

CHAPTER 5

A Study on Economic Corridors and Industrial Zones, Ports and Metropolitan and Alternative Roads in Myanmar

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CHAPTER 5

A STUDY ON ECONOMIC CORRIDORS AND INDUSTRIAL ZONES, PORTS, AND METROPOLITAN AND ALTERNATIVE ROADS IN MYANMAR

Myinmo Zaw and Toshihiro Kudo

INTRODUCTION

Myanmar, a country in Southeast Asia, borders India, Bangladesh, China, Laos, and Thailand, serving as a crucial trading hub for the region. This country with a thriving population of more than 55 million people is ripe for investment and exponential economic growth within the next decade. Myanmar is a country rich in natural resources such as precious gems, priceless jade, natural gas, petroleum, copper, nickel, tin, gold, silver, zinc, and a host of other raw materials. Myanmar is also rich in terms of agriculture and fishery resources and has a high volume of annual exports from these two industries. In modern times, the Republic of the Union of Myanmar has become a crucial component in the East-West Economic Corridor, ASEAN's economic development, and the provision of a regional commerce link between China, India, and Southeast Asia.

A survey was conducted in the major cities of Myanmar such as Yangon, Mandalay, Mawlamyine, and Dawei to collect various data on industrial zones, ports and harbors, airports, roads, railways, and other development projects. Among the

selected cities, Yangon and Mandalay are metropolitan areas while Mawlamyine was the third-largest city and the projected end of the East-West Economic Corridor, and Dawei is assumed to be a new extension of the Southern Economic Corridor. This paper will discuss the current situation, the possibilities of a development plan, and the advantages and disadvantages of industrial zones and transportation linkages.

Yangon, formerly the political capital up to 2005, continues to be the country's commercial and logistics hub for international trade. It has the highest concentration of industrial production facilities in Myanmar. Yangon also has the largest metropolitan population, and therefore the biggest number of public transport facilities in the country. The ports and harbors in the Yangon area facilitate almost the entire international overseas container and cargo trade. The majority of the country's production facilities are located within the Yangon region due to the establishment of 23 industrial zones. Although the industrial zones lack one-stop service and adequate utilities, infrastructure and management, it is still considered an advantage for companies to invest in the zones if they want to manufacture goods which will be consumed by the general Myanmar population or want to take advantage of the cheap labor for export-oriented production.

Mandalay, the ancient capital, is situated geographically in the middle of the country. It is the second-largest city in Myanmar and is located in the Mandalay Division, which has the largest population of all divisions. Although there are some small and medium-size industrial enterprises located in the Mandalay Industrial Zone, and in the surrounding area, the majority of the people in the Mandalay Division derive their livelihood from agriculture and commerce (via inland waterways or overland trucking routes). Mandalay is located in the designated dry zone region, due to the low

levels of annual rainfall as well as the fact that beans, pulses, and cotton are the main crops which thrive in the area. The major highway connecting the China-Myanmar border to Mandalay and onward to Yangon serves as the primary artery for trade and commerce. Along this busy commercial route, raw materials such as rubber and ore and agriculture products are exported while manufactured goods and finished products are imported.

Mawlamyaine, a midway point between the southern coastal cities of Myanmar and the main city of Yangon, used to be an important trading hub. The small docks and jetties located along the city's coastline were used to transport bulk goods along the many rivers and waterways connecting Mawlamyaine to Yangon or into the heartland. Railroads and commercial trucking roads from Myeik and Dawei pass through Mawlamyaine and link up with Yangon as well. The importance of the city is due to the Greater Mekong Subregion program's designation of Mawlamyaine as the entry and exit point of the western end of the East-West Economic Corridor. This crucial trading and commerce corridor links Thailand, Myanmar, Vietnam, and Laos. The road linking Myanmar and Thailand via the Friendship Bridge, between Myawaddy and Mae Sot, has been used for commerce, which provided a major source of revenue for traders and merchants in Mawlamyaine. Due to the development of new roadways and trading networks that circumvent Mawlamyaine, the city has lost most of its revenue and importance as a commercial hub within the past decade. Although there is a small industrial zone located a few kilometers from the city, the industrial capacity is insufficient and meager at best. Recent developments in roads, bridges, and commercial routes have rendered this trading city obsolete and researchers must now consider Yangon as the entry and exit point of the East-West Economic Corridor.

Dawei, an important trading port city during the colonial times, has become less important in the modern era due to the advent of commercial shipping and commercial highways. This city located in the Taninthary Division serves as a city center and small commercial hub for goods from Thailand passing through from Ranong and other Thai border towns. Currently the rubber processing, planting, harvesting, and palm oil industries are the primary industries in the area but future economic prospects for Dawei are highly positive. The Italian-Thai Development Public Company Limited's proposed deep-sea port and special economic zone project, initiated in 2008, is the key factor to Dawei's future prosperity. The project will fully utilize Dawei's potential to become a highly developed international container port and manufacturing facility, enriching both the Thai and Myanmar economies as well as creating revenue for international investors. There is much debate over the cost and feasibility of this project but optimists view it as a way to extend the Southern Economic Corridor from Bangkok to Dawei and create a base of operations where companies and governments can invest, resulting in exponential commercial growth in the region.

Industrial zones were implemented by authorities in the 1990s to create a designated area for manufacturing facilities and a base of operations for investors in and around the major cities in Myanmar. Initially there were only a few locations around the Yangon City area due to the developed transportation networks, roads, and port infrastructure. Gradually, over the decades, more than 23 industrial zones have been created in Yangon alone. There are 18 other industrial zones in the country in cities such as Mandalay, Meikhtila, Monywa, Pakokku, Myaung Mya, Mawlamyaine, Myeik, Bago, and Pyay. The crucial issues faced by investors that chose to locate factories in these zones are the lack of one-stop service, special economic/tax treatment

and an effective zone management authority, and the problems with power shortages, water supply, water treatment, road infrastructure, and export/import processes. With development of special economic zone policies and a focus on development of zone infrastructure and management, Myanmar could potentially become a highly attractive market for international investment.

1. DIFFERENT FUNCTIONS AND CHARACTERISTICS OF MAJOR CITIES

1.1. Yangon

Yangon was the capital of Myanmar until 2005 and it remains the country's most populated business city. The largest urban center known as the Greater Yangon metropolitan area is situated in the Yangon Division that forms four districts and 45 townships. The city plays a vital role in the country's economy due to its overseas trading ports and existence as the largest manufacturing and trading center. The GDP of the Yangon Division in 2009-2010 (at 2005-2006 constant price) was kyat 3,855 billion, or 20.4% of the country's economy. A total of 33 townships out of the 45 townships in the Yangon Division are under the Yangon City municipal area and administered by the Yangon City Development Committee. There are 33 townships, 735 wards, and 3,666 roads and streets in Yangon City. The city has the largest port, handling about 90% of Myanmar's overseas trade (if we exclude the natural gas exports to Thailand by pipeline). Most of the labor-intensive export-oriented industries such as garments and footwear are located in the city area.

After opening up to the outside commercial world through more than 20 years of the market economy policy, Yangon has experienced the rapid growth of private businesses soaring in number by about 10 times since 1988. More service-oriented businesses have emerged in Yangon, where previously there had been only trade-based ones. Yangon businesses rely heavily on the local market, which is growing larger year by year. Most businesses focus mainly on the Yangon market, which is the largest consumer market of Myanmar with more than 5 million people and high affordability.

However, the production sector still has room to expand, even though many industrial zones have already been developed and established. Most of the locally produced products are still inconsistent in quality, and as such efforts should be made to push toward quality production for integration in the international market. If production, trading, and services are more balanced with better distribution networks and less curtailing factors, there would be an upswing in future Yangon business.

1.1.1. Yangon City Transport

The estimated population of Yangon City and its surrounding suburban areas is more than 5 million people, of which 2.2 million commuters rely on passenger buses as a means of transportation. There are 4,108 passenger buses in 217 transportation lines providing services to Yangon City dwellers (Table 1).

In Yangon, the number of vehicles has reached 250,000, or 60% of the total vehicles of Myanmar. The city has 254,797 passenger cars, 61,132 trucks, 19,807 buses, and 62,585 other types of vehicles, totaling 398,320. Even though there are 1.7 million motorcycles in Myanmar, motorcycles are not allowed to ride in Yangon City. Although the number of vehicles has increased, some of the roads are not wide enough

to accommodate the sudden influx of vehicles. Most of the roads are 40 feet to 70 feet wide. Passenger busses take up one lane of the road, and the remaining 13-feet-wide road area is left for other vehicles, and this causes frequent traffic jams. The traffic jams usually occur at the main commercial downtown areas and at the roads where most of the passenger buses travel. Many privately owned vehicles block road lanes in front of the education facilities (schools, private learning centers) and near specialist clinics.

Table 1: Number of Buses and Passengers in Yangon City in September 2010

No.	Particular	No of transportation line	Types of Motor Vehicles			Total	Total passengers a month	Total passengers a day
			City Bus	Mini Bus	Others			
1.	Buses Control Committee (Inter- City)	142	1,317	173	706	2,539	56,965,855	1,898,862
2.	Than Myan Thu	17	56	11	473	540	3,202,430	106,748
3.	Ban Dula	21	473	-		473	4,573,075	152,436
4.	Shwe Yangon	28	93	20	228	346	1,904,300	63,477
5.	Shwe Eae Thae	2	80			80	397,620	13,254
6.	Myanmar War Veteran Association	1	-		55	55	96,296	3,210
7.	Shwe Inn Wa	4	49		0	49	537,200	17,907
8.	City Development Committee	1	20		0	20	39,600	1,320
9.	GEC	1	-		6	6	6,165	206
	Total	217	2,088	204	1,468	4,108	67,722,541	2,257,418

Source: Central Buses Control Committee, Yangon.

1.1.2. Yangon Port

Trading began developing as soon as the country started practicing a market-oriented economic system. Since Yangon is a busy river port, it has terminals, wharves, and berths that total 21 facilities, including container terminals (Table 2) and general cargo ports (Table 3). Seagoing vessels can dock at four main terminals and four wharves. These include Myanmar International Terminal Thilawa (MITT), which is an investment of Hong Kong-based Hutchison Port Holding Company; Bo Aung Kyaw Wharves (BSW) of Lann Pyi Marine Co. Ltd under Union of Myanmar Economic Holding; Asia World Port Terminal of Asia World Co. Ltd (a local private company); Myanmar Industrial Port Wharves under an Egyptian investment named Myanmar Integrated Port Ltd (MIPL); and Sule Pagoda Wharves (Myanmar Port Authority). There are two coastal jetties in

Table 2: Port Facilities with Container Handling in Yangon

No.	Name of Wharves	Length (m)	Apron Width (m)	Storage Area		Owner	Remarks	Container Capacity (TEU)
				Yard (m ²)	Shed (m ²)			
1.	Ahlone Wharves							1,000
	No.1	198	30.5	43,630	2,675.5	AWPT	Container & G.C	
	No.2	156	19.5	3,483	1,895.0	AWPT	Container & G.C	
	No.3	260	30.5	7,928	1,859.0	AWPT	Container & G.C	
2.	Myanmar Industrial Port	310	18.0	102,385	6,140.0	MIP	Container & G.C	300
3.	Bo Aung Gyaw Wharves							1,000
	No.1	137	15.2			UMEHL	Container & G.C	
	No.2	137	15.2	48,000	400.0	UMEHL	Container & G.C	
	No.3	183	30.0			UMEHL	Container	
4.	MITT Wharves	1,000	30.0	500,000	20,000.0	MITT	Container & GC	1,500

Source: Myanmar Port Authority.

Table 3: Port Facilities for General Cargo in Yangon

No.	Name of Wharves	Length (m)	Apron Width (m)	Storage Area		Owner	Remarks
				Yard (m ²)	Shed (m ²)		
1.	Hteedan Rice Berth	139.0	12.5	-	6,688.80	MPA	Rice & Rice Products
2.	Sule Pagoda Wharves						
	No.1	137.0	12.2	6,967.5	5,016.60	MPA	General Cargo
	No.2	137.0	12.2	5,574.0	5,202.40	MPA	General Cargo
	No.3	137.0	12.2	10,683.5	3,855.350	MPA	General Cargo
	No.4	137.0	12.2	3,251.5	6,688.80	MPA	General Cargo
	No.5	160.0	15.2	6,038.5	17,595.26	MPA	General Cargo
	No.6	160.0	15.2	3,251.5	16,062.41	MPA	General Cargo
	No.7	158.5	15.2	1,042.3	13,098.90	MPA	General Cargo
3.	Port Health Jetty	91.0	12.2	-	4,366.30	MPA	General Cargo
4.	Hteedan Berth	180.0	21.0	21,738.6	-	MEC	General Cargo
5.	Thaketa Wharves						
	No.1	106.2	19.5	16,294.0	4,462.00	MFSL	GC/Coastal Cargo/Passengers
	No.2	106.2	19.5				
6.	MIPL Wharf	200.0	17.0	20,000.0	3,000.00	MIPL	GC/Liquid Bulk Cargo

Source: Myanmar Port Authority.

Yangon, namely Thaketa Jetty and Port Health Jetty, where ships going to Myeik, Dawei, and Bangladesh are approached.

Normal overseas trade can be conducted only in Yangon, and other exports are conducted as border trade. The latter is carried out through border trade zones and border posts designated by the government.

Yangon Port has 24 berths, which are able to accommodate 1,752 vessels a year. The number of containers handled at Yangon Port has increased by 2.5 times in the past 10 years. In 1998-99, a total of 108,695 TEUs moved through Yangon but that increased dramatically to 281,704 TEUs in just 2009-2010. The Asia World Port

Terminal, which is located in Ahlone Township, a semi-downtown area, handled 40% of all container shipments into Myanmar in 2009-2010, followed by Bo Aung Kyaw Wharves at 30% and MIPL at 18%. MITT held only a 12% market share due to transportation constraints between industrial zones and the port.

There are advantages and disadvantages between Yangon Port and Myanmar International Terminal Thilawa (MITT) in terms of location and efficiency. Yangon Port is situated in the downtown area and has location advantages in being close to industrial zones as goods can be transported in a short time and at low cost. Myanmar International Terminal Thilawa (MITT), however, is located at a disadvantage being in the Thilawa area 20 kilometers away from industrial zones. Moreover, the road between the new bridge and MITT is in poor condition. The container transportation charges are much higher at MITT, contributing to the terminal occupying only a 12% market share despite having the highest capacity among all port facilities in Myanmar. As most of Yangon Port is under the state-owned enterprise Myanmar Port Authority, the port facilities are obsolete and lack sufficient generators. Port operations often stop when there is an electricity blackout. Among the terminals in Yangon, it is observed that the Asia World Port Terminal is the most efficient. Another disadvantage for Yangon Port is its water depth. All berths are situated at the inner harbor, and the berthing vessels need to pass two underwater sandbars (outer bar and inner bar). The berth allowance depth is only 9 meters and a vessel's maximum permissible draft is subject to the depth of the inner bar, which is shallow in the dry season. Maintaining the depth of the inner bar is done by dredging every year, which is costly for the Myanmar Port Authority. The allowable length of 167 meters is also a constraint for large vessels.

1.1.3. Yangon Port Development Plan

Myanmar, adopting an open market economic system since the late 1990s, has allowed international trade to increase dramatically over the past two decades. According to the available data released by the Central Statistics Organization, foreign trade soared 12-fold in terms of value over 20 years. Total trade volume rose from US\$956 million in 1989-1990 to US\$11,790 million in 2009-2010, establishing an upward trend for coming years. Myanmar trades with many countries across the world by using sea transport, and most of the export commodities are transported by ship from Yangon Port, where import commodities are unloaded as well. In this regard, the port facility should be efficient and able to handle the loading, unloading, and storage of commodities.

The government of Myanmar has a plan to upgrade Yangon Port swiftly, taking into consideration the day-by-day growth of commodity flow. The port development plan is formulated to improve the port facility by building new jetties, constructing a four-lane road between Strand Road and Yangon River from Htitan Kyatsharsoon to Botataung Market, and improving the waterway through dredging of Yangon River.

The Myanmar Port Authority is responsible for all seaports in the country. The Yangon seaport (Yangon Port and Myanmar International Terminal Thilawa (MITT)) is the largest of all, with the 16 jetties of Yangon Port and the six jetties of Myanmar International Terminal Thilawa (MITT) totaling 22 where international vessels can be moored. At present, only 22 vessels can be moored simultaneously and 23.7 million tons of freight can be handled annually.

In accordance with the port development plan of 2010, projects are under way to build new jetties in Yangon Port and Myanmar International Terminal Thilawa (MITT). For the development of Yangon Port, new jetties would be constructed in the area

between Thanlyatsoon and Ahlone Sinmin Jetty. The area designated for construction of 13 new jetties covers 225 acres where 26 vessels could be moored.

Myanmar International Terminal Thilawa (MITT), 37 plots 200 meters in length and 750 meters in width are being reclaimed, with 28 already settled. On completion of new jetties in Yangon Port and at Myanmar International Terminal Thilawa (MITT) facility, there will be 62 jetties where up to 75 vessels can be moored. The port handling volume will be 100 million metric tons a year. Hence, freight handling capacity will rise nearly five times.

With a view to improving the waterway of Yangon River, dredging of the river is being carried out daily at Yangon Port for the convenience of vessels 167 meters long, 15,000 tons in total weight, and 9 meters in draft, and at Myanmar International Terminal Thilawa (MITT) for vessels 200 meters long, 20,000 tons in weight, and 9 meters in draft.

The Yangon Port Development Plan presents measures to be taken until the port can cope with 35,000-ton vessels to catch up with commodity flow in the future.

Upon completion of the project, waterways into and out of Yangon Port will be deep enough for 35,000-ton vessels with a more than 9-meter draft to go along the river. In addition, port services would be improved to handle the goods promptly with the increased number of jetties and container yards.

As regards the road construction for transporting commodities to and from Yangon Port, a new four-lane road between Strand Road and Yangon River would be constructed with six-feet-wide pedestrian lanes on both sides of the road. The new road would be 48 feet wide and 4.54 miles long from the Htitan Kyatsharsoon truck yard and the Botataung Market road, ensuring that container trucks can travel smoothly

without traffic congestion on Strand Road. Moreover, there is a plan to build a railroad along with a new Strand Road.

In order to achieve regular and smooth commodity flow by road from the Yangon region to the Ayeyarwaddy region and Upper Myanmar, some road sections would be upgraded into six-lane facilities linking Strand Road and No. 2 Road. This would enable trucks to run directly to Upper Myanmar through No. 2 Road and to the Ayeyarwaddy region through the new Strand Road, Kyimyindine Road, and Bayintnaung Bridge.

As Yangon Port is handling 800 to 1,000 containers a day and most of the port's facilities are situated downtown, the traffic congestion in the city is a major issue. In order to ease the traffic problem and promote the systematic allocation of container vehicles, a container yard terminal is planned for construction by Dagon Seikan International Logistics Service Ltd. in the Yuzana Garden City Compound of Dagon Seikan Township, Yangon Division.

The container yard would have spacious area for accommodating 800-1,000 container vehicles, and other facilities such as office buildings, workshops, and guest houses. It is located about 15 kilometers from Yangon Port and the terminal at Myanmar International Terminal Thilawa (MITT).

1.1.4. Airport and Airline Services

Construction of the Yangon International Airport Building began in 1952. The runway, taxiway, and apron of Yangon Airport was constructed by Denmark-based Christiana & Nielsan Company (Thai branch), and the old terminal building began operations in 1957.

Before 1988, the old terminal building provided adequate services for all travelers

without difficulty, congestion or delay. After 1988, due to the open market economy, tourist promotion activities, general liberation of air transport, and foreign investment in the national airline Myanmar Airways International, there was a dramatic increase in traffic through the old terminal. The number of tourists coming into Myanmar increased to more than 800,000, compared to 25,000 in 1980, and domestic passenger travel reached 1.2 million people. Although the Ministry of Transportation and the Department of Civil Aviation had renovated and extended the old terminal building to accommodate the increased traffic through the airport, there were still many difficulties in providing adequate services. Therefore, two new stories were added and an international terminal building 340 feet in length and 140 feet in width was constructed by the Public Works Department and put into operation in 1996. Along with the Public Works Department, the private firm Asia World Co. Ltd was in charge of upgrading the terminal building and extending the runway from 8,100 feet to 11,200 feet. The terminal was increased from 340 feet to 800 feet in length and 140 feet in width, while the airport apron was widened and lengthened by 600 feet in either direction. Due to the increase in the number of flights and passengers, and power shortages, there are still problems facing this new terminal.

The construction project for the new terminal building was launched in 2003. The new terminal building was inaugurated in May 2007. The building's dimensions are 832 feet in length, 206 feet in width, and 68 feet in height. It can withstand earthquakes of magnitude 8 on the Richter scale. The new terminal building houses a VIP lounge, a spacious lobby, waiting lounges at the gates, offices, souvenir shops, cafes, canteens, and restrooms.

A total of 280 vehicles can be parked at the ground floor and underground parking

areas. The new terminal building was equipped with five lifts, three escalators, four stairs, 12 immigration counters, 30 check-in counters, two transit counters, and five counters of money changers. The building was fitted with an EM electronic lock system, card access system, fire protection and warning system, plasma screen flight-information system, and news and information system. In addition, it has 300 telephone lines. The new terminal building can handle 1,800 passengers per hour and 2.7 million per year. The airport currently has a capacity of five aircraft per hour. The new terminal building has a total of four passenger-boarding shoots measuring 138 feet by 10 feet.

Four domestic airlines and 15 international carriers provide service at the airport.

1.1.5. Railway Service

The first railway line in Myanmar was inaugurated in May 1877, carrying passengers over a distance of 262 kilometers from Yangon to Pyay. Yangon Railway Station was built in the same year in the downtown area. Total floor area is 5,110 square meters for serving a million passengers a year. Currently, Yangon provides rail service to cities such as Mandalay, Naypyitaw, Mawlamyaine, Ye/Dawei, Tharsi, Pyay, and Bago. The Yangon-Mandalay train runs five times, while the Yangon-Naypyitaw and Yangon-Mawlamyaine trains run only twice a day. There is a circular train service in Yangon that caters to commuters. The network has 39 stations that loop around the various parts of Yangon. Myanmar plans to construct a railway network centered at Nay Pyi Taw in the near future. The importance of the Yangon railway service will lessen in coming years.

1.2. Mandalay

Mandalay City, the capital of the Mandalay Division, is located on the east bank of the Ayeyarwaddy River in the Upper Myanmar region. Mandalay City was expanded to accommodate people migrating in for business opportunities. With more than 1 million people, it has the second-largest urban population after Yangon. There are five townships in Mandalay City. The Mandalay Division is situated in the middle of the country, with overland road access to the China border in the north, the Indian border in the west, and to the new political capital Na Pyi Taw and Yangon in the south. The city's primary functions are as a center for transit trade, a logistics hub, and as a base of manufacturing facilities. The factories produce consumer and capital goods for markets in the surrounding states and divisions. These production facilities are situated in the Mandalay Industrial Zone at the fringe of the city. With the increase in urban population, demand in consumer goods has climbed along with changing consumption patterns and consumer behavior. Mandalay is the second-largest urban consumer market in Myanmar. The conservative social-relationship dynamics, commerce, eating habits, and lifestyles have changed remarkably over the past few years. As border trade between Myanmar and China grows year by year, businesses in Mandalay are on the rise because of the export-import goods passing through the city. In 2009-2010, the volume of Myanmar-China border trade was US\$1,059 million and Myanmar-India border trade was US\$13.7 million. There is a possibility that the border trade between Myanmar and China could reach US\$1,500 million in the near future. Likewise, there is great potential in the border trade between Myanmar and India.

As regards the regional transportation routes, Mandalay is at the important junction of Asian Highway Route AH1 from Myawaddy to Tamu and AH14 from

Mandalay to Muse. The inhabitants and businesses in Mandalay enjoy the benefits of growing regional commercial trade due to the city's strategic geographic location. With further improvements to the communications infrastructure and highway networks, Mandalay will become an even more commercially successful urban city.

1.2.1. Mandalay Highway Bus Terminal & Merchandise Center Project

As passenger and cargo vehicles are passing through Mandalay City, the Mandalay Highway Bus Terminal & Merchandise Center project is planned for establishing a terminal area between Hton Bo-Myitnge Shortcut Road and Phyt Seik Gone Village in Pyigyí Tagun Township. The Mandalay Highway Bus Terminal & Merchandise Center Project has a land area of 65.95 acres. Plans are to construct 360 business-apartments, a merchandise center for cargo vehicles plying between industrial zones, warehouses, factories, and the Yatanarpon Cyber City. The intention is to keep cargo in the center before uploading onto vehicles bound for China and Thailand.

1.2.2. Transportation in the City

From Mandalay, it is easy to travel to various townships with the 243 highway passenger bus lines leaving from four passenger bus terminals. For highway cargo transport, 279 cargo bus lines provide service from two cargo terminals. There are also 47 bus lines providing public transportation services centered at Zay Cho in the city.

In Mandalay, only 10% of the 1 million population uses passenger buses for transportation. Individual transportation is widely popular in Mandalay, such as using one's own vehicle, motorbike or bicycle. The number of motorbikes increased from 65,718 in 2003 to nearly 500,000 in 2010, due mainly to the increased issuance of

motorbike licenses. Hence, traffic congestion frequently occurs in the Central Business District of Mandalay. Road discipline and regulations are weak. Mandalay was constructed in the shape of a perfect square, and where the roads intersect frequently there is traffic congestion. With a view to reducing road hazards and easing traffic jams, special roads for motorbike and bicycles have been constructed and one-way roads have been designated in some areas. Delays in trips often occur due to the speed limitation of bicycles and even motorbikes. There are 43 bus lines with 1,500 vehicles. Most traffic congestion occurs at the road intersections of Museum-Mahamuni Pagoda and Zaychotaw-Kaingdam at 84th Street. To solve the problem of traffic congestion, intersections between 84th and 85th Streets and 27th and 28th Streets were changed to one-way roads. Although these are 60 feet wide and could be upgraded to six-lane roads, it is used as two-way road due to the lapsed practice of traffic regulation and discipline.

With the increase in vehicles and population, urban roads are being upgraded and new roads are being constructed in line with Mandalay City Development Council planning to meet future infrastructure demand. Therefore, 90% of road congestion has been alleviated but congestion still occurs where road networks were not able to be expanded in the crowded Central Business District.

1.2.3. Railway Service

Mandalay has one of the largest rail stations in Myanmar. The station is the gateway to Upper Myanmar, representing 5,031 kilometers of national rail network. The 647-kilometer journey from Yangon to Mandalay is mostly traveled by train due to dangerous or rough road conditions. There is also riverboat transportation from Yangon

to Mandalay along the Ayeyarwaddy but it is much slower than the overland transportation options. Two local private companies operate railway transportation services between Mandalay and Myitkyina. Mandalay is on the route of Trans Asian Railways that connects Thailand with Europe and South and Central Asia via Myanmar.

1.2.4. Mandalay International Airport

Mandalay International Airport (Tadaoo) opened in September 2000 at a cost of US\$150 million and represents the largest and most modern international airport in Myanmar. The maximum capacity of the airport is estimated at 3 million passengers annually. This new airport occupies a land area of 25,015 acres and boasts a concrete runway 14,000 feet long and 200 feet wide. It is located in the center of Myanmar about 35 kilometers from Mandalay. It takes approximately 1 hour to get from the airport to the center of the city. It is expected that Mandalay International Airport would become a transportation hub for the region en route to other major Asian cities, particularly Beijing, Hanoi, Bangkok, Calcutta, and Dhaka.

The terminal building has been equipped with six passenger lifts, one freight lift, three escalators, and a baggage handling system. There are six passenger-boarding bridges and three of them can handle modern Boeing 747-400 planes. There is enough space for 10 planes to anchor and at a rate of eight minutes per plane. The 14,000x200ft runway is large enough to allow any size of commercial airplane to land. Mandalay International Airport was built to attract international tourists and business people to the city. The important fact is that with the rate of passenger arrivals in the past 10 years in proportion to the airport's size and facilities, it can be assumed that the infrastructure can cope with 8,000 passengers daily.

1.3. Yatanarpon Cyber City

With all of the technological developments around the world, the role of the ICT (information and communication technologies) sub-sector should be promoted accordingly. In Myanmar, the establishment of Yatanarpon Cyber City plays a vital role in the ICT sub-sector. Phase 1 was launched in December 2007 at posted mile 27/0 near Pyinsa Village, Pyin Oo Lwin Township, Mandalay Division. The Yatanarpon Cyber City development project has a land area of more than 10,000 acres, with the software industry area and the hardware industry area allotted 2,500 acres each.

The establishment of Yatanarpon Cyber City was undertaken by the Ministry of Communications, Posts and Telegraphs. The project was carried out with the belief that development of the software and hardware industries with up-to-date ICT sub-sector information would boost Myanmar's information technology (IT) expertise. The project is a joint government and private mission to promote investment in Myanmar's IT industry.

The area is designated as a special MPT (*Myanmar* posts and telecommunications) project zone and is regarded as a vital gateway for local and international business investment. Through government-sanctioned operational procedures and long-term investment incentives, it provides qualified infrastructure such as dedicated high-speed connectivity for all types of investors and developers both local and from overseas.

Yatanarpon Cyber City started software development with local sourcing and outsourcing operations by establishing seven "incubation centers." The rental price for an incubation center is kyat 200,000 per month, to be reviewed every three years. In the incubation centers, software developers will have the freedom to implement

research projects, IT innovation projects, and system networking designs. Investors in these high-tech facilities will benefit from government incentives and Yatanarpon Teleport Company logistical support, and will have first priority in recruiting the best trained IT personnel from schools in Myanmar.

Since 2007, Yatanarpon Teleport has installed co-location servers and undertaken webhosting and dial up operations nationwide. Currently, FTTx¹ (fiber to the home) triple play work is being implemented as a pilot project. This will provide a high speed of Internet service compared to the ADSL connection. At present, 60 lines based on the FTTx system have been connected in Pyin Oo Lwin. In the future, the FTTx system would be expanded across the country in cooperation with industries.

For example, a solar cell factory and a fiber optics cable manufacturing facility were established in the Yatanarpon Teleport zone. Other arrangements were made to run a soft switch branch section for controlling software industries in October 2010. In addition, the MCC Training Institute has opened graduate courses to produce high-quality computer experts holding bachelor of science and business IT degrees.

While carrying out ICT operations, Yatanarpon Cyber City produced CDMA² 800MHz, CDMA 450 MHz telephone handsets, fiber optic cables, BBU³ (base-band

1 Fiber to the x (FTTx) is a generic term for any broadband network architecture that uses optical fiber to replace all or part of the usual metal local loop used for last mile telecommunications. The generic term originated as a generalization of several configurations of fiber deployment (FTTN, FTTC, FTTB, FTTH ...), all starting with FTT but differentiated by the last letter, which is substituted by an x in the generalization.

2 Code division multiple access (CDMA) is a channel access method used by various radio communication technologies. It is the mobile phone system.

3 Base-band unit (BBU): The digital signal processor serves to detect the presence of a second SAT generated by the mobile unit by sampling and processing successive samples of the second SAT and measuring the power thereof.

unit) and RRU⁴ (remote radio unit) antennas and accessories. At present, It is also producing underground fiber optic cables for the FTTx system, and it will make overhead fiber optic cables in the near future.

Currently, there are 16 investors doing business in Yatanarpon Cyber City. The following table shows the number of investors (Table 4).

Table 4: Investor List in Yatanarpon Cyber City

No.	Investor	Project
1.	Thawtarwin	Fiber cable, Optical joining connector
2.	Yatanarpon Production Co., Ltd	Solar cell
3.	Tharmoenyae Chanthar Tun Waithar	Digital Auto Exchange, Transmission Equipment
4.	Asia World	CDMA, Cellular BTS
5.	Elite Tech	Mobile Products
6.	FISCA	PSTN Exchange Subscriber Apparatus
7.	Jade Land	Fiber Cable & Connector
8.	Hightech Princess	Security Product for Communication
9.	MCC Group	ICT Training Center, Out-Sourcing
10.	Myanmar Info Tech	Out-Sourcing, Off-shore Programming, R&D
11.	MAXINET	Software Development, Transmission Equipment
12.	Global Technology	Sortswitch, Wi-max
13.	IGE	Computer & Network Accessories
14.	Fortune International	GPON System ¹⁾
15.	Yatanarpon Cyber Corporation	In-sourcing, Out-Sourcing
16.	ITCS	Mobile Phone and Accessories

Note: 1) GPON (gigabit passive optical network) standard differs from other PON standards in that it achieves higher bandwidth and higher efficiency using larger, variable-length packets. GPON offers efficient packaging of user traffic, with frame segmentation allowing higher quality of service (QoS) for delay-sensitive voice and video communications traffic.

Source: Yatanarpon Teleport.

⁴ Radio remote unit (RRU): The remote radio unit includes an active part and a passive part, where the active part and the passive part are placed respectively on an active module and a passive module that are independent of each other and the active module and the passive module are connected via a pluggable connecting device. Because the passive part is more reliable and less liable to breakdown than the active part, when the active part needs to be repaired, it is unnecessary to dismantle the entire unit. Therefore, the repair is easier and faster and the repair cost is lower. The operation reliability of the base station system is also improved.

Yatanarpon Cyber City consists of ICT-related facilities such as Technological University, Yatanarpon Internet Exchange Point-IXP, the Yatanarpon web portal, and triple play softswitch, all inaugurated in October 2010. Yatanarpon IXP was installed with the necessary ISP (Internet service provider) equipment to provide Internet service to the people. Now Internet users can visit the web portal of their choice, whereas in the past they had to rely on the websites of providers in foreign countries. Triple-play service provides Internet, telephone, and video IPTV (Internet protocol television) to users through communication media. Although Yatanarpon Cyber City is being built for development of ICT, the accessibility and reliability of Internet services are still questionable as the facilities are under the control of the Ministry of Communications, Posts and Telegraphs.

1.4. Mawlamyaine

Mawlamyaine, the capital of the Mon State, was the third-largest city after Yangon and Mandalay before Nay Pyi Taw became the capital of Myanmar. It is one of the townships of the Mawlamyaine District. The main transport route, the 180-mile Yangon-Mawlamyaine Road, extends to Dawei as the Mawlamyaine-Dawei Road. The land area of Mawlamyaine Township is about 50 square miles, covering 22 wards, 19 village tracts and 48 villages. The population of Mawlamyaine City proper is 202,000 people and that of the whole township is estimated at 464,000. About 1,600 businesses, excluding factories in the industrial zone, are operating within the city area.

High-speed public coastal passenger crafts are available from Yangon to Mawlamyaine, Dawei, Myeik, and Kawthaung in the south. In addition, cooperative and privately owned schooners carry goods and passengers along the Yangon,

Mawlamyaine, Myeik, and Kawthaung coastal route. Altogether, 12 pontoon jetties are found in the city, including seven jetties for public use but these are very old and rarely used by small vessels. Air transportation service between Yangon and Mawlamyaine was suspended for a long time due to many reasons, one of which is that road and railway transport are more convenient and less expensive. Travel by train to Mawlamyaine is so much easier now with the inauguration of the new Mawlamyaine railway station in 2006. After completion of Thanlwin River-cross Railway Bridge, the longest at 2 kilometers, transportation by train on the Yangon-Mawlamyaine route became smoother, less costly and more time-saving.

Mawlamyaine was a busy commercial city in the past based on border trade activities, due to its geographic proximity to the Thai border and accessibility via the river. Mawlamyaine was a bustling port in British colonial times. It was also prosperous during the time of the socialist government from the 1960s to the early 1990s due to the emergence of black market smuggling operations. Today, Mawlamyaine is no longer a vital commercial city because the trade route from Mei Sot to Myawaddy bypasses Mawlamyaine through the town of Hpa-an and on to Yangon. In addition, huge cargo from Thailand through Kawthaung at the southern tip of Myanmar is directly transported by sea to Yangon, circumventing the Mawlamyaine port facilities.

For the success of the East-West Economic Corridor, the ports at the eastern and western ends of the corridor play important roles. At the eastern end is the Da Nang Deep-Sea Port with supportive services provided by Tien Sa Seaport and Han River Port, and it has a throughput capacity of 4 million metric tons a year.

At the western end of Mawlamyaine, there were preliminary plans for the

construction of a deep-sea port. These plans were deemed unfeasible due to geographical constraints and technical limitations. Mawlamyaine Port is designated as one of eight coastal ports in Myanmar by the Myanmar Port Authority. But the Myanmar Port Authority has already acknowledged that maritime access to Mawlamyaine Port is not deep enough for vessels of more than 4.5 meters in draft. Besides, it is 20 knots away from the mouth of Than Lwin River, which makes the port difficult to access by coastal ships. The coastline of the Mawlamyaine jetty area is 3 kilometers long, and the area is packed with seven small jetties which are suitable for trawlers and ferry boats traveling to nearby places.

Therefore, Mawlamyaine will not be the western end of the East-West Economic Corridor. The present route for border trade is from Yangon to Bago, Thaton, Hpa-an, and Myawaddy. The trade between Myanmar and Thailand through the Myawaddy Trade Zone totals about US\$150 million a year according to Myanmar official figures, but it is probably US\$300 million or more in actual value. The East-West Economic Corridor should not end at Mawlamyaine as projected, and the corridor could be extended to Yangon through the Hpa-an route as there are international port facilities available in Yangon, especially at Thilawa. However, the road between Yangon and Myawaddy should be upgraded to be suitable for heavy trucks.

1.5. Dawei

Dawei, formerly known as Tavoy, is a city in southeastern Myanmar. It is the capital city of the Tanintharyi Region, formerly called the Tanintharyi Division, situated 614.3 kilometers south of Yangon on the northern bank of the Dawei River. Dawei Township is part of the Dawei District, which consists of four townships and an area of

5,308 square miles, where 210,000 people reside. Being a coastal area, Dawei is in between a mountain range lying at the east going north to south, and the Andaman Sea. Dawei is 384 miles from Yangon and 187 miles from Mawlamyaine. Passenger buses run from Dawei to Yangon every day. The trip takes 24 hours as the road is bad between Dawei and Ye. There are several trucks in the bus terminal which generally carry rubber, cashews, and betel nuts from Dawei to Yangon, and various commodities are also carried from Yangon.

There is a railway line between Dawei and Mawlamyaine stretching 200 miles, with daily service. In 2009-2010, the railway carried 38,000 passengers. A new rail line is under construction from the Dawei train station to Dawei Port.

There are two old ports in Dawei and one in Thayetchaung. The Dawei River is narrow and not suitable for coastal ships. Shin Phyu Pyin Port, 25 miles away from Dawei and within Thayetchaung Township, was built in 1960 for coastal ships. This port has two 120-foot pontoon jetties where passengers and cargo ships from the Five Star Line and fuel ships from the Ministry of Energy berth two or three times a month. There are three shuttle boats plying daily between the Shin Phyu Pyin Port of Dawei and Myeik Kawthaung. Daily flight service is provided for the Yangon-Dawei route by three local airlines: Yangon Airways (three flights a week), Air Bagan (four flights a week), and Myanmar Airways (five flights a week).

1.5.1. Dawei Deep-Sea Port Project

The Dawei Deep-Sea Port project was started after the signing of an MOU at the special meeting of the ASEAN foreign ministers in Singapore on 19 May 2008. The foreign ministers of Myanmar and Thailand signed the MOU on implementation of the Dawei

Deep-Sea Port and Industrial Estate, and road and rail links to Thailand.

Later, the MOU was signed between the Myanmar Port Authority and Italian-Thai Development Public Company Limited on 12 June 2008. Italian-Thai Development kicked off preliminary studies and the site surveys in June 2008. This includes the geotechnical survey and the topographic survey. The scope of preparation work in 2010 is:

- 1) Small port
- 2) Soil boring at deep-sea port basin
- 3) Accommodation and site office
- 4) Trans-border rail link
- 5) Nabule-Phu Nam Ron Road

In regard to the geographic review, Italian-Thai Development believes that the proposed project area will become an Asian regional hub linking to China and Southeast Asia, India, the Middle East, Europe, and Africa. It is at the end of the Southern Economic Corridor of the Greater Mekong Subregion, and a gateway to the Indian Ocean. Along the Southern Economic Corridor, one route is from Dawei to Kanchanaburi, Bangkok, Sisophon, Siem Reap and then Quy Nhon, and another way goes to Phnom Penh, Ho Chi Minh City and Vung Tau.

Italian-Thai Development has assessed this area as a good location for deep-sea port development due to the following facts:

- 1) Natural water depth able to accommodate large vessels
- 2) Natural shelter good for anchorage
- 3) No physical underwater and sub-soil obstructions for approach channel and port basins

- 4) Sufficient flat hinterland for the industrial estate in order to support throughput for the port
- 5) Economical transportation on roads and rail links between Dawei and Thailand
- 6) Sufficient local supply of construction materials

According to the port plan, vessels can approach through navigation channel and fair ways to port areas. The development project has two port areas as follows:

- 1) The deep-sea port north area covers 2.7 square kilometers, with a 1.5-square-kilometer cargo yard and a 1.4-square-kilometer shipbuilding yard.
- 2) The deep-sea port south area covers 3 square kilometers, and a 1.5-square-kilometer agriculture yard is included.

On 2 November 2010, the managing director of the Myanmar Port Authority and the chairman of Italian-Thai Development signed the framework agreement on implementation of the project for the Dawei Deep-Sea Port and Industrial Estate, and road and rail links to Thailand.

Port facilities and industries are well linked under the project and Italian-Thai Development estimates that the steel industry will be supported by bulk port, requiring throughput of iron ore, coal, and other materials, and will export its own finished products totaling 40 million tons a year. The port will handle 5 million tons of agricultural products such as rice, sugar, corn, tapioca, and other grains per year. Imports of coal will reach 25 million tons a year. The port will handle 3.2 million TEUs a year, which is equivalent to 45 million tons, 50 million tons of general cargo, 35 million tons of chemicals and petrochemicals, and 36 million tons of crude oil. The handling capacity of the port is 200 million tons a year.

Dawei Port is 370 kilometers from Bangkok and 70 kilometers to the border at

Kanburi. It needs a corridor link to Thailand to include roads, railways, transmission lines, and oil and gas pipelines. The right of way of the proposed corridor is a 40-meter 8-lane highway, 25-meter double railway lines, a 60-meter transmission line, and oil and gas pipelines totaling 200 meters. There will be a bridge crossing Dawei River and a tunnel for a rail link in the mountainous area. The rail link can extend from Dawei to Kunming, China, approximately 1,700 kilometers.

The construction period for the Dawei Deep-Sea Port and Industrial Estate trans-border link will be at least 10 years. The project has three phases of five years each. The first phase of infrastructure construction will start in 2011.

The eastern coastline of Dawei is regarded as the area with the most potential as it is the end of the GMS Southern Economic Corridor and is a hub connecting to GMS countries, South Asia and Southeast Asia. There is large potential to develop the deep-sea port and other businesses due to the geographic location. The objective in developing the Dawei Deep-Sea Port is to promote trade, investment, tourism, fishery, mining, natural gas, and other industries by launching integrated area development that will benefit Myanmar and Thailand. The port will benefit not only these two countries but also many other countries along regional and international trade routes. The development of the deep-sea port will enhance the promotion of trade and investment among ASEAN and neighboring countries.

Italian-Thai Development has much confidence in their conceptual plan and is looking forward to finding investors who will come and join the plan. The dream of developing the deep-sea port project might face two types of challenges as follows:

- 1) **Internal challenge** – Achieving the project will depend on the political climate and trade and business relationships between two countries. Even so, the most important factor will be the security risk along the corridor of the trans-border link.
- 2) **External challenge** – The external challenges are the degree of investors' confidence in the project, competition from the efficiency of Singapore's port, and changing conditions of international sea routes and trade routes. Total regional trade passing through Myanmar from neighboring countries was estimated at US\$84 billion in 2009. Italian-Thai Development has to calculate how much Dawei Deep-Sea Port will attract from that figure and the extent of the challenge from other alternative trade and maritime routes such as Jakarta, Indonesia.

2. INDUSTRIAL ZONES IN MYANMAR

Since adopting a market-oriented economic system toward building a modern developed nation, Myanmar has carried out liberalization measures to enhance private-sector participation in the process of economic development. These measures have had a significant impact.

As regards the industrial sector, measures such as allowing more private sector participation through the relaxation of private investment registration, promotion of cottage industries, and promotion of privatization have been undertaken to encourage development of the sector. Myanmar is an agrarian country and its economy depends almost wholly on the agricultural sector, while the industrial sector's share of the national GDP is not more than 20%. Myanmar aims to follow in the footsteps of newly-industrialized countries in the region as far as promoting the share of the

secondary sector in the national GDP. In this regard, the government established the Myanmar Industrial Development Committee (MIDC) to support industrial development by appropriate means. As a consequence, the number of private-owned industries increased from 26,690 in 1998 to 43,789 in 2009, which includes 10,879 cottage-industry enterprises. As far as employment is concerned, the number of industrial laborers climbed to 3,485,264 in 2009, up from 1,224,363 in 1988 on an annual growth rate of 2.8%.

One of the steps by the MIDC has been to set up industrial zones in the outskirts of cities and towns in various states and regions where there are sizeable numbers of private small and medium-sized industries (SMIs). Eighteen industrial zones have been established in Myanmar, with four zones and 14 industrial parks in Yangon and an additional 14 zones in 14 local cities (Figure 1). The total number of industries in the 18 zones are 10,347. Some 44% of total establishments are located in Yangon, followed by Mandalay with 11%. While large-scale industries occupy most of the area in the industrial zones, it is small-scale industries that make up the majority of registered private industries throughout the country. According to the Private Industries Law 1990, industries are divided into three groups: large, medium and small. The Promotion of the Cottage Industry Law 1991 expressed that small-scale industries which use power at less than three HP or manpower not exceeding nine workers, and handicrafts in which the number of workers is not limited are called cottage industries. Industry classification by size is shown in Table 5.

Figure 1: Map of Industrial Zones in Myanmar



Source: MIDC.

Table 5: Industries Classification by Size

Particular	Small	Medium	Large
Machine Power (HP)	3-25	26-50	50 above
Work force	10-50	51-100	101 and above
Capital outlay (Kyat million)	Up to 1	1-5	Over 5
Production value (Kyat million)	Less than 2.5	2.5 to 5	Over 5

Source: Private Industries Law, 1990.

In Myanmar, there are more than 40,000 registered industries, most of which are in the Yangon region, either within or outside of industrial zones. According to the available data, 14 industrial zones have been established in the Yangon region to accommodate various kinds of companies owned by national citizens and foreigners for the manufacture of industrial products provided with standard infrastructure services.

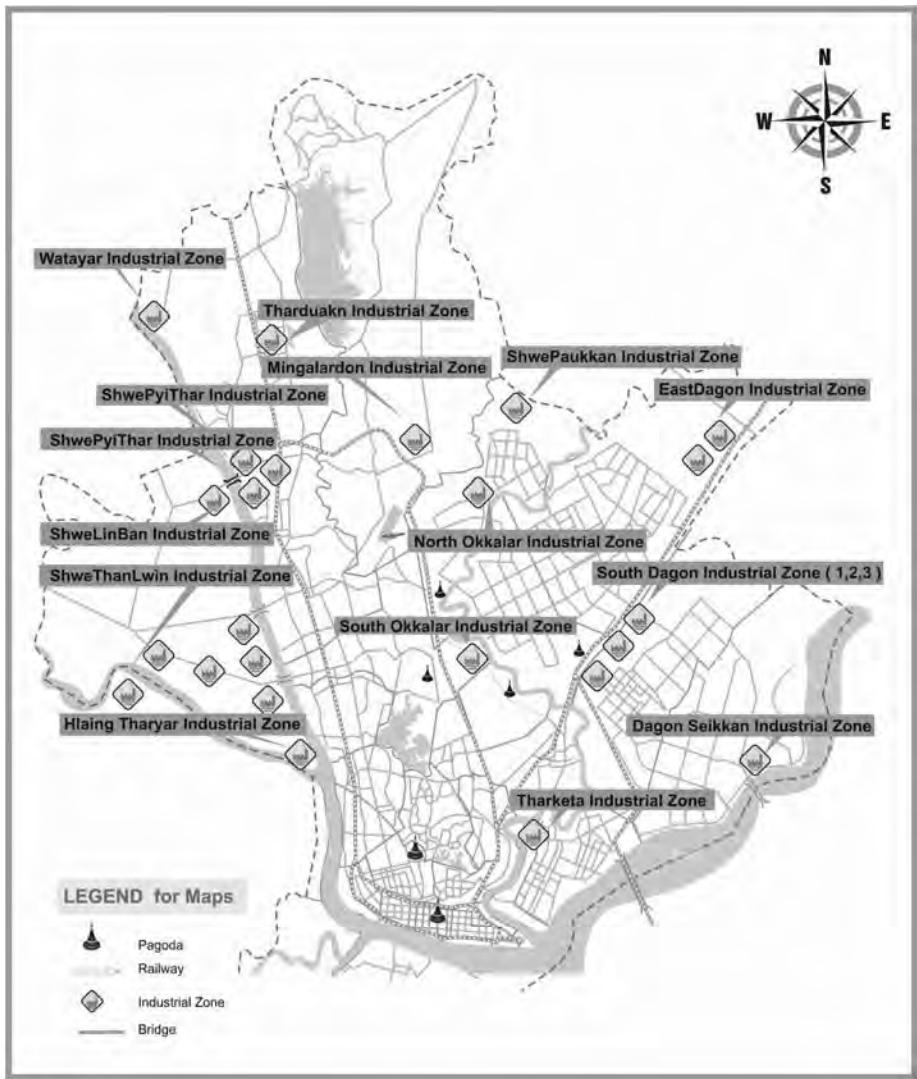
2.1. Industrial Zones in Yangon

Industrial Zones in Yangon (Figure 2) are divided into four types: FDI, joint venture, local privately owned, and local government-owned. A comparison of the industrial zones is shown in Table 6.

The regulations and services provided in the industrial zones differ among the industrial zone management committee. Some just provide standard facilities. The annual land rent and land use premium are also not the same depending on factors such as location and infrastructure.

The Mingaladon Industrial Park (23 kilometers north of the Yangon city center), Yangon Industrial Park Tharketa Industrial Zone, Dagon Myothit South South Dagon, South Okkalapa, and Hlaing Thar Yar Industrial Zone are favorable zones (Figure2). Shwe Pauk Kan, Myaung Da Kar, Shwe Pyi Thar, and Shwe Lin Pan are less favorable zones. As for the land area, the Hlaing Thar Yar Industrial Zone is the largest with 1,401 acres, followed by Shwe Pyi Thar at 1,300 acres, Dagon Seik Kan Port at 1,208.6 acres, Shwe Lin Pan at 1,100 acres, and Yangon Industrial Park at 989.6 acres. The remaining zones are not of significant land area.

Figure 2: Map of Industrial Zones in Yangon



Source: MIDC.

Table 6: Comparison of Industrial Zones in Yangon by Types (Continues)

No.	Type of Industrial Zone	Foreign Direct Investment FDI	Local Private	JV (Foreign + UMEHL)	Local + DHSHD
1.	Year of establishment	1998	2000	1991	1990
2.	Number of Industrial Zone	1	1	1	15
3.	Developer	DHSHD & Mitsui & Co., Ltd	Zaykabar Company Limited	Myanma Economic Holdings LTd.	DHSHD
4.	Infrastructure 1) Electricity (b) Charges (ii) Foreign (ii) Local 2) Water a) provided by Developer b) Charges 3) Waste Water Treatment 4) Telephone/Fax Line a) provided by Developer b) install installation fee c) Line phone Charges (i) Overseas	Deposit- US\$25 kW to YESB US\$ 0.08/kWh + 10% costing + capacity charges - total supply capacity of 5000 m ³ /day from 15 deep wells US\$ 0.50/m ³ US\$ 0.70/m ³ (Treated water charges) Capacity 5,000 m ³ /day Auto 300 Lines. (34 lines already used and 265 lines ready for installation) US\$ 2000/line in US\$ (depend on country)	Transformer is installed by Zaykabar Co., Ltd for public Area US\$ 0.08/kWh + 10% costing + capacity charges Ks 50/kWh Tenant digs own tube-well and water supplied by YCDC For Joephyu water, Ks. 77/unit (0.06 US\$/unit) Nil PABX system Ks. 500,000/extension line (u\$500/line) in US\$	Tenant will arrange own transformer for factory. US\$ 0.08/kWh + 10% costing + capacity charges Ks 50/kWh Water pumped deep wells within their own compound. Nil Self development if necessary MEHL will assist if necessary in acquiring permissions from MPT - in US\$	Own arrangement through zone committee US\$ 0.08/kWh + 10% costing + capacity Ks 50/kWh to be dug own tube well Own tube well Nil Own arrangement through Zone Committee US\$ 1500/line in US\$

Table 6: Comparison of Industrial Zones in Yangon by Types (Continued)

No.	Type of Industrial Zone	Foreign Direct Investment FDI	Local Private	JV (Foreign + UMEHL)	Local + DHSHD
	(ii) Local 5) Roads 6) Estate Security for whole IZ	US\$ 0.15/minute Concrete main Rd. (8m wide) Concrete subroads (7m wide) Provided (24 hours) security service	in US\$ (for over sea call) Ks.25/minute (for local call) Concrete main Rd. (5.5 m wide 2 lane) Concrete main Rd (2.7 m wide 2 lane) Provided (24 hours) security service	in US\$ (for over sea call) Ks.25/minute (for local call) There is no need to construct the road as it locates beside No.3 Highway Road. Not provided	in US\$ (for over sea call) Ks.25/minute (for local call) Concrete roads (6m wide) Not provided
5.	Services Provided	Maintenance of estate utilities, Landscaping and 24 hour security service, Business support services and any other consultations	Maintenance of estate utilities, Landscaping and 24 hour security service, Business support services and any other consultations	Nil	Industrial zones are established as industrial towns so that factories are mixed with housing
6.	1) Management fees 2) Maintenance Fees 3) Zone Committee Fees 4) Annual Land Rental fee	US\$ 0.04/m ² /month Nil Nil US\$ 0.30/m ² /yr (reviewing max. 15% every 5 years)	Nil Ks. 12,000/factory/mth (US\$ 12/mth) Ks. 500/Acre/mth (US\$0.0001/m ² /mth) Ks. 364/acre/mth (US\$ 0.00009/m ² /mth)	Nil It is paid by UMEHL	 For Foreign (US\$ 20/Acre/month) For Local (Ks.3000/Acre/month) (US\$0.0007/m ²) Ks. 364/acre/mth (US\$ 0.00009/m ² /mth)

Table 6: Comparison of Industrial Zones in Yangon by types (Continued)

No.	Type of Industrial Zone	Foreign Direct Investment FDI	Local Private	JV (Foreign + UMEHL)	Local + DHSHD
7.	Land Lease Period a) Foreign b) Local	60 years (leasehold until Feb-2048, transferable)	60 year grant	5 years, Extenable 5 yearly up to 30 years	(lease hold for 30 years, extendable) 60 year grant
8.	Land Use Premium a) Foreign Investor b) Local	US\$ 4/m ² / yr (under plan) Nil	US\$ 3/m ² /year Ks. 40-50 million/acre=US\$ 9.88-12.36/m ²	US\$ 3/m ² /year (UMWHL invests the capital in kind in share (i.e industrial land) as JV Minium US\$ 2/m ² /year	US\$ 3/m ² /year (increase max, 15% every 5 year Ks. 100-325 million / acre = (US\$ 24.7-80.31)/m ²
9.	Payment Terms for land Use Premium	3 Installments 1) 10% on booking 2) 50% (upon singing of sub-lease agreement) 3) 40% (upon signing of physical delivery receipt)	4 Installments 1) 40% 2) 20% 3) 20% 4) 20% (All charges are paid within 3 month)	3 Installments 1) 50% 2) 25% 3) 25%	3 Installments 1) 50% 2) 25% 3) 25%

Notes: UMEHL- Union of Myanmar Economic Holding limited, DHSHD- Department of Human Settlement and Housing Development.

Source: Based on documents provided by the Mingaladon Industrial Park.

Owing to their favorable location and facilities, the Hlaing Thar Yar, Shwe Pyi Thar, Dagon Seik Kan, and Shwe Lin Pan zones have sold out all of their land plots for industrial establishments.

Infrastructure development and facilities constitute key factors in assessing the quality and standard of services provided by the industrial zones. Pertaining to the infrastructure facilities, the water supply, power supply, and road and communication facilities are decisive elements of the infrastructure. The main sources of the water and power supplies are Myanmar Electrical Power Enterprise, Electrical Supply Enterprise, and Yangon City Development. As the demand and the supply of water and electrical power are not equalized, most of the industrial zones have supportive measures to bolster the water supply and electrical power, including the digging of tube wells, establishing electrical substations, transformers and transmission lines, and placing stand-by generators. For instance, Dagon Myothit South South Dagon has installed four 500KVA power substations, a 750KVA generator, and a high-tension cable 3,696 feet long. For sufficient water supply, it set up two underground 10,000 gallon water tanks and dug three tube wells. Similarly, the Hlaing Thar Yar Industrial Zone has 10MW/11KVA substations, stand-by generators, and sufficient water supply with tube wells. Yangon Industrial Park has 10MW/11KVA substations and a 100KVA transformer, and for sufficient water supply it dug its own tube wells.

For better communications, zone management committees have their own arrangements for communicating within the zone and contacts to the outside. Among the industrial zones, Mingaladon Industrial Park has 300 auto lines, Yangon Industrial Park has a PSPX system, and the Shwe Pauk Kan Industrial Zone has 450 auto lines, 117 GSM mobile phones, and 80 sets of CDMA.

Road conditions are generally fair as every industrial zone has concrete roads wide enough for heavy vehicles to travel along. However, roads can be bad in the rainy season, and there also might be disrepair in the open season.

As mentioned previously, the land rents of the industrial zones are different. The land rent at Mingaladon Industrial Park is US\$0.30/m²/yr. Yangon Industrial Park, Hlaing Thar Yar, Shwe Pyi Thar, and Dagon Seik Kan all have the same rate of US\$0.00009/m²/month.

The land use premium and the lease period are also important to foreign investors. The land use premiums and the lease periods are US\$40/m² for a full-term lease (leasehold until February 2048, transferable) at Mingaladon Industrial Park, US\$3/m²/yr and US\$9.88/m² (for a 60-year grant) at Yangon Industrial Park, US\$3/m²/yr (minimum five years up to 30 years) at the Pyinmabin Industrial Zone, and US\$3/m²/yr (leasehold for 30 years extendable) at Dagon Seik Kan.

The South Dagon Industrial Zone ranks first in number of companies with 1,401, followed by Hlaing Thar Yar with 511 and Shwe Pyi Thar with 228 companies. There are 19 kinds of industrial groups operating in the industrial zones. Among the groups, the garment, food processing, and household goods companies together make up the majority, representing more than 75% of total enterprises.

An industrial zone management committee is formed in every industrial zone to supervise and facilitate the day-to-day operations of companies, and to implement the short-term and long-term targets on upgrading the zone in accordance with international standards.

2.2. Mandalay Industrial Zone

In 1990, the Mandalay Industrial Zone project was started to encourage industrial development. The government designated the site on the Yangon-Mandalay Road's eastern side, namely Yar Taw. The new industrial town was put under the administrative area of Pyi Gyi Ta Kon Township as Industrial Zone 1. In 1998, Sein Pan industrial establishments were moved to the new San Pya industrial town and this became Industrial Zone 2. In Industrial Zone 2, Mandalay Royal Industrial Co, Ltd. has advanced industrial machinery and equipment. These include vertical lathes using heavy machines, and milling and gear hobbing machines for gear and pinion production. There is a forging machine for boiling raw iron sculpture in the electrical and iron boiling factory. The Good Brother Co., ltd. factory also produces transportation vehicles and agriculture implements. Other factories also make agricultural equipment such as bulldozers, excavators, lathes, and boats.

The Mandalay Industrial Zone is located in Pyi Gyi Tagon Township with a land area of 1,249.33 acres and 3,140 land plots. There are 1,159 enterprises, including 317 large, 232 medium-scale and 610 small companies (Table 7). For administration purposes, the area is divided into two parts as the ward of Industrial Zone 1 and the ward of Industrial Zone 2 in Pyi Gyi Tagon Township. However, there is only one Industrial Zone Management Committee.

Table 7: Industries in Mandalay Industrial Zone by types of business

No.	Type of business	Total Business			
		Large	Medium	Small	Total
1.	Food Stuffs businesses	104	57	20	181
2.	Clothing businesses	10	3	2	15
3.	Construction	25	1	5	31
4.	Consumer goods	25	7	6	38
5.	Household commodities	15	6	1	22
6.	Printing and Production	12	1	11	1
7.	Raw materials	46	8	78	31
8.	Chemical and Energy	3	39	4	163
9.	Agriculture equipment	32	1	9	8
10.	Machines and Spare Parts	45	4	1	9
11.	Transportation	-	105	473	32
12.	Electrical equipments	-	-	-	5
13.	General industries	-	-	-	623
	Total	317	232	610	1,159

Source: Mandalay Industrial Zone Management Committee.

2.3. Mawlamyaine Industrial Zone

With the third-largest population in Myanmar, Mawlamyaine plans to develop industries by establishing an industrial zone. Kyauktan Village, the land area at the side of the Mawlamyaine-Ye railroad, was first chosen as the site for the Mawlamyaine Industrial Zone. But it is farmland that floods frequently in the rainy season, which would require heavy investment. Therefore, it was deemed an inappropriate site for construction. After the opening of the Attaran Suspension Bridge on 26 March 1998, the Myanmar Industrial Construction Service, Ministry of Industry, instead chose to prepare land for the industrial zone at Nyaungbinseik Village, Kyaikmgyaw Township on the Mawlamyaine-Phan Road some 1,600 feet away from the bridge and five miles from Mawlamyaine. This has only

207 companies, of which most are engaged in industrial raw materials such as rubber. Due to insufficient infrastructure and technology, the development of this zone is not found to be significant (Table 8).

2.4. Dawei

The Dawei Deep-Sea Port and Industrial Estate, and road and rail links to the Thailand Construction Project will be the first-ever special economic zone in Myanmar. The Dawei Deep-Sea Port and Industrial Estate is expected to cover an area of 250 square kilometers or 61,775 acres. The project will require spacious land to avert industrial congestion and environmental problems, and for future expansion. The industrial estate has five planned zones as follows (Figure 3):

Table 8: Number of Business in Mawlamyine Industrial Zone

No.	Industrial	Total Business			
		Large	Medium	Small	Total
1.	Food and Beverages	9	42	-	51
2.	Clothing and garment	-	2	-	2
3.	Construction materials	2	1	-	3
4.	Consumer goods	6	11	-	17
5.	Household good	1	1	-	2
6.	Industrial raw materials	6	3	-	99
7.	Metal and oil products	-	19	1	20
8.	Electronic	-	1	-	1
9.	Transportation service	20	-	-	20
10.	General	3	67	12	82
	Total	47	147	13	207

Source: Mawlamyine Industrial Zone Management Committee.

Figure 3: Industrial Estate Plan



Source: The presentation of ITD at Dawei Deep-sea Port Site on July 20, 2010.

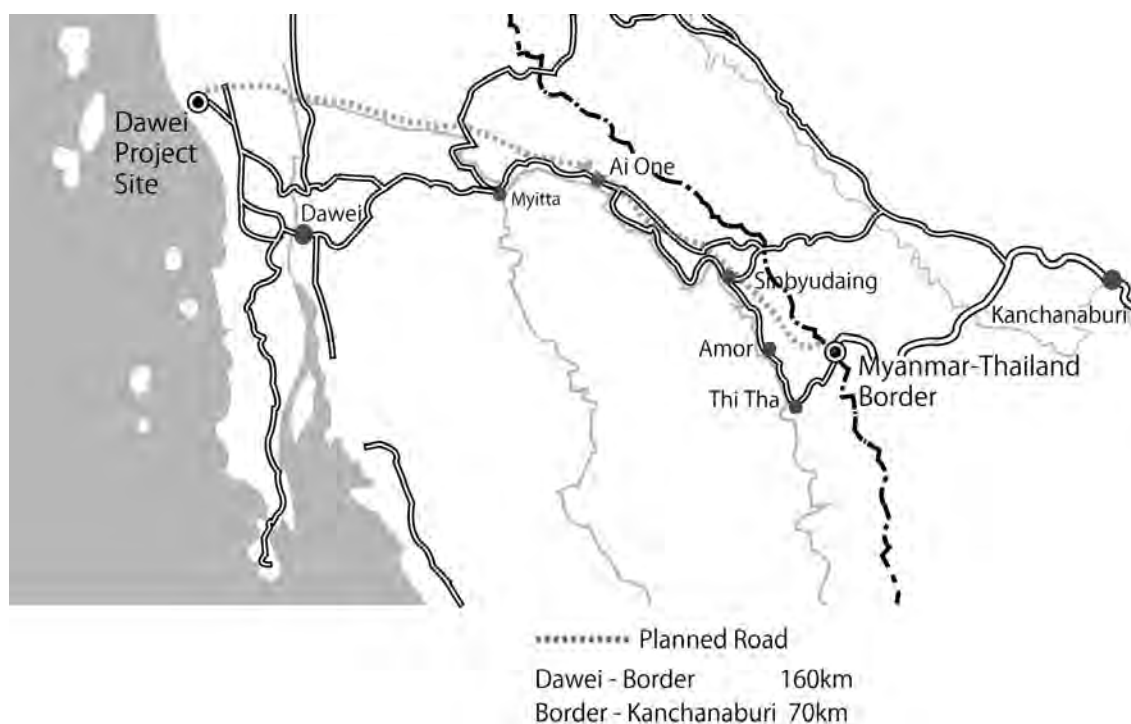
- 1) Zone A - Heavy industry zone (38.3 square kilometers) including a coal-fired power plant, steel mill, and fertilizer, ship-building, and cargo yards, as well as the deep-sea port;
- 2) Zone B - Heavy industry zone for oil and gas storage, with an oil refinery, gas separation plant, and compound circled power plant;
- 3) Zone C - Medium and heavy industry zone (44.7 square kilometers) for the upstream and downstream petroleum industries;
- 4) Zone D - Medium industry zone (58.6 square kilometers);
- 5) Zone E - Light industry zone (43 square kilometers); and

- 6) Public area (13.5 square kilometers) for a commercial complex, authority center, and township and district offices.

According to the project plan, a power station that can generate 4,000MW will be constructed for the whole estate. The industrial estate will need at least 300,000 cubic meters of raw water per day. A reservoir will be built to provide 100 million cubic meters to the estate during the four months of the dry season. The motor road and railway, each 160 kilometers long that will link the Dawei Deep-Sea Port to the Myanmar-Thai border will be built in phases (Figure 4). The road will reach the GMS Southern Economic Corridor that leads to Vung Tau and Quy Nhon in Vietnam through Sisophon of Cambodia via Bangkok, Thailand. The 220-meter-wide road includes an eight-lane highway together with the railroad, pedestrian lane, local road, Union Road, and traffic islands. Oil and natural gas pipelines will be laid parallel to the motor road and railway.

Myanmar developed its Special Economic Zone Law in early 2005 and plans to establish a special economic zone in the Thilawa area near Yangon City. However, the law has not been enacted due to objections raised by local industrialists who are demanding to be granted privileges similar to those offered to foreign investors in the zones. Furthermore, the government has been occupied with the task of transforming Nay Pyi Taw into the capital of Myanmar. Enactment of the law has been suspended since then. Now the project is officially known as the Dawei Deep-Sea Port project, the first special economic zone in Myanmar without being under the rule of this law. Of course such a project would not be realized overnight. But Myanmar would earnestly prepare to meet the challenges arising from constructing a deep-sea port of international standard.

Figure 4: Dawei Deep Sea Port Plan



Source: The presentation of ITD at Dawei Deep-sea Port Site on July 20, 2010.

CONCLUSION

This study has examined some aspects of the infrastructure readiness of major cities in Myanmar which will physically link to economic corridors and the regional transportation network, where economic corridors enhance the integration of the economic activities of the region.

Accordingly, this study has attempted to analyze industrial estates, city transportation, port facilities, airline services, and water transportation infrastructure with data collected in Yangon, Mandalay (including Yatanarpon), Mawlamyaine, and

Dawei.

Yangon is now Myanmar's major commercial center, where most of the industrial zones have been established and the transportation infrastructure is the best of all cities. Establishment of the international airport and the Yangon Port Development Plan may support and enhance trade and industry with better logistic facilities. Yangon is the most favorable city to be the western end of the East-West Economic Corridor, instead of Mawlamyine which was envisaged as such in the previous plan.

As regards Mandalay, it is the commercial hub in Upper Myanmar with great potential to raise the national income through trade, especially border trade with China and India. In addition, Yatanarpon Cyber City was established 20 miles away from Mandalay and this will undoubtedly escalate the economic growth not only in Mandalay but also in the country as a whole.

The study illustrates that Mawlamyine will become a city on the route of the extension road and railway from Dawei to Yangon and elsewhere in Myanmar. In addition, Dawei is an economically promising region due to its potential as a deep-sea port and special economic zone at the end of the extension of the Southern Economic Corridor, which will facilitate Myanmar's integration into the regional and international economic community.

This study provides to some extent the necessary data and information for development targets in the implementation of the East-West Economic Corridor and Southern Economic Corridor development projects. The current study was specifically designed to evaluate factors related to the historical background and the current situation. Therefore, further research is recommended regarding development of the infrastructure in major cities and their networks, as well as the development of projects

related to the economic corridors that serve as gateways to economic development for Myanmar and its neighbors.