Federation of Myanmar Engineering Societies

Myanmar Tunneling and Underground Space Committee (MTUSC)

Tunneling and Development Works

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CEC, Fed. MES
Chair for MTUSC
5th October, 2024

Contents

(1) History of tunneling

(2) What is tunneling work

(3) Method of tunnel construction

(4) Some famous tunnel of the world

(5) Myanmar and tunneling organization

(6) Tunneling experience with Myanmar

(7) Future Plan of tunneling works in Myanmar

(1) History of Tunneling

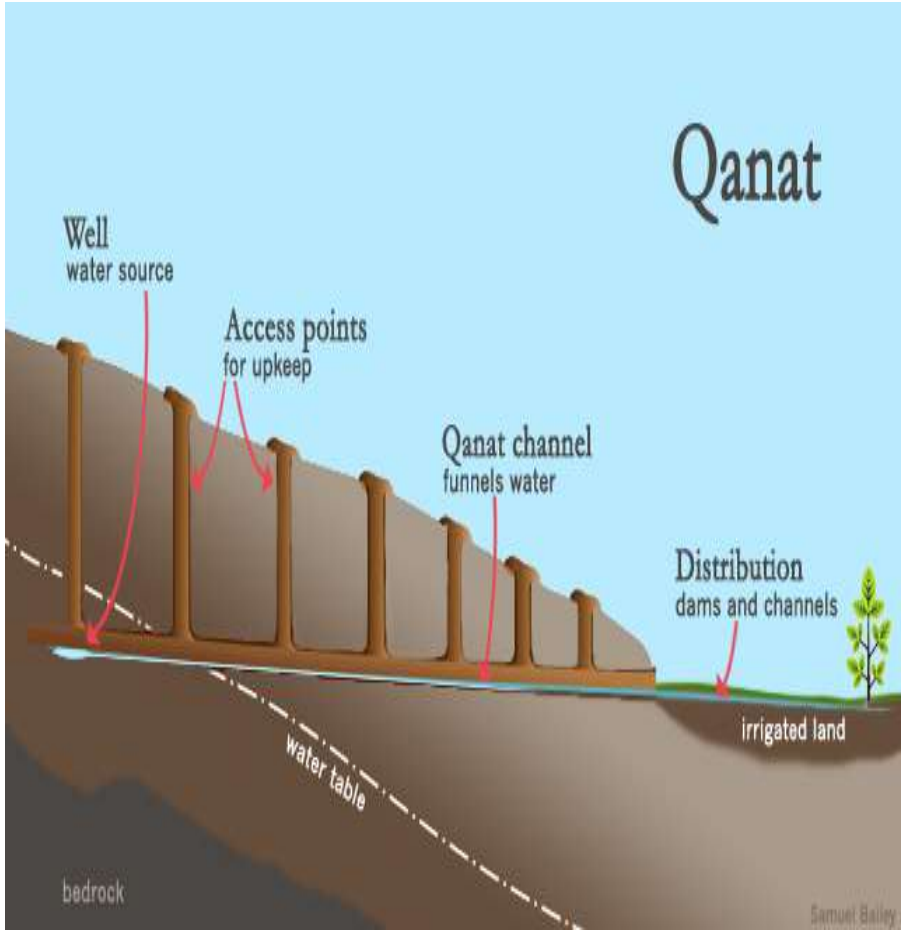
- Tunneling works were started since from ancient time before 17th Century.

- The qanat or kareez of Persia are water manage system used to practice a reliable supply of water to human settlement or for irrigation in hot, arid and semi-arid climates. The deepest known qanat is in the Iranian city of Gonabad, which after 2700 years, still provide drinking and agricultural water to nearby 40,000 people, it main well depth is more than 360 meter (1180 ft) and its length is 45 km (28 mile)

Source- Internet

The qanat or kareez (Source-Internet)

Profile



Underground canal

Qanat well (Source-Internet)

(2) What is Tunneling Work

- Tunnel is an artificial underground passage, especially are built through a hill or under a building, road, or river, is a long, half cylinder or horseshoe shape. (Oxford Dictionary)

Advantages.

(1) More economical than open-cuts beyond certain depth.

(2) Avoid disturbing or interfering with surface life and traffic during construction.

(3) The case of area welfare and bombing, the tunnels would grant better protection as compared to bridges.

(4) Tunnels avoid the dangerous open-cut very near to the structures.

(5) Tunnels prove to be cheaper than bridge or open-cut to carry public utility service like water, sewer, gas, electricity and telephone lines.

(6) If tunnels are provided with easy gradients, the cost of hauling is decreased.

(7) The safety of tunnel construction has considerably increased by the improved modern methods of construction and construction equipment.

(8)There is freedom from snows and iceberg hazards.

(9) There is overall reduction in cost because of shortening the distance.

(10) Tunnels avoid interference with surface and air rights.

Continued

Disadvantages of Tunnels

(1) The initial cost of construction is high as compared to an open-cut.

(2) It is necessary to have skilled labor and technical supervisions of high order for construction of a tunnel.

(3) It takes long time for the successful completion of a tunnel under normal condition.

(4) The construction of tunnel requires specialized and sophisticate equipment.

Source-Internet

(3) Method of tunnel construction

Methods of Tunnel Construction (source- Internet)

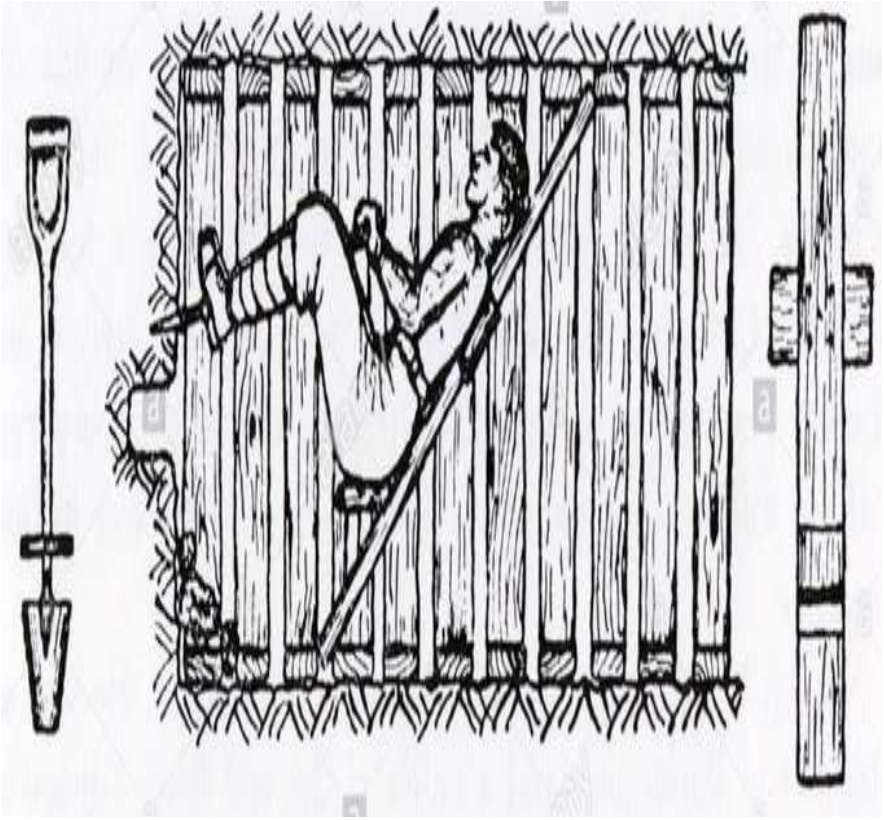
(1) Cut and Cover method

Continued

(2) Bored tunnel method

Continued

(3) Clay kicking method



(4)Shaft method

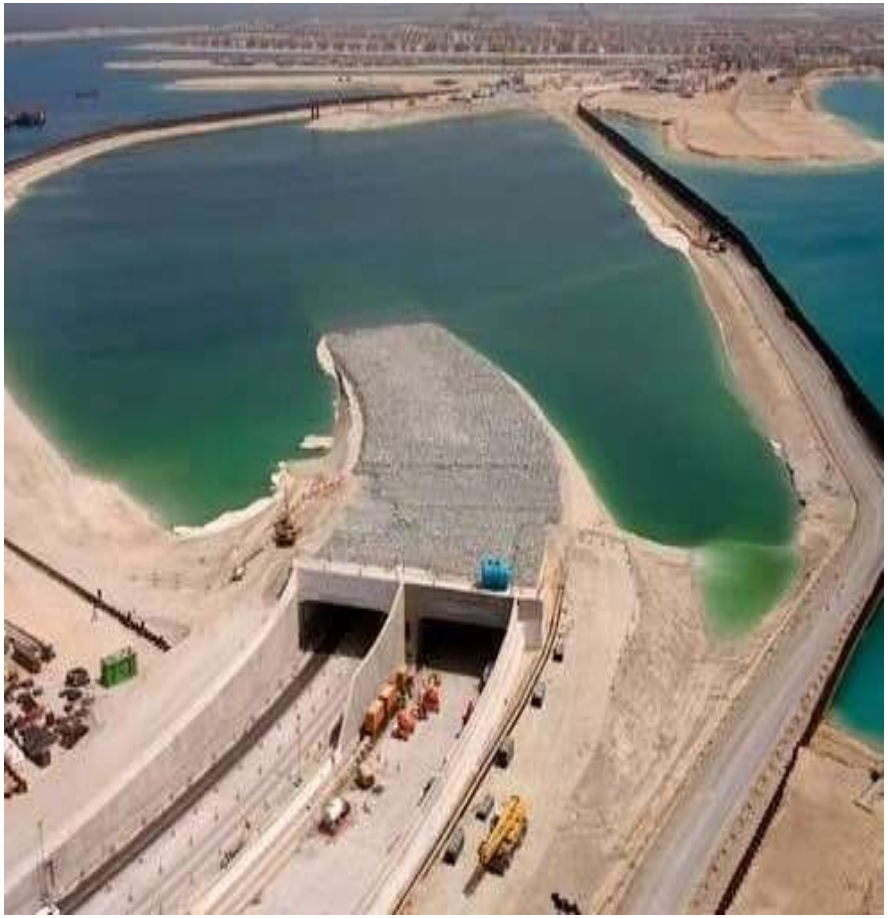
Continued

(5) Pipe jacking method

(6) Box jacking method

Continued

(7) Underwater tunnels



(8) Drilling and blasting

(4) Some Famous Tunnels of the World

Longest and deepest railroad Tunnel

- Gothard Base Tunnel
- Longest and deepest railway tunnel
- Location- Switzerland, under Swiss Alps between Northern & Southern parts of Switzerland.
- Length - 57 km
- Height – 5.20 m

Opened in 2016

Construction period 17 years

Cost over 12 billion Swiss francs

Source- Internet

Longest tunnel in Asia

- Highway tunnel
- Location- Chenani to Nashri in Jammu Region on NH 44
- Length – 9.28 km
- Completed in April 2017

Source- Internet

Longest underwater tunnel

- Seikan Tunnel
- Location – Tsugaru strait

between Hokkaido island and Aomori Prefecture

Length- 53.9 km, out of which **23.3** km portion is under the seabed.

Water depth- 787m

Construction period- 1964-1988

Tnnnel under English Channel

Lowest point – 75 m below the sea bed and 115 m below sea level

Length under water **– 37.9** km out of total length 50.45 km

Opened in1994

Connect Folkestone (Kent, England) _with Coquelles (Pas-deCalais,France)

Source- Internet

SMART Tunnel
Storm water Management and Road Tunnel

- Location- Kualalumpur, Malaysia
- Length- 9.7 km storm water bypass with 4km dual deck motor-way
- 13.2 m diameter
- Longest storm water drainage in SEA
- Completed in 2007

- Source- Internet

(5) Myanmar and Tunneling Organization

Tunneling organization

- Global level tunneling organization was formed as ITA (International Tunneling Association) in April 1974 at Oslo, Norway, following a conference at Washinton DC(USA) in 1970 as leading international association, comprising currently 80 member nations and 128 Corporate Affiliate Members (CAM)

Aim of the association

To encourage the use of subsurface and has promoted advance in preparatory investigations, planning, design, construction, maintenance and safety of tunnels and underground space. ITA represents all aspects of tunnels and underground space planning, design, and construction.

Myanmar Tunneling and Underground Space Committee (MTUSC)

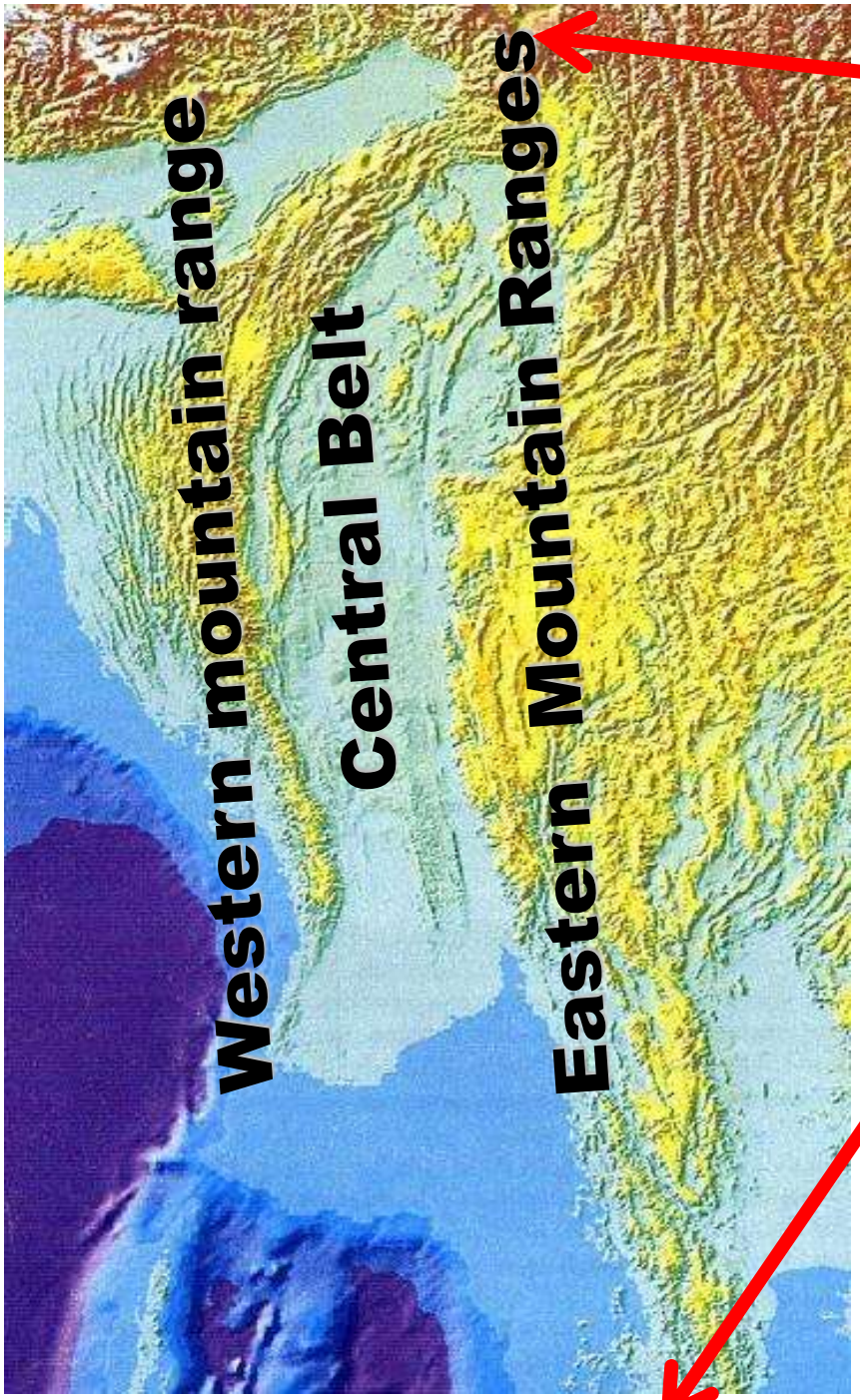
MTUSC was formed in 2012 under the umbrella of Myanmar Engineering Society and is became a member of ITA in the same year in 2012 during the WTC, that was held in Bangkok,

With the aim

- to promote the tunneling technology among the Myanmar engineers and geologist.
- To share knowledge of tunneling and underground construction technique by holding seminars, workshops and trainings.
- Cooperation and collaboration with international association for promoting of tunneling technology.

Myanmar

- **Area : 677,000 m2**
- **Population : 54 million**


Western mountain range
Central Belt
Eastern Mountain Ranges


CHINA
INDIA
BANGLADESH
MYANMAR
LAOS
Bay of Bengal
South China Sea
VIETNAM
THAILAND
CAMBODIA
MALAYSIA
BRUNEI
SINGAPOR

(6) Tunneling experience with Myanmar

Tunneling works in ancient time

- An ancient tunnel discovered at Thiho Shin Pagoda in Pakokku on August 4th, 2020. Had about 8 feet in depth. In that tunnel there are three rooms with about 10 square feet in space. Nothing is found in that tunnel.

Tunneling experience with Myanmar

It was found that the earliest experience for construction of tunnels in Myanmar is Maungtaw- Buthitaung railroad in Yakhine State and these two tunnels were completed in 1918 and constructed by Martin construction company from Florida, America.

These two tunnels are (1) Taung Khaung Che (Small tunnel) and (2) Taung Khaung Gyi (Long Tunnel), (7) mille and (9) mile away from Buthitaung.

Size of tunnels are:

15.5 ft diameter

Height- 12.5 ft

Length- 98 ft and 658 ft

Constructed with 3 ft thick brick masonry work.

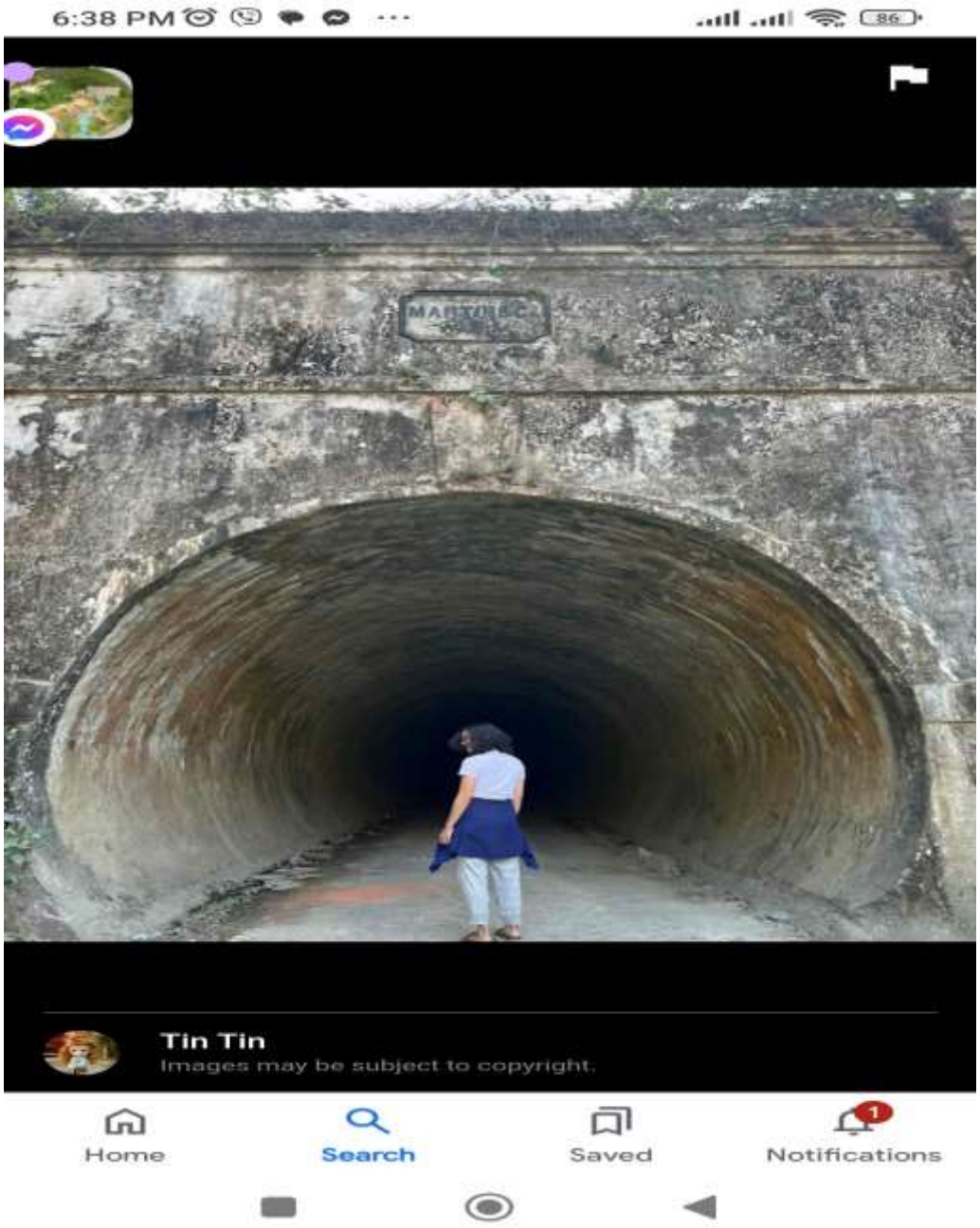
At present use as Tourist attraction.

Earliest tunnel in Myanmar

Maungtaw- Buthitaung Railroad tunnel in Yakhine State

Taung Khaung Gyi

(Long Tunnel)

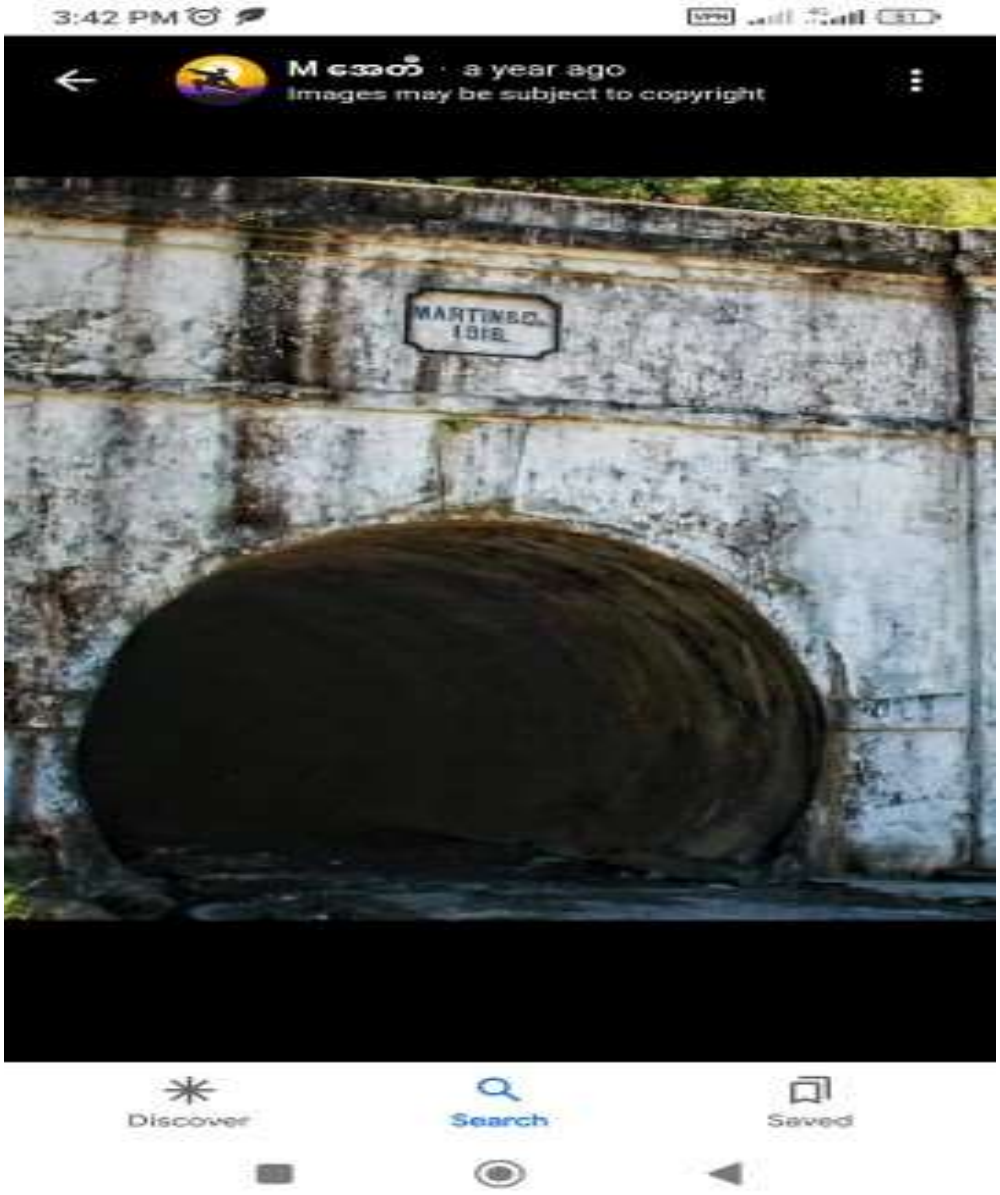


Earliest tunnel in Myanmar

Maungtaw- Buthitaung Railroad tunnel in Yakhine State

Taung Khaung Che

(Small Tunnel)



Earliest Tunnel in Myanmar

Sin Taung Railway tunnel

Constructed in 1913

Shan State, Nyaung Shwe township

Railway Tunnels since Pre-war

Total Number of Railway Tunnels = 11 Tunnels

Total Length of Railway Tunnels = 885 m

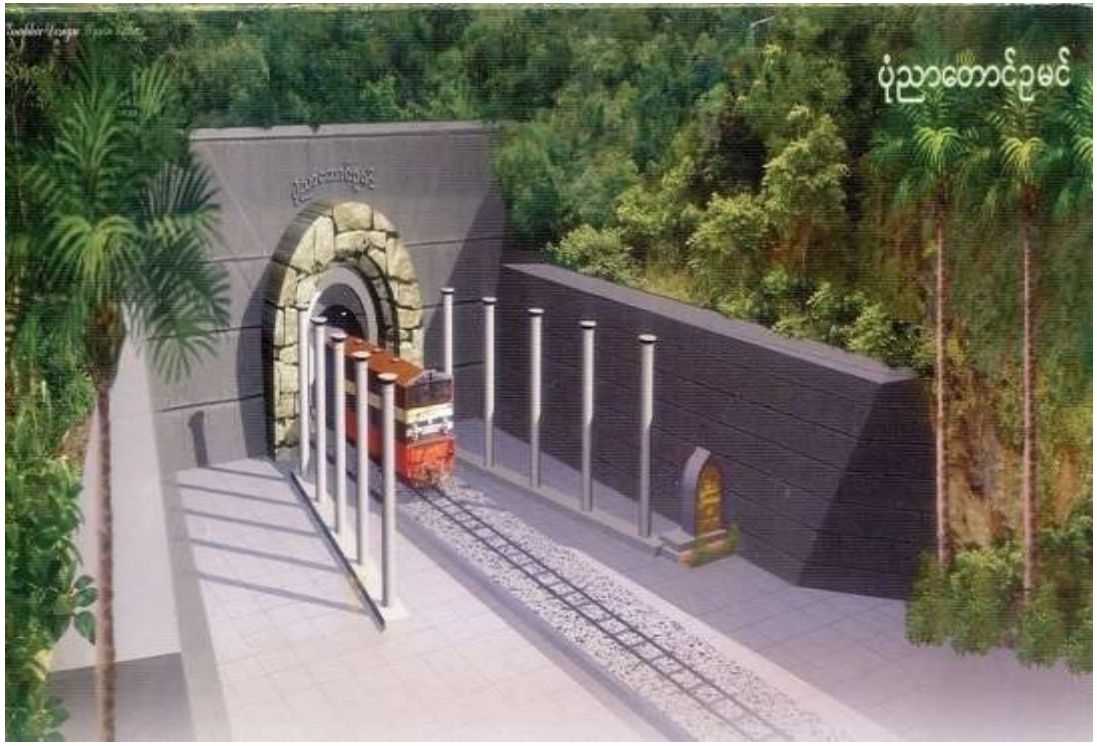
Railway Tunnels since Pre-war

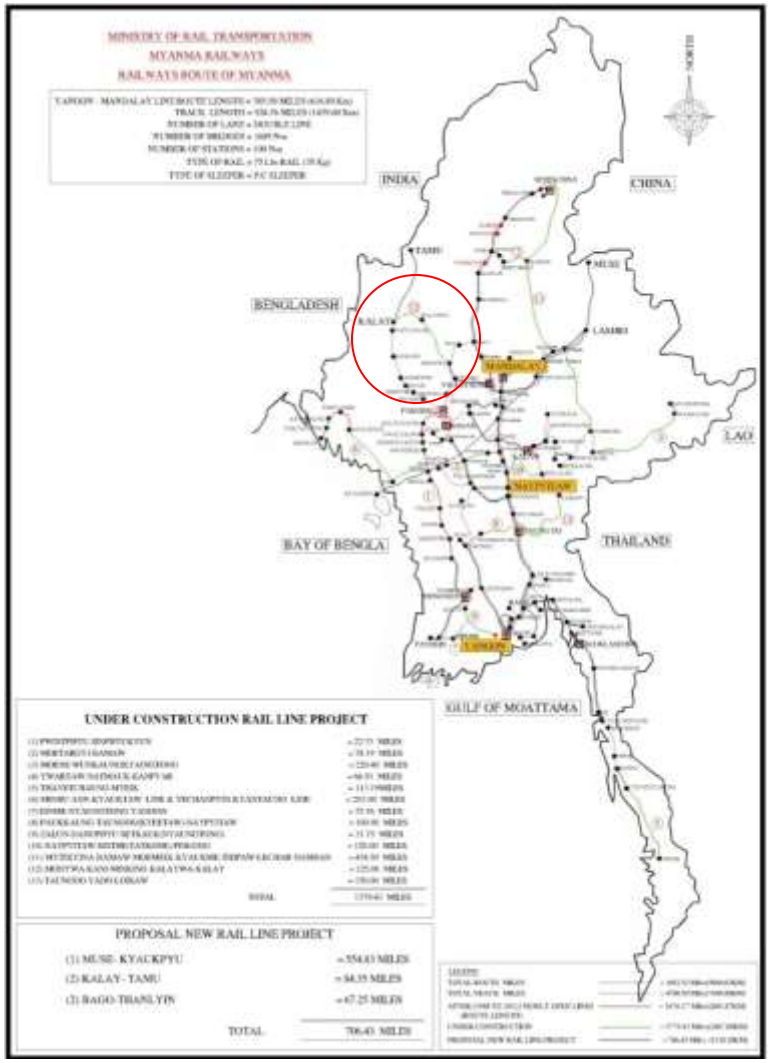
Railway Tunnels built during pre-war still using with meter gauge track

The most recent Railway Tunnel
Pon Nyar Range Railway Tunnels(completed in 2007)

Total Length = 1,710 m

The Longest Railway Tunnel in Myanmar





Tunneling activities of Myanmar

The most recent Railway Tunnel (2007)

Pon Nyar Range Railway Tunnel Completed in year 2007
still using with meter gauge track

The most recent Railway Tunnel (2007)

Pon Nyar Range Railway Tunnel Completed in year 2007
still using with meter gauge track

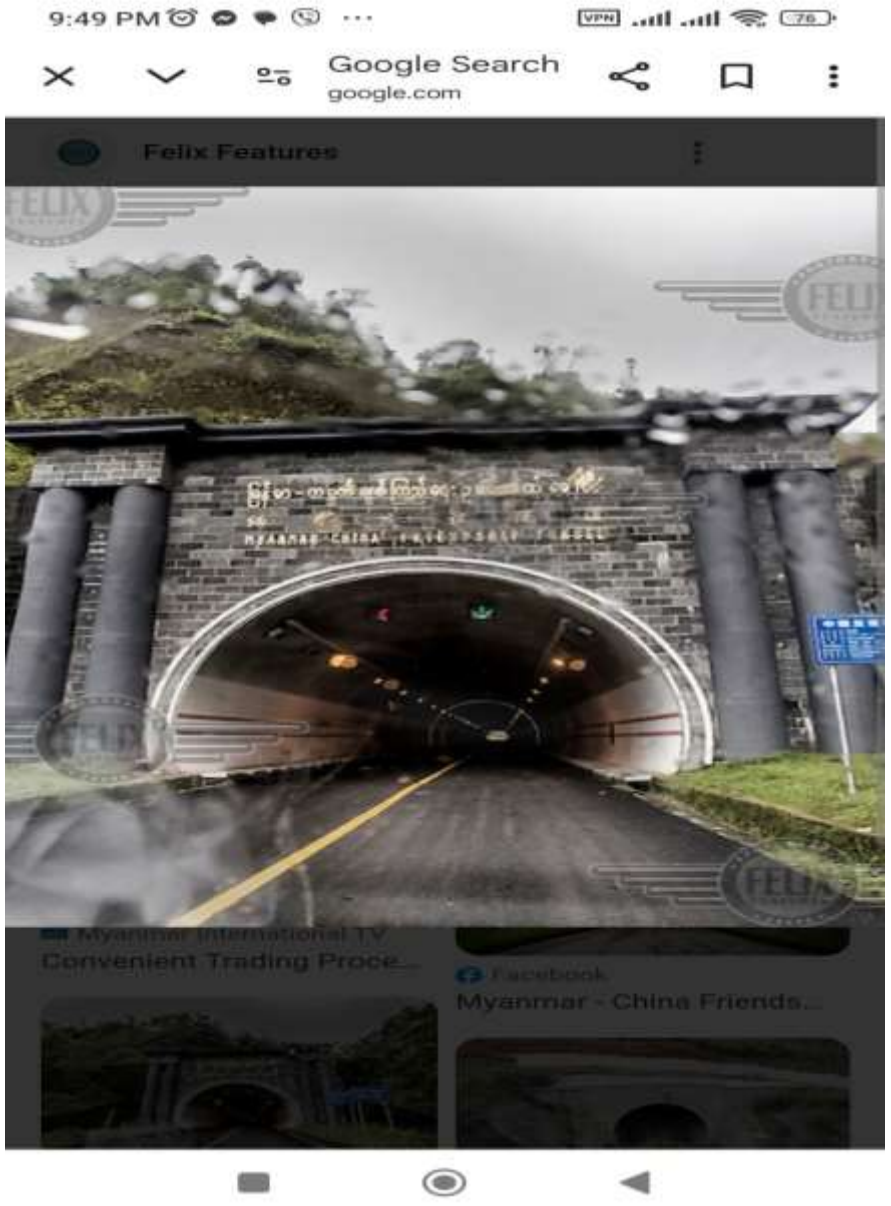
Some completed tunneling works in Myanmar

- (1) Tunnel works constructed by Myanmar's Military Engineers. (25-6-2009), (Aljeazera)
- (2)Constructing a tunnel in Rakhine Yoma some 80 Km west of Padan township. The tunnel is 50 feet wide and 50 feet high.
- (3) China-Myanmar railway Tunnel complete for Dali-Ruilli section (330 Km), Yunan province SW China (8-5-2022). Key part of China-Myanmar rail road..
- (4)Myanmar-China friendship Tunnel in Kachin State. (Kanpaikti) on Kanpaikti-Myitkyina road.

Recently constructed Road Tunnel

Myanmar – China Friendship tunnel in Kachin State

Location - Kanpaikti on Kanpaikti-Myitkyina Road



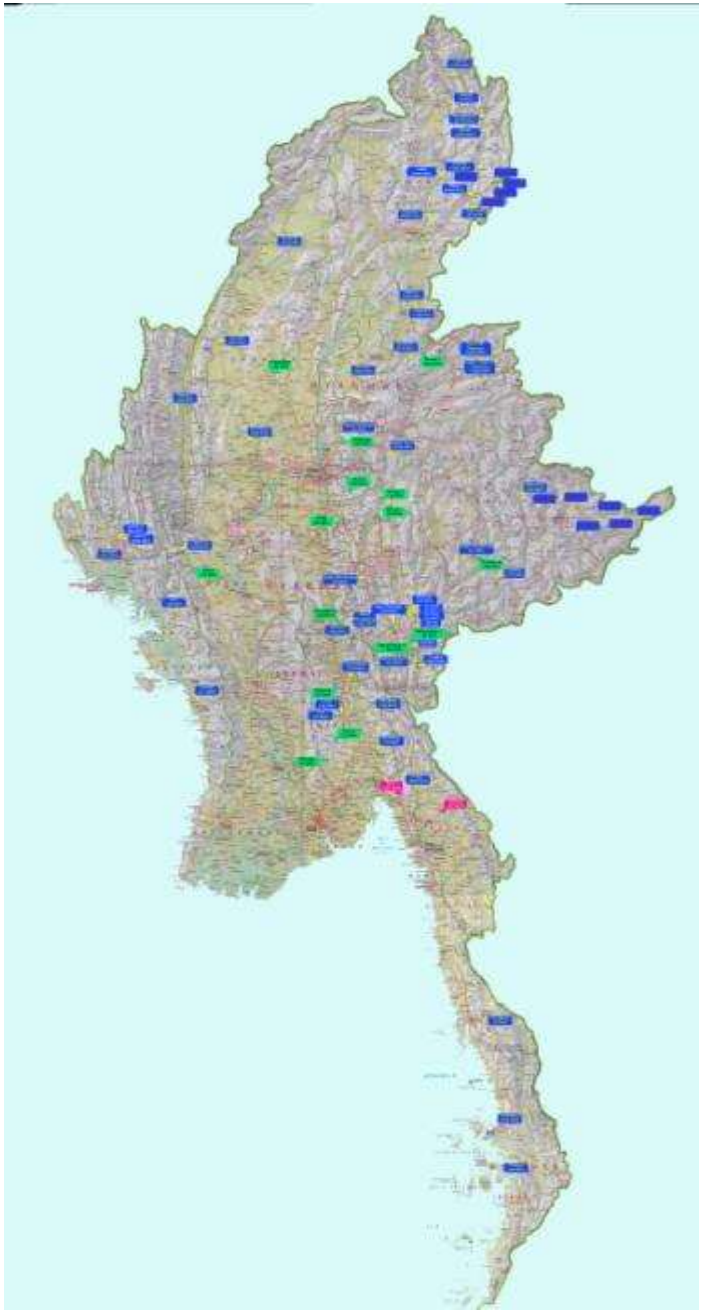
Tunnels in Hydropower Projects

Hydro-Power Plants as of 2015

- Completed Hydropower dams 24 dams
- 62 plants are under construction

Tunnels in Hydropower Projects as of 2015

- Completed 33 hydro-tunnels
- total length of 34,000 m.
- Most of them are headrace and diversion tunnels



Kinda and Mone Tunnel

Kinda

- Diameter 24.6 feet (7.34 Meter)
- Length 1525 feet
- Discharge 4024 cusec (2*28 MW)
- Completed in 1989-90

Mone	Diversion	Penstock
Diameter	37.4 feet	37.4 feet
Length	3625 feet	1539.31 feet
Discharge	34120 cusec	
Completed in	2006-2007	

- Surge Tank Diameter 87 feet Depth 228.5 feet

Tunneling Practice in Hydropower Projects

Paunglaung HPP Headrace Tunnel

Paunglaung HPP Headrace Tunnel

Kun HPP Headrace Tunnel

Kun HPP Headrace Tunnel

Tunneling Practice in Hydropower Projects

Shweli 1 HPP — Access Tunnel

Shweli 1 HPP — Headrace Tunnel

Kabaung HPP — Headrace Tunnel

Kabaung HPP — Headrace Tunnel

Tunneling Practice in Hydropower Projects

Phyu HPP Headrace Tunnel

Phyu HPP Headrace Tunnel

Thaukyegat 2 HPP Headrace Tunnel

Thaukyegat 2 HPP Headrace Tunnel

Tunneling Practice in Hydropower Projects

Upper Paunglaung HPP Diversion Tunnel

Upper Paunglaung HPP Diversion Tunnel

Nancho HPP Headrace Tunnel

Nancho HPP Headrace Tunnel

Tunneling Practice in Hydropower Projects

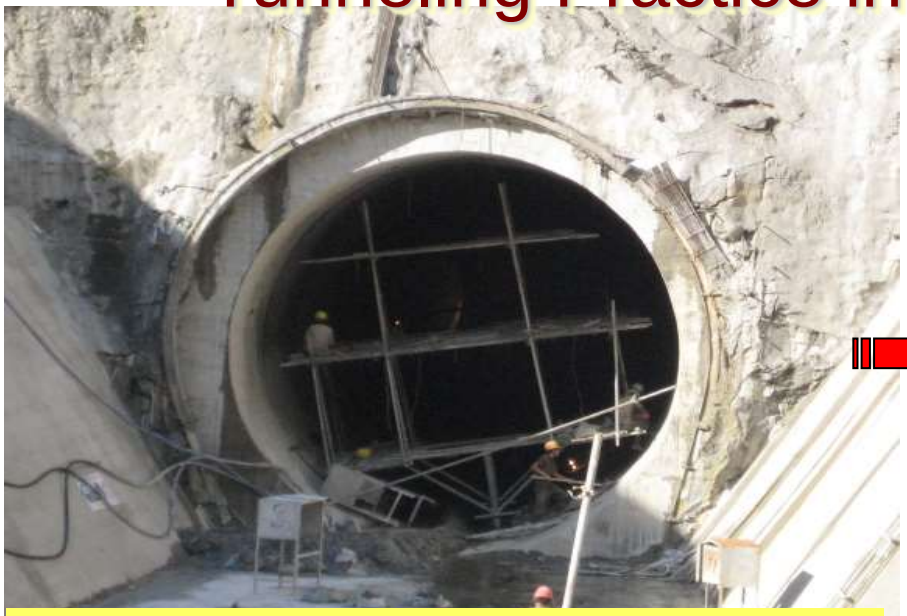
Yeywa HPP Access Tunnel

Yeywa HPP Access Tunnel

Thahtay HPP Headrac Tunnel

Thahtay HPP Headrace Tunnel

Tunneling Practice in Hydropower Projects



Dapein (1) Diversion Tunnel

Dapein (1) Adit Tunnel

Chipwinge Headrace Tunnel

Chipwinge Headrace Tunnel

(7) Future plan of tunneling works in Myanmar

(7-1) Railway Tunnels – Under Plan

(1) Nansan – Kyaing Ton Railway Line

(2) Nay Pyi Taw – Pim Laung Railway Line

(3) Minn Bu – Sittway Railway Line

Railway Tunnels – Future Plan (Continue)

Mul Sel – Kyauk Phyu Railway (885km)

To link southern China and Kyauk Phyu (western coastal area)

Total 101 tunnels ; Total length = 151 km

Nay Pyi Taw-kyauk Phyu railway also under consideration

(7-2) Planned Road Tunneling works in Myanmar

(1)**Myanmar tunnel projects proposed for mountain routes**

Three road tunnels have been planned as part of highway project in Shan mountains by the Myanmar Government under the project of China's Belt and Road (BRI) scheme. The scheme includes Expressways, a bridge and a tunnel. (Within 1700 km from Kuming- Mandaly-Yangon) Tunnels would run through:

(a) Wa Ta Lone Mountain 8.4 km 97 million $

(b) Khyauk Nwe Mountain 1 and 7.0 km, 100 million $

(c) Kyauk Nwe Mountain 2 8.3 km, 120 million $

- The tunnels would form part of the project for the Taunggyi-Loilin road in Shan state. Initially planned to include all three tunnels but now consider only Wa Ta Lone tunnel. under BRI.
- Fund; Expected from ODA Japan, Economic Development and Cooperation Fund (ECDF), and ADB

(7-3) Planned Urban tunneling project

- Major master plan project (JICA)
- For judging the future population increases with increasing the number of trips.

UMRT Line (1) Urban Mass Rapid Transit with high speed.

North – South connecting CBD with Yangon International Airport

21.8 km length via Yangon Central Station and Mindama sub-center area including 10.3 km of underground combine with elevated way.

UMRT Line (2) East – West line Length 26.0 km

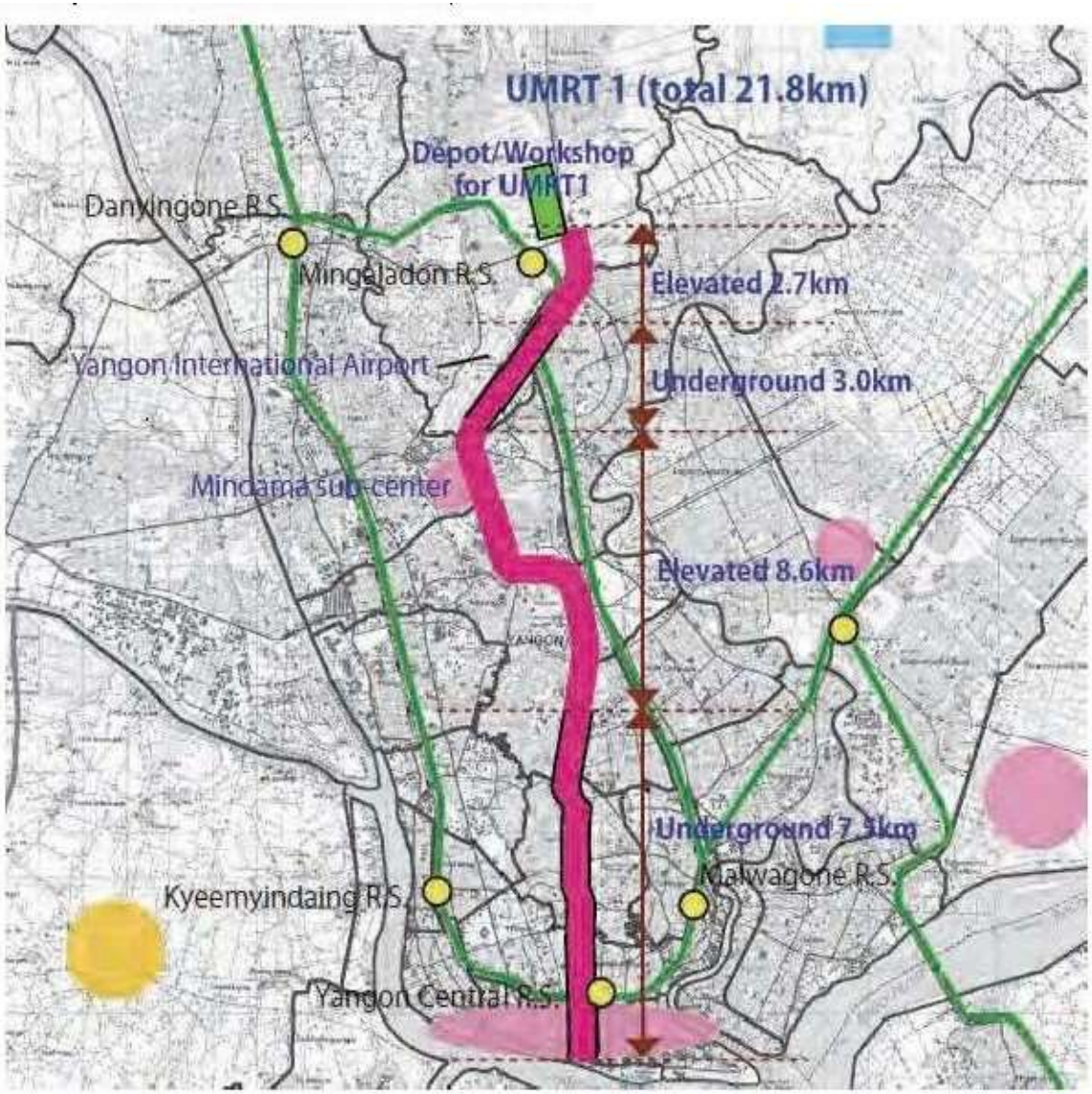
Hlaing Tharya – Mindama and Toe Kyaung Kalay Station including 13.0 km of underground way.

UMRT Line (1)

North – South connecting CBD with Yangon International Airport 21.8 km

Underground 10.3 km

Elevated 11.5 km



Source: YUTRA Project Team

Figure 6.2.1.17 Location Map for UMRT Line1

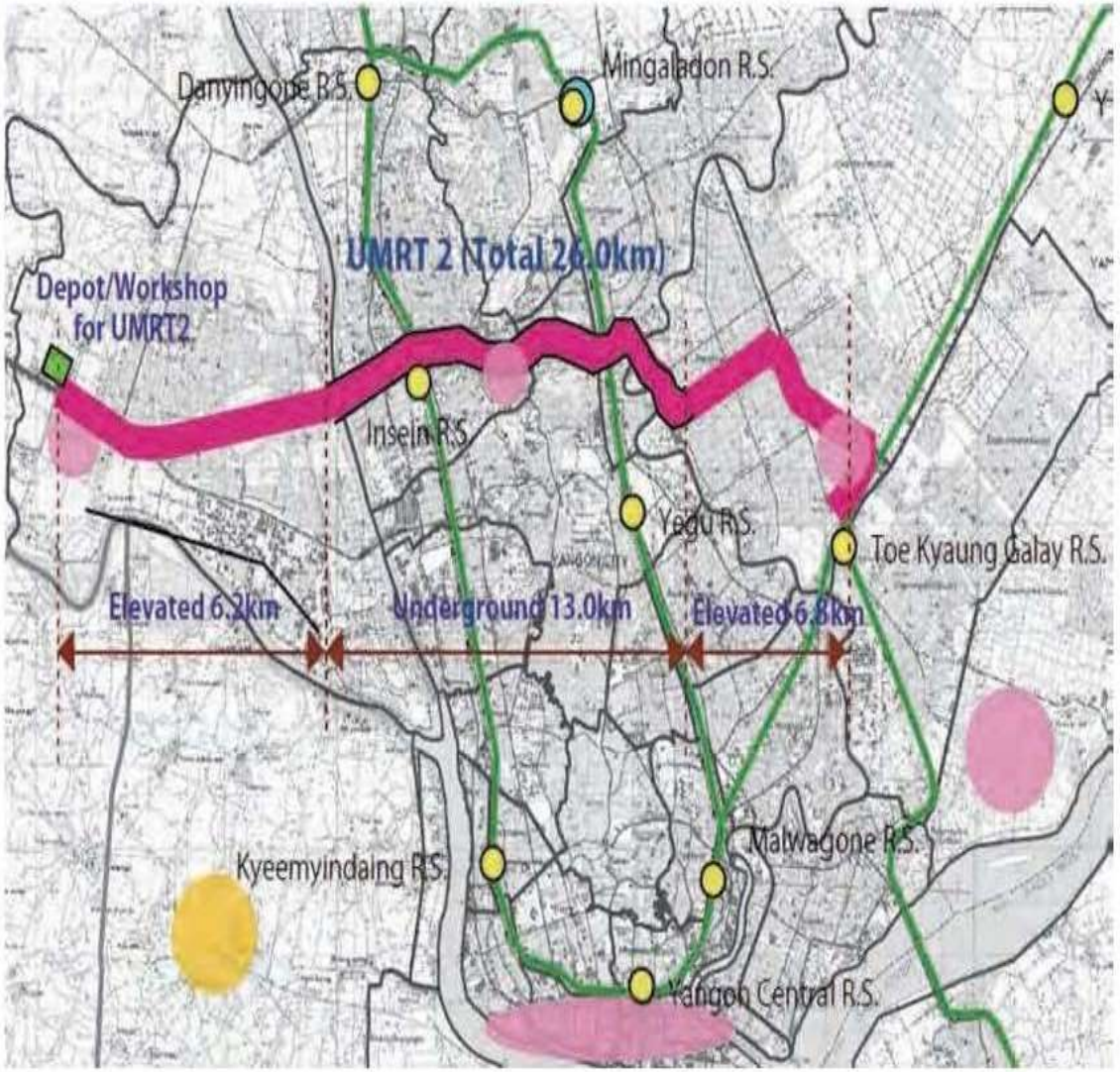
UMRT line (2)

East – West line 26 km

Underground 13 km

Elevated 13 km

From Hlaing Tharya to Toe Kyaung Kalay Railway Station



Source: YUTRA Project Team

Figure 6.2.1.19 Location Map for UMRT Line2

Thank you for your kind attention