

5 ONGOING AND PROPOSED PROJECTS

5.1 On-going Projects

This section provides an outline of all major on-going projects in Yangon Region by various transport related agencies as available to the YUTRA project team by December, 2013.

5.1.1 Road Transport Sector

1) Road Infrastructure Projects under Local Funding

Roads & Bridges (Engineering Department), YCDC is currently upgrading major roads to the concrete ones along with the construction of pavements and beautifying. (Table 5.1.1.1)

Table 5.1.1.1 Upgrading Road Infrastructure by YCDC

No.	Items	Description
Upgrading Road Infrastructure - Completed		
1.	Location	Waizayandar Road (From Eiksitan Creek To Thuwunna Bridge)
	Length of the road (km)	8.42
	Width of the road (m)	21.95
	Project cost (Kyats)	5.7337 billion
	Starting Date	4 March, 2012
	Completion Date	5 October, 2013
	Completion percentage	100%
Upgrading Road Infrastructure - Ongoing		
2.	Location	Shukhinthar Myopat Road (From Thanlyin Chin-kat Road To Mahabandoola Bridge)
	Length of the road (km)	6.49
	Width of the road (m)	20.12
	Project cost (Kyats)	3.5802 billion
	Starting Date	21 February, 2013
	Completion percentage	60%
3.	Location	Bayint Naung Road Portion (1) (From Kamaryut Creek To Padauk Creek)
	Length of the road (km)	3.74
	Width of the road (m)	21.95
	Project cost (Kyats)	2.1541 billion
	Starting Date	20 June, 2013
	Completion percentage	50%

Source: Roads & Bridges (Engineering Department), YCDC

2) Flyover Projects

The flyover projects which are just completed are listed in Table 5.1.1.2.

Table 5.1.1.2 Flyover Projects

No.	Items	Description
Flyover Project - Completed		
1.	Project Name	Hledan Flyover Project
	Location	Yangon – Pyay Road (Hledan Intersection)
	General Feature	Bridge type: Steel girder & Reinforced concrete structure Length of bridge: 764.13 m

No.	Items	Description
		Foundation type: Reinforced concrete bore pile Super structure: Steel girder & Reinforced concrete slab and hand rail No. of Lanes: 4 lanes ROW: 13.20 m Platform width: 0.91 m Clearance height: 5.49 m
	Contractor	Shwe Taung Development Co., Ltd. (Myanmar)
	Consultant	T.Y.Lin International PTE. Ltd. (Singapore) VERTEX Asia Pacific PTE. Ltd. (Singapore)
	Project Management Consultant	Tokyu Construction Co., Ltd. (Japan)
	Status	Completed (February 2012 – April 2013)
2.	Project Name	Bayint Naung Flyover Project
	Location	Bayint Naung Road – Thamine buteryone Road (Bayint Naung Intersection)
	General Feature	<u>2nd layer:</u> Bridge type: PC-I girder & Reinforced concrete structure Foundation type: bore pile No. of lanes: 4 lanes ROW: 17.60 m Length of bridge: 440 m (including approaching road) Clearance height: 5.49 m <u>3rd layer:</u> Bridge type: PC-I girder & Reinforced concrete structure Foundation type: bore pile No. of lanes: 2 lanes ROW: 10 m Length of bridge: 599.99 m (including approaching road) Clearance height: 5.49 m
	Contractor	First Myanmar Construction Co., Ltd. (Myanmar) TPC Pre-stressed Concrete (Thailand)
	Consultant	Asian Engineering Consultants Corp. Ltd. (Thailand)
	Project Management Consultant	Asian Engineering Consultants Corp. Ltd. (Thailand)
	Starting Date	5 June, 2012
	Completion Date	2 nd layer: 31 October, 2013 3 rd layer: 24 November, 2013
3.	Project Name	Shwe Gone Daing Flyover Project
	Location	Kabaraye Pagoda Road – Shwe Gone Daing Road (Shwe Gone Daing Intersection)
	General Feature	Bridge type: Steel-box girder & Reinforced concrete structure Foundation type: Reinforced concrete bore pile No. of lanes: 4 lanes ROW: 13.89 m Length of bridge: 627.75 m Clearance height: 5.49 m
	Contractor	Capital Development Ltd. (Myanmar)
	Consultant	JFE Engineering Corporation (Japan)
	Project Management Consultant	Capital Development Ltd. (Myanmar)
	Starting Date	12 December, 2012
	Completion Date	1 December, 2013
	Project Cost (Estimated)	17.44 billion Kyats

Source: Roads & Bridges (Engineering Department), YCDC

3) New Bridge Construction Project

No. (2) Bayint Naung Bridge spanning the Hlaing River which is parallel with the existing Bayint Naung Bridge is under construction by Public Works, Ministry of Construction (Figure 5.1.1.1). The construction was started on 2012 and expected to be finished on mid-2014. It is expected to mitigate traffic congestion by having both a 2-lanes existing bridge and a 4-lanes new bridge beside it crossing the Hlaing River, in conjunction with the Bayint Naung new flyover.



Source: YUTRA Project Team

Figure 5.1.1.1

Location of Bayint Naung Bridge

4) Public Bus Transportation Project

At present, there are no on-going projects for improvement of public bus transportation system in Yangon Region. Recently, Myanmar Government keen to implement BRT system in Yangon.

The government has planned to implement BRT system to help for alleviation of traffic congestion in Yangon. A coordination meeting on introduction of BRT system to Yangon was held at YCDC on 9 July, 2013. It was attended by Deputy Minister of Rail Transportation, Yangon Region Development Affairs Minister as well as Mayor, Yangon Region Transport Minister, members of Yangon Region Central Supervisory Committee for Motor Vehicles and Vessels, other governmental agencies, all bus lines committee, and owners from bus lines. The routes, types of bus for BRT and formation of BRT technical support committee were discussed at the meeting. (See Figure 5.1.1.2)

The plan has become talk of the town after the authorities revealed the plan to initiate the project as they sought solutions for easing growing traffic jams in the city.

A BRT technical support committee has been formed by Yangon Region Government on 25 July, 2013, with 14 members from YCDC, transport-related organizations and bus lines

committee. Yangon Region Government has requested the BRT technical support committee to prepare implementation plan for BRT. The local government would seek advices and approval from the central government for the project. The report was expected to submit to Yangon Region Government by the end of October, 2013. However, it has been delayed due to the BRT technical support committee has not drawn the plan yet. Although the government has planned to start the BRT system this year, it seems to be delayed.

YUTRA project team is also invited by BRT technical support committee to present regarding BRT planning and implementation issues.



Source: YUTRA Project Team

Figure 5.1.1.2 Presentation of BRT Expert from YUTRA Project Team at BRT Technical Support Committee Meeting on 5 December, 2013

5) Traffic Management

YCDC and traffic police have designated tow-away zones on 37 roads in Yangon (16 North-South roads and 21 East-West roads), with the aim of reducing congestion due to on-street parking. On 11 November, 2013, Yangon Region Government has announced that the vehicles are prohibited from parking on the following roads as shown in Table 5.1.1.3. The authority has started taking action against the offending motorists in line with the vehicle law and fines and 64 cars have been towed until 14 November, 2013. Before the cars are cleared, police will make three warning announcements over a loudspeaker. If the car owners do not move their vehicles during this time, a tow truck will take the cars to a police parking lot (Figure 5.1.1.3). The drivers whose cars have been towed must go to court to pay a fine ranging from Kyats 10,000 to Kyats 400,000, plus tow-truck fees, before they can reclaim their vehicles.



Source: YUTRA Project Team

Figure 5.1.1.3 Tow Truck in Yangon

Table 5.1.1.3 Tow-Away Zone

No.	North-South Roads
1.	From Htauk-Kyant intersection, along Pyay Road until Phone Gyi Road and Strand Road Junction
2.	From Insein Buteryone Road and Insein Road junction (Near the BOC Bus Stop), along Insein Road until Hledan intersection
3.	From Lower Mingalardon Road and Bayint Naung Road Junction, along Bayint Naung Road, Thamine Buteryon Road and Ywa Ma Kyaung Junction, along Bayint Naung Road until Hledan Road and Narnattaw Road Junction
4.	From Hledan Road and Narnattaw Road Junction, along Kyeemyindaing Kannar Raod, until War Dan Street and Strand Road Junction
5.	From Lan Thit Street and Baho Road Junction, along Baho Road, Thamine Buteryon Intersection, Parami Intersection, Oakkyin Buteryon Intersection, from that Ywa Ma Kyaung Street, along Baho Road until Hantharwaddy Road
6.	From Pyay Road and Min Dhama Intersection, along Min Dhama Road until Parami Intersection
7.	From Pyay Road and Inya Intersection, along Inya Road until Parami Intersection
8.	From Kyun Taw Road and Narnattaw Intersection, along Kyun Taw Street until Hantharwaddy Road
9.	From Hantharwaddy round about, along the U Wisarya Road, Dhama Zedi Intersection, U Wisarya round about, until Shwe Dagon Pagoda Road
10.	From Bo Gye Aung San Road and Shwe Bon Thar Road Junction, along Shwe Bon Thar Road until Strand Road
11.	From Corner of Kan Yeik Thar Road and Upper Pansodan Road to Upper Pansodan Road, along Pansodan Road until Strand Road
12.	From Corner of Kan Yeik Thar Road and Thein Phyu Road, along Thein Phyu Road until Strand Road
13.	North Okkalapa Township, Corner of Wai Bar Gi Road and Thu Dhamar Road (6 Khway Near Waizayandar Road), along Thu Dhamar Road, From that, along Waizayandar Road, Ayer Wun Road to Thu Wunna Bridge, From that Ayer Wun Road, Min Nandar Road, From that Min Nandar Road, Corner of Yamonnar Road and Min Nandar Road, From that Min Nandar Road, Maha Bandoola Bridge to Batahtaung Zay Road to Lower Pazundaung Road Intersection
14.	Thingangyun Township, Lay Daunt Kan Intersection (Pyi Htaung Su Fly Over Bridge), Along Than Thu Mar Road, Thamain Bayan Intersection (in front of Chicken & Duck Market)
15.	Corner of Thamain Bayan Road and Than Thu Mar Road (in front of Chicken & Duck Market) along Upper Pazundaung Road, Corner of Bo Gye Road and Lower Pazundaung Road, From that, along Lower Pazundaung Road until Monkey Point
16.	South Okkalapa Township, Corner of Parami Road and Than Thu Road, along Than Thu Mar Road, Lay Daunt Kan Intersection (Pyi Htaung Su Flyover), From that, along Lay Daunt Kan Road, East Race Road, From that, along the East Race Road, Tarmwe Intersection, Corner of Shwe Gon Taing Road and Thamain Bayan Road
No.	East-West Road
1.	Mingalardon Township, Corner of No. (3) Main Road and Khayae Pin Road, along Khayae Pin Road, Pyay Road Intersection, From that Aung Mingalar Intersection to Shwe Pyi Thar Bridge
2.	Insein Township, Corner of Pyay Road and Lan Thit Road (Arlain ngar sint street) Baho Intersection, From that Along the Hlaing River Road Up to Aung Zay Ya Bridge
3.	Ma-yan-gone 8 miles Intersection, Along the Kabaraye Pagoda Road, From that Corner of Ko Min Ko Chin Road and Up to Nanda Wun Street, From that Ko Min Ko Chin Road, Bahan Road, From That U Htaung-Bo round about to Zoological Garden Street, From that, Along the Signal Pagoda Road, Corner of Sule Pagoda Road and Strand Road
4.	Sule Pagoda Road to Gyo Phyu Road, From that, Corner of Zoological Garden Street and Bo Min Khaung Road
5.	Ma-yan-gone 8 miles Intersection, Along the Kyaik Wine Pagoda Road, Insein Intersection, From that, Along the Thamine Buteryon Road to Bayintnaung Bridge
6.	North Dagon Township, Corner of Pin-lon Road and U Wisarya Road, Along the Parami Road, Waizayandar Intersection, Kabaraye Pagoda Intersection, Pyay Intersection, Insein Intersection, From that Baho Intersection up to Bayintnaung Intersection
7.	Corner of Sayar San Road and University Avenue Road, Along the University Avenue Road up to Hledan Intersection

8.	Hledan Intersection, Along the Hledan Road up to Kyeemyindaing Intersection
9.	Corner of Pyay Road and Narnattaw Road, along the Narnattaw Road up to Kyeemyindaing Kannar Intersection
10.	Hantharwaddy round about, Along the Hantharwaddy Road, Kyun Taw Intersection, From that Baho Intersection up to Kyeemyindaing Kannar Road
11.	Aung Yadanar Road and Kannar Lan Thit, Along the Kannar Lan Thit up to Monkey Point
12.	Corner of Bargayar Road and Dhama Zedi Road, Along the Dhama Zedi Road up to Strand Intersection
13.	Corner of Kabaraye Pagoda Road and Dhama Zedi Road, Along the Dhama Zedi Road, from that Along Shin Saw Pu Road up to Baho Intersection
14.	U Wisarya round about, Along the Ahlone Road up to Baho Road
15.	U Wisarya round about, Along the U Htaung-Bo Road, U Htaung-Bo round about, From that, Along the Kanyeikthar Road up to Nat Mauk Street
16.	Corner of Lower Kyeemyindaing Road and Aung Yadanar Road, Along the Bo Gyoe Road up to Upper Pazundaung Intersection
17.	Corner of Strand Road and Anawrahta Road, Along Maha Bandoola Road up to Lower Pazundaung Road
18.	Corner of Strand Road and Maha Bandoola Road, Along Maha Bandoola Road up to Yamonnar Road
19.	Corner of Strand Road and Merchant Road, Along Merchant Road up to May Yu Road
20.	Corner of Lower Kyeemyindaing Kannar Road and Kannar Lan Thit Road, Along the Strand Road up to Monkey Point
21.	U Htaung-Bo Kone round about to Bahan Road, From that, Along the Nat Mauk Road Kanyeikthar Intersection, From that, Along the Kanyeikthar Road up to U Htaung-Bo round about

Source: Myanma Alinn Daily Newspaper, As of November 11, 2013

5.1.2 Railway Transport Sector

1) New Modern Train to Yangon's Circular Railway

Yangon circular railway has been equipped with a new train on 1 November 2013. The new train has 6 carriages with room for up to 648 passengers and tickets cost 300 kyats each. It departs from Insein to Yangon at 5 am, then back to Insein from downtown Yangon, then from Insein to Hlawka. It circles round the city four times. The train is designated to stop at every one of the 39 stations along the route, which is 45.9 km long.

2) Technical Assistant for Railway Safety and Service Improvement

Currently JICA study team, collaboration with Myanma Railway, MORT is conducting "Technical Assistant for Railway Safety and Service Improvement Project". The objectives of this project is

- To establish plan for improvement of operation for enhancement of safety and service
- Technical capacity building/technical transfer for track maintenance skill by using Yangon-Mandalay suburban line

3) Railway Central Control Center System Installation

Since Yangon Circular Railway signal system is quite old and has many problems such as frequent malfunction with no changing signal color due to fail-safe system worked by short-circuited track circuit by water-soaked track in every rainy season. In order to eliminate the problems, appropriate safety facilities such as OCC, electronic interlocking device, etc., will be installed as urgent countermeasure by JICA grant aid. Therefore, JICA study team, cooperation with Myanma Railway, currently studying in order to decide the scope of grant aid for railway safety facilities.

5.1.3 Water Transport Sector

1) Inland Water Transport Project

On-going project in Inland Water Transport is described in Table 5.1.3.1.

Table 5.1.3.1 On-going Inland Water Transport Project

Items	Description
Project Title	The Project for Upgrading Ferry Boats in Yangon City
Implementing Organization	Inland Water Transport, Ministry of Transport JICA
Outline of the Project	<p>(1) Background and Necessity of Project: The ferry route connecting the central area of Yangon with Dala township crossing Yangon River is being used by an average of more than 32,000 passengers every day, especially exceeding the capacity during the morning and evening rush hours. The existing ferry boats in operation are progressively decrepit with damaged hulls and frequent inundation, each of which must be sent to dock for 3 months in a year. It is too dangerous to function as public transportation, and it is difficult to operate stably. As the route flows rapidly near Yangon Port where there are many large boats, an accident can cause extended damages. Since many of the residents in Dala township are general workers and low-income persons who use ferry boat frequently as public transportation, it is an urgent issue to upgrade ferry boat as part of improvement of public transportation network in Yangon City.</p> <p>(2) Purpose and Outline of Project: The purpose of the project is to improve safety by replacing the existing aged boats by 3 new ferries for crossing Yangon River and contribute to improvement of transportation in Yangon City. The project is expected to improve the safety and credibility of river transportation as well as the living environment of the citizens of Yangon.</p>
Project Location	Yangon-Dala ferry service
Implementing Schedule	Project Period: 1 July 2013 – 31 October 2014 Construction of 3 ferry boats in Japan will be completed in October 2014. Ferry boats will be transported to Yangon and handed over to IWT in October 2014.
Estimated Project Cost	JPY 1,168,000,000 (the maximum provision amount)

Source: JICA and Inland Water Transport, Ministry of Transport

2) Port Development Project

Privatization Project for Port Industry

Myanmar Port Authority (MPA) is solely responsible for port planning under the direction of Ministry of Transport (MOT). Foreign and local investors are also permitted to develop ports in accordance with the Union of Myanmar, Foreign Investment Law-1998, Myanmar citizens Investment Law-1998 and Myanmar Companies Act 1914 under 100% Foreign Investment by BOT basic and/or Joint Venture subject to the approval of the Myanmar Investment Commission (MIC). Four systems have been applied to raise the fund for port development.

- 100% national investment
- 100% investment under BOT basic by foreign and/or local investors
- Joint-venture between MPA and foreign and/or local investors
- Grant aids or soft loan financed by international organizations

The government allowed the private sector to participate in building new wharves and jetties. Myanmar International Terminal Thilawa (MITT) and Myanmar Integrated Port Limited (MIPL) were established and they are carrying out to supply better port services. Asia World Port Terminal (AWPT) and Myanmar Industrial Port (MIP) were also established to support port services in Yangon port. The current participation of private sector for port industry is listed in the following Table 5.1.3.2.

Table 5.1.3.2 Current Participation of Private Sector for Port Industry

Project Description	Location	Executing agency	Investment scheme	Investment amount	Starting Date	Completion Date
<u>Construction of Container Depot</u> Container Yard Area – 9.75 acres Container storages capacity – Total 4,387 TEUs	Botataung No. 1 Inland Container Depot	MPA & Allied Container Services Singapore	JV	US\$ 7.02 millions	–	1997
<u>Construction of General Cargo and Container Wharves</u> Total quay length – 155.8 m Apron width – 30.5 m Water depth (apron) – 9.1 m Accommodative size of vessel – 15,000 tons (DWT)	No. 2 Ahlone Wharf, Kyeemyindine Township	Asia World Port Management Co., Ltd.	25 years (BOT)	US\$ 4.6 + Kyats 439.3 millions	April 25, 1996	May 24, 2001
<u>Construction of General Cargo and Container Wharves</u> Total quay length – 210.8 m Apron width – 30.5 m Water depth (apron) – 9.1 m Accommodative size of vessel – 15,000 tons (DWT)	No. 1 Ahlone Wharf, Kyeemyindine Township	Asia World Port Management Co., Ltd.	25 years + 5 years x 3 times (BOT)	US\$ 21.0 + Kyats 2,343.6 02millions	November 25, 1998	May 24, 2002
<u>Construction of General Cargo and Container Wharves</u> Total quay length – 259.7 m Apron width – 30.5 m Water depth (apron) – 9.1 m Accommodative size of vessel – 15,000 tons (DWT)	No. 3 Alone Wharf, Kyeemyindine Township	Asia World Port Management Co., Ltd.	30 years + 5 years x 3 times (BOT)	US\$ 18.0 + Kyats 1,420.0 millions	September 1, 2001	February 28, 2006
<u>Designed to Handle General and Containerized Cargo</u> Total quay length – 238 m Backup area – 13.726 acres Water depth (apron) – 9.1 m Accommodative size of vessel – 15,000 tons (DWT)	No. 4 Alone Wharf, Kyeemyindine Township	Asia World Port Management Co., Ltd.	30 years (BOT)	US\$ 1.5 million + Kyats 14 billions	November 25, 2006	May 2012
Total quay length – 304.8 m Apron width – 21.9 m Water depth (apron) – 6.1 m Accommodative size of vessel – 8,000 tons (DWT)	Myanmar Industrial Port (MIP), Ahlone Township	Myanmar Industrial Port	25 years (BOT)	Kyats 4,836.52 million	May 6, 2000	January 4, 2003
Total quay length – 198 m Apron width – 17 m Water depth (apron) – 10 m Accommodative size of vessel – 20,000 tons (DWT)	Thilawa Plot. 4 Thanlyin Township	Myanmar Integrated Port Limited (MIPL)	25 years (BOT)	US\$ 18.2 million	July 10, 1996	March 25, 1998

Project Description	Location	Executing agency	Investment scheme	Investment amount	Starting Date	Completion Date
Total quay length – 304.8 m Apron width – 9.1 m Water depth (apron) – 3.0 m Accommodative size of vessel – 20,000 tons (DWT)	Thilawa plot 5,6,7,8 & 9 Thanlyin Township	Myanmar International Terminals Thilawa Limited	25 years (BOT)	US\$ 101.284 million	–	1997

Source: Myanmar Port Authority, Ministry of Transport

Rehabilitation Project of Port Facilities

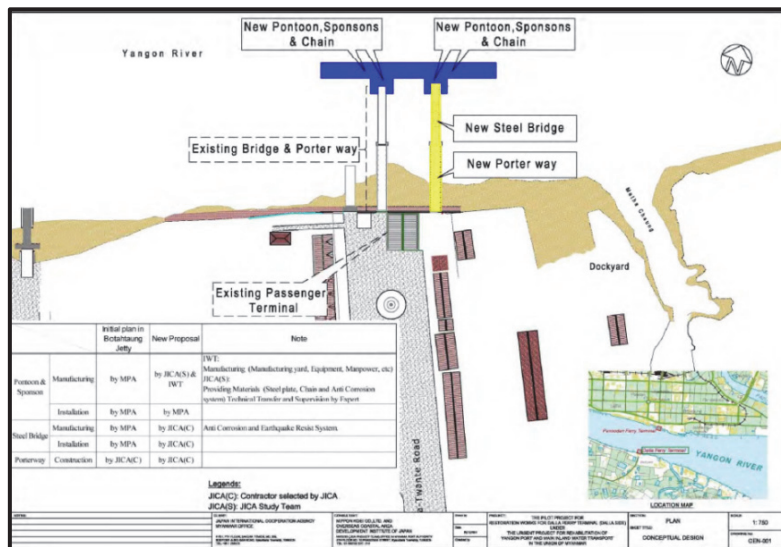
Cyclone Nargis attacked Myanmar on 2nd May 2008, and inland water transport infrastructure such as port facilities and navigation channel had serious damages. In order to recover inland water transport system in Yangon, Japan has supported to recover port facilities, dockyard facilities and navigation system in cooperation with MPA and IWT. (See Table 5.1.3.3)

Table 5.1.3.3 On-going Project by Myanmar Port Authority

Items	Description
Title	The Urgent Project for Rehabilitation of Yangon Port and Main Inland Water Transport in the Union of Myanmar
Implementing Organization	Myanmar Port Authority JICA
Outline of the Project	(1) Objectives of the Project: The objectives of the project are: <ul style="list-style-type: none"> ▪ To make recovery plans of the Yangon port facilities ▪ To make recovery plans of the main inland water transport in the project area ▪ To develop the capacity of MPA and IWT, through the implementation of the project (s) (2) Pilot Project: Restoration works for a part of Botahtaung Jetties 4, 5 and 6 concrete jetty with pontoon system and partial low stage floor adaptable for berthing and cargo handling under a wide range of 6 m tide. Capacity development through the rehabilitation of a jetty with Japanese technology For this pilot project, re-construction of Botahtaung Jetty which connects Dala Jetty is planned by Japanese Grant Aid. Profile of the new Botahtaung Jetty is shown in Figure 5.1.3.1 and Figure 5.1.3.2.
Project Location	The project area shall cover Yangon port and four major routes of inland water transport ways, operated by IWT in Delta Area, as listed below: <ul style="list-style-type: none"> ▪ Yangon-Maubin-Myaungmya-Labutta-Kanbet Route ▪ Yangon-Kyeikat-Bogale-Mawlamyinegyun Route ▪ Myaungmya-Pathein Route ▪ Kyeikat-Phyarpon
Project Component of Capacity Development	(1) Two Trainings: <ul style="list-style-type: none"> ▪ Recovery of navigation system of Yangon Port (Step 1, 2, & 3) ▪ Repairing of ships and metal structures (Step 1, 2 & 3) (2) Two Studies: <ul style="list-style-type: none"> ▪ Study of tide observation system ▪ Supplemental study on maritime disaster risk management (3) A Pilot Project: <ul style="list-style-type: none"> ▪ Restoration work for the Botahtaung Jetty ▪ Dala Ferry Terminal Jetty (Dala side)

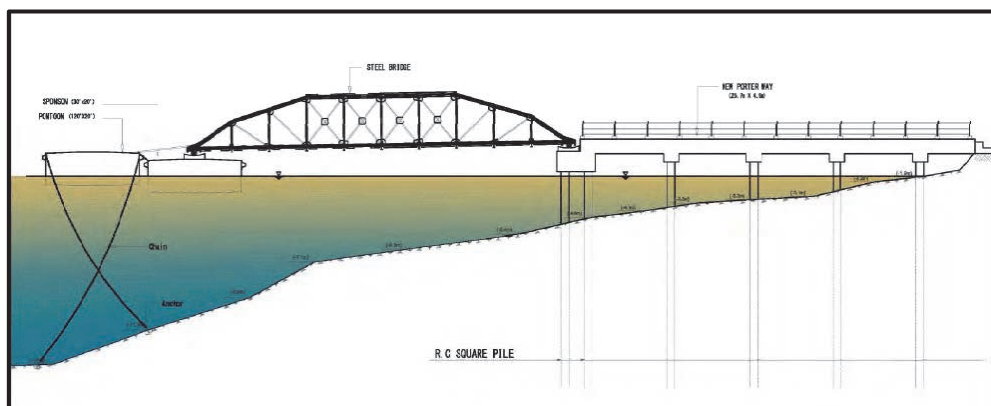
Items	Description
Implementing Schedule	Training for recovery of navigation system of Yangon Port (Step 1, 2 & 3) <ul style="list-style-type: none"> ▪ Step-1: Ship maneuvering: 2009 ▪ Step-2: Navigation aid: 2010 ▪ Step-3: Reduction of accident: 2013
	Training for repairing of ships and metal structures (Step 1, 2 & 3) <ul style="list-style-type: none"> ▪ Step-1: Arc welding (basic): 2009 ▪ Step-2: Sustainable arc welding & cradle building: 2010 ▪ Step-3: Co2 welding & inspection: 2012
	Study of tide observation system <ul style="list-style-type: none"> ▪ Installation of 2 ATG at MP & MITT: 2009 ▪ Analysis for 1 year's observation: 2010 ▪ Analysis of 3 years' observation: 2012-2013
	Supplemental study on maritime disaster risk management <ul style="list-style-type: none"> ▪ Reappearance of Nargis by simulation: 2009 ▪ Analysis of future cyclone & tsunami (Yangon): 2010 ▪ Analysis of future cyclone & tsunami (Delta Area): 2012-2013
	Restoration work for the Botahtaung Jetty: 2009 – 2015

Source: Nippon Koei



Source: Nippon Koei

Figure 5.1.3.1 Plan View of New Botahtaung Jetty



Source: Nippon Koei

Figure 5.1.3.2 Section View of New Botahtaung Jetty

5.1.4 Air Transport Sector

1) Project for Improvement of Nationwide Airport Safety and Security

6 Japanese private companies concluded an agreement on 10 September 2013 with the Department of Civil Aviation, Ministry of Transport, on the “Project for Improvement of Nationwide Airport Safety and Security”.

This project is designed to improve aviation safety at Myanmar’s international and major airports (Yangon, Mandalay, Nyaung-U, Heho, Thandwe and Dawei). To satisfy the International Civil Aviation Organization (ICAO) safety standards, equipment such as Doppler VHF omnidirectional radio range beacons and distance measuring equipment, flight procedure design systems, various aeronautical lights, and communication control units will be supplied to improve air traffic safety and fire engines, X-ray screening machines explosive detection devices and other equipment for airport security will be installed as necessary.

The project is intended to enhance Myanmar’s airports’ capacity to handle the burgeoning air traffic in the region by improving the safety and reliability of air transport and establishing more efficient air routes. The project will be implemented with 1.233 billion yen by JICA Grant Aids.

5.2 Projects Proposed/Planned by Various Agencies

There are numerous transport related projects, which have been proposed/planned by various transport related agencies. This section outlines these projects in details such as executing agency, estimated project costs, implementing schedule, etc. where available.

5.2.1 Road Transport Sector

1) Road Infrastructure Projects

Public Works, Ministry of Construction has planned to upgrade road infrastructure, as listed in Table 5.2.1.1, in cooperation with international agencies by Grant Aids or loans.

Table 5.2.1.1 Upgrading Road Infrastructure Projects Planned by Public Works, MOC

No.	Project Description	Implementing Organization	Funding Source	Estimated Project Cost	Project Period
1.	Upgrading Thanlyin – Thilawa Road	Public Works, MOC JICA	JICA	-	2015 - 2016
2.	East Dago – No. (2) Main Road	Public Works, MOC ADB	ADB	US\$ 58 million	2016 – 2018
3.	Thilawa – East Dagon Road	Public Works, MOC ADB	ADB	US\$ 41 million	2016 – 2018
4.	Upgrading Yangon – Mandalay New Expressway	Yangon-Mandalay Expressway Project was started on 10 October 2005 and opened to public for <ul style="list-style-type: none"> ▪ Yangon – Naypyitaw portion on 25 March 2009 ▪ Naypyitaw – Sakeinn portion on 29 December 2010 ▪ Sakainn – Tadaoo – Tagonedine on 23 December 2011. Yangon-Mandalay New Expressway is 366 miles 3 furlon long and concrete pavement width is 100 ft. (8 lanes x 12.5 ft.). PW is planning to upgrade this expressway to Asphalt Concrete Pavement Road to improve service year.			

Source: Public Works, Ministry of Construction

2) New Bridge Construction Projects

There are 6 new bridge construction programs proposed by Public Works, Ministry of Construction, as listed in Table 5.2.1.2.

Table 5.2.1.2 New Bridges Construction Projects Proposed by Public Works, MOC

No.	Items	Description
1.	Bridge Name	Thaketa Bridge No. (2) ¹⁾
	Bridge Type	Cable-stayed bridge with anchor span Steel box girder PC box girder
	Location	Crossing Pazundaung Creek Pazundaung/Dawpone township
	Implementing Organization	Public Works, Ministry of Construction JICA
	Funding Source	-
	Estimated Project Cost (USD)	10 million
	Project Period	2014 – 2016
2.	Bridge Name	Bago River Bridge ²⁾
	Bridge Type	-
	Location	Crossing Bago River (Yangon – Thilawa) Thanlyin/Thaketa
	Implementing Organization	Public Works, Ministry of Construction JICA
	Funding Source	-
	Estimated Project Cost (USD)	110 million
	Project Period	2016 – 2019
3.	Bridge Name	Wartayar Bridge
	Bridge Type	Suspension Bridge 2 lanes
	Location	Crossing Hlaing River Htantapin – Hmawbi Road
	Implementing Organization	Public Works, Ministry of Construction Korea
	Funding Source	EDCF Korea Grant Aid
	Estimated Project Cost (USD)	27 million
	Project Period	2016 - 2017
4.	Bridge Name	Aye ywar Bridge
	Bridge Type	P-C Box Girder 4 lanes
	Location	Crossing Hlaing River Kyeemyindine – Aye village road
	Implementing Organization	Public Works, Ministry of Construction Korea
	Funding Source	EDCF Korea Grant Aid
	Estimated Project Cost (USD)	58 million
	Project Period	2016 - 2017
5.	Bridge Name	Korea-Myanmar Friendship Dala Bridge ³⁾
	Bridge Type	Cable-stayed 4 lanes
	Location	Crossing Yangon River Connecting Dala township and Kyauktada township
	Implementing Organization	Public Works, Ministry of Construction Korea Government
	Funding Source	ODA Loan/Grant Aid
	Estimated Project Cost (USD)	188.7 million

No.	Items	Description
	Project Period	2016 - 2019
6.	Bridge Name	Thilawa – Thakhut Yangon River Bridge
	Bridge Type	-
	Location	-
	Implementing Organization	Public Works, Ministry of Construction Japan Government
	Funding Source	ODA Loan
	Estimated Project Cost (USD)	200 million
	Project Period	2028 – 2031
7.	Bridge Name	No. (2) Bayint Naung Bridge (Under Construction)
	Bridge Type	Steel Truss
	Location	Crossing Hlaing River Yangon-Pathein Road
	Implementing Organization	Public Works, Ministry of Construction
	Funding Source	-
	Estimated Project Cost (USD)	-
	Project Period	2012 – mid of 2014 (Expected)

Source: Public Works, Ministry of Construction

- Note:
- 1) Feasibility study is currently conducting in YUTRA project.
 - 2) Feasibility study is currently conducting in YUTRA project.
 - 3) Feasibility study is currently conducting under Korean assistance.

3) Flyover Projects

Yangon Region Government is planning to construct a flyover at the Myaynigone Intersection. The project is estimated to cost around Kyats 17 billion and the money is expected to come from Yangon's regional government budget of next fiscal year as well as from international agencies to cover some expenses.

The bridge is planned to begin near Mahar Myaing Medical Centre on Pyay Road on the north side of the junction and continue to the traffic light at the junction with Shin Saw Pu Road. No more details plan are available to YUTRA Project Team.

The government is planning 3 special projects in the next fiscal year: the Myaynigone flyover, a new Nga Moe Yeik Bridge linking between Dawpon and Thingankyun townships and renovating an old Nga Moe Yeik Bridge linking Dawpon and Mingalar Taung Nyunt townships.

4) Public Bus Transportation Projects

The Road Transport (RT) department has offered tender to local and foreign companies to operate transport services as a joint venture with the department. The selected local companies; Forever Green Right Services Co., Ltd. and San Yaung Ni Co., Ltd.; in joint venture with RT, has submitted the proposal for their project at Myanmar Investment Commission (MIC), awaiting the approval to start the project. The project includes construction of bus terminals, vehicles maintenance and passengers' transportation. (see Table 5.2.1.3)

Table 5.2.1.3 Public Transport Services Project Proposed by Road Transport, MORT

Project Description	Implementing Organization	Investment Scheme	Investment Amount	Project Period	Status
<ul style="list-style-type: none"> ▪ Investment of City Bus, Highway Bus ▪ Construction of Bus Terminal ▪ Vehicle Repaired Workshop 	<ul style="list-style-type: none"> ▪ Road Transport, MORT ▪ Forever Green Right Services Co., Ltd (Myanmar) 	JV (30+10+10) years	Kyat 7,140 million	One year construction period	<ul style="list-style-type: none"> ▪ After getting approval from MIC ▪ Expected to start January 2014
<ul style="list-style-type: none"> ▪ Investment of City Bus ▪ Rental Services ▪ Construction of Bus Terminal ▪ Vehicle Repaired Workshop 	<ul style="list-style-type: none"> ▪ Road Transport, MORT ▪ San Yaung Ni Co., Ltd (Myanmar) 	JV (30+10+10) years	Kyat 5,726 million	One year construction period	<ul style="list-style-type: none"> ▪ After getting approval from MIC ▪ Expected to start April 2014

Source: Road Transport, Ministry of Rail Transportation

5) Traffic Management

At present, Yangon Region Government has designated 37 roads as a tow-away area as part of a measure to reduce traffic congestion. However, the government's measures has not eased the traffic situation, therefore, the authorities has plan to establish car parking zones to make it more convenience. YCDC will implement parking areas in Yangon, but it depends on ground conditions and budget availability.

Furthermore, according to YCDC, Yangon authorities are planning to build a multi-storey car parking in downtown area in a land plot owned by YCDC. However, it did not disclose the details of the construction plan.

5.2.2 Railway Transport Sector

1) Upgrading Yangon-Mandalay Railway with Japan's Assistance

Yangon-Mandalay railway will be upgraded in three phases with the US\$ 500 million expected to be loaned by Japan. Japan-Myanmar co-technician group has reportedly been studying 166 mile railway part of Yangon-Taungoo among the railway parts of Yangon-Taungoo, Taungoo-Yamethin and Yamethin-Mandalay appropriated for the first phase. (see Table 5.2.2.1)

Table 5.2.2.1 Yangon-Mandalay Railway Modernization & Rehabilitation Project

Items	Description
Title	Yangon-Mandalay Railway Modernization & Rehabilitation Project (Phase-I) (Yangon-Taung Oo Section – 166 miles)
Implementing Organization	Myanma Railway, Ministry of Rail Transportation
Outline of the Project	<p>(1) Objectives of the Project</p> <ul style="list-style-type: none"> ▪ To rehabilitate the deteriorated rail infrastructures and relevant facilities of the existing railway between Yangon and Taung Oo city ▪ To modernize in order to increase safety and speed of train operation, to reduce transportation cost, and to increase passengers and freight transportation <p>(2) Scope of Work</p>

Items	Description
	<ul style="list-style-type: none"> ▪ Rehabilitation of Existing Infrastructure <ul style="list-style-type: none"> ✓ Roadbed works: shaping embankment, stone, raising-up embankment, slope protection ✓ Bridge works: rebuild new PC bridges, rehabilitate super-structures and sub-structures of all bridges ✓ Track works: replacing new rails and turnouts, adding ballast, procurement maintenance machines, etc. ✓ Other civil works: installation fence, improvement level crossing structures, etc. ▪ Modernization of Signaling and Telecommunication Systems <ul style="list-style-type: none"> ✓ OCC, signaling, telecom, level crossings ▪ Rehabilitation and Modernization of Rolling Stocks and Workshops <ul style="list-style-type: none"> ✓ Procurement of workshop equipment, test run device, diesel multiple units (DMU) and diesel-electric multiple unit (DEMU, Rail Bus) ▪ Enhancing of Freight Transport Business <ul style="list-style-type: none"> ✓ Rehabilitate warehouses and improving security ✓ Renovate freight stations and procurement facilities for containers transportation
Project Location	Yangon – Taung Oo area
Implementing Schedule	Starting the detailed design work from 2014
Estimated Project Cost (JPY)	73,036 million
Funding Source	Japan ODA loan

Source: Myanma Railway, Ministry of Rail Transportation

2) Upgrading Yangon Central Railway Station

Two Japanese companies, along with two Singaporean firms, have proposed to the Myanmar government for a project to upgrade Yangon Central Railway Station, including the compound yard. The upgrade will be included construction of world-class apartments and public services at the station, as well as an upgrade of the railway system itself.

The ministry will invite tenders after permissions from the National Government, and once the budget and the quality of the winning companies are confirmed. No further details are available to YUTRA Project Team.

5.2.3 Water Transport Sector

1) Inland Water Transport Projects

The outline of some projects proposed by Inland Water Transport is provided in Table 5.2.3.1.

Table 5.2.3.1 Proposed/Planned Projects by Inland Water Transport, MOT

No.	Items	Description
1.	Project Title	Project for Purchasing New Vessels and Barges for Inland Water Transport
	Implementing Organization	Inland Water Transport, Ministry of Transport Japanese Government
	Outline of the Project	(1) Project Outline: 37 numbers of new vessels and barges shall be purchased and provided to Rakhine, Delta, Ayeyarwaddy and Cargo Transport Divisions for transportation of passengers and cargo. Most of vessels will be used in Yangon Region. (2) Project Objective: Over-aged vessels and barges shall be gradually written off and replaced by new ones thus improving passengers and cargo transportation and increasing revenue of Inland Water Transport. (3) Project Output: When the project is achieved, the inland water passengers and cargo transportation of Myanmar will be improved to promote economy and thus the poor people will have the benefit. Safe and sound transportation of passengers and cargo will be available for public.
	Project Location	Yangon, Upper Myanmar, Rakhine and Delta Region
	Estimated Project Cost	USD 31.77 millions
2.	Project Title	Project for Upgrading the Dala Shipyard of Inland Water Transport
	Implementing Organization	Inland Water Transport, Ministry of Transport Japanese Government
	Outline of the Project	Dala shipyard under IWT shall be upgraded as follows. <ul style="list-style-type: none"> ▪ Machine shops, Workshops, Slipways and docking system shall be upgraded. ▪ Machineries and equipment for ship repairing and ship building shall be upgraded. ▪ Technology for repairing, construction and shipyard management shall be upgraded.
	Project Location	Dala Shipyard, Dala township
Estimated Project Cost	Total Cost: USD 18 millions <ul style="list-style-type: none"> ▪ USD 10.0 million for upgrading of machine shops, workshops, slipways and docking facility ▪ USD 7.0 million for replenishing modern machineries and machine tools for replacing and construction of vessels and barges ▪ USD 1.0 million for enhancing shipyard management capacity and technology for repairing and construction of vessels and barges 	

Source: Inland Water Transport, Ministry of Transport

2) Port Development Projects

Yangon port is the largest and the most important international port in Myanmar. Nowadays, Yangon port has been extending to promote its capacities in the area of inner bar area as well as Thilawa area. The Government of Myanmar has a plan to upgrade Yangon port region into an international standard one as part of its plan for urbanization of the commercial hub of Yangon. Upgrading work includes extension of retaining wall of the port deep into the river, filling earth and construction of recreation centers and shops on the site, upgrading of some pontoon bridges into ones that can handle containers and international general cargo vessels, equipping freight-handling equipment and constructing port facilities including modern business buildings within the compound and building of inland port terminals in Yangon port.

Regarding the future development of ports, several extended wharves as well as new ones will be established at some existing terminal and wharves. Figure 5.2.3.1 show the expected area for development of international port/terminals.

MPA is planning to build 7 new wharves which will be located in Ahlone forestry compound and Thein Phyu shipyard. It is expected to handle about 85% of the import and export cargo coming into Myanmar. Myanmar Economic Corporation (MEC) will build the new wharves in Ahlone forestry compound.

Yangon port development project, which are either planned or scheduled to be started in the near future, are listed in Table 5.2.3.2.



Source: Myanmar Port Authority, Ministry of Transport

Figure 5.2.3.1 Location Map for Future Port Development at Yangon Inner Harbor Area

Table 5.2.3.2 Proposed/Planned Projects by Myanmar Port Authority, MOT

No.	Project Name	Project Description	Project Location	Executing Agency	Status
1.	Expansion of Botahtaung Foreshore	Expansion of back-up area of Botahtaung foreshore by constructing revetment and reclamation for implementation of the recreational and commercial buildings at the premises	Botahtaung	MPA	Scheduled Expected completion date: 2014
2.	Upgrading Lanmadaw Foreshore Area	Upgrading of the local jetties as international inland port terminals, development and reconstruction of infrastructures as modernized commercial buildings at Lanmadaw foreshore area, between Ywarhit Creek and Sintoodan Jetty	Lanmadaw	MPA	Proposed
3.	Upgrading Sule Pagoda Wharves Area	Upgrading and renovation of Sule No. (1), (2), (3), and (4) wharves as a multi-purpose terminal to be accommodated international general/container cargo vessels which shall include renovations and strengthening of wharves structures installation of cargo handling equipments, construction port related facilities at the back-up area	Sule	MPA	Schedule Expected starting date: 2014
4.	Upgrading Nanthidar Jetty	Upgrading of the Nanthidar and Pansodan-Dala Passenger jetties as modernized passenger terminal, development and construction of modernized commercial buildings at back-up area	Pansodan	MPA	Proposed

Source: Myanmar Port Authority, Ministry of Transport

5.2.4 Air Transport Sector

1) Hanthawaddy International Airport Project

Myanmar is set to build a new international airport, to be called the Hanthawaddy International Airport, which is located in Bago Region, 80 km northeast of Yangon. It covers an area of 3,912 hectares which will be 9 times larger than existing Yangon International Airport and will be capable of handling at least 12 million passengers per year.

South Korea Incheon Airport Consortium, which is among 7 prequalified foreign tenderers from Singapore, Japan, France and South Korea, won the tender for building the Hanthawaddy International Airport and got a priority right for negotiation. The estimated project cost is about USD 1.5 billion. The airport will be developed under BOT agreement. Construction will be started on 2014 and is expected to be completed by the end of 2017, and start operating by the beginning of 2018. The airport will remain under Incheon's ownership until 2067, at which time control of the airport will be transferred to the Myanmar government.

Yangon is now Myanmar's financial hub. However, the country hopes to create a second commercial hub around the Hanthawaddy International Airport, and possibly build a high-

speed train network connecting the two cities. At the moment, it is just a proposal and the detailed plan has not yet been made whether the Hanthawaddy-Yangon link would comprise rail as well as road, or how the proposed connection would dovetail with existing road and rail connections into Yangon.

2) Expansion and Upgrading Existing Yangon International Airport

A consortium led by Myanmar private company, comprising companies from China, Singapore and Malaysia, won the tender for upgrading existing Yangon International Airport and got a priority right for negotiation.

The existing Yangon International Airport is capable of handling 2.7 million passengers a year and an extension is planned to bring the number of passengers to 6 million by 2017. The estimated cost is USD 150 – 170 million. The redevelopment of Yangon airport will take place at the same time as a new international airport; Hanthawaddy International Airport, which will be constructed at Bago Region.

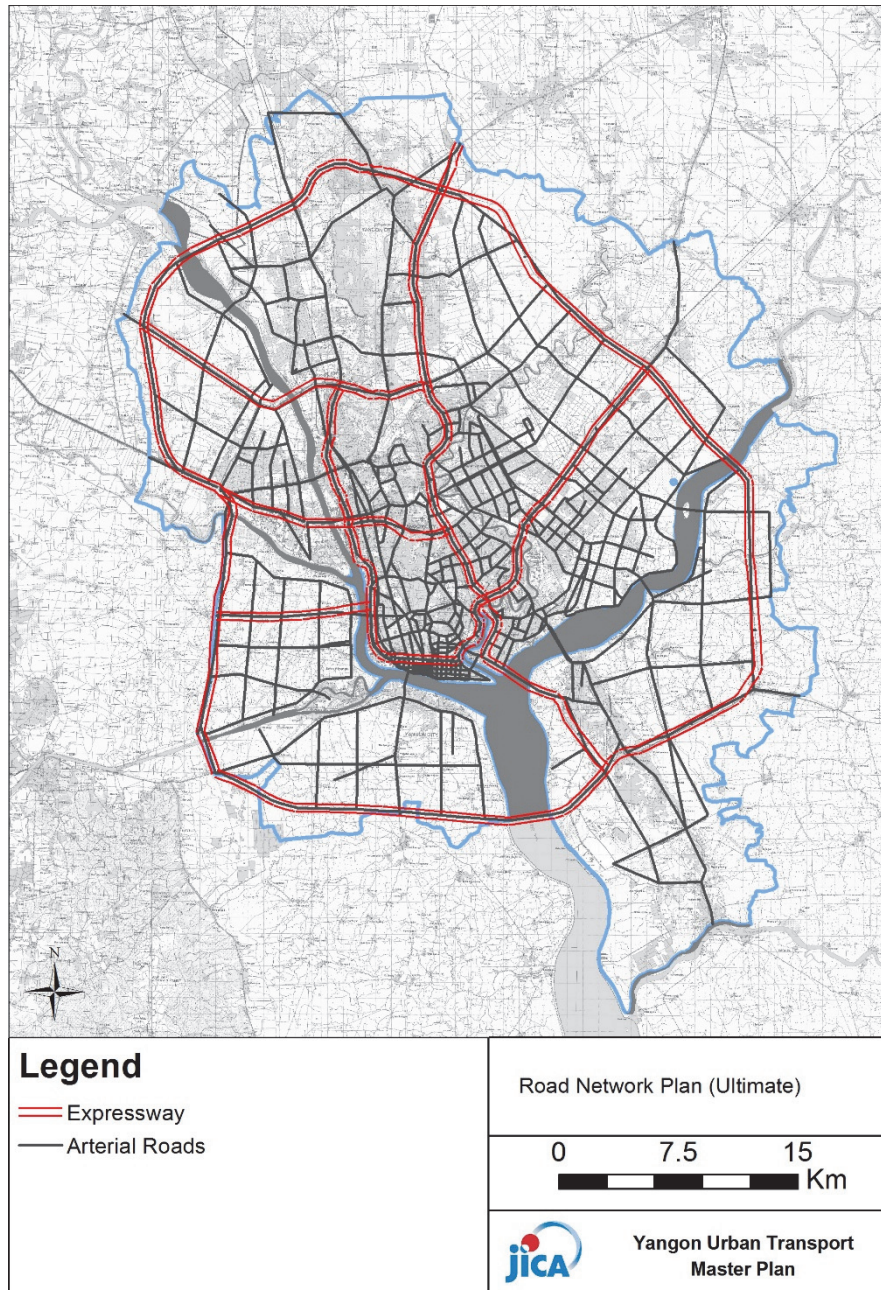
6 MASTER PLAN 2035

6.1 Transport Network Planning

6.1.1 Transport Network Formation

1) Road and Expressway

Based on the demand/supply gaps identified in Section 3.4 of this report, the “Do-maximum” transport network was first prepared. This is the basis for the master planning where unnecessary transport links or routes are removed vis-à-vis the result of traffic assignment. The Do-maximum network is shown below.



Source: YUTRA Project Team

Figure 6.1.1.1 Do-maximum Road Network

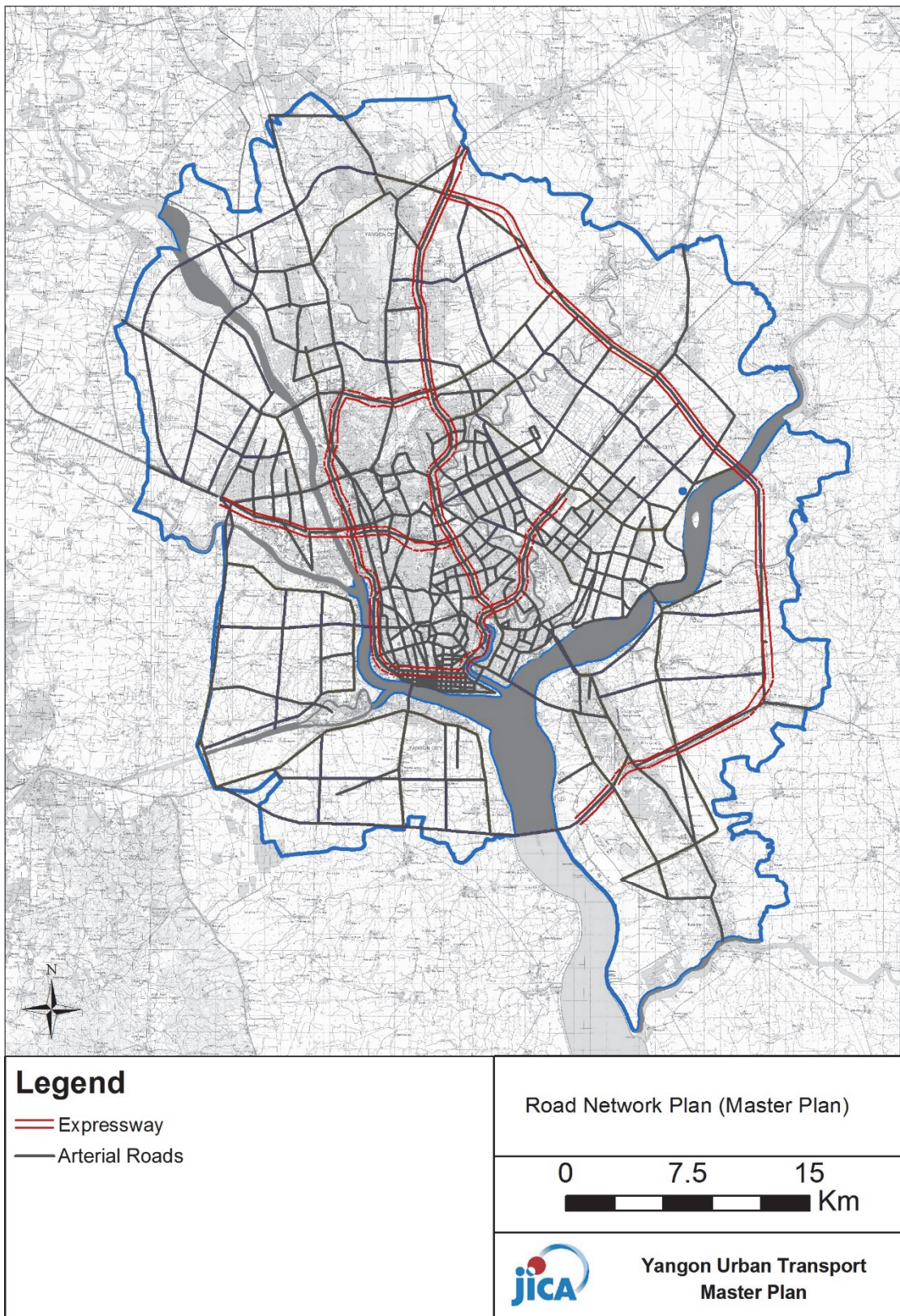
This Do-Maximum network includes not only the existing network but many new projects proposed or planned by related organizations and other studies. For example, YCDC proposes the Outer Ring Road (ORR) and its distributor roads, and the SUDP considered it as one of the possible projects in their conceptual road network. The other expressways shown in the figure (in red) are the candidate projects identified by YUTRA in the light of the estimated demand/supply gaps in the future. There are other candidate arterial roads surrounding the central area of Yangon assumed by YUTRA. It is noted, however, that almost no candidate arterial roads are assumed within the proposed Inner ring Road (IRR).

However, judging from the result of demand forecast, traffic demand is scarce on some of the road links, and they are considered overinvestment for the master plan by 2035, and were excluded. However there is an exception. The Outer Ring Road (ORR) has shown only little loadings, and should have been excluded naturally. Due, however, to the strategic importance as the national freight corridor, the eastern half of the Outer Ring Road (the section between the entrance/exit to/from the Yangon – Mandalay Expressway and Thilawa SEZ) was re-categorized as a mid-term project. This is consistent with the national transport study (MYT-Plan).

The recommended road network is presented in Figure 6.1.1.2 and Figure 6.1.1.3 shows its breakdown to short-, middle- and long-term.

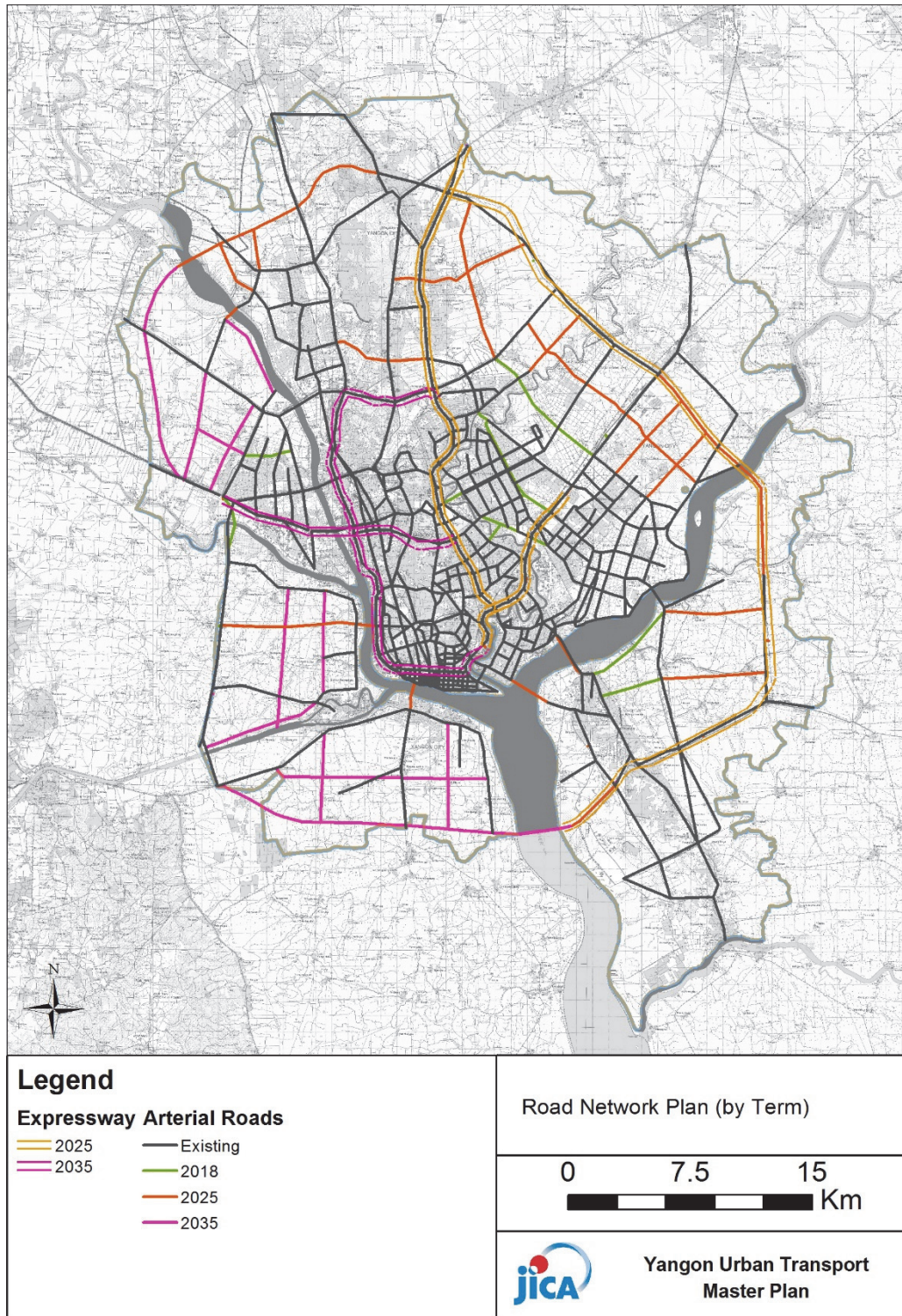
With regard to SUDP, the proposed road network has been changed slightly although the future urban structure remains the same. The reason of these changes is basically the difference in the volume of estimated traffic demand. These changes include:

- Strengthening of urban expressway network, particularly in the central area of Yangon (e.g. Inner Ring Road).
- Delay of the completion of the eastern half of Outer Ring Road due to the scarcity of demand.
- Removal of some arterial roads in the outskirts of Yangon due also to the low traffic demand.



Source: YUTRA Project Team

Figure 6.1.1.2 Recommended Road Network for 2035



Source: YUTRA Project Team

Figure 6.1.1.3 Recommended Road Network for Short-, Middle- and Long-term

2) Railway and BRT

(1) Railway

Based on the results of demand forecast, three alternative route network layouts in 2035 are planned as shown in Table 6.1.1.1. Case1 is recommended as the most appropriate

alternative in terms of total balance including i) layout balance of North-South axis and East-West axis, ii) connectivity among railway lines (number of transfer stations). The initial cost will be higher than the others, but the difference is not large.

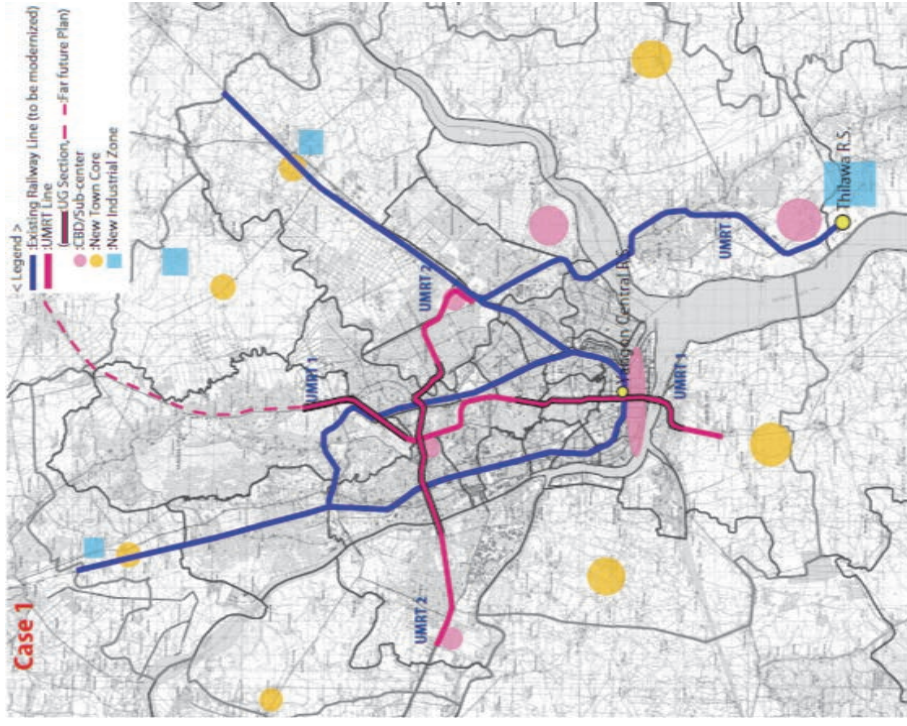
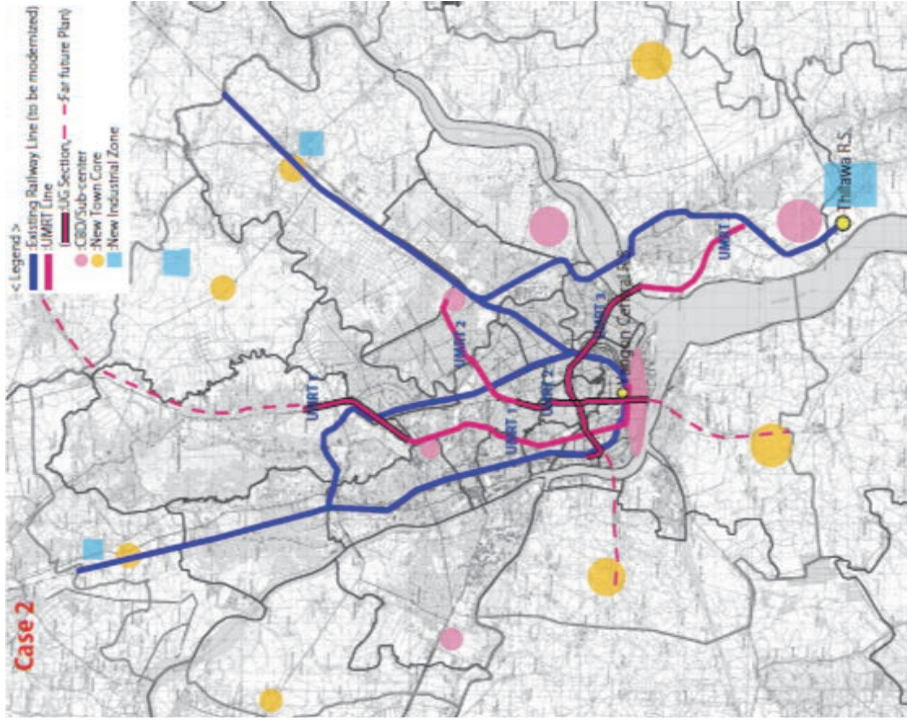
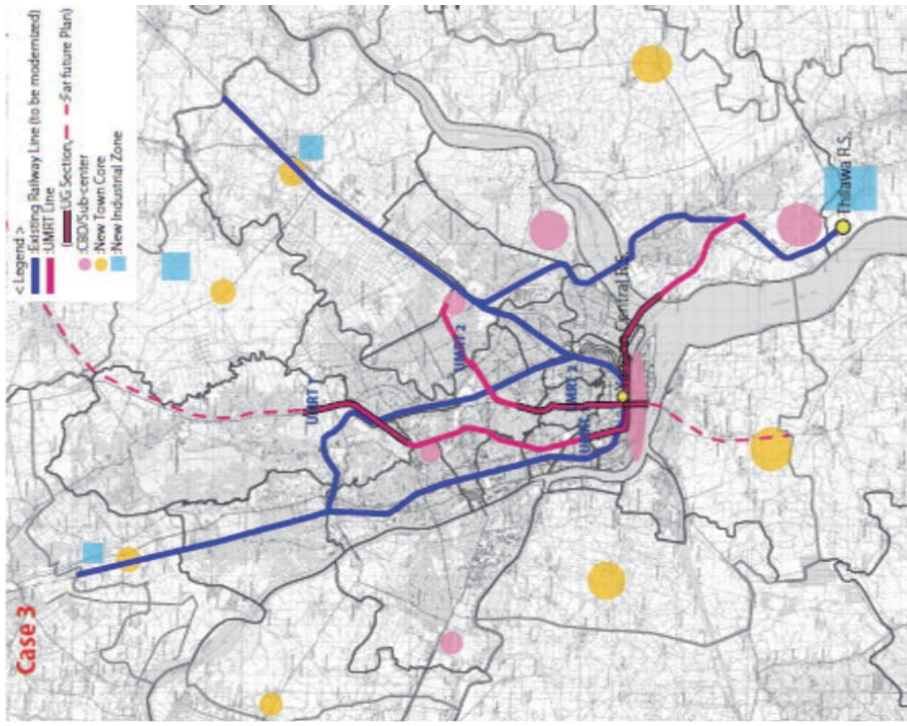
The recommended network includes all existing lines of MR including the Circular Railway and the suburban lines such as yangon-Mandalay and Yangon-Pyay. It is noted that two new urban railways are proposed; one in north-south direction from the present Yangon Airport to Dala via the present CBD, and the other in west-east direction connecting new urban centers proposed by SUDP. Although some short branch lines are less important from the standpoint of urban transport, YUTRA assumed all existing MR lines would continue operation taking into account the estimated demand and the positive will of MR.

Table 6.1.1.2 presents the railway network plan for short-, middle- and long-term.

Even if the railway network is established, it will not fulfil full function by itself. Integration between railway network and other public transport network especially of BRTs and buses is essential.

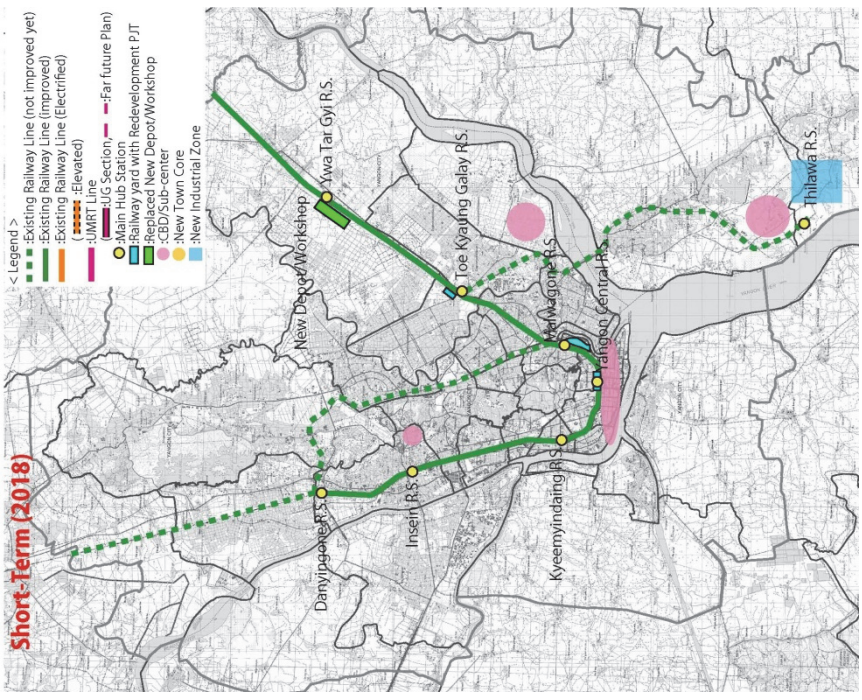
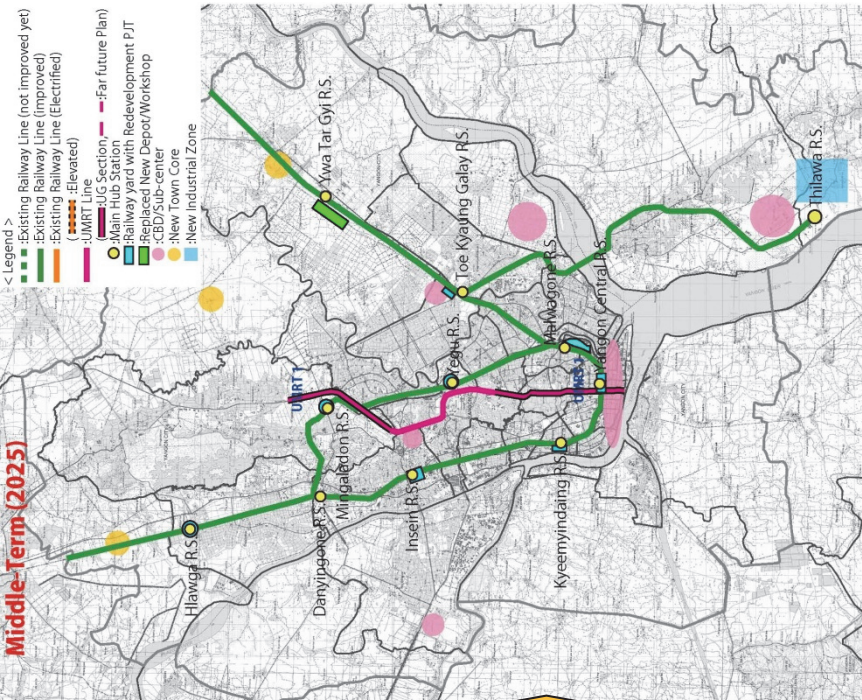
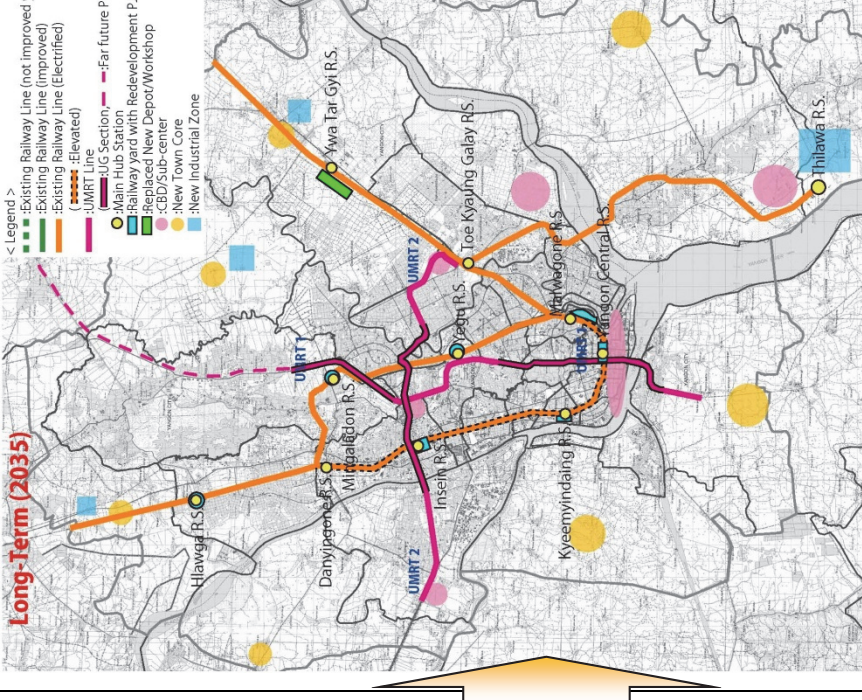
With regard to SUDP, SUDP has proposed five (5) new urban railway lines totalling to about 232 km. However, this was found too ambitious in terms of fund requirement as mentioned later in this report, and reduced to two (2) lines in the master plan of YUTRA. YUTRA has proposed instead less expensive several BRT Lines to cover the future urban area planned by SUDP.

Table 6.1.1.1 Comparison of Alternative Railway Networks

	Case1	Case2	Case3
Network Length	175.9km Existing Line Modernization: 122.1km UMRT Line: 53.8km (Underground: 27.2km, Elevated: 26.6km)	181.6km Existing Line Modernization: 122.1km UMRT Line: 59.5km (Underground: 25.3km, Elevated: 34.2km)	173.2km Existing Line Modernization: 122.1km UMRT Line: 51.1km (Underground: 22.0km, Elevated: 29.1km)
No. of Line	6 lines Existing Line: 4 lines, UMRT Line: 2 lines	7 lines Existing Line: 4 lines, UMRT Line: 3 lines	6 lines Existing Line: 4 lines, UMRT Line: 2 lines
Alternative Route Network Layout Plan			
Feature of the Lines	Existing railway lines (YCR and Suburban lines of Yangon-Mandalay Line, Yangon-Pyay Line, and Thilawa Access Line) are modernized as commuter line. 2 UMRT lines are installed UMRT-1 is planned to install one of North-South axis which have many traffic volume for commuter. There are 2 roads for potential UMRT-1 route, Kaba Aye Rd. and Pyay Rd. Regarding Case1, UMRT-1 run along Kaba Aye Rd. in consideration of the importance as the main street, the population density, current traffic jam, etc. UMRT-2 is installed as East-West axis. The route is planned to connect sub-centers planned by SUDP, named Hlaing Tharya, Mindama, and Dagon Myothit.	Existing railway lines (YCR and Suburban lines of Yangon-Mandalay Line, Yangon-Pyay Line, and Thilawa Access Line) are modernized as commuter line. 3 UMRT lines are installed UMRT-1 is planned to install one of North-South axis which have many traffic volume for commuter. There are 2 roads for potential UMRT-1 route, Kaba Aye Rd. and Pyay Rd. Regarding Case 2, UMRT-1 run along Pyay Rd. in consideration of the easy construction work due to enough road width. On the other hand, Kaba Aye Rd. has higher importance as traffic axis. In addition, it seems the future urban area will expand to the northeast area like Dagon Myothit, etc. due to no splitting by big river, low dense land use, etc. Hence, UMRT-2 is planned to connect Yangon central station with Dagon Myothit along Kaba Aye Rd., Parami Rd., and Pinlon Rd. UMRT-3 is installed as East-West axis. The route is planned along Shwe Gon Daing Rd. due to the current heavy traffic. The route is extended to Thilawa for future commuters.	Existing railway lines (YCR and Suburban lines of Yangon-Mandalay Line, Yangon-Pyay Line, and Thilawa Access Line) are modernized as commuter line. 2 UMRT lines are installed UMRT-1 is planned to install one of North-South axis which have many traffic volume for commuter. Regarding UMRT-1, the northern part (between Yangon Central Station and the northern end of the line) is same as UMRT-1 of case2. However, the UMRT-1 is extended from Yangon Central Station to the southeast direction in order to connect CBD with Thilawa for future commuters. Regarding UMRT-2, same as Case2.

Rough Length and Preliminary Cost Estimate of Each Line	Case1			Case2			Case3		
	Existing Railway Improvement (At-grade)	km	mil.US\$	Existing Railway Improvement (At-grade)	km	mil.US\$	Existing Railway Improvement (At-grade)	km	mil.US\$
	YCR (Western Half)	21.0	485	YCR (Western Half)	21.0	485	YCR (Western Half)	21.0	485
	YCR (Eastern Half)	26.5	568	YCR (Eastern Half)	26.5	568	YCR (Eastern Half)	26.5	568
	Yangon-Mandalay	28.3	144	Yangon-Mandalay	28.3	144	Yangon-Mandalay	28.3	144
	Yangon-Pyay	20.1	500	Yangon-Pyay	20.1	500	Yangon-Pyay	20.1	500
	Thilawa Branch Line	26.2	766	Thilawa Branch Line	26.2	766	Thilawa Branch Line	26.2	766
	Sub-total		2,462	Sub-total		2,462	Sub-total		2,462
	Electrified (YCR Western half is "Electrified + Elevated")			Electrified (YCR Western half is "Electrified + Elevated")			Electrified (YCR Western half is "Electrified + Elevated")		
	YCR (Western Half)	21.0	1,260	YCR (Western Half)	21.0	1,260	YCR (Western Half)	21.0	1,260
	YCR (Eastern Half)	26.5	398	YCR (Eastern Half)	26.5	398	YCR (Eastern Half)	26.5	398
	Yangon-Mandalay (AG)	28.3	425	Yangon-Mandalay (AG)	28.3	425	Yangon-Mandalay (AG)	28.3	425
	Yangon-Pyay (AG)	20.1	302	Yangon-Pyay (AG)	20.1	302	Yangon-Pyay (AG)	20.1	302
	Thilawa Line (AG)	26.2	393	Thilawa Line (AG)	26.2	393	Thilawa Line (AG)	26.2	393
	Sub-total		2,777	Sub-total		2,777	Sub-total		2,777
	Existing Railway Total			Existing Railway Total			Existing Railway Total		
		122.1	5,239		122.1	5,239		122.1	5,239
	UMRT			UMRT			UMRT		
	UMRT1	21.8	2,253	UMRT1	21.4	1,554	UMRT1	35.2	3,417
	(UG section)	10.5	1,575	(UG section)	3.0	450	(UG section)	14.5	2,175
	(EV section)	11.3	678	(EV section)	18.4	1,104	(EV section)	20.7	1,242
	UMRT1 Extension	6.0	693	UMRT2	15.9	1,629	UMRT2	15.9	1,629
	(UG section)	3.7	555	(UG section)	7.5	1,125	(UG section)	7.5	1,125
	(EV section)	2.3	138	(EV section)	8.4	504	(EV section)	8.4	504
	UMRT2	26.0	2,730	UMRT3	22.2	2,664			
	(UG section)	13.0	1,950	(UG section)	14.8	2,220			
	(EV section)	13.0	780	(EV section)	7.4	444			
	UMRT Total	53.8	5,676	UMRT Total	59.5	5,847	UMRT Total	51.1	5,046
	Total Network Length	175.9	10,915	Total Network Length	181.6	11,086	Total Network Length	173.2	10,285
Balance of N-S axis and E-W axis	Better N-S axis: 4 lines, E-W axis: 2 lines			Moderate N-S axis: 5 lines, E-W axis: 1 lines			Worse N-S axis: 5 lines, E-W axis: 0 lines		
Connectivity with Urban Functions (CBD/Sub-center, New town core, New industrial zone)	Better CBD/Sub-center: 6 points among total 6 points (connecting all) New Town Core: 3 points among total 7 points New Industrial Zone: 3 points among total 4 points			Moderate CBD/Sub-center: 5 points among total 6 points New Town Core: 2 points among total 7 points New Industrial Zone: 3 points among total 4 points			Moderate CBD/Sub-center: 5 points among total 6 points New Town Core: 2 points among total 7 points New Industrial Zone: 3 points among total 4 points		
Connectivity among Railway Lines(No. of Transfer Station)	Moderate 9 stations			Better 11 stations			Worse 7 stations		
Cost Aspect	High (middle among them) US\$ 10,915 mil. (Railway project only. Except railway related project such as station redevelopment, etc.)			High (highest among them) US\$ 11,086 mil. (Railway project only. Except railway related project such as station redevelopment, etc.)			High (lowest among them) US\$ 10,285 mil. (Railway project only. Except railway related project such as station redevelopment, etc.)		
Environmental Aspect	During Construction: Little negative impact, After Completion: Positive impact Existing Railway Modernization: Few resettlement due to existing railway improvement. Some influence to road traffic and some influence to neighboring citizens during construction. UMRT: Normal resettlement to be required. Some influence to road traffic and neighboring citizens during construction. Give positive impact due to reducing traffic jam, improving convenience for all Yangon citizens (especially commuters), energy consumption lower than motor cars, etc.			Same as Case1.			Same as Case1.		
Remarks	Most appropriate network among them in terms of layout balance of N-S and E-W, and connectivity with urban functions. The connectivity among railway and the cost is not the best one, but in moderate level.			Layout balance of N-S and E-W, and connectivity with urban function is lower than Case1. The cost is highest.			Most poor network among them in terms of layout balance of N-S and E-W, and connectivity among railway. The cost is lower than the others, but not so much.		
Evaluation Result	Recommended Source: YUTRA Project Team			Not recommended			Not recommended		

Table 6.1.1.2 Recommended Railway Network Plan for Short-term, Middle-term, and Long-term

	Short-term (year 2020)	Middle-term (year 2025)	Long-term (year 2035)
Network Length	49.3 km (except 72.8km length operating lines without improvement) Existing Line Modernization: 49.3km UMRT Line: 0km	143.9km Existing Line Modernization: 122.1km UMRT Line: 21.8km (Underground: 10.5km, Elevated: 11.3km)	186.3km Existing Line Modernization: 122.1km UMRT Line: 53.8km (Underground: 27.2km, Elevated: 26.6km)
No. of Line	2 lines Existing Line: 2 lines, UMRT Line: 0 lines	5 lines Existing Line: 4 lines, UMRT Line: 1 lines	6 lines Existing Line: 4 lines, UMRT Line: 2 lines
Infrastructure Layout Plan			
Project Cost	For Railway Project: USD 629mil. For Station Plaza/Land Development: USD 3,614mil. Depot/Workshop Relocation: USD 308mil. Note: It is expected station plaza/land development projects can be arranged as PPP scheme in order to obtain money from private investor.	For Railway Project: USD 4,087mil. (total: USD 4,716mil.) For Station Plaza/Land Development: USD 2,724mil. (total: USD 6,338mil.) Depot/Workshop Relocation: USD 104mil. (total: USD 412mil.) Note: It is expected station plaza/land development projects can be arranged as PPP scheme in order to obtain money from private investor.	For Railway Project: USD 6,201mil. (total: USD 10,915mil.) For Station Plaza/Land Development: 0 (total: USD 6,338mil.) Depot/Workshop Relocation: 0 (total: USD 412mil.) Note: It is expected station plaza/land development projects can be arranged as PPP scheme in order to obtain money from private investor.
Remarks	The plan is prepared by following the principles: "short-term project shall be high maturity status", "to realize development scenario which has good harmonization of the implementation timing between railway infrastructure project and the related project such as station plaza development, land development along railway with depot/workshop relocation" "to fulfill the scenario that development benefit from railway yard redevelopment can be allocated to the next railway infrastructure project" In order to enhance the railway improvement effect, 2 railway yard development projects at Yangon central station and Malwagone depot/workshop are planned. New depot/workshop is planned at the northeast outskirts of Yangon in order to relocate the function of current depot/workshop at Yangon central station and Malwagone depot/workshop.	The plan is prepared by following the principles: "to give first priority to existing line improvement in terms of cost aspect", "to give first priority to existing line improvement in terms of cost aspect", "First UMRT installation should be planned in consideration of feasible timing in order to avoid being dream", "to realize development scenario which has good harmonization of the implementation timing between railway infrastructure project and the related project such as station plaza development, land development along railway with depot/workshop relocation" "to fulfill the scenario that development benefit from railway yard redevelopment can be allocated to the next railway infrastructure project" In order to enhance the railway improvement effect, 3 railway yard development projects at Insein workshop and Kyeemyindaing Station are planned. New depot/workshop is planned at the northeast outskirts of Yangon in order to relocate the function of current depot/workshop at Yangon central station and Malwagone depot/workshop.	The plan is prepared by following the principles: "to fulfill the scenario that development benefit from railway yard redevelopment can be allocated to the next railway infrastructure project" "to apply Step Development effectively which means to conduct electrification, grade separation, etc. on step-by-step basis regarding existing line modernization", "In order to enhance the railway improvement effect, 3 railway yard development projects at Yangon central station and Malwagone depot/workshop are planned." New depot/workshop is planned at the northeast outskirts of Yangon in order to relocate the function of current depot/workshop at Yangon central station and Malwagone depot/workshop.

Source: YUTRA Study Team

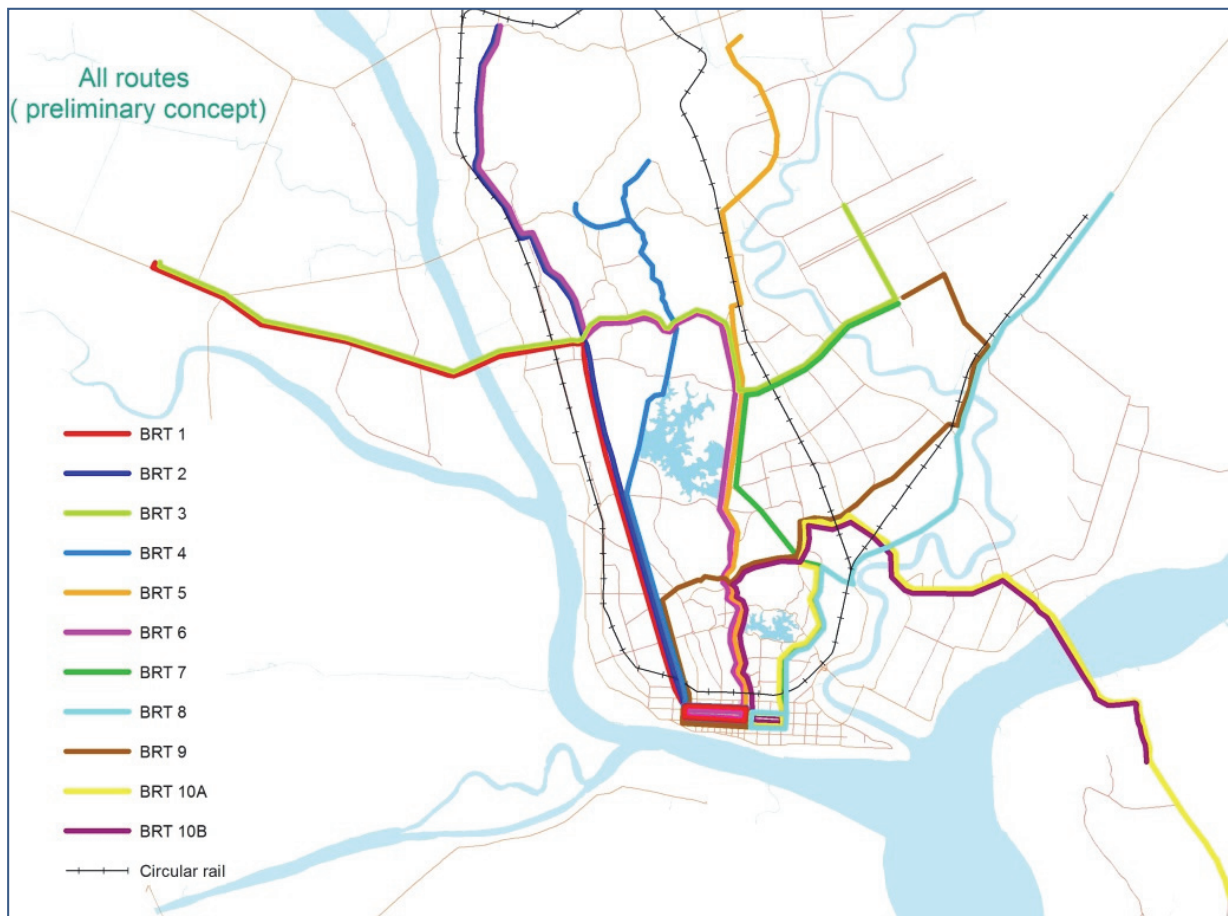
(2) BRT

The criterion for designing a BRT network for Yangon includes three main factors, being:

1. Selection of the high demand corridors, specifically those that have a high level of bus services (showing existing patterns of travel).
2. Sufficient road space to assign lanes to a BRT while maintaining sufficient space for the movement of mixed traffic (one lane in each direction being assigned exclusively to a BRT). Wherever possible, road widening and the reduction of footpath space are avoided.
3. Developing the BRT network into a comprehensive network that provides good access and connectivity; a total system with adequate coverage supported by secondary and feeder bus routes.

Based on the traffic demand forecast and road condition, BRT network was planned as shown in Figure 6.1.1.4. In addition, all BRTs are proposed as short-term project to be implemented by 2018.

As compared to SUDP which proposed LRTs in the CBD, YUTRA's proposal somewhat inclines toward BRT. Although YUTRA does not deny the possibility of LRT, Monorail or other transit systems, they must be justified during the feasibility stage in terms of demand magnitude, cost performance, etc.

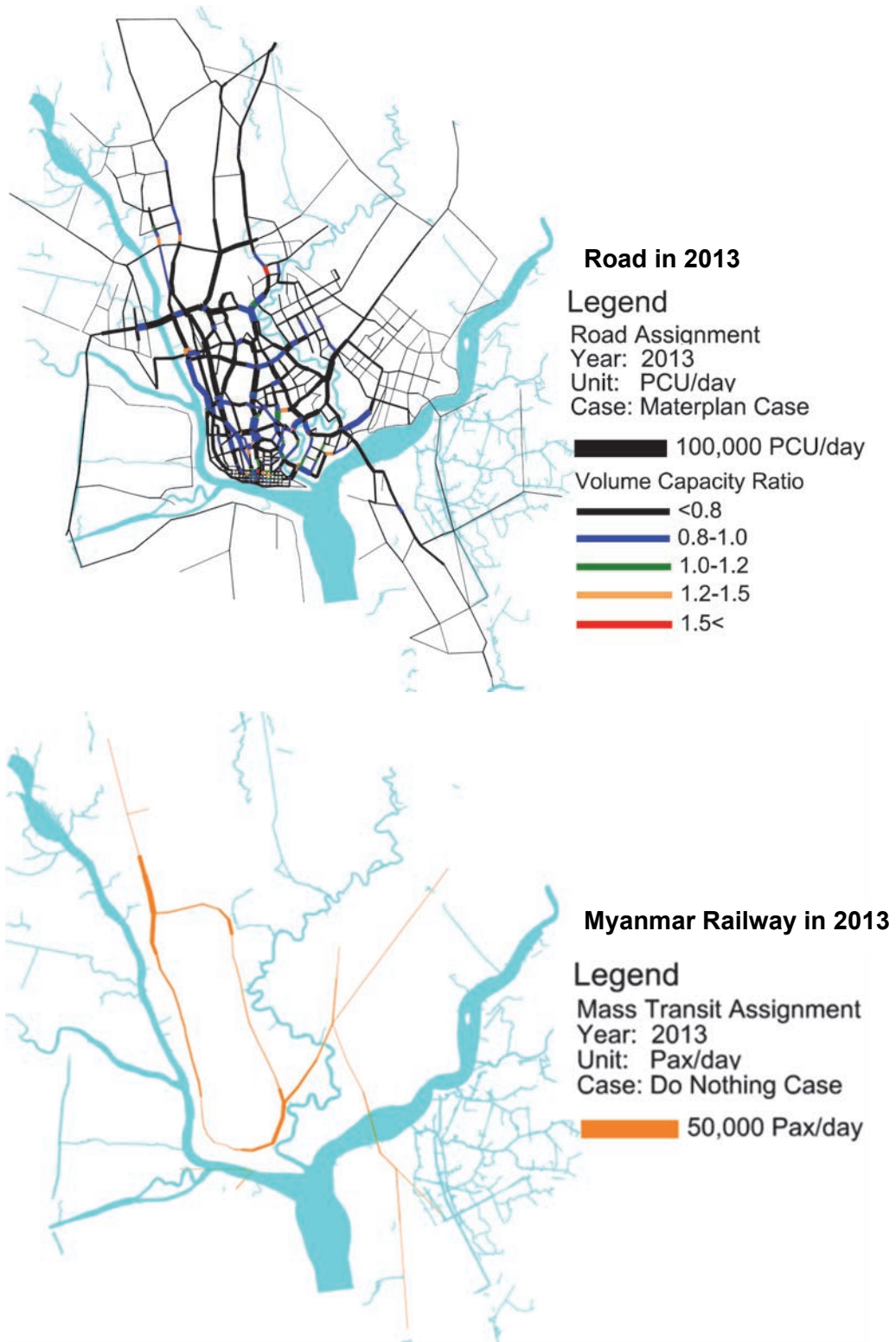


Source: YUTRA Project Team

Figure 6.1.1.4 Recommended BRT Routes

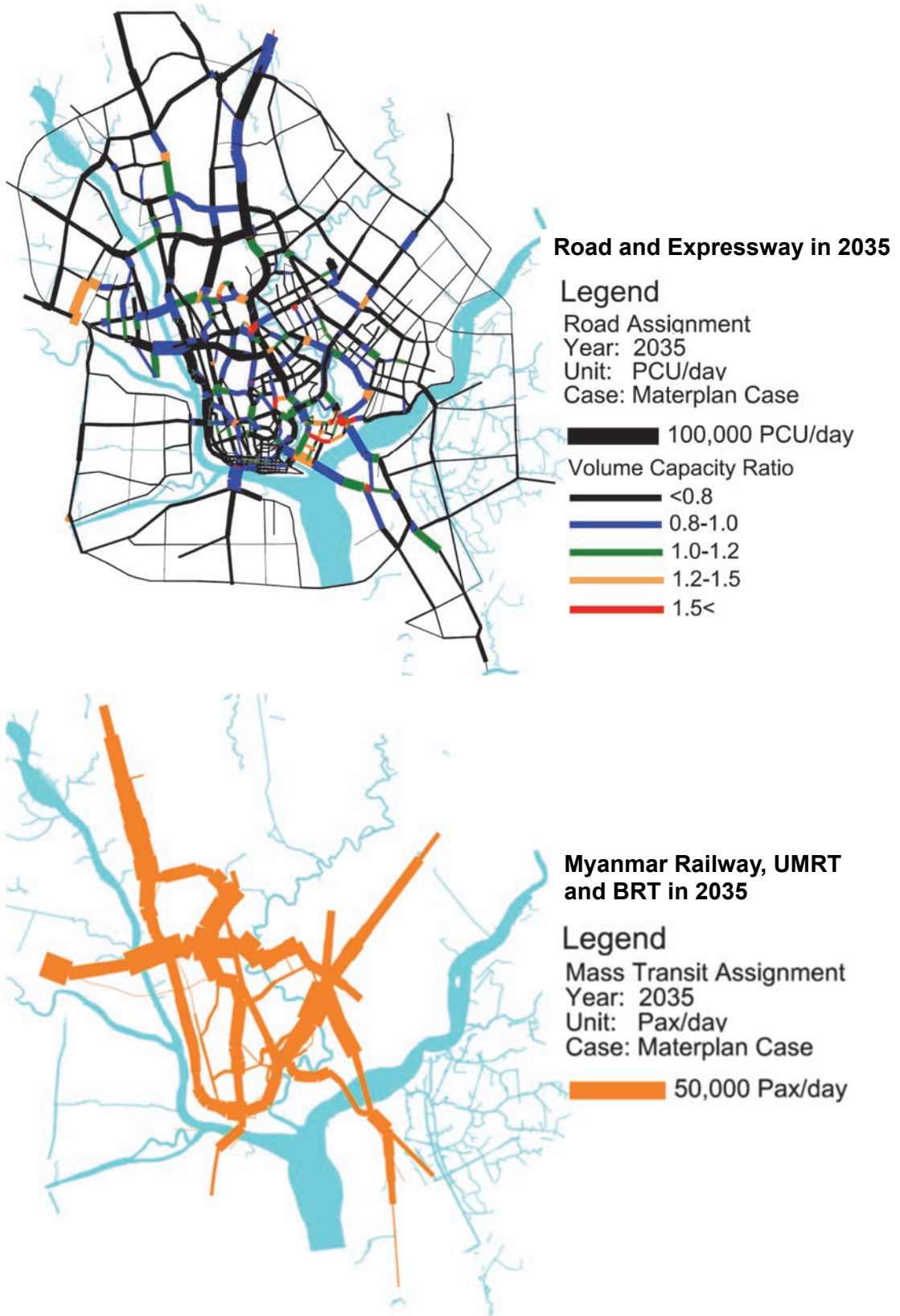
6.1.2 Transport Network Assessment

Figure 6.1.2.1 and Figure 6.1.2.2 show the result of traffic assignment for 2013 and 2035, respectively.



Source: YUTRA Project Team

Figure 6.1.2.1 Assigned Traffic Volume, 2013



Source: YUTRA Project Team

Figure 6.1.2.2 Assigned Traffic Volume, 2035

Table 6.1.2.1 summarises the transport network performance for 2013, 2018, 2025 and 2035. Even after implementing all the proposed projects, road network performance will deteriorate gradually towards 2035. The largest advantage of this master plan is the increasing share of mass transit (Myanmar Railway, UMRT and BRT). The overall share of public transport will decrease significantly, however, will remain relatively high against the pressure of rapid motorization.

Table 6.1.2.1 Transport Network Performance

Indicator	2013	2018	2025	2035
Average volume/ capacity ratio (road)	0.27	0.35	0.34	0.42
Average travel speed (kph, road)	30	22	28	24
Public transport share in terms of pax-km (%)	74	65	63	58
Mass transit share in terms of pax-km (%)	1	12	21	22

Source: YUTRA Project Team