APPENDIX 1-2

PRESENTATION MATERIAL(2)
**AGENDA OF DISCUSSION**

1. INTRODUCTION OF YUEX STUDY TEAM UNDER YUTRA STUDY

<table>
<thead>
<tr>
<th></th>
<th>2014</th>
<th>2015</th>
<th>2017</th>
<th>2022</th>
</tr>
</thead>
<tbody>
<tr>
<td>We are here now.</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Supplemental Study (6 months)</td>
<td></td>
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<tr>
<td>Feasibility Study (9 months)</td>
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<tr>
<td>Selection of Consultant (6 months)</td>
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<tr>
<td>Detailed Design (18 months)</td>
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<tr>
<td>Tender/Construction (48 months)</td>
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</tbody>
</table>

2. INTRODUCTION OF THE PROPOSED PROJECT (YUEX AND YORR)

3. INQUIRIES TO MOC FROM THE TEAM
   3.1 General comments to the YUEX (positive or negative)
   3.2 Development plan of MOC regarding the urban expressway
   3.3 Possibility of J-ODA funding

4. INQUIRIES FROM MOC TO THE TEAM

5. FURTHER SCHEDULE

6. OTHERS IF ANY

**What is YUEX?**

**OUTLINE OF YUEX**

(Wai Za Yantar Road)
1. BACKGROUND OF THE PROPOSAL

1) ROAD NETWORK PROPOSED IN SUDP (2013)

Construct high-capacity road network to cope with future traffic demand.

Radial-circumferential road system is intended.

1) The outer ring road located in suburban area (less land acquisition issue) was proposed to enhance decentralization of the urban area.
2) The inner ring road was proposed as an additional option for further study.

2) ROAD NETWORK PROPOSED IN YUTRA (2014)

Traffic demand forecast was conducted and it concluded that;

1) The inner ring road network shall be strengthened to absorb the recent rapid increased traffic demand.
2) The outer ring road shall be strengthened later depending on the development of the suburb area.

2. OUTLINE FEATURES OF YUEX

1) STRATEGIC LAYOUT OF YUEX TOWARDS 2025

4 lanes Urban Expressways on Existing 6 lanes Aarterial roads
- Expansion of Road Capacity in the dense built-up area
- Elevated viaduct structure “on” the existing wide arterial roads

2) CROSS SECTIONAL CONCEPT OF YUEX

6 lanes road (width of each lane is approx. 3.6m.)

IMAGE OF ELEVATED EXPRESSWAY

Before: Traffic Jam
(After: Free Flow)
2) CROSS SECTONAL CONCEPT OF YUEX

(At-graded Section)
For non-buildup area, at-graded expressway can be proposed.

(Elevated Section)
For buildup area, elevated viaduct expressway is proposed.

Proposed route (arterial roads) is still not so congested and the construction of the viaduct could be possible now...

3) TRAFFIC DEMAND FORECAST BY YUTRA (2014)

The results of the traffic demand forecast indicated:
1) Most of the major arterial roads will be saturated in "DO-NOTHING" case.
2) The capacity of the arterial roads need to be extended but the widening will be a difficult measure due to land acquisition.
3) In YUTRA/SUDP, "viaduct ring road" was proposed to extend the capacity of the arterial roads. Also the modal split to MRT was considered in the traffic analysis.
4) NUMBER OF LANES FOR YUEX

YUEX
YANGON URBAN EXPRESSWAY

Due to land constraint, “Diamond Type” is proposed for YUEX.

6) TYPE OF INTERCHANGES (ON/OFF RAMPS)

YUEX
YANGON URBAN EXPRESSWAY

Due to land constraint, “Diamond Type” is proposed for YUEX.

IC layout of YUEX
### 3. Proposed Alignment of YUEX

**General Features and Applied Cross Sections**

<table>
<thead>
<tr>
<th>Sections (Length)</th>
<th>General Features and Applied Cross Sections</th>
</tr>
</thead>
<tbody>
<tr>
<td>N Section 16.5km</td>
<td>Extension from the existing expressway. Mostly in non build-up area and the cross sections (Figure 2.5.2 and 2.5.3) are applied. (Sta.0+000-16+500)</td>
</tr>
<tr>
<td>R1 Section 14.5km</td>
<td>Mostly in build-up area and the elevated cross section (Figure 2.5.1) is applied. (Sta.16+500-31+000)</td>
</tr>
<tr>
<td>E Section 6.9km</td>
<td>Mostly in build-up area and the elevated cross section (Figure 2.5.1) is applied. (Sta.31+000-37+900)</td>
</tr>
<tr>
<td>R2 Section 24.3km</td>
<td>Mostly in build-up area and the elevated cross section (Figure 2.5.1) is applied.</td>
</tr>
<tr>
<td>W Section 7.9km</td>
<td>Mostly in non build-up area and the cross sections (Figure 2.5.2 and 2.5.3) are applied.</td>
</tr>
<tr>
<td>M Section 6.7km</td>
<td>Mostly in build-up area and the elevated cross section (Figure 2.5.1) is applied.</td>
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<tr>
<td>S Section 9.5km</td>
<td>Mostly in build-up area and the elevated cross section (Figure 2.5.1) is applied.</td>
</tr>
</tbody>
</table>

*Key Location Map*
### 4. Proposed Viaduct Structures

1) Superstructure for Standard Section

Pre-casting PC Girder which is fabricated at factory and/or girder casting yard under quality control are extracted since many number of girders has to be fabricated in short time.

- PC-I Composite Girder: 35m
  (applicable length: 25~40m)
- PC-U Composite Girder: 40m
  (applicable length: 35~60m)
- Steel Box Girder: 50m
  (applicable length: 40m~)

![Superstructure for Standard Section](image)

<table>
<thead>
<tr>
<th>PC-I Composite Girder</th>
<th>PC-U Composite Girder</th>
<th>Steel Box Girder</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Spans</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>35m</td>
<td>40m</td>
<td>50m</td>
</tr>
<tr>
<td><strong>Structural Feature</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre-casting section is precasted and erected at site. Pre-casting PC slab is used.</td>
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</tr>
<tr>
<td><strong>Erection Method</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Track Crane and beam is standard section and Ernest Girder at narrow section.</td>
<td>Track Crane and beam is standard section and Ernest Girder at narrow section.</td>
<td>Track Crane and beam is standard section and Ernest Girder at narrow section.</td>
</tr>
<tr>
<td><strong>Costs</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>1.15</td>
</tr>
<tr>
<td><strong>Maintenance</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>It is necessary to replace Expanding pins and Bearing shoes once 10-20 years.</td>
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</tr>
<tr>
<td><strong>Technical Transfer</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10%</td>
<td>10%</td>
<td>10%</td>
</tr>
<tr>
<td><strong>Evaluation</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recommended</td>
<td>Recommended</td>
<td>Recommended</td>
</tr>
</tbody>
</table>

![Sketch of PC-I Composite Girder](image)

Source: Japan Pre-stressed Concrete Contractors Association
2) Superstructure for Special Section

<table>
<thead>
<tr>
<th>Type of Bridge</th>
<th>Applicable Span Length</th>
<th>PC Concrete</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continuous Box</td>
<td>Concrete Slab, Steel Slab</td>
<td>40m - 80m, Steel plate Deck</td>
</tr>
<tr>
<td>Girder</td>
<td>Beam, Steel Box Girder</td>
<td>40m ~ 70m, Cantilever Erection</td>
</tr>
</tbody>
</table>

Steel Box Girder less than 70-80m span length, generally Steel Box Girder with RC slab becomes economical than Steel Box Girder with steel Plate deck.

3) Sub-structure for Standard Section

The shape of sub-structure adopts 1-Column & T-shape Type. In this case, there are the following advantages.
- Detour procedure is simple due to 1 step detour.
- Fence is straight and fixed during construction period for Pier Column and Foundation
- Due to smooth line of fence, traffic flow is smooth.
**Sub-structure for Standard Section**

Rotation Steel Pile type is selected as the recommended foundation type at area where is difficult to secure enough construction yard.

However, as for PC Pile and PC Well foundation, those foundation type also can be the eco-friendly type and construction cost might be cheaper than other foundation types in future, when fabrication factory of PC Pile and PC Well is established in Yangon.

Therefore, more detailed comparison study shall be carried out in consideration of the possibility of application of PC pile and PC Well in next stage.

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**Sub-structure for Standard Section**

Eco-friendly Method:
- More-advanced method
- No bentonite circulation system
- Site becomes very clean. And, no dust is expected

Compact Shape
Skin friction becomes bigger by compressing surrounding soil.

Sketch of Screw Steel Pile
4. OPERATION AND MAINTENANCE OF EXPRESSWAY

1) Traffic Control

Current Situation of Yangon-Mandalay Expressway
- Traffic Control (information collection / provision) is not conducted.
- CCTV camera is deployed at (6) toll gate, only monitored by toll collection offices.

Proposal in YUEX
- Establishment of “Traffic Control Centre (TCC)” and appropriate “Traffic Management”
- Suitable Traffic Control System should be developed
- Education/Training for traffic control should be conducted

Traffic Information Collection
- Traffic Counter
- Weather Information

Traffic Management Centre
- JARTIC
- Japan Road Traffic Information Center

Traffic Information Provision
- VMS
- Highway Radio
- TV, Radio
- Smartphone
- Other expressway companies
- MLIT etc.

2) Toll Collection

Current Situation of Yangon-Mandalay Expressway
- Toll fee is collected by manual base
- Study of ETC Installation is conducted by PW

Proposal in YUEX
- Installation of “Electric Toll Collection System” and deployment of ETC facilities
- Suitable organization structures for ETC should be developed
- Education/Training for toll collection should be conducted

Reference
- Development of Ring Roads
- Safety Facilities
Effects of ETC installment by Japanese Experiences

Causes of congestion on expressways

- Merging Point: 32%
- Toll Plaza: 31%
- Sag & Tunnel: 40%
- Other: 7%

31% of congestion is due to inadequate capacity at toll gates.

Effects of ETC installation

Time Loss  ETC Usage

Before

98% decrease

After

3) Inspection and Maintenance

Current Situation of Yangon-Mandalay Expressway
- Visual base inspection only
- Simple routine maintenance (Cleaning etc.) and rehabilitations of pavement etc.

For appropriate inspection and maintenance for YUEX
⇒ Suitable and well-planned inspection / maintenance framework should be established
⇒ Properties and condition of road structures should be managed by database system
⇒ Education / Training for inspection / maintenance should be conducted

Inspection Framework

BMS/PMS and Strategic Maintenance

Inspection and Maintenance

Example of Inspection and Maintenance of Japanese Expressway

Bridge Inspection

Seismic Retrofitting

Pavement Inspection

Cleaning (Tunnel)

Rehabilitation of Concrete damaged by Salt

(Reference) Development of Ring Roads

3 Circle, 9 Radial Expressways

In Tokyo Metropolitan Area

- Reduce Traffic in Urban Area

Decentralize Traffic from Urban to Suburb Area

Move Directly between Suburb Areas

Keep Diversion under Emergency Situation
(Reference) Safety Facilities

Example of Safety Facilities on Japanese Expressway

Not only safety facilities, but also many measures are required to archive safe expressway operation.

<table>
<thead>
<tr>
<th>Expressway</th>
<th>Length (km)</th>
<th>No of Deaths</th>
<th>Traffic Volume</th>
<th>Year</th>
<th>Deaths per Billion Vehicle KM Traveled</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yangon-Mandalay</td>
<td>587</td>
<td>78</td>
<td>Approx. 4,500</td>
<td>2012</td>
<td>40.3</td>
</tr>
<tr>
<td>NEXCO East</td>
<td>3,720</td>
<td>70</td>
<td>Approx. 26,500</td>
<td>2012</td>
<td>1.5</td>
</tr>
</tbody>
</table>