FY2020 Study on Business Opportunity of High-quality Infrastructure to Overseas

The Study on Thilawa Smart City and Yangon - Thanlyin Transportation Corridor Development

Summary Report

March 2021

METI
Ministry of Economy, Trade and Industry

ORIENTAL CONSULTANTS GLOBAL
Global Consulting for Sustainable Development

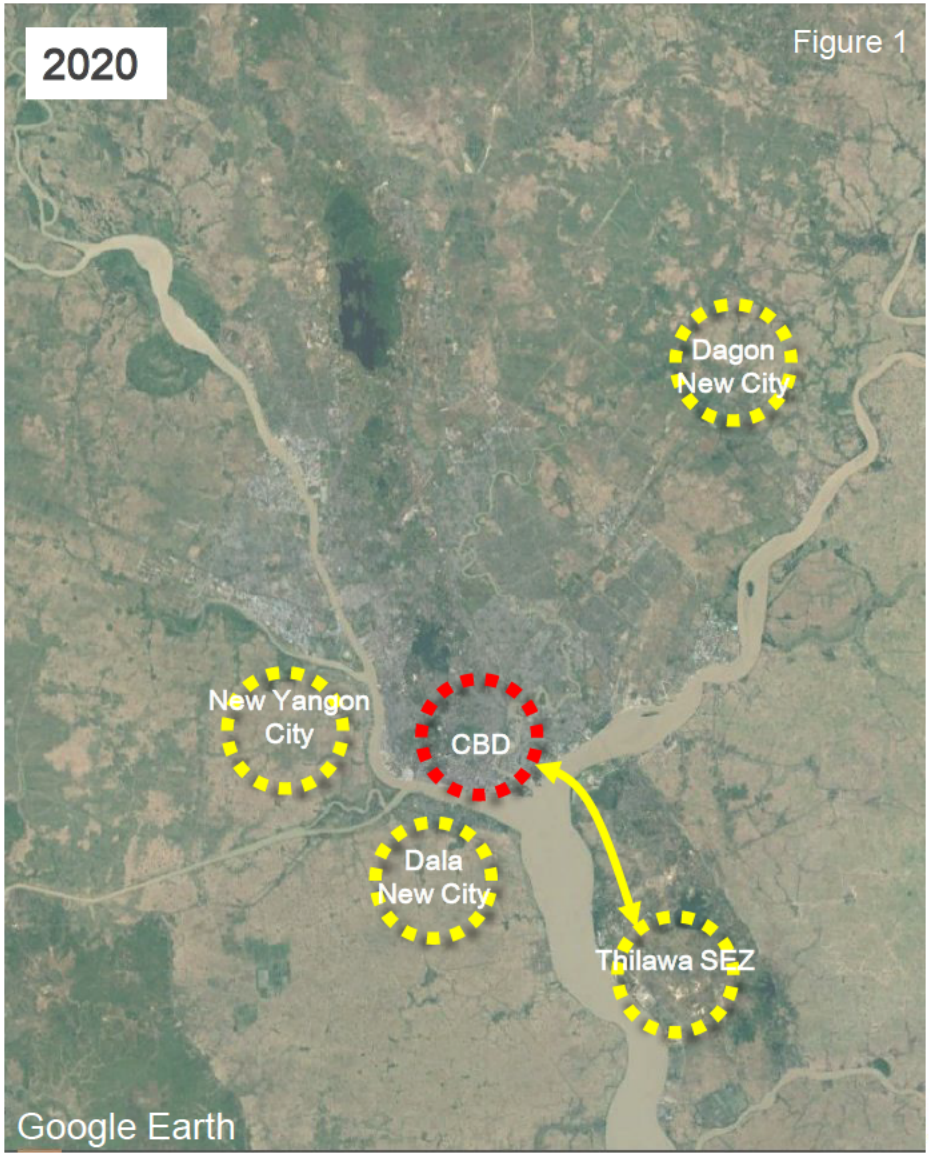
NIPPON KOEI

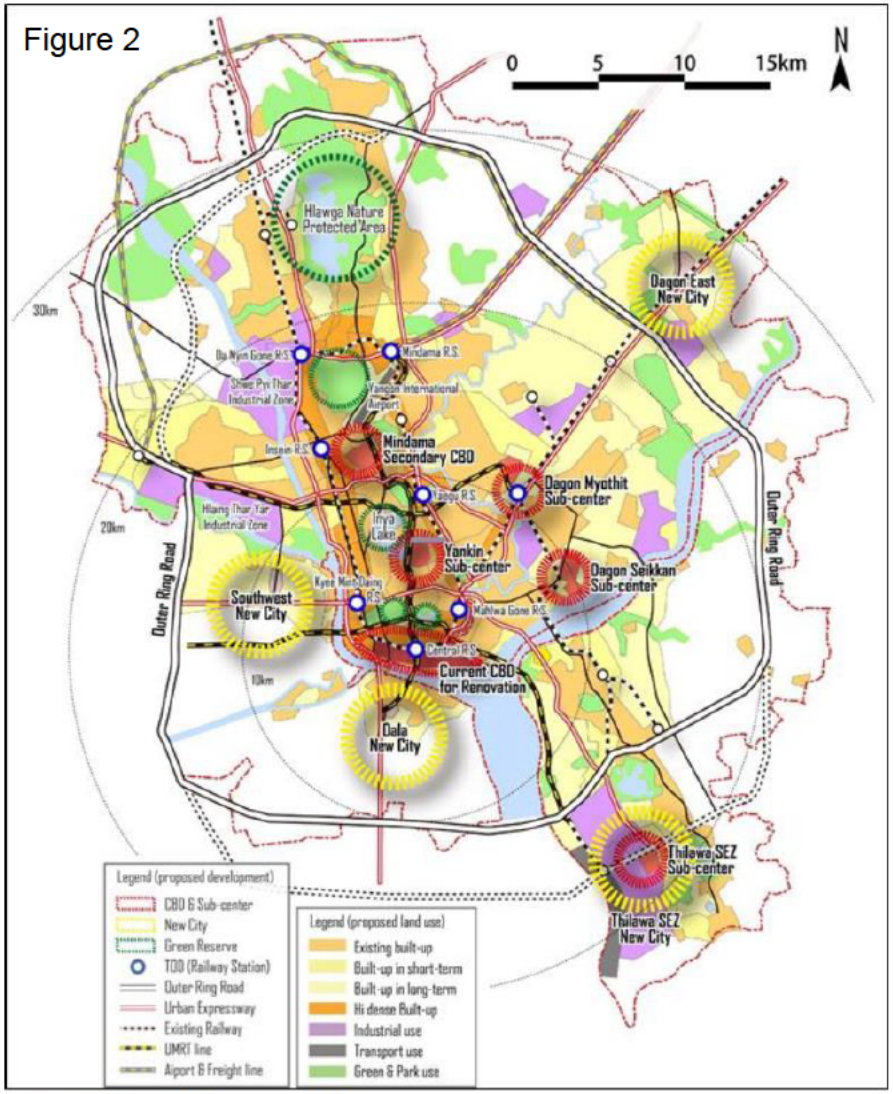
Contents

1. Background and Objective of the Project

- Background
  - In Thilawa area, development of industrial park has great achievements which already created more than 10,000 employments.
  - As Thilawa locates close to the city center of Yangon, therefore, there is an extremely high potential to develop this area as a sub-center. However, due to existence of Bago river between the two areas the development is insufficient.
  - Proper transportation access and infrastructure to the city center and smart city needs to be developed in an integrated manner. The plan to establish Thilawa smart city will be formulated by linking it with the redevelopment plan of city center.
- Objectives
  - Developing proper connections by road and railway between the central Yangon and Thilawa smart city
  - Considering technical matters regarding the crossing options of the Bago River by a long span bridge or a tunnel.
  - Considering development policy of Thilawa smart city and urban development in the central area.
  - Considering the potentials of cooperation and financing scheme involving the Japanese organizations.

2. Review of Future Development Plans and Formulation of Smart City Development Concept



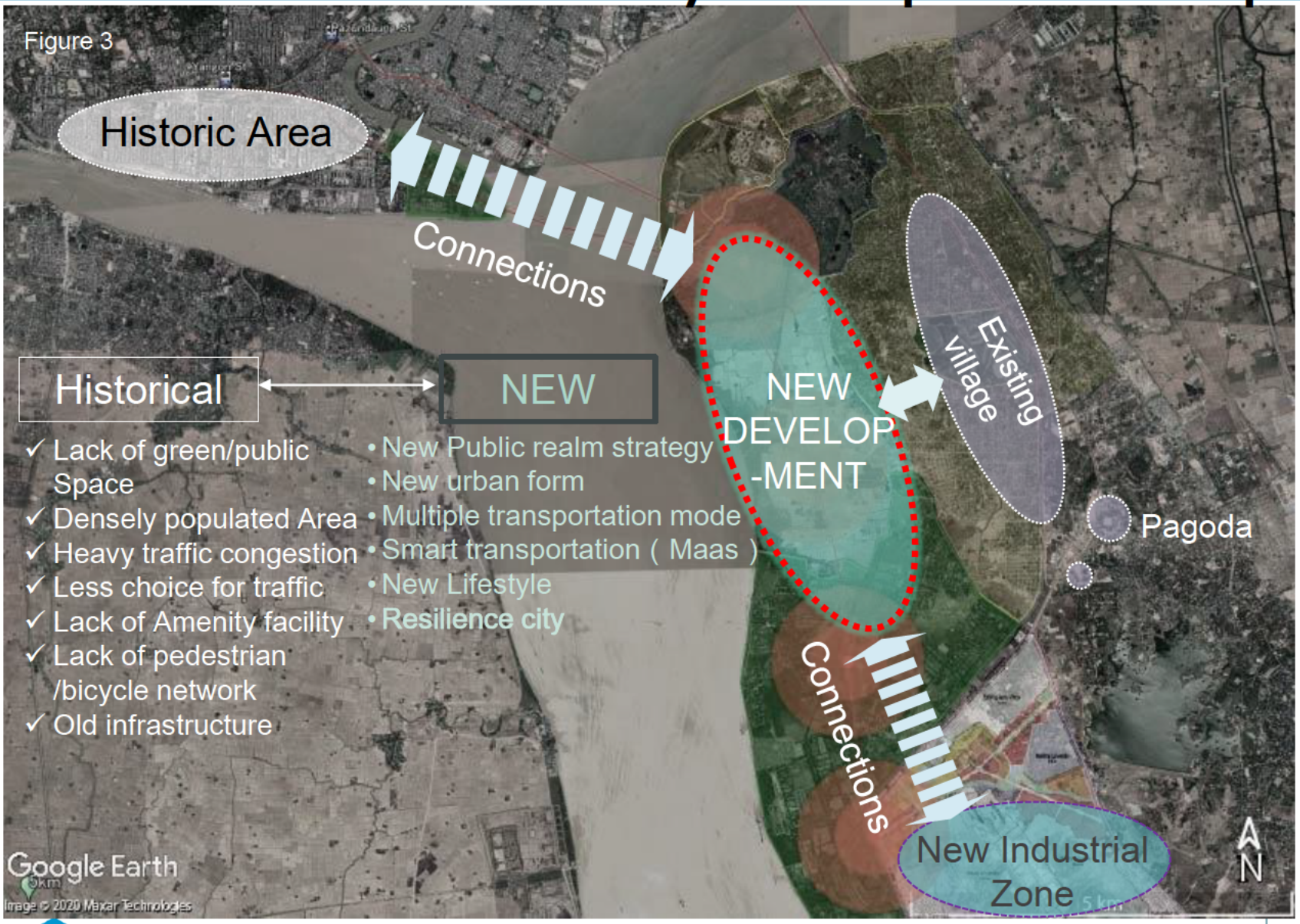


Updated SUDP(JICA Study)

Urban Structure Plan in Yangon Region(2040)

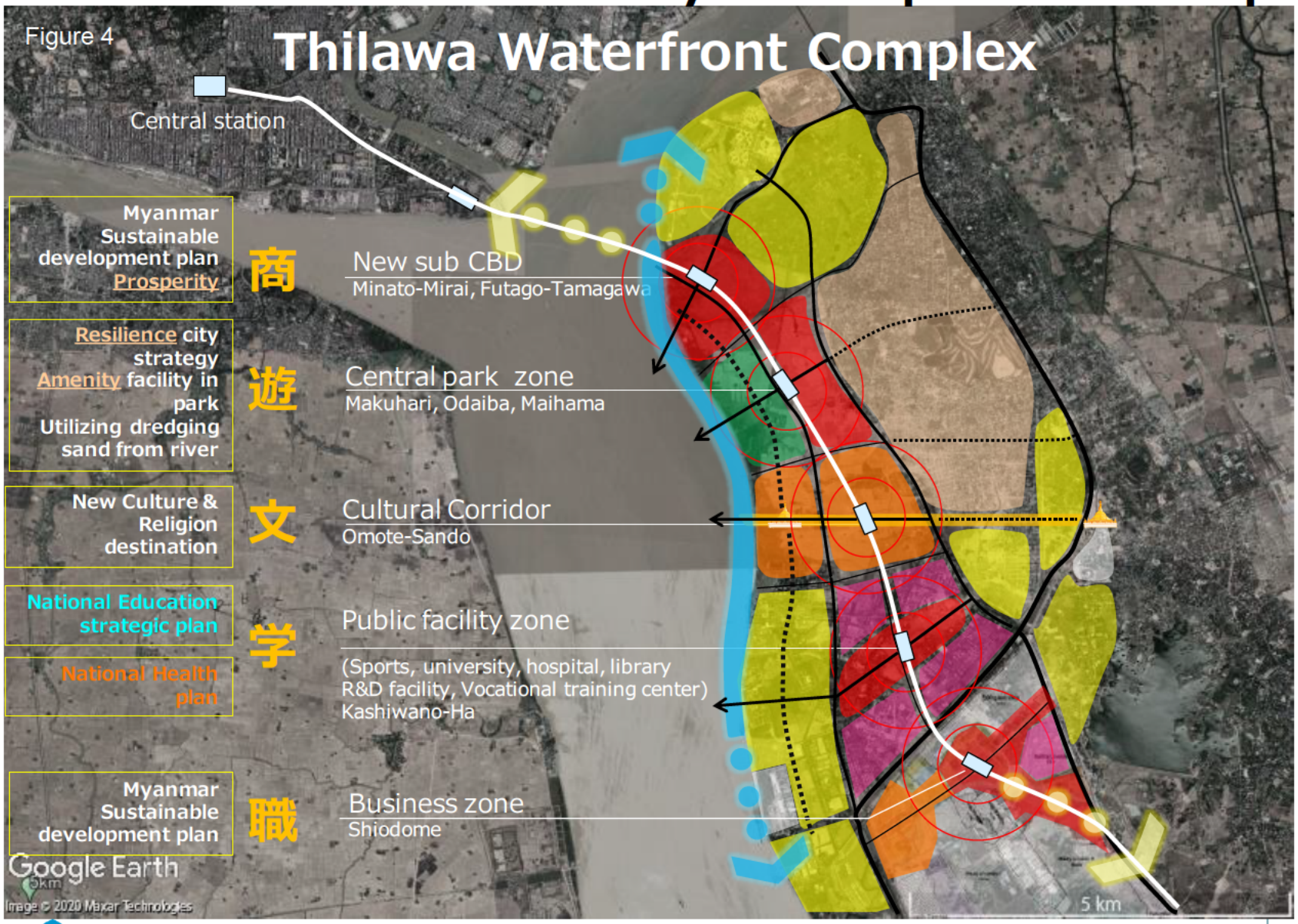
2. Review of Future Development Plans and Formulation of Smart City Development Concept

Figure 3



2. Review of Future Development Plans and Formulation of Smart City Development Concept

Figure 4



2. Review of Future Development Plans and Formulation of Smart City Development Concept

Expected Development Area and Scale

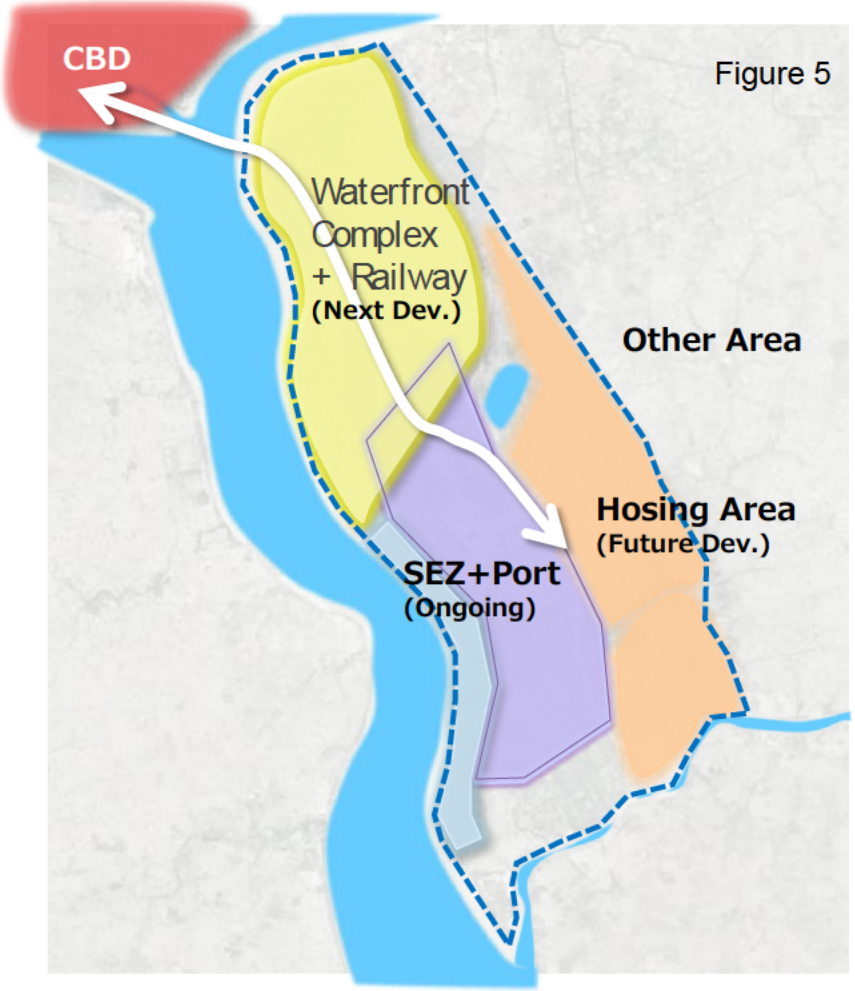


Figure 5

Thilawa Waterfront 13,000ha

Figure 6

Residents
1.4 Million pop

Workers
0.9 Million pop

Priority Area	Residents 1,000,000 pop Workers 800,000 pop
Waterfront Complex 4,000ha	Residents 740,000 pop Workers 380,000 pop
Thilawa SEZ 2,900ha	Residents 270,000 pop Workers 420,000 pop

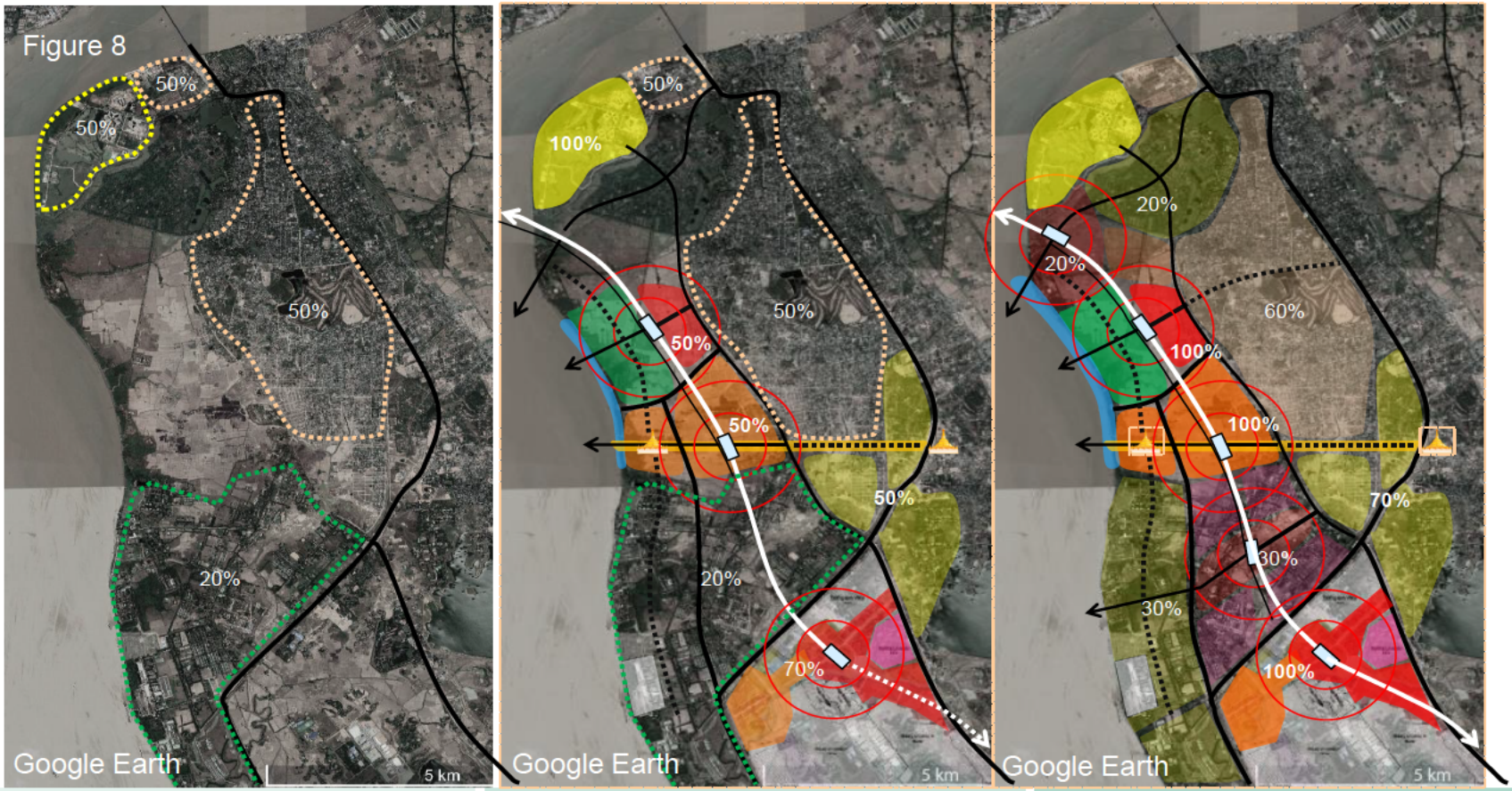
Housing Area

Excluded Area

2. Review of Future Development Plans and Formulation of Smart City Development Concept

Figure 7

2. Review of Future Development Plans and Formulation of Smart City Development Concept



- Existing residential areas and Star City are being developed.
- Industrial area of SEZ are developing strongly. North side of SEZ is planned to develop residential and commertial area
- Agricultural land (surplus development land) in the central area

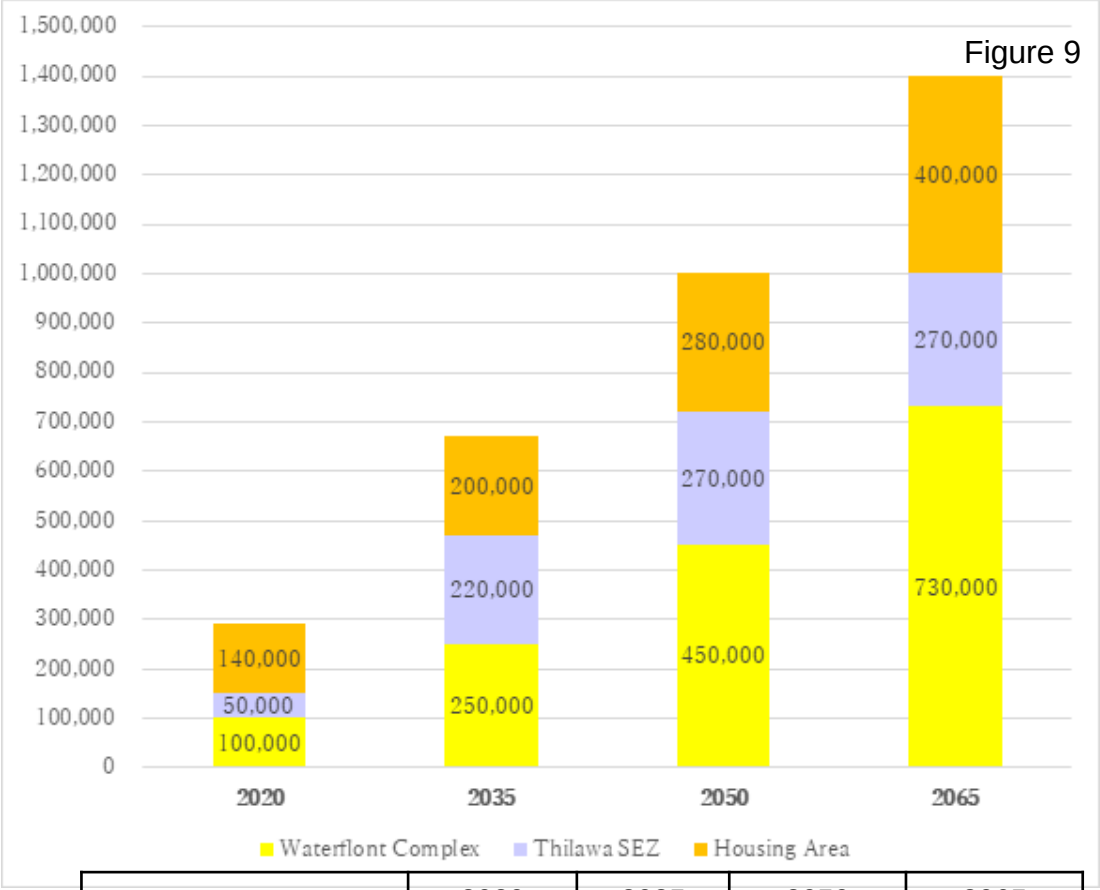
- MRT will open around 2035 (3 stations in the initial stage)
- Public-led development promotion
- ✓ Station Play: Park and sports facilities, including a water reservoir
- ✓ Station Learn /Work: Mass supply of residence by public housing
- Private sector-led development mainly in SEZ

- Public-led development spread to private development
- Redevelopment of military land and existing residential areas is also promoted.
- New sub CBD station and other stations also opend

2. Review of Future Development Plans and Formulation of Smart City Development Concept

Population Size in Phase-year

Figure 9



	2020	2035	2050	2065
Waterfront Complex	100,000	250,000	450,000	730,000
Thilawa SEZ	50,000	220,000	270,000	270,000
Housing Area	140,000	200,000	280,000	400,000
Thilawa Waterfront	**290,000**	**670,000**	**1,000,000**	**1,400,000**

3. Travel Demand Forecast (Population Density by Zone)

Population Density by Zone

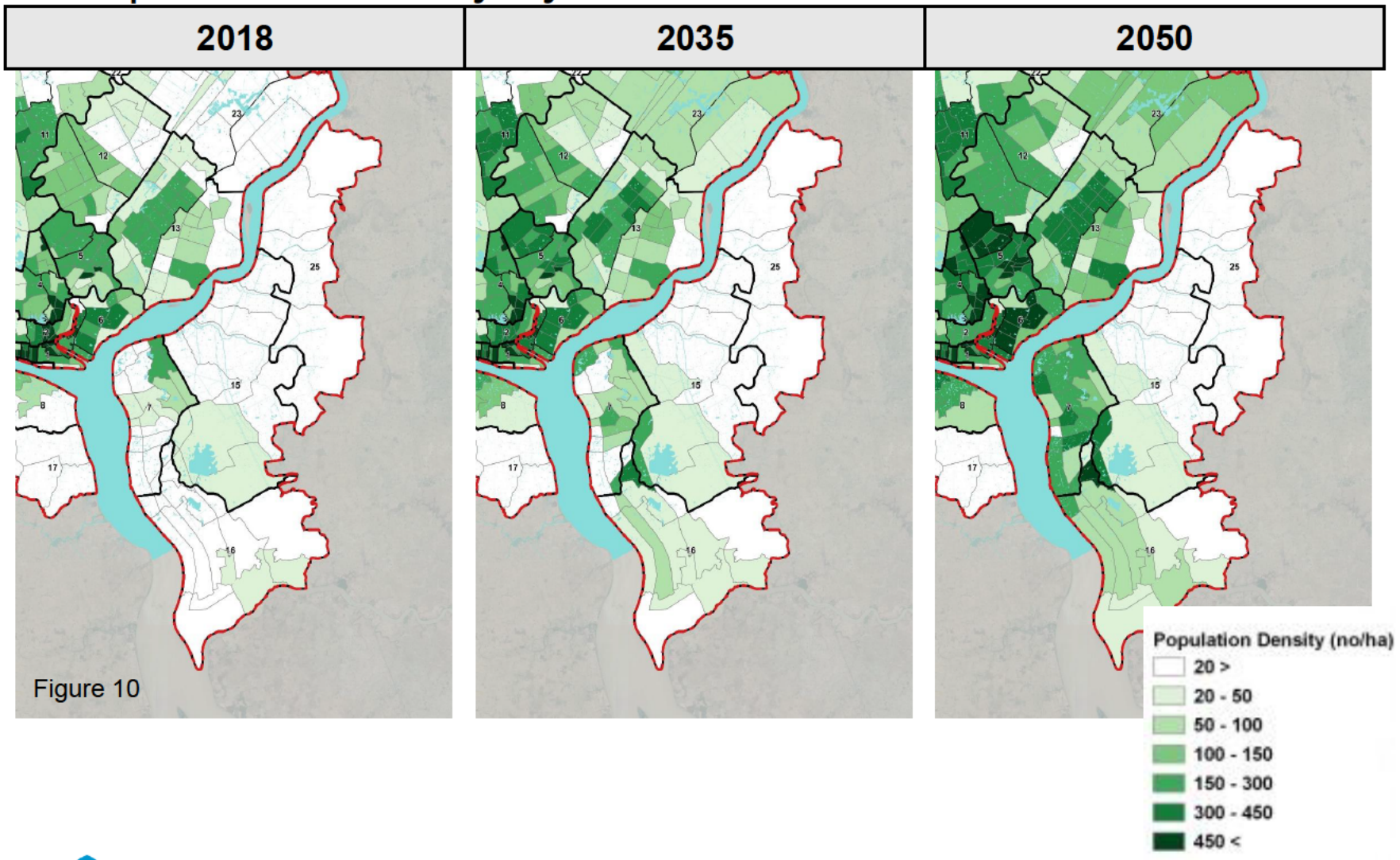


Figure 10

3. Travel Demand Forecast (Socio-economic Frame)

Table 1

Cluster	Area		2018	2035	2050	2065
7	1	7. Waterfront Complex	109,092	203,800	344,670	515,987
	0	7. Other Area	46,689	51,292	55,422	77,591
15	1	15. Waterfront Complex	8,746	78,300	100,122	113,326
	3	15. Housing Area	74,835	87,026	106,348	112,542
	0	15. Other Area	30,616	60,643	110,227	154,318
16	1	16. Waterfront Complex	2,242	58,100	81,294	100,687
	2	16. Thilawa SEZ	6,267	102,929	177,188	270,000
	3	16. Housing Area	54,602	112,974	193,652	287,458
25	0	25. Other Area	25,251	48,065	84,351	118,091
Total			**358,340**	**803,129**	**1,253,273**	**1,750,000**

Table 2

v2	2018	2035	2050	2065
Waterflont Complex 4000ha	120,080	340,200	526,085	730,000
SEZ 3000ha	6,267	102,929	177,188	270,000
Housing Area	129,437	200,000	300,000	400,000
Project Area	**255,784**	**643,129**	**1,003,273**	**1,400,000**
(+ Other Area)	102,556	160,000	250,000	350,000
Total (7+15+16+25)	**358,340**	**803,129**	**1,253,273**	**1,750,000**

3. Travel Demand Forecast (Results for each route option)

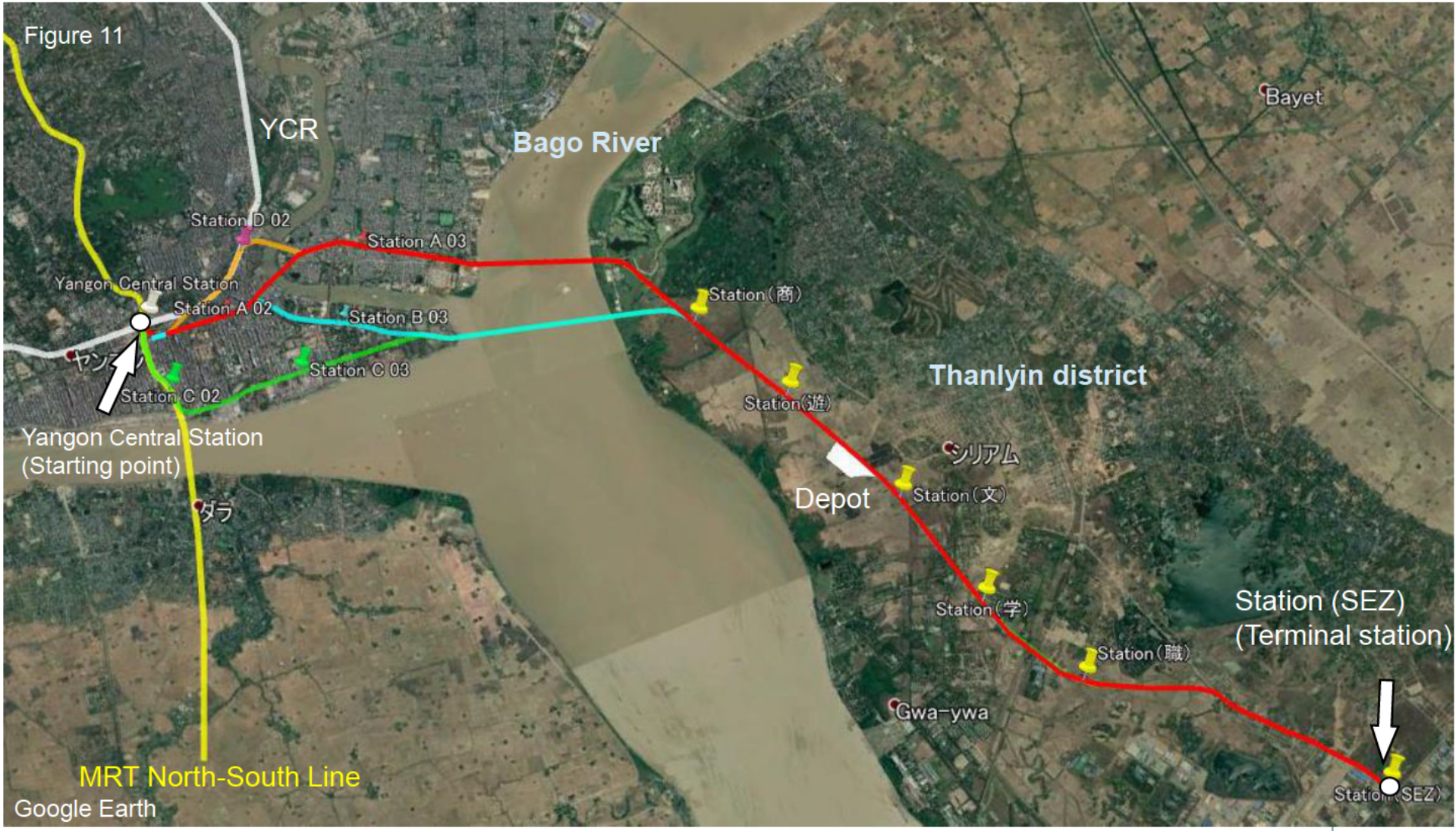
Table 3

Year	Route Option	Length (km)	Ridership (000 /day)	Pax-km (000/day)	Average Trip Length (km)	PPHPD	Pax/km (000)	Pax-km/km (000)
2050	A	18.7	987	11,183	11.3	43,700	52.9	599.3
	B	18.4	968	10,769	11.1	42,900	52.5	584.0
	C	18.3	939	8,534	9.1	38,000	51.3	466.1
	D	18.9	987	10,916	11.1	41,300	52.3	578.4

* Route option will be explained in next slide.

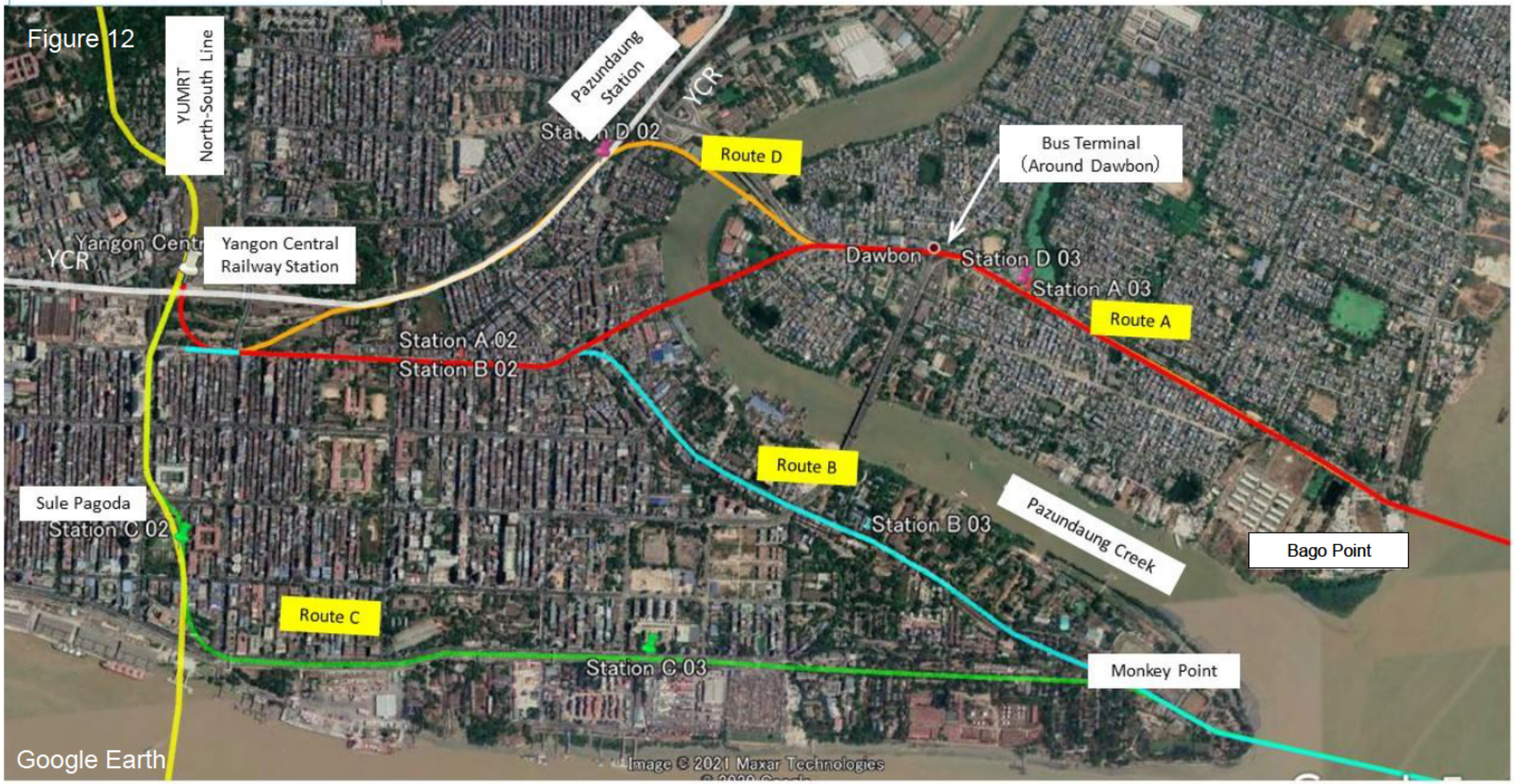
4. Study on Route Alternatives of Railways and Roads

Overall route map



4. Study on Route Alternatives of Railways and Roads

Railway Route Alternatives (CBD & River Crossing)



4. Study on Route Alternatives of Railways and Roads

Table 4

Route		Route A		Route B	Route C	Route D
Basic Structure	Structure	Elevated	Underground	Underground	Underground	Elevated
	Station (9 in total)	Elevated: 9	Elevated: 5 Underground: 3 On ground: 1	Elevated: 5 Underground: 3 On ground: 1	Elevated: 5 Underground: 3 On ground: 1	Elevated: 9
	Structure Length (excl. Bago River)	Elevated: 20.0km	Elevated: 12.5km Underground: 7.0km On ground: 0.7km	Elevated: 12.2km Underground: 7.3km On ground: 0.4km	Elevated: 12.9km Underground: 7.2km On ground: 0.4km	Elevated: 20.2km
	Crossing Bago River	Bridge 1600m	Shield Tunnel 1600m	Shield Tunnel 2200m	Shield Tunnel 2200m	Bridge 1600m
Estimated Construction Cost	Construction Cost (Ratio)	70.9Billion Yen (1)	10.04 Billion Yen (1.42)	9.96 Billion Yen (1.340)	10.10Billion Yen (1.42)	7.014Billion Yen (1.01)
Traffic Demand (PPHPD_2050)		43,100	43,100	42,000	37,700	40,800
Convenience	Surrounding Facilities	New Station near a midsize school Pass near a bus terminal at Dawbon	New Station near a midsize school Pass near a bus terminal at Dawbon	New Station near a midsize school New station in a Navy facility	Historical Building (Sule Pagoda), Bank, Embassy, etc. Pass through Central Yangon	Pass near the bus terminal at Dawbon
	Connectivity	Transfer to YCR Future Extension	Transfer to YCR Through operation to MRT North-South Line is possible	Transfer to YCR Through operation to MRT North-South Line is possible	Through operation to MRT North-South Line is possible	Transfer to YCR Connectivity at Pazundaung St. Future Extension
Land Acquisition	Approximate Area/ Resettlement House	13925m2 50 Houses	3696m2 23 Houses	5296m2 29 Houses	3296m2 0 Houses	24775m2 51 Houses
Feasibility of Construction		Bridge at Pazundaung Creek	Long-distance tunnel Large earth covering at river crossing	Long-distance tunnel Large earth covering at river crossing	Construction near a historical building Connecting station for the MRT North-South Line will be larger and deeper: some sections of the North-South Line will need to be constructed ahead of time.	Bridge at Pazundaung Creek Construction near existing railroad Sharp Curve in front of Pazundaung Creek

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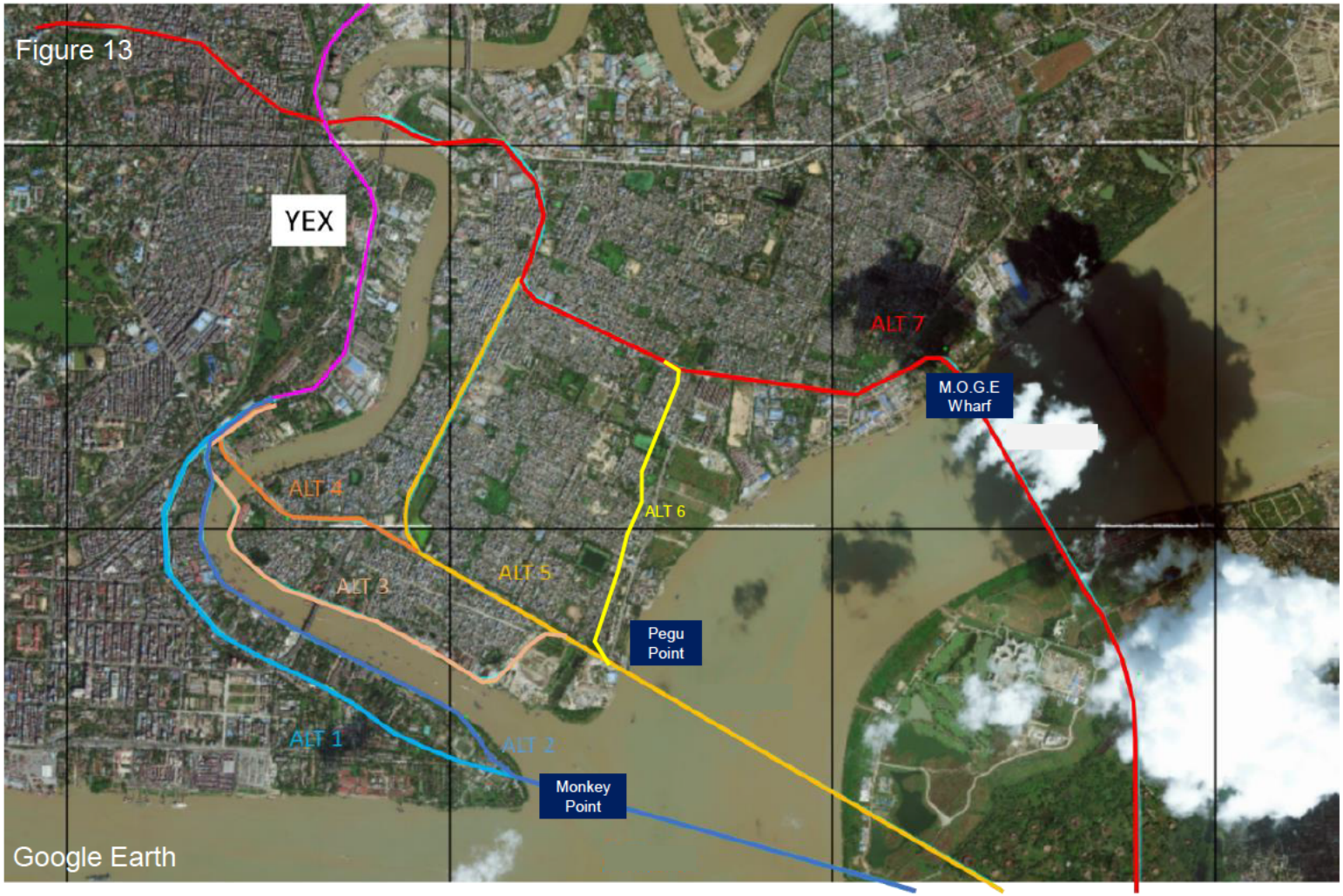
As the primary railway route selection, 3 options in the red frame are selected
* Yellow hatching area is disadvantageous compared with other plans → Routes C and D are non-recommended plans.

4. Study on Route Alternatives of Railways and Roads

Highway Route Selection – Plan of VIEW



4. Study on Route Alternatives of Railways and Roads

Table 5

			Road						
			1	2	3	4	5	6	7
Railway	A	Elevated structure	✓	× Because Railway elevated structure is not selected	✓ (Railway–Road bridge)	× (Railway–Road bridge) Not economical because railway – road section is too long	✓ (Railway–Road bridge)	✓ (Railway–Road bridge)	✓
		Underground structure	✓	× Because Railway elevated structure is not selected	×	×	×	×	✓
	B	Underground structure	×	× Because Railway elevated structure is not selected	✓	✓	✓	✓	✓
	C	Underground structure	Not recommended						
	D	Elevated structure							

✓ : Road elevated structure and Railway underground structure are developed sepaletly

✓ : Railway–Road combined bridge

× or △ : conflict between railway and road or unrealistic plan

Possible Alternative

4. Study on Route Alternatives of Railways and Roads

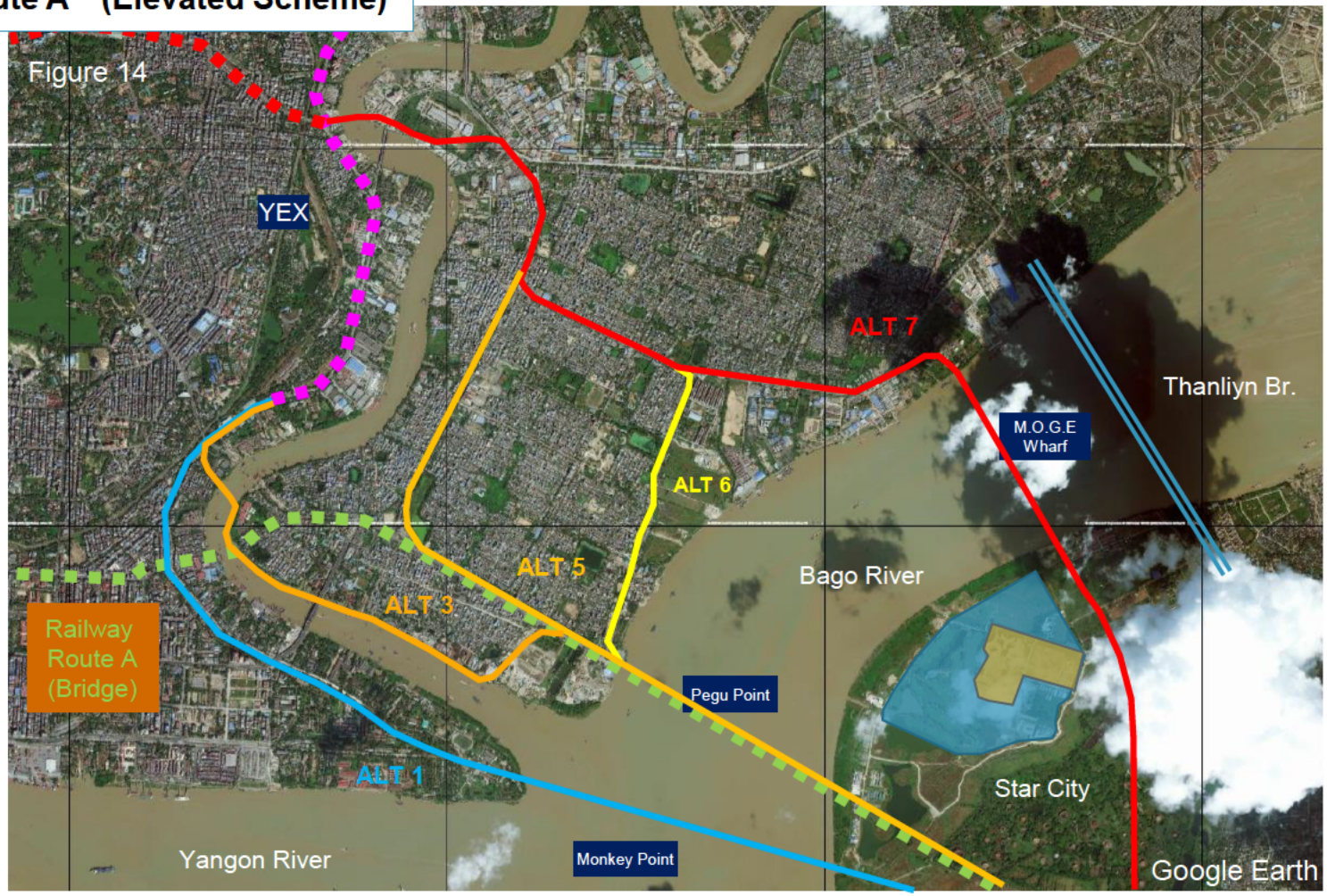
Estimated Construction Costs and Land Acquisition Costs for Each Combination

Table 6

			Road	ALT1		ALT3		ALT4	ALT5		ALT6		ALT7		
			Railway	Route A		Route A	Route B	Route B	Route A	Route B	Route A	Route B	Route A		Route B
				Elevated	Underground	Elevated	Underground	Underground	Elevated	Underground	Elevated	Underground	Elevated	Underground	Underground
Estimated construction cost	Road	Viaduct		174.4M USD	174.4M USD	149.3M USD	149.3M USD	98.6M USD	226.5M USD	226.5M USD	232.8M USD	232.8M USD	217.1M USD	217.1M USD	217.1M USD
		Earthwork		214.1M USD	214.1M USD	217.3M USD	217.3M USD	217.3M USD	217.3M USD	217.3M USD	217.3M USD	217.3M USD	235.0M USD	235.0M USD	235.0M USD
		River Section	Pazundaung Creek	-	-	227.9M USD	227.9M USD	199.4M USD	142.4M USD	142.4M USD	142.4M USD	142.4M USD	142.4M USD	142.4M USD	142.4M USD
			Bago River	644.9M USD	644.9M USD	-	540.3M USD	540.3M USD	-	540.6M USD		540.3M USD	448.7M USD	448.7M USD	448.7M USD
		Sub-total (A)		**1033.4M USD**	**1033.4M USD**	**594.5M USD**	**1134.8M USD**	**1055.6M USD**	**586.2M USD**	**1126.8M USD**	**592.6M USD**	**1132.8M USD**	**1043.3M USD**	**1043.3M USD**	**1043.3M USD**
	Railway	Railway (station)		118.9M USD	233.0M USD	118.9M USD	233.0M USD	233.0M USD	118.9M USD	233.0M USD	118.9M USD	233.0M USD	118.9M USD	233.0M USD	233.0M USD
		Railway (tracks)		308.9M USD	662.3M USD	308.9M USD	661.3M USD	661.3M USD	308.9M USD	661.3M USD	308.9M USD	661.3M USD	308.9M USD	662.3M USD	661.3M USD
		Shaft, Tempolary road		-	51.8M USD	-	45.3M USD	45.3M USD	-	45.3M USD	-	45.3M USD	-	51.8M USD	45.3M USD
		River Section	Pazundaung Creek	26.4M USD	-	26.4M USD	-	-	26.4M USD	-	26.4M USD	-	26.4M USD	-	-
			Bago River	214.2M USD	-	-	-	-	-	-	-	-	214.2M USD	-	-
		Subtotal (B)		**668.3M USD**	**947.1M USD**	**454.2M USD**	**939.6M USD**	**939.6M USD**	**454.2M USD**	**939.6M USD**	**454.2M USD**	**939.6M USD**	**668.3M USD**	**947.1M USD**	**939.6M USD**
		River		-	-	603.8M USD	-	-	603.8M USD	-	603.8M USD	-	-	-	-
		Ground		-	-	50.0M USD	-	-	153.8M USD	-	-	-	-	-	-
		Sub-total (C)		**0.0M USD**	**0.0M USD**	**653.8M USD**	**0.0M USD**	**0.0M USD**	**757.5M USD**	**0.0M USD**	**603.8M USD**	**0.0M USD**	**0.0M USD**	**0.0M USD**	**0.0M USD**
	Total Sum (A+B+C)			**1701.7M USD**	**1980.5M USD**	**1702.4M USD**	**2074.4M USD**	**1995.2M USD**	**1797.9M USD**	**2066.4M USD**	**1650.5M USD**	**2072.4M USD**	**1711.6M USD**	**1990.3M USD**	**1982.9M USD**
Land	Road		area (m^2)	17,200	17,200	69,900	69,900	9,760	41,970	41,970	53,500	53,500	58,900	58,900	58,900
	Railway		area (m^2)	13,925	3,696	13,925	5,296	5,296	13,925	5,296	13,925	5,296	13,925	3,696	5,296
	Road-rail bridge		Double deck	0	0	6,240	0	0	19,240	0	0	0	0	0	0
	Total		**Land area (m^2)**	**31,125**	**20,896**	**90,065**	**75,196**	**15,056**	**75,135**	**47,266**	**67,425**	**58,796**	**72,825**	**62,596**	**64,196**
			Cost	**119.8M USD**	**80.5M USD**	**346.8M USD**	**289.5M USD**	**58.0M USD**	**289.3M USD**	**182.0M USD**	**259.6M USD**	**226.4M USD**	**280.4M USD**	**241.0M USD**	**247.2M USD**
Construction Cost + Land Acquisition Cost (Ratio)				**1.82B USD**	**2.06B USD**	**2.05B USD**	**2.36B USD**	**2.05B USD**	**2.09B USD**	**2.25B USD**	**1.91B USD**	**2.30B USD**	**1.99B USD**	**2.23B USD**	**2.23B USD**
				(1.00)	**(1.13)**	**(1.12)**	**(1.30)**	**(1.13)**	**(1.15)**	**(1.23)**	**(1.05)**	**(1.26)**	**(1.09)**	**(1.22)**	**(1.22)**

4. Study on Route Alternatives of Railways and Roads

Route A (Elevated Scheme)



4. Study on Route Alternatives of Railways and Roads

Route A (Elevated)

Table 7

	ALT 1		ALT3		ALT5		ALT6		ALT7	
Integration with Railway	None (Road-only bridge)		Integrated (Road-rail bridge)		Integrated (Road-rail bridge)		Integrated (Road-rail bridge)		Integrated (Road-rail bridge)	
Length	13.7km		13.5km		15.0km		14.8km		15.0km	
Traffic Volume*1	46,000PCU/day	Fair	59,000PCU/day	Good	58,000PCU/day	Good	59,000PCU/day	Good	59,000PCU/day	Good
Road Alignment (No. of application of min. radius)	2	Good	5	Poor	2	Good	5	Poor	4	Poor
Construction Cost*2 (Only road)	180.4 billion yen (109.6 billion yen)	Good	180.4 billion yen (63.0 billion yen)	Good	190.5billion yen (62.1 billion yen)	Poor	175.0 billion yen (62.8 billion yen)	◎	181.4 billion yen (110.6 billion yen)	Fair
Land Acquisition*2 (for road)	31,000㎡ (17,000㎡)	Good	90,000㎡ (70,000㎡)	Poor	75,000㎡ (42,000㎡)	Fair	67,000㎡ (54,000㎡)	Fair	73,000㎡ (59,000㎡)	Fair
No. of Affected house*2	Railway：50 Road: 100	Poor	Railway：50 Road: 0	Good	Railway：50 Road:50	Fair	Railway：50 Road:70	Poor	Railway：50 Road:60	Poor
Constructability	General condition in urban area	Fair	Bridges girder is erected on river, so temporary structure are necessary	Poor	General condition in urban area	Fair	General condition in urban area	Fair	General condition in urban area	Fair
Recommended Proposal (points)	**Recommendation (Economical) (13)**		**(11)**		**Recommendation (Project Effective) (13)**		**(12)**		**(10)**	

*1：Weighted average of each IC distance (from YEX to YORR)
*2:The sum including railway costs
*3: Good3 points,　Fair2 points,　Poor1 point

4. Study on Route Alternatives of Railways and Roads

Route A (Underground Scheme)

4. Study on Route Alternatives of Railways and Roads

Route A (Underground)

Table 8

	ALT 1		ALT7	
Integration with Railway	Road-only bridge		Road-only bridge	
Length	13.7km		15.0km	
Traffic Volume*1	47,000PCU/day	Poor	59,000PCU/day	Good
Road Alignment （No. of application of min. radius）	2 Points	Good	4 Points	Poor
Construction Cost*2 （individual road cost）	210.0 billion yen （109.6 billion yen）	Good	211.0 billion yen （110.6 billion yen）	Poor
Land Acquisition*2 （for road）	21,000㎡ （21,000㎡）	Good	52,000㎡ （49,000㎡）	Poor
No. of Affected house*2	Railway：23 Road:100	Poor	Railway：23 . Road:60	Good
Constructability	General condition in urban area	Good	General condition in urban area	Good
Recommended Proposal (points)	**Recommendation (10)**		**(9)**	

*1：Weighted average of each IC distance (from YEX to YORR)
*2:The sum including railway costs
*3: Good3 points, Fair2 points, Poor1 point

4. Study on Route Alternatives of Railways and Roads

Route B (Underground Scheme)

4. Study on Route Alternatives of Railways and Roads

Route B (Underground Scheme)

Table 9

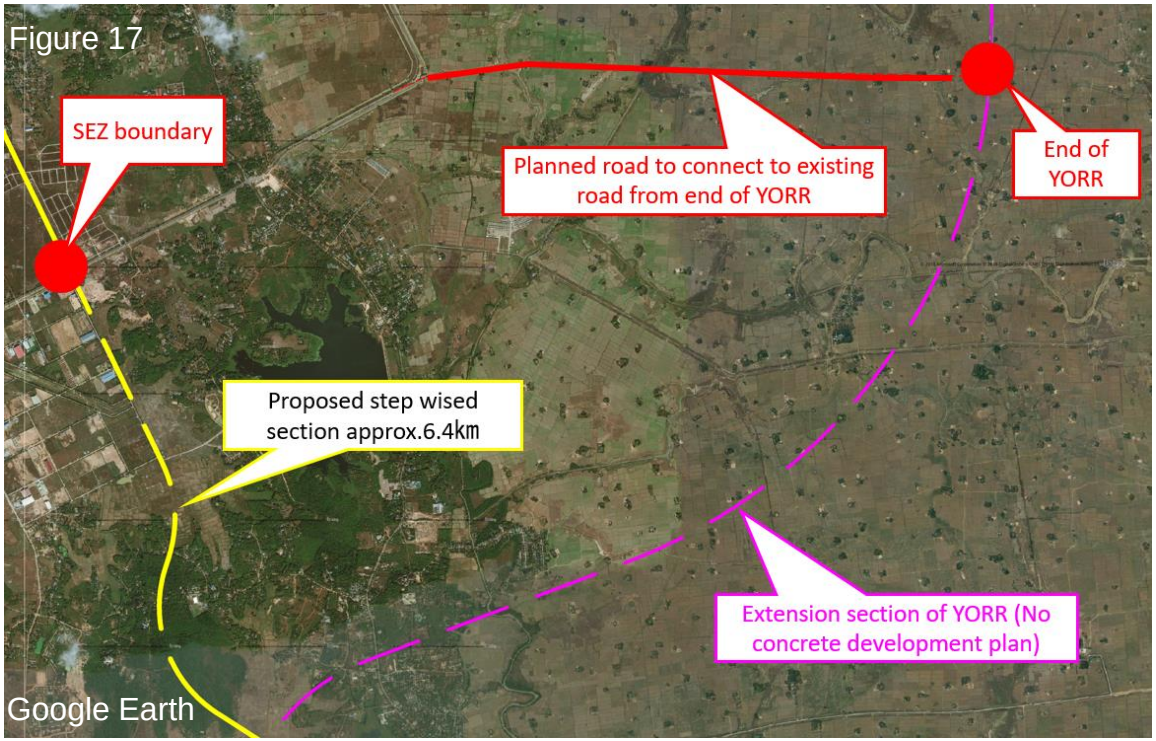
	ALT3		ALT4		ALT5		ALT6		ALT7	
Integration with Railway	None (Road-only Bridge)		None (Road-only Bridge)		None (Road-only Bridge)		None (Road-only Bridge)		None (Road-only Bridge)	
Length	13.5km		12.9km		15.0km		14.8km		15.0km	
Traffic Volume*1	59,000PCU/day	Good	57,000PCU/day	Good	58,000PCU/day	Good	59,000PCU/day	Good	59,000PCU/day	Good
Road Alignment (No. of application of min. radius)	5 Locations	Poor	1 Location	Good	2 Locations	Good	5 Location	Poor	4 Locations	Poor
Construction Cost*2 (Only road)	219.9 billion yen (120.3 billion yen)	Poor	211.5 billion yen (111.9 billion yen)	Fair	219.0 billion yen (119.4 billion yen)	Fair	219.7 billion yen (120.1 billion yen)	Poor	210.2 billion yen (110.6 billion yen)	Poor
Land Acquisition*2 (for road)	75,000㎡ (60,000㎡)	Poor	15,000㎡ (10,000㎡)	Good	47,000㎡ (42,000㎡)	Fair	59,000㎡ (54,000㎡)	Fair	64,000㎡ (59,000㎡)	Fair
No. of Affected house*2	Railway : 50 bld. Road:0 bld.	Good	Railway : 50 bld. Road:3 bld.	Good	Railway : 50 bld. Road:50 bld.	Poor	Railway : 50 bld. Road:70 bld.	Poor	Railway : 50 bld. Road:60 bld.	Poor
Constructability	Bridges girder is erected on river, so temporary structure are necessary	Poor	General condition in urban area	Fair	General condition in urban area	Fair	General condition in urban area	Fair	General condition in urban area	Fair
Recommended Proposal (points)	**(10)**		**Recommended (15)**		**(14)**		**(9)**		**(10)**	

*1 : Weighted average of each IC distance (from YEX to YORR)
*2:The sum including railway costs
*3: Good3 points, Fair2 points, Poor1 point

5. Phased Development Plan

<Road>

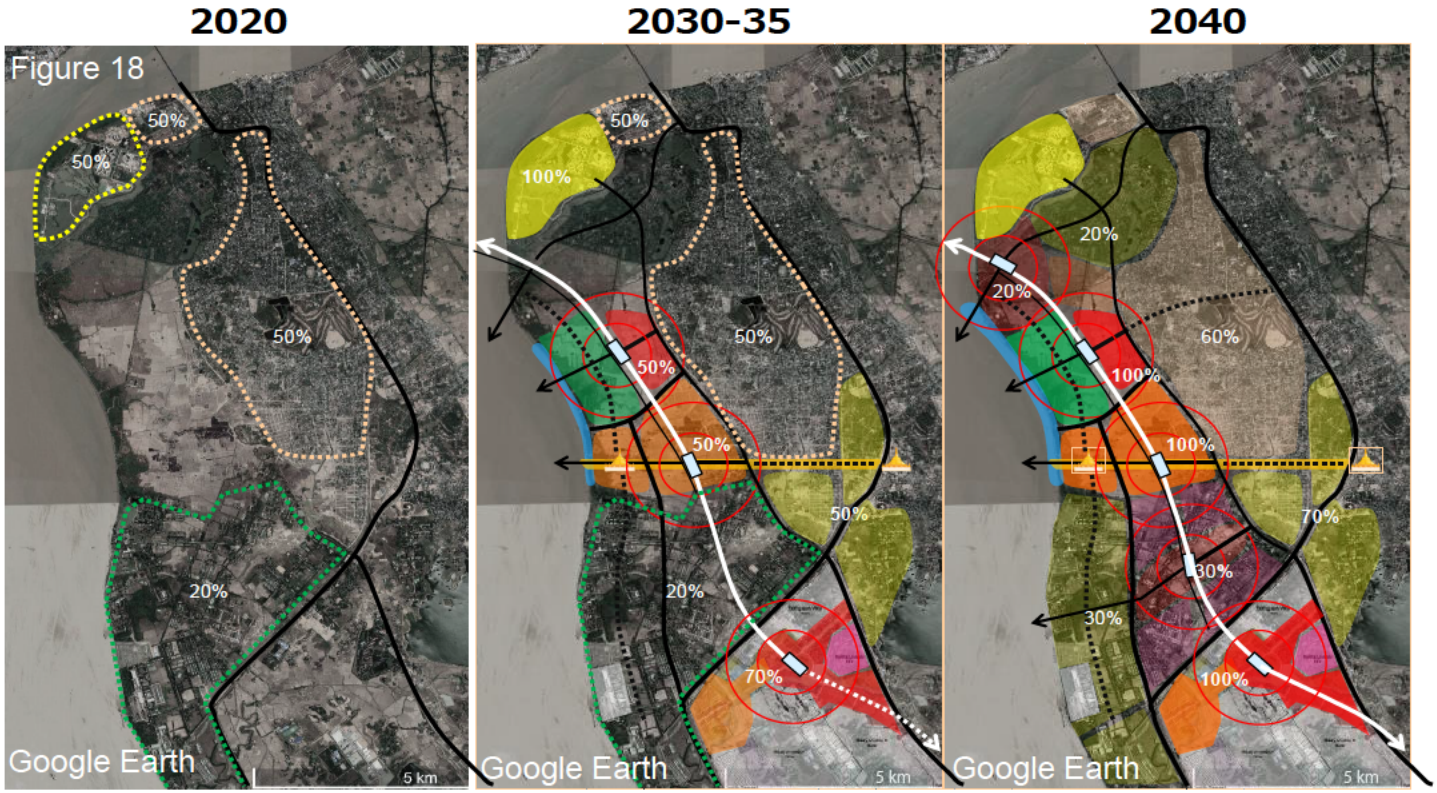
- The section between Thilawa SEZ~YORR shall be executed in the next phase because of reasons below.
  - ✓ Traffic volume in the section connecting SEZ~YORR is approximately 11,000pcu/day which is smaller than other IC section.
  - ✓ Planned end point of YORR is as shown below. There are no concrete plan for extension section.



5. Phased Development Plan

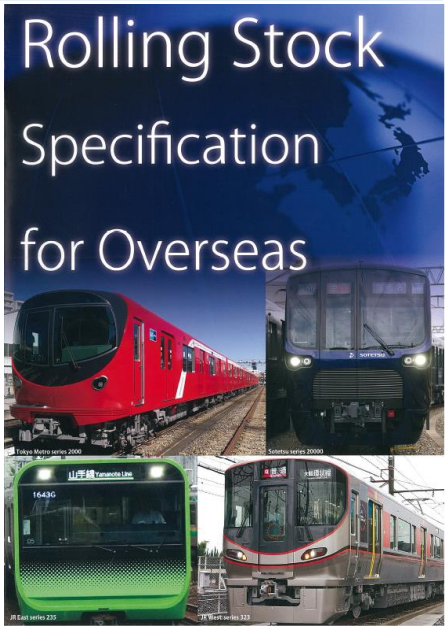
<Railway>

- As demand for railway is not expected to be high in the early stages of development, the Yangon–Thanlyin Urban Railway is expected to partially open (Yangon Central Station – Station 8 (職)).
- In the 2040s, when waterfront development is in full swing, new station will be built along the way and the line will be extend to the Thilawa SEZ.



6. Railway System Plan

Figure 19



Specification of Rolling Stock for Thilawa MRT

- Rolling stock specification for Thilawa MRT is designed based on the specification of RS of YUMRT E/W Line and standard specification of RS in Japan (*1).
- Regarding the passenger capacity, the peak congestion rate was set at 7 people/ m2 for standees, which is equivalent to the congestion rate of 180% in Japan.

Table 10

No.	Item	Thilawa MRT	YUMRT E/W Line	Standard Spec. (*1)
1	No. of cars/trainset	8 cars	8 cars	3-11 cars
2	Passenger capacity (ppl./trainset)	2226 (414 seats), 7ppl/m2 for standees	2226 (414 seats), 7ppl/m2 for standees	-
3	Passenger capacity at leading car (ppl./car)	264 (45 seats), 7ppl/m2 for standees	264 (45 seats), 7ppl/m2 for standees	264 (48 seats), 7ppl/m2 for standees
4	Passenger capacity at middle car (ppl./car)	283 (54 seats), 7ppl/m2 for standees	283 (54 seats), 7ppl/m2 for standees	283 (54 seats), 7ppl/m2 for standees
5	Max. speed	100km/h (operating) 120km/h (design)	80km/h (operating) 100km/h (design)	120km/h or less (design)

6. Railway System Plan

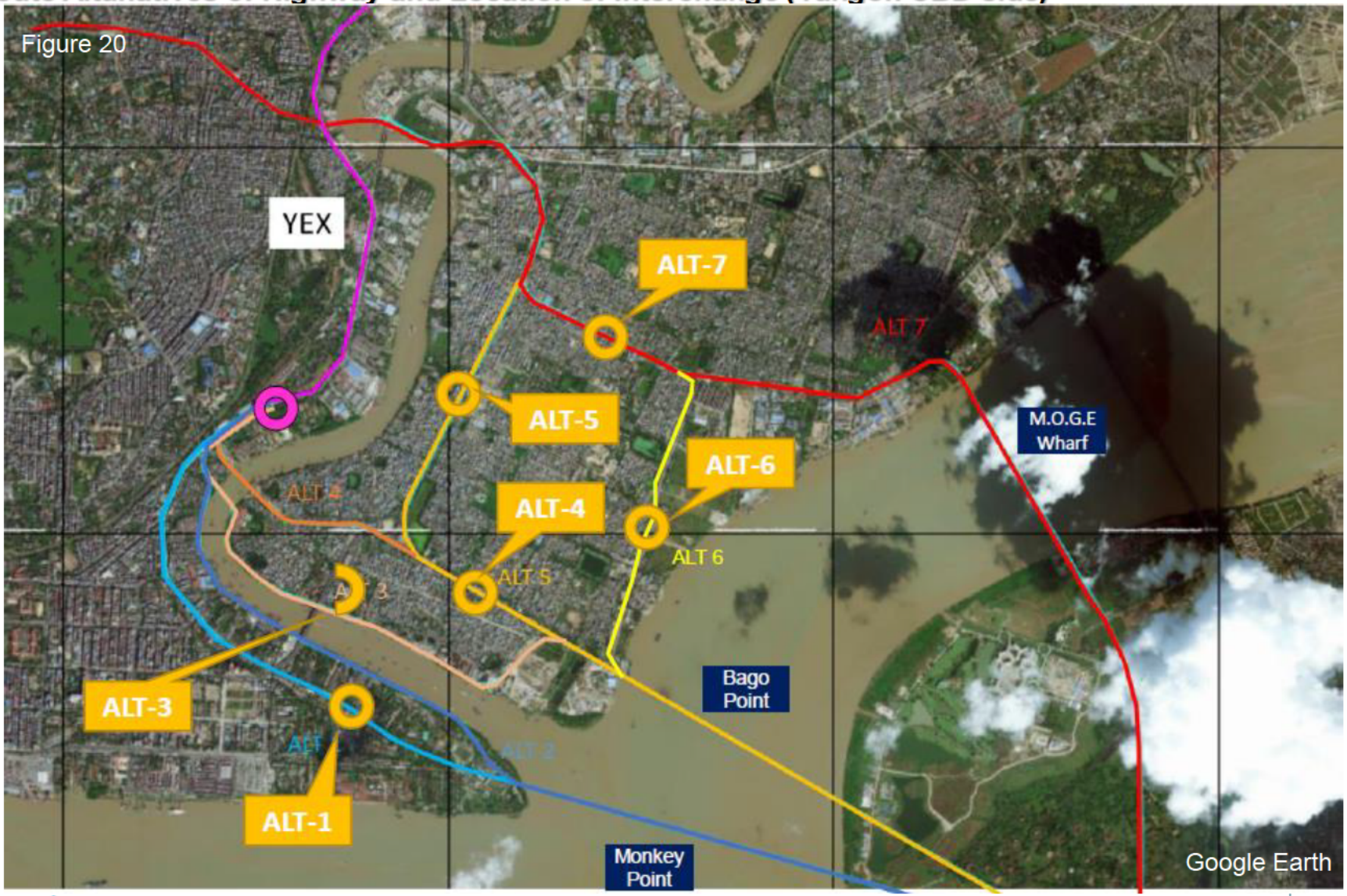
Table 11

No.	Item	Thilawa MRT	YUMRT E/W Line	Standard Spec. (*1)
6	Car body dimension	L:19.5 m × W:2.95 m × H:3.675 m	L:19.5 m × W:2.95 m × H:3.675 m	L:19.5 m × W:2.95 m × H:3.675 m
7	Passenger Door	4 doors/ side	4 doors/ side	4 doors/ side
8	Acceleration	1.0m/s2	1.0m/s2	1.0m/s2
9	Deceleration	1.0m/s2 (Service) 1.2m/s2 (Emergency)	1.0m/s2 (Service) 1.2m/s2 (Emergency)	1.0m/s2 (Service) 1.2m/s2 (Emergency)
10	Track gauge	1435mm	1435mm	1067mm/1435mm
11	Power supply	DC1500V Overhead Catenary/ DC750V Third rail	DC1500V Overhead Catenary	DC1500V Overhead Catenary/ DC750V Third rail
12	Signal system	Communication Based Train Control (CBTC)	Communication Based Train Control (CBTC)	Audio Frequency track circuit Automatic Train Control (AF-ATC)

(*1) Regarding the standard specification, the "Proposed Basic Composition of the Technical Specifications for Overseas Rolling Stock (STRASYA revised version)" issued by the Ministry of Land, Infrastructure, Transport and Tourism and JARTS was referred to. This specification is a standard specification to export RS to Southeast Asia, South Asia, and the Middle East based on the RS specifications in Japan.

7. Road Development Plan

Route Altanatives of Highway and Location of Interchange (Yangon CBD side)



7. Road Development Plan

Route Alternatives of Highways (Thanlyin Township)

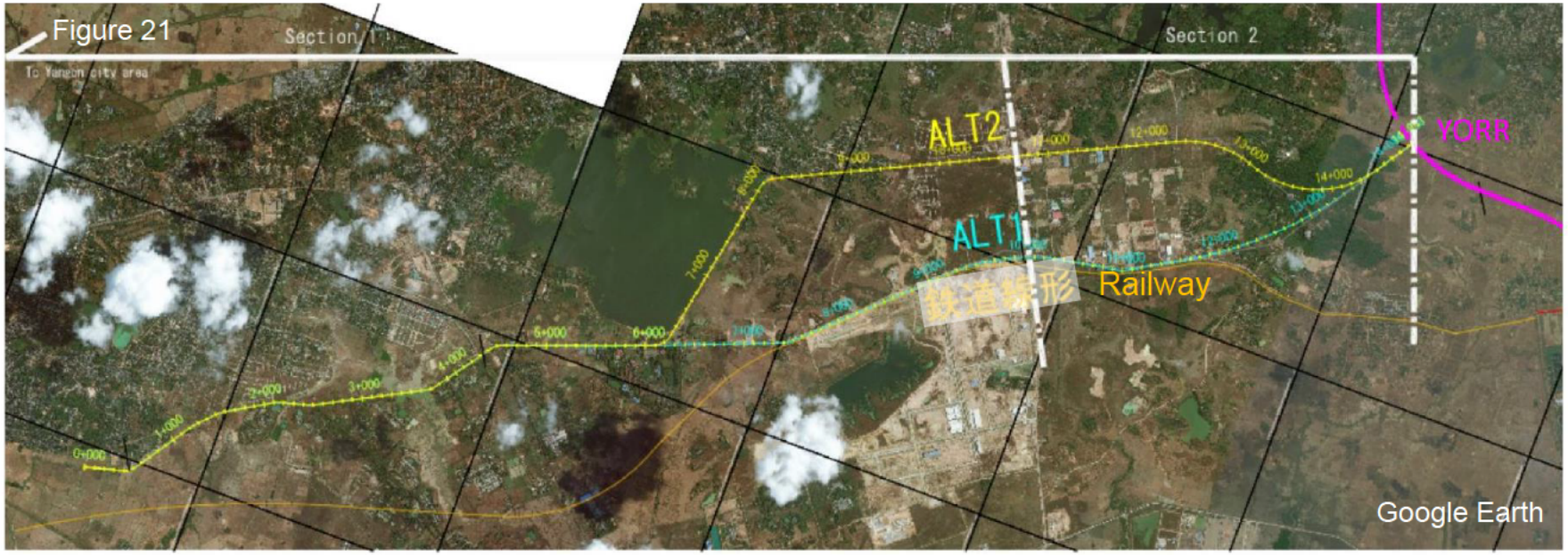


Table 12		Section 1 0 + 500 ~	Section 2	Affected House	Land Acquisition area	Conflict with Railway
ALT 1	Length	9.5km	5.7km	77 buildings	720,000㎡	Conflict with Railway
	Construction Cost	16.2 billion yen	9.7 billion yen			
ALT 2	Length	4.0km	6.4km	153 buildings	790,000㎡	Conflict with Railway
	Construction Cost	17.3 billion yen	10.9 billion yen			

8. Environmental and Social Considerations

【Railway】Yangon side：Affected area

8. Environmental and Social Considerations

	Type	Affected place and size (m2)		Amount	Remarks
Route A	Elevated 50	①	3,900	16	Area: 15×260m
		②	5,625	14	MECW's Land, affected big 2 warehouses
		③	2,400	0	Bago point, Yangon Water boom (park)
		Station A02	2,000	20	Big buildings→Serious impact (current space25m)
		Station A03	0	0	ROW is wide, construct at bus terminal
	Underground 23	①Yard for shaft	800	2	MECW and Bago point, 2 warehouses at MECW
		Station A02	2,000	20	Big buildings→Serious impact (current space25m)
		Entrance/Vent	448	1	Assumed Big building
		Station A03	0	0	ROW is wide, construct at bus terminal
		Entrance/Vent	448	0	ROW is wide, construct at bus terminal
Route B	Underground 29	①Yard for shaft	400	0	Military area
		Station B02	2,000	20	Big buildings→Serious impact (current space25m)
		Entrance/Vent	448	1	Assumed Big building
		Station B03	2,000	5	Closed to Training center? (current space 30m)
		Entrance/Vent	448	3	Possible avoid impact?
Route C	Underground 0	①Yard for shaft	400	0	Military area
		Station C02	2,000	0	Construct at Park, front side is Court
		Entrance/Vent	448	0	Construct at Park, front side is Court
		Station C03	0	0	Land is wide, no need to land acquisition
		Entrance/Vent	448	0	Land is wide, possible to avoid impact?
Route D	Elevated 51	①②③	17,775	51	①30②6③15, there are monastery and warehouse
		④	2,400	0	Bago point, Yangon Water boom (park)
		Station D02	4,600	0	Bago point, Yangon Water boom (park)

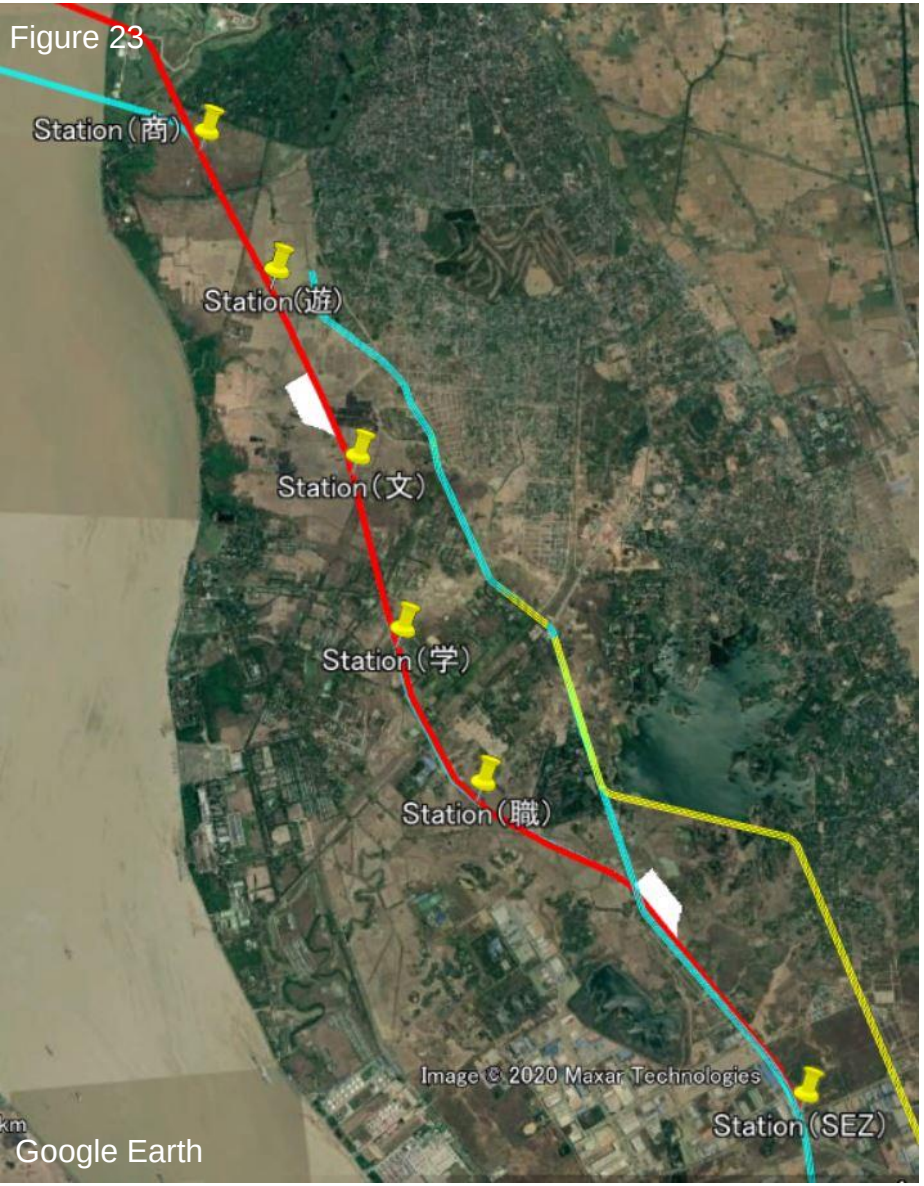
Table 13

Table 14

Necessary width (Elevated)	15m
Necessary width for station (Elevated and Underground)	23m
Necessary land with for ground station	33×200m ↓ 23+(5+5)×200m
Yard for Shaft	400m2
Entrance/Vent	448m2

8. Environmental and Social Considerations

Figure 23



【Railway】Thanlyin side: Affected area

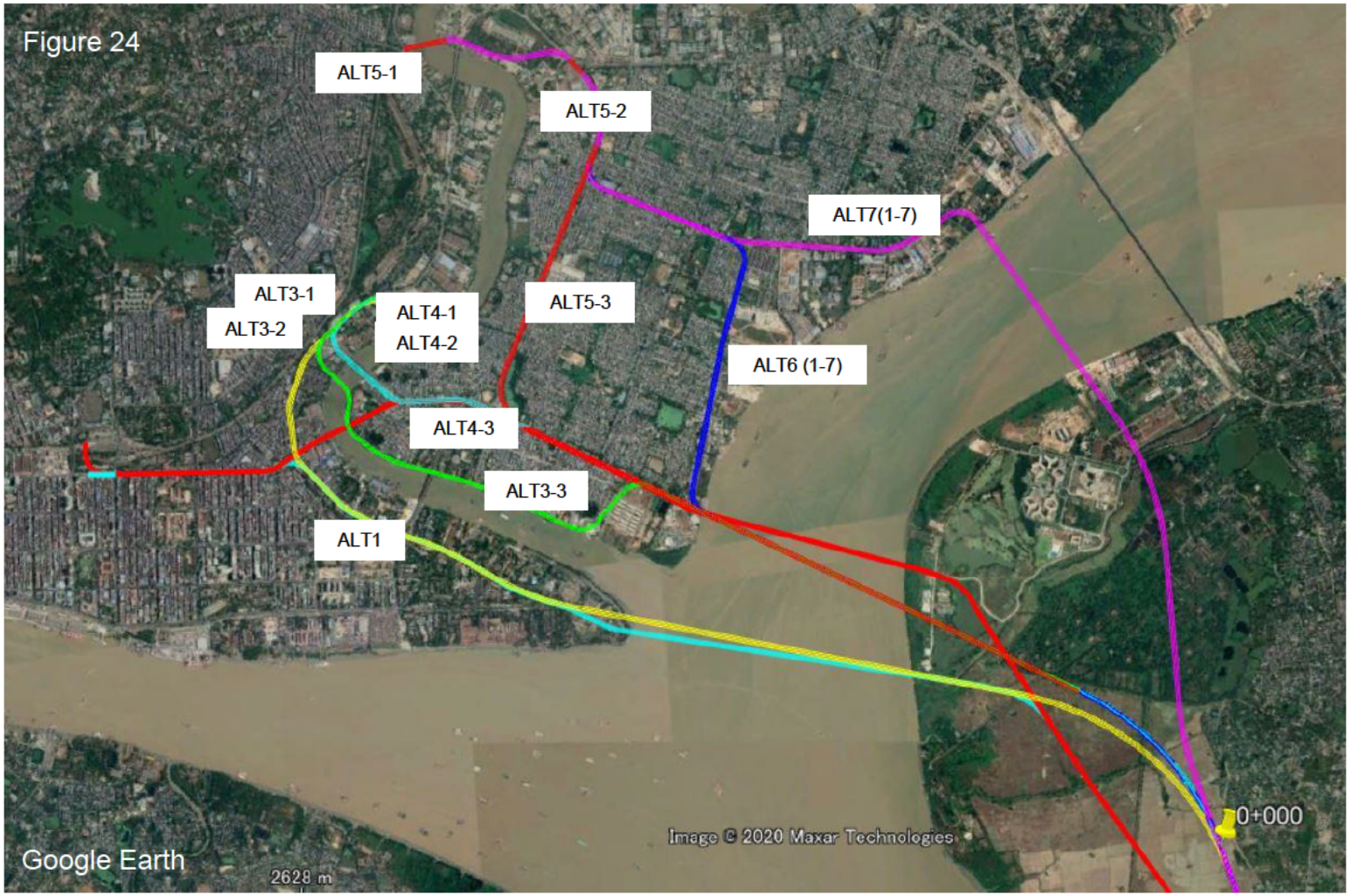
Table 15

Zone	Amount of affected structures	Remarks
River side ~ Station（商）	0	Star City and MOEE land
Station（商）~ Station（遊）	0	MOEE land and private farmland
Station（遊）~ Station（文）	0	Private farmland
Station（文）~ Station（学）	2	Military area
Station（学）~ Station（職）	10	There is small village, military area, MEC, SEZ
Station（職）~ Station（SEZ）	0	Expected impact in case of ALT 2 of Road Plan

*Necessary width of area = 15m
*Location of Depot is under consideration. Not expected at dense zone
*MEC=Myanmar Economic Corporation

8. Environmental and Social Considerations

【Road】 Yangon side until 0+000 at Thanlyin side: affected area



8. Environmental and Social Considerations

【Road】 Yangon side until 0+000 at Thanlyin side: affected area and structures

Table 16

		Origin	Destination.	ROW	Width	Difference	Length	Total (m2)	Affected structure	Remarks	Thanlyin side～0+000	
											Amount	Remarks
ALT1		0	4,300	31	27	4	4,300	17,200	100	There are large structures, except military area	0	N/A
ALT3	sec-1	0	600	31	25	6	600	3,600	0	Large structure (Vehicle shop) at origination	0	Structures at Star City and MOEE.
	sec-2	600	900	23	0	23	300	6,990	0	Structure at Monastery and MOC warehouse		
	sec-3	1,000	3,700	23	0	23	2,700	62,910	0	2 dense zone, Dock Yard, warehouse etc.		
ALT4	sec-1	0	400	31	25	6	400	2,400	2	Large structure (Vehicle shop) at origination	0	Structures at Star City and MOEE.
	sec-2	400	600	23	0	23	200	4,660	1	Structure at MOC area		
	sec-3	900	3,600	30	30	0	2,700	0	0	2+000～3+000 enough space?		
ALT5	sec-1	0	100	23	0	23	100	2,330	4	Market at origination	0	Structures at Star City and MOEE.
	sec-2	400	1,200	23	0	23	800	18,640	6	Vehicle factory and land		
	sec-3	1,200	4,200	31	24	7	3,000	21,000	50<	Same of ALT4-sec3 after 4+200		
ALT6	sec-1	0	100	23	0	23	100	2,330	4	Market at origination	0	Structures at Star City and MOEE.
	sec-2	400	1,200	23	0	23	800	18,640	6	Vehicle factory and land		
	sec-3	1,200	2,100	31	23	8	900	7,200	15	Enough space? No affect?		
	sec-4	2,100	2,400	23	0	23	300	6,990	25	Many Small shops		
	sec-5	2,400	3,300	24	26	0	900	0	0	No widening		
	sec-6	3,300	3,600	23	0	23	300	6,990	10	At 3+600, Market?		
	sec-7	3,600	5,300	31	28	3	1,700	5,100	10	Pagota at Destination		
ALT7	sec-1	0	100	23	0	23	100	2,330	4	Market at origination	0	Structures at Star City and MOEE.
	sec-2	400	1,200	23	0	23	800	18,640	6	Vehicle factory and land		
	sec-3	1,200	2,100	31	23	8	900	7,200	15	Enough space? No affect?		
	sec-4	2,100	2,400	23	0	23	300	6,990	25	Many Small shops		
	sec-5	2,400	3,300	24	26	0	900	0	0	No widening		
	sec-6	3,300	4,700	31	34	0	1,400	0	0	No Widening		
	sec-7	4,700	5,300	23	0	23	600	13,980	10	There are structure before curve?		

8. Environmental and Social Considerations

【Road】 Thanlyin side (0+000 ~ 14+900) : Affected area and structures

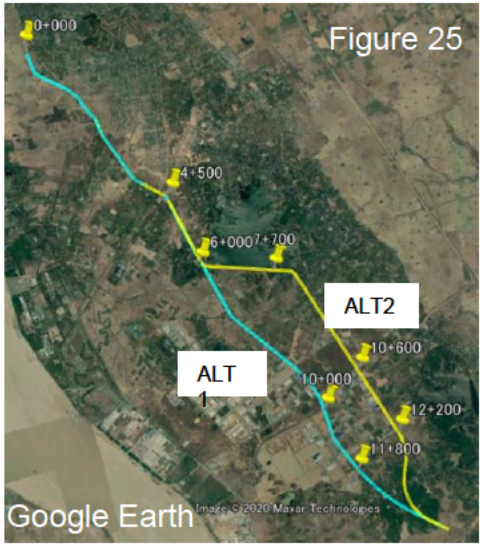


Figure 25

Table 17

		Origin	Destination	Current width	difference	length	Total (m2)	Amount of structures	Remarks
ALT1	sec-1	500	1300	0.00	58.8	800	47,000	20	No existing road, there are few structures
	sec-2	1300	4500	8.00	50.8	3200	162,400	25	Possible to avoid impacts?
	sec-3	4500	10000	8.00	50.8	5,500	279,125	25	There are monastery, sheds? Houses and Factory
	sec-4	10000	11800	10.00	48.8	1,800	87,750	2	Possible to avoid impacts
	sec-5	11800	14260	0.00	58.8	2,460	144,525	15	There are houses under trees?
ALT2	sec-1	500	1300	0.00	58.8	800	47,000	20	No existing road, there are few structures
	sec-2	1300	4500	8.00	50.8	3200	162,400	25	Possible to avoid impacts?
	sec-3	4500	6100	8.00	50.8	1,600	81,200	10	Monastery
	sec-4	6100	7700	5.00	53.8	1,600	86,000	5	Near curve point
	sec-5	7700	10600	0.00	58.8	2,900	170,375	70	Pass through at small village
	sec-6	10600	12200	6.00	52.8	1,600	84,400	20	Close to factory at right side
	sec-7	12200	14900	0.00	58.8	2,700	158,625	3	There are houses under trees?

9. MaaS and Access Transport

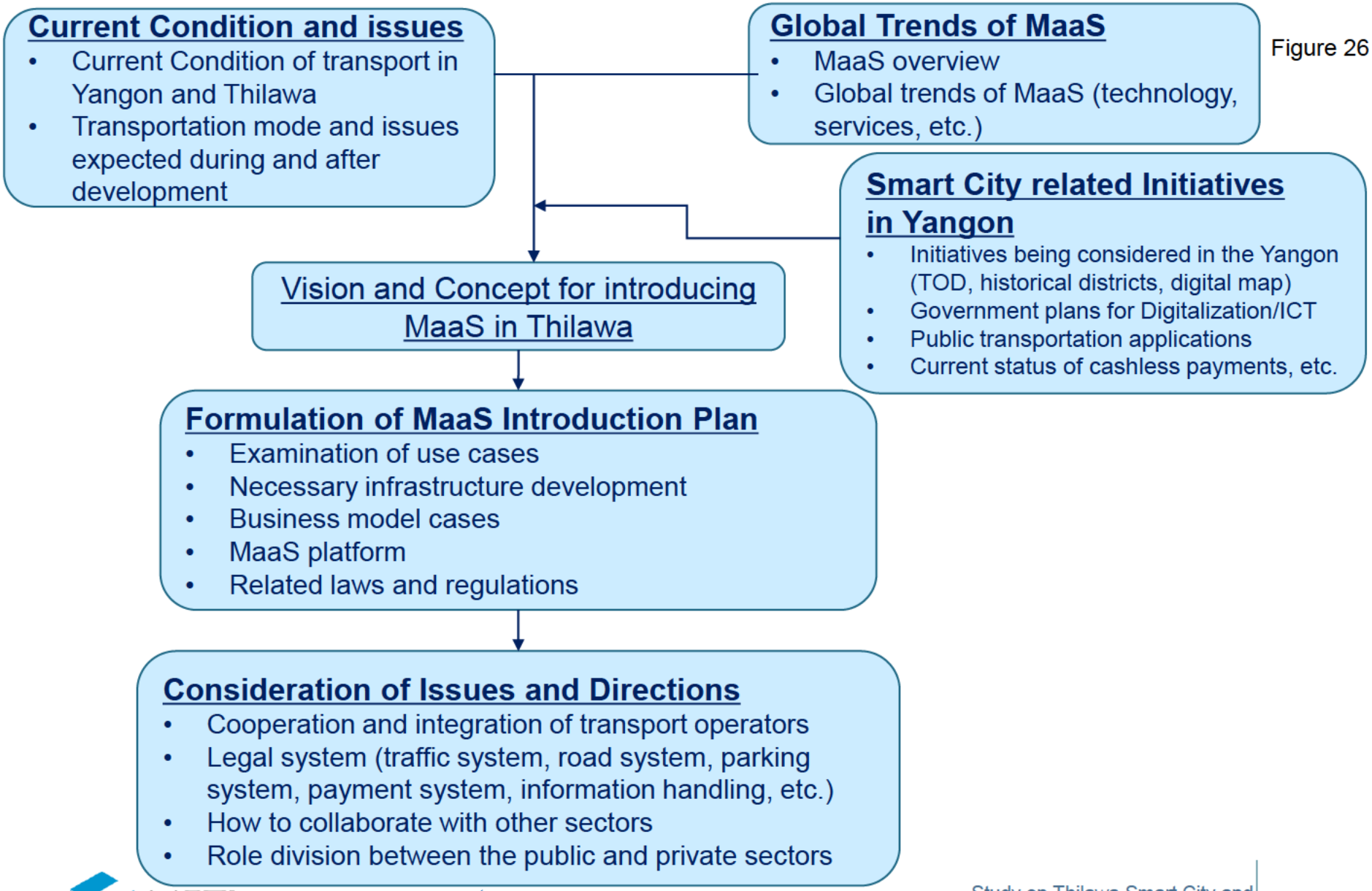


Figure 26

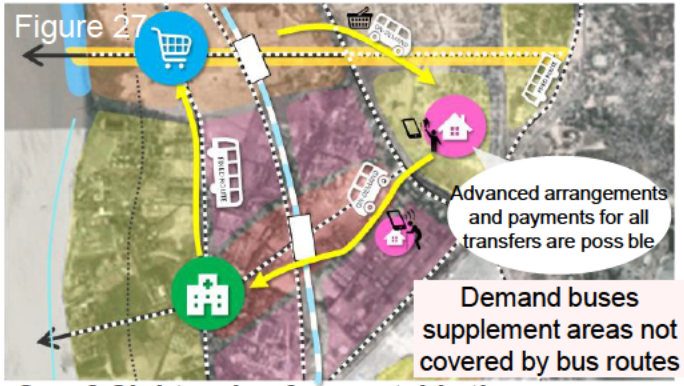
9. MaaS and Access Transport (Vision & Concept of MaaS)

Vision: To ensure flexible (any time & any where) mobility service in Thilawa Smart City and its surrounding area.

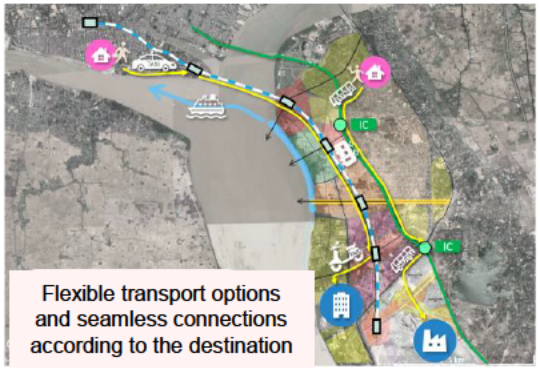
Concept: Realization of 4C (Choice, Convenience, Customization, Cost Savings) through MaaS platform

Expected use cases in future in Thilawa

Case1:Travel within the area: Regional mobility



Case2: Commuting from outside the area: Railway and regional mobility



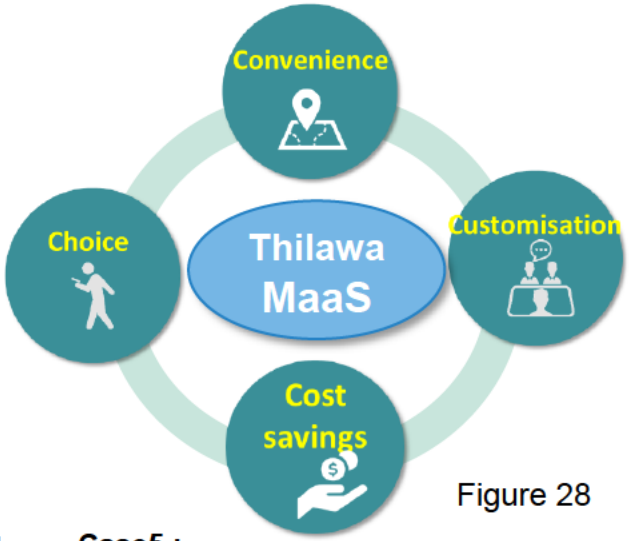
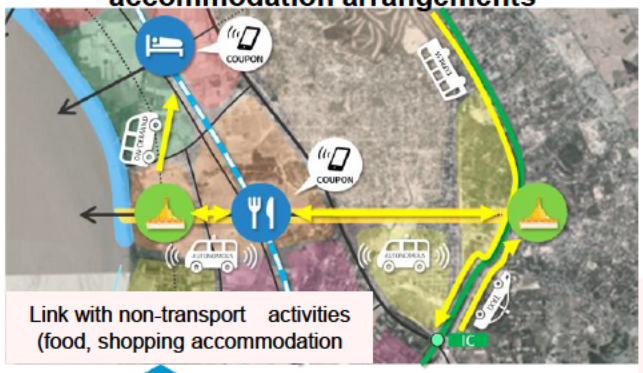
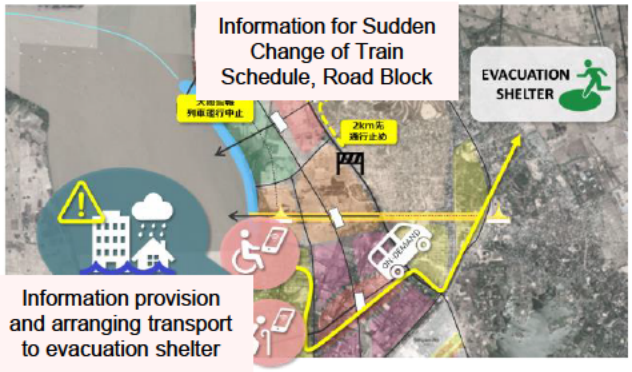


Figure 28

Case3 Sightseeing from outside the area: MRT ticket, regional mobility, coupon, accommodation arrangements



Case4: Evacuation/Alternative routes in the event of a disaster

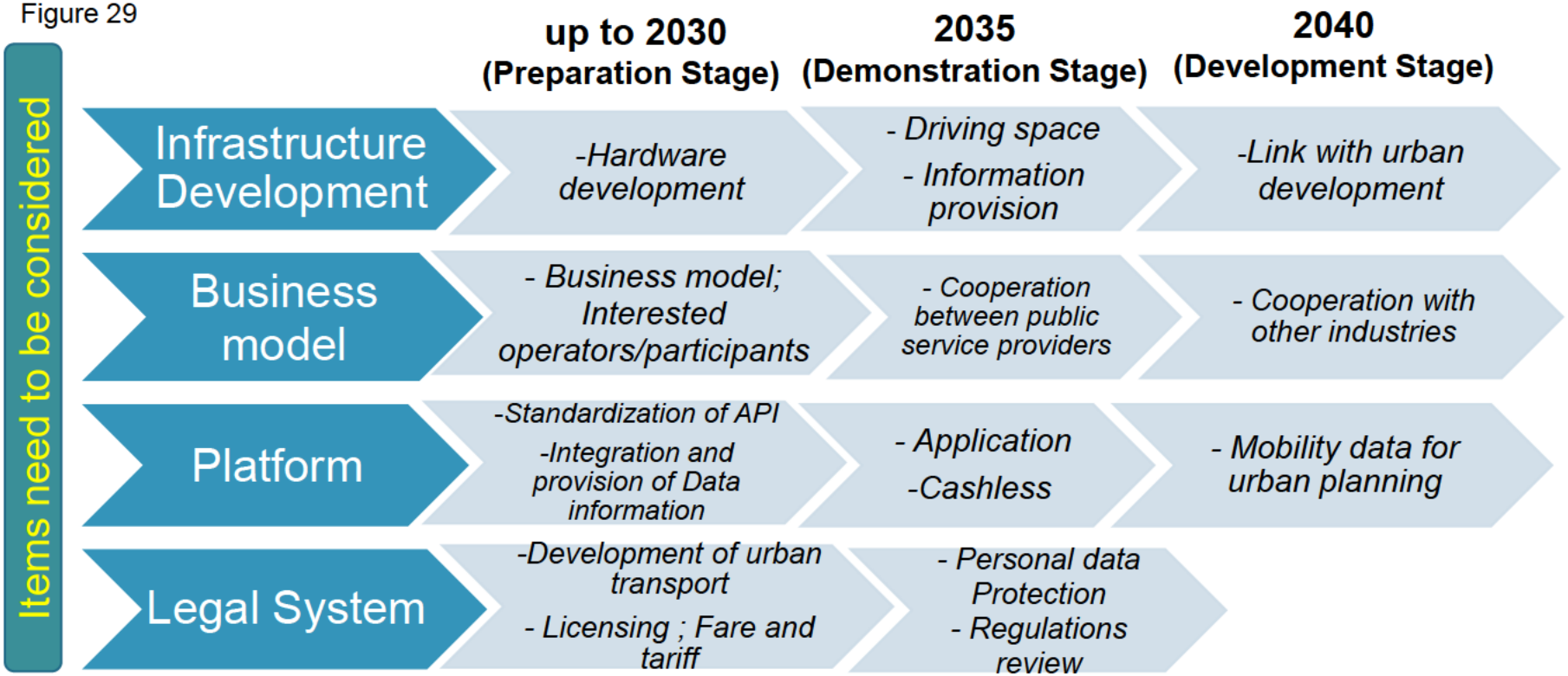


Case5 : Daily logistics, service provision

9. MaaS and Access Transport (Plan of MaaS Introduction)

Hope to Incorporate into ODA loan of the infrastructure development projects

Figure 29



Level of MaaS — Level 3 — Level 4

Level 3: Integration of providing services (packaging, fixed price services, cooperation with operators)
Level 4: Integration of overall social objectives (regional transport policies, public-private partnership)
Note: Information provision, etc. is expected to start in the preparatory stage by 2030 in collaboration with ongoing projects.

10. Project Evaluation

10.1 Preconditions

- Calculated based on the constant price of 2020
- The network road in Thanlyin Township will be prepared in order to measure and evaluate the economic and financial impact of railway and expressway construction.

Table 18

Case	Case 1	Case 2	Case 3	Case 4
Railway route	Route A			Route B
Distance of railway	15.5 km			15.0 km
Structure at crossing river (railway)	Viaduct		Underground	
Expressway route	ALT 1	ALT 5	ALT 1	ALT 4
Distance of expressway (Yangon CBD Side)	13.7 km	15.0 km	13.7 km	12.9 km
Type of expressway bridge	Single bridge	Combined with a railway bridge	Single bridge	Single bridge

Table 19

Opening Year of Railway and Expressway	2035
Completion Year of Development at Thanlyin Township	2065
Evaluation Period	2028 – 2064 (railway construction period: 7 years + operational period: 30 years)

Exchange Rate (Oct 2020)

USD 1.00 = JPY 106

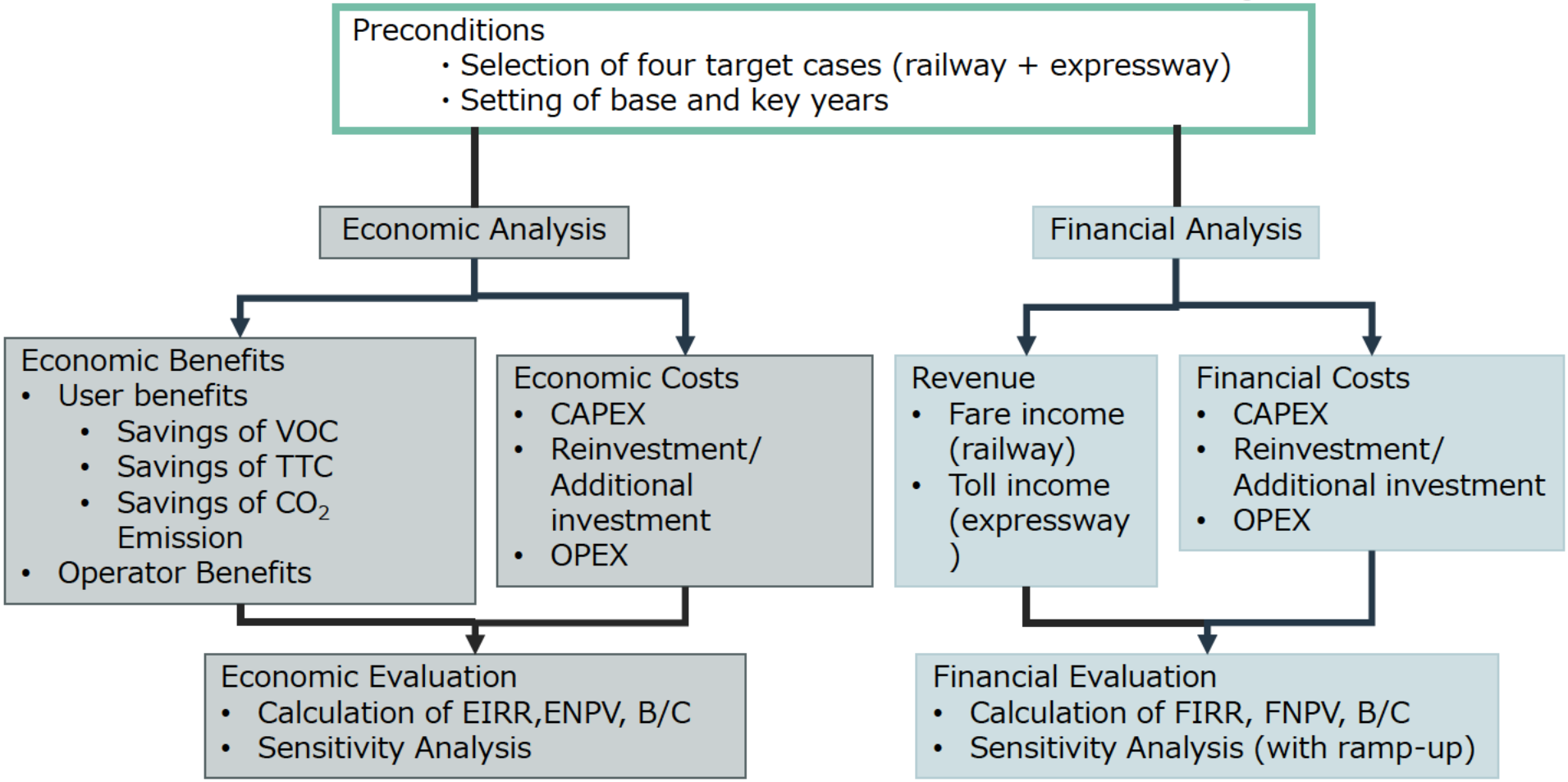
USD 1.00 = MMK 1,289

MMK 1.00 = JPY 0.082

10. Project Evaluation

10.1 Preconditions (Flowchart of Work)

Figure 30



10. Project Evaluation

10.1 Preconditions

- Initial investments are described in 11.2.
- All initial investment costs are to be covered by equity.
- Operation and maintenance (O&M) costs are shown in 11.2.
- For transport cost saving, see 11.3.
- The fare is set based on 400 MMK + 40 MMK/km and no fare revision is envisaged.
- Toll setting of the expressway is assumed as follows.

Table 20 (Unit: MMK/km)

	2035-2039	2040-2044	2045-2049	2050-
Car	73.4	88.4	105.8	126.1
Taxi	73.4	88.4	105.8	126.1
Light Truck	146.8	176.8	211.6	252.2

- Asset holding tax, corporate income tax, etc. are not taken into account.
- Only cash flow calculations are performed.
- Reinvestment and additional investment costs are shown in 11.2.
- Social discount rate: 10%, Discount rate of financial analysis: 9.5%

10. Project Evaluation

10.2.1 CAPEX・OPEX of Railway

1.1 Base (Route A (Elevated)

Table 21

	Mil USD
1. Eligible Portion	
Civil	589
Architecture	119
System	389
Rolling Stock	352
Sub-Total	1,450
2. Non-Eligible Portion	
Land Acquisition	79.0
Utility Relocation	1.7
Sub-Total	80.7

1.2 System (Rolling Stock) Repair and Spare Parts

- 747,226 million MMK (580 million USD)

Table 22

System Name	Lifespan
Overhaul of Rolling Stock, Signaling System	15 years
Distribution (mainline), Lighting Power Station, Systems in Depot, AFC, PSD	20 years
Signaling System	15 years
Telecommunication, Power SCADA, ATS Facility SCADA Systems	10 years

2. O&M Costs of Railway

Table 23

(Unit: million MMK)

Line Name	Thilawa Route A	Thilawa Route B	Expressway (all routes)
2035	70,324	69,327	2,123
2050	82,105	81,024	2,276

10.2.2 CAPEX・OPEX of Expressway

1.1 Base Cost (ALT 1 (Single))

Table 24

	Mil USD
1. Eligible Portion	
Civil	999
2. Non-Eligible Portion	
Land Acquisition	1,125
Total	1,124

1.2 Additional and Reinvestment of Expressway

- 88,023 million MMK (68 million USD)

Table 25

System Name	Lifespan
Toll Collection Facility	5-15 years
ITS Facility	5-15 years
Power Receiving Facility	5-15 years
Communication Network Facility	10 years
Vehicles	5 years

2. O&M Costs of Expressway

- 2,123 million MMK (2035)
- 2,276 million MMK (2050)

10.2.3 Initial Investments by Case

Table 26

(Unit: million USD)

Case		Case 1	Case 2	Case 3	Case 4
Railway Route		Route A			Route B
Railway River Crossing Condition		Viaduct		Underground	Underground
Expressway Route		ALT 1	ALT 5	ALT 1	ALT 4
Expressway River Crossing Conditions		Single	Combined	Single	Single
Railway	1.1 Base cost	1,450	1,578	1,908	1,899
	1.2 Economic cost	1,776	1,962	2,271	2,267
	1.3 Financial cost	1,921	2,120	2,462	2,457
Expressway	2.1 Base cost	999	980	999	1,044
	2.2 Economic cost	1,294	1,404	1,294	1,319
	2.3 Financial cost	1,443	1,551	1,444	1,475
Total	3.1 Base cost	2,449	2,558	2,907	2,943
	3.2 Economic cost	3,069	3,367	3,565	3,586
	3.3 Financial cost	3,364	3,672	3,906	3,932

Note 1: The cost of the combined bridge of expressway and railway is divided equally into railway and road.

Note 2: The costs apply the constant price of 2020.

Note 3: House demolition costs are not included in this study.

Note 4: The base costs above mean civil, architecture, railway system and rolling stock costs.

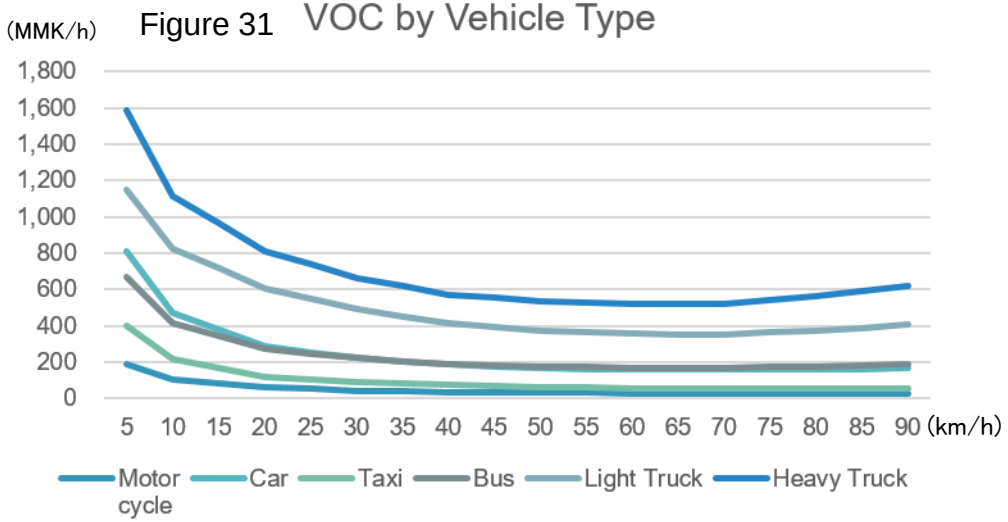
10.3 Transport Costs Reduction

Incremental Willingness to Pay as User Benefits

1. Reduction of vehicle operation costs (VOC)

- Update the unit prices by vehicle type from the YUTRA study to 2018 prices.

Figure 31 VOC by Vehicle Type



Source: Updated from YUTRA survey

2. Reduction of Travel Time Cost (TTC)

- Update the travel time costs by vehicle type from the YUTRA study to 2018 prices.

Table 27

Vehicle Type	Motor cycle	Car	Taxi	Bus	Rail
(MMK/h)	795	1,950	1,523	980	980

Source : Updated from YUTRA survey

10.4 Accessed Benefits

1. User Benefits from Improved Access Infrastructure

- Reduction of travel time cost (TTC) and vehicle operating cost (VOC) by improving mobility in Thanlyin area through the railway construction.
- Reduction of travel time cost (TTC) and vehicle operating cost (VOC) by less congestion in the Yangon CBD area.

2. Supplier Benefits

- The difference between operating revenue and operating expenditure as a benefit attributable to the railway business, etc. as a result of implementation of the project.

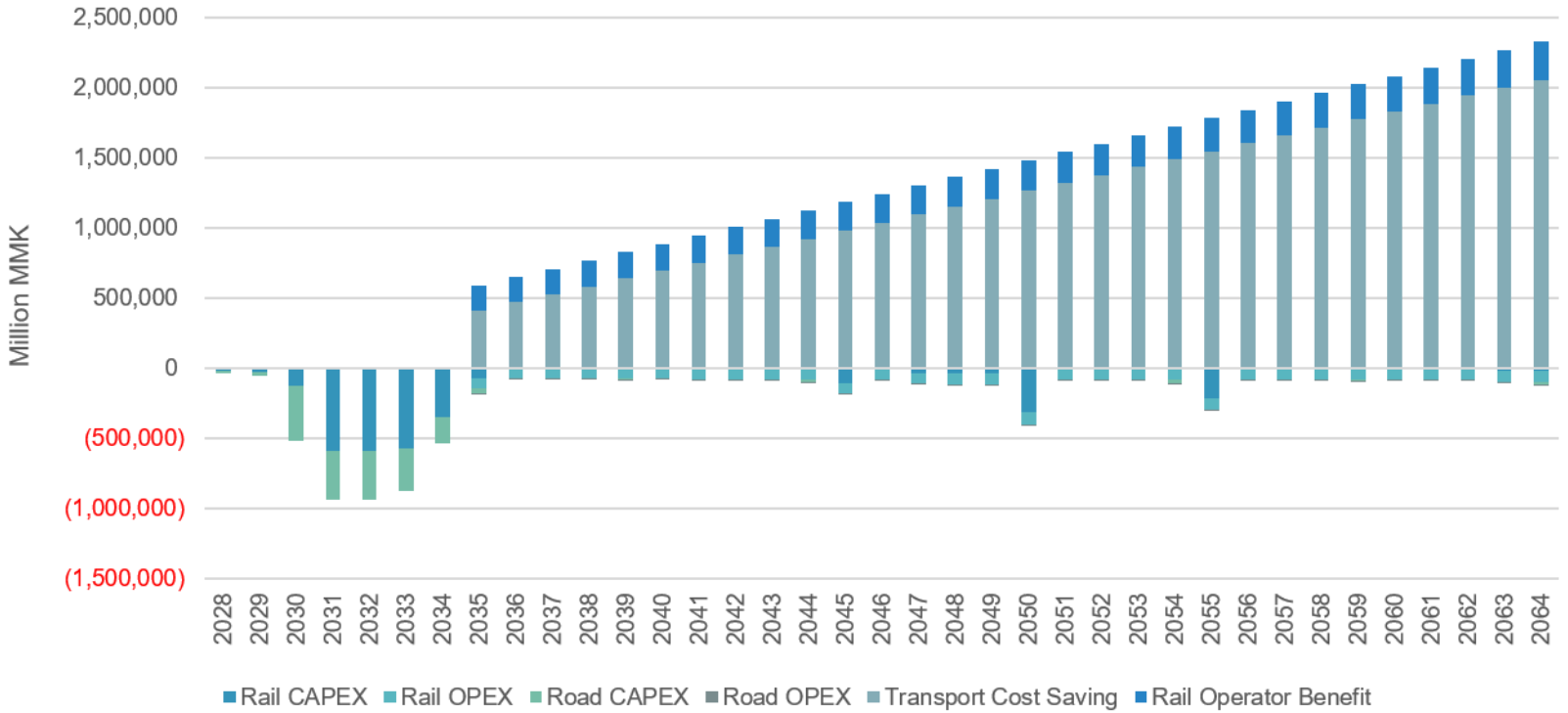
3. Urban Development Effect (west side of the Bago River)

- Qualitative evaluation of impacts, by integrated urban development such as road and railway construction in Thanlyin area, on the reduction of traffic congestion in the Yangon CBD due to relocation of people there (further study is necessary).

10.5 Economic Benefits

- Case 1, “with case” includes both of railway and expressway, “without case” means no existence of railway and expressway.
- EIRR = 16.8%, ENPV = 2,868 billion MMK, B/C = 1.9

Figure 32 Economic Benefits and Costs



10.5 Summary of Economic Analysis

1. Results of Economic Analysis for Case 1

Table 28

Without Case		With Case		Results		
Railway	Expressway	Railway	Expressway	EIRR (%)	ENPV (billion MMK)	B/C
×	×	×	○	19.4	1,904	2.7
×	×	○	×	11.7	320	1.2
×	×	○	○	16.8	2,868	1.9

2. Results of Economic Analysis ("with case" includes both railway and expressway.)

Table 29

	EIRR	ENPV (billion MMK)	B/C
Case 2	19.7%	4,113	2.2
Case 3	15.4%	2,500	1.7
Case 4	11.3%	478	1.1

3. Sensitivity Analysis (Case 1: "with case" includes both railway and expressway.)

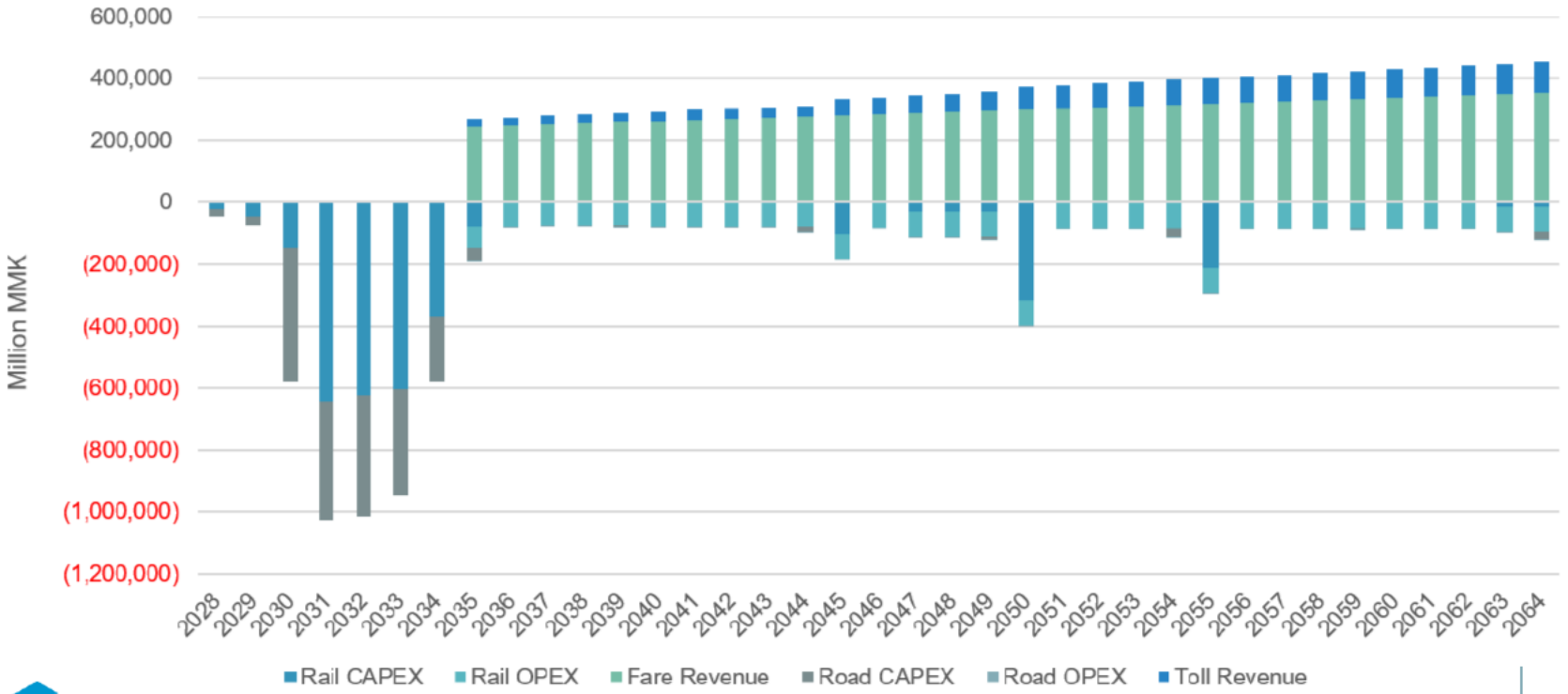
Table 30

Items	Base Case	Economic Benefits -10%	Economic Costs +10%	Benefits -10% Costs +10%
EIRR (%)	16.8	15.6	15.7	14.5
ENPV (billion MMK)	2,868	2,276	2,562	1,970
B/C	1.9	1.7	1.8	1.6

10.6 Financial Analysis

- Case 1, “with case” includes both of railway and expressway, “without case” means no existence of railway and expressway
- FIRR = 3.8%、FNPV = −1,520 billion MMK、B/C = 0.6

Figure 33 Financial Benefits and Costs



10.6 Summary of Financial Analysis

1. Results of Economic Analysis for Case 1

Table 31

Without Case		With Case		Results		
Railway	Expressway	Railway	Expressway	FIRR (%)	FNPV (billion MMK)	B/C
No	No	No	Yes	0.4	-975	0.2
No	No	Yes	No	6.1	-546	0.7
No	No	Yes	Yes	3.8	-1,520	0.6

2. Results of Economic Analysis ("with case" includes both railway and expressway.)

Table 32

	FIRR	FNPV (billion MMK)	B/C
Case 2	3.5%	-1,723	0.5
Case 3	3.0%	-1,935	0.5
Case 4	2.7%	-2,029	0.5

3. Sensitivity Analysis (Case 1: "with case" includes both railway and expressway.)

Table 33

Items	Base Case	Railway ramp up○ Expressway ramp up×	Railway ramp up× Expressway ramp up○	Railway ramp up○ Expressway ramp up○
FIRR (%)	3.8	2.5	3.7	2.4
FNPV (billion MMK)	-1,520	-2,016	-1,555	-2,050
B/C	0.6	0.4	0.5	0.4

11. Long-Term Framework for Integrated Development Implementation

11.1.1 Features of This Project

- National Level Project
  - Population Size (1.0 million residents in 2050, 1.4 million residents in 2065)
  - Development Area (waterfront complex area of 4,000 ha; total area of the waterfront is 13,000 ha)
  - USD 4,000 million budget for transport access infrastructure
  - Impacts of the Project (mitigation of urban issues such as traffic congestion at the centre of Yangon, creation of job opportunities for national economic development, user benefits of transport access infrastructure)
- Necessity of Simultaneous of Arrangement of Urban Development and Transport Access Infrastructures
  - No existence as a single project of either transport access infrastructure and urban development

✓ To implement this project effectively, 1) it needs to be positioned as a nationally promoted project, 2) urban development and transport access infrastructure development need to be promoted integrally, and 3) a long and integrated framework needs to be arranged.

11. Long-Term Framework for Integrated Development Implementation

11.1.2 Integrated Development of Urban Development and Transport Access Infrastructures

Table 34

Phase	Preconditions	Situation	Assumed Development Scheme for Each Project
1st Phase of Urban Development	Development with railway construction (assuming that urban development around stations happens) The necessity of relevant infrastructures such as station plazas or streets	In 2035 (opening of the railway and expressway) • Three stations out of five in the Thanlyin area will be developed with prioritisation • Area population: 670,000 • Area development situation: 40% - 50%	• Development body: public entity (main) + private entity (around SEZ) • Fund procurement: public fund (main) + private fund • Fund source: government budget + lease income + benefits from developments • O&M: public entity + private entity
2nd Phase of Urban Development	Development with railway construction (assuming that development happens in surroundings of stations + along the railway line)	In 2050 (15 years after opening) • Development of all the five stations and along the railway line • Area population: 1,000,000 • Area development situation: 70% - 80%	• The same scheme with the 1st phase of the project • The portion of the private sector investment will increase
3rd Phase of Urban Development	Development based on the 2nd Phase (assuming that the development of distant areas from stations happens)	In 2065 (30 years after opening) • Development of distant areas from stations • Area population: 1,400,000 • Area development situation: 100%	• Basically, development by private sectors

11. Long-Term Framework for Integrated Development Implementation

11.1.2 Integrated Development of Urban Development and Transport Access Infrastructures

Table 35

Project	EIRR (%)	FIRR (%)	Situation	Assumed Project Scheme for Each Project
Expressway Project (*1)	19.0	0.4	• Economic viability can be confirmed • Difficult to confirm the financial viability as a single project	• Design and construction: public entity • Fund procurement (Finance): public fund • Funding: fare income + subsidies etc. • O&M body: basically public entity (*3)
Railway Project (*2)	11.7	6.1	• Economic viability can be confirmed though it is not very high • Difficult to be viable as a private project	• Design and construction: public entity • Fund procurement (financing): public fund • Funding: fare income + subsidies, etc. • O&M body: basically public entity (*3)

- ➢ Though each transport access infrastructure can be viable economically as a single project, in terms of financing the following have been confirmed: “initial investment cannot be covered” or “not suitable for a private company due to the length of the project period of the railway project”.
- ✓ An integrated implementation scheme is essential.

11. Long-Term Framework for Integrated Development Implementation

11.1.3 Revenue Structure of Urban Railway Project (New Line)

i. Business with Heavy Assets

- Fixed costs to maintain heavy assets are high, so the break-even point is also very high.
- If the line is operated solely, it will take a long time to reach the break-even point of the costs and revenues with the increase of passengers.
- The break-even point is high, but once the revenues reach the break-even point, huge profits can be expected.

ii. Business with Networks

- Once networks are structured at a certain level, the passenger demand for the networks will increase and the passengers of the first constructed line also increase. As a result, the first line will be able to reach the break-even point.
- During the period of structuring networks, lines whose revenues reach the break-even point can support the ones whose revenues have not reached that point yet (cross-subsidisation).

➢ It is desirable that one organisation controls the cross-subsidization system and manages the urban railway, rather than developing it separately.

11. Long-Term Framework for Integrated Development Implementation

11.2.1 Case of Development Entity in Myanmar

- A joint public corporation of Japan and Myanmar can be suggested as the reference case (based on Myanmar Special Economic Zone Law)
- Since this project assumes the development project scheme as a national project, it is necessary to consider a new development entity.

Table 36 Table：Case of Special Economic Zone Project in Myanmar

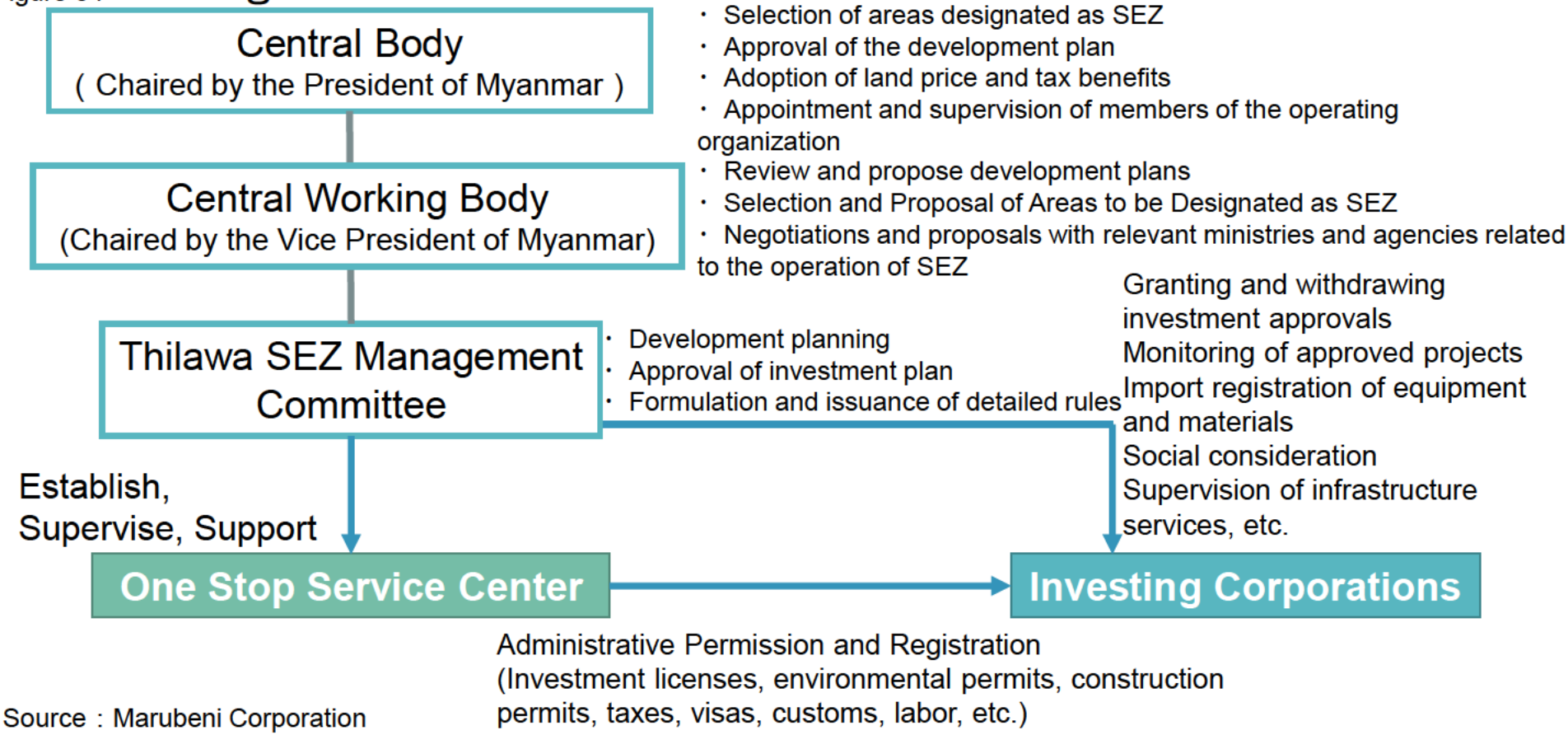
SEZ Case	Development Entity	Public Authority	Related Law	Note
Thilawa	Myanmar-Japan Thilawa Development Ltd. (Japanese investment: 49%, Myanmar's investment: 51%)	Thilawa SEZ management committee (TSMC)	Myanmar Special Economic Zone Law	Yen loan for infrastructure development
Dawei	Ithalian-Thai Development (became) Dawei SEZ Development Co. (Myanmar government's investment: 50%, Thai government investment: 50%)	Dawei SEZ management committee (TSMC)	Dawei Special Economic Zone Law → Myanmar Special Economic Zone Law	-

11. Long-Term Framework for Integrated Development Implementation

11.2.1 Case of Development Entity in Myanmar

i) Thilawa SEZ

Figure 34 • Organisation



Source : Marubeni Corporation
Thilawa SEZ Management Committee

11. Long-Term Framework for Integrated Development Implementation

11.2.2 Case of Integrated Development Project Scheme

Table 37

Case	Project Scale	Development Entity	Project Scheme
Den-en-toshi- Line	Area：5,000 ha Planned Population：400,000	Tokyu Corporation (Private Railway Operator)	Land readjustment project and railway development conducted by a railway operator
Tama Newtown	Area：2,884 ha Planned Population：340,000	Public Developer [Tokyo metropolitan government, Japan Housing Corporation (current UR), Tokyo Metropolitan Housing Supply Corporation, etc.]	Infrastructure development based on full land acquisition, Large cost sharing by the developer based on MOU
Tsukuba Express	Area：3,221 ha Planned Population：250,000	Local public bodies Housing and Urban Development Corporation (public developer) Railway Operator	Integrated land readjustment project and infrastructure development, mainly conducted by the public

*The total development area of this project is 13,000ha; the area of Thilawa SEZ is 2,900 ha; and the area of Thilawa Waterfront Complex is 4,000 ha.

11. Long-Term Framework for Integrated Development Implementation

11.2.2 Case of Integrated Development Project Scheme

i) Den-en-toshi Line (Area : 5,000 ha, Planned Population: 400,000)

Figure 35

Map of Den-en-toshi Line

Source: Tokyu Corporation

- Land readjustment by a private railway operator
- Railway development integrated with land readjustment project
- Achieve the increase of ridership and the land value along the line

11. Long-Term Framework for Integrated Development Implementation

11.2.2 Case of Integrated Development Project Scheme

ii) Tama Newtown Project
（Area：2,884 ha, Planned Population: 340,000）

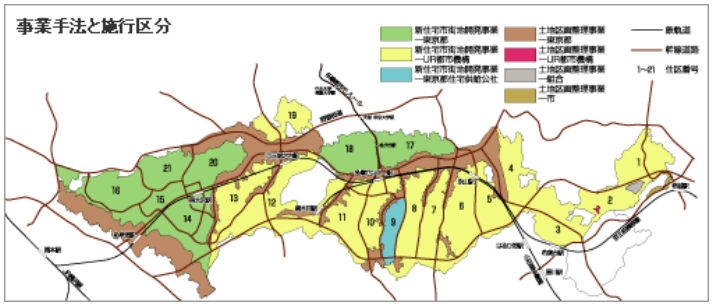


Figure 36　Project Scheme

Source：Urban Renaissance Agency

Table 38

Item		Railway	Street	River	Sewage	Park
New Housing and Urban Development Project Area	Site	X	X	X	X	X
	Construction	X	X	X	X	X
Land Readjustment Project Area	Site	X	-	-	-	-
	Construction	X	X	X	-	-
Out of Newtown	Site	X	-	-	-	-
	Construction	X	-	-	-	-

Cost Allocation by the New Housing and Urban Development Project Developer (Public Developer)

Note: X means cost allocation

Source：”Study on the urban infrastructure development in the development process of Tama Newtown”

- New Housing and Urban Development Project and Land Readjustment Project
- Large cost sharing by the public developers based on MOU

11. Long-Term Framework for Integrated Development Implementation

11.2.2 Case of Integrated Development Project Scheme

iii) Tsukuba Express Development
（Area：3,211 ha, Planned Population：250,000）

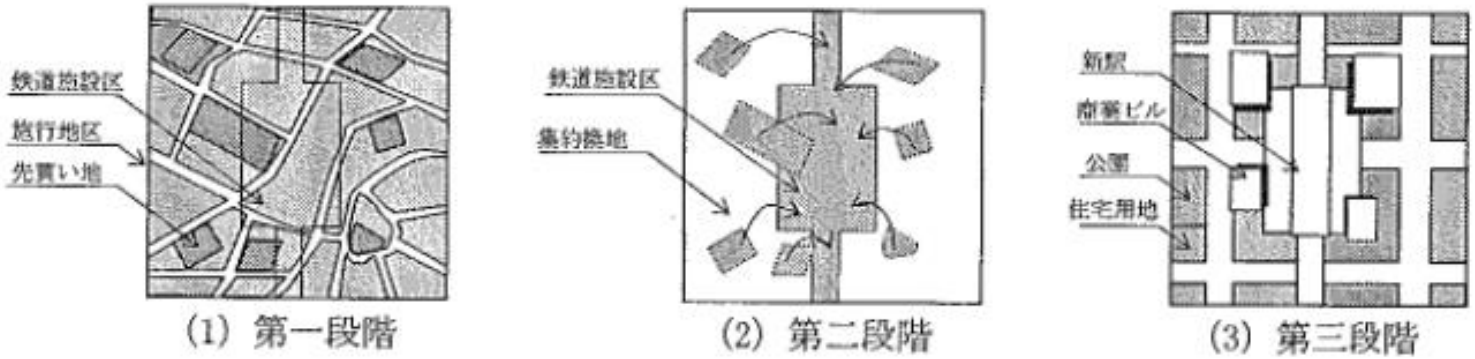


Figure 37 Image of Integrated Land Readjustment Project

Source："Construction History of Tsukuba Express"

- First and only project where the Integrated Development Law was applied
- Secure the railway facility site systematically with integrated land readjustment project led by the public sector
- Railway development in accordance with housing and public facility supplies

11. Long-Term Framework for Integrated Development Implementation

11.2.3 Case of Specific Funding System

i) Road-Specific Funding System

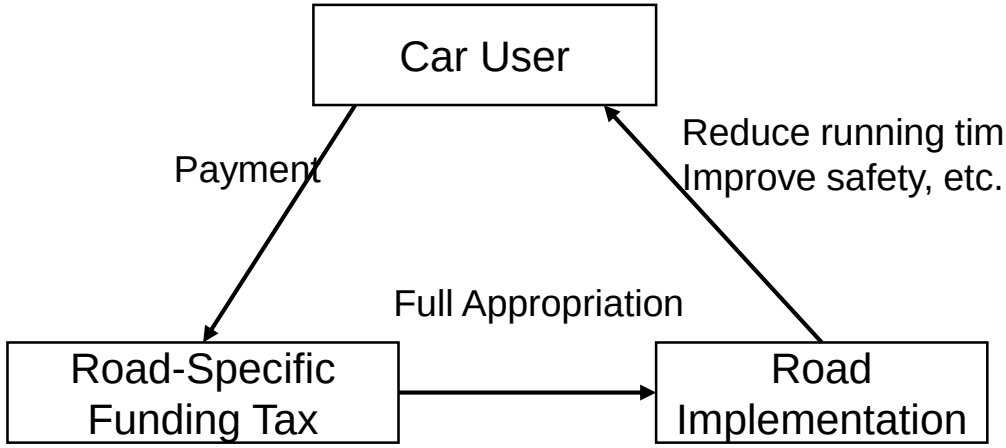


Figure 38 Image of Road-Specific Funding System

Source: Ministry of Land, Infrastructure, Transport and Tourism

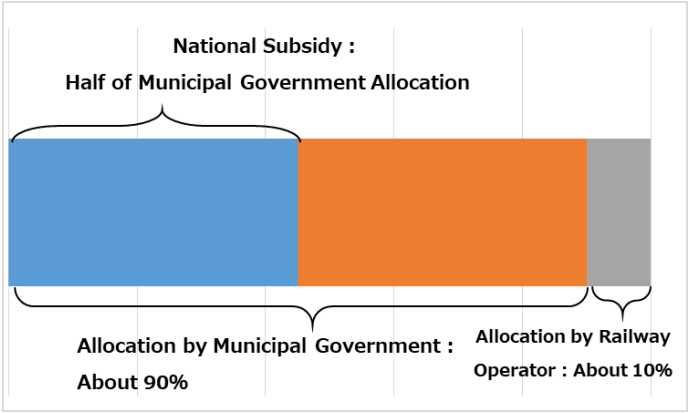


Figure 39 Image of Cost Allocation in Continuous Level Crossing Project

Source: Study Team, based on the material of Ministry of Land, Infrastructure, Transport and Tourism

- Road implementation from the sources such as gasoline taxes, based on the concept of beneficiary-pays-causer
- Source of national subsidy for continuous level crossing project
- In continuous level crossing project, a railway operator pays the cost as beneficiary

11.2.4 Lessons from the Network Development of Transport Access Inrastructure

1. By developing transport access infrastructures (railways, roads, etc.) as network, the profitability of main lines can be improved and this enables the internal subsidy by the operator.
2. The developed network improves the convenience and the value of the surrounding areas and enables the return of development profits.
3. A virtuous cycle is established in which local tax revenues increase, enabling further implementation of projects and expansion of networks.
4. The network contributes to the local and national economic growth.

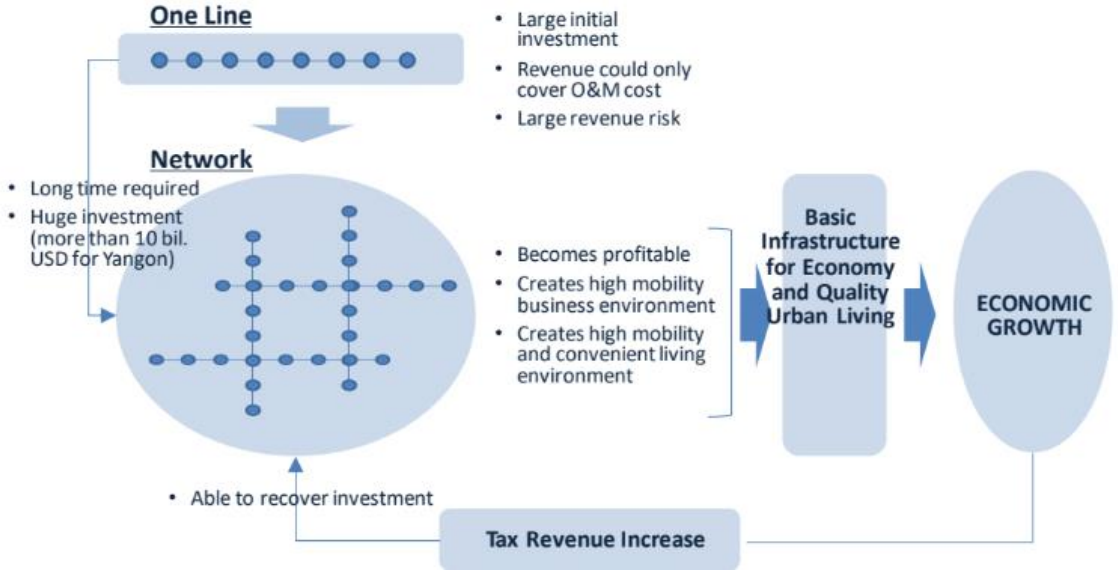


Figure 40 Image of Transport Access Infrastructure Development

11. Long-Term Framework for Integrated Development Implementation

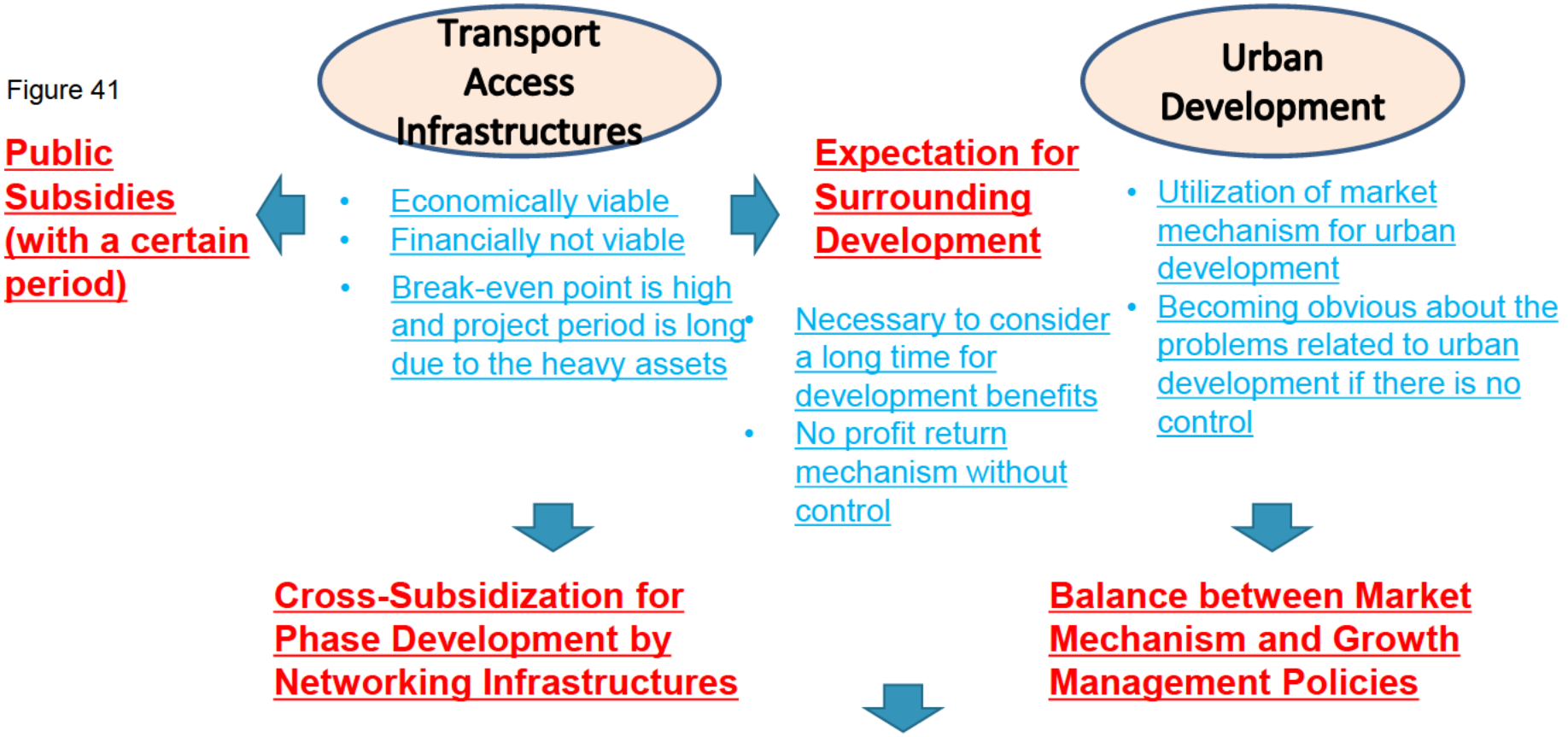
11.2.5 Cases in Other Countries

Table 39

Case	Master Plan	Main Policy	Feature	Implication	Land Owner
Hong Kong	1. Ten-year plan for the public provision of housing	1. R+P (Rail plus Transport Programme) 2. Relaxation of floor area ratio restriction	1. Reduce the concentration of population in urban areas 2. Giving exclusive development rights to railway operators at market prices to plan and develop their projects, so that they can enjoy the benefits of development through increased property values along their lines and compensate for infrastructure costs 3. 800-1000% floor area ratio in the city centre, which has a positive impact on the R+P of high-rise residential buildings.	・Granting of development rights to infrastructure developers enabled development profits to compensate for infrastructure development costs ・Inducement through floor area ratio bonus	Development rights granted or leased by the Hong Kong Government
Singa-pore	1. Five-Year Plan for housing units 2. Land Transport Master Plan	1. Low-cost housing supply by Housing and Development Board 2. Policies for the restriction of road transport demand (Vehicle Quota System, Electric Road Pricing System, etc.)	1. A combination of government-led low-cost housing provision and railway development 2. Encouraging the use of public transport, including restricting the use of private cars 3. Reducing the burden of commuting to work and school by creating cities where people can live close to work. 4. Avoiding delays in the opening of railways due to the burden of maintenance by having the Land Transport Agency develop the infrastructure and the private sector operate it.	・Integrated implementation of land expropriation, housing supply, and public transportation based on a long-term plan and led by the government ・A business structure of infrastructure development (public) and management (private)	Compulsory land acquisition by Singapore Land Authority based on the Land Acquisition Act

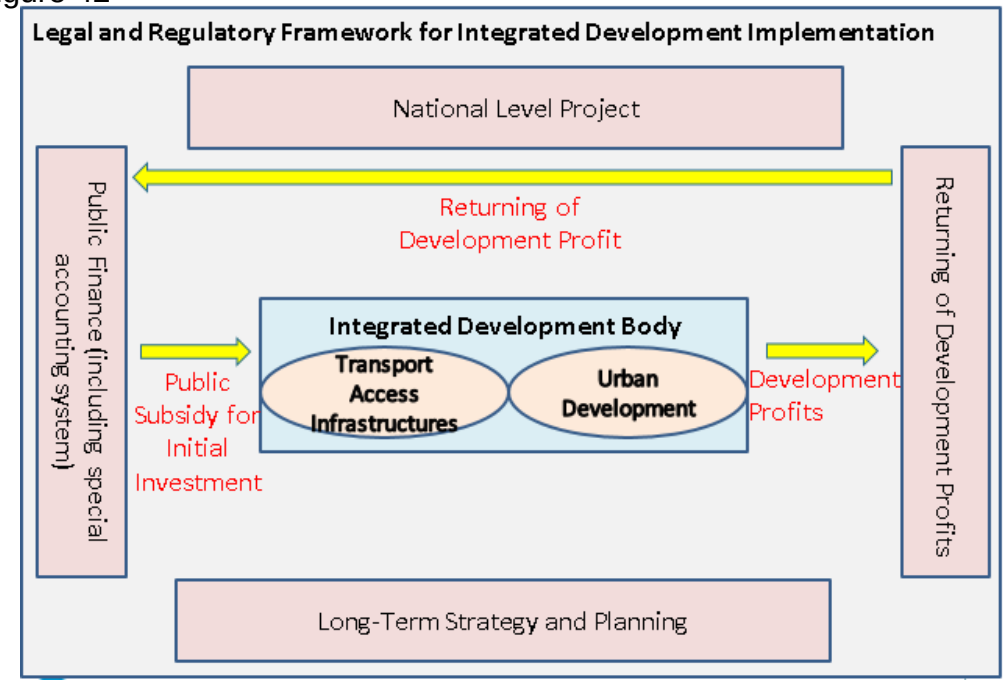
11. Long-Term Framework for Integrated Development Implementation

Figure 41



11. Long-Term Framework for Integrated Development Implementation

Figure 42



1. Long-Term Plan/ Strategy

- Setting of blueprint
- To prioritize the design of the implementation system
- To clarify the timing of implementation

2. Integrated Planning/ Development Body

- (At the beginning of the project) the nation will be in charge of the promotion of the project.
- Planning of integrated plan/ body by utilizing cross-subsidisation or the returning of development benefits.

3. Budget/ Financial Framework

- Establishment of a special accounting system (linked to the long-term plans, implementing bodies, and specific financial resources).
- Establishment of "land readjustment project system" or similar system with "integrated land adjustment" to bear the burden of transport access infrastructure development.
- Establishment of development banking system / long-term credit banking system (substituted by the capital market development in the future)

11. Long-Term Framework for Integrated Development Implementation

11.3.2 Image of Long-Term Framework

Table 40

	1st Phase (2021-35)	2nd Phase (2036-50)	3rd Phase (2051-2065)
1 . Long-Term Strategy/ Program	1.1 Creation of blueprint 1.2 Creation of long-term strategy /program	1.3 Monitoring/ rolling of long-term strategy and development plan	
2 . Integrated Development Plan and Body	2.1 Planning of integrated development plan and body 2.2 Establish of integrated development plan and body	2.3 Operation of urban development and transport access infrastructures under the development plan and body	2.4 Dissolution, separation or privatization of the integrated development plan and body (the timing is undecided)
3 . Budgets/ Financial Sources	3.1 Establishment of specific financial recourses (special accounts, law for integration, and long-term bank credit system	3.2 To maintain the specific financial resources	3.3 Sunset of specific financial resources by substituted by the capital market
4. Legal and Regulatory Framework	4.1 Legal and regulatory frameworks for 1 to 3		

12. Toward Realisation

- To position the development of smart cities and related infrastructure in the Thilawa area as a national project
- To establish a mechanism for the implementation of the project (national level promotion mechanism)
- To secure a budget (including grant aid from JICA, ADB, WB, etc.) for planning and conducting various surveys for the realisation of the project, and to prepare for the sequential implementation of the surveys.
- To carry out a series of basic surveys (survey, landownership, geological survey, environmental survey, etc.)
- To update the urban plan for the Thilawa area (including securing land for roads, railways, etc.)
- To develop a series of infrastructure plans (master plan including transport, water, sewage, electricity, telecommunications, utilities, etc.)
- To draw up a financing plan for the implementation of the project and to raise funds in sequence.

Figure 43

Image of Railway-road Bridge Crossing Bago River

Railway: Route A, Road: ALT 5, Viewpoint from Thanlyin side

Figure 44

Image of Railway Bridge and Road Bridge Crossing Bago River

Railway: Route A, Road: ALT 1
Left: Yangon-Thanlyin Urban Railway, Right: Yangon-Thanlyin Urban Expressway

（様式２）

二次利用未承諾リスト

報告書の題名
The Study on Thilawa Smart City and Yangon - Thanlyin Transport Corridor Development
Summary Report

委託事業名
令和2年度質の高いインフラの海外展開に向けた事業実施可能性調査事業

受注事業者名
株式会社オリエンタルコンサルタンツグローバル

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3	Figure 2	Urban Structure Plan in Yangon Region (2040)
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5	Figure 4	Land use planning and development concepts
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