI, especially in the manufacturing sector, aimed at generating job opportunities and enhancing foreign exchange earnings. The manufacturing sector is expected to become active and grow drastically as Vietnam has demonstrated it to date. However, at present manufacturing activities in Myanmar are labor-intensive, such as the production of garments, processed foods and beverages, shoe making, etc. and do not include high-technology industrial products as yet. A change in the type of manufacturing activity is foreseen in quite near future that would be initiated by FDI, especially from Japanese manufacturers.

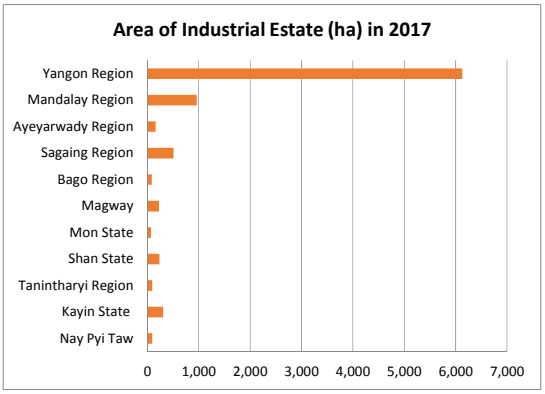
2) Industrial Estates

Figure-2.3.5 shows that the total number of industrial estates developed and in operation in Myanmar is 47, with a total area of around 8,900 hectares. The total number of enterprises operating in industrial estates is around 6,800. As shown in the graphs, most industrial

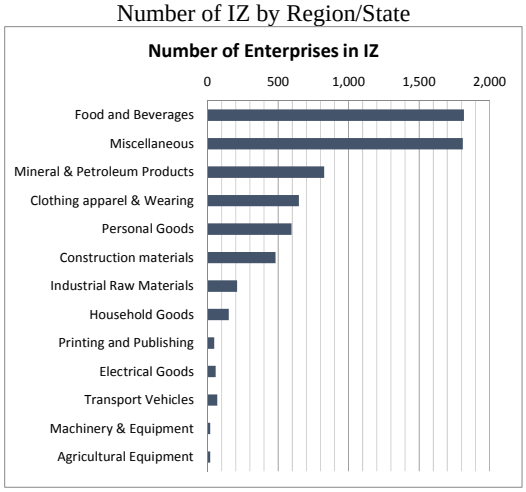
activities are concentrated in Yangon (44%) and Mandalay (27%). The largest industrial activity in terms of the number of enterprises operating in industrial estates is production/ processing of food and beverages, followed by miscellaneous products, mineral products and clothing (apparel and weaving). Manufacturing activity related to vehicles, electrical products, machinery, etc. is quite limited and is concentrated in Yangon.



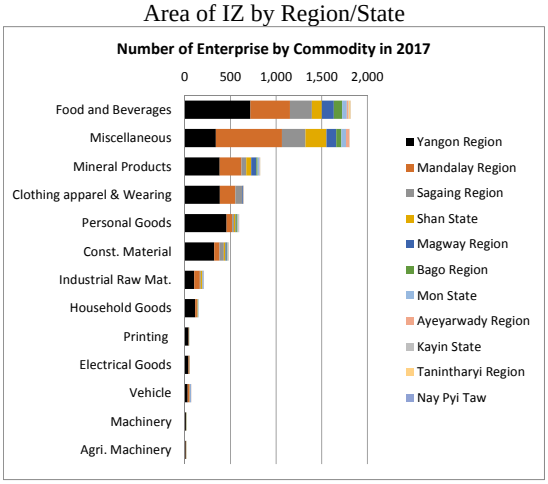
Number of IZ by Region/State



Area of IZ by Region/State



Number of Enterprises by Product

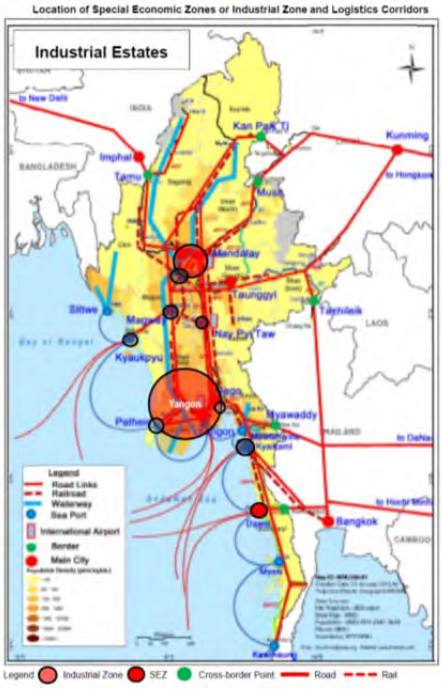


Number of Enterprise by Region/State

Source: Study Team based on data obtained from Ministry of Industry

Figure-2.3.5 Present Situation of Industrial Estates of Myanmar

Figure-2.3.6 illustrates the geographical distribution of industrial estates in Myanmar in 2017 and the transport links connecting the industrial estates. However, most of the industrial estates that are developed are substandard from the perspective of international standards, except the example of the Thilawa Industrial Estate, which has been planned, designed, implemented and operated by Japanese private interests, in collaboration with ODA allocated for the preparation of the necessary infrastructure. Several industrial estates planned and designed to meet with the international standards have been in operation since the late 1990s in Yangon. Mandalay is the second largest region that accommodates industrial estates.



Source: Study Team

Figure-2.3.6 Distribution of Industrial Estates

As shown in **Figure-2.3.5** above, manufacturing food and beverage processing and garment products are the main activities in present IZs in Mandalay. However, the manufacturing of mechanical products has been expanding gradually. It is to be noted that a large-scale industrial estate has been under development in Myota around 57 km south-west of Mandalay and situated near Ayeyarwaddy River. The number of tenants to enter and start their operation is around 80 at present.

For comparison, the number of industrial estates in Vietnam is 59 and the total area of the industrial estates is around 9,300 hectares. The total volume of port containers handled in Vietnam in 2014 was around 10.0 million TEU. If the average volume of containers handled by area of the industrial zone in Vietnam per month is adopted as a reference, the container traffic volume of Myanmar can be estimated at around 8.0 million TEU per year, assuming that all the containers will be generated and attracted by industrial estates alone.

3) Special Economic Zones

Three Special Economic Zones (SEZs) have been planned since 2008 and have been established to concentrate investment in manufacturing activity at strategic locations in Myanmar, for the facilitation of industrialization, thereby creating a considerable number of job opportunities. The outlines and present situations of SEZs are summarized in **Table 2.3.1.** However, at February 2017 the only SEZ taking shape and becoming operative is the Thilawa SEZ.

Table-2.3.1 Outline of SEZs as of February 2017

SEZ	Total Area Planned	Completed Area	Notes
Thilawa SEZ	2,500 ha.	396 ha.	● Location: 25 km south from Yangon ● Japanese/Myanmar initiative ● Developer: Myanmar-Japan Thilawa Development (MJTD) ● Class-A: 396 ha. Commissioned in May 2015 ● 20 Japanese tenants have already started their business operation as of December 2016 ● The total number of tenants reserved and contracted was 75 as of November 2016.
Kyaukpyu SEZ	7,500 ha.	None	● Location: 600 km northwest from Yangon ● Chinese initiative ● Crude oil storage / pumping station in operation ● Crude oil / gas transmission pipelines completed in July 2013 ● First crude oil transmission in 2015 ● -25m deep sea port is available for crude oil tanker ● Present port is only for unloading and transmission of oil to China through oil pipeline. ● This port is located on Made Island and caters only to tankers, but no land transport is connected with mainland.
Dawei SEZ	20,000 ha.	None	● Location: 630 km south-east from Yangon by road and around 400 km from Yangon by ship: and 300 km west from Bangkok by road. ● Development initiative was by a private developer from Thailand at the beginning of development process. ● Due to lack of financial capability of private developers, development work was suspended. ● SPV was established to restart the development July 2015 ● Estimated cost for development of needed infrastructure i.e. access road, railway, power, port, etc. is huge (US$ 8 billion or so)

Source: Study Team based on various information relevant to these 3 SEZs

Thilawa SEZ: The development of this SEZ started in 2011 and the first phase of development of the SEZ was commissioned in May 2014. It was completed in 2016. In February 2016, a considerable number of contracts with prominent FDI committed to start their manufacturing activities immediately after completion of utility service facilities. As of December 2016, 20 Japanese companies have started their businesses. Beside the SEZ, the international container terminals have been under preparation (60 hectares with 4 berths in total 800m) to start construction under financial assistance from the Government of Japan. The multi-purpose container terminal developed by Myanmar International Terminal Thilawa (MITT) and operated by Hutchison Port (75 hectares with five berths in total 1,000 m) has already commissioned. The railroad exists behind both container terminals. This railroad can be utilized for freight transport including container transport when the Bago Bridge is improved for such purpose to link the terminal with Yangon and the hinterland of these terminals.

Kyaukpyu SEZ: The development plan for Kyaukpyu SEZ has been prepared, and it has obtained the status of SEZ for inviting FDIs (especially for manufacturing activities with Chinese investment). Kyaukpyu has already been developed as the lifting port for crude oil and gas transferred through the Trans Myanmar oil and gas pipelines to Kunming in the Yunnan Province of China. Since the Kyaukpyu water area has sufficient water depth to accommodate Very Large Crude Carriers (VLCC) for unloading crude oil, this area is considered suitable for the development of a deep sea port for commercial and industrial purposes. However, the land-transport access to the port hinterland and to Kunming, China as an ultimate destination of the cargo transport link has not been fully developed. The roads across the mountains (Arakan Mountain Range and mountainous plateau of Shan State, etc.) are narrow with steep slopes and a considerable number of sharp bendy curves, that do not comply with the haulage requirements of industrial goods by Heavy Loaded Vehicles (HLV). In February 2017 no significant signs for the commissioning of the physical development of this SEZ can be seen.

Dawei SEZ: The development plan for Dawei SEZ has been prepared as one of the largest industrial zones in the world and has obtained the status of SEZ for inviting FDIs, especially for the development of heavy industries (refineries, LNG plants, chemical complexes, blast furnaces, etc.) and for light industries in 2008, based on a bilateral agreement between the Governments of Myanmar and Thailand. The progress of development stalled in 2010, due to financial difficulties of the private industrial area developer who obtained the development rights for this huge industrial project. However, the project restarted with the assistance of Government of Japan in July 2015. Although a Special Purpose Vehicle (SPV) was organized for restarting the execution of the project, no significant progress has been made by February 2017. The estimated cost for development of transport access alone is more than US$ 1.5 billion.

Development of Other SEZs: As described in above, at present only one SEZ is taking shape and is ready to commence manufacturing activity in Thilawa. Myanmar is striving to expand the manufacturing sector as quick as possible that can be accelerated by increased in-flow of FDI into the manufacturing sector. In order to achieve the goal the development and realization of more SEZs in strategic locations is imperative.

4) Urban-Rural Synergy Strategy

In Myanmar, at present, around 70% of the total population resides in rural areas, where the major economic activity is farming, and around 30% of the population resides in urban areas (Source: Population Census 2014), where main activities are manufacturing and services. As the share of GDP generated in rural areas accounts for only around 30% and the same for urban areas accounts for almost 70% of GDP, this causes regional disparities. An equitable development needs to be realized to ensure inclusive growth, especially in rural areas. One

of the comparative advantages of rural areas in Myanmar is a large potential for the export of farm products, if current productivity can be improved and the value of products increased. On the other hand, urban areas have a large potential for industrialization, if the current bottlenecks that hamper the proper development of the manufacturing sector, such as shortages of power are eliminated. In such a way, the rural areas and urban areas need to be developed in parallel. Such a simultaneous development will create a synergy between rural and urban areas, thereby developing characteristics in the respective areas. The improvement and development of logistics system connecting the rural areas and the urban areas strongly will substantially contribute to the enhancement of synergies between the two areas.

5) Shortcomings in the view of Logistics

Trunk Road: The long-distance haulage of Myanmar is concentrated along the AH1 especially the segment linking between Yangon and Mandalay. Although the expressway linking Yangon with Mandalay (around 650 km long) has been constructed, the heavy-loaded vehicles are not allowed to use this expressway but the Yangon-Mandalay Highway or AH1 which is congested and dangerous because it passes through a number of local cities and towns. Thus, the transport efficiency of heavy loaded vehicle for long-distance haulage is low. The existing transport infrastructures are to be fully utilized and used efficiently. In this view point, the Yangon-Mandalay Expressway is to be opened for the long-distance haulage of cargo by heavy loaded vehicles.

Truck Terminals: The truck terminal developed at Yangon is narrow and outdated. It is congested always as the truck terminal functions as the wholesale market of farm products, processed foods, daily consumables, and construction materials. The truck terminals in the major cities in rural areas are narrow and outdated as well. Some of the truck terminals in the rural areas are used as the inter-city bus terminals, thus the efficiency of cargo transportation by large-sized trucks is low. Many of the trucks are forced to stay in the truck terminal to search the cargo for return trip or return to origin place without cargo. These factors push up the trucking charges in general. The efficiency of cargo arrangement at the truck terminals is quite low at present. In this point of view, the truck terminals having sufficient space for truck maneuvering and storing of goods need to be developed at strategic locations in Yangon and other cities.

Regional Roads: The trunk roads for regional connections are not adequately developed since such connections with neighboring countries were neglected until the country opened it door to the world in 2011. The road transport capacity is not sufficient for future cargo traffic demand in general. The bridges are weak and not prepared for the transportation of heavy-loaded vehicles. Many bridges need to be reinforced or replaced with new bridges. As the regional roads pass through several cities and towns at present, it is needed to provide by-passing route aiming at smooth traffic as well as avoiding traffic accidents.

Rural Roads: The rural roads are substandard and deteriorated since no proper maintenance has been carried out. The bridges are weak and not suitable for cargo transport by large-sized trucks. In the rainy season, many of rural roads are inundated by flood and their network is disrupted. Many of the bridges in the rural areas are submersible and are often impassable during rainy season.

Regional and Domestic Connectivity: The connectivity between rural and urban areas is weak and vulnerable against rain and natural disasters such as floods and landslides at present. The reinforcement of connectivity in both regional and domestic aspects is needed, to provide sound and smooth access between producers and consumers that would achieve the objectives of the rural-urban synergy strategy. The improvement of the road conditions especially in the rural area is imperative and important to achieve an equitable development throughout the country. The feeder roads that form the hub and spoke with the strategic nodes as the hub along the logistics corridor are to be developed in parallel with the improvement or development of the major links that form the logistics corridor.

International Port: At present, the Yangon Port including the ports in the Thilawa Terminal Area is the only one and the largest major commercial and international port in Myanmar. Since the water depth is shallow or -9m, the maximum size of ships allowed to call at the port is 15,000 DWT. Due to this condition, the Yangon Port is served by the feeder lines mainly plying between Yangon and Singapore or Port Kelang of Malaysia. The container terminal operating at present is Myanmar International Terminal Thilawa (MITT) owned by MPA and operated by Hutchison Port. The port container handling volume has been increasing at it is expected to reach 1.0 million TEU soon. As the container traffic volume is expected to increase sharply, a new container terminal is planned to be constructed in the Thilawa Terminal Area. The preparation of constructing a new container terminal (berth length 800m) is underway at present with the technical and financial assistance of the Government of Japan. However, the port cargo handling capacity needs to be expanded further to meet with continuously increasing container traffic volume.

Inland Waterway Transport: Ayeyarwaddy River (2,160km long), one of the world's greatest rivers runs through a vast plain blessed with good soil that ensures high potential for agricultural production. At the same time, Ayeyarwaddy River functions as the major navigation channel for the inland waterway transport linking Yangon and Mandalay; and linking Mandalay and Myitkyina the city located at the most northern part of Myanmar. The inland waterway transport along Ayeyarwaddy River as well as its tributary Chindwin River is important transport means for agricultural products, construction material, fuel, daily consumables, etc. especially for the rural population along the rivers. As the water levels of these rivers fluctuate by season the inland waterway transport during low water level is problematic. Most of the river ports along the major rivers are old fashioned and narrow for

mechanical cargo handling, thus the cargo handling is done manually. The improvement of navigation channels for safe transport throughout the year and the river ports for mechanical cargo handling as well as channel maintenance are imperative to utilize the inland waterway transport at optimum level.

Coastal Shipping: The total length of the coast of Myanmar facing the Bay of Bengal and the Andaman Sea is around 2,300km. Eight local ports and Yangon Port serve as the ports for the coastal shipping services. Most of the coastal areas are poorly connected with roads and / or railways, so the coastal shipping plays an important role for the transport of food items, daily consumables, fuel, construction materials, etc. to these rural areas. However, all local ports are old fashioned and narrow for cargo maneuvering, hence the cargo transport efficiency is quite low. The expansion and modernization of all local ports and improvement of connectivity between Yangon Port and the local ports are needed.

Air Cargo Transport: Although not sufficient, international airports such as Yangon International Airport and Mandalay International Airport are furnished with air cargo handling facilities and equipment, but local airports are not equipped with modern and sufficient cargo facilities and handing equipment at present. When the frequency of domestic flights increases and the size of aircrafts is enlarged, the air cargo transport will become possible for transporting high valued products from the rural areas to major demand areas, and if such cargo will be transferred to international flights at the international airports the products of rural area will have access to the international markets.

Logistics Services: The sustainable and sound industrial development that can be equitable to all players concerned with industrialization can only be achieved by organizing reliable supporting industries that support manufacturers whose target market is the worldwide international market. Fostering supporting industries is essential to convert Myanmar into an industrialized country. However, the facilitation to develop SMEs is lacking. This gives concern to SMEs which undertake the transport / distribution of manufactured goods. The industrial structure of the region could support industries that supply intermediate goods among countries, creating a mountain-like structure of supporting industries, which support the industries of each country in a flexible manner. However, to develop such supporting industry, especially in the manufacturing of intermediate goods, a logistics system of international standard is needed.

Transport and Logistics Industries: The main players of the transport and logistics system are the private companies which engage with the transportation and management of cargo movement along the supply chain. Almost all private companies providing transport and logistics services are classed as Small-medium Enterprises (SMEs). Since the cargo insurance system is weak and not efficient, most of the traders transport their cargoes by their own cargo transportation equipment mostly trucks and store their cargoes in their own

warehouses. Therefore, the number of companies specializing in cargo transport and logistics service is limited at present. Under such circumstances, the cargo transport and logistics industry is fragmented. A coordination and collaboration among private companies engaging with cargo transport and logistics service is imperative so as to maximize the cargo transport efficiency. Sharing transport and logistics information among private companies may ensure the return cargo and thereby increase the cargo loading factor in general.

6) Opportunities

Myanmar is called the Last Frontier for investment in South East Asia, especially for manufacturing activities. As presented in Chapter-2.2 (1) the geographical location of Myanmar is at an intersection node of a wider region composed of India in the west, China to the north, and Thailand to the east and other ASEAN countries to the south-east. If this geographic advantage could be utilized as much as possible, as one of the important comparative advantages of Myanmar, the manufacturing sector in Myanmar will flourish and prepare power supply and logistics systems spanning the whole of Myanmar, the region, and the world, through various gateways.

(3) Industrial Sector

1) General

The potential for the construction industry in Myanmar is large. This is true not only for urban development but also for infrastructure development taking place throughout the country which generates demand for construction materials, such as cement, gravel, sand, reinforced steel bars, metals, roofing materials, wallpaper, wood products, glass, furniture, etc. This demand is increasing strongly.

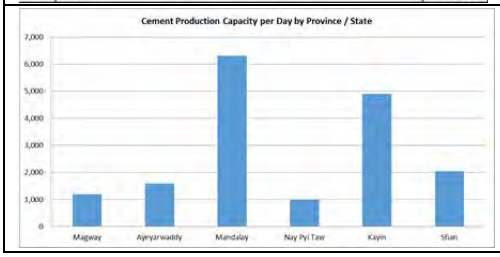
Cement production has been one of the leading industrial activities in Myanmar. **Figure-2.3.7** shows the distribution of installed capacity of cement plants operating at present and illustrates where such plants are located. The installed capacity of cement plants in total is around 6.1 million tonnes or 17,000 tonnes per day at present. Myanmar has an abundant volume of raw materials needed for cement production throughout the country but concentrated mostly in the Mandalay, Shan and Kayin regions.

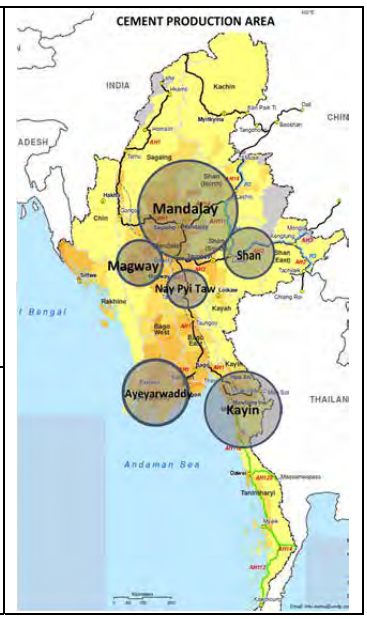
2) Shortcomings in terms of Logistics

The characteristics of construction materials are mostly heavy, bulky and low value per ton. The majority of these construction materials, including rocks, gravels, sand and steel bars are transported by railways, inland waterway vessels, and coastal ships, alike. However, most transport equipment, such as wagons, barges, ships, etc. are old and the respective infrastructure needed such as railway tracks, ports, etc. are deteriorated. The cargo handling facilities and equipment are lacking at the locations where cargo loading and unloading

operation is taken place. Unless such transport modes are renovated, land transport by large trucks will dominate transport for these bulky, heavy and low value products, which is quite uneconomical, and this will increase the costs of transport, especially where such materials are needed in rural areas.

	Location of Cement Plant	tpd
1	Thayet Township, Magway Region,Myanmar	1,200
2	Kyankin Township,Ayeyarwaddy Region,Myanmar	1,600
3	Kyaukse Township, Mandalay Region, Myanmar	500
4	Kyaukse Township,Mandalay Region, Myanmar	700
5	Patheingyi Township,Mandalay Region, Myanmar	1,200
6	Kyaukse Township,Mandalay Region, Myanmar	300
7	Kyaukse Township,Mandalay Region, Myanmar	600
8	Tharzi Township,Mandalay Region,Myanmar	500
9	Tharzi Township,Mandalay Region,Myanmar	1,250
10	Tharzi Township,Mandalay Region,Myanmar	1,250
11	Lewe Township,Nay Pyi Taw,Myanmar	500
12	Lewe Township,Nay Pyi Taw,Myanmar	500
13	Myaingalay,Hpa-An Township,Kayin State	4,900
14	Pinlaung Township,Shan State, Myanmar	800
15	Taunggyi Township,Shan State,Myanmar	1,250
	Total	17,050





Source: Study Team based on the data obtained from the Ministry of Industry

Figure-2.3.7 Distribution of Cement Plants by Production Capacity in 2015

3) Opportunities

Vietnam is the largest cement producing country in South East Asia. The installed capacity of 58 cement plants in total in Vietnam is estimated to be at around 91 million tonnes, followed by Indonesia (63 million tonnes by 15 plants) and Thailand (46 million tonnes by 14 plants). Judging by the population of Vietnam, cement plant production capacity in Myanmar can be expanded by 2.5 or 3.0 times the present capacity. Several cement plants are about to be constructed by FDI mostly by Thai private cement companies. In addition to this, plants that manufacture concrete secondary products such as hollow concrete blocks for building works, sewer concrete pipes, terrazzo tiles, concrete sidewalls, etc. are expected to be constructed where the demand for such products can be expected.

(4) Energy Sector

1) General

Myanmar (then Burma) started production of crude oil in the 1920's. At present, Myanmar produces crude oil at a rate of around 7,600 barrels/day (bpd) and natural gas at 55 mmcf onshore. The total length of crude oil pipeline is around 119 km and gas pipeline is around 2,874 km. Two gas fields are active and the gas is transmitted through 286.5 km of offshore gas pipeline and 149.7 km of on-shore gas pipeline. There exists a 760 km long crude oil pipeline and a 782 km gas pipeline for transit of crude oil and natural gas from Kyaukpyu to China.

Figure-2.3.8 shows the oil and gas fields that are operating. Three crude oil refineries have a total installed capacity of 51,000 bpd; 3 LPG plants of 50 mmscfd; five fertilizer plants produce ammonia 1,340 tpd and urea 2012 tpd; and one methanol plant 450 tpd are operating in 2015. Although the production volume is quite small, crude oil has been produced at onshore oil and gas fields in Myanmar near Magway since the 1920's. There are three refineries in Myanmar operating at Thanbayakan (locally produced crude oil[4] at 25,000 bpd), Chauk (locally produced crude oil at 6,000 bpd) both near Magway and Thanlyin (Malaysian crude oil imported at 20,000 bpd) near Yangon. The daily consumption of petroleum products in Myanmar in 2014 was around 28,000 bpd increasing rapidly in parallel with economic growth. Several projects for the development of refineries are planned including one at Magway where the crude oil transmission pipeline from Kyaukpyu to China crosses and one at the Dawei SEZ. The production capacity of refinery planned to be built in Dawei has been approved in 2016 is 115,000 bpd, which is quite big and sufficient to cover the future demand of petroleum products in Myanmar.

Although the Ministry of Energy invited international qualified refinery operators from the world for the expansion of Thanlyin refinery in November 2016, the contract has not been awarded yet in May 2017. Present Thanlyin refinery's production capacity is around 20,000 bpd, while it is planned to increase to 150,000 bpd. The project location is around 10 km from Thilawa Terminal Area facilities. The award of forming the joint venture operator has not been determined yet. However, if this project will be implemented one of the candidate sites for the expansion of Thilawa Terminal in the Yangon Port will be lost.

Figure-2.3.9 shows the crude oil transmission pipeline (Sino-Myanmar Pipeline) having transmission capacity of 12 million tonnes of crude oil per year from the Middle-East and Africa. This crude oil pipeline is owned and operated by the joint venture company formed by Myanmar company and China National Petroleum Cooperation (CNPC). The construction works was completed in August 2014. The construction works of natural gas transmission pipeline having transmission capacity of 12 bcm was completed in June 2013. The gas is produced in Myanmar's Shwe Project and transmitted to Kunming, China through Myanmar to China. The gas transmission started in October 2013.

As of 2014, in onshore oil and gas concession area, 16 contracts are active in 16 onshore blocks with 12 foreign companies from 11 countries and in offshore area 18 contracts are active in 19 offshore blocks with eight foreign companies from eight countries. **Figure-2.3.10** shows the location of these blocks for oil and gas exploration.

[4] Grade of crude oil produced in the central part of Myanmar is API 35 with low sulfur content. Crude oil production has started almost 100 years ago. These days the production volume is around 10,000 bpd which has been decreased from 30,000 bpd recorded in1980s.

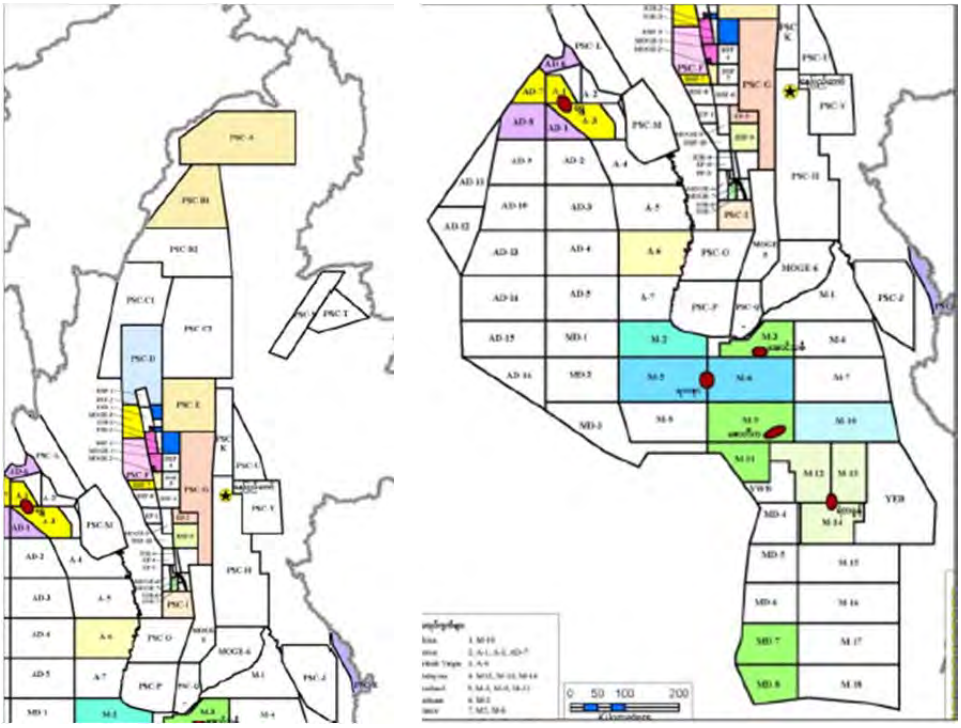
- Current onshore production:
  Crude oil: 7,500 bbl/day and Natural gas: 55 mmcf
- Current offshore production:
  Producing fields: Yadana, Yatagun and Shwe
  Crude oil: 10,000 bbl/day,
  Natural gas: 1,400 mmcf

Source: The Current Status and Future Vision of Oil and Gas Sector in Myanmar, Ministry of Energy

Figure-2.3.8 Oil and Gas Fields in Myanmar

Source: The Current Status and Future Vision of Oil and Gas Sector in Myanmar, Ministry of Energy

Figure-2.3.9 Oil and Gas Transmission Pipeline to China



Current Onshore Activities **Current Offshore Activities**

Source: The Current Status and Future Vision of Oil and Gas Sector in Myanmar, Energy Planning Department, Ministry of Energy, 2014

Figure-2.3.10 Current Oil and Gas Exploration Activities in Myanmar

Myanmar has a long history of crude oil production and refining from the late 19th century (started from 1853). In the 19th century and the beginning of the 20th century, the products produced and sold were kerosene or lamp fuel for the then Burma and India. The history of energy development has changed drastically from production of crude oil and refining to the production of natural gas and exporting of gas to neighboring countries, i.e. Thailand and China. As such, the history of energy development of Myanmar will continue to change in the 21st century and beyond. Major international oil companies engaged in Myanmar at present include Total S.A.(France), the Essar Group (India), CNOOC (China), Sinopec (China), Petronas (Myanmar) and Puma (global downstream operator). Considering the names of these energy development international companies, the prospect of Myanmar's crude oil extraction and the natural gas production seems bright.

2) Shortcomings in View of Logistics

At present, a large volume of petroleum products is imported from refineries operating in Singapore or Malaysia to meet rapidly increasing demand. Myanmar is however an oil and gas producing country, although proven deposits of crude oil are small (150 million barrels or 0.016% of the total crude oil proven deposit of the world). This will be increased once the latest oil and gas exploration technology is introduced and production activity will take place dynamically. While the proven deposits of natural gas are considerable large as 16 tcf or 0.25% of the total gas proven deposits of the world. This is expected to occur on the basis of laws and regulations giving importance to the transparency of conditions of concessions and exploration rights. When the production volume will increase in parallel with increased demand, a problem will be the transport of dangerous cargoes in liquid form such as gasoline and diesel fuel by tanker lorry from Yangon to Mandalay. At present, most of the transport of petroleum products is undertaken by tanker lorry except for some volume that is transported by inland water transport tanker from local refineries operating in the central part of Myanmar along Ayeyarwaddy River. This situation can be rectified by the use of pipelines for transmitting petroleum products so as to avoid excessive transport of petroleum products by land transport or by tanker lorry, for which the transport cost is much higher than that by railway tanker, IWT tanker, or pipeline.

3) Opportunities

Kyaukpyu is the deep sea port where it is possible to accommodate VLCC. At present the crude oil unloaded at Kyaukpyu crude oil terminal is transferred to China through the oil and gas pipelines developed and operated by Myanmar and China joint venture companies. The crude oil lifted and transported can be utilized as the feedstock for refining and/or production of fertilizer / LPG, etc. Magway can be considered as the intersection node composed of crude oil / gas pipelines and inland waterway transport along Ayeyarwaddy River, railway and road network. Either in Kyaukpyu or in Magway or in the best selected location

hydrocarbon based chemical industrial complex can be planned. Products produced by such industry could substitute a part of imported products of the similar kind and quality in the future or could even be exported to meet international market demand.

2.4 Expansion of Trade

2.4.1 Past Record of Trade

The trade of Myanmar has been expanding at a quite rapid pace from US$14.7 billion (or US$11.0 billion excluding trade through pipelines) in 2011, to US$ 27.6 billion (or US$25.1 billion) in 2015, e.g. growing at a rate of 23% per year. **Table-2.4.1** shows the changes of trade value by gateway.

Table-2.4.1 Change of the Trade Value by Type of Gateway

Value-US$ Million

No. EXPORT - Description	Unit	Normal Export (Air+Sea)					Border Export (Land)					Total				
		2011	2012	2013	2014	2015	2011	2012	2013	2014	2015	2011	2012	2013	2014	2015
1 Agricultural Products (Rice and rice products, Maize, Beans)	US$	1,530	1,304	1,082	1,036	1,343	749	1,217	1,721	1,548	1,546	2,279	2,521	2,803	2,584	2,889
2 Animal Products (Raw hide, leather and others)	US$	7	10	11	8	8	78	50	5	1	1	86	60	16	8	8
3 Aquaculture Products (Fish, Prawn and others)	US$	318	491	240	158	177	225	269	304	265	270	542	760	545	423	446
4 Mine Products (Jewellery, green stone and others)	US$	582	115	624	697	688	725	427	622	775	357	1,308	541	1,246	1,472	1,045
5 Forest Products (Timber, plywood and others)	US$	586	653	696	403	183	14	10	31	5	3	600	663	727	408	187
6 Industrial Finishing Products (Sugar, clothes and others)	US$	4,077	4,164	4,721	4,741	4,051	8	27	118	1,059	2,062	4,085	4,191	4,840	5,800	6,113
7 Others (Draw and back, re-export and others)	US$	319	89	1,003	700	559	28	48	80	56	184	347	137	1,084	756	744
Sub-total Export	US$	7,419	6,825	8,378	7,743	7,009	1,827	2,048	2,882	3,709	4,423	9,246	8,873	11,260	11,452	11,432
	%	80%	77%	74%	68%	61%	20%	23%	26%	32%	39%					
No. IMPORT - Description	Unit	Normal Import (Air+Sea)					Border Import (Land)					Total				
		2011	2012	2013	2014	2015	2011	2012	2013	2014	2015	2011	2012	2013	2014	2015
1 Capital products (Cement, steel, car, home appliances, etc.)	US$	3,024	3,213	4,448	6,094	7,051	730	596	908	1,096	1,669	3,754	3,809	5,356	7,190	8,720
2 Raw materials (Wheat, chemical, paper, tyres, petroleum, etc.)	US$	3,669	3,629	4,233	5,340	4,532	346	354	552	639	519	4,015	3,984	4,785	5,979	5,052
3 Commodities (Battery, medichine, soap, cosmetics, clothes, etc.)	US$	1,121	1,185	1,533	2,611	2,469	208	220	373	449	604	1,329	1,405	1,906	3,060	3,072
Sub-total Import	US$	7,814	8,027	10,214	14,044	14,052	1,284	1,171	1,833	2,184	2,792	9,098	9,198	12,046	16,228	16,844
	%	86%	87%	85%	87%	83%	14%	13%	15%	13%	17%					
No. TRADE TOTAL	Unit	Normal Trade (Air+Sea)					Cross-border Trade (Land)					Total				
		2011	2012	2013	2014	2015	2011	2012	2013	2014	2015	2011	2012	2013	2014	2015
1 Export	US$	7,419	6,825	8,378	7,743	7,009	1,827	2,048	2,882	3,709	4,423	9,246	8,873	11,260	11,452	11,432
2 Import	US$	7,814	8,027	10,214	14,044	14,052	1,284	1,171	1,833	2,184	2,792	9,098	9,198	12,046	16,228	16,844
TRADE TOTAL	US$	15,233	14,852	18,592	21,787	21,060	3,111	3,219	4,715	5,893	7,215	18,344	18,071	23,307	27,680	28,275
	%	83%	82%	80%	79%	74%	17%	18%	20%	21%	26%					

Source: Study Team based on the data obtained from the Ministry of Commerce

Figure-2.4.1 illustrates the change of export and import value by type of gateway for the period of 2011-2015.

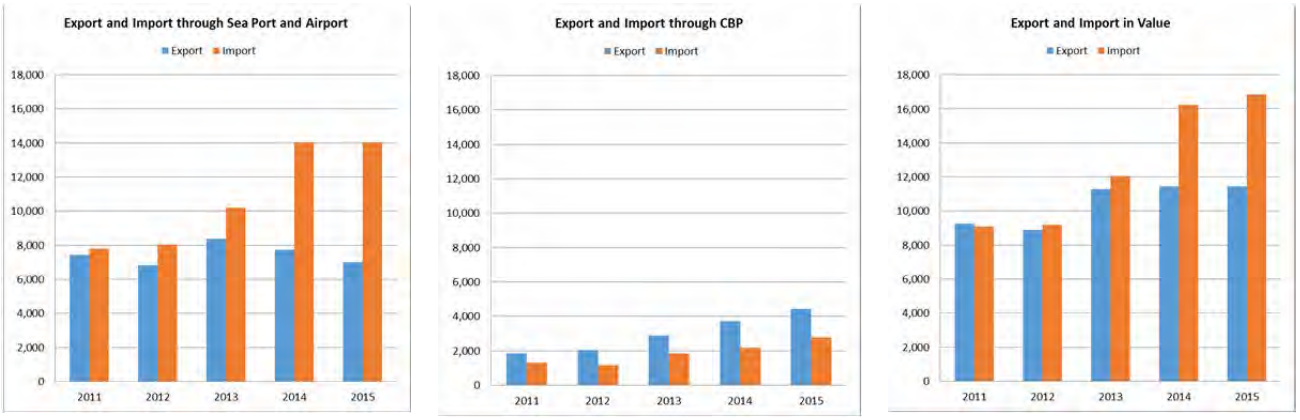


Figure-2.4.1 Changes of Export and Import Value by Type of Gateway

As shown in the above graphs, the export value through the sea ports has been decreasing while both export value and import value through the cross-border points have been increasing sharply at an average annual growth rate of 24%. In the case of the cross-border trade, the export value is more than the import value constantly in this period of time. This steady increase trend of cross-border trade may expand further because of strengthening of the regional economic integration movements of the ASEAN Economic Community.

Table-2.4.2 shows the trade amount by the geographical location of trade partners.

Table-2.4.2 Export and Import Amount in 2011 and 2015 by Directions

TRADE IN VALUE (Unit: US$ million)

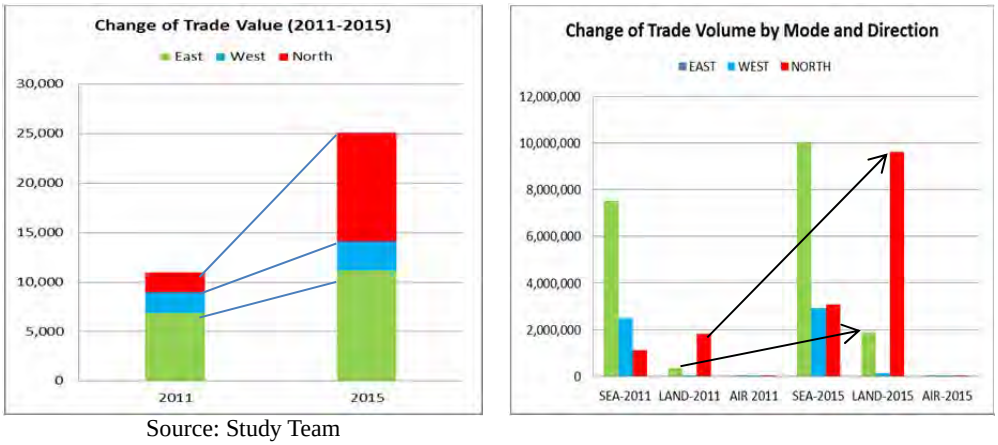
		2011					2015				
		TOTAL	SEA	LAND	AIR	PIPELINE	TOTAL	SEA	LAND	AIR	PIPELINE
Exports	EAST	5,273	1,568	0	101	3,503	5,033	1,765	243	511	2,514
	WEST	1,386	1,331	0	27	0	1,488	1,355	64	69	0
	NORTH	423	361	0	31	0	4,595	285	4,242	67	0
	Subtotal	7,082	3,261	0	159	3,503	11,115	3,405	4,549	648	2,514
Imports	EAST	5,235	5,115	0	119	0	8,637	7,661	869	106	0
	WEST	720	604	0	115	0	1,486	1,379	20	87	0
	NORTH	1,623	1,585	0	38	0	6,388	4,529	1,709	151	0
	Subtotal	7,578	7,305	0	272	0	16,511	13,569	2,598	344	0
Trade	EAST	10,507	6,683	0	220	3,503	13,670	9,426	1,113	617	2,514
	WEST	2,106	1,936	0	142	0	2,975	2,734	83	156	0
	NORTH	2,047	1,947	0	69	0	10,983	4,814	5,951	218	0
	Total	14,660	10,566	0	431	3,503	27,627	16,974	7,147	991	2,514

TRADE IN VALUE (Excluding by Pipeline) (Unit: US$ million)

		2011				2015			
		TOTAL	SEA	LAND	AIR	TOTAL	SEA	LAND	AIR
Exports	EAST	1,669	1,568	0	101	2,519	1,765	243	511
	WEST	1,359	1,331	0	27	1,488	1,355	64	69
	NORTH	392	361	0	31	4,595	285	4,242	67
	Subtotal	3,420	3,261	0	159	8,602	3,405	4,549	648
Imports	EAST	5,235	5,115	0	119	8,637	7,661	869	106
	WEST	719	604	0	115	1,485	1,379	20	87
	NORTH	1,623	1,585	0	38	6,388	4,529	1,709	151
	Subtotal	7,577	7,305	0	272	16,510	13,569	2,598	344
Trade	EAST	6,903	6,683	0	220	11,156	9,426	1,113	617
	WEST	2,078	1,936	0	142	2,974	2,734	83	156
	NORTH	2,016	1,947	0	69	10,983	4,814	5,951	218
	Total	10,997	10,566	0	431	25,112	16,974	7,147	991

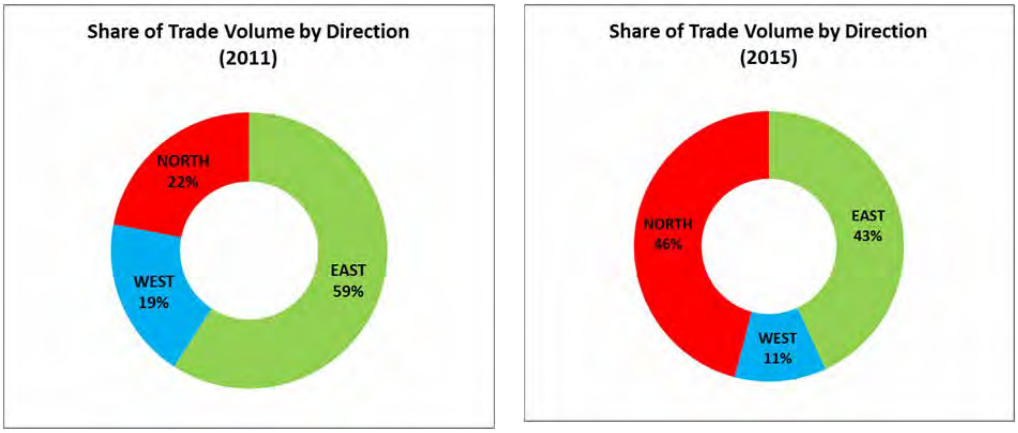
Source: Study Team based on trade statistics prepared

Since 2011, trade with China started through the cross-border post located on the Myanmar border with China, at Muse. The trade volume through this land gateway in the north of Myanmar changed the trade traffic pattern drastically. At the same time, the land gateway at the east of Myanmar mainly for the trade with Thailand grew substantially, and this changed the trade traffic pattern in the east of Myanmar as well. Such changes are illustrated in **Figure-2.4.2.** These figures clearly indicate that the trade between Myanmar and the countries located to the east increased substantially and the trade with the countries located in the north has also increased substantially. The continuation of this pattern of trade can be foreseen in future. **Figure-2.4.3** illustrates the changes in share of trade by countries located geographically to the east of Myanmar. The proportion of the trade value between Myanmar and the countries located to the East, West and North is around 44:44:12 (or rounded as 40:40:20). The proportion of the trade value between the countries located to the East and West is 80:20.



Source: Study Team

Figure-2.4.2 Change of Trade Value and Trade Traffic Pattern

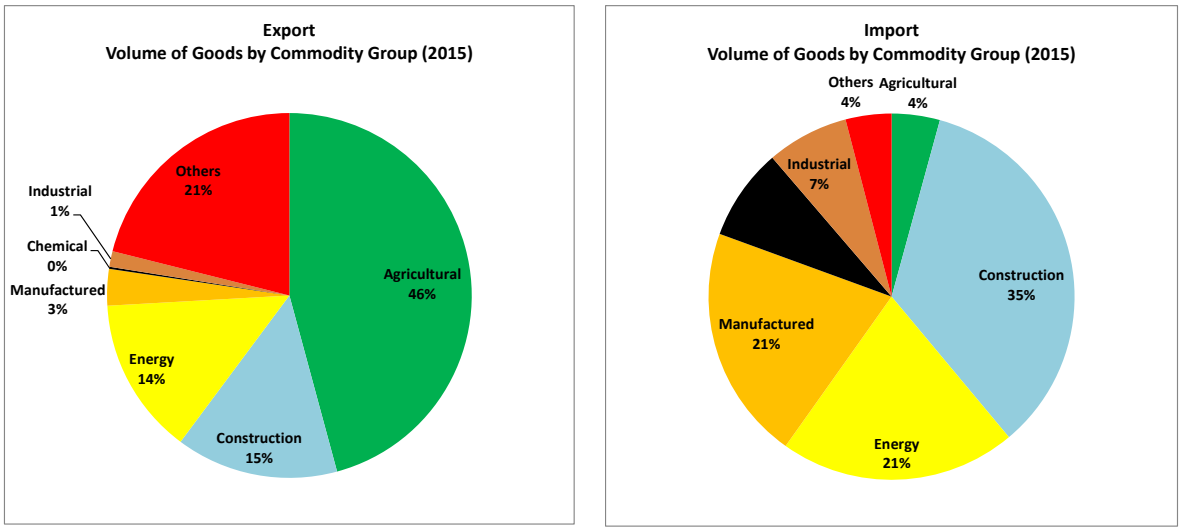


Source: Study Team based on sorted trade statistics of Myanmar

Figure-2.4.3 Proportion of the Trade Value by Location of Trade Partners

(1) Present Situation of Total Trade

The volume of commodities exported in total in 2015 was around 16.0 million tonnes, of which agricultural products comprised some 7.4 million tonnes, and accounted for around 46% of the total export volume. This was followed by construction materials (mainly sand) and energy (mainly gas). On the other hand, the volume of total commodities imported in the same year was around 19.8 million tonnes, of which construction materials (mainly cement) was around 6.9 million tonnes and which accounted for some 35% of the total import volume. This was followed by energy products (mainly petroleum products) – around 4.1 million tonnes – and by manufactured goods at around 4.1 million tonnes. **Figure-2.4.4** illustrates the proportion of these commodities, for exports and imports.



Exports **Imports**

Source: Study Team based on the trade statistics of Myanmar

Figure-2.4.4 Major Commodities for Exports and Imports

(2) Perspective of Trade by Major Commodity

A rapid expansion of the total volume of trade can be foreseen by 2030. Just five years after Myanmar opened her economy, total trade value increased almost 1.76 times in a five-year period, e.g. has grown at an Average Annual Growth Rate (AAGR) of 12%. The growth rate of trade value in the Indochina Peninsula (12%) is not very high. **Table-2.4.3** shows the change of AAGR of GDP and the trade value in each five-year period since 1996 and for the 15-years from 1996 up to 2015 in Vietnam.

Table-2.4.3 Change of GDP and Trade Value in Vietnam in the Past

	1996～2000	2001～2005	2006～2010	2011～2015	1996～2015
Average Growth Rate of GDP	6.1%	13.3%	15.2%	10.9%	12.0%
Trade Value	13.6%	18.4%	19.0%	16.1%	17.3%

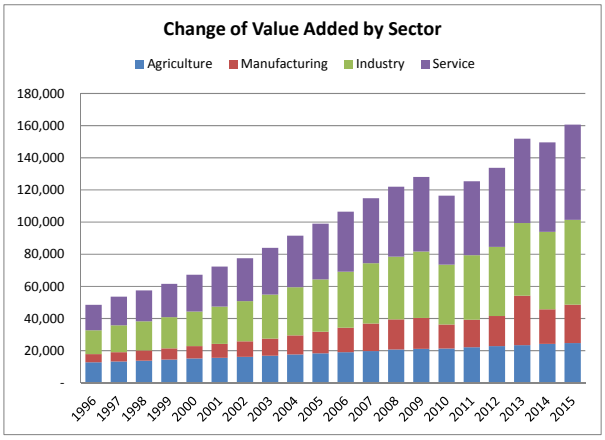
Source: Study Team based on the World Bank data

Figure-2.4.5 shows the changes of export and import values in Vietnam since 1996 to 2015 (a 20 year period). As shown in this figure, the stable and rapid economic growth of Vietnam has been attained by a rapid expansion of the manufacturing sector, which grew from almost zero at the beginning, in 1996.

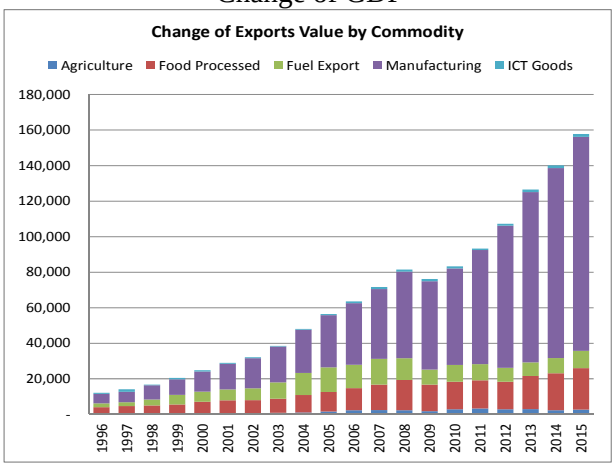
The economic growth of Myanmar is expected and assumed to be led by the expansion of manufacturing / industrial activities, aside from the increased production and export of agricultural products in future. Most such manufactured goods will be transported by containers. As the economy grows, the volume of containers grows at a larger growth ratio than the economy or GDP. For instance, the AAGR of GDP of Vietnam for the period 1996 – 2007 was around 6.5% and the AAGR of trade value in the same period was around 16%. The AAGR of port container traffic volume in the same period in Vietnam was 18.0%, which is more than the trade value.

Figure-2.4.6 illustrates the growth of port container traffic volume in Vietnam over the period 1991 – 2007. Although the situation in Vietnam in the past may differ and not be the same as Myanmar at present, the AAGR of container traffic volumes can be used as important reference data for the demand forecast used in this Study. The details of the demand forecast are discussed and presented in Chapter 4.

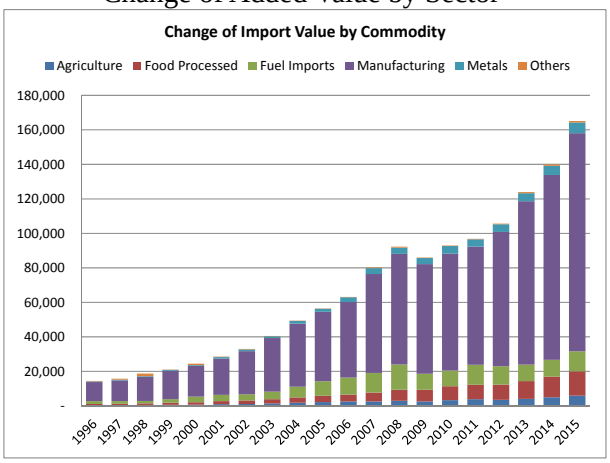
Change of GDP



Change of Added Value by Sector



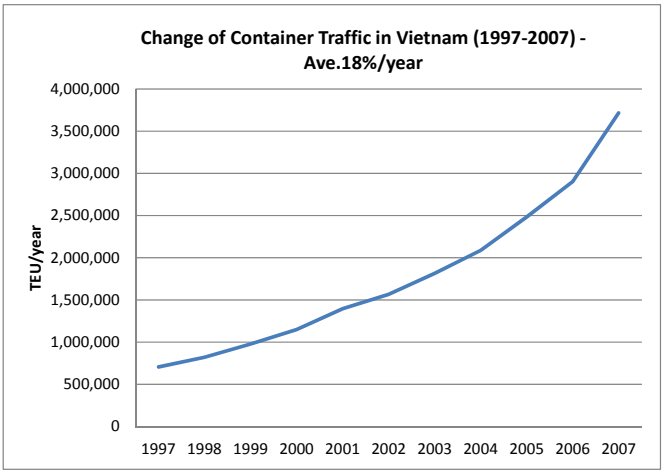
Change of Exports Value

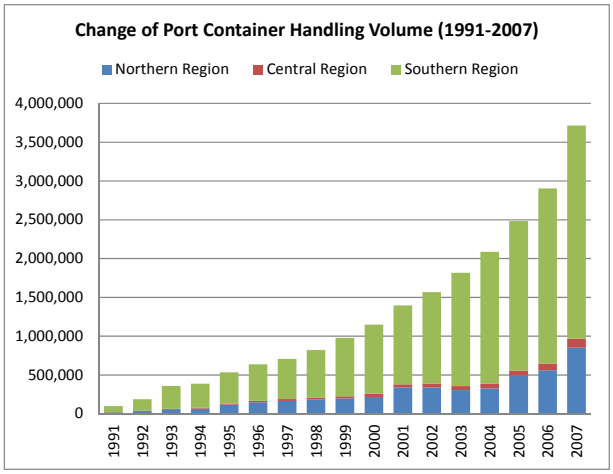


Change of Imports Value

Source: Study Team based on the World Bank data

Figure-2.4.5 Change of Economic Indicators of Vietnam (1996-2015)



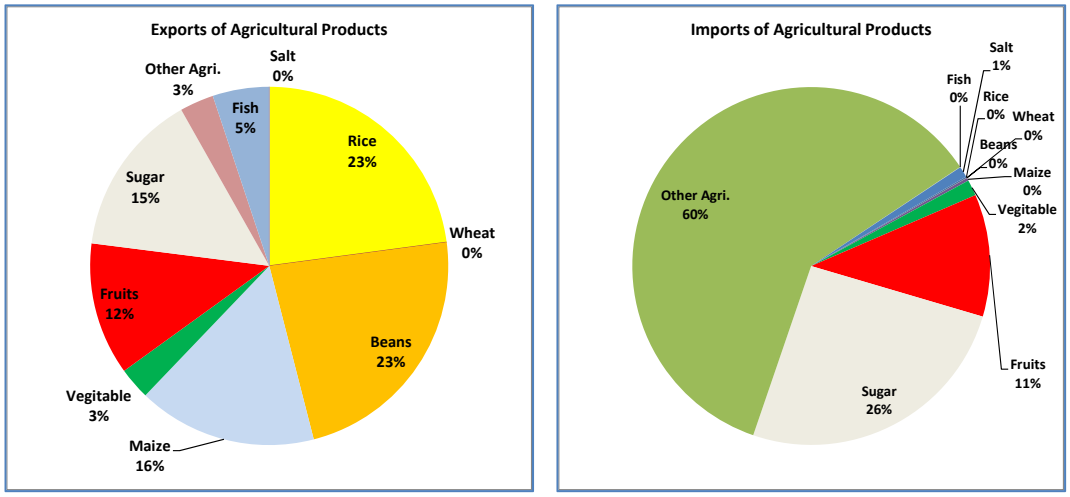


Source: Study Team based on the technical report of VITRANSS-II

Figure-2.4.6 Growth of Port Container Traffic Volume in Vietnam

(3) Agricultural Products

The export volume of beans in 2015 was almost 1.71 million tonnes, followed by rice at 1.69 million tonnes and maize at 1.2 million tonnes. The total volume of these three major crops accounts for almost 60% of the total volume of agricultural products exported. **Figure-2.4.7** illustrates the share of each commodity in the total export and import values in 2015, respectively.



Export Volume Share by Crop **Import Volume Share by Crop**

Source: Study Team based on various data

Figure-2.4.7 Share of the Total Exports and Imports Value by Agricultural Product

The present total population of the world is estimated at around 7.1 billion; anticipated to increase to 8.3 billion by 2030. In 2030, shortages of food and water could occur. Myanmar has a rich water supply throughout the year. However the growing and exporting of rice is limited due to a lack of quality control and management. Myanmar could be very important country to supply rice to satisfy the demand for food and other crops.

Myanmar produces various beans and pulses and its production volume in 2015 was around 4.0 million tonnes. However, the processing capacity of beans to edible oil is still limited and not exploited efficiently. A large volume of edible oil mostly palm oil is imported from Malaysia and other Asian countries despite the fact that Myanmar produces a big volume of beans suitable for oil extraction. As such Myanmar needs to add more value on their farm products through processing primary products.

(4) Energy Products

The major energy product exported by Myanmar is natural gas. Meanwhile, the import volume of oil (petroleum products) is 3.7 million tonnes. The import of petroleum products could be substituted by the local production of petroleum products, using either the crude oil locally produced or imported crude oil carried by large size crude oil carriers to Kyaukpyu and/or Dawei.

(5) Industrial Products

Fertilizer: Major products falling under the category of industrial products are plastics, fertilizers and pharmaceutical products. These are not produced intensively in Myanmar but depend on imports. The volume of fertilizers imported in 2015 was around 1.0 million tonnes. Since Myanmar is a country producing crude oil and natural gas that is a feedstock for processing into fertilizers, fertilizer imports may be substituted by locally produced fertilizers, when chemical complexes are put into operation in future.

Garment: Garments are a major industrial product for export from Myanmar, and production and export volumes are expected to grow because low labor costs are one of the important comparative advantages of Myanmar. However, raw materials for the garment industry are imported from neighboring countries. The situation may need to be rectified in future.

Rubber: The rubber industry is an important industry in Myanmar, especially in the south-east region, where a huge rubber plantation has been developed over a long period. Although the export market for rubber produced in Myanmar (around 184,000 hectares) has been for a long time limited only to China, the market is now expanding to include other Asian countries, such as Vietnam and South Korea. The tire industry demands natural rubber to improve the quality of synthetic rubber tires. The total volume of natural rubber exported in 2015 was around 93,000 tonnes. Rubber is one of the important sources of income in the south-eastern region of Myanmar. The rubber industry will be developed further for processing locally available raw materials to produce more valuable products in future. Many of trees producing raw rubber at present are old, and require replanting over large areas. Old rubber trees can be cut and crushed to turn them into wood chips that can be used for both bio-mass power generation and export as bio-mass energy feedstock. In such a case, a deep sea port would be necessary for use of bulk carriers to ensure that the market price for such products is competitive.

Paper: Myanmar is endowed with vast areas of forest, however, wood has not been utilized as material for paper production, as it requires the import of softwoods or wood chips to mix with locally made wood chips in order to produce high quality paper. The import volumes of paper in 2015 were around 211,000 tonnes. The import of paper can be substituted by use of locally available wood chips, rather than use of unprocessed logs.

Vehicles and Electronic Products: Myanmar imports a considerable number of secondhand cars from abroad, especially from Japan. When the per capita GDP reaches a certain level, purchase of cars will increase, and road users will start to purchase new cars in future. Some of the automobile manufacturers with famous brands are considering an expansion of their manufacturing capacities, to locate factories in competitive locations, meeting their respective business strategies. As discussed in **Chapter-2.1.1 (10)** the fragmented type of manufacturing activity will become more common in Myanmar. Car manufacturing in complete form requires

long experience and high skills to operate and manage production lines in a sophisticated way, to make products competitive in the world market. Myanmar cannot jump into such a high level of manufacturing; the level of manufacturing will be upgraded step-by-step. In the case of Thailand, now called the Detroit of South-East Asia, it took almost 25 years to reach this level. The development of supporting industries will form the initial stage of such industrial development. This can be the same for the manufacturing of electronic industrial products.

However, the basis of the industrial development for the manufacturing sector in Myanmar requires first the improvement of the logistics system in a holistic way, composed of improvement of infrastructure, institutions, administration and upgraded skills of the logistics service providers.

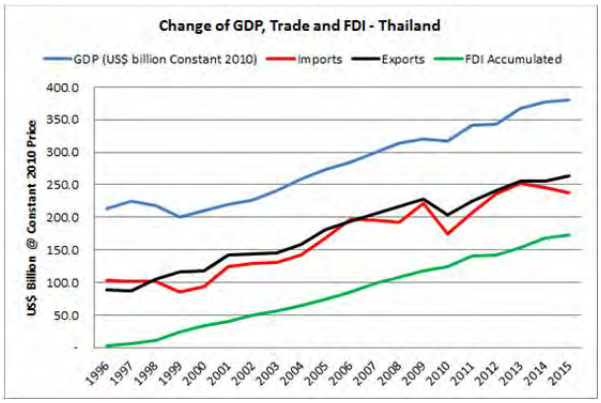
CHAPTER-3 VARIOUS DEVELOPMENT PLANS AND POLICIES

3.1 Country Context

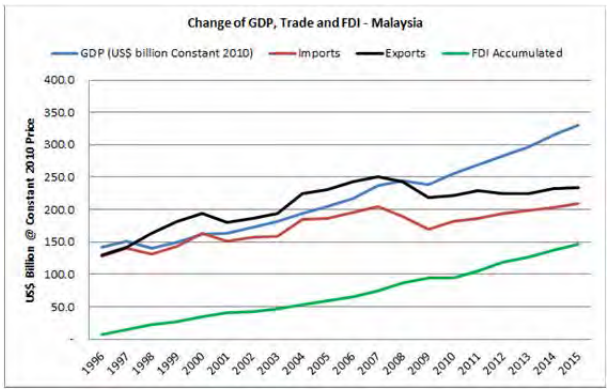
Myanmar has begun to embark on a triple transition since 2011: from an authoritarian military system to democratic governance; from a centrally directed economy to a market-based economy; and from 60 years of conflict to peace in the border areas. In the economic sphere, the key reforms have aimed to remove major policy distortions by liberalizing the foreign exchange market and relaxing controls on foreign ownership of enterprises. (Source: The World Bank)

Figure-3.1.1 shows the changes of GDP, trade and FDI inflow between 1996 and 2015 of major member countries of ASEAN in the Indochina Peninsula: namely Thailand, Malaysia, Vietnam and Myanmar. As the method for compiling the economic data changed to comply with international standards, the data for Myanmar is limited only to the period after 2000. As shown in these figures, the economic growth of Thailand and Malaysia (the core of the ASEAN economy in the Indochina Peninsula and original members of ASEAN); as well as in Vietnam (a late comer to ASEAN) is due to increase in accumulated FDI amount. This has stimulated an increase in exports. On the other hand, an increase in GDP per capita has stimulated the increase in imports. It is assessed that the growth of GDP can be attributed to combination of increase in these factors. It is widely known that the engine of economic growth of ASEAN member countries in the Indochina Peninsula has been the FDI inflow and the latecomers of ASEAN such as Cambodia, the Lao PDR, Myanmar and Vietnam (the CLMV) seem to be following the same path. Vietnam changed its economic regime to a market oriented economy in 1996, and has dynamically promoted FDI inflow by opening up its economy to the world with the aim of economic growth. Vietnam has pursued economic growth and has increased its GDP per capita by around 2.6 times over the past 20 years.

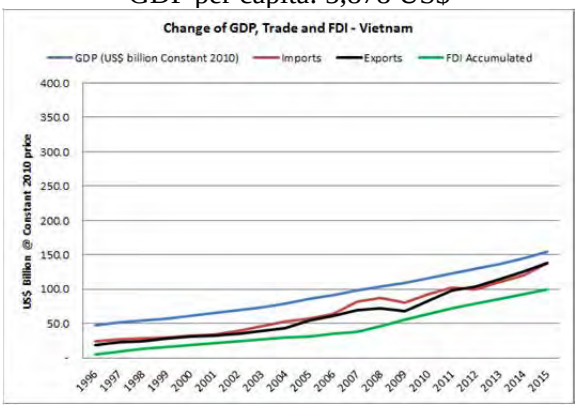
The countries whose population is more than 30 million in the Indochina Peninsula are, in order of descending size, Vietnam (93 million), Thailand (66 million), Myanmar (51 million) and Malaysia (30 million) respectively. These countries, the member countries of AEC, could be considered as a model example for Myanmar's economic development. Vietnam can be assessed as one of the appropriate models or goals which joined ASEAN later in the 1990s and is a transition country.



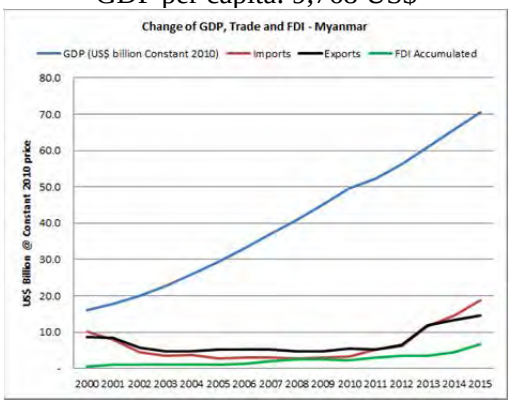
Thailand
Population: 66 million, GDP: 395.2 billion US$
GDP per capita: 5,878 US$



Malaysia
Population: 30 million, GDP: 296.2 billion US$
GDP per capita: 9,768 US$



Vietnam
Population: 93 million, GDP: 202.0 billion US$
GDP per capita: 2,215 US$



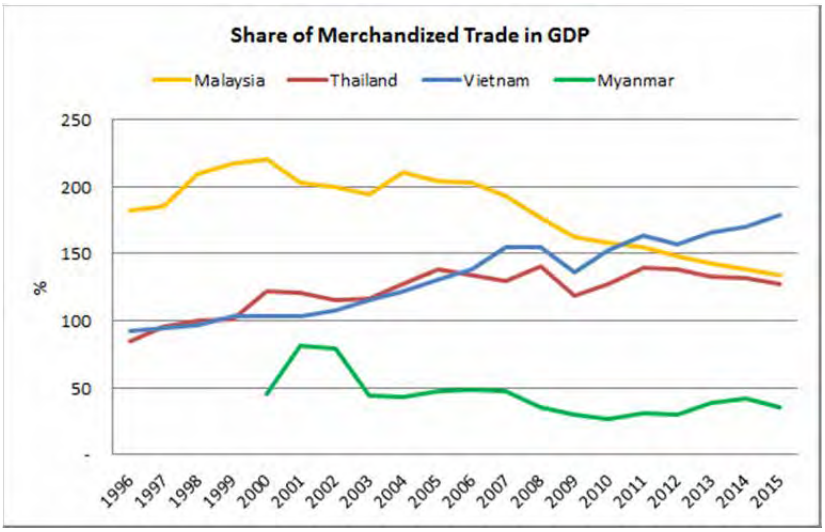
Myanmar
Population: 51 million, GDP: 68.3 billion US$
GDP per capita: 1,307 US$

Source: Study Team based on the data of the World Bank Data

Figure-3.1.1 Changes of GDP, Trade, and FDI Accumulated of Four Major Countries in the Indochina Peninsula

Figure-3.1.2 illustrates the historical changes of share of annual trade amount (the total of merchandize trade amount in the GDP) of the four major countries in the Indochina Peninsula mentioned above. As shown in this figure, the share of the trade amount of Myanmar in the GDP is substantially low when compared with the other three countries (It accounts for only one third of the share of Vietnam).

Rapid growth of Myanmar's GDP started from 2011 when the democratic and open economic policies were adopted: only six years ago. If a comparative model for the economic development of Myanmar is Vietnam, the present position of Myanmar is equivalent to that of Vietnam in the latter-half of the 1990's. As shown in the above figures, if Myanmar follows the economic growth pattern of Malaysia, Thailand and Vietnam, it would need to achieve a greater promotion of FDI inflow as well as an expansion of trade. If Myanmar pursues a similar economic development pattern, the preparation of business environment (cutting of red tape, taxes and fees, special economic zones, one-stop investment service, single window customs clearance, easing of regulations, etc.) achieved by the other ASEAN countries since 1990's will be required.



Source: Study Team based on the data of the World Bank Data

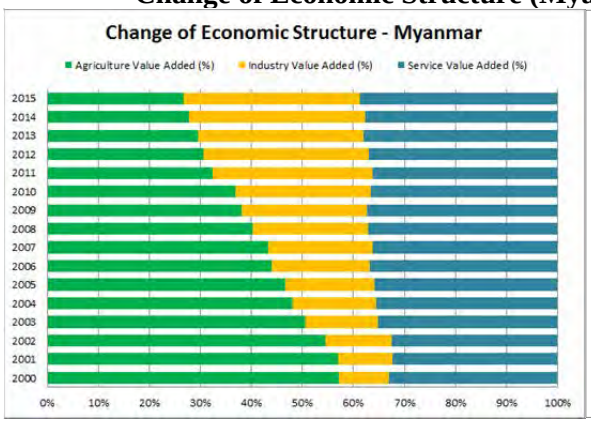
Figure-3.1.2 Changes in the Share of Trade Amount in GDP in Four Major Countries in the Indochina Peninsula

Other measures have included stimulating direct foreign investments, financial sector reform and creating conducive environment for job creation. All these reforms have a potential to make considerable improvements to development outcomes in the country and raise incomes of its citizens. The 5-7 % annual economic growth is expected to continue during the coming years, driven primarily by natural resources extraction and energy sectors. The economy of the urban areas may flourish by expansion of the manufacturing industries due to the inflow of FDIs, especially in and surrounding areas of urban areas. The materials and labors needed to support manufacturing activities will be provided by the rural areas at first, however, the industrial activities will expand to the rural areas gradually. Thus, the synergy between the urban areas and rural areas for economic development will be enhanced in the future. In such a way the equitable economic development will be ensured throughout the country.

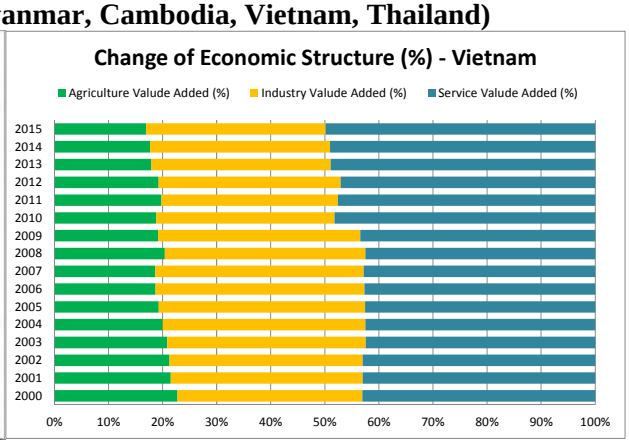
Figure-3.1.3 illustrates the change of the economic structures in Myanmar, Cambodia and Vietnam, which are the CLMV countries, and of Thailand and Malaysia which are representatives of emerging industrial countries in the Indochina Peninsula.

As shown in **Figure-3.1.3**, the share of the agriculture sector in the GDP of Vietnam in 2000 was around 20% and the share of the industrial sector was around 30%: close to the economic situation of Myanmar in 2015. The change of economic structure in Myanmar, which started since the year 2000 is considered to be quite rapid. The development policy and the direction of Myanmar were established and the National Comprehensive Development Plan, and respective plans for the agriculture, industrial and transport sector were formulated based on the changes of economic structure, economic growth, and an expansion of the industrial sector, as demonstrated by Thailand and Vietnam. The basic direction of these economic development plans and infrastructure development master plans aims at the value-added increase by means of FDI inflow promotion, trade expansion, agriculture and industrial development, as described above.

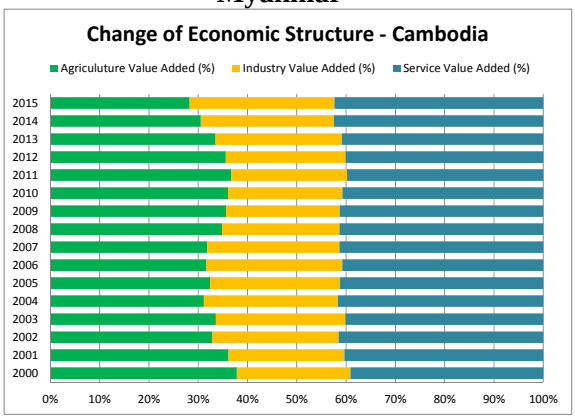
Change of Economic Structure (Myanmar, Cambodia, Vietnam, Thailand)



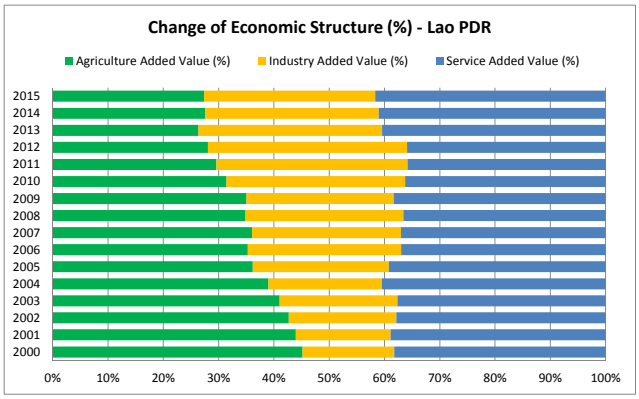
Myanmar



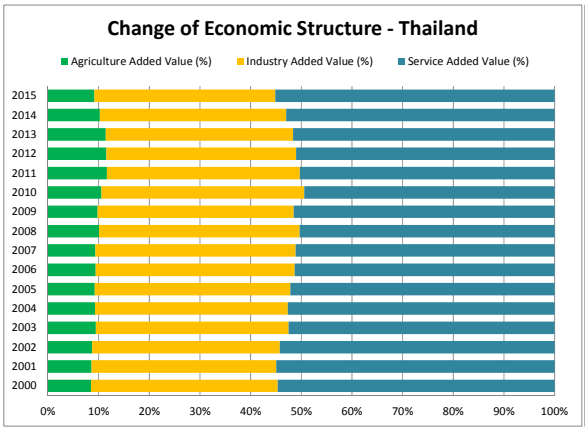
Vietnam



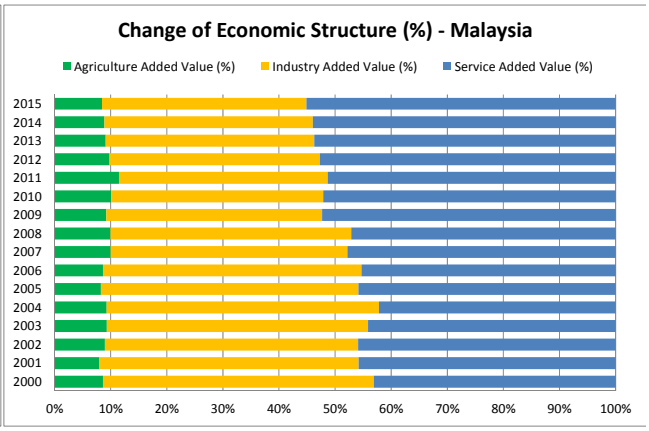
Cambodia



Lao PDR



Thailand



Malaysia

Source: Study Team based on the data of the World Bank Data

Figure-3.1.3 Comparison of Share of Value Added of Agriculture Sector in GDP

3.2 Current Development Plans of Myanmar

This chapter outlines ongoing development plans and policies for the development of Myanmar. The Study will take into account the essence of following plans and strategies. The list of plans is in order of year prepared.

1) National Comprehensive Development Master Plan (NCDP) - 2014
2) Agriculture Development Policies (ADP) - 2014
3) Industrial Policy Paper (IPP) - 2014

4) National Spatial Development Framework (NSDF) - 2014
5) National Transport Master Plan (MYT-Plan) - 2014
6) Myanmar Industrial Development Visions (MIDV) - 2015
7) National Export Strategies (NES) - 2016
8) New National Economic Policies (NEP) - 2016

The direction of strategies, policy recommendations, and Action Plans provided in the Study will be in line with the parameters of the existing national plans and policies.

3.2.1 National Comprehensive Development Plan (NCDP) - 2014

The plan period of the NCDP is 20 years and this is a national development plan that was formulated after the transition to a civilian rule by the Ministry of National Planning and Economic Development and published in 2014. It oversees the policy framework for development of Myanmar until the year 2030. Vision, strategy and plan can be summarized as follows

Vision	***"To build a new prosperous and inclusive Myanmar, a fully developed nation that is integrated into the global community."***
Strategic Goal	1. To build a growing, diversified and sustainable economy with emphasis on the implementation of de-concentration and de-centralization process to achieve comparative advantages in different industrial sectors and transforming Myanmar into a major trading production economy in ASEAN. 2. To ensure inclusive growth and human-centered development especially on the well-being and quality of life for the whole population, realization of democratic and people-centered growth to bring benefits to all its citizens.
Strategies	ST1: Strengthen public institutions and governance
	Updated legislative base and regulatory framework, development of public institutional capacity, civil society participation in governance, fiscal policy and public expenditure management, reform of state economic enterprises and public-private-partnership
	ST2: Create enabling environment and strong enterprise base
	Maintaining a stable macro-economy, modernizing the institutional, policy and regulatory environment, developing private sector capabilities, strengthening FDI systems and process, developing efficient labor markets, increase access to capital to productive enterprise and projects
	ST3: Expand domestic and global connectivity and enhance economic integration
	Developing of economic corridors linking with Thailand, accelerates connectivity in under-developed areas by reinforcement of rural road networks, linking national and international connectivity at strategic nodes, and enhance trade facilitation by improvement of customs procedure at the international sea port and cross-border points.
	ST4: Foster internationally competitive sectors and industries
	Diversify and upgrade production, added value to primary goods exports, strengthen domestic SME export potential, production linkage and enterprise clustering, supporting domestic innovation, green technologies as drivers of growth
	ST5: Develop local economic potential and reduce regional disparities
	Regional and states development, develop cross-border economics zones, enhancing connectivity to improve cluster formation, improving access to public services, increased citizen voices and participation
	ST6: Promote human development
	Improve public services quality, inclusive access to quality public services, employment and economic opportunities, increase citizen participation in government, establish social protection, improve sub-national statistics
	ST7: Safeguard the environment and resource base
	Sustainable environment management, responsible investment, mitigating environmental health risk, resilience to climate change, land ownership and use

Source: Study Team based on NCDP and Industrial Master Plan (First Draft)

According to the NCDP, Myanmar is expected to experience significant changes in industrial development in the first two 5-year plan periods. During these plan periods, the main outputs will be on agricultural modernization to boost regional and state development through comparative advantage. Also, development of first level processing of primary goods and labor-intensive industry would add value to primary goods exports and foster competitiveness. The private sector-led industrial development will be encouraged with the promotion of value-added products.

Term	First 5-years	Second 5-year	Third 5-year	Fourth 5-year
Period	2011-2015	2016-2020	2021-2025	2026-30
Focal Point	● Focused upon reformation undertaken by government	● Finalization of various sectoral master plan	● Acceleration of long-term infrastructure development ● Decentralization of governance ● Promotion of export-oriented products	● Expansion of infrastructure ● Strengthened competitiveness of agriculture and industrial products ● Established economic corridors
Situation	●	● Experiencing significant changes in industrial development ● Institutional reformation of government	● Development of medium-technology industries	● Access to regional production network and global value chain
Goal	● Macroeconomic stabilization ● New legislation to support democratization	● Agricultural modernization ● Added value to primary goods export by labor-intensive industries ● Creating international hub	● Gradual shift to high-technology industrial development	● Adaptation of higher technologies for future sustainable development
Supporting Factor	● Supported by external partners	● Supported by external partners	● Supported by external partners	● Supported by external partners

Source: Study Team based on NCDP and Myanmar Industrial Master Plan (First Draft)

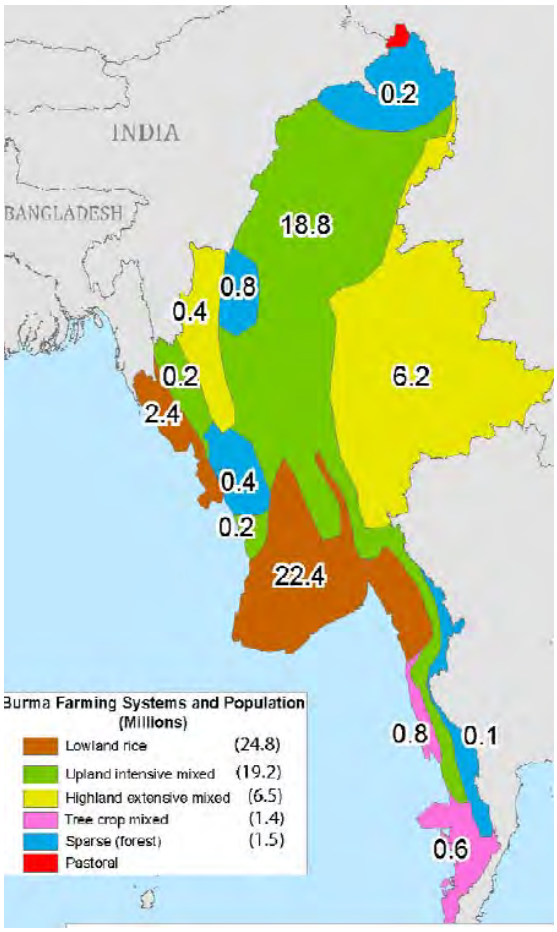
3.2.2 Agriculture Development Policies - 2014

As shown in **Figure-3.1.3,** the share of added value of agriculture sector in the entire GDP of Myanmar accounted for around 40% in 2010 but decreased to around 27% in 2015. The share of agriculture in the GDP of the country is the largest among ASEAN member countries. The sector also provides employment to about 53% of the labor force and is a source of livelihood for about 70 % of the population, which lives in rural areas.

Figure-3.2.1 shows the zone by type of farming and population of relevant agricultural zone. As seen in these figures, the rural population concentrates in lowland rice area (Ayeyarwaddy

Region) and upland intensive mixed zone (i.e. Bago, Magway, Mandalay, Sagaing, and Kachin).

Source: Strategic Agriculture Sector and Food Security Diagnostic for Myanmar, USAID, July 2013, Downloaded from FAO GeoNetwork



Source: Strategic Agriculture Sector and Food Security Diagnostic for Myanmar, USAID, July 2013

Figure-3.2.1 Agricultural Zone by Type of Farming

Agricultural Zone: Amid wide diversity, three broad agro-ecological zones dominate the agricultural landscape: the Delta, the Dry Zone and the hilly areas. In the south, the densely populated Delta Zone is home to roughly 22 million people who concentrate primarily on lowland rice production, particularly during the monsoon season. Moist monsoon winds off the Bay of Bengal bring seasonal rains to the coastal and Delta regions. In contrast, the middle part of Myanmar lies in the monsoon's rainfall shadow, creating a dry zone in which population clusters along the main river valleys. Farmers in the Dry Zone cultivate a range of rain-fed crops and where water availability permits, summer and monsoon rice. Roughly 19 million people live in the Dry Zone. The third largest agricultural zone lies in the hilly areas of the country, dominated by Shan State in the eastern part of Myanmar, which is home to another 6.5 million people. Farmers in this zone produce a wide range of rain-fed tree-crops and horticulture products along with rice, maize and pulses. Three different seasons enable farmers to cultivate crops at different times of the year, depending on where they farm. The main farming season occurs during the hot, rainy monsoon period, which runs from May to October across most of the country. The ensuing

dry months begin with a cool, dry winter season running from October to February, while a dry, hot summer season runs from February to April. The structure of crop, livestock and fish production varies considerably across Myanmar's three seasons as well as its three principal agro-ecological zones.

(1) Sectorial and Institutional Context

Good Potential for Agricultural Growth: Myanmar has good potential for agricultural growth with its abundant land and water resources. The country has relatively abundant agricultural land resources, which translate into the highest agricultural land area per agricultural worker in the East Asia (about 1.1 ha/worker, compared to 0.8 ha/worker in Thailand and Cambodia and less than half of this in Vietnam and Indonesia). The average farm size is about 2 ha, which is the largest in East Asia after Thailand (3.1 ha), and double that of prevailing in Vietnam's Mekong Delta region. Myanmar also has abundant water resources, which enables the development of irrigated agriculture. The average water availability of over 20,000 m^3 per capita is high compared to the Asian average of some 4,000 m^3 per capita. Although endowed with adequate water resources, the uneven spatial and temporal distribution of rainfall makes irrigation, drainage and flood management indispensable to enhance farm productivity. All rainfall is concentrated in the monsoon period (June-November). In the Dry Zone of the country the average annual rainfall is less than 800 mm, making irrigation essential for securing the wet season crop and for growing a dry season crop. Rice dominates agricultural production and farm income generation in Delta and Dry Zone. In 2010-2011, rice accounted for 70% of the total arable area of Myanmar, 30% of gross agricultural output, and 95 % of total cereal output of the country. The average paddy yield, estimated at 2.5 tonnes per hectare by the United States Department of Agriculture, is amongst the lowest in Asia. Paddy yields in Central Thailand and Vietnam with similar rice varietal mix average 3.8 tonnes and 5.6 tonnes per hectare, respectively.

Export Markets at Immediate Neighboring Countries: Myanmar is close to large markets in China and India and has a domestic food market, which is projected to grow in the coming years. The largest agricultural export category, beans and pulses, is directed almost entirely to India. The second largest agricultural export category is rice. About one half of rice exports go to African countries and another half to China, which in 2012, became the largest global importer of rice. Depending upon improvements in rice productivity and quality, Myanmar has ample opportunity to further increase exports to Africa, the Middle East, and the European Union. Income growth and improved infrastructure will also help to expand the domestic market for rice and many other commodities. Furthermore, farmers in the main production areas of the Dry Zone and Delta regions have relatively good access to markets and traders who can buy more of their products, should productivity be improved.

(2) Sector Issues

Prevailing Conditions: Looking forward, three alternative pathways for Myanmar's agricultural sector can be foreseen. Under a Business as Usual scenario, Myanmar's agriculture will continue along its current low-productivity, highly volatile trajectory. Strategic Options for Myanmar's Agricultural Sector agricultural productivity stems from five decades of underinvestment in the agricultural support institutions that drive farm productivity growth. Heavy volatility in agricultural production and prices emerges as a result of poor water control in the presence of increasingly irregular rainfall patterns, unpredictable policies, high transport costs, poor rural communications and a lack of diversification among export markets.

Table-3.2.1 Comparison of Indicators of Agricultural Productivity and Food Security

Country	Agricultural Income per Agricultural Worker (US$ per year)	Poverty (% under US$ 1.25/day)	Malnutrition (% children underweight)
Malaysia	6,680	<1	13
Philippines	1,119	18	21
Indonesia	730	18	20
Thailand	706	<1	7
Bangladesh	507	43	41
Cambodia	434	23	29
Vietnam	367	17	20
Myanmar	**194**	**26**	**32**

Source: Integrated Household Living Conditions (IHLCA) in 2011, World Bank Development Indicator in 2012, Millennium Development Goal Indicators (MDG) in 2012

(3) Farm Products

Rice: As growing water scarcity constrains production around the globe, and particularly in neighboring China and India, Myanmar's water resources will offer a significant agricultural competitive advantage. In addition, the country's diverse topography and eco-systems enable farmers to produce a wide range of cereals, pulses, horticulture, fruits, livestock and fish. Combined with its strategic location between two enormous regional markets, in India and China, and easy access to buoyant markets in the Gulf, Myanmar's farmers and agribusinesses find themselves well-positioned to contest both regional and global agricultural markets. Many pathways are possible. Thailand and Vietnam have claimed Myanmar's position as the world's leading rice exporters.

Pulse Products: Pulse production has grown more rapidly than any other agricultural commodity group since liberalization in 1988, at a compound annual rate of 9% per year. Early liberalization of pulse marketing, 15 years earlier than rice marketing, resulted in improved incentives to pulse growers and traders, who quickly emerged to contest export

markets in India. The rapid surge in pulse exports that occurred during the 1990's and early 2000's appears to have peaked in the late 2000s, as domestic production has bumped up against fluctuating demands in Indian markets, where 70% of Myanmar's pulse exports are sent, and competitive pressures from other major exporters from Africa and Australia.

Livestock Products: National accounts indicate that livestock and fisheries account for about 20% of total agricultural income in Myanmar, though these estimates may understate the economic and nutritional importance of these sectors. Within the livestock sector, recent estimates place the national chicken flock in excess of 170 million birds plus another 15 million ducks. Cattle holdings number about 14 million head with a roughly equal number small livestock such as pigs and goats. The Dry Zone is especially important for livestock production. About half of the country's cattle are raised in the Dry Zone, while 77% of the sheep and goats are found in this zone as well (JICA 2010).

Crops: Within the agricultural sector, crop production accounts for about 80% of total agricultural income. And within the crop sector, rice dominates land use. Annually, paddy accounts for roughly half of all planted area, with that share rising to about 60% during the monsoon season and falling to around 40% in the winter and summer seasons when pulses become equally important. Oilseeds, dominated by sesame, account for over one quarter of cropped area during the monsoon season. Most crop production takes place on relatively small plots. As a general rule, lower value crops such as paddy and pulses and oilseeds, are farmed on larger surfaces, while high-value horticulture and fruit crops take place on much smaller landholdings. Paddy farmers cultivate an average of 2.0 ha per holding, with pulses and oilseed crops closer to 4 acres. Onions, garlic and potato holdings average about 0.6 ha each, while vegetables and cut flowers are grown on holdings between 0.6 and 0.7 acres in size. These high value crops enable small landholders to earn high returns from small holdings.

Vegetable, Fruits and Other Cash Crops: Cash crops including fresh fruits, vegetables and flowers - provide earnings for about 15% of rural households in Myanmar. Income from horticulture products assumes most importance in the hilly zones of Shan State and other border zones, where roughly one-third of rural households earn some income from horticulture sales and one-sixth depend on horticulture crops as their primary source of income. In contrast, the Delta zone sees the lowest levels of horticulture production because of high incidence of fungal diseases and pests. In addition, a thriving green belt just outside Yangon provides vegetables for much of the city and in the process provides significant incomes and employment. National account estimates suggest that livestock and fisheries account for about 20% of total agricultural incomes in Myanmar, though these estimates may understate the economic and nutritional importance of these non-crop sectors. As with high value horticulture products, small stock and poultry attract considerable interest among landless and near landless households because of their high value and low land requirements.

Horticulture Products: Horticulture and poultry output have grown at 6% to 8% annually over the past two and a half decades, driven by growing urban demand and growing incomes. With the removal of international economic sanctions on Myanmar in 2012, accelerated urbanization and income growth stands likely to accelerate these growth rates in the future. Consequently, opportunities for peri-urban agriculture will become increasingly important as more industrialized zones are created.

Fishery Products: In the early 2000s, marine and inland fisheries and aquaculture provided seasonal employment for as many as 12-15 million people (FAO 2005). Fish and shrimp have now become major exports, and the fishing sector provides two-thirds of the animal proteins in the human diets, with per capita consumption of fish and fisheries products estimated at 23 kg/year around 2012. Ayeyarwaddy and Tanintharyi Regions are by far the largest fish producers.

Marketing of Products: Despite low levels of urbanization (about one-third of the national population), Myanmar's extremely high rate of rural landlessness results in a large majority of households being net purchasers of staple food. According to the Agricultural Census of 2003, 2.5 million holdings, or about 40% of rural households produced crops primarily for sale. The remaining 60% produced mainly for subsistence. In 2011, less than 10% of landless households sold any crops, while virtually all purchased food (LIFT 2012). Because landless rural households and urban households are net buyers of food staples, marketed shares are high for most crops. For many decades, the Government of Myanmar exercised tight control over these major food and agricultural markets, beginning in 1962. Heavy state controls on production and marketing have given way to gradual liberalization beginning in 1988. Liberalization of pulse production and marketing proceeded most quickly and fully, beginning in 1988, resulting in rapid increase in farmer incentives and hence rapid growth of pulse production and exports. Paddy market reform began 15 years later, in 2003, with the abandonment of compulsory government procurement of paddy and the cessation of ration channel distribution.

(4) Physical Infrastructure Development Aspect in General

Development Direction: By provision of irrigation facilities with agriculture extension services under well-institutionalized administration and management system, the agricultural productivity and profitability will increase resulting poverty reduction among participating farmers. The poverty is estimated to be between 26 and 37 % depending on the methodology used. Almost 76 % of all poor live in rural areas (World Bank). Agriculture has a strong record in reducing poverty worldwide, especially in agriculture-based economies such as Myanmar where agriculture accounts for 27% of GDP and 52% of total employment. According to the 2008 World Development Report, GDP growth originating in agriculture is at least twice as effective in reducing poverty as GDP growth originating outside agriculture.

Around 33% of all the poor in the country lives in the Dry Zone. A more productive agriculture will stimulate job creation through increased agro-processing and trading activities and earn foreign exchange through exports.

Water Resources: Myanmar's agricultural potential remains considerable given the country's resource endowments and favorable geographic location. Its considerable water resources center around the Ayeyarwaddy and related river systems which supply 24,000 m^3 per capita of renewable fresh water each year, over ten times the levels available in China and India and more than double the water resources of Vietnam, Thailand and Bangladesh (ADB 2012). Moreover, three of its four major river systems originate within the country, giving Myanmar exclusive control over these considerable water resources. Myanmar enjoys abundant water resources with significant coastal access, groundwater and four major rivers, which allow for irrigation and hydropower generation. Only about 10% of the total water resources available to the country are utilized, and 90% of that use is for irrigation. Though its water resources are among the largest in the region, availability varies temporally and spatially. Roughly 80% of fresh water flows during the May-October monsoon season with the remaining 20% available during the November-April dry season. Seasonal water scarcity is a particular challenge in areas such as the Dry Zone and Rakhine State in the west.

Climate Change: In the Dry Zone, the main natural climate risks for agriculture are droughts and to a lesser extent floods on a seasonal basis, as well as climate variability. Land degradation due to low access to and awareness about sustainable land management practices, improper irrigation management, and weak land tenure security adds to the natural hazards. Myanmar's vulnerability to climate change is linked to its characteristics as a low developed, conflict fragile, predominantly agrarian country with nearly 70% of the population living in rural areas. Weak adaptive capacity, poor infrastructure and limited institutions exacerbate the country's vulnerability to climate variability and change.

Irrigation: About 75% of irrigation areas in Myanmar are located in the Dry Zone. According to the MOAI data, there are about 250 dams and over 600,000 ha of irrigation schemes in the Dry Zone, or about 80 % of the country's total dam-related irrigation infrastructure, which could contribute to agricultural intensification. However, many of these schemes function below their potential because of the inappropriate operation of reservoirs, incomplete irrigation and drainage infrastructure, and a lack of responsive on-farm irrigation system management. Consequently, while about 2 million ha was equipped with irrigation and drainage infrastructure in 2011/12, a second irrigated crop is being grown on only 28% of this area. While the main canals are generally in good condition, the distributaries and lower level canals have more problems due to limited maintenance. Below the outlet of the water courses, where the management of water is the responsibility of the farmers, infrastructure is often missing. This results in uneven water distribution, ineffective water

use and water shortages at the tail-end of the canals during dry season but often inundation during the rainy season due to lack of drainage.

Drainage: Drainage has generally not been part of the development of the irrigation systems and lack of drainage is increasingly a significant problem in some schemes. Below the outlet of the water courses, where the management of water is the responsibility of the farmers, infrastructure is often missing. This results in uneven water distribution, ineffective water use and water shortages at the tail-end of the canals during dry season but often inundation during the rainy season due to lack of drainage.

Transport Infrastructure: Transportation and logistics cost are high in Myanmar as a result of many decades of underinvestment, heavy regulation and limited structures linking the water, road and rail transportation (Wong and Wai 2013). Currently, Myanmar ranks lowest in the ASEAN region in quality of logistics and transport-related infrastructure (ADB 2012). The country's main rivers offer potentially cheap internal transport. Yet the management of intermodal connections, linking water transport, rail, road and air are not well developed. As a result, investments in an integrated intermodal logistics system would help agribusiness to overcome high transportation costs so that Myanmar's agribusiness trading networks becomes increasingly more competitive (Min and Kudo 2012, Wong and Wai 2013). The recent ADB review has concluded that, "Investment in the sector during the last 20 years has focused largely on major highways and new railways, with much less attention on operations and maintenance and improvements in lower level networks. A key challenge now is to improve the lower level networks and link them to the major networks to increase access for regional towns, local communities, and rural areas through lower transport costs and wider service." These investments require urgent attention since they will strongly influence Myanmar's ability to maximize the potential benefits of increasing connections with the region via overlapping regional organizations such as ASEAN, GMS and the Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation (BIMSTEC), as well as bilaterally with trade partners.

3.2.3 National Spatial Development Framework (NSDF) - 2014

Basis of Long Term Plan: National Comprehensive Development Plan targeting at 2030 was prepared by the Ministry of National Planning and Economic Development (MNPED) with the consultation of United Nations Development Program (UNDP).

Development Policy: The Government has laid down four economic policy objectives – (i) sustaining agriculture development towards industrialization and all-round development, (ii) balanced and proportionate development among regions and states, (iii) inclusive growth for the entire population and (iv) quality of statistics and statistical systems. Based on policy and framework, the first 5-year spatial development plan (2011-16) targeted towards 'People

Centered Development' was formulated in line with long-term National Comprehensive Development Plan (2011-31). The vision of Myanmar is to become a modern, democratic and developed nation that meets the aspirations of its people through People Centered Development. The Myanmar National Spatial Development Plan will support and materialize the National Comprehensive Development Plan.

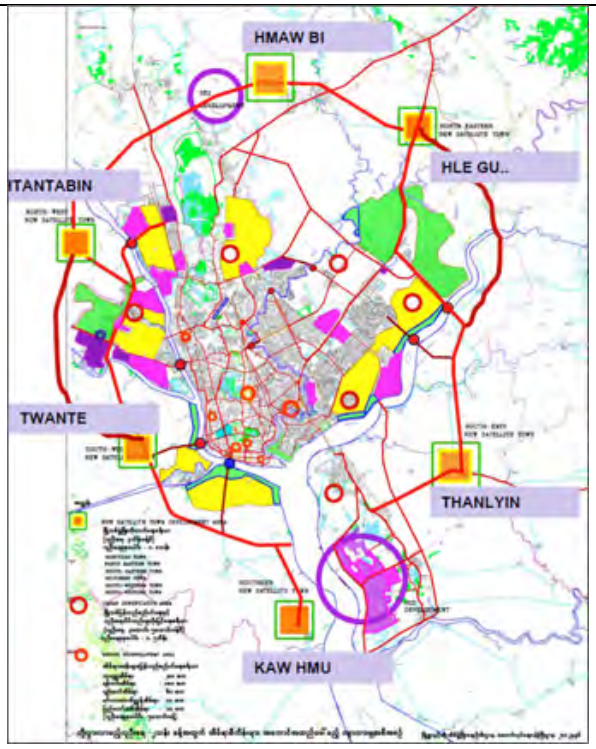
Special Economic Zones: The open-door policy drastically changed the business environment for the private sector. It creates more job opportunities, better systems for public utilities, education and healthcare and uplifts the living standard in urban areas. Myanmar is developing special economic zones in three areas – Dawei, Thilawa and Kyaukphyu – for international investors and multinational companies as developers and partners. In the long run, Myanmar is embarking on two poles – Yangon and Mandalay – with growth centers in most regional capitals.

Growth Areas and Economic Corridor: Growth areas and economic corridor are attracting attention as the traction power to develop national economy, and Ministry of National Planning and Economic Development (MNPED) expresses intention to place special economic zones （SEZ）with focus on the growth areas. Ministry of Construction (MOC) has the idea of designating eight candidate growth areas as shown in **Figure-3.2.2**. Dawei, Thilawa (Yangon), and Kyaukpyu - the first, second and third coastal growth areas from the south - are the only SEZs so far to be designated based on the Myanmar Special Economic Zone Law legislated in January 2011. The three SEZs are expected to be the core areas to attract foreign investment hereafter.

Urban Development: Urban land use will be integrated in the National Comprehensive Land Use Plan to systematically allocate reserved land for future urban development. As for the development of Yangon, the spatial development plan was prepared by the Yangon City Development Committee (YCDC) with the assistance of the Ministry of Construction as illustrated in **Figure-3.2.3.** An integrated urban network system will be developed through surveys and analysis of the socioeconomic potential of individual urban centers. Resilience of the urban centers and the urban network system will be built up. And spatial development planning policies and guidelines will be drawn up for national, regional and state levels.

Source: DHSHD

Figure-3.2.2 Location Plan of Growth Areas and Economic Corridors



Source: Ministry of Construction

Figure-3.2.3 Proposed Housing Development Plan 2040 for Greater Yangon

3.2.4 Myanmar Industrial Development Visions (MIDV) - 2015

MIDV is a proposal of future vision form industrial development of Myanmar and policies that should be implemented to realize the vision. The MIDV was mapped in July 2015, with the coordination of the Ministry of Economy, Trade and Industry of Japan (METI) and among other ministries. The MIDV diagnoses that Myanmar is reaching a stage where it needs a comprehensive policy to achieve nationwide balanced development and an approach to select development projects among the multiple choices available.

The objectives of MIDV are as follows:

(1) To elaborate projection of Myanmar's staged industrial development that simultaneously achieves geographically balanced development, "Urban-Rural Synergy", and sustainable economic growth. It puts emphasis on the virtuous cycle that will equally benefit urban and rural areas.; and
(2) To clarify priority industrial policies to be implemented for the next coming five years to realize the future projection.

Furthermore, the vision stresses the importance of increasing international competitiveness of the domestic industry and establishing a stable macroeconomic base.

Currently, the structural challenge facing Myanmar is that 60% of the entire working population

is clustered in the rural areas working in primary industries – agriculture, forestry and fishery – generating almost 30% of the entire GDP. This demonstrates the weakness of industrial sector in Myanmar. Concerning the rest of the population, approximately only about 40% are in the urban areas and generate almost the double amount than the rural areas, or 70% of the entire GDP. Hence the MIDV recommends Myanmar to shift its direction toward balanced urban and rural area development by adopting different strategies. By development of foreign capital-led labor-intensive industries in urban areas and products from high-value added industries (textiles) in rural areas will explore Myanmar's comparative advantage and will create a virtuous cycle. Moreover, through modernizing and mechanization, the productivity and efficiency of agriculture will significantly improve, and the laborers can be transferred to labor-intensive manufacturing industries in the urban areas. The MIDV stresses that the market should explore the comparative advantages (high quality and low-cost laborers). In details, both labor-intensive industries in urban areas and primary commodity industries in the rural areas will have comparative advantages.

The MIDV highlights that cluster formation of manufacturing industry in the urban areas is important in order to achieve well-balanced sustainable national development. Development of cluster of manufacturing will provide stable employment opportunities and production of value-added high-quality export products will earn foreign exchange as well. The centralized manufacturing industries in the urban areas are currently in the two polar of Yangon and Mandalay. The following list of manufacturing industries is expected to be clustered for the next five years during the short-term period.

- Construction material
- Food processing
- Chemicals
- Plastics processing
- Textile products
- Other industries (e.g. labor-intensive assembly, etc.)

Specific manufacturing industries expected in mid-term and long-term under improved business environment are as follows:

- Transportation machinery (e.g. motorbikes, vehicles, etc.)
- Electric/electronics
- Other machinery
- Iron and steel
- Non-ferrous manufacturing
- Petroleum refining and petrochemicals

Beside the cluster formation of manufacturing industries, the future of agriculture, forestry, fishery and other industries in the rural areas are important in order to accomplish well-balanced sustainable economic development. Agriculture, forestry and fishery industries account for about 30% of GDP and there is a huge potential for improvement. These industries have abundant export power yet to be explored, because Myanmar borders with huge potential markets like China, India and Thailand. The three abovementioned industries play important roles in providing employment and conserving the national land as well. There is a big room for increasing productivity by introducing modern technology and know-hows of mechanization. The improvement of quality control system is important as well. The improvement of logistics infrastructure will enhance regional development. Finally, high value-added products, value chain and exploiting local unique industries will help accelerating the balance regional development in Myanmar.

In addition to these industries, the promotion and at the same time the preservation of traditional handicraft industry of Myanmar is important such as textile fabrics, wood curving, lacquer products, bamboo craft, etc. Since these traditional craft industries fall under the category of cottage industries having long history especially in rural area, the income generated from production and selling these craft products forms important part of additional income of rural population. The international tourists visiting famous and valuable culture tourism destinations are considered as the market of such products and such international tourists would expand the market for Myanmar's traditional handicrafts. If a proper marketing of such kind of products toward the international market meeting with their demand will be conducted, then the exports of Myanmar handicrafts especially to the industrialized countries in a big volume can be foreseen in the future as experienced by Vietnam.

3.2.5 Industrial Policy Paper - 2016

The industrial policy paper was formulated by the Ministry of Industry in August 2015. The paper emphasizes Myanmar's vision, missions and plans for industrial development.

Vision of the State	***"To establish a new peaceful and modern developed democratic nation"***
Vision of Industrial Paper	***"to establish a new modern industrial nation,"***
Strategic Goal	Develop industrial sector to be the core of economic development by transform Myanmar's industrial structure from agricultural country to an industrial country.
Six cross-sectoral policies	
	1. Human resources 2. Development of technology and innovation 3. Financing 4. Development of infrastructure 5. Market expansion 6. Tax and procedure relief

The Ministry of Industry emphasizes the importance of developing six cross-sectoral policies in order to achieve industrial development. Cross-sectoral policies are considered as the key foundation for the successful implementation of industrial policies. Modernization of machinery and technology combined with development of human resources will improve the employment and increase the income levels. Moreover, efficient use of resources will help the establishment of stabilized industries on a long-term basis. The cross-sectoral policies will support following ten priority industries for the short term.

(1) Textile and garment industry
(2) Food processing and packaging industry
(3) Plastic processing industry
(4) Labor-intensive CMP industry
(5) Machinery, tools and parts industry
(6) Chemical industry
(7) Tire and rubber industry
(8) Pulp, paper and paper products industry
(9) Pharmaceutical industry

On top of the selected priority industries, the paper also points out the importance of balanced regional development in Myanmar. The Government will consider different options when deciding the allocation of industries (manufacturing, services and other industries). It will be based on the geographical location, population and infrastructure. The accessibility to the market and transportation will be considered when new industries are to be located. The two main economic axes and central points of the states are Yangon and Mandalay. The Government wants to improve the participation into the industrial sector in the urban areas. In the rural areas, mechanization and adoption of new modern technologies to transform the outdated agricultural industries and for production of value-added product will be promoted in order to reduce poverty and improve the GRDP of the rural areas

Moreover, the importance of maintaining and increasing the flow of foreign investment into Myanmar and fulfillment of basic requirements of FDI in order to attract the entry of foreign investment are highlighted. The Government has prioritized creation of an attractive environment for foreign investment so that Myanmar can emerge amongst other ASEAN countries. Exemption of tax, and revision on existing foreign investment laws are also to be considered. Moreover, the Government plans to establish large industries and advance industries to attract more and more domestic and foreign investment on the long-term basis.

Myanmar aims at to play a bigger role in ASEAN and the region itself. Moreover, it is important that industrial products meeting with both international and ASEAN standards to have competitiveness in the global market. Myanmar, as a member of ASEAN, also aims to carry out reforms towards the ASEAN Vision 2020 to develop proportionally, reduce poverty and narrow

the gap of socio-economic level in the region. It highlights that Myanmar will cooperate and participate in both local market and ASEAN market actively in accordance with the ASEAN Trade Agreements. The Government aims to improve the industrial sector by economic reforms and enable the national industries to have access with global product networks so as to enter into the Global Supply Chain.

Establishment and upgrading the existing industries in the Industrial Zones (IZ) and the Special Economic Zones (SEZ) are important for Myanmar's industrial development. Industrial Zones have been developed since 1995 and more industrial zones are scheduled to be established. There are ongoing development plans of SEZ in different areas of Myanmar such as Dawei, Thilawa and Kyaukpyu. Establishment of IZ near the borders with neighboring countries will provide better economic corridor. The paper points out that this will also create more employment opportunities and enhance regional development at the same time boosting the industrial development.

3.2.6 The National Export Strategy (NES) - 2016

NES is an official document drafted in March 2015. The NES has been published to guide Myanmar's exports. The NES is a result of cooperation form the leadership of Ministry of Commerce with the technical assistance of the International Trade Center (ITC), the financial support from Germany's Federal Ministry for Economic Cooperation and Development (BMZ) and the German Agency for International Cooperation (GIZ).

Over the last decade, Myanmar has recorded rapid economic reform and strong export growth. Especially, since 2011, Myanmar has undergone market-oriented economic reform and it is emerging as an important trade and investment destination in Southeast Asia. Now more than ever, trade will become the engine for Myanmar's development. As a result, the NES has been prepared to increase the competitiveness of enterprises, improve the business environment for development and expand the country's trade while contributing to poverty reduction. The key objective of the NES is to increase and diversify Myanmar's exports while reducing dependence and vulnerability to a single market.

It highlights the importance of export development in order to accelerate economic activity and industrialization. The NES is composed of 12 separate documents; including seven priority sector analysis and 4 cross-sector functional strategies. The seven priority sectors for the NES have been selected based on (1) the current and potential trade performances and the capacity to contribute to export growth, (2) domestic supply conditions captured by production capacity, (3) socio-economic impact and current employment rate, and (4) other qualitative criteria determined by the NES team. The vision and strategies presented in the NES can be summarized as follow:

Vision	***"Sustainable export-led growth and prosperity for emerging Myanmar"***
Seven Priority Sector	
Rice	1. Once one of the top exporters of rice in the world, Myanmar's rice export now accounts for only 1.8% of the national exports in 2011. 2. The underexploited sector has a high potential for socio-economic impact, food security and significant growth potential. 3. The performance remains poor due to the lack of irrigation for most paddy fields. 4. The global market for rice seems promising for Myanmar: key success element will be the improvement of seed quality, purity to ensure the varieties produced and meeting market requirement. 5. Policy of the Government to work towards rural development and improvement in the quality of life will also result promotion of rice production.
Beans, pulses and oilseeds	1. One of the largest cultivators of beans and pulses in the world and produces over 20 varieties of pulses and beans. One of the largest producers of oilseeds. 2. Beans and pulses accounted for 9.6% of Myanmar's total exports in 2012. 3. Other essential crops for the edible oil sector include soya beans and palm oil. 4. Now production relies upon traditional equipment, manpower, techniques and machinery.
Fisheries	1. The seafood sector has a large potential to contribute to food security, employment and economic development. 2. An important source of income for domestic population. 3. Myanmar has abundant inland water resources and substantial fisheries in the major rivers.
Textiles and garments	1. The apparel industry of making yarn, fabrics and garment emerged in the 1990s and ranked as the highest export item in 2000. However, the industry declined over the following largely due to sanctions imposed by the USA. 2. Textile and garments industry still remains as the main manufacturing industry. 3. The industry can encourage employment of women and is generally a major driver of employment. 4. Comparative advantage of abundant and low-cost labor presents an opportunity to expand labor-intensive and export-oriented production.
Forestry product	1. The forestry sector accounts for around 1.0% of entire GDP. However, there are around 100 wood-based industries in Myanmar. 2. Myanmar is the world's leading exporters of tropical hardwood log and non-coniferous logs. 3. With big potential but currently Myanmar's forestry products in the international market does not comply with the international standards and certification requirements.
Rubber	1. Currently, the sector's contribution to the entire GDP is very low but development of the sector could have a high socio-economic impact and become a driver of employment, revenue and strengthen the balance of payment with strong export. 2. Myanmar is a small player in the rubber market ranking 13th in the world export.
Tourism	1. Myanmar offers vast forest reserves, beaches and rich cultural heritage including UNESCO World Heritage sites that present a huge potential for tourism, however, the potential remains unexploited. 2. Tourism is considered as a key export sector for Myanmar in the service industry. 3. Tourism master plan was launched in 2013 with a view to increasing tourism competitiveness and conserving the environmentally sensitive areas. 4. The development of tourism has a high socio-economic impact since it can be a drive for employment, 5. Tourism offers great potential for Myanmar and can generate vast investment.
Cross-sectoral Functional Strategies for Strengthen Business Environment	
	1. Trade facilitation and logistics 2. Quality management 3. Access to finance 4. Trade information and promotion

3.2.7 New Economic Policy - 2016

In July 2016 the Government of Myanmar presented the 12-point national economic policy (NEP) highlighting the importance of developing a market-oriented system in all sectors to establish an economic framework to support the national reconciliation. The policy puts national reconciliation as the top priority, based on a policy that states "just balancing of sustainable resource mobilization and allocation across states and regions". The new government expressed commitment to financial sector reform in order to sustainably provide capital to people, attract foreign direct investment and to create a stable international business environment. This translates into possibility of greater regional cooperation and bigger economic growth potential.

Furthermore, the Government prioritizes the development of effective basic infrastructure, including transportation, access to electricity and information. Through modernization and development of the agriculture and livestock sector, the Government aims to promote inclusive growth, enhanced food security and better living standards.

Myanmar expects bolstering of the industrial / service sectors and increased exports by supporting value-added crops and livestock breeding. The Government aims to reform SOEs and support SMEs to improve the ease of doing business in Myanmar. Supporting competition to create a vibrant private sector is emphasized as well. Additionally, the Government highlights that it will focus on job creation to reduce domestic poverty and inequality. Finally, the Government promises to promote inclusive economic growth and development. The 12-point policy by order of priority can be summarized as shown in **Table-3.2.2**.

Table-3.2.2 12 Points of National Economic Policy of 2016

	National Economic Policy
NEP-1	Government will ensure the transparency of natural resources extraction and extract resources in sustainable manner as per Extractive Industries Transparency Initiative.
NEP-2	Government will support competition and a vibrant private sector to practice a market-oriented system in every sector.
NEP-3	Strengthen public financial management and attain macroeconomic stability by making public spending more efficient and improve budget transparency. Government will tackle smuggling or fully account for Myanmar's foreign exchange earnings and streamlining the tax system to boost public revenue.
NEP-4	Develop infrastructure that focus on producing and distributing power, building and maintaining rural roads and developing better port facilities.
NEP-5	Government will support the agricultural and livestock sectors to promote inclusive growth, enhance food security, increase export thereby boost living standards of farmers.
NEP-6	Government will focus on job creation to reduce domestic poverty and inequality and encourage migrant workers and the displaced to return from overseas. Most of jobs being created in special economic zones and by infrastructure development projects, particularly in rural areas.
NEP-7	Government welcomes the foreign direct investment and prepares a stable environment where companies feel secure to invest and improve the regulations meeting with requirement of FDI.

	National Economic Policy
NEP-8	Government will address human capital and commit to developing a skilled workforce to fill jobs created in the manufacturing and service sectors.
NEP-9	Government will create a stable financial system that cay substantially provide capital to businesses, farmers and households.
NEP-10	Government will reform the state-owned enterprises, making them more accountable and responsive to the public and privatizing them where necessary.
NEP-11	Government will help small and medium enterprises (SME) by improving the ease of doing business in Myanmar, increasing access to financial services and developing more skilled workforce[1].
NEP-12	Government will promote inclusive economic growth and development to enable the country to escape from poverty and deserved to achieve the prosperity of the people.

3.2.8 Myanmar Industrial Master Plan (DRAFT) -2017

The Myanmar Industrial Master Plan composes the following set of policies and these policies are outlined in this sub-chapter.

A. Cross-sector Industrial Policy	B. Development Strategy and Policy for the Short-Term Priority Industries
01. Human Resource Development	01. Textile & Garment Industry
02. Development of Technology & Innovations	02. Food Processing & Packaging Industry
03. Financing Policy	03. Plastic Processing Industry
04. Development of Infrastructure	04. Construction Materials Industry
05. Market Expansion	05. Labor-intensive CMP Industry
06. Tax & Procedure Relief	06. Machinery, Tools & Parts Industry
07. Foreign Direct Investment Policy	07. Chemical Industry
08. Privatization & Restructuring Policy	
09. Human Resource Development	

Source: Myanmar Industrial Master Plan (DRAFT), Ministry of Industry (2017)

(1) Overview of Myanmar's Industrial Development

Myanmar finally opened its door to international market only in 2011, when a new civilian-government came into power. Since then, Myanmar has reengaged itself back to market economy. Ever since the economic liberalization, Myanmar has recorded skyrocketing growth annually. The domestic GDP grew by 5-8% per annum over the last five years. Since 2011, the Government introduced a series of economic reforms and policies to promote industrial development. The reforms show the Government's effort to accelerate economic development and a strong commitment towards a democratic market-oriented economy.

Reform: Reforms have promoted export and FDI-led development strategies while trying to create a positive business environment for investors, through the development of SEZ and the enforcement of new business laws. The Government implemented new investment laws to increase investment flow domestically and internationally. The Myanmar Special Economic Zone Law was promulgated in 2011 to attract more foreign investment. The new SEZ law is a clear shift to attract foreign investment and make a favorable environment for foreign

[1] Myanmar was ranked 167th out of 189 countries in the World Bank's ease of doing business ranking last year.

investors. There was a clear shift and change in domestic investment and FDI after the reform. Before the implantation of the reform, FDI was mostly concentrated in energy and power (oil and gas, mining and hydroelectric power sectors). During the period from 2013 to 2014, all types of investments to Myanmar drastically shifted to manufacturing sector and among other top-ranked sectors were transport, communications, hotels and tourism.

Promotion of FDI: The FDI has both direct and indirect effects on economic growth through exports and economic growth. The FDI inflow can play a vital role in host countries due to the fact that it increases the supply of funds for domestic investments. Furthermore, FDI inflow can not only increase the export capacity of the host country but also encourage the creation of new jobs. For rapid expansion of exports, trade liberalization policies trigger FDI inflow, which results in (a) augmenting domestic capital for exports, (b) helping transfer of technology and new products for exports, (c) facilitating access to new and large foreign markets, and (d) providing training for the local workforce and upgrading technical and management skills. Therefore, the FDI flow in Myanmar could be also an indicative parameter for determining the potential priority industry.

Lift of Sanctions: Another factor that supported Myanmar's rapid industrial development was the lifting of sanctions from the West. With the lifting of sanctions, Myanmar's economy faces an opportunity to quickly integrate with the regional and global networks. Additionally, the Asian Development Bank resumed loans to Myanmar for the first time in 30 years to boost social and economic development. As a result of increasing ODA, Myanmar emerged as one of the top recipient countries in the world. (Source: KIEP 2015, World Economic Today, Vol.15 No.35, pg.2)

Expansion of Trade: Myanmar's total exports are very limited to and concentrated on a few products such as natural gas, agricultural products like beans and wood products. This is mostly due to the fact that the exports have little value-addition and weak embodiment of technology. Myanmar's trade is largely concentrated in the ASEAN region but it not globalized yet. Most of Myanmar's exports are concentrated to its neighboring countries; China, India and especially Thailand. Over 40% of the exports are solely focused to Thailand. This shows that Myanmar remains very vulnerable to shifts in the Thai market conditions.

In short, the recent economic growth of Myanmar and the Government efforts for its economic reforms are impressive. However, Myanmar is still an agro-based economy and in the early stages of industrialization confronting with many challenges to overcome to accelerate industrial development. By successfully addressing these challenges in front of them, Myanmar has the potential to transform to a more efficiently industrialized economy.

(2) Development of Infrastructure

Status of Development of Industrial Zones in Myanmar: The current industrial structure of Myanmar –based on 19 active industrial zones –has been shaped in the 1990s: The majority of the industrial zones have been established under the State Law and Order Restoration Council (SLORC) in 1995 and 1996. (UNIDO, MOI 2013) Along with the re-introduction of border trade in Myanmar, the establishment of industrial zones was part of a comprehensive reform 77 agenda after the end of the era of Socialist Burma with the main policy objective of re-opening the country to foreign investment and trade. Industrial zones in Yangon Region (particularly Mingaladon Industrial Park operated as a joint venture of Ministry of Construction and with a private developer), Mandalay, Bago, Hpa An and Nay Pyi Taw appear to be the most promising industrial zones with high potential and a dedicated location along major traditional trade routes.

The establishment of the Special Economic Zones in Thilawa (Yangon Region), Dawei (Tanintharyi Region) and Kyaukphu (Rakhine State), which aim at providing industrial infrastructure at international standard along with investment incentives, show the recognition of the need and efforts of the Government of Myanmar to create a business-enabling environment in order to attract investment.

(3) Key issues in the provision of infrastructure and logistics services for industrial growth in Myanmar

1) Issues of Overall Policy Coordination

Despite fragmented control of different ministries and stakeholders over certain aspects of infrastructure development, no effective coordination mechanism has been in place, which ensures the efficient provision of required infrastructure and the integration of industrial companies into logistics networks.

The development of a competitive industrial sector in Myanmar requires stronger cooperation between different ministries to provide the entire required infrastructure for the establishment and operation of industrial companies. Difficulties in coordination, however, exist not only on a policy level, but equally on the level of industrial zones that are not provided with the best possible connection to infrastructural networks or stable electricity. An overall platform for the alignment of the work of different ministries to coordinate or jointly discuss the infrastructural requirements in the industrial field and the respective responsibilities of the different ministries does not exist. Current policies do therefore not systematically address the need for diversification of modes of transport and intermodal connections.

2) Issues Related to Industrial Zones

Based on government policy, industrial companies are predominantly located in industrial zones in Myanmar that face numerous difficulties in accommodating industrial companies appropriately.

Industrial zones in Myanmar are largely underdeveloped and fail in providing a business-enabling environment for industrial companies due to various factors: Industrial zone locations have often not been determined in the quest for an ideal location in infrastructural terms; potentials for a multimodal access to the zones have largely remained unexplored.

3) Issues Related to the Road Network

The quality of a majority of the highways is inferior, certain roads are seasonally impassable and logistics costs are exceptionally high due to frequent toll gates operated along major roads by different actors.

Road Safety: The road infrastructure requires significant investment and upgrades in order to be capable of becoming one of the backbones of an industrialized Myanmar in the short run. Features of numerous roads (e.g. Mawlamyine -Ye, Taunggyi -Kyaing Tong, Magway –Sittwe) do not reflect basic requirements for the safe coexistence of the multiple different road users such as for instance trucks, buses, motorcycles and slow agricultural vehicles. Currently missing road shoulders may well absorb the traffic of slower road users and may significantly accelerate traffic overall, while enhancing safety. Flooding and landslides during the rainy season regularly interrupt major roads (e.g. Hakha –Kalaymyo) and prevent the flow of cargo for weeks. Even the Yangon –Mandalay Expressway as one of most sophisticated roads is not permitted to be used by trucks due to mostly road safety concerns given the width of the two comparatively narrow lanes per direction.

PPP or BOT: Practiced systems of PPP of Ministry of Construction with private companies under so called “BOT” agreements for the construction (or often only maintenance) of road infrastructure are ineffective in providing road infrastructure at minimum costs and high quality. With the objective of overcoming budgetary limitations for the construction of roads, the concept of BOT as a means to engaging the private sector in road construction has been introduced. As confirmed by major companies involved in the operation of BOT road sections, no transparent tender processes are conducted by the Ministry of Construction before awarding the operation of a certain road to a company.

4) Issues Related to the Railway Network

Despite promising initiatives and potentials, the possible role of the railway system of Myanmar for facilitating industrial growth in the country is not sufficiently explored and in

focus. Feasibility studies for transnational railway linkages have been conducted, but none of the respective transnational connectivity projects have so far commenced.

Myanmar possesses a considerable railway network of 3,795 route miles and 960 railway stations (as of May 31, 2015) accessing all states and regions of the country apart from mountainous Chin State (MR 2015). Due to the allocation of investments into the countrywide expansion of the rail network rather than the maintenance of the core network, the quality of the rails has significantly deteriorated over time. Consequently, the average speed of a passenger train between Mandalay and Lashio (313 km) is less than 20 km/h. A technical study of the railway network in Myanmar by UNESCAP also suggests for this route an entire reconstruction (in partially improved alignment) to use the route for commercially viable freight services in the future. The situation along this route may be considered characteristic for the entire railway network of Myanmar, which needs to be fundamentally modernized as a significant investment into Myanmar's industrial future.

5) Issues Related to Inland Waterways

The possible role of domestic waterways as part of the national logistics infrastructure for industrial growth remains largely unexplored despite potentials to bridge important gaps.

Inland Water Transport (IWT), as a state-owned transport enterprise under Ministry of Transport and Communications (MOTC), is the largest provider of domestic transportation services for passengers and freight in Myanmar. The currently most frequented transportation routes along the 5,000 km of navigable waterways are along the Ayeyarwaddy and Chindwin river systems as well as within the Ayeyarwaddy Delta, while the Kaladan Multi-Modal Transit Transport project in Rakhine and Chin State is likely to significantly increase the importance of the Kaladan River. Along these rivers, however, no river port infrastructure worth mentioning for the industrial sector has been developed, as vessels and passenger ships mostly solely stop at landing beaches. The domestic waterways (particularly Ayeyarwaddy River and Chindwin River) may represent important routes for industry produce as well as raw materials providing distinct location advantages to underdeveloped industrial areas, if regular cargo service along the river systems with a modern and appropriate fleet is established (with ships also to be operated in shallow water), a considerably more significant budget allocation to dredging guarantees all-year passable routes and inland ports with easy to use facilities may make cargo flow along the domestic waterways more attractive.

6) Issues regarding Maritime Port Development

The current focus on only one port location with significance in international trade needs to be shifted to a system of multiple ports closely integrated into domestic logistics networks.

The largest share of international trade of Myanmar (around 90%, 12 million tonnes of import and export in 2011) is handled in Yangon. This concentration understandably overwhelms the port capacity as well as the urban transport system of Yangon as an increasingly congested and polluted city, while there is barely any positive due to the concentration of trade in Yangon. Congestion at the harbor and (despite improvements) still long clearance processes are also due to the lack of bonded warehouses as well as due to the high share of general cargo. Given the shallow draft of only around seven meters, the port of Yangon only accommodates vessels of up to a maximum 12,000 deadweight tonnes. Yangon Port is handling container shipments and general cargo.

7) Issues Related to the Aviation Sector

The aviation sector of Myanmar is largely unused for industrial purposes. Only Yangon International Airport possesses cargo handling facilities.

Despite a network of 30 regularly frequented domestic airports, only Yangon International Airport is handling cargo (13,095 tonnes in 2015). Mandalay International Airport will – after a planned extension –also start airfreight operation. As the production volume of high-value products is low at present, the expansion of air cargo handling capacity may be seen in the medium term.

8) Issues Related to Logistics and International Trade

Various factors in domestic transportation network still hamper its effectiveness and efficiency in enabling the growth of Myanmar's industrial sector.

Considerable bottlenecks in industrial supply chains are not necessarily caused by underdeveloped infrastructure itself, but by poor management of the infrastructural systems without a sufficient consideration of efficiency in terms of transport logistics:

(i) Lacking research, data collection and insufficient availability of vocational or academic training in supply chain management and logistics in Myanmar represents a bottleneck for the future development of efficient supply chains in Myanmar. Research has not been undertaken to measure domestic transportation costs along different routes and modes of transport, to determine issues, quick wins as well as needs for longer term rehabilitation or infrastructure construction projects based on a transport logistics perspective.

(ii) Multimodal and intermodal transportation represents a largely unexplored concept within Myanmar, as the predominant mode of transportation is solely by road. Based on projects driven by the Government of India along the Kaladan River as well as through UNESCAP related to the establishment of dry port lead to a first exposure of Myanmar to these systems, although they are systematically to be explored on a

countrywide scale.

(iii) The opening of further border trade points and transparent procedures regarding the export and import of goods as well as immigration rules for the entry and exit of foreign nationals across the national borders are to be developed (e.g. two border crossing points in Muse, Kayah State; Three Pagoda Pass, Karen State; Mongla, Special Administrative Region in Shan State; recently opened Lao-Myanmar Friendship Bridge).

(iv) Myanmar's dedicated location between India, China and ASEAN is unequivocally interpreted as an opportunity for economic development in publications. Positive and negative effects of prospective transit trade onto the economy and communities adjacent to major transport corridors are to be studied and proactive mitigation measures for future issues to be put in place. The customs department confirmed that no particular countrywide legal and regulatory framework to address the issue of transition trade has been put in place. It is likely that transit trade will predominantly occur along the following corridors:

Rakhine / Chin State: (India –) Sittwe –Ponnagyun –Paletwa (–India)
sea –domestic waterways –road

Rakhine State / Yangon –China: Kyaukphu SEZ / Yangon –Mandalay –Muse (–China)
sea –rail / road / pipeline

Tanintharyi Region –Thailand: Dawei SEZ –Thailand
sea –rail / road

- Warehouses are rare in general, while the establishment of bonded warehouses has only been begun recently. The insufficient availability of cold storages and trucks with a cooling system is limiting Myanmar's opportunities in agriculture and in food processing industries with perishable outputs.

(4) Policy focus on infrastructural development stipulated in Myanmar's development plans

The Industrial Policy formulated by the Ministry of Industry values the pivotal importance of the infrastructure for industrial development. Namely, the relevance of supplying industrial zones sufficiently with electric power, gas, water, communication infrastructure and a road grid is mentioned along with location advantages of industrial zones in proximity to roads, ports and airports are mentioned.

The NCDP mostly puts into focus the concept for development along economic corridor axes in Myanmar, which align with the transnational highway network of the Greater Mekong Sub-region (GMS). This approach is mainly driven by the motivation to promote cross-border trade and the participation of the GMS countries in regional production networks. Otherwise,

the NCDP follows the JICA-supported Myanmar Transport Master Plan: Particularly the development objective of an enhancement of the connectivity to Myanmar's border areas is mentioned. The establishment of cross-border economic zones is outlined as a concept to stimulating socio-economic development in the borderland periphery.

The MIDV equally emphasizes the role of infrastructural improvements and the need for an enhancement of connectivity in order to promote industrial growth. In line with the Transport Sector Master Plan, emphasis is placed on the industrial and urban poles of growth of Yangon and Mandalay. In accordance with the JICA National Electricity Master Plan proposes an increase in power-generating capacity up to 14,542 MW until 2030 along with investments into the transmission system.

(5) Policy Recommendations for Development of Infrastructure

Infrastructural requirements of industrial companies do not only comprise a consideration of the roads, railways, waterways and transmission lines connecting an industrial estate with external infrastructural networks. Instead, desirable infrastructural planning has equally to comprise the successful integration of proposed industrial parks into social and environmental systems in a sustainable way.

The key factor is to transform Myanmar's existing industrial companies so that they can operate at a certain location in a better and profitable way, become drivers of nationwide industrialization through the attraction of local and foreign industrial investment, and be enablers of the integration of Myanmar into regional production networks and infrastructural networks (e.g. of the Greater Mekong Sub-region). Amongst other factors, the success of industrial companies is dependent on their access…

- to productive inputs (i.e. particularly raw materials from factor markets, human resources, land)
- to local, national or international product markets,
- to efficient supply chains,
- to essential conditions for production (e.g. electricity, water access) and
- to desirable conditions through an industry-enabling environment (e.g. industrial parks offering business support services, a green and healthy environment with recreational facilities).

The policy directions for development of infrastructure to accelerate the industrialization can be summarized in **Table-3.2.3.**

Table-3.2.3 Development of Infrastructure for Industrial Sector

DEVELOPMENT OF INFRASTRUCTURE FOR INDUSTRIAL SECTOR
DIRECTION 1 **Building Excellent Networks in the Infrastructural Sub-Sectors for an Economically Diverse Myanmar with a Strong Industrial Sector**
Policy 1.1 (Power Infrastructure): Expand Myanmar's power infrastructure in terms of generation and transmission to enable and power up industrial growth Amongst the different infrastructural sub-sectors, the insufficient power infrastructure of Myanmar represents one of the greatest current obstacles and threats to progress in industrial development. To accomplish the establishment of a diversified industrial sector in Myanmar translating the agricultural, natural and human resources, production potentials as well as location advantages into value added production and shared prosperity, aim of the Government has to be to guarantee uninterrupted power supply to any industrial facility in the country at any given time (with power backup through two independent sources of power). The planning of generation capacity as well as the transmission systems needs to be based on the prospective power requirements of industry.
Policy 1.2 (Roads): Unfolding short-term potentials of Myanmar's road infrastructure through "quick wins" and new technology The road network has – amongst all modes of inland transportation – to date by far the greatest importance. In order to provide road infrastructure, most major highways are operated under the so called "BOT" contracts with local companies, although the provision of services of these companies often only comprises the maintenance of an existing road. Overall, despite considerable transportation charges for road usage, the quality of roads in Myanmar is poor. It is suggested to prioritize the upgrade of rather long road sections in topographically uncomplicated terrain that can be realized within comparatively compact budget and time to accelerate traffic significantly ("quick wins").
Policy 1.3 (Rail): Establishing rail infrastructure as a strong backbone of Myanmar's agricultural and emerging industrial sectors Although significant and motivated efforts have been undertaken to extend the railway network, the poor quality of the meter-gauge network and non-mechanized handling of non-containerized general cargo do not allow the use of the railway system for industrial purposes largely. Given the potentials and existing concepts to link Myanmar with its neighboring countries by rail, an entire reassessment of the potentials of the railway system to facilitate Myanmar's potential integration into regional production networks is suggested.
Policy 1.4 (Water): Developing inland waterways, (inland) ports and coastal shipping as unexplored axes of transportation Cargo traffic volumes along the major river systems of Ayeyarwaddy River and Chindwin River currently still remain unexplored also given the lack of river ports with cargo handling facilities. Under this policy, it is suggested to establish new freight routes via the river systems and along the coastal routes that would allow increased connectivity of the industrial locations Pathein, Pyay, Pakokku, Mandalay, Monywa, Kalewa and Mawlamyine with international ports in the future. Under this policy, it is suggested to establish a comprehensive Waterway Development Plan including economic feasibility studies for the major developments of inland port infrastructure.

DIRECTION 2.
Managing and Governing Myanmar's "New" Infrastructure in the Best Possible Way through Market-Based Pricing, Supply Chain Focus, Intermodal Transport and Smart and Transparent Infrastructural Growth

Policy 2.1 (Pricing): Provide infrastructural services at appropriate prices reflecting market conditions

In different infrastructural sectors, prices for the usage of services are fixed by the Government at a comparatively low rate.

Policy 2.2 (Infrastructure governance and management): Strengthen inter-ministerial coordination mechanism to provide infrastructural solutions in a coordinated approach and to improve infrastructure management

Infrastructure as a bottleneck to industrial and overall economic development in Myanmar represents a considerable issue (e.g. annual flooding of roads, quality and safety of roads) that may in some cases prevent desirable industrial investments at locations outside of Yangon. Given the duration of the planning and construction of industrial facilities and the long-term and strategic orientation of such investments, the Government may well attract industrial investors in advance based on a clear timeline for the completion of high-quality infrastructure at international standard.

Policy 2.3 (Intermodal system): Encourage containerization to allow intermodal transport

The lacking use of standard containers in Myanmar hampers the introduction of intermodal transport concepts on a larger scale. The significance of general cargo particularly at congested Yangon Port is decelerating freight handling processes.

Policy 2.4 (Role of logistics): Establishing research and central data collection in the field of logistics

Data on the movement of freight in Myanmar are already collected by various entities and institutions (e.g. through the numerous toll gates along major roads as well as through private sector associations). However, difficulties in the consolidation of the considerable amount of data prevented the compilation of a nationwide logistics database.

Direction 3.
Establishment of Cluster-Based Industrial Parks at Infrastructural Nodes in the Sense of an Effective, Sustainable and Inclusive Industrial Development Strategy

Aspect 1: Industrial focus areas and locations

Defining industrial focus areas and ideal locations based on development strategy (import substitution, export-led growth or industrial fragmentation) and local strengths and competitive advantages

In order to establish a diversified industrial sector in Myanmar, it is suggested to develop promising industry at certain locations in a structured approach: in industrial clusters promoting synergies between industrial companies. It is suggested that – in line which the NCDP – primarily urban centers along the major economic corridors of Myanmar are chosen for clustered industrial parks. These locations may for instance be second or third-tier cities (e.g. Taunggyi, Hpa An), junctions of major economic corridors (e.g. Bago, Meiktila, Sittwe), towns with certain dominant industries (e.g. gems and jewelry industry in Myitkyina, seafood industry in Rakhine State or Mawlamyine) or otherwise important towns with specific potentials (e.g. Nay Pyi Taw for high-tech industry).

	Aspect 2: Reducing national disparities, increasing trans-national cooperation ***Developing of cross-border economic zones (including cross-border industrial production) to create practical economic bridges between Myanmar and adjoining countries*** As stipulated in the National Comprehensive Development Plan (NCDP) for Myanmar, the establishment of cross-border economic zones is desired. None of such cross-border economic zones exists in Myanmar at the moment, although the respective opportunities of a development of industrial sites in proximity to the national border of Myanmar have been recognized: Industrial zones are currently under construction in Myawaddy (near Mae Sot, Thailand) and Muse (near Ruili, China). With these industrial developments, however, the actual concept of cross-border economic zones is not realized: In contrast to border economic zones, cross-border economic zones represent a high degree of transnational cooperation, as ideally complementary factor endowments from each side of the border can be used in one economic area without any barriers (e.g. tariffs, import and export license requirements). As the example of the new industrial zone in Myawaddy shows, there is an urgent need for coordination and cooperation between Myanmar and its neighboring countries in such developments. Technical assistance is recommended to be provided to Ministry of Industry and other stakeholders involved in the development in Myawaddy as well as the planned industrial zone in Muse on best practices in transnational cooperation in an industrial context (e.g. lessons learned from Cambodia).
	Aspect 4: Sustainable and inclusive industrial development ***Integrating cluster-based industrial parks into social and environmental systems as places of progress, excellence and qualification*** In the past, one explanation for the establishment of industrial zones outside of urban centers may have been that industry has traditionally been associated with noise and pollution. Cluster-based industrial parks of Myanmar – in contrast – may represent a fully new approach to sustainable industrial development:
	Aspect 5: Transformation of the current industrial structure ***Redefining and reshaping Myanmar's current industrial landscape according to potentials and performance of industrial zones*** In case of insufficient growth potential of certain industrial zones with numerous problems, further steps related to a reclassification into a "Small and Medium Industrial Park" (with respective appropriate support to tenant companies e.g. through SME Center under Ministry of Industry) is to be provided. In case of strong growth potentials, the administration of the industrial zone may be transferred to a private investor in an open tender process.

(6) Market Expansion

Myanmar's Advantageous Situation: Myanmar is definitely in an advantageous situation because of its founder membership with the World Trade Organization (WTO), the multilateral body on trade, and its membership with ASEAN, the major regional preferential trading body of Asia. Being a member of the WTO, Myanmar enjoys Most Favored Nation Treatment with the entire membership. It has bound 18.5% of its tariff lines (all tariff lines under agriculture), with the simple average final bound rate at 87.2%, making the trade environment more transparent in Myanmar. This brings a wide range of opportunities for Myanmar's exports,

enabling it to overcome its supply-side constraints. It is also eligible for the Doha recommendation which make sure that 100% duty-free, quota-free market access shall be granted to LDCs.

Intra-ASEAN Trade: Myanmar has a bigger share in the intra-ASEAN trade than with the rest of the world. Its trade with other ASEAN members accounts for around 40% of total imports and around 50% of its total exports. By 2015, ASEAN proposed to establish a single market and production base in the region, with freer flow of goods (ATIGA), services (AFAS), skilled labor, and capital (ACIA). Thus, opening wide variety of opportunities for Myanmar to accomplish its objective of export led growth. The basic principle for granting origin status to a product is 40% regional/local-content, which makes Myanmar an attractive destination for producers who wants access to ASEAN market.

ASEAN Integration: Although Myanmar's increasing integration with ASEAN is promising, this does not guarantee Myanmar to emerge as an attractive market. The current market size of Myanmar's economy is too small. Moreover, trade is highly concentrated on a few export items like petroleum gas with a very few neighbors like China, India and Thailand. In 2003, the export of petroleum gas was US$ 642 million, which accounted for 29% of the country's exports. The export of petroleum gas has been increasing over the past ten years. As a result, in 2013, the export of petroleum gas increased to US$ 3.5 billon, accounting for 44% of the country's exports. Consequently, a market expansion policy is fundamental for Myanmar's industrial development.

1) Integration with the Regional and Global markets

Myanmar, as a founding member of the WTO, agrees with the principles of this organization. In the last years, Myanmar has improved the trade regulations significantly in order to integrate regionally and to reemerge in the international markets. Through active participation in the ASEAN community, Myanmar has achieved comprehensive access to the Asian market and also signed many bilateral agreements with strategic partners as indicated below.

2) The National Single Window

Myanmar is introducing some trade facilitation measures, including the move towards a National Single Window (NSW). It is currently under the leadership of Customs Department to establish a NSW and an e-custom system in order to ease the complicated trading procedures. The systems are composed under the leaderships of the Myanmar Automated Cargo Clearance System (MACCS) and the Myanmar Customs Intelligence System (MCIS). The systems are expected to be in operation by the end of 2016. The first stage initiates with the implementation of the new systems in Yangon's airport, eleven sea ports and one economic zone. During this process the NSW will connect the different

governmental institutions involved in trade permits (Animal and Plant Quarantine, Drug Administrations, Fishery Department, among others).

3) SMEs Internationalization

The Central Department of SMEs Development of the Ministry of Commerce is responsible to promote and develop SMEs in Myanmar, which represent more than 96% of economic units. However, in its current organization structure and activities, only a few are devoting to promote market expansion issues. It is required to restructure and introduce a new orientation of the institution to promote the establishment of SMEs. The recent Small and Medium Enterprise Development Policy (2015) listed different activities that are required to expand SMEs. Some of the activities should be:

- Facilitating information related to foreign markets, transport information, product standardization
- Provide market promotion
- Support education of SMEs to support internationalization

(7) Policy Focus

The current policies on market expansion issues are particularly linked to the National Export Strategy (NES), which emphasizes four essential components: (a) trade facilitation and logistics, (b) quality management, (c) access to finance, and (d) trade information and promotion.

1) Trade facilitation and logistics

The goal of this policy is to upgrade the capacities of international logistic enterprises (freight forwarders, logistic enterprises, customs brokers) and the soft and hard logistics infrastructure with the introduction of an e-government system, the improvement of transportation networks and logistic infrastructure. Moreover, the NES also considers the need to amend the regulatory framework of all types of transport (road, rail, and inland waterway transport and air transport regulations). Finally, the policy includes the need to actively adopt the models of Public and Private Partnership (PPP) to support the development of transport infrastructure.

2) Quality management

This component focuses on upgrading the policies, regulations and standards of trade to comply with international regulations. This will help to build up confidence and transparency among business operators and other trade related institutions. Additionally, this policy emphasizes the need to improving the adoption of best quality practices by exporters, traders as well as famers and processors.

3) Access to finance

This policy aims to integrate Myanmar into the international financial trade networks. It encourages adopting international standards in terms of trade financing, regulation of payments for exports and imports, improved access to financial mechanisms and improved transparency in the public administration sector to support the development of trade financing. In particular, this policy aims to improve regulations of the bank system to (a) relax regulations limiting liquidity, (b) enact mission legislation, and (c) achieve a more sophisticated financial market in terms of better risk management. Finally, an important issue considered is the need to encourage the banks to apply international business practices and improve skills of staffs to provide support to trade-related financial operations.

4) Trade information and promotions

It is recommended to provide better information to the stakeholders involved in export-led value chains. It includes a one-stop portal for the dissemination of information. The policy considers the improvement of the geographic coverage of information collection and dissemination, creation of IT focal points as well as the improvement of timing in the delivery of valuable information.

Other existing development plans like the NCDP and MID also emphasize the need to make market expansion efforts.

5) Diversification of Export Markets

The NCDP highlights the need to increase commercial ties with strategic markets, where trade has been restricted before due to sanctions. International sanctions imposed on Myanmar resulted into high dependency and export concentration in the ASEAN region. During this time, it was not possible to promote trade and development with the USA and the EU. In this regard, now the trade expansion policies require rebuilding trade relationship with other strategic markets.

6) Market expansion boosted by FDI

The MIDV highlights that during the process of industrialization, investment and industrial development priorities should be settled by market demand rather than state-driven decisions. In this regard, the MIDV indicates that trade development should be led by a competitive industrial setting based on FDIs. Consequently, market expansion would be led by investments that are able to match domestic and international demands in areas where Myanmar's comparative advantages can be boosted through FDI. In this perspective, market expansion policies cannot be delinked from FDI promotion policies.

7) Enact a trade promotion agency

Currently, Myanmar does not have a trade promotion agency. However, the Government is considering the establishment of a trade promotion agency with the aim of supporting the internationalization of products and services as indicated by the Ministry of Commerce. Among services, a special attention should be given to the tourism sector, which has great potential of growth and have important linkages to several manufacturing sectors.

3.3 Summary of Development Policies and its Implications

The development policy of national economy and economic sectors that were taken into consideration for the formulation of the Study is summarized in the area of hard components and soft components respectively as follows:

(1) Hard Components

1) National Comprehensive Development Plan (NCDP)

NCDP's policies focus on the transformation of Myanmar into a major trading production economy in ASEAN and promote FDI inflow particularly into the manufacturing sector so as to change the industrial structure significantly. To realize such changes, the creation of an enabling environment and a strong enterprise base is quite important. This includes the reinforcement of domestic and global connectivity that would enhance the economic integration with the regional and global markets. Consequently, the local economy will be enhanced, and current economic disparities will be reduced.

This implies that a reinforcement of regional, international and domestic connectivity is to be enhanced and bottlenecks for freight transport are to be removed to maximize freight transport capacity, to promote smooth and seamless freight transport to make Myanmar's export products competitive in regional and global markets. Special attention is to be focused on or around the cross-border economic zones.

2) Agriculture Development Policy (ADP)

The ADP's strategies focus on the maximization of agricultural potentiality of Myanmar that is endowed with vast land and water resources under moderate climatic conditions, to provide food security first and then expand exports of agricultural products such as beans and rice. The ADP recognizes that Myanmar can be one of the leading rice exporting countries in the world. This requires the creation of multimodal freight transport, to reduce and rationalize transport cost for agricultural products aimed at the global market to improve market access for farmers, especially in rural areas, with an aim of increased income for farmers.

This implies that a regional and domestic connectivity between farmlands and demand areas are to be reinforced for transportation of farm products, enabling the selection of the appropriate transport mode at multimodal hub, in order to make farm products more competitive. The transport costs should be reduced by the modernizing of truck terminals at major cities where farm products are collected and distributed to consumers. Thereafter, the facilities necessary for the enhancement of the export of rice and other farm products are to be developed and modernized.

3) Industrial Policy Paper

The Industrial Policy Paper emphasizes the need to develop Myanmar's industrial sector as the core of economic development, thereby transforming Myanmar from an agriculture-based economy to an industry-based economy. The development and upgrading of industrial zones is to be enhanced.

This implies that access to existing and newly developed industrial zones - especially the Special Economic Zones - is to be reinforced and improved to ensure that such industrial zones are connected in the supply chain with regional and global hub. The development of international ports and cross-border gateways are to be focused to ensure the linkage with global market.

4) National Spatial Development Framework (NSDF)

NSDP's policy focuses on the development of SEZ at Dawei, Thilawa and Kyaukphu as well as at the two growth poles, namely at Yangon and Mandalay.

This implies that the linkage between these SEZs and trunk road, major railway and/or trunk marine route are to be reinforced and any bottlenecks are to be removed. Smooth freight transport in and around Yangon and Mandalay is to be ensured, to enhance economic activities and to avoid the development of traffic congestion in and around both of these cities.

5) Myanmar Industrial Development Visions (MIDV)

The MIDV's strategy focuses on the formation of manufacturing industries in the urban areas to achieve well balanced sustainable national economic development through an enhancement of industrial development by means of the promotion of FDI in the manufacturing / industrial sectors based on comparative advantages of Myanmar (its geographical location, competitive labor market, vast human resources, etc.) At the same time, agriculture, forestry, fishery and other industrial activities in rural areas are to be enhanced, to achieve well-balanced sustainable economic development. Special attention is drawn to promotion of traditional handicraft industries.

This implies that the development and reinforcement of major linkage between Yangon and Mandalay is to be enhanced taking into account the reinforcement of feeder roads for regional development purposes, at the same time. Logistics infrastructure is to be improved to enable smooth and effective transportation throughout the year at least transport / logistics cost, with the aim of further developing the comparative advantage of Myanmar. Utilization of local airports and arterial road networks is also a focus to promote the export of traditional handicrafts and farm products as well.

6) National Exports Strategy (NES)

The NES's strategies focus on increasing the competitiveness of enterprises through improvement of the business environment aimed at development and expansion of Myanmar's trade, while contributing to poverty reduction. The development and expansion of exports is recognized as the engine for acceleration of economic development, which will accelerate the industrialization process. The export of rice, beans and pulses is emphasized. The markets are to be diversified and expanded however such an expansion of the market can be accelerated by enhancement of the FDI inflow especially to the manufacturing sector.

This implies that the logistics system is to be modernized, improved and upgraded to the level of international standards. The connectivity with neighboring countries, region and global market is to be reinforced, to integrate Myanmar in the global supply chain. The linkage between trunk road, railway and maritime routes; and Special Economic Zones where the FDI for the manufacturing sector will be concentrated, should be developed without bottlenecks and smooth as well as effective freight transport operations should be ensured.

7) New Economic Policies (NEP)

The NEP's strategies focus on the national reconciliation and balanced economic development throughout the country, by means of the development of necessary infrastructure to support the promotion of FDI. The creations of more and more job opportunities in and around the SEZs, as well as in and around industrial zones, are also emphasized.

This implies that the logistics system is to be modernized, improved and upgraded to the level of international standards that will encourage increased FDI inflow. The connectivity with neighboring countries, regional and global market is to be reinforced, to integrate Myanmar into the global supply chain. The linkage between trunk road, railway and maritime route; and Special Economic Zones where the FDI for the manufacturing sector will be concentrated, should be developed without bottlenecks, to ensure smooth and effective freight transport operation. As for regional development, the maintenance and upgrading of rural roads is emphasized.

8) Myanmar Industrial Master Plan (MIMP - Draft)

The MIMP's policies focus on the promotion of FDI and the area of FDI particularly to manufacturing sector that would accelerate industrial development. The improvement of logistics system is one of the key factors to ensure a strong and balanced industrial development. There is no proper warehousing system at present and this is to be rectified to ensure optimum logistics operation for both international and domestic cargo movement.

This implies that the logistics system is to be modernized, improved and upgraded to the level of international standards that would encourage FDI inflow dynamically. The connectivity with neighboring countries, region and global market is to be reinforced so as to integrate Myanmar in the global supply chain. The upgrading the trunk roads linking major cities and industrial zones are important. The efficiency of freight transport should be increased through the provision of multimodal hubs connecting available different transport modes such as roads, railways, inland waterways, coastal shipping and airport at important and strategic intersection nodes, gateway nodes, commercial nodes, etc. An expansion of port capacity and cross-border facilities to cope with increasing freight transit demand is necessary. The establishment and running of dry ports for railway freight transport, truck terminals for domestic freight movement is imperative, to optimize the use of available transport modes at least cost with the shortest lead time.

(2) Institutional Aspect

Various development policies have been formulated as mentioned above and the strategies and policies at national level stated in these plans are to be taken into account for the formulation of the Study. **Table-3.2.4** summarizes the strategy and policies of each plan mentioned above.

Table-3.2.4 Development Strategies and Policies of each Development Plan

Plan	Strategy	Policy Focus	Implication to NLMP Plan
National Comprehensive Development Plan (NCDP)	Strategy-ST1	Strengthen public institutions and governance	Establish or organize the department in MOTC specialized for planning and management of logistics sector.
	Strategy-ST2	Create enabling environment and strong enterprise base	Transport safety (road, navigation, etc.)
	Strategy-ST3	Expand domestic and global connectivity and enhance economic integration	Smooth customs clearance by use of e-Customs
	Strategy-ST4	Foster internationally competitive sectors and industries	Foster private entities undertaking logistics operation
	Strategy-ST5	Promote human development	Prepare human development plan for improvement of logistics sector
Agriculture Development Policy (ADP)	Strategy	Improve logistics performance	Improve quality of logistics and transport-related infrastructure
National Export Strategy (NES)	Strategy	Enhance trade facilitation and logistics	Improve customs clearance and cargo handling procedures at gateways (ports, and cross-border points)
	Strategy	Improvement of access to finance	Establish special financial scheme for SMEs undertaking logistics services
Myanmar Industrial Master Plan – DRAFT (MIMP)	Strategy	Human resources development	Develop human resources managing and administrating the logistics sector, and operating and management of private entities engaging with logistics services
	Strategy	Operation and maintenance of e-customs system	Operate and disseminate the use of e-customs system (MACCS)
	Strategy	Ensure road / transport safety	Prepare and execute road transport safety program
	Strategy	Develop SMEs	Develop SMEs engaging with logistics services
	Strategy	Enhance trade facilitation	Amend regulatory framework of all types of transport

Source: Study Team based on policies formulated and presented in various development plans

3.4 Economic and Logistics Development Scenario

3.4.1 Economic Development Scenario

(1) Basis of Economic Development Scenario

The rapid growth of the GDP of Myanmar started in 2011 (only six years ago), when the Government introduced the democratic policy and a series of economic reforms to promote industrial development. GDP grew by 5-8% per annum over the last five-year period. Since 2011, the reforms show the Government's efforts to accelerate economic development and a strong commitment towards a democratic market-oriented economy.

(2) Waves of Reform by Sector

Primary Economic Sector: In Myanmar, agriculture sector accounts for around 27% of GDP, around 70% of the total populations reside in the rural area and around 56% of the total labor force engages with agriculture activities in 2015. The average annual growth rate of its value added in the period 2011-2015 is 0.7%. Around 20-30% of the total number of farmers are landless farmers and they are thought to be the important source of labor supply. Agriculture is the driving force of Myanmar's major productivity. According to the Agriculture Development Policies (ADP), the major policy issues are (a) to increase farmers' income by improved productivity, (b) to increase income from non-farming activities, (c) to enhance local private investments, (d) to organize small scale agro-industrial group, (e) to enhance participatory development by farmers, and (f) to improve infrastructures (i.e. irrigation system, rural road, education, health facilities, etc.). The wave of reform is raging in agriculture. The agriculture sector will supply the less-expensive and safe farm products to the market through improvement of farm productivity and quality of farm products as well as develop the overseas market through reinforcement of competitiveness.

Secondary Economic Sector: The industry of Myanmar is biased toward natural resource development including natural gas, and it accounts for around 35% of GDP in 2015. The average annual growth rate of its value added in the period 2011-2015 is 13.4%, which is remarkable. The manufacturing sector has been expanding, and the major industries are garment and food processing industries. However most of garments produced and exported are based on Cut-Make-Pack[2] (CMP) type contract. In line with the National Export Strategy (NES) and the industrial policy, reforms have promoted export and FDI-led development strategies, while trying to create a positive business environment for local and foreign investors, through the development of SEZ's and the enforcement of new business laws in line with the Myanmar Industrial Policy. The Government implemented new investment laws to increase investment flow domestically and internationally. There was a clear shift and change in domestic investment and FDI after the reform. Before the implementation of the reform, FDI was mostly concentrated in the energy and power (oil and gas, mining and hydroelectric power sectors). Looking at the period between 2013 and 2014, all types of investments drastically shifted to the manufacturing sector and amongst other top-ranked sectors were transport, communications, hotels and tourism. The FDI has both direct and indirect effects on economic growth, through exports and economic growth.

[2] The vast majority of Myanmar's garment factories operate under the Cut-Make-Pack (sometimes called Cut-Make-Trim) system. This is a form of contract work. Typically, a foreign buyer with the necessary financial and technical abilities will pay contracting fees to a garment factory in Myanmar to carry out the labor-intensive task of cutting the textile fabric, sewing garments together according to design specifications and then packing the garment for export to international markets.

Tertiary Economic Sector: The tertiary sector or service sector of Myanmar accounts for around 39% of GDP in 2015. The average annual growth rate of its value added in the period 2011-2015 is 8.5%. The service sector has been expanding gradually in parallel with the growth and expansion of the secondary economic sector. The drivers of service sector development are tourism, transport, telecommunication, trade and finance.

(3) Underlying Development Policy Framework

To prepare the basis for formulating logistics development framework, it requires examination on the prospects of economic development of Myanmar up to 2030. The economic development prospect is prepared based on various national development policies discussed in preceding sub-chapter 3.2 Current Development Policies. The major development policies referred to for the examination on the economic development prospects are as follows:

Title of Development Plan	Abbreviation	Year
Overall Development Plan / Policies		
1 National Comprehensive Development Plan	NCDP	2014
Economic Development Plan / Policies		
2 New National Economic Policies	NEP	2016
Agriculture Sector Development Plan		
3 Agriculture Development Policies	ADP	2014
Industrial Sector / Investment Plan		
4 Industrial Policy Paper	IPP	2014
5 Myanmar Industrial Development Vision	MIDV	2015
6 Myanmar Industrial Master Plan (Draft)	MIMP	2017
Trade Policy		
7 National Export Strategy	NES	2016
Physical Development Plan		
8 National Spatial Development Framework	NSDF	2014
9 National Transport Master Plan	NTMP	2014

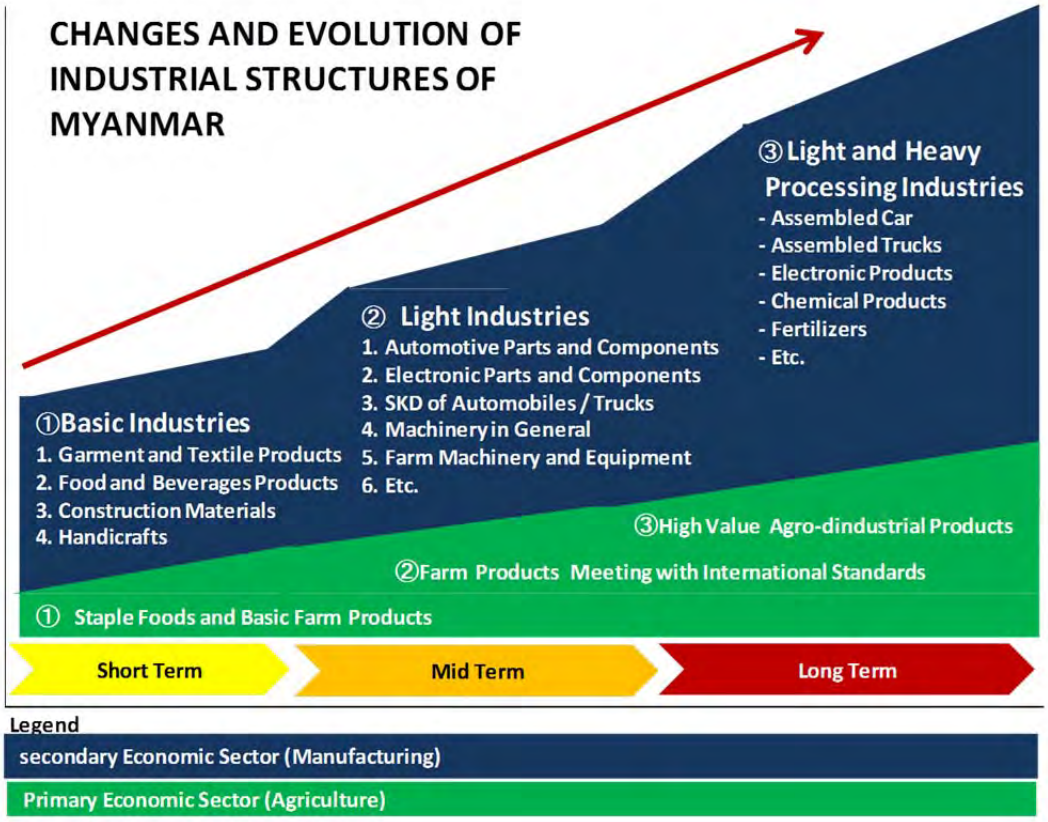
The economic development scenario examined is elaborated from mainly on the NCDP, and the scenario led by the industrial sector is based mainly on the industrial development perspective discussed in the IPP, MIDV, and MIMP-Draft. The strategy on the urban and rural synergy is in conjunction with the ADP.

(4) Economic Development Scenario

In the short time period, the improvement of existing basic industries will be expanded, and the quality of farm and industrial products will be upgraded. In mid-term plan period, the manufacturing activities will expand, and the level of manufacturing will be upgraded from simple CMP type business to the manufacturing of high-tech products mainly for re-exports to the world market. The agricultural production will continue its expansion and more value will be added by enhancement of agro-industries for processing of farm products locally available of which quality meet with the regional and international standards. Subsequently, heavy industrial type chemical processing business will commence the business activities such as

production of petroleum, chemical products including fertilizer, pharmaceutical products, etc.

To elaborate projections for Myanmar's staged industrial development simultaneously achieves geographically balanced development, urban-rural synergy and sustainable growth. The MIDV highlights that the cluster formation of manufacturing industry in urban areas is important in order to achieve well-balanced sustainable national development. Based on the above discussions, the economy is expected to be led by the main two pillars: the one is the manufacturing sector utilizing FDI and the other is the promotion and enhancement of agro-industries in the rural areas. The economic development scenario is prepared as shown in **Figure-3.3.1** below:



Source: Study Team based on the Myanmar Industrial Master Plan (MIMP-Draft) 2016

Figure-3.3.1 Economic Development Scenario of Myanmar

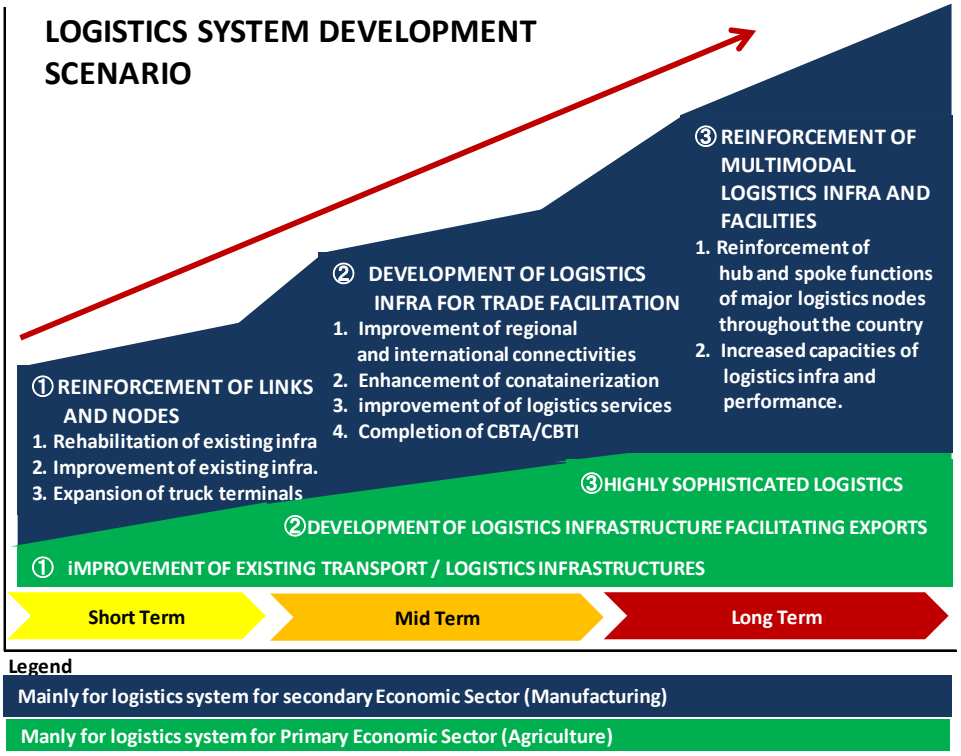
3.4.2 Logistics Development Scenario

The perspective of economic, industrial and agricultural developments discussed in preceding sub-section can only be realized when the logistics system is developed to meet with the requirement of FDI manufacturers and investors. The lead time of freight transport become as short as possible and predictable, and the freight transport cost become competitive in the region. At the same time, the logistics system is developed to meet with the supporting industries including agriculture of which activities took place mostly in the rural areas and reduce the transport cost to maximize the value attained by the farmers and promoting rural industries

including agro-industries in the rural area that will generate the job opportunities, thereby increase the average income of farmers and rural population.

The better and high performance of logistics system ensures the facilitation of trade, and this will lead to the improvement and development of domestic logistics system. The international logistics providers will transfer the technologies and skills of international standard level to local logistics providers by providing training for the local workforce and upgrading technical and management skills as well. Through combination of these effects, the markets for the Myanmar industrial and agricultural products will be expanded on a global basis.

Figure-3.3.2 illustrates that perspective of Myanmar's logistics system development that will be progressed in parallel with the economic development or lead the economic development.



Source: Study Team

Figure-3.3.2 Development Perspective of Myanmar's Logistics System

As illustrated in the above figure, in the short-term plan period, the existing infrastructure will be rehabilitated, improved and upgraded while the institutional development and organization of private sector are required. Subsequently, in mid-term plan period, the connectivity with neighboring countries is reinforced by completion of necessary infrastructure and institutional arrangement. Then, the key infrastructure will be commissioned, and the logistics service level will be upgraded to international standard.

CHAPTER-4 NATIONAL TRANSPORT MASTER PLAN

4.1 Outline of National Transport Master Plan (NTMP)

The NTMP was formulated with technical assistance of JICA and approved by the Cabinet as the national development plan for the transport sector on 4th January 2014. The objectives of the NTMP are designed to provide guidance for a long-term investment program for the transport sector in general that will help the Government to achieve its economic growth targets by 2030. In addition, this Master Plan provides the guidelines that are adaptable to other industrial sectors for promotion of private investment, to assist the investment planning and decision making for a variety of transport sector related investment projects.

(1) Basis of the NTMP

NTMP is designed and formulated in conjunction with Myanmar's National Comprehensive Development Plan (NCDP), which describes the country's development vision and strategic goals. Furthermore, the NTMP is delineated based on the National Spatial Development Framework (NSDF). The NSDF is a synthesis of regional (i.e. international, ASEAN, Asian and GMS) and national transport sector strategies, policies and programs including economic corridor concepts. It identifies the existing and committed international, national and regional highway / railway corridors and strategic transport facilities (i.e. ports, airports, rail stations and interchanges); and special centers that exhibit commitment to urbanization and investment in terms of transport networks and facilities based on forecast of population, population density and other attributes such as proximity to urban centers, ports, airports, railway hubs, industrial zones, special economic zones (SEZ), border towns, tourism hubs, etc.

(2) Transport Sector Vision, Strategy and Policies

The sector Vision spelled out in the NTMP is as follow:

"To develop an efficient, modern, safe, and environmentally-friendly transportation system in a coordinated and sustainable manner that embraces all transport modes for the benefit of the country and people of Myanmar."

Based on this sector development vision, the following transport sector development policies are formulated and proposed as shown in **Table-4.1.1**. The details of the vision are provided in the Final Report of the Study Program for the National Transport Master Plan (NTMP).

Table-4.1.1 Transport Policies in NTMP

Ref. No.	Transport Policies
TP-01	Better planning and coordination
TP-02	Infrastructure development
TP-03	Better environment, safety and security
TP-04	Institutional and regulatory development
TP-05	Reasonable transport pricing and secured budgeting

Source: NTMP, 2014

Accordingly, the cross-sector strategic objectives were formulated as shown in **Table-4.1.2**.

Table-4.1.2 Strategic Objectives of NTMP

Ref. No.	Title of Strategic Objectives
TO-01	To develop an initial (preliminary) database urgently and develop it step-by-step
TO-02	Effective use of the National Transport Master Plan (NTMP)
TO-03	Enhance participation planning by use of Strategic Environment Assessment (SEA) procedure
TO-04-1	Establishment of planning unit (or department)
TO-04-2	Technical cooperation / exchange program
TO-05-1	Vocational training and professional certificate
TO-05-2	Professional engineer
TO-06-1	Develop EIA guidelines for transport sector
TO-06-2	Increase public awareness
TO-07	Secure permanent funding source for the development of road infrastructure and services
TO-08-1	Increase technical capacity in higher education systems
TO-08-2	Increase technical research and development

Source: NTMP, 2014

A set of comprehensive policies relevant to all modes of transport, as well as development strategies for specific modes like road, rail, airport, seaports, marine and inland waterway, as well as associated projects and activities that can help these modes achieve the vision and its objectives were formulated and proposed. The sub-sectoral vision and the title of strategic objectives formulated are as tabulated in **Table-4.1.3**.

Although the NTMP presents the vision, strategy and policies for the development of the transport sector in general covering passenger and freight transports as a whole, particular attention has not been paid to prepare specific development guidelines for the development of the logistics sector. This National Logistics Development Plan or MYL-Plan supplements the NTMP to present the development guidelines for the logistics sector.

Table-4.1.3 Transport Sector Development Vision in the NTMP

Sub-sector	Visions of NTMP	
Road	*"Develop all-weather and safe road transport infrastructure in order to fulfill and economic transport needs of the nation in a coordinated manner with other modes of transport; build a robust foundation for land transport industries in terms of road infrastructure and regulatory framework; and achieve environmentally-friendly road transport system development throughout the country."*	
	Strategic Objectives	
	RD-01	Improved standards
	RD-02	Road network development
	RD-03	Safe trunk road network
	RD-04	Effective asset management
	RD-05	Reduction of traffic accidents
	RD-06	Effective institutional set-up
	RD-07	Private sector participation
	RD-08	Stimulate growth with infrastructure
Railway	*"Develop safe rail network and services along the designated major economic development corridors in order to fulfill social and economic transport needs of the nation in a coordinated manner with other mode of transport to achieve higher inter-modality; contribute to the environmental improvement through introduction of low carbon technologies; and build preferred business environment through provision of safe, punctual, comfort and high capacity trail transport services with affordable yet reasonable price."*	
	Strategic Objectives	
	RWY-01	Establishment of Asset Management System (AMS)
	RWY-02	Cost effective railway network development
	RWY-03	Safe rail transport service provision
	RWY-04	Safety first
	RWY-05	Enhanced environment consideration
	RWY-06	Private sector participation
	RWY-07	Industry efficiency
	RWY-08	Sector readiness
	RWY-09	Stimulate economic growth
	RWY-10	Reorganization
Waterway	*"Develop world-class international gateway port(s) as one of the hub seaports in Asia and all-weather and 24-hours inland waterway transport services along the designated development corridor to fulfill social and economic transport needs of the nation in a coordinated manner with other modes of transport to enable higher inter-modality; and build preferred business environment in the country through provision of safe, punctual and high-capacity water transport services with competitive price."*	
	Strategic Objectives	
	WT-01	Urgent port capacity improvement for Yangon Port including Thilawa area
	WT-02	New port infrastructure (build deep water seaport) to accommodate Central North-South Development Corridor
	WT-03	Port planning and development
	WT-04	Strengthen administration capability
	WT-05	Expand navigation options for inland waterways
	WT-06	Modernize infrastructure for inland waterway network
	WT-07	Self-sustaining inland water transport business
	WT-08	Upgrading equipment necessary for inland waterway transport

Sub-sector	Visions of NTMP	
Civil Aviation Sector	*"Develop and strengthen the safe, secured, efficient, sustainable and environmentally-friendly aviation industry in order to make Myanmar one of the major aviation hubs in Asia"*	
	Strategic Objectives	
	CA-01	Strengthen regulatory function of the Department of Civil Aviation
	CA-02	Prepare plan for future growth
	CA-03	Develop a nationwide airport system
	CA-04	Modernize air navigation services in line with ICAO and GANP
	CA-05	Strategic partnership with private sector

Source: NTMP, 2014

(3) Corridor Development Strategy of NTMP

The key development strategy adopted for the preparation of NTMP was the corridor-based transport infrastructure development strategy. This strategy is basically in line with the corridor development strategy prepared and presented by the Asian Development Bank in 2010 for the Greater Mekong Sub-region Corridor Development Plans and also the regional transport development strategy of ASEAN, Brunei Action Plan (ASEAN Strategic Transport Plan) in 2010. The advantages of the proposed corridor development in the NTMP are to:

- Provide a spatial focus to transport improvement, connecting growth centers and catalyzing the development of surrounding locations;
- Open up many opportunities for various types of investment;
- Promote synergy and enhance the impact on regional economy;
- Provide a mechanism for prioritizing and coordinating investments; and
- Generate tangible demonstration effects.

This corridor development approach mainly for the GMS countries in the region was adapted to both the transport sector development of Myanmar and the development of the logistics system in Myanmar as well. **Figure 4.1.1** shows the strategic linkages (corridors) of the transport development in the NTMP.

(4) Selected Priority Corridors in the NTMP

A multi-criteria analysis was conducted to select the priority corridors amongst the proposed strategic linkages. The evaluation indicated by the multi-criteria analysis applied in the assessment included: "connectivity" between growth centers (a corridor having connection with a larger growth center is given a high score), "contribution" to regional economy (a corridor having a larger existing and/or future GRDP generated in the sphere of influence along the corridor is given a high score), "traffic demand" (a corridor of higher traffic demand is given a high score) and "investment efficiency" (a corridor showing a higher volume capacity ratio is given a high score). Each evaluation indicator ranges from 1 (low priority) to 5 (high priority) and a consolidated evaluation is made by averaging the score for each evaluation indicator. **Table 4.1.4** presents the assessment results for each corridor and

indicates development corridors of the first priority (the average score for these first priority corridors exceeds 3.5), including:

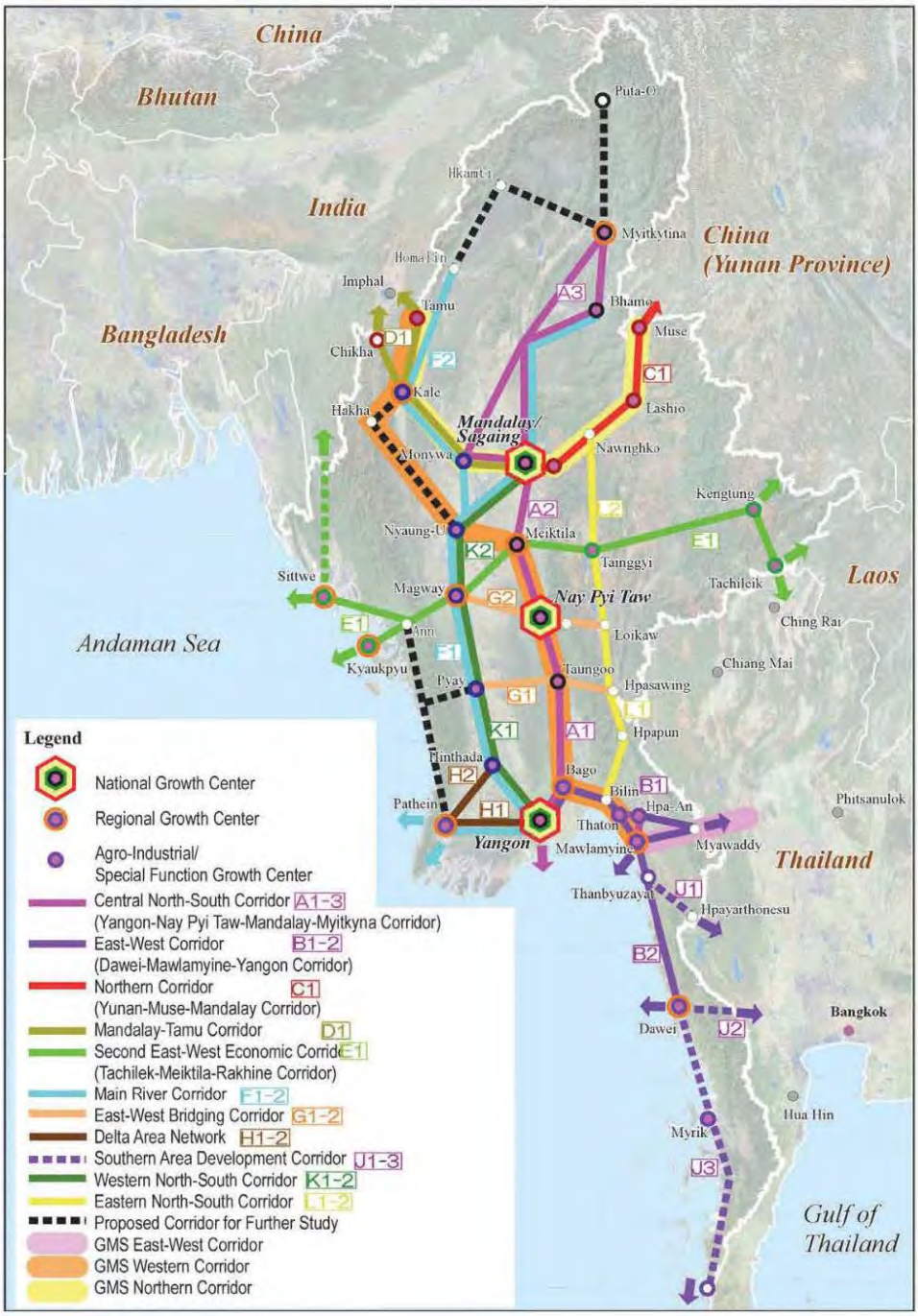
A: Central North-South Corridor (Yangon – Nay Pyi Taw – Mandalay)

B: East-West Corridor (Yangon – Hpa An- Myawaddy)

C: Northern Corridor (Mandalay – Muse)

K: Western North-South Corridor (Yangon – Pyay – Magway)

H: Delta Area Network



Source: NTMP, 2014

Figure-4.1.1 Selected Centers and Related Hierarchy of Strategic Linkages in the NTMP

Table-4.1.4 Multi-criteria Analysis and Indicated Priority Development Corridors

Development Corridor	Section	Code	Growth Center	Contribution (Economy)	Investment Impact (Traffic)	Investment Efficiency	Average Score
A. Central North-South Corridor	Yangon-Nay Pyi Taw	A1	5	5	5	5	5.0
	Nay Pyi Taw- Mandalay	A2	5	3	5	5	4.5
	Mandalay – Myitkyna	A3	4	4	2	2	3.0
B. East - West Corridor	Yangon - Hpa-An – Myawaddy	B1	4	5	4	3	4.0
	Mawlamyine – Dawei	B2	3	1	1	1	1.5
C. Northern Corridor	Mandalay – Muse	C1	4	3	3	4	3.5
D. Mandalay - Tamu Corridor	Mandalay – Tamu	D1	4	4	2	1	2.8
E. Second East - West Corridor	Tachilek - Meiktila – Kyaukpyu	E1	3	4	2	1	2.5
G. East - West Bridging Corridor	Hpasawing – Pyay	G1	3	1	1	1	1.5
	Loikaw – Magway	G2	3	2	1	1	1.8
H. Delta Area Network	Yangon – Pathein	H1	4	4	3	4	3.5
	Pathein – Hinthada	H2	3	1	1	1	1.5
J. Southern Area Development Corridor	Thanbyuzayat – Hpayarthonesu	J1	3	1	1	1	1.5
	Dawai - Thai Border	J2	3	1	1	1	1.5
	Dawei – Kawthaung	J3	3	1	1	1	1.5
K. Western North-South Corridor	Yangon - Pyay – Magway	K1	4	5	3	4	4.0
	Magway – Mandalay	K2	4	4	2	3	3.3
L. Eastern North - South Corridor	Bilin – Loikaw	L1	3	1	1	1	1.5
	Loikaw – Nawnghko	L2	3	1	1	1	1.5

First priority corridor
Second priority corridor

Source: NTMP, 2014

4.2 Implications for National Logistics Master Plan (NLMP)

The logistics corridors proposed in this report (National Logistics Master Plan: NLMP) are considered as the upgrading of transport corridors and are to be developed on top of the transport corridors in a strategic manner, with an approach to transform transport corridors into logistics corridors by adding projects specifically designed for development of the logistics corridor.

(1) Freight Transport Demand Analysis in NTMP

Table-4.2.1 presents the volume capacity ratios estimated in the NTMP for each corridor by comparing the 2030 passenger and freight demand (volume) and existing road-based capacity (capacity) for 2013. These V/C ratios indicate how urgent improvements are required for capacity expansion.

Table-4.2.1 Volume Capacity Ratio by Development Corridor estimated in NTMP

Development Corridor	Section	Code	Freight Volume Capacity Ratio	Passenger Volume Capacity Ratio
A. Central North-South Corridor	Yangon-Nay Pyi Taw	A1	1.09	1.30
	Nay Pyi Taw- Mandalay	A2	1.09	1.49
	Mandalay - Myitkyna	A3	0.42	0.81
B. East - West Corridor	Yangon - Hpa-An - Myawaddy	B1	1.81	1.98
	Mawlamyine - Dawei	B2	0.16	0.09
C. Northern Corridor	Mandalay - Muse	C1	2.14	0.87
D. Mandalay - Tamu Corridor	Mandalay - Tamu	D1	0.19	0.48
E. Second East - West Corridor	Tachilek - Meiktila - Kyaukpyu	E1	0.18	0.32
G. East - West Bridging Corridor	Hpasawing - Pyay	G1	0.03	0.01
	Loikaw - Magway	G2	0.12	0.51
H. Delta Area Network	Yangon - Pathein	H1	0.67	1.45
	Pathein - Hinthada	H2	0.08	0.31
J. Southern Area Development Corridor	Thanbyuzayat - Hpayarthonesu	J1	0.00	0.00
	Dawai - Thai Border	J2	0.00	0.00
	Dawei - Kawthaung	J3	0.01	0.09
K. Western North-South Corridor	Yangon - Pyay - Magway	K1	1.67	1.05
	Magway - Mandalay	K2	0.94	0.60
L. Eastern North - South Corridor	Bilin - Loikaw	L1	0.03	0.01
	Loikaw - Nawnghko	L2	0.02	0.02

Source: NTMP, 2014

Road-based traffic capacity for passenger traffic was set to 40% of the existing road design capacity (of typical cross section of the road to form the corridor), while the remaining 60% was allocated to freight traffic, as the freight carrying capacity of the road segment.

Freight transport demand for each development corridor was estimated in the NTMP. The following corridors were identified as the major freight transport corridors in Myanmar.

A: Central North-South Corridor (Yangon - Mandalay)
B: Part of East-West Corridor (Yangon - Hpa An - Myawaddy)
C: Northern Corridor (Mandalay - Muse)
K: Part of Western North – South Corridor (Yangon - Pyay - Magway)

The freight transport demand has been re-examined in detail as explained in this report based on the latest and detailed data/information of the cargo movement such as HS coding statistics (HS: Harmonized Commodity Description and Coding System) to establish the logistics development plan in Myanmar.

(2) Proposed Infrastructure Development in the NTMP

The NTMP proposed the transport infrastructure projects based on the development strategy for each corridor, as summarized in **Table-4.2.2**.

Table-4.2.2 Infrastructure Project Component in the NTMP

Major Freight Transport Corridors	Development Strategy to propose transport projects
A: Central North-South Corridor	➢ Provide high-speed, high capacity, safe and reliable transport network and services as the primary corridor element ➢ Enable multi-modal transport ➢ Make efficient use of existing transport facilities ➢ Segregate inter- and intra-city traffic
B: East-West Corridor	➢ Improve connectivity (land transport, freight movement) between Myanmar and Thailand ➢ Contribute to the coastal development between Yangon and Mawlamyine ➢ Integrate the corridor with the new transport hub (Hanthawaddy International Airport) ➢ Use the existing transport facilities efficiently ➢ Provide safe/reliable transport network/service, particularly for freight transport
C: Northern Corridor	➢ Improve connectivity (land transport, freight movement) between Myanmar and Yunnan Province ➢ Contribute to the industrial development in Muse, Lashio, Mandalay / Sagaing area ➢ Integrate the corridor with the new transport hub (Mandalay and Muse Dry port) ➢ Use the existing transport facilities efficiently ➢ Provide safe/reliable transport network/service, particularly for freight transport
K: Western North – South Corridor	➢ Provide high-speed, high capacity, safe and reliable transport network and services as the primary corridor element ➢ Alternative routes for the central north-south corridor (to form two primary elements in the North-South network) ➢ Enable multi-modal transport ➢ Make efficient use of the existing transport facilities ➢ Segregate inter- and intra-city traffic

Source: NTMP, 2014

The NTMP emphasized that a systematic and comprehensive development of the transport network, composed of roads, seaports, airports, inland waterways that reinforces connectivity and networks linking major cities inside and outside of the country would be essential to support and promote economic growth and the industrialization process, in as smooth a way as possible. The improvement of connectivity between major cities inside and outside Myanmar will contribute to the expansion of trade and development of economic activities amongst the cities located on these networks. The improvement of these networks will expand the land area needed for the establishment of industries that would spur the potentially of connected cities. Furthermore, the improvement of connectivity with neighboring countries would not only ensure access to the markets for goods produced in Myanmar in other countries but would also enable Myanmar to link with the global supply chain including neighboring countries, to support and promote fragmentation of the manufacturing processes that will bring substantial benefits to Myanmar. This would enhance the possibility of attracting new industries to Myanmar even further.

The NTMP is the basis of this report (NLMP: National Logistics Master Plan) and the projects to 2030 proposed in NTMP are basically to remain same but several additional projects have been proposed for logistics development. The project's priority was re-examined through technical discussions with related authorities and was accepted by the Joint Coordination Committee (JCC) for the NLMP.

CHAPTER-5 REGIONAL COOPERATION FRAMEWORK

5.1 ASEAN Cooperation

This chapter discusses about present economic and transport cooperation of Myanmar with ASEAN and neighboring countries namely India and China. The essential contents of cooperation with these region and countries that are to be considered for the preparation of the study of Myanmar are indicated by underlining relevant part of sub-chapters.

5.1.1 ASEAN Economic Cooperation

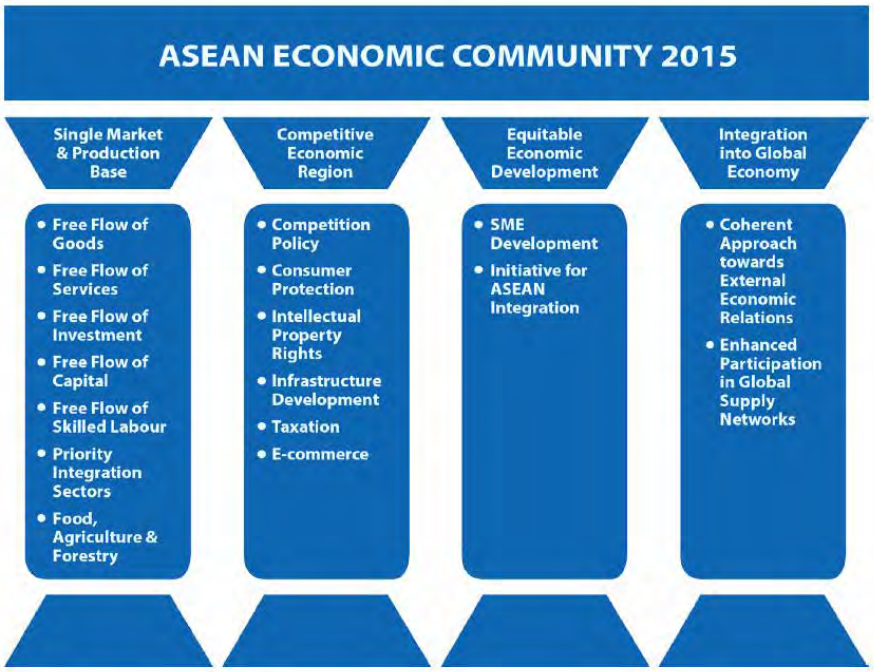
The Association of Southeast Asian Nations (ASEAN) has made extraordinary progress since it was founded in 1967 by Brunei Darussalam, Indonesia, Malaysia, Philippines, Singapore, and Thailand so called ASEAN6. It has been transformed into an increasingly well-regulated, dynamic and creative platform for trade and commerce across what may regard as the world's fastest-developing economic region. Vietnam (1995), Lao PDR (1997), Myanmar (1997), and Cambodia (1999) all of which have been based on socialism until joining ASEAN in the 1990's. These four countries that joined ASEAN in the 1990s are referred to as CLMV. At present ASEAN is composed of 10 countries including CLMV. Although economic gap between ASEAN6 and CLMV has been significantly wide, it has been narrowed down in recent years.

2015 was a key milestone in the ASEAN integration agenda. Economically, ASEAN as a region has achieved significant progress and prosperity. The GDP has nearly doubled since 2007 to the present, with a combined GDP of over US$ 2.5 trillion, while average GDP per capita grew by almost 80% to over US$ 4,000. Over the same period, ASEAN has also become more influential, with growing markets regionally and globally. By 2015, it become Asia's 3rd largest and the world's 7th largest market and among the most advanced integrated markets. With a combined population of over 622 million, ASEAN has a vast consumer base, behind only China and India globally. Over 50% of ASEAN's population is under the age of 30, making up a large portion of both current and future workforce.

The cumulative effect of intra-regional trade and investment is significantly large. Collectively, the intra-ASEAN market is the largest for ASEAN trade at 24.1% in 2014. Likewise, the region has become one of the largest fastest growing investment destinations, accounting for 11% of total global foreign direct investment (FDI) inflows in 2014 as compared with just 5% in 2007. At 17.9%, ASEAN's intra-regional FDI inflow is second largest by partner, lagging behind only the EU-28.

(1) The Four Pillars of ASEAN Economic Integration

The ASEAN Economic Community (AEC) blueprint is built on four inter-related and mutually-reinforcing pillars: (a) a single market and production base, (b) a highly competitive economic region, (c) a regional of equitable economic development, and (d) a region fully integrated into the global economy as illustrated in **Figure-5.1.1**. As broad and multi-faceted as these are, the goals of the AEC have already been met on many fronts.



Source: A Blueprint for Growth, ASEAN Economic Community 2015: Progress and Key Achievements, ASEAN Secretariat 2016

Figure-5.1.1 Four Pillars of ASEAN Economic Integration

The first AEC pillar seeks to create a single market and production base through free flow of goods, services, investment, skilled labor and freer flow of capital. Cumulatively, this aims for a more liberalized market that provides population with greater opportunities to trade and do business within and outside the region, with reduced trade costs and improved investment regimes that make ASEAN a more attractive investment destination for both international and domestic investors.

The second AEC pillar helps to create a business-friendly and innovation-supporting regional environment. That is achievable through adoption of common frameworks, standards and mutual cooperation across many areas, such as in agriculture and financial services, and in competition policy, intellectual property rights, and consumer protection. It also supports improvements in transport connectivity and other infrastructure networks; these have facilitated cross-border transportation contributed to reducing overall costs of doing business, while providing ASEAN people and business with better opportunities to work together more productively. In turn, such development provides the impetus to start new business, expand the existing market base, encourage strategic sourcing of goods and

services within the region as well as create employment.

The third AEC pillar seeks to achieve sustainable and balanced growth and development through equitable economic development. This is done through creative initiatives that encourage SMEs to participate in regional and global value chains, and focused efforts to build the capacity of the ASEAN's new member states to ensure their effective integration into the economic community.

The fourth AEC pillar envisages nothing less than ASEAN's full integration into the global economy. This is pursued through a coherent approach towards external economic relations, including through free trade areas and comprehensive economic partnership agreements, and enhanced participation in global supply network.

(2) Key Achievement Toward a Single Goods Market

Under the goal of creating market and production base are the central themes of the free flow of goods, services, investment, and skilled-labor as well as freer flow of capital, as mentioned earlier. For goods, the aim has been no less than to eliminate trade bottlenecks; that has involved the daunting task of removing tariffs, reducing paper work and cutting the waiting times of getting products to market, with the added benefit to reducing risks associated with consigning goods.

Significant progress has been made in tariff elimination. Pursuant to the commitments made in the ASEAN Free Trade Area (AFTA) in 1992, and later in the ASEAN Trade in Goods Agreement (ATIGA) in 2010, Member States have eliminated import duties among themselves by 2010 for the ASEAN-6 (Brunei Darussalam, Indonesia, Malaysia, the Philippines, Singapore and Thailand), and – by 2015 with flexibility to 2018 – for CLMV (Cambodia, Lao PDR, Myanmar and Vietnam). To date, the ASEAN-6 have virtually eliminated their intra-regional tariffs, with 99.2% of tariff lines at 0%. For the CLMV, the figure stands at 90.9% giving and ASEAN average of 96%.

(3) Key Achievement Toward a Connected AEC

A competitive economic region is a connected region. In a world of global value chains, production spans distant locations and across multiple borders. To stay competitive, transport time and distribution costs need to be reduced through infrastructure development as well as efficient and enhanced institutions.

Spanning diverse topographies, from archipelagic Indonesia and the Philippines, to a landlocked Lao PDR and the single island city state of Singapore, ASEAN requires an integrated approach to connectivity. Efficient logistics and distribution services are an important source of regional competitiveness, particularly for perishable and other time-sensitive goods. To achieve this requires support for physical infrastructure like

highway, airports and rail links, power grids and gas pipelines as well as improving cross-border agreements and institutional connectivity.

(4) Transport Time and Distribution Costs Need to be Reduced

The ASEAN Highway Network is a vital infrastructure and logistics component, which supports trade facilitation, investment opportunities and tourism. The Singapore-Kunming Railway Link (SKRL) is a development project linking ASEAN with China over a total length of around 7,000 km. Work toward the completion of such flagship infrastructure projects, which have been identified as priorities in ASEAN's transport cooperation, will continue beyond 2015.

(5) A Globally-engaged ASEAN

A well-positioned region at the center of global production networks, ASEAN has relied on its competitive workforce, resources, knowledge and skills, as well as diverse strengths and potentials to integrate into the global economy. The region also seeks to make the most of trade and investment links with major regional economies through the "ASEAN+1" free trade and comprehensive economic partnership agreements (FTAs/CEPs) with China, Japan, the Republic of Korea, India, Australia and New Zealand.

ASEAN has elevated these partnerships by asserting its centrality and taking a lead in negotiations towards the Regional Comprehensive Economic Partnership (RCEP), a Free Trade Agreement (FTA) involving ASEAN and its six FTA partners. Starting in 2014, negotiations for this ASEAN-led agreement are expected to be substantially concluded by the end of 2015, with further technical works to continue into 2016. RCEP is aimed at achieving a modern, comprehensive, high-quality and mutually beneficial economic partnership agreement between ASEAN and FTA partners. With combined GDP of about US$ 22.7 trillion, about 30% of global output, the RCEP also has the potential to transform the region into the world's largest integrated markets of about 3.4 billion people (or nearly half of the world's population). When concluded, RCEP is expected to deliver tangible benefits to business through potential improvements in market access, trade facilitation, regulatory reform and more trade-facilitative rules of origin. It will mark the early success of ASEAN as a collective and pro-active player in global trade and economic governance.

5.1.2 Brunei Action Plan (2011-2015)

The remarkable economic growth in many of ASEAN Member States (AMSs) has been a success story of economic development in the world. In achieving this growth, AMSs have successfully been attracting Foreign Direct Investment (FDI), upgrading industrial structures, and integrating themselves more into the world economy through the participation in the international and regional production and distribution networks. All these developments have

been supported by continuous improvement of the transport infrastructure network and services in the region.

Indeed, an efficient, secure and integrated transport network in ASEAN is still vital for realizing the full potential of the regional economic integration as well as further enhancing the attractiveness of the region as a single production, tourism and investment destination. An integrated transport network is also vital for narrowing development gaps in the region. This task has been set as the ultimate objective 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 (AEC)** Blueprint and the Roadmap for the ASEAN Community adopted by the ASEAN Leaders in 2009. To achieve this objective, cooperation and integration of the ASEAN transport sector have been guided by a series of consecutive plans of actions, i.e. 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 (ATAP)** 2005-2010 that covers land, air, and maritime transport, and transport facilitation.

As the ATAP expired in 2010, the **ASEAN Strategic Transport Plan (ASTP)** 2011-2015, also referred to as **Brunei Action Plan (BAP)** 2011-2015 adopted as its successor plan to provide the main reference guiding ASEAN transport cooperation and integration up to 2015. Based on a comprehensive assessment of the current transport situation in ASEAN and of the achievements in the implementation of the ATAP and other related plans, the ASTP identifies strategic actions to be implemented in the period 2011-2015 to support the realization of the AEC by 2015 as well as the new priority of enhancing regional connectivity identified in the Master Plan on ASEAN Connectivity (MPAC). The ASTP is also formulated to reflect other ongoing developments in the world such as changing economic landscape, mainly due to emergence of new economic powers such as China and India, and growing global concerns over environment, climate change, safety and security. It also seeks to identify long-term vision of ASEAN transport cooperation beyond 2015. The ASTP was formulated based on the comprehensive assessment and recommendations of the Final Report on the ASTP: 2011-2015 prepared and submitted by the Economic Research Institute for ASEAN and East Asia (ERIA) Study Team with the financial and in-kind support from the ERIA.

(1) ASEAN Transport Action Plan (ATAP): 2005-2010

In the period of 2005-2010, ASEAN transport cooperation has been guided by the ATAP 2005-2010 and three sectoral Roadmaps, i.e. the Roadmap for Integration of Air Travel Sector (RIATS), the Roadmap towards an Integrated and Competitive Maritime Transport in ASEAN and the Roadmap for the Integration of Logistics Services (RILS), which identified sectoral goals and strategic thrusts. The ongoing actions will be carried over to the ASTP as they are still highly relevant up to 2015 and beyond.

(2) Strategic Goals, Actions and Milestones for 2011-2015

Developing an efficient, secure and integrated transport system to support the realization of the AEC and regional connectivity through improving its competitiveness and attractiveness to investments, facilitating the flow of goods, services and people, and integrating with the global economy, as identified in the previous ASEAN transport plans of actions, will remain the ultimate objective of ASEAN transport cooperation in the period of 2011-2015 and beyond. Towards that end, the ASEAN transport sector will continue to undertake concerted actions in all four areas of land transport, air transport, and maritime transport and transport facilitation to achieve the specific strategic goals set for each area in line with the ultimate objective.

(3) Land Transport

The main goal for land transport is to establish a safe, efficient, environmental-friendly and fully integrated regional land transport system to promote trade and tourism within ASEAN and with neighboring countries. The priority will be given to the completion of the ASEAN Highway Network (AHN) and the Singapore-Kunming Railway Link (SKRL) so that the land transport infrastructure network could help realize the strategy of developing the economic development corridors. Taking into account various advantages of railways and inland waterway related to climatic and environmental benefits, efforts are required to improve their share in ASEAN. The strategic goals and actions are set for the land transport sector for the period 2011-2015 is shown in **Table-5.1.1**:

Table-5.1.1 Strategic Goals and Actions of Land Transport Development

Ref. No.	Action Plan
LTG-1.	Accomplish the implementation of the SKRL project;
LTG-2.	Complete the ASEAN Highway Network (AHN);
LTG-3	Reduce road fatalities by 50% in AMS by 2020;
LTG-4.	Establish efficient and integrated inland waterway transport (IWT) network;
LTG-5	Develop “Intelligent Transport System” (ITS)
LTG-6	Enhance human, technical and institutional capacity in ASEAN Member States (AMS)
LTG-7	Establish a sustainable, energy efficient and environmental-friendly transport system.

(4) LTG-1 Accomplish the implementation of the SKRL Project.

The SKRL has been a priority agenda in the ASEAN transport cooperation, and the political motivation to complete the SKRL is significantly high. The SKRL is expected to provide an alternative mode of land transportation, which is more environment-friendly than road transportation. The SKRL has two lines, the Eastern Line through Thailand, Cambodia and Vietnam, with a spur line between Lao PDR and Vietnam, and the **Western Line through Thailand and Myanmar (see Figure-5.1.2)**. The main tasks to be undertaken to achieve this goal are to complete the missing link sections, especially those linking between

Cambodia with Vietnam, Cambodia with Thailand and Myanmar with Thailand, and to upgrade some sections to support the smooth operation of the whole SKRL. **Figure-5.1.2** illustrates the railway network of SKRL over the Indochina Peninsula. The specific actions and timelines to achieve this goal are as shown in **Table-5.1.2** below:

Table-5.1.2 Actions and Time Line of Development of SKRL

LTA-1	**Construct the missing link sections and spur lines of SKRL**				
Country	Terminal Location	Via	Terminal Location	Distance (km)	Target Year
Myanmar	**Thanbyuzayat**	**-**	**Three Pagoda Pass**	**111**	**2020**
Cambodia	Poipet	-	Sisophon	48	2013
Cambodia	Phnom Penh	-	Loc Ninh	255	2015
Lao PDR	Vientiane	Thakek	Mu Gia	466	2020
Vietnam	Loc Ninh	-	Ho Chi Minh	129	2020
Vietnam	Mu Gia	Tan Ap	Vung Ang	119	2020
LTA-2	**Supplementary Upgrading Works in AMS to Support SKRL (Rehabilitation, double tracking)**				
Country	Terminal Location	Via	Terminal Location	Distance (km)	Target Year
Cambodia	Sisophon	-	Phunom Penh	338	2013
Malaysia	Ipoh	-	Padang Besar	329	2013
Thailand	Kaeng Khoi	Bua Yai	Nong Khai	586	2013
LTA-3	Formulate a Strategy for a Seamless Operation of SKRL by 2013				
LTA-4	Mobilize financial resources and technical assistance from external partners, either on a bilateral basis or with the coordination of ADB, to support the completion of SKRL in accordance with the agreed deadline.				
LTA-5	Study the Possibility of Extending the SKRL to Surabaya, Indonesia				
LTA-6	Conduct a Feasibility Study and Preliminary Design for the Railway Spur Line between Kanchanaburi and Dawei[1]				

As the initial capital investment cost for railway track construction works alone between Dawei and Laem Chabang Port (460 km long) was estimated to be US$ 2.6 billion which is too high and not financially viable, the another route linking Kanchanaburi and Dawei are under selection for financial evaluation at present although no funding for such study has been secured yet at the time of writing this report.

[1] LTA-6 was executed by the team of Thai engineering consultants in 2016. The estimated cost for 145 km in Myanmar (Dawei – Phu Nam Long is US$ 2.2 billion and for 315 km in Thailand (Laem Chabang Port Freight Station) is US$ 2.4 billion. In total of 460 km the estimated cost reached to US$ 4.6 billion for double track railway with 1,000 mm gauge.

Source: ASEAN Secretariat, Brunei Action Plan

Figure-5.1.2 Singapore-Kunming Rail Link (SKRL) Route Network

(5) LTG-2 Complete the ASEAN Highway Network.

Sustaining and supporting the rapid economic and social development in ASEAN presents a range of complex challenges for the land transport system. Providing the capacity to accommodate vastly increasing vehicles especially 2-3 wheelers, freight volumes and meet the personal mobility needs of burgeoning urban populations is in itself a daunting task. Considering that currently railways and inland waterways have a very limited role in ASEAN, it is likely that the road sector will continue its dominance in the forthcoming years. With such trend, it is vital to accelerate the implementation of the AHN Project, especially to complete the missing sections and improve the quality of road infrastructure in the AMSs as envisaged in the MOU on the ASEAN Highway Network (AHN) Project. **Figure-5.1.3** illustrates the AHN over the geographic coverage of ASEAN.

Considering the importance of **Transit Transport Routes (TTR)** in enhancing the trade and economic growth in the AMSs, the highest priority is given to upgrade existing "below Class III" sections of the TTR, total road length of which is 1,999.55 km in Indonesia, Lao PDR, and Myanmar, by 2012. The second priority is given to the construction of the missing links in Myanmar (201km), and upgrading of other "below Class III" sections in Indonesia, Lao PDR, Malaysia, Myanmar, and Vietnam, with a total length of 4,536.7 km. The upgrading of other existing "Class II or III" roads with high traffic volume to "Class I" could also be implemented,

subject to the availability of financial and other resources in the respective country.

Taking advantage of the strategic location of ASEAN as the geographic center of Asia, the most vibrant economy in the world, ASEAN has set a goal to become a transport hub in the region. For this purpose, road infrastructure development needs to be prioritized from the perspective of ASEAN and surrounding regions. It is therefore important to expedite the completion of the East-West Economic Corridor (EWEC) by constructing the missing link in Myanmar, to promote the Mekong – India Economic Corridor (MIEC) by constructing the Mekong Bridge in Neak Loeung (Cambodia)[2], a highway between Kanchanaburi and Dawei, and to upgrade the extension of the AHN to China and India, particularly sections from Hanoi via northern Lao PDR through Myanmar to the border with India, by 2015. Identifying and developing a network of dry ports in accordance with existing ASEAN initiatives such as the SKRL and the AHN would also need to be considered to support the development of regional multimodal transport systems in order to enhance intra- and extra-ASEAN connectivity.

Source: ASEAN Secretariat, Brunei Action Plan

Figure-5.1.3 ASEAN Highway Network (including Asian Highway)

[2] Neak Loeung Bridge known as Tsubasa Bridge (2.2 km long) along the highway linking Kandal Province with Neak Loeung in Cambodia is the longest bridge across the Mekong River in Cambodia was founded and built by a grant-in-aid of the Government of Japan and it was opened to traffic in April 2015.

The specific actions and timelines to achieve the goal of LTG-2 are as shown in **Table-5.1.3** below:

Table-5.1.3 Action Plan of LTG-2 Development of ASEAN Highway Network

LTA-7	**Complete the AHN by Constructing the Missing Links and Upgrading Class III and Above**				
■	**Upgrading "below Class III" Roads on the TTR by 2012**				
Country	Section	Distance (km)	Section	Distance (km)	Target Year
Myanmar	AH1	781	AH2	593	2012
	AH3	93			2012
Lao PDR	AH12	293	AH15	98	2012
Indonesia	AH25	141			2012
■	**Construction of Other Missing Link Sections on the AHN**				
Country	Section	Distance (km)	Section	Distance (km)	Target Year
Myanmar	AH112	60	AH123	141	2020
■	**Upgrade "below Class III" Roads on the TTR by 2012**				
Myanmar	AH111	239	AH112	1,085	2012
Lao PDR	AH131	96	AH132	126	2012
Vietnam	AH13	215	AH132	160	2012
Malaysia	AH150	40			2012
Indonesia	AH150	1,762	AH151	612	2012
Myanmar	Construct the Missing Link of EWEC in Myanmar				
Myanmar	Build the Highway between Kanchanaburi and Dawei by 2020				
Myanmar	Upgrade the Extension of AHN to China and India, particularly sections from Hanoi via Northern Lao PDR through Myanmar to the border with India by 2015				
Cambodia	Construct the Mekong Bridge in Neak Loeung (National Road No.1 in Cambodia) by 2015				
■	Upgrade "Class II or III" Sections with High Traffic Volume to "Class I" by 2020				
LTA-8	**Identify and Develop a Network of ASEAN Dry Port in accordance with existing ASEAN initiatives such as AHN and SKRL**				
LTA-9	Install Common Road Signs and Route Numbering System in All Designated Route with a Specific Priority on TTR Routes				
LTA-10	Conduct a Feasibility Study on Bridging the Archipelagic and the Mainland ASEAN by 2015				
LTA-11	Formulate "the ASEAN Regional Road Safety Strategy Plan 2-12-2020" and "National Road Safety Action Plan 2012-2020" by the year 2012 and their Implementation				

Source: Study Team based on Brunei Action Plan

5.1.3 Implementation Progress of the Brunei Action Plan (BAP) 2011-2015

(1) Land Transport

The priority of land transport work has been given to the completion of the ASEAN Highway Network (AHN) and the Singapore-Kunming Rail Link (SKRL) project. Currently, there are two ongoing constructions of SKRL missing link sections, i.e. Poipet-Sisophon and Aranyaprathet - Klongluk. The construction of Aranyaprathet-Klongluk Section including the railway bridge connection between Cambodia and Thailand with funding from the Government of Thailand was completed in August 2015.

SKRL: The construction of SKRL section from Phnom Penh to Tra Peang Sre (Cambodia/Vietnam border) is behind schedule and still seeking fund for the project implementation. On SKRL sections from Lao PDR (Vientiane-Thakek-Mu Gia) to Vietnam (Mu Gia-Tan Ap-Vung Ang), ROK confirmed that the feasibility study on development of said railway lines had been approved by its National Assembly and would be announced

soon. On the proposed construction of SKRL network between Myanmar (Thanbyuzayat-Three Pagoda Pass) and Thailand (Three Pagoda Pass-Nam Tok), both Member States agreed to replace it with the railway line linking Dawei Port (Myanmar) to Kanchanaburi (Thailand). The supplementary upgrading work in Cambodia, Malaysia and Thailand to support SKRL has made good progress. Cambodia completed the Phase I rehabilitation project from Phnom Penh to Bat Deoung in March 2014 and will start the work on strengthening all railway bridges for Bat Deoung-Sisophon (306 km) section in 2016.

ASEAN Highway Network (AHN): On AHN there are no more AHN missing links in the region and the total length of roads below Class III reduced by 46.2%, from 5,311.2 km in 2010 to 2,454 km in 2015, which include 1,200 km on the priority Transit Transport Routes (TTR). Lao PDR and Myanmar have put up efforts to upgrade their below class III roads on TTR by 2019 and 2021, respectively. The upgrading of AH-112 road sections from Thanbyuzayat to Lehnya (719 km) and AH-123 connects Dawei Special Economic Zone and the border town Htiki/Ban Phu Nam Ron (132 km) is expected to be completed by 2020. On the missing link of 'East West Economic Corridor' in Myanmar, it was completed as Myanmar confirmed that there is no missing link in the said corridor.

Road Safety: As to road safety, ASEAN Member States have made good progress towards increasing the level of road safety in the region. Most ASEAN Member States have developed or revised their respective national road safety action plans to be aligned with the United Nations Decade of Action for Road Safety 2011-2020 that aims at stabilizing and then reducing the forecast level of global road fatalities and serious injuries by increasing activities conducted at national, regional and global levels. As to the framework for road safety strategies at regional level, ASEAN has come up with the ASEAN Regional Road Safety Strategy which was adopted by the 40th Senior Transport Officers Meeting (STOM) and 21st ASEAN Transport Ministers Meeting (ATM) in November 2015 in Kuala Lumpur. ASEAN Member States have also appointed the Malaysian Institute of Road Safety Research (MIROS) as an ASEAN Regional Road Safety Centre which aims to provide knowledge on road safety situation in ASEAN Member States which include information on the following: traffic laws and regulations, road accident data, road transport data, vehicle regulations concerning standard and inspections, driver training and driver testing, traffic police activities, road safety training in schools, road safety information/campaigns to the community.

Intelligent Transport System (ITS): Under the BAP, ASEAN is committed to formulate Intelligent Transport Systems Master Plans for ASEAN and respective Member States. ASEAN Member States recognized that ITS plays an important role in shaping the future ways of mobility and the transport sector. In this regard, ASEAN Member States underscored the need to update and refresh the first version of the ITS Policy Framework and

come up with the second version of the ASEAN ITS Policy Framework. The review and update of ASEAN Intelligent Transport System (ITS) Policy Framework is in progress and expected to be completed by 2016.

(2) Transport Facilitation

Operationalization of Protocol : The ASEAN Framework Agreement on the Facilitation of Goods in Transit (AFAFGIT) has been in force since 2000 however its full implementation relies on the operationalization of its protocols. The ASEAN Framework Agreement on the Facilitation of Inter-State Transport (AFAFIST) is ratified by and in force in Cambodia, Lao PDR, the Philippines, Thailand and Vietnam; while the ASEAN Framework Agreement on Multimodal Transport (AFAMT) is ratified by and in force in Cambodia, Myanmar, Lao PDR, the Philippines, Thailand and Vietnam. ASEAN Member States are exerting their efforts to enact their domestic laws to fully operationalize AFAMT.

ASEAN Customs Transit System (ACTS): Given the importance of efficient cross border operations in the region to support the realization of AEC, significant efforts are required to minimize and eventually remove the barriers at national borders. To this end, the European Union (EU) through the ASEAN Regional Integration Supported by EU (ARISE) has extended technical assistance to ASEAN Member States which aims to progress in removing barriers related to transport including preparation for and implementation of ASEAN transport facilitation agreements and other relevant initiative to facilitate movement of goods and passenger vehicles as well as implementation of connectivity initiatives. The activities under ARISE also include ASEAN Customs Transit System (ACTS) pilot project which is targeted to be implemented in 2016.

People Mobility: To support greater people mobility within the region, as mandated by the BAP and Master Plan on ASEAN Connectivity, ASEAN Member States is finalizing the ASEAN Framework Agreement on the Facilitation of Cross Border Transport of Passengers by Road Vehicles (ASEAN CBTP). The agreement will facilitate cross border transport of people between and among the Contracting Parties through road vehicles and to simplify and harmonize transport, customs, immigration, quarantine procedures and requirements.

Logistics Industry: With regard to logistics industry, ASEAN Member States recognized the need to enhance the competitiveness of the industry through capacity building. In this context, the project on “Sustainable Human Resources Development in Logistics Services for ASEAN Member States” had been carried out by the ASEAN Federation of Forwarders Association (AFFA) with the technical assistance from Japan. The output of the project is Train-for-Trainer Manuals, which form Core Curriculum for Logistics and Supply Chain Management.

5.1.4 ASEAN Transport Cooperation Beyond 2015

The ASEAN Strategic Transport Plan (ASTP) stipulates specific goals, actions and milestones in support of the enhancement of the ASEAN Connectivity and the establishment of the AEC by 2015. It is noted that the target implementation date of 2016 was made by ASEAN Leaders in January 2007 to accelerate the establishment of AEC as originally envisioned in the ASEAN Vision 2020, in response to intensifying global and regional competitions. There is a need to look beyond 2015 and formulate a vision for continuing and strengthening ASEAN transport cooperation after the 5 years under the ASTP. Some of the actions agreed in this ASTP will not be completed by 2015 and need to be continuously taken into consideration beyond 2015. In order to achieve truly ultimate objective of ASEAN transport cooperation, ASEAN needs to formulate a common transport policy, as the ultimate goal of ASEAN transport cooperation.

(1) Land Transport in 2015 and Beyond

The improvement of the AHN will facilitate economic growth but at the same time, if not planned, it would also generate more traffic volume, congestions, accidents and carbon emission. To avoid such situation, the balance between the economic growth and transportation need to be maintained. The AHN and the SKRL, when completed, will serve as the main skeleton of land transport for the region. Further development vertically at the national level is necessary for improved accessibility, as well as horizontally at the regional level to support regional economic development. In this process, efforts must also be directed to mitigating negative environmental and social impacts, controlling carbon emissions, promoting energy efficient multimodal transportation (including possible modal shifts), encouraging the use of public transportation, improving network level transportation service by appropriate utilization of ITS and Information and Communication technology (ICT) and reducing traffic accidents.

The regional land transport network will be developed during the ASTP duration and it will gain popularity and importance, and will offer new business opportunities for the people. However, globalization is an irreversible trend and new challenges and demands will emerge in land transport sector. The reduction of private vehicles, reducing congestions and accidents, developing integrated multimodal transport, utilization of ITS and ICT, enhancing capacity, strengthening financial system and controlling carbon emission will be the major challenges for land transport sector in 2015 and beyond.

(2) Controlling Carbon Emission

Considering the consequences of global warming, the challenge of land transport sector will reduction of the carbon emission generated by transport sector. Along with the development of public transport, the efficient rail network and inland waterway will be the key and will

facilitate in controlling the carbon emission. However, the success of the rail transport and to certain extent Inland Water Transport (IWT) will depend on three basic concepts i.e. comfortable, economical and time-saving and these concepts need to be addressed during the planning of projects to win the acceptability from the people. Being economical and energy efficient, IWT can play a more important role in freight transportation. For better and greener future, the other alternatives like use of bio-fuel, design of better mileage vehicles, use of renewable energy in transport also needs to be promoted and planned for.

(3) Multimodal Transport and Land Bridge Corridors:

The central role of regional initiatives will be to cooperate in the building of the trunk routes by road, rail and waterway, with feeder, local and distribution networks and interlinking them with other modes of transport, which will provide access to intra, inter-regional and global networks. The development of "Multimodal Transport" including "Land Bridge Corridors" will be the thrust area in the future. For better accessibility with the rest of the world, the SKRL network and AHN need to be fully developed and to be integrated with "Trans-Asian Railways" and "Asian Highways" respectively.

5.1.5 Transport Facilitation in 2015 and Beyond

Multimodal Transport System: There are still a lot of challenges that ASEAN has to address and to work on beyond 2015 for transport facilitation to enhance the competitiveness of ASEAN logistics industry. Establishment of safe and secure inter-state transport system is one of the most important challenge to improve ASEAN's competitiveness in the world. Full operationalization of the three framework agreements on transport facilitation has to be accelerated alongside the ASTP and the Master Plan on ASEAN Connectivity (MPAC) to minimize the dwell time of trucks at national borders to decrease the transaction costs of moving goods between countries in the region. This is an essential element to realize the vision of "single market and production base" as envisaged in the AEC Blueprint, and it is necessary to cooperate with the implementation bodies for trade facilitation.

It is important for ASEAN to streamline sectoral strategies with reference to the concept of multimodal transport system in order to enhance intra and inter ASEAN connectivity. Although the full implementation of the strategy will take a long time, it is nevertheless important to have a clear strategy for multimodal development in the ASEAN region in consonance with developments in the border of ASEAN+6 (ASEAN plus China, India, Japan, South Korea, Australia and New Zealand) region.

5.1.6 Kuala Lumpur Transport Strategic Plan (ASEAN TRANSPORT STRATEGIC PLAN 2016-2025)

Transport has been recognized by the ASEAN Leaders as the very basis of the ASEAN economic development and integration as it plays a crucial role in the movement of goods, services, capital and people. It also provides great support in binding ASEAN's economies closer together and in building the ASEAN Economic Community that is so vital for the future of ASEAN nations. The ASEAN Strategic Transport Plan / Brunei Action Plan (BAP), which was adopted by the 16th ASEAN Transport Ministers (ATM) Meeting in November 2010, serves as the main reference guiding ASEAN transport cooperation and integration as well as identifies strategic actions to be implemented in the period 2011-2015. The BAP also supports the new priority of enhancing regional connectivity identified in the Master Plan on ASEAN Connectivity (MPAC).

Through the BAP, ASEAN Member States continue to undertake concerted actions to achieve the specific strategic goals set for transport sector in line with the ultimate objective to realize an efficient and integrated transport system to support the realization of the ASEAN Economic Community and for ASEAN to integrate with the global economy, improve competitiveness and enhance the inflow of foreign direct investment. In line with ASEAN's work on post-2015 vision and with the successful conclusion of BAP, ASEAN Transport Ministers agreed to formulate the transport vision for post-2015 and develop the successor of BAP, namely: ASEAN Transport Strategic Plan or Kuala Lumpur Transport Strategic Plan (KLTSP).

KLTSP: The KLTSP aims to support the realization of the vision of the ASEAN Economic Community (AEC) 2025 which calls for a deeply integrated region that will contribute towards a highly cohesive ASEAN economy. In this regard, the KLTSP, which serves as a guiding regional policy document, outlines 30 specific goals, 78 actions and 221 milestones in the areas of air transport, land transport, maritime transport, sustainable transport and transport facilitation.

The KLTSP was developed by the members of the Task Force on the Development of Successor ASEAN Strategic Transport Plan through consultation and with the inputs from the ASEAN Secretariat and all working groups, and sub-working groups under the ambit of STOM. The KLTSP has been built upon the achievements of the BAP 2011-2015 and aligned with the following post-2015 vision for transport cooperation which was adopted by ASEAN Transport Ministers:

"Towards greater connectivity, efficiency, integration, safety and sustainability of ASEAN transport to strengthen ASEAN's competitiveness and foster regional inclusive growth and development"

Land Transport Infrastructure: Recognizing that transport infrastructure is a key determinant of performance in the transport sector, ASEAN Member States shall continue to achieve land transport infrastructure (road and railway) integration and inter-modal interconnectivity, with principal airports, ports, and inland waterway and ferry links. ASEAN Member States shall also promote concerted and coordinated efforts at policy and operation level to develop ASEAN land transport trade corridors.

Road Safety: With regard to road safety, considering that the 2013 World Health Organization Global Status Report on Road Safety, which describes that 1.24 million people are killed on the roads a year, of which 53,537 are from ASEAN Member States, causing major threats to public health and development around the globe and taking into account the rapid growth of motorization in the region, ASEAN Member States underscored the need to undertake collective effort to reduce the risk of road crashes especially among vulnerable road users.

Sustainable Transport: As the international community is paying increasing attention to the transport sector as one of the crucial components for sustainability of development patterns, ASEAN Member States agreed to actively pursue sustainable transport and include this issue as part of regional transport strategic plan. The approach for increasing transport sustainability will focus on formulating a regional policy framework to support sustainable transport, which includes low carbon modes of transport, energy efficiency and user-friendly transport initiatives, integration of transport and land use planning.

Transport Facilitation: Considering that transport costs and high-quality services are increasingly significant for trade and production patterns, for the period of 2016-2025, ASEAN Member States shall continue to exert their effort to operationalize transport facilitation agreements that directly impact the logistics sector in the future. The operationalization of the ASEAN Framework Agreement on Facilitation of Cross-Border Transport of Passengers by Road Vehicles (CBTP) shall also be worked on. In addition, ASEAN Member States shall undertake various programs or activities to enhance capacity and skills development to further progress regional transport facilitation cooperation as well as transport facilitation beyond ASEAN.

5.1.7 ASEAN Protocol for Logistics

ASEAN Transport Ministers agreed and concluded the ASEAN Sectoral Integration Protocol for the logistics services sector

The objectives of this initiative are to:

- Create an ASEAN single market by 2015 by strengthening ASEAN economic integration through liberalization and facilitation measures in the area of logistics services; and

- Support the establishment and enhance the competitiveness of an ASEAN production base through the creation of an integrated ASEAN logistics environment.

The roadmap provides concrete actions that ASEAN Member Countries shall pursue to achieve greater and significant integration of logistics services in ASEAN, through progressive implementation of the measures, which include the liberalization of logistics services, enhancing competitiveness of ASEAN logistics services providers through trade and logistic services facilitation, expanding capability of ASEAN logistics service providers, human resources development, and enhancing multimodal transport infrastructure and investment.

5.2 Strategy and Action Plan for the Greater Mekong Sub-region (East-West Economic Corridor)

The Strategy and Action Plan for the EWEC as a means of consolidating planning and programming activities by government authorities and development partners were prepared in 2010 by the Asian Development Bank.

The EWEC vision is to create an economic corridor that will stimulate the type of economic growth that reduces poverty and raises the standards of living in the areas covered by the corridor. The goals of the EWEC are, (i) to enhance connectivity of the corridor areas by reducing cross-border transactions and transportation costs; (ii) to increase competitiveness through economies of scale offered by cross-border investments that based on value-adding process and take advantage of the comparative advantages of different areas within the corridor; (iii) to empower the private sector by promoting joint financial, technological, marketing, production, and other collaborations in the EWEC areas; and (iv) to reduce poverty, support development of rural and border areas, and increase the earnings and provide employment to the low-income group.

Enhancing connectivity: The strategic objective for enhancing connectivity in the EWEC involves the completion of the main artery of the corridor through multimodal transportation systems and developing secondary road systems to link rural communities to markets. Those infrastructural improvement aim to improve linkage to gateway and interchange nodes by saving time, reducing risks, and lowering transportation costs; encouraging trade along the corridor, as well as promoting production and employment opportunities; and improving the livelihood of people in the corridor area. The proposed secondary road improvement program will support the latter objective by helping to link rural areas to markets. **Figure-5.2.1** illustrates the GMS transport corridor as well as the East-West Transport Corridor.

Source: ADB

Figure-5.2.1 GMS East-West Transport Corridor

The East West Economic Corridor (EWEC) was launched in 1998 as one of the flagship initiatives of the Greater Mekong Sub-region (GMS). It has adopted a holistic approach to developing a cost-effective way of instituting an efficient transport system for moving goods and people in the sub-region, while simultaneously developing telecommunications and energy infrastructure, tourism, and a policy and regulatory environment that facilitates and encourages private sector development. The corridor extends 1,320 km as a continuous land route between the Andaman Sea in the Indian Ocean and the South China Sea. It links important commercial nodes in each ASEAN member countries: (i) Mawlamyine - Myawaddy in Myanmar, (ii) Mae Sot – Phitsanulok - Khon Kaen – Kalashin - Mukdahan in Thailand, (iii) Savannakhet - Dansavanh in the Lao PDR, and (iv) Lao Bao-Dong Ha-Hue-Da Nang in Vietnam. The border nodes contain checkpoints of Myawaddy-Mae Sot between Myanmar and Thailand, Mukdahan – Savannakhet between Thailand and the Lao PDR, and Dansavanh - Lao Bao between the Lao PDR and Vietnam. The gateway nodes include the important gateway at Da Nang in Vietnam and Mawlamyine in Myanmar for access to external market. There are five interchange nodes as Myawlamyine in Myanmar for the interchange of Yangon-Dawei, (ii) Phitsanulok in Thailand, (iii) Khon Kaen in Thailand for the interchange of Nong Khai – Bangkok, (iv) Khanthabouly in the Lao PDR, and (v) Dong Ha in Vietnam for the interchange for Highway 1A leading to the North-South Economic Corridor.

Border Nodes between Myanmar and Thailand: There are two border nodes located at present between Myanmar and Thailand. One is at the border gate at Myawaddy (in Kayin State) and one is at the Three Pagoda Pass (in Mon State). The details of the two cross-border points/nodes are as follows:

(1) Myawaddy Cross Border point/node

The border node or cross-border point between Myanmar and Thailand in southeastern part of Myanmar, at Myawaddy (in Kayin State, Myanmar) and Mae Sot (in Thailand) was connected by the Friendship Bridge in 1997. However the bridge is narrow and is limited for small trucks only. Therefore the trans-loading from large trucks to small trucks is needed on both sides of the cross-border point. Trans-loading operations take around 36 hours at minimum. Thus various logistics providers have built their own warehouses to meet cargo traffic demand. The Myawaddy Trade Zone opened in 2008 and the industrial zone (200 ha.) in 2011. The trade value registered at Myawaddy has increased from US$145 million (around 330,000 tonnes) in 2012 to US$ 726 million in 2015 (around 1.9 million tonnes). The average annual growth rate of cross-border trade at Myawaddy in the four years since Myanmar opened to the World was recorded at 72%, which is remarkable. This rapid growth of border trade has continued at similar (high) rate of growth.

As the capacity of bridge linking Myanmar and Thailand at Myawaddy is insufficient to handle a rapid increase in cross-border trade, another bridge was planned to be constructed in 2013. The construction works of the Second Friendship Bridge (of a suspension type) capable of carrying heavily loaded trucks of GVW 60 tonnes, started in July 2015. Construction works at the bridge are almost completed and the bridge is expected to be commissioned in 2018, after the completion of the connecting road between the new bridge and the Myawaddy Trade Zone.

The Ministry of Transport and Communications (MOTC) and MIFFA outlined four steps to improve logistics at the Thai-Myanmar border's major trading point, located between Myawaddy and Mae-Sot in Thailand. The first step involves manual trans-loading; the second refers to the exchange of containers by crane-lifting; the third is the current pilot scheme exercising semi-trailer swapping or so-called head change; and the fourth and ultimate goal is to have a system allowing the free flow of trucks across the border.

(2) The Three Pagoda Pass Cross Border point/node

The other border gate between Myanmar and Thailand is located at the Three Pagoda Pass (in Mon State), 160 km southeast of Mawlamyine. The rehabilitation of the national road stretching from Thanbyuzayat to the Three Pagoda Pass is ongoing in 2017. The cross-border transport infrastructure is still in its infancy and needs to be developed to meet with the rapid growth of cross-border trade at this border point with Thailand. The route length linking with Yangon and Bangkok via Mawlamyine, Thanbyuzayat and Three Pagoda Pass in Myanmar and Kanchanaburi in Thailand is around 690km, which is shorter than the route length linking Yangon and Bangkok, via Mawlamyine and Myawaddy in Myanmar and Rahaen in Thailand (780km). The railway link between Thanbyuzayat and Namtok in Thailand is the missing link of the SKRL and requires careful study ahead of construction.

5.3 ASEAN Economic Community

In August 2006 at the 38th ASEAN Economic Ministers Meeting (AEM) held in Kuala Lumpur, Malaysia, the ASEAN economic ministers agreed to develop a single and coherent blueprint for advancing the ASEAN Economic Community (AEC) by 2015 by identifying the characteristics and elements consistent with the Bali Concord II. The strategic schedule of the AEC blueprint is based on the four pillars; Pillar-1 Single Market and Production Base, Pillar-2 Competitive Economic Region, Pillar-3 Equitable Economic Development and Pillar-4 Integration into the Global Economy. The strategies for each pillar are composed of following elements:

Pillar-1	Pillar-2	Pillar-3	Pillar-4
Single Market and Production Base	**Competitive Economic Region**	**Equitable Economic Development**	**Integration into the Global Economy**
➢ Free flow of goods ➢ Free flow of services ➢ Free flow of investment ➢ Free flow of capital ➢ Free flow of labor ➢ Priority integration sectors ➢ Food, agriculture and forestry	➢ Competition policy ➢ Consumer protection ➢ Intellectual protection right ➢ Infrastructure ➢ Taxation ➢ E-commerce	➢ SME development ➢ Initiative for ASEAN Integration	➢ Coherent approach towards external economic relations ➢ Enhanced participation in global supply networks

Source: A Blueprint for Growth, ASEAN Economic Community 2015: Progress and Key Achievements, ASEAN Secretariat 2016

Under Pillar-1 Single Market and Production Base, liberalization is emphasized through the reduction and/or elimination of customs taxes on all trading goods. However, CLMV countries are exempted and need to eliminate customs taxes on sensitive products only by 2015. The member countries of ASEAN will be challenged to comply with all of the agreed conditions and elements by 2018.

(1) Impact of the AEC in the Region

In 2015, the AEC was formally established. As the major trade partners of Myanmar are the ASEAN countries and intra-regional trade and investment are emphasized under the AEC framework agreement, more ASEAN products will come into Myanmar with “No” customs tariff rates and ASEAN investment will flow into Myanmar. Therefore if Myanmar cannot export more, the incomes of people may decrease and some of the numerous SMEs may fail.

Although a large market with a total population of more than 600 million people in 2015 and the fact that tariff barriers amongst member countries have reduced steadily, the elimination of Non-Tariff Barriers (NTB) has not progressed as well. However, it is foreseen that the real economic integration of the AEC will progress strongly. In parallel with the growing of the intra-regional trade of ASEAN member countries, it is expected that the access to the global market through the Free Trade Agreement (FTA) and Economic Partnership Agreement (EPA) concluded by each of the ASEAN countries with industrialized countries will be

expanded and it will become easier thereby for trade to expand on a global scale.

Through the creation of the AEC, the intra-regional division of labor and intra-regional trade are expected to increase, which will contribute to the economic growth of the countries within the region, including Myanmar. For instance, the FDI and the large sized local manufacturers operating in Thailand plan and intend to optimize their production locations by reducing their labor costs and by reorganizing their logistics networks. This is so-called Thai Plus-One movement. The Thai Plus-One movement of Japanese manufacturers has been seen already in Cambodia and in Lao PDR. This movement is about to start in Myanmar soon, especially once the international container terminal is expanded and the cross-border infrastructure with Thailand is improved and expanded, and the cross-border transport agreement with Thailand is improved and implemented.

If the transit volume or movement of goods and people increases, the needs for cross-border trade and the development or improvement of transport infrastructure e.g. roads, railways and ports will increase, accordingly. If the cross-border trade expands, land-based freight transport volumes will increase, therefore the CLMV countries are considered as countries having economic advantage.

(2) Impact of the AEC to the Economy of Myanmar

Myanmar will likely benefit more from the reforms than most other ASEAN nations. Aside from Cambodia, in 2014 Myanmar had the lowest GDP per capita amongst member states, at $1,127, according to data from the IMF, compared to $2,862 in the Philippines, $3,524 in Indonesia and $5,896 in Thailand. From 2011 through 2014 Myanmar posted a compound annual GDP growth rate of 8.1%, compared to 3.6% in Thailand, 6.6% in the Philippines and 5.5% in Vietnam. The ASEAN-wide growth rate for the same period was 5.6%. Myanmar's relatively low level of economic development when compared to many of its neighbors, plus its competitively priced workforce and vast reserves of natural resources, mean that Myanmar is well positioned to grow under the AEC, which is expected to make trade and investment easier and cheaper between member states.

A key challenge for Myanmar in this climate is to manage trade effectively, and to ensure that it does not simply rely on raw natural resource exports for too long. The Government has worked to encourage valued-added exports across a variety of market segments, but a considerable amount of work is still required here. Myanmar has adopted an export-led policy, which better reflects the economic situation in Myanmar. There are still challenges, of course, but trade has more than doubled over the past five years, and it is clear that its neighbors will continue to purchase various products from Myanmar.

(3) Effect of the AEC to Customs Clearance

In order to achieve the goal of creating the AEC and the Initiative of ASEAN Integration, the first regional framework agreement focused was the trade liberalization and elimination of customs to enhance the free flow of goods among the member states forming the AEC. The

Cross-Border Trade Agreement (CBTA) between the countries bordering each other have been negotiated and concluded country by country in the past. In 2015 when the AEC was commissioned the CLMV (Cambodia, Lao PDR, Myanmar and Vietnam) were given the preparation time to operationalize the regional agreement framework to participate in the AEC in view of customs. In 2018, the CLMV join to the regional agreement fully.

Since the tariff of imported goods by member states of the ACE is unified to almost zero and the customs clearance procedure will be standardized and unified. Thus the Customs clearance will become simple and easy. It is expected that the required time to clear the goods from the customs area at the national border is expected to be reduced sharply. This simplification of customs clearance procedure and exercising free trade in the region would enhance the trade of Myanmar substantially.

5.4 Cooperation with Immediate Neighboring Countries

5.4.1 India–Myanmar–Thailand Trilateral Agreement

(1) Myanmar–India Bilateral Trade

In 2012, over 15% of Myanmar's total exports were directed to India. India is the third largest trade partner of Myanmar, following Thailand and the PRC. India–Myanmar bilateral trade has grown steadily, reaching a level of $1,813 million in 2012, of which Myanmar's exports to India were valued at $1,227 million, while imports from India were $586.7 million. In the early 1990s, bilateral trade stood at $55 million, then increased to $200 million in 2000, then to $1.8 billion in 2012.

Trade: Myanmar's exports to India at present are dominated by agricultural and forestry products, while the largest share of imports from India is pharmaceutical. Although the trade between Myanmar and India are open the volume of border trade is negligible compared to the global-trade of both countries. Myanmar's main imports from India at present are cotton yarn, auto parts, soya bean meal, and pharmaceuticals. The main exports to India are betel nuts, dried ginger, green mung beans, black beans, turmeric root, resin, and medicinal herbs. According to the Myanmar Department of Border Trade, the border trade turnover between India and Myanmar has ranged from $10 million to $22 million, without taking informal trade into account.

Cross-border Trade Point: India and Myanmar have four Cross-border Points (CBP) dealing with border trade, of which the Moreh–Tamu CBP is the most active. The Border Trade Agreement (BTA) signed between Myanmar and India in 1994 gave border trade a legal framework. The Moreh–Tamu Land Customs Station (LCS) was opened in April 1995, while a second border trade point at Champai–Rih was opened in 2004. Border trade is also allowed at Nampong–Pan Saung, while a trade point is being proposed at Avakhung–Pansat/Somrai. India and Myanmar signed a memorandum of understanding in 2012 to open border markets further.

Upgrading of Border Trade: There is still a low volume of border trade at the Moreh – Tamu LCS . The border point suffers from a lack of modern trade infrastructure (hardware and software), an absence of adequate security, and until recently, an anomalous exchange rate between India and Myanmar. Transport connections on both sides remain underdeveloped. Other problems include large informal trade (therefore, unaccounted), goods smuggling, including drugs and narcotics, and human trafficking. Ransoms paid to insurgent groups, political strikes, and ethnic conflicts at the border areas are common and are major deterrents to trade between the two countries. However, there are developments aimed at improving border trade. Both India and Myanmar have agreed to upgrade the status of border trade to normal trade. In December 2012, rice, wheat, medicines, and 18 other items were added to the list of goods for trade at India–Myanmar border areas.

Myanmar as a Prime Transportation Hub: Myanmar has the potential to become a prime transportation hub in Asia and to serve as a gateway between South Asia, Southeast Asia, and East Asia. It shares land borders with the People's Republic of China (PRC) to the north and northeast, the Lao PDR and Thailand to the east and southeast, and Bangladesh and India to the west and northwest. Strategic investments in transport infrastructure are urgently needed because existing transport links between Myanmar and its neighbors are limited and substandard. (Source: Myanmar: The Key Link between South Asia and Southeast Asia, ADBI Working Paper Series)

Shipping Routes**:** Various bilateral and multilateral programs are developing transport links to make the most of Myanmar's elongated shape, which features a 2,800-kilometer coastline with access to sea routes through the Bay of Bengal and major inland waterways. Physical connectivity with Myanmar's coastline and to the Indian Ocean has become a priority for Myanmar's neighbors. Their primary objective is to establish alternative shipping routes to reduce their dependency on the Strait of Malacca. As a result, Myanmar's infrastructure program is also focused on constructing deep-sea ports and on strengthening north–south connectivity via roads, railways, and inland waterways. (Source: Connecting Asia: Infrastructure for Integrating South and Southeast Asia, ADB Institute)

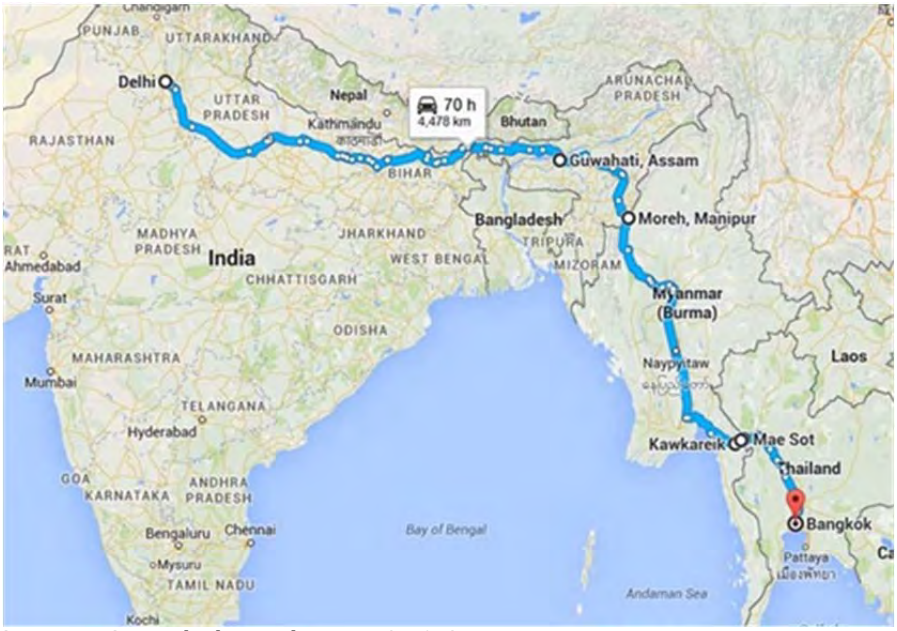
(2) Myanmar as a Gateway of India to Southeast Asia.

Myanmar is strategically important to India as it is the only ASEAN country that shares a border with India and can act as a link between India and ASEAN. In this point of view, Myanmar is India's gateway to Southeast Asia. Linking of the trilateral pact between India-Myanmar-Thailand (IMT) making way for the IMT Highway provides seamless vehicular movement between SAARC and ASEAN nations, enhancing trade, business, health, education and tourism between India, Myanmar and Thailand. The previously linked Bangladesh, Bhutan, India, Nepal (BBIN) Motor Pact had identified 14 routes for passenger services and seven routes for cargo movement. In order to catalyze investments from the

Indian private sector as part of Regional Comprehensive Economic Partnership (RCEP), there is a proposal for a Project Development Company through separate Special Purpose Vehicles setting up manufacturing hubs in Cambodia, Myanmar, Laos and Vietnam (CLMV) in order to cultivate extensive economic relations with Southeast Asia.

(3) India–Myanmar–Thailand Trilateral Highway (IMT Highway)

The India–Myanmar–Thailand Trilateral Highway project was conceptualized in 2002 to provide a 1,360 km road linking northeast India and Southeast Asia. The road is planned to connect Moreh on the Indian side in Manipur with Mae Sot town in Thailand, passing through Bagan in central Myanmar. With a total length of 1,360 km the IMT Highway will link Moreh in India to Mae Sot in Thailand via Myanmar; along route Moreh (India) to locations of Tamu, Kalewa, Yagyi, Monywa, Mandalay, Meiktila, Nay Pyi Taw, Payagyi, Theinzayat, Thaton, Hpa'an, Kawkareik and Myawaddy in Myanmar, further linking to Mae Sot in Thailand. The road's construction began in 2012, aimed at completing it by 2016. Major stretches of road already exist but sections have to be improved and interconnected. The alignment of the highway is such that it shares the same road links as AH1 and AH2. **Figure-5.4.1** illustrates the route of the India – Myanmar - Thailand Trilateral Highway.



Source: Lt Gen Prakash Katoch - June 28, 2016

Figure-5.4.1 India-Myanmar-Thailand Trilateral Highway

This project will allow freight and container trucks to move across the borders from India to Myanmar and Thailand via Chiang Rai and border towns. The road is expected to boost trade and commerce in the ASEAN-India Free Trade Area, as well as with the rest of Southeast Asia. India has also proposed extending the highway to Cambodia, Lao PDR and Vietnam. The development of the Trilateral Highway has been slow due to human resources, technology, advisory service, and funding constraints. However, commitment in the project was renewed after the Indian government offered a $500 million loan to Myanmar, partly to

renovate segments of the highway that fall under Myanmar's responsibility. Currently, the project is scheduled for completion in 2016.

(4) Myanmar–Northeast India Link

Inadequate physical connectivity between Myanmar and northeast India constrains border trade. The northeast region is connected by land with the rest of India through West Bengal. The surface transport system for movement of cargo and passengers to and from the northeastern states consists of road, rail, and waterways. Most of the cargo originates from Kolkata and terminates at Guwahati and vice versa. From Guwahati, the cargo gets distributed to various northeastern states. Floods, landslides, road blockages, and local unrest can affect the transport links. Most cross-border trade in India's northeast region is conducted through the Moreh CBP. Yet, trade at this CBP has represented less than 1% of India's total trade with Myanmar in the last decade. This is in contrast with border trading activities on the PRC–Myanmar and Thailand–Myanmar borders. According to Myanmar's Department of Border Trade, border trade with the PRC surpassed $7.8 billion in the four years to FY2011, while border trade with India reached only about $66 million. Border trade with Thailand surpassed $1.5 billion during the same period and border trade with Bangladesh was more than $117 million (Eleven Weekly Media 2013).

(5) Other Myanmar – India Links

Kaladan Multimodal Transport Project: The Kaladan Multi-Modal Transport Project designed to link Kolkata and Sittwe in Myanmar by sea (539 km) – link Sittwe to Paletwa jetty by Kaladan river (158 km) – road link Palewa to Indo-Myanmar border (110 km) – road link Indo-Myanmar border to Lawangtlai in Mizoram (100 km) – continuing further to Dabaka in Assam (850 km long NH-54) and rest of India's road network.

Moreh–Tamu route: The main gate for border trade between India and Myanmar is between Moreh in India and Tamu in Myanmar. The route has overlaps with AH-1 and AH-2. The section lying in India is in poor condition compared to the section in Myanmar, which was implemented with the assistance of the Indian government. On the Indian side, the 109 km section from Moreh to Imphal, the capital city of Manipur State, goes through Palel. On the Myanmar side, a 150 km road from Tamu to Kalemyo and a 10 km road from Kyigone to Kalemyo were completed by India in 2001, and named the Friendship Highway. This is the only operational cross-border road link along the 1,643 km India–Myanmar border. The road from Tamu to Kalemyo is in good condition as a result of a maintenance work done by the Myanmar government in 2008. India has committed to extend the upgrading of this highway further to Monywa.

Zolkawtar–Rhee route: The route from Zolkawtar in Mizoram State of India and Rhee in Chin State of Myanmar has the potential to help improve border trade. This route would be the shortest land route connecting Myanmar and Kolkata through northeast India and Bangladesh if the section from Aizawl to Agartala were improved.

Nampong–Pangsu route (Stilwell Road) : Stilwell Road (1,736 km) was built during World War II but fell into disuse after the war. Starting from Ledo in India's Assam state, it weaves through upper Myanmar to reach Myitkyina before turning eastward to end in the PRC's Yunnan Province. The road crosses the India–Myanmar border at Nampong–Pangsu, where border checkpoints have been established by bilateral agreement. Currently, the border is not yet open for official border trade.

5.4.2 Myanmar with China

(1) General

China is the largest trade partner of Myanmar at present. Yunnan Province of China is considered as the landlocked region at the western end of China. As the landlocked region of China, Yunnan Province has a long dream to have the transport route connecting with the commercial port as close as possible to Kunming. In the meantime, it attempts to improve its economic and political status in China by means of its role as the channel and pivot to the Indian Ocean. For example, Yunnan wishes that China-Myanmar rail link becomes a breakthrough of making use of regional superiority. To construct the passage between Yunnan and Myanmar reaching the Indian Ocean and connecting Asia and Europe with Africa, to establish Yunnan province's new geo-strategic status, namely International Strategic Passage. Yunnan's strategic status will be raised in China's overall political and economic structure. This sub-chapter discusses about the construction of Sino-Myanmar Transport Corridor and analyzes its implication. The corridor is one part of ambitious scheme of the Provincial Government of Yunnan that will put the provincial capital of Kunming at the center of a regional free trade zone.

(2) Historical Background

The project is mainly motivated by China's economic and political-cum strategic considerations, and will draw closer bilateral geopolitical and economic bond. It will not only further integrate two countries' economy but combine both political and strategic interests. Thus, it contains India's influence in Myanmar, and finally expands its strategic influence into Southeast Asia and the Indian Ocean. The completion of the project of China-Myanmar oil and gas pipelines have given China favorable opportunities to realize its old dream of China – Burma/Myanmar transport link. Myanmar's importance in world affairs has long derived from its critical geostrategic position. Myanmar became China's gateway or back door before the World War II. Since then "Burma Road" has become a

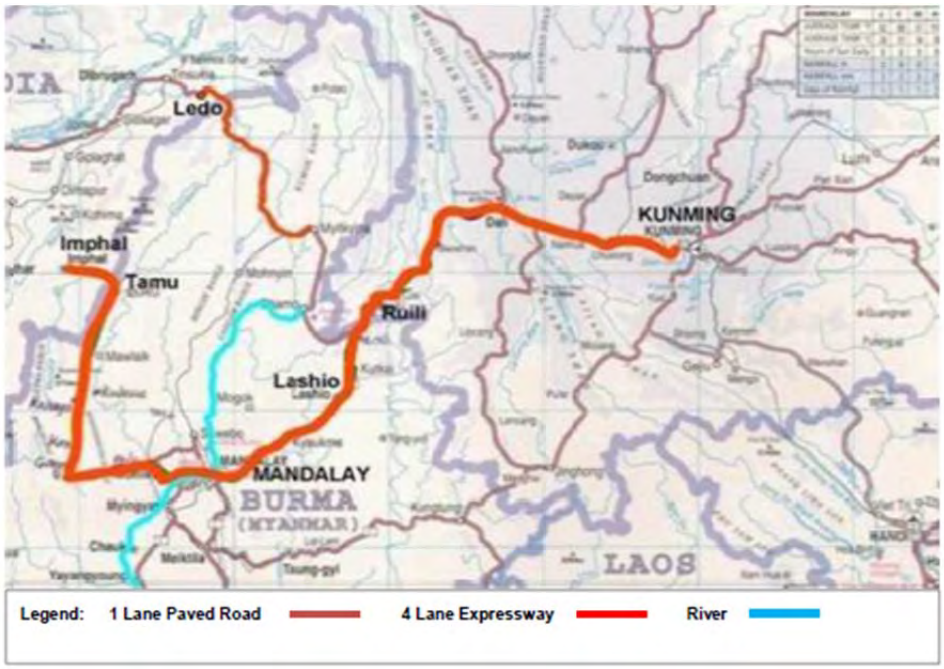
concrete and the most well-known example illustrating Chinese understanding of Myanmar's importance for China.

(3) Yunnan International Passage Initiative

Yunnan Province shares 4,060 km land border with Myanmar, Lao PDR and Vietnam. For China, the province is the most convenient location connecting the Indian Ocean with the Pacific Ocean, bridging three markets of China, Southeast Asia and South Asia. The provincial government of Yunnan planned the initiative of "Yunnan International Passage" in 1992.

Western Development Policy: In order to mitigate the gap of economic disparities between East and West China, redress the long-standing domestic imbalance of regional development, a drive was launched by the Government of China in 1999 to promote social and economic progress in the central and western parts of the country by injecting financial aid and offering favorable policies. This policy is called "Western Development" and the policy prioritized transport in its national economic development. Based on the Western Development policy the construction of an international passage connecting China to Southeast Asia and South Asia was determined at the Ninth Plenary Session of the Sixth Yunnan Provincial Committee of the Chinese Communist Party (CCP) in December 1999.

Construction of Highways: The construction of highways and rail is the keystone and skeleton of Yunnan traffic network linking neighboring countries and providing a shortcut and convenient transport network connecting with the sea via Gizhou, Guangsi eastwards, with the middle-west area via Sichuan northwards, with peripheral Vietnam, Lao PDR, Thailand and Myanmar southwards. At a result, China has made efforts to push Sino-Myanmar Transport Corridor project since the beginning of 21st century. According to the "Layout of Yunnan Road Network (2005-2020)", Yunnan Province has been implementing the plans to construct main highway passages leading to Vietnam, Lao PDR, Thailand and Myanmar by 2010. **Figure-5.4.2** shows the selected routes to link the North East Region of India through Myanmar.



Source: Regional China Cross-border Trade and Market Opportunity Conference, Taiwan External Trade Development Council (TAITRA)

Figure-5.4.2 Highway Development Plan Linking Kunming with North East States of India

Construction of China-Myanmar Railways: In 1995, the construction of Singapore - Kunming Railway Link (SKRL) was agreed among ASEAN member countries and China. China formulated three routes options: (1) east route < Singapore - Kuala Lumpur – Bangkok - Phnom Penh – Ho Chi Minh – Hanoi – Kunming>, (2) west routes <Singapore - Kuala Lumpur – Bangkok – Yangon – Lashio – Ruili – Dali – Kunming>, (3) middle route <Singapore - Kuala Lumpur – Bangkok – Vientiane – Shagyong - Xiangyum. The West route is 2,600 km-long, and needs building of 840 km of new railways, of which China-Myanmar railway is one section. In China's section, Kunming-Ruili railway is 690 km long. In 1998, the railway between Kunming and Dali via Guangtong was completed and put into service. So it still requires constructing the railway of Dali-Ruili. Besides, 132 km new railway from Ruili to Lashio needs building if China's railway is to be linked to Myanmar's railway net. Now, China is making an effort to realize the railway link between Kunming and Yangon as well. **Figure-5.4.3** shows the railway network plans of Yunnan Province.

Railway Network in the Indochina Peninsula

Railway Link between Kunming and Europe

Railway Network Plan in Myanmar and Thailand

Source: Regional China Cross-border Trade and Market Opportunity Conference, Taiwan External Trade Development Council (TAITRA)

Figure-5.4.3 Railway Network Plans of Yunnan Province

China-Myanmar Transport Corridor: As for mutual cooperation and mutual development, China-Myanmar Transport Corridor is the extension of "West Development" strategy. For a long time, transport infrastructure has been weak and economy developed slowly in West China. In the "West Development" strategy, China wants to use Myanmar as a relay station for the export of West China's products and import of resources, and a convenient channel for Southwest China's opening-up. For Yunnan, Guizhou, Sichuan and other West provinces in China, China-Myanmar transport corridor not only facilitates them nearer to foreign markets than the Pacific Ocean route but gives them the opportunity to breach the bottleneck of inadequate transport infrastructure. The expectation of Yunnan is that the Special Economic Zone (SEZ) ports at Sittwe and Kyaukpyu in Rakhine State, Myanmar will clear all goods produced in Chongqing, Chengdu and Yunnan Provinces in western China. The changes are enormous, instead of shipping south out of Chongqing to Shanghai and middle river cities can ship up to Chongqing then deliver through Myanmar by rail or road.

Southern Silk Road Control: China's blueprint includes complete control over the Southern Silk Road and all freight forwarding within Southeast Asia and the Indian subcontinent that will be accessible by new infrastructure and transit lines as a part of "One

Belt and One Road Strategy" of the Government of China at present. A few overland road and rail lines will connect this area to China's export market. Reduced shipping costs by at least $900 US$ per container will make China made goods even more competitive in India, Bangladesh, Bhutan and Nepal.

Roads through to Imphal in India's North Eastern States offer direct overland connections to India. This area has been impoverished, isolated and underdeveloped, however the road / rail link with China through Myanmar will change the significance of what was once a backwater in India to a mega Inter-Asia freight forwarding transit center.

CHAPTER-6 CARGO DEMAND FORECAST

6.1 Factors Considered for Cargo Demand Forecast

The cargo flow situation in terms of volume throughout the country as a whole has not been studied in Myanmar in-depth in the past. Although various studies have been carried out focusing mainly on the volume of person-trips, in this project, the forecast and perspective of cargo flow are studied and determined to prepare the logistics development plan from a long-term perspective. The cargo demand forecast model evaluated might be the first one prepared in Myanmar. For the consultants and relative organizations that may engage in the future in such cargo demand forecast exercise, it is recommended to collect more detailed data so as to make more precise cargo flow volume estimations. The cargo demand forecast has been carried out based on various factors of economy such as Gross Domestic Product (GDP) growth, growth of GDP per capita, economic structure, trade balance, trade partners, regional economy, trend of manufacturing industry in Asia, regional logistics networks, etc. as discussed below.

6.1.1 Basic Method Applied for Estimation of Cargo Flow Volume

The key drivers of cargo transportation demand forecast are future population and economic activities of country as a whole and each region and state as well as major cities and gateways. Therefore the framework of population and economy should be briefly reviewed at first. And the cargos by commodity or item are considered in this chapter. Present population by region/state is based on the Statistical Yearbook of Myanmar and future population forecast follows the United Nations prediction.. **Figure-6.1.1** illustrates the growth of population since 1973 to 2014 and its projection up to 2030 by total, region and state.

There are some estimations of GDP per capita by the United Nations as shown in **Figure-6.1.2.** It is about US$1,400 per capita in 2014. Future economic framework is determined to depend on “Myanmar National Transport Master Plan 2014 by JICA - NTMP”. Household expenditure is projected to increase more than three times the 2015 value by 2030 due to the growth of both economy and population. The projection of expenditure by household up to 2030 is as shown in **Figure-6.1.3**.

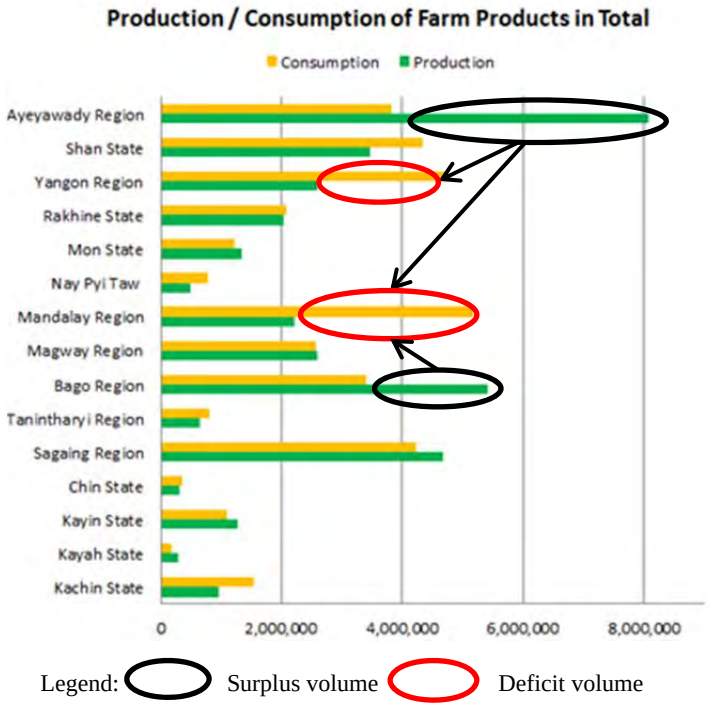
Cargo transportation demands are estimated by cargo item at present and in the future. Available statistic data including trade data that is compiled by the Ministry of Commerce are fully used for the estimation at present or the statistical data available as of year 2015. For the future forecast toward 2030, the economic growth ratio, production volume of major commodities by region and state, the consumption volume of goods per person and so on are used. The consumption volume of goods is transported from the sources to the users / consumers where relevant demand exists for each kind of commodity. The consumption

volume of goods by region/state and by country can be expressed in simple formula as shown below:

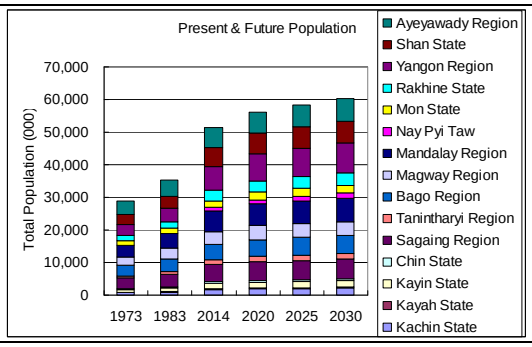
Production Volume – Export Volume + Import Volume = Consumption Volume

International trade cargo volume is forecasted based on the above formula and the ratio of cargo handled at sea ports and Cross-Border Points (CBP).Since the data on the transit cargo volume to and from China or Thailand via Myanmar are not available, therefore the forecast for transit cargo volume was not done. Generated, attracted and intra cargo volume of each cargo item by region/state are estimated by the analysis of present supply and demand of relevant cargo item or in other word commodity.

For example, the below figure extracted from **Figure-2.3.3** "Production / Consumption of Farm Products in Total" illustrates the concept of supply and demand relationship. A commodity produced is assumed to be transported from a surplus area to several deficit areas.

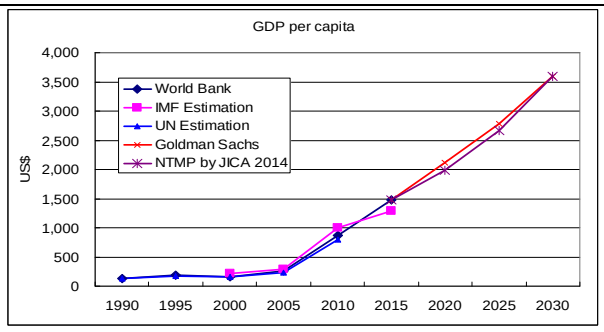


Because each cargo item has different characteristics, the production and consumption volumes are to be estimated by item and one by one respectively. The OD distribution is estimated subsequently by gravity model. Then the OD of each cargo item was totaled to estimate the cargo volume of Myanmar. **Figure-6.1.4** illustrates the basic flow chart to prepare the estimation / forecasting cargo OD matrix table.



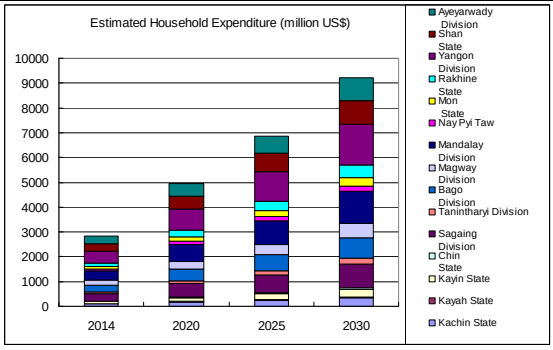
Source: Statistical Yearbook of Myanmar / UN (the 2015 Revision) & Study Team Estimation

Figure-6.1.1 Present and Forecast of Population



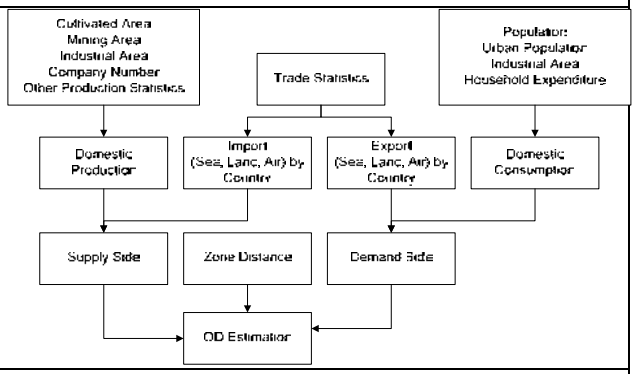
Source: World Bank, IMF, UN, Goldman Sachs

Figure-6.1.2 Growth Projection of GDP per Capita



Source: Study Team Estimation based on the Statistical Yearbook of Myanmar

Figure-6.1.3 Estimated Household Expenditure



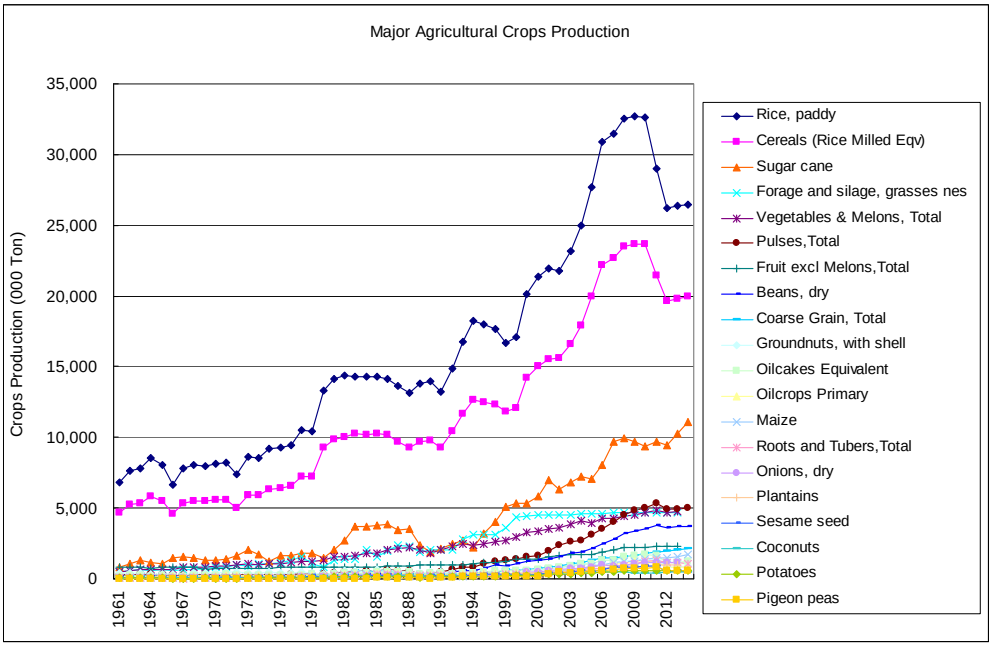
Source: Study Team

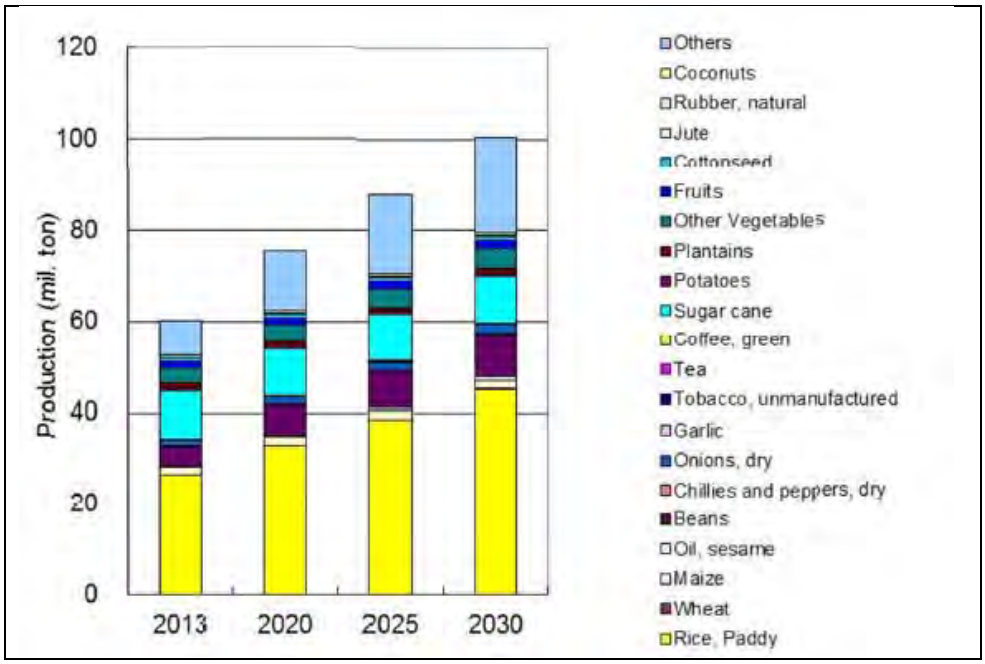
Figure-6.1.4 Basic Flow Chart to Estimate / Forecast Cargo Flow Volume

6.1.2 Key Drivers for Cargo Demand Forecast

(1) Agricultural Products

Data of agricultural production in Myanmar is available from FAOSTAT over the past 50 years. Although there is the possibility that production quickly increases, as in recent years, it is assumed that future forecast growth is comparatively slow, because of crop substitution and international competition. **Figure-6.1.5** illustrates the current (2013) and projected crop production volume by kind, up to 2030. The production by region is estimated by cultivated area of the crop.

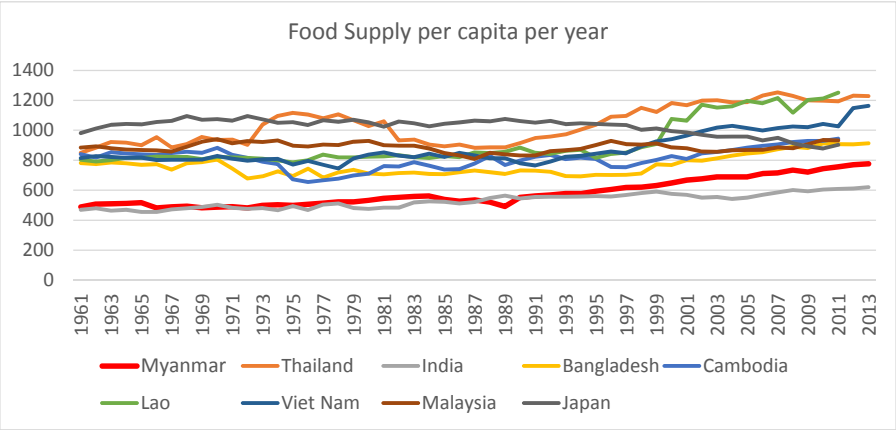




Source: Study Team based on data available from FAOSTAT

Figure-6.1.5 Crops Production Record and Forecast in Myanmar in Weight

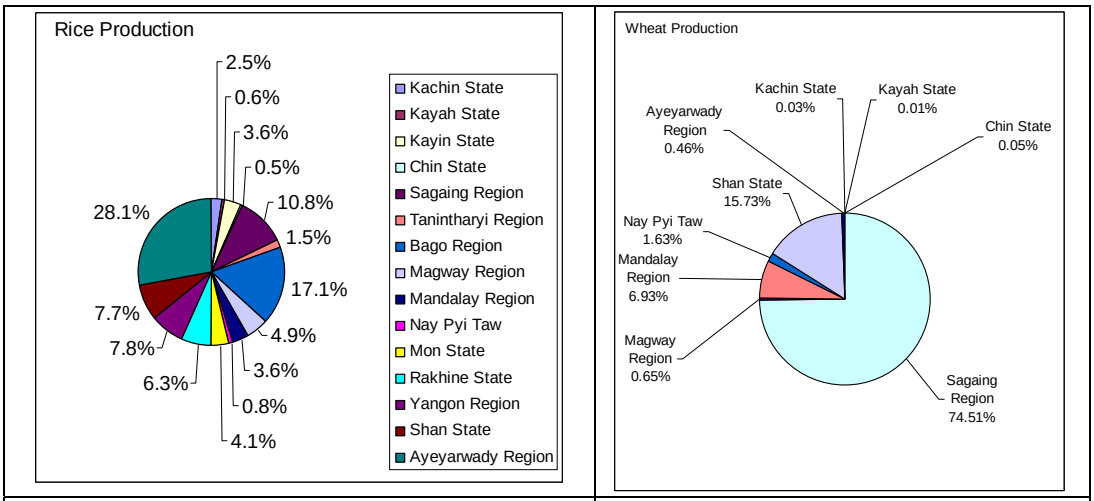
Food supply has been increasing year-by-year, as illustrated in **Figure-6.1.6**, and is assumed to grow continuously. At present, the consumption per capita is smaller than that of surrounding Countries. It is about 800kg per year per person, and is assumed to increase up to 900kg at least, in future. However, such growth will not continue forever. Japan, for example, has been registering a decrease in consumption of crops per capita in recent years.



Source: Study Team based on available data from FAOSTAT

Figure-6.1.6 Food Supply per Capita per Year

For example, domestic production of rice in Myanmar in 2013 was 26 million tonnes, but wheat production was only 186,000 tonnes. The production volume and the production area of these crops differ widely, as shown in **Figure-6.1.7.** Therefore, agricultural production by region/state was estimated for the cultivated area of each crop, and the consumption of crops is estimated in terms of population.



Share of Rice Production Hectare by region/ state

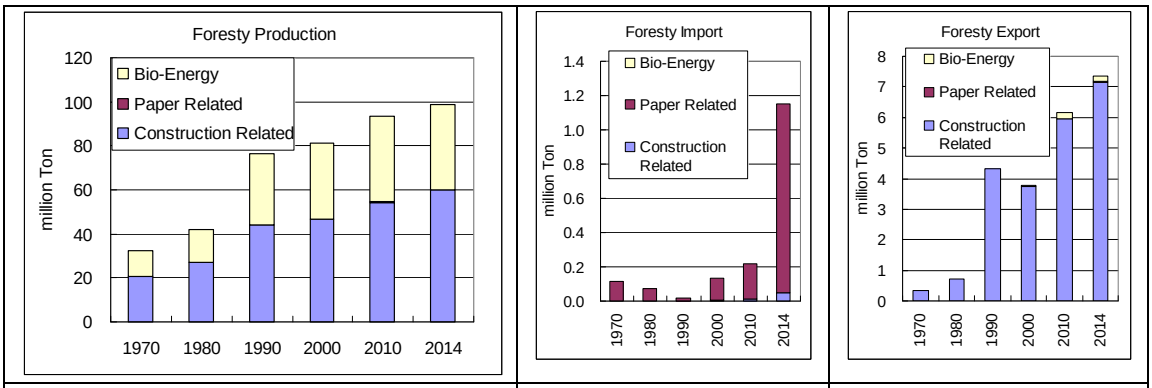
Share of Wheat Production Hectare by region/state

Source: Study Team Estimation based on the Statistical Yearbook of Myanmar 2015 and FAOSTAT

Figure-6.1.7 Production Area of Rice and Wheat

(2) Forestry Products

Production volumes of logs and fuel woods have dominated the production volume of forest products, and the export ratio is less than 20%. In the past, most logs were exported, however, this has been prohibited since 2014. In recent years, the import of paper has been quickly increasing. **Figure-6.1.8** illustrates the changes of production, import and export volumes of forestry products.



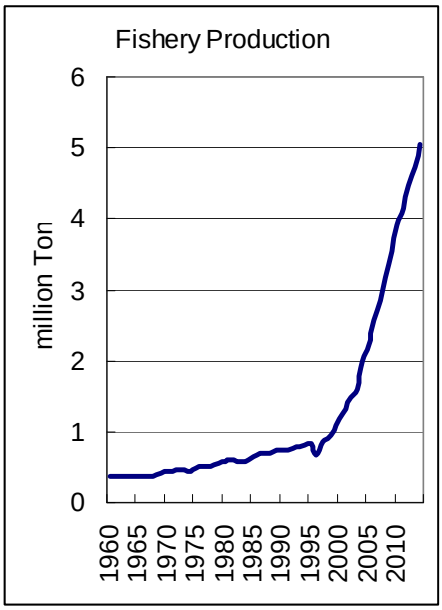
Production Volume of Forestry Products	Import Volume	Export Volume

Source: Study Team based on available data from FAOSTAT

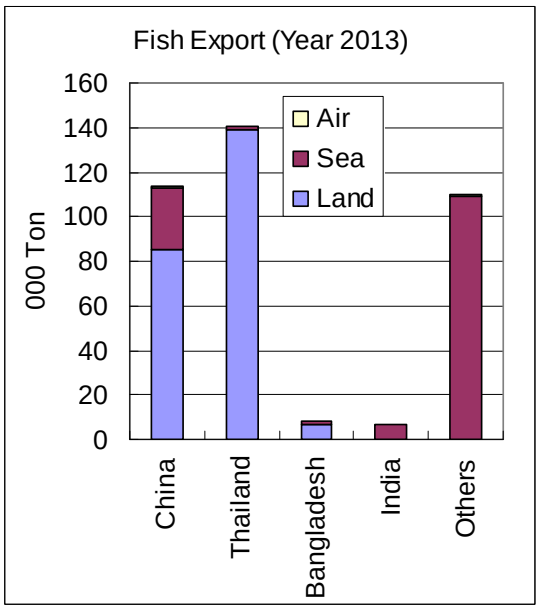
Figure-6.1.8 Production and Imports/Exports of Forestry Products

(3) Fishery Products

Production of fishery products has expanded quickly in recent years. It might be caused by the growth of domestic consumption and the growth of exports through improved transport. Shanghai crabs and some garments are exported by air, but the most exports are transported to Thailand through border trade. Exports to China have a large share. **Figure-6.1.9** illustrates the changes in fishery production volume by year.



Production Volume of Fishery Products
Source: World Bank



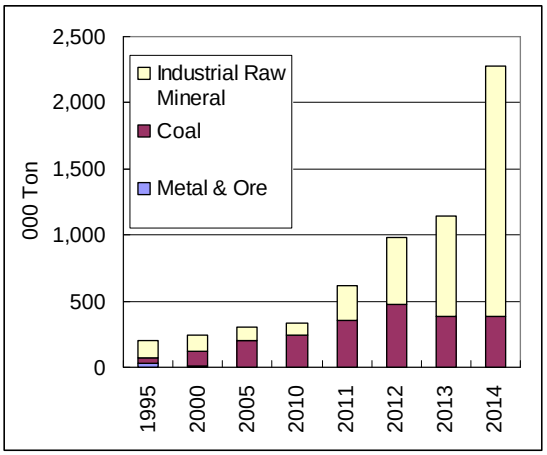
Destination of Exports
Source: Study Team Estimation based on Myanmar Trade Statistics

Figure-6.1.9 Production and Exports of Fishery Products

(4) Mining Products

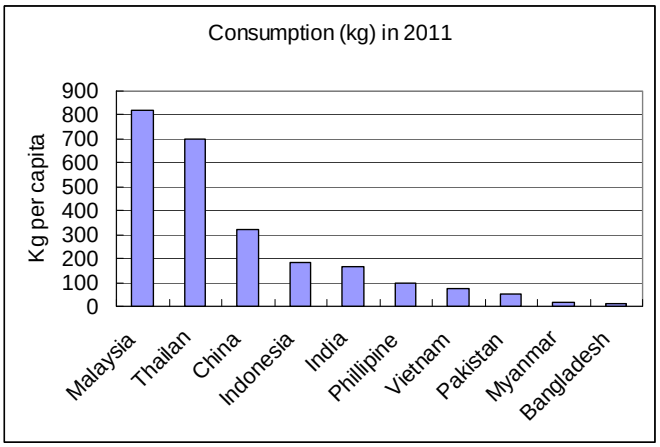
Because the production and the export data in the Statistical Yearbook of Myanmar are inconsistent and there might be some errors, mining production was estimated by total volume. The border trade accounts for only 4% of the total trade volume and most cargo is handled through seaports. **Figure-6.1.10** illustrates the changes in the production of mining products.

Although a small volume of crude oil is produced and refined in the Magway Region, almost all crude oil is imported. In the trade statistics, small exports are recorded, but this might be transit trade. The refined products are mainly imported from Singapore by sea. They are distributed throughout the Country mainly by tanker lorries and some products are transported to Mandalay by inland waterway transport and are then distributed by tanker lorries to the hinterland areas. Therefore Mandalay is considered as one of transshipment bases for petroleum products. The consumption of petroleum products per person was only 17kg (18 liters) in year 2011, but is projected to increase to the level of 60kg (70 liters), which is the same level of Vietnam some four years ago. As the consumption increases in proportion to economic growth and the increase in population, demand will increase at least 2.5 times as much as the present level, which is the same level of India and Indonesia at present. As the result, transport by tanker lorries will become difficult and dangerous in coming years. **Figure-6.1.11** illustrates the comparison of petroleum product consumption per year in various countries in Asia and the Middle East.



Source: Mining Enterprise
(Statistical Yearbook 2015)

Figure-6.1.10 Change of Production Volume of Mining Products



Source: BP Statistical Review of World Energy

Figure-6.1.11 Consumption of Petroleum per Capita

(5) Manufactured Products

As the average wage of manufacturing workers is substantially lower than that of other countries situated in the Indochina Peninsula and ASEAN, new investments and new developments from both the neighboring countries and the world is expected, with investors looking for low wages combined with a reasonable quality of labor and at the same time with a large market such as China and India in close proximity. **Table-6.1.1** shows the average monthly wage of workers in the manufacturing sector in major cities in the Asian region. As shown in the table below, the monthly wage of manufacturing workers in Yangon is almost one fifth of workers in Bangkok.

The cargo volume generated from manufacturing industries at present is small (i.e. 820,000 tonnes per year). The volume of production was estimated based on the sales amount of products. Food and beverages and construction materials are comparatively important within the manufacturing sector. Although the production of vehicles, electronics and machinery is very small (i.e. 150 tonnes per year), these are expected to grow quite quickly, as experienced in Vietnam in the early stages of the dynamic economic growth between 1995 and 2010, which led to the tremendous growth of the manufacturing sector when FDI flowed in. At present these commodities are mostly imported.

Table-6.1.1 Average Monthly Wage of Manufacturing Workers

Year 2013	Wage ($ per month) of Manufacturing Workers
Kuala Lumpur	429
Bangkok	366
Jakarta	241
Ho Chi Minh	173
Hanoi	155
Vientiane	137
Phnom Penh	101
Dhaka	86
Yangon	**71**

Source: JETRO

The apparel industry, manufacturing clothes using fibers and fabrics imported from abroad, is a major processing industry in Myanmar at present. However, the manufacturing industry in Myanmar will grow quickly as Myanmar welcomes the FDI, especially where job creation can be expected, and will form a foundation for economic growth in future.

Table-6.1.2 tabulates the production volumes of commodities in the manufacturing sector, in tonnes.

Table-6.1.2 Production of Selected Commodities (excluding Oil and Gas)

Unit: ton

Ton	1995	2000	2005	2010	2011	2012	2013	2014
Food and Beverages	529,729	763,316	569,828	583,428	539,357	552,540	535,565	381,683
Tobacco	853	2,521	2,822	4,330	5,604	5,741	6,594	8,006
Textile (Cotton)	20,948	33,406	23,218	26,088	18,487	9,848	3,890	2,581
Made-up Articles	8,568	4,023	2,436	2,732	1,035	468	216	314
Personal Requisites	1,471	3,591	3,389	589	58	627	612	0
Pharmaceuticals	1,253	1,765	1,999	1,654	1,508	1,465	2,044	1,963
Household Goods	37,912	48,890	70,924	46,593	12,336	15,567	12,645	757
Electrical Goods	156	178	422	383	266	71	1	2
Building Materials	600,184	476,068	606,319	598,792	580,687	497,521	487,109	255,740
Machinery	61	60	189	326	138	26	59	6
Vehicles	1,067	1,102	3,384	3,647	1,416	1,723	168	142
Stationary	17,060	17,928	19,011	14,691	13,233	4,171	818	625
Others	146,230	162,229	101,724	36,122	166,725	209,366	157,001	166,000
Total	1,365,492	1,515,077	1,405,666	1,319,374	1,340,851	1,299,134	1,254,722	817,821

Source: Study Team. Estimated based on the Statistical Yearbook of Myanmar 2015

Several large-sized industrial estates are either under construction or in the planning stage at present. **Table-6.1.3** shows the area of industrial estates existing and under planning. Looking at the current trend of operating enterprises in the SEZs, the marketing target for industrial estates in Mandalay might be China and the industrial estates in the Yangon area might look forward to investors from Thailand, Japan and the EU, etc.

Table-6.1.3 Planned Industrial Estates and Existing Industrial Enterprise

Location	Area Planned (ha)	Existing Nos of Industrial Enterprise
Kachin State		
Kayah State		
Kayin State	306	28
Chin State		
Sagaing Region	510	718
Tanintharyi Region	96	25
Bago Region	83	192
Magway Region	226	333
Mandalay Region	959	1,810
Nay Pyi Taw	237	
Mon State	69	163
Rakhine State		
Yangon Region	6,128	5.549
Shan State	235	45.2
Ayeyarwaddy Region	161	68

Source: Ministry of Industry

Cement: It is expected that cement industry will be developed quickly in the near future because a high potential for construction demand is foreseen. At present, demand is met by imported cement mostly from Thailand, but new plants will be constructed in this high demand area in future. A new cement plant (with a production capacity of 1,800,000 tonnes per year) is planned to be commissioned in Mawlamyine (Mon State) by a Thai company in 2016, and new investments in cement production from other Countries is expected to grow

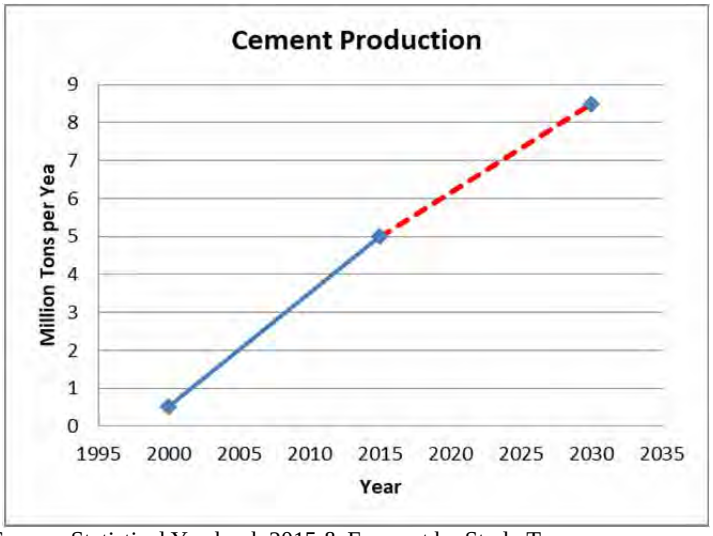
up steadily to meet with the ever increasing demand for cement. **Table-6.1.4** tabulates the location of cement plants and their installed capacity by operator.

Table-6.1.4 Location and Capacity of Cement Plants

Plant Operator	region/state	Capacity (tpd)
Thayet	Thayet Township, Magway Region, Myanmar	1,200
Kyankin	Kyankin Township, Ayeyarwaddy Region, Myanmar	1,600
Kyaukse	Kyaukse Township, Mandalay Region, Myanmar	500
Hsinmin	Kyaukse Township, Mandalay Region, Myanmar	700
AAA Cement	Patheingyi Township, Mandalay Region, Myanmar	1,200
Tigerhead	Kyaukse Township, Mandalay Region, Myanmar	300
Elephant	Kyaukse Township, Mandalay Region, Myanmar	600
YCDC	Tharzi Township, Mandalay Region, Myanmar	500
Shwetaung	Tharzi Township, Mandalay Region, Myanmar	1,250
Htoo Group	Tharzi Township, Mandalay Region, Myanmar	1,250
NCDC	Lewe Township, Nay Pyi Taw, Myanmar	500
Max	Lewe Township, Nay Pyi Taw, Myanmar	500
Myaingalay	Myaingalay, Hpa-An Township, Kayin State	4,900
Naga	Pinlaung Township, Shan State, Myanmar	800
KBZI	Taunggyi Township, Shan State, Myanmar	1,250

Source: Study Team based on the data obtained from the Ministry of Industry

Figure-6.1.12 illustrates the past record of cement production from 1995 to 2016, and if the cement plant on the **Table-6.1.4** are developed it is expected increase.



Source: Statistical Yearbook 2015 & Forecast by Study Team

Figure-6.1.12 Forecast of Cement Production Volume

Sand: Sand is an essential material for making reinforced concrete structures as well as for reclaiming land. For constrution work, the volume of sand is necessary about three (3) times as muh as the one of cement. Therefore the domestic demand for sand will increase in proportion to the growth of the construction industry. At present, a huge volume of sand has been exported to Singapore, where land reclamation works have been continuously going on and where there is a plan to reclaim land of more than 5.2 km^2 in total by 2030. Myanmar

may supply the sand required by dredging river bottoms and ports, although there is a trade-off with the environment.

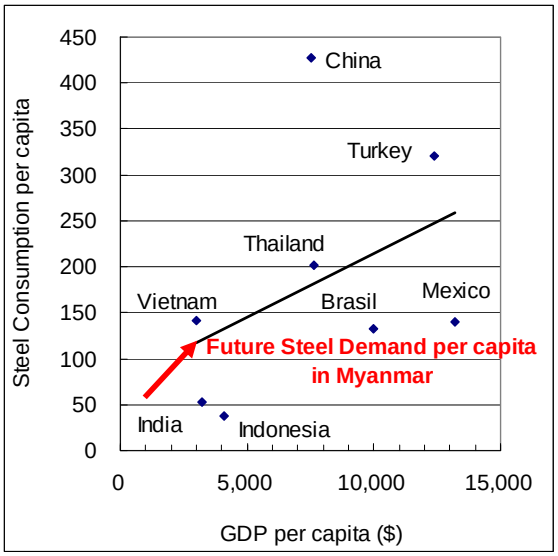
Food and Beverages: As the consumption volume of food and beverages have been increasing steadily in line with the growth of household expenditure.

Paper: The demand for paper has quickly grown, attributed to a change in life-style from personal use to industrial use, such as for packaging materials.

Apparel: the demand of apparel per person per year is estimated to be about 22 kg in Japan and 10 kg in Thailand. It is currently about 6.4kg in Myanmar. If it is assumed that this volume increases to 8kg in future (to the current level of Thailand), 482,000 tonnes of demand will be represented as the size of the domestic market. This can be expected to happen, although the present demand is 209,000 ton per year.

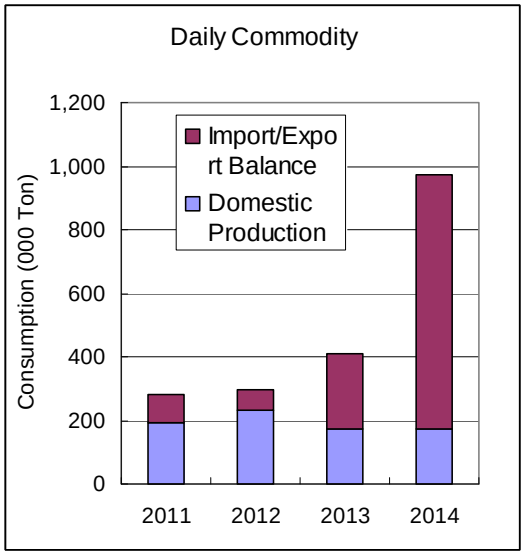
Steel and Iron: Demand for steel and iron is almost proportional to growth of GDP per capita. Therefore the production and imports are expected to increase according to the growth of consumption. (See **Figure-6.1.13** for the demand estimation for steel and iron products)

Daily Consumable Goods: The production of daily consumable goods will increase in future in line with growth of the economy, although the increase of demand is supplied mainly by imports at present. (See **Figure-6.1.14** Daily Consumable Goods)



Source: World Steel Association

Figure-6.1.13 Demand of Steel



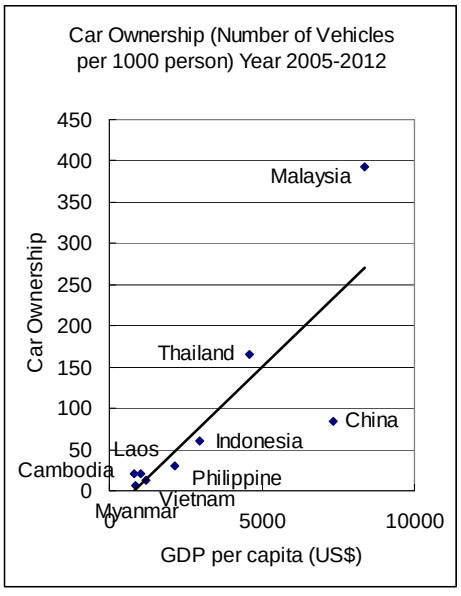
Source: Statistics & Estimation by Study Team based on Trade Records

Figure-6.1.14 Demand of Daily Commodities

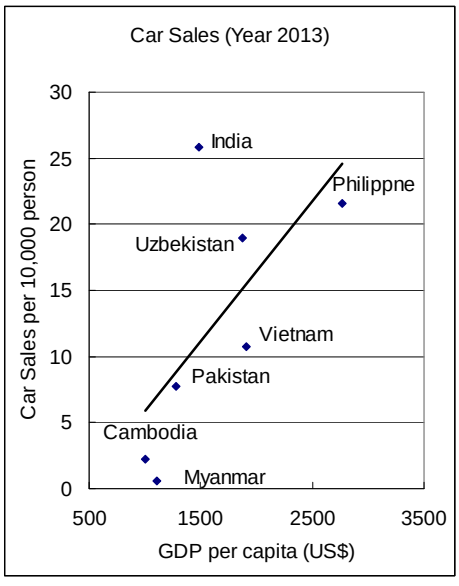
Manufactured Products: It is difficult to forecast the production volume of manufacturing industries for vehicles, machinery and electronics because the production of these items in Myanmar at present is very small and so the demand is not yet obvious. It is assumed that the production of these items is totally dependent and concerned with the new investments made either by FDI or by local entities. The industries depend on new investments. Most global investors regard Myanmar as the last frontier for industrial development in Southeast Asia, which has dilligent and honest population, lower wages for manufacturing laborers and rich natural resources. Therefore, manufacturing industries have the potential to be quickly developed, as happened in Thailand in the 1980's and in Vietnam from the 1990's to date.

For example, car ownership and car sales generally increase in proportion to the size of GDP per capita, and the export of parts pushes up production. In this Chapter it is assumed that the cargo volume of manufacturing industries grows by as much as 30% per annum, and that this growth ratio can be applied to the growth of trade volumes for these products. The annual growth ratio of these items can be referred closely to the registered growth ratio estimated from the experiences of Vietnam in the past, as Vietnam opened its economy to the world in 1995- and at that time activities of manufacturing industries were almost zero.

Automobiles: Figure-6.1.15 illustrates the relationship between car ownership and sales and GDP per capita in US Dollars. The number of automobiles and / or its production in Myanmar is expected to increase in line with the growth of GDP per capita in Myanmar.



Source: World Bank



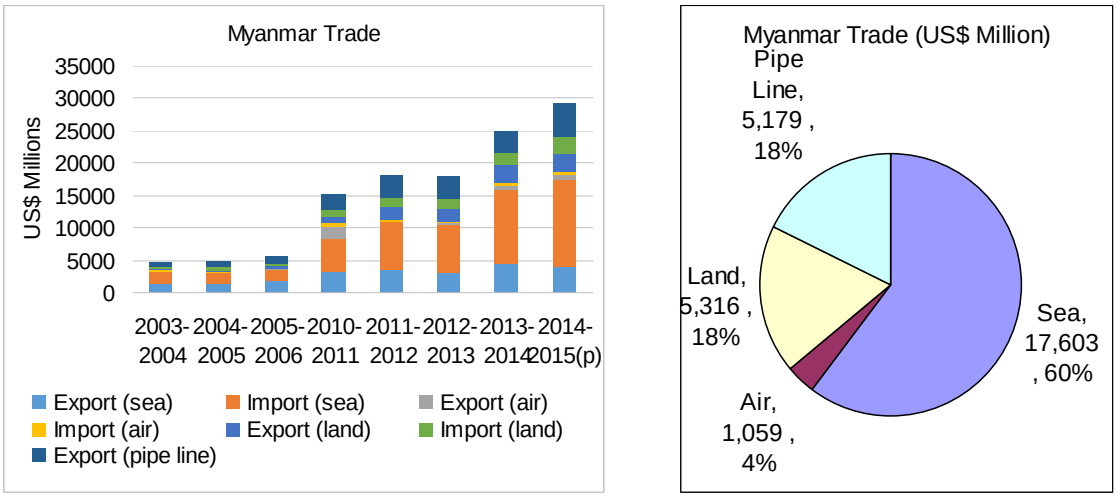
Source: JAMA

Figure-6.1.15 Relationship between Car Ownership, Sales and GDP per Capita

6.2 International Cargo Traffic

(1) Current International Cargo Volumes

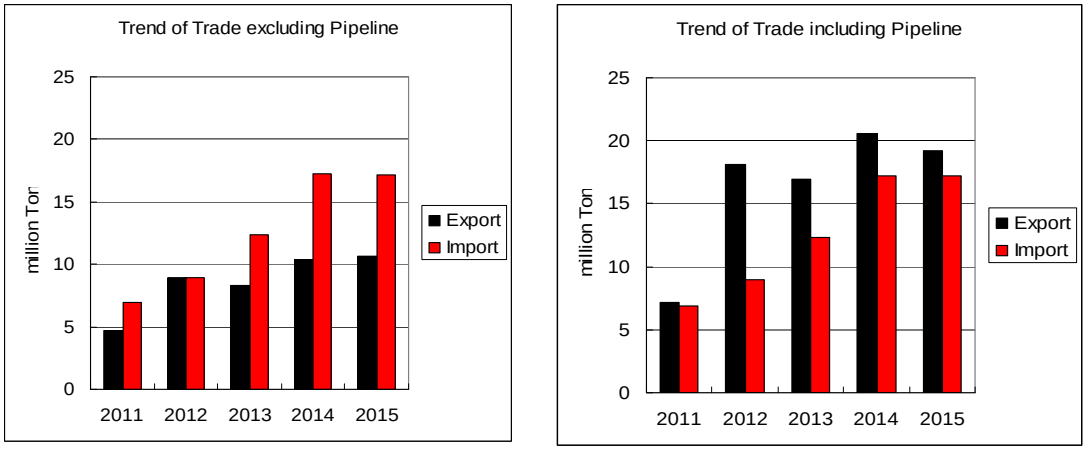
For the analysis of the cargo flow, the cargo volumes of imports and exports are more important than the value of cargo. Although the data obtained from the Customs Department are mainly summed up by value, the share of trade value by transport mode is 60% by sea, 18% by land, 18% by pipeline, and 4% by air. The largest share in the export value is by pipeline, as shown in **Figure-6.2.1.**



Source: Customs Department

Figure-6.2.1 Trends in Myanmar Trade

Figure-6.2.2 illustrates the changes of exports and imports in value between 2011 and 2015. The trade value of commodities in Myanmar, excluding oil and gas transported by pipeline, shows that a trade deficit started from 2013 and tends to continue into the future.

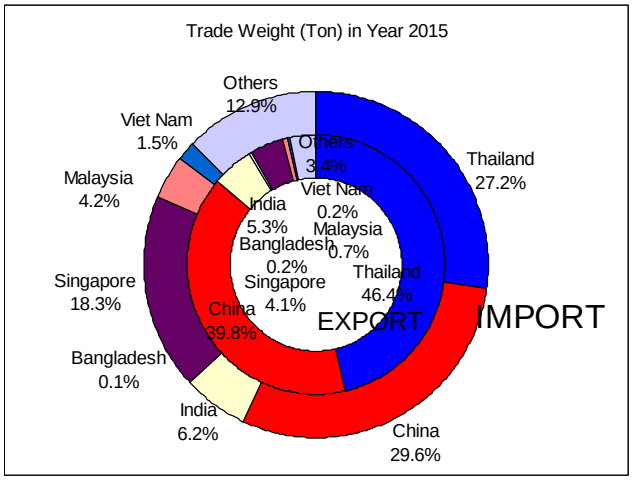


Source: Study Team Estimation based on Myanmar Trade Statistics

Figure-6.2.2 Trends in Trade

The value of each commodity registered in the form of the HS code is converted to weight in metric tonnes. The volumes of commodity data recorded in the form of HS code traded in the past were obtained from the Central Statistics Office under the Ministry of Commerce, amounted to 1,778,626 records.

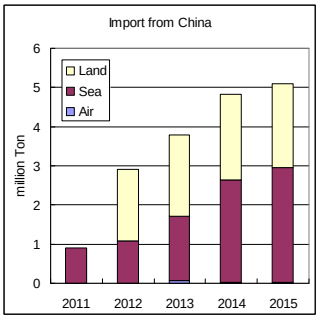
The trade volume with other neighboring countries such as India and Bangladesh is very small. Border trade is quite important for Myanmar although the trade volume by land transport with neighboring countries, including Vietnam and Malaysia) is almost non-existent at present. However it may grow fast if the transport service becomes convenient, quick and more competitive in terms of transport cost. The trade volume in 2015 for exports and imports by trading partner is illustrated in **Figure-6.2.3.**



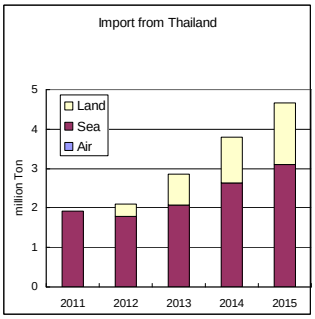
Source: Study Team Estimation based on Myanmar Trade Statistics

Figure-6.2.3 Trade Volume of Myanmar in Weight (Tonnes) in 2015

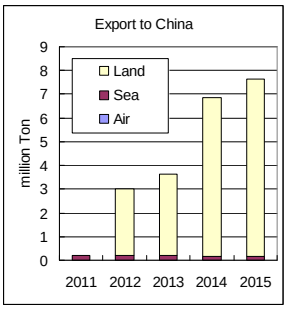
The largest trade partner of Myanmar is China and followed by Thailand, whichare connected by land. Thus the border trade with these countries is quite high especially with China as shown in above figure. It is to be noted that the most of trade cargo relative to China is transported by land.



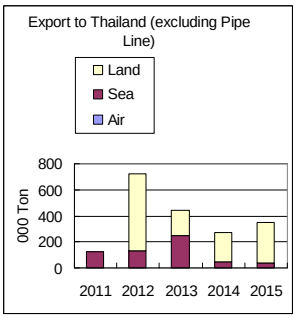
Imports from China



Imports from Thailand



Exports to China

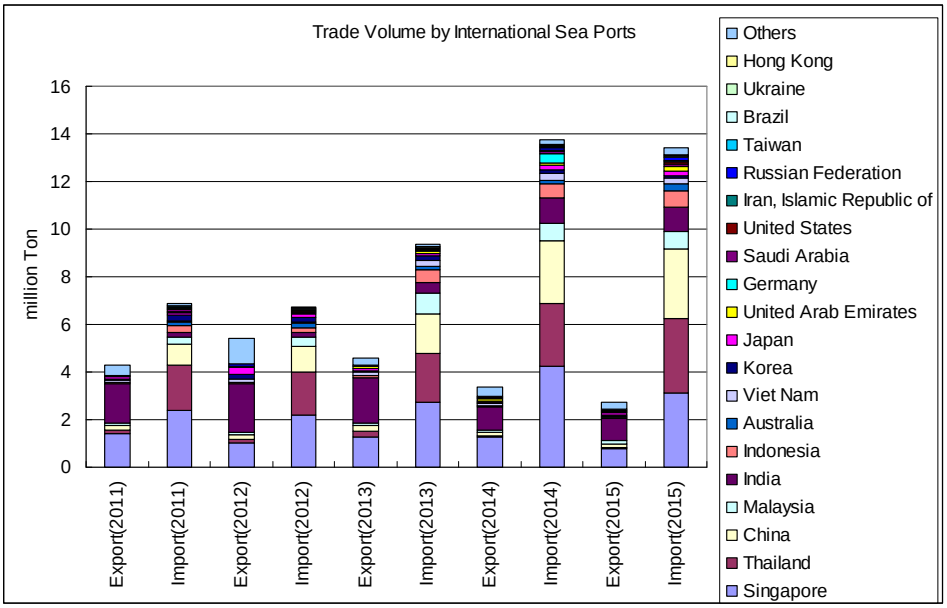


Exports to Thailand

Source: Study Team Estimation based on Myanmar Trade Statistics

Figure-6.2.4 Imports from and Exports to China and Thailand

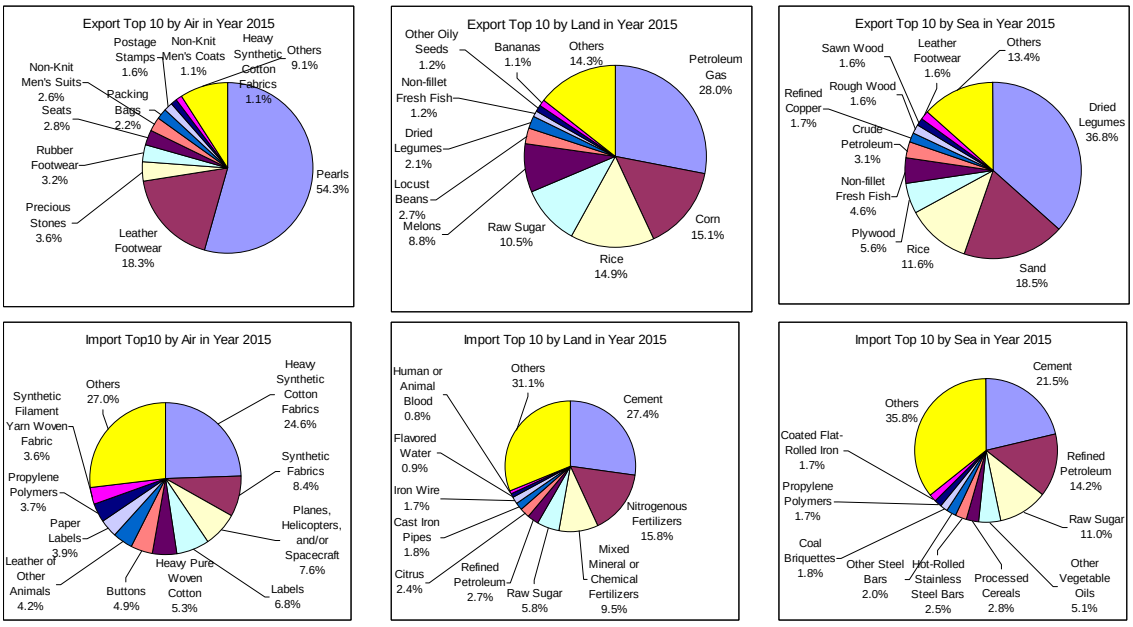
The main export destinations for sea cargo are India, followed by Singapore and China. The largest volume of sea cargo is imported from Singapore, followed by Thailand and China. The major partners in international maritime trade are Singapore, Thailand, China and India. Those countries can be connected by land, if there are suitable land transport networks. Sea cargo volume is illustrated in **Figure-6.2.5**.



Source: Study Team Estimation based on Myanmar Trade Statistics

Figure-6.2.5 Trade Volume at International Sea Ports by Country

Figure-6.2.6 illustrates the ratio of the top 10 trade commodities by air, land and sea modes. The major export commodity is agricultural products and the major import product is cement.

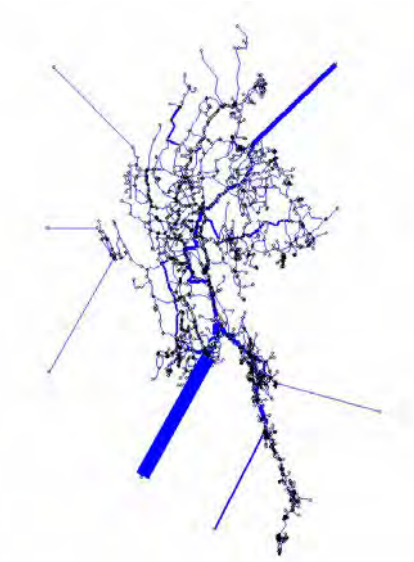


Source: Study Team Estimation based on Myanmar Trade Statistics
Note: Pipeline trade is not included in the above figure

Figure-6.2.6 Trade Volume Ratio by Commodity

(2) Trade Cargo Flow

Figure-6.2.7 illustrates only trade cargoes that include the total volume of cargo exported and imported thus it does not include the volume of commodities produced solely for domestic consumption. All cargo flows in the figure represent imported or exported cargoes, so the transported volume handled at Yangon Port, the China border, and the Thailand border can be seen as large. Trade cargos are distributed throughout Myanmar. This flow does not represent the cargo flow on the road network, but transport volume is assigned on the minimum path as a desired line[1].



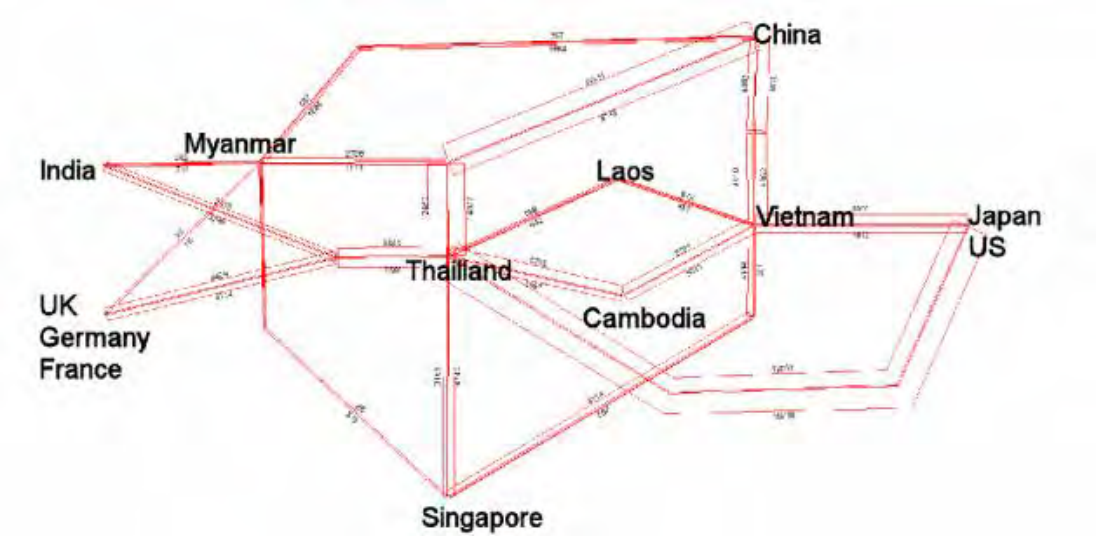
Source: Study Team, Estimation based on Myanmar Trade Statistics as of 2015

Figure-6.2.7 Current Trade Cargo Flow

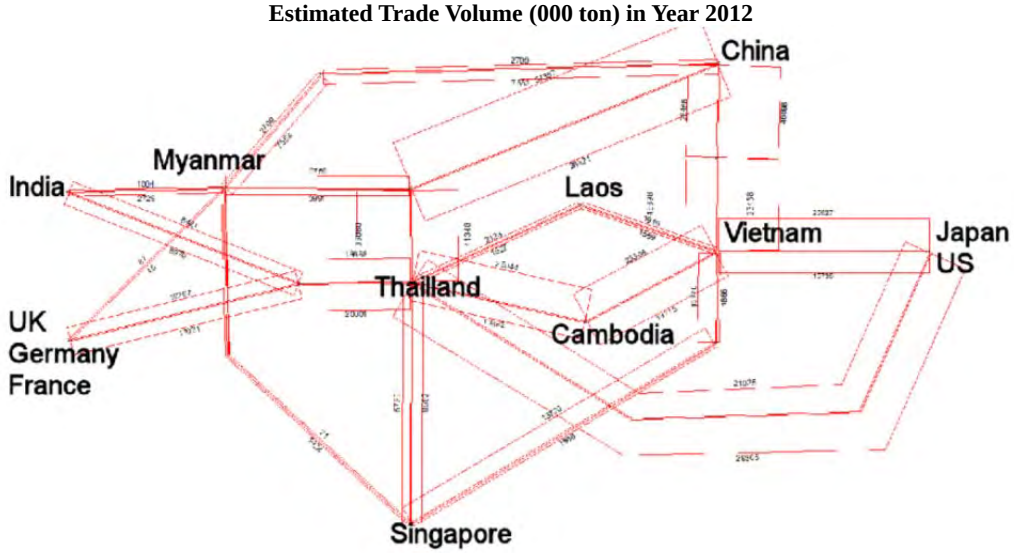
Nevertheless, the trade volume in Myanmar is still smaller than that of neighboring countries. The potential expansion of trade is considered as high, as the current trend of trade cargo traffic growth with neighboring countries suggests. Especially, the growth of economy and trade of Vietnam in the recent years could be considered as a model adoptable to forecast the future of the Myanmar economy in general and the growth of container handling volume at gateways in particular.

Figure-6.2.8 illustrates the image of trade cargo flow and volumes by link connecting with countries located in the Indochina Peninsula, as well as world markets in 2012 and in 2025. As apparent from these figures, the trade cargo generation and attraction by Thailand and China affects trade cargo volumes in Myanmar considerably.

[1] Mimimum path is the path of shortest distance on the network that a cargo dispatched from origine point arrives at destination in shortest time along the desired line (desired path).



Estimated Trade Volume (000 ton) in Year 2012



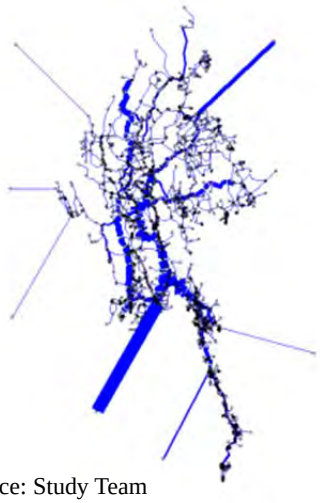
Estimated Trade Volume (000 ton) in Year 2025

Source: Study Team, Estimation based on the United Nations Statistical Division (COMTRADE),

Figure-6.2.8 Trade Cargo Flows in Indochina Peninsula

6.3 Cargo Flow Volume Estimation and Projection

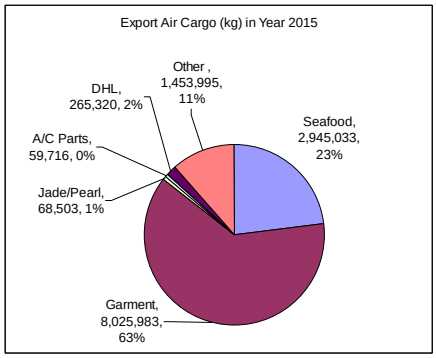
The total cargo flow volume estimated by commodity item can be presented as illustrated in **Figure-6.3.1**. It is to be noted that road, river and railway networks are not identified in this figure; therefore, the transport routes shown in this figure shows only the cargo flow patterns. However, the major cargo flow patterns and cargo flow volumes by route can be understood. This flow does not mean cargo flow on road network, but the trade assignment on the minimum path as desired lines for commodity flow. The total cargo volumes transported by railways was approximately 1 million tonnes in 2015 by origin and destination analysis.



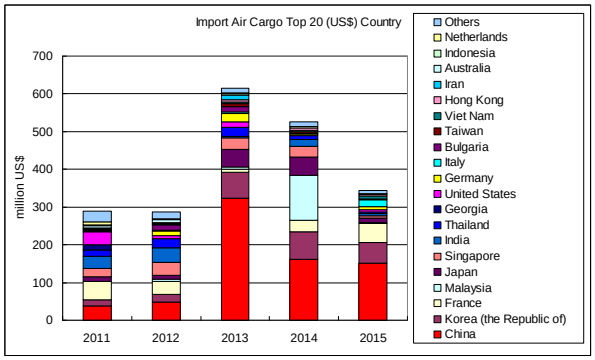
Source: Study Team

Figure-6.3.1 Estimated Cargo Flow Volume by Route

Air Cargo: Air cargo is not included in the above OD estimation because it is directly transported from the airport to destination countries. Total exports in 2015 were 13,095 tonnes, of which 23% was accounted by seafood and garments accounted for 63%. The largest source country for import cargoes by air was China, followed by Korea, France, Malaysia and Japan based on average volumes over the past five years. **Figure-6.3.2** illustrates trade volumes of air cargo by commodity and by source country.



Source: Study Team



Source: Estimation based on Myanmar Trade Statistics

Figure-6.3.2 Export and Import Cargo Volumes by Air Transport

6.4 Methodology for the Cargo Demand Forecast

The cargo flow situation throughout the country as a whole has not been studied in the past in depth. Various studies have been carried out but these studies focused mainly on passengers. In this project, the forecast and perspective of cargo flow are studied and determined to prepare the development plan for a long-term perspective. The cargo demand forecast model evaluated is probably the first one prepared for Myanmar. The consultants and the organizations that may engage in future to undertake such a cargo demand forecast exercise, recommend collection of more detailed data to provide more precise cargo flow volume estimations.

(1) Domestic Production and Consumption Volumes

Firstly, the domestic production and consumption volume of 29 kinds of commodities was estimated to understand the present situation of cargo flow volumes and to provide a basis for the forecasts. The basic concept is indicated in a simple way. Each characteristic of each commodity is described in the first section. **Table-6.4.1** shows the sources of information and data for the estimation of cargo volumes.

Table-6.4.1 Domestic Production & Consumption Volumes by Major Commodities

Domestic	Production	Consumption
1 Rice	The agricultural production volume of these commodities in a 50-year time series is available from the agricultural statistics of FAO called FAOSTAT including production volume per hectare. Hectarage of cultivated area by state / region is available from the Statistical Yearbook of Myanmar. The trend of production volume can be known by computation of past records based on the data available from FAOSTAT useful for projection of production volume in future.	Consumption volume of most crops is proportionate to population. Some crops depend on demand from urban population.
2 Wheat		
3 Beans		
4 Maize		
5 Vegetables		
6 Fruits		
7 Sugar		
8 Other Agricultural		
9 Fish	Data prepared by the World Bank are available. The trend in production volume is used for the production volume forecast.	The population that consumes fish is estimated by geographical location and household expenditure registered in Statistical Yearbook.
10 Salt	The production volume of salt registered is available from the Statistical Yearbook and production area is selected from the map.	In future it is assumed the industrial use of salt will increase about eight times personal use.
11 Oil	Production data is available from the Statistical Yearbook. In the future it is expect that some new oil wells will be exploited and production will increase.	General use of household can be estimated by household expenditure by Statistical Yearbook. Industrial and automotive use can be estimated in accordance with the trend of economic development.
12 Coal		
13 Plastics	The Statistical Yearbook estimates production volume of plastics. The distribution volume is estimated by the number of companies located in states / regions and cultivated area. In the future demand volume of plastics and fertilizer are assumed based on the annual growth rate of other developing countries. Demand volume of pharmaceutical is assumed to increase at around three times based on relevant data available from other countries.	Future consumption volume of plastics and fertilizers are estimated based on the annual growth rate of household expenditure by each state/region. Pharmaceutical consumption is assumed at about three times the production volume.
14 Fertilizers		
15 Pharmaceutical		
16 Wood	The export of logs is prohibited therefore processed wood furniture and housing materials are estimated and forecast. The production of sand and cement can be estimated from the production volume of cement plant locatec in various states / regions.	It is assumed some parts of wood are processed and exported. Growth is proportional to the growth of population by region/state because of the demand and onsumption depends on population and size of GDP.
17 Iron		
18 Sand		
19 Cement		
20 Food Processed	Present production volume is estimated based on Industrial Statistics and their distribution in state/region is assumed by the number of companies in operation.	The consumption of garments is forecast as 8kg/per person in future, which will increase from 6.4kg/per person. It might increase to 10 kg in future. The forecast of consumption volume of paper includes not only printing materials but also packing materials.
21 Garments		
22 Paper		
23 Rubber		

Domestic	Production	Consumption
24 Vehicle	Present cargoes can be estimated based on industrial statistics and the distribution can be computed based on the number of companies in each state. Future growth of this item mainly depends on new investment by domestic and foreign companies especially for manufacturing industries. Because foreign direct investment needs highly educated personnel, new manufactured industries will be developed near Yangon, Mandalay and Bago except in the border areas. The forecast for production and consumption volume including trade volume is computed in a high case and in a Medium case.	There are two kinds of consumption. One is the consumption of the domestic market. Another is the consumption in the form of exports (consumed in the World market). The volume of parts and components of manufactured goods produced for export to foreign countries is considered under the category of consumption volume. The volume of industrial parts and components as the intermediary goods is assumed to increase with a high annual growth rate registered in the past in Developing Countries experiencing rapid industrial development, due to inflow of FDI into the manufacturing sector, such as Vietnam.
25 Electronics		
26 Machines		
27 General		
28 Others 29	Other items	Other items

Source: Study Team

(2) International Cargo

Trade occurs basically when the local production volume is not available to meet local demand or the demand of the markets externally (as surplus products) is distributed to the demand area internally. The main determining factor for cargo traffic volumes of each commodity is its consumption volume. The market price of the imported goods is considered as one of the factors of consumption of products. However, such a factor is not considered for the estimation of cargo flow volume to simplify the calculation. As discussed in the preceding section, the consumption volume can be estimated by region or area by adopting the following simple formula:

Production Volume – Export Volume + Import Volume = Consumption Volume (PEIC)

Therefore, the import and export data for each commodity in volume is essential to estimate the volume of cargo transport. **Table-6.4.2** shows the sources of data related to international trade.

Table-6.4.2 Estimation of Import & Export Volumes

Zone	Border	Source of Trade Data and Their Status
16	Yangon/Thilawa Terminal Area	Yangon Port compiles the statistics for import/export data by cargo item. It is important that they are compiled by cargo item.
17	West Port Group (Sittwe, Kyaukpyu, Thandwe, Pathein)	The trend of total volume is compiled but cargo items are not completed.
18	South Port Group (Mawlamyaine, Dawei, Myeik, Kawthaung)	There exist four (4) major local ports along the coast in the south-eastern and the southern part of Myanmar, namely Mawlamyine, Dawei (local), Myeik, and Kawthaung. The annual cargo volume of these ports is more or less 1.0 million tonnes in 2015 and the cargo demand can be projected based on cargo demand trend in each region/state. None of them handle international / trade cargoes. In Dawei, a new international port is planned for the development and operation of the Dawei SEZ, which is located around 20 km north from Dawei City where the Dawei (local) Port is situated. This New Dawei International Port is planned to handle mainly trade cargoes. However the port development is at the planning stage and therefore the cargo demand volume for the New Dawei International Port depends solely on its development plan. According to the Dawei SEZ plan, most of the trade cargo is assumed to be generated by energy related plants, and manufactures located within the Dawei SEZ and diversified trade cargo to and from the Laem Chabang Port situated in Thailand is not considered. The port cargo handling volume of the New Dawei International Port is assumed to be around 1.6 million TEUs per year in 2035 planned by ITD.
19	CBP on the border with China	The Study Team obtained 1,778,626 records of HS code trade data registered on commercial invoices from the Central Statistics Office (CSO) of Ministry of Commerce. The border trade volumes are estimated by cargo type.
20	CBP on the border with Thailand	
21	CBP on the border with India	
22	CBP on the border with Bangladesh	

Note: CBP means a Cross Border Point situated along the border.
Source: Study Team

(3) Gravity Model and Fratar Method Applied

The computation of generated cargo volume excluding the cargo moved intra-region, and attracted cargo volume excluding the cargo moved intra-region is undertaken by zone. Under the ordinary process, the digital network map with inventory that shows condition and transport capacity of each transport mode is needed. A simple gravity model was applied for cargo volume estimation, as a first stage of the computation of the cargo volume estimation. The present pattern method and the gravity model method are used for estimating the traffic flows. The present pattern method is effective when the current flow is almost clearly understood, and it is common that the gravity model method is used when it will change from the present situation to the future prediction. Since it is known from the traffic surveys

that the cargo flows are inversely proportional to the square of the travel time, it is judged that it is appropriate to adopt the gravity model method when the present pattern is not known. The formula of the gravity model is as follows:

$$T_{ij}^{C} = \frac{G_i^c x A_j^c}{D_{ij}}$$

Where;

I_{ii}^{C} : Intra traffic of cargo "c" in zone "i" (neighbor consumption of cargo "c")

P_i^C : Production of cargo "c" in Zone "i"

S_i^c : Consumption of cargo "c" in Zone "I"

If $P_i^C > I_{ii}^C$, $G_i^c = P_i^C - I_{ii}^C$: Generated Cargo "c" from zone "i"

If $S_i^c > I_{ii}^C$, $A_j^c = S_i^c - I_{ii}^C$: Attracted Cargo "c" to zone "j"

D_{ij} : distance between zone "i" and zone "j"

Secondary the FRATAR Model is applied on each movement of commodity one by one in order to fit with estimated total cargo volume. The formula of FRATAR Model is as follows:

$$T_{ij}^{n} = T_{ij}^{n-1} \times \frac{G_i}{\sum_j T_{ij}^{n-1}} \times \frac{A_j}{\sum_i T_{ij}^{n-1}} \times \frac{\dfrac{\sum_j T_{ij}^{n-1}}{\sum_j (T_{ij}^{n-1} \times \dfrac{A_j}{\sum_i T_{ij}^{n-1}})} + \dfrac{\sum_i T_{ij}^{n-1}}{\sum_i (T_{ij}^{n-1} \times \dfrac{G_i}{\sum_j T_{ij}^{n-1}})}}{2}$$

Where;

T_{ij}^{n} : Traffic Volume between zone I and zone j at the iteration n

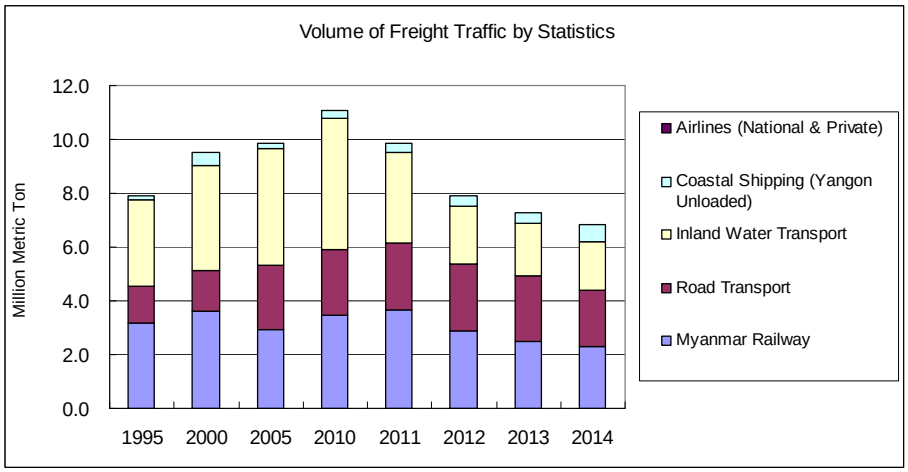
G_i : Generated Traffic Volume of zone i

A_j : Attracted Traffic Volume of zone j

6.5 Present Origin-Destination Table

(1) Cargo Flow Volumes Shown in Statistical Yearbook

Figure-6.5.1 illustrates the cargo traffic volumes by transportation mode that is prepared based on the cargo tonnage data by transportation mode published in the Myanmar Statistical Yearbook 2015. However, the total cargo volume is estimated as less than 8 million tonnes which is considered as very low. This level of cargo volume is evaluated and judged that it cannot support the life of Myanmar people since the cargo volume per person is computed at less than 150kg. The cargo volume in this report was computed based on all available data such as production volume data by regin / state and by each major commodity, all available trade statistics and registered data at ports, customs office and other gateways in HS code, etc.



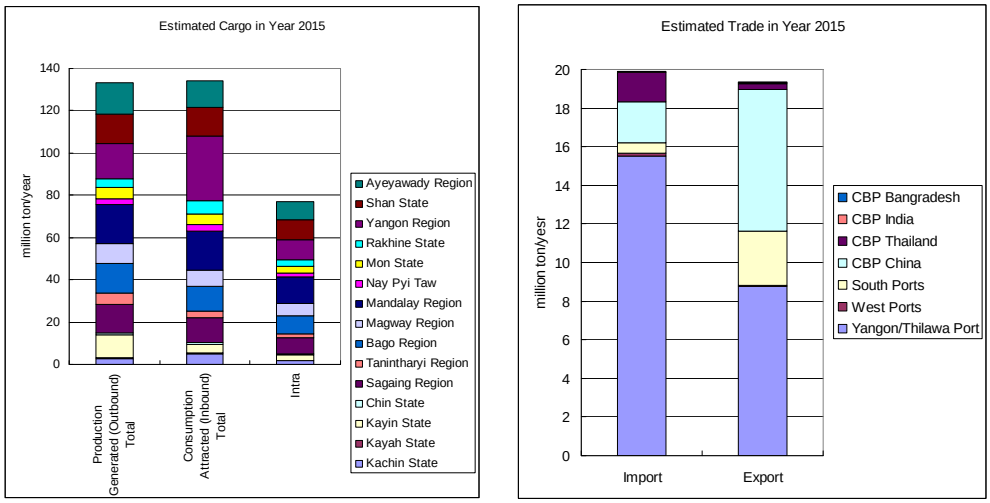
Source: Statistical Yearbook of Myanmar 2015

Figure-6.5.1 Cargo Volumes by Traffic Mode published in the Statistical Yearbook of Myanmar

In concluding the estimation of domestic cargo flow volume, it is recalculated at around 2,980 kg per person. In such a case, the cargo flow volumes by transport mode as shown in the above figure do not figure out the present situation. The data sorted through the source shown in the **Table-6.4.2** was used for analysis on the current cargo flow volume and future cargo demand volume.

The production and the consumption volume are estimated at around 140 million tonnes, and intra production and consumption, which refers to production and consumption in the same region/state, is estimated at around 80 million tonnes. The production and consumption volume of one commodity differs from others, the shortage of one item for consumption is covered by the same commodity where production volumes exceed the consumption is carried to the other area where consumption volumes does not meet with the consumption volumes. The shortage of volumes of one item in the domestic market is covered by imported volumes of same item from foreign countries and the overproduction volumes of one item in the domestic market is exported to foreign market.

The production, exports, imports and consumption for each commodity cargo are estimated and sorted in the form of an OD table. **Figure-6.5.2** illustrates the cargo flow volumes by region/state.



Note: Yangon/Thilawa Port means Yangon Port and Thilawa Terminal Area.
Source: Study Team, estimated based on Myanmar Trade Statistics

Figure-6.5.2 Present Cargo Volume by Area

The present cargo OD estimated table is shown in **Table-6.5.1**. The estimated cargoes at ports are the same as the loaded/unloaded cargoes by port statistics, and border trade is also the same as trade statistics by border trade.

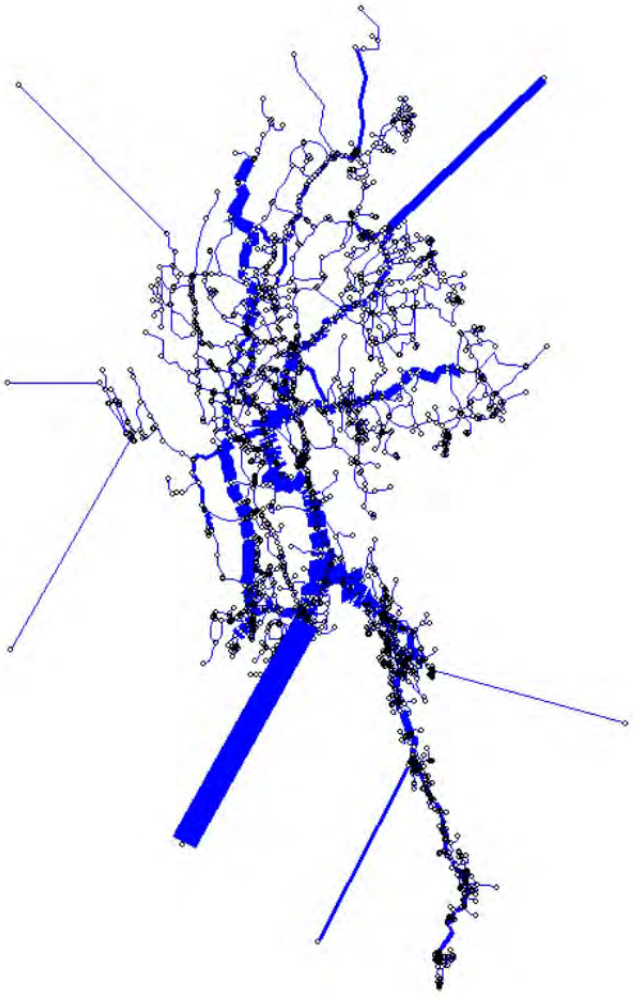
Table-6.5.1 Present Estimated Cargo OD

000 Ton	Kachin State	Kayah State	Kayin State	Chin State	Sagaing Region	Tanintharyi Region	Bago Region	Magway Region	Mandalay Region	Nay Pyi Taw	Mon State	Rakhine State	Yangon Region	Shan State	Ayeyawaddy Region
Kachin State	1,585	0	1	0	0	1	100	46	158	22	37	1	231	0	195
Kayah State	2	282	5	0	0	4	16	6	49	9	8	1	57	13	16
Kayin State	454	45	2,832	59	602	154	267	8	77	11	300	341	3,886	191	31
Chin State	0	0	0	405	0	1	38	37	96	10	13	1	85	0	82
Sagaing Region	310	33	72	68	7,446	289	64	150	258	9	168	736	790	188	1,074
Tanintharyi Region	305	19	28	31	402	1,931	48	8	106	17	28	131	1,106	124	82
Bago Region	109	7	35	23	53	57	8,668	66	775	168	84	65	1,597	273	262
Magway Region	68	6	41	13	47	57	48	5,785	190	8	100	348	881	209	22
Mandalay Region	761	122	22	188	1,490	62	89	125	12,356	85	54	290	1,363	497	68
Nay Pyi Taw	47	20	5	9	72	11	25	17	20	2,025	23	76	378	41	48
Mon State	64	7	26	10	79	12	13	9	103	19	3,032	50	1,135	60	1
Rakhine State	35	6	18	13	104	5	1	20	297	44	1	3,337	20	124	0
Yangon Region	43	7	16	8	82	35	380	47	298	36	79	58	9,162	115	157
Shan State	46	68	13	7	13	106	141	148	281	43	90	349	441	9,674	732
Ayeyawaddy Region	375	10	64	93	152	148	20	336	1,801	235	32	45	997	824	8,289
Terminal Thilawa Area	331	48	91	62	705	242	1,397	382	1,378	200	419	530	7,902	826	986
West Ports	11	2	0	5	0	0	7	27	0	0	1	52	0	22	24
South Ports	48	9	0	14	0	11	105	23	0	0	46	80	0	89	138
CBP China	229	16	4	18	402	32	148	176	433	33	24	63	72	320	133
CBP Thailand	66	9	398	11	105	102	145	18	42	11	160	70	270	63	75
CBP India	0	0	1	2	5	1	2	3	7	0	1	1	3	1	2
CBP Bangladesh	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Total	4,890	716	3,674	1,040	11,760	3,262	11,723	7,436	18,727	2,985	4,699	6,624	30,376	13,653	12,417

000 Ton	Terminal Thilawa Area	West Ports	South Ports	CBP China	CBP Thailand	CBP India	CBP Bangladesh	Total
Kachin State	44	0	0	224	1	1	0	2,645
Kayah State	6	0	0	115	2	0	0	592
Kayin State	1,085	0	52	158	71	4	1	10,630
Chin State	15	0	0	79	0	3	0	866
Sagaing Region	399	0	17	1,318	14	2	1	13,407
Tanintharyi Region	339	0	0	914	36	11	3	5,669
Bago Region	1,162	0	0	401	27	7	2	13,840
Magway Region	1,352	0	0	295	10	0	2	9,482
Mandalay Region	269	2	102	408	2	2	0	18,358
Nay Pyi Taw	139	1	58	37	2	1	0	3,056
Mon State	379	0	0	218	21	7	1	5,247
Rakhine State	18	0	0	64	17	2	4	4,130
Yangon Region	2,913	17	2,606	337	36	5	0	16,439
Shan State	113	0	0	1,773	3	0	0	14,041
Ayeyawaddy Region	556	0	0	985	52	10	6	15,029
Terminal Thilawa Area	0	0	0	0	0	0	0	15,500
West Ports	0	0	0	0	0	0	0	152
South Ports	0	0	0	0	0	0	0	564
CBP China	0	0	0	0	0	0	0	2,103
CBP Thailand	0	0	0	0	0	0	0	1,543
CBP India	0	0	0	0	0	0	0	31
CBP Bangladesh	0	0	0	0	0	0	0	1
Total	8,790	20	2,834	7,325	294	56	21	153,324

Note: Terminal Thilawa Area means Yangon Port and Thilawa Terminal Area.
Source: Study Team

The total cargo flow volume estimated by commodity item can be shown by applying a simple pattern as illustrated in **Figure-6.5.3**. In this Figure, the networks of road, river and railway are not identified; therefore the transport route shown in this figure is to be understood as just showing the cargo flow patterns. However the major cargo flow in terms of volume and route can be understood. It is to be noted that this flow does not mean the cargo flow only on the road network, but they are assigned on the minimum path as a desired line of commodity flow.



Source: Estimated by Study Team

Figure-6.5.3 Estimated Cargo Flow Volumes and Pattern

Railway Cargo: The total cargo volume transported by railway was 2 million tonnes in 2015 based on the statistics of Myanma Railway. However the volume identified clearly by origin and destination analysis, it was approximately 1 million tonnes as shown in **Table-6.5.2** and **Figure-6.5.4**. **Figure-6.5.5** illustrates change of the cargo volume by commodity, based on the statistics of Myanma Rail.

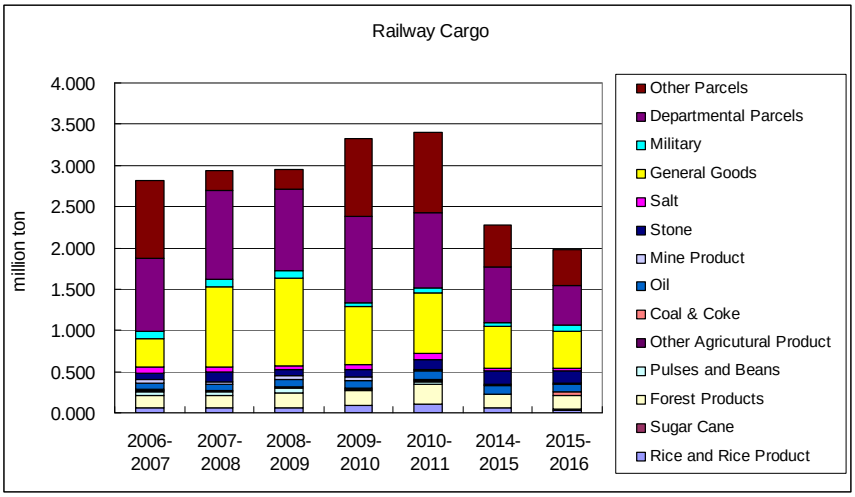
Table-6.5.2 Present Major Railway Cargoes

Railway Cargo (Tonnes)	Generated	Attracted
Kachin State	49,780	144,400
Kayah State	0	0
Kayin State	0	0
Chin State	0	0
Sagaing Region	129,600	141,200
Tanintharyi Region	0	0
Bago Region	14,780	9,600
Magway Region	0	0
Mandalay Region	337,197	338,579
Nay Pyi Taw	0	46,300
Mon State	69,800	0
Rakhine State	0	0
Yangon Region	379,079	292,057
Shan State	4,000	12,100
Ayeyarwaddy Region	0	

Source: Myanma Rail

Source: Estimated by Study Team based on MRT

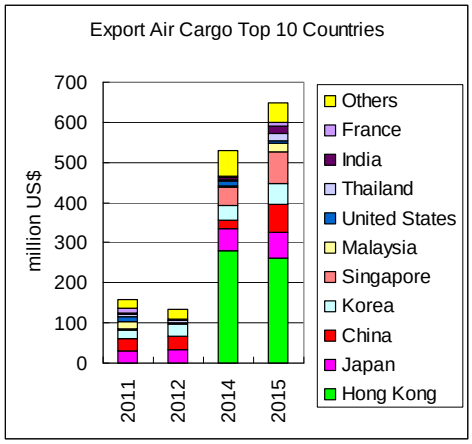
Figure-6.5.4 Present Estimated Cargo Flow Volumes by Railway Mode



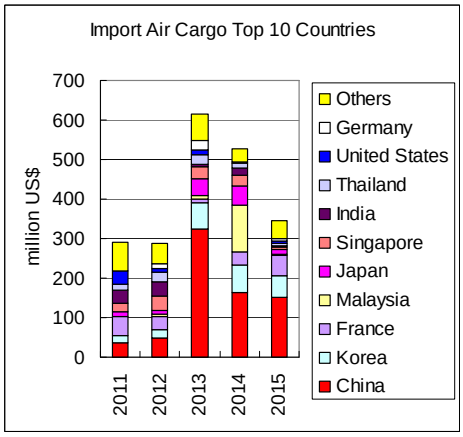
Source: Myanma Rail Transportation, Myanmar Railway "Facts about Myanma Railways Up to December 2011"

Figure-6.5.5 Cargo Volume Trend by Commodity by Rail Transport Mode

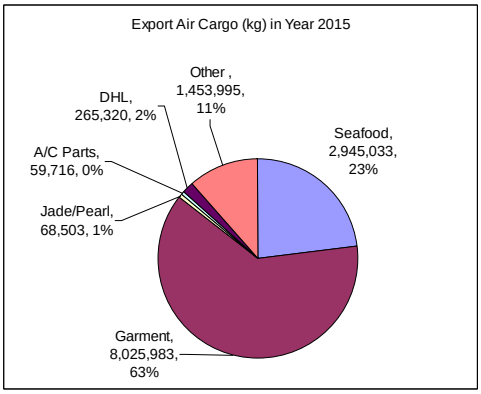
Air Cargo: Air cargoes are not included in the above OD estimation because they are directly transported from the airports to destination countries. Total export by air in 2015 was 13,095 tonnes, of which 23% was accounted by Shanghai crabs and 63% accounted for by garments. The largest source country of import cargo by air is China, followed by Korea, France, Malaysia and Japan with an average volume over the past five years. **Figure-6.2.6** illustrates the trade volumes of air cargo by commodity and by source country.



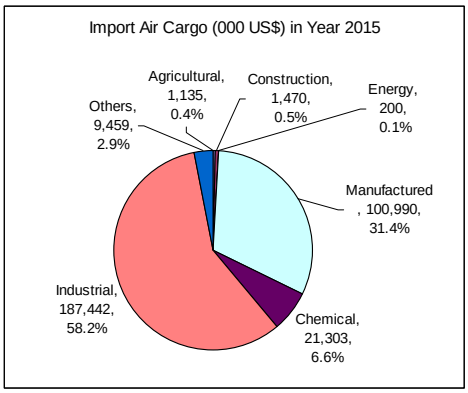
Source: Estimated by Myanmar Trade Statistics



Source: Estimated by Myanmar Trade Statistics



Source: Survey by Study Team



Source: Estimated by Myanmar Trade Statistics

Figure-6.5.6 Export and Import Cargo Volumes by Air Transport Mode

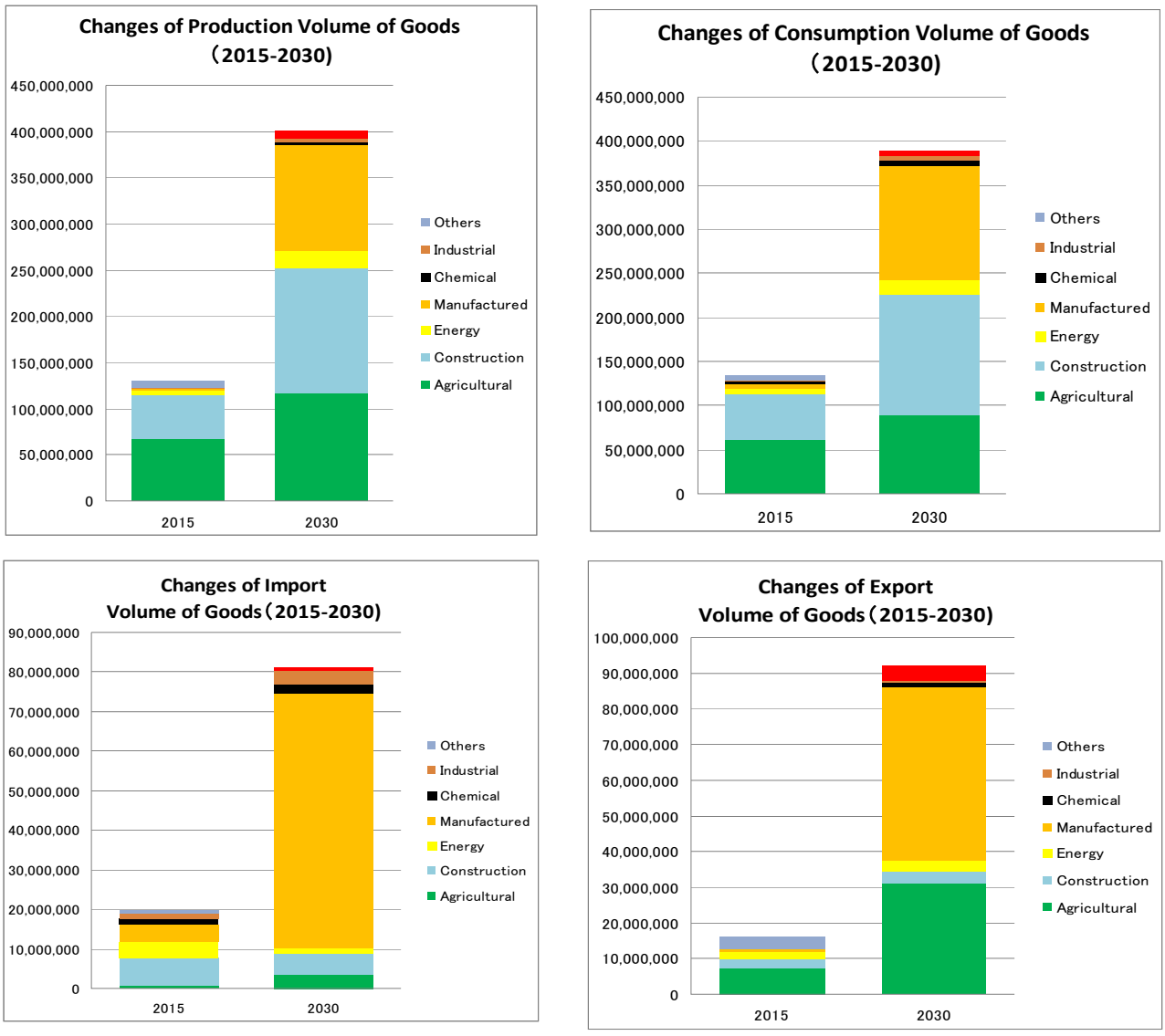
6.6 Cargo Demand Forecast

6.6.1 Cargo Volume Forecast as Base Case

The total cargo volume in year 2030 is projected to reach 485 million tonnes from 153 million tonnes at present, through the summation of each forecast cargo volume prepared in OD form. This projected volume includes intra cargo movements within region/state. The annual growth rate is 8.0%. The cargo volume transported per day is projected to be 1.3 million tonnes per day in future, from 0.4 million tonnes per day at present. In the Study referred to as the National Transport Master Plan, this was projected to be 0.972 million tonnes per day in 2030, however such differences in forecast daily cargo volumes might arise from a difference in zone size and the inclusion of cargo intra-zonal flows with each in region/state.

The cargo volume per capita grows to 8.0 tonnes in 2030 from 2.9 tonnes in 2015. There is still more potential of growth when the correlation with economic growth from other developed countries is considered, especially if infrastructure and logistics systems are fully developed in future.

The import volumes of petroleum, fertilizer and cement are assumed to decrease in future, due to an increase in domestic production for these commodities. The total import cargo volume is projected to grow at an average annual growth rate of 9.8%. The total export cargo volume is projected to increase at an average annual growth rate of 11.2%, however the export volume of sand is assumed to decrease. It is assumed that the share of border trade volume will increase from 29% at present to about 44% in the future total for import and export cargo volumes. **Figure-6.6.1** illustrates the changes in production, consumption, export, and import volumes for commodities, by commodity group.

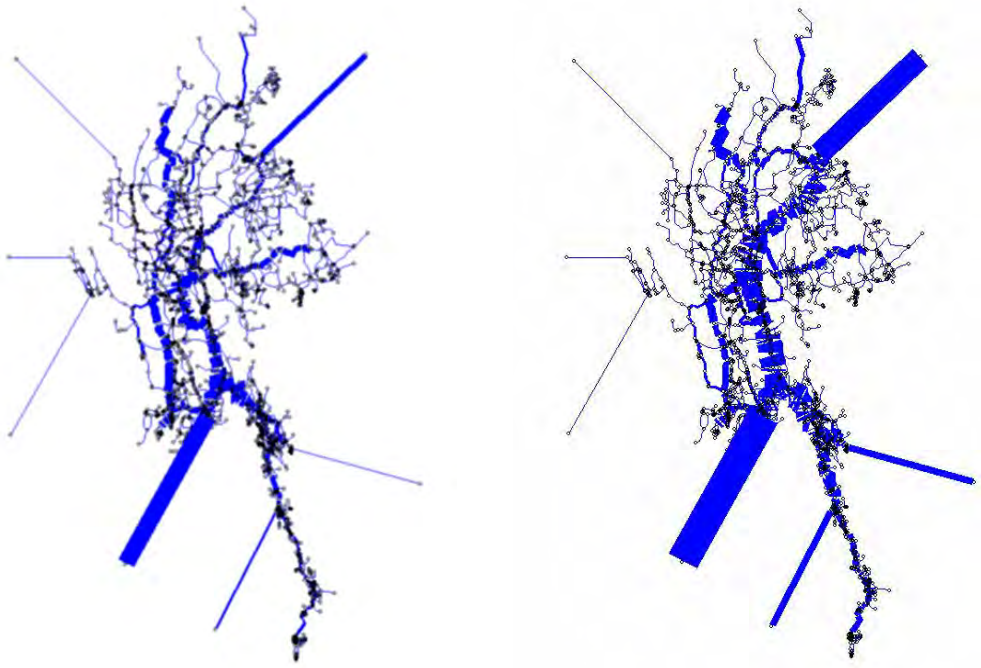


Source: Study Team

Figure-6.6.1 Projection of Cargo Production, Consumption, Import and Export Volumes

Cargo flow patterns in 2015 and 2030 are illustrated in **Figure-6.6.2**. However, the transport routes of cargo by mode do not appear in this figure, since all cargo is assigned only to road mode, therefore only the volume amongst regions/state should be referred. The large cargo volume to and from Dawei appears in this figure because a refinery is expected to be in operation in future there. These flows do not mean direct cargo flows on the road networks, even if they appear so however the cargo volumes are assigned on only the minimum path, as a desired line, because the aim of the Study is not preparation of a road inventory to serve traffic planning purposes.

2015 **2030**

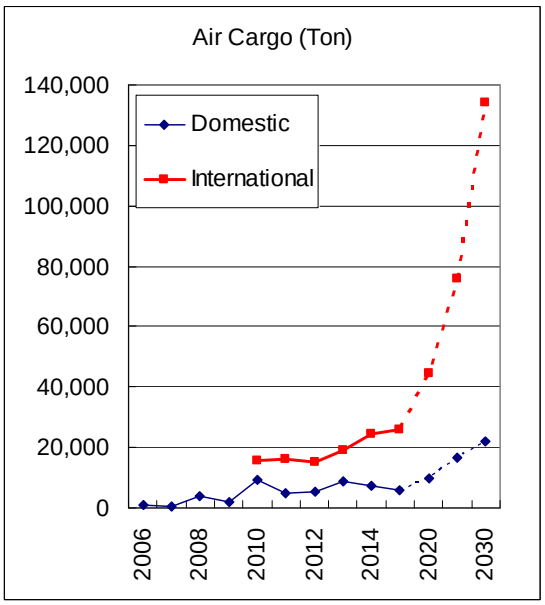


Source: Study Team

Figure-6.6.2 Estimated Present Pattern and Forecasted Pattern of Cargo Flows

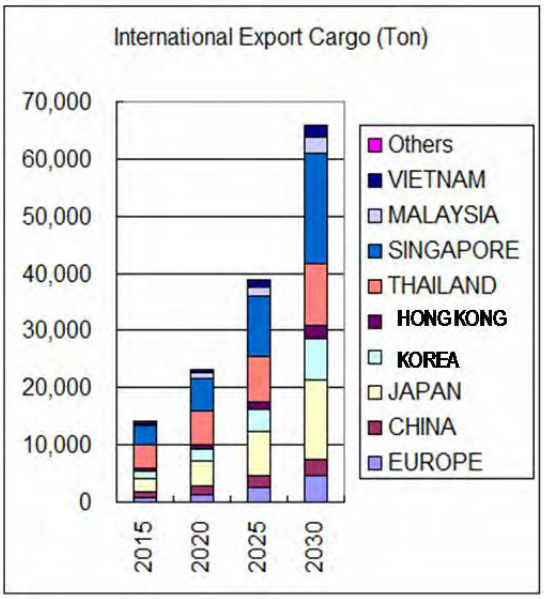
6.6.2 Air Cargo Volume Forecast

Air cargo volume is not included in the above forecast. **Figure-6.6.3** and **Figure-6.6.4** illustrate the forecast for air cargo volumes. As shown in these figures, domestic cargo volume will grow to 3.7 times of the present volume in future, by computation using the annual growth ratio. If the international cargo volume will grow more than the average growth ratio of recent years, it might become 5.2 times of present volume. There is a possibility that some parts of international air cargo (to Thailand and China) will transfer to land transport mode. However international air cargo might then increase to more than 200,000 or 500,000 tonnes, when compared with the other developing countries. It is assumed that after opening Hanthawaddy airport, which is located about 77 km away from Yangon in Bago Region, most air cargo will move to the new airport from the existing Yangon airport. The export destination is assumed to follow the present pattern, however, it is difficult to assume the import source countries, since the import sources will expand worldwide.



Source: Study Team

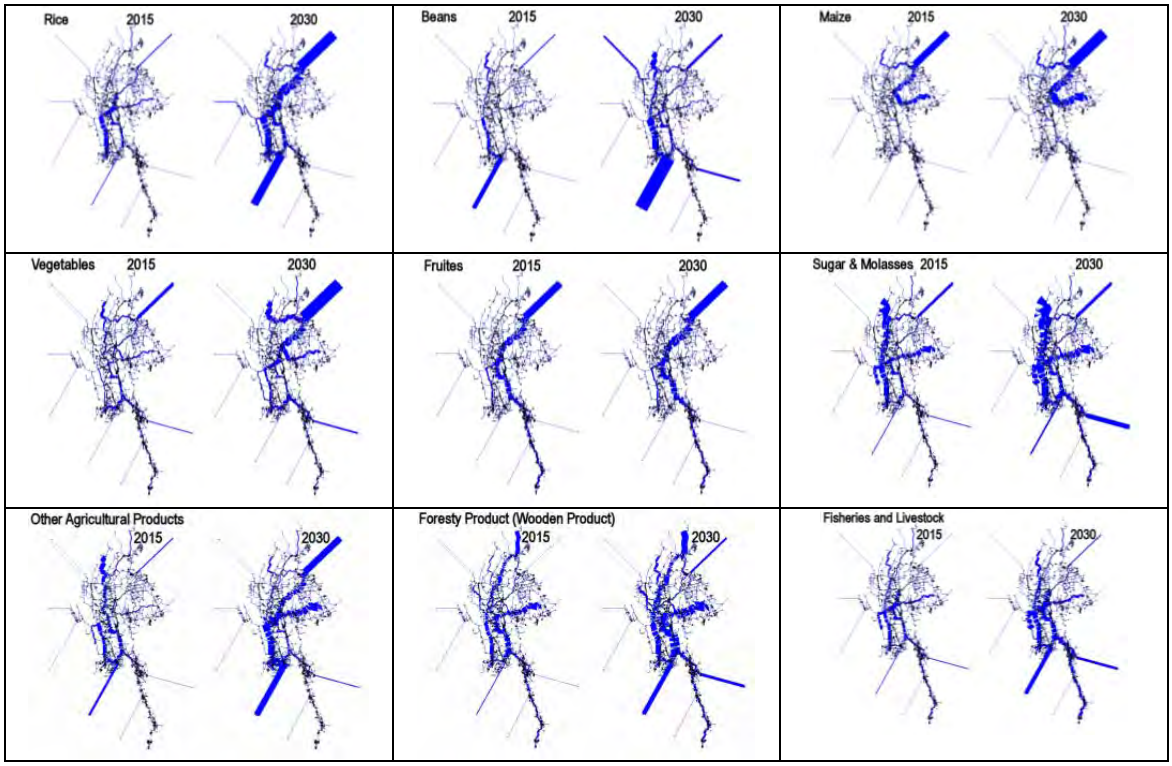
Figure-6.6.3 Forecasted Growth of Air Cargoes

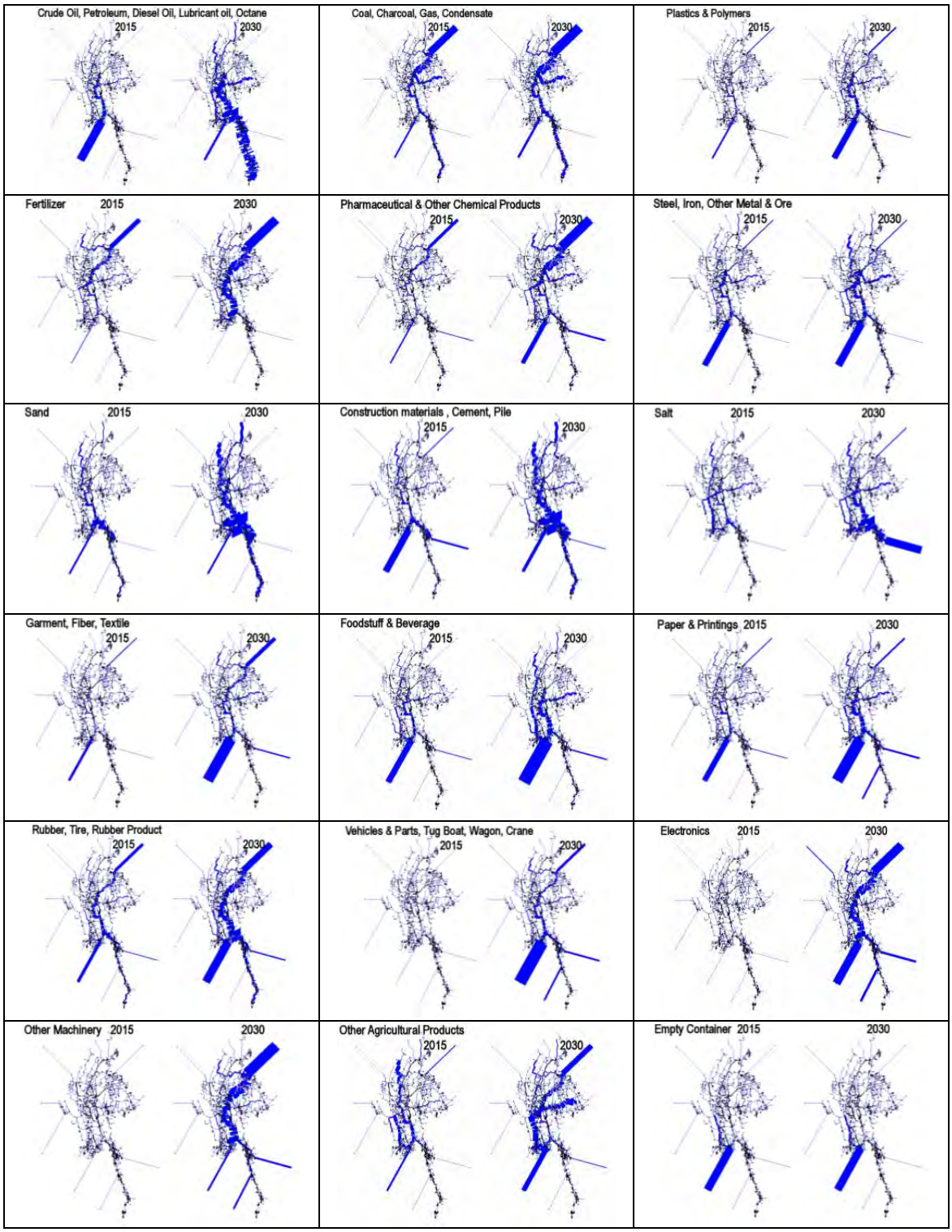


Source: Study Team

Figure-6.6.4 Forecasted Destination of Export Air Cargoes

Figure-6.6.5 illustrated both present (2015) and future (2030) cargo volumes and flow pattern by commodity (cargo item). The unit of width of the line showing the cargo flow differs for each commodity, since the total volume of respective commodities differ considerably, however the unit of width of the line is the same for the same commodity, to show the difference between present and future cargo volumes.





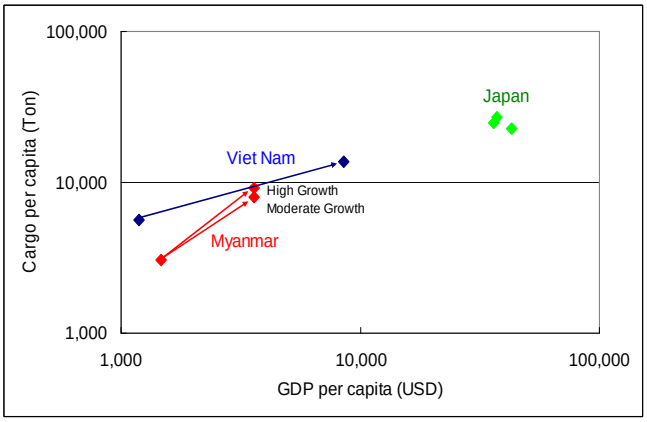
Source: Study Team
Note: Scale of cargo transport volume differs by commodity.

Figure-6.6.5 Present and Future Cargo Flow Pattern by Commodity

6.6.3 Consideration on Moderate (Medium) Growth Case

In the above forecast, the cargo volume for manufactured goods depends on new future investments in the manufacturing sector. As there are few manufacturing industries in Myanmar at present, the growth of this item might be considerably higher. In another case in which the growth rate of manufactured goods is assumed at a moderate rate is forecast as discussed below.

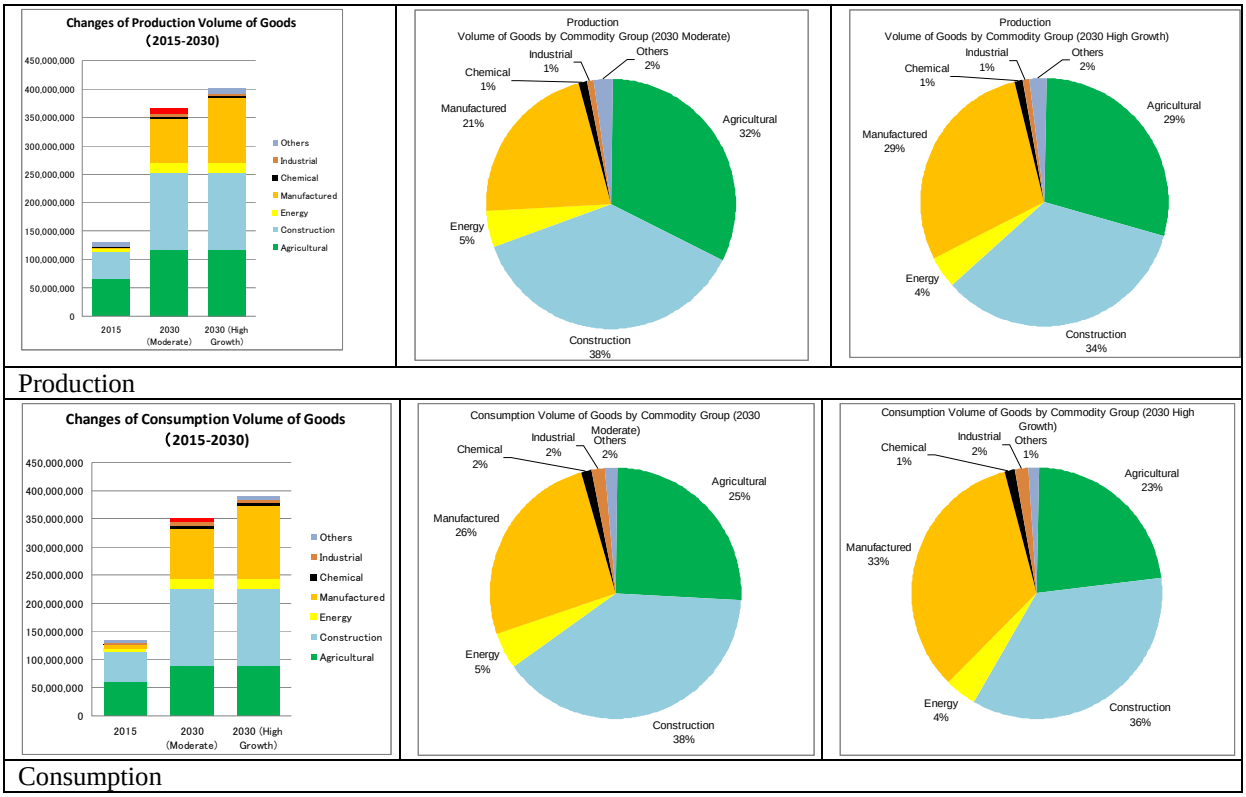
The difference between the High Growth Case and the Moderate Growth Case is not so large, as is illustrated in **Figure-6.6.6.** The Moderate Case is a little bit smaller than that of the experience in Vietnam.



Source: Myanmar (Study Team), Vietnam (JICA VITRANSS2 2008), Japan (MLIT in Japan)

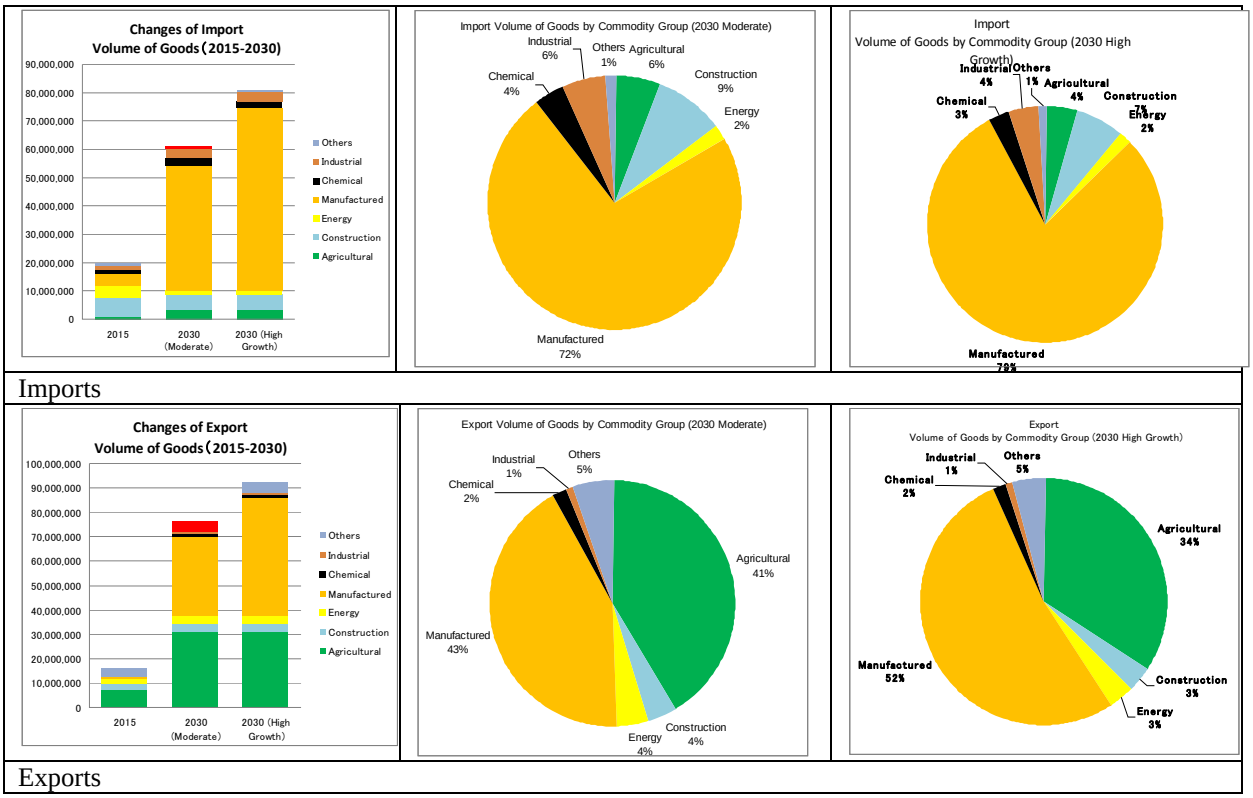
Figure-6.6.6 High Growth and Moderate Growth based on Growth of GDP per Capita

Figure-6.6.7 and **Figure-6.6.8** illustrates the projected cargo volume by different aspects.



Source: Study Team

Figure-6.6.7 Change of Production and Consumption Volume by Commodity Group



Source: Study Team

Figure-6.6.8 Change of Import and Export Volumes by Commodity Group

6.6.4 Summary of Cargo Demand Forecast

The cargo demand forecast is carried out by compilation of demand forecast of each commodity selected as described above as the Base Case. Thereafter, four cases as High Case-A, High Case-B, Moderate Case-A and Moderate Case-B were examined. In the case of High Case-A and Case-B, the growth rate of domestic cargo of Case-B is assumed to be higher than that of Case-A, however, the growth rate of trade cargo volume is not changed. In the case of Moderate Case-A, the growth rate of domestic cargo volume is assumed to be lower than that of High Case-A, however, the growth rate of trade cargo volume is assumed to be the same of High Case-A. In the case of Moderate Case-B the growth rate of domestic cargo is the same of Moderate Case-B, however, the growth rate of trade cargo is lower than that of Moderate Case-A. As for the cargo demand forecast by transport mode, Moderate Case-B was chosen. **Table-6.6.1** shows the result of cargo demand forecast in the total annual cargo volume in 2015 and 2030 by case.

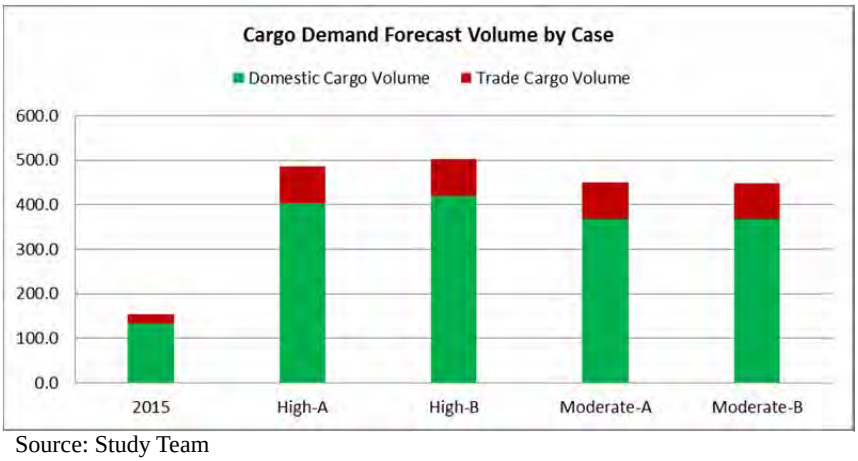
Table-6.6.1 Summary of Cargo Demand Forecast by Case

(Unit: million tons/year)

Case	2015	Share	2030	Share	CAGR
High Case A					
Total Cargo Volume	153.3	100%	485.3	100%	8.6%
Domestic Cargo Volume	133.4	87%	404.1	83%	8.2%
Trade Cargo Volume	19.9	13%	81.2	17%	10.6%
High Case B					
Total Cargo Volume	153.3	100%	501.9	103%	8.8%
Domestic Cargo Volume	133.4	87%	420.7	87%	8.5%
Trade Cargo Volume	19.9	13%	81.2	17%	10.6%
Moderate Case A					
Total Cargo Volume	153.3	100%	429.3	88%	7.6%
Domestic Cargo Volume	133.4	87%	368.1	76%	7.5%
Trade Cargo Volume	19.9	13%	81.2	17%	10.6%
Moderate Case B					
Total Cargo Volume	153.3	100%	429.3	88%	7.6%
Domestic Cargo Volume	133.4	87%	368.1	76%	7.5%
Trade Cargo Volume	19.9	13%	79.5	16%	10.4%

Source: Study Team

Figure-6.6.9 illustrates the cargo demand forecast volume by domestic cargo and trade cargo in various cases mentioned above.



Source: Study Team

Figure-6.6.9 Sumamry of Cargo Demand Forecast by Case

6.6.5 Consideration of the Patterns of Trade

The patterns of trade were studied in the two cases as the High Growth Case and as the Moderate Growth Case. One is projected on a trend basis, based on present pattern of trade as Case-A, and the other projects that almost all trade traffic will pass through the land borders, instead of Yangon Port as Case-B for trade including transit cargoes between Myanmar and the countries located to the East of Myanmar. The total trade volume is same but the volume of each border gate differs.

Table-6.6.2 shows the trade cargo volume passing through each gateway (international sea port and cross-border point (CBP)) under High Growth Case-A and Case-B. **Figure-6.6.10** shows the same in graph form. **Table-6.6.3** shows the trade cargo volume passing through each gateway (international sea port and cross-border point (CBP)) under Moderate Growth Case-A and Case-B. **Figure-6.6.11** shows the same in graph form.

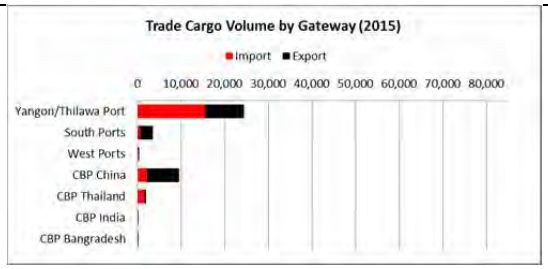
Table-6.6.2 Trade Cargo Volume per Year by High Growth Case-A and Case-B

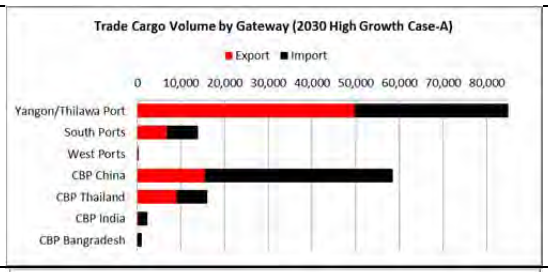
Year 2015				
000 tons/year	Import	Export	Total	Share
Yangon/Thilawa Port	15,500	8,790	24,290	61.9%
South Ports	564	2,834	3,398	8.7%
West Ports	152	20	172	0.4%
CBP China	2,103	7,325	9,428	24.0%
CBP Thailand	1,543	294	1,837	4.7%
CBP India	31	56	87	0.2%
CBP Bangradesh	1	21	22	0.1%
Total	19,894	19,340	39,234	100.0%

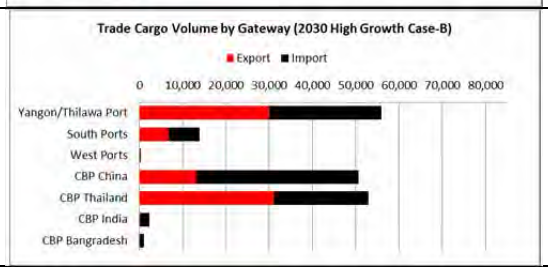
Year 2030	High Growth Case-A			
000 tons/year	Import	Export	Total	Share
Yangon/Thilawa Port	49,820	35,079	84,899	48.0%
South Ports	6,691	7,121	13,812	7.8%
West Ports	192	42	234	0.1%
CBP China	15,383	43,095	58,478	33.1%
CBP Thailand	9,009	6,999	16,008	9.1%
CBP India	104	2,210	2,314	1.3%
CBP Bangradesh	35	913	948	0.5%
Total	81,234	95,459	176,693	100.0%

Year 2030	High Growth Case-B			
000 tons/year	Import	Export	Total	Share
Yangon/Thilawa Port	30,073	25,822	55,895	31.6%
South Ports	6,689	7,123	13,812	7.8%
West Ports	192	42	234	0.1%
CBP China	13,112	37,522	50,634	28.7%
CBP Thailand	31,013	21,840	52,853	29.9%
CBP India	104	2,211	2,315	1.3%
CBP Bangradesh	35	913	948	0.5%
Total	81,218	95,473	176,691	100.0%

Figure-6.6.10 Trade Cargo Volume per Year by High Growth Case-A and Case-B







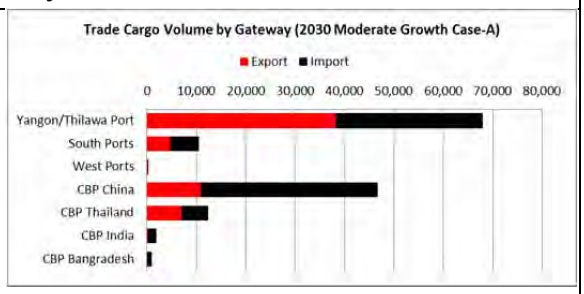
Source: Study Team

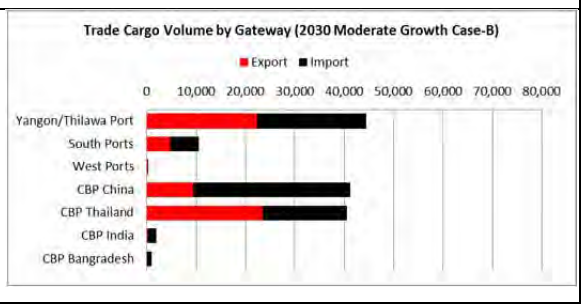
Table-6.6.3 Trade Cargo Volume per Year by Moderate Growth Case-A and Case-B

Year 2030	Moderate Growth Case-A			
000 tons/year	Import	Export	Total	Share
Yangon/Thilawa Port	38,249	29,677	67,926	48.3%
South Ports	4,691	5,873	10,564	7.5%
West Ports	192	42	234	0.2%
CBP China	10,963	35,799	46,762	33.2%
CBP Thailand	7,009	5,399	12,408	8.8%
CBP India	95	1,755	1,850	1.3%
CBP Bangradesh	35	913	948	0.7%
Total	61,234	79,458	140,692	100.0%

Year 2030	Moderate Growth Case-B			
000 tons/year	Import	Export	Total	Share
Yangon/Thilawa Port	22,297	22,109	44,406	31.8%
South Ports	4,691	5,873	10,564	7.6%
West Ports	192	42	234	0.2%
CBP China	9,475	31,738	41,213	29.5%
CBP Thailand	23,448	17,029	40,477	29.0%
CBP India	95	1,755	1,850	1.3%
CBP Bangradesh	35	913	948	0.7%
Total	60,233	79,459	139,692	100.0%

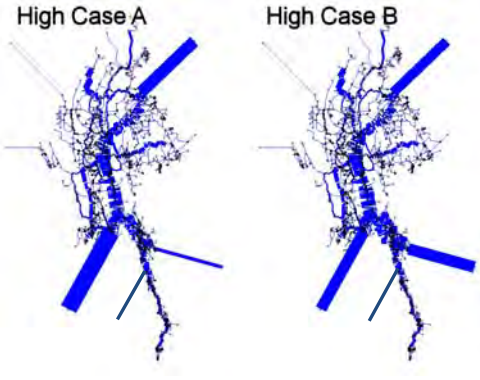
Figure-6.6.11 Trade Cargo Volume per Year by Moderate Growth Case-A and Case-B





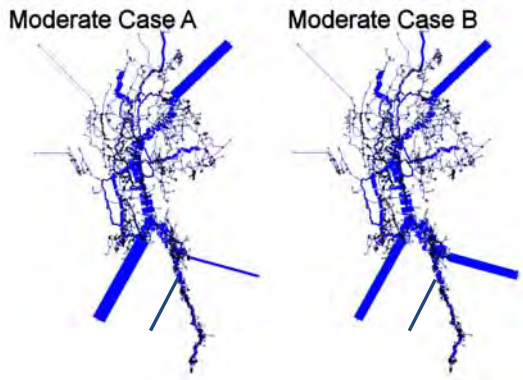
Source: Study Team

Figure-6.6.12 illustrates the cargo traffic pattern of the High Growth Case in Case A and Case B; and **Figure-6.6.13** illustrates the trade volume by trade pattern in the Moderate Growth Case of Case A and Case B in Year 2030, respectively. And volume by the width of line for each case, respectively.



Source: Study Team

Figure-6.6.12 Cargo Flow in the High Growth Case, in 2030



Source: Study Team

Figure-6.6.13 Cargo Flows in the Moderate Growth Case in 2030

The growth case selected for subsequent cargo demand forecast by transport mode is the Moderate Growth Case-B taking into account the physical limitation of container terminal development in the Yangon Port, avoiding excessive investment needed for the infrastructure development; and utilization of existing infrastructure as much as possible.

6.7 Modal Share Model

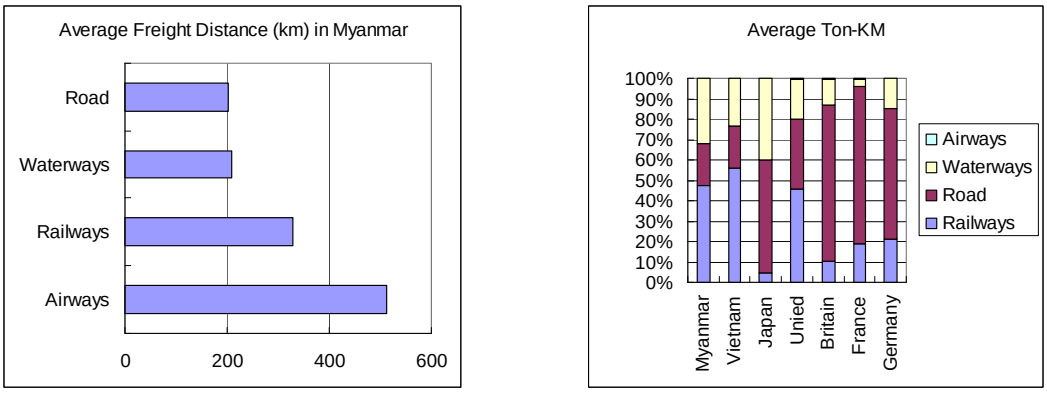
(1) Logit Model

It is understood that in the "Myanmar National Transport Master Plan 2014" prepared by JICA the following "Logit" modal share model was used for the person and cargo volume estimation.

For Person Trips	For Cargo Trips
$\frac{1}{1+\exp(-\lambda(C_{ij}^2 - C_{ij}^1))}$ λ : Scale Parameter C_{ij}^1 : Travel cost by mode 1 between i and j C_{ij}^2 :Travel cost by mode 2 between i and j	$P_i = \frac{\exp(U_i)}{\exp(U_l)+\exp(U_j)}$ $U_i = a * time_i + b * cost_i$ $U_j = a * Time_j + b * cost_j$ U_i : Utility of mode i $time_i$: Transportation time by mode i $cost_i$: Transportation cost by mode i Uj : Utility of mode j $timej$: Transportation time by mode j $costj$: Transportation cost by mode j

Although the above models can be applied for the computation of transit volumes of cargo in two types of transport mode, at least three freight transport modes: trucks, railways, and inland waterway should be computed in this Study. If coastal ships and air are also included, this kind of binary mode share model cannot be applied to deal with (plural) number of transport modes. A more important issue is existence and availability of a digital overlay map that contains inventories and characteristics of each transport mode, covering the whole area of Myanmar. However the necessary survey to prepare such digital overlay maps has not been carried out in the past in Myanmar, and no resources and time were available to prepare such digital map for this Study. Even if a GIS digital map could be prepared, there exists another problem related to the estimation of parameters needed to run a Logit model. Generally speaking, special research or preparation of present modal share data is necessary to estimate parameters, however such research has not yet been carried out in Myanmar. Therefore, a simplified method was applied for this Study. Some of existing data showing the modal share of cargo transport volumes in Myanmar are available, as follows. However the modal share ratio shown in such data- as shown in **Figure-6.7.1** - seems to be not applicable to this Study simply because of the results of the survey data, comparisons with other statistical data and the comparisons with other Countries. For example, the modal shares of the railways and waterways in Myanmar shown in the Statistical Yearbook of

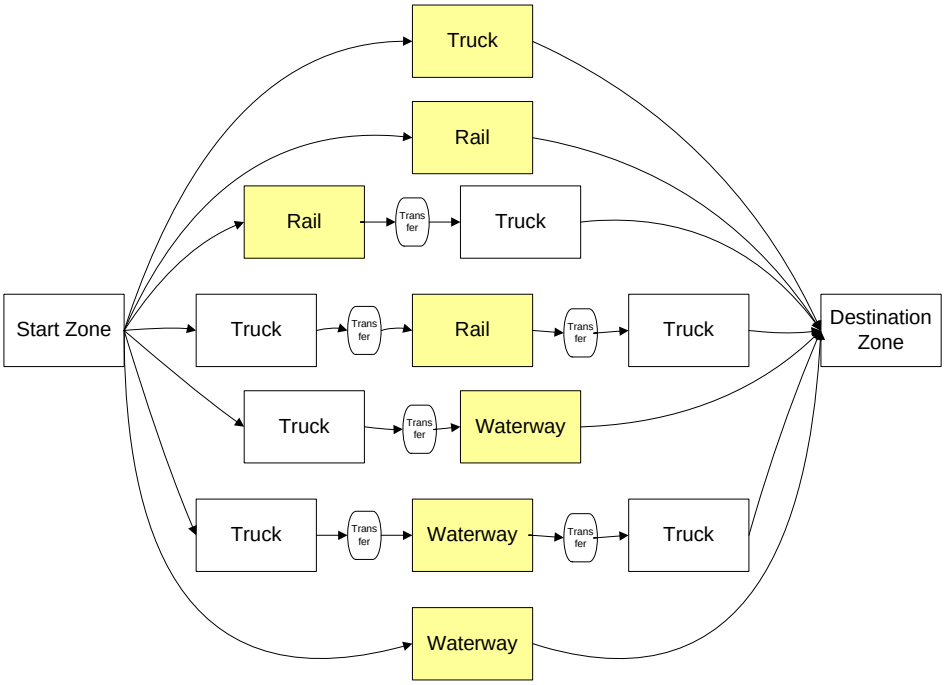
Myanmar are much higher than for road, but in the survey most cargo was carried by truck.



Source: (Myanmar) Statistical Yearbook of Myanmar 2015, (Vietnam) General Statistics Office of VIET NAM, (Japan) MLIT, (USA) National transport statistics, (EU) EU Energy and transport in Figures

Figure-6.7.1 Modal Share Data Available from Statistics in Myanmar

Various transport modes can be used to move one commodity as a cargo from an origin zone to a destination zone. Passing points to reach to the destination differ by transport mode. In this Study, three types of transport: trucks, railways, and waterways were considered; then the optimum route was selected for every zonal pair. The optimum time, cost and trans^shipment times were estimated for each route. Modal share is estimated for those parameters by applying the simulation model presented in **Figure-6.7.2**. As shown in this figure, the cargo volumes were assigned on three optimum routes. This is the modal share simulation model used in this Study.



Source: Study Team
Note: Transfer time is added at each transshipment point. And because there are modes that are easy to carry depending on the type of goods, all optimum routes of all modes were not used, and the route of the longest duration was discarded in the simulation process. Major mode is called representative mode in traffic analysis. The yellow boxes in the above figure show the representative mode.

Figure-6.7.2 Simulation Model for Selection of Optimum Routes

(2) Estimation Case

The modal share of cargo flow is estimated by use of a simplified "Logit" model, which is mostly used for estimation of cargo flow volumes. The basic formula is described in the preceding section. Various cases- as shown in **Table-6.7.1** - can be assumed for model application. The model assesses the effect of improvement and increased transport capacity. The improvement of the transshipment facility might shorten time needed for loading/unloading operational time.

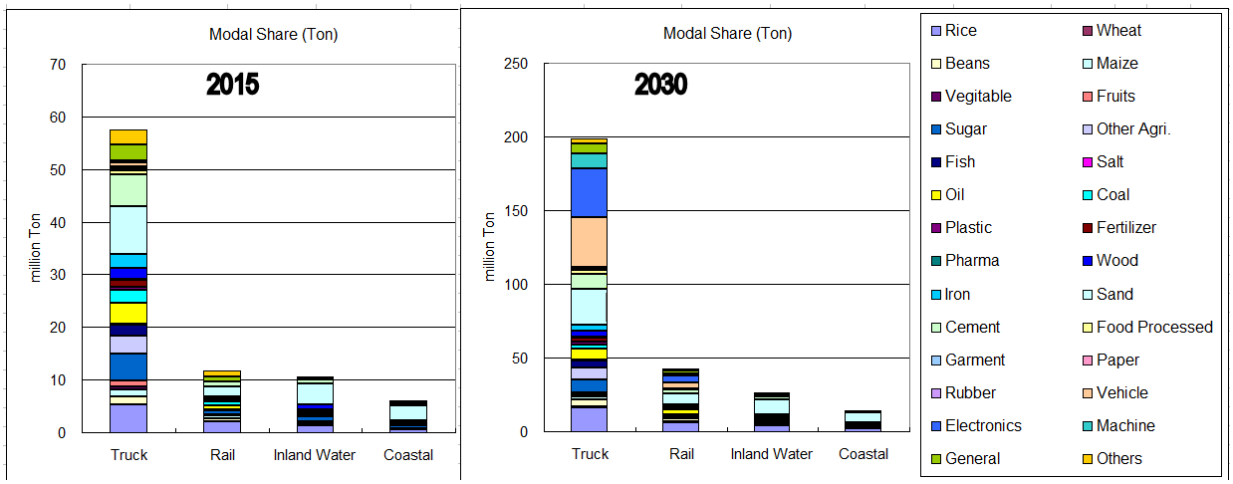
Table-6.7.1 Various Factors impacting the Mode Share Forecast

		Present Trade Pattern	Shifted Pattern to the border
Forecast Case	High Growth	High Case A	High Case B
	Moderate Growth	Moderated Case A	Moderate Case b
Mode Variation	- Trend - Improve Road Network - Improve Railway Network - Improve Waterway Network - Transshipment Facility - Stock Yard		

Source: Study Team

(3) Cargo Volume by Mode

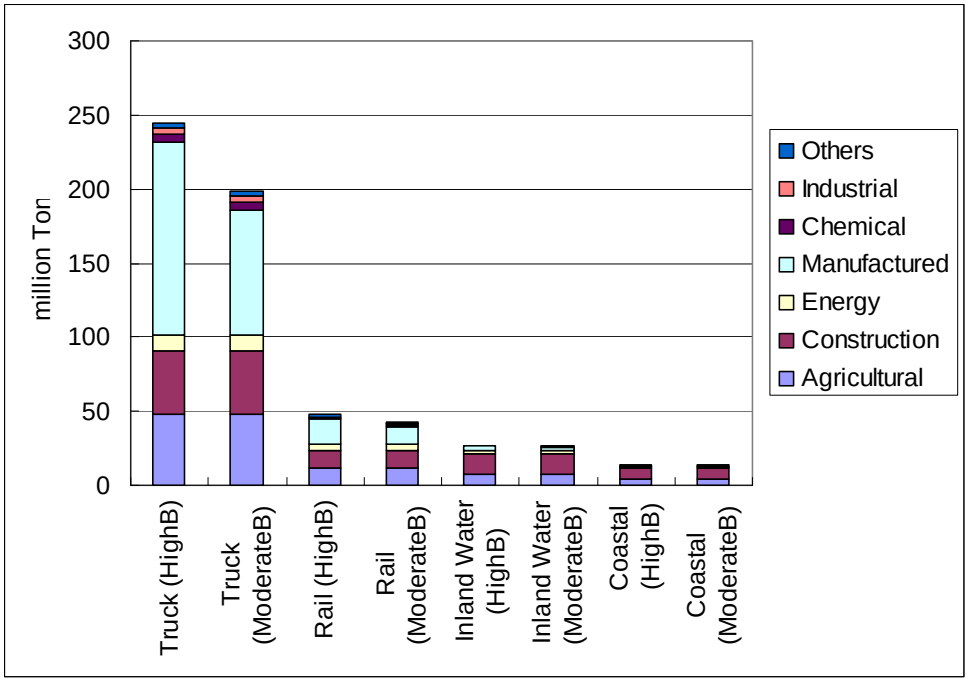
The precise present modal share ratio for cargo transport by mode is difficult to analyze, as no proper statistical data exists in Myanmar. The truck interview survey conducted at selected region/state boundaries, however, does not cover whole area of Myanmar, and the intrazonal data within the region/state where the most cargoes move was not obtained either. The data for inland waterway transport is available only from IWT, the public corporation responsible for inland water transport. However, the ratio of sample is small and it did not cover all operators. Interview survey on the coastal shipping was also carried out by sampling limited data. The data available from Myanma Railways is comparatively complete, except the estimated volume of annual cargo in a form of OD included some ambiguous data, especially for short distance trips. Therefore, the following present modal share is estimated by the logit model. In the future modal share under the Moderate case, the cargo movement pattern shifted to the border from the seaport somewhat, together with improvement of the railway. The cargo volume by gateway differs between the present and the future in 2030. All transport modes are forecast to undertake to transport considerably larger volumes of cargo than the present cargo volume. Most shortages of transport capacity in rail, inland waterway and coastal shipping modes are assumed to be covered by (highways) trucks. **Figure-6.7.3** illustrates the change of share of cargo transport by transport mode and by commodity.



Source: Study Team
Note: 2030 Case (Moderate Growth, shifting trade cargo volume partly to CBP, Railway Improvement)

Figure-6.7.3 Change of Modal Share between 2015 and 2030

The considerable difference between the present situation of the modal share and the future forecast for 2030 is attributed by changes in generated / attracted cargo volumes in the manufacturing sector. The cargo transport in tonnes by mode will be affected by this difference in volume substantially. Under such future patterns, trucks will undertake the bulk of freight cargo transport. However, the volume of trucks is much different between the High Growth and the Moderate Growth Cases. The share of other modes is not much affected by the difference in case. Therefore, the Moderate Growth Case is adopted to proceed with further Study in this Chapter. **Figure-6.7.4** illustrates the differences in transport volumes of cargo assigned to each transport mode in total and by commodity.



Source: Study Team

Figure-6.7.4 Difference between High Growth B and Moderate Growth B in 2030

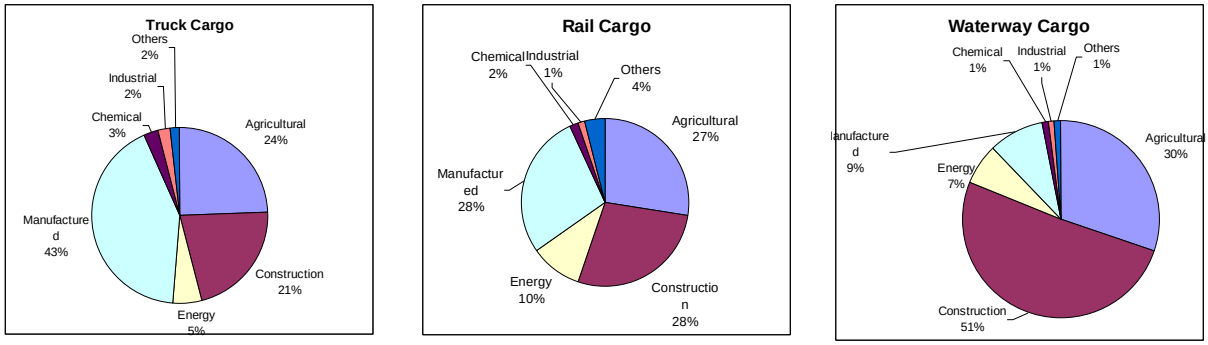
The modal share ratio of forecast cargo transport mode by cargo category in 2030 under the moderate growth case, with the trade cargo movement pattern shifted from ports to borders and improved railway transport performance is shown in **Table-6.7.2.** Since the transport of manufactured goods, chemical goods, and industrial goods should be carried out in as short a transport time as possible, these goods are mainly carried by truck, which does not need to take much time for loading / unloading of cargo of for transshipment operations. As for agricultural products and construction materials, water transportation is still appropriate in consideration of the lower transport costs.

Table-6.7.2 Transport Mode by Cargo Category in 2030 under Moderate Growth Case, Shifting Trade from Port to Border, with Railway Performance Improvement

	Truck	Rail	Inland Water	Coastal	Total
Agricultural	67.0%	16.3%	11.0%	5.7%	100.0%
Construction	56.1%	15.4%	17.7%	10.4%	100.0%
Energy	59.1%	23.8%	9.7%	7.4%	100.0%
Manufactured	85.1%	12.1%	2.4%	0.5%	100.0%
Chemical	83.2%	11.4%	4.6%	0.8%	100.0%
Industrial	85.5%	10.2%	5.3%	1.6%	100.0%
Others	59.1%	29.4%	4.6%	6.9%	100.0%

Source: Study Team

In the above case in 2030, the cargo share ratios by commodity and by mode are shown in **Figure-6.7.5.** Manufactured goods are assumed to be carried mainly by truck and rail, and the major portion of construction materials is assumed to be carried by waterways. The share ratio of agricultural products is relatively high for all modes. The share of transport mode is evaluated as prausible for the transport of each commodity, judging from the results of simulation carried out in this Study.



Source: Study Team

Figure-6.7.5 Cargo Type Ratio in 2030 by Mode (moderate B, railway improvement)

Generated/attracted tonnage of cargo simulated by "Logit" model in 2015 and 2030, under a moderate growth scenario, shifted trade patterns from ports to border gateways and included railway performance improvement is shown in **Table-6.7.3.** This is one example of several cargo demand forecast cases that were simulated under various conditions for the planning exercise. In this example, cargo volume transported by road at Myawaddy, or by railway at

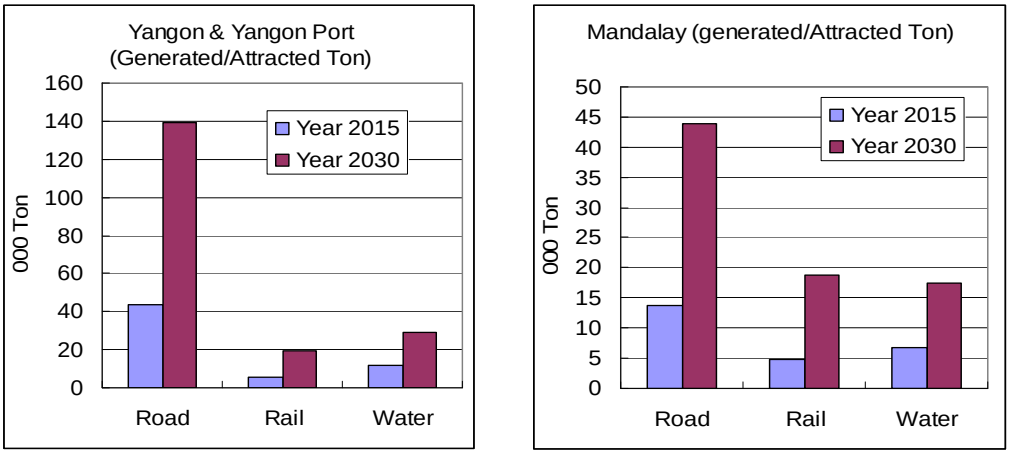
Mandalay, and water cargo at Mandalay all increase sharply. At all other points, the cargo volume increases between 2015 and 2030. However, the total cargo volume is not same, since these cargo flows do not include intra-regional / intra-state cargo flows and transshipment cargo is counted on several modes.

Table-6.7.3 Generated/Attracted Volume by Mode and by region/state in 2015 and 2030

000 Ton	Year 2015						Year 2030 Moderate Growth & Shifted Trade Pattern to Border					
	Road		Rail		Water		Road		Rail		Water	
	Generated	Attracted	Generated	Attracted	Generated	Attracted	Generated	Attracted	Generated	Attracted	Generated	Attracted
Kachin State	487	1,343	218	512	355	1,450	684	2,757	374	1,403	498	3,777
Kayah State	252	392	5.4	42	0	0	436	1,010	119	152	0	0
Kayin State	6,813	801	984	41	0	0	20,491	3,039	2,829	78	0	0
Chin State	388	555	100	106	0	0	1,430	1,079	201	1,060	0	0
Sagaing Region	3,955	1,811	1,072	879	1,279	1,971	7,213	5,444	3,332	4,027	2,448	4,940
Tanintharyi Region	1,073	841	85.4	265	1,806	224	5,918	1,593	4,360	267	5,005	172
Bago Region	3,201	2,15.5	994	537	1,080	491	8,413	6,399	5.230	2,114	2,301	407
Magway Region	3,783	1,725	530	901	1,024	665	10,983	4,033	2,736	5.501	2,867	1,461
Mandalay Region	7,674	5,990	1,279	3,430	3,423	3,326	29,185	14,698	6,417	12,350	7,335	10,076
Nay Pyi Taw	889	820	141	140	0	0	2,677	2,192	615	504	0	0
Mon State	836	1,310	405	246	1,074	211	4,363	2,618	2,006	775	2,917	736
Rakhine State	705	2,544	0	0	88	743	2,112	5.226	0	0	473	1,559
Yangon Region	5,564	17,931	1,190	1,727	4,547	5,580	34,039	64,562	6,373	9,578	12,558	14,684
Shan State	3,432	3,383	935	596	0	0	5,863	7,635	1,846	1,519	0	0
Ayeyawaddy Region	4,077	2,957	1,456	578	1,208	593	8,699	5,882	4,257	1,555	3,869	988
Yangon Port	13,346	6,722	1,395	916	765	1,158	22,484	17,974	778	2,892	343	1,551
West Ports	136	18	0	0	16	2	177	39	0	0	15	3
South Ports	319	1,639	15.2	853	89	341	3,598	3,887	963	1,662	131	324
Muse	2,103	7,325	0	0	0	0	9,475	31,738	0	0	0	0
Myawaddy	1,543	5.54	0	0	0	0	23,448	17,028	0	0	0	0
Chikha	31	5.2	0	0	0	0	95	1,755	0	0	0	0
Maungdaw	1	20	0	0	0	1	31	826	0	0	4	87

Source: Study Team

In all regions/states, the rate of increase of generated / attracted cargo volumes is quite high. For example, the cargo volume at Yangon and Mandalay by truck will increase more than three times the present volume. Both railway cargo and waterway cargo volumes will considerably increase. This means that a shortage of transport capacity due to a lack of relevant modal infrastructure capacity could become significant in future.



Source: Study Team

Figure-6.7.6 Generated/Attracted Cargo Volume Growth in Mandalay and Yangon between 2015 and 2030

Table-6.7.4 shows one of the cargo volume origin-destination tables. This is forecast under the Moderate Growth Case, with the trade-shift partly to border and railway improvement in 2030. The waterway OD includes inland waterway and coastal shipping transport, according to the connectivity between zones. The unit is thousand tonnes per year. Because the OD table is estimated by gravity model, it is assumed that all intrazonal production in a zone is consumed at first in the same zone, but mutual demand/supply between nearby zones will be transported in the real world.

Table-6.7.4 Annual Cargo Volume OD in 2030

(Moderate Case: Trade cargo shift partly to CBP, Railway improvement)

Truck

Truck (000 Ton)	Kachin State	Kayah State	Kayin State	Chin State	Sagaing Region	Tanintharyi Region	Bago Region	Magway Region	Mandalay Region	Nay Pyi Taw	Mon State	Rakhine State	Yangon Region	Shan State	Ayeyawaddy Region
Kachin State	0	0	0	0	2	1	17	13	70	3	4	0	139	1	98
Kayah State	2	0	2	0	0	3	7	129	32	11	3	0	42	56	10
Kayin State	93	18	0	14	591	1	5	1	4	0	12	230	15,981	53	2
Chin State	2	0	0	0	206	1	12	14	54	3	7	1	72	6	56
Sagaing Region	270	43	9	471	0	228	13	205	237	11	55	591	605	110	1,202
Tanintharyi Region	438	37	92	44	563	0	107	4	635	31	119	28	2,250	211	151
Bago Region	35	10	50	6	56	22	0	20	592	116	63	75	2,399	80	271
Magway Region	171	444	8	23	110	46	36	0	860	417	35	2,635	1,652	979	91
Mandalay Region	738	146	4	317	923	58	73	394	0	183	57	296	2,587	3,146	201
Nay Pyi Taw	11	46	0	2	22	4	5	786	94	0	8	61	785	140	54
Mon State	12	9	42	6	56	3	13	4	76	18	0	54	2,074	23	4
Rakhine State	44	9	27	16	140	3	4	557	461	78	1	0	62	147	22
Yangon Region	113	31	37	26	532	69	2,212	648	1,307	441	298	406	0	405	1,437
Shan State	41	123	4	6	27	56	44	116	1,681	53	42	291	328	0	739
Ayeyawaddy Region	196	15	69	29	208	58	9	22	1,104	174	26	90	2,318	481	0
Yangon Port	79	17	1	17	196	48	590	228	515	97	104	325	19,057	257	759
Sittwe Ports	4	1	0	2	2	0	2	93	2	0	0	53	0	10	8
Dawei Ports	45	9	5	10	157	143	64	93	246	64	72	83	2,305	151	151
Muse	245	19	1	18	924	21	33	230	5,183	117	16	77	1,731	754	107
Myawaddy	216	31	2,688	28	709	828	3,154	458	1,529	374	1,695	326	10,165	617	516
Chikha	2	0	0	43	18	1	0	4	13	1	0	1	5	6	1
Maungdaw	1	0	0	0	2	0	0	16	1	0	0	5	4	1	1
Total	2,757	1,010	3,039	1,079	5,444	1,593	6,399	4,033	14,698	2,192	2,618	5,626	64,562	7,635	5,882

Truck (000 Ton)	Yangon Port	Sittwe Ports	Dawei Ports	Muse	Myawaddy	Chikha	Maungdaw	Total
Kachin State	99	0	0	199	37	1	0	684
Kayah State	18	0	0	102	16	0	1	435.68
Kayin State	387	0	38	30	3,029	1	1	20490.8
Chin State	45	0	0	64	11	877	0	1429.98
Sagaing Region	356	0	54	2,107	273	363	10	7212.55
Tanintharyi Region	113	0	92	271	717	9	5	5917.88
Bago Region	2,142	0	6	540	1,883	8	42	8412.79
Magway Region	1,465	23	27	1,027	412	91	433	10983.4
Mandalay Region	159	2	138	19,201	455	104	2	29184.7
Nay Pyi Taw	102	1	69	251	219	13	2	2677.3
Mon State	117	0	18	178	1,645	5	8	4363.33
Rakhine State	142	0	0	177	111	7	103	2111.57
Yangon Region	10,668	13	3,406	4,435	7,289	249	17	34038.8
Shan State	198	0	20	1,963	125	7	1	5863.09
Ayeyawaddy Region	1,850	0	22	1,192	615	20	202	8699.49
Yangon Port	0	0	0	0	194	0	0	22483.7
Sittwe Ports	0	0	0	0	0	0	0	176.909
Dawei Ports	0	0	0	0	0	0	0	3597.89
Muse	0	0	0	0	0	0	0	9475.29
Myawaddy	113	0	0	0	0	0	0	23448.2
Chikha	0	0	0	0	0	0	0	95.2068
Maungdaw	0	0	0	0	0	0	0	31.0251
Total	17,974	39	3,887	31,738	17,028	1,755	826	201,814

Source: Study Team

Railway

Rail (000 Ton)	Kachin State	Kayah State	Kayin State	Chin State	Sagaing Region	Tanintharyi Region	Bago Region	Magway Region	Mandalay Region	Nay Pyi Taw	Mon State	Rakhine State	Yangon Region	Shan State	Ayeyawadd y Region
Kachin State	0	0	0	1	0	0	40	6	160	2	2	0	68	0	46
Kayah State	0	0	0	1	0	0	11	2	83	1	1	0	9	1	3
Kayin State	59	8	0	9	517	0	1	480	24	0	2	0	1,631	28	1
Chin State	2	0	0	0	7	1	21	10	75	2	3	0	33	4	23
Sagaing Region	97	8	1	246	0	47	344	415	1,556	7	12	0	140	30	190
Tanintharyi Region	293	21	50	45	423	0	95	104	774	13	108	0	2,074	94	111
Bago Region	116	21	3	36	734	9	0	523	1,734	178	15	0	722	498	31
Magway Region	85	6	7	169	117	13	306	0	1,055	50	11	0	339	118	41
Mandalay Region	582	60	2	157	1,843	31	302	492	0	88	18	0	2,132	500	91
Nay Pyi Taw	5	3	0	17	18	1	88	54	116	0	1	0	231	12	6
Mon State	6	3	2	7	35	2	4	94	175	4	0	0	1,295	5	298
Rakhine State	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Yangon Region	42	7	5	330	182	30	576	228	2,866	72	104	0	0	93	372
Shan State	6	7	0	10	8	8	141	50	1,342	9	9	0	70	0	114
Ayeyawaddy Region	61	1	4	24	20	17	2	287	2,240	46	425	0	314	22	0
Yangon Port	26	4	0	5	81	20	153	102	101	18	33	0	0	66	168
Sittwe Ports	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dawei Ports	21	4	2	4	42	86	33	55	48	12	30	0	520	47	60
Muse	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Myawaddy	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chikha	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Maungdaw	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	1,403	152	78	1,060	4,027	267	2,114	2,901	12,350	504	775	0	9,578	1,519	1,555

Rail (000 Ton)	Yangon Port	Sittwe Ports	Dawei Ports	Muse	Myawaddy	Chikha	Maungdaw	Total
Kachin State	50	0	0	0	0	0	0	374
Kayah State	6	0	0	0	0	0	0	118.639
Kayin State	44	0	24	0	0	0	0	2829.28
Chin State	20	0	0	0	0	0	0	201.072
Sagaing Region	220	0	17	0	0	0	0	3331.63
Tanintharyi Region	88	0	65	0	0	0	0	4359.62
Bago Region	1,010	0	1	0	0	0	0	5630.08
Magway Region	414	0	5	0	0	0	0	2736.48
Mandalay Region	74	0	45	0	0	0	0	6417.1
Nay Pyi Taw	38	0	25	0	0	0	0	615.445
Mon State	70	0	4	0	0	0	0	2005.52
Rakhine State	0	0	0	0	0	0	0	0
Yangon Region	0	0	1,466	0	0	0	0	6372.93
Shan State	69	0	4	0	0	0	0	1846.44
Ayeyawaddy Region	788	0	5	0	0	0	0	4256.62
Yangon Port	0	0	0	0	0	0	0	778.357
Sittwe Ports	0	0	0	0	0	0	0	0
Dawei Ports	0	0	0	0	0	0	0	962.718
Muse	0	0	0	0	0	0	0	0
Myawaddy	0	0	0	0	0	0	0	0
Chikha	0	0	0	0	0	0	0	0
Maungdaw	0	0	0	0	0	0	0	0
Total	2,892	0	1,662	0	0	0	0	42,836

Source: Study Team

Inland Waterway

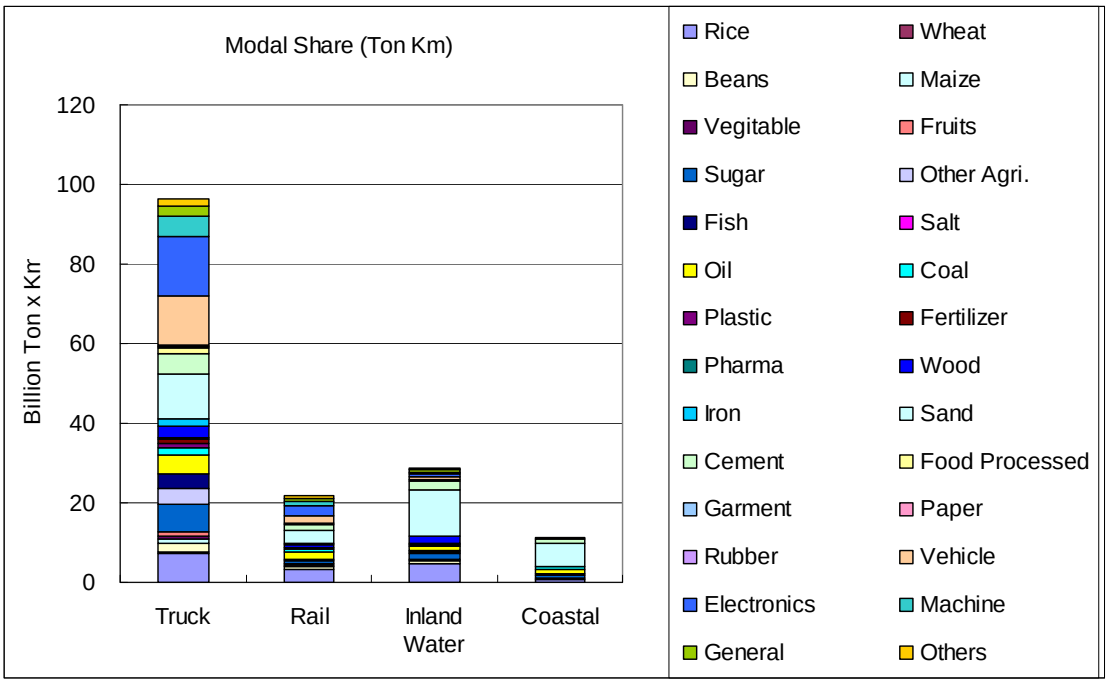
Water Way (000 Ton)	Kachin State	Kayah State	Kayin State	Chin State	Sagaing Region	Tanintharyi Region	Bago Region	Magway Region	Mandalay Region	Nay Pyi Taw	Mon State	Rakhine State	Yangon Region	Shan State	Ayeyawaddy Region
Kachin State	0	0	0	0	0	0	0	23	197	0	0	0	208	0	34
Kayah State	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Kayin State	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chin State	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sagaing Region	37	0	0	0	0	0	0	83	1,469	0	0	0	602	0	170
Tanintharyi Region	0	0	0	0	0	0	21	404	0	0	31	0	4,445	0	31
Bago Region	0	0	0	0	0	2	0	0	27	0	5	10	1,864	0	25
Magway Region	159	0	0	0	316	3	0	0	1,134	0	0	0	804	0	15
Mandalay Region	1,030	0	0	0	2,184	0	89	349	0	0	0	0	3,379	0	174
Nay Pyi Taw	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mon State	0	0	0	0	0	0	1	0	0	0	0	51	2,426	0	364
Rakhine State	0	0	0	0	0	0	1	0	0	0	0	0	432	0	8
Yangon Region	2,511	0	0	0	2,386	155	251	451	4,827	0	137	1,416	0	0	97
Shan State	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ayeyawaddy Region	30	0	0	0	30	5	0	17	2,371	0	550	41	423	0	0
Yangon Port	9	0	0	0	24	3	37	134	51	0	7	24	0	0	54
Sittwe Ports	0	0	0	0	0	0	0	0	0	0	0	7	6	0	2
Dawei Ports	0	0	0	0	0	4	7	0	0	0	6	8	93	0	13
Muse	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Myawaddy	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chikha	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Maungdaw	0	0	0	0	0	0	0	0	0	0	0	1	3	0	0
Total	3,777	0	0	0	4,940	172	407	1,461	10,076	0	736	1,559	14,684	0	988

Water Way (000 Ton)	Yangon Port	Sittwe Ports	Dawei Ports	Muse	Myawaddy	Chikha	Maungdaw	Total
Kachin State	36	0	0	0	0	0	0	498
Kayah State	0	0	0	0	0	0	0	0
Kayin State	0	0	0	0	0	0	0	0
Chin State	0	0	0	0	0	0	0	0
Sagaing Region	87	0	0	0	0	0	0	2447.86
Tanintharyi Region	69	0	4	0	0	0	0	5004.57
Bago Region	360	0	0	0	0	0	8	2301.03
Magway Region	437	0	0	0	0	0	0	2867.19
Mandalay Region	129	0	0	0	0	0	0	7335.5
Nay Pyi Taw	0	0	0	0	0	0	0	0
Mon State	69	0	5	0	0	0	1	2917.48
Rakhine State	17	0	0	0	0	0	15	473.229
Yangon Region	0	3	315	0	0	0	9	12558
Shan State	0	0	0	0	0	0	0	0
Ayeyawaddy Region	348	0	0	0	0	0	53	3868.66
Yangon Port	0	0	0	0	0	0	0	342.866
Sittwe Ports	0	0	0	0	0	0	0	15.4404
Dawei Ports	0	0	0	0	0	0	0	130.505
Muse	0	0	0	0	0	0	0	0
Myawaddy	0	0	0	0	0	0	0	0
Chikha	0	0	0	0	0	0	0	0
Maungdaw	0	0	0	0	0	0	0	4.1469
Total	1,551	3	324	0	0	0	87	40,765

Source: Study Team

6.8 Cargo Volume Projection by Mode in ton-km

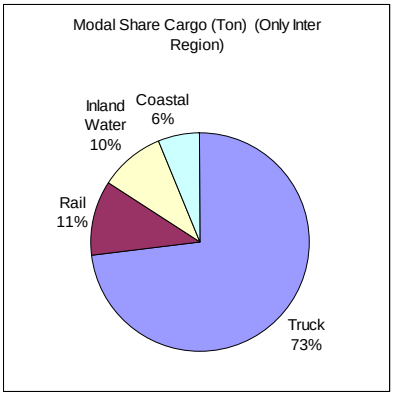
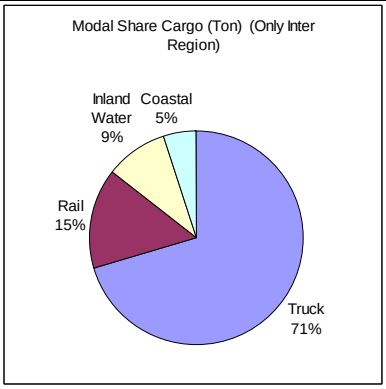
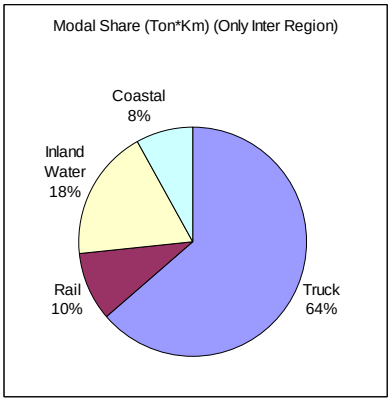
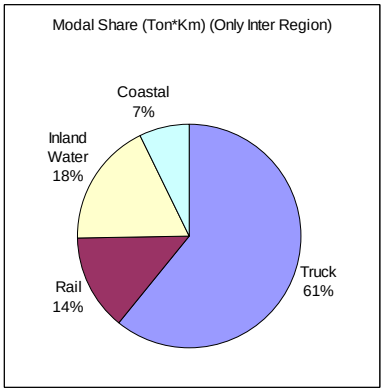
The cargo transport volume in ton-km by cargo type differs from tonnage, as the cargo transport volume in ton-km of some items, which need long-distance transportation, is large. Cargo, which is transported for long distance trips from a supply point to a demand point, is high, and cargo to be transported for short distances is low. For example, a comparison of cargo transport volume in ton-km by inland waterway transport mode appears much higher since the average transportation distance by inland waterway is much longer than is the case using other transport modes. **Figure-6.8.1** illustrates the comparison of cargo transport volume in ton-km in 2030 by transport mode.



Source: Study Team

Figure-6.8.1 Cargo Transport Mode in ton-km by Mode in Year 2030
(Under Moderate Case: shift to border and railway improvements)

Figure-6.8.2 shows the comparison between the Base Case and the Moderate Case where the transport capacity of the railway is improved under the moderate growth scenario and the movement of trade cargo pattern shifts from ports to border gateways, referred to as the case of Moderate B in 2030. The modal share ratio of the railway is larger than in the Base Case in both tonnage and ton-km volume through the improvement of the railway. Several cases were simulated to obtain cargo transport volumes in ton-km by mode, to evaluate the impact of transport mode shifts.

	Basic Case (Moderate B)	Railway Improvement (Moderate B)
In ton		
In ton-km		

Source: Study Team

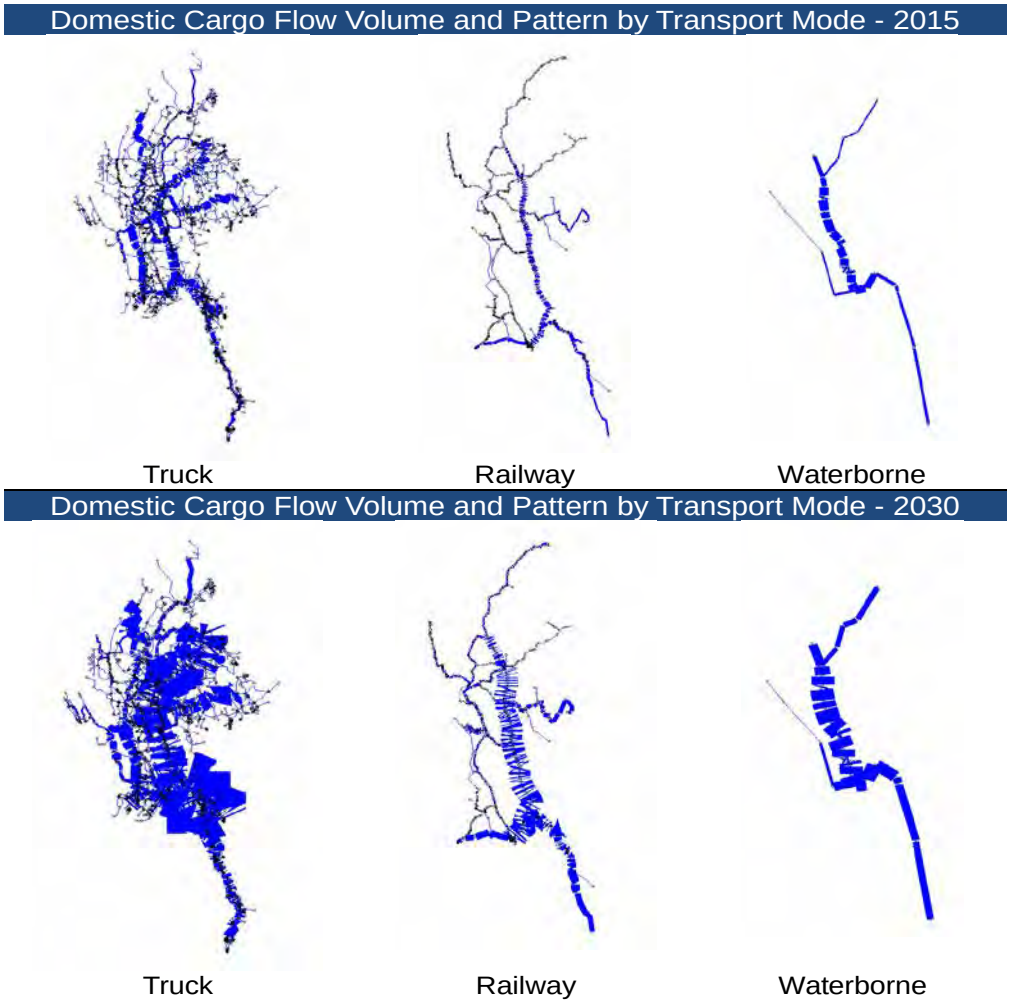
Figure-6.8.2 Comparison of Different Cases in ton and ton-km by Improvement of Railway Transport Capacity

6.9 Cargo Flow Pattern by Transport Mode

(1) General

The estimated and projected cargo flow patterns in 2015 and 2030 by transport mode under Moderate B scenario in the Base and Improved Case of railway transport capacity are presented in **Figure-6.9.1.** The cargo transport volume assigned to trucks in 2030 is quite large, but the scale of unit is not adjusted to show the flow volume in this illustration.

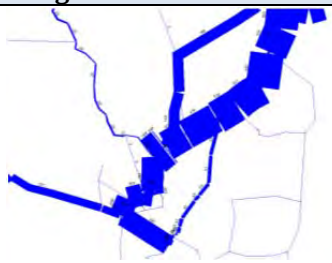
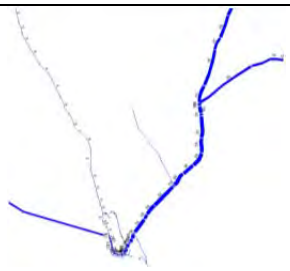
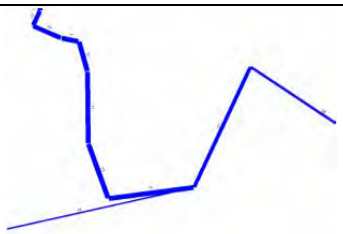
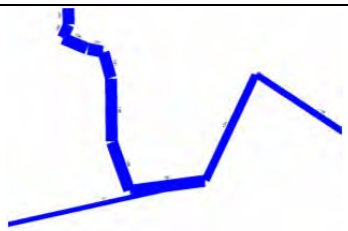
Figure-6.9.2 is an illustration of the enlarged view of cargo traffic volume near Yangon by mode. The figures shown along each segment are the cargo transport volumes in ten thousand tonnes (10,000 tonnes) per year in this illustration. For the cargo transport volume by waterway in this figure, the cargo transport volume by inland water transport and coastal shipping transport are combined. The networks appearing in these figures do not precisely explain the alignment, segment and assigned volumes, as the simulation of cargo traffic flow is estimated among regions/state - and the real networks were not considered in detail.



Note: Waterborne means the cargo transport by ship i.e. inland waterway transport and coastal shipping.
Source: Study Team

Figure-6.9.1 Change of Cargo Flow Volume and Pattern in 2015 and 2030 under Two Cases

Daily truck cargo volume on the main trunk road between Yangon and Mandalay in 2030 is projected to reach 74,000 tonnes in both directions. If the average loading weight of a truck is assumed to be 15 tonnes per truck, the volume of trucks is estimated at around 5,000 units. Given this is the projected volume of cargo or volume of trucks hauling between Yangon and Mandalay Highway, the present road capacity is insufficient to ensure smooth and effective traffic flow even though mixed traffic (with passenger cars or motorcycles) is not assumed on this highway.

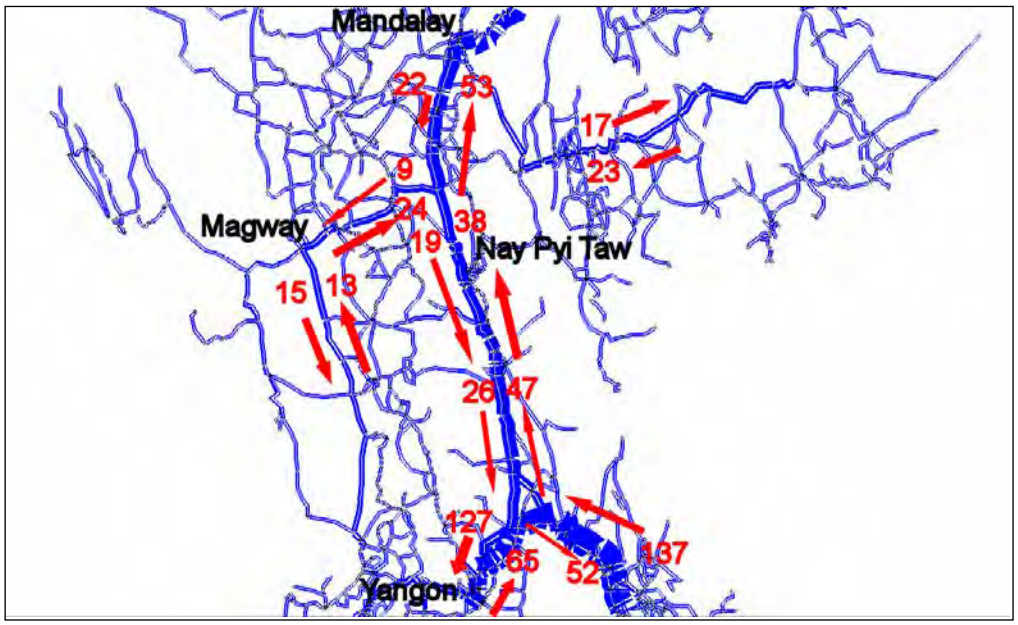
	Cargo Traffic Flow in 2015	Cargo Traffic Flow in 2030
Truck		
Rail		
Waterway		

Source: Study Team

Figure-6.9.2 Cargo Traffic Flow near Yangon

Under such forecast traffic conditions along the Yangon – Mandalay Highway, it is proposed to utilize the existing expressway that to date has not allowed use by heavy and long-distance cargo trucks (only provincial buses as well as passenger cars). Further, the acceleration of transport modal shift from truck to railway and inland waterway transport should be enhanced in as short a timeframe as possible. A bottleneck can be foreseen in the Thilawa Area, because of a rapid increase in cargo traffic carried by trucks. The bottleneck of cargo traffic is recommend to be solved through expansion of the bridge crossing over the Bago River, and introduction of high capacity freight railway system, etc. The inland waterway transport for transferring cargo from the port area to the northern part of Yangon has been already commenced and it is enhanced furher.

Figure-6.9.3 illustrates and shows the daily cargo traffic volumes by link in thousand tonnes per day.



Source: Study Team

Figure-6.9.3 Daily Cargo Traffic Volume in 2030
(Under Moderate Growth, Trade Cargo Traffic Pattern Shift, Rail Capacity Improvement)

(2) Cargo Transit Volume at Cross-border Points

As a rapid increase in the volume of trucks passing the cross-border points along the border with China and Thailand can be foreseen between 2015 and 2030 and beyond, the development of other routes, diversification of routes and an increase in the capacity of customs posts is imperative. At present those routes pass through mountainous areas.

Table-6.9.1 shows the estimated volume of trucks per day in 2030 at cross-border points along the border with China and Thailand, respectively. As the area where these cross-border facilities are located is mountainous, the expansion of road width might not be easy from both engineering and a financial point of view. Therefore other road routes should be developed or the railway route should be developed, where railway development can take place. Assuming the average cargo loading capacity of a truck is 15 tonnes, the maximum number of trucks in one way per day is computed as about from 7,000 to 8,000 units. This exceeds the maximum capacity of a two-lane road. Under such cargo traffic conditions, the development of the railway linking Myanmar and Thailand might offer one of the solutions. **Figure-6.9.4** illustrates the cargo traffic volume assigned to trucks relevant to cross-border points along the border with China and Thailand respectively in 2015 and 2030.

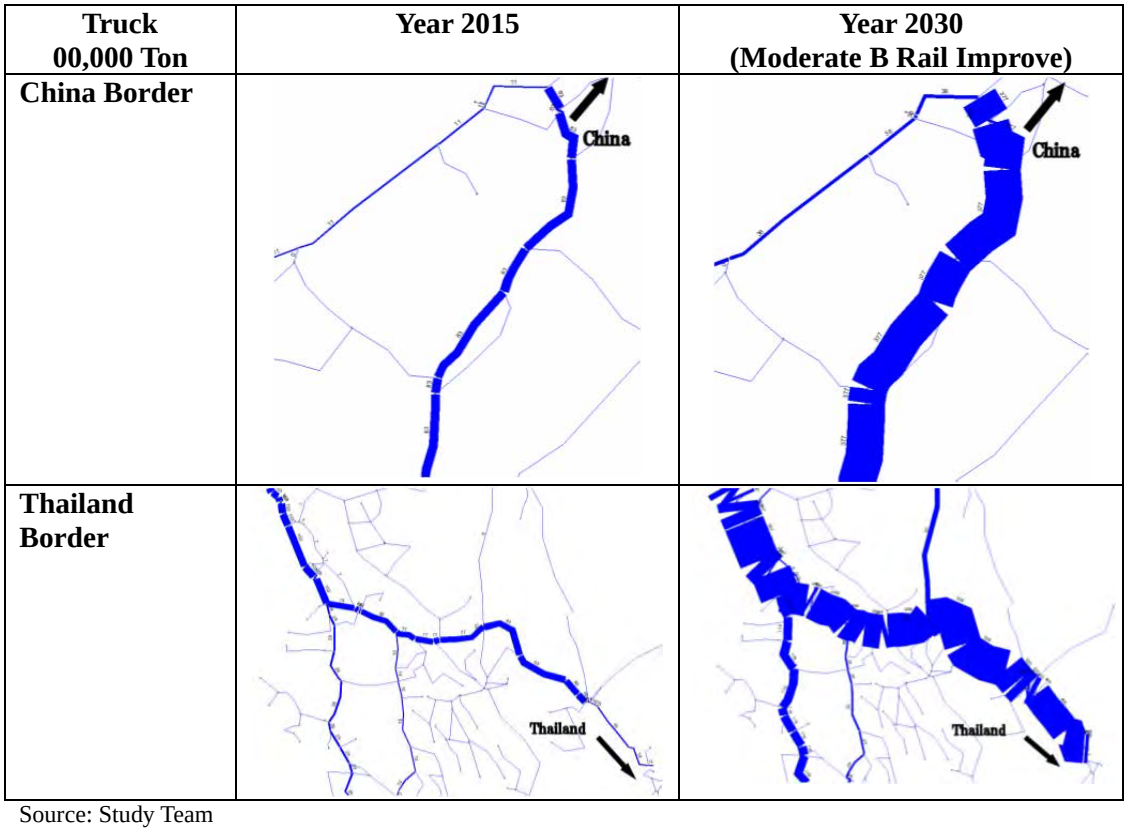
The demand forecast of international cargo volumes to be handled by the land borders was carried out, and border cargo volumes projected for 2030, under different scenarios and cases, as illustrated in **Figure-6.9.5**. Cargoes should be all transported by trucks before the implementation of the railway connection.

Table-6.9.1 Cargo Traffic Volumes per Day in 2030

(Unit: thousand tonnes)

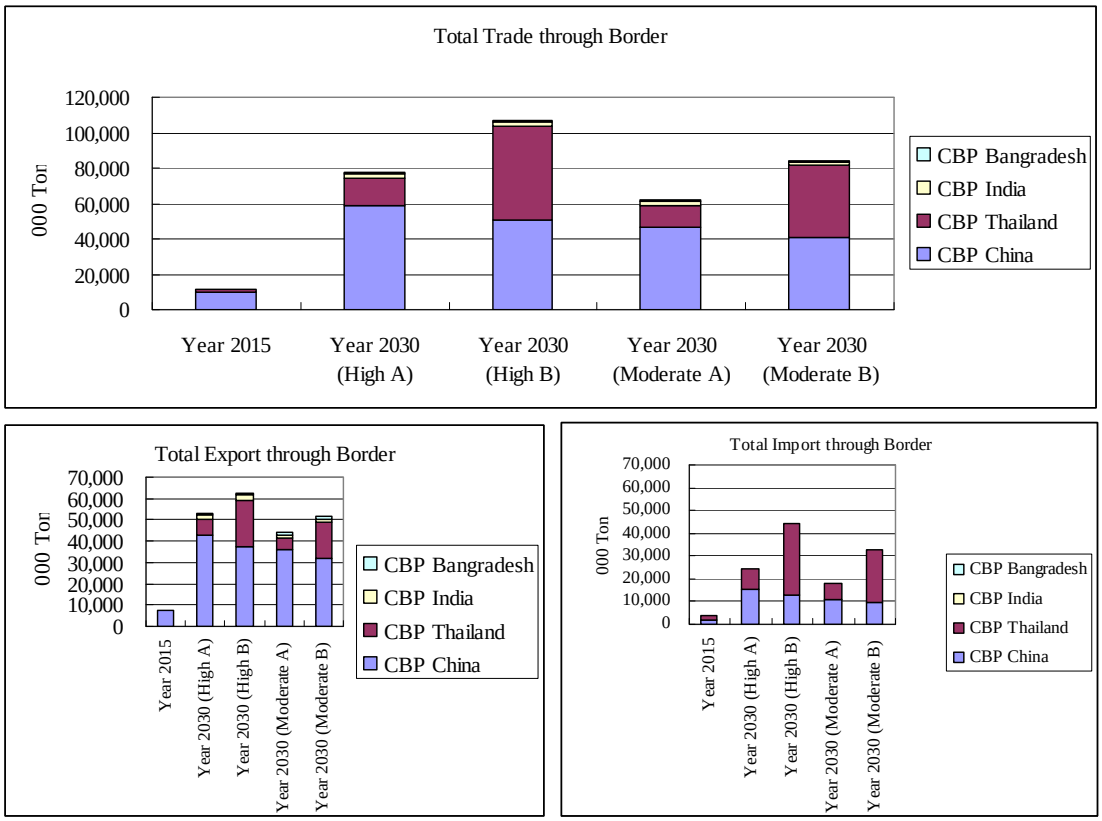
Location		Direction	High B	Moderate B
China Border	On the Way	From China	32	23
		To China	96	81
	At the Border	From China	36	26
		To China	103	84
Thailand Border	On the Way	From Thailand	123	105
		To Thailand	51	39
	At the Border	From Thailand	85	64
		To Thailand	60	47
India Border	On the Way	From India	1	1
		To India	4	4
	At the Border	From India	0.3	0.3
		To India	6	5

Note: The figure includes rounding errors because of the estimation by annual cargo volume.
Source: Study Team



Source: Study Team

Figure-6.9.4 Annual Cargo Traffic Volumes Assignable to Trucks in 2030 at the China and Thailand Borders

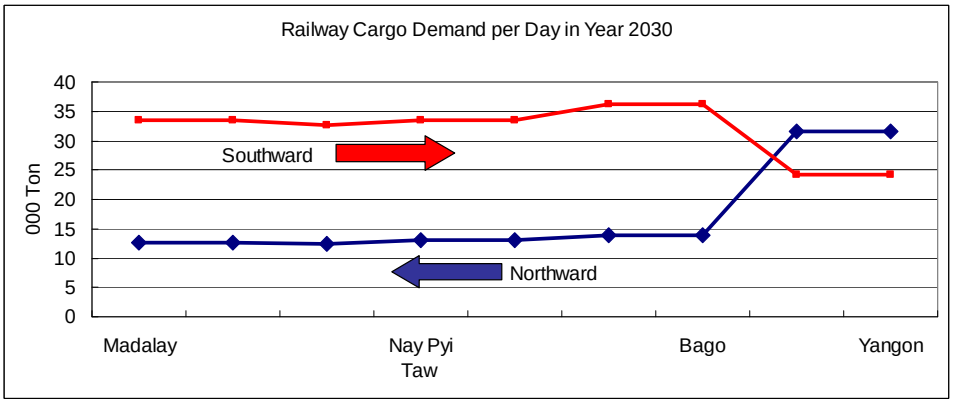


Source: Study Team

Figure-6.9.5 Change of Projected Annual Cargo Volumes at Land Borders by Scenario

(3) Cargo Transport Volumes by Railway (Yangon–Mandalay)

Cargo volume to be transported by railway per day between Yangon and Mandalay in 2030 is estimated to be about 50,000 tonnes. This exceeds the cargo transport capacity of the existing railway. Therefore, the number of cargo trains needs to be increased and haulage is necessary to meet with forecast transport demand. **Figure-6.9.6** illustrates the daily cargo traffic volume assigned to the railway.

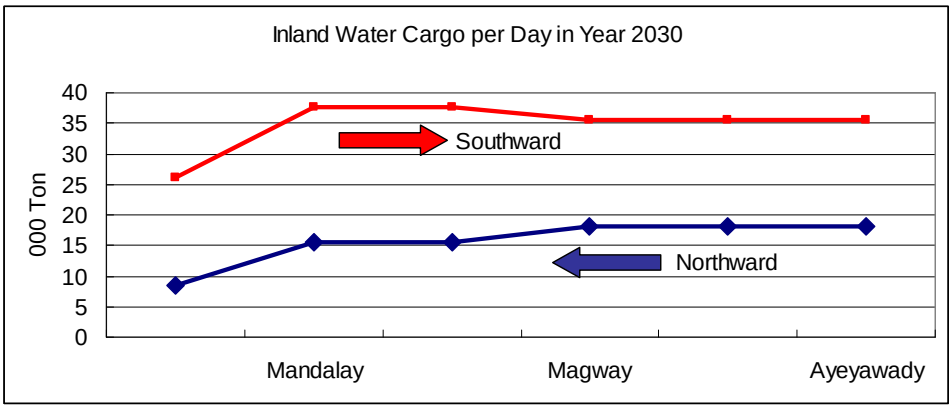


Source: Study Team

Figure-6.9.6 Railway Cargo Traffic Volume per Day in 2030
(Moderate B Railway Improvement)

(4) Cargo Transport Volumes by Inland Waterway (Yangon–Mandalay)

Daily cargo volume to be transported by inland waterways along Ayeyarwaddy River in 2030 is shown in **Figure-6.9.7.** The common loading capacity of inland water vessels plying between Yangon and Mandalay is 1,000 tonnes. However the capacity of vessels operating for short distances mostly in the Ayeyarwaddy Delta or in the downstream area is around 100 tonnes; and this cargo demand suggests the requirement for a fairly large number of vessels. However, the operation of large-sized inland water transport vessels along Ayeyarwaddy River is not easy because of existence of so many shallows along the navigation channel.

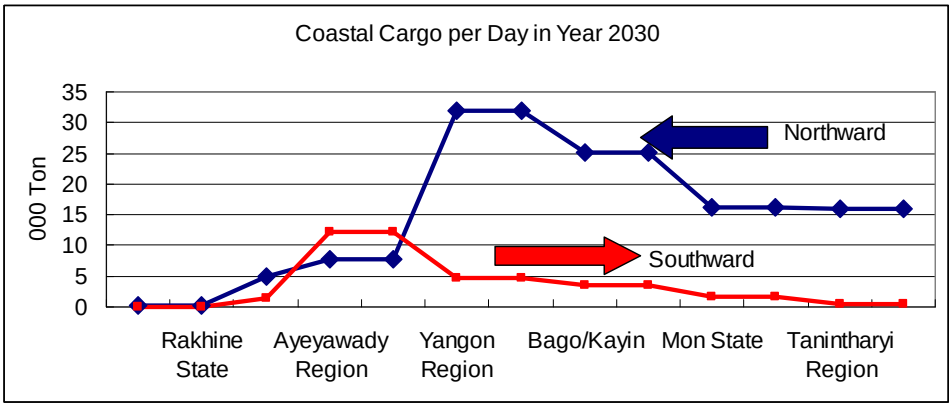


Source: Study Team

Figure-6.9.7 Inland Water Cargo Traffic Volumes per Day in 2030
(Moderate B Railway Improvement)

(5) Cargo Transport Volumes by Coastal Shipping

The cargo demand per day by coastal shipping in 2030 is shown in **Figure-6.9.8.** The cargo traffic volume northbound is estimated to be somewhat larger than that of southbound traffic. This is because of an assumption that a refinery will be established in Dawei SEZ and the petroleum products will be transported to the demand area mainly in Yangon.

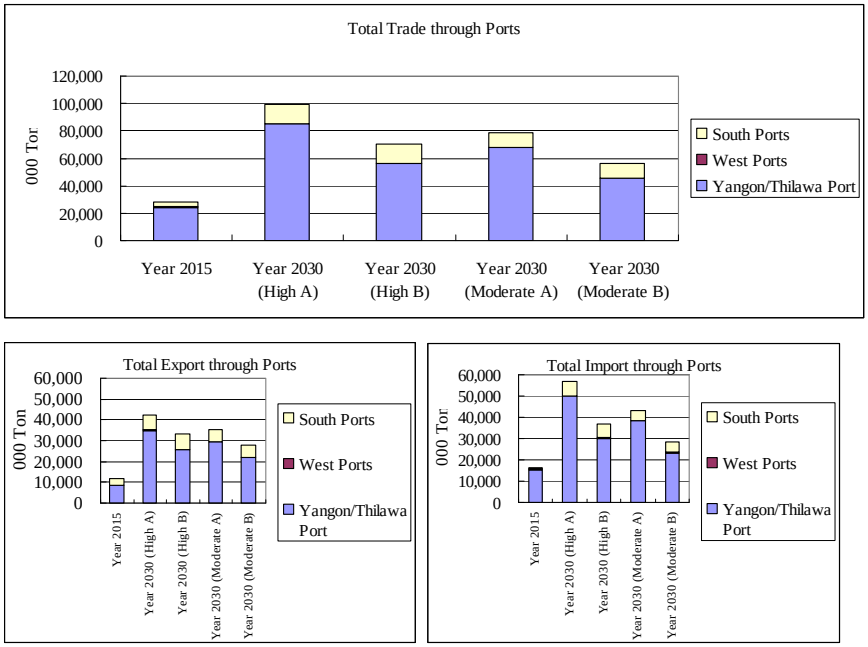


Source: Study Team

Figure-6.9.8 Coastal Shipping Cargo Volumes per Day in 2030
(Moderate B Railway Improvement)

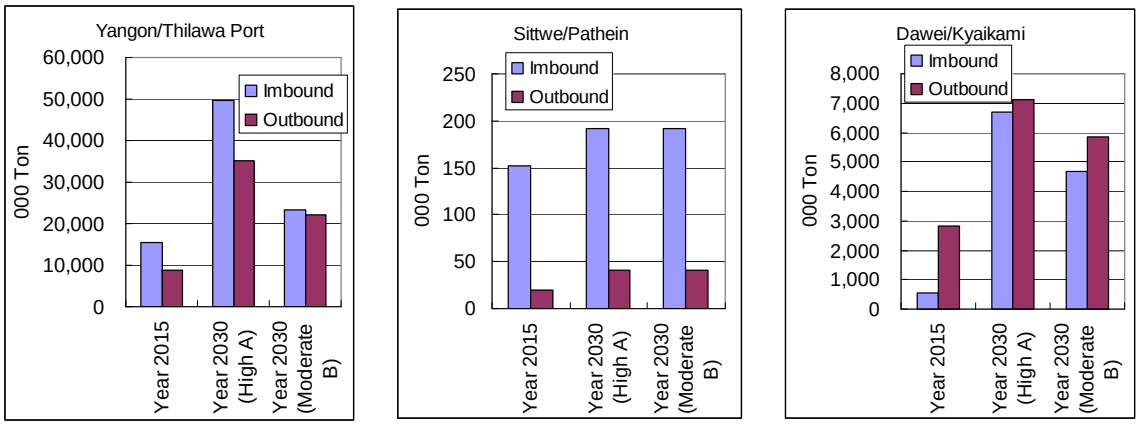
(6) Port Cargo Volume per Year for International Ports

The port cargo demand projected is shown in **Figure-6.9.9.** The port cargo volume for specific ports, such as Yangon/Thilawa, Sittwe/Pathein and Dawei/Kyaikkami ports are projects shown in **Figure-6.9.10.**



Note: Terminal Thilawa Area means Yangon Port and Thilawa Terminal Area.
Source: Study Team

Figure-6.9.9 Projected Cargo Volumes for International Ports



Note: Yangon/Thilawa Port means Yangon Port and Thilawa Terminal Area.
Source: Study Team

Figure-6.9.10 Inbound and Outbound Cargo Volumes for International ports

(7) Port Cargo Volumes for Domestic Ports

Table-6.9.2 shows the domestic cargo volumes handled by the eight major local ports located along the coast including the designated port for domestic cargo traffic at Yangon Port in 2016, which is estimated based on the results of the waterway transport survey that was carried out during the course of the Study. The total annual cargo volume handled by local ports in 2014 was registered at around 3.2 million tonnes. The demand forecast for domestic cargo volumes to be handled by the eight major local ports was carried out taking into account the growth rate of production / consumption volumes for each major commodity up to 2030 by region/state and commodity. **Table-6.9.3** shows the cargo demand forecast for local ports in 2030. The total annual cargo volume handled by local ports is projected to be around 8.0 million tonnes. As such the port cargo volume of local ports in 2030 will increase around 2.5 times the volume estimated in 2016.

Table-6.9.2 Estimated Port Cargo Volume of the Local Ports in 2015

(Unit: '000 tonnes/year)

2015 ('000 tons)	YGN	STW	KPY	TDW	MLM	MYK	DWE	KWT	Total
Total	1,070	595	144	57	181	583	227	372	3,229
Outbound	496	379	78	57	29	84	195	310	1,628
Inbound	574	216	66	-	152	499	32	62	1,601
General Cargo	697	515	132	8	181	559	81	135	2,309
Outbound	123	299	66	8	29	60	49	73	708
Inbound	460	53	51	-	123	7	-	-	695
Construction	395	188	-	-	29	423	83	236	1,354
Outbound	332	65	-	-	-	24	83	174	677
Inbound	63	123	-	-	29	400	-	62	677
Diesel	58	55	27	50	-	92	96	29	405
Outbound	41	15	12	50	-	-	63	29	209
Inbound	16	40	15	-	-	92	32	-	195
Fertilizer	34	-	-	-	-	-	-	34	68
Outbound	-	-	-	-	-	-	-	34	34
Inbound	34	-	-	-	-	-	-	-	34

Source: Study Team based on the result of waterborne transport survey in 2016
Note: YGN=Yangon, STW=Sittwe, KPY=Kyaukpyu, MLM=Mawlamyine, MYK=Myeik, DWE=Dawei, KWT=Kawthaung

Table-6.9.3 Port Cargo Demand Forecast for the Local Ports in 2030

(Unit: '000 tonnes/year)

2030 ('000 tons)	YGN	STW	KPY	TDW	MLM	MYK	DWE	KWT	Total
Total	2,920	1,604	331	57	331	1,329	597	819	7,988
Outbound	1,056	1,089	78	57	88	216	349	754	3,686
Inbound	1,864	515	253	-	243	1,114	248	100	4,336
General Cargo	2,106	1,019	244	8	285	209	146	174	4,190
Outbound	517	860	66	8	88	180	146	174	2,039
Inbound	1,589	159	178	-	197	28	-	-	2,151
Construction	599	372	-	-	46	476	140	554	2,186
Outbound	498	214	-	-	-	35	140	455	1,341
Inbound	101	158	-	-	46	440	-	100	845
Diesel	112	213	86	50	-	645	311	29	1,447
Outbound	41	15	12	50	-	-	63	29	209
Inbound	71	199	75	-	-	645	248	-	1,237
Fertilizer	103	-	-	-	-	-	-	96	199
Outbound	-	-	-	-	-	-	-	96	96
Inbound	103	-	-	-	-	-	-	-	103

Source: Study Team based on the result of waterborne transport survey in 2016 and demand forecast toward 2030

Table-6.9.4 shows the projection of domestic cargo volumes handled by the eight major local ports based on the trend of cargo handling volume by each local port.

Table-6.9.4 Port Cargo Volume Projection on Trend Basis

(Unit: '000 tonnes/year)

Local Port	Population by District (Unit: '000)			2014 (Base Year)	2020	2030
	Total	Urban Areas	Urbanization Ratio (%)			
Yangon	7,360	5,160	70.1	1,263	1,580	2,294
Sittwe	535	133	25.0	255	383	753
Kyaukpyu	439	44	10.1	160	240	471
Thandwe	357	63	17.8	38	56	111
Pathein	1,630	303	18.6	81	122	239
Mawlamyine	1,232	434	35.2	220	330	649
Dawei	493	107	21.9	462	693	1,364
Myeik	693	151	21.8	197	295	580
Kawthaung	221	79	35.7	362	543	1,068
Total	—	—	—	3,038	4,242	7,529

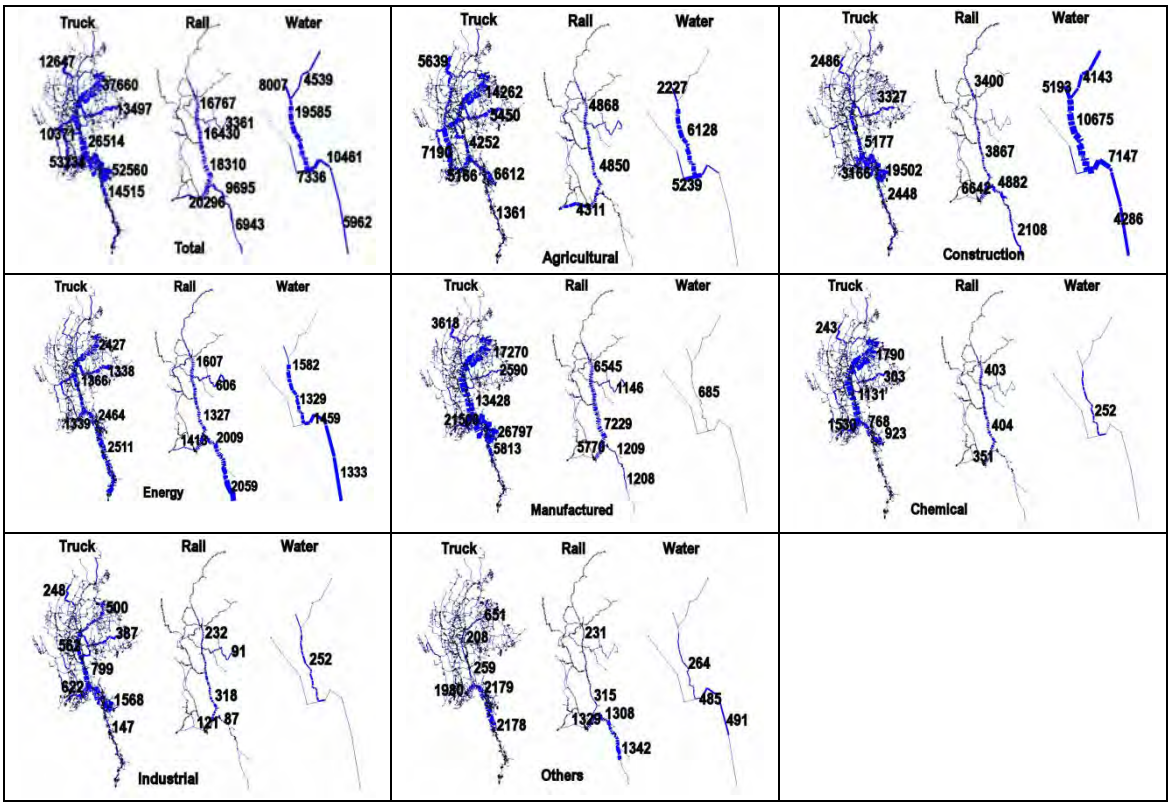
Note: Projection based on trend.
Source: Study Team

As shown in the projections of cargo volume assigned to each port in 2030 in the above tables, there are some discrepancies. This may happened due to the difference of cargo volumes estimated in the base year. However, the important matter for formulation of the master plan is to understand the minimum requirement for preparation of necessary port infrastructure and facility in accordance with the cargo demand. The plan of port development and provision of facilities including cargo handling equipment in details shall be carried out to comply with the cargo volume that will increase surely due to the changes of policy and changes of industry and trade structure.

(8) Cargo Transit Volumes by Mode and by Commodity Group

Figure-6.9.11 illustrated future annual cargo volumes and flow patterns by diffetent mode and by different commodity in 2030. The unit of width of the line showing the cargo flow differs for each commodity, since the total volume of respective commodities differs considerably. However the unit of width of the line is same for same commodity, to indicate the volume by mode. The cargo volume projected and presented for major sections is in thousand tonnes per year.

As shown in these figures, the cargo demand was projected by transport mode and commodity. The infrastructure for each transport mode are to be properly developed so that various transport modes can be selected or combined by the shippers or logistics providers according to their commodity to be transported properly and easily.



Source: Study Team

Figure-6.9.11 Annual Cargo Traffic Volume by Mode by Commodity in Thousand Tonnes under Moderate Growth, Trade Shift to Border and Railway Improvement

CHAPTER-7 LOGISTICS SECTOR ISSUES

7.1 Factors Underpinning Logistics Performance Improvement

7.1.1 Evolution from Physical Distribution Systems to Logistics Systems

Cargo transport is a part of the process of the movement of goods through the market. This process has been referred as the Physical Distribution System. Physical distribution means the movement of goods from producer to consumer and is a concept that is composed of various activities such as packaging, transport, storage, handling, and management of related information. The process covers the total movement of goods from the production location of raw materials to factories, from factories to the other factories, from factories to shops, and from shops to consumers. Physical Distribution, a term used to express the movement of goods, appeared in the 1970's in a period when the economies of industrialized countries expanded at a relatively fast pace. The major form of freight transport in this period was "small variety - mass production". However, this form of freight transport has changed rapidly over time. As supply-side economies have changed to demand-side economies, the production style has changed from "small variety - mass production" to "large variety - small production" on worldwide basis. .

This change in the way of transporting goods increases running costs, as well as labor costs. Thus, management of freight transport has to be optimized as much as possible. In line with such optimization, the system that ensures procurement of materials, production and distribution of products meeting with market demands at appropriate time has become an indispensable management tool for the strategic business management of modern enterprises. The objective of the development of logistics systems is not only limited to minimizing the cost of transporting goods, but also includes the pursuit of optimum solutions related to transport and distribution of goods and provision of optimum best services in line with demand.

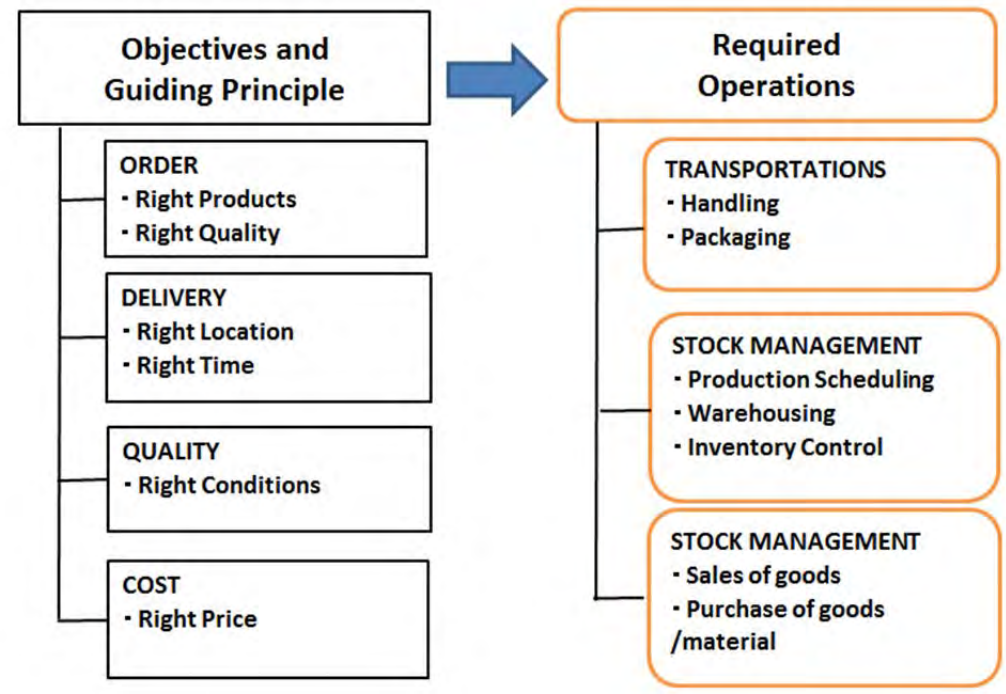
Performance of logistic systems is thought to be a factor in the level of international competitiveness, increasing the power of product marketing / and the export of products produced and the efficiency of business. Myanmar's economy was liberalized and opened its door to the world in 2011 and needs to catch up to international or at least regional standards of logistics service practice in the shortest possible timeframe. The development of the logistics system, especially for transport and distribution of trade goods is expected to play a dynamic role in spurring evolution of prevailing conventional or traditional physical distribution systems to logistics systems satisfying international, regional and domestic demands. **Table-7.1.1** presents the difference in concept between physical distribution systems and logistics systems.

Table-7.1.1 Difference of View between Physical Distribution Systems and Logistics Systems

Definition of Physical Distribution System	Definition of Logistics System
The spatially and timely economic activity process of transporting goods from suppliers (producers) to customers (consumers). In general, the activities that comprehensively control the process from packaging, transporting, storage, handling, processing and relevant information. (JIS 1999)	The management activity to combine and integrate activities for purchase, production, sales and salvage of goods by adopting highly sophisticated ways of packaging, transporting, storage, handling, processing and managing relevant information to meet the needs of end-users as well as social issues such as environmental conservation. (JIS 1999)
Image of Physical Distribution Activity	**Image of Logistics Activity**
Product Out	Market In
Beneficiaries of Improvement of Physical Distribution System	**Beneficiaries of Improvement of Logistics System**
Conventional cargo transport method for domestic cargoes. The beneficiaries are farmers, producers and manufacturers.	Modern cargo transport method for international cargoes of relatively high value provides efficiency and competitiveness to the local firms reaching out to global businesses. The direct beneficiaries are industrial business establishment and commercial sectors. The indirect beneficiaries are consumers and firms designing their supply chain to realize market share.
Methods Applicable for Improvement of Physical Distribution System	**Methods Applicable for Improvement of Logistics System**
● Maintaining the minimum functions required for transport and distribution of goods (cargoes) in a classic and conventional way. ● Replacement of transport equipment ● Replacement / renew warehouses / storage facilities ● Pursue merits of scale by adopting low-frequency mass transit schedules ● Increase the volume of stocks as large as possible	● Enhancement of transport quality, sophistication of cargo handling systems complying with international agreements ● Professionalization of the cargo transport business ● Supply chain management aimed at minimizing inventory volume by application of high frequency – small lot cargo transport ● Delivery of goods (cargoes) in small lots in high frequency or so-called Just-in-Time mode (JIT)
Way of Thinking on Distribution of Goods in Physical Distribution Service	**Way of Thinking on Distribution of Goods in Logistics Service**
● Large warehouses for large inventory volumes ● Door-to-Door transport by one large truck	● Transport of goods by large trucks ⇒delivery point⇒sorting / transship⇒JIT transport by use of medium / small trucks
Major Commodities Transported by Physical Distribution System	**Major Commodities Transported by Logistics System**
Primary foods, agricultural products, construction materials, steel products, industrial raw materials, large size machinery, daily consumables, etc. In general the goods are bulky and of low value.	Industrial manufactured products, precision industrial products, parts / components, fine raw materials, durable consumable goods, refrigerated / chilled products. In general the goods are compact and of high value.
Major Transport Mode Used for Physical Distribution System in Myanmar	**Major Transport Mode Appropriate to Use for Logistics System in Myanmar**
Road Transport: General trucks Railway Transport: Railway Freight Trains Liquid Cargo: Tanker Lorries River Transport: Inland Water Transport (Pushers / tug barges) Coastal Shipping: LOLO, general cargo ships Maritime Transport: Feeder ships	Road Transport: Container trailer trucks Railway Transport: Container Block Trains Liquid Cargo: Pipelines River Transport: Inland Water Transport by self-propelled barges Coastal Shipping: LOLO or RORO Maritime Transport: Large size container ships, bulk Carriers calling deep-sea ports

7.1.2 Guiding Principle for Logistics System Development

In a competitive world market, goods need to be efficiently transported as far as possible at minimum cost. The right products must be delivered by producers (manufacturers or shippers) to customers (consumers or consignees) at the right location and at the right time without damage, and at least cost. In order to achieve this objective, the logistics providers (transporters) need to undertake the transport of goods, in principle. However, such transport services can be delivered in a more holistic way. Trucking companies, forwarders, warehouse companies, or a combination of these business activities i.e. logistics providers, deliver the services of cargo packaging, labeling and handling. Upon the request of producers, the logistics providers deliver management services for stock control and management. **Figure-7.1.1** illustrates the objectives and required operations of the logistics system.



Source: Study Team

Figure-7.1.1 Guiding Principle of Logistics System Development

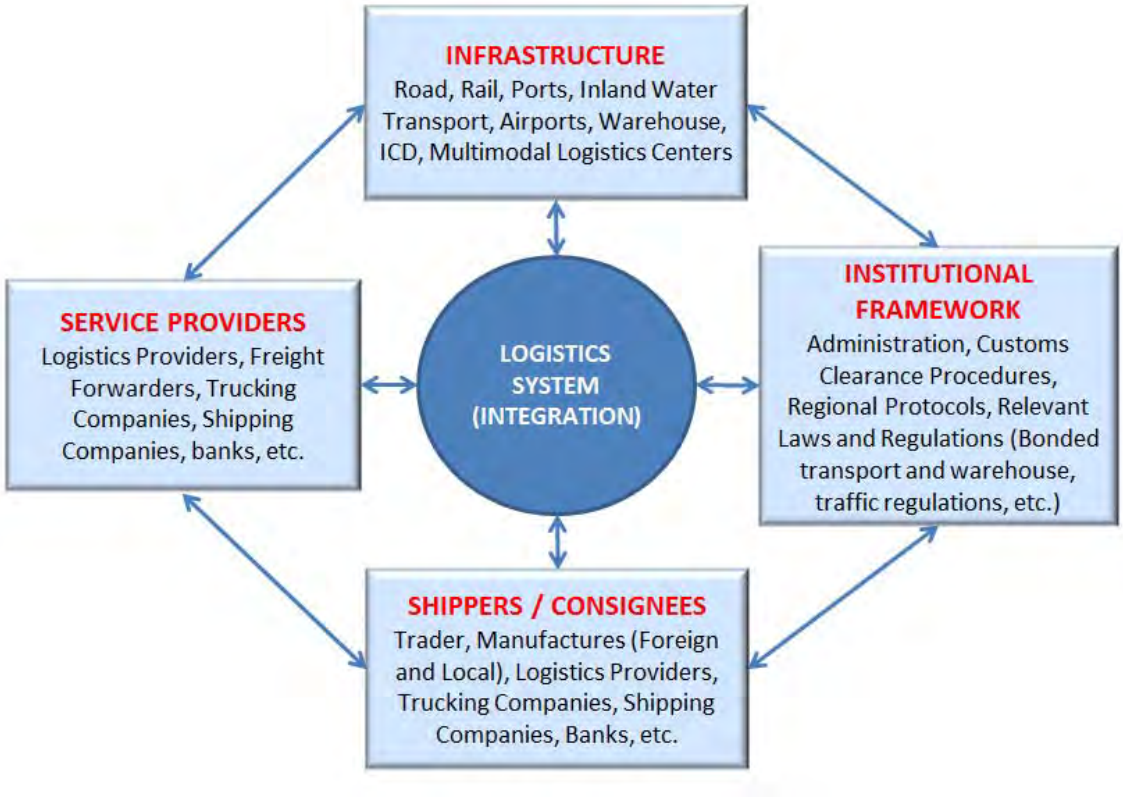
The objectives of logistics system development can be expressed in a simple way as follows:

"The objectives of logistics system development are to move the goods at the right place, at the right time, in the right condition, and at the right price so as to raise and to maintain competitiveness of producers or a country"

7.1.3 Structure of Logistics Systems

The development of logistics systems requires the integration of four major components structuring the logistics system, as shown in **Figure-7.1.2.** While the development of "Infrastructure" serves as a single component of the aforementioned logistics system,

development of "institutional framework", fostering "service providers" and the active participation of major players of the logistics system, such as shippers and consigners as well as consignees, are integrated in realizing the overall development of logistics system. The Logistics Masterplan takes into account the importance of the integration of four elements structuring the logistics system.



Source: Dr. Ruth Banomyong, Thammasat University

Figure-7.1.2 Four Important Elements Structuring the Logistics System

In order to attain the optimum effects of logistic systems development, a holistic development approach is essential. A harmonized and stepwise development is needed, otherwise the impact of investment would not be maximized. Components to be planned and executed for Myanmar are summarized in **Table-7.1.2.**

This means that the logistics performance of a country does not depend only on the development of related transport or logistics infrastructure but also on the capacity development of related institutions, as well as human resources development in the logistics business sector, for example logistics companies, freight companies, trucking companies, customs brokers, etc.

Table-7.1.2 Components of Logistical Systems Development

Major Components	Subject Items for Development / Rehabilitation / Improvement
Infrastructure	Roads, railways, seaports, river ports, airports, truck terminals, logistic parks, warehouses, transport equipment, cargo handling equipment, etc.
Institutional Matters	Establishment of laws and regulations for safe and punctual delivery of goods at right price, improvement of customs procedures (simplification of process – Single Window), introduction and operationalization of e-customs, legislations of bonded transport, traffic regulations, effective administrative system, legislation, development planning, monitoring, etc. Introduction and operationalize the port EDI system. Institutional financing system for the SMEs engaging with transportation and logistics business. Establishment of organizations/departments responsible for logistics such in central/local government, chambers of commerce, etc.
Shipper / Consignee	Human resource development for improvement of business and logistics management skills, development of international relations, etc.
Service Provider	Human resources development for business and logistics management, inventory control and warehouse management, utilization of ITC, international relations, etc.

Source: Study Team

7.1.4 Sequence of Logistics Systems Development

To follow the development sequence of logistics systems, it is important to attain the optimum impact of efforts and investment by both the public and the private sectors. Myanmar, since 2011, opened up to the international logistics network. The improvement of traditional or conventional physical distribution systems is needed, while on the other hand the logistics system is strongly needed for an enhancement of industrial development, at the same time.

The level of freight transport in Myanmar has been at the level of physical distribution as discussed above and does not yet meet international or regional requirements. The situation needs to be changed and upgraded to make Myanmar more competitive and to realize the sustainable economic development throughout the country in an equitable manner.

The virtuous cycle of development factors of the logistics system is outlined in **Figure-7.1.3.** Industrial development promotes trade, and then promotion of trade leads to increase in trade cargo volumes, which enhances the development of the logistics system. Such movement will stimulate physical distribution systems, which mainly involves transport of domestic cargoes. Subsequently, the development and improvement of physical distribution systems will boost industrial development further, thus physical distribution systems will improve as a whole, in parallel with economic development.

How this cycle of impacts is moved depends upon the realization of projects included within a clearly established development strategy for the logistics sector. Improvement of related regulations, necessary infrastructure, fostering human resources in both administration and private enterprises are all indispensable for the realization of the virtuous cycle.

Development Factors of Logistics System and Its Cycle

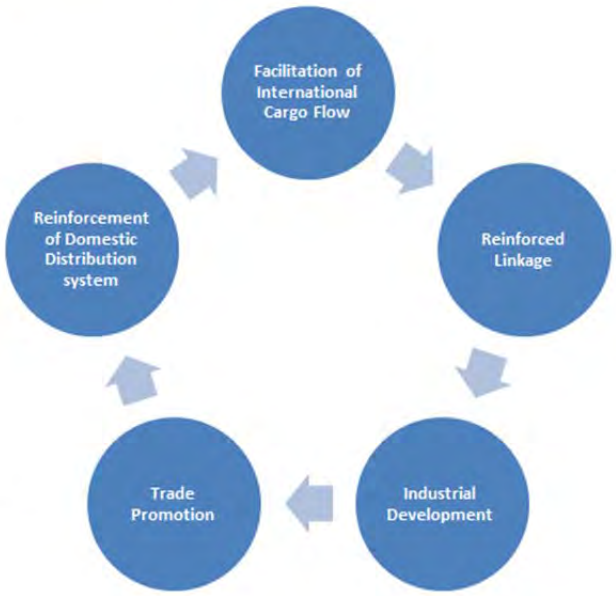
① **International Cargo Flow Facilitation:** Improvement of system that restricting cargo flow due to complex customs clearance procedures, ensureing transperancy of clearance, provision of proper facilities, etc. will be carried out.

② **Reinforcement of Connectivity:** Linkage among neigboring countries and the world market will be developed, thereby the international cargo volme will increase as cargo flow will be facilitated.

③ **Industrial Development:** Foreign direct investment will be dynamically promoted thereby the industry of which market is the world will be expanded.

④ **Trade Promotion:** Development of high quality logistics system that handles ever increasing international cargo flow volume will create more competitive products manufactured thereby the trade will be promoted further.

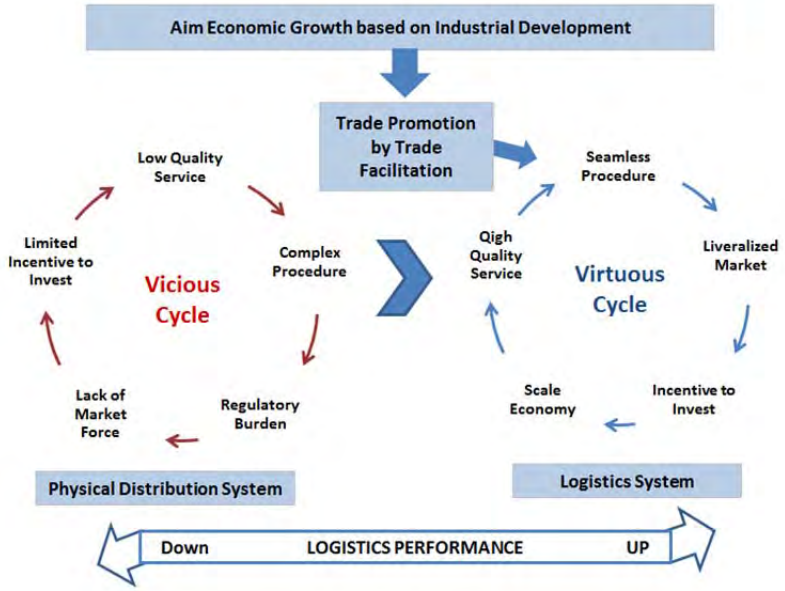
⑤ **Improvement of Domestic Physical Distribution System:** Stable development of economy by means of expansion of industry would cut off the vicious cycle that a domestic distribution systems fall into and lead to a good circulation, tehreby the distribution system of the country as a whole will be improved. This virtuous cycle will increase the efficiency of cargo flow or logistics performance thereby the competitiveness of products will increase and the international cargo flow volume will increase further.



Source: Study Team

Figure-7.1.3 Development Factor of Logistics System and its Cycle

One of the most important issues to be addressed in the current stage of economic development of Myanmar is the development of a proper logistics system. **Figure-7.1.4** illustrates that trade promotion aimed at industrial development will cut off the vicious cycle of obsolete and conventional physical distribution systems and will activate the good circulation of turning the physical distribution system into the logistics system that will make Myanmar a competitive regional international industrial country.



Source: Study Team

Figure-7.1.4 Circulation of Improving Physical Distribution System

Although the type of cargo handled by conventional physical distribution system cannot be demarcated clearly, the demarcations of the types of cargo by distribution systems are shown in **Table-7.1.3.**

Table-7.1.3 Type of Major Cargo Handled by Type of Goods Distribution System

Goods Distribution System	Major Types of Cargo Handled
● Physical Distribution System	Domestic cargoes (agricultural products, cottage industries, locally produced construction materials, etc.)
● Logistics System	International trade and/or transit cargoes (mostly high-value agriculture products, manufactured goods, industrial goods, durable consumer goods, etc.)

Source: Study Team

It is proposed to emphasize the development of logistics systems at the primary stage as a lever to activate and lead to a good development of conventional physical distribution systems and to convert such systems to the higher level of logistics system in due course.

This is because the financial or economic viability of improvement or development of logistics system - aimed at attaining the optimum investment efficiency-, is much higher than that required for improvement of conventional physical distribution systems.

7.2 Sector Issues

7.2.1 Sector Issues in General

(1) Introduction

The development of logistics services and communication technologies has revolutionized production and distribution processes, and has created the “global market”. It is within this competitive environment that shippers and consignees require efficient logistics services that can move their goods at the right place, at the right time, in the right condition, and at the right price. In order to understand the current cargo transport situation and physical distribution system of Myanmar various interview surveys were carried out and observation of major transport infrastructures were observed as a part of diagnostic survey.

(2) Quantitative Analysis of Current Logistics Conditions

In parallel with the truck interview survey and the waterborne transport survey carried out for the cargo demand forecast, other kinds of surveys were undertaken including value chain analysis, and truck terminal analysis. The following are the results from these surveys in order to understand the current logistical situation in quantitative way.

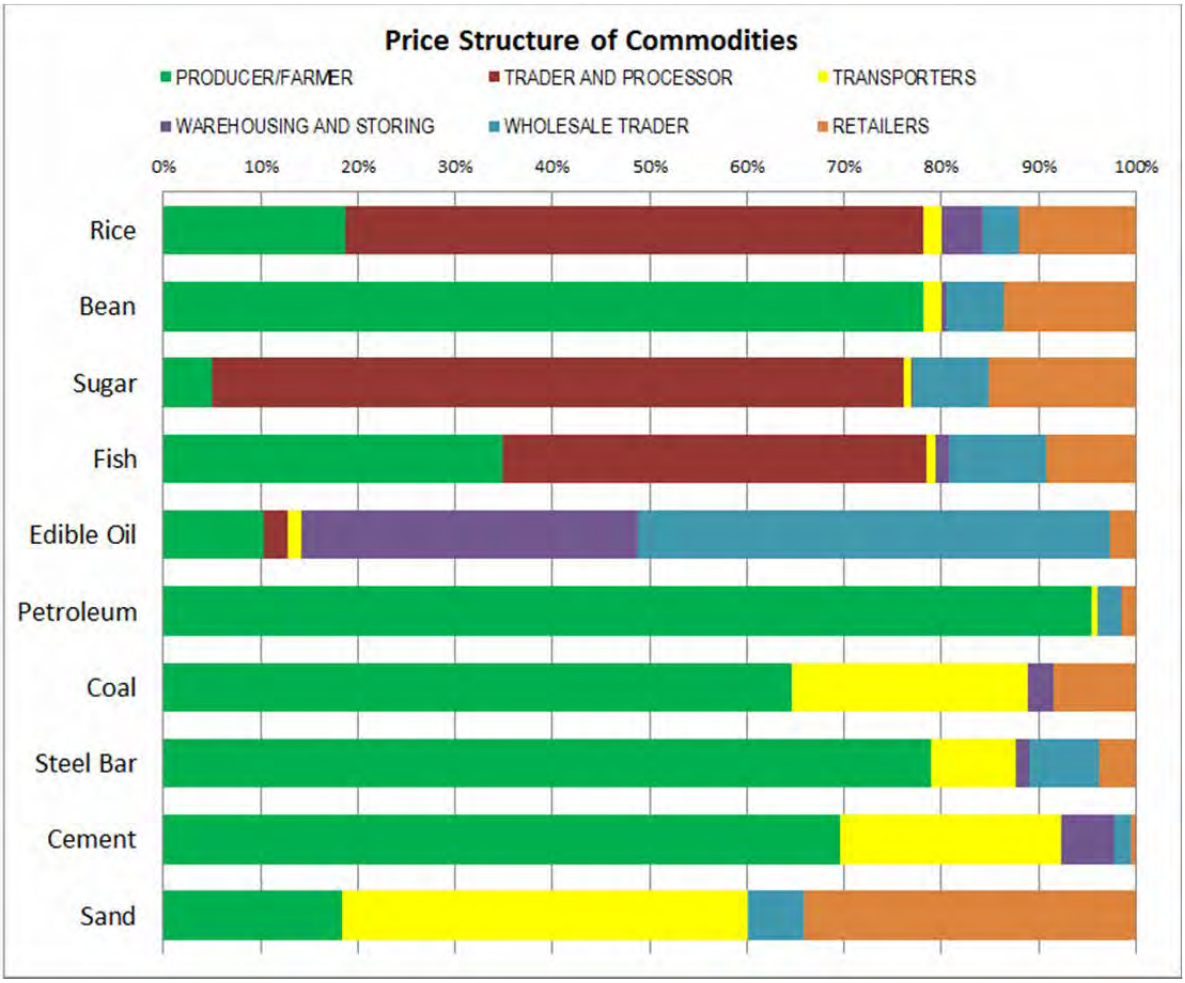
1) Share of Transport Cost in Value Chain, by Commodity

The value chain of ten major commodities was analyzed by each commodity, based on the data collected through the supply / value chain survey conducted in Yangon, Mandalay,

Bago, Mawlamyine, Magway and Pathein in April 2017. The commodities surveyed were as follows:

(i) Agricultural Commodities:	Rice, Beans, Sugar, Fish, Edible Oils
(ii) Energy Commodities:	Petroleum Products, Coal
(iii) Construction Materials:	Cement, Steel Bars, Sand

Figure-7.2.1 shows the composition of value by commodity and average market price of each commodity as well as the share of transport cost, and the transport cost per kilogram. As shown in this figure, the cargo transport cost for domestic cargo varies substantially by type of commodity.



Note:
1) The value added of each chain of supply of goods is measured along the supply chain (producer / farmer – trader / processor – transporter – warehousing / storing – wholesale trader – retailer)
2) The number of samples obtained is 57 samples for different kind of commodity (10) at Yangon, Bago, Magway, Mandalay, Ayeyarwaddy and Pathein.

Source: Study Team based on the data collected through Value Chain Survey

Figure-7.2.1 Composition of Value by Activity and by Commodity

Table-7.2.1 summarizes the result of value chain analysis.

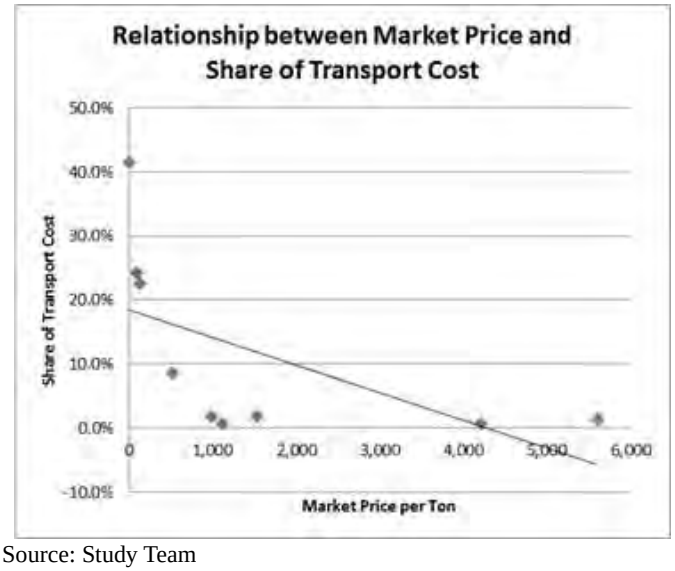
Table-7.2.1 Summary of Average Market Price and Transport Cost by Commodity

Commodity	Market Price	Share of Transport Cost	Average Transport Cost
	MMK/kg	%	MMK/kg
Rice	1,525	2	30
Bean	985	2	20
Sugar	1,108	1	9
Fish	4,200	1	37
Edible Oil	6,600	1	82
Petroleum	975	1	5
Steel Bar	520	9	45
Cement	130	23	29
Coal	89	24	21
Sand	7.5	42	3

Source: Study Team, Result of supply / value chain survey on major commodities

As shown in the above figures, the share of transport cost in the market price of building materials such as cement, sand and steel is quite high, at between 20-40 %, whilst the share of transport in the market price of agricultural products such as rice, beans, sugar, and edible oils is quite low at about 1 or 2 %. The share of transport cost for energy products or coal is around 24%, but for petroleum products it is much lower, at about 1%. However, in the case of the transport of petroleum products, these transportation cost is born by traders themselves. Therefore, the actual share of transport cost in the market price is unknown.

Figure-7.2.2 shows the relationship between the market price and share of transport cost. As shown in this figure, the lower the market price, the larger the share of transport cost. Most agricultural products are transported over short distances or within the region, however, most building materials are transported over longer distances or on an inter-regional basis.



Source: Study Team

Figure-7.2.2 Relationship between the Share of Transport Cost and the Market Price by Commodity

This result of the analysis suggests that attention be drawn to the infrastructure needed for the long-distance transport of lower value goods, such as cement, steel bars, and sand as well as coal. Generally, relevant transport infrastructure for transport of these focal commodities includes river ports for inland waterways transport and seaports for coastal shipping.

2) Truck Turnaround Time for Domestic Cargo Transport at Yangon Truck Terminal

The truck turnaround time was measured by undertaking truck terminal surveys throughout Myanmar: at Yangon, Mandalay, Pathein, Bago, Mawlamyine, Myawaddy, Dawei and Magway. Truck Turnaround Time between Yangon and Mandalay Link: the results of the truck terminal survey carried out in Yangon's truck terminal (Bayint Naung Truck Terminal) in 2016 are summarized in **Table-7.2.2. Figure-7.2.3** shows the composition of the truck turnaround time.

The measurement of necessary hours for loading and unloading operation was carried out by pattern of cargo loading / unloading operation as follows:

Pattern-1: Truck carrying cargo enters into the truck terminal for unloading and loading cargo to go back to its point of origin. (Load Factor: 1.0)

Pattern-2: Truck carrying cargo enters into the truck terminal for unloading only and returns to the point of origin without cargo (empty back-haul). (Load Factor: 0.5)

Pattern-3: Truck enters the truck terminal without cargo but instead loads cargo to carry to its destination.

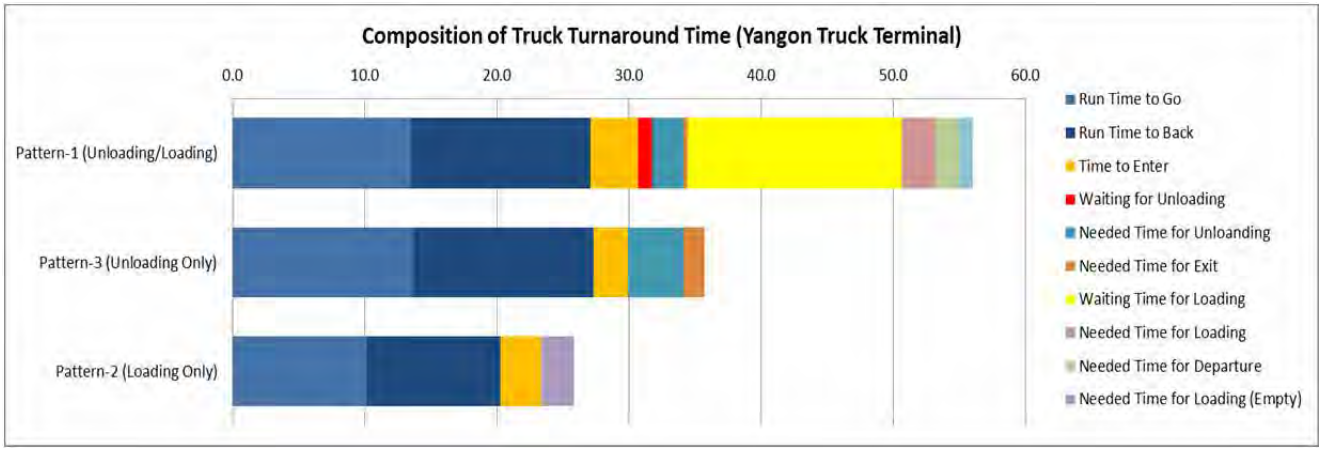
Truck Run-time between Yangon and Mandalay: The gross run-time of trucks plying Yangon and Mandalay was measured at around 18 hours per trip. The distance between Yangon and Mandalay is around 650 km for road transport. If the average speed of truck run on the expressway is assumed at 65 km per hours, the truck running time can be 10 hours, or less than half of current trip time. If heavy trucks will be permitted to travel on the existing expressway, instead of using the existing Yangon-Mandalay Road, truck turnaround times can be reduced drastically. This would contribute to a significant reduction in trucking costs.

Table-7.2.2 Truck Turnaround Time Analysis at Bayint Naung Truck Terminal (Yangon)

Nos. of Samples	Pattern	Link	Run Time to Go	Run Time to Back	Time to Enter	Waiting for Unloading	Needed Time for Unloanding	Needed Time for Exit	Waiting Time for Loading
			A	B	C	D	E	F	G
12	Pattern-1	Yangon-Mandalay	18.2	18.2	4.4	1.5	2.8	0.0	22.9
2	Pattern-1	Yangon-Bago	3.0	3.0	1.5	0.0	1.0	1.5	0.0
3	Pattern-1	Yangon-Pathein	2.0	2.0	1.8	0.0	1.3	1.0	0.0
17	Average	Pattern-1 (Unloading/Loading)	13.6	13.6	3.6	1.1	2.3	0.4	16.2
8	Pattern-2	Yangon-Mandalay	24.9	24.9	2.9	0.0	7.3	2.5	0.0
2	Pattern-2	Yangon-Bago	4.0	4.0	4.8	0.0	1.1	0.4	0.0
6	Pattern-2	Yangon-Pathein	1.9	1.9	1.4	0.0	1.2	0.8	0.0
16	Average	Pattern-3 (Unloading Only)	13.7	13.7	2.6	0.0	4.2	1.6	0.0
4	Pattern-3	Yangon-Mandalay	22.9	22.9	6.0	0.0	0.0	0.0	0.0
7	Pattern-3	Yangon-Bago	7.5	7.5	2.9	0.0	0.0	0.0	0.0
4	Pattern-3	Yangon-Pathein	2.0	2.0	0.5	0.0	0.0	0.0	0.0
15	Average	Pattern-2 (Loading Only)	10.1	10.1	3.1	0.0	0.0	0.0	0.0

Nos. of Samples	Pattern	Link	Needed Time for Loading	Needed Time for Departure	Needed Time for Loading (Empty)	Total Dwell Time	Truck Turnaround Time	Load Factor	Share of Dwell Time
			H	I	J	K	L	M	N
12	Pattern-1	Yangon-Mandalay	2.9	2.2	0.0	36.7	73.1	1.0	50%
2	Pattern-1	Yangon-Bago	2.3	1.0	0.0	54.5	60.5	1.0	90%
3	Pattern-1	Yangon-Pathein	1.3	1.0	0.0	7.5	11.5	1.0	65%
17	Average	Pattern-1 (Unloading/Loading)	2.5	1.8	0.0	33.6	**60.7**	1.0	**55%**
8	Pattern-2	Yangon-Mandalay	0.0	0.0	0.0	12.7	62.4	0.5	20%
2	Pattern-2	Yangon-Bago	0.0	0.0	0.0	13.9	21.9	0.5	63%
6	Pattern-2	Yangon-Pathein	0.0	0.0	0.0	10.1	13.9	0.5	73%
16	Average	Pattern-2 (Unloading Only)	0.0	0.0	0.0	11.9	**39.2**	0.5	**30%**
4	Pattern-3	Yangon-Mandalay	0.0	0.0	2.8	7.1	52.9	0.5	13%
7	Pattern-3	Yangon-Bago	0.0	0.0	2.3	25.4	40.4	0.5	63%
4	Pattern-3	Yangon-Pathein	0.0	0.0	2.5	20.8	24.8	0.5	84%
15	Average	Pattern-3 (Loading Only)	0.0	0.0	2.5	19.3	**39.6**	0.5	**49%**

Source: Study Team based on the analysis on data obtained through the truck terminal survey.



Source: Study Team based on the analysis on data obtained through truck terminal survey

Figure-7.2.3 Composition of Truck Turnaround Time at Yangon Truck Terminal

Truck DwelTime: As shown in the above table, the dwell time of trucks plying between Yangon and Mandalay in the truck terminal is around 36.7 hours, which accounts for almost 51% of the truck turnaround time[1] of 73.1 hours. Both the truck turnaround time for distance of 650 km and dwell time[2] in the truck terminal of 36.7 hours are considered as too long. It is to be noted that truck dwell times in truck terminals are less than 6 hours in Japan. Even if trucks are not in operation, the fixed costs expenses, such as depreciation

1 Truck turnaround time is the time taken by truck to run from the point of origin to the point of destination, unloading the cargo, reloading cargo and return to the point of origin and complete the complete its transportation of cargo by unloading the cargo at the point of origin.

2 Truck dwell time is the time that the time taken by truck to enter the point of destination, stays at the point of destination for unloading / reloading cargo and exit to the other destination or the total time stay idle in one place for waiting cargo to be loaded or unloaded.

costs, bank interest for loan repayments, etc. will still accrue. Therefore if the dwell time of trucks can be reduced substantially, the transport costs of cargo will also decrease.

One of the reasons for such a long dwell time of trucks at the truck terminal is that cargo owners must find and arrange return cargos by themselves. Only 10% of return cargoes are arranged by agents. There are even situations under which a truck driver himself must find a return cargo at the truck terminal. This situation can be improved either by utilization of agents or logistics service providers more actively, or by the introduction of a Cargo-Truck Matching System[3] - an information exchange platform between cargo owners and transporters on an Internet website. A large number of trucking companies use this Cargo-Truck Matching System for their business arrangements in Japan these days.

Load Factor: The load factor of truck plying between Yangon and Mandalay is computed at 0.79, which is good, however, a large number of trucks are forced to stay at the truck terminal to find their return cargoes. If a truck runs with a full cargo on both legs of the trip on the same route, its load factor is 1.0, whilst if the truck has no cargo (empty) back to its origin, its load factor is 0.5. The average load factor of trucks in Myanmar is computed at 0.65. If average load factors can be increased to 0.75 (similar level in Japan measured by large-size truck), at least 10% of the total cost of transporting cargoes by truck could be saved.

Through conduct of truck driver interview surveys (43,256 units in 7 days) the share of empty trucks in inter-regional road cargo traffic along major roads was analyzed. The result of the share of empty trucks by survey point is shown in **Table-7.2.3.** As shown in this table, the average load factor for trucks is 0.90. However, the load factor along roads linking with the cross-borders is quite low. This means that the return cargo arrangement for international / regional trucking services is an issue and should be addressed, since cargo volumes are expected to increase rapidly along routes linking through the cross-border areas with Thailand.

[3] Consigners can find out appropriate trucks for transporting their goods and truckers can find out appropriate cargoes to transport wanted by Consigners on the website through use of internet.

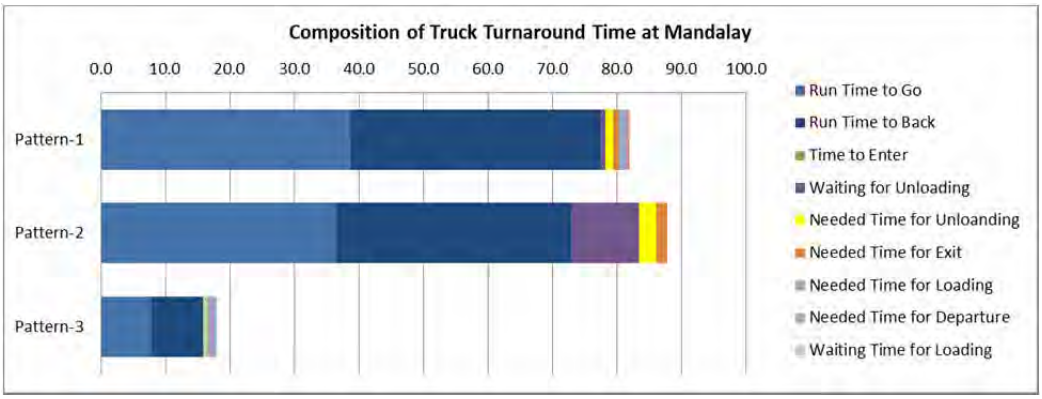
Table-7.2.3 Share of Empty Trucks in the Total Road Cargo Traffic

Survey Point	Empty Truck Ratio	Load Factor	Nos of Empty Truck	Total Nos of Truck
1 Muse (Cross Border with China)	10.8%	0.89	467	4,322
2 Tachilek (Cross Border with Thailand)	25.1%	0.75	130	518
3 Kawkareik (Cross Border with Thailand)	46.3%	0.54	1,207	2,609
4 Kalaw (Border of Shan & Mandalay)	8.4%	0.92	313	3,723
5 Pwekauk (Border of Shan & Mandalay)	4.7%	0.95	207	4,448
6 Kantalu (Sagaing) (Border of Mandalay & Sagaing)	23.9%	0.76	560	2,347
7 Nyaung-U (Border of Mandalay & Magway)	25.4%	0.75	138	541
8 Myothit (Magway) (Border of Minbu and Magway)	3.3%	0.97	38	1,155
9 Swa (Border of Mandalay & Bago)	3.5%	0.97	234	6,731
10 Nawadei Bridge (Border of Magway & Bago)	7.0%	0.93	135	1,933
11 Bo Myat Tun Bridge (Border of Ayeyarwaddy & Yangon)	7.3%	0.93	117	1,595
12 Bago College (Border of Yangon & Bago)	0.7%	0.99	55	7,814
13 Phayargyi (Bago) (Border of Bago & Mon)	7.4%	0.93	183	2,492
14 Mawlamyaing (Border of Mon & Tanintharyi)	18.1%	0.82	538	2,975
Total	10.0%	0.90	4,324	43,256

Source: Study Team, based on the Truck Driver Interview Survey in 2016

3) Truck Turnaround Time for Domestic Cargo Transport at Mandalay Truck Terminal

The truck turnaround time of trucks plying between Yangon and Mandalay was measured by undertaking truck terminal surveys at both Yangon and Mandalay truck terminals. The results of the survey conducted at the Mandalay Truck Terminal are summarized in **Table-7.2.4. Figure-7.2.4** shows the composition of truck turnaround time.



Source: Study Team based on the analysis on data obtained through truck terminal survey

Figure-7.2.4 Composition of Truck Turnaround Time at Mandalay Truck Terminal

Table-7.2.4 Composition of Truck Turnaround Time Analysis at Mandalay Truck Terminal

Truck Terminal at Mandalay (Unit: hour/truck)

Nos. of Samples	Pattern	Link	Run Time to Go	Run Time to Back	Time to Enter	Waiting for Unloading	Needed Time for Unloanding	Needed Time for Exit	Needed Time for Loading
			A	B	C	D	E	F	G
2	Pattern-1	Yangon	24.5	24.5	0.0	0.5	2.5	0.5	2.5
4	Pattern-1	Muse	48.5	48.5	0.0	1.5	0.0	1.0	0.5
2	Pattern-1	Mawlamyaing	32.5	32.5	0.0	0.0	1.5	0.0	1.5
2	Pattern-1	Pyay	39.5	39.5	0.0	0.0	2.5	2.0	0.0
	Average		38.7	38.7	0.0	0.7	1.3	0.9	1.0
6	Pattern-2	Yangon	34.0	34.0	0.0	10.0	2.7	2.6	0.0
1	Pattern-2	Muse	45.0	45.0	0.0	4.5	1.0	0.0	0.0
1	Pattern-2	Mawlamyaing	48.0	48.0	0.0	23.0	2.0	0.0	0.0
1	Pattern-2	Pyay	31.0	31.0	0.0	7.0	5.0	0.0	0.0
	Average		36.4	36.4	0.0	10.5	2.7	1.7	0.0
1	Pattern-3	Yangon	52.0	52.0	0.0	0.0	0.0	0.0	0.0
3	Pattern-3	Muse	4.9	4.9	0.0	0.0	0.0	0.0	0.0
1	Pattern-3	Myawaddy	35.0	35.0	0.0	0.0	0.0	0.0	0.0
9	Pattern-3	Mandalay	1.0	1.0	0.0	0.0	0.0	0.0	0.0
	Average		7.9	7.9	0.0	0.0	0.0	0.0	0.0

Nos. of Samples	Pattern	Link	Needed Time for Departure	Waiting Time for Loading	Needed Time for Loading	Needed Time for Departure	Dwell Time	Truck Turnaround Time	Share of Dwell Time
			H	I	J	K	L	M	N
2	Pattern-1	Yangon	0.5	0.0	0.0	0.0	5.5	55.0	10.0%
4	Pattern-1	Muse	0.0	0.0	0.0	0.0	22.5	118.8	18.9%
2	Pattern-1	Mawlamyaing	1.0	0.0	0.0	0.0	7.0	72.0	9.7%
2	Pattern-1	Pyay	1.5	0.0	0.0	0.0	6.5	85.0	7.6%
	Average		0.6	0.0	0.0	0.0	12.8	89.9	14.2%
6	Pattern-2	Yangon	0.0	0.0	0.0	0.0	15.2	83.2	18.3%
1	Pattern-2	Muse	0.0	0.0	0.0	0.0	5.5	95.5	5.8%
1	Pattern-2	Mawlamyaing	0.0	0.0	0.0	0.0	25.0	121.0	20.7%
1	Pattern-2	Pyay	0.0	0.0	0.0	0.0	12.0	74.0	16.2%
	Average		0.0	0.0	0.0	0.0	14.9	87.7	16.9%
1	Pattern-3	Yangon	0.0	1.5	2.5	0.5	4.5	108.0	4.2%
3	Pattern-3	Muse	0.0	1.9	0.3	0.1	2.3	12.0	19.2%
1	Pattern-3	Myawaddy	0.0	0.0	1.0	1.0	2.0	71.0	2.8%
9	Pattern-3	Mandalay	0.0	0.5	1.2	0.2	2.1	4.0	52.5%
	Average		0.0	0.8	1.1	0.3	2.3	17.9	12.9%

Source: Study Team based on the analysis on data obtained through truck terminal survey

Truck Turnaround Time in Rural Areas: The results of truck terminal surveys carried out at six major provincial cities are shown in **Table-7.2.5. Figure-7.2.5** shows the composition of truck turnaround time.

Truck Running Time in Rural Areas: An average gross running time of trucks in rural areas of Myanmar is around 12 hours per one way.

Truck Dwell Time: As shown in the below table, the average truck dwell time at provincial truck terminals is around 13.7 hours, accounting for almost 33.5 % of the truck turnaround time, which is 39.9 hours.

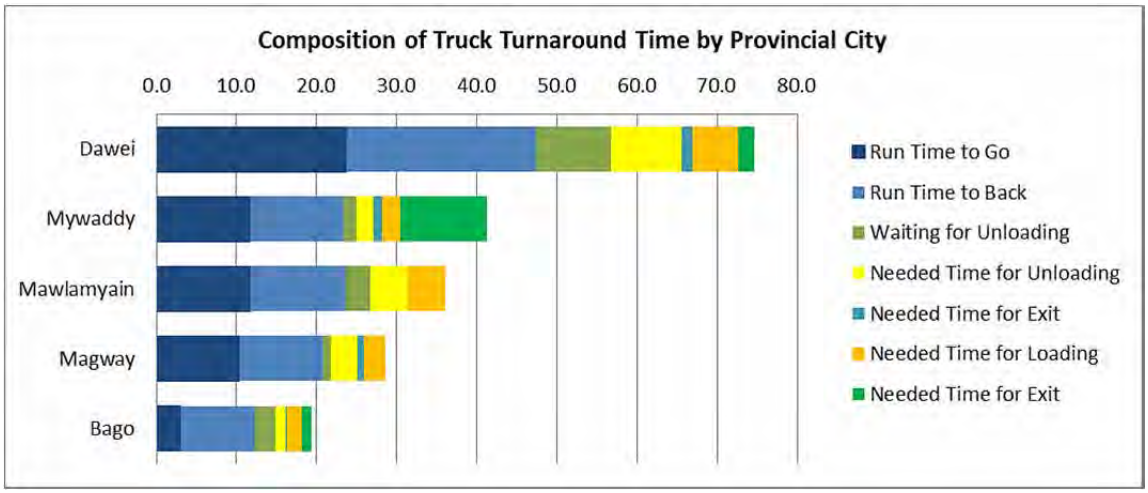
Load Factor: The average load factor of trucks in rural areas is 0.53, which means most trucks return to their origin without a return cargo. If the load factor could be improved the freight transport cost could be reduced accordingly.

Table-7.2.5 Composition of Truck Turnaround Time at Provincial Cities

(Unit: hours/truck)

Nos. of Samples	Route	Run Time to Go	Run Time to Back	Waiting for Unloading	Needed Time for Unloading	Needed Time for Exit	Needed Time for Loading	Needed Time for Exit	Wating Time for Loading	Needed Time for Loading	Needed Time for Exit	Dwell Time	Truck Turnaround Time	Share of Dwell Time
		A	B	C	D	E	F	G	H	I	J	K	L	M
City Truck Terminals (Pattern-1)														
9	Mywaddy	11.7	11.7	1.6	2.1	1.1	2.3	10.8				18.0	41.3	43.6%
12	Dawei	23.7	23.7	9.4	8.8	1.3	5.8	1.9				27.2	74.6	36.5%
21	Mawlamyain	11.8	11.8	3.1	4.7	0.0	4.6	0.0				12.4	36.0	34.4%
55	Magway	10.4	10.4	0.9	3.4	0.8	2.6	0.0				7.7	28.6	26.9%
23	Bago	3.0	9.3	2.5	1.4	0.1	1.9	1.2				7.1	25.8	27.5%
	Average	10.6	11.9	2.5	3.7	0.6	3.1	1.2				11.1	34.9	31.9%
City Truck Terminals (Pattern-2)														
36	Dawei	20.9	20.9	7.6	12.6	2.6						22.8	64.7	35.2%
8	Mawlamyain	12.5	12.5	4.4	4.0	0.0						8.4	20.9	40.2%
50	Pattein	12.2	12.2	3.8	4.2	3.5						11.5	36.0	31.9%
14	Bago	4.2	4.2	3.1	1.8	1.1						6.1	14.4	42.4%
	Average	14.1	14.1	5.0	6.7	2.6						14.3	41.6	34.4%
City Truck Terminals (Pattern-3)														
40	Miyawaddy	14.6	14.6						0.0	1.6	2.2	13.4	42.5	31.5%
15	Bago	2.8	2.8						1.1	2.3	1.7	5.0	10.6	47.2%
	Average	11.4	11.4	0.0	0.0	0.0	0.0	0.0	0.3	1.8	2.1	11.1	33.8	32.9%

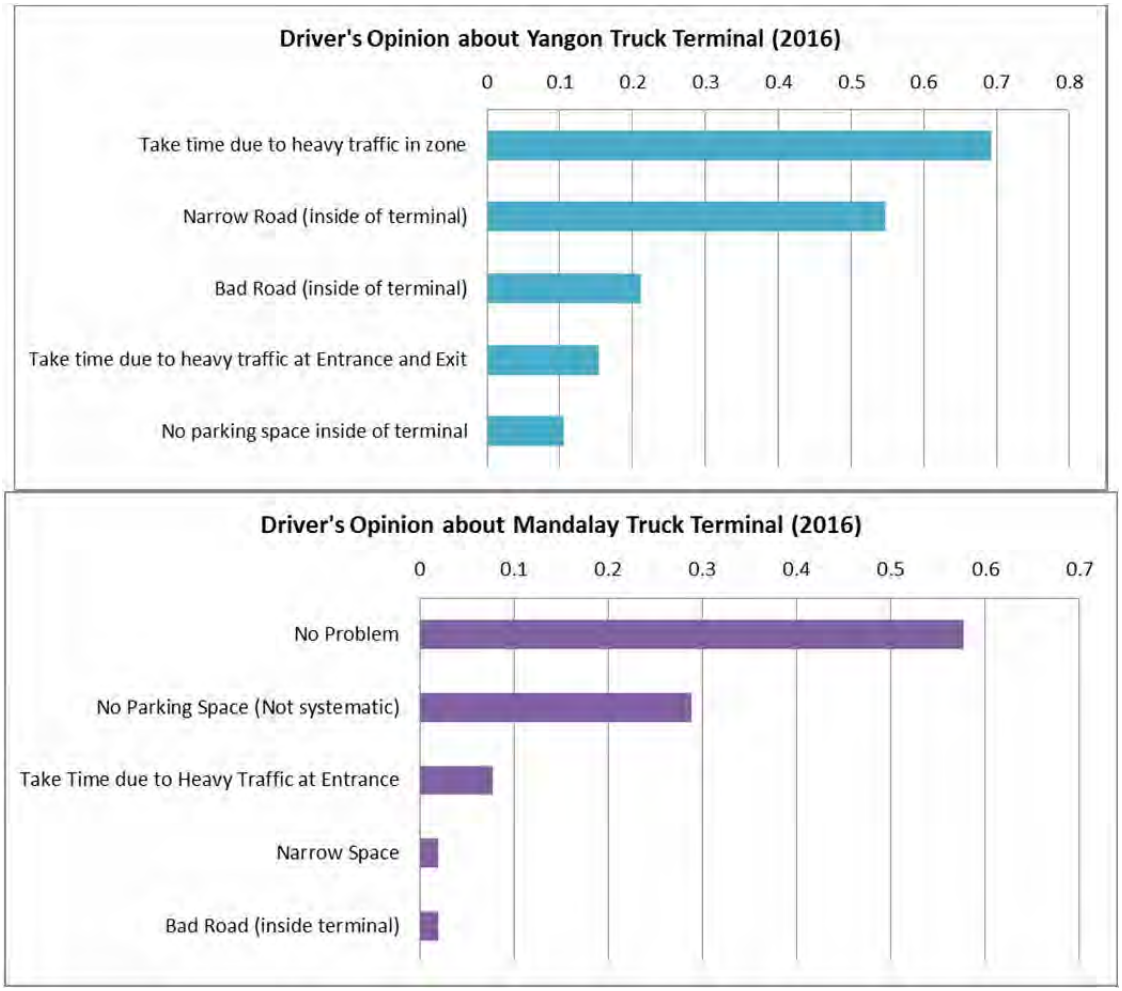
Source: Study Team based on the analysis on data obtained via truck terminal surveys at six cities



Source: Study Team based on the analysis on data obtained via cities truck terminal surveys at six cities

Figure-7.2.5 Composition of Truck Turnaround Time at Selected Provincial Cities

Opinion Survey on Truck Drivers: At Yangon Truck Terminal 104 samples and at Mandalay Truck Terminal 52 samples were collected through the truck driver interview surveys. **Figure-7.2.6** shows the truck drivers' opinions about the conditions of the truck terminals in Yangon and Mandalay, respectively.



Source: Study Team abased on collected data through the truck driver interview survey at the truck terminals

Figure-7.2.6 Truck Drivers' Opinion on Conditions of Truck Terminals

As shown in the above figures, the operating condition of the Yangon Truck Terminal is quite bad as this terminal's capacity is almost saturated, while the capacity of the truck terminal in Mandalay seems quite sufficient since this terminal was opened only three years ago.

Issues to be addressed: A lengthy truck turnaround time seems a basic cause of high transport costs in general. Efforts should be directed to reduce truck turnaround times as much as possible, by reducing vehicle running time (an increase an average running speed, whilst maintaining road safety) and to shorten dwell times at truck terminals by introduction of mechanized cargo loading / unloading operations or containerized cargoes, and to increase load factors by the introduction of Cargo-Truck Matching Systems[4]. Most of plots composed of office, warehouse and cargo handling space in the truck terminal

[4] Cargo-Truck Matching System is the business matching system for freight transport service and is operated by the intermediate company who is requested by the cargo owner (consigner) to find out the best suit truck to transport his cargo to where the consigner wants to dispatch, propose a truck seeking a return cargo to his original place to such consigner or vise-versa. When the requirement of both parties is met a contract is concluded through this intermediate company either through phone conversation or by information exchange through internet. The consigner find the most suitable trucking service, and trucks find a cargo to transport, and the intermediate company obtains margin between selling price and buying price of trucking service.

have been sold out to individual business entities. Then, the truck terminals are not managed and operated publicly although these were planned and developed by each city government. In Myanmar, another aspect of truck terminals is its function as a wholesale market. Function of truck terminal and market should be separated. This way of management needs to be changed under a public / private collaboration system, as benefits that will be attained by optimum use of truck terminals accrue to the general population and nation.

Estimated Economic Benefit due to Shorten Dwell Time: The economic benefits accrue to the national economy due to shortening the truck dwell time at the truck terminals to half of current average truck dwell time for the cargo transport between Yangon and Mandalay is estimated at around US$ 270 per one cycle of trailer truck loading 15 tonnes of cargo. This means that the transport charge can be reduced around 28% from prevailing charge for the Yangon-Mandalay route. **Table-7.2.6** shows how this economic benefit is computed on the basis of conditions assumed. If this rate of saving transport cost per cycle of cargo haulage by trailer truck is applied to the projected cargo flow volume forecast between Yangon and Mandalay, the annual saving in 2025 could be around US$ 360 million, which is substantial.

Table-7.2.6 Estimated Economic Benefit due to Shortening Truck Dwell Time by Half

Economic Benefit per Once Cycle of Cargo Transport by Truck

Trailer Truck	Unit	As usual	Improved
Distance	km	600	600
Return Trip	km	1,200	1,200
VOC in Use	US$ per 1,000km	560	560
VOC in Time	US$ per hour	15	15
Speed	kph	60	60
Runtime	hours	20	20
Dwell Time	hours	36	18
Turnaround Time	hours	56	38
Total Cost	US$ per Cycle	1,212	942
Difference	US$ per Cycle		270
Difference	%		28.7%

Economic Benefit in 2025

Cargo Volume	1,000tons/year	20,000	20,000
Average Load	tons	15	15
Number of Cycle	cycle	1,333	1,333
Saving	US$ million		360

Source: Study Team

4) Cargo Turnaround Times through Warehouses

In industrial zones, factories own their own warehouses; and these are managed and controlled by the factory operators themselves. However, most domestic cargoes transported by trucks to and from the truck terminals at Yangon and Mandalay are stored temporarily at each warehouse to where trucks deliver cargoes, as truck terminals often function as a wholesale market or as retailer shops. Most warehouses are owned and

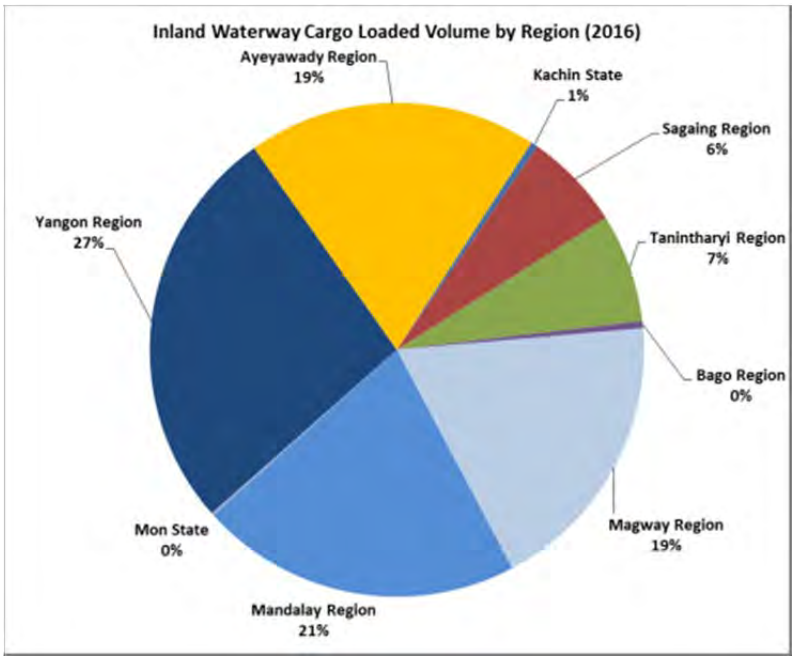
operated by cargo owners or traders individually. Cargo owners often own their own trucks for transporting their cargoes.

The average storage capacity of more than 70% of the total number of warehouses is below 1,000 square feet, which is considered as very confined and narrow. Within such a limited space in the warehouse, it is difficult to conduct modern logistics activities, which includes inventory control. Larger space for warehouses, together with a sufficient number of truck berths are needed to improve logistics performance for the handling of the domestic cargoes. More than 70% of the cargo owners or warehouse operators at truck terminals ship their cargoes 30 times a month, on average. This means that only one shipment is undertaken each day or maybe twice each weekday. The results of the analysis of warehouse operations at truck terminals show clearly that the logistics performance in Myanmar is rather low.

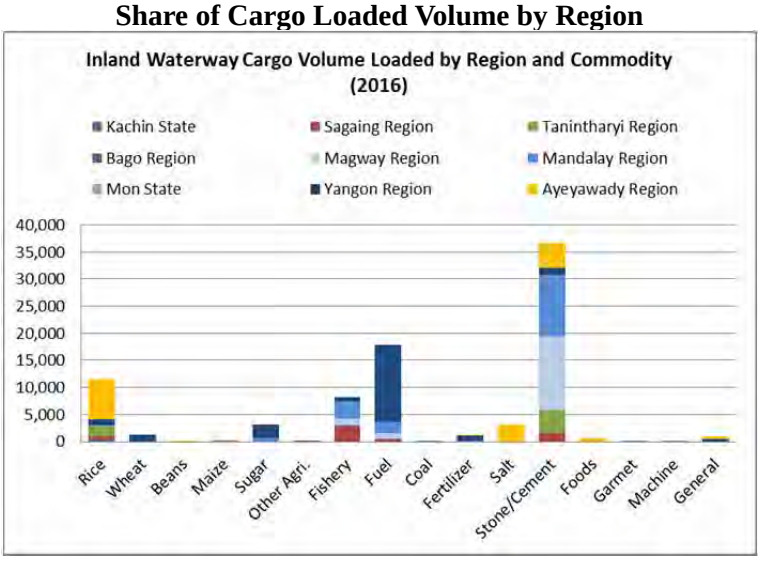
Issues to be addressed: The average space of warehouses needs to be large enough to permit easy operations for storage / delivery of goods to meet the demand and in accordance with the inventory control schedule. An enlargement of warehouse space is feasible, as implemented at the truck terminal in Mandalay. In the new truck terminal in Mandalay, one large shed is used as a shared warehouse to increase cargo turnaround times and to reduce storage costs.

5) IWT Vessel Turnaround Time Survey for Domestic Cargo Transport

The cargo transported by inland waterways transport along the Ayeyarwaddy River through the Yangon-Bago-Magway-Sagaing-Mandalay regions dominate cargo volumes transported by inland water transport mode. The turnaround time of inland water transport vessels (averaging 1,000 tonnes) for the Yangon – Mandalay route was analyzed as 10 days (up river) and 7 days (down river) in total 17 days per round voyage/trip. Most of the commodities transported by inland waterways mode are construction materials, fertilizers, and sugar and petroleum products. **Figure-7.2.7** shows the cargo transport volume by inland waterway transport and commodity, by region.



Share of Cargo Loaded Volume by Region



Commodity Loaded by Region

Source: Study Team based on the data collected through the Waterborne Transport Survey

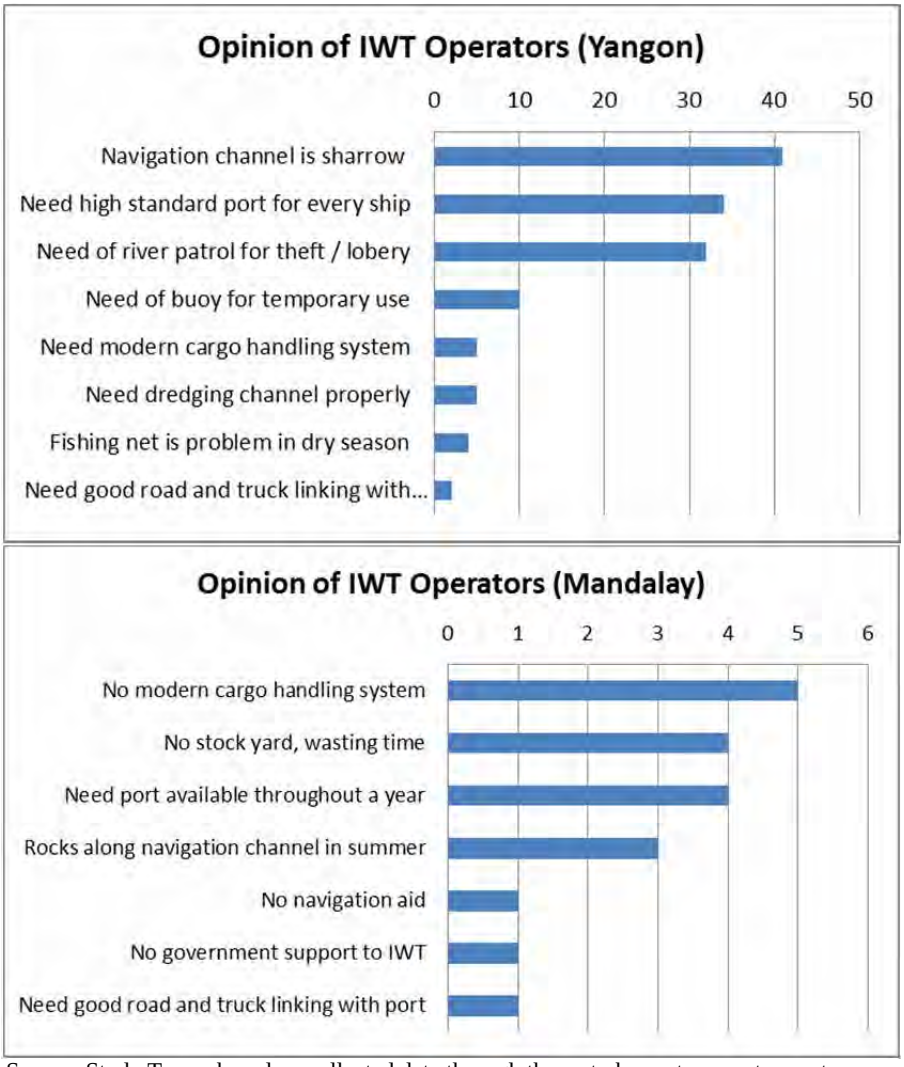
Figure-7.2.7 Inland Waterway Transport Cargo Transport Volume by Region

It is computed that the berthing time of inland waterway transport vessels of 1,000 tonnes is around 87 hours per trip from Yangon to Mandalay. As the total vessel voyage time is 240 hours, the berthing time accounts for 37%, which is quite lengthy. Since almost all river ports (with loading / unloading facilities) are not designed and developed to meet the berthing requirements of 1, 000-ton class inland waterway transport vessels, all cargo handling is done by laborers without any proper cargo handling equipment.

Opinion Survey on Inland Waterway Transport Operators: At Yangon 48 samples and at Mandalay 25 samples were collected through the waterborne operator interview surveys. **Figure-7.2.8** shows the inland waterway transport operators' opinions about the conditions of the navigation channel, loading / unloading operations and the safety of inland

waterway transport.

The results of the survey show clearly that major problems for inland waterways transport are a lack of proper ports for inland waterway transport operations and a lack of safe navigation channels. Some respondents pointed out a lack of connections with the road system.



Source: Study Team abased on collected data through the waterborne transport operator survey

Figure-7.2.8 Opinions of Inland Waterway Transport Operators

Issues to be addressed: Efforts should be first directed to reduce the berthing time of inland water transport vessels in the 1,000 ton class, to optimize the use of inland waterways transport for the transport of low value but bulky commodities such as construction materials, petroleum products, and rice or sugar. With the concept of the economies of scale, the common perception may be that the transportation cost of goods becomes lower if the vessels that carry those goods get larger. However, the voyage of large-sized vessels is hampered in the dry season due to the existence of shallow parts in navigation channels. The improvement of navigation channels throughout the year is imperative to ensure reliable, speedy at low cost and safety vessel navigation.

6) Ship Turnaround Time Survey for Domestic Coastal Shipping

The average ship turnaround time[5] includes the voyage time of ships plying between a port of origin and a port of destination and amounts to around 111 hours or 4.6 days, of which around 69 hours or 2.9 days is considered as ship berthing time for loading or unloading cargo. **Table-7.2.7** shows the average berthing time, trip time and total voyage time (ship turnaround time) and the share of berthing time of the ship turnaround time. As shown in this table, the berthing time is longer than the voyage time and accounts for around 60% of vessel turnaround time. This is chiefly due to the low port cargo handling productivity and efficiency of local ports, which is carried out mostly by manual means.

Table-7.2.7 Average Berthing Time and Trip Time

(Unit: hours/ship)

Time	YGN	STW	KPY	MLM	DWI	MYK	KWT	Average
Berthing Time	72.8	52.0	51.6	19.9	57.3	140.1	88.8	68.9
Trip Time	71.3	42.0	37.0	37.4	20.4	30.8	59.8	42.7
Total Voyage Time	144.1	94.0	88.6	57.3	77.7	170.9	148.5	111.6
Share in Total Time	YGN	STW	KPY	MLM	DWI	MYK	KWT	Average
Share of Berthing Time	51%	55%	58%	35%	74%	82%	60%	59.2%
Share of Trip Time	49%	45%	42%	65%	26%	18%	40%	40.8%
Turnaround Time	100%	100%	100%	100%	100%	100%	100%	100.0%

Source: Study Team based on the data collected through the coastal shipping survey in 2016

Table-7.2.8 shows the average trip time, berthing time, trip time and ship turnaround time of major links served by large ship of GRT 1,300 – 1,800, carrying general cargoes, cement and fuel. The number of days for one trip is 10 days on average and the dwell time (berthing time) is around 3 days therefore the share of dwell time is 33% of ship turnaround time.

Issues to be Addressed: Coastal shipping is considered as the one of the useful means for the transport of low value goods such as construction materials and especially for rural areas situated along the coastline, where road and rail networks cannot provide transport daily consumable goods. Local ports are in need of increased port cargo handling capacity to meet with increasing cargo transport demand and to make the transport cost competitive, so as to avoid diversion from maritime mode to road or railway mode, which could increase the cost of living in rural areas situated along the coastline.

Table-7.2.8 Average Trip Time and Berthing Time of Large Size Coastal Ships

Ship Size	Link		Distance	Speed	Trip Hours	Berthing Time	Turn Around Time	Turn Around Time	Share of Dwell Time
GRT	From	To	km	km/hour	hours	hours	hour	days	%
1,300	Yangon	Mawlamyaing	190	16.0	13	10	36	1.5	27.8%
1,400	Yangon	Sittwe	850	12.2	72	48	192	8.0	25.0%
1,650	Yangon	Dawei	460	13.0	34	140	208	8.7	67.3%
1,160	Yangon	Khawtaung	900	14.4	63	71	197	8.2	36.0%
1,400	Sittwe	Khawtaung	1,300	12.5	96	75	267	11.1	28.1%
1,800	Kyaukpyu	Khawtaung	1,200	10.0	130	32	292	12.2	11.0%

Source: Study Team based on the waterborne transport survey in 2016

[5] Ship turnaround time means the total voyage time from the point of origin to the point of destination and return to the point of origin including necessary time for cargo loading / unloading operation as well as berthing time.

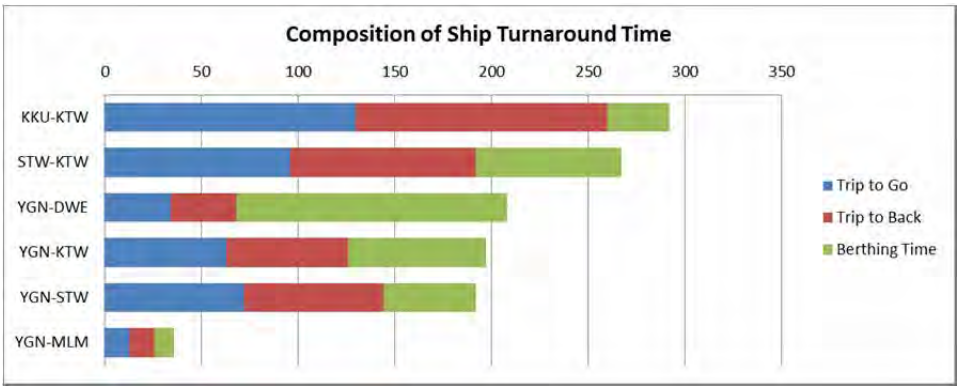


Figure-7.2.9 Composition of Ship Turnaround Time (Large Size Ships)

(3) International / Regional Cargo Transport

1) Maritime Transport Cost and Lead Time

Almost 90% of international maritime cargo is handled by the Port of Yangon at present. The port is situated at around 32 km (17 nm) inland from Elephant Point on the Gulf of Martaban. Two bars in the channel restrict the drafts of vessels calling Yangon. The Yangon Port is accessible to ships of up to the overall length of 167 meters and with draft of around 9 meters. Therefore, most of maritime transport to and from Yangon Port is restricted to feeder ships plying between Singapore and Yangon. This leads to a relatively high cost of maritime transport and long lead-times. **Table-7.2.9** shows the container transport cost and voyage days by route.

Table-7.2.9 Maritime Transport Cost and Voyage Days of East Bound Route

(Unit: US Dollars per Container)

Route			Voyage	Container	Freight	THC		Total
From		To	Days	Size	Net	Loading	Unloading	
Tokyo	⇒	Yangon	19 days	20'	700	300		1,000
				40'	1,350	450		1,800
Yangon	⇒	Tokyo	23 days	20'	300		300	600
				40'	600		450	1,050
Tokyo	⇒	Laem Chabang	10 days	20'	150	300	80	530
				40'	300	450	120	870
Laem Chabang	⇒	Tokyo	8 days	20'	300	80	300	680
				40'	600	120	450	1,170
Laem Chabang	⇒	Yangon	10 days	20'	700	80		780
				40'	1,350	120		1,470
Yangon	⇒	Laem Chabang	7 days	20'	150		80	230
				40'	200		120	320

Source: Study Team

2) Port Clearance of Trade Cargoes

Trade cargo transport efficiency is low, with quite long cargo dwell times at ports and cross-border points, leading to high transport costs. The average dwell time of cargoes in ports waiting for cargo clearance is around seven days. Although the electronic customs clearance system has been introduced, it is not fully operational yet. Both bonded transport and bonded warehouse systems have not been fully established yet, so customs clearance procedure needs to be done in the port. The delays in cargo clearance reduce port cargo handling capacity substantially.

3) Regional Road Transport Cost and Lead Time

Regional cargo traffic volumes passing between Myanmar and Thailand through the cross-border point located at Myawaddy have increased sharply since the completion of Kawkareik Road in 2015 and the improvement of trans-loading operations and customs clearance procedures at the Myawaddy Trade Zone (MTZ). **Table-7.2.10** shows the changes of lead-time between 2014 and 2016. As shown in this table, the lead-time connecting Bangkok and Yangon has been shortened from 88 hours (3.7 days) to 64 hours (2.7 days). The second bridge crossing over the border between Myanmar and Thailand at Myawaddy is expected to be completed in 2017 to meet with the ever-increasing cargo traffic volumes passing this cross-border point.

The connectivity with neighboring countries i.e. Thailand, China and Myanmar, is weak. Many of the regional corridors do not satisfy the requirements set for so-called "Heavy Loaded Vehicles" and lengthy customs clearance procedures hamper the smooth and quick cargo movement.

Table-7.2.10 Change of Lead Time for Cross-border Trade Cargo via Myawaddy

Shorten Lead-time by Improvement of Trans-loading Operation and Customs Clearance Procedure in Myawaddy Trade Zone (MTZ)

	Thailand		Myanmar					Total in hours		Total in Day	
Before Kawkareik Road Completed	Thailand (Leaving from Bangkok)	Transport	Myawaddy Trade Zone (MTZ)		Waiting for Change of Road Direction	Transport	Consignee in Yangon				
			Private Warehouse	Customs Office			Arrival	**88**	hours	**3.7**	days
			Unloading / Loading by Manual Labor	Conventional Customs Clerance Procedure							
		16 hours	24 hours		24 hours	24 hours					

	Thailand		Myanmar					Total in Hours		Total in Hours	
Afte Kawkareik Road Completed (2016)	Thailand (Leaving from Bangkok)	Transport	Myawaddy Trade Zone (MTZ)		Waiting for Change of Road Direction	Transport	Cosignee in Yangon				
			Private Warehouse	One Stop Station (OSS) Customs			Arrival	**64**	hours	**2.7**	days
			Unloading / Trans-loading by Manual Labor	Conventional Customs Clerance Procedure							
		16 hours	24 hours		0	24 horus					

Note: Change from one-way operation to two-way operation on Myawaddy route.
Source: Study Team

Issues to be Addressed: Cargo traffic volumes will increase drastically after the completion of the cross-border bridge at Myawaddy. The capacity of the cross-border facility namely the Myawaddy Trade Zone needs to be upgraded and its cargo handling capacity to be increased. If the trucking cost of 40' containers for Laem Chabang – Yangon will become the same level or less than US$ 1,470 per 40-foot container, this land route might be preferred by traders, and container traffic volumes could increase drastically. Cross-border facilities and cargo clearance systems need to be developed to meet with forecast cargo traffic volumes.

(4) Multi-modal Transport

1) Fragmentation of Cargo Transport Operations

The linkages between different cargo transport modes i.e. road – railway, railway – port, river-port – railway / road, are quite weak at present. Although the transport cost of inland

waterway cargo transport and railway freight transport are lower than trucking cost, the transport efficiency of these transport modes are quite low and not punctual, thus the freight transport is biased to road transport. The selection of transport mode by shippers or by logistics service providers is difficult therefore some rationalization or optimization of transport operations is impossible. Especially in rural areas, inland waterways transport can be utilized further however, there are no properly designed river ports. For river ports cargo transport is forced to depend only on trucking, whose transport cost is the highest amongst other transport modes.

2) Warehousing

Although there are many warehouses especially in the suburbs of major urban areas, they are used by manufacturers and traders but not for logistics services. Small size warehouses are concentrated in truck terminals. However these also belong to traders or individual transporters. Thus storage of goods are handled individually but not in a collective way. As there is no large-scale warehouse the number of companies that is possible to use and manage the inventory is quite limited. If the trader need to store their goods in a large volume they need to own their own warehouse. However as they fall under the SME and lack financial capability they cannot build and own their warehouse. If there is a large-scale warehouse in which it is possible to rent out space from time to time, to those who want and needs to store goods at right price, the delivery of goods will become punctual and the logistics cost can be reduced, so as to make the competitiveness of goods as high as possible.

One large warehouse in the Mandalay Truck Terminal is used as public warehouse and its spaces are rent out to the traders and trucking companies. The warehouse of this type (publicly owned and operated on rent system is to be expanded throughout Myanmar so as to optimize freight transport efficiency.

Issues to be Addressed: Myanmar Railways (MR) has already contracted international private logistics service providers for development and operation of the Inland Container Depots (ICD) at both Yangon and Mandalay. This will enable the transport of containers by railway. The use of machinery for container handling will become common in future. Therefore the development of multimodal cargo transport hubs or logistics parks becomes imperative.

7.2.2 Current Issues in Myanmar's Logistics Systems

Based on the findings and knowledge accumulated through similar studies of development plans for transport sub-sectors including road, railway, port, airport, logistics facilities, alike in the past, the issues to be addressed for development of logistics system by transport mode were identified as follows by trade cargo and domestic cargo:

(1) Trade Cargo – Maritime Transport

1) Long lead-time and high cost of maritime transport, as only feeder lines from Singapore or Colombo can be used;
2) Port cargo clearance takes 5-7 days- although the electronic customs clearance system has been introduced it is not fully operational;
3) Port capacity for handling containerized cargo will be insufficient to meet with demand by 2030;
4) Specialized yard and terminal for bulk cargo such as grain, edible oil, cement, chemical products, etc. exist but not organized collectively and separated;
5) No port is available for export of agricultural commodity such as rice by bulk carrier (handy bulker of 35,000 – 50,000 DWT which require at least 12.5 m water depth along the berth) commonly used by the major rice exporting countries such as Thailand and Vietnam.

(2) Trade Cargo – Land Transport

1) Since the liberalization of Myanmar's economy was adopted only 7 years ago in 2011, the handling capacity of cross-border facilities is still in an infant stage, thus waiting times for customs clearance and trans-loading operation are still long, although a one stop service has been introduced;
2) Roads network is not fully developed to meet with requirements of large traffic volumes of heavily loaded vehicles;
3) There is a shortcoming in diversification of road links with neighboring countries;
4) Low utilization of transport modes that are suitable for long distance cargo transport especially for low value commodities i.e. railways and the inland waterways transport system;
5) Low level of road transport safety lead to frequent traffic accidents;

(3) Domestic Cargo – Land Transport

1) Capacity of all types of transport infrastructure i.e. roads, railways, logistic facilities, etc. is too low to cope with forecast rapidly increasing cargo traffic volumes;
2) Connectivity between trunk roads and feeder roads is weak;
3) Regional connectivity with neighboring countries is weak;
4) Road system has not been fully developed to cope with a large traffic volumes and the requirements of heavily loaded vehicles;
5) Capacity and efficiency of truck terminals are low;
6) Truck terminals and railway freight transport systems are not ready for the transport of containerized goods; and
7) Linkages between different transport modes are weak. No proper multi-modal transport facilities exist at present.

(4) Domestic Cargo – Waterborne Transport

1) Capacity of inland waterway transport is low due to the lack of modern port facilities and safe navigation channels throughout the year;
2) Inland waterway transport vessels are life expired- and modern vessels are needed to meet the requirements of containerized cargo transport; and
3) Capacity of coastal shipping is low due to a lack of modern port facilities equipped with mechanized cargo handling systems to increase port productivity.

(5) Overall Cross-cutting Issues

1) Laws and regulations supporting modernization of the logistics system are lacking;
2) Shortfalls of human resources to deal with rapidly increasing international and domestic cargo traffic volumes at both administration side and in the private sector;
3) In general, the storage capacity for goods at ports, river ports, truck terminals and at commercial nodes is lacking;
4) Dwelling time of freight trucks, inland waterway transport vessels, and coastal ships at the location where cargo loading / unloading operation take place are considerably long thereby pushing up transport costs;
5) Load factors of trucks, railways, inland waterways transport, and coastal shipping is low, thereby pushing up transport costs;
6) Lack of space and facilities for handling empty containers;
7) Lack of safety measures taken and regulations enforced for all transport modes;
8) Lack of alternative regional and international freight transport routes, therefore, the freight transport cannot be diverted when the major freight transport route is closed due to natural disaster alike;
9) The trucks, railway locomotives, railway container transport wagons, inland waterway transport vessels, and coastal cargo ships are all old and consume higher rate of fuel; and
10) The freight transport equipment, drivers and professional logistics service providers are insufficient to deal with sharply increasing cargo demand;
11) The private sector transport companies are fragmented and not organized properly and most of them fall under the SMEs; and
12) The financial capability of the SME cargo transport companies is weak, thus the transport vehicle fleet and the inland waterway transport vessel fleet as well as coastal cargo ship fleet cannot be expanded although the infrastructure is developed properly, thus the maximization of investment effects on the infrastructure development cannot be attained as expected.

7.2.3 Issues within Each Modal Sub-sector

The particular issues of cargo transport, storage, and distribution (logistics system) by sub-sector (by road, railway, inland waterway, maritime, coastal shipping, logistics) to be addressed are summarized by cargo transport mode in order of priority, as follows:

(1) Road Cargo Transport

Issues by Type of Cargo Transport Mode	
1) Trade Cargo	
(i)	The roads and bridges of international routes (especially the links connecting Myanmar and Bangkok or the East West Corridor of the GMS) do not comply with the requirement of international cargo traffic volume, which is expected to increase rapidly (width, number of lanes, specifications for surface treatment, axle weight, etc.) <Ref. Note-1>
(ii)	Slow speed due to mixed traffic, low transport safety. <Ref. Note-2>
2) Domestic Cargo	
(i)	In rural areas, provincial road and farm to market roads are narrow and many road segments are inundated in the rainy seasons. These arterial roads are not suitable for the transport of cargo by heavily loaded vehicle (HLV) but rather by small or medium sized trucks.
(ii)	Increase in the number of traffic accidents is foreseen, due to increased traffic s especially of large-sized cargo trucks
(iii)	Rate of loss / waste of farm products during storage and transport is quite high due to a lack of proper storage facilities and transport capability, especially during the rainy season as inadequate provision of farm-to-market roads that become impassable because of mud
(iv)	Increase of number of tank lorries transporting dangerous liquid cargoes such as petroleum products may cause fatal traffic accidents
3) Common Issue	
(i)	Truck turnaround times are lengthy due to congestion and lack of handling capacity at truck terminals since they are often narrow and handling efficiency is low
(ii)	Lack of number of licensed / skilled truck drivers is low
(iii)	Cargo transport vehicles are old and need to be replaced with new ones, and it is necessary to expand truck fleet to meet with the cargo demand, however, the financial capability of private trucking companies is too weak to increase the number of trucks.

Note:
1) The replacement of bridges has been on-going prior to the road improvement project with financial assistance of the Government of Japan. The road-widening project is planned to be financially assisted by ADB.
2) Opening of YGN-MDL Expressway is under preparation.

(2) Railway Cargo Transport

Issues by Type of Cargo Transport Mode	
1) Trade Cargo	
(i)	A dramatic increase of container traffic volumes is foreseen but no strategic plan to deal with containerized cargoes has been prepared yet <Ref. Note-1>
(ii)	No efficient linkages with the newly developed container terminal at Thilawa area as a gateway of Myanmar exists as yet
(iii)	A clear development, operation and management plan to commence container block train operations has not been prepared as yet. This is to be prepared and the operation of container block train system is ready to start at the time the ICD in Yangon and Mandalay will be commissioned.
2) Domestic Cargo	
(i)	Mixed freight train system is inefficient to transport cargo in time.
(ii)	Low operational efficiency due to the mixture of passenger and freight traffics does not enhance rationalization of operation costs
(iii)	Life expired track, locomotives, wagons and signals <Ref. Note-2>
(3) Common Issue	
(i)	Fare setting without financial viability of investment
(ii)	Combination with trucking services or coordination with truck terminals are lacking.

Notes:
1) Development concession for the ICD has been already given to the private sector.
2) Rehabilitation of the Yangon-Mandalay railway track is on-going and expected to be completed by 2023 under technical and financial assistance from the Government of Japan.

(3) Inland Waterways Cargo Transport

Issues by Type of Cargo Transport Mode	
1) Trade Cargo	
(i)	At present transportation of trade and transit cargoes by inland waterways is limited, however, trade cargo may be handled in future due to the increased trade and transit container volumes and creation of trans-loading system either through specialized terminal or ship-to-ship transfer.
2) Domestic Cargo	
(i)	Depending on the transport distance, inland waterway transport is much competitive than land cargo transport, especially for the transport of bulky and low value commodities such as agricultural products, agricultural inputs, sugarcane, sand, gravel, cement, and forestry products, etc. However such advantages of IWT cannot be utilized without proper waterway and river ports
(ii)	Most cargo handling at loading / unloading points along the river is done manually, which leads to low cargo handling efficiency.
(iii)	Most present barges specialized for cargo transport is small and outdated. Most such small inland water transport vessels are owned by SMEs whose low financial capability prevents renewal of inland water transport vessels.
	As the volume of demand for transport of dangerous liquid cargoes (i,e, fuel) is foreseen, increased risk of fatal accidents is anticipated.
3) Common Issue	
(i)	The water level of rivers such as the Ayeyarwaddy River fluctuates more than 10 m a year between the rainy season and the season, thus it is not easy to operate IWT vessels constantly throughout the year
(ii)	Financial capability of inland waterway transport operators is limited, thus the improvement and expansion of the fleet is difficult.
(iii)	No proper means to transport containerized cargoes
(iv)	Inland waterway transport vessels are old and need to be replaced with new ones, and it is necessary to expand truck fleet to meet with the cargo demand, however, the financial capability of private inland waterway transport companies is too weak to increase the number of vessels.

(4) Waterborne Cargo Transport

Issues by Type of Cargo Transport Mode	
1) Trade Cargo	
(i)	The water depth of the Yangon Port including Thilawa Terminal Area is shallow at -9 m thus a large-sized vessel of international trunk line cannot call the port.
(ii)	As a large-size vessel cannot call the port, the major international maritime transport relies chiefly on the feeder vessels plying with Singapore, causing the maritime transport cost to be comparatively high.
(iii)	There exists a development plan of a deep-water port that is integrated with the development of huge SEZ in Dawei south of the country. A land transport linking between this planned port and the border with Thailand to connect this port with Bangkok is essential, however, the cost of both port and road developments is enormously high.
(iv)	Export of rice and other bulky agriculture products are enhanced by the Government, however, no port exists having sufficient depth for calling of bulk-carriers suitable to transport such types of cargo worldwide at competitive price.
2) Domestic Cargo	
(i)	Linkages between international maritime and coastal shipping as well as with inland waterway transport are weak.
3) Common Issue	
(i)	The policies for water area management, laws and regulations, basic direction of the port development and port development plans have not been formulated in harmonious way or in national interest viewpoint but independently by each entity and agency concerned without control.
(ii)	Coastal shipping vessels are old and need to be replaced with new ones, and it is necessary to expand truck fleet to meet with the cargo demand, however, the financial capability of private coastal shipping companies is too weak to increase the number of vessels.

(5) Coordination of Inland Waterway Transport and Coastal Shipping

Issues by Type of Cargo	
1) Trade Cargo	
(i)	Inland waterway transport can be used for transferring trade cargo between the Port of Yangon and inland container depot to ease the cargo traffic volume in and around Yangon (gateway node), however, such system has not been developed fully yet.
(ii)	Present inland waterway transport system cannot handle containerized goods in an efficient and safe manner.
2) Domestic Cargo	
(i)	Transport efficiency of coastal shipping is relatively low due to insufficient cargo handling space at all coastal ports
(ii)	Low value and bulk and/or break-bulk trade cargoes (i.e. cement, construction machines, etc.) are transshipped at Yangon or gateway port.
(iii)	Coastal shipping does not transport containerized cargoes
3) Common Issue	
(i)	The transport capacity of coastal shipping is considered low because of lack of port facilities and life expired ships. Mechanization of cargo handling systems at the ports have not progressed and cargo is handled mostly by laborers therefore the port cargo handling efficiency is very low.
(ii)	The areas of port backyards are very narrow because most of the ports for coastal shipping are located quite close to cities. The cargo handling capacity of the ports is low since the areas for parking trucks and space for cargo storage are limited. The capacities of warehouses located behind the ports are insufficient in general.
(iii)	No containerized cargoes are transported by coastal shipping due to weight of containers (i.e., vessels used for coastal ship cannot sustain the weight of the containers)
(iv)	The coordination between coastal shipping and inland waterway transport is insufficient. This is the area where the MOTC's intervention and coordination are required.

(6) Air Cargo Transport

Issues by Type of Cargo	
1) Trade Cargo	
(i)	The international airport of Yangon has become cramped, thus the allocation of land necessary for the construction of an air cargo handling facility became difficult.
(ii)	The cargo handling capacity of air cargo handling terminal is insufficient and the facility to handle the goods require refrigeration is not provided sufficiently.
(iii)	The cargo transport volume is merely 0.01% of the total cargo volume of Myanmar, however, it is expected to increase to meet with the demand of perishable products such as high value marine products, cut flowers, seasonal fashion products, precision manufactured goods, etc. preferably to be transported by air.
(iv)	In order to attain competitiveness of air cargo transport, the consolidation of cargoes operated and managed by the private sector is necessary.
(v)	Cargo transfer system is not prepared for trade cargo that will be transported by air from local airports to key international airports.
2) Domestic Cargo	
(i)	No facility exists for air transport of domestic cargo at local airports because of limited demand.
(ii)	The frequency of flights is low thus there is insufficient cargo space for air cargo transport
(iii)	The access to airports is inadequate.
3) Common Issue	
(i)	Airports are not used effectively for transport of high value products, as no strategic plan to utilize air cargo transport is prepared and implemented. Such plan is to be formulated in collaboration with the private companies engaging with the production / supply of high value commodities in the rural areas.

(7) Cross-cutting Issues

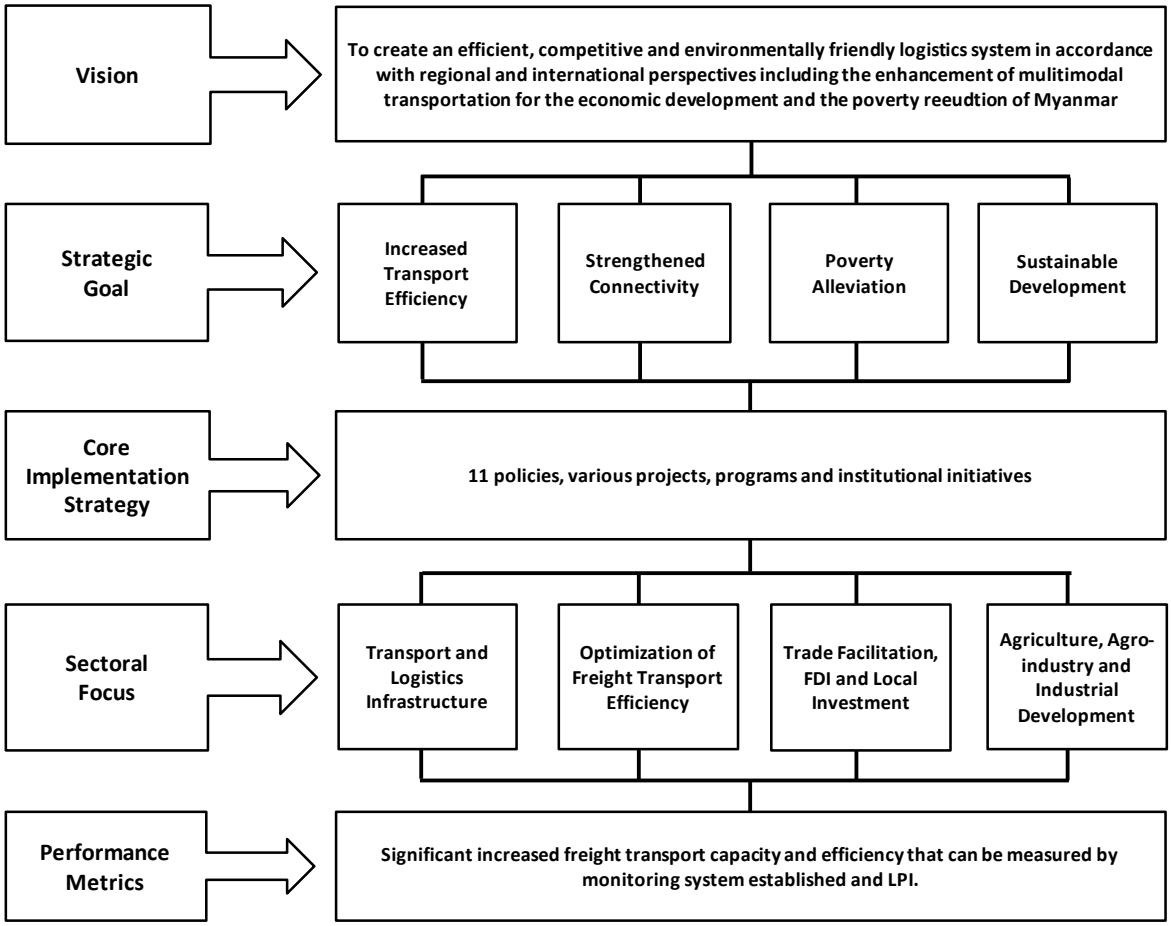
Issues by Type of Cargo	
1) Trade Cargo	
(i)	Seamless container transport is limited. Most of the containers are de-vanned at the port and transferred to the destination. Bonded container transport is not common at present. Most of the cargoes passing through the cross-border points are to be trans-loaded to the trucks of neighboring countries.
(ii)	Most of designated road links forming the logistics corridors are not adequate enough for cargo transport by Heavily Loaded Vehicles (HLV).
(iii)	Connectivity with neighboring countries has improved; however, more efforts are needed to open up new links.
(iv)	Customs clearance procedures have become simpler somewhat compared with several years ago. However they still require a long time to complete.
(v)	Dependency on feeder services from Singapore dominates the international maritime transport, for which the freight charge is considerably high.
2) Domestic Cargo	
(i)	Agriculture is one of the major and important economic activities of Myanmar; however, agricultural products are mostly vulnerable against rain and are perishable. No proper storage facilities and transport means protective against rain is available in most of the rural areas where agriculture is the sole economic activity and income source of people.
(ii)	Most farm-to- market roads in rural areas are narrow and they are not all-weather roads therefore transport of products by large heavy trucks is not suitable.
(iii)	Truck terminals are not efficiently used for cargo transport in rural areas.
(iv)	No special financial schemes for SMEs undertaking logistics services that fall under the SME category.

The logistics system development strategy and policy are formulated taking those issues and feasible measures into account as discussed.

CHAPTER-8 LOGISTICS DEVELOPMENT VISION AND STRATEGY UP TO 2030

8.1 Structure of the Logistics Development Vision and Strategies

Based on the result of a diagnostic analysis of the current logistics system in Myanmar, effective countermeasures were defined and summarized, as described in the preceding section. However, it is important to address the development and improvement of the logistics system in Myanmar, in a holistic approach. Therefore, a development vision and strategies should be clearly presented. This chapter describes the visions and practical strategies for Myanmar to develop and improve the logistics system in a holistic way. **Figure-8.1.1** illustrates the structure of Vision, Strategic Goals, Strategies, Guiding Principles, and Sectoral Focus.



Source: Study Team

Figure-8.1.1 Structure of Vision, Strategic Goal, Core Implementation Strategy, Guiding Principles, Focus and Metrics

8.2 Overall Strategies for Logistics Development

(1) Current National Economic Development Strategies and Policies

This study is designed and formulated in conjunction with the following strategies, policies and plans adopted by the Government of Myanmar (GOM) :

1) National Comprehensive Development Master Plan (NCDP)
2) Agriculture Development Policies (ADP)
3) Industrial Policy Paper (IPP)
4) National Spatial Development Framework (NSDF)
5) National Transport Master Plan (NTMP)
6) Myanmar Industrial Development Visions (MIDV)
7) National Export Strategies (NES)
8) New Economic Policies (NEP)
9) National Industrial Master Plan (MIMP-Draft as of 2017)

(2) Logistics Development Vision and Goals of the Logistics Sector in Myanmar

Based on the country context, economic development scenario and logistics development scenario discussed in preceding chapter; the long-term national economic development plan; development master plan and policies of respective economic sector; regional cooperation framework and the development vision set out in the NTMP, the Vision for logistics development in Myanmar is delineated as described below:

"To create an efficient, competitive and environmentally friendly logistics system in accordance with regional and international perspectives including the enhancement of multimodal transportation for the economic development and the poverty reduction of Myanmar"

Source: Study Team

(3) Strategic Goals of Logistics Development

The strategic goals of the logistics development are as follows:

1) To reduce and rationalize the cargo transport / logistics costs as well as the lead times for the transport of goods;
2) To reduce and rationalize the costs for all kinds of cross-border transactions and international trade;
3) To increase competitiveness through economies of scale offered by cross-border and international investments that are based on value-added processes and which take advantage of the comparative advantages of different areas along the respective logistics corridors;
4) To reinforce the hub and spoke cargo transport functions throughout Myanmar, through provision of orderly modern truck terminals and feeder road networks;

5) To enhance urban and rural synergies by linking urban industrial areas with rural areas, through the provision of effective freight transport and rural road networks;
6) To reduce poverty, support development in rural areas (including in border areas); and
7) To increase earnings and employment opportunities by generating quality jobs in a wide range of sectors including logistics sector.

(4) Logistics Development Policies

Based on this logistics development Vision, logistics development policies by sub-sector of the logistics system are formulated as follows:

Ref. No.	Logistics Policies
LP-01	Better planning and coordination and collaboration between the public and private sectors
LP-02	Reinforce regulatory functions of respective government ministries and agencies concerned with the logistics system
LP-07	Develop necessary infrastructure
LP-04	Enhance containerization to increase cargo transport efficiency
LP-05	Enhance multimodal transport systems to increase cargo transshipment efficiency
LP-06	Develop hub and spoke functions at major transport nodes to enhance urban – rural synergies
LP-07	Realize reasonable cargo transport pricing and logistics costs
LP-08	Shorten lead-time and increase predictability
LP-09	Diversify freight transport routes to ensure uninterrupted cargo flow
LP-10	Enhance transport safety and cargo security
LP-11	Foster private logistics service providers

(5) Cross-sector Strategic Objectives

The cross-sector strategic objectives were formulated as follow:

Ref. No.	Title of Strategic Objectives
LO-01	Formulation and effective implementation of the Logistics Development System
LO-02	Establishment of planning and management unit (or department)
LO-07	Technical cooperation / exchange program
LO-04	Vocational training and professional certificate
LO-05	Enhance collaboration between public and private sectors for efficient and effective cargo transportation

A set of comprehensive policies relevant to all modes of transport, as well as development strategies for specific modes like logistics, road, rail, airport, seaports, sea and inland waterways, as well as associated projects and activities that can help these modes achieve the Vision and its Objectives were formulated and proposed. The sub-sectoral Vision and the title of strategic objectives formulated are as tabulated in **Table-8.2.1** Logistics Development Visions of the NLMP.

As such, although the NTMP presents the Vision, strategy and policies for the development of the transport sector in general (covering passenger and freight transport as a whole), particular attention has not been paid to prepare specific development guidelines for the logistics sector nor for freight (cargo) transport. This study supplements the NTMP and presents development guidelines for the logistics sector and cargo transport.

Table-8.2.1 Logistics Development Vision and Strategy of the Logistics Development System

Sub-sector	Vision and Strategy of the Logistics Development System by Sub-sector	
Logistics (Overall)	Sub-sector Development Vision in view of Logistics Development	
	"To eliminate bottlenecks for collection, storage and distribution of cargoes by improvement of connectivity and introduction of modern cargo transport means, enhanced containerization in an integrated and collective way to make the National Logistics competitive and to enhance inclusive growth."	
	Strategic Objectives	
	LOS-1	Attain higher cargo transport efficiency through competition in the market
	LOS-2	Facilitate trade to enhance industrialization by providing proper and efficient logistics system in a form of logistics corridors
	LOS-3	Develop human resources to help the logistics system function properly
	LOS-4	Develop logistics system that support agriculture and manufacturing activities, thereby generating a variety of quality job opportunities, including the jobs related to logistics services
	LOS-5	Strong and wide connectivity of cargo transport links to be created not only for regional connectivity but also for the rural road network
Road	Sub-sector Development Vision for Logistics Development	
	"To develop safe, efficient, internationally standardized, road infrastructure systematically integrated with all modes of transport to support the economic development of Myanmar in a sustainable manner"	
	Strategic Objectives	
	LRS-1	Development of high-standard highways as the fundamental backbone for the freight transport
	LRS-2	Upgrading of rural road networks to strengthen the logistics transport network and to provide market access for rural areas
	LRS-3	Development of bypass routes to detour congested areas to reduce transport time and the number of traffic accidents in urban areas
	LRS-4	Improvement of accessibility to promote effective use of logistics facilities
	LRS-5	Provision of redundancy and robustness for the main transport corridors to strengthen national logistics
	LRS-6	Improvement of awareness of traffic safety and upgrading of road infrastructure to reduce traffic accidents
Railway	Sub-sector Development Vision for Logistics Development	
	"To establish railway freight transport services having advantages of punctuality, rapidity and accessibility focusing on container transport. Strengthen the foundation of management system for railway freight related services to make railway mode a profitable transport mode to be chosen by customers."	
	Strategic Objectives	
	LFS-1	Enhancement of railway transport on the Yangon-Mandalay axis
	LFS-2	Improvement of freight railway transportation services for customers satisfaction
	LFS-3	Speedier and large volume railway freight service by introduction of scheduled container block train service

Sub-sector	Vision and Strategy of the Logistics Development System by Sub-sector	
Maritime Transport	Sub-sector Development Vision for Logistics Development	
	"To develop and maintain a proper and effective international port system to meet with increasing container traffic demand and refurbish local ports to provide and maintain the least cost transport means for bulky goods for the local cities situated along the coastal route to enhance the development of areas that lag behind in national economic development."	
	Strategic Objectives	
	LWS-1	Legislation of the "Port Act"
	LWS-2	Improvements of domestic ports
	LWS-3	Increase port capacity for international / trade cargoes
	LWS-4	Develop port for bulk carrier aiming at increased export of agricultural product to the world market
	LWS-5	Securing of navigation safety
Inland Waterway Transport	Sub-sector Development Vision for Logistics Development	
	"To promote inland water transport as the least-cost transport means especially for bulky cargo transport and for container cargo transport along the major river systems and to play an important role for sustaining rural development along the major river systems."	
	Strategic Objectives	
	LIS-1	Enhancement of utilizing inland waterway transport in main rivers
	LIS-2	Development of sustainable transport networks
	LIS-3	Sustainable utilization of waterway transport connecting villages along small rivers
	LIS-4	Improvement of organization and laws
	LIS-5	Increase inland waterway transport efficiency
Civil Aviation Sector	Sub-sector Development Vision for Logistics Development	
	"To prepare the freight transport system so as to transport high valued goods by the fastest means to international as well as domestic markets."	
	Strategic Objectives	
	LAS-1	Strengthen international air cargo facilities
	LAS-2	Strengthen domestic air cargo facilities
	LAS-3	Enhance aviation safety & security
Logistics (particular)	Sub-sector Development Vision for Logistics Development	
	"To establish and develop an efficient and modern cargo collection, storage and distribution system in collaboration with public and private sector, optimize the cargo transport cost and shorten lead times, by fostering qualified logistics providers including trucking, warehousing and forwarding companies."	
	Strategic Objectives	
	LLS-1	Improvement of truck terminals at major cities throughout Myanmar
	LLS-2	Improve and modernize the logistics service level
	LLS-3	Enhance containerization and palletization
	LLS-4	Develop the logistics system effective for Myanmar
	LLS-5	Increase load factor of transport means by enhancement of sharing the logistics data and information
	LLS-6	Meeting with ever increasing freight volume by expansion of fleets
	LLS-7	Develop multimodal logistics hubs at strategic locations

8.3 Logistics Development Strategy by Sub-sector

8.3.1 Overall Strategies for Logistics Development

Strategy-LOS-1	Attain higher cargo transport efficiency through competition in the market

Cargo transport efficiency can be increased through a reduction of layover times of transport equipment, cargo dwell times, and increased cargo loading factors through a competition in the market. These can be realized efficiently by setting up cargo collection / delivery facilities, i.e. logistics parks, truck terminals, alike at the transport nodes. The government will guide and support the private sector and regulate their investment in logistics facilities aimed at increasing cargo transport efficiency in total.

Strategy-LOS-2	Facilitate trade to enhance industrialization by providing proper and efficient logistics systems in a form of logistic corridors

The effect of foreign direct investment (FDI) is substantial to attain economic growth and smooth transition to an industrial country, by adding high value to the country's economy. A proper and strong logistics system is a key factor to attract FDI as well as local investment, especially in the manufacturing sector. Concentration of investment along the area constituting the transport corridor in strategic manner would be a key factor to transform the transport corridor into a dynamic economic corridor. Such a concentration of investment can be guided and induced by adding the logistics function onto the transport corridor. In such a way the transport corridor will be transformed into a logistics corridor.

Strategy-LOS-3	Develop human resources to help the logistics system function properly

At present the human resources needed to arrange the logistics system is lacking at work sites (i.e. truck drivers, seamen, cargo handling equipment operators, forwarders, customs officers, etc.), at management offices (i.e. managers and operators of logistics service providers, IT engineers for operations of e-customs, modern train operators and controllers, warehouse inventory controllers, etc.) and at government administration offices (i.e. legislators, planners, controllers, statistical data management personnel, custom officers etc.). The human resource development in general and the development of administrative officers and managers in particular, is essential to create a modern and competitive logistics system. However, one of the most effective approach for human resources development is on-the-job training by the private entities operating cargo transport and logistics services. Most of the private entities concerned with the logistics operation fall under SMEs. The institutional financing system to foster the SMEs is necessary.

Strategy-LOS-4	**Develop logistic system that supports agriculture and manufacturing activities thereby generating a variety of quality job opportunities including jobs related to logistics services**

The Government of Myanmar attaches importance to industrial development aimed at creating a variety of job opportunities throughout the country. The development of modern and competitive logistics system is an indispensable factor to promote such industrial activities. The economic development needs to be supported by the modern logistics systems, however the system is to cover both urban and rural areas; the former for production of goods and the latter for supporting industrial activities through supplying human resources as well as materials needed for the production of goods, in an effective way as much as possible. The development of the logistics system itself generates a variety of job opportunities.

Strategy-LOS-5	**Strong and wide connectivity of cargo transport links to be created not only for regional connections but also for the rural road network**

Such logistics corridors should be linked to each other strongly, however the diversified links of cargo transport system should be designed so that a single link is not choked by a natural calamity, and to avoid the full-scale closure of one link due to an accident or so on. The connectivity of links is to be created not only for trade cargo transport but also for domestic cargo transport. Such wide and strong cargo transport links is the key to attain the equitable development throughout the country and enhance urban and rural synergies to create a strong foundation for economic and industrial development.

8.3.2 Roads Sub-sector

Based on the designated logistics development corridors in this study, the development vision of the road sector has been proposed referring to the following authorized plans:

1) ASEAN Transport Strategic Plan (2016-2025)
2) National Transport Master Plan (NTMP)
3) Master Plan for Arterial Road Network Development in Myanmar (ARND)

The ASEAN Transport Strategic Plan, “Kuala Lumpur Strategic Plan (KLSP)”, was referred by the other two road development plans and the basis of these plans. The KLSP sets the concrete target implementation schedule to improve the arterial roads in Myanmar toward 2025 in consistency with ASEAN design standards.

The NTMP established the implementation list of the road sector for the arterial road network and the existing expressway. The ARND was prepared on the basis of the transport development corridor program, which was set by the NTMP and newly proposed the development program of the expressway network.

Strategy-LRS-1	**Development of high-standard highways as the fundamental backbone for the freight transport**

As proposed in the ARND, the high-standard expressway road network will be necessary as the long-term development scenario of the country. Currently, the quality of road infrastructure in Myanmar has not yet fulfilled the international standards, as pointed out in the KLP.

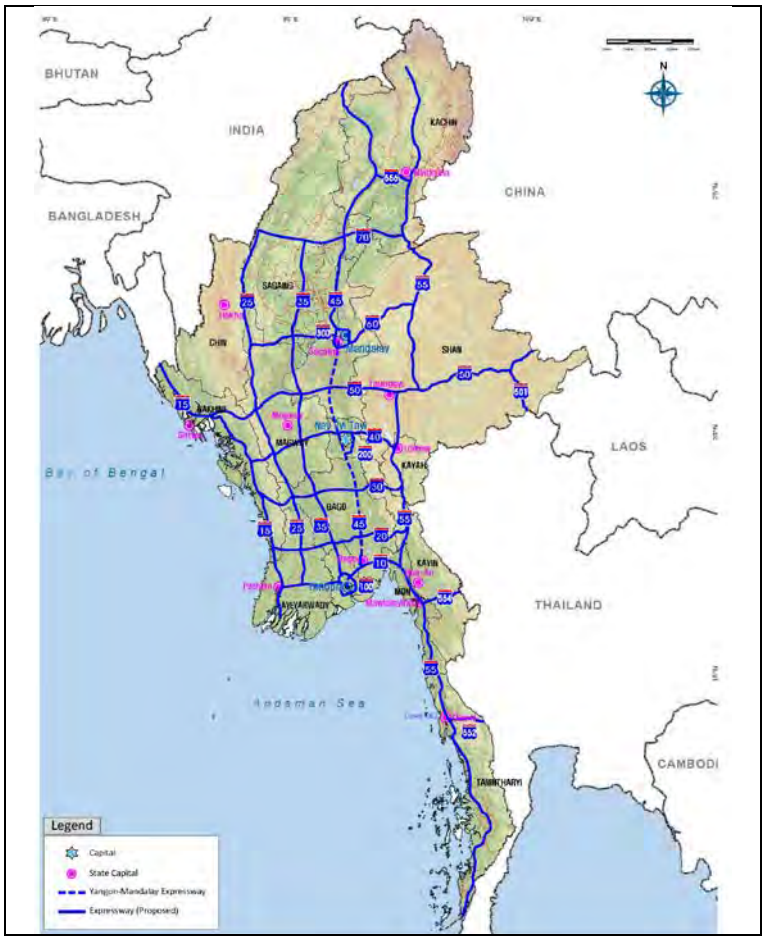
Present and urgently required infrastructure development of the road sector is to upgrade the backbone road network to fulfil the international standard, and such prioritized fundamental road network shall be part of the logistics corridor.

The Asian/ASEAN Highway is positioned as a fundamental road network for logistics in the KLSP and the target road classification is given for the arterial road network in Myanmar. The Asian/ASEAN Highway covers the boundaries with neighboring countries and the major arterial road network (i.e. National Highways under MoC).

The NTMP proposed the efficient use of the existing Yangon-Mandalay Expressway and the upgrading of the arterial road network including the Asian/ASEAN Highway, as prioritized in the KLP. On the other hand, the Master Plan for Arterial Road Network Development Plan (ARND) proposed a grid pattern network for the expressways, as shown in **Figure-8.3.1**.

The expressway network will be constructed in the long-term development plan similar to the developed countries. In the Arterial Road Network Development Plan (ARND), the financial viability of the proposed expressways was studied technically and ARND concluded that most of the expressways have less than viable FIRR (Financial Internal Rates of Return). Therefore, the development of the expressway network shall be studied further in detail based on the individual traffic demand forecasts including a careful financial viability review by the private entities as well, since development of expressways is commonly implemented by Public-Private Partnership/Built Operate Transfer (PPP/BOT) schemes in the world.

In this context, the development of the Asian/ASEAN Highway has been given a first development priority as the fundamental road network for logistics in this Study.



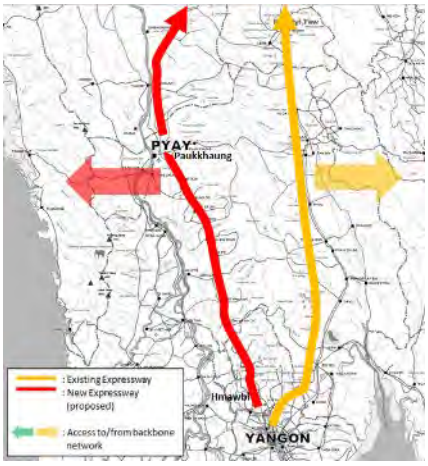
Source: Master Plan for Arterial Road Network Development Plan (2015)

Figure-8.3.1 Expressway Network in the Master Plan for Arterial Road Network

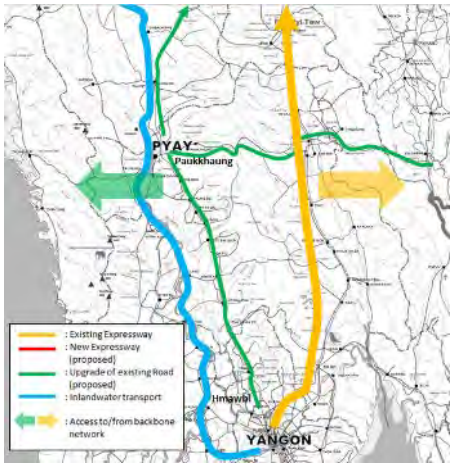
Strategy-1.1: Efficient use of Existing Expressway (LC-NS: North-South Corridor)

The existing Yangon-Nay Pyi Taw-Mandalay Expressway is the primary road network in the proposed North-South Logistics Corridor (LC-NS), which has 587.km long access controlled alignment. Currently, the expressway use is restricted for heavy loaded cargo transport use except special cases permitted by MoC. For the north-south corridor, a new Expressway (Hmawbi-Paukkhaung Expressway) was proposed in the ARND but the financial viability of the project shows negative FIRR calculated as -4.1%. It is seen as rather effective and reasonable to invest in the existing trunk road network.

Accordingly, a development policy for the corridor (LC-NS) is alternatively proposed as shown in **Figure-8.3.2**. Firstly, the existing expressway should be utilized as a fundamental trunk route for cargo transport. Improvement of arterial roads has been given high priority instead of the Hmawbi-Paukkhaung Expressway. **Figure-8.3.2** proposes to divide the demand for freight movement between a road network component and an inland waterway transport component. Investment in the economic corridor should include both road development and enlargement of the river port facilities for inland waterway transport. It is important to spur the development of the whole logistics industry.



Source: Study Team based on ARND
Proposed network in ARND
(Existing expressway + New expressway)

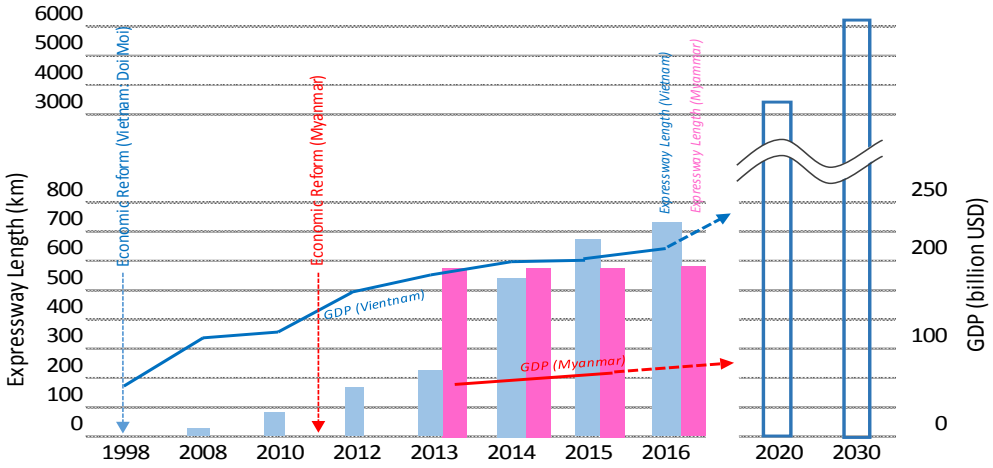


Source: Study Team
Proposed Development Concept
(Existing expressway + IWT)

Figure-8.3.2 Development Concept of North-South Corridor with Inland Waterway Transport

By focusing the specific corridor and transport mode strategically, modal shift towards transport on inland waterways can be realized. It is better to promote the modal shift, since transport on inland waterways is economical and environmentally friendly. Major commodities transported by the inland waterway fall under low-value and bulky goods. Unless the freight transport capacity of the inland waterway is increased, those low and bulky goods should be transported by an alternative transport mode, which is the road transport. However this is to be avoided since the transport cost of freight by trucks is the highest among other freight transport modes. The inland waterways can offer the transport of goods at the lowest possible cost, however, the lead time is much longer than that of trucking. The development of road links with the river ports and the existing highways is essential. In such a way, both lead time and transport cost can be optimized. Thereafter the highway along Ayeyarwaddy River can be improved at later stage.

The current road length of the Yangon-Mandalay Expressway exceeds the length of expressways of Vietnam which is one of the countries forming the CLMV countries that were latecomers to ASEAN in 1990's, in 2014, even though Vietnam is a more developed country than Myanmar, with a population twice that of Myanmar today. When compared to Vietnam, the expansion of the expressways in Myanmar should wait for further economic development and increase of cargo demand. Until such time comes, the investment for expressway is to be concentrated to the existing expressway linking Yangon and Mandalay to utilize this expressway fully. The investments should be directed to the infrastructure for other modes including the infrastructure development or improvement of inland waterway and railway transport. **Figure-8.3.3.** illustrates the changes in highway development in Vietnam from 1998 to date.



Source: Study Team

Figure-8.3.3 Expressway Development in Vietnam

In 2016, the length of the expressway network in Myanmar is 587 km and the GDP is US$ 62.6 billion. **Table-8.3.1** presents the result of a preliminary examination of the current and future road capacity of the main logistics corridors. It has been estimated based on the cargo demand volume forecasted in this study. The traffic volume was preliminarily estimated on the basis of several assumptions such as a heavy vehicle ratio of 15%, since the analysis of the passenger traffic volume is out of the scope of works of this Study. The peak hour traffic volume of the section of Yangon-Bago in the North-South Corridor is estimated as 11,822 pcu/hour in 2030. It means that the arterial road, NH-1 (4 to 6-lane) will not be able to handle the traffic and there is a need to use the expressway for the trucks.

Table-8.3.1 Preliminary Examination of Road Capacity

Corridor	Section	Year	Cargo volume		Cargo vehicle		Passenger Car		All vehicle		Lane capaity	Num. of Lanes
			(ton/year)	(ton/day)	(truck/day)	(pcu/day)	(car/day)	(pcu/day)	(pcu/day)	(pcu/h)	(pcu/lane)	(lane)
MI	Tamu-Mandalay	2015	500,000	1,639	109	383	729	729	1,111	111	1,063	0.1
		2030	4,400,000	14,426	962	3,366	6,412	6,412	9,778	978	1,063	0.9
NS	Yangon-Bago	2015	14,100,000	46,230	3,082	10,787	20,546	20,546	31,333	3,133	1,650	1.9
		2030	53,200,000	174,426	11,628	40,699	77,523	77,523	118,222	11,822	1,650	7.2
	Bago-Mandalay	2015	8,400,000	27,541	1,836	6,426	12,240	12,240	18,667	1,867	1,650	1.1
		2030	37,000,000	121,311	8,087	28,306	53,916	53,916	82,222	8,222	1,650	5.0
TM	Kyauphyu-Magway	2015	7,000,000	22,951	1,530	5,355	10,200	10,200	15,556	1,556	1,063	1.5
		2030	10,800,000	35,410	2,361	8,262	15,738	15,738	24,000	2,400	1,063	2.3
	Magway-Mongla	2015	2,400,000	7,869	525	1,836	3,497	3,497	5,333	533	1,063	0.5
		2030	4,100,000	13,443	896	3,137	5,974	5,974	9,111	911	1,063	0.9
SE	Bago-Mawlamyine	2015	10,300,000	33,770	2,251	7,880	15,009	15,009	22,889	2,289	1,650	1.4
		2030	58,000,000	190,164	12,678	44,372	84,517	84,517	128,889	12,889	1,650	7.8
	Thaton-Myawaddy	2015	8,500,000	27,869	1,858	6,503	12,386	12,386	18,889	1,889	1,063	1.8
		2030	21,000,000	68,852	4,590	16,066	30,601	30,601	46,667	4,667	1,063	4.4
	Mawlamyine-Thanbyuzayat	2015	2,800,000	9,180	612	2,142	4,080	4,080	6,222	622	1,063	0.6
		2030	21,100,000	69,180	4,612	16,142	30,747	30,747	46,889	4,689	1,063	4.4
	Thanbyuzayat-Dawei	2015	2,900,000	9,508	634	2,219	4,226	4,226	6,444	644	1,063	0.6
		2030	13,000,000	42,623	2,842	9,945	18,944	18,944	28,889	2,889	1,063	2.7

Source: Study Team

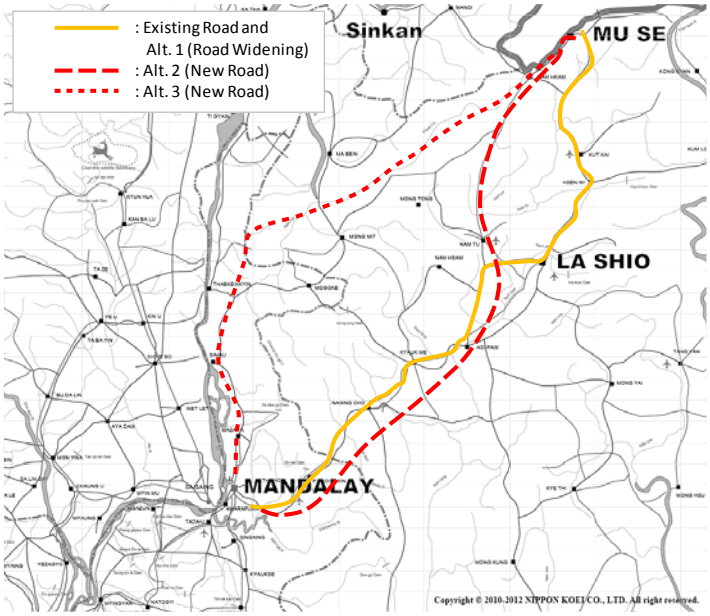
Strategy-1.2: Strengthen the northern part of North-South Economic Corridor

The road connecting Mandalay - Muse is a main arterial road for the border trade with China and one of major road networks within the proposed North-South Logistics Corridor. To expand road capacity in this corridor, a Chinese enterprise is conducting a feasibility study, which will be completed in 2017. The feasibility study proposes seven alternative routes, including an option of the widening of the existing road. The existing road is a mountainous road with a possible risk of road closure or blockade due to landslides and traffic accidents. To accelerate transport and keep punctuality, avoid logistics damage, the road should be designed at least to the Asian Highway Class- II standards. It is also important for national security purposes to secure the redundancy of the road network along the largest border trade corridor. The bottlenecks on the existing Mandalay-Muse Road should be eliminated. The photographs shown below present the bottlenecks on this road at Gokhtaik. Goat Twin Viaduct to overpass this valley should be constructed.

(Queuing heavy vehicles to pass the valley, Goat Twin Viaduct is proposed to across the valley)

(Traffic accident occurred at hairpin turn)

Figure-8.3.4 Indicates Alternative routes on the Mandalay-Muse Road.



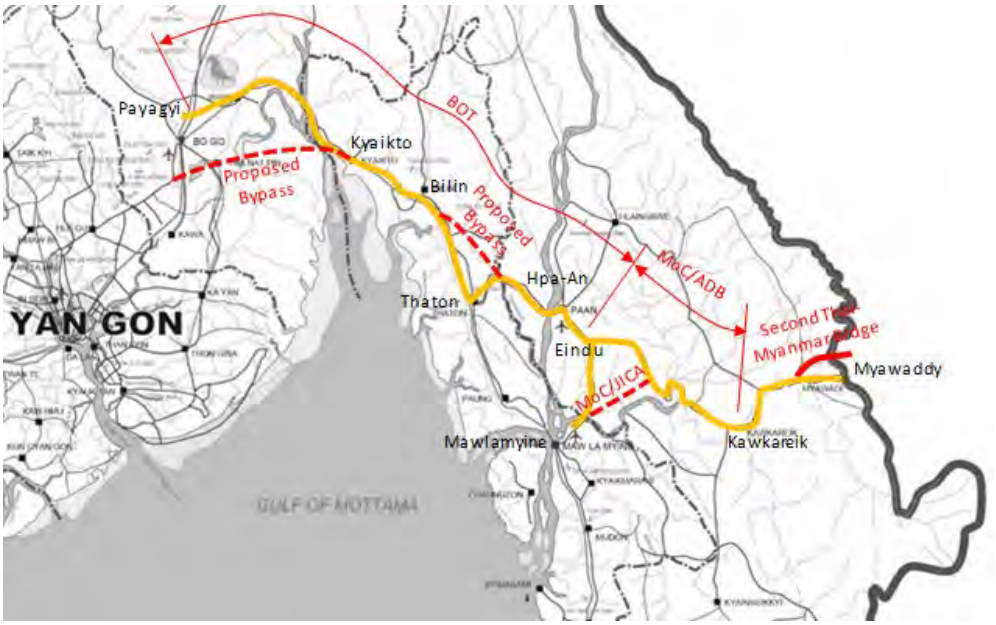
Source: Study Team based on information from MoC

Figure-8.3.5 Alternative Routes between Mandalay and Muse

Strategy-1.3: Strengthen the East-West Economic Corridor
(LC-SE: South-East Logistics Corridor)

The Payagyi - Myawaddy Road is a main logistics route for the border trade with Thailand. The section between Payagyi and Thaton is predicted to be saturated by 2030 as a result of a preliminary examination of the road capacity (See **Table-8.3.1**). The road section between Eindu-Kawkareik is being improved through a MoC/ADB scheme for 2-lane with AH standard. Also MoC/JICA will replace three bridges in order to eliminate weight restrictions on the existing bridges. The preliminary examination of the road capacity indicates the required number of lane is 4.4-lanes (means 6-lanes) for the corridor. The road widening for this section might be difficult, due to mountainous terrain. Another alternative route such as Three Pagoda Pass Road (construction works ongoing by MoC) shall be developed to ensure the connectivity of the logistics route between Myanmar and Thailand in parallel with the study on the railway linking between Mawlamyine and Kanchanabri of Thailand. .

The traffic volumes on the Payagyi-Thaton road will increase after the development of the Dawei SEZ. The Bago-Bilin Expressway and the Bilin-Mawlamyine Expressway are proposed in ARND and FIRR of the expressway is calculated the highest as 9.7%. Therefore, those sections might have a possibility for development by PPP/BOT scheme since the FIRR is much higher than for the other proposed expressways in the ARND. Payagyi-Myawaddy Road consists of the section operated by MoC as a BOT as shown in **Figure-8.3.6.** The section under operation by a BOT company (the Shwe Than Lwin Company) is being upgraded by the Company and the remaining section under the MoC is also being upgraded, aided by the ADB. The section between Kawkareik and Myawaddy has been improved with support from Thailand. The road section between Payagyi and Hpa-An passes through some small- to medium-sized cities. Detours on the route such as provision of bypass roads will be effective to realize a smooth logistics flow and an improvement of traffic safety.



Source: Study Team

Figure-8.3.6 Development Concept of EWEC

It is essential for the development of expressways to have a detailed financial implementation plan and assured funding to allow procurement. There are many funding resources such as bilateral loans, government budget, international financial institution (IFI: WB, ADB, etc.) loans, private investment (PPP/BOT) and so on. In line with other neighboring ASEAN countries such as Thailand, Vietnam, a special organization for the development of expressways, such as Expressway Authority should be established, for preparation of development plans, managing implementation of projects and maintenance of the expressway.

Strategy- LRS-2	**Upgrading of rural road network to strengthen the logistics transport network and to provide market access for rural areas**

The rural trunk roads in Myanmar have low-cost minimum standards pavements, such as bituminous surface treatment, and the geometric design is often also substandard when compared to internationally adopted standards, even for the national road network. The road network was not designed for heavy loads, which are needed to support the rapidly increasing logistics demand. The road infrastructure should be improved and should satisfy the minimum requirements of the international standards immediately, so as not to hinder the economic development of Myanmar.

Strategy-2.1: Strengthening of the rural arterial roads (General)

The rural arterial road network connects and supplements the high-standard road network mentioned in Strategy-LRS-1, which mainly consists of national roads under the jurisdiction of the MOC. The rural arterial road network should be upgraded in terms of its capacity and design classification. The development of the road network has been prioritized in the previously authorized master plans (NTMP and ARD). The implementation schedule of the

upgrading of the Asian/ASEAN Highway is set in Kuala Lumpur Strategic Plan (KLSP). The designated roads show AH "below Class III" roads listed in **Table-8.3.2** should be upgraded to Class II or III.

Table-8.3.2 ASEAN Highway Upgrading Plan under KLSP

ID	Road Section	Target Section	Completion Year
LT-2.1.7.	AH-1:Tamu-Mandalay-Meiktila-Yangon-Bago-Payagyi-Thaton-Myawaddy	229 of 1,656km	2021
LT-2.1.4	AH-2: Meiktila-Loilem-Kyaing Tong-Tachilek	7.07 of 807km	2021
LT-2.2.4	AH-111: Thibaw-Loilem	227. of 27.9km	2027.
LT-2.2.5	AH-112: Mawlamyine-Ye-Mahwal Taung	44.06km	2020
LT-2.2.6	AH-112: Dawei-Myeik	145km	2020
LT-2.2.7	AH-112: Myeik-Tanintary	64km	2020
LT-2.2.8	AH-112: Tanintaryi-Bokepyin	156km	2020
LT-2.2.9	AH-112: Bokepyin-Kawtaung	87.94km	2020
LT-2.2.10	AH-112: Lanya-Khlongloi	60km	2027.
LT-2.2.11	AH-127.: Myittar-Thai Border	85km	2020
LT-2.2.12	AH-127.: Dawei-Myittar	56km	2020

Source: Asian Highway Database, UNESCAP, 2015

Table-8.3.3 Classification and Design Standards on the Asian/ASEAN Highway Network

Highway classification		Class II				Class III			
Terrain classification		L	R	M	S	L	R	M	S
Design speed (km/h)		80	60	50	40	60	50	40	30
Width (m)	Right of way	40				30			
	Lane	3.50				3.00 (3,25)			
	Shoulder	2.50		2.00		1.5 (2.0)		0.75 (1.5)	
	Median strip	NA				NA			
Min. radii of horizontal curve (m)		210	115	80	50	115	80	50	30
Pavement slope (%)		2				2 – 5			
Shoulder slope (%)		3 - 6				3 – 6			
Type of pavement		Asphalt/cement concrete				Double bituminous treatment			
Max. Super-elevation (%)		10				10			
Max. Vertical grade (%)		4	5	6	7	4	5	6	7
Structure loading (minimum)		HS20-44				HS20-44			

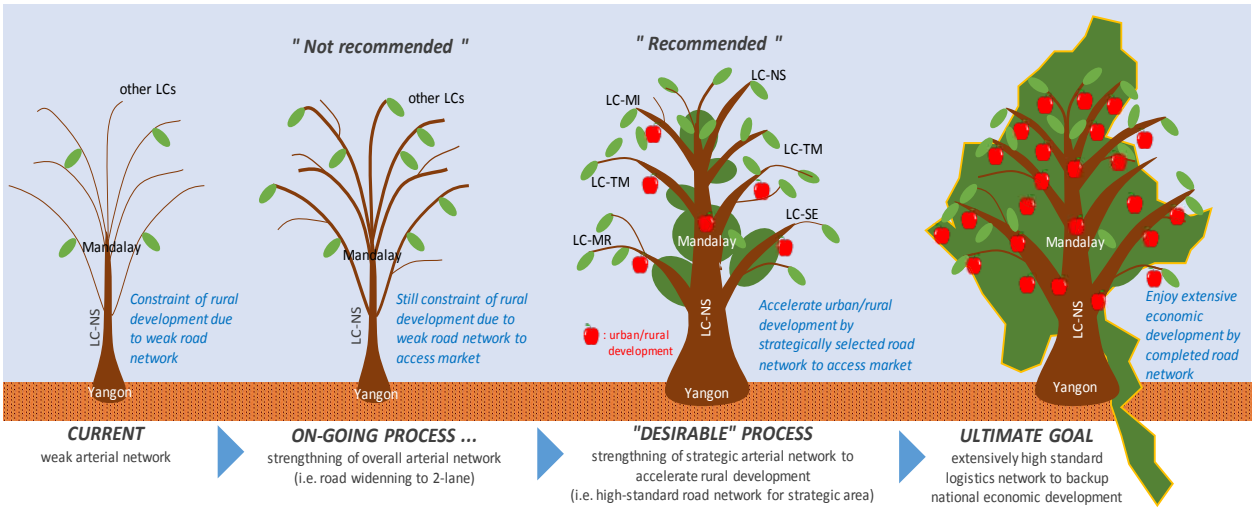
Note: Figures in parentheses are desirable values, Terrain classification (L: Level, R: Rolling, M: Mountain, S: Steep)
Source: UNESCAP, 2015

The MoC is upgrading the overall road network but the budget for upgrading work is limited. Most of the upgrading work consists of road widening, from narrow 2-lane roads to 2-lane roads with low cost pavement, such as bituminous treatment, as shown in the photographs to the right. The alignment of some of rural arterial roads (even national highways) is substandard according to internationally adopted design standards. The photograph to the right shows a large truck going out of the road carriageway at a hairpin turn on the national highway (on the Mandalay- Muse Road).


(widening to 2-lane by bituminous treatment)


(out of carriageway at hairpin turn)

Figure-8.3.7 presents the conceptual image of the road development process. Currently, the road network in Myanmar is quite weak like a "thin tree" and leads to increased transport costs ("***CURRENT***" in the figure). The MoC is upgrading the overall road network by widening and by applying low cost pavements, such as bituminous treatments, under a limited budget. The budget is distributing to overall road network and the condition of the road will be still weak and does not drastically contribute to reducing transport costs ("***ONGOING PROCESS***" in the figure). This study proposes the development concept of "selection and concentration" by applying a high standards (at least to Class II) on the selected roads in order to accelerate the development of rural industries, through accessing the major consuming markets (Yangon, Mandalay, and other major cities, mainly along LC-NS) in Myanmar ("***DESIRABLE PROCESS***" in the figure).

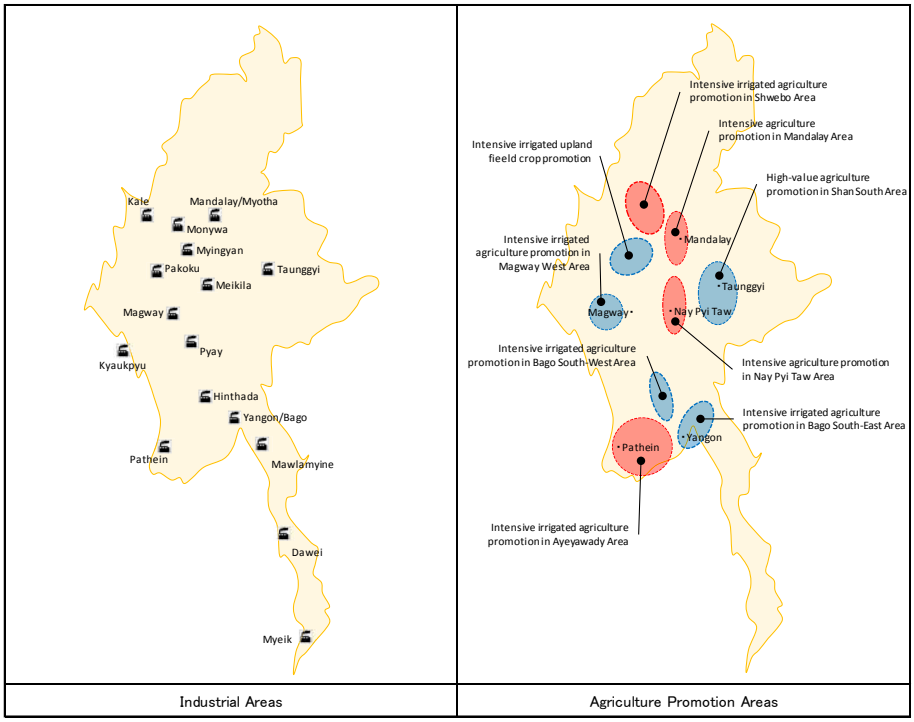


Source: Study Team

Figure-8.3.7 Conceptual Image of Road Development Process

LC-NS, North-South Corridor, represented by the Yangon-Mandalay Expressway will be the strategically important backbone of the logistics network. The road network to connect the selected rural areas listed below will be upgraded, connecting to the backbone network of the LC-NS. **Figure-8.3.8** illustrates the geographical distribution of industrial zones and potential agricultural areas.

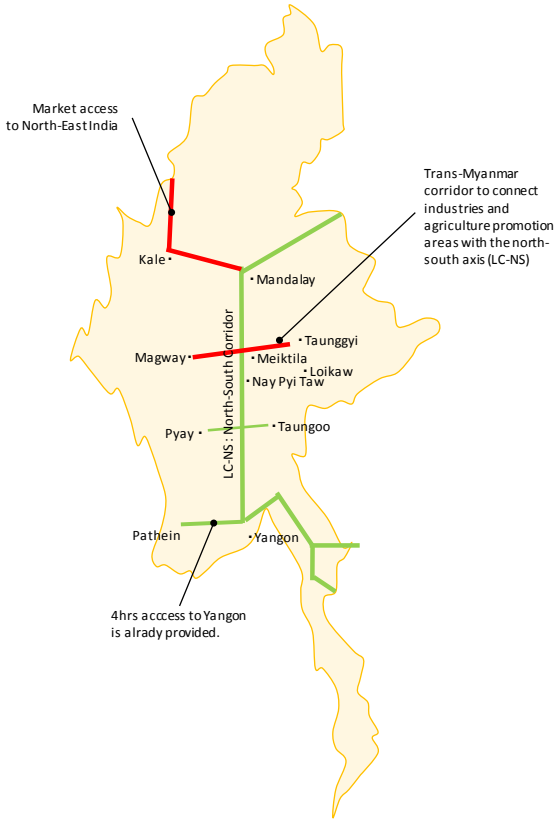
- Industrial areas;
- Agricultural promotion areas; and
- Large consumption area.



Source: based on Arterial Road MP and Preparatory Survey for Intensive Agriculture Promotion Program (JICA)

Figure-8.3.8 Industrial Areas and Agriculture Promotion Areas

Accordingly, the priority development roads to connect rural arterial roads with the backbone road network have been selected concerning the abovementioned industrial areas and agriculture promotion areas.



Source: Study Team

Figure-8.3.9 Priority Development Corridors

Strategy-2.2: Strengthen Myanmar-India Logistics Corridor (LC-MI)

The Tamu-Mandalay Road is identified as a part of Asian Highway Network (AH-1) and connects Myanmar and the North-East States of India (Assam, Arunachal Pradesh, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, and Tripura). Currently the trade volume via this road is quite limited. The road condition is not proper for heavy vehicles' use. For instance the load limitation of bailey bridges is GWT 17- ton only.

(Deformed abutment and wooden piers)

(GWT 17-ton load restrictions)

Bilateral trade is likely to grow in future due to the large population of the North-East States of India and the potential of development of the states based on the "Look East" policy of India. The Government of Japan also supports this policy and the development of the road network in the states is currently assisted by JICA. The road network along this corridor will connect the agricultural promotion areas and the industrial areas; with the large market in the North-East States of India. The population of the North-East States in total is 47.5 million (3.9% of the total population of India) as shown in **Table-8.3.4.**

Table-8.3.4 Area, Population and Literacy Rate of North-East States

Items	Unit	Assam	Manipur	Meghalaya	Mizoram	Nagaland	Tripura	Total	All India
Area	Sq.km	78,478	22,727	22,429	21,081	16,579	10,48.3	171,740	7,287,267
Population	(000)	71,169	2,722	2,964	1,091	1,981	7,671	47,598	1,210,197
Literacy Rate	%	72.19	79.21	74.47	91.77	79.55	87.22		74.04

Source: North-East Council, Shillong, 2011 Statistics

The market potential of the North-East States of India can be also justified by the proposed Kaladan Multimodal Project, which will be the main logistics supply route to the States via inland waterway transport through Sittwe Port.

Strategy-2.3: Strengthening of the Trans Myanmar Logistics Corridor
(LC-TM: Trans Myanmar Logistics Corridor)

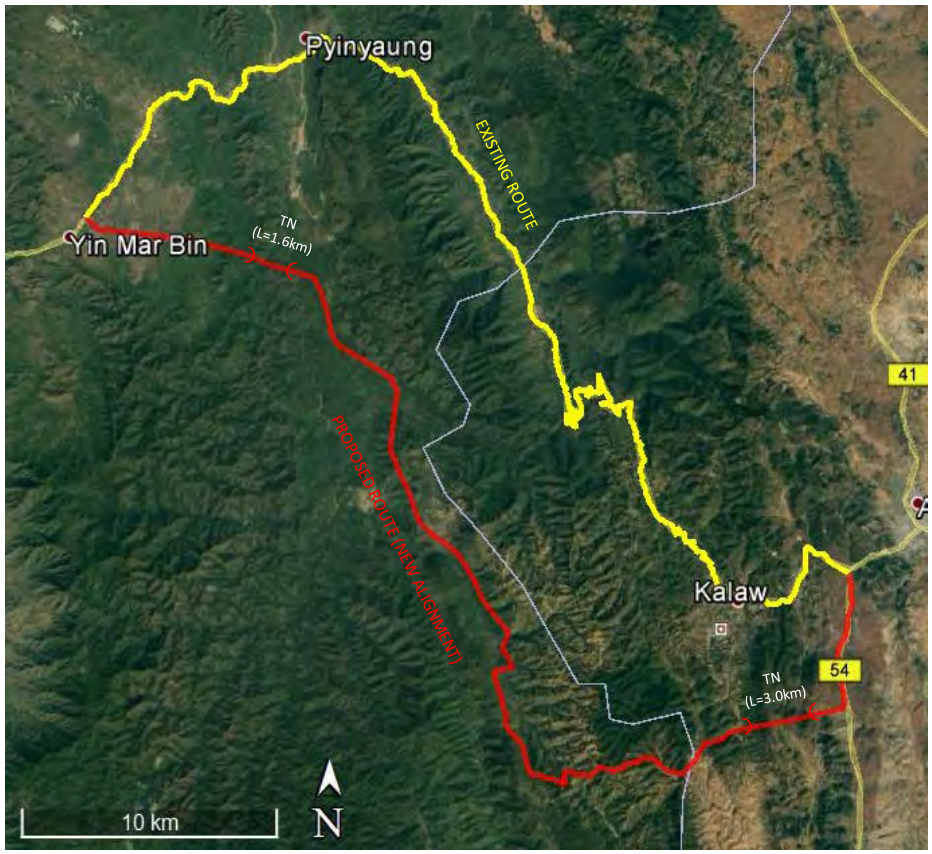
The corridor of the Trans-Myanmar connecting Magway to Taunggyi is proposed as a priority development corridor of the road network to support development of industrial areas and agricultural promotion areas in Shan State. The corridor has been already identified as a part of Asian Highway Network (AH-2). The corridor consists of the flat section

(Magway-Meiktila) and the mountainous section (Meiktila-Heho). The alignment of the corridor in the mountainous section has hairpin turns to pass the Shan Plateau, which has 1,200m elevation. Main logistics movement to and from Shan Plateau is borne by road sector since the network of inland water and railway sectors are not operated sufficiently due to the terrain restriction of the mountainous plateau.

(Earth cutting slopes on the corridor)

(Hairpin turns on the corridor)

The road widening of the existing corridor will be technically difficult due to the steep topographic conditions. The construction of a new alignment could be considered instead of road widening. The new alignment (or upgrading of the existing road) would be possible to reduce the travel time between Meiktila and Taunggyi, as indicated in the conceptual alignment below. **Figure-8.3.10** shows the alignment and section of the proposed route.



Indicator	Existing Route	Proposed Route
Route length	64 km	52 km
Travel time	110 minutes (V=35km/h))	62 minutes (V=50km/h)

Source: Study Team

Figure-8.3.10 Proposed Trans-Myanmar Corridor

Strategy-2.4: Improvement of rural secondary/tertiary roads

While concentrating investments along certain economic corridors encourages development of the corridor, it will require long-term efforts to improve the rural secondary/tertiary roads to access rural areas. **Table-8.3.5** shows ongoing projects for the improvement of rural roads.

Table-8.3.5 Ongoing Rural Road Improvement Projects

Region/State	Road Project	Road Classifications	Funding Agent
Ayeyarwaddy	Maubin-Pyapon Road Rehabilitation Project	Union Road	ADB
	Regional Development Project for Poverty Reduction		JICA
Kayah	Hpruso-Muso-Hoya Road	Regional Road	
	Taunggoo-Mawchi-Loikaw Road	Union Road	
Kayin	Zartabyin-Kyonfae-Kyagalay Road	Union Road	
	Bridge No. (1/1 & 2/1) Building on Hlaingbwe-Shwegon Road	Union Road	
Chin	Hakha-Gangaw Road	Union Road	
	Kalay-Phalan-Harkhar Road	Union Road	
	ThineNgin-TeeTain Road	Union Road	
Sagaing	Monywa-Ayataw-Shwebo Road	Union Road	
Tanintharyi	Dawei-Malwetaung Section of Yangon-Myeik Road	Union Road	
Bago	Daik-U-Sittaung Road	Union Road	
Magway	Minhla-Tayet Road		
Mandalay	Mandalay-Moegoke (Phawtaw-Moegoke) Road	Union Road	
	HanMyintMo-MyoGyi-YwarNgan-Pintaya-AungPan Road	Union Road	
Mon	Tayanar-Phayargone Road	Ministry of Progress of Border Areas and National Races	
Rakhine	Toungup-Maee Road		
Yangon	Kunchankone-Tawkhayan(west)-Botdin Road	Regional Road	
	KawHmu-WarPaLouThout-ThaYeyTaw Road	Union Road	
	MaKyeeKan-HnetAwwSann-KyeikHtaw Road	Union Road	
	Dala-Thakhut-Latkhotekone Road	Regional Road	
Shan	HanMyintMo-MyoGyi-YwarNgan-Pintaya-AungPan Road	Union Road	
Ayeyarwaddy	KyeinPinSae-SetKaw-DaNuPyu-ZaLun-HinThada Road	Union Road	

Source: Study Team

Strategy-LRS- 3	Development of bypass routes to detour congested areas to reduce transport time and the number of traffic accidents in urban areas

Traffic congestion in urbanized areas seriously disturbs logistics movement. Thus, it is essential to bypass built-up areas, to let the traffic flow without interference from local traffic, to reduce congestion in built-up areas, and to improve road safety. A bypass may be specifically designated for a logistic route in city urbanized built-up areas. The development of the ring road network is planned as bypasses for major cities, such as Yangon and Mandalay. The ring road controls unregulated urban sprawl and provide detour of congested urban areas for logistics transport. The outer ring road in Yangon has been proposed, but has not yet been implemented

without any concrete progress reported. Urbanization is rapidly growing and the construction of the ring road will require land acquisition and compensation. Likewise, the land might be getting difficult to be procured, because land related costs and compensation cost increase constantly.

Even in suburban areas, arterial roads pass through residential areas. The number of traffic accidents related to cargo trucks is relatively greater than for other vehicles, due to the mixed use of the residents' community road and the logistics route as the following picture. Detour routes, such as bypass roads, will be effective for this issue.

Source: Study Team

Strategy-3.1: Acceleration of development of ring roads in major cities

Traffic congestion is a serious social issue, especially in Yangon city area. The outer ring road and the inner ring road have been proposed by YUTRA (Yangon Urban Transport Master Plan). The outer ring road will be a diversion route for the logistics vehicles, to avoid the traffic congestion in the city center. Also the ring road is proposed for other major cities, to take the logistic routes away from the city center and suburban areas.

Strategy-3.2: Provision of by-pass roads to detour rural residential areas

As well as the above mentioned development concept, the by-pass roads are proposed to steer the traffic flow of heavy trucks on to logistics routes, and light vehicles on to community routes.

Strategy-LRS-4	Improvement of accessibility to promote effective use of logistics facilities

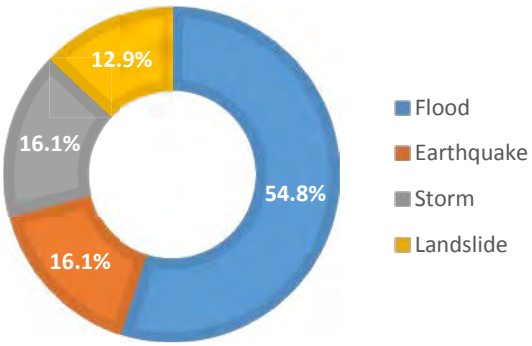
A high-speed and high-capacity road network and services shall be provided to/from major dry-ports, sea and river ports, logistic terminals and airports, in order to facilitate logistics services and to provide the movement of goods and services and people to and from urban areas.

Strategy-4.1: High-standard accessibility for the designated primary logistic facilities

The industrial areas listed in **Figure-8.3.9** and the proposed logistics terminals need to have high-standard access roads to promote the development of industrial areas.

Strategy-LRS-5	**Provision of redundancy and robustness for the main transport corridors to strengthen the national logistics lifelines**

Myanmar is disaster prone country, with the risk of flooding, earthquakes, landslides, cyclones, conflicts of ethnic minorities, etc. Strategically planned redundant road connections makes it possible to minimize the loss occurred during the transport of commodities and to ensure continuity of supplying goods. **Figure-8.3.11** shows the frequency by type of disaster.



Source: International Disaster Database www.endat.2015

Figure-8.3.11 Frequency by Type of Disaster in Myanmar

Strategy-5.1: Ensure redundant access for the designated priority economic corridors

Priority economic corridors designated in NTMP shall be strengthened providing an alternative redundant access. The following priority economic corridors were designated in the NTMP.

1) Northern Corridor, major risks: landslides, earthquakes, flooding

2) East-West Corridor, major risks: landslides, flooding, ethnic conflicts

Western Corridor also has a border with India and is an important logistic route. The road condition is quite vulnerable and current traffic volume, both of passenger vehicles and cargo trucks, is much smaller than the above two corridors. Accordingly, the development priority of the Western Corridor is to upgrade the existing road condition to at least AH Class II as targeted in ASEAN Transport Strategic Plan.

Strategy-LRS-6	**Improvement of awareness of traffic safety and upgrading of road infrastructure to reduce traffic accidents**

Naturally, as a developing country, the traffic accident rate of Myanmar is more than three times that of the developed countries. Road Transport Administration Department (RTAD) under the Ministry of Transport and Communications (MOTC) has been endeavoring to promote driver's safety awareness nationwide but the target is not able to meet at present and road infrastructure has not yet fulfilled the international design standards yet. There is a proper testing system for

truck drivers however more appropriate education and trainings of truck drivers is needed so as to increase the number of qualified truck drivers.

Strategy-6.1: Improvement of the traffic safety awareness of truck drivers

Logistics demand is increasing rapidly due to recent economic development and the demand for trucking of goods and truck drivers is also increasing. The comprehensive efforts of the related parties in road safety for improvement of traffic safety are imperative in line with the logistics development. The driving license system and transport safety enforcement systems have to be improved further.

Strategy-6.2: Improvement of the safety level of road infrastructure

The design standards currently applied in Myanmar are listed below. Geometric standards are available and generally have followed international design standards. However, these standards were often not respected for roads built in the past. There are a considerable number of blind spots, blind curves, blind slopes, etc. that may cause fatal traffic accidents, especially by heavy loaded vehicles on trunk roads in remote areas. **Table-8.3.6** shows the road design standards for Myanmar.

Table-8.3.6 Road Design Standards for Myanmar

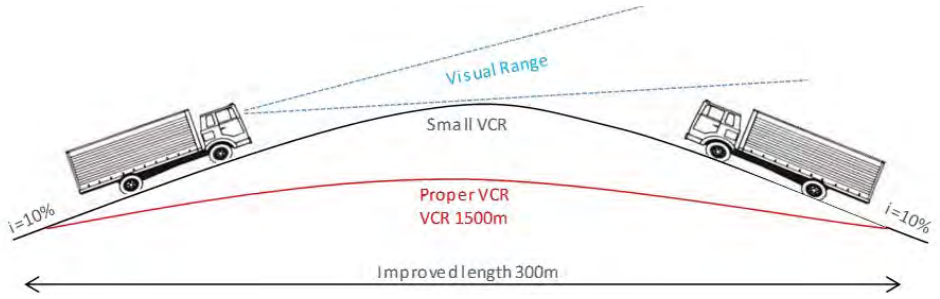
Classification	Publishing
Geometric Design Standards	Road Design Criteria, MoC, 2015
Structural Design Standard	Oversea Road Note 7.1, TRRL, UK
Construction Manual	UNDP
Maintenance Manual	MoC

Source: Study Team

Installation of Road Safety Audit, which has been proposed in the Master Plan for Arterial Road, will be an effective tool to help rectify the shortcomings. Establishment of installation standards on road safety facilities is necessary. **Figure-8.3.12** and **Figure-8.3.13** both present examples of above discussions.

Source: Study Team

Figure-8.3.12 Substandard Vertical Alignment on NH-8



Source: Study Team

Note: VCR (Vertical Curve Radius)

Figure-8.3.13 Lack of Required Sight Distance by small VCR

8.3.3 Logistics Development Strategy of Railway Sub-sector

Railway Freight Transport Strategy

The strategy on railway sub-sector is as follows:

Strategy-LFS-1	Enhancement of railway transport on the Yangon – Mandalay axis

This corridor has the highest transport volume in Myanmar. It would accelerate railway infrastructure development to function as a logistics corridor for international and national cargo transport. The route between Yangon and Mandalay is the north-south railway freight transport axis in Myanmar. The route has already been funded by the Government of Japan under a yen loan. In addition to that the implementation of the necessary works started in 2016. The improvement of railway track between Yangon and Mandalay will be completed by 2023 and the Inland Container Depo (ICDs) is expected to be completed by 2023 as well at Yangon and Mandalay. When the railway track improvement is completed, the container block train will be introduced to transport around 300,000TEUs per year. The system to operate the container transport by container block train will change the logistics system dramatically for long haulage of international and domestic transport. This will be the modernization of logistics system as a whole since the collection, storing and delivery of containerized cargo in the most efficient modern way.

Strategy-LFS-2	Improvement of freight railway transportation services for customer's satisfaction

The current railway transport fare is lower than the expectation of forwarders of container railway services according to the interviews conducted. Increasing the transport service level such as punctuality, rapidity, and accessibility also increases the confidence of forwarders. Even though the fare level would be increased, upgrading of the service level (i.e. scheduled rail way operation, regular container transport service, cargo consolidation, multimodal freight transport operation etc.).

Strategy-LFS-3	Speedier and large volume railway freight service by introduction of scheduled container block train service

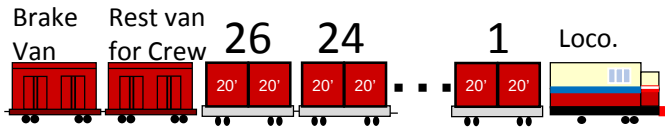
A Container block train is a freight railway service handled only at the origin and the final destination, with a fixed car set operation throughout the (haul) journey. The service is provided with point to point transit (direct transport service) mainly. The service has advantages such as: (1) the trains are prioritized after passenger trains for most cases of container block train operations and high speed and punctual operations are expected, (2) there is a reduced handling time, resulting from the absence of train shunting, and (3) there is reduction of the vibrations to the cargo due to reduced shunting.

All railway transport services have been on car loading service basis until July 2017. Paleik Railway Station is located 20km south of Mandalay Railway Station on the Yangon-Mandalay Line. The station and its terminal area had been used as a timber storage terminal from 2002 until 2010. However, a regular container freight service between Yangon (Wadan Railway Station) and Paley Railway Station started in August 2017 by Myanma Railways (MR). Much growth is expected in the demand for container freight transport on this route in coming years and its capacity needs to be expanded.

(1) Preconditions

Prior to discussion about the action needed, the preconditions for freight railway operation shall be set. The maximum composition of a train in Myanmar Railway in general is as follows:

1 locomotive, 26 wagons, 1 rest van for crew, and 1 brake van.



Source: Study Team

Figure-8.3.14 Assumed Composition of a Freight Train

In the study, the same composition is assumed for carrying out the calculation in the conservative case. This is because the freight railway facility is designed for maximum composition of the train to date. The capacity is calculated using 26 wagons, equivalent to 52 TEUs (=26 wagons x 2 TEUs/ wagon). The annual carrying capacity is assumed at approximately 380,000 tonnes/ year[1]. Although the capacity varies by wagon type, it is noted that the bulk cargo will be transported by wagon, which is designed by commodity. Furthermore, the bulk cargo will be carried on the basis of a contract between MR and the

[1] If it is assumed that there are 365 days of operation a year and 20 tonnes volume per one TEU with 26 wagons per train-set, annual carrying capacity is 26 wagons x 2 TEUs/ wagon x 20 tonnes/ TEU x 365 days = 379,600 tonnes/ year.

consigner. The volume forecast for bulk cargo cannot be made at this stage. Thus, the capacity is calculated on container cargo basis i.e., 40 tonnes per wagon (2 TEU) in this study. According to the precondition noted above, the number of freight trains in both directions to carry the estimated freight demand is summarized in **Table-8.3.7** below.

Table-8.3.7 Estimated Railway Demand and the Number of Freight Trains in 2030

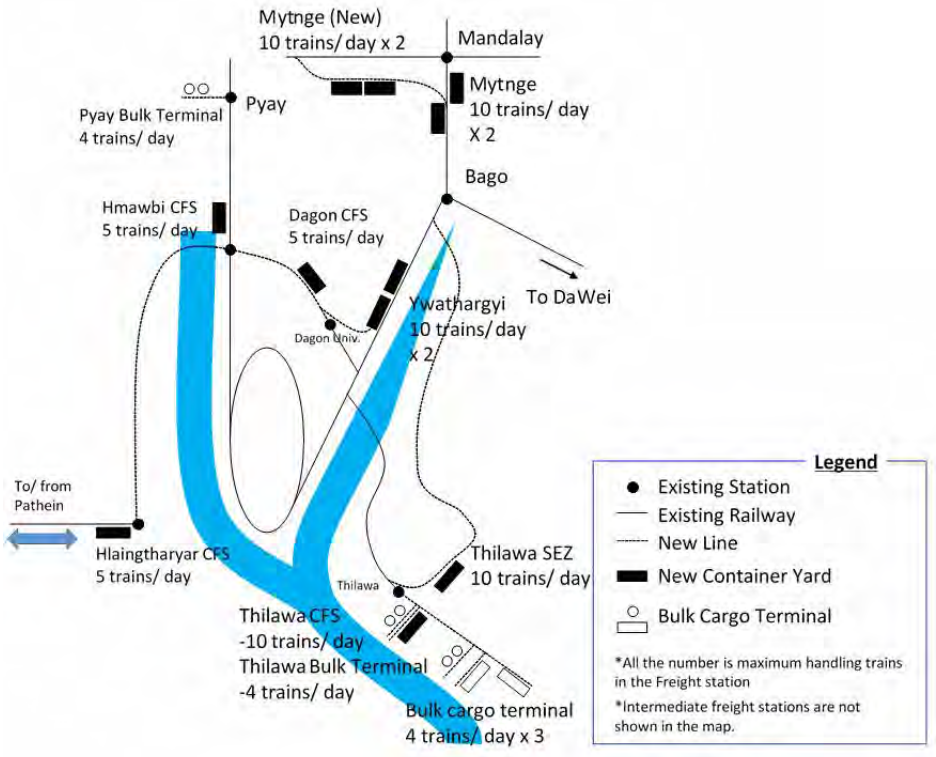
Estimated Demand (2030) in million tonnes/ year			
Corridor / Sta.	NS*	SE**	Sta.
Mandalay			
	18.3		
Bago			Bago
	27.3	9.3	
Yangon			Mawlamyine
NS Corridor		16	
Subtotal	45.6		Thanbyuzayat
		5.1	
			Dawei
			SE Corridor
		30.4	Subtotal
Total	76		

Preliminary Number of Trains (2030) for both ways			
Corridor / Sta.	NS*	SE**	Sta.
Mandalay			
	48		
Bago			
	72	24	
Yangon			Mawlamyine
		42	
			Thanbyuzayat
		14	
			Dawei

*NS: North-South Corridor, **SE: South-East Corridor
Source: JICA Study Team

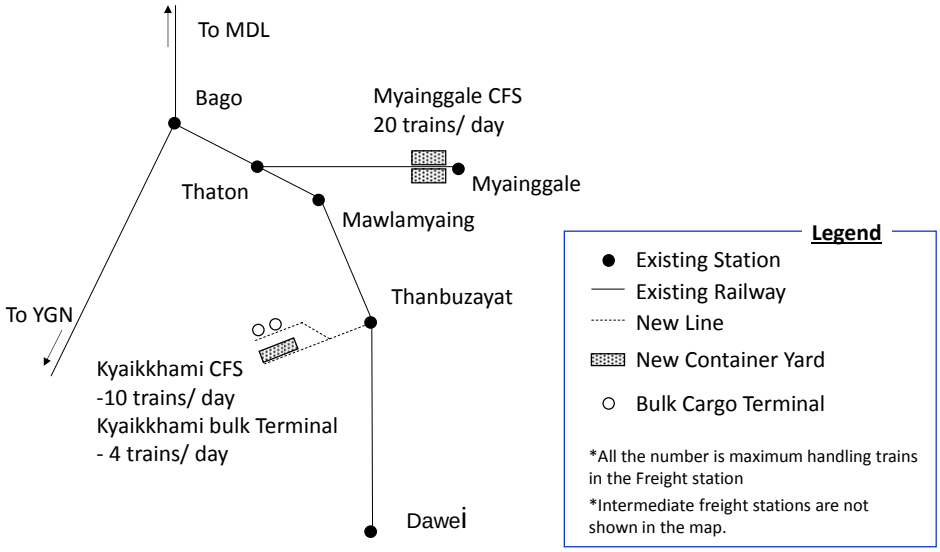
(2) Freight Station Development Plan

Freight station developments are arranged as follows to handle the estimated future demand for North South and South East Corridor as shown in **Figure-8.3.15**and **Figure-8.3.16,** respectively.



Source: Study Team

Figure-8.3.15 Freight Station Arrangement (image) along North South Corridor



Source: JICA Study Team

Figure-8.3.16 Freight Station Arrangement (image) along South East Corridor

It should be noted that the bulk cargo handling capacity and the location shall be studied in the further feasibility study with the potential private companies involved. The type of the freight station is explained in next sub-clause.

(3) Action Needed

1) Ensure punctual and scheduled freight train operation

In the current freight railway service, the train is set up once the cargo is collected. The train is not scheduled regularly and a forwarder cannot fix the arrival time. If a regular and fixed freight train is operated and the train does not wait for cargo to be collected, a forwarder can schedule when he/she should deliver the cargo and when the cargo will arrive at the station. The current railway shippers transport cargo which is not required to arrive early or on time such as feeds, stone, diesel fuel, oil, construction materials, seasoning, and so on. The infrastructures are to be reinforced to transport heavy and high-valued goods. The fixed scheduled freight train operation is imperative to make sure of punctual delivery of goods in general and for manufacturing activities in particular.

2) Fixed car set container transport introduction (Container Block Train)

Only two container trains are operated daily in Myanmar. However, the container is fixed on the wagon and cannot be separated. Therefore, the advantage of container trains that lower the transport cost possible by means of employment of mechanized cargo handling system and integrate freight transport is not utilized. Also, yard facilities are not developed for container handling and no containers are handled in the yard even though mechanized handling is an advantage of container transport. Although shippers or forwarders need low cost transport, railway transport needs cargo loading and unloading operation at departing terminal and arriving terminal. Currently these cargo handling are conducted manually. To

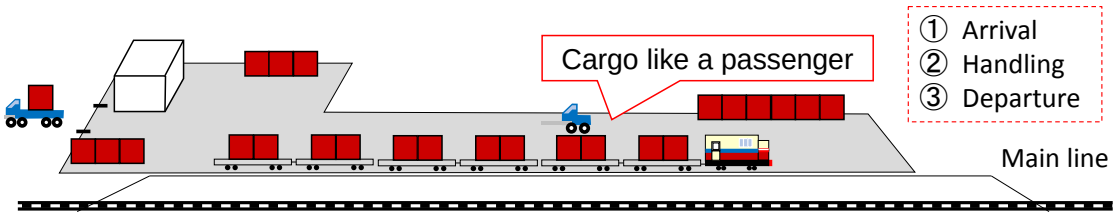
improve this ineffective cargo handling method, the palletization and containerization of cargo will enhance the efficiency of cargo handling and will reduce the transport costs.

Myanma Railways (MR) requested to various transport and logistics service companies to prepare all the required facilities to join the container transport services such as handling facilities, containers, and so on. The investment for the necessary facilities to introduce container service has been the obstacle for the companies to participate in the container transport service. Only the Yuzana Group and Kerry Logistics are container service providers in Myanmar so far. Preparing the facilities to use container transport in freight stations will enhance and increase the accessibility of transporting the containerized goods.

3) Introduction of handling works on arrival track (Effective and Speedy Container Handling System: E&S System)

It is found that there is a potentiality that some forwarders will shift from serving to the trucking companies to serving the railway freight operator through the interview survey on the forwarders. Current cargo handling system takes a long time for loading cargo to and unloading cargo from wagons and arranging the train by shunting is needed. Fixed wagon transport would become possible by adopting container handling and transport system. In such a way the land area for yard can be minimized and the cargo arrangement can be simplified.

Contrary to current conventional freight wagon arrangement system, the Effective and Speedy Container Handling System (E&S System) will only have three simple steps as follows: (1) train arrival, (2) cargo handling at the same track, and (3) departure after cargo handling. This makes it possible to simplify the track layout. The handling time will become only 1~2 minutes to load or unload one container to one wagon by use of one forklift. In such a mechanized cargo (container) handling system, the containers are loaded to or unloaded from wagon of freight train as if the passenger get on or get off from the passenger train. The container behaves like a passenger in a passenger train service and this increases the speed directly. **Figure-8.3.17** illustrates the concept of this system.

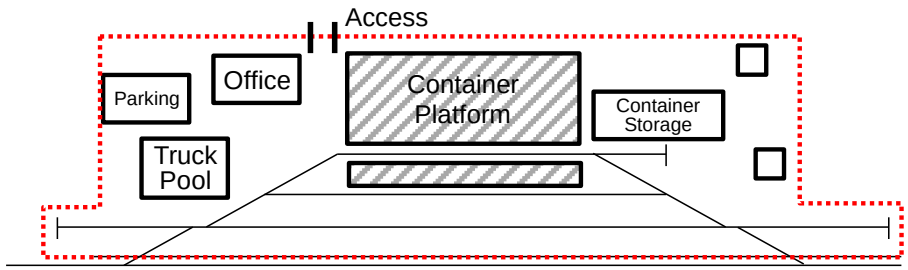


Source: Study Team

Figure-8.3.17 Effective and Speedy Container Handling System (E&S System)

Layout of the Container Yard for Railway Freight Station

The container yard for railway freight station functions not only as cargo handling yard but also as container maneuvering area to transfer containers between trucks and freight trains. Both single-sided container freight station and its required facilities are as shown in the figure below.



Source: Study Team

Figure-8.3.18 Small-sized Container Yard Facilities (Image)

Handling duration

In the table below, the duration of handling works are assumed.

Daily freight handling duration

Maintenance work is assumed at 4 hours/day; thus, daily freight handling duration is as follows:

(24 hours – 4 hours) x 60 min. = 1,200 min.

Table-8.3.8 Duration of the Container Handling Work

Items	Time	Remarks
Train arrival and removal of locking device	15 min.	Referring to the Japanese working duration
Handling duration	20 min.	2 min. x 52 containers / 3 forklifts = 35 min. ・ 2 min. is assumed for container loading and unloading referring to the Japanese working duration ・ Unloading 52 containers of 20 ft. ・ 3 forklifts do handling works in parallel.
Fixing work for 1 train	10 min.	Referring to the Japanese working duration
Braking test for 2 train	10 min.	Referring to the Japanese working duration
Total	70 min.	-

Source: JICA Study Team

Daily freight operation hours

Maintenance work is assumed at 4 hours/day; thus, daily freight operation hours is as follows:

(24hour-4hours) x 60min. = 1,200 min.

Assumptions of the handling volume

The line occupancy ratio is assumed at 0.6 because of the train speed is to be reduced and track closure is necessary when the train enters into a freight station. The calculation below shows the handling volume.

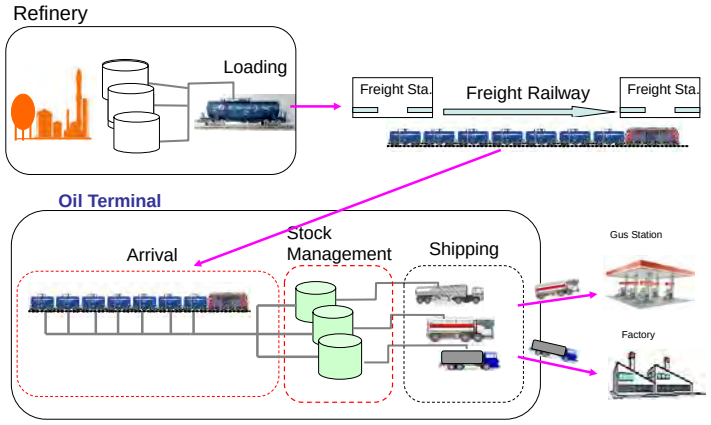
1,200 min. / 70 min. x 0.6 = 10.3 train/day

It is possible to operate 10 or more trains per day at one handling line station for 26 wagons train-set operations. According to the calculation above, the estimated handling volume in a one-sided yard is 1.5 million tonnes per year.

4) Development of bulky cargo transportation by railway

Bulk cargo, usually used for oil, cement, and ballast transport, needs numerous numbers of trucks and this causes road congestion. Through a railway, a greater volume of cargo can be transported at one time.

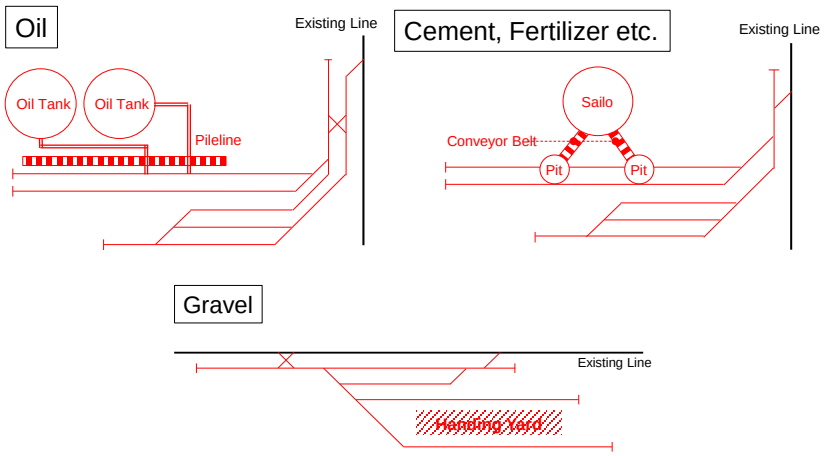
The figure below shows an example of the oil cargo movement through a railway in Japan. The wagons rotate between stations and are operated by the Japan Freight Railway Company (JRF).



Source: JICA Study Team

Figure-8.3.19 Oil Cargo Movement by Railway in Japan

Bulky cargoes such as oil, cement, stone, and grain, are currently transported by truck and this causes traffic congestion. On the other hand, railway service is possible to transport high volume of cargo in one trip and rail is one of the most environment-friendly transport modes. Because of this, railway transport is suitable for bulky and long-distance transport of high volume cargoes. The logistics center for the above cargoes and the required facilities shall be introduced. The bulk cargo will be loaded or unloaded at the pit by conveyor belt or pipelines. The layout of the bulk cargo freight railway in the case of oil, cement, fertilizer and gravel are shown in **Figure-8.3.20.**



Source: Study Team

Figure-8.3.20 Example of the Station Layout of Oil, Cement/Gravel and Gravel

The bulk cargo station needs longer handling duration compared to containers. The handling duration is shown below.

Table-8.3.9 Duration of the Bulk Cargo Handling Work

Items	Time	Remarks
Shunting works	90 min.	30 min. x 3 times shunting works = 90 min. ・30 min. / shunting work ・3 times shunting assumed
Handling duration	65 min.	5 min. / wagon x 13 wagons = 65 min. ・5 min. for loading per wagon from silo, oil terminals are assumed* ・Two wagons loading at the same time are assumed.
Loading finishing work	10 min.	Referring to the Japanese working duration
Braking test	10 min.	Referring to the Japanese working duration
Total	190 min.	-

Note: *The loading time varies according to the commodity and the loading/ unloading facility.
Source: Study Team

The line occupancy ratio is assumed at 0.6 which is same as the condition of container transportation and thereby:

1,200 min. / 190 min. x 0.6 = 4.0 train/day

It is possible to operate 4 trains/day for bulk cargo station. According to the calculation above, the estimated handling volume in the one-sided yard is around 3.8 million tonnes per year but it depends on the gravity of the commodity to be transported.

5) Introduction of freight railway related service

Currently, the forwarders take charge of the cargo handling activities and MR transports the loaded wagons between stations as the railway operator. Warehouses are not located at freight stations to store and keep cargo properly and cargoes are left at the platform area until they are received by the forwarders. There is a risk of cargo theft and deterioration of quality

of commodity during temporary storing of goods.

To promote freight railway service, the handling services at the station and the distribution service from the railway station are needed to be planned carefully. The availability of packaging service of goods may attract shippers of goods to use the railway freight transport.

In addition, applying the E&S System and speedy car loading service will reduce the yard area substantially. The saved land can be used for new services and it is highly recommended to increase revenue by the introduction of new services such as: cargo storage service, handling works service under MR, trucking service to and from train station, job opportunity creation in new services, and property development,.

6) Privately-owned Wagon Scheme Introduction

In Japan, the freight railway businesses are mostly operated by the Japan Freight Railway Company (JRF). Privately owned wagons are wagons which are owned by private companies registered to JRF. The privately-owned wagon scheme is specified in the Japan Railway Act, and this scheme has been applied ever since. The features and advantages of this system are summarized in the table below.

Table-8.3.10 Feature and Advantages for the Privately-owned Wagon Scheme

Features	Advantages	
	for Wagon Owners	for JRF
– Owned by private companies – Can be designed according to cargo loading facility as necessary by consigner – Freight fare shall be discounted – To enhance bulk cargo transport	– Wagons can be used freely as scheduled by the owner – The commodity which cannot be loaded on a regular wagon can be transported using a privately-owned wagon (e.g., highly toxic substance) – Handling works can be optimized at loading site – JRF handles the proper maintenance of the wagons – Discount scheme is available (e.g., vacant operation service is free of charge up to 80 km)	– To secure stable consigner – New wagon procurement is not required for JRF

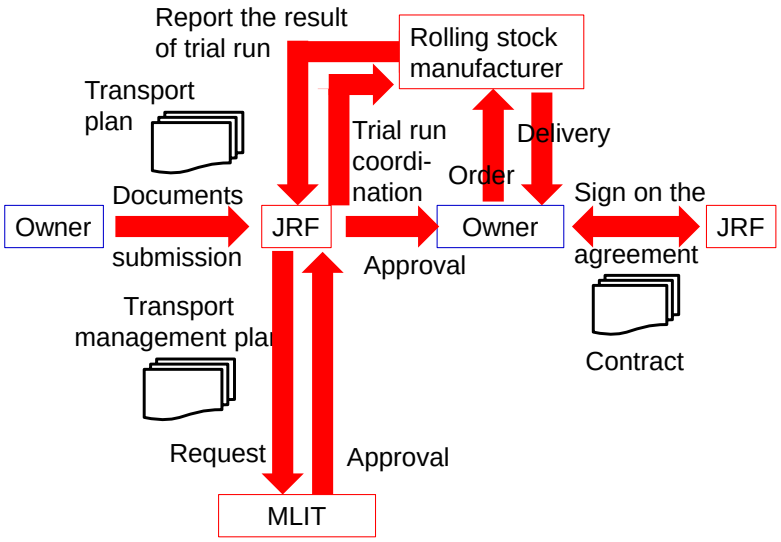
Source: Study Team

The wagons are properly maintained by the JRF, and the fare discount is determined between JFR and the owner. There is no need to procure wagons by JRF for freight volumes to be secured. The procurement and investment to the wagons needed are solely responsible of the private owners therefore JRF does not need to invest for provision of wagons but JRF can enjoy the revenue generated from such arrangement with the private wagon owners.

The requirements of owners to secure the safety of railway operations and to satisfy with the freight transportation volumes are as follows:

- The design of wagons conforms to the particulars of rolling stock provided.
- The owner shall have an executive line for loading / unloading operation of their goods.
- The conditions relevant to the operation and maintenance of wagons shall be agreed between JRF and the owner.
- Designated commodity transport is possible exclusively.

Figure-8.3.21 illustrates the business structure of privately owned wagon scheme operated in Japan by JRF.



Source: Study Team

Figure-8.3.21 Process to Introduce to the Privately-Owned Wagons in Japan

8.3.4 Maritime Transport Sub-sector

The strategy on water borne transport sub-sector is as follows;

Strategy-LWS-1	Legislation of the "Port Act"

Legislation of "Port Act"

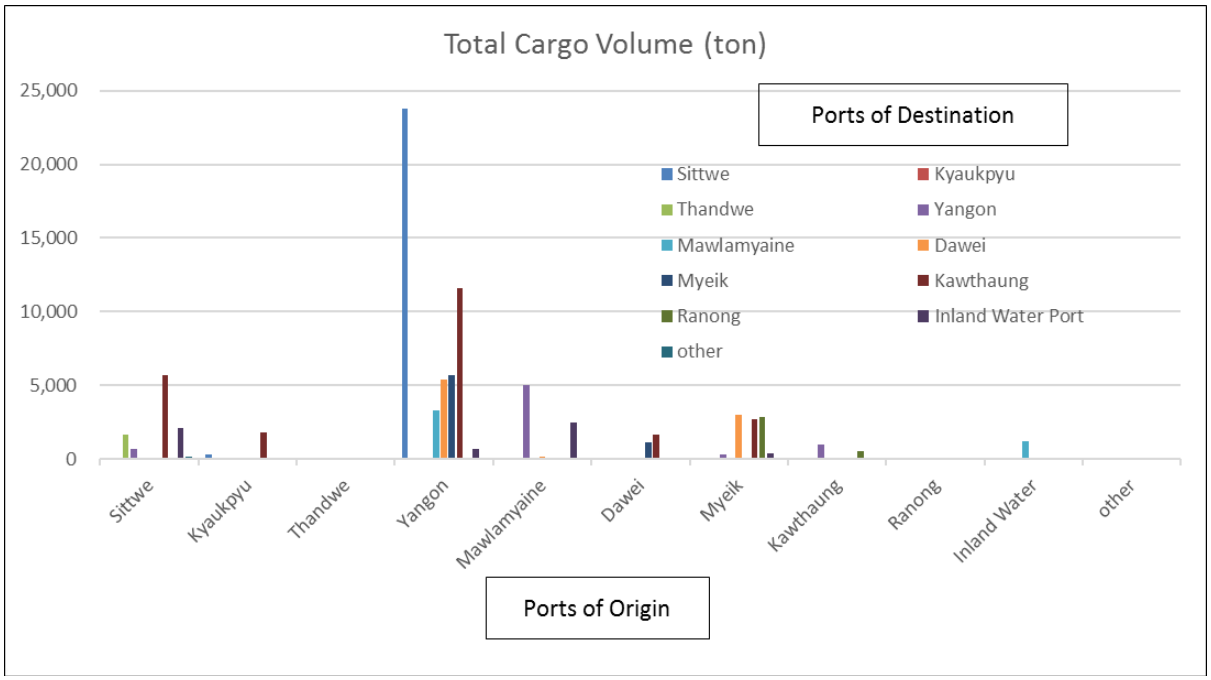
It is common throughout the world for a port area or port limit area to be managed by the public sector, based on the principle that the water area of a country, with the exception of privately owned water areas, should be used for the public interest. From this principle, port planning, construction, operation and maintenance of all ports are regulated by the "Port and Harbor Law" in Japan. The national government is responsible for formulating the "Basic Direction" of the port development. Subsequently, port management bodies should formulate "Port Planning" that conforms with the "Basic Direction". In addition, it is stipulated that the national government and port management bodies must coordinate with each other in the above-mentioned actions.

The National Port Development Policy does not exist in Myanmar at present. The new "Port Act" was formulated in April 2015 in Myanmar. In this new "Port Act", the determination of the Port Limit is regulated but no concept of a public water area management system is stipulated. Accordingly, it is possible for the private sector to develop and utilize the public water area exclusively if the private entity owns the land in front of the water area. In addition, there is no clause in the "Port Act" which requires the establishment of a nation-wide port location plan and the necessary functions and capacities of ports from the national viewpoint, which aims at

achieving well-balanced national development. Consequently, the port development within a port limit is conducted by private companies in a disorderly manner, which prevents the well-balanced development of nationwide ports. In order to prevent the situation described above and to make effective use of public water areas, it is necessary to amend the "Port Act". Based on amendment of the "Port Act", the national government needs to establish a basic port development policy, port location plan throughout the country at strategic locations and port layout plan for each port leading to well-balanced national land development.

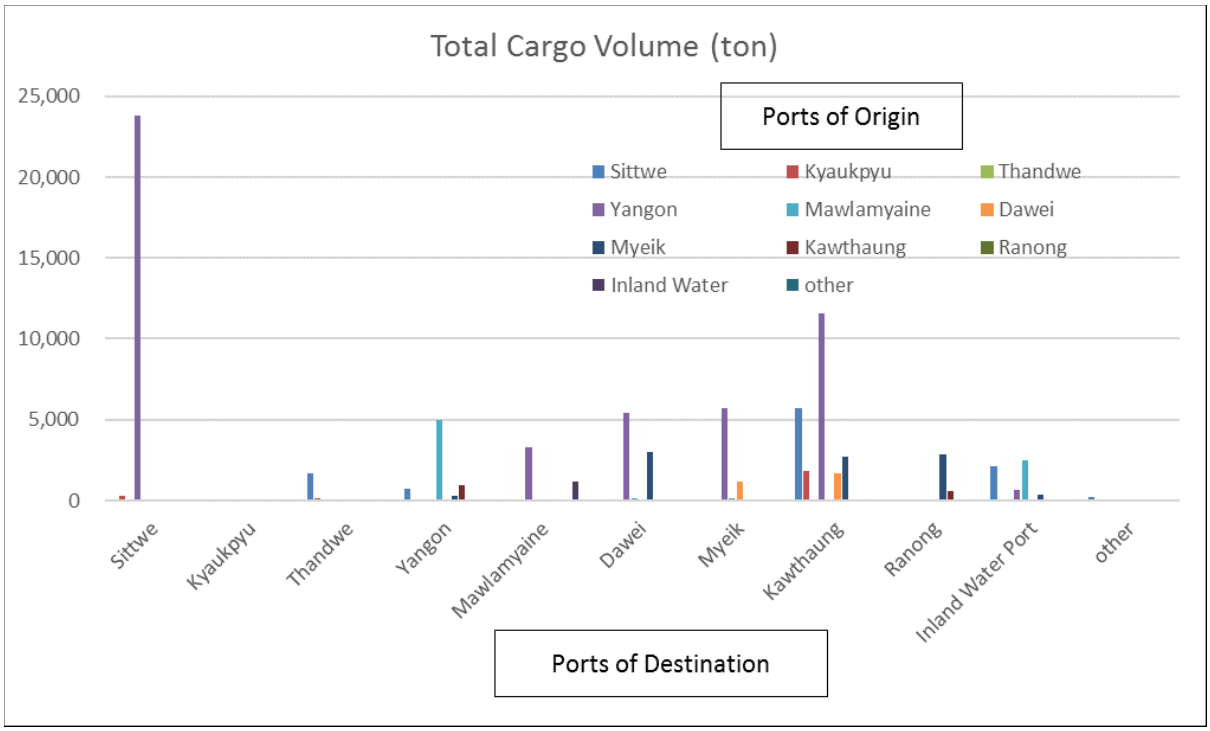
Strategy-LWS-2	Improvement of domestic ports

The results of the OD survey conducted by the Study Team are shown in **Figure-8.3.22** and **Figure-8.3.23**. According to the results, a relatively large volume of port cargo moves among the northern ports such as Sittwe port, Kyaukpyu port and Thandwe port and the southern ports such as Dawei port, Myeik port and Kawthaung port. Then, the northern network and the southern network are connected with Yangon and constitute the Coastal Marine Logistics Corridor in Myanmar as shown in **Figure-8.3.24.**



Source: Study Team

Figure-8.3.22 OD Analysis by Cargo Transport Volume seen from Ports of Origin



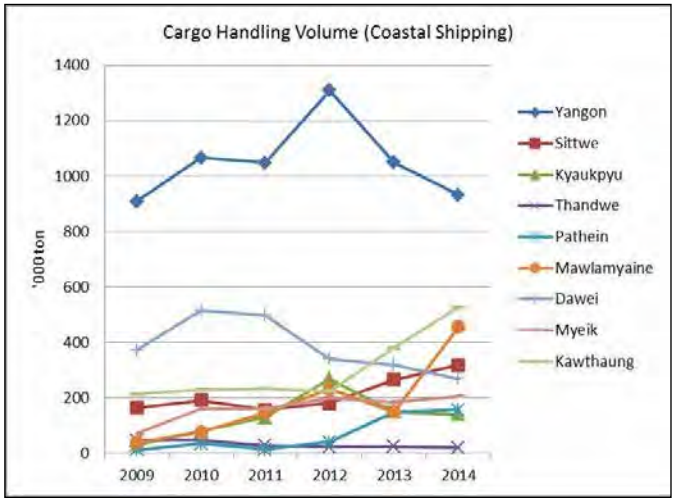
Source: Study Team

Figure-8.3.23 OD Analysis by Cargo Transport Volume seen from Ports of Destination

At present and in future, the Coastal Marine Logistics Corridor is expected to play a very important role in the transport of the large volume of long haul cargo along the coastal area, since the road network is in an underdeveloped state. The coastal shipping cargo volume fluctuates each year and no constant increasing trend is observed according to the statistics prepared by MPA, as shown in **Figure-8.3.25.** The sudden increase of cargo at ports in Mawlamyine, Kyaukpyu, Dawei and Kawthaung is observed due to the ad hoc transport demand for construction materials. The accumulated cargo handling volume of coastal shipping is shown in **Figure-8.3.26.**

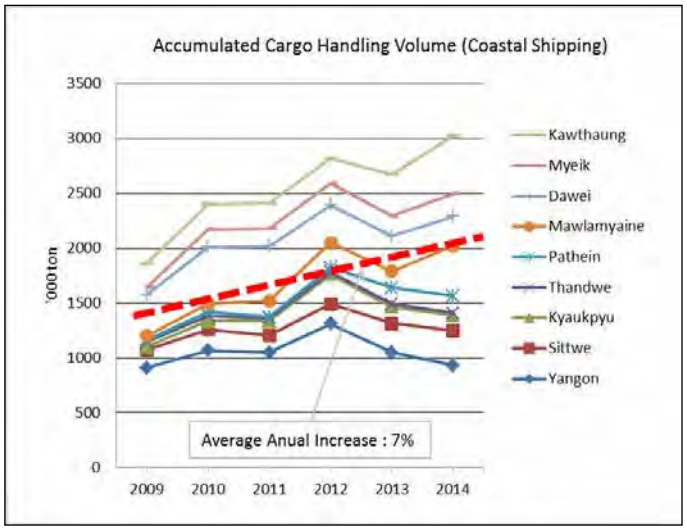
Source: Study Team

Figure- 8.3.24 Coastal Marine Logistics Corridor



Source: Study Team based on the dara of MPA

Figure-8.3.25 Cargo Handling Volume of Coastal Shipping



Source: Study Team based on the dara of MPA

Figure-8.3.26 Accumulated Cargo Handling Volume of Coastal Shipping

The average annual increase of cargo of the ports is estimated at 7%. Provided that the annual increase rate remains at 7%, the cargo volume in 2020 and 2030 is estimated as shown in **Table-8.3.11.** In this, the annual increase rate of Yangon Port is set at 7.8% based on the JICA study report of "The Preparatory Survey for the Project for Expansion of Yangon Port in Thilawa Terminal Area" (2014.6)

Table-8.3.11 Coastal Cargo Demand Estimate

Unit: thousand tonnes

Port	Population of District（thousand）			2014 (Base Year)	2020	2030
	Total	Urban	Urban (%)			
Yangon	7,360	5,160	70.1	1,263	1,580	2,294
Sittwe	535	133	25.0	255	383	753
Kyaukpyu	439	44	10.1	160	240	471
Thandwe	357	63	17.8	38	56	111
Pathein	1,630	303	18.6	81	122	239
Mawlamyine	1,232	434	35.2	220	330	649
Dawei	493	107	21.9	462	693	1,364
Myeik	693	151	21.8	197	295	580
Kawthaung	221	79	35.7	362	543	1,068
Total				3,038	4,242	7,529

Note: The cargo demand estimated for Dawei Port is of Dawei local port. In case of Dawei SEZ development, it should be increased.
Source: Study Team

Cargo Handling Capacity of Existing Facilities

The tidal ranges of the ports in Myanmar are large as shown in **Table-8.3.12**. Under this natural condition, pontoon jetties are employed at all ports for the berthing of small freeboard ships during various tidal situations. Jetties used for the berthing of 500 GRT class ships, however, are reinforced concrete structures, which can allow mechanical cargo handling operations. The number of major berthing facilities by the type of structure is shown in **Table-8.3.13**.

Table-8.3.12 Tidal Range of Ports in Myanmar (m)

Port	HWL	LWL	Tidal Range
Sittwe	2.44	0.14	2.30
Kyaukpyu	2.88	0.61	2.27
Thandwe	2.41	0.17	2.24
Pathein	2.59	0.91	1.68
Yangon	5.81	0.76	5.05
Mawlamyine	4.15	0.49	3.66
Dawei	4.78	0.24	4.54
Myeik	5.51	0.30	5.21
Kawthaung	3.90	0.47	3.47

Source: Study Team

All ports rely on manual cargo handling due to the structural condition of the pontoons employed at major facilities. However, mechanical cargo handling operations are conducted at some reinforced concrete piers. In order to handle the estimated cargo demand shown in **Table-8.3.13**, it is necessary to increase cargo-handling capacity by employing cargo-handling equipment at all reinforced concrete piers.

Table-8.3.13 Number of Berthing Facility and the Maximum Cargo Handling Capacity

Port	Number of Berth		Handling Capacity '000t/Berth/Year		Total Handling Capacity '000t/Year		
	Concrete Jetty	Pontoon	Mechanical	Manual	Mechanical	Manual	Total
Yangon	10	77	110	42	1,100	1,786	2,486
Sittwe	8	17	110	42	880	546	1,426
Kyaukpyu	7	2	110	42	770	84	414
Thandwe	1	2	110	42	110	84	194
Pathein	2	9	110	42	220	778	598
Mawlamyine	2	7	110	42	220	294	514
Dawei	11	5	110	42	1,210	210	1,420
Myeik	9	17	110	42	990	546	1,576
Kawthaung	2	20	110	42	220	840	1,060
All Ports	48	94	-	-	5,280	4,368	9,648

Source: Study Team

The maximum handling capacity of the existing facilities can be estimated as shown in **Table-8.3.13** based on the assumption that annual cargo handling capacity per one berth is 42 thousand tonnes, in the case of manual handling, and 110 thousand tonnes in the case of mechanical handling. The cargo handling capacity of all ports is sufficient to meet the forecast demand in 2020 if mechanical cargo handling is introduced at concrete piers. However, each port should be improved and developed as proposed below in order to increase cargo-handling productivity and to meet future requirements.

Since the cargo handling areas of most of domestic ports is quite narrow, mechanical cargo handling is difficult, and cargo loading / unloading operations take quite long time. Average berthing time of coastal shipping vessels per trip accounts for almost a half of the total number of navigation days. Rationalization or reduction of transport cost can be realized by improvement of port facilities of domestic port. Major commodities transported by the coastal shipping vessels are low-value and bulky goods. Therefore, if the transport efficiency of coastal shipping decrease and capacity will become insufficient to handle increased cargo demand of such commodities the trucking will become necessary. This alternative transport is to be avoided as the transport cost of trucking is much higher than that of coastal shipping.

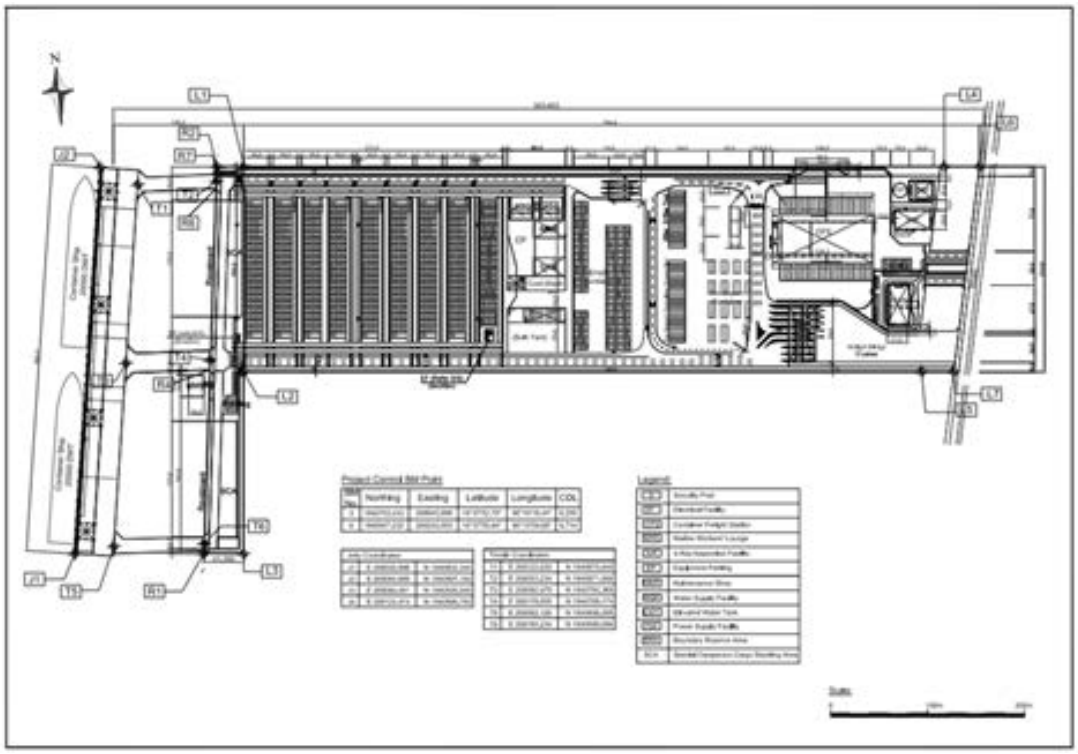
The outline of the development and improvement plans of each local port is prepared and presented in Volume 2 of the Final Report, Appendix-2 “Port Development Plans”.

Strategy-LWS-3	**Increase port capacity for international / trade cargoes**

The old port of Yangon is situated on Yangon River about 32 km inland from Elephant Point on the Gulf of Martaban. There has been much development lately and Yangon Port now extends both west of and south of the old port in a mixed management and ownership model whereby both government run ports or terminals operate side by side with privately run terminals. The two main private ports or terminals are the Asia World Container Port (AWCP) situated just west of the old port on the north bank of Yangon River and Myanmar International Terminal

Thilawa (MITT), located 16 km downstream of the old port in the Thilawa area. The maximum draft of Yangon Port is 9 meters or 20,000 DWT container ships. Since Yangon Port's water depth is shallow, feeder ships can call the port thus the maritime transport cost is rather high.

Almost all of the 37 plots of Thilawa Terminal Area have been leased out on a long-term basis to private companies and the development and operation of some areas has been commenced. The MPA container terminal is under construction at Plots 25 and 26 by using Japanese ODA; the Phase I project is expected to be completed in 2019. The Phase I project is composed of a quay wall of 400 m in length and a container yard of 200 m in width as the minimum requirement for container terminal as shown in **Figure-8.3.27**. In order to fulfill the container terminal function, however, it is necessary to widen the container yard to 400 m corresponding to the length of the quay wall after the completion of the current construction project.



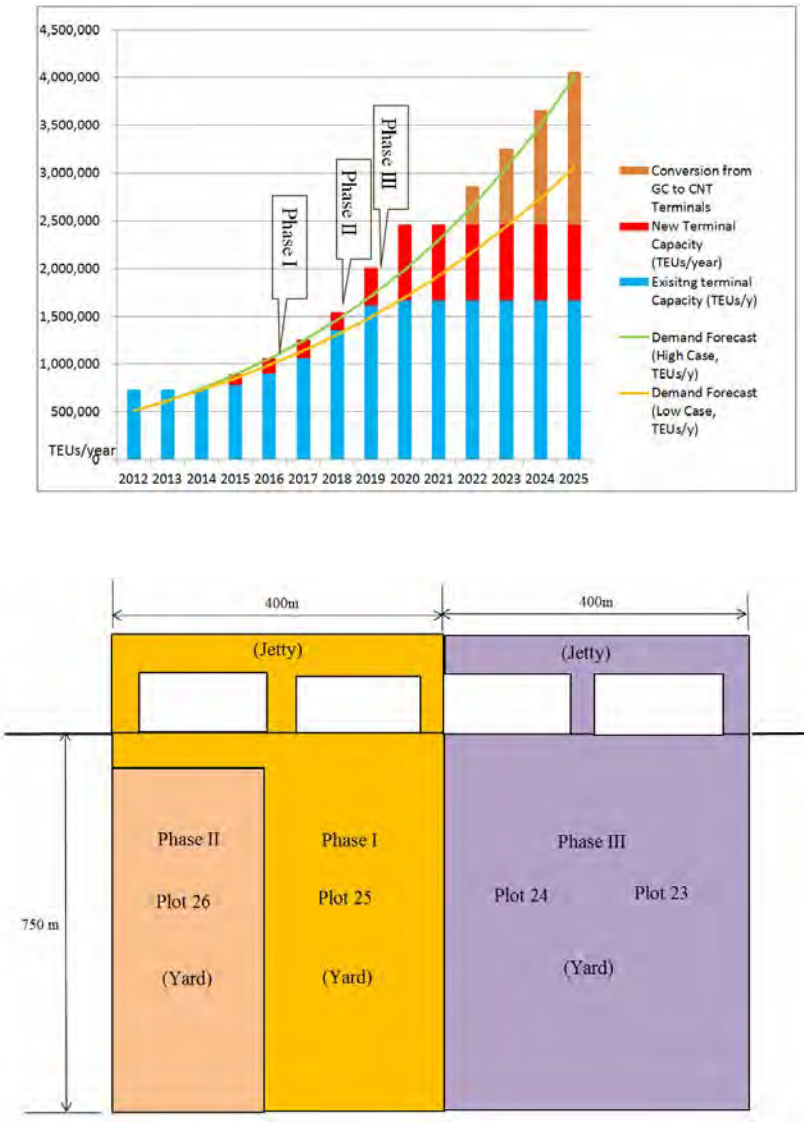
Source: "The Preparatory Survey for the Project for Expansion of Yangon Port in Thilawa Terminal Area" (2014.6)

Figure-8.3.27 Layout Plan of Thilawa Terminal Area's Container Terminal (Phase I)

The container handling volume at Yangon Port has steadily increased in accordance with the economic development of Myanmar, reaching about 900,000 TEUs in 2015. This volume is slightly higher than the demand forecast of about 850,000 TEUs estimated at the time of the original development plan study.

Therefore, it will be necessary to complete the construction of the Phase II container yard (Plot 26, 200m in width) by 2018 as shown in **Figure-8.3.28** to meet the High Case Demand. Similarly, it will be necessary to complete the Phase III project (Plots 23 and 24, 400m in width) by 2019 and further additional expansion is expected. Even in the case of Low Case estimates,

the Phase I project should be completed by 2020 and the Phase III by 2027. When Phase-III is completed the total container handling capacity will reach around 2.0 million TEUs. The container handling demand after 2025 will exceed the capacity of the Thilawa Terminal Area even if the current project is successfully realized and some plots are converted to container terminals. Therefore, it is necessary to develop new terminals at other areas or provide the alternative means of transporting containerized trade commodities.



Source : "The Preparatory Survey for the Project for Expansion of Yangon Port in Thilawa Terminal Area" (2014.6)

Figure-8.3.28 Stage-wise Development Plan of Thilawa Container Terminal

Strategy-LWS-4	**Develop port for bulk carrier aiming at increased export of agricultural product to the world market**

In line with the policy set out in the National Export Strategy (NES) of the Ministry of Commerce on the expansion of exporting agricultural products to the world market the international port is needed to be developed to accommodate the bulk carriers (30,000 – 40,000 DWT) of which draft is more than 11 m. In order to compete in the world rice market, it is imperative to transport export rice by bulk carriers of this class.

The potential site for the development of deep sea port that can accommodate the bulk carriers mentioned above and close to Yangon or major rice production areas of Myanmar (e.g. Ayeyarwaddy Delta, Bago, Magway) is Kyaikkami around 75 km south of Mawlamyine.

Along the southern coast of Myanmar, a water depth of -12m is only available at the south coast of the Kyaikkami Temple situated at the estuary of the Thanlwin River. In this area, candidate areas for the development of a deep-sea port are the Kyaikkami coast and the Kaleguk area situated along the southern coastline about 75 km from Kyaikkami. The candidate sites are shown in **Figure-8.3.29**.

Based on its close proximity to Yangon Port, which is the most important factor in determining whether a port is suitable for serving as a substitute of Yangon Port, the Kyaikkami area is judged to be a superior location compared to other areas.

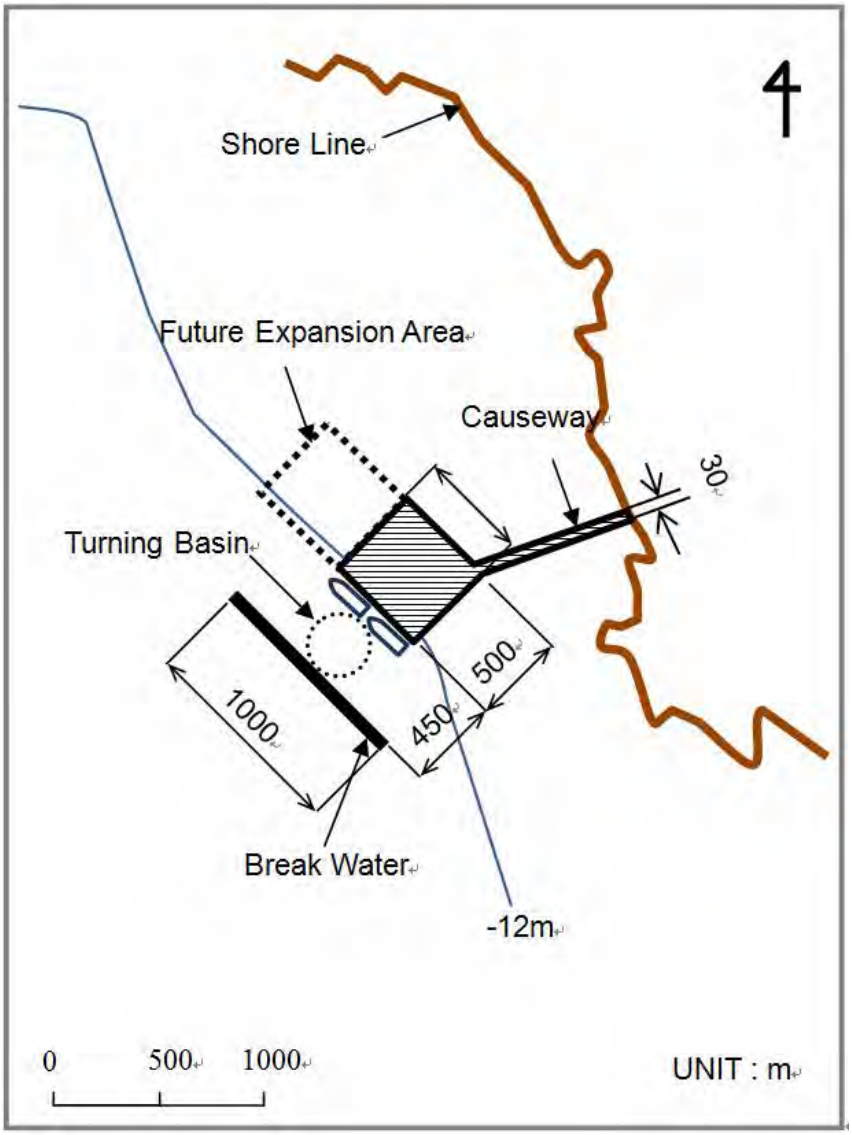
Source: Study Team

Figure-8.3.29 Location of Mawlamyine and Kyaikkami Port

The distance by road from Yangon to Kyaikkami is about 370 km but it is only 180 km by sea. Therefore, it is possible to transport cargo not only by trucks but also by coastal shipping vessels and barges. If waterborne transport by barges that connects inland demand with sea ports will be an effective transport means.

The export of rice and beans (the increase of these commodities are considered in the national economic development strategy) can be handled at this port instead of Yangon Port, which has the draft limit of 9m. This port is relatively near the production areas of rice and beans and able to accommodate ships of 40,000DWT class (draft of about 11m) which can transport cargos as far as Middle East and Africa. However, since the candidate area for the development of the new deep-sea port faces the Bay of Bengal, marine conditions during monsoon seasons are expected to be severe. Consequently, this port should have a breakwater. In addition, land reclamation to secure a water depth of -12 m will be necessary because a considerable dredged material is to be dumped but no deep-sea area is available in the vicinity of the coastline.

Figure-8.3.30 shows the preliminary layout plan of Kyaikkami Port.



Source : Study Report of Port Development Projects in the Southern Area of Myanmar (2015, MLIT)

Figure-8.3.30 Preliminary Layout Plan of Kyaikkami Port

Strategy-LWS-5	Securing of navigation safety

The entrance channel of Yangon Port has the following problems.

- Since the channel passes through the Outer Bar at the river mouth and the Inner Bar at Yangon River, which are subject to sedimentation basically from the upstream, it is difficult to maintain the water depth of the channel by dredging.
- The draught of calling ships is restricted to 9 m, even when ships enter the port by utilizing the flood tide level of about 6 m.
- Night navigation is also allowable as the condition of tide time, even though the better navigation aids are to be developed

- During rough seas, it is very dangerous for pilots to work at the floating pilot station (converted from an ordinary ship) located at the estuary.

Due to the above problems, ships can usually call at flood tide and according to the tide time.

Consequently, it is envisaged that calling ships will have to wait a long time at the river mouth, which will make it difficult to improve the port efficiently.

The area of Yangon Port is very narrow and it is difficult to expand port facilities since the port area is very close to the downtown area and extends along a valuable water front area. This area is expected to be used as a part of city functions in future. Therefore, it is necessary to increase the cargo handling productivity of the existing port to cope with the increase in the cargo handling demand expected in future.

The restrictions on the time a ship can enter the port can be removed and improved by expanding the navigation aids, installing navigation aids and a fixed type pilot station. This would increase the efficiency of port use and promote navigation safety throughout the year. The maximum size of ships calling to Yangon Main Port and Thilawa Container Terminal shall be less than 167 m and 200 m in overall length and 9 m in draft respectively.

Therefore, the maximum ship size at Yangon Port is less than 15,000 DWT. Ships entering to Yangon Port (inner harbor area) has to pass the Monkey Point, which is 4.5 m in depth below LWL and the shallowest section of the channel.

Accordingly, the maximum size of ships shall be less than 9 m in draft even though ships utilize the tidal range. On the other hand, ships calling at Yangon Port (Thilawa Terminal Area), which is located 16 km downstream, can reach its terminal without passing through the Monkey Point. Therefore, the draft restriction of ships calling to Yangon Port shall be increased to 10 m. Consequently, the maximum ship size can be increased to 20,000 DWT (container) and the handling capacity of the whole Yangon Port can be increased which eventually will contribute to the improvement of logistics productivity of the country as a whole.

8.3.5 Inland Water Transport Sub-sector

The following strategy and action plans are proposed in consideration of the present conditions and issues regarding the inland water transport sub-sector as shown in Chapter 7.

(1) Strategy of Inland Water Transport Sub-sector

Strategy-LIS-1	Enhancement of utilizing the inland waterway transport in main rivers

Although land transport and railways have been developed already, around one-third (1/3.) of the total cargo volume is carried by water transport because of its advantages in mass or heavy cargo transport, lower transport cost, small damage from vibration and so on. The condition of

the waterway transport network, which was developed during colonial time, has deteriorated, however many people use inland waterway transport still. As the inland waterway transport is substantially advantageous to the peoples residing along the rivers and major part of Myanmar is covered by major rivers.

Yangon, which is an international gateway of Myanmar, and Mandalay, which is currently the second most populated city in Myanmar, have important roles as logistics hubs. The route between Yangon to Mandalay is the main corridor for logistics including road, railway and water transport.

Currently, cargo volume has increased along with the rapid economic growth of Myanmar. The contents of cargo are not only agricultural products but also industrial commodities because industrial zones have been developed across the whole area of the country. Use of inland water transport is essential to handle these cargoes with low cost. However, there are issues regarding the current water transport such as efficiency, punctuality and promptness, as discussed in Chapter 6. It is necessary to address these issues to enhance the utilization of inland waterway transport.

The volumes of container cargo have increased rapidly at Yangon Port, which is mainly used for international trade (2012: around 420,000 TEUs and 2016: around 1,060,000 TEUs). At present most of the trade containers arriving at Yangon Port are de-vanned to transport the goods contained in the containers to the inland areas. This operation is one the factors pushing up the transport cost. If the containers arrived at Yangon Port are transported to the inland area under bonded cargo transport status without de-vanning operation, the cost can be reduced substantially. Furthermore, if the containers can be transferred directly from the container ship to the inland waterway transport vessels directly and transported to designated location in the inland area along the main river the transport cost will be reduced further. And if such trade containers can be transported to and from the industrial zones located at inland and along the main river from Yangon Port, the cost competitiveness of manufactured products will increase and the industrial development will be enhanced due to a substantial transport cost reduction by use of the inland waterway transport. However a safe and reliable inland waterway transport can only be attained by both an improvement of navigation channel and the river ports. Therefore, it is essential to develop the vessels, river ports and channel.

Strategy-LIS-2	**Development of sustainable transport networks**

Currently, the re-evaluation of the inland waterway transport has started mainly in Europe in consideration of the low emission of greenhouse gases and to relieve traffic congestions in urban areas, for example waterway logistics utilizing the Rhine River in Germany and the Yantse in China. It is important to carry out sustainable development of the environmentally

friendly transport network, utilizing existing infrastructure.

There is a concern that the measures for disaster and terrorism responses may be insufficient (the same as in other Asian countries) if the transport network depends only on the road network. Once infrastructure has been blocked, huge costs and much time will be required to reopen it. Thus, it is important to maintain existing infrastructure properly.

A large and heavy cargo that cannot be transported by truck and railway is better to be transported by the inland waterway and a dangerous cargoes such as petroleum products is better to be transported by the inland waterway to relieve risks for road traffic as well.

Strategy-LIS-3	**Sustainable utilization of waterway transport connecting villages along small rivers**

Myanmar is covered with an extensive inland waterway transport network. Coupled with the well-connected inland waterway transport network and the fertile land in the Ayeyarwaddy River Basin, the agricultural population ratio is high – approximately 60% of the total population lives around river basins. The inland waterway transport is an important transport mode, due to the less-developed local road network. Therefore, it is essential to maintain and to expand the utilization of the inland waterway transport, which has been mainly operated by IWT in these rural areas.

Small boats are used as a main transportation in the rural area where the other transportation network has not been developed. These many inland waterway transport vessels are made of wood, so they are aging quickly and their present fuel efficiency is quite low. Thus, it is effective to introduce FRP vessels, which have high durability and economic efficiency and is easy to maintain. It is expected that by shifting from wood to FRP vessels there will be a reduction of travel and transport costs.

Strategy-LIS-4	**Improvement of organization and law**

Until a few years ago, the water transport sector had been operating under law legislated during the time of British colonial rule. However, for the recent past years, the revision of the laws is progressing. In future, there will be a need for enactment of appropriate laws.

DMA organizes the registration and inspection of vessels, but their capacity and the outcome is substandard. Ship accidents happen frequent. Insurance system for the safe of inland waterway transport and for vessels is needed for safe cargo transport and passengers as well as crews.

Under the umbrella Ministry of Transport and Communications (MOTC), IWT is responsible for inland water transport, and DWIR is responsible for navigation channel development. Both organizations face with financial difficulties and management level is not sufficiently high.

The improvement to function as sound and sustainable organizations is needed.

The development of infrastructure for inland waterway transport and for the expected rapid development of other sectoral infrastructure requires government funds and, there is a need for investments by the domestic and foreign private sector. Therefore, transparency and improvements in the law related to investments by the private sector is important.

Strategy-LIS-5	Increase inland waterway transport efficiency

The inland waterway transport system along the major river system of Myanmar is possible to play an important role for the transportation of low-value and bulky cargoes as well as daily consumables for the rural areas along the river system. Furthermore, the inland waterway transport is environment friendly transport mode since the fuel consumption or emission volume of GHGs is comparatively low compared with other freight transport modes. However, at present the freight transport efficiency is quite low due to a lack of necessary infrastructure and appropriate vessels.

Since the infrastructure for the inland waterway transportation lack the transport efficiency remaining at low level or deteriorating further. The system has been falling into the vicious circle. The improvement and upgrading of channel, river port, cargo handling system, vessels, and fostering pilot and crews are needed to initiate the virtuous circle. The following actions are considered as needed to increase the transport efficiency of the inland waterway transport system.

(2) Action Needed

1) Port Development

(i) Yangon

The inland terminal, which is able to handle the container and heavy cargo such as steel products, is only Shwe Me terminal, although there are a lot of terminals for trade cargo in Yangon. Although the number of berthing container ships at Shwe Me terminal has been increasing but it is still small.

In future, it is expected that containerization be developed for inland waterway transport mainly between Yangon and Mandalay. Therefore, it is desired to construct an inland terminal able to handle containers. In that situation, problems may occur, as the space for cargo handling and container storage is insufficient, because Yangon main port is situated in an urban area. In Yangon, a relocation plan has already been developed to shift some parts of present operations to the Thilawa area. On the other hand, there is potential area that can be developed for berthing of inland water transport vessels or international container terminal.

(ii) Mandalay

Mandalay is located almost in the center of Myanmar and functions as a hub for inland waterway transport. The existing port at Mandalay is located inside the urban area (similar to Yangon) and difficult to handle containerized cargo at present due to a limited space and traffic congestion around the port. In future, the container traffic by the inland waterway transport will be realized mainly between Yangon and Mandalay. Therefore, it is necessary to construct a new port having sufficient space to handle the containers.

(iii) Ayeyarwaddy Division (Ayeyarwaddy Delta Area)

In Ayeyarwaddy Delta area, there is a demand for transport of rice to Yangon. At present the major transport is borne by road network since the rice milling process is mostly operated in and around Yangon. There is a plan to transfer the rice mills from Yangon to the Ayeyarwaddy Delta area in future.

The construction of rice mills has started already at Myeongmya. There is a demand of river ports that is possible to handle containers after rice milling operation will start in this area. It is expected that the transportation cost of milled rice can be reduced substantially by use of container which is transported to and from the international port directly by the inland waterway transport.

2) Other Areas

It is expected that container transport will be developed across Myanmar and efficient inland waterway transport will be realized. However, it is difficult to maintain over 300 river ports and develop new ports that can handle container cargos at the same time, due to budgetary limitations. The container transport demand at small local ports might not be high. It is required for such small local ports to upgrade the existing outdated port infrastructure such as wooden jetty bridges, narrow cargo handling spaces, etc., to ensure safety, and the other ports need to change from wooden bridge which is dangerous to handle cargo to pontoon type jetty to ensure the safety and efficiency of cargo handling.

Concrete Actions

- Improvement of port facilities aiming at increased transport efficiency of the inland waterway transport and to reduce the loads to the road traffic and environment.
- Expansion of the pontoon type port facility
- Securing of the cargo handling yards
- Securing of the depth of mooring basins
- Measures to promote modal shift (collaboration with other transport mode)
- Development of customs in local ports


Source: Study Team

Figure-8.3.31 Loading and Unloading by Manual Handling

3) Channel Development

In order to achieve stable and safe inland waterway transport throughout the year, it is required to expand the installation of navigation aids preferably at places where bend sections and shallow points are formed. It is also required to carry out regular inspection and maintenance of dredging and navigation aids for channel changes by soil discharge. Moreover, expansion of installation of beacons and navigation aids with signaling function should be carried out for night navigation and improvement of transportation efficiency. It is also considered to improve safety and efficiency navigation by providing necessary information collected by radar, AIS or VHF radio-phone and installing vessel traffic system (VTS) for navigation control.

Concrete Actions

- Securing of depth of channels
- Preparation of navigation charts and deployment of navigation aids
- Deployment of safety navigation aids during navigation at night

4) Vessel Development

The registered vessels for inland waterway transport total more than 40,000 vessels, however almost half of the vessels were constructed over 40 years ago and have already aged. Moreover, installation ratio of navigation equipment is extremely low. Resulting dangerous navigations since the navigation is dependent on the experience and judgment of ship operators. It is necessary to modernize vessels for achieving safe navigation under severe natural conditions, which includes a large fluctuation of water level between the rainy season and the dry season, and faster water flow velocity. In order to consider a new type of vessel, it is important to select the appropriate type of vessels for each navigation route and facility of port, such as 1) simple ships which are easy to construct, 2) FRP ships which have excellent durability, light weight and ease of repair, 3) barges for shallow water which can navigate even in the dry season, 4) landing craft, etc.

In the cargo transport department of IWT, they owned 75 self-propelled vessels and 137 non-self-propelled vessels in January 2014. These are mainly used for the transport of bulk and heavy cargoes. In order to improve the efficiency of transport, it is expected to introduce container ships in future.

Concrete Actions

- Shifting to FRP vessels from wooden boats (reduction of repair cost, better draft, less de-forestation)
- Replacement of aging vessels such as hulls, engines, propellers, corrosion protection system, etc. (improvement of fuel consumption, promptness, safety and efficiency, and reduction of failure risk and repair cost)
- Introduction of coastal vessels (such as in the Rakhine State, Tanintharyi Region, etc.)
- Expansion of speed passenger vessels
- Expansion of sightseeing vessels (for development of tourism)
- Development of special purpose vessels (such as for medicine, libraries, entertainment, etc.)
- Expansion of barges for containers and tugboats

Source: IWT

Figure-8.3.32 Barge and Tug Boats with Aging

5) Shipyard Development

To reduce dangerous operations due to inadequate maintenance and aging of vessels, it is required to improve the existing shipyards; construct new shipyards; carry out adequate maintenance and inspection of vessels; and install new facilities which is possible to build the new-type vessels. It is also important to ensure sufficient budget for maintenance of facilities and machinery even new facilities are provided. A new financial scheme is to be designed which may include a long-term agreement with the ship owners for maintenance of their vessels.

Source: Study Team

Figure-8.3.33 Eroded Vessels Waiting Maintenance

Concrete Actions

- Improvement of efficiency and productivity
- Provision of large-scale repair facilities and equipment
- Management of facilities, equipment and inventory of consumables
- Shifting ship building and maintenance works to FRP vessels
- Higher revenues by diversified management (such as real estate development)

6) Human Resource Development

The government agencies, universities, shipyards, private organizations are expecting strong support from Japanese ODA regarding 1) tangible elements such as facilities, equipment, machines and teaching books for the human resource development, and 2) intangible element such as instructor, education system, and so on. However, there is no clear goal for human resource development, no clear method for achieving the goal, and no clear training plan of each short-term, mid-term and long-term although IWT has a short-term training for each department.

Therefore, projects for human resource development should be created by discussing with Myanmar officials and Japanese officials, then a comprehensive program regarding human resource development in consideration of the importance and priority will be initially developed. It is necessary to consider the budgetary limitation such as construction of facilities and equipment required for ability development training. In particular, the improvement of safety and efficiency of operation, which has a large room for improvement, and the reduction of operating costs are desirable to work on a priority basis.

Concrete Actions

- Improvement of Universities (MMU, MMMC, etc.) and other educational institutions
- Capacity building of crew
- Change in awareness of crew
- Capacity building of shipyard staff
- Capacity building regarding marketing
- Capacity building regarding operating control
- Capacity building regarding river port development, operation and management
- Capacity building regarding conservation of riverbanks and maintenance of channels
- Capacity building regarding flood control, and water resources

7) Development of Legal System (Clarification, Transparency and Improvement)

The relevant laws of inland waterways in Myanmar are as follows;

(i) The Inland Steam Vessels Act, 1917
(ii) The Obstruction in Fairways Act, 1881

(iii) The Defile Traffic Act, 1907
(iv) Nationalization of Rakhine Water Transportation Act, 1948
(v) Inland Water Transportation Act,1952, and
(vi) Nationalization of Rakhine Water Transportation Act, 1953

The legislation of laws has been done in the past 60 to more than 100 years, and various amendments were made. Then, it is desired to seek support from Japan including the English translation of the laws.

The IWT, a public corporation, has caused significant financial losses due to soaring fuel and labor costs in the past. However the situation has improved because of increased tariff since 2012. However, the inland waterway transport sub-sector has been suffering from a chronic shortage of budget at present. Improvement of financial return, renewal of asses and development of human resources may possibly done by ensuring the long-term transport contracts with the cosigners and other with appropriate financial schemes.

Concrete Actions

- Policy support such as tax exemptions since the effect to the economy by transporting goods in rural areas at the lowest possible transport charge
- Enhance foreign investment to this sub-sector
- Improvement of navigation channels and aid
- Inspection of vessels
- Tariffs and tolls for navigation, berthing and mooring
- Registration of vessels (classification registration)
- Prescribed penalties regarding mendacious reports by private companies, such as cargo volumes
- Certification system for crew and engineers

8) Statistics Development

The Government of Myanmar has begun to establish a statistical system and to introduce the electronic data recording system instead of handwriting records. In addition to the establishment of these effective management systems, proper operation of the collected statistic data will be necessary.

It is expected that effective planning of future development and proper budgetary measures will realize based on the current state analysis and

Source: DWIR

Figure-8.3.34 Sample of Statistical Data (Handwritten)

future forecast such as the cargo volumes, number of passengers, etc.

Concrete Actions

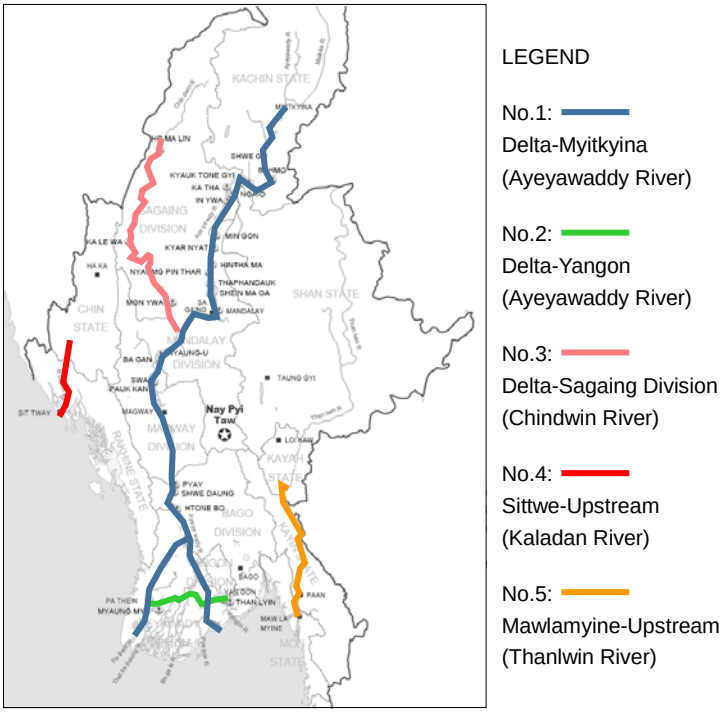
- Digitization of statistics
- Recording, managing and reporting for accurate and leak-free statistics
- Publication of documents

9) Development Plan

Although the masterplan has been formulated for the road and railway sectors in Myanmar, there is no masterplan for the inland waterway transport sector. Besides, the budget of DWIR, which plays a role in the maintenance and management of navigation channels, such as dredging, is limited. Thus, the masterplan for inland waterway transport should be formulated to make more efficient use of this budget.

Concrete Actions

- National Inland Waterway Master Plan Study
- Designation of National Inland Waterway for the systematic development



Source: Study Team

Figure-8.3.35 Location of Each National Inland Waterway (tentative)

8.3.6 Aviation Sub-sector

(1) Strategy of Aviation Sub-sector

The strategies of the aviation sub-sector are evaluated below:

Strategy-LAS-1	Strengthening international air cargo facilities

With the potential for future cargo movements, Yangon International Airport (YIA), Mandalay International Airport (MIA), Nay Pyi Taw International Airport (NYT) and the proposed Hanthawaddy International Airport (HIA) are the primary targeted airports for strengthening air cargo facilities after discussion with the Department of Civil Aviation (DCA). YIA is currently the only airport with an air cargo facility installed. Therefore, strengthening and improvement of the international air cargo facilities are urgently necessary. For this purpose, YIA has now started a project to improve the international air cargo facility under a private airport operator, Yangon Aerodrome Company Limited (YACL). MIA is also considering to constructing cargo facility under MC Jalux Airport Services Co., Ltd. (MJAS).

1) Yangon Metropolitan Area

YIA is the only international gateway and domestic hub airport in the Yangon Metropolitan Area, located near the center of Yangon urban area. YIA's import cargo warehouse was old and narrow, but in November 2016, YACL developed an import cargo warehouse. The export cargo warehouse, managed by Mingaladon Cargo Services Public Co., Ltd. (MCS) since 2012, has currently enough space for cargo handling activities. Therefore, YIA's capacity for air cargo has enough space. However, current cargo operations are manual operation and randomly piled up cargo items are located inside the warehouse. Also, access to the cargo warehouse is far from the aircraft parking apron, due to an opposite location and one cannot be constructed in the front, due to lack of space at the airport.

However, after the opening of HIA in future, around year 2023, HIA will be the hub airport for international passengers as well as for cargoes in the Yangon Metropolitan Area. YIA will shift mainly to domestic flight airport based on the National Aviation Strategic Plan of DCA. Therefore, resolutions of those issues such as manual operations and poor accessibility of YIA are dealt with at HIA as a new cargo facility with modern airfreight characteristics. It is expected to increase international cargo activities such as high value goods for export and for import of related parts and components of the manufacturers at the Thilawa Special Economic Zone (SEZ) and at Bago IZ.

2) Mandalay International Airport (MIA)

Mandalay is the second largest city in Myanmar, which is located in the center of the country, with potential of cargo activities for nearby highland areas such as perishable products (i.e. fruits and vegetables) and horticultural products such as flowers in the future. Moreover, MIA is a designated cargo hub airport by DCA and MJAS therefore it must respond to the expectations of DCA, even by means of concession agreements with private sector for the operation and maintenance of cargo handling facility. MIA is currently planning to construct a cargo facility near the passenger terminal area under its own budget.

According to the interview with the forwarding company, the cold chain system has not been completed for the export products by air at YIA yet. Under such situation, it is necessary to furnish the refrigerated store and start its operation as early as possible.

All international airports at present are operated and managed by private investors under concession agreements, thus the investment to furnish or expand the air cargo handling facilities and equipment are totally at the discretion of investors. Japanese private company involves with the operation and management of both HIA and MIA, which is able to provide the advanced facilities and management skills for airfreight service.

Strategy-LAS-2	Strengthening domestic air cargo facilities

Heho Airport, Nyaung U (Bagan) Airport, Kyaukpyu Airport, Sittwe Airport, Tachileik Airport, Dawei Airport, Myeik Airport, and Kawthaung Airport are designated as priority domestic airports for air cargo facilities by the DCA. These airports now serve frequent flights for domestic passengers.

The provision of air cargo handling facilities at these airports could lead to the development of local industries including agro-processing and farming of highly valued products such as horticultural products, i.e., flowers, fruits, and vegetables; and catching or culturing of high value marine products, i.e., fresh crabs, lobsters, abalones, sea cucumbers, etc., that have great demand in regional, as well as international markets.

Local airports located in areas endowed with valuable natural, historical, or cultural tourism resources may promote rapid tourism development and secure transport capability of cargoes by providing air cargo handling facilities. The larger the volume of passenger including tourist arrivals by air, the larger aircrafts with larger cargo compartment will be deployed. Transshipping export cargoes immediately to international flights arriving from other local airports will allow transport of goods to the world market or major cities of the world such as Schiphol of Amsterdam which is a regional hub airport in EU within 24 hours.

Strategy-LAS-3	Enhance aviation safety and security

DCA has carried out measures to improve the airport facilities and equipment to meet the standards and requirements of the International Civil Aviation Organization (ICAO) for 29 airports operated by DCA. Currently YACL is constructing a new cargo facility and extension (new shed) due to inadequate operation of existing facilities. However, new cargo facilities will change the process system such as use of new equipment such as forklift, X-ray scanning machine and other essential handling equipment. YACL is trying to enhance cargo safety awareness as well as effective and efficient cargo handling management.

Unfortunately, airport facilities and equipment of other airports were not improved properly in recent years. Basic airport facilities such as runways, taxiways, and apron are fundamental for safety operation for passengers and cargo services. Furthermore, aviation security is currently a critical issue worldwide. Therefore, it is urgently required to enhance aviation safety, provide security facilities, and necessary equipment not only at the international airports but also at the major domestic airports.

8.3.7 Logistics Sub-sector

In under-developed countries, it is observed that production/consumption activities have gradually shifted from product-push economy to demand-pull economy. For example, e-commerce such as Amazon will connect manufacturing and consumers directly. It is confirmed that some entrepreneurs are eager to provide such services in Myanmar.

In order to respond to such demand, logistics plays an important role even in entrepreneurs business. This shift requires a change of doing business by logistics providers, from large quantity/one time delivery to provide frequent/small quantity deliveries. In addition, inventory management is a critical task to be realized. Logistics providers in developed countries have been making efforts to provide accurate and cost-effective inventory operations for handling a large variety of small lot commodities, whilst achieving cost reductions. Principally, from small lots to a large variety of lots, cargo handling is likely to result in high operational costs, as well as frequent extra/dead stocks.

In this context, it is important for logistics providers to implement efficient inventory management while keeping operational costs low, as well as to avoid excess stock and opportunity losses.

Following inventory-oriented services, transport is another important service menu. Logistics hubs (centers) connecting the trunk line with distribution network firmly leads to providing “Just in Time (JIT)” delivery by small-medium sized trucks. This is because the road situation is insufficient for large sized trucks, except on the primary roads in Myanmar. In this context,

logistics facilities should consider effective inventory functions, collaborating with a facilitated transport system. Good collaboration of transport system and inventory management is a key issue.

(1) Strategy for Logistics Sub-sector

Strategy-LLS-1	**Improvement of truck terminals at major cities throughout Myanmar**

The truck terminal is considered as a transport node mainly for domestic cargoes. At present, truck terminals in Myanmar are obsolete and old fashioned and cannot match the demand for services, in terms of both quantity and quality of services. Congestion at truck terminals causes unnecessary layover-time of trucks and cargoes to be transported, which increases the costs of transport.

Strategy-LLS-2	**Improvement and modernization of the logistics service level**

The current principal theory adopted by the local logistics companies including trucking companies seems “product out” but not “market in”. In a market-oriented economic system, a fair and proper competition among producers, farmers, manufacturers, transport service companies alike is essential to upgrade the quality level of services not only to deal with international / trade cargoes but also to handle domestic / local cargo transport and delivery. A function of warehouses needs to be incorporated into the logistics system to ensure the spirit of Just-in-Time logistics.

Strategy-LLS-3	**Enhance containerization and palletization**

Containers are intensively used for both international and domestic cargoes aimed at reducing transport / cargo handling costs, speeding cargo handling through use of cargo handling machines, protecting cargoes from rain during transport, and use of containers as a temporary storage facility for products, especially in rural areas where no modern storage facilities exist. However, the use of container for freight transportation in Myanmar is rather restricted to the trade cargo transport linking between the international port and the industrial zones since the containers used for transport of goods are owned by the shipping companies but not the local logistics service providers.

The railway freight system is planned to be drastically changed from conventional freight train that is operated on ad hoc basis to regular freight train operation using the container block trains. In such a case the container block train will carry both international containers and domestic containers if the domestic containers will be used widely by the shippers or logistics service providers.

However, there should be some organizations / entities that own or lease the containers that can be used for the transportation of domestic freight traffic. At present, there are neither domestic owners of container in a big volume nor manufacturers of container for domestic freight transport.

If the pallet[3] is used for freight transport, the cargo handling efficiency will be increased instead of using manual labor for loading / unloading the cargo totally. However, the pallet needs to be standardized so that the circulation of pallet between senders and receivers can be done easily. The circulation system of pallets has not been developed and tested yet in Myanmar. Therefore, the study and pilot project are needed for the use of pallet prior to the implementation of containerization as well as palletization movement.

Strategy-LLS-4	Develop the logistics system effective for Myanmar

The logistics system should be designed as a practicable system taking into account local conditions, such as weak linkages in the international road network, poor road conditions in rural areas which are often inundated during the rainy season, truck driving regulations, transport safety measures, demand for container transport that will increase rapidly in future. The railway network is well developed and the inland waterway transport system is conventional means of transporting goods and passengers in Myanmar. These existing transport infrastructure and systems are to be fully utilized by improvement and enhancement to increase their transport efficiency.

Strategy-LLS-5	Increase load factor of transport means by enhancement of sharing the logistics data and information

The average load factor[2] of trucks, inland waterway transport, and coastal shipping is quite low especially in rural areas. The load factor of trucks plying between Yangon and Mandalay is relatively high. However, the trucks are forced to stay at the truck terminal for almost 36 hours per one trip or half of the truck turnaround time of one trip. If the truck dwell time is shortened from 36 hours to 6 hours or so and the load factor increased to 1.0 the freight transport cost by long distance trucking can be reduced to half of its current level. One of the reasons of comparatively higher transport cost in Myanmar is this quite low loading factor or low transport efficiency of trucking operation.

The load factor can be increased by arrangement of return cargo for long hauling trucks prior to the departure of truck from origin point. This can be made possible by sharing of logistics information by the party that wants to ask a trucking company to transport goods and the

[2] Load factor: Ratio of loaded cargo against total pay load capacity of truck, vessel, etc. If load factor is 1.0 the truck is loaded fully for both outward and return trip.
[3] Pallet: Tool often made of wooden plate or plastic plate for easy handling of cargoes by use of forklift

trucking company that wants to secure return cargo. If there is a specialized company (logistics service provider) who operates such cargo / truck matching system, the average load factor of trucking can be increased without much investment. Such system will be possibly applicable for other transport modes.

Strategy-LLS-6	Meeting with ever increasing freight volume by expansion of fleets

Truck Fleet: At present, the number of heavy trucks that can carry more than 10 tonnes of cargo is around 120,000 units in Myanmar. However, if the cargo demand will increase for trucking as projected according to the cargo demand forecast, the number of trucks to be added by 2030 on current truck fleet will be around 200,000 units.

Inland Waterway Transport Vessel Fleet: Similarly the number of inland waterway transport vessels to be added by 2030 on current inland waterway transport fleet is estimated to be around 2,000 (1,000 DWT class)

Coastal Fleet: 1,000 coastal shipping vessels will be needed.

In parallel with the improvement, upgrading and development of relevant infrastructures (roads, railways, inland waterways, ports, airports, and logistics parks), it is necessary to expand the freight transport fleets of various transport modes, which will require a huge amount of investment.

Most of the truck owners / operators, inland waterway transport vessel owners / operators, and coastal shipping vessel owners / operators are SMEs. The commercial bank loan conditions are harsh and not easily accepted by the SMEs. Institutional financial system for SMEs needs to be reinforced and designed to meet with the requirement of the SMEs in the logistics sector.

The logistics sector should become a foundation of modern economic and industrial development, thereby creating job opportunities indirectly. However, the logistics sector itself requires vast numbers of skilled workers, including truck drivers, logistics service providers, forwarders, custom processing operators, thus creating direct job opportunities. Most companies engaged in transport services fall under the category of SME. The financial capability of SMEs to acquire new trucks, vessels or cargo handling equipment or warehouses to replace old fleet, equipment and facilities is limited. The institutional financial system designed for the development of SMEs in the logistics sector is, therefore, essential.

Strategy-LLS-7	Develop multi-modal logistics hubs at strategic locations

All of the strategies presented above can be demonstrated by the logistics center concept composed of warehouses, freight stations, cargo terminals, management offices, customs offices, etc. The logistics center takes various forms such as truck terminal, inland container depot (ICD) especially related to the railway container transport system, logistics park, etc. The logistics center can be considered as a core facility forming the multimodal freight logistics hubs (MMH) and such MMH is to be developed at major and strategic freight transport nodes. The freight transport nodes take various forms as well, such as gateway node, intersection node, industrial node, commercial node, etc.

1) Functions of Logistics Centers

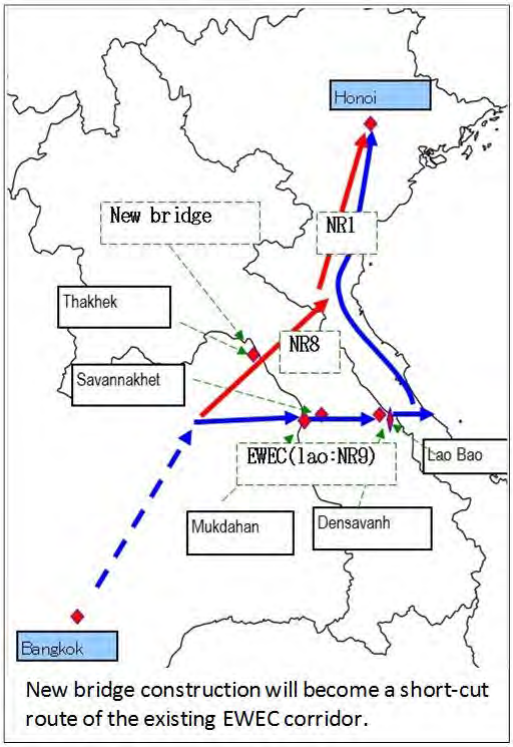
(i) Modal change

Eight ICDs have been proposed by MR. Modal change facilities from road freight transport to railway freight transport need to be developed to ease the burden on road traffic. However, transshipment cost is a critical issue for intermodal transport. In this context, containerization is a very important process to ease transshipment operations, but currently transshipment is done on a manual basis for connecting different transport modes. Current efficiency is unfortunately very low.

(ii) International/domestic linkages

Normally ports and inland depots play an important role in cargo status i.e. changing international cargo to domestic cargo. Insufficient transit (bonded cargo) transport systems significantly hinder the role of inland depots; because there is a principle that cargo clearance should be conducted at the entry points of a country. Especially, land border crossings have a high potential in Myanmar. Currently, border transport between Myanmar and China; and Myanmar and Thailand has been growing. However, transshipment operations at the cross-border points of both Myanmar / China, and Myanmar / Thailand lag far behind international standards.

There are possibilities to seek another destination such as India and its shortcut route. Taking a look at the example of Vietnam (Hanoi) and the Thailand (Bangkok) route, the EWEC (East West Economic Corridor) has been used, as shown in **Figure-8.3.36**. After the new bridge construction is completed at Thakhek, experts focused on the feasibility of whether the new route could provide a shorter transit service. In the case of Myawaddy route, the three-pagoda pass route is regarded as short-cut route, connecting Yangon and Bangkok.



Source: Study Team

Figure-8.3.36 Shortcut Potentiality for Bangkok/Hanoi route

(iii) Domestic terminals

Currently, domestic terminals are not efficiently operated in Myanmar, loading and unloading operations totally depend on manual process at truck terminals and railway terminals. This requires long transit times and hinders quick vehicle turn-around time. Obviously, a shorter truck turnaround operation provides cost reductions and speedier delivery. In order to do this, it is necessary to promote palletization and mechanical operation systems by forklift. It may be worth to consider using the cage type pallet (rolling box) with casters at its bottom which can be moved manually as shown in the illustration below. This type of caster may be efficient to the location where the forklifts are not available.

Image of cage (Rolling box)	Image of use
	Labor can move a lot of cargo with the help of casters.  Caster

Source: Study Team

The rolling casters can be carried inside a container or loaded onto truck by use of dock leveler as shown in below photos.

Truck berths with sufficient height for forklift operations	Dock leveler, which aims to match existing truck heights and the truck berth
	

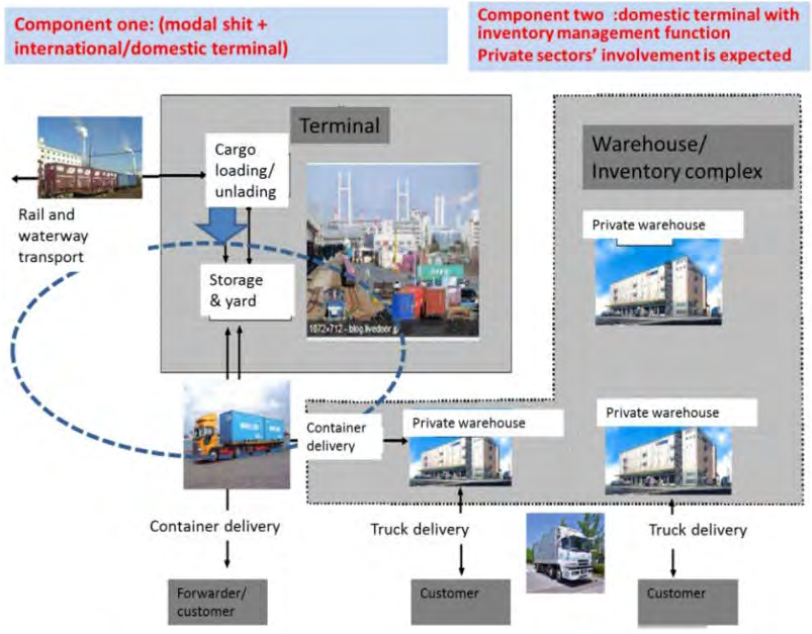
Source: Study Team

Avoiding lengthy waiting time is a critical factor in logistics systems performance.

(iv) Modernization of logistics services

In addition, inventory management facilities become necessary through combination of JIT delivery systems. Collaboration with terminal and warehouse functions can provide a comprehensive service. The terminal and warehouse functions are presented in **Figure-8.3.37.**

In particular, this component of logistics centers focuses on inventory management operation, so that users are not limited to only logistics providers, but also retailers, wholesalers or other parties. In this context, the private investment for development of such function is more feasible.



Source: Study Team

Figure-8.3.37 Image of Logistics Center

In order to grow these logistics functions, improved procedures are needed. Transit system development will be an important issue, as well as supporting import/export procedure facilitation through MACCS installation. In particular, cross-border procedure facilitation is essential for Myanmar and the ASEAN region, where the most important border posts are located. Since ASEAN is now eager to facilitate border procedures, the Southeast of Myanmar namely Myawaddy and Three Pagoda Pass needs to catch up with ASEAN standards to meet the demand for facilitated border cargo movements.

In order to develop inland depots, transit procedures need to be developed to facilitate the movement of goods. Without this, inland depot services would be limited and users could not benefit from inland depots. Congestion at gateways would also remain the same.

8.4 Logistics Corridor Development Strategy

(1) Definition of Logistics Corridor

When the transport or logistics development plan is to be formulated on a long-term basis, how to attain the optimum investment efficiency, and effectiveness of investment should be the primary concern of planner. To attain the best outcome for investment, the links connecting transport nodes need to be selected and prioritized according to the volume of demand and connect such links to build up network structure where such network is needed. Such nodes are industrial / commercial nodes, border nodes along the border, gateway nodes (sea ports, airports) and / or interchange nodes. Among such transport links forming a network of links and considered important from a strategic viewpoint in terms of cargo traffic volume and potential location, forming a foundation for economic development can be referred to as “Logistics Corridors”. The strategy aims at economic development on and along such corridors, through development of various infrastructures defined as a Corridor Development Strategy. However, not all transport links will be targets of the corridor development strategy; links that comply with a number of the following conditions to satisfy large cargo volumes in the most effective manner can only be referred to as “National Logistics Corridors”. In an international terminology, transport links that can be defined as the Logistics Corridor should meet the following conditions, that:

- Form an important and major cargo transport axis;
- There is a large volume of international freight flow;
- Is suitable for provision of transport infrastructure and services for various modes of transport along a strategically selected transport link i.e. a road, a railway, inland waterway, airport, pipeline, power transmission line, telecommunication line, etc. and
- Is linked with major terminals and transport nodes.

(2) Evolution of Transport Corridors to Economic Corridors

The level of corridor by function can be classified as shown in **Table-8.4.1.** This clarification of level enables policymakers to better understand the functional level of a corridor and to determine what should be priorities in terms of development. The objective is to reach Level-4, which is a full-fledged economic corridor. The goal of the logistics development of Myanmar at present is to upgrade relevant transport corridors to the Logistics Corridor or Level-3 of the corridor development level.

Table-8.4.1 Classification of Corridor by Level

Stage	Range of Function	Definition
Level-1	Transport Corridor	Corridor that physically links an area of a region
Level-2	Multimodal Transport Corridor	Corridor that physically links an area or region through the integration of various modes of transport.
Level-3	Logistics Corridor	Corridor that not only physically links an area or a region but also harmonizes the corridor institutional framework to facilitate the efficient movement and storage of freight, people and related information.
Level-4	Economic Corridor	Corridor that is able to attract investment and generate economic activities along the less developed areas or regions. Physical linkages and logistics facilitation must be in place in the corridor as a prerequisite.

Source: Study Team with reference of report on GMS Logistics Corridor prepared by Dr. Ruth Banomyong of Thammasat University, Thailand

(3) Development of Transport Nodes as the Logistics Nodes

The NTMP suggests adopting a Transit-Oriented-Development (TOD) strategy although there are not identified projects clearly designed, based on the TOD strategy. TOD strategy is the term used often in the urban transport development plan to enhance and reinforce transport performance, in coordination of public transport and private transport, as well as real estate development by the private sector guided by the concerned transport administration or local government. The strategic development of transport nodes is essential to upgrade or to transform a transport corridor to a logistics corridor. There are several kinds of transport nodes where public investments that would induce private sector investments in the logistics services are guided, such as follows:

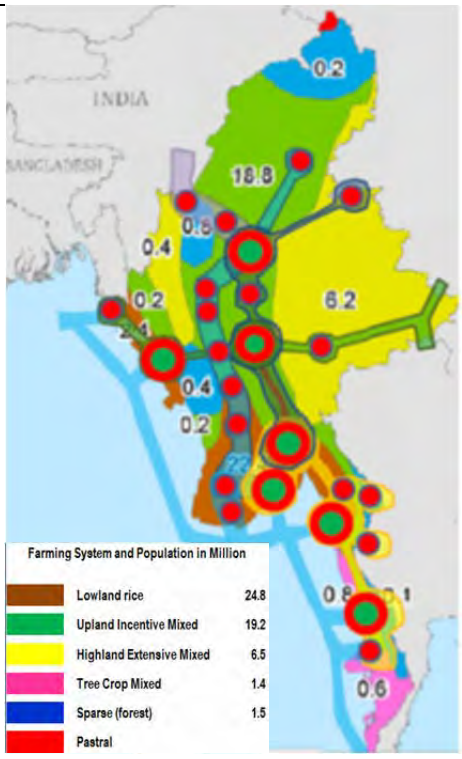
1) Multimodal nodes (where roads, railways, airports and / or sea and river ports are situated).
2) Commercial nodes (major cities, industrial zones, etc.);
3) Border nodes (border crossing points on the national borders, etc.);
4) Gateway nodes (seaports, airports); and
5) Intersection nodes (intersection of highways, where many links cross each other, etc.)

Such transport nodes need to be developed or upgraded to be logistics nodes in a strategic manner guided by the transport administration, aimed at enhancement of public and private

investment relating to logistics services; such as customs facilities, warehouses, logistics parks, truck terminals, etc.

(4) Development of Transport Nodes as the Logistics Nodes

Based on the Vision and the logistics development strategy, as well as the development approach discussed in preceding sections, the logistics development corridors (taking into account of transport corridor plans and the cargo flow patterns projected in Chapter-6 Cargo Demand Forecast), logistics corridors are defined as described below. The transport links were defined from current and future cargo O-D patterns and the spatial development plan prepared, as illustrated in **Figure-8.4.1**. For details of the logistics corridor development, refer to Chapter 9.



Source: Agricultural Map: Strategic Agriculture Sector and Food Security Diagnosis for Myanmar, USAID and Industrial Map is prepared based on NCDP, and others.

Figure-8.4.1 Spatial Development Plan

Source: Study Team

Figure-8.4.2 Logistics Corridor